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Technical Report Overview

Report: 2019 Annual Report: Elk Valley Regional and Site-Specific Groundwater Monitoring Programs

Overview: This report presents the 2019 results of the regional groundwater monitoring program and the site-specific programs at Fording River Operations, Greenhills Operations, Line Creek Operations, Elkview Operations, and Coal Mountain Operations required under Permit 107517. This report summarizes the results of groundwater quality in 2019 and compares them to relevant screening values. It also compares groundwater chemistry to nearby surface water chemistry to understand groundwater transport pathways.

This report was prepared for Teck by SNC-Lavalin Inc.

For More Information

If you have questions regarding this report, please:

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Future studies will be made available at teck.com/elkvalley



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2019 Annual Report: Elk Valley Regional and Site-Specific Groundwater Monitoring Programs

Fording River Operations

Greenhills Operations

Line Creek Operations

Elkview Operations

Coal Mountain Operations

Regional Groundwater Monitoring Program

VOLUME II OF III

Prepared for:

Teck Coal Limited

March 31, 2020

Internal Ref: 671557 › Final › V1

Appendix I

Government Approval Letters



ENV Approval Conditions and Previous Recommendations

The Ministry of Environment & Climate Change Strategy (ENV) assessment letters for the SSGMP updates and annual reports are included in this Appendix. Additionally, the ENV approval letters for the 2017 RGMP and the 2018 SSGMP updates are also included in this Appendix. Recommendations from the assessment letters and relevant recommended approval conditions related to the 2018 Annual reports for each mine site are outlined below. Additionally, recommendations from the annual and update reports are listed below.

ENV Recommendations from the Assessment Letters

FRO SSGMP

Recommendations provided by ENV regarding the 2018 FRO SSGMP Annual Report are summarized in Table I-A along with the location where comments were addressed.

Table I-A: FRO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment
The borehole logs of all the wells included in the updated monitoring network should be included as an appendix to the reports.	Appendix IV.
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Figures FR-1 to -3; FR-10 to -13.
Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.	Figure FR-9. Groundwater levels in the POTWELLS area currently not available.
Review the groundwater elevation logger data at FR_HMW1S and FR_HMW1D, as the time plots show abrupt changes between August 2016 and October 2017, which may lead to mis-representative vertical gradients. Correct the automated data where appropriate, to be consistent with the groundwater level manual measurements.	Addressed in Teck June 7, 2019 Response.
Outline the watershed divides of all the sub-catchments located in the FRO permitted area.	Drawing 6.
Outline the losing and gaining reaches of the Fording River and tributaries, where these can be inferred, on the map showing groundwater level contours.	Drawing 11.
Add maps showing the potential sources and pathways identified for each sub-catchment.	Drawing 6.

Table I-A Cont'd): FRO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.	Addressed in Teck June 7, 2019 Response.
Use the Kendall Test to identify trends in the Cl concentration time series.	Sections 4.3.2.2 and 4.3.3.2.
Add former monitoring well FR_HMW4 on the map (labelled differently from the current wells), so that historical data collected from this well can support interpretation.	Drawing 6.

GHO SSGMP

Recommendations provided by ENV regarding the 2018 FRO SSGMP Annual Report are summarized in Table I-B along with the location where comments were addressed.

Table I-B: GHO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Figures GH-1, GH-4, GH-5, GH-11 to -14.
Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.	Figure GH-6 (pumping rates only). Groundwater levels in the pumping wells are currently not available.
Outline the watershed divides of all the sub-catchments located in the GHO permitted area.	Drawing 7.
Outline the losing and gaining reaches of the Elk River, Fording River, Greenhills Creek and respective tributaries, where these can be inferred, on the map showing groundwater level contours.	Drawing 11.
Add maps showing the potential sources and pathways identified for each sub-catchment.	Drawing 7.
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.	Addressed in Teck June 7, 2019 Response.
Use the Kendall Test to identify trends in the Cl concentration time series.	Sections 5.3.2.2, 5.3.3.2 and 5.3.4.2; Appendix VII.

LCO SSGMP

Recommendations provided by ENV regarding the 2018 LCO SSGMP Annual Report are summarized in Table I-C along with the location where comments were addressed.

Table I-C: LCO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Appendix B of Golder's 2019 SSGMP report included in Appendix II.
Outline the watershed divides of all the sub-catchments located in the LCO permitted area.	Figure 2-5 of Golder's 2019 SSGMP report included in Appendix II.
Outline the losing and gaining reaches of the Elk River, Fording River, Line Creek and respective tributaries, where these can be inferred, on the map showing groundwater level contours.	Figures 4-1 and 4-2 of Golder's 2019 SSGMP report included in Appendix II.
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.	Addressed in Teck June 7, 2019 Response.
Use the Kendall Test to identify trends in the Cl concentration time series.	Trend analyses completed for Q1 and Q4 data at four locations and one RGMP location in Study Area 7 in Appendix E.

EVO SSGMP

Recommendations provided by ENV regarding the 2018 EVO SSGMP Annual Report are summarized in Table I-D along with the location where comments were addressed.

Table I-D: EVO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment
The borehole logs and installation diagrams of all the wells included in the updated monitoring network should be included as an appendix to the reports.	Appendix IV.
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Figures 1, 2, 9, 11, 12, 13, 14, 15, 21.
Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.	Figure 21.
Outline the watershed divides of all the sub-catchments located in the EVO permitted area.	Drawing 9.
Outline the losing and gaining reaches of the Elk River, Michel Creek and tributaries, where these can be inferred, on the map showing groundwater level contours.	Flow Accretion studies have not been completed. Discussion of gaining and losing reaches is discussed in Section 7.3.6.
Add maps showing the potential sources and pathways identified for each sub-catchment.	Drawing 9.
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed. Also increase vertical scale to ease visual interpretation. Update cross-section BB' (drawing 653245-004) to include the information from Sparwood Well #4 (replacement of Well #3, also referred to as RG-DW-03-04).	Addressed in Teck June 7, 2019 Response.

Table I-D (Cont'd): EVO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment
Use the Kendall Test to identify trends in the Cl concentration time series.	Sections 7.3.3.2, 7.3.4.2, and 7.3.5.2; Appendix VII.
Label provincially mapped aquifer 1080 IA on the drawings and include a description of provincially mapped aquifer 1082 IIC in the report.	Drawing 12.

CMO SSGMP

Concordance with the recommendations provided by ENV regarding the 2018 CMO SSGMP Annual Report is summarized in Table I-E.

Table I-E: CMO ENV Recommendations and Concordance

ENV Recommendation	Where Addressed and/or Comment
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Figures CM-1, CM-2, CM-3, CM-10, CM-11, CM-12.
Outline the watershed divides of all the sub-catchments located in the CMO permitted area.	Drawing 10.
Outline the extent of the valley bottom sediments along Corbin and Michel Creek.	Drawing 3.
Outline the losing and gaining reaches of Corbin and Michel Creek, where these can be inferred, on the map showing groundwater level contours.	Vertical hydraulic gradients indicative of groundwater-surface water interaction are discussed in Sections 8.3.3.1 and 8.3.4.1. Gaining and losing reaches will be evaluated following completion of a flow accretion study for Michel Creek planned for completion in 2020.
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.	Addressed in Teck June 7, 2019 Response.
Replace the groundwater level profile located between the shallow and deep measured levels shown on the cross-sections with a phreatic and potentiometric profile. Also review the groundwater profile on cross-section KK' that suggests a divide at the location of CM_MW7.	Drawings 48, 49, 50, 51, 52, 53, 54 and 55.
Use the Kendall Test to identify trends in the Cl concentration time series.	Sections 8.3.3.2 and 8.3.4.2; Appendix VII.

RGMP

The 2018 RGMP Annual report was reviewed and accepted by ENV in an approval letter dated February 19, 2020 included in this Appendix. There were no specific recommendations from the review of the 2017 and 2018 Annual RGMP reports.

2018 Annual Report Recommendations by Program

The following recommendations provided for each operation were incorporated or assessed in this year's annual reports.

FRO SSGMP

The following recommendations were developed in the 2018 Annual Report for FRO (SNC-Lavalin, 2019b):

- › For nested wells, monitor wells on the same day, one right after the other, and collect manual depth to groundwater measurements for each well prior to purging rather than purging and sampling one well and then moving to the paired well.
- › Analyze trip blanks for dissolved organic carbon (DOC) and the same dissolved metals package as site samples.
- › When possible, avoid collecting samples in back to back months between quarter (i.e., June of Q2 and July of Q3) and instead evenly space sampling events throughout the year.
- › Complete a quality assurance/quality control (QA/QC) on laboratory results as they come in to identify hold-time and other errors that may arise to rectify in the subsequent sampling event.
- › Wells FR_KB-1, FR_KB-2, and FR_KB-3A/B, installed in the Kilmarnock alluvial fan in 2018 should be evaluated as a possible replacement for FR_TT43.
- › Once approved, implement the 2018 SSGMP Update.
- › Continue to monitor increases of sulphate and dissolved selenium in reference well FR_HMW5 and reassess this well as a reference well under the RGMP.

The 2018 FRO SSGMP Update (SNC-Lavalin, 2019g) also identified data and recommendations in the SSGMP program. The following summarizes recommendations to be addressed in the annual SSGMP report:

- › Install new background well to replace FR_HMW5 as a background well. Once this nested well is installed, it should be incorporated into the SSGMP.
- › Install a new monitoring well adjacent to surface water station FR_HC1, downgradient of FR_HMW1S/D and upgradient of the confluence of Henretta Creek and the Fording River.
- › A review of data collected from wells installed as part of other programs (i.e., FR_TBSSMW-1/2, FR_TB-1A/B, FR_TB-2A/B) should be completed as part of the annual report.
- › Deployment of dataloggers in FR_MW-1B, FR_09-01-A/B, FR_09-02-A, FR_09-04-A, FR_KB-1, FR_KB-2, and FR_KB-3A/B and upload of data during quarterly monitoring and sampling.
- › Add monitoring wells FR_GCMW-1B, FR_GCMW-2, FR_TBSSMW-1, FR_TBSSMW-2, FR_KB-1, FR_KB-2, FR_KB-3A/B, and FR_MW-SK1-A/B to the monitoring and sampling program.
- › Install a flow rate meter on the Greenhouse Wells so that pumping rates can be monitored. Collect continuous water level measurements from FR_GH_WELL3, or another FR_GHHW, and incorporated into the program. Assess and select Test Wells in the Potable Wells area for continuous water level measurement. If Test Wells are not suitable, then new monitoring wells are recommended.
- › As ongoing programs at FRO are completed, the current monitoring well network and surface water locations for the SSGMP should be re-evaluated and relevant locations should be included.
- › Monitoring frequency should be reviewed on an annual basis to assess adequacy to address the seasonal variability and to address whether frequency should be reduced if little to no variability is observed.

GHO SSGMP

The following recommendations were developed in the 2018 Annual Report for GHO (SNC-Lavalin, 2019d):

- › Once approved, implement the 2018 SSGMP Update.
- › Complete hydraulic conductivity testing at monitoring wells which have not previously been tested (GH_MW-RLP-1D and GH_MW-TD) [Note the 2018 SSGMP Update recommends that GH_MW-RLP-1D be removed from the program and replaced by a shallow groundwater monitoring well and based on artesian conditions at GH_MW-TD, hydraulic conductivity testing at this well will not be completed].
- › For nested wells, monitor wells on the same day, one right after the other, and collect manual depth to groundwater measurements prior to purging either well rather than purging and sampling one well and then moving to the well pair.
- › Implement the new data logger deployment procedures to ensure that continuous water level measurements are properly obtained from select monitoring wells.
- › Field filter and preserve groundwater samples for analysis of dissolved metals and dissolved organic carbon (DOC).
- › Use trip blanks and analyze for parameters listed in the 2014 SSGMP and the 2018 SSGMP Update once approved.
- › Ensure groundwater samples are packed in coolers in such a way to minimize sample loss during transport.
- › Continue discussions with the laboratory on the best procedures to minimize hold-time exceedances.
- › Complete a QA/QC on laboratory results as they come in to identify hold-time and other errors that may arise to rectify in the subsequent sampling event.
- › As recommended in the 2018 SSGMP Update, attempt to re-develop monitoring well GH_MW-PC. High field turbidity values have been measured in this well in addition to variable field parameter readings. If Teck suspects the integrity of the monitoring well may be compromised, the well should be decommissioned according to the Groundwater Protection Regulation (GWPR) and re-installed in a suitable location.

The 2018 GHO SSGMP Update (SNC-Lavalin, 2019h) also identified data and recommendations in the SSGMP program. The following summarizes recommendations to be addressed in the annual SSGMP report:

- › As on-going programs at GHO are completed, the current monitoring well network and surface water locations for the SSGMP should be re-evaluated and relevant locations should be included.
- › Collect additional data to adequately assess capture zones of the four GHO supply wells [GH_POTW09, GH_POTW10, GH_POTW15, and GH_POTW17] to evaluate potential impacts on groundwater quantity as well as confirm the low potential for downward migration of Cl from surface water.
- › Incorporate data from two nested wells (GH_MW-MC1S/D and GH_MW-MC2S/D), completed as part of the CPX2 Project, into in the GHO SSGMP.
- › Incorporate additional studies as part of the CPX2 Project to address the absence of deep groundwater data around Leask Pond. It is also recommended to install data loggers in new wells.
- › Incorporate additional studies completed as part of the CPX2 Project to address the absence of shallow groundwater data around Wolfram Pond.

- › Incorporate information from the groundwater-surface water study for the Elk River Side Channel, completed under the Local Aquifer Effects Monitoring Program (LAEMP), to address the gap at the Elk River side channel and tributaries on the west side of GHO.
- › Incorporate results from the Regional Water Quality Model (RWQM) mass balance program to address the unknown geochemical mechanism for the year-round attenuation of selenium and nitrate in the Elk River valley bottom.
- › Incorporate results from the RGMP to address the unknown groundwater conditions to the north of GH_GA-MW-1.
- › Incorporate results from studies associated the CPX2 Project and the groundwater – surface water interaction assessment at Greenhills Creek to address the absence of groundwater data to the east of the tailings storage facility (TSF) [Note the CPX2 Project has been split and is now two separate programs: CPX2 and the TSF Permitting Project. This study is part of the TSF Permitting Project].
- › Monitoring frequency should be reviewed on an annual basis to assess adequacy to address the seasonal variability and to address whether frequency should be reduced if little to no variability is observed.

LCO SSGMP

The following recommendations were developed in the 2018 Annual Report for LCO (Golder, 2019b):

- › Pressure transducers to be deployed as deep as possible to maximize submergence time.
- › Reduce the sampling frequency from quarterly to bi-annual as seasonal trends become established, with sampling occurring during freshet between May and June when water levels are highest and during winter between November and February when water levels are lowest. Newly installed wells should be sampled quarterly for at least two years to evaluate seasonality.

The 2018 LCO SSGMP Update (Golder, 2019f) also identified data and recommendations in the SSGMP program. The following summarizes recommendations to be considered for improvement of the SSGMP at LCO:

- › QA/QC performance to be reviewed so findings may be implemented in next years program for continuous improvement.
- › Perform Mann-Kendall analysis on the water quality dataset to inform sampling frequency wells in the monitoring network.
- › Continue using the data collection and analytical methods established in 2017 Annual Report (Golder, 2018).
- › The number of wells sampled as part of the SSGMP in the Process Plant area should be reduced, with continued monitoring and sampling at LC_PIZP1103 and LC_PIZP1104, and continued water level monitoring (without sample collection) at LC_PIZP1101 and LC_PIZP1105. Substituting LC_PIZP1104 for LC_PIZP1101 in the RGMP should also be considered as concentrations of Cl are higher in the latter.
- › Installation of nested of monitoring well pairs (shallow and deep completed within overburden) should be considered at the following locations based on the trigger criteria specified below, which were not met in 2018.
- › Downgradient of monitoring station LC_LC4 on the edge of the Fording River floodplain where Line Creek may lose water to ground as it flows over sediments mapped as glaciofluvial within Study Area 5 of the RGMP. To be installed if concentrations of dissolved selenium and at least one other Cl in groundwater from RGMP Study Area 7 well RG_DW-02-20 show increasing trends by Mann-Kendall

analyses that cannot be explained by mixing between the Elk River and the valley-bottom aquifer, which would suggest a down-valley groundwater pathway from the Process Plant and/or Coarse Coal Rejects (CCR).

- › Downgradient of the pond south of the Process Plant and CCR along a potential flowpath to the Elk River within its floodplain within Study Area 6 of the RGMP. To be installed if concentrations of dissolved selenium and at least one other CI in groundwater from RGMP Study Area 7 well RG_DW-02-20 show increasing trends by Mann-Kendall analyses that cannot be explained by mixing between the Elk River and the valley-bottom aquifer, which would suggest a down-valley groundwater pathway from the Process Plant and/or CCR.
- › Downgradient of monitoring station LC_DC1 where Dry Creek flows over glaciofluvial sediments in the Fording River valley bottom, in Study Area 2 of the RGMP. To be installed if regional groundwater monitoring wells GH_POTW10, GH_POTW15, GH_POTW17, and GH_MW_RLP-1D collectively show an increase in CI concentrations that cannot be explained by mixing between the Fording River and the valley-bottom aquifer and which suggest a down-valley groundwater pathway from Dry Creek.

EVO SSGMP

The following recommendations were developed in the 2018 Annual Report for EVO (SNC-Lavalin, 2019c):

- › Ensure field and trip blanks are analysed for the same parameters to provide comprehensive comparisons.
- › Ensure all parameters stabilize before sampling and avoid sampling if bubbles present in tubing.
- › Ensure dataloggers are reinstalled after each sampling event to the specified depth. Reviewing data after each datalogger download would identify errors and allow for timely correction.
- › Remove the nested well EV_ER1gwS/D from the SSGMP and transition to RGMP as indicated in the 2018 SSGMP Update (SNC-Lavalin, 2019i).
- › Evaluate whether newly-installed groundwater monitoring wells in the Michel Creek Valley should be included in SSGMP monitoring.
- › Once approved, implement the 2018 SSGMP Update.

The 2018 EVO SSGMP Update (SNC-Lavalin, 2019i) also identified data and recommendations in the SSGMP program. The following summarizes recommendations to be addressed in the annual SSGMP report.

- › Conduct hydraulic conductivity testing at EV_series wells and subsequent data analysis.
- › Deployment of data loggers at EV_MW_MC2B, EV_MW_MC1B, EV_MW_GT1B, and EV_BC1B and upload data during quarterly monitoring and sampling. Conduct data reduction for use in reports.
- › Discontinue monitoring and sampling at EV_MCgwS and EV_ECgw during Q1 as these locations are frozen.
- › To address the gap of shallow groundwater quality in the vicinity of Goddard Creek Sedimentation Pond, complete desktop assessment. This gap was also identified in the RGMP. If necessary, conduct an intrusive investigation downgradient of the pond.
- › To address the gap downgradient of the South Pit Sedimentation Pond, complete a desktop assessment. This gap was also identified in the RGMP. If necessary, conduct an intrusive investigation in an accessible area.
- › To address the absence of continuous water level data and pumping rates for supply wells, pumping rates will be recorded and continuous water level data from nearby monitoring wells will be evaluated. If they are not suitable, additional monitoring wells may need to be installed adjacent to the supply well.

- › As ongoing programs at EVO are completed, the current monitoring well network and surface water locations for the SSGMP should be re-evaluated and relevant locations should be included.
- › Monitoring frequency should be reviewed on an annual basis to assess adequacy to address the seasonal variability and to address whether frequency should be reduced if little to no variability is observed.

CMO SSGMP

The following recommendations were included in the 2018 Annual Report for CMO (SRK, 2019b):

- › Continue quarterly monitoring at all groundwater monitoring locations.
- › Ensure that one travel blank is included in each sampling survey. This will help distinguish between sample contamination and laboratory error.
- › Review sampling procedures to minimize potential contamination.
- › Closely monitor parameters that appear to be increasing in certain wells. This includes fluoride in CM_MW1-SH, barium in CM_MW1-DP, and selenium in CM_MW5-SH.

Recommendations included in the 2018 CMO SSGMP Update (SRK, 2018b) that were pertinent to future annual SSGMP reporting included the following:

- › Continue monitoring as per the original groundwater monitoring plan (SRK, 2015a), except for the removal of analysis of total metals for groundwater samples.
- › Install and monitor an additional shallow monitoring well downgradient of the Main Interceptor Sedimentation Ponds.
- › Install and monitor an additional nested monitoring well downgradient of the Middle Mountain CCR.
- › Monitor flow and water quality at four additional surface water stations along Michel Creek.

RGMP

The following recommendations were included in the 2018 Annual RGMP (SNC-Lavalin, 2019e):

- › Once approved, implement the 2017 RGMP Update.
- › Complete hydraulic conductivity testing at GH_MW-RLP-1D.
- › Monitor pumping rates and water levels in supply wells GH_POTW09, GH_POTW10, GH_POTW15, and GH_POTW17 at GHO upon completion of an assessment of the feasibility of installing dataloggers.
- › A re-survey of the wells at CMO to top of pipe casing should be completed.
- › If concentrations of Cl at EV_RCgw remain elevated, additional investigations may be required to determine the possible source and spatial extent of the elevated Cl.
- › Replace the reference well FR_HMW5 as a reference well under the RGMP as mining activity may be influencing groundwater chemistry at this location. The installation of a suitable replacement well should follow a holistic review of background monitoring locations in the Elk Valley. In the meantime, FR_HMW5 should continue to be monitored.

Monitoring and Sampling Procedures:

- › When possible, collect samples at least 60 days after the last sampling event.
- › For nested wells, monitor wells on the same day, one right after the other, and collect manual depth to groundwater measurements prior to purging either well rather than purging and sampling one well and then moving to the well pair.
- › Implement the new data logger deployment procedures to ensure that continuous water level measurements are properly obtained from select monitoring wells.
- › Ensure all parameters stabilize before sampling and avoid sampling if bubbles present in tubing.
- › Review sampling procedures to minimize potential contamination when collecting samples and handling field blanks.
- › Field filter and preserve groundwater samples for analysis of dissolved metals and dissolved organic carbon (DOC).
- › Ensure that one trip blank is included for each sampling event.
- › Attempt to collect field and trip blanks from locations associated with both the RGMP and other associated programs (e.g., Site-specific Groundwater Monitoring Program and/or Regional Drinking Water Program).

Sample Submission, Analysis, and Quality Assurance/Quality Control (QA/QC):

- › Analyze samples (including duplicates, trip, and field blanks) for parameters listed in the 2017 RGMP Update once approved.
- › Continue discussions with the laboratory on the best procedures to minimize hold-time exceedances.
- › Complete a QA/QC on laboratory results as they come in to identify hold-time and other errors that may arise in order to rectify them in the subsequent sampling event.

ENV Approval Letters

RGMP and SSGMP updates were accepted with conditions listed in associated approval letters included in this Appendix.

References

- Golder Associates Ltd., 2019b. *Line Creek Operations Site Specific Groundwater Monitoring: 2018 Annual Report*. Prepared for Teck Coal Limited. Dated March 2019.
- Golder, 2019f Golder Associates Ltd. 2019f. *Line Creek Operations Site Specific Groundwater Monitoring Program 2018 Update*. Prepared for Teck Coal Limited. Dated September 30, 2019.
- SNC-Lavalin Inc. 2019b. 2018 *Site-Specific Groundwater Monitoring Report – Fording River Operations*. Prepared for Teck Coal Limited. Dated March 28, 2019.
- SNC-Lavalin Inc. 2019c. 2018 *Site-Specific Groundwater Monitoring Report – Elkview Operations*. Prepared for Teck Coal Limited. Dated March 28, 2019.
- SNC-Lavalin Inc. 2019d. 2018 *Site-Specific Groundwater Monitoring Report – Greenhills Operations*. Prepared for Teck Coal Limited. Dated March 28, 2019.
- SNC-Lavalin Inc. 2019e. 2018 *Regional Groundwater Monitoring Program Annual Report*. Prepared for Teck Coal Limited. Dated May 16, 2019.

- SNC-Lavalin Inc. 2019g. *Fording River Operations Site-Specific Groundwater Monitoring Program 2018 Update*. Prepared for Teck Coal Limited. Dated September 30, 2019.
- SNC-Lavalin Inc. 2019h. *Greenhills Operations Site-Specific Groundwater Monitoring Program 2018 Update*. Prepared for Teck Coal Limited. Dated September 30, 2019.
- SNC-Lavalin Inc. 2019i. *Elkview Operations Site-Specific Groundwater Monitoring Program 2018 Update*. Prepared for Teck Coal Limited. Dated September 30, 2019.
- SRK Consulting (Canada) Inc. 2015a. *Coal Mountain Operations Load Balance Model*. Prepared for Teck Coal Limited – Coal Mountain Operations. SRK Project No. 1CT017.047. Dated June 2015.
- SRK Consulting (Canada) Inc. 2018b. *Recommendations for Specialty Sampling of Teck's Groundwater Monitoring Wells to Support Assessment of Selenium and Nitrate Reduction in Groundwater for the Instream Sinks Program – DRAFT*. Memorandum prepared for Teck Coal Limited. Dated September 11, 2018.
- SRK Consulting (Canada) Inc. 2019b. *2018 Site Specific Groundwater Monitoring Annual Report: Coal Mountain Operations*. Prepared for Teck Coal Limited. SRK Project No. 1CT017.215. Dated March 27, 2019.



MINISTRY ASSESSMENT REPORT

Report prepared by: Sarah Alloisio, Hydrogeologist – Mining **Date:** April 2, 2019

Statutory Decision Maker: Doug Hill, Regional Operations Director - Mining

File:	107517	Tracking Number:	n/a
Application type:	2017 and 2018 Submission to fulfill the requirements of Sections 9.2.2, 9.2.2.1 and 10.4 in Permit 107517 – Fording River Operations Site-Specific Groundwater Monitoring Program.		
Applicant:	Teck Coal Limited		

1. Executive Summary

This Ministry Assessment Report describes the review and recommendations provided for the 2018 update of the Fording River Operations Site-Specific Groundwater Monitoring Plan (FRO SSGMP) and the 2017 Annual Report of the FRO SSGMP, which were submitted to fulfill the requirement of the Elk Valley Permit (107517). The requirements related to the 2018 Plan are included in Section 9.2.2 (Site-Specific Groundwater Monitoring) and 9.2.2.1 (Fording River) of PE107517 and in the conditions outlined in the Approval letter of the 2015 FRO SSGMP, dated April 18, 2017. The requirements related to the 2017 Annual report are included in Section 10.4 (Groundwater Reporting Requirements) of PE 107517.

The review concludes that the 2018 Plan does not meet several of the permit requirements and approval letter conditions, whereas the 2017 Annual Report meets the requirements. It is recommended that a revised 2018 Plan should be submitted, which fulfills the requirements and approval conditions where gaps have been identified, as shown in Table 1 and 2.

The data gaps identified and the recommendations provided in the 2018 Plan and the 2017 Annual Report are reasonable and should be implemented. Additional data gaps were identified in this review and additional recommendations are provided to address these gaps.

2. Application Request

Approval of the Fording River Operations Site-Specific Groundwater Monitoring Plan (FRO SSGMP), dated October 31, 2018, and of the 2017 FRO Annual Report, dated March 31, 2018.

3. Background Information

In April 2013, Coal Limited (Teck) submitted a site-wide groundwater Monitoring Plan (now SSGMP) for the Fording River Operations following a request from ENV (then Ministry of Environment). The 2013 plan was approved by ENV and included the requirement that a revised plan must be submitted to the Director for approval October 31, 2015 and every three years subsequently. In November 2014, ENV approved the Elk Valley Water Quality Plan and issued an area-based effluent permit (PE 107517) to Teck. Section 9.2.2 of PE 107517 requires Teck to develop and implement Site-Specific Groundwater Monitoring Programs (SSGMPs) for the five mining operations located within the boundaries of area considered under Permit 107517 – Fording River, Greenhills, Line Creek, Elkview and Coal Mountain. Section 9.2.2.1 includes the requirements related to the SSGMP for the Fording River Operations (FRO SSGMP). The first FRO SSGMP was submitted in October 2015 and ENV issued an Approval letter for the Program on April 18, 2017. The conditions included in the Approval Letter required the completion of a hydrogeological assessment to determine the suitability of the Greenhouse Wells and Potable Wells for monitoring, and to improve the characterization of the groundwater system within the alluvial fan in the Kilmarnock Creek drainage. The assessment was required to be submitted by September 30, 2017, and ENV received it on September 28, 2017. The updated version of the FRO SSGMP was due for submission on October 31, 2018, and ENV received it on that date. The 2017 FRO Annual Report was due for submission on March 31, 2018 and was received on that date.

4. First Nations Consultation and ENV Review

The Ktunaxa Nation Council (KNC) was consulted during the review of the FRO SSGMP. KNC provided ENV with the review comments on the 2018 FRO SSGMP and on the 2017 Annual Report for the FRO SSGMP prepared by their QP (Waterline). The comments provided by KNC were carefully reviewed and accounted for in the preparation of this document.

5. Technical Review

The following reports submitted to ENV by Teck Coal Limited (Teck) were reviewed to prepare this document:

- The approval letter dated April 18, 2017 containing the conditions for the 2018 FRO SSGMP update;
- Hydrogeological Assessment, Fording River Operations, Elkford, BC, dated September 28, 2017;
- The FRO Site-Specific Groundwater Monitoring program (FRO SSGMP) dated October 31, 2018;
- The 2017 FRO Site-Specific Groundwater Monitoring Annual Report, dated March 31, 2018;

The following documents provided by KNC were used to support the review:

- Hydrogeological Review, Fording River Operations Site-Specific Groundwater Monitoring Program, dated March 2019;

- Recommendations for the Elkview (EVO), Coal Mountain (CMO), Fording River (FRO), Green Hills (GHO) and Line Creek Operations (LCO) 2017 Annual Groundwater Reports, dated October 5, 2018.

5.1. Concordance of the 2018 FRO SSGMP and the 2017 GHO Annual report with Sections 9.2.2, 9.2.2.1 and 10.4 of Permit 107517

The FRO SSGMP was reviewed to identify whether and to what extent it satisfies the requirements of PE107517, Sections 9.2.2, 9.2.2.1 and 10.4. Concordance to the permit requirements is classified in Table 1 as complete (Y), partially complete (P) or absent (N). No comments are provided in Table 1 for the requirements fulfilled by the Plan.

Table 1 Concordance with PE 107517 requirements

PE 107517 Requirement	Assessment	Concordance
Section 9.2.2		
<i>a. The Permittee must develop and implement a comprehensive groundwater monitoring program at each mine site, prepared by a qualified professional. This program must be conducted to the satisfaction of the Director and must include the following:</i>		Y
<i>i. Characterization of the groundwater system, aquifer characteristics (e.g., hydraulic conductivity and storativity), water quality and connectivity to the surface water system;</i>	A characterization of the heterogeneity of the hydraulic properties in the overburden aquifers is missing, as is a description of groundwater-surface water connectivity and interaction (e.g. spatial distribution of gaining and losing reaches).	P
<i>ii. Characterization of seasonal variability in the groundwater system (quality and quantity).</i>		Y
<i>a.3 Provision of a site specific conceptual model and the information necessary to support the development and verification of water quality predictions for the mine site. The site specific conceptual model shall be provided with the</i>		Y

<p><i>groundwater monitoring plan update on October 31, 2018, and updated with subsequent revisions to the monitoring plan;</i></p>		
<p><i>a.4 Site specific numerical groundwater models may be required to support permitting activities. Numerical models, where required, must consider all available, relevant monitoring data (e.g., groundwater and surface water monitoring, stream flow, and precipitation data) and be developed by a Qualified Professional to meet the intended modelling purpose.</i></p>	<p>Several numerical groundwater models have been developed by Qualified Professionals in the field of Hydrogeology in the FRO area, in support of EA and permit applications. These include the following:</p> <ul style="list-style-type: none"> - Swift Pit EA model (Golder, 2012); - Turnbull South Pit EA model (Golder, 2012); - Lake Mountain Pit model (Condition 2.13 of PE 424) (OHGE, 2015-ongoing); - Swift and Cataract Creek Collection System Seepage models (AMEC, 2017-ongoing); - FRO AWTF-S intake, Kilmarnock alluvial fan model (Golder, 2018-ongoing). <p>These numerical models require the development of a robust underlying conceptual model to be reliable prediction tools. The conceptual models underlying the existing numerical models would inform the Conceptual Site Model for the FRO area if they were integrated with it.</p>	<p>Y</p>
<p>9.2.2.1 Fording River Operations</p>		
<p><i>b. Groundwater monitoring must be conducted in accordance with the approved plan, dated April 4, 2013 with addendum dated January 2, 2014. A revised plan must be submitted to the Director for approval October 31, 2015 and every 3 years subsequently. The Permittee must respond within 30 days to comments/requests made by the Director on the</i></p>		<p>N/A</p>

<i>submission until the Director is satisfied with the submission.</i>		
10.4 Groundwater Reporting Requirements		
<i>c. A map of monitoring locations with Environmental Monitoring Stations (EMS) and Permittee descriptors;</i>		Y
<i>d. Cross-Sections showing well installation details stratigraphy, groundwater elevations, and flow. Cross-sections should be in the direction of groundwater flow and perpendicular to groundwater flow;</i>	Well stratigraphy is missing from the cross-section, so that consistency with the extent of the hydrogeological units represented on the cross-section cannot be assessed.	Y/P
<i>e. Drawings showing locations and water quality data of groundwater sampling points;</i>		Y
<i>f. A summary of background information on that year's program, including a discussion of the program modifications relative to previous years;</i>		Y
<i>g. A summary of measured parameters, including appropriate graphs and comparison of results to Approved and Working Water Quality Guidelines, or other criteria and benchmarks as specified by the Director;</i>		Y
<i>h. If applicable, a summary of exceedances of screening benchmarks;</i>		Y
<i>i. Evaluation and discussion of spatial patterns and temporal trends;</i>		Y
<i>j. A summary of all QA/QC issues during the year; and,</i>		Y
<i>k. Recommendations for further study or measures to be taken.</i>		Y

5.2. Concordance of the 2018 FRO SSGMP with the 2017 Approval Conditions

The 2018 FRO SSGMP was reviewed to identify whether and to what extent it satisfies the conditions included in the Approval Letter of April 18, 2017 (conditions *a* to *h* in the table below). Concordance to the conditions of the Approval Letter is classified in Table 2 as complete (Y), partially complete (P) or absent (N).

Table 2 – Concordance of 2018 FRO SSGMP with conditions of Approval Letter

Condition (Approval Letter April 18, 2017)	Assessment	Concordance
<p><i>a. An evaluation of the appropriateness and adequacy of the use of the Greenhouse Wells and the Potable Wells in the SWGMP must be completed. The evaluation must include any further work that is required to fill remaining gaps and, if necessary, timelines associated with future drilling and monitoring well installations or other programs needed to fill the gaps.</i></p>	<p>No individual access point to the Potable Wells is present to allow measurement of groundwater levels and no indication of further work to address this gap is provided.</p>	<p>Y/P</p>
<p><i>b. Available additional data from previous drilling programs (including the 2015 Active Water Treatment Plant drilling) must be compiled and reviewed by a Qualified Professional to evaluate if existing studies provide the necessary information to understand groundwater influences from the Kilmarnock Creek drainage. If information gaps remain, a plan (locations, depth, rationale, etc.) for the completion of additional groundwater investigations in the alluvial fan of the Kilmarnock Creek drainages will be included in the review, along with timelines for the completion of the investigations.</i></p>	<p>An improved characterization of the groundwater system in the Kilmarnock Creek drainage is provided. The characterization is based on the 2017 Hydrogeological Assessment, which integrated the information obtained from all the monitoring wells drilled prior to September 2017, including those completed in 2015 for the Active Wastewater Treatment Facility – South (FRO AWTF-S) Geotechnical Evaluation and Residuals Landfill Drilling, and those included in the FRO SSGMP. The additional hydrogeological investigation and numerical groundwater modelling conducted in 2018 for the relocation of the FRO AWTF-S intake in Kilmarnock Creek has led to a much improved characterization of the groundwater system. This improved understanding has not yet been incorporated in the conceptual model for the Kilmarnock Creek drainage, but work is ongoing.</p>	<p>Y/P</p>
<p><i>c. Groundwater samples used for</i></p>	<p>This requirement is met for most samples. Due</p>	<p>Y/P</p>

<p><i>the groundwater monitoring program are obtained from individual groundwater monitoring wells with known construction details and screen depths, unless otherwise documented by a Qualified Professional as to how monitoring program objectives are met from other selected sampling wells. Documentation must include supporting rationale and data limitations.</i></p>	<p>to lack of access to individual wells, composite groundwater samples are collected from the Potable wells (FR_POTWELLS).</p>	
<p><i>d. A discussion of the effects of FRO's dewatering management strategy may have on on-site transport of contaminants and groundwater flow regimes.</i></p>	<p>Section 4.10.1 of the 2018 FRO SSRGMP indicates how the water collected in the current pits at FRO will be managed (decanted in ponds, used as make-up water in the Process Plant , treated and/or discharged to the receiving environment). Section 4.10.1.1 states that only the Turnbull South and Swift Pit are expected to act as local groundwater sinks and may have local effects on baseflow in Fording River and tributaries. However, no rationale is provided for considering only the Turnbull and Swift Pit as groundwater sinks. For example, the Lake Mountain Pit will also be excavated below the elevation of the Fording River and the water table, so it would potentially reduce the baseflow in Fording River. Also, no estimates of the maximum groundwater pit inflow and cone of drawdown are provided. No assessment is made on the effect of the pit water management strategy on the on-site transport of contaminants. The only consideration related to changes in water quality resulting from the pit water management strategy is that decanting of pit water in the sedimentation ponds will act as pre-treatment by reducing the Total Suspended Solids (TSS) load.</p>	<p>P</p>
<p><i>e. A description of on-site contaminant sources along with the potential contaminants of concern. Notation of potentially acid generating wastes is required, since they have more potential to change over time.</i></p>		<p>Y</p>
<p><i>f. Identification of key areas for additional groundwater</i></p>		<p>Y</p>

<i>monitoring and data gap and uncertainty analysis completed for those key areas.</i>		
<i>g. Cross section drawings that include well details, and groundwater and surface water levels at an appropriate scale to allow for visual interpretation.</i>	Additional cross-sections should be developed in the Fording River valley bottom north of the South Tailings Pond, in the Kilmarnock Creek and Henretta Creek watersheds (see Table 1, point <i>d.</i>). A larger vertical scale should be used in cross-sections AA' (Drawing 659042-006) and CC' (Drawing 659042-008) and the range of minimum and maximum elevation displayed on the vertical axis of the cross-section should be reduced to be only slightly greater than the interval between the minimum and maximum elevation of the cross-sections.	P
<i>h. If and where required to inform management trigger response, triggers must be developed using the framework outlined under the Regional Groundwater Monitoring Program.</i>	As stated in Section 6.8 of the 2018 FRO SSGMP, groundwater triggers have not yet been developed within the framework of the RGMP, and triggers applying to FRO will be considered through the ongoing development in the RGMP. As such, this requirement is presently not applicable.	N/A

5.3. Data Gaps

The 2018 FRO SSGMP identifies the areas where additional monitoring activities and installation of new wells are required to address data gaps. An updated proposed groundwater monitoring network for FRO and the rationale for the well selection is summarized in Table U of the 2018 FRO SSGMP.

The review of the data gaps and selected additional wells is summarized in Table 3. No comments are included where the recommendations are considered acceptable.

Table 3 – Review of data gaps and selected existing wells

Study Area	Data Gap (from 2018 FRO SSGMP)	Selected well(s) and rationale	Review comment
Henretta Valley			
Background	<i>It is uncertain as to how representative reference monitoring well FR_HMW5 is as a background well. Excluding the anomalous result from Q2 2017, concentrations of dissolved selenium in groundwater at this location were greater than the detection limit for four out of the ten sampling events in the last three years. Concentrations of sulphate have also been increasing suggesting a possible mine influence as the Henretta spoils are approximately 140 m away.</i>	<i>This gap will be filled by continued monitoring to evaluate the significance of this trend. Evaluation of this well as an appropriate reference well should be conducted under the RGMP.</i>	The increasing trend in sulphate concentration over the last three years indicate that this well is likely affected by the mining activities in the Henretta watershed, and is therefore not representative of background conditions.
Fording River Valley			
Fording River	<i>Monitor seepage and attenuation</i>	<i>Add wells FR_TBSSMW-1</i>	

valley	<i>downgradient of Turnbull spoil and Henretta Ridge and provide more understanding of groundwater-surface water interactions in Fording River valley bottom.</i>	<i>and FR_TBSSMW-2 to the monitoring network.</i>	
	<i>Monitor groundwater quality downgradient of Clode Creek and Clode Settling Pond as a number of potential sources and transport pathways to groundwater were identified.</i>	<i>Add wells FR_GCMW-1B and FR_GCMW-2</i>	
Kilmarnock Creek	<i>Monitoring of the effects of mine-influenced Kilmarnock Creek on shallow groundwater quality has only just begun. Localized groundwater flow regime, including horizontal and vertical gradients in the fan, is unknown. Deep groundwater quality downgradient of the fan in the Fording River valley bottom is unknown.</i>	<i>SNC-Lavalin recommended adding existing monitoring well FR_TT43 to the SSGMP in 2017 and additional wells are being drilled. Once these wells are completed, monitoring and sampling data should be reviewed to evaluate if these wells would be suitable for monitoring in the SSGMP to fill the data gap. Additional wells will be drilled between FR_09-01-A/B and FR_GHHW to evaluate deep groundwater quality and vertical gradients downgradient of the alluvial fan. New wells will be evaluated for possible inclusion in the SSGMP to fill data gap.</i>	
Greenhouse Wells (FR_GHHW)	<i>The RGMP identified the spatial extent of the coarse-grained aquifer intercepted at the Greenhouse Wells, as well as the spatial extent of the down-valley groundwater transport of CI in Study Area 1, as gaps in the RGMP program. A down-valley groundwater transport pathway was identified in the Fording River valley bottom to the east of the Fording River.</i>	<i>These gaps will be filled through additional studies planned in the RGMP. Once wells are completed, they will be evaluated for possible inclusion in the SSGMP.</i>	
PAG Materials	<i>Little recent information is available regarding PAG material at FRO. An ARD/ML management plan should be considered in the next FRO SSGMP annual report.</i>	<i>This gap will be filled by FROs ARD/ML management plan that is currently under development.</i>	

Additional data gaps were identified during the review, which are not included in the 2018 Plan. These are as follows:

- Background conditions in Fording River upgradient of mining activities.
- Groundwater pathway downgradient of Henretta Spoils, to confirm whether high CI concentrations are localized in the area of Henretta Spoils and the Henretta backfilled pits.
- Groundwater characterization in Kilmarnock watershed between the toe of the spoils and the confluence with Fording River.

- Groundwater characterization in the Swift and Cataract Creek watersheds.

6. **Recommendations**

6.1 Permittee's Recommendations

The key recommendations provided in the 2018 FRO SSGMP are described in Table 3, with other recommendations related to monitoring methodology, included in Section 6 of the Plan.

The 2017 Annual Report also includes recommendations, which pertain to the implementation of field practices, such as field filtering of dissolved metals and dissolved organic carbon samples and collection of duplicate samples from the wells with higher CI concentrations instead of the reference well (FR_HWM5).

These recommendations are helpful to increase the understanding the groundwater pathway in the FRO area and should be implemented in the monitoring program.

6.2 ENV Recommendations

In addition to the recommendations provided by Teck, the following should also be implemented:

2018 FRO SSGMP

The 2018 FRO SSGMP does not meet several of the requirements under PE 107517 and the 2018 Approval Letter. As such, a revised 2018 FRO SSGMP should be submitted, which fulfills the requirements where these are indicated as incomplete on Table 1 and 2. Specifically, the revised Plan should include the following:

- Characterization of heterogeneity of hydraulic properties and spatial differences in surface water – groundwater interaction.
- Assessment of the effect of pit dewatering on the groundwater flow pattern, baseflow and movement of contaminants along the groundwater pathway.
- Develop cross-sections in the Fording River valley bottom north of the Tailings South Pond, in the Henretta watershed. Cross-sections should be developed parallel and perpendicular to the main direction of groundwater flow.

The revised 2018 FRO SSGMP should be submitted by September 30, 2019.

2017 Annual Report for the FRO SSGMP

The 2017 Annual Report for the FRO SSGMP meets the permit requirements and no revised version needs to be submitted.

2018 Annual Report for the FRO SSGMP

The 2018 Annual Report should be updated as follows:

- The borehole logs of all the wells included in the updated monitoring network should be included as an appendix to the reports.
- The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.
- Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.
- Review the groundwater elevation logger data at FR_HMW1S and FR_HMW1D, as the time plots show abrupt changes between August 2016 and October 2017, which may lead to misrepresentative vertical gradients. Correct the automated data where appropriate, to be consistent with the groundwater level manual measurements.
- Outline the watershed divides of all the sub-catchments located in the FRO permitted area.
- Outline the losing and gaining reaches of the Fording River and tributaries, where these can be inferred, on the map showing groundwater level contours.
- Add maps showing the potential sources and pathways identified for each sub-catchment.
- Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.
- Use the Kendall Test to identify trends in the CI concentration time series.
- Add former monitoring well FR_HMW4 on the map (labelled differently from the current wells), so that historical data collected from this well can support interpretation.

The 2018 Annual Report should also be accompanied by the delivery of the following:

- All the raw groundwater quality and quantity data and metadata presented in the reports in MS Excel table format. Draft templates for the data tables should be submitted for review and approval by ENV prior to delivery. The templates should be developed to allow ENV staff to

conduct effectively independent interpretation and analysis (e.g. graphical representation, pivot table generation, determination of statistical indicators).

- Lithological logs and installation diagrams of new monitoring wells should be uploaded to the BC GWELLS database.

2021 FRO SSGMP

Field activities

The following field activities should be conducted to support the 2021 update of the FRO SSGMP:

- Install a well upgradient of FR_HWM5 that is not affected by mining and is suitable to monitor background conditions. The increase in sulphate concentrations observed in FR_HWM5 indicate that this well is most likely affected by the Henretta spoils, and is therefore not representative of background water quality. This well should be included in both the FRO SSGMP and RGMP.
- Install a well in the Fording River valley bottom upgradient of the confluence with Henretta Creek and of all mining activities, to monitor background conditions for the Fording River. This well should be included in both the FRO SSGMP and RGMP.
- Install a monitoring well between FR_HWM1S/D and the confluence of Henretta Creek and Fording River to confirm whether the contamination detected in the wells installed in the backfilled pits is localized or is transported downstream.
- Confirm whether the Potable Wells are adequate for monitoring, by determining whether groundwater quality at this location may be affected by enhanced leakage from the Fording River induced by pumping. If the wells are confirmed to be adequate for monitoring, install a monitoring well near the Potable Wells to allow sampling from an individual well instead of collecting composite samples from the well cluster.
- Add to the monitoring network one or more wells among those installed in 2018 in the Kilmarnock Creek alluvial fan. Pressure transducers should be installed in the wells indicated in Section 6.2.1, and also in wells in the Kilmarnock watershed.
- Add to the monitoring network one or more wells among those installed in the Swift Creek and Cataract Creek watersheds in relation to the Swift pit project. This would also fulfill Condition 1 of the Approval letter for the Greenhills Operations (GHO) SSGMP dated June 14, 2016.
- Retain the pH lab analysis, as the difference between the field and lab pH is an indication of the corresponding reduction in alkalinity in the sample from the time of collection. This allows the identification of samples where alkalinity is underestimated.

These field activities should be implemented by September 30, 2019, so that the additional six months of monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the FRO SSGMP, which will be submitted by March 31, 2020.

Conceptual Model

The 2021 FRO SSGMP should also include an update of the Conceptual Model, by integrating the results of the studies that are currently ongoing, such as the Kilmarnock groundwater study in support of the FRO-South Active Water Treatment Facility intake/outfall application and the in-stream sink studies on groundwater loss conducted in the Kilmarnock watershed.

Integration with the AMP and TMP

The 2021 FRO SSGMP should integrate with the Adaptive Management Plan (AMP) and the Tributary Management Plan (TMP) as follows:

- Define groundwater triggers for the FRO area based on those that will be developed in the AMP and implemented in the Regional Groundwater Monitoring Plan.
- Incorporate the changes introduced in the 2019 AMP (e.g. consideration of the effect of groundwater discharge to streams on calcite development, according to Main Question 4 in the AMP).
- Consider the installation of additional monitoring wells to support the characterization of surface water – groundwater interaction in the tributaries selected in the 2020 TMP that are likely groundwater-fed (e.g. Fish Pond Creek).

The integration of the regional and site-specific groundwater monitoring programs with the AMP and TMP should also be based on the outcome of the upcoming Groundwater Working Group meetings.

Groundwater Working Group Meetings

The Groundwater Working Group (GWG) established October 2016 should continue to provide guidance for groundwater programs. The Groundwater Working Group will consist of members from Teck Coal Limited (Teck), the Ktunaxa Nation Council (KNC), Ministry of Environment and Climate Change Strategy (ENV) and Interior Health (IH), and may expand to include participants from Ministry of Energy and Mines (MEM) and Ministry of Forest, Lands and Natural Resource Operations (FLNRO). The frequency of GWG meetings should be increased from one to at least two per year, so that discussions and management decisions can respond more readily to the changes in environmental conditions, mine operations and plans occurring in the Elk Valley, including the Fording River Operations.

Should you have any questions about the above, please contact me at 604-582-5277 or Sarah.Alloisio@gov.bc.ca.

Sincerely,



Sarah Alloisio Ph.D, P.Geol.

Hydrogeologist – Mining Operations, ENV

Cc: Jeanien Carmody-Fallows, Section Head, Authorizations, Mining Operations, ENV



MINISTRY ASSESSMENT REPORT

Report prepared by: Sarah Alloisio, Hydrogeologist – Mining **Date:** April 2, 2019

Statutory Decision Maker: Doug Hill, Regional Operations Director - Mining

File:	107517	Tracking Number:	n/a
Application type:	2017 and 2018 Submission to fulfill the requirements of Sections 9.2.2, 9.2.2.1 and 10.4 in Permit 107517 – Greenhills Operations Site-Specific Groundwater Monitoring Program.		
Applicant:	Teck Coal Limited		

1. Executive Summary

This Ministry Assessment Report describes the review and recommendations provided for the 2018 update of the Greenhills Operations Site-Specific Groundwater Monitoring Plan (GHO SSGMP) and the 2017 Annual Report of the fro SSGMP, which were submitted to fulfill the requirement of the Elk Valley Permit (107517). The requirements related to the 2018 Plan are included in Section 9.2.2 (Site-Specific Groundwater Monitoring) and 9.2.2.2 (Greenhills) of PE107517 and in the conditions outlined in the Approval letter of the 2014 GHO SSGMP, dated June 16, 2016. The requirements related to the 2017 Annual report are included in Section 10.4 (Groundwater Reporting Requirements) of PE 107517.

The review concludes that the 2018 Plan does not meet several of the permit requirements and approval letter conditions, whereas the 2017 Annual Report meets the requirements. It is recommended that a revised 2018 Plan should be submitted, which fulfills the requirements and approval conditions where gaps have been identified, as shown in Table 1 and 2.

The data gaps identified and the recommendations provided in the 2018 Plan and the 2017 Annual Report are reasonable and should be implemented. Additional data gaps were identified in this review and additional recommendations are provided to address these gaps.

2. Application Request

Approval of the Greenhills Operations Site-Specific Groundwater Monitoring Plan (GHO SSGMP), dated October 31, 2018 and of the 2017 GHO Annual Report, dated March 31, 2018.

3. Background Information

In May 2014, Coal Limited (Teck) submitted a site-wide groundwater Monitoring Plan (now SSGMP) for the Greenhills Operations following a request from ENV (then Ministry of Environment). The 2014 plan was approved by ENV on June 14, 2016, and included the requirement that a revised plan must be submitted to the Director for approval October 31, 2018 and every three years subsequently. In November 2014, ENV approved the Elk Valley Water Quality Plan and issued an area-based effluent permit (PE 107517) to Teck. Section 9.2.2 of PE 107517 requires Teck to develop and implement Site-Specific Groundwater Monitoring Programs (SSGMPs) for the five mining operations located within the boundaries of area considered under Permit 107517 – Fording River, Greenhills, Line Creek, Elkview and Coal Mountain. Section 9.2.2.2 includes the requirements related to the SSGMP for the Greenhills Operations (GHO SSGMP). The two conditions included in the Approval Letter for the 2014 GHO Plan required (1) completing the well installations described in the letter from Teck to ENV, dated December 5, 2014 with the revisions described in the email from Jim Thorner to ENV, dated December 7, 2015; and (2) include updated cross-sections in the GHO Annual Reports as the drilling program and understanding of hydrogeology advances. The updated version of the GHO SSGMP was due for submission on October 31, 2018, and ENV received it on that date. The 2017 GHO Annual Report was due for submission on March 31, 2018 and was received on that date.

4. First Nations Consultation and ENV Review

The Ktunaxa Nation Council (KNC) was consulted during the review of the GHO SSGMP. KNC provided ENV with the review comments on the 2018 GHO SSGMP and on the 2017 Annual Report for the GHO SSGMP prepared by their QP (Waterline). The comments provided by KNC were carefully reviewed and accounted for in the preparation of this document.

5. Technical Review

The following reports submitted to ENV by Teck Coal Limited (Teck) were reviewed to prepare this document:

- The approval letter dated June 16, 2016 containing the conditions for the 2018 GHO SSGMP update;
- The GHO Site-Specific Groundwater Monitoring program (GHO SSGMP) dated October 31, 2018;
- The 2017 GHO Site-Specific Groundwater Monitoring Annual Report, dated March 31, 2018;

The following documents provided by KNC were used to support the review:

- Hydrogeological Review, Greenhills Operations Site-Specific Groundwater Monitoring Program, dated March 2019;
- Recommendations for the Elkview (EVO), Coal Mountain (CMO), Greenhills (GHO), Fording River (FRO) and Line Creek Operations (LCO) 2017 Annual Groundwater Reports, dated October 5, 2018.

5.1. Concordance of the 2018 GHO SSGMP and the 2017 GHO Annual report with Sections 9.2.2, 9.2.2.2 and 10.4 of Permit 107517

The GHO SSGMP was reviewed to identify whether and to what extent it satisfies the requirements of PE107517, Sections 9.2.2, 9.2.2.2 and 10.4. Concordance to the permit requirements is classified in Table 1 as complete (Y), partially complete (P) or absent (N). No comments are provided in Table 1 for the requirements fulfilled by the Plan.

Table 1 Concordance with PE 107517 requirements

PE 107517 Requirement	Assessment	Concordance
Section 9.2.2		
<i>a. The Permittee must develop and implement a comprehensive groundwater monitoring program at each mine site, prepared by a qualified professional. This program must be conducted to the satisfaction of the Director and must include the following:</i>		Y
<i>i. Characterization of the groundwater system, aquifer characteristics (e.g., hydraulic conductivity and storativity), water quality and connectivity to the surface water system;</i>	A characterization of the heterogeneity of the hydraulic properties in the overburden aquifers based on depositional mechanisms and the hydraulic test results is missing, as is a description of groundwater-surface water connectivity and interaction (e.g. spatial distribution of gaining and losing reaches).	P
<i>ii. Characterization of seasonal variability in the groundwater system (quality and quantity).</i>		Y
<i>iii. Provision of a site specific conceptual model and the information necessary to support the development and verification of water quality predictions for the mine site. The site specific conceptual model shall be provided with the groundwater monitoring plan update on October 31, 2018, and updated with</i>		Y

<i>subsequent revisions to the monitoring plan;</i>		
<i>iv. Site specific numerical groundwater models may be required to support permitting activities. Numerical models, where required, must consider all available, relevant monitoring data (e.g., groundwater and surface water monitoring, stream flow, and precipitation data) and be developed by a Qualified Professional to meet the intended modelling purpose.</i>	No numerical groundwater models have been developed to date in the GHO area	N/A
9.2.2.2 Greenhills Operations		
<i>Groundwater monitoring must be conducted in accordance with a plan approved by the Director. The Greenhills Operations Site Wide Groundwater Monitoring program has been submitted to the Director. The Permittee must respond within 30 days to comments/requests made by the Director on the submission until the Director is satisfied with the submission. A revised plan must be submitted to the Director October 31, 2018 and every 3 years subsequently.</i>		N/A
10.4 Groundwater Reporting Requirements		
<i>a. A map of monitoring locations with Environmental Monitoring Stations (EMS) and Permittee descriptors;</i>		Y
<i>b. Cross-Sections showing well installation details stratigraphy, groundwater elevations, and flow. Cross-sections should be in the direction of groundwater flow and perpendicular to groundwater flow;</i>	Well stratigraphy is missing from the cross-section, so that consistency with the extent of the hydrogeological units represented on the cross-section cannot be assessed.	Y/P
<i>c. Drawings showing locations</i>		Y

<i>and water quality data of groundwater sampling points;</i>		
<i>d. A summary of background information on that year's program, including a discussion of the program modifications relative to previous years;</i>		Y
<i>e. A summary of measured parameters, including appropriate graphs and comparison of results to Approved and Working Water Quality Guidelines, or other criteria and benchmarks as specified by the Director;</i>		Y
<i>f. If applicable, a summary of exceedances of screening benchmarks;</i>		Y
<i>g. Evaluation and discussion of spatial patterns and temporal trends;</i>		Y
<i>h. A summary of all QA/QC issues during the year; and,</i>		Y
<i>i. Recommendations for further study or measures to be taken.</i>		Y

5.2. Concordance of the 2018 GHO SSGMP with the 2016 Approval Conditions

The 2018 GHO SSGMP was reviewed to identify whether and to what extent it satisfies the conditions included in the Approval Letter of June 14, 2016 (conditions 1 and 2 in Table 2 below). Concordance to the conditions of the Approval Letter is classified in Table 2 as complete (Y), partially complete (P) or absent (N).

Table 2 – Concordance of 2018 GHO SSGMP with conditions of Approval Letter.

Condition (Approval Letter June 14, 2016)	Assessment	Concordance
Condition 1		
<i>a. Drill one well below the Tailings Pond (to monitor groundwater quality downgradient of the Tailings Pond and identify potential</i>	Monitoring well GH_MW_TD was installed on November 21, 2014. However, this well was installed under more than 30 m of till and is artesian, so it is not adequate to potential contamination from seepage in shallow	P

impacts from pond seepage).	permeable deposits acting as a groundwater pathway.	
<i>b. Drill the West Seep well along Greenhills Creek (to monitor potential impacts from CCR and Plant).</i>	Monitoring well pair GH_MW-GHC-1S/D (screened in silty gravel and bedrock) was installed in 2014.	Y
<i>c. Drill one well near the confluence of Thompson Creek and Elk River (to allow comparison of groundwater and surface water chemistry and levels with nearby station ER1a).</i>	Monitoring well GH_MW-ERSC-1 (screened at the overburden/bedrock contact) was installed in 2014.	Y
<i>d. Drill the upper Thompson Creek well (to assess potential impacts from the Rosebowl spoil).</i>	Monitoring well pair GH_MW-UTC-1S/D (1S screened in clay and bedrock and 1D screened in bedrock) was installed in 2016. Both wells were installed in low-conductivity units and are therefore unsuitable for monitoring.	P
<i>e. Drill one well near the Rail Loop (to assess potential impact of the coal storage area on the nearby aquifer).</i>	Monitoring well GH_MW-RLP was installed in the Rail Loop area in 2015, and was replaced by well GH_MW-RLP-1D (screened to 80 m bgs) in 2016. However, this well is unsuitable to monitor potential contamination in the shallow sand and gravel unit.	P
<i>f. Drill the Upper Hawk Spoil well (to assess any potential impacts of the legacy Hawk and east Spoil on groundwater in the upper Greenhills Creek watershed)</i>	The well was not drilled because its proposed location was inaccessible due to a landslide that occurred from the East Spoil in Nov-Dec 2014. It is not known whether this area is currently accessible and another borehole location has been identified.	P
<i>g. Drill three wells to the east of the GHO area in the Swift Creek, Cataract Creek and Porter Creek watersheds. (to assess potential impacts of operations at Greenhills on groundwater in the eastern catchments)</i>	Monitoring well GH_MW-PC (screened in sand, silt and bedrock) was installed near Porter Creek Sediment Pond on September 2, 2016. However, this well is likely unsuitable for monitoring since it is screened across the overburden-bedrock interface and the screen extends above the measured groundwater level in the well. No wells have been installed in the Swift Creek and Cataract Creek watersheds.	P
Condition 2		N/A
<i>Provide cross-sections to satisfy Section 10.4 of Permit 107517 as the drilling program and understanding of hydrogeology advances</i>	Well stratigraphy is missing from the cross-section, so that consistency with the extent of the hydrogeological units represented on the cross-section cannot be assessed.	Y/P

5.3. Data Gaps

The 2018 GHO SSGMP identifies the areas where additional monitoring activities and installation of new wells are required to address data gaps. An updated proposed groundwater monitoring network for GHO and the rationale for the well selection is summarized in Table T of the 2018 GHO SSGMP.

The review of the data gaps and selected additional wells is summarized in Table 3. No comments are included where the recommendations are considered acceptable.

Table 3 – Review of data gaps and selected existing wells

Study Area	Data Gap (from 2018 GHO SSGMP)	Selected well(s) and rationale	Review comment
Elk River Valley			
Mickelson Pond	<i>No groundwater monitoring in the valley bottom downgradient of the pond, which has the potential for mine-contact water to infiltrate to ground.</i>	<i>Groundwater in this area is currently being assessed as part of the GHO Mine Life Extension. A drilling investigation is planned as part of that project. Once wells are completed, data would be reviewed to evaluate which wells would be suitable for monitoring in the SSGMP.</i>	
Leask Pond	<i>No deep groundwater data as GH_GA-MW-4 is a shallow water table well. No continuous water level data exists for this well, which appears to be under the influence of surface water.</i>	<i>Groundwater in this area will be studied in the Elk River Side Channel LAEMP; results from this study would be reviewed to assess whether the data gap for deep groundwater still exists. If so, the gap would be filled by the installation of a deep monitoring well at this location. Data loggers for continuous water levels specified in SSGMP.</i>	
Wolfram Pond	<i>No shallow groundwater data as GH_GA-MW-2 is a deep well with a number of overlying clay units.</i>	<i>Groundwater in this area will be studied in the Elk River Side Channel LAEMP; results from that study would be reviewed to assess whether a gap still exists. If so, the gap should be filled by the installation of a shallow monitoring well at this location.</i>	
Elk River Side Channel	<i>Geochemical mechanism for the year-round 40% attenuation of selenium and nitrate in the Elk River valley bottom is unknown but suspected to be related to attenuation in groundwater.</i>	<i>An in-stream sinks study as part of the RWQM is currently underway.</i>	
North of GH_GA-MW-1	<i>Groundwater conditions to the north of this location are unknown and will need to be understood to develop and understanding of effects of the GHO Mine Life Extension Project on groundwater.</i>	<i>Baseline studies in this area are currently underway and gaps will be identified as part of these studies. A drilling investigation and monitoring well installation</i>	<i>Well GH_GA-MW-1 is installed in very low-conductivity material and is unsuitable for monitoring. No understanding of groundwater – surface water</i>

		<i>is planned as part of the baseline studies. Once wells are completed, data would be reviewed to evaluate which wells would be suitable for monitoring in the SSGMP.</i>	interaction at the location of GH_ER2 is possible, since no wells are currently installed near this station.
South of Thompson Creek	<i>No groundwater data exist to the west of the Tailings Storage Facility (TSF) area.</i>	<i>TSF is not a significant source of CI; however, this potential pathway may need to be evaluated for any future developments in this area, and if necessary, through the installation of monitoring wells west of the TSF.</i>	
Fording River Valley			
Porter Creek drainage	<i>No continuous water level data for GH-MW-PC, a well that appears to be under influence of surface water. High turbidity in this well has been identified as an issue during sampling.</i>	<i>Data logger for continuous water levels specified in SSGMP. The well should be re-developed to remove fines from the formation; however, if Teck suspects the integrity of the well is compromised, it should be decommissioned and re-installed in a suitable location.</i>	GH-MW-PC is screened across the overburden-bedrock contact and the measured groundwater level is below the top of the screened interval, so the well is unsuitable for monitoring.
Greenhills Creek	<i>No continuous water level data for GH_MW-TD</i>	<i>Data logger and hydraulic conductivity testing specified in SSGMP.</i>	GH_MW-TD is drilled mostly in till and screened at approximately 30 mbgs, so it is unsuitable to monitor potential impacts from the TSF on the shallow sediments discharging to the Fording River.
Rail Loop	<i>No hydraulic conductivity data for GH_MW-RLP-1D</i>	<i>Hydraulic conductivity testing specified in SSGMP.</i>	GH_MW-RLP-1D is screened below thick layers of clay and till, so it is unsuitable to monitor the potential impacts of the Rail Loop Sediment Pond on the shallow sand and gravel sediments discharging to the Fording River.
Fording River	No continuous water level data in supply wells	<i>Data logger for continuous water levels specified in SSGMP.</i>	No pumping rates recorded at the supply wells that are used for monitoring.

Additional data gaps were identified during the review, which are not included in the 2018 Plan. These are as follows:

- No monitoring wells are installed in the provincially mapped Aquifer 1056, which is located in the Elk River valley bottom fluvial sediments and in hydraulic connection with the river.
- No wells are installed in the Swift and Cataract Creek watersheds, to monitor for potential impacts from the North and Connector Spoils.

6. Recommendations

6.1 *Permittee's Recommendations*

The key recommendations provided in the 2018 GHO SSGMP are described in Table 3, with other recommendations related to monitoring methodology, included in Section 6 of the Plan.

The 2017 Annual Report also includes recommendations, which pertain to the list of analytes, sampling frequency, hydraulic testing at monitoring wells where these tests have not been carried out.

These recommendations are helpful to increase the understanding the groundwater pathway in the GHO area and should be implemented in the monitoring program.

6.2 *ENV Recommendations*

In addition to the recommendations provided by Teck, the following should also be implemented:

2018 GHO SSGMP

The 2018 GHO SSGMP does not meet several of the requirements under PE 107517 and the 2016 Approval Letter. As such, a revised 2018 GHO SSGMP should be submitted, which fulfills the requirements where these are indicated as incomplete on Table 1 and 2. Specifically, the revised Plan should include the following:

- Characterization of heterogeneity of hydraulic properties and spatial differences in surface water – groundwater interaction.
- Replace monitoring well_GH_MW_TD with a well completed in the shallow sediments that is suitable to monitor potential impacts of the Tailings Pond.
- Replace wells_GH_MW-UTC-1S/D with a well pair installed in the sand and gravel sediments discharging into Thompson Creek to monitor potential impacts of Rosebowl Spoil.
- Replace well GH_MW-RLP-1D with a well completed in the shallow sediments to monitor potential impacts from the Rail Loop sediment pond.
- Replace well GH_MW-PC with a well completed in the shallow sediments and screened below the observed range of groundwater levels.
- Provide an update on the current accessibility of the upper Hawk Spoil and if so, whether a borehole location has been selected.
- Install wells in the Swift Creek and Cataract Creek watersheds, which can be included in both the FRO and GHO SSGMP monitoring networks.

These field activities should be implemented by September 30, 2019, so that the additional six months of monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the GHO SSGMP, which will be submitted by March 31, 2020.

2017 Annual Report for the GHO SSGMP

The 2017 Annual report for the GHO SSGMP meets the permit requirements and no revised version needs to be submitted.

2018 Annual Report for the GHO SSGMP

The 2018 Annual Report should be updated as follows:

- The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.
- Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.
- Outline the watershed divides of all the sub-catchments located in the GHO permitted area.
- Outline the losing and gaining reaches of the Elk River, Fording River, Greenhills Creek and respective tributaries, where these can be inferred, on the map showing groundwater level contours.
- Add maps showing the potential sources and pathways identified for each sub-catchment.
- Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.
- Use the Kendall Test to identify trends in the CI concentration time series.

The 2018 Annual Report should also be accompanied by the delivery of the following:

- All the raw groundwater quality and quantity data and metadata presented in the reports in MS Excel table format. Draft templates for the data tables should be submitted for review and approval by ENV prior to delivery. The templates should be developed to allow ENV staff to conduct effectively independent interpretation and analysis (e.g. graphical representation, pivot table generation, determination of statistical indicators).
- Lithological logs and installation diagrams of new monitoring wells should be uploaded to the BC GWELLS database.

2021 GHO SSGMP

Field activities

The following field activities should be conducted to support the 2021 update of the GHO SSGMP:

- Replace monitoring well GH_GA-MW-1 with a well completed in more conductive sediments and near station GH_ER2, so to assess the interaction between surface water and groundwater. Include this well in the Regional Groundwater Monitoring network.
- Install a monitoring well in the Elk River fluvial sediments of Aquifer 1056 and include this well in the Regional Groundwater Monitoring network.
- Retain the pH lab analysis, as the difference between the field and lab pH is an indication of the corresponding reduction in alkalinity in the sample from the time of collection. This allows the identification of samples where alkalinity is underestimated.
- Record the groundwater levels and pumping rates at all the supply wells that are also used for monitoring.

These field activities should be implemented by the end of 2019, so that the additional monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the GHO SSGMP, which will be submitted by March 31, 2020.

Conceptual Model

The 2021 GHO SSGMP should also include an update of the Conceptual Model, by integrating the results of the studies that are currently ongoing, such as the GHO Mine Life Extension Project, Elk River Side Channel LAEMP and the RWQM in-stream sinks program.

Integration with the AMP and TMP

The 2021 GHO SSGMP should integrate with the Adaptive Management Plan (AMP) and the Tributary Management Plan (TMP) as follows:

- Define groundwater triggers for the GHO area based on those that will be developed in the AMP and implemented in the Regional Groundwater Monitoring Plan.
- Incorporate the changes introduced in the 2019 AMP (e.g. consideration of the effect of groundwater discharge to streams on calcite development, according to Main Question 4 in the AMP).

- Consider the installation of additional monitoring wells to support the characterization of surface water – groundwater interaction in the tributaries selected in the 2020 TMP that are likely groundwater-fed.

Groundwater Working Group Meetings

The Groundwater Working Group (GWG) established October 2016 should continue to provide guidance for groundwater programs. The Groundwater Working Group will consist of members from Teck Coal Limited (Teck), the Ktunaxa Nation Council (KNC), Ministry of Environment and Climate Change Strategy (ENV) and Interior Health (IH), and may expand to include participants from Ministry of Energy and Mines (MEM) and Ministry of Forest, Lands and Natural Resource Operations (FLNRO). The frequency of GWG meetings should be increased from one to at least two per year, so that discussions and management decisions can respond more readily to the changes in environmental conditions, mine operations and plans occurring in the Elk Valley, including the Greenhills Operations.

Should you have any questions about the above, please contact me at 604-582-5277 or Sarah.Alloisio@gov.bc.ca.

Sincerely,



Sarah Alloisio Ph.D, P.Geo.

Hydrogeologist – Mining Operations, ENV

Cc: Jeanien Carmody-Fallows, Section Head, Authorizations, Mining Operations, ENV



MINISTRY ASSESSMENT REPORT

Report prepared by: Sarah Alloisio, Hydrogeologist – Mining **Date:** April 8, 2019

Statutory Decision Maker: Doug Hill, Regional Operations Director - Mining

File:	107517	Tracking Number:	n/a
Application type:	2017 and 2018 Submission to fulfill the requirements of Sections 9.2.2, 9.2.2.4 and 10.4 in Permit 107517 – Elkview Operations Site-Specific Groundwater Monitoring Program.		
Applicant:	Teck Coal Limited		

1. Executive Summary

This Ministry Assessment Report describes the review and recommendations provided for the 2018 update of the Elkview Operations Site-Specific Groundwater Monitoring Plan (EVO SSGMP) and the 2017 Annual Report of the EVO SSGMP, which were submitted by Teck Coal Ltd. (Teck) to fulfill the requirement of the Elk Valley Permit (107517). The requirements related to the 2018 Plan are included in Section 9.2.2 (Site-Specific Groundwater Monitoring) and 9.2.2.4 (Elkview) of PE107517 and in the conditions outlined in the Approval letter of the 2015 EVO SSGMP, dated April 18, 2017. The requirements related to the 2017 Annual report are included in Section 10.4 (Groundwater Reporting Requirements) of PE 107517.

The review concludes that the 2018 Plan does not meet several of the permit requirements and approval letter conditions, whereas the 2017 Annual Report meets the requirements. It is recommended that a revised 2018 Plan should be submitted, which fulfills the requirements and approval conditions where gaps have been identified, as shown in Table 1 and 2.

The data gaps identified and the recommendations provided in the 2018 Plan and the 2017 Annual Report are reasonable and should be implemented. Additional data gaps were identified in this review and additional recommendations are provided to address these gaps.

2. Application Request

Approval of the Elkview Operations Site-Specific Groundwater Monitoring Plan (EVO SSGMP), dated October 31, 2018, and of the 2017 EVO Annual Report, dated March 28, 2018.

3. Background Information

In November 2014, BC Ministry of Environment and Climate Change Strategy (ENV, then Ministry of Environment) approved the Elk Valley Water Quality Plan and issued an area-based effluent permit (PE 107517) to Teck. Section 9.2.2 of PE 107517 requires Teck to develop and implement Site-Specific Groundwater Monitoring Programs (SSGMPs) for the five mining operations located within the boundaries of area considered under Permit 107517 – Elkview, Greenhills, Line Creek, Elkview and Coal Mountain. Section 9.2.2.4 includes the requirements related to the SSGMP for the Elkview Operations (EVO SSGMP). In March 2015, Teck submitted the first SSGMP for the Elkview Operations to fulfill the requirements of Permit 107517. The 2015 plan was approved by ENV subject to the conditions included in the Approval Letter issued on April 18, 2017. The conditions include the requirement that a revised plan must be submitted to the Director for approval October 31, 2015 and every three years subsequently. Site-specific conditions included in the Approval Letter include the discussion of the effects of EVO's dewatering management strategy on groundwater flow and transport of contaminants, and a discussion of the baseline conditions summarized in Baldy Ridge Expansion (BRE) Annex D – Hydrogeological Baseline Report. The updated version of the EVO SSGMP was due for submission on October 31, 2018, and ENV received it on that date. The 2017 EVO Annual Report was due for submission on March 31, 2018 and was received on March 28, 2018.

4. First Nations Consultation and ENV Review

The Ktunaxa Nation Council (KNC) was consulted during the review of the EVO SSGMP. KNC provided ENV with the review comments on the 2018 EVO SSGMP and on the 2017 Annual Report for the EVO SSGMP prepared by their QP (Waterline). The comments provided by KNC were carefully reviewed and accounted for in the preparation of this document.

5. Technical Review

The following reports submitted to ENV by Teck were reviewed to prepare this document:

- The approval letter dated April 18, 2017 containing the conditions for the 2018 EVO SSGMP update;
- The EVO Site-Specific Groundwater Monitoring program (EVO SSGMP) dated October 31, 2018;
- The 2017 EVO Site-Specific Groundwater Monitoring Annual Report, dated March 28, 2018;

The following documents provided by KNC were used to support the review:

- Hydrogeological Review, Elkview Operations Site-Specific Groundwater Monitoring Program 2018 Update, dated March 2019;
- Recommendations for the Fording River (FRO), Coal Mountain (CMO), Elkview (EVO), Green Hills (GHO) and Line Creek Operations (LCO) 2017 Annual Groundwater Reports, dated October 5, 2018.

5.1. Concordance of the 2018 EVO SSGMP and the 2017 GHO Annual report with Sections 9.2.2, 9.2.2.4 and 10.4 of Permit 107517

The EVO SSGMP was reviewed to identify whether and to what extent it satisfies the requirements of PE107517, Sections 9.2.2, 9.2.2.4 and 10.4. Concordance to the permit requirements is classified in Table 1 as complete (Y), partially complete (P) or absent (N). No comments are provided in Table 1 for the requirements fulfilled by the Plan.

Table 1 Concordance with PE107517 requirements

PE 107517 Requirement	Assessment	Concordance
Section 9.2.2		
<i>a. The Permittee must develop and implement a comprehensive groundwater monitoring program at each mine site, prepared by a qualified professional. This program must be conducted to the satisfaction of the Director and must include the following:</i>		Y
<i>i. Characterization of the groundwater system, aquifer characteristics (e.g., hydraulic conductivity and storativity), water quality and connectivity to the surface water system;</i>	As stated in Section 5.3 of the 2018 EVO SSGMP, the hydraulic conductivity estimates obtained for some wells do not reflect the subsurface material encountered during drilling and the monitored groundwater level fluctuations. This inconsistency is recognized as a gap. A characterization of the heterogeneity of the hydraulic properties in the overburden aquifers is also missing, as is a description of groundwater-surface water connectivity and interaction (e.g. spatial distribution of gaining and losing reaches).	P
<i>ii. Characterization of seasonal variability in the groundwater system (quality and quantity).</i>		Y
<i>iii. Provision of a site specific conceptual model and the information necessary to support the development and verification</i>		Y

<p><i>of water quality predictions for the mine site. The site specific conceptual model shall be provided with the groundwater monitoring plan update on October 31, 2018, and updated with subsequent revisions to the monitoring plan;</i></p>		
<p><i>a.4 Site specific numerical groundwater models may be required to support permitting activities. Numerical models, where required, must consider all available, relevant monitoring data (e.g., groundwater and surface water monitoring, stream flow, and precipitation data) and be developed by a Qualified Professional to meet the intended modelling purpose.</i></p>	<p>A numerical groundwater flow model was developed to characterize potential effects of the Baldy Ridge Extension (BRE) project. Integration of the conceptual model underlying the BRE model would likely improve the LCO area conceptual model.</p>	<p>Y</p>
<p>9.2.2.1 Elkview Operations</p>		
<p><i>b. Groundwater monitoring must be conducted in accordance with the approved plan, dated April 4, 2013 with addendum dated January 2, 2014. A revised plan must be submitted to the Director for approval October 31, 2015 and every 3 years subsequently. The Permittee must respond within 30 days to comments/requests made by the Director on the submission until the Director is satisfied with the submission.</i></p>		<p>N/A</p>
<p>10.4 Groundwater Reporting Requirements</p>		
<p><i>c. A map of monitoring locations with Environmental Monitoring Stations (EMS) and Permittee descriptors;</i></p>		<p>Y</p>
<p><i>d. Cross-Sections showing well installation details</i></p>	<p>Well stratigraphy is missing from the cross-sections, so that</p>	<p>Y/P</p>

<p><i>stratigraphy, groundwater elevations, and flow. Cross-sections should be in the direction of groundwater flow and perpendicular to groundwater flow;</i></p>	<p>consistency with the extent of the hydrogeological units represented on the cross-section cannot be assessed. A larger vertical scale would improve readability of cross-sections.</p> <p>A cross-section along Erickson Creek that includes well EV_ECgw is missing. This cross-section is required to confirm whether this well is adequate to monitor groundwater – surface water interaction. The well location relative to Erickson Creek and the well bottom elevation relative to the streambed elevation represented on the cross-section would help determine whether groundwater chemistry is influenced by surface water at the well location.</p>	
<p><i>e. Drawings showing locations and water quality data of groundwater sampling points;</i></p>		<p>Y</p>
<p><i>f. A summary of background information on that year's program, including a discussion of the program modifications relative to previous years;</i></p>		<p>Y</p>
<p><i>g. A summary of measured parameters, including appropriate graphs and comparison of results to Approved and Working Water Quality Guidelines, or other criteria and benchmarks as specified by the Director;</i></p>		<p>Y</p>
<p><i>h. If applicable, a summary of exceedances of screening benchmarks;</i></p>		<p>Y</p>
<p><i>i. Evaluation and discussion of spatial patterns and temporal trends;</i></p>		<p>Y</p>
<p><i>j. A summary of all QA/QC issues during the year; and,</i></p>		<p>Y</p>
<p><i>k. Recommendations for further study or measures to</i></p>		<p>Y</p>

<i>be taken.</i>		
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5.2. Concordance of the 2018 EVO SSGMP with the 2017 Approval Conditions

The 2018 EVO SSGMP was reviewed to identify whether and to what extent it satisfies the conditions included in the Approval Letter of April 18, 2017 (conditions *1a* to *1f*, *2*, *3* and *4* in the table below). Concordance to the conditions of the Approval Letter is classified in Table 2 as complete (Y), partially complete (P) or absent (N).

Table 2 – Concordance of 2018 EVO SSGMP with conditions of Approval Letter

Condition (Approval Letter April 18, 2017)	Assessment	Concordance
<i>1a. A discussion of the effects EVO's dewatering management strategy may have on on-site transport of contaminants and groundwater flow regimes;</i>	While a list of the open pits in the EVO area and an overview of the pit water management strategy is provided (e.g. which pits currently require dewatering, transfer of mine water across pits and discharge into the environment), there is no characterization of the source of mine water (runoff or groundwater), dewatering methods (dewatering wells / drains) and inferred cones of drawdown induced by pit dewatering. An estimate of the extent of current and projected cones of drawdown is needed to assess whether pit dewatering induces enhanced leakage from nearby surface water bodies to groundwater, which may affect groundwater flow patterns and contaminant transport.	P
<i>1b. An inventory of onsite contaminant sources along with the potential contaminants of concern. Special noting of potentially acid generating wastes is needed, since they have more potential to change over time;</i>		Y
<i>1c. Identification of key areas for additional groundwater monitoring and data gap and uncertainty analysis completed for those key areas;</i>	Additional recommendations are provided in this review.	Y
<i>1d. Discussion of baseline conditions summarized from the BRE Annex D - Hydrogeological Baseline Report;</i>		Y
<i>1e. Supporting borehole logs and hydraulic testing information; and,</i>	As noted in the Plan, hydraulic testing data are not available for all wells and are therefore a data gap. No lithological logs and installation	P

	<p>diagrams are available for wells EV_HW1, EV_MR2, EV_RCgw, EV_WH50gw and EV_BRgw. (note: Harmer well is referred to as EV_HW1 in the text of the 2018 Plan, and as EV_HM1 on the drawings)</p>	
<p><i>If. Cross-section drawings that include well details, and groundwater and surface water levels at an appropriate scale to allow for visual interpretation.</i></p>	<p>Well stratigraphy is not shown, and the cross-section vertical scale is too small to allow visual interpretation.</p>	P
<p><i>2. If and where required to inform management response, triggers will be developed using the framework outlined under the Regional Groundwater Monitoring Program.</i></p>	<p>Groundwater triggers will be developed as part of the 2019 AMP.</p>	N/A
<p><i>3. Groundwater samples used for the groundwater monitoring program are obtained from individual groundwater monitoring wells with known construction details and screen depths, unless otherwise documented by a Qualified Professional as to how monitoring program objectives are met from other selected sampling wells. Documentation will include supporting rationale and data limitations.</i></p>	<p>The EVO monitoring network includes three supply wells (EV_RCgw, EV_WH50gw and EV_BRgw). The 2018 EVO SSGMP (Section 4.10) indicates that the groundwater withdrawal rates from these wells are negligible except from April to July, when pumping may induce leakage from Michel Creek. The chemistry of groundwater samples collected at the supply may therefore be affected by recharge from contaminated surface water. No discussion on these potential effects is provided to support the use of these supply wells as monitoring wells.</p>	P
<p><i>4. The seep samples may be removed from the groundwater program going forward, as recommended in the annual report. If further investigation is required in these areas, it is recommended that dedicated groundwater wells be installed.</i></p>		Y

5.3. Data Gaps

The 2018 EVO SSGMP identifies the areas where additional field investigations are required to address data gaps. The data gaps and recommended activities are included in Table S of the 2018 EVO SSGMP.

The review of the data gaps and selected additional wells is summarized in Table 3. No comments are included where the recommendations are considered acceptable.

Table 3 – Review of data gaps and recommended field investigations

Study Area	Data Gap (from 2018 EVO SSGMP)	Recommended activities	Review comment
Elk River Proximal to EVO			
Goddard Creek Sedimentation Pond	<i>Groundwater quality in the shallow and deep valley-bottom aquifers near to Goddard Creek Sedimentation Pond is unknown, and this is an area where mine influenced surface water may be losing to ground.</i>	<i>This was considered a gap in the RGMP that is applicable to the SSGMP monitoring network. The gap would be filled through additional investigations, and if necessary through the installation of monitoring wells downgradient of the pond.</i>	
Michel Creek			
Aqueduct Creek	<i>Groundwater quality at the base of Baldy Ridge where Aqueduct Creek infiltrates to ground is unknown. There are currently no dedicated monitoring wells to confirm a suspected down-valley groundwater flow direction of mine-influenced and deep groundwater quality, and flow direction is unknown.</i>	<i>This was considered a gap in the RGMP that is applicable to the SSGMP monitoring network. A drilling investigation is planned under the RGMP in the area of Aqueduct Creek. Once wells are installed and sampled, data should be reviewed to evaluate which wells would be suitable for monitoring in the SSGMP.</i>	
Downgradient of Erickson Creek and the South Pit Decant Pond	<i>No groundwater data exist downgradient of Erickson Creek and the South Pit Decant Pond where surface water elevated in CI is identified to potentially infiltrate to ground.</i>	<i>This was considered a gap in the RGMP that is applicable to the SSGMP monitoring network. Drilling will be conducted in Erickson Creek drainage as part of the EVO AWTF program. Once wells are installed and sampled, data should be reviewed to evaluate if the gap for Erickson Creek is filled. For the South Decant Pond, the gap would be filled through review of existing data to confirm the identified pathway, followed by necessary installation of monitoring wells if necessary.</i>	
Michel Creek	<i>The absence of continuous water level data and pumping rates for the Harmer (EV_HM1) and Machine Shop Rebuild (EV_MR2) supply wells in the Michel Creek valley bottom is identified as an uncertainty as potential effects on groundwater flow regime and surface water interactions may occur between April and June.</i>	<i>It is recognized that this is a gap better addressed through the RGMP; however, since operations are responsible for carrying out monitoring for the RGMP it was included. The gap could be filled by the installation of data loggers in these wells and improved monitoring of</i>	

		<i> pump cycling/pumping rates.</i>	
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Additional data gaps were identified during the review, which are not included in the 2018 Plan. These are as follows:

- Groundwater conditions are unknown in the Elk River valley bottom upgradient of the EVO mining activities. Groundwater monitoring in this area would allow the contamination potential due to upstream mining to be separated from the effect of the mining activities in the EVO area.
- Baseline groundwater conditions are unknown in the Michel Creek valley bottom upgradient of the EVO mining activities (upgradient of the confluence with Erickson Creek). Groundwater monitoring in this area would allow the effect of upstream conditions in Michel Creek (and the potential future Michel Coal project) to be separated from the contamination related to mining at EVO.
- Wells EV_MCgwS/D, EV_GV3gw and EV_GCgw are completed in low hydraulic conductivity material and are not suitable to monitor contaminant transport in the high hydraulic conductivity deposits representing the main potential groundwater pathway.
- The groundwater conditions in the Brodie, Gate, South Gate alluvial fan and in the Erickson Creek valley deposits are insufficiently characterized to allow an adequate water resource assessment for the planned Active Wastewater Treatment Facility (AWTF) at EVO.

6. Recommendations

6.1 Permittee’s Recommendations

The key recommendations provided in the 2018 EVO SSGMP are described in Table 3, with other recommendations related to hydraulic conductivity testing, logger installation, monitoring methodology and analytes (e.g. replacement of alkalinity with bicarbonate, carbonate and hydroxide), included in Section 6.2 of the Plan.

The 2017 Annual Report also includes recommendations, which pertain to the implementation of field practices, such as calibration of field probes and manual level measurements prior to sampling and deploying or uploading data from level loggers.

These recommendations are helpful to increase the understanding the groundwater pathway in the EVO area and should be implemented in the monitoring program.

6.2 ENV Recommendations

In addition to the recommendations provided by Teck, the following should also be implemented:

2018 EVO SSGMP

The 2018 EVO SSGMP does not meet several of the requirements under PE 107517 and the 2017 Approval Letter. As such, a revised 2018 EVO SSGMP should be submitted, which fulfills the

requirements where these are indicated as incomplete on Table 1 and 2. Specifically, the revised Plan should include the following:

- Review the hydraulic conductivity estimates and characterize heterogeneity of hydraulic properties and spatial differences in surface water – groundwater interaction.
- Assess the effect of pit dewatering on the groundwater flow pattern, baseflow and movement of contaminants along the groundwater pathway.
- Develop a cross-section in the area of EV_ECgw to determine whether this well is representative of the aquifer valley bottom and was installed sufficiently deep to monitoring groundwater – surface water interaction. Also compare fluctuations in groundwater and surface levels with precipitation to determine the main source of recharge to the aquifer at this location.
- Include Harmer well (note: resolve the inconsistent naming EV_HM1 and EV_HW1), the Machine Rebuild Shop well (EV_MR2) in the SSGMP and equip them with data loggers.
- Assess whether pumping from the supply wells EV_RCgw, EV_WH50gw and EV_BRgw induce negligible enhanced leakage from Michel Creek and are therefore suitable for monitoring. If the wells are considered to be suitable for monitoring, include them in the SSGMP and install data loggers.

The revised 2018 EVO SSGMP should be submitted by September 30, 2019.

2017 Annual Report for the EVO SSGMP

The 2017 Annual Report for the EVO SSGMP meets the permit requirements and no revised version needs to be submitted.

2018 Annual Report for the EVO SSGMP

The 2018 Annual Report should be updated as follows:

- The borehole logs and installation diagrams of all the wells included in the updated monitoring network should be included as an appendix to the reports.
- The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.
- Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.
- Outline the watershed divides of all the sub-catchments located in the EVO permitted area.

- Outline the losing and gaining reaches of the Elk River, Michel Creek and tributaries, where these can be inferred, on the map showing groundwater level contours.
- Add maps showing the potential sources and pathways identified for each sub-catchment.
- Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed. Also increase vertical scale to ease visual interpretation. Update cross-section BB' (drawing 653245-004) to include the information from Sparwood Well #4 (replacement of Well#3, also referred to as RG-DW-03-04).
- Use the Kendall Test to identify trends in the CI concentration time series.
- Label provincially mapped aquifer 1080 IA on the drawings and include a description of provincially mapped aquifer 1082 IIC in the report.

The 2018 Annual Report should also be accompanied by the delivery of the following:

- All the raw groundwater quality and quantity data and metadata presented in the reports in MS Excel table format. Draft templates for the data tables should be submitted for review and approval by ENV prior to delivery. The templates should be developed to allow ENV staff to conduct effectively independent interpretation and analysis (e.g. graphical representation, pivot table generation, determination of statistical indicators).
- Lithological logs and installation diagrams of new monitoring wells should be uploaded to the BC GWELLS database.

2021 EVO SSGMP

Field activities

The following field activities should be conducted to support the 2021 update of the EVO SSGMP:

- Install a well in high conductivity material at the location of EV_GV3gw, to monitor the shallower sand gravel deposits that are more vulnerable to contamination.
- Replace well EV_GCgw, which was completed in a low hydraulic conductivity unit, with a shallow and deep well installed in the high hydraulic conductivity units identified at this location.
- If well EV_ECgw is found to be unsuitable to monitor the valley bottom deposits along Erickson Creek, replace it with a new monitoring well in the valley bottom.
- Install a baseline monitoring well along Michel Creek valley bottom deposits upgradient of the confluence with Erickson Creek.

- Install a monitoring well in the Elk River valley bottom upgradient of the EVO mining operations, so that the contaminant contributions from upstream mining and EVO mining can be assessed.
- Add an existing monitoring well (or install a new well, if no suitable well currently exist) at the confluence of South Gate Creek and Michel Creek, to improve the understanding of the groundwater pathway in the alluvial fan at the base of Brodie, Gate and South Gate Creek.
- Replace monitoring wells EV_MCgwS/D, which are installed in low hydraulic conductivity material, with a well pair (shallow and deep) in higher hydraulic conductivity units.
- Where no logs and diagrams are available (such as in supply wells EV_RCgw, EV_WH50gw and EV_BRgw), conduct downhole camera surveys and downhole geophysics (resistivity, gamma ray) to determine screen intervals and lithologies.
- Use a sealed cap in well in EV_ECgw, once this is confirmed to be suitable for monitoring the valley bottom aquifer along Erickson Creek.
- Retain the pH lab analysis, as the difference between the field and lab pH is an indication of the corresponding reduction in alkalinity in the sample from the time of collection. This allows the identification of samples where alkalinity is underestimated.

These field activities should be implemented by September 30, 2019, so that the additional six months of monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the EVO SSGMP, which will be submitted by March 31, 2020.

Conceptual Model

The 2021 EVO SSGMP should also include an update of the Conceptual Model, by integrating the results of the studies that are currently ongoing, such as the Sparwood Area Groundwater Supporting Study and the groundwater study in support of the planned AWTF at EVO.

Integration with the AMP and TMP

The 2021 EVO SSGMP should integrate with the Adaptive Management Plan (AMP) and the Tributary Management Plan (TMP) as follows:

- Define groundwater triggers for the EVO area based on those that will be developed in the AMP and implemented in the Regional Groundwater Monitoring Plan.
- Incorporate the changes introduced in the 2019 AMP (e.g. consideration of the effect of groundwater discharge to streams on calcite development, according to Main Question 4 in the AMP).

- Consider the installation of additional monitoring wells to support the characterization of surface water – groundwater interaction in the tributaries selected in the 2020 TMP that are likely groundwater-fed.

The integration of the regional and site-specific groundwater monitoring programs with the AMP and TMP should also be based on the outcome of the upcoming Groundwater Working Group meetings.

Groundwater Working Group Meetings

The Groundwater Working Group (GWG) established October 2016 should continue to provide guidance for groundwater programs. The Groundwater Working Group will consist of members from Teck Coal Limited (Teck), the Ktunaxa Nation Council (KNC), Ministry of Environment and Climate Change Strategy (ENV) and Interior Health (IH), and may expand to include participants from Ministry of Energy and Mines (MEM) and Ministry of Forest, Lands and Natural Resource Operations (FLNRO). The frequency of GWG meetings should be increased from one to at least two per year, so that discussions and management decisions can respond more readily to the changes in environmental conditions, mine operations and plans occurring in the Elk Valley, including the Elkview Operations.

Should you have any questions about the above, please contact me at 604-582-5277 or Sarah.Alloisio@gov.bc.ca.

Sincerely,



Sarah Alloisio Ph.D, P.Geo.

Hydrogeologist – Mining Operations, ENV

Cc: Jeanien Carmody-Fallows, Section Head, Authorizations, Mining Operations, ENV



MINISTRY ASSESSMENT REPORT

Report prepared by: Sarah Alloisio, Hydrogeologist – Mining **Date:** April 8, 2019

Statutory Decision Maker: Doug Hill, Regional Operations Director - Mining

File:	107517	Tracking Number:	n/a
Application type:	2018 Plan Submission to fulfill the requirements of Sections 9.2.2, 9.2.2.3 and 10.4 in Permit 107517 – Line Creek Operations Site-Specific Groundwater Monitoring Program. 2017 Annual Report submission to fulfill the requirements of Section 5.3 of Permit PE-106970 and Condition 3.1.1.3 of Permit PE-5353 (Line Creek Phase I and II)		
Applicant:	Teck Coal Limited		

1. Executive Summary

This Ministry Assessment Report describes the review and recommendations provided for the 2018 update of the Line Creek Operations Site-Specific Groundwater Monitoring Plan (LCO SSGMP) and the 2017 Annual Report of the LCO SSGMP, which were submitted to fulfill the requirement of the Elk Valley Permit (107517). The requirements related to the 2018 Plan are included in Section 9.2.2 (Site-Specific Groundwater Monitoring) and 9.2.2.3 (Line Creek) of PE107517 and in the conditions outlined in the Approval letter of the 2013 LCO SSGMP, dated April 4, 2018. The requirements related to the 2017 Annual report are included in Section 10.4 (Groundwater Reporting Requirements) of PE 107517. The 2017 Annual Report was submitted also in accordance with Section 5.3 of Permit PE-106970, dated October 28, 2013, and Condition 3.1.1.3 of Permit PE-5353, as it includes monitoring locations at LCO Phase I and II.

The review concludes that the 2018 Plan does not meet several of the permit requirements and approval letter conditions, whereas the 2017 Annual Report meets the requirements. It is recommended that a revised 2018 Plan should be submitted, which fulfills the requirements and approval conditions where gaps have been identified, as shown in Table 1 and 2.

The data gaps identified and the recommendations provided in the 2018 Plan and the 2017 Annual Report are reasonable and should be implemented, with the modifications indicated in Table 3 and Section 6.1. Additional data gaps were identified in this review and additional recommendations are provided to address these gaps.

2. Application Request

Approval of the Line Creek Operations Site-Specific Groundwater Monitoring Plan (LCO SSGMP), dated October 31, 2018 and of the 2017 LCO Annual Report, dated March 31, 2018.

3. Background Information

In October 2013, Coal Limited (Teck) submitted a site-wide groundwater Monitoring Plan (now SSGMP) for the Line Creek Operations following a request from ENV (then Ministry of Environment). The 2013 Plan was approved by ENV on April 4, 2018, and included the requirement that a revised plan must be submitted to the Director for approval October 31, 2018 and every three years subsequently. In November 2014, ENV approved the Elk Valley Water Quality Plan and issued an area-based effluent permit (PE 107517) to Teck. Section 9.2.2 of PE 107517 requires Teck to develop and implement Site-Specific Groundwater Monitoring Programs (SSGMPs) for the five mining operations located within the boundaries of area considered under Permit 107517 – Fording River, Line Creek, Line Creek, Elkview and Coal Mountain. Section 9.2.2.3 includes the requirements related to the SSGMP for the Line Creek Operations (LCO SSGMP). The updated version of the LCO SSGMP was due for submission on October 31, 2018, and ENV received it on that date. The 2017 LCO Annual Report was due for submission on March 31, 2018 and was received on March 29, 2018.

4. First Nations Consultation and ENV Review

The Ktunaxa Nation Council (KNC) was consulted during the review of the LCO SSGMP. KNC provided ENV with the review comments on the 2018 LCO SSGMP and on the 2017 Annual Report for the LCO SSGMP prepared by their QP (Waterline). The comments provided by KNC were carefully reviewed and accounted for in the preparation of this document.

5. Technical Review

The following reports submitted to ENV by Teck Coal Limited (Teck) were reviewed to prepare this document:

- The approval letter dated April 4, 2018 containing the conditions for the 2018 LCO SSGMP update;
- The LCO Site-Specific Groundwater Monitoring program (LCO SSGMP) dated October 2018;
- The 2017 LCO Site-Specific Groundwater Monitoring Annual Report, dated March 2018;

The following documents provided by KNC were used to support the review:

- Hydrogeological Review, Line Creek Operations Site-Specific Groundwater Monitoring Plan 2018 Update, dated March 16, 2019;
- Recommendations for the Elkview (EVO), Coal Mountain (CMO), Line Creek (LCO), Fording River (FRO) and Line Creek Operations (LCO) 2017 Annual Groundwater Reports, dated October 5, 2018.

5.1. Concordance of the 2018 LCO SSGMP and the 2017 LCO Annual report with PE 107517, PE 106970 and PE 5353

The LCO SSGMP was reviewed to identify whether and to what extent it satisfies the requirements of PE107517, Sections 9.2.2, 9.2.2.3 and 10.4. The requirements of Section 5.3 in Permit 106970 and Condition 3.1.1.3 in Permit 5353 are also included in this review. Concordance to the permit requirements is classified in Table 1 as complete (Y), partially complete (P) or absent (N). No comments are provided in Table 1 for the requirements fulfilled by the Plan.

Table 1 Concordance with PE 107517 requirements

PE 107517 Requirement	Assessment	Concordance
Section 9.2.2		
<i>a. The Permittee must develop and implement a comprehensive groundwater monitoring program at each mine site, prepared by a qualified professional. This program must be conducted to the satisfaction of the Director and must include the following:</i>		Y
<i>i. Characterization of the groundwater system, aquifer characteristics (e.g., hydraulic conductivity and storativity), water quality and connectivity to the surface water system;</i>	A characterization of the heterogeneity of the hydraulic properties in the overburden aquifers based on depositional mechanisms and the hydraulic test results is missing, as is a description of groundwater-surface water connectivity and interaction (e.g. spatial distribution of gaining and losing reaches). The assumed gradient of 0.1 in the overburden is very high and no justification is provided for this value.	P
<i>ii. Characterization of seasonal variability in the groundwater system (quality and quantity).</i>		Y
<i>iii. Provision of a site specific conceptual model and the information necessary to support the development and verification of water quality predictions for the mine site. The site specific conceptual model shall be provided with the groundwater monitoring plan update on October 31, 2018, and updated with subsequent revisions to the monitoring plan;</i>	The conceptual model is described briefly and mostly in generic terms in Section 2. The description is also fragmented, as parts of it are included in Section 5, in relation to the groundwater monitoring program design. A site-specific conceptual model supported by the available data is missing.	P
<i>iv. Site specific numerical</i>	Two numerical groundwater modeling studies	N/A

<p><i>groundwater models may be required to support permitting activities. Numerical models, where required, must consider all available, relevant monitoring data (e.g., groundwater and surface water monitoring, stream flow, and precipitation data) and be developed by a Qualified Professional to meet the intended modelling purpose.</i></p>	<p>have been developed to date in the LCO area, in support of the Phase II Baseline and Assessment, and of the Hydrogeologic Investigation for the Dry Creek Water Management System. These numerical models require the development of a robust underlying conceptual model to be reliable prediction tools. The conceptual models underlying the existing numerical models would inform the Conceptual Site Model for the LCO area and likely improve it, if they were integrated with it.</p>	
<p>9.2.2.3 Line Creek Operations</p>		
<p><i>Groundwater monitoring must be conducted in accordance with a plan approved by the Director. The Line Creek Operations Site Wide Groundwater Monitoring program has been submitted to the Director. The Permittee must respond within 30 days to comments/requests made by the Director on the submission until the Director is satisfied with the submission. A revised plan must be submitted to the Director October 31, 2018 and every 3 years subsequently.</i></p>		<p>N/A</p>
<p>10.4 Groundwater Reporting Requirements</p>		
<p><i>a. A map of monitoring locations with Environmental Monitoring Stations (EMS) and Permittee descriptors;</i></p>		<p>Y</p>
<p><i>b. Cross-Sections showing well installation details stratigraphy, groundwater elevations, and flow. Cross-sections should be in the direction of groundwater flow and perpendicular to groundwater flow;</i></p>	<p>Cross-sections AA' and CC' developed for the LCO area show only the wells located along the cross-section, but not the projection of nearby wells, where stratigraphy and water levels are likely representative of the corresponding locations on the cross-sections. Also, well stratigraphy is missing from the cross-sections, so that consistency with the extent of the hydrogeological units represented on the cross-section cannot be assessed. Ericsson Fault is shown on cross-sections AA' and CC' but not in plan view, on Figure 3 (which shows the cross-sections in plan view) or other maps included in the SSGMP. No cross-section perpendicular to AA' was developed despite the presence of wells. Cross-section BB' is not based on well information, since no wells are located</p>	<p>P</p>

	sufficiently close to be representative of conditions on the cross-section. The location of the cross-sections is not clearly shown on Figure 3 due to the figure scale. (note: Figure 3 is erroneously referred to as Figure 5 in Section 5.0 and 5.1, and well LC_PIZDC1306 is incorrectly labelled as LC_PIZDC1305 on cross-section CC ²)	
c. Drawings showing locations and water quality data of groundwater sampling points;		Y
d. A summary of background information on that year's program, including a discussion of the program modifications relative to previous years;	The report does not state if the SSGMP was modified from the previous year, and no modifications (if present) are discussed. The logger data signalling that the transducer is above the groundwater level are not included.	Y/P
e. A summary of measured parameters, including appropriate graphs and comparison of results to Approved and Working Water Quality Guidelines, or other criteria and benchmarks as specified by the Director;		Y
f. Evaluation and discussion of spatial patterns and temporal trends;		Y
g. A summary of all QA/QC issues during the year; and,		Y
h. Recommendations for further study or measures to be taken.		Y
PE106970 – Section 5.3		
Requirement	Assessment	Concordance
<i>The Permittee must develop and implement a comprehensive groundwater monitoring program for the Line Creek Mine Phase II area, prepared by a qualified professional. This program must be conducted to the satisfaction of the Director and should achieve the following objectives at a minimum:</i>		Y
i. Characterize the groundwater resource (including water quality, quantity, flow characteristics, hydraulic conductivity of the affected aquifer(s), and relationship to surface water system);	A characterization of the heterogeneity of the hydraulic properties in the overburden aquifers based on depositional mechanisms and the hydraulic test results is missing, as is a description of groundwater-surface water connectivity and interaction (e.g. spatial distribution of gaining and losing reaches). The assumed gradient of 0.1 in the overburden	P

	is very high and no justification is provided for this value.	
ii. <i>Identify (and if necessary, quantify) impacts to groundwater from mining-related activities;</i>	A description of potential sources, groundwater pathways and receptors is provided where impacts are identified in qualitative terms. No quantitative estimates of impacts based on the available data are included.	Y/P
ii. <i>Provide the information necessary to support the development and verification of water quality prediction for the mine site (as per Section 5.5)</i>		Y
PE 5353 – Condition 3.1.1.3		
<i>The most current groundwater monitoring program must be implemented to satisfy monitoring of the discharge from the ERX Coarse Coal Rejects (ERX/CCR) dump.</i>		Y

5.2. Concordance of the 2018 LCO SSGMP with the 2018 Approval Conditions

The 2018 LCO SSGMP was reviewed to identify whether and to what extent it satisfies the conditions included in the Approval Letter of April 4, 2018 listed in Table 2 below. Concordance to the conditions of the Approval Letter is classified in Table 2 as complete (Y), partially complete (P) or absent (N).

Table 2 – Concordance of 2018 LCO SSGMP with conditions of Approval Letter.

Condition (Approval Letter April 4, 2018)	Assessment	Concordance
<i>a. A discussion of the effects that LCO's dewatering management strategy and Dry Creek recapture may have on on-site transport of contaminants and groundwater flow regimes;</i>	This discussion is missing.	N
<i>b. An inventory of known or suspected areas of potential contamination along with the potential contaminants of concern. This should also consider the most recent version of the Metal Leaching/Acid Rock Drainage Management Plan, since there is potential to change over time. The known or</i>	The seep from the West Line Creek Active Wastewater Treatment Facility (AWTF) waste rock pile is not included in the inventory of (known or suspected) contamination sources listed in Table 4. The ML/ARD study for LCO has not been completed to date, and potential sources of ML/ARD are those assumed for the 2017 Regional Water Quality Model. (note: Figure 14, which shows the CI sources, is	P/N

<p><i>suspected areas of potential contamination should be shown and labelled on the drawings;</i></p>	<p>erroneously referred to in the body of the Plan as Figure 9.)</p>	
<p><i>c. Identification of key areas for additional groundwater monitoring and data gap and uncertainty analysis completed for those key areas;</i></p>		<p>Y</p>
<p><i>d. Supporting documentation for the monitoring locations included in the plan, including supporting borehole logs, groundwater flow (vertical and horizontal) data, and hydraulic testing information. Specific information will be included regarding the location of background groundwater quality information, and the inclusion of wells LC_PIZM0903 and LC_PIZ_ER1 that are show in the December 16, 2015 assessment but are not included in the annual reports;</i></p>	<p>Well FR_HW5, which is located in the FRO area several kilometers north of the LCO area and is most likely affected by mining operations in FRO, is used to define background groundwater quality for LCO.</p>	<p>P</p>
<p><i>e. Cross-section drawings that include well details, and groundwater and surface water levels and details (i.e., size and depth to the bottom of adjacent settling ponds) at an appropriate scale to allow for visual interpretation;</i></p>	<p>Cross-sections AA' and CC' developed for the LCO area show only the wells located along the cross-section, but not the projection of nearby wells, where stratigraphy and water levels are likely representative of the corresponding locations on the cross-sections. Also, well stratigraphy is missing from the cross-sections, so that consistency with the extent of the hydrogeological units represented on the cross-section cannot be assessed.</p> <p>Ericsson Fault is shown on cross-sections AA' and CC' but not in plan view, on Figure 3 (which shows the cross-sections in plan view) or other maps included in the SSGMP. No cross-section perpendicular to AA' was developed despite the presence of wells. Cross-section BB' is not based on well information, since no wells are located sufficiently close to be representative of conditions on the cross-section.</p> <p>The location of the cross-sections is not clearly shown on Figure 3 due to the figure scale. (note: Figure 3 is erroneously referred to as</p>	<p>P</p>

	Figure 5 in Section 5.0 and 5.1, and well LC_PIZDC1306 is incorrectly labelled as LC_PIZDC1305 on cross-section CC`)	
<i>f. Assessment of elevated concentrations of constituent of interest in Phase II groundwater wells, where minimal effects are expected due to the early stages of mining in the area;</i>		Y
<i>g. Updated contingency and management triggers (as discussed in the December 15, 2015 memo) with related actions, including how the triggers will be calculated or determined; and,</i>	Triggers will be developed as part of the 2019 AMP update and will be based on the outcome of the 2019 GWG meeting.	N/A
<i>h. Identification of monitoring locations that represent background groundwater concentrations for the purposes of this project.</i>	Well FR_HW5, which is located in the FRO area several kilometers north of the LCO area and is most likely affected by mining operations in FRO, is used to define background groundwater quality for LCO.	N

5.3. Data Gaps

The 2018 LCO SSGMP identifies the areas where additional monitoring activities and installation of new wells are required to address data gaps. These are summarized in Section 5.3, Section 9.0, highlighted in Table 4 and their indicative location in shown on Figure 16a, b, and c of the 2018 LCO SSGMP.

The review of the data gaps and selected additional wells is summarized in Table 3. No comments are included where the recommendations are considered acceptable.

Table 3 – Review of data gaps and potential well installations

Study Area	Data Gap (from 2018 LCO SSGMP)	Recommendation (from 2018 LCO SSGMP)	Review comment
Line Creek – Processing Plant			
Regional Study Area 5 – eastern portion	<i>Groundwater pathway from potential sources in the Phase I of the mine has not been investigate</i>	<i>A well pair (shallow and deep) should be installed in the alluvial fan and glaciofluvial sediments adjacent to Line Creek close to the eastern boundary of Study Area 5, to assess the significance of groundwater as a pathway for contamination from Phase I to Line Creek.</i>	
Regional Study Area 5 –	<i>The groundwater pathway in the valley bottom along Fording River near the</i>	<i>This area expected to be influenced by contact water</i>	The installation of a well pair (shallow and deep) in

western portion	<i>confluence with Elk River has not been investigated.</i>	<i>originating from upstream mines plus potential loading from Line Creek. Hence, the investigation of the western portion of Study Area 5 aligns more with the objectives of the RGMP.</i>	the overburden at the confluence between Fording River and Elk River would be beneficial not only for the RGMP but also to investigate the interaction between groundwater and surface water in this area, which is relevant to characterize contamination pathways near the sources.
Regional Study Area 6 – southern portion	<i>The groundwater pathway from the CCR, Reclaimed CCR and the pond south of the Plant has not been characterized.</i>	<i>While adding monitoring in this area would meet the objective of characterizing groundwater pathways for potential transport to the Elk River, previous monitoring downgradient of CCR and the Process Plant Pond north of the Plant have consistently yielded concentrations of the CI below the primary screening levels.</i>	The installation of a well pair (shallow and deep) in the overburden downgradient of the Plant area would be beneficial not only for the RGMP but also to investigate the interaction between groundwater and surface water in this area, which is relevant to characterize contamination pathways near the sources. It is also not clear what data the “previous monitoring” downgradient of the Plant area mentioned in the 2018 Plan refers to.
Line Creek – Dry Creek			
Regional Study Area 2	<i>Mixing of the Fording River and valley bottom aquifer may or may not be sufficient to explain CI concentrations in GH_POTW10 and other monitoring wells downgradient of the confluence with Dry Creek, and donw-valley groundwater pathway from Dry Creek may be present</i>	<i>Assess future monitoring data for the presence of increasing trend of CI concentration at GH_POTW10 and nearby wells and install a well pair immediately downgradient of the confluence Fording River and Dry Creek, in Study Area 2.</i>	The installation of a well pair in the valley bottom sediments at the confluence between Dry Creek and Fording River would allow the contribution from Phase II to be monitored over time, as the waste rock deposition in the Dry Creek watershed progresses.

1. Recommendations

6.1 Permittee’s Recommendations

The key recommendations provided in the 2018 LCO SSGMP are described in Table 3, with other recommendations related to monitoring methodology, the well network and sampling frequency included in Section 9.0 of the Plan. I concur with these recommendations except for the one whereby sampling frequency would be reduced from quarterly to six-monthly. Sampling frequency should be maintained as quarterly, so that changes in seasonal fluctuations related to climate trends or changes in operations can be more easily detected.

The 2017 Annual Report also includes recommendations, which pertain to the list of analytes and installation of pressure transducers. With regard to the list of analytes, if wells LC_PIZP1101 and

LC_PIZP1105 are removed from the monitoring network, the list of analytes recommended in the 2017 Annual Report that apply to these wells should be applied to well LC_PIZP1104.

6.2 ENV Recommendations

In addition to the recommendations provided by Teck, the following should also be implemented:

2018 LCO SSGMP

The 2018 LCO SSGMP does not meet several of the requirements under PE 107517 and the 2018 Approval Letter. As such, a revised 2018 LCO SSGMP should be submitted, which fulfills the requirements where these are indicated as incomplete on Table 1 and 2. Specifically, the revised Plan should include the following:

- Characterization of heterogeneity of hydraulic properties and spatial differences in surface water – groundwater interaction.
- Provide a site-specific conceptual model based on the available information and including a characterization of the geological and hydrogeological setting.
- Update the cross-sections by projecting all nearby wells and the corresponding stratigraphy and develop a cross-section perpendicular to AA`.

The revised 2018 Plan should be submitted by June 30, 2019.

2017 Annual Report for the LCO SSGMP

The 2017 Annual report for the LCO SSGMP meets the permit requirements and no revised version needs to be submitted.

2018 Annual Report for the LCO SSGMP

The 2018 Annual Report should be updated as follows:

- The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.
- Outline the watershed divides of all the sub-catchments located in the LCO permitted area.
- Outline the losing and gaining reaches of the Elk River, Fording River, Line Creek Creek and respective tributaries, where these can be inferred, on the map showing groundwater level contours.

- Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.
- Use the Kendall Test to identify trends in the CI concentration time series.

The 2018 Annual Report should also be accompanied by the delivery of the following:

- All the raw groundwater quality and quantity data and metadata presented in the reports in MS Excel table format. Draft templates for the data tables should be submitted for review and approval by ENV prior to delivery. The templates should be developed to allow ENV staff to conduct effectively independent interpretation and analysis (e.g. graphical representation, pivot table generation, determination of statistical indicators).
- Lithological logs and installation diagrams of new monitoring wells should be uploaded to the BC GWELLS database.

2021 LCO SSGMP

Field activities

The following field activities should be conducted to support the 2021 update of the LCO SSGMP:

- Install a well pair in the eastern portion of Study Area 5, in the valley bottom at the confluence between Line Creek and Fording River;
- Install a well pair in the western portion of Study Area 5, in the valley bottom at the confluence between Fording River and Elk River;
- Install a well pair in the southern portion of Study Area 6, downgradient of the Plant area;
- Install a well pair in Study Area 2, in the valley bottom at the confluence between Dry Creek and Fording River;
- Reduce the acceptable criteria for turbidity in groundwater samples from 200 NTU to 50 NTU, as indicated in the *BC Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (http://www2.gov.bc.ca/assets/gov/environment/waste-management/industrial-waste/industrial-waste/water_air_baseline_monitoring.pdf). The Guidance document indicates that “*In order to prevent excessive data loss, a maximum upper bound of turbidity may be established (e.g., 200 NTU) to allow provisional data to be collected from wells that may have justifiably high natural turbidity.*” A justification will therefore needs to be provided if an acceptable criteria higher than 50 NTU is used.

These field activities should be implemented by the end of 2019, so that the additional monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the LCO SSGMP, which will be submitted by March 31, 2020.

Conceptual Model

The 2021 LCO SSGMP should include an update of the Conceptual Model, by integrating the results of the studies that are currently ongoing.

Integration with the AMP and TMP

The 2021 LCO SSGMP should integrate with the Adaptive Management Plan (AMP) and the Tributary Management Plan (TMP) as follows:

- Define groundwater triggers for the LCO area based on those that will be developed in the AMP and implemented in the Regional Groundwater Monitoring Plan.
- Incorporate the changes introduced in the 2019 AMP (e.g. consideration of the effect of groundwater discharge to streams on calcite development, according to Main Question 4 in the AMP).
- Consider the installation of additional monitoring wells to support the characterization of surface water – groundwater interaction in the tributaries selected in the 2020 TMP that are likely groundwater-fed.

Groundwater Working Group Meetings

The Groundwater Working Group (GWG) established October 2016 should continue to provide guidance for groundwater programs. The Groundwater Working Group will consist of members from Teck Coal Limited (Teck), the Ktunaxa Nation Council (KNC), Ministry of Environment and Climate Change Strategy (ENV) and Interior Health (IH), and may expand to include participants from Ministry of Energy and Mines (MEM) and Ministry of Forest, Lands and Natural Resource Operations (FLNRO). The frequency of GWG meetings should be increased from one to at least two per year, so that discussions and management decisions can respond more readily to the changes in environmental conditions, mine operations and plans occurring in the Elk Valley, including the Line Creek Operations.

Should you have any questions about the above, please contact me at 604-582-5277 or Sarah.Alloisio@gov.bc.ca.

Sincerely,



Sarah Alloisio Ph.D, P.Geo.

Hydrogeologist – Mining Operations, ENV

Cc: Jeanien Carmody-Fallows, Section Head, Authorizations, Mining Operations, ENV



MINISTRY ASSESSMENT REPORT

Report prepared by: Sarah Alloisio, Hydrogeologist – Mining **Date:** April 9, 2019

Statutory Decision Maker: Doug Hill, Regional Operations Director - Mining

File:	107517	Tracking Number:	n/a
Application type:	2018 Plan Submission to fulfill the requirements of Sections 9.2.2, 9.2.2.5 in Permit 107517 – Coal Mountain Operations Site-Specific Groundwater Monitoring Program. 2017 Annual Report submission to fulfill the requirements of Section 10.4 in Permit 107517.		
Applicant:	Teck Coal Limited		

1. Executive Summary

This Ministry Assessment Report describes the review and recommendations provided for the 2018 update of the Coal Mountain Operations Site-Specific Groundwater Monitoring Plan (CMO SSGMP) and the 2017 Annual Report of the CMO SSGMP, which were submitted to fulfill the requirement of the Elk Valley Permit (107517). The requirements related to the 2018 Plan are included in Section 9.2.2 (Site-Specific Groundwater Monitoring) and 9.2.2.5 (Coal Mountain) of PE107517. The requirements related to the 2017 Annual report are included in Section 10.4 (Groundwater Reporting Requirements) of PE 107517.

The review concludes that the 2018 Plan and the 2017 Annual Report meet the requirements.

The recommendations provided in the 2018 Plan and the 2017 Annual Report are reasonable and should be implemented. Additional data gaps were identified in this review and additional recommendations are provided to address these gaps.

2. Application Request

Approval of the Coal Mountain Operations Site-Specific Groundwater Monitoring Plan (CMO SSGMP) dated October 31, 2018 and of the 2017 CMO Annual Report, dated March 28, 2018.

3. Background Information

In November 2014, Teck submitted a Groundwater Monitoring Program for CMO following request by ENV (then MOE). Also in November 2014, ENV approved the Elk Valley Water Quality Plan and

issued an area-based effluent permit (PE 107517) to Teck. Section 9.2.2 of PE 107517 requires Teck to develop and implement Site-Specific Groundwater Monitoring Programs (SSGMPs) for the five mining operations located within the boundaries of the area considered under Permit 107517 – Fording River, Greenhills, Line Creek, Elkview and Coal Mountain. Section 9.2.2.5 includes the requirements related to the SSGMP for the Coal Mountain Operations (CMO SSGMP). Following comments and requests to revise the Plan from ENV, Teck submitted the approved version of the first CMO SSGMP in May 2015. The updated version of the CMO SSGMP was due for submission on October 31, 2018, and ENV received it on that date. The 2017 CMO Annual Report was due for submission on March 31, 2018 and was received on March 28, 2018.

4. First Nations Consultation and ENV Review

The Ktunaxa Nation Council (KNC) was consulted during the review of the CMO SSGMP. KNC provided ENV with the review comments on the 2018 CMO SSGMP and on the 2017 Annual Report for the CMO SSGMP prepared by their QP (Waterline). The comments provided by KNC were carefully reviewed and accounted for in the preparation of this document.

5. Technical Review

The following reports submitted to ENV by Teck Coal Limited (Teck) were reviewed to prepare this document:

- The CMO Site-Specific Groundwater Monitoring program (CMO SSGMP) dated October 2018;
- The 2017 CMO Site-Specific Groundwater Monitoring Annual Report, dated March 28, 2018;

The following documents provided by KNC were used to support the review:

- Hydrogeological Review, Coal Mountain Operations Site-Specific Groundwater Monitoring Plan 2018 Update, dated March 16, 2019;
- Recommendations for the Elkview (EVO), Greenhills (GHO), Line Creek (LCO), Fording River (FRO) and Coal Mountain Operations (CMO) 2017 Annual Groundwater Reports, dated October 5, 2018.

5.1. Concordance of the 2018 CMO SSGMP and the 2017 CMO Annual Report with PE 107517

The 2018 CMO SSGMP and 2017 Annual Report were reviewed to identify whether and to what extent it satisfies the requirements of PE107517, Sections 9.2.2, 9.2.2.5 and 10.4. Concordance to the permit requirements is classified in Table 1 as complete (Y), partially complete (P) or absent (N). No comments are provided in Table 1 for the requirements fulfilled by the Plan.

Table 1 Concordance with PE 107517 requirements

PE 107517 Requirement	Assessment	Concordance
Section 9.2.2		
<i>a. The Permittee must develop and implement a comprehensive groundwater monitoring program at each mine site, prepared by a qualified professional. This program must be conducted to the satisfaction of the Director and must include the following:</i>		Y
<i>i. Characterization of the groundwater system, aquifer characteristics (e.g., hydraulic conductivity and storativity), water quality and connectivity to the surface water system;</i>		Y
<i>ii. Characterization of seasonal variability in the groundwater system (quality and quantity).</i>		Y
<i>iii. Provision of a site specific conceptual model and the information necessary to support the development and verification of water quality predictions for the mine site. The site specific conceptual model shall be provided with the groundwater monitoring plan update on October 31, 2018, and updated with subsequent revisions to the monitoring plan;</i>		Y
<i>iv. Site specific numerical groundwater models may be required to support permitting activities. Numerical models, where required, must consider all available, relevant monitoring data (e.g., groundwater and surface water monitoring, stream flow, and precipitation data) and be developed by a Qualified Professional to meet the intended modelling purpose.</i>	No numerical models have been developed to date in the CMO area.	N/A
9.2.2.5 Coal Mountain Operations		
<i>iii. Implement drilling requirements identified in the qualified 3rd party Gap Analysis and Recommendations</i>		Y

<i>Report by July 31, 2015.</i>		
<i>iv. Implement the full monitoring program by September 15, 2015.</i>		Y
<i>v. A revised plan must be submitted to the Director October 31, 2018 and every 3 years subsequently.</i>	A revised plan was submitted on October 31, 2018.	Y
10.4 Groundwater Reporting Requirements		
<i>a. A map of monitoring locations with Environmental Monitoring Stations (EMS) and Permittee descriptors;</i>		Y
<i>b. Cross-Sections showing well installation details stratigraphy, groundwater elevations, and flow. Cross-sections should be in the direction of groundwater flow and perpendicular to groundwater flow;</i>	The groundwater table profile shown on cross-section KK' suggests that groundwater flow is to the west but also to the east of CM_MW7. There does not appear a reason why groundwater should flow east along this cross-section.	Y
<i>c. Drawings showing locations and water quality data of groundwater sampling points;</i>		Y
<i>d. A summary of background information on that year's program, including a discussion of the program modifications relative to previous years;</i>	The report does not state if the SSGMP was modified from the previous year, and no modifications (if present) are discussed.	Y/P
<i>e. A summary of measured parameters, including appropriate graphs and comparison of results to Approved and Working Water Quality Guidelines, or other criteria and benchmarks as specified by the Director;</i>		Y
<i>f. Evaluation and discussion of spatial patterns and temporal trends;</i>		Y
<i>g. A summary of all QA/QC issues during the year; and,</i>		Y
<i>h. Recommendations for further study or measures to be taken.</i>		Y

5.2. Data Gaps

The 2018 CMO SSGMP identifies the areas where additional monitoring activities and installation of new wells are required to address data gaps. These are summarized in Section 7 and 8 of the 2018 CMO SSGMP.

The review of the data gaps and selected additional wells is summarized in Table 3. No comments are included where the recommendations are considered acceptable.

Table 3 – Review of data gaps and potential well installations

Study Area	Data Gap (from 2018 CMO SSGMP)	Recommendation (from 2018 CMO SSGMP)	Review comment
Main Interceptor Sedimentation Ponds	<i>No monitoring of the potential overburden groundwater pathway for seepage from the ponds. The loading from the pond seepage to Corbin Creek is unknown, however, the predictions of the water load balance model at Corbin Creek at sensitive to seepage from the ponds.</i>	<i>CM_MW9, a monitoring well installed in the overburden installed downgradient and adjacent to the ponds 9i.e. near CM_MW4), to help assess potential leakage from the ponds.</i>	
Middle Mountain CCR	<i>Review of recent seep monitoring efforts downgradient of Middle Mountain Coarse Coal Reject (CCR) has indicated elevated sulphate in this area.</i>	<i>A monitoring well pair (CM_MW10) installed in the overburden and shallow bedrock downgradient and adjacent to the Middle Mountain CCR, to monitor potential seepage from the CCR.</i>	
Michel Creek valley bottom	<i>The hydraulic gradient observed between 234 Pit and CM_MW7 raises the potential risk of seepage of poor quality water from the pit reaching Michel Creek. Given the heterogeneity and anisotropy of the bedrock hydraulic conductivity, groundwater pathways are difficult to characterize.</i>	<i>Add surface water monitoring stations to allow identification of the areas where seepage may affect Michel Creek. Recommended positions (CM_M4, CM_M5, CM_M6 and CM_M7) are positioned to enable differentiation of seepage from 37 Pit, 34 Pit and 14 Pit. If water quality impacts are detected in Michel Creek, the location of future monitoring wells (if required) will be better constrained by the recommended surface water monitoring stations.</i>	<i>It is recommended that quarterly streamflow monitoring is also conducted at the proposed stations, so to develop a flow accretion profile along Michel Creek. This would allow losing and gaining sections to be defined, thus improving surface water – groundwater characterization of this portion of the Creek.</i>

1. Recommendations

6.1 Permittee’s Recommendations

The key recommendations provided in the 2018 CMO SSGMP are described in Table 3, and described in more detail along with a proposed monitoring schedule in Section 7 and 8 of the Plan. I concur with these recommendations.

The 2017 Annual Report also includes recommendations in Section 6, which pertain to blank and field samples, review of data outliers and review of water quality data at CM_MW7 to assess the potential seepage from 34 Pit towards Michel Creek.

6.2 ENV Recommendations

In addition to the recommendations provided by Teck, the following should also be implemented:

2018 CMO SSGMP

The 2018 CMO SSGMP meets the requirements under PE 107517 and should be approved.

2017 Annual Report for the CMO SSGMP

The 2017 Annual report for the CMO SSGMP meets the permit requirements and should be approved.

2018 Annual Report for the CMO SSGMP

The 2018 Annual Report should be updated as follows:

- The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.
- Outline the watershed divides of all the sub-catchments located in the CMO permitted area.
- Outline the extent of the valley bottom sediments along Corbin and Michel Creek.
- Outline the losing and gaining reaches of Corbin and Michel Creek, where these can be inferred, on the map showing groundwater level contours.
- Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.
- Replace the groundwater level profile located between the shallow and deep measured levels shown on the cross-sections with a phreatic and potentiometric profile. Also review the groundwater profile on cross-section KK' that suggests a divide at the location of CM_MW7.
- Use the Kendall Test to identify trends in the CI concentration time series.

The 2018 Annual Report should also be accompanied by the delivery of the following:

- All the raw groundwater quality and quantity data and metadata presented in the reports in MS Excel table format. Draft templates for the data tables should be submitted for review and approval by ENV prior to delivery. The templates should be developed to allow ENV staff to

conduct effectively independent interpretation and analysis (e.g. graphical representation, pivot table generation, determination of statistical indicators).

- Lithological logs and installation diagrams of new monitoring wells should be uploaded to the BC GWELLS database.

2021 CMO SSGMP

Field activities

The following field activities should be conducted to support the 2021 update of the CMO SSGMP:

- Install monitoring wells CM_MW9 and CM_MW10S/D as described in Table 3;
- Add surface water stations CM_M4, CM_M5, CM-M6 and CM_M7 as described in Table 3. Conduct water sampling and streamflow monitoring at these stations, so to define a flow accretion profile to support the characterization of surface water – groundwater interaction. Following the surface water quality assessment at these locations based on one year of monitoring data, up to four monitoring wells should be installed there is evidence of potential seepage from the pits.
- Retain the pH lab analysis, as the difference between the field and lab pH is an indication of the corresponding reduction in alkalinity in the sample from the time of collection. This allows the identification of samples where alkalinity is underestimated.

All field activities should be implemented by the end of 2019, so that the additional monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the CMO SSGMP, which will be submitted by March 31, 2020. The installation of monitoring wells in the Michel Creek valley bottom, if need, should be completed by September 2020.

Integration with the AMP and TMP

The 2021 CMO SSGMP should integrate with the Adaptive Management Plan (AMP) as follows:

- Define groundwater triggers for the CMO area based on those that will be developed in the AMP and implemented in the Regional Groundwater Monitoring Plan.
- Incorporate the changes introduced in the 2019 AMP (e.g. consideration of the effect of groundwater discharge to streams on calcite development, according to Main Question 4 in the AMP).

Groundwater Working Group Meetings

The Groundwater Working Group (GWG) established October 2016 should continue to provide guidance for groundwater programs. The Groundwater Working Group will consist of members from Teck Coal Limited (Teck), the Ktunaxa Nation Council (KNC), Ministry of Environment and Climate Change Strategy (ENV) and Interior Health (IH), and may expand to include participants from Ministry of Energy and Mines (MEM) and Ministry of Forest, Lands and Natural Resource Operations (FLNRO). The frequency of GWG meetings should be increased from one to at least two per year, so that discussions and management decisions can respond more readily to the changes in environmental conditions, mine operations and plans occurring in the Elk Valley, including the Coal Mountain Operations.

Should you have any questions about the above, please contact me at 604-582-5277 or Sarah.Alloisio@gov.bc.ca.

Sincerely,



Sarah Alloisio Ph.D, P.Geo.

Hydrogeologist – Mining Operations, ENV

Cc: Jeanien Carmody-Fallows, Section Head, Authorizations, Mining Operations, ENV



File: PE107517

March 11, 2020

Mariah Arnold
Sr. Lead Environmental Sciences
Cam Jaeger
Coordinator Environment

Teck Coal Limited
124B Aspen Drive
Sparwood, BC V0B 2G0

Dear Mariah and Cam:

RE: Elk Valley Site-Specific Groundwater Monitoring Programs (SSGMP) - 2018 Update

The 2018 update of the Site-Specific Groundwater Monitoring Plans (2018 SSGMPs) for Teck's operations in the Elk Valley (Fording River, FRO; Greenhills, GHO; Line Creek, LCO; Elkview, EVO; Coal Mountain, CMO) dated October 31, 2018 were received and reviewed by staff of the Ministry of Environment and Climate Change Strategy (ENV). Ministry Assessments for the 2018 SSGMPs were submitted by ENV to Teck in April 2019, which indicated that four of the five plans (FRO, GHO, LCO and EVO) did not meet the requirements described in Permit 107517. ENV requested a revised version of these plans to be submitted by September 30, 2019. ENV has received and completed the review of the revised submissions.

Pursuant to Section 9.2.2 of Permit PE107517, the 2018 update of the Elk Valley Site-Specific Groundwater Monitoring Plans (2018 SSGMP) for the following operations: Fording River Operations (FRO); Greenhills Operations (GHO); Line Creek Operations (LCO); Elkview Operations (EVO) and Coal Mountain Operations (CMO), are accepted with the following conditions:

1. Updated Site-Specific Groundwater Monitoring Plans for FRO, GHO, LCO, EVO and CMO will be submitted to the Director for approval **by October 31, 2021.**
2. The 2021 SSGMP updates will include the following:

- a. Expand the site-specific monitoring well network as follows:
 - i. FRO - Swift Creek valley bottom. Add a well to the FRO network, to investigate the presence of a potential mine-affected groundwater transport pathway in overburden and/or shallow weathered bedrock in the area downgradient of the Swift Creek sediment management system towards the Fording River valley bottom aquifer.
 - ii. GHO – Porter Creek valley bottom. Replace GH_MW-PC with a well pair installed in unconsolidated sediments and bedrock, to monitor a potential mine-affected groundwater transport pathway and investigate the surface water – groundwater interaction upgradient of the confluence with Fording River.
 - iii. LCO – Dry Creek. Add to the LCO well network the new well that is planned to be installed in Study Area #2 and added to the RGMP network, as per the Work Plan included in the ENV Acceptance Letter for the 2017 RGMP Update.
 - iv. LCO – Confluence of West Line Creek and Line Creek. Add to the LCO well network well AWTF-MW-15-02B and AWTF-Seep, if suitable, and/or a new well pair installed in the area downstream of the confluence of West Line Creek with Line Creek, where the surficial geology mapping indicates the presence of fluvial deposits. The objective of monitoring this well(s) and seep is to investigate the presence of a potential mine-affected groundwater transport pathway by-passing the AWTF intake location.
 - v. LCO – Background. Install a well pair (overburden / bedrock) upstream of the LCO mine-affected areas in the area within the Tornado Creek watershed where surficial geology mapping indicates the presence of fluvial deposits. Use this well to characterize background conditions for LCO. If no unconsolidated deposits are found in the area indicated by mapping, install a well in weathered bedrock to characterize background bedrock conditions in LCO.
 - vi. EVO – Grave Creek. Install a well in unconsolidated sediments in the Grave Creek valley fill aquifer, at a shallower depth than EV_GV3gw, to investigate a potential shallow groundwater pathway and the interaction between surface and shallow groundwater.
- b. Update the Conceptual Site Model for each operation, based on the integration of the updated groundwater monitoring data set and relevant information obtained from other groundwater studies supporting site-specific permit applications or regional programs (e.g. Kilmarnock alluvial fan groundwater study conducted in support of the FRO-S Active Wastewater Treatment Plant, groundwater investigations in the Clode Creek watershed, updated modelling and flow accretion survey in Dry Creek as part of the LCO Dry Creek Structured Decision Making process (SDM)).
- c. Update maps for the same themes and in the same format as those included in the revised 2018 SSGMPs. Update the maps for LCO and CMO using the same format and notation of the maps included in FRO, GHO and EVO.

- d. Update hydrogeological cross-sections to reflect the information acquired from new wells (and updated locations in plan view, where cross-sections have been extended to include new wells). Additional cross-sections will be developed for all wells, in directions parallel and perpendicular to the main direction of flow. The cross-sections should show all the wells (including wells drilled for purposes other than monitoring, e.g. geotechnical wells) used to define them, with the following details: well screens location, average groundwater elevation and elevation of nearby surface water bodies. The stratigraphic logs of all the wells used to define the cross-sections will also be provided.
- e. Update the structure of the documents describing the plans for LCO and CMO to be consistent with those prepared for FRO, GHO and EVO.
- f. Update the characterization of the effect of dewatering of the pits that intercept groundwater on the groundwater head, flow pattern and on interaction of groundwater with surface water.

If you have any questions, please contact Sarah Alloisio, Hydrogeologist, at Sarah.Alloisio@gov.bc.ca or at 236-468-2286.

Yours truly,



Liz Freyman
for Director, *Environmental Management Act*
Mining Operations

Cc: Jeanien Carmody-Fallows, Section Head, Mining Authorizations, ENV
Heather McMahon, Ktunaxa Nation Council



File: PE107517

February 19, 2020

Mariah Arnold
Sr. Lead Environmental Sciences
Cam Jaeger
Coordinator Environment

Teck Coal Limited
124B Aspen Drive
Sparwood, BC V0B 2G0

Dear Mariah and Cam:

RE: Elk Valley Regional Groundwater Monitoring Program (RGMP) - 2017 Update

The 2017 update of the Elk Valley Regional Groundwater Monitoring Program (2017 RGMP) dated September 2017 has been received and reviewed by ministry staff, along with the 2017 and 2018 Regional Groundwater Monitoring Program Annual Reports dated March 2018 and March 2019.

Pursuant to Section 9.2.1 of Permit PE107517, I hereby accept the 2017 update of the Elk Valley Regional Groundwater Monitoring Program (2017 RGMP), subject to the following conditions:

1. The Groundwater Work Plan will be carried out as written. The Groundwater Work Plan and the accompanying Table of Proposed Drilling Locations (Proposed Drilling Locations), which were discussed during the Groundwater Working Group (GWG) meeting of November 26-27, 2019 and submitted to ENV on January 7, 2020, are included as appendices to this Letter. Specifically, the monitoring wells proposed as part of the ongoing Mass Balance Investigation studies in support of the Regional Water Quality Model will be installed as soon as possible, subject to access and permitting constraints, and added to the Regional Groundwater Monitoring Network. Updates on the implementation of the Work Plan will be provided to the GWG during the Group's meetings and conference calls. All proposed changes to the Work Plan and Proposed Drilling Locations will need to be justified and will require review by the GWG and approval prior to being implemented.
2. An update of the RGMP must be submitted to the Director for approval **by September 30, 2020** and will meet in full, all the requirements detailed in point *i* to *vii* Of Section 9.2.1 of Permit PE107517.

Specifically, the 2020 RGMP update will contain the following:

- 2.1 Based on the data acquired from the monitoring between 2017 and December 31, 2019, a “updated description of relevant aquifer characteristics (e.g. hydraulic conductivity, storage properties, transmissivity, etc.), and a description of regional groundwater flow patterns (directions and velocities) and recharge areas, fate, groundwater interactions with surface waters, the effects of groundwater withdrawals on the SW/GW interactions, and the mobility of mine related constituents of interest.” (point *vi* of Section 9.2.1).
- 2.2 An updated Conceptual Site Model (CSM), and on a closer integration with the Site-Specific groundwater programs, the Mass Balance Investigation and the Sparwood Area Groundwater Study.
- 2.3 A list of all the hydrogeological studies conducted between 2017 and 2019, in support of other programs included in the Elk Valley Area-Based Management Plan (e.g. Regional Aquatic Effects Assessment, Regional Water Quality Model) or permit applications (e.g. Fording River South water treatment plant intake, Elkview and Fording River North Saturated Rock Fill), with an overview of each study and indication of whether and what information resulting from these studies is relevant to inform the CSM.
- 2.4 In addition to the maps included in the 2017 update, include the following maps:
 - i. Updated maps of the location of the existing groundwater monitoring wells included in the RGMP and proposed new RGMP wells (if applicable). The location of surface water monitoring stations should also be added as a reference.
 - ii. Updated maps allowing the visualization of the main aspects of the Conceptual Site Model (e.g. surface and groundwater pathways, indicative gaining and losing stream reaches, receptors associated with monitoring wells).
 - iii. Maps showing all the locations of the hydrogeological studies referred to in point 2.3 (two maps showing the study locations located in the northern and southern portion of the Elk Valley, respectively).
- 2.5 Updated hydrogeological cross-sections to reflect the information acquired from new wells (and updated locations in plan view, where cross-sections have been extended to include new wells). Additional cross-sections will be developed for all the wells included in the updated regional groundwater monitoring network, in directions parallel and perpendicular to the main direction of flow. The cross-sections should show all the wells (including wells drilled for purposes other than monitoring, e.g. geotechnical wells) used to define them, with the following details: topographic profile, bedrock contact elevation (where this is available or can be inferred), well screens location, average groundwater elevation and elevation of nearby surface water bodies. The stratigraphic logs of all the wells used to define the cross-sections will also be provided.

2.6 An update on how the RGMP addresses the changes introduced in the 2018 Adaptive Management Plan (AMP), with reference to Question 4 (effects of groundwater discharge to streams on calcite development) and Question 6 (groundwater triggers).

3. Provide a proposed Work Plan for 2020-2023 with proposed well drilling locations to fill in any remaining gaps identified during the update, with a tentative schedule for its implementation, as per condition *iv* of PE107517, Section 9.2.1 “Identify limitations and data gaps and conduct additional studies necessary to refine the hydrogeological conceptual model, determine the location and extent of mine-affected groundwater discharge to surface waters and to evaluate management and mitigation options.”

Further, the Director expects the following:

- The GWG established in October 2016 will continue to provide guidance for groundwater programs. The GWG will consist of members from Teck Coal Limited (Teck), the Ktunaxa Nation Council (KNC), Ministry of Environment (ENV), Interior Health Authority (IHA) and may expand to include participants from Ministry of Energy and Mines (MEM), Ministry of Forest, Lands and Natural Resource Operations and Rural Development (FLNRORD).
- A minimum of two (2) in-person meetings and two (2) conference calls of the GWG will be held in 2020. The GWG will meet approximately every three months, to maintain continuity in the communication and activities related to the groundwater programs. This will ensure that these programs achieve the objectives of the Elk Valley Area-Based Management Plan (ABMP) to protect groundwater, human health and aquatic ecosystems.

If you have any questions, please contact Sarah Alloisio, Hydrogeologist, at Sarah.Alloisio@gov.bc.ca or at 236-468-2286.

Yours truly,



Liz Freyman, Head, Environmental Impact Assessment Section - Mining
for Director, *Environmental Management Act*
Mining Operations

cc: Heather McMahon, Ktunaxa Nation Council (HM McMahon@ktunaxa.org)

Appendix II

LCO SSGMP





REPORT

Site Specific Groundwater Monitoring: 2019 Annual Report

Teck Coal Limited - Line Creek Operations

Submitted to:

Carla Froyman-Parker, Water Lead

Teck Coal Limited - Line Creek Operations

Submitted by:

Golder Associates Ltd.

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19135981-2020-064-R-Rev1

25 March 2020



Distribution List

Electronic Copy - Teck Coal Limited

Electronic Copy - Golder Associates Ltd.

Executive Summary

In compliance with requirements of British Columbia Ministry of Environment and Climate Change Strategy (ENV) discharge permit PE106970 and Permit 107517 issued under the *Environmental Management Act*, this report presents the results of the 2019 Line Creek Operations (LCO) Site Specific Groundwater Monitoring Program (SSGMP).

The groundwater monitoring locations were selected in consideration of the conceptual groundwater model and sources, pathways and receptors, targeting areas of higher potential for groundwater quality impacts. In general, groundwater flow in the bedrock and within the colluvium and till included in the overburden in the uplands is limited due to their lower hydraulic conductivity. The main aquifer is within the valley bottom sediments that includes glaciofluvial sediments. These valley bottom aquifers also collect and concentrate groundwater discharge, as they occupy topographically low areas and are characterized by a high degree of surface water-groundwater interaction between the aquifer and surface water bodies that incise into the aquifer.

The monitoring is focused on the valley-bottom sediments in four areas:

- LCO Phase 1 - due to proximity to pits and waste rock spoils.
- LCO Process Plant - due to proximity process plant ponds and Coarse Coal Reject.
- LCO Dry Creek Area - due to recently placed waste rock in this watershed.
- Outside of LCO – to evaluate for any down-valley pathways for contact water.

A total of 10 monitoring wells are being monitored for water quality on a quarterly basis and for water levels in a combination of one-time quarterly measurements and continuous measurements. No material quality assurance or quality control concerns were identified regarding Constituents of Interest (CI) for this report, except for one nitrate detection above five times the laboratory detection limit in the trip blank collected during the first quarter (Q1). There were no exceedances of British Columbia Contaminated Sites Regulation (BC CSR) standards for CI at the groundwater locations within the LCO site. Increasing trends were noted for sulphate in LC_PIZP1105 (Process Plant area) based on a Mann Kendall trend analysis for both Q1 and Q4. Increasing trends were noted for dissolved cadmium in LC_PIZP1104 and LC_PIZP1105 during Q4 and Q1, respectively. Dissolved selenium concentrations had increasing trends at LC_PIZP1104 during Q1 (near the Process Pond) and LC_PIZDC0901 (Dry Creek area) during Q4. Consistently, there was no clear increasing trend in CI at groundwater monitoring locations downgradient of LCO, which are also included in the Regional Groundwater Monitoring Program (GH_POTW10 and RG_02-20).

Local exceedances of non-CI are within the range of previous measurements and are interpreted to be due to naturally-occurring processes (dissolved barium, chloride, cobalt, fluoride, lithium, manganese and molybdenum). Dissolved boron slightly exceeded the irrigation watering standard (500 µg/L) at LC_PIZP1103 during the May 2019 sampling event (concentrations ranged from 480 µg/L to 570 µg/L), however 2018 concentrations ranged near the standard (480 to 500 µg/L). Dissolved cobalt concentrations exceeded drinking water standard (1 µg/L) in LC_PIZP1104 during each sampling event with concentrations ranging from 1.07 to 1.88 µg/L. This is well below the cobalt interim background estimate of 20 µg/L (BC MOE 2018), however above the 2018 cobalt concentration range of 0.1 to 0.4 µg/L.

For continuous improvements, recommendations include update of field documentation procedures for deployment of pressure transducers (and specifically the re-deployment of the transducer in LC_PIZP1001 to below the water table) and review of sampling frequency. The purpose of seasonal monitoring at this time is to collect information in order to reduce sampling frequency in the near future.

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1.0 INTRODUCTION

Teck Coal Limited (Teck) Line Creek Operations (LCO; Figure 1-1) implemented a Site-Specific Groundwater Monitoring Program (SSGMP) and implemented ongoing quarterly monitoring in 2013. This report encompasses site-specific data collected in the 2019 calendar year.

1.1 Background

In 2013, LCO implemented a groundwater monitoring program to meet requirements of British Columbia Ministry of Environment and Climate Change Strategy (ENV) discharge permit PE106970 and Permit 107517 issued under the *Environmental Management Act*. Since November 2014, LCO has been required to meet requirements for the SSGMP set in Permit 107517, which was also issued by ENV under the *Environmental Management Act* and authorizes effluent discharge from the five Teck mines in the Elk Valley.

An initial SSGMP was submitted in 2013 (Golder 2013a). The SSGMP was updated in 2015 (Golder 2015a) and in October 2018 (Golder 2018a) following several significant changes, as summarized below:

- Development and implementation of the Elk Valley Regional Groundwater Monitoring Program (RGMP; SNC-Lavalin 2015a, SNC-Lavalin 2015b and SNC-Lavalin 2017).
- Approval of the SSGMP by the ENV in a draft letter dated November 1, 2017, as described in the initial SSGMP (Golder 2013a) plus the update in the 2015 (Golder 2015a).
- Continued improvement in the conceptual model for groundwater flow in the Elk Valley and at LCO.

The draft approval letter from the ENV included several conditions. Teck also received comments on the SSGMP from the Ktunaxa Nation Council (KNC) in a letter dated November 20, 2017. The approval conditions and comments from the KNC have been addressed in the updated SSGMP (Golder 2018a), in the 2018 annual report (Golder 2019), and in ongoing implementation of the SSGMP. Concordance with the recommendations provided by ENV regarding LCO SSGMP is summarized in Table A.

Table A: ENV Recommendations and Concordance

ENV Recommendation	Where Addressed and/or Comment
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Appendix B (includes precipitation data) Figures 4.1 & 4-2 (includes estimated surface water elevations) – surface water elevation data not available
Outline the watershed divides of all the sub-catchments located in the LCO permitted area.	Figure 3
Outline the losing and gaining reaches of the Elk River, Fording River, Line Creek and respective tributaries, where these can be inferred, on the map showing groundwater level contours.	Figures 4-1 and 4-2
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.	Addressed in Teck June 7, 2019 Response
Use the Kendall Test to identify trends in the Cl concentration time series.	Trend analyses completed for Q1 and Q4 data at four locations and one RGMP location provided in Appendix E

The main changes in the SSGMP between 2013 and 2015 were the initiation of annual reporting and expansion of the monitoring network, with the 2015 annual report (Golder 2016a) including 12 monitoring wells and 2 wells downgradient of LCO. A well in the Line Creek valley-bottom near the Horseshoe Ridge Pit (LC_PIZM0903) initially included in the SSGMP was removed from the program in 2015. A well in the Coarse Coal Rejects (CCR) area (LC_PIZ_ER1) was removed from the program in 2015 due to its location within the permitted CCR area, selenium concentrations below detection (Golder 2015a), and indication of selenium reduction within and under CCR at GHO and other coal mines in Alberta and British Columbia (Kennedy et al. 2015; SRK 2011).

The monitoring network and frequency did not change between 2015 and 2018. The 2018 update of the SSGMP (Golder 2018a) included three potential new monitoring well locations.

The LCO SSGMP is complementary and overlaps with the Elk Valley Regional Groundwater Monitoring Program (RGMP) and the groundwater monitoring program for the Line Creek Active Water Treatment Facility.

1.2 Site Specific Groundwater Monitoring Program Objectives

The objectives for the LCO SSGMP are based on the requirements of the LCO discharge permits (PE106970 and PE5353) and site-specific requirements in Sections 9.2.2 and 10.4 of Permit 107517 which specifies that each site groundwater monitoring program must include:

- Characterization of the groundwater system, aquifer characteristics (e.g., hydraulic conductivity and storativity), water quality, and connectivity to the surface water system.
- Characterization of seasonal variability in the groundwater system (quality and quantity).
- Provision of the information necessary to support the development and verification of water quality predictions for the mine site.

Table B: Permit Requirement from Section 10.4 of Permit 107517

Permit Requirement	Relevant Section in This Report
i. a map of monitoring locations with EMS and Permittee descriptors;	Figure 3 Tables 2-1, 3-1, 3-2, 3-3, 3-4
ii. cross-sections showing well installation details, stratigraphy, groundwater elevations and flow. Cross-sections should be in the direction of groundwater flow and perpendicular to groundwater flow;	Figures 2-3a, 2-3b, 2-3c Appendix D Appendix F
iii. drawings showing locations and water quality data of groundwater sampling points;	Figures 4-3 and 4-4
iv. a summary of background information on that year's program, including discussion of program modifications relative to previous years; and	Section 4.0
v. a summary of measured parameters, including appropriate graphs and comparison of results to, applicable standards, or other criteria and benchmarks as specified by the Director;	Appendix C Figures 4-5, 4-6, 4-7, 4-8
vi. if applicable, a summary of exceedances of screening benchmarks;	Figures 4-3 and 4-4
vii. evaluation and discussion of spatial patterns and temporal trends;	Section 5.0
viii. a summary of all QA/QC issues for the year; and	Section 4.2
ix. recommendations for further study or measures to be taken.	Section 7.0

1.3 Summary of Changes between the 2019 and 2018 Groundwater Monitoring Programs

There were no changes to the 2019 SSGMP compared with 2018.

1.4 Previous Groundwater Work

Previous work that supports the objectives for the SSGMP are summarized in the Table 1-1.

Dry Creek Diversion Modelling

In 2013, a local groundwater study was performed in the overburden area within the footprint of the Dry Creek Water Management System (DCWMS) to support the design of the Dry Creek diversion (Golder 2013b). Details about this work and supporting reports are presented in Table C.

Table C: Dry Creek Diversion Summary

Year	Reference	Milestone
2013	Golder 2013b	Installed 10 monitoring wells, water quality sampling, water level monitoring, hydraulic testing and development of a conceptual model. Wells were limited to the east of Dry Creek due to access issues (Figure 3).
2014	Golder 2014a	Two additional wells were drilled on the west side of Dry Creek when access to the diversion structure area became available.
2016	Golder 2016b	<p>Numerical modelling was performed as part of <i>Mines Act</i> permit condition C-129 C.1 (e) from the February 19, 2014 amendment that was rescinded and replaced with the following condition:</p> <p><i>The Permittee shall develop a three-dimensional groundwater model to assess uncertainties in, and changes to, the groundwater flow regime in the Dry Creek Valley over life of mine and into closure. The model shall be used to evaluate the design of the DCWMS, the potential for uncontrolled seepage around the diversion structure, and the need for additional monitoring locations and contingency measures. Results of this modelling shall be provided to the Chief Inspector by October 30, 2016 and shall be used to inform the development of options for site performance objectives and instream flow measurements.</i></p> <p>This permit condition was satisfied and the modelling results predicted that for the life of mine, the Site Performance Objectives (SPO) for selenium and cadmium concentrations will be met at the monitoring location downstream of the diversion structure. Therefore, it is recommended that routine monitoring (surface water and groundwater) and facility inspections be completed to confirm model predictions, and, if needed, updating for continuous improvement.</p>

1.5 Integration between Elk Valley Regional Groundwater Monitoring Program and Site Groundwater Monitoring Programs

There are three levels of groundwater monitoring programs for Teck at Line Creek, summarized below from regional to local scales:

- The RGMP is focuses on monitoring off-site changes to groundwater in the valley-bottom deposits of the major tributaries (i.e., Fording River, Elk River and Michel Creek).
- The LCO SSGMP is used to identify potential impacts to groundwater quality within the mine permitted area and focuses on monitoring near potential sources (focus of the current report).

- The West Line Creek Active Water Treatment (WLC AWTF) groundwater program is required under refuse permit PR106789 with the objective of characterizing the local groundwater quality and verify the performance of the lined landfill facility.

Annual reports are prepared for the three programs. If an individual program identifies a gap, trend or pathway of concern, the data from the complementary program can be reviewed to understand the extent of the water quality anomaly (e.g., from local to regional programs) or to understand the source of the water quality anomaly (e.g., from regional to local programs). The programs also provide a basis for continuous improvement by checking the new monitoring data against the current conceptual model and provide means to evaluate the effectiveness of mitigations, such as water treatment, to improve water quality.

The RGMP will focus on fate and transport of constituents of interest (CI) in groundwater in the valley bottom of the main stems, and how they relate to applicable receptors. The main source of CI (selenium, sulphate, nitrate, cadmium and calcite) are waste-rock piles in upland areas of the Line Creek and Dry Creek watersheds. It is anticipated that the majority of the regional groundwater monitoring will be located outside mine operations permitted boundaries.

1.6 Linkages to the Adaptive Management Plan

As required in Permit 107517 Section 11, Teck has developed an Adaptive Management Plan (AMP) to support implementation of the EVWQP to achieve water quality targets including calcite targets, ensure that human health and the environment are protected, and where necessary, restored, and to facilitate continuous improvement of water quality in the Elk Valley. Following an adaptive management framework, the AMP identifies six Management Questions (MQ) that will be re-evaluated at regular intervals as part of AMP updates throughout EVWQP implementation. The AMP also identifies key uncertainties (KU) that need to be reduced to fill gaps in current understanding and support achievement of the EVWQP objectives.

The results presented in this report provide information relevant to five of the six MQs and many of the KUs identified in the AMP. Groundwater quality monitoring data along with data collected from other programs are needed for re-evaluating the answers to MQ 1 (“Will water quality limits and SPOs be met for selenium, nitrate, sulfate and cadmium?”), MQ 2 (“Will the aquatic ecosystem be protected by meeting the long-term SPOs?”), MQ 3 (“Are the combinations of methods for controlling selenium, nitrate, sulfate and cadmium included in the implementation plan the most effective for meeting limits and SPOs?”), MQ 5 (“Does monitoring indicate that mine-related changes in aquatic ecosystem conditions are consistent with expectations?”), and MQ 6 (“Is water quality being managed to be protective of human health?”).

Groundwater quality monitoring data assist in reducing KU 1.2 (“How will uncertainty in the Regional Water Quality Model be evaluated to assess future achievement of limits and SPOs?”), KU 2.1 (“How will the science-based benchmarks be validated and updated?”), KU 2.2 (“How will the integrated assessment methodology used to derive area-based SPOs be validated and updated?”), KU 3.4 (“What additional flow and groundwater information do we need to support water quality management?”), KU 6.1. (Is our understanding of local groundwater conditions for current and future drinking water (DW) use sufficient to minimize human exposure to constituents?), KU 6.2 (“Is the spatial extent of mine-influenced groundwater sufficiently characterized to manage water quality in order to support meeting the environmental objectives of the EVWQP?”), and KU (6.3 What are appropriate groundwater-related triggers and how can they be used?). Progress on reducing these KU, and associated learnings, will be described in Annual AMP Reports. Results from this report and other 2019 site-specific groundwater monitoring reports will inform the 2019 Regional Groundwater Monitoring Report, which is the main report for conveying results of work to reduce KU 6.1 and KU 6.2. Groundwater triggers under KU 6.3 will be developed in consultation with the Groundwater Working Group (GWG) and implemented in the appropriate monitoring programs once developed.

The 2019 Regional Groundwater Monitoring Report will also be the main report for conveying DW trigger results under the AMP, informed by the Elk Valley Drinking Water Evaluation and Sampling Program.

Refer to Teck’s 2018 AMP for more information on the adaptive management framework, Management Questions, Key Uncertainties, the Response Framework, Continuous Improvement, linkages between the AMP and other EVWQP programs, and AMP reporting.

2.0 LCO GROUNDWATER CONCEPTUAL MODEL

The groundwater conceptual model for LCO is updated with new information for continual improvement, with more significant updates in the SSGMP report (three-year cycle) as compared to the annual reports. Since 2007, detailed hydrogeologic studies as part of environmental assessments for expanding Teck operations in the Elk Valley (Golder 2014b, 2015c, 2015d, 2016b; Teck 2011a, 2011b, 2014a, 2015a, 2015b), including LCO Phase II, have significantly contributed to the understanding of local and regional hydrogeology. Previous work includes summaries of hydraulic test and water quality data, data synthesis including cross-sections, and data maps and numerical groundwater models to predict flow directions and flow velocities. An example of groundwater flow patterns in the Elk Valley is shown in Figure 2-1.

Groundwater flow in the mountainous region of the Elk Valley is topographically-driven and consists of local, intermediate, and regional flow regimes. The local flow system generally forms an unconfined aquifer in the overburden deposits (e.g., discontinuous till and colluvium) and shallow bedrock. Groundwater recharge to these shallow aquifers occurs from local topographic highs and discharge is to the nearest tributary stream, maintaining its perennial flow. At lower elevations the local flow system will discharge to the valley bottom sediments. The local flow system will have shorter flow paths and relatively high groundwater velocities. In intermediate and regional flow systems the groundwater flow paths are significantly longer, and the velocities are relatively low. This is due to decreasing hydraulic conductivities with depth in the Elk Valley bedrock units. These intermediate and regional flow systems discharge at low elevations to valley bottom sediments and often produce upward vertical hydraulic gradients between bedrock and overburden aquifers. Therefore, valley bottom sediments along main-stem rivers are recharged by local to regional groundwater flow systems but also by infiltration from direct precipitation, infiltration along losing reaches of the main-stems, and infiltration from losing reaches of tributaries where they enter the main-stem floodplain.

The valley-bottom deposits are considered the primary aquifer in the Elk Valley, with fluvial and glaciofluvial deposits in the floodplains of the main-stem rivers and larger tributaries forming the largest and most transmissive aquifers (Figure 2-1). At LCO, fluvial and glaciofluvial sediments (shown in light blue and bright green) in Figure 2-2 are present in the valley bottoms of Line Creek, Fording River and Elk River. Fluvial sediments have also been identified in Dry Creek. At the lower elevations of Line Creek, an alluvial fan overlaps the Fording River valley bottom sediments. Although these valley-bottom aquifers can be regional in extent, local groundwater flow patterns often dominate with flow toward and discharging to the surface water body that incise into these sediments or flow parallel along losing or dry stretches before gaining stretch returns downgradient.

Due to the varying degrees of surface-water groundwater interaction, groundwater monitoring primarily occurs in the valley bottom to monitor potential effects from an operation but also to identify the potential for a down-valley pathway and degree of surface water-groundwater interaction in local areas. In most areas of LCO, groundwater flows toward the main-stem rivers and larger tributaries and groundwater quality is expected to be better than surface water due to attenuation mechanisms along the pathway. In areas with strong local surface water-groundwater interaction, groundwater quality is similar to surface water quality. The amount of surface water-groundwater interaction has a high degree of spatial and temporal variability as it depends on the interplay of multiple variables including:

- Relative water levels in the river and groundwater system.
- River morphology and gradient.
- Hydraulic properties and the heterogeneity of the streambed and valley-bottom deposits.

- Distance from river.
- Pumping from wells.

For Line Creek, the groundwater-surface water interactions are dependent on the strata underlying the creek (Figure 2-3b):

- All contact water collects downgradient in Line Creek as flow occurs in a canyon with bedrock exposed in the creek bed.
- Downgradient of the canyon, Line Creek flows on permeable fluvial sediments and infiltration occurs to the Fording River valley bottom aquifer with eventual discharge to the Fording River that is the regional topographic low.
- Local gaining and losing reach, east of LC_LC4, where Line Creek flows over the alluvial fan and west into the valley bottom in the Fording River (Figure 4-1). Flow is not south into the Process Plant Area.

At Dry Creek, the groundwater-surface interactions are also dependent on the strata underlying the creek. The results of a flow accretion study completed in November 2018 (last page of Appendix D), together with groundwater elevations measured in wells, are outlined below:

- Up gradient of the Dry Creek – East Tributary of Dry Creek confluence, field investigations identified lower permeability units in the tributary valley bottom that confine flow paths from the deeper bedrock recharged on the ridge tops and results in upwards hydraulic gradient and gaining reaches. In select wells, upward hydraulic gradients are measured in confined discontinuous gravel lenses overlying bedrock and underlying till (cross-section provided in Appendix D).
- A losing to dry reach has been identified at and downgradient of the confluence that is attributed to higher permeability sediments part of the East Tributary alluvial fan (Figure 4-2) before gaining conditions return approximately between 1 and 1.5 km downgradient of the confluence. Downward gradients have also been measured in wells completed in lower permeability till (cross-section provided in Appendix D; Table H).
- Dry Creek is expected to lose water to infiltration when flowing over the Fording River floodplain that is underlain by permeable fluvial sediments with eventual discharge to the Fording River that is the regional topographic low.

Further flow accretion studies are planned for the LCO area to gather more information on the surface water-groundwater interactions.

In terms of groundwater flow velocities, the groundwater system can be subdivided as follows:

- Overburden systems that include valley-bottom sediments, waste rock and CCR from mining operations with hydraulic conductivities for coarse fraction typically in the 10^{-2} to 10^{-5} m/s range; for a scoping level estimate, assuming a gradient of 0.1 and a porosity of 0.3 (typical values for shallow aquifers), the groundwater velocity is expected to range up to hundreds of m per year.

- Bedrock systems with typical hydraulic conductivities in the 10^{-7} to 10^{-9} m/s range; for a scoping level estimate, assuming a gradient of 0.01 and a porosity of 0.01 (typical values for fractured bedrock aquifer), the groundwater velocity is expected to be up to 1 m per year.

Waste rock piles form thick unsaturated zones with thin basal aquifers atop the native ground of valley flanks and bottoms. Groundwater mounds below waste rock piles with the majority discharging as surface water at the toe of the waste rock spoils in combination with shallow groundwater before being directed to the nearest surface water body.

Water quality data from LCO is consistent with the conceptual model for groundwater flow described above. Potential sources, pathways and receptors are discussed in Golder (2018a).

The conceptual models are live tools that are continually checked and updated as needed as new data becomes available.

2.1 Groundwater Monitoring Program Design

The LCO SSGMP began in 2013 and is updated every three years (e.g., 2015, and 2018). This annual report focuses on data collected in 2019 and includes results from 2013 to 2018 for temporal context.

The report includes groundwater quality results, specifically for the CI identified in the provincial Ministerial Order No. 113 (the Order): selenium, cadmium, nitrate, and sulphate (Teck 2014a). LCO and regional monitoring, especially in mine-affected areas, indicate that cadmium concentrations tend to be lower in groundwater than surface water. Hence, this report focuses on selenium, sulphate, and nitrate. These constituents can often help understand the interaction between mine-affected waters, groundwater and surface watercourses.

Groundwater at LCO is divided into four spatial areas for the purpose of the monitoring program (Figure 3):

- LCO – Phase I Area is in the upper portion of Line Creek. Groundwater in this area is proximal to pits and waste rock spoils. Surface water in West Line Creek (WLC), which emerges from a rock drain under the WLC Spoil, is treated at the WLC AWTF.
- LCO - Process Plant Area is adjacent to the confluences of Line Creek, the Fording River, and the Elk River in the valley-bottom of the Elk River. Proximal to this area are the process plant ponds and CCR, which are potential sources of contact waters. Groundwater near the Fording and Elk Rivers are also prone to receiving mine-affected surface water and groundwater from upstream mine operations.
- LCO - Dry Creek Area includes permitted area for the Phase II LCO mining, which includes waste rock storage at the southern portion of the Dry Creek watershed, north of Phase I LCO mining. Contact water effects from recently placed waste rock on groundwater could be detected in this area. Additional information on the hydrogeology in this area is provided in Appendix D, and in Golder (2014a, 2016c).
- Outside LCO - Wells currently located downgradient of Dry Creek and the Process Plant Area (part of regional program but considered in this report for context).

Groundwater monitoring in the area of the WLC AWTF is reported separately on an annual basis (Golder 2018b).

The groundwater monitoring network was designed by assessing potential source zones, pathways and receptors, as discussed in Golder (2018a), and summarized in the table below:

Table D: Summary of Sources and Pathways and Monitoring Well Locations

Area	Potential CI Source	Potential Pathway	Groundwater Monitoring Locations ^(a)
Process Plant	Process Plant Ponds, Coarse Coal Rejects	Infiltration through fine-grained sediments and 30 m-thick unsaturated zone, groundwater transport to valley-bottom aquifer, Fording River and Elk River	LC_PIZP1101, LC_PIZP1103, LC_PIZP1104, LC_PIZP1105 plus additional wells for groundwater levels
	Line Creek	Infiltration to valley-bottom aquifer, groundwater transport to Fording River (Study Area #5)	Surface water only: LC_LC4, LC_LC5
	Fording River	Infiltration to valley-bottom aquifer, groundwater transport to Elk River (Study Area #5)	Surface water only: LC_LC5, EV_ER4
	Reclaimed CCR	Infiltration to valley-bottom aquifer, groundwater transport to Elk River (Study Area #6)	Surface water only: EV_ER4
Phase I	West Line Creek Spoil, North Line Creek Spoil, Burnt Ridge South Spoil, Horseshoe Spoil North Line Creek Pit, Burnt Ridge South Pit, Horseshoe Ridge Pit Ore Handling Area	Surface water transport: minor tributaries to Line Creek	Surface water only due to discharge from terminus of aquifer: LC_LC3, LC_LCDSSLCC, LC_LC4
		Upland groundwater transport discharging to Line Creek	
		Upland groundwater transport discharging indirectly to Line Creek through groundwater springs that daylight along the SE slope of the WLC catchment	
Phase II	Dry Creek Spoil	Infiltration through fine-grained sediments to patchy upland aquifer in tributary valley bottom, groundwater transport to Dry Creek	LC_PIZDC1306, LC_PIZDC1307, LC_PIZDC1308, LC_PIZDC1404S, LC_PIZDC1404D, LC_PIZDC0901
		Surface water infiltration to valley-bottom aquifer and Fording River (Study Area #2)	GH_POTW10 (downgradient of study area and LCO)

a) Except where noted.

The approach for the LCO site specific annual monitoring was to review time series plots for the areas of interest, compare to surface water trends, assess the spatial distribution relative to hydrogeologic settings and mine operations, and include trends in local water downgradient of LCO footprint boundaries.

3.0 APPLICABLE REGULATORY CRITERIA

3.1 Primary Screening

In BC, environmental matters pertaining to contaminated sites generally fall under the jurisdiction of the ENV, pursuant to the *Environmental Management Act* (EMA, SBC 2003, Chapter 53 assented to 23 October 2003). The key regulation under the EMA that relates to the assessment and remediation of contaminated sites is the Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 13/2019, updated to 24 January 2019]).

The CSR provides numerical standards for the evaluation of soil, groundwater, sediment and soil vapour quality. The following standards are considered applicable to the Site for the purposes of this monitoring program (Table 3-3):

- CSR numerical standards applied to analytical groundwater data were based on protection of aquatic life receiving freshwater (AW-F) and DW in accordance with ENV Document Protocol 21 for Contaminated Site: Water Use Determination, dated 31 October 2017. The following water use criteria were considered: aquatic wildlife (AW), irrigation water (IW), water used for livestock and water used for DW. Additionally, an interim background groundwater estimate of 20 µg/L for cobalt was used to screen the data consistent with ENV Technical Bulletin 3 Regional Background Concentrations for Select Inorganic Substances in Groundwater dated 24 September 2018.

3.2 Secondary Screening

Recharge of groundwater from surface water elevated in selenium means that groundwater may be higher than CSR standards. As a result, a secondary screening step consists of comparing the results to Permit 107517 limits and SPOs (Table 3-4) and the Canadian Drinking Water Quality Guidelines (Health Canada 2017).

This approach is consistent with the Elk Valley Regional Groundwater Monitoring Program (SNC-Lavalin 2017).

4.0 MONITORING AND ANALYSIS METHODS

4.1 Sampling

Groundwater sampling at LCO was conducted by Teck's contractor Nupqu Development Corporation (Nupqu) and by Teck LCO technicians, in accordance with the British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples (BC MOE 2013). In particular, "Part E: Water and Wastewater Sampling" contains applicable guidance in the "Ambient Freshwater and Effluent" section as well as throughout the "Groundwater Pollution Monitoring" section.

Prior to sample collection, wells were purged using a low-flow pump until in situ water quality readings stabilized. In situ water quality readings were obtained using a YSI Pro-Plus multiparameter instrument. Sample bottles and preservatives were provided by an accredited third-party analytical laboratory, ALS Environmental Laboratories (ALS). Sample bottles were certified clean and nitrile gloves were worn by the field technicians. Samples collected for dissolved parameters (e.g., dissolved metals and dissolved organic carbon) were field-filtered using an in-line filter. Due to field conditions and/or logistics, if samples are not field filtered then samples are shipped to the lab on the same day as sampling to minimize hold time prior to analysis. Samples requiring preservation were preserved accordingly in the field. The methods used for monitoring the field parameters with a YSI Pro-Plus multiparameter instrument are presented in Table 3-1. Calibration records for the multiparameter instrument were maintained by LCO.

4.2 Data Quality Assurance and Quality Control (QA/QC)

Environmental monitoring was conducted by Teck LCO Environment personnel and Nupqu personnel. All personnel were trained, experienced and competent.

Analysis of water samples is conducted by ALS in Calgary, AB, except for analysis of metals (total and dissolved) which were conducted by ALS in Vancouver, British Columbia. ALS Calgary laboratory is accredited by the Canadian Association for Laboratory Accreditation (CALA), for tests listed on their Scope of Accreditation. Water samples were submitted to ALS in Calgary, Alberta instead of ALS in Burnaby, British Columbia to minimize holding time exceedances. The laboratory provided sample bottles and containers, appropriate preservatives, and other necessary supplies (e.g., in-line filters for dissolved metals samples). ALS Limits of Reporting (LOR) for each parameter is included in the summary tables for blanks samples. The LOR is the detection limit (DL) for each analytical method plus a factor of safety to account for the standard error for each analytical method. In this report, the method detection limit (MDL) refers to the DL plus this factor of safety and is equivalent to the LOR. The MDLs for the samples collected in 2019 were below the BC CSR standards.

Groundwater monitoring at LCO in 2019 included the collection of QA/QC samples, including duplicates, field blanks and trip blanks. Acceptability criteria for review of QA/QC samples and the results of the QA/QC review are provided in Appendix A.

For reviewing the results of duplicate samples and the associated parent samples, LCO utilizes the criteria detailed in Part A, Appendix 3 (page 26) of the BC Field Sampling Manual for Continuous Monitoring (BC MOE, 2013), which notes that the Relative Percent Difference (RPD) is expected to be somewhat greater in field duplicates than for laboratory duplicates. Using the example Acceptability Criteria of BC MOE (2013) as a guide, the following Acceptability Criteria were established for review of LCO field duplicate analyses (Appendix A) as noted in Table A1 of Appendix A:

- “Pass” denoted that RPD values for duplicate samples were $\leq 20\%$ or both duplicate values were less than the MDL.
- “Pass-1” denoted that one or both duplicate values were less than five times the MDL. The RPD value was calculated; however, an RPD target was not identified.
- “Pass-2” denoted that both duplicate values were greater than five times the MDL, and the RPD value was $>20\%$ and $\leq 50\%$.
- “Fail” denoted that that both duplicate values were greater than five times the MDL, and the RPD was $>50\%$.

The laboratory RPD is analysis dependent; however, based on the ALS laboratory certificates of analysis (COAs) an internal precision criterion of $\leq 20\%$ RPD is generally consistent for the parameters provided within this report.

Four sets of field duplicates were collected during the 2019 groundwater sampling program (Appendix A, Table A1). The RPD values for analyzed parameters was calculated in accordance with the BC Field Sampling Manual for Continuous Monitoring (BC MOE 2013). Using the criteria for analysis of the RPD values provided above, 94% of the duplicate analyses were classified as “Pass”, 5% of the duplicate analyses were classified as “Pass-1”, 0% of the duplicate analyses were classified as “Pass-2”, and 1% of the duplicate analyses were classified as “Fail”.

A review of the results with RPD greater than 50% indicated that these exceedances were generally not consistent between samples for one or more analytes. Both the original and duplicate samples were included in the 2019 assessment summary tables and screened against the referenced standards for interpretation of the results.

Four field blank samples were collected during the 2019 groundwater sampling program (Appendix A, Table A2). Based on the results, 93% of the analyses were below MDLs); therefore, considered acceptable. The following analytes had reportable concentrations above MDLs and required further review:

- Field blank Sample ID WG_Q1-2019-MT1:
 - Ammonia concentration of 1.05 mg-N/L, above the MDL (0.010 mg-N/L);
 - Total chromium concentration of 0.0004 mg/L, above the MDL (0.0001 mg/L); and
 - Total Kjeldahl Nitrogen concentration of 4.76 mg/L, above the MDL (0.05 mg/L).
- Field blank Sample ID WG_Q3-2019_010:
 - Ammonia concentration of 0.0075 mg-N/L, above the MDL (0.005 mg-N/L); and
 - Total lead concentration of 0.000064 mg/L, above the MDL (0.00005 mg/L).

- Field blank Sample ID WG_Q4-2019_004:
 - Dissolved barium concentration of 0.00029 mg/L, above the MDL (0.0001 mg/L);
 - Dissolved calcium concentration of 0.063 mg/L, above the MDL (0.05 mg/L);
 - Total manganese concentration of 0.0001 mg/L at the MDL (0.0001 mg/L);
 - Dissolved silicon concentration of 0.227 mg/L, above the MDL (0.05 mg/L);
 - Dissolved sodium concentration of 0.233 mg/L, above the MDL (0.05 mg/L);
 - Dissolved tin concentration of 0.00075 mg/L, above the MDL (0.0001 mg/L); and
 - Total tin concentration of 0.00012 mg/L, above the MDL (0.0001 mg/L).

Detections of acidity, pH and oxidation-reduction potential in blanks were not included in the list above, as some acidity is expected to be present in de-ionized water. The detected ammonia concentration and Total Kjeldahl concentration in Sample ID WG_Q1-2019-MT1 and the dissolved tin concentration in Sample ID WG_Q4-2019_004 were above $5 \times$ MDL; however, concentrations were below referenced BC CSR standards (1.31 mg-N/L for ammonia, no standard for TKN and 2.5 mg/L for dissolved tin). Some parameters detected in the field blanks, were also detected in the trip blanks, suggesting introduction of these parameters in the field or during shipment and handling.

A trip blank was submitted during each quarterly sampling event (Appendix A, Table A3). The following analytes had reportable concentrations above MDLs and required further review:

- Trip blank Sample ID WG_Q1-2019_RD1 MT1:
 - Ammonia concentration of 0.292 mg-N/L, above the MDL (0.005 mg-N/L);
 - Total iron concentration of 0.022 mg/L, above the MDL (0.01 mg/L);
 - Total manganese concentration of 0.00014 mg/L, above the MDL (0.0001 mg/L);
 - Nitrate concentration of 0.125 mg-N/L, above the MDL (0.005 mg/L);
 - Total Kjeldahl Nitrogen concentration of 0.301 mg-N/L, above the MDL (0.05 mg/L); and
 - Phosphorus concentration of 0.0033 mg/L, above the MDL (0.002 mg/L).
- Trip blank Sample ID WG_Q2-2019_RD1:
 - Ammonia concentration of 0.0334 mg-N/L, above the MDL (0.005 mg-N/L).
- Trip blank Sample ID WG_Q4-2019_006:
 - Ammonia concentration of 0.0069 mg-N/L, above the MDL (0.005 mg-N/L).

Detections of acidity, pH and oxidation-reduction potential in trip blanks were not included in the list above, as some acidity is expected to be present in de-ionized water. The detected ammonia, nitrate, Total Kjeldahl Nitrogen and phosphorus concentrations in the first quarter trip blank were greater than 5 x MDL, suggesting potential cross-contamination related to sample transport and storage conditions. This may have an effect on the interpretation of the results for those parameters, however the parameters are not CI, except for the nitrate detection in the trip blank collected during Q1.

Samples collected as part of the 2019 sampling program had turbidity levels below the Acceptable Criteria of 200 nephelometric turbidity units (NTU) (BC MOE 2016), with the exception of LC_PIZP1105 collected in March and June 2019 which had field-measured turbidity units of 1072.1 and 370 NTU, respectively (Appendix C). Elevated field-measured turbidity (>50 NTU) was also observed in March at LC_PIZP1104 (150 NTU), November at LC_PIP1105 (122.74 NTU) and March at LC_PIZDC1307 (60 NTU). These elevated field-measured turbidity values (>50) may be attributed to increased surface water infiltration during the first quarter, except for at LC_PIP1105. Metals concentrations at LC_PIZP1105 were below the BC CSR standards with the exception of lithium and therefore the elevated turbidity is not expected to have a significant affect on the data conclusions in this report.

Hold time exceedances as provided in the COAs (Appendix G) were reviewed. Exceedances with respect to pH and oxygen-reduction potential were noted for multiple sampling events. The field-measured value is recommended for these parameters. Hold time exceedances with respect to orthophosphate and total suspended solids were also noted for March 2019 events as outlined in the COAs. Hold time exceedances with respect to nitrites and nitrates were noted in July 2019 sampling events and may affect the interpretation of the results. However, long-term trends in nitrate concentrations are assessed within the report.

Overall, the results from the QA/QC program completed in 2019 are considered acceptable for the purposes of this report.

4.3 Statistical Analysis

Statistical analyses were completed using the following two methods to provide an objective assessment of variation in groundwater chemistry data at key locations:

- Control charting to define variation relative to mean values.
- Trend analysis using seasonal Mann-Kendall statistical analysis to assess changes over time. Data from the first quarter (Q1) of each year was utilized, as well as data from the fourth quarter (Q4).

The groundwater wells and the rationale for selecting them for statistical analysis is provided below:

- LC_PIZP1104 and LC_PIZD1105: valley-bottom aquifer between the Process Ponds and the Elk River, with higher concentrations of CI than other wells in the Process Plant area (Figure 4-3).
- LC_PIZDC0901 and LC_PIZDC1306: tributary valley-bottom sediments between the Phase II spoil and the Fording River, with higher concentrations of CI than other wells in the Dry Creek area (Figure 4-4).

- RG_02-20: valley-bottom aquifer in the valley-bottom aquifer downgradient approximately 4.3 km south of the LCO project operational boundary and adjacent to the Elk River, with selenium concentrations periodically exceeding the water quality criteria (Figure 4-3).

Control charting and seasonal trend analysis focused on groundwater quality parameters: dissolved selenium, sulphate, nitrate, and dissolved cadmium for LC_PIZP1104 , LCPIZD_0901, LC_PIZP1105 and LC_PIZP1306. Total selenium and total cadmium concentrations were included in the statistical analysis for RG_02-20. Total metals, rather than dissolved metals, was analyzed as from RG_02-20 is used as a source of drinking water..

Control charts are tools that allow graphical investigation of data in a meaningful and transparent manner, while providing control limits (Chapman et al. 2007). Control charts were formulated using the Shewhart charting method (Shewhart 1931). The upper control limited was calculated as the 99.7 percentile of the entire dataset plus the mean of the entire dataset. This is similar to establishing control limits via plus or minus three times the standard deviation ($\pm 3\sigma$), if the data is normally distributed. If lower control limits were found to be negative values, the lower control limits were considered as zero.

To identify and determine temporal trends in groundwater quality parameters, parameters were analyzed using Mann-Kendall trend analysis (Hirsch et al. 1982; Gilbert 1987). Seasonal Mann-Kendall trend analyses were completed for annual results collected during the first quarter (Q1: defined from 1 January to 31 March) (note that for RG_02-20, one sampling event included for the Q1 analysis was from April since the Q1 sample was not available) and the last quarter (Q4: defined from 1 October to 31 December). Half the detection limit was substituted for data that were reported below the detection limit. The rationale behind the selection of groundwater monitoring wells for the Mann-Kendall trend analysis can be seen in Table E below.

Table E: Rationale for Selection of Wells for Mann-Kendall Trend Analysis

Area	Well Name	Rationale
Phase I – Process Plant (Ponds)	LC_PIZP1104	Monitor water quality downgradient of Process Plant ponds prior to the Elk River and Fording River confluence to detect seepage from Process Plant ponds
	LC_PIZP1105	
Phase II – Dry Creek (Diversion Structure)	LC_PIZDC0901	Monitor water quality near Dry Creek to detect seepage near diversion structure for proposed water treatment plant
	LC_PIZDC1306	
Non-LCO Monitoring Well (Downgradient of Plant Site)	RG_02-20	Monitor water quality to detect seepage downgradient of LCO Plant Site, Greenhills Operations, and Fording River Operations

5.0 RESULTS

The results of the 2019 groundwater monitoring program are presented for three general areas (Figure 3):

- LCO – Process Plant Area.
- LCO – Dry Creek Area.
- Outside LCO – Offsite Wells.

Groundwater elevations and contours in the Process Plant and Dry Creek areas are shown on Figures 4-1 and 4-2, respectively. Hand groundwater level measurements collected throughout the 2019 calendar year are summarized in Table F below.

Table F: Manual (Hand) Water Level Measurements

General Area	Well ID	Date (2019)	Manual Water Level Measurement (mbtoc)	Top of Casing Elevation (masl)	Manual Groundwater Elevation (masl)
Dry Creek Area	LC_PIZDC0901	March 26	4.11	1693	1688.89
		June 5	5.97		1687.03
		September 3	6.72		1686.28
		November 6	7.52		1685.48
	LC_PIZDC1306	March 25	7.74	1709.04	1702.3
		May 29	Artesian		N/A
		August 15	Artesian		N/A
		November 7	2.06		1707.98
	LC_PIZDC1307	March 21	7.15	1691.21	1684.06
		May 29	2.73		1688.48
		August 22	3.26		1687.95
		October 30	3.26		1687.95
	LC_PIZDC1308	March 21	3.31	1691.37	1688.06
		May 29	2.08		1689.29
		August 22	2.51		1688.86
		October 30	3.02		1688.35
	LC_PIZDC1404S	March 20	5.71	1706.60	1700.89
		May 23	1.33		1705.27
		August 15	3.23		1703.37
		October 23	4.69		1701.91
LC_PIZDC1404D	March 20	7.10	1706.86	1699.76	
	May 23	3.81		1703.05	
	August 15	4.48		1702.38	
	October 23	5.68		1701.18	

Table F: Manual (Hand) Water Level Measurements

General Area	Well ID	Date (2019)	Manual Water Level Measurement (mbtoc)	Top of Casing Elevation (masl)	Manual Groundwater Elevation (masl)
Process Plant Area	LC_PIZP1001	March 14	57.95	1287.83	1229.88
		November 13	49.71		1238.12
	LC_PIZP1101	January 22	31.40	1267.06	1235.66
		April 25	31.03		1236.03
		July 17	30.95		1236.11
		November 21	31.11		1235.95
		December 5	30.93		1236.13
		December 16	31.20		1235.86
		LC_PIZP1103	March 13		28.29
	May 6		28.08	1236.46	
	July 9		28.04	1236.50	
	October 10		28.28	1236.26	
	LC_PIZP1104	March 14	35.01	1272.10	1237.09
		March 18	34.45		1237.65
		May 27	34.95		1237.15
		September 6	34.92		1237.18
		September 12	34.96		1237.14
		November 13	34.96		1237.14
		November 14	34.95		1237.15
	LC_PIZP1105	March 31	38.41	1273.86	1235.45
		June 24	38.42		1235.44
		June 25	38.42		1235.44
		September 5	38.40		1235.46
November 13		38.37	1235.49		

Spatial variation in concentrations of dissolved selenium, dissolved cadmium, dissolved sulphate, and nitrate for groundwater locations and select surface water locations are presented on Figures 4-3 and 4-4 (highest concentrations in 2019 at each site are shown for surface water data). For each area, selenium, nitrate, and sulphate concentrations from sampling locations have been plotted on time series plots see Figures 4-5 to 4-8. Groundwater level measurements from a representative well were coupled with chemistry results to aid in the assessment of temporal variations (Figures 4-5a,b,c and 4-6a,b,c). Groundwater levels over time in each well are provided in Appendix B. Concentrations of Cl and comparisons to CSR standards are presented in Tables 4-1 and 4-2. The results for a suite of analytes for sampled locations with comparison to BC CSR are presented in Appendix C. Results of the statistical analyses including quality control charts and seasonal Mann-Kendall trend analyses are shown in Appendix E. Borehole logs are provided in Appendix F. Laboratory reports are provided in Appendix G (electronic copy of report only).

5.1 Line Creek – Process Plant Area

Groundwater Levels

Groundwater levels in monitoring wells in the Process Plant area ranged from approximately 1,235 to 1,268 metres above sea level (masl) (Figure 4-1). Groundwater flow in the valley-bottom aquifer underlying the Process Plant area is directed from the eastern edge of the valley bottom-sediments (East), including recharge from Line Creek and Grave Lake, to the Elk River (West). No vertical hydraulic gradients were calculated for the Process Plant Area due to the lack of nested wells in the area.

Groundwater Quality

Concentrations of CI were below BC CSR standards at sampled groundwater locations from the Process Plant area in 2019 (Figure 4-3, Table 4-1). Below is a summary of the CI concentrations in groundwater at monitoring wells in the Process Plant area in 2019 (excluding RG_02-20):

- Dissolved selenium concentrations ranged from <0.05 µg/L (LC_PIZP1101 and LC_PIZP1103 during multiple sampling events) to 0.704 µg/L (LC_PIZP1105 on March 29).
- Sulphate concentrations ranged from 2.56 mg/L (LC_PIZP1101 on January 22) to 102 mg/L (LC_PIZP1105 during multiple sampling events).
- Nitrate concentrations ranged from <0.005 mg-N/L (LC_PIZP1101 during multiple sampling events) to 0.605 mg-N/L (LC_PIZP1105 on June 25).
- Dissolved cadmium concentrations ranged from <0.005 µg/L (LC_PIZP1101 on July 17) to 0.146 µg/L (LC_PIZP1104 on March 18).

Localized exceedances of dissolved chloride, boron, cobalt, fluoride, lithium, manganese, and molybdenum concentrations are present in results from wells (LC_PIZP1101, LC_PIZP1103, LC_PIZP1104, and LC_PIZP1105) in the Process Plant area (Appendix C). This is similar to 2018 results (Golder 2019), except for dissolved boron and cobalt, which were new exceedances in 2019 in the Process Plant area:

- Chloride concentrations exceeded IW (100 mg/L) at LC_PIZP1104 and LC_PIZP1105, during each of the 2019 sampling events. Chloride concentrations in these wells ranged from 118 mg/L to 203 mg/L.
- Fluoride concentrations exceeded IW (1 mg/L), water used for livestock (1 mg/L) and DW (1.5 mg/L) at LC_PIZP1101 during each of the 2019 sampling events, and from 1.69 mg/L to 1.83 mg/L.
- Dissolved boron exceeded IW (500 µg/L) in LC_PIZP1103 during the May sampling event. Concentrations measured in 2019 ranged from 480 µg/L to 570 µg/L. They were either marginally above or marginally below IW.
- Dissolved cobalt concentrations exceeded DW (1 µg/L) in LC_PIZP1104 during each sampling event and 2019 concentrations ranged from 1.07 to 1.88 µg/L. This is well below the cobalt interim background estimate of 20 µg/L (BC MOE 2018), however above the 2018 cobalt concentration range of 0.1 to 0.4 µg/L.
- Concentrations of dissolved lithium exceeded DW (8 µg/L) in each of the four wells during each of the 2019 sampling events. Concentrations ranged from 9 µg/L to 122 µg/L.

- Dissolved manganese concentrations exceeded IW (200 µg/L) at LC_PIZP1101, LC_PIZP1103 and LC_PIZP1104 during at least three sampling events in 2019. Dissolved manganese concentrations above IW ranged from 222 µg/L to 1,070 µg/L.
- Dissolved molybdenum concentrations were above IW (10 µg/L) at LC_PIZP1101 and LC_PIZP1103 during at least two sampling events in 2019. Dissolved molybdenum concentrations above IW ranged from 10.7 µg/L to 12.7 µg/L.

The exceedances listed above could be related to dissolution of naturally occurring sedimentary minerals in the glacial tills in this area and produced by the erosion of carbonate and evaporite minerals from the Wisukitsak Range (Figure 2-2). Other processes affecting groundwater chemistry include reductive dissolution and cation exchange associated with calcite-saturated waters.

The Elk Valley Regional Groundwater Monitoring Program considers irrigation and livestock watering receptors; however, water is not used for irrigation or livestock near the Process Plant. These results are generally consistent with 2018 results.

Surface Water Quality

Surface water maximum concentrations of dissolved selenium, dissolved cadmium, dissolved sulphate, and nitrate in the Elk River at Order Station 200027 (EV_ER4), located southwest and generally downgradient of the Process Plant, are shown on Figure 4-3; time series concentrations are shown on Figure 4-5 for comparison to the groundwater results. Surface water concentrations of dissolved selenium and nitrate are one to two orders of magnitude higher than groundwater concentrations; however, sulphate concentrations in groundwater samples from wells LC_PIZP1104 and LC_PIZP1105 were comparable to surface water concentrations (Figure 4-5). Dissolved selenium concentrations in surface water were consistently above DW, or marginally below.

Spatial and Temporal Trends

Time series plots of groundwater levels measured continuously with pressure transducers in five groundwater wells (LC_PIZP1001, LC_PIZP1101, LC_PIZP1103, LC_PIZP1104 and LC_PIZP1105) in the Process Plant area during 2019 are provided in Appendix B. The transducer data was corrected by using data from a barologger located at DCPond 1 (Figure 4-2) and further corrected for elevation by utilizing the hand water level measurements, since the depth of logger deployment was not consistently recorded for each logger. At LC_PIZP1001, the transducer was set at or above the water level in the well throughout its deployment since 2015, however groundwater levels were measured manually.

Groundwater levels measured in LC_PIZP1101 from December 2014 to December 2019, containing the longest continuous record in the Process Plant area, show a muted response to seasonal variations (Appendix B, Figure B1c). With groundwater levels approximately 30 m below ground level and the water level in the Process Plant ponds, the muted response to seasonal variations is likely due to attenuation of pressure responses by the thick unsaturated zone, as opposed to being controlled by the pond water elevation.

The groundwater level measurements at LC_PIZP1103 indicated less than 1 m of variation in 2019 in response to the annual snowmelt freshet, and the transducer recorded slow responses to sampling events indicative of low permeability (the well was completed in a thick silt unit with hydraulic conductivity of 7×10^{-8} m/s, which overlies bedrock). The groundwater level measurements at LC_PIZP1104, which was screened across two sand and gravel units and had a hydraulic conductivity of 3×10^{-4} m/s, indicate less than 1 m variation during a period including the annual snowmelt freshet.

Low dissolved selenium concentrations in groundwater adjacent to the Process Plant ponds CCR (<1 µg/L) from 2013 to 2019 contrasts maximum 2019 dissolved selenium concentrations in nearby permitted surface water monitoring site (LC_LC4) and Order Stations (GH_FR1, EV_ER4). Selenium concentrations were 47.7 µg/L in Line Creek (LC_LC4), 82 µg/L in Fording River (GH_FR1), and 22.8 µg/L in the Elk River (200027 or EV_ER4) (Figures 4-3 and 4-4). Surface water being the primary pathway of transport for contact waters, coupled with the nominal seepage and infiltration of surface water from LCO into valley-bottom aquifers, results in elevated dissolved selenium concentrations in surface water relative to groundwater at the location of the monitoring wells. Statistical and visual trends for CI trends can be seen below in Table G.

Dissolved selenium concentrations are typically lower in drainage from CCR piles as compared to drainage from waste rock piles because oxidation-reduction potential is lower within and under CCR piles. Previous carbon content measurements at mine sites across Alberta and British Columbia (Kennedy et al. 2015; SRK 2011) indicate that elevated carbon content within the CCR piles can provide enough substrate for the establishment of microbial communities capable of reducing oxidized metals (e.g., selenate, nitrate, and ferric iron). In reducing environments, selenium is more stable in the selenide anion, which preferentially forms insoluble selenide minerals rather than mobilizing in the dissolved phase. Statistical and visual trends for CI trends can be seen below in Table G.

There were no visual temporal trends in the CI in the monitoring well with the longest monitoring record (LC_PIZP1101; Figure 4-5, where concentration in quarterly samples from 2013 to 2018 were generally lower than in other monitoring locations (Table 4-1). Sulphate concentrations in well LC_PIZP1105 had an increasing trend in the first and fourth quarter (Appendix E and Figure 4-5), however, concentrations remained below the lowest referenced BC CSR standard (DW, 500 mg/L). Statistical and visual trends for CI trends can be seen below in Table G.

Control charting indicated concentrations of CI remained below the Upper Control Limit (Figures E3 and E4 in Appendix E). The calculated upper control limits for nitrate, sulphate, cadmium and selenium decreased from 2018 to 2019, except for a minor increase ($<1\%$) of the selenium upper control limit at RG_02-20 and a significant ($>200\%$) increase in cadmium at LC_PIZP1104 (Table E3, Appendix E). The significant change in the cadmium control limit is attributed to the March 2019 concentration of 0.146 µg/L, which is considered an outlier and exceeds the 2018 upper control limit. The March 2019 cadmium concentration should be excluded when calculating the 2020 upper control limits. Statistical and visual trends for CI trends can be seen below in Table G.

Temporal trend analysis (i.e., seasonal Mann-Kendall statistical analysis) suggests that nitrate concentrations at LC_PIZP1104 and LC_PIZP1105 have no trend in Q1 and Q4 from 2014 to 2019 (Appendix E). Dissolved selenium concentrations at LC_PIZP1104 had an increasing trend in Q1 and were considered to have a stable trend in Q4. Maximum dissolved selenium concentration in Q1 (0.188 µg/L) was below the lowest referenced BC CSR standard (DW, 10 µg/L). Dissolved sulphate concentrations at LC_PIZP1105 had an increasing trend in Q1 and Q4. Trend analysis for dissolved cadmium at LC_PIZP1104 for Q1 and Q4 had no trend and probably increasing trend, respectively, and at LC_PIZP1105 for Q1 and Q4 had an increasing trend and no trend, respectively (Appendix E). Maximum dissolved cadmium concentration for LC_PIZP1104 in Q4 (0.0257 µg/L) and for LC_PIZP1105 in Q1 (0.0633 µg/L) was below the lowest reference BC CSR standard (Aquatic Life [freshwater], 4 µg/L). Temporal and Visual trends for CI trends can be seen below in Table G.

Table G: Temporal and Visual Trends

Well ID	Sulphate		Selenium		Nitrate		Cadmium	
	Visual Trend	Mann-Kendall Trend	Visual Trend	Mann-Kendall Trend	Visual Trend	Mann-Kendall Trend	Visual Trend	Mann-Kendall Trend
LC_PIZP1001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LC_PIZP1002	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LC_PIZP1003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LC_PIZP1101	Decreasing	N/A	Stable	N/A	Stable	N/A	Increasing	N/A
LC_PIZP1103	Increasing	N/A	Decreasing	N/A	Decreasing	N/A	Increasing	N/A
LC_PIZP1104	Decreasing	No Trend (Q1) and Decreasing (Q4)	Stable	Increasing (Q1) and Stable (Q4)	Increasing	No Trend (Q1 and Q4)	Stable	No Trend (Q1) and Probably Increasing (Q4)
LC_PIZP1105	Increasing	Increasing (Q1 and Q4)	Decreasing	No Trend (Q1) and Stable (Q4)	Stable	No Trend (Q1 and Q4)	Increasing	Increasing (Q1) and No Trend (Q4)
LC_PIZDC0901	Increasing	Stable (Q1) and No Trend (Q4)	Stable	No Trend (Q1) and Increasing (Q4)	Decreasing	No Trend (Q1 and Q4)	Increasing	No Trend (Q1) and Stable (Q4)
LC_PIZDC1306	Stable	Not enough data (Q1) and Stable (Q4)	Stable	Not enough data (Q1) and No Trend (Q4)	Stable	Not enough data (Q1) and No Trend (Q4)	Stable	Not enough data (Q1) and No Trend (Q4)
LC_PIZDC1307	Stable	N/A	Stable	N/A	Increasing	N/A	Stable	N/A
LC_PIZDC1308	Stable	N/A	Decreasing	N/A	Decreasing	N/A	Decreasing	N/A
LC_PIZDC1404D	Stable	N/A	Stable	N/A	Stable	N/A	Increasing	N/A
LC_PIZDC1404S	Stable	N/A	Stable	N/A	Stable	N/A	Stable	N/A
RG_02-20	Stable	Increasing (Q1) and No Trend (Q4)	Stable	Stable (Q1 and Q4)	Decreasing	Stable (Q1) and Probably Decreasing (Q4)	Stable	No Trend (Q1) and Probably Decreasing (Q4)
GH_POTW10	Stable	N/A	Stable	N/A	Stable	N/A	Stable	N/A

Note: N/A = Analytical or Mann-Kendall data was not available for the groundwater monitoring well.

5.2 Line Creek – Dry Creek Area Groundwater Levels

Groundwater levels in monitoring wells in the Dry Creek area ranged from approximately 1,685 to 1,707 masl (Figure 4-2). The conceptual understanding of groundwater flows in this area, developed as part of the Structured Decision-Making Process for Dry Creek indicate that above East Tributary confluence, groundwater flow is directed toward and discharges to Dry Creek, consistent with a gaining reach. Near and downgradient of East Tributary confluence, there is a losing to dry reach that is likely associated with coarse sediment of the East Tributary alluvial fan. In the losing to dry reach, groundwater flow is directed parallel to the creek. This is supported by the flow accretion studies that are currently ongoing as part of the Structured Decision-Making Process.

Vertical gradients indicate the upward or downward flow in aquifers or the flow between adjacent geologic units. This is determined by the change in groundwater elevation of two nested wells over the change in distance between the midpoint of the two well screens ($\frac{dy}{dx}$) where y is the change in groundwater elevation and x is the distance between screen midpoints of the saturated portion of the well screens. The groundwater elevations for the two nested monitoring wells (LC_PIZDC1404D and LC_PIZDC1404S; and LC_PIZDC1307 and LC_PIZDC1308) in the Dry Creek area had vertical gradients for both 2018 and 2019 indicative of downward flow based on the difference in head pressure. The calculations of the vertical gradient based off the groundwater elevations found on Figure 4-2 are represented in the table below:

Table H: Vertical Gradient between Dry Creek Area Nested Wells

	Monitoring Well	Depth to Top of Screen (masl)	Depth to Base of Screen (masl)	Screen Length (m)	Midpoint of Screen or Saturated Screen (masl)	Groundwater Elevation (masl)	Vertical Gradient	Direction of Vertical Gradient
2019	LC_PIZDC1404D	1673.15	1670.11	3.04	1671.63	1701.25	0.025	Downwards Flow
	LC_PIZDC1404S	1695.83	1692.79	3.04	1694.31	1701.82		
	LC_PIZDC1307	1657.95	1655.96	1.99	1656.96	1686.51	0.070	Downwards Flow
	LC_PIZDC1308	1684.52	1681.46	3.06	1682.99	1688.35		
2018	LC_PIZDC1404D	1673.15	1670.11	3.04	1671.63	1700.5	0.022	Downwards Flow
	LC_PIZDC1404S	1695.83	1692.79	3.04	1694.31	1701.0		
	LC_PIZDC1307	1657.95	1655.96	1.99	1656.96	1685.3	0.107	Downwards Flow
	LC_PIZDC1308	1684.52	1681.46	3.06	1682.99	1688.1		

Note: Midpoint of screen lengths used to calculate vertical gradient since well screens were completely saturated based on groundwater elevations. Groundwater elevations utilized from the fourth quarter of 2019.

Groundwater Quality

Concentrations of CI were below BC CSR standards at sampled groundwater locations near the Head Pond diversion structure (Figure 4-4; Table 4-2) in 2019. Below is a summary of the CI concentrations in groundwater at monitoring wells in the Dry Creek area in 2019 (excluding GH_POTW10):

- Dissolved selenium concentrations ranged from <0.05 µg/L (LC_PIZDC1307, LC_PIZDC1404D and LC_PIZDC1404S during multiple sampling events) to 4.12 µg/L (LC_PIZDC1306 on August 15).
- Sulphate concentrations ranged from <0.3 mg/L (LC_PIZDC1307 and LC_PIZDC1404D during multiple sampling events) to 20.3 mg/L (LC_PIZDC0901 on June 5).
- Nitrate concentrations ranged from <0.005 mg-N/L (LC_PIZDC1307, LC_PIZDC1308, LC_PIZDC1404D and LC_PIZDC1404S during multiple sampling events) to 0.644 mg-N/L (LC_PIZDC0901 on June 5).
- Dissolved cadmium concentrations ranged from <0.005 µg/L (LC_PIZDC1404S during multiple sampling events) to 0.14 µg/L (LC_PIZDC1306 on November 7).

Localized exceedances of dissolved barium, cobalt, lithium, and molybdenum concentrations are present in results from wells (LC_PIZDC1306, LC_PIZDC1307, LC_PIZDC1308, LC_PIZDC1404D, and LC_PIZDC1404S) near the diversion structure for the DCWMS (Appendix C). This is similar to 2018 results (Golder 2019):

- Dissolved barium exceeded DW (1,000 µg/L) at LC_PIZDC1307 and LC_PIZDC1404D during each of the 2019 sampling events. Concentrations in these wells ranged from 1,370 µg/L to 4,450 µg/L.
- Dissolved cobalt exceeded DW (1 µg/L) in LC_PIZDC1308 during the March sampling event, and was measured at 1.69 µg/L. This is well below the cobalt interim background estimate of 20 µg/L (BC MOE 2018).
- Dissolved lithium exceeded DW (8 µg/L) in LC_PIZDC1306, LC_PIZDC1307, LC_PIZDC1308 and LC_PIZDC1404D during at least three sampling events in 2019. Dissolved lithium concentrations in these wells exceeding DW ranged from 8.3 µg/L to 746 µg/L.
- Dissolved molybdenum concentrations were above IW (10 µg/L) at LC_PIZDC1307 and LC_PIZDC1404D during each of the sampling events in 2019. Dissolved molybdenum concentrations above IW ranged from 19.4 µg/L to 34.2 µg/L.

Surface Water Quality

A summary of concentrations of the CI in Dry Creek surface water station LC_DC1 (Figure 4-4) were compared to groundwater (Figure 4-6) as follows:

- There was a general increasing trend in sulphate concentrations in surface water (Figure 4-6a), with sulphate concentrations higher in surface water compared to groundwater in 2019.
- There was a general increasing trend in dissolved selenium concentrations in surface water from approximately 2017 (Figure 4-6b), with selenium concentrations higher in surface water compared to groundwater in 2019. Dissolved selenium concentration in surface water were above DW during the majority of the sampling events in 2019.

- There was a general increasing trend in nitrate concentration in surface water (Figure 4-6c), with nitrate concentrations generally higher in surface water compared to groundwater in 2019.

Increase in dissolved sulphate, nitrate, and dissolved selenium concentrations at LC_DC1 appears to be the result from the increase in contact water from the permitted LCO Phase II to the Dry Creek Area.

Spatial and Temporal Trends

Plots of continuous and manual groundwater levels measured over time in the six groundwater wells (LC_PIZDC1306, LC_PIZDC1404S, LC_PIZDC1404D, LC_PIZDC1308, LC_PIZDC1307 and LC_PIZDC0901) in the Dry Creek area during 2019 are provided in Appendix B.

The continuous water level measurements in wells in the Dry Creek area show a seasonal high from April to June related to spring snowmelt and seasonal low in the winter months. Specific observations for water levels in each well are provided below:

- Seasonal variations are more pronounced in wells LC_PIZDC1306, LC_PIZDC1404D, LC_PIZDC1404S, LC_PIZDC1307 and LC_PIZDC0901, and the magnitude of the peak groundwater elevations is approximate 5 m or higher.
- The groundwater levels at LC_PIZDC0901 are generally more variable than seasonal fluctuations and the water level in the monitoring well appears to respond to individual precipitation events.
- Shallow well LC_PIZDC1308 has a muted response to seasonal variations with magnitudes ranging from approximately 1 to 2 m compared to the associated deep well LC_PIZDC1307 that has water level changes of 5 m or more.
- Although the continuous groundwater level record for LC_PIZDC1306 is shorter (July 2015 to September 2017) than the other monitoring wells in the Dry Creek area, a larger seasonal response is typically visible with elevated groundwater levels in June of each year (wasn't manually measured until November 2019) and magnitude changes typically range between 6 and 8 m as compared to other locations).

Overall, a decreasing trend over time is visible in the groundwater levels at Dry Creek wells (i.e., LC_PIZDC1404D, LC_PIZDC1404S, LC_PIZDC1308, LC_PIZDC1307 and LC_PIZDC0901).

The valley bottom in Dry Creek has primarily upward flow directions in both the bedrock and deeper overburden (Appendix D; Golder 2014a, 2016c), upgradient of the East Tributary Confluence. Therefore, the seasonal variation in the groundwater levels appears to represent pressure responses at the watershed scale, with groundwater flux in the bedrock and overburden likely increasing seasonally in response to snowmelt and rainfall.

Dissolved selenium and sulphate concentrations in groundwater in the Dry Creek area during 2019 were generally within historical concentration ranges, consistent with the early stage of mining (Figure 4-6). In 2019, dissolved selenium, nitrate and sulphate concentrations in surface water in the Dry Creek area generally increased during the year.

At LC_PIZDC0901 (Dry Creek Area), increasing nitrate concentrations were measured from 2013 until June 2015, followed by decreasing concentrations until January 2019 (Figure 4-6 and Table 4-2). This monitoring well was completed in low-permeability till (9×10^{-9} m/s; Teck 2011a), which suggests that the flux associated with the increased nitrate concentrations would likely be low. Nitrate concentrations measured at sampled monitoring wells in the Dry Creek area during 2019 have returned to or remain generally within historical concentration ranges.

Control charting indicated concentrations of Cl remained below the Upper Control Limit (Figures E1 and E2, Appendix E). The percent change of Upper Control Limits was calculated for LC_PIZDC0901 from 2018 to 2019, and minor increases of the Upper Control Limits were noted for sulphate (<5%) and cadmium (<1%). Refer to Appendix E, Table E4.

At LC_PIZDC0901, trend analyses (i.e., seasonal Mann-Kendall trend test) showed no trends and/or stable trends for nitrate, sulphate, dissolved selenium, and dissolved cadmium concentrations during Q1 (Appendix E). In comparison, an increasing trend was noted for dissolved selenium concentrations during Q4. Maximum dissolved selenium concentrations in Q4 were 1.57 µg/L, which is below the lowest referenced BC CSR standard (DW standard: 10 µg/L for dissolved selenium). At LC_PIZDC1306 trend analyses showed no trends and/or stable trends for nitrate, sulphate, dissolved selenium, and dissolved cadmium concentrations during Q4 (Appendix E). However, in Q1 there was insufficient data to support trend analysis for nitrate, sulphate, dissolved selenium, and dissolved cadmium concentrations (Appendix E).

5.3 Outside Line Creek – Offsite Wells (Wells in Regional Program)

Two wells downgradient of LCO were reviewed to assess potential pathways on the valley-bottom aquifers and for overlap with the RGMP. These wells are in or near Study Areas (Figure 3) that have been identified in the RGMP to understand constituents in groundwater potentially related to mining.

Total selenium and total cadmium were chosen for offsite wells because total metals analyses are appropriate for water supply wells, as the focus for water supply is on end-use for the water, whereas the focus on monitoring wells is on metal transport through the aquifer. BC CSR Schedule 3.2 standards are generally applicable to only dissolved metals but were conservatively applied to total selenium and total cadmium for wells in the regional program.

Fording River Valley-Bottom Downgradient of Dry Creek Confluence

Supply well GH_POTW10, located at Teck Greenhills Operations and adjacent to the Fording River 4 km downgradient of Dry Creek, is part of the regional program and had Cl concentrations below BC CSR standards during 2019 sampling events. This well was sampled in January, April, August and November of 2019 and yielded total selenium concentrations from 2.86 to 4.56 µg/L, sulphate concentrations from 187 to 197 mg/L, nitrate concentrations from 0.288 to 0.688 mg-N/L and total cadmium concentrations from 0.0083 to 0.0113 µg/L.

Overall, there were no visible increasing or decreasing trends in nitrate, total selenium, sulphate and total cadmium concentrations from this well from June 2012 to November 2019 (Figure 4-7, Table 4-2). Total selenium and nitrate concentrations show a seasonal low from April to June related to spring snowmelt and seasonal high in the winter months.

In comparison to the nearest Order Station # 200378 (GH_FR1; Figure 4-7), the concentrations in GH_POTW10 are lower (except for sulphate) and consistent with mixing between the hydraulically-connected groundwater in the valley-fill sediments and the Fording River (see purple and teal flow lines in illustration on Figure 2-4b).

Downgradient of Confluence of Line Creek with Fording River, Elk River Valley Fill Sediments

Domestic well RG_02-20 is within Study Area #7 in a valley-bottom area of the Elk River downgradient of LCO and approximately 5.5 km downgradient of the confluence between the Fording River and the Elk River. This well was sampled in February, May, August and November of 2019 (Figure 4-7; Table 4-1). In 2019, total selenium concentrations ranged from 9.67 µg/L to 13.7 µg/L and exceeded DW (10 µg/L) in three of the four sampling events. Total selenium concentrations were below the secondary screening criteria (Table 3-4): the Canadian Drinking Water Quality Guideline of 50 µg/L (Health Canada 2017) and LCO permit (PE107517) limit of 50 µg/L, and the SPO of 23 µg/L (Permit 170517). Sulphate concentrations at RG_02-20 ranged from 61.6 to 87 mg/L, nitrate concentrations ranged from 2.17 mg-N/L to 2.99 mg-N/L and total cadmium concentrations ranged from 0.0066 µg/L to 0.0097 µg/L.

In comparison to the nearest Order Station # 200027 (EV_ER4; Figure 4-7), the concentrations at the monitoring well are similar, consistent with exchanges between groundwater in the valley-bottom and surface water (see purple and teal flow lines in illustration on Figure 2-4b). There appears to be a lag in the seasonal variation in the sulphate, selenium, and nitrate concentrations in groundwater at RG_02-20, relative to the seasonal variation in the Elk River at EV_ER4, with annual peaks in groundwater delayed by approximately one to three months. This lag suggests a pathway of surface water flowing to groundwater in this location.

Trend analyses (i.e., seasonal Mann-Kendall statistical analysis) showed that total selenium concentrations at RG_02-20 had a stable trend from 2014 to 2019 in Q1. There was no trend for total cadmium and stable trend for nitrate concentrations in Q1, respectively. There was an increasing trend in sulphate concentrations from 2014 to 2019 in Q1. Maximum sulphate concentrations in Q1 were 78.9 mg/L, which is below the lowest referenced BC CSR standard (DW standard: 500 mg/L for sulphate). Trend analyses in Q4 from 2014 to 2019 showed a probably decreasing trend for total cadmium and nitrate, and no trend and stable trend for sulphate and total selenium, respectively.

5.4 Check of Conceptual Groundwater Model

The Regional and LCO SSGMP are complementary and support the conceptual model:

- The highest concentrations of Cl are generally measured in tributaries within mine-influenced areas, consistent with surface water being the primary pathway for transport of contact water as shown in time series plots (Figures 4-5, 4-6 and 4-8). It should be noted that no dewatering took place at LCO during 2019.
- The bedrock water quality shows relatively low concentrations of Cl compared to surface water, consistent with low bedrock hydraulic conductivity measured valley-wide (e.g., LC_PIZDC1307 and LC_PIZDC1404D).
- Distal to operations, the water quality in the valley-bottom aquifers is generally better than or equal to the surface water quality, which suggests different degrees of local surface water-groundwater interaction versus predominance of a down-valley flow component (Figures 4-3 and 4-4).

6.0 SUMMARY

The results from the 2019 annual review of the LCO SSGMP show the following:

- No material quality assurance or quality control concerns were identified regarding Constituents of Interest for this report, except for one nitrate detection above five times the MDL in the trip blank collected during the first quarter (Q1).
- There were no exceedances of BC CSR standards for the CIs at sampled groundwater locations within the LCO site (Tables 4-1 and 4-2). Consistently, there was no clear increasing trend in CIs at groundwater monitoring locations downgradient of LCO (GH_POTW10 and RG_02-20), which are also included in the regional groundwater monitoring program.
- The Regional and LCO Site Specific programs support the conceptual groundwater discussed in Section 2.0.
- Localized exceedances of dissolved chloride, boron, cobalt, fluoride, lithium, manganese, and molybdenum concentrations are present in results from wells (LC_PIZP1101, LC_PIZP1103, LC_PIZP1104, and LC_PIZP1105) in the Process Plant area (Appendix C). This is similar to 2018 results (Golder 2019), except for dissolved boron and cobalt. Dissolved boron slightly exceeded the irrigation watering standard (500 µg/L) at LC_PIZP1103 during the May 2019 sampling event, however 2018 concentrations ranged near the standard. Dissolved cobalt concentrations exceeded drinking water standard (1 µg/L) in LC_PIZP1104 during each sampling event with concentrations ranging from 1.07 to 1.88 µg/L. This is well below the cobalt interim background estimate of 20 µg/L (BC MOE 2018), however above the 2018 cobalt concentration range of 0.1 to 0.4 µg/L.
- Localized exceedances of dissolved barium, cobalt, lithium, and molybdenum concentrations are present in results from wells (LC_PIZDC1306, LC_PIZDC1307, LC_PIZDC1308, LC_PIZDC1404D, and LC_PIZDC1404S) near the diversion structure for the DCWMS (Appendix C). This is similar to 2018 results (Golder 2019).
- Surface water drainage from the permitted LCO Phase II into the Dry Creek Area increased dissolved selenium, nitrate, and dissolved sulphate at the surface water station LC_DC1.
- Increasing trends based on Mann Kendall analysis were noted for sulphate in LC_PIZP1105 (Process Plant area) for both Q1 and Q4 (Figure 4-5a). Increasing trends were noted for dissolved cadmium in LC_PIZP1104 and LC_PIZP1105 during Q4 and Q1, respectively. Dissolved selenium concentrations had increasing trends at LC_PIZP1104 during Q1 (near the Process Pond) and LC_PIZDC0901 during Q4.
- LC_PIZDC1307 and LC_PIZDC1404D were drilled deeper than the remaining wells (>31.8 m versus <16.5 m). The groundwater chemistry pertaining to these wells could indicate a greater degree of influence from the underlying bedrock aquifer system given the upward hydraulic gradient within the bedrock, hence, the localized exceedances of dissolved barium and molybdenum.

7.0 RECOMMENDATIONS FOR 2020

A thorough review of the 2019 groundwater quality data has been completed as requested by Teck LCO. Recommendations are provided below:

- It is recommended to install the pressure transducers as deep as possible to maximize transducer submergence below the fluctuating water level (specifically, the transducer in LC_PIZP1001 needs to be installed deeper as it is currently above the water level).
- The current groundwater monitoring program should continue, along with continued coordination with the Regional Groundwater Monitoring Program and the West Line Creek Active Water Treatment groundwater program. The recommended list of analytes is shown in Table 5-1. The type of monitoring and frequency recommended for 2020 is shown in Table 5-2 and are consistent with the 2019 program. However, a review of the suggested monitoring sampling frequency provided in the updated SSGMP (Golder 2018a) should be completed and may lead to an adjusted monitoring/sampling schedule.
- The purpose of seasonal monitoring at this time is to collect information in order to reduce sampling frequency in the near future. As seasonal trends are established, reduce frequency of sampling from quarterly to twice per year: May to June during freshet when surface flows, groundwater levels, and dilution will be the highest, and November to February during winter when water levels will be the lowest. For any new wells, perform quarterly sampling for two years to establish seasonal variations.

8.0 CLOSING

We trust the above document meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

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TABLES

**Table 1-1
Previous SSGMP Work Summary Table**

Area	Study	Methods	Source
Site-wide	Phase II Baseline and Assessment	Well installations Groundwater levels Water quality sampling Numerical flow modelling with particle tracking	Teck 2011a and 2011b
	Groundwater Monitoring Program	Groundwater levels Water quality sampling Establish, review and assess monitoring program	Golder 2013a Golder 2015a Golder 2018a Plus annual monitoring reports for 2015, 2016, 2017 and 2018
Phase II: Dry Creek	Hydrogeologic Investigation for the Dry Creek Water Management System	Well installations Groundwater levels Water quality sampling Numerical flow modelling with particle tracking, which included assessment of potential seepage bypass	Golder 2013b Golder 2014a Golder 2016b Golder 2016c
Phase I: West Line Creek	Research on infiltration and unsaturated flow through waste rock and groundwater flow and water quality downgradient of waste-rock pile	Well installations Groundwater levels Water quality sampling Isotopic assessment	Szmigielski 2015 Barbour et al. 2016
	Hydrogeologic Investigation for Residuals Landfill for Active Water Treatment Facility	Well installations Groundwater levels Water quality sampling	SRK 2013 Tetra Tech 2015
	Groundwater Monitoring Program	Groundwater levels Water quality sampling Establish, review and assess monitoring program	Golder 2016a
Process Plant Area	Groundwater assessments fueling areas, a truck wash and ponds at the Process Plant	Well installations Groundwater elevations Water quality sampling	AMEC 2010 AMEC 2013

**Table 2-1
Summary of Groundwater Sampling Locations**

Area		Well Name	Alternate Well Name	ENV EMS1	Easting (m UTM)	Northing (m UTM)	Ground Elevation (masl)	Top of Casing Elevation (masl)	Monitoring Program	Screened Lithology	Hydraulic Conductivity (m/s)	Depth to Screen (mbgs)	Rationale	2018 Sample Frequency	Parameters Reviewed
Process Plant	Ponds	LC_PIZP1101	MW11(P)-01	E302410	653956	5528265	1266.06	1267.06	LCO, Regional	Coarse-grained sand	7.E-04	40.5	Monitor water quality to detect seepage from Process Plant ponds	Quarterly	Se, Cd, NO ₃ , SO ₄
		LC_PIZP1103	MW11(P)-03	none	654250	5528634	1263.49	1264.53	LCO	Clayey silt above bedrock	7.E-08	38.1		Quarterly	Se, Cd, NO ₃ , SO ₄
		LC_PIZP1104	MW11(P)-04	none	653940	5528165	1271.15	1272.10	LCO	Coarse-grained sand	3.E-04	36.8		Quarterly	Se, Cd, NO ₃ , SO ₄
		LC_PIZP1105	MW11(P)-05	E302411	653984	5528075	1272.94	1273.86	LCO	-	-	38.1		Quarterly	Se, Cd, NO ₃ , SO ₄
Dry Creek	Diversion Structure	LC_PIZDC1306	MW13-3S	none	658278	5541059	1708.15	1709.05	LCO	Valley-bottom sediments (Quaternary)	3.E-05	16.5	Monitor water quality to detect for seepage near diversion structure for proposed water treatment plant	Last 3 Quarters	Se, Cd, NO ₃ , SO ₄
		LC_PIZDC1307	MW13-1D	none	658169	5541230	1690.51	1691.22	LCO, Regional		1.E-07	34.6		Quarterly	Se, Cd, NO ₃ , SO ₄
		LC_PIZDC1308	MW13-1S	none	658168	5541232	1690.42	1691.37	LCO, Regional		7.E-07	9		Quarterly	Se, Cd, NO ₃ , SO ₄
		LC_PIZDC1404S	MW14-04S LC-PIZDC1402	none	658192	5541069	1705.36	1706.50	LCO		4.E-08	12.6		Quarterly	Se, Cd, NO ₃ , SO ₄
		LC_PIZDC1404D	MW14-04D LC-PIZDC1401	none	658192	5541069	1705.36	1706.93	LCO		5.E-08	35.3		Quarterly	Se, Cd, NO ₃ , SO ₄
		LC_PIZDC0901	GA-DC1-A	none	658048	5541500	1690	1693	LCO		9.E-09	9.4		Quarterly	Se, Cd, NO ₃ , SO ₄
Regional Wells	Downgradient of Dry Creek	GH_POTW10	-	none	653321	5545426	-	-	Regional	-	-	-	Monitor water quality to detect seepage downgradient of Dry Creek, Greenhills Operations, and Fording River Operations	Quarterly	Se, Cd, NO ₃ , SO ₄
	Downgradient of Plant Site	RG_02-20	-	none	Private	Private	-	-	Regional	-	-	-	Monitor water quality to detect seepage downgradient of LCO Plant Site, Greenhills Operations, and Fording River Operations	Quarterly	Se, Cd, NO ₃ , SO ₄

Notes:
 m UTM = metres on Universal Transverse Mercator projection, zone 11; m/s = metres per second; mbgs = metres below ground surface; Se = selenium, Cd = cadmium, NO₃ = nitrate, SO₄ = sulphate; - = unknown or not applicable.
 ENV EMS = Ministry of Environment and Climate Change Strategy EMS number
 LCO = Line Creek Operations

Field Parameters Collected During LCO Groundwater Sampling

Parameter	Methodology
Conductivity	2510 B Self-Contained Conductivity Instrument
Dissolved Oxygen	4500 - OG Membrane Electrode Method
Oxidation-Reduction Potential	2580 Oxidation-Reduction Potential (ORP) Method
pH	4500 H ⁺ B Electrometric Method
Temperature	2500 B Electronic Thermometer
Turbidity	2130 B Nephelometric Method

Guideline Comparison for Groundwater Sampling Locations

Location Name	Guideline	Description
LC_PIZDC1307	BC CSR	LCO and Regional Groundwater Sampling Location
LC_PIZDC1308	BC CSR	LCO and Regional Groundwater Sampling Location
LC_PIZP1101	BC CSR	LCO and Regional Groundwater Sampling Location
GH_POTW10	BC CSR	Regional Groundwater Sampling Location
RG_20-02	BC CSR	Regional Groundwater Sampling Location
LC_PIZDC1404D	BC CSR	LCO Groundwater Sampling Location
LC_PIZDC1404S	BC CSR	LCO Groundwater Sampling Location
LC_PIZDC1306	BC CSR	LCO Groundwater Sampling Location
LC_PIZDC0901	BC CSR	LCO Groundwater Sampling Location
LC_PIZP1103	BC CSR	LCO Groundwater Sampling Location
LC_PIZP1104	BC CSR	LCO Groundwater Sampling Location
LC_PIZP1105	BC CSR	LCO Groundwater Sampling Location
LC_PIZP1001	N/A	Water Level Monitoring Only
LC_PIZP1002	N/A	Water Level Monitoring Only
LC_PIZP1003	N/A	Water Level Monitoring Only

Notes:

BC CSR: British Columbia Contaminated Sites Regulations

N/A = not applicable

LCO = Line Creek Operations

**Table 3-3
Primary Screening Threshold Values**

Well Name	LC_PIZDC0901, LC_PIZDC1306, LC_PIZDC1307, LC_PIZDC1308, LC_PIZDC1404D, LC_PIZDC1404S, LC_PIZP1101, LC_PIZP1103, LC_PIZP1104, LC_PIZP1105, GH_POTW10, RG_02-20				
Screening Levels	Primary Screening				
	British Columbia Contaminated Site Regulation Guideline Values				
Parameters	Units	Aquatic Life (freshwater)	Irrigation	Livestock	Drinking Water
Aluminum	µg/L	-	5000	5000	9500
Ammonia (as N)	mg-N/L	1.31-18.5 ^c	-	-	-
Antimony	µg/L	90	-	-	6
Arsenic	µg/L	50	100	25	10
Barium	µg/L	10000	-	-	1000
Beryllium	µg/L	1.5	100	100	8
Boron	µg/L	12000	500	5000	5000
Bromate	µg/L	-	-	-	10
Cadmium	µg/L	3.5-10 ^a	5	80	5
Calcium	mg/L	-	-	1000	-
Chloride	mg/L	1500	100	600	250
Chlorine	µg/L	20	1000	-	-
Chromium	µg/L	10	8	50	50
Cobalt	µg/L	40	50	1000	1
Copper	µg/L	80-90 ^a	200	300	1500
Fluoride	mg/L	3 ^a	1	1	1.5
Iron	µg/L	-	5000	-	6500
Lead	µg/L	6-160 ^a	200	100	10
Lithium	µg/L	-	2500	5000	8
Manganese	µg/L	-	200	-	1500
Mercury	µg/L	0.25	1	2	1
Molybdenum	µg/L	10000	10	50	250
Nickel	µg/L	1500 ^a	200	1000	80
Nitrate (as N)	mg/L	400	-	100	10
Nitrate and Nitrite (as N)	mg/L	400	-	100	10
Nitrite (as N)	mg/L	0.2-0.8 ^b	-	10	1
Selenium	µg/L	20	20	30	10
Silver	µg/L	15 ^b	-	-	20
Strontium	µg/L	-	-	-	2500
Sodium	mg/L	-	-	-	200
Sulphate	mg/L	4290 ^b	-	1,000	500
Thallium	µg/L	3	-	-	-
Tin	µg/L	-	-	-	2500
Titanium	µg/L	1000	-	-	-
Uranium	µg/L	85	10	200	20
Vanadium	µg/L	-	100	100	20
Zinc	µg/L	900-3150 ^b	5000 ^c	2000	3000

Notes:

BC Contaminated Site Regulations: BC MOE (1997) Generic Numerical Water Standards (Criteria). Accessed February 2020.

^a = standard is hardness dependent; ^b = standard is chloride dependent; ^c = standard is pH dependent

Chromium Standard is specific to chromium VI.

- = No primary or secondary screening threshold regulations; µg/L = microgram per litre; mg/L = milligram per litre

**Table 3-4
Secondary Screening Threshold Values**

Well Name		LC_PIZDC0901, LC_PIZDC1306, LC_PIZDC1307, LC_PIZDC1308, LC_PIZDC1404D, LC_PIZDC1404S, GH_POTW10		LC_PIZP1101, LC_PIZP1103, LC_PIZP1104, LC_PIZP1105, RG_02-20		LC_PIZDC0901, LC_PIZDC1306, LC_PIZDC1307, LC_PIZDC1308, LC_PIZDC1404D, LC_PIZDC1404S, LC_PIZP1101, LC_PIZP1103, LC_PIZP1104, LC_PIZP1105, GH_POTW10, RG_02-20	
Screening Levels		Elk Valley Effluent Permit Threshold Values: Permitted Discharge at LCO Compliance Point	Elk Valley Effluent Permit Threshold Values: Site Performance Objective (GH_FR1)	Elk Valley Effluent Permit Threshold Values: Permitted Discharge at LCO Compliance Point	Elk Valley Effluent Permit Threshold Values: Site Performance Objective (EV_ER4)	Canadian Drinking Water Quality Guidelines	
Parameter	Units						
Selenium	µg/L	50	63	50	23	50	

Notes:

µg/L = microgram per litre

LCO = Line Creek Operations

**Table 4-1
Groundwater Monitoring Locations with Chemistry Data
Process Plant Area and Downgradient Location**

Area	Well Name	Sample Date	Nitrate, as N mg/L	Selenium (dissolved) µg/L	Sulphate mg/L	Cadmium (dissolved) µg/L		
Phase I - Process Plant	LC_PIZP1101	13-Jun-2013	< 0.0050	< 2.0	3.29	< 0.200		
		26-Aug-2013	< 0.0050	< 0.10	5.41	< 0.010		
		20-Dec-2013	0.0115	< 0.10	5.29	< 0.010		
		12-Mar-2014	< 0.0050	< 0.10	4.65	< 0.010		
		26-Jun-2014	< 0.0050	< 0.10	4.31	< 0.010		
		24-Sep-2014	< 0.0050	< 0.10	3.86	< 0.010		
		12-Dec-2014	< 0.0050	< 0.10	3.7	< 0.010		
		14-Mar-2015	0.0072	< 0.10	3.5	< 0.010		
		12-Jun-2015	0.0066	< 0.050	3.49	< 0.005		
		24-Sep-2015	< 0.0050	< 0.050	3.49	< 0.005		
		18-Dec-2015	< 0.0050	< 0.050	4.35	< 0.005		
		15-Mar-2016	< 0.0050	< 0.050	3.83	< 0.005		
		17-Jun-2016	< 0.0050	< 0.050	4.14	< 0.005		
		15-Sep-2016	< 0.0050	< 0.25	3.5	< 0.025		
		12-Dec-2016	< 0.0050	< 0.25	3.62	< 0.025		
		15-Mar-2017	0.0074	< 0.050	3.44	< 0.0050		
		13-Jun-2017	< 0.0050	< 0.050	2.97	0.0058		
		21-Sep-2017	< 0.0050	< 0.050	2.7	< 0.0050		
		3-Nov-2017	< 0.0050	< 0.25	2.84	0.075		
		20-Mar-2018	< 0.0050	< 0.050	2.61	< 0.0050		
		19-Jun-2018	0.0083	< 0.050	2.71	< 0.0050		
		13-Sep-2018		< 0.050		0.0155		
		16-Nov-2018	< 0.0050	< 0.050	2.58	0.0113		
		22-Jan-2019	< 0.0050	< 0.050	2.56	0.0065		
		25-Apr-2019	0.0143	0.1	2.64	0.0073		
		17-Jul-2019	< 0.0050	< 0.050	3.3	< 0.0050		
		17-Jul-2019 (Dup)	< 0.0050	< 0.050	2.83	< 0.0050		
		16-Dec-2019	< 0.0050	< 0.050	3.88	0.0104		
		LC_PIZP1103	12-Dec-2014	< 0.050	0.31	36.7	< 0.010	
			13-Mar-2015	0.011	0.29	37.5	< 0.010	
	12-Jun-2015		< 0.010	0.13	33.5	< 0.005		
	23-Sep-2015		< 0.025	< 0.050	32.9	< 0.005		
	14-Dec-2015		< 0.025	0.064	31.2	< 0.005		
	15-Mar-2016		< 0.025	0.059	31.1	< 0.005		
	13-Jun-2016		0.036	< 0.050	33	0.0066		
	12-Sep-2016		< 0.025	0.051	29.2	0.0119		
	12-Dec-2016		0.0239	0.26	32.2	< 0.025		
	15-Mar-2017		0.062	< 0.050	30.5	0.0083		
	13-Jun-2017		0.128	< 0.050	29.3	0.0214		
	13-Sep-2017		0.144	< 0.050	29.4	0.0114		
	31-Oct-2017		0.156	0.073	29	0.011		
	6-Mar-2018		0.399	0.053	30.1	0.0184		
	14-Jun-2018		< 0.40	0.051	31	0.0146		
	21-Aug-2018		0.116	< 0.050	27.8	0.0114		
	19-Nov-2018		0.159	< 0.050	30	0.0219		
	13-Mar-2019		0.124	< 0.050	28.8	0.0561		
	6-May-2019		0.0878	< 0.050	28.7	0.0191		
	10-Jul-2019		0.144	< 0.050	27.9	0.0105		
	10-Oct-2019		< 0.0050	0.211	29.1	< 0.0050		
	LC_PIZP1104		11-Dec-2014	0.266	0.16	89.5	0.016	
			13-Mar-2015	0.109	< 0.10	58.1	0.021	
			11-Jun-2015	0.264	0.109	92.4	0.023	
			24-Sep-2015	0.128	< 0.050	54	0.0326	
			17-Dec-2015	0.303	0.101	89.4	0.0102	
			17-Mar-2016	0.312	0.096	94.1	0.0188	
			15-Jun-2016	0.288	0.107	86.2	0.0167	
			14-Sep-2016	0.347	0.137	86.2	0.0146	
			9-Dec-2016	0.348	0.33	81.4	< 0.025	
		23-Mar-2017	0.428	0.114	91.8	0.0212		
		13-Jun-2017	0.431	0.342	97.1	0.0212		
		20-Sep-2017	0.528	0.109	96.4	0.0124		
		2-Nov-2017	0.574	0.119	80.6	0.0135		
		13-Mar-2018	0.472	0.15	170	0.013		
		15-Jun-2018	0.599	0.235	102	0.0113		
		28-Nov-2018	0.491	0.113	85.8	0.0208		
		28-Nov-2018 (Dup)	0.483	0.138	85.7	0.0228		
		18-Mar-2019	0.357	0.188	74.7	0.146		
		27-May-2019	0.165	0.137	40.3	0.0069		
		12-Sep-2019	0.279	0.155	60.5	0.0453		
	21-Nov-2019	0.249	< 0.050	36.2	0.0257			
	LC_PIZP1105	11-Dec-2014	< 0.050	0.21	49.7	0.041		
		12-Mar-2015	0.044	0.2	60.4	0.026		
		11-Jun-2015	0.065	0.502	58.6	0.03		
		23-Sep-2015	0.048	0.434	60.4	0.0185		
		17-Dec-2015	0.041	0.652	68.4	0.0215		
		17-Mar-2016	0.035	0.657	75.3	0.0291		
		15-Jun-2016	0.04	0.597	82.6	0.0251		
		14-Sep-2016	0.034	0.773	83.2	0.0291		
		16-Dec-2016	0.0323	0.64	78.1	0.027		
		22-Mar-2017	0.07	0.521	80.4	0.0404		
		16-Jun-2017	0.064	0.499	74.9	0.0511		
		21-Sep-2017	0.074	0.406	124	0.0523		
		2-Nov-2017	0.216	< 0.25	81.3	0.028		
		20-Mar-2018	0.027	0.391	82.7	0.0358		
		19-Jun-2018	0.083	0.37	102	0.061		
		7-Sep-2018	0.045	0.411	184	0.0745		
		29-Mar-2019	0.181	0.704	102	0.0633		
		25-Jun-2019	0.605	0.237	87.9	0.0528		
		5-Sep-2019	0.039	0.078	95.2	0.0355		
		14-Nov-2019	0.051	0.238	102	0.067		
	Non-LCO Monitoring Wells	Downgradient of Plant Site	RG_02-20	26-Mar-2014	3.36	13.3 (Total)	68.6	0.011 (Total)
				24-Apr-2014	3.36	13.0 (Total)	71.3	0.014 (Total)
				3-Jul-2014	3.69	14.4 (Total)	81.2	< 0.01 (Total)
				24-Nov-2014	2.5	10.0 (Total)	59.6	< 0.2 (Total)
				10-Mar-2015	2.97	12.0 (Total)	69.1	< 0.2 (Total)
				26-Nov-2015	2.44	9.79 (Total)	60.2	0.0096 (Total)
				1-Jun-2016	3.62	12.6 (Total)	87.60	0.008 (Total)
				28-Jun-2016	3.26	11.2 (Total)	83.60	< 0.005 (Total)
				14-Sep-2016	2.12	7.43 (Total)	59.9	0.0076 (Total)
				12-Dec-2016	2.19	8.54 (Total)	63.3	0.01 (Total)
1-Mar-2017				2.75	9.5 (Total)	74.6	0.0097 (Total)	
29-May-2017				2.97	10.2 (Total)	74.8	0.0088 (Total)	
21-Aug-2017				1.81	7.56 (Total)	52.8	0.0071 (Total)	
15-Nov-2017				2.05	7.88 (Total)	56.5	0.0062 (Total)	
13-Feb-2018				2.73	12.4 (Total)	75.4	0.0086 (Total)	
25-Apr-2018				2.97	13 (Total)	78.9	0.0125 (Total)	
26-Sep-2018				2.08	9.6 (Total)	58.9	0.0086 (Total)	
26-Nov-2018				2.37	9.36 (Total)	63.9	0.0055 (Total)	
25-Feb-2019				2.76	12.9 (Total)	77.6	0.0077 (Total)	
27-May-2019				2.99	13.7 (Total)	87	0.0077 (Total)	
20-Aug-2019	2.22	10.1 (Total)	67.1	0.0097 (Total)				
28-Nov-2019	2.17	9.67 (Total)	61.6	0.0066 (Total)				
Primary Screening: BC CSR Guidelines								
Aquatic Life (freshwater)	Maximum	400	20	4,290 ^c	4 ^c			
Drinking Water	Maximum	10	10	500	5			
Livestock	Maximum	100	30	1,000	80			
Irrigation	Maximum	-	20 ^a , 50 ^b	-	5			
Secondary Screening: Permit Limits, Site Performance Objectives, and Canadian Guidelines								
Canadian Drinking Water Guideline	Maximum	Not applied	50	Not applied	Not applied			
Elk Valley Effluent Permit Threshold Values: Permitted Discharge at LCO Compliance Point	Monthly Average	7	50	-	0.58			
Elk Valley Effluent Permit Threshold Values: Site Performance Objective at Order Station EV_ER4	Maximum	4	23	429	0.24			
BOLD	Concentration greater than BC CSR Drinking Water guideline.							
ITALICS	Concentration greater than BC CSR Livestock guideline							
INVERSE	Concentration greater than BC CSR Irrigation guideline							
Comparisons of groundwater quality to water quality guidelines made for reference purposes only.								
BC Contaminated Sites Regulations: BC MOE (1997) Generic Numerical Water Standards (Criteria). Accessed February 2019.								
Canadian Drinking Water Guidelines: Health Canada (2017). Guidelines for Canadian Drinking Water Quality Summary Table.								
Secondary screening applies only when primary screening yields an exceedance. Elk Valley Effluent Permit PE107517. Issued November 19, 2014.								
LCO = Line Creek Operations								
- = no guideline.								
^a = Standard for continuous applications on crops								
^b = Standard for intermittent application on crops								
^c = Hardness of 250 mg/L is assumed								
(Dup) = Duplicate sample								
µg/L = microgram per litre; mg/L = milligram per litre								
Sampling Notes:								
2018: LC_PIZP1104 had insufficient water levels for sample collection in Q3 (July to September).								
2018: LC_PIZP1101 missing Nitrate and Sulphate results due to constraints in the field during sampling event (September 13, 2018)								

Table 4-2

Groundwater Monitoring Locations with Chemistry Data for Dry Creek Area and Downgradient Location

Area	Well Name	Sample Date	Nitrate as N	Selenium (dissolved)	Sulphate	Cadmium (dissolved)
			mg/L	µg/L	mg/L	µg/L
Phase II - Dry Creek	LC_PIZDC1306	9-Jun-2015	0.176	3.24	6.53	0.113
		22-Sep-2015	0.08	2.96	6.67	0.103
		15-Dec-2015	0.0906	2.15	6.33	0.121
		16-Mar-2016	0.0702	1.53	6.01	0.0233
		10-Jun-2016	0.105	2.23	6.14	0.141
		13-Sep-2016	0.11	2.82	6.47	0.124
		12-Jun-2017	0.2	5.6	6.89	0.124
		14-Sep-2017	0.155	3.59	6.52	0.133
		1-Nov-2017	0.135	3.06	6	0.125
		25-Jun-2018	0.228	5.18	8.02	0.124
		23-Aug-2018	0.156	4.23	6.63	0.152
		23-Aug-2018 (Dup)	0.154	4.56	6.62	0.393
		26-Nov-2018	0.265	4.13	6.88	0.157
		25-Mar-2019	0.0962	2.1	5.97	0.131
		29-May-2019	0.171	3.05	6.85	0.131
		15-Aug-2019	0.154	4.12	6.97	0.119
		7-Nov-2019	0.114	3.36	6.06	0.14
		9-Dec-2014	< 0.0050	< 0.10	1.71	< 0.010
		10-Mar-2015	0.0073	< 0.10	0.44	< 0.010
		10-Jun-2015	< 0.0050	< 0.050	0.45	< 0.005
		22-Sep-2015	< 0.0050	0.053	< 0.30	< 0.005
	16-Dec-2015	< 0.0050	< 0.050	< 0.30	< 0.005	
	16-Mar-2016	< 0.0050	< 0.050	< 0.30	< 0.005	
	10-Jun-2016	< 0.0050	< 0.050	< 0.30	< 0.005	
	13-Sep-2016	< 0.0050	< 0.050	< 0.30	< 0.005	
	13-Dec-2016	< 0.0050	< 0.25	< 0.30	< 0.025	
	16-Mar-2017	< 0.0050	< 0.050	< 0.30	0.0121	
	12-Jun-2017	< 0.0050	< 0.050	< 0.30	0.0155	
	19-Sep-2017	< 0.0050	< 0.050	< 0.30	< 0.015	
	1-Nov-2017	0.0058	0.14	< 0.30	0.0337	
	7-Mar-2018	< 0.0050	< 0.050	< 0.30	< 0.015	
	13-Jun-2018	< 0.0050	< 0.050	< 0.30	< 0.030	
	29-Aug-2018	< 0.0050	< 0.050	< 0.30	< 0.015	
	26-Nov-2018	< 0.0050	< 0.050	< 0.30	< 0.010	
	21-Mar-2019	< 0.0050	< 0.050	< 0.30	< 0.010	
	29-May-2019	0.0104	< 0.050	< 0.30	< 0.015	
	22-Aug-2019	< 0.0050	< 0.050	< 0.30	< 0.030	
	30-Oct-2019	0.0121	< 0.050	0.38	< 0.010	
	9-Dec-2014	0.219	0.73	5.3	0.097	
	10-Mar-2015	0.112	0.27	4.78	< 0.010	
	10-Jun-2015	0.667	0.686	5.38	0.132	
	22-Sep-2015	0.383	0.375	4.24	0.139	
	16-Dec-2015	0.107	0.177	4.41	0.125	
	16-Mar-2016	0.0082	< 0.050	3.23	< 0.005	
	10-Jun-2016	0.258	0.317	5.11	0.161	
	13-Sep-2016	0.0326	0.141	4.6	0.095	
	13-Dec-2016	0.0432	< 0.25	5.09	0.17	
	16-Mar-2017	0.0055	< 0.050	2.5	0.0091	
	12-Jun-2017	0.159	0.301	4.74	0.133	
	19-Sep-2017	< 0.0050	< 0.050	1.92	0.023	
	1-Nov-2017	0.0627	< 0.050	1.84	0.0361	
	7-Mar-2018 (Dup)	0.0052	< 0.050	2.1	< 0.005	
	7-Mar-2018	< 0.0050	< 0.050	2.02	< 0.005	
	13-Jun-2018	0.181	0.16	5.53	0.116	
	29-Aug-2018	0.0383	0.098	5	0.127	
	27-Nov-2018	< 0.0050	0.058	5.1	0.0211	
	21-Mar-2019	< 0.0050	< 0.050	5.13	0.0059	
	21-Mar-2019 (Dup)	< 0.0050	0.072	5.05	0.0055	
	29-May-2019	0.115	0.266	5.74	0.126	
	22-Aug-2019	0.126	0.21	5.47	0.0351	
	30-Oct-2019	0.0142	0.075	4.2	0.0469	
	30-Oct-2019 (Dup)	0.0156	0.053	4.52	0.039	
	9-Dec-2014	< 0.0050	< 0.10	8.74	< 0.010	
	9-Mar-2015	< 0.0050	< 0.10	6.3	< 0.010	
	9-Jun-2015	< 0.0050	< 0.050	5.79	< 0.005	
	22-Sep-2015	< 0.0050	< 0.050	5.5	< 0.005	
	15-Dec-2015	< 0.0050	< 0.050	5.52	< 0.005	
16-Mar-2016	< 0.0050	< 0.050	5.31	< 0.005		
10-Jun-2016	< 0.0050	< 0.050	5.22	< 0.005		
13-Sep-2016	0.0134	< 0.050	5.85	< 0.005		
13-Dec-2016	0.0061	< 0.25	5.36	< 0.025		
16-Mar-2017	0.0471	< 0.050	5.28	< 0.0050		
12-Jun-2017	0.0078	< 0.050	4.64	< 0.0050		
14-Sep-2017	0.0311	< 0.050	4.82	< 0.0050		
1-Nov-2017	< 0.0050	< 0.050	4.68	< 0.0050		
6-Mar-2018	< 0.0050	< 0.050	4.34	< 0.0050		
11-Jun-2018	< 0.0050	< 0.050	< 0.30	0.0138		
11-Jun-2018 (Dup)	< 0.0050	< 0.050	< 0.30	< 0.0050		
20-Aug-2018	< 0.0050	< 0.050	5.13	< 0.0050		
14-Nov-2018	< 0.0050	< 0.050	4.95	< 0.0050		
20-Mar-2019	0.0088	< 0.050	4.88	< 0.0050		
23-May-2019	< 0.0050	< 0.050	4.8	< 0.0050		
23-May-2019 (Dup)	< 0.0050	< 0.050	4.79	< 0.0050		
15-Aug-2019	< 0.0050	< 0.050	5.08	< 0.0050		
23-Oct-2019	< 0.0050	< 0.050	5.57	< 0.0050		

Groundwater Monitoring Locations with Chemistry Data for Dry Creek Area and Downgradient Location

Area	Well Name	Sample Date	Nitrate as N	Selenium (dissolved)	Sulphate	Cadmium (dissolved)	
			mg/L	µg/L	mg/L	µg/L	
Non-LCO Monitoring Wells	LC_PIZDC1404D	9-Mar-2015	0.01	< 0.10	< 0.60	< 0.010	
		9-Jun-2015	< 0.010	< 0.050	< 0.60	< 0.005	
		22-Sep-2015	< 0.025	< 0.050	< 1.5	< 0.005	
		16-Dec-2015	< 0.025	< 0.050	< 1.5	< 0.005	
		16-Mar-2016	< 0.025	< 0.050	< 1.5	< 0.005	
		10-Jun-2016	< 0.025	< 0.050	< 1.5	0.0071	
		13-Sep-2016	< 0.025	< 0.050	< 1.5	< 0.005	
		13-Dec-2016	< 0.0050	0.41	0.44	< 0.025	
		16-Mar-2017	< 0.0050	< 0.050	0.5	0.0061	
		12-Jun-2017	< 0.0050	< 0.050	< 0.30	0.008	
		14-Sep-2017	< 0.0050	< 0.050	< 0.30	< 0.0050	
		1-Nov-2017	< 0.0050	< 0.050	< 0.30	0.0064	
		6-Mar-2018	< 0.0050	0.11	0.84	0.006	
		11-Jun-2018	< 0.0050	< 0.050	4.44	< 0.0050	
		23-Aug-2018	< 0.025	< 0.050	< 1.5	0.0184	
		14-Nov-2018	< 0.0050	< 0.050	< 0.30	0.0064	
		20-Mar-2019	< 0.0050	0.061	< 0.30	0.0157	
		23-May-2019	< 0.0050	< 0.050	< 0.30	0.0142	
		15-Aug-2019	< 0.0050	< 0.050	< 0.30	< 0.010	
		23-Oct-2019	0.0078	< 0.050	< 0.30	< 0.020	
		28-Aug-2013	LC_PIZDC0901	0.213	< 0.50	3.29	0.053
		19-Dec-2013		0.25	0.57	3.5	0.091
		11-Mar-2014		0.0243	0.31	4.87	0.065
	26-Jun-2014	0.298		0.37	3.4	0.066	
	23-Sep-2014	0.689		4.76	11.5	0.068	
	10-Dec-2014	1.24		0.9	8.31	<0.2 (Total)	
	11-Mar-2015	3.9		2.18	12.9	0.047	
	10-Jun-2015	8.1		1.76	17.6	0.0791	
	22-Sep-2015	4.85		0.275	15.1	0.128	
	16-Dec-2015	2.67		1.34	14.2	0.0767	
	16-Mar-2016	1.87		1.74	17.8	0.0327	
	10-Jun-2016	1.23		1.9	15.7	0.116	
	13-Sep-2016	0.685		1.85	12.8	0.0395	
	15-Dec-2016	0.575		0.99	11.9	0.068	
	16-Mar-2017	0.189		2.56	10.7	0.0427	
	12-Jun-2017	0.39		0.513	10.5	0.0983	
	19-Sep-2017	0.166		0.476	12.4	0.107	
	7-Mar-2018	0.105		2.46	11.8	0.0777	
	18-Jun-2018	0.351		2.29	18.8	0.0633	
	23-Aug-2018	0.0751		0.867	17.2	0.106	
	18-Dec-2018	0.0165		1.43	18.3	0.139	
	26-Mar-2019	0.273		0.894	3.61	0.0757	
	5-Jun-2019	0.644		1.01	20.3	0.108	
	3-Sep-2019	0.339	0.55	12.3	0.0948		
	6-Nov-2019	0.113	1.57	11.7	0.0564		
	Downgradient of Dry Creek	GH_POTW10	6-Jun-2012	0.196	2.71 (Total)	180	0.01 (Total)
			5-Dec-2012	0.366	3.92 (Total)	187	0.01 (Total)
9-Oct-2013			0.495	3.95 (Total)	192	0.01 (Total)	
1-May-2014			0.89	5.78 (Total)	194	0.012 (Total)	
8-Oct-2014			0.482	3.95 (Total)	189	0.01 (Total)	
8-Jun-2015			0.405	3.72 (Total)	196	0.0054 (Total)	
4-Nov-2015			0.493	3.7 (Total)	190	0.0052 (Total)	
7-Mar-2016			0.705	4.62 (Total)	191	0.0061 (Total)	
14-Jun-2016			0.445	3.35 (Total)	200	0.0052 (Total)	
16-Aug-2016			0.391	2.93 (Total)	186	0.0067 (Total)	
17-Nov-2016			0.478	3.73 (Total)	185	0.0094 (Total)	
7-Feb-2017			0.675	4.39 (Total)	182	0.0055 (Total)	
19-Jun-2017			< 0.025	0.119 (Total)	278	0.0188 (Total)	
25-Sep-2017			0.453	3.06 (Total)	191	0.0085 (Total)	
16-Nov-2017			0.448	3.92 (Total)	195	0.01 (Total)	
6-Mar-2018			0.591	4.56 (Total)	193	0.0062 (Total)	
11-Jun-2018			0.269	2.66 (Total)	198	0.0062 (Total)	
29-Aug-2018 (Dup)			0.294	2.55 (Total)	188	0.0085 (Total)	
29-Aug-2018			0.295	2.69 (Total)	188	0.0096 (Total)	
4-Oct-2018			0.369	2.74 (Total)	191	0.0105 (Total)	
15-Jan-2019	0.539	4.11 (Total)	189	0.0083 (Total)			
24-Apr-2019	0.688	4.56 (Total)	197	0.0099 (Total)			
22-Aug-2019	0.288	2.86 (Total)	187	0.0102 (Total)			
13-Nov-2019	0.445	3.61 (Total)	194	0.0113 (Total)			

Primary Screening: BC CSR Guidelines						
Aquatic Life (freshwater)	Maximum	400	20	4,290 ^c	4 ^c	
Drinking Water	Maximum	10	10	500	5	
Livestock	Maximum	100	30	1000	80	
Irrigation	Maximum	-	20 ^a , 50 ^b	-	5	
Secondary Screening: Permit Limits, Site Performance Objectives, and Canadian Guidelines						
Canadian Drinking Water Guideline	Maximum	Not applied	50	Not applied	Not applied	
Elk Valley Effluent Permit Threshold Values: Permitted Discharge at LCO Compliance Point	Monthly Average	7	50	-	0.58	
Elk Valley Effluent Permit Threshold Values: Site Performance Objective at Order Station GH_FR1	Maximum	20	63	429	0.39	

BOLD Concentration greater than BC CSR Aquatic Life and Drinking Water guideline.
ITALICS Concentration greater than BC CSR Livestock guideline
INVERSE Concentration greater than BC CSR Irrigation guideline

Comparisons of groundwater quality to water quality guidelines made for reference purposes only.
 BC Contaminated Sites Regulations: BC MOE (1997) Generic Numerical Water Standards (Criteria). Accessed February 2019.
 Canadian Drinking Water Guidelines: Health Canada (2017). Guidelines for Canadian Drinking Water Quality Summary Table.
 Secondary screening applies only when primary screening yields an exceedance. Elk Valley Effluent Permit PE107517. Issued November 19, 2014.
 LCO = Line Creek Operations
 - = no guideline.
^a = Standard for continuous applications on crops
^b = Standard for intermittent application on crops
^c = Hardness of 250 mg/L is assumed
 (Dup) = Duplicate sample
 µg/L = microgram per litre; mg/L = milligram per litre
 Sampling Notes:
 2018: LC_PIZDC1306 could not be sampled in Q1 (January to March) due to frozen conditions.

Recommended List of Analytes for the LCO Sitewide Groundwater Monitoring Program

CAS-RN	Parameter
Field Measured	
pH-F	pH, Field
TEMP-F	Temperature, Field
COND-F	Conductivity, Field
DO-F	Dissolved Oxygen, Field
Physical Parameters	
COND-L	Conductivity
pH-L	pH
TDS	Total Dissolved Solids (Filtered Residue)
TDS(Calc)	Total Dissolved Solids (Calculated)
TSS-L	Total Suspended Solids
TURB-L	Turbidity
Alk-T	Alkalinity, Total as CaCO3
HARD	Hardness
Anions	
-	Bicarbonate
16887-00-6	Chloride
14808-79-8	Sulphate
24959-67-9	Bromide
16984-48-8	Fluoride
Nutrients	
14797-55-8	Nitrogen - Nitrate
14797-65-0	Nitrogen - Nitrite
7664-41-7	Nitrogen - Ammonia
TKN	Nitrogen - Total Kjeldahl
14265-44-2-O	Phosphate, Ortho
Dissolved Metals	
7429-90-5	Aluminum
7440-36-0	Antimony
7440-38-2	Arsenic
7440-39-3	Barium
7440-69-9	Bismuth
7440-41-7	Beryllium
7440-42-8	Boron
7440-43-9	Cadmium
7440-70-2	Calcium
7440-47-3	Chromium
7440-48-4	Cobalt
7440-50-8	Copper
7439-89-6	Iron
7439-92-1	Lead
7439-93-2	Lithium
7439-95-4	Magnesium
7439-96-5	Manganese
7439-97-6	Mercury
7439-98-7	Molybdenum
7440-02-0	Nickel
7440-09-7	Potassium
7782-49-2	Selenium
7440-22-4	Silver
7440-23-5	Sodium
7440-24-6	Strontium
7704-34-9	Sulphur
7440-28-0	Thallium
7440-31-5	Tin
7440-32-6	Titanium
7440-61-1	Uranium
7440-62-2	Vanadium
7440-66-6	Zinc
Organics	
C-DOC	Dissolved Organic Carbon
C-TOC	Total Organic Carbon
Extractable Hydrocarbons	
-	Extractable Petroleum Hydrocarbons C10-C19
-	Extractable Petroleum Hydrocarbons C19-C32
-	Sum of extractable petroleum hydrocarbons
-	Total extractable hydrocarbons C10 - C30

Recommended Water Level and Groundwater Monitoring for 2020

Location Name	Type of Monitoring		Frequency of Data/Sample Collection	
	Water Level	Groundwater Sampling	Water Level	Groundwater Sampling
LC_PIZDC0901	Yes	Yes	Continuous ^a /Quarterly	Quarterly ^c
LC_PIZDC1306	Yes	Yes		Quarterly ^c
LC_PIZDC1307	Yes	Yes		Quarterly ^c
LC_PIZDC1308	Yes	Yes		Quarterly ^c
LC_PIZDC1404D	Yes	Yes		Quarterly ^c
LC_PIZDC1404S	Yes	Yes		Quarterly ^c
LC_PIZP1101	Yes	Yes		Quarterly ^c
LC_PIZP1103	Yes	Yes ^d		Quarterly ^c
LC_PIZP1104	Yes	Yes		Quarterly ^c
LC_PIZP1105	Yes	Yes ^d		Quarterly ^c
LC_PIZP1001	Yes	No		N/A
LC_PIZP1002	Yes	No		N/A
LC_PIZP1003	Yes	No		N/A
GH_POTW10 ^b	Covered by Regional Program			
RG_02-20 ^b				

Notes:

^a = All monitoring wells should have data loggers installed for continuous water level measurements except where low water levels in a well make it unfeasible (LC_PIZP1105).

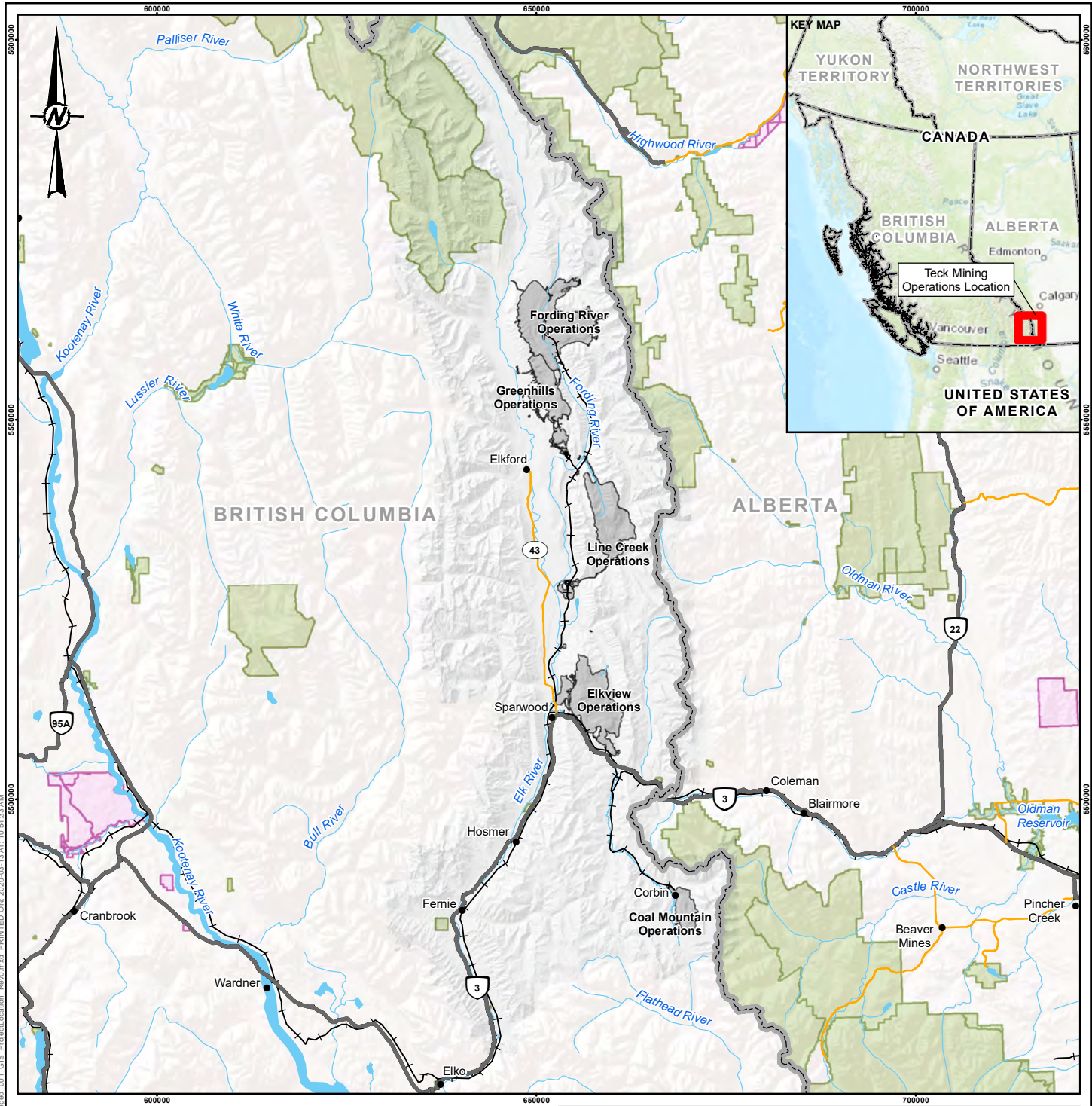
"Spot" water level measurements taken during each quarterly visit

^b = GH_POTW10 and RG_02-20 are covered by the Regional Program

^c = If approved by ENV, frequency could be reduced to twice per year, as seasonal variations are established.

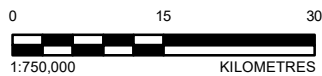
^d = If approved by ENV, the number of wells sampled in the Process Plant Area could be reduced.

FIGURES



LEGEND

- CITY / TOWN / COMMUNITY
- CANADIAN PACIFIC RAILWAY
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- WATERCOURSE
- ▭ PROVINCIAL/TERRITORIAL BORDER
- ▭ COAL MINING OPERATION
- ▭ FIRST NATIONS RESERVE
- ▭ PROVINCIAL PARK / PROTECTED AREA
- ▭ WATERBODY



REFERENCE(S)

BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 DATUM: NAD 83 PROJECTION: UTM ZONE 11

CLIENT
TECK COAL LIMITED

PROJECT
**TECK LINE CREEK OPERATIONS
 ANNUAL GROUNDWATER MONITORING PROGRAM**

TITLE
PROJECT LOCATION

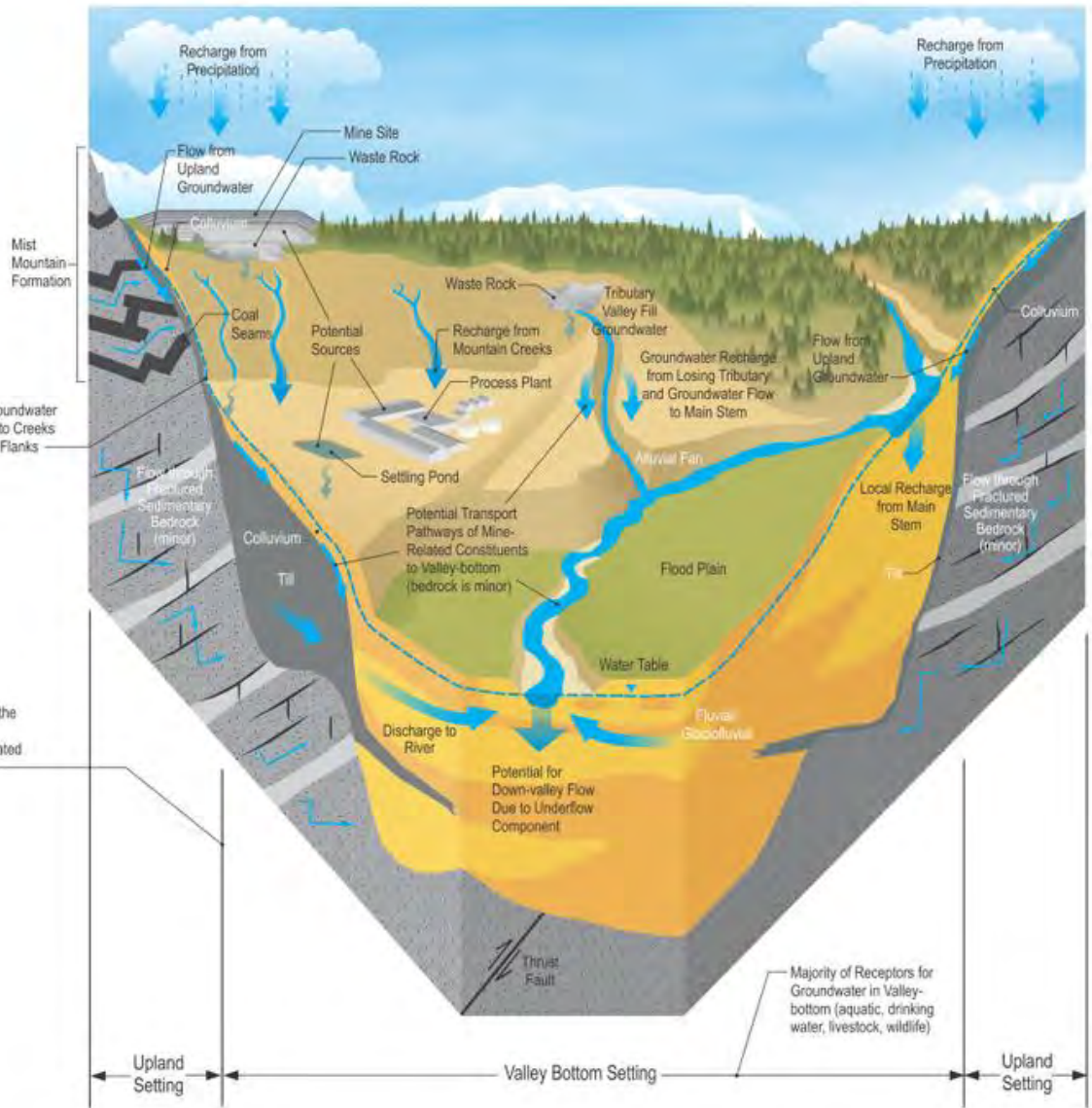
CONSULTANT	
YYYY-MM-DD	2020-03-13
DESIGNED	KF
PREPARED	DR
REVIEWED	LO
APPROVED	JM

PROJECT NO.	PHASE	REV.	FIGURE
19135981	3	0	1-1



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSIA 25mm

PATH: I:\CLIENTS\TECK_COAL\19135981\Mapppan\Products\003_BasemapHydrotopography\19135981_1_B_Hydrotopo_001_GIS_Project\location_Rev0.mxd PRINTED ON: 2020-03-13 AT: 10:54:33 AM



REFERENCE

from SNC-Lavalin 2017

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD 2020-03-13

PREPARED KF

DESIGNED KF

REVIEWED LO

APPROVED JM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

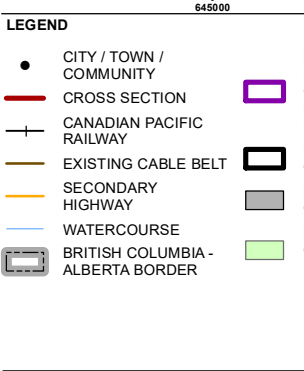
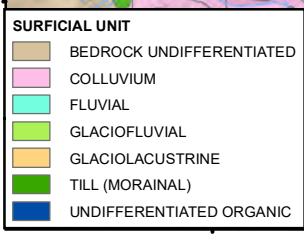
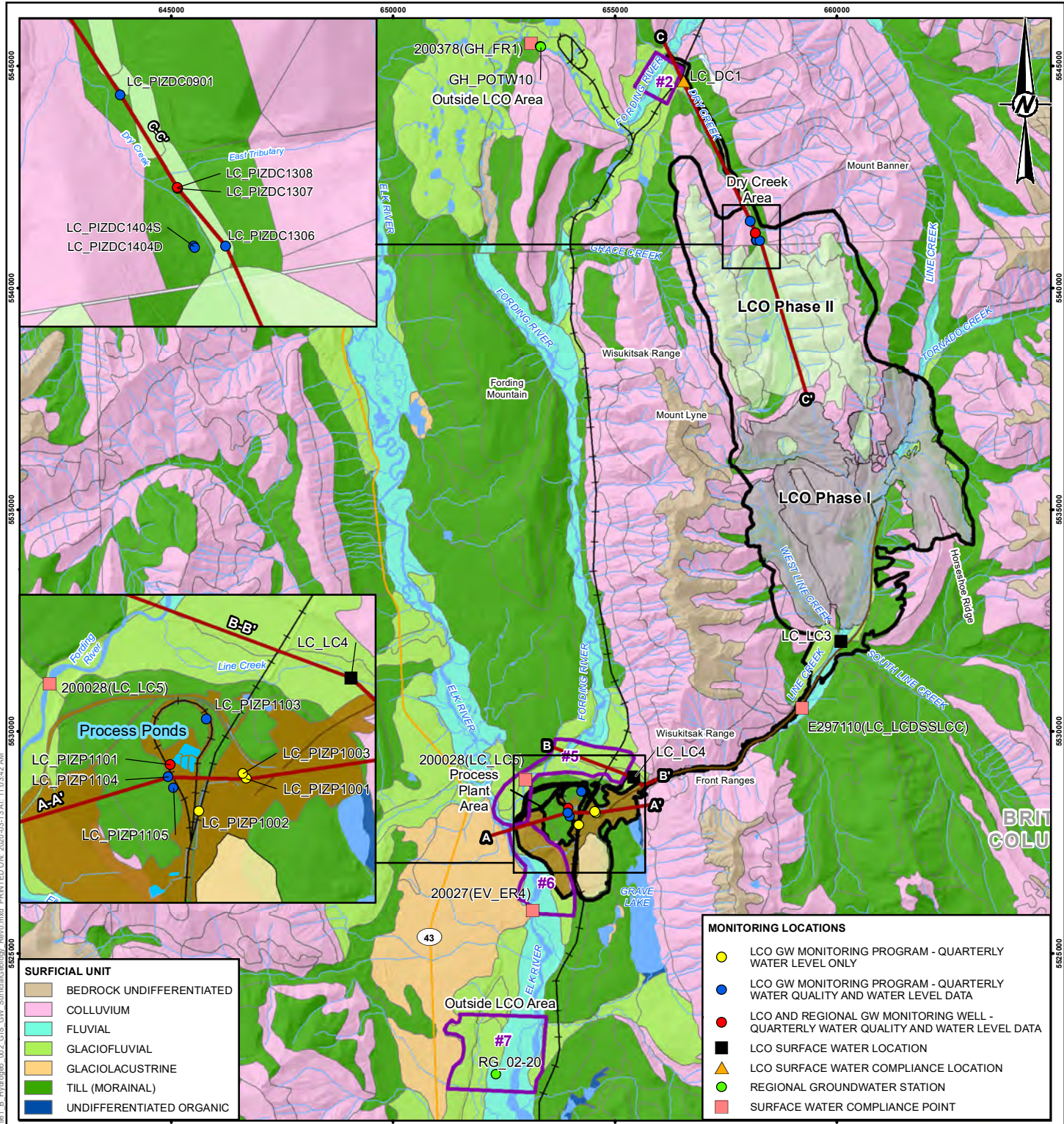
**SCHEMATIC OF SURFACE AND GROUNDWATER
FLOW IN THE ELK VALLEY REGION**

PROJECT NO.
19135981

PHASE
3

REV.
A

FIGURE
2-1



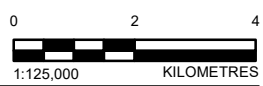
SURFICIAL UNIT

- BEDROCK UNDIFFERENTIATED
- COLLUVIUM
- FLUVIAL
- GLACIOFLUVIAL
- GLACIOLACUSTRINE
- TILL (MORAINAL)
- UNDIFFERENTIATED ORGANIC

LEGEND

- CITY / TOWN / COMMUNITY
- CROSS SECTION
- CANADIAN PACIFIC RAILWAY
- EXISTING CABLE BELT
- SECONDARY HIGHWAY
- WATERCOURSE
- BRITISH COLUMBIA - ALBERTA BORDER
- KEY AREA IN THE REGIONAL GROUNDWATER MONITORING PROGRAM
- LINE CREEK OPERATIONS
- LINE CREEK OPERATIONS PHASE I
- LINE CREEK OPERATIONS PHASE II
- PERMITTED COAL REJECTS AREA
- PROCESS PLANT SITE
- WATERBODY

REFERENCE(S)
 BASE DATA OBTAINED FROM TECK COAL LIMITED AND GEOGRATIS © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. SURFICIAL GEOLOGY OBTAINED FROM GOVERNMENT OF BC.
 PROJECTION: UTM ZONE 11 DATUM: NAD 83



MONITORING LOCATIONS

- LCO GW MONITORING PROGRAM - QUARTERLY WATER LEVEL ONLY
- LCO GW MONITORING PROGRAM - QUARTERLY WATER QUALITY AND WATER LEVEL DATA
- LCO AND REGIONAL GW MONITORING WELL - QUARTERLY WATER QUALITY AND WATER LEVEL DATA
- LCO SURFACE WATER LOCATION
- LCO SURFACE WATER COMPLIANCE LOCATION
- REGIONAL GROUNDWATER STATION
- SURFACE WATER COMPLIANCE POINT

CLIENT
TECK COAL LIMITED

PROJECT
TECK LINE CREEK OPERATIONS ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE
SURFICIAL GEOLOGY

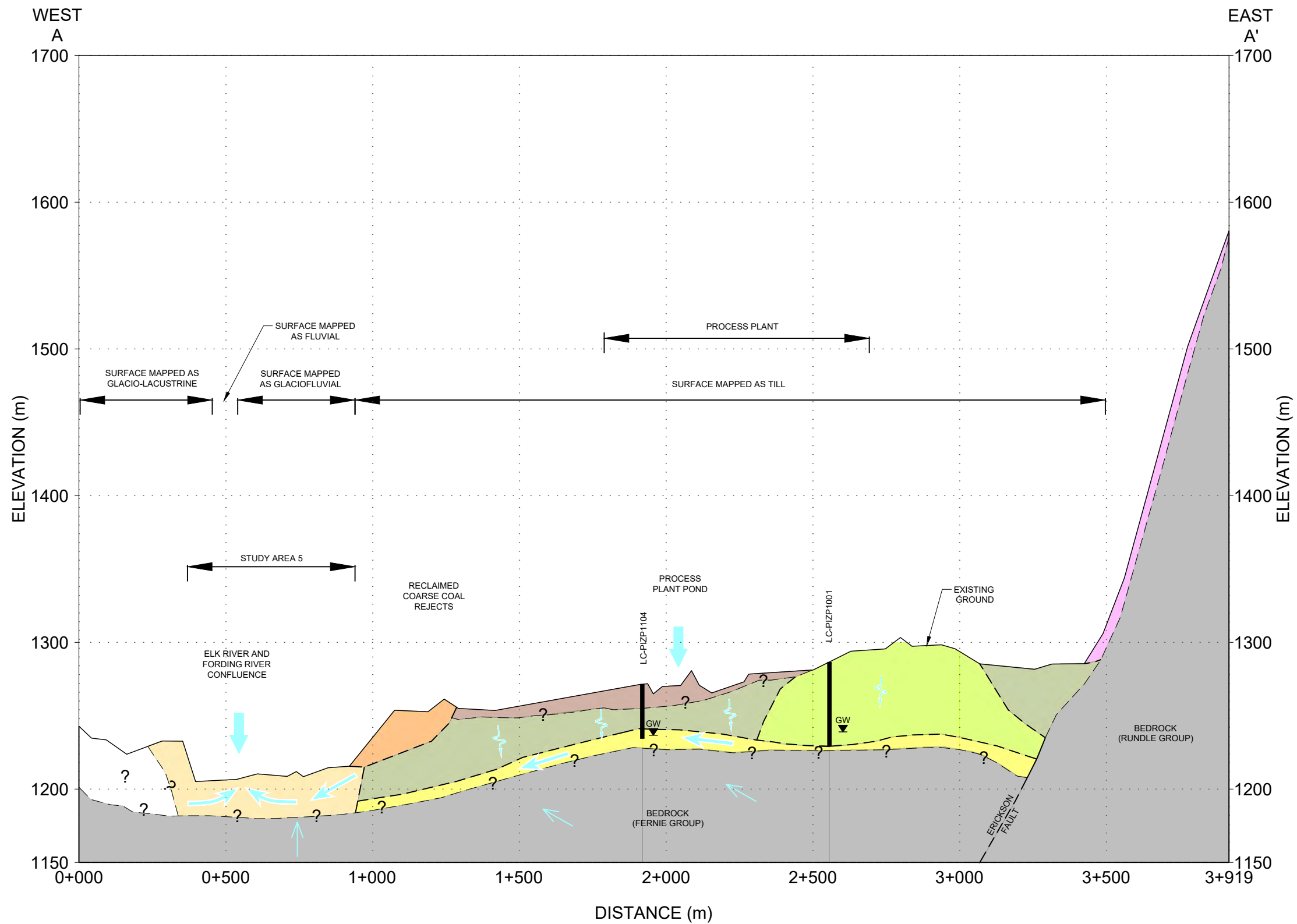
CONSULTANT	YYYY-MM-DD	2020-03-13
	DESIGNED	KF
	PREPARED	DR
	REVIEWED	LO
	APPROVED	JM

PROJECT NO.	PHASE	REV.	FIGURE
19135981	3	0	2-2



25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4.

PATH: I:\CLIENTS\TECK_COAL\19135981\Mapproj\Products\003_BasemapHydrogeology_Rev0.mxd PRINTED ON: 2020-03-13 AT: 11:03:42 AM



LEGEND

GROUNDWATER ELEVATION	FILL
INTERPRETED GROUNDWATER FLOW DIRECTIONS	GRAVELLY TILL
INFILTRATION	SAND
BEDROCK	SILTY TILL
CLAY	
COLLUVIUM	

NOTE(S)

- REFER TO FIGURE 2-2 FOR LOCATION OF CROSS-SECTION A-A'.
- DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. FOR DETAILED STRATIGRAPHY OF EACH BOREHOLE LOCATION REFER TO THE RECORD OF BOREHOLE SHEETS.
- GROUNDWATER ELEVATIONS MEASURED IN 2019 Q4.

CLIENT
TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	AM
DESIGN	KF
REVIEW	LO
APPROVED	JM

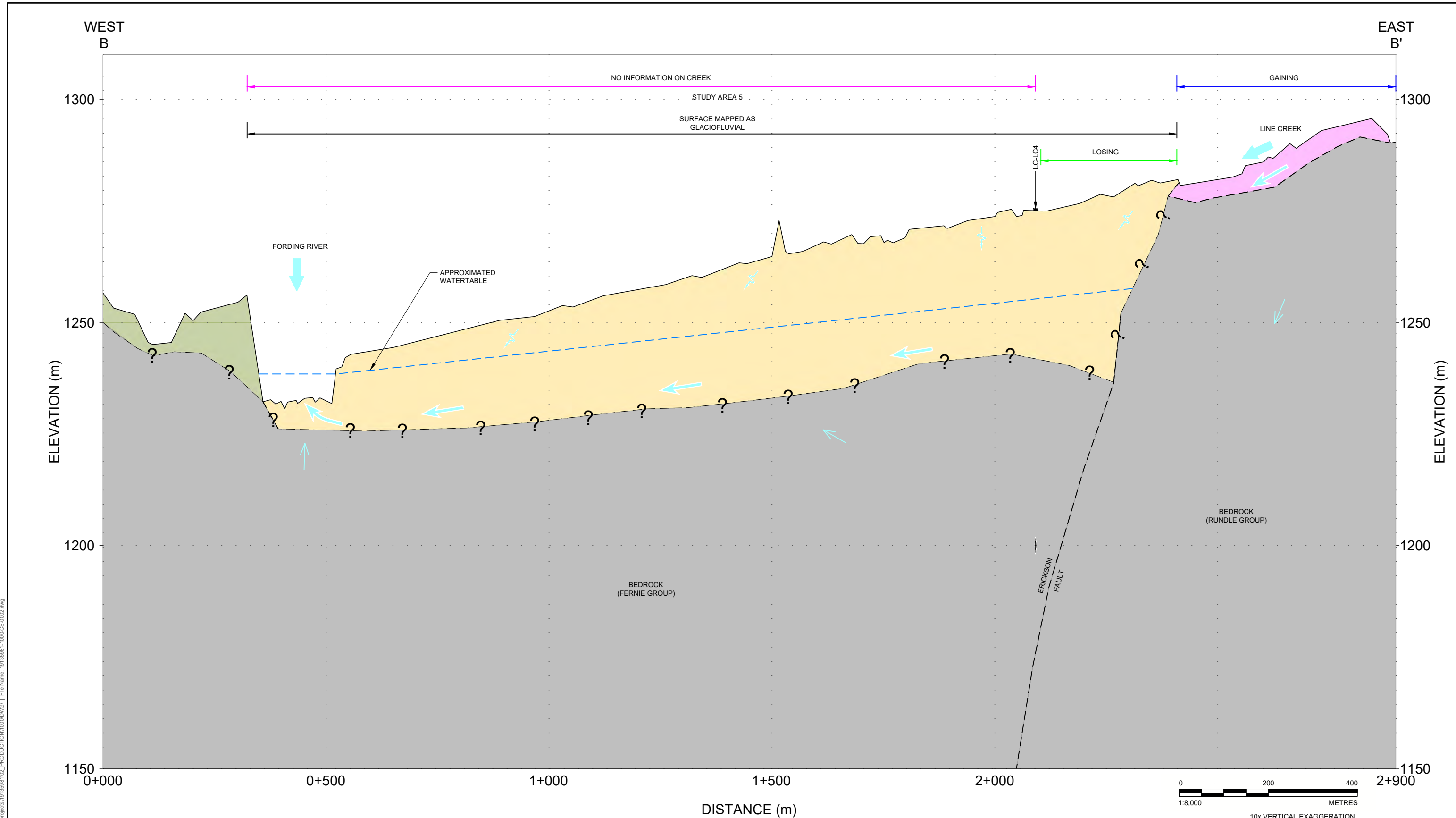
PROJECT
TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE
CROSS SECTION A - A' : PROCESS PLANT AREA

PROJECT No. 19135981	CONTROL 3-CS-0001	Rev. 0	FIGURE 2-3a
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Path: \\golder\golder\CAL\IMC\A\TECK\linecreek\19135981\192_PROD\FIG\19135981_1000_CS-0001.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSIB 28 mm



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LEGEND			
GROUNDWATER ELEVATION	FILL		
INTERPRETED GROUNDWATER FLOW DIRECTIONS	GRAVELLY TILL		
INFILTRATION	SAND		
BEDROCK	SILT		
COLLUVIUM	TILL		
COLLUVIUM AND TILL	LINE CREEK REACH		
DENSE TILL			

NOTE(S)

- REFER TO FIGURE 2-2 FOR LOCATION OF CROSS-SECTION B-B'.
- DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. FOR DETAILED STRATIGRAPHY OF EACH BOREHOLE LOCATION REFER TO THE RECORD OF BOREHOLE SHEETS. DATA HAS BEEN INTERPOLATED FROM BOREHOLES TO THE SOUTH AS NO BOREHOLES WITHIN CROSS SECTION.
- NO GROUNDWATER MONITORING WELLS ARE SHOWN WITHIN THE CROSS SECTION AS THE NEAREST GROUNDWATER MONITORING WELLS ARE APPROXIMATELY 750 m TO THE SOUTHWEST.

DISTANCE (m)

CLIENT
TECK COAL LIMITED

CONSULTANT

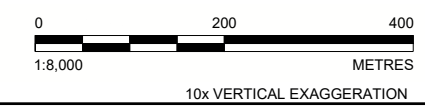


YYYY-MM-DD	2020-03-13
PREPARED	AM
DESIGN	KF
REVIEW	LO
APPROVED	JM

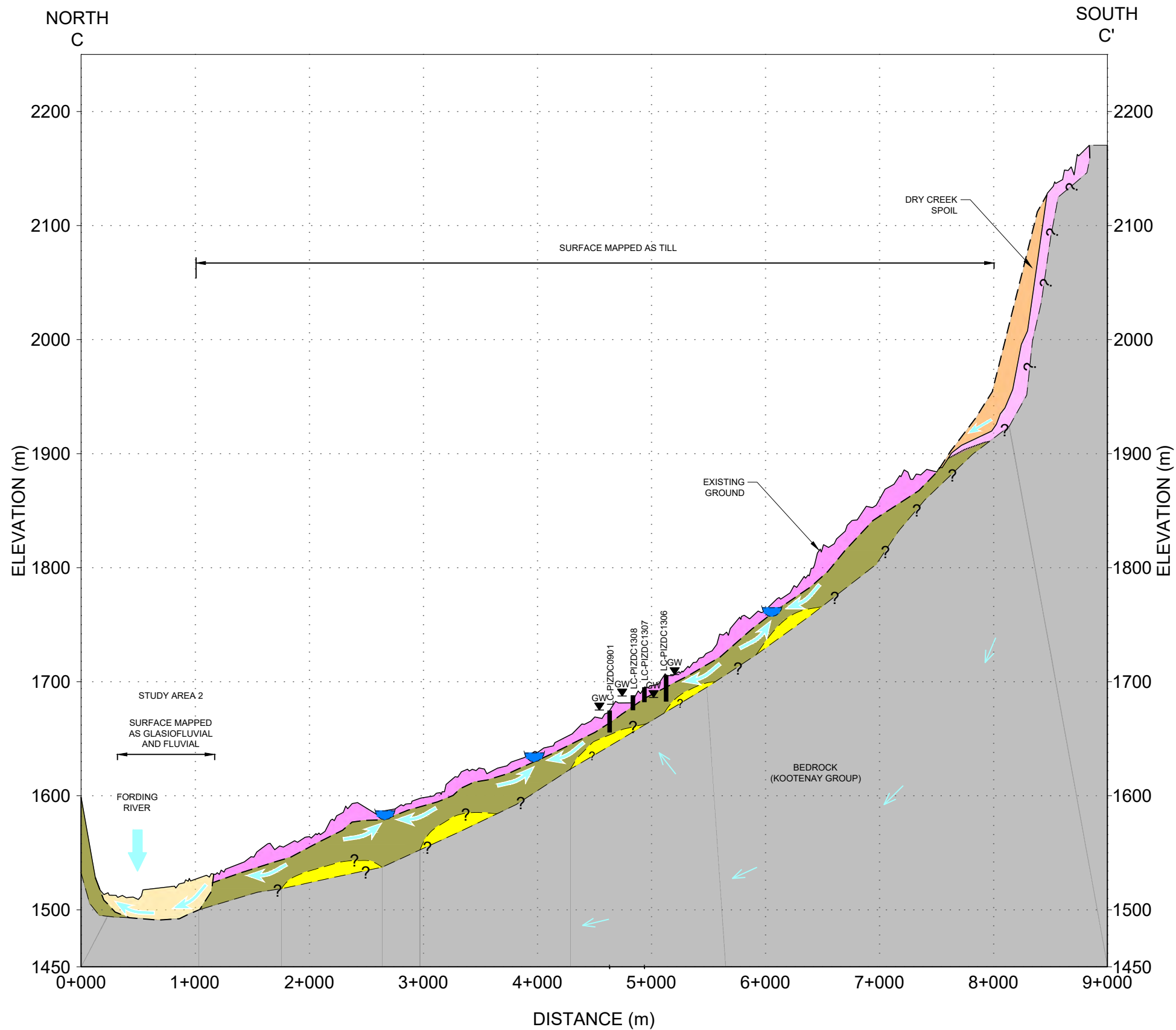
PROJECT
TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE
CROSS SECTION B - B' : LINE CREEK IN FORDING VALLEY BOTTOM

PROJECT No.	CONTROL	Rev.	FIGURE
19135981	3-CS-0002	0	2-3b



25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4S/B



Path: \\golder\golder\CALM\CAD\TECH\Drawings\19135981\19135981_02_PROD\19135981_02_PROD\19135981_02_PROD_CS-0003.dwg

GROUNDWATER ELEVATION	DENSE TILL
INTERPRETED GROUNDWATER FLOW DIRECTIONS	FILL
INFILTRATION	GRAVELLY TILL
THEORETICAL LOCATION OF TRIBUTARY	SAND
BEDROCK	SILT
COLLUVIUM	TILL
COLLUVIUM AND TILL	

- NOTE(S)**
- REFER TO FIGURE 2-2 FOR LOCATION OF CROSS-SECTION C-C'.
 - DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. FOR DETAILED STRATIGRAPHY OF EACH BOREHOLE LOCATION REFER TO THE RECORD OF BOREHOLE SHEETS.
 - GROUNDWATER ELEVATIONS MEASURED IN 2019 Q4.

CLIENT
TECK COAL LIMITED

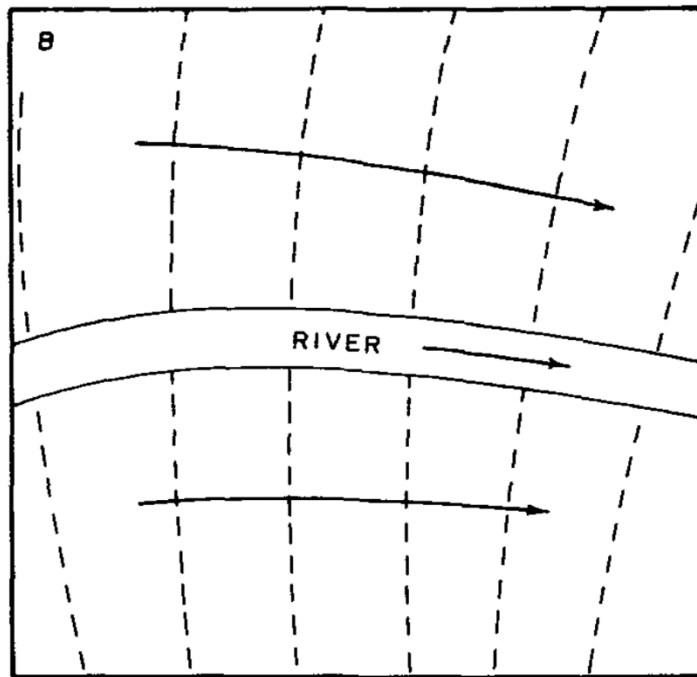
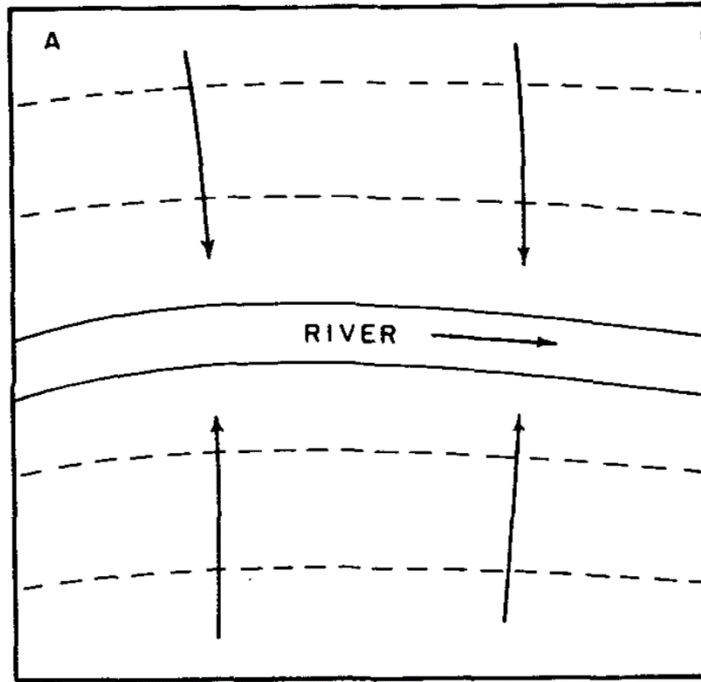
CONSULTANT	YYYY-MM-DD	2020-03-13
	PREPARED	AM
	DESIGN	KF
	REVIEW	LO
	APPROVED	JM

PROJECT
TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE
CROSS SECTION C - C' : DRY CREEK

PROJECT No.	CONTROL	Rev.	FIGURE
19135981	3-CS-0003	0	2-3c

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANS/B



NOTES

Upper flow sketch is the Baseflow end member and the Lower sketch is the Underflow end member

REFERENCE

from Larkin and Sharp 1992

CLIENT

TECK COAL LIMITED

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

CONSULTANT



YYYY-MM-DD 2020-03-13

PREPARED KF

DESIGNED KF

REVIEWED LO

APPROVED JM

TITLE

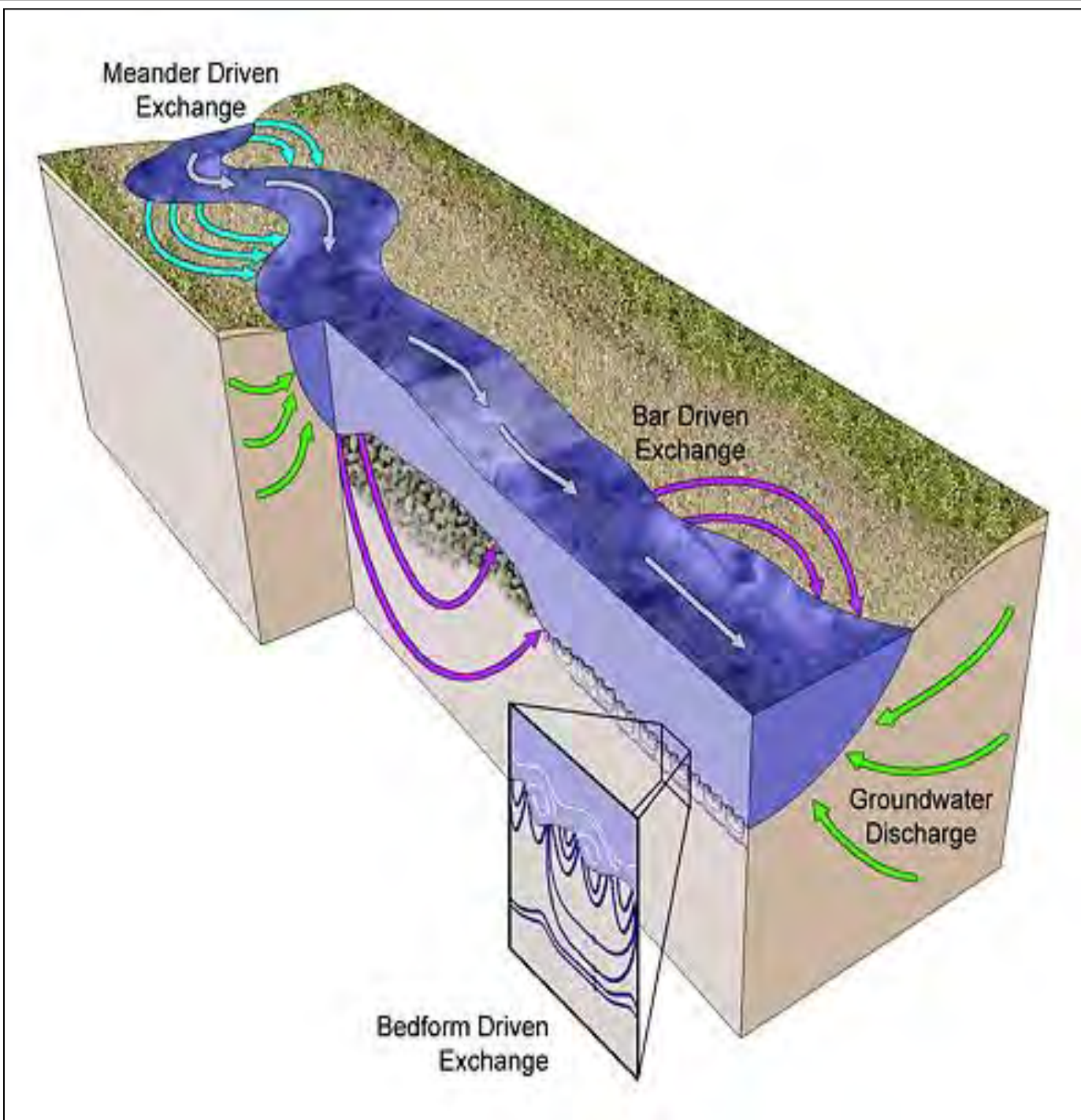
**SCHEMATIC FOR FLOW DIRECTIONS IN
VALLEY-BOTTOM AQUIFER**

PROJECT NO.
19135981

PHASE
3

REV.
A

FIGURE
2-4a



NOTES

Illustration showing the baseflow dominated groundwater flow (green flow lines) directed to the valley-bottom river and smaller scale exchanges between surface water and groundwater (purple, teal and blue flow lines) due to interplay of many variables.

SOURCE

<http://susa.stonedahl.com/research.html>

CLIENT

TECK COAL LIMITED

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

CONSULTANT



YYYY-MM-DD 2020-03-13

PREPARED KF
DESIGNED KF
REVIEWED LO
APPROVED JM

TITLE

3D VISUALIZATION OF GROUNDWATER AND
SURFACE WATER FLOW

PROJECT NO.
19135981

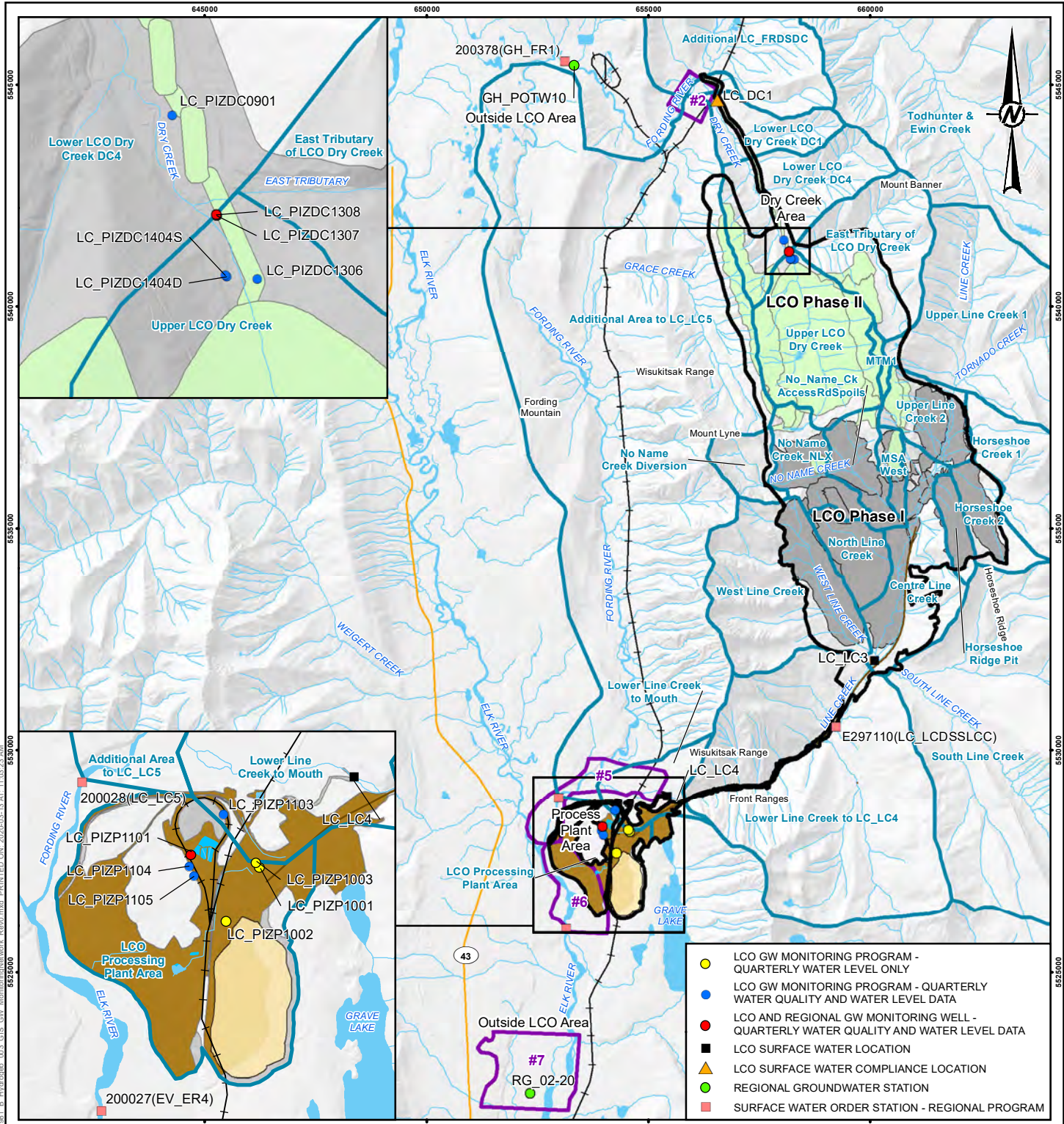
PHASE
3

REV.
A

FIGURE
2-4b

https://golderassociates.sharepoint.com/sites/28510/Deliverables/Draft_Report/Figures

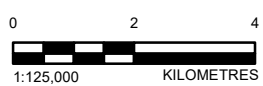
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A 25 mm



- LCO GW MONITORING PROGRAM - QUARTERLY WATER LEVEL ONLY
- LCO GW MONITORING PROGRAM - QUARTERLY WATER QUALITY AND WATER LEVEL DATA
- LCO AND REGIONAL GW MONITORING WELL - QUARTERLY WATER QUALITY AND WATER LEVEL DATA
- LCO SURFACE WATER LOCATION
- ▲ LCO SURFACE WATER COMPLIANCE LOCATION
- REGIONAL GROUNDWATER STATION
- SURFACE WATER ORDER STATION - REGIONAL PROGRAM

LEGEND

- CANADIAN PACIFIC RAILWAY
- EXISTING CABLE BELT
- SECONDARY HIGHWAY
- WATERCOURSE
- KEY AREA IN THE REGIONAL GROUNDWATER MONITORING PROGRAM
- LINE CREEK OPERATIONS
- LOCAL WATERSHED
- LINE CREEK OPERATIONS PHASE I
- LINE CREEK OPERATIONS PHASE II
- PERMITTED COAL REJECTS
- PROCESS PLANT SITE
- WATERBODY



REFERENCE(S)

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 PROJECTION: UTM ZONE 11 DATUM: NAD 83

CLIENT
TECK COAL LIMITED

PROJECT
**TECK LINE CREEK OPERATIONS
 ANNUAL GROUNDWATER MONITORING PROGRAM**

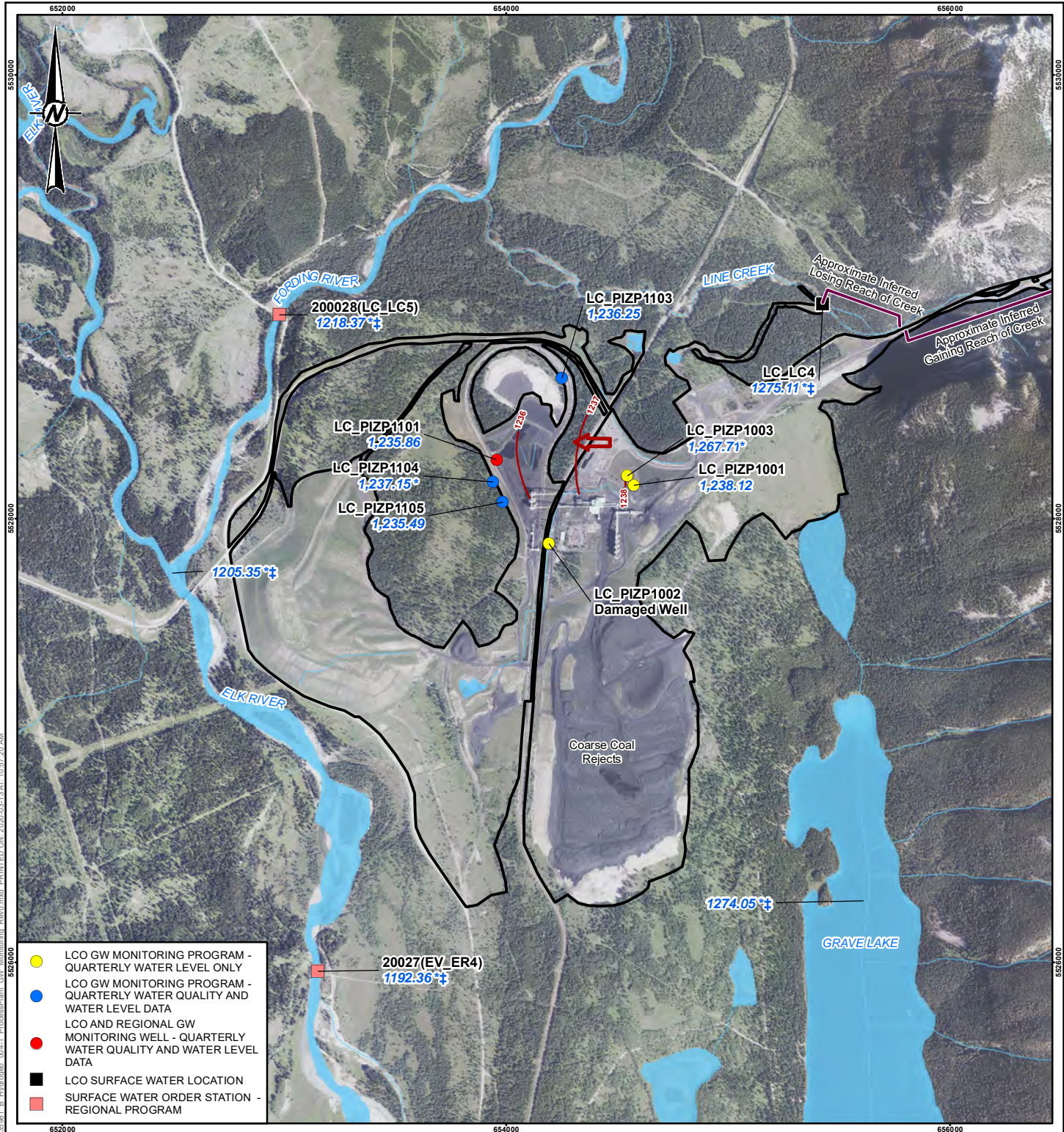
TITLE
LCO GROUNDWATER MONITORING NETWORK - 2019

CONSULTANT	YYYY-MM-DD	2020-03-13
DESIGNED	KF	
PREPARED	DR	
REVIEWED	LO	
APPROVED	JM	

PROJECT NO.	PHASE	REV.	FIGURE
19135981	3	0	3

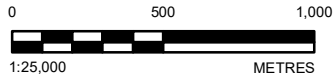


IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSIA 25mm



- LCO GW MONITORING PROGRAM - QUARTERLY WATER LEVEL ONLY
- LCO GW MONITORING PROGRAM - QUARTERLY WATER QUALITY AND WATER LEVEL DATA
- LCO AND REGIONAL GW MONITORING WELL - QUARTERLY WATER QUALITY AND WATER LEVEL DATA
- LCO SURFACE WATER LOCATION
- SURFACE WATER ORDER STATION - REGIONAL PROGRAM

- LEGEND**
- ➔ GROUNDWATER FLOW DIRECTION
 - 1199.1 WATER ELEVATION (mASL)
 - WATER ELEVATION CONTOUR (mASL)
 - WATERCOURSE
 - PROJECT OPERATIONAL BOUNDARY
 - WATERBODY



NOTE(S)

- ± WATER LEVEL ELEVATIONS OBTAINED FROM 2019 LIDAR.
- * WATER ELEVATION NOT USED IN CONTOURING.
- GROUNDWATER LEVEL MEASUREMENTS TAKEN IN 2019 FOURTH QUARTER (Q4).

REFERENCE(S)

HYDROLOGY, PROJECT DATA, AND 2019 ORTHOPHOTO OBTAINED FROM TECK COAL LIMITED.
 PROJECTION: UTM ZONE 11 DATUM: NAD 83

CLIENT
 TECK COAL LIMITED

PROJECT
 TECK LINE CREEK OPERATIONS
 ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE
LCO PROCESS PLANT AREA GROUNDWATER MONITORING NETWORK IN SURFICIAL SEDIMENTS

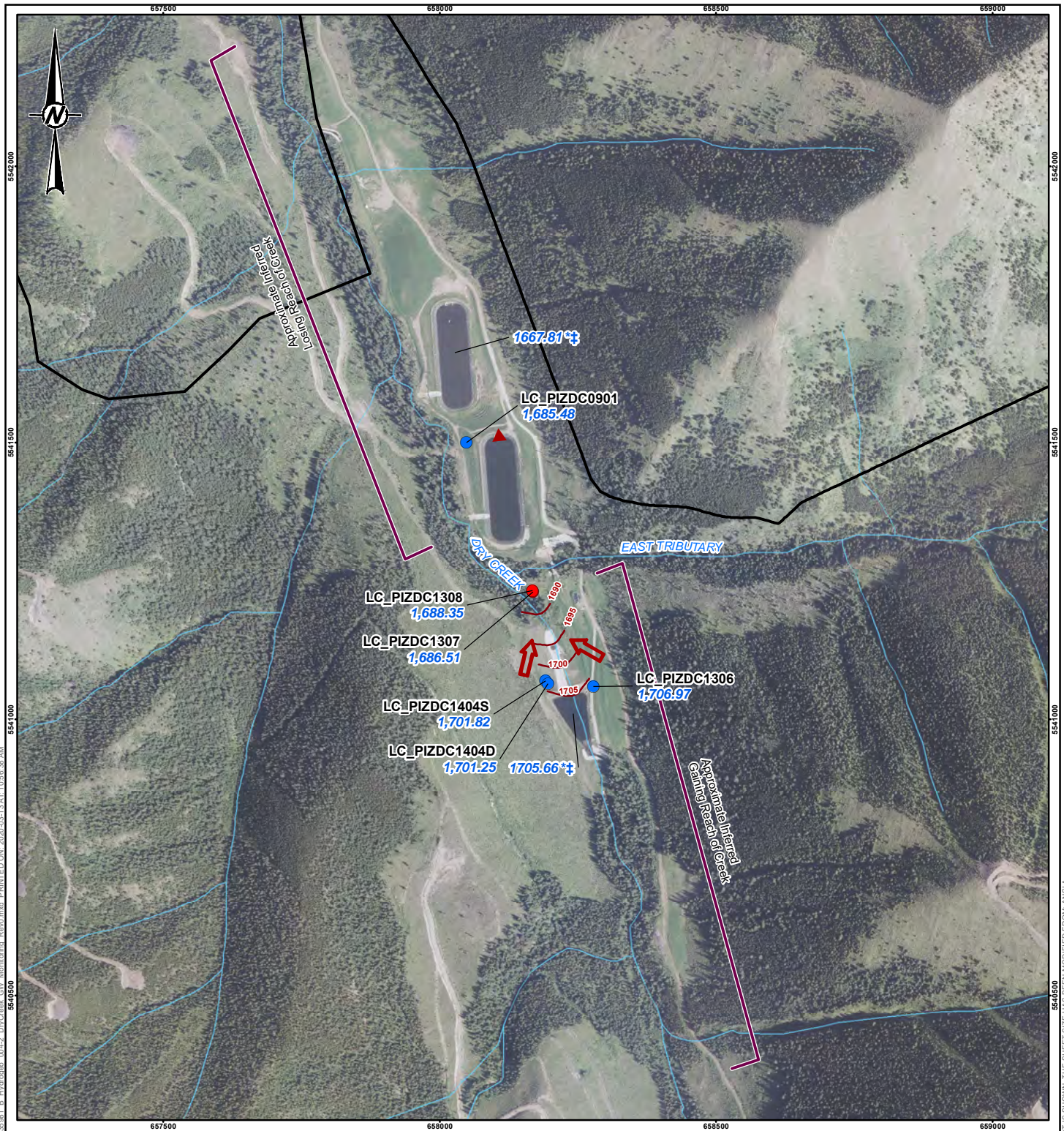
CONSULTANT	YYYY-MM-DD	2020-03-13
	DESIGNED	MS
	PREPARED	CN/PS
	REVIEWED	LO
	APPROVED	JM



PROJECT NO.	PHASE	REV.	FIGURE
19135981	3	0	4-1

PATH: I:\CLIENTS\TECK_COAL\19135981\Map\Plant\Products\003_Basin\Hydro\topo\19135981_1_B_Hydro\001_1_ProcessPlant_GW_Monitoring_Rev0.mxd PRINTED ON: 2020-03-13 AT: 10:57:29 AM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSIA 25mm



LEGEND

- GROUNDWATER FLOW DIRECTION
 - LCO GW MONITORING PROGRAM - QUARTERLY WATER QUALITY AND WATER LEVEL DATA
 - LCO AND REGIONAL GW MONITORING WELL - QUARTERLY WATER QUALITY AND WATER LEVEL DATA
 - DCP1 BAROLOGGER LOCATION
 - WATER ELEVATION (mASL)
 - WATER ELEVATION CONTOUR (mASL)
 - WATERCOURSE
 - PROJECT OPERATIONAL BOUNDARY
- 0 200 400
1:10,000 METRES

NOTE(S)

*± WATER LEVEL ELEVATION OBTAINED FROM 2019 LIDAR AND NOT USED IN CONTOURING. GROUNDWATER LEVEL MEASUREMENTS TAKEN IN 2019 FOURTH QUARTER (Q4).

REFERENCE(S)

HYDROLOGY, PROJECT DATA, AND 2019 ORTHOPHOTO OBTAINED FROM TECK COAL LIMITED. PROJECTION: UTM ZONE 11 DATUM: NAD 83

CLIENT
TECK COAL LIMITED

PROJECT
TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE
LCO DRY CREEK AREA GROUNDWATER MONITORING NETWORK IN VALLEY BOTTOM SEDIMENTS

CONSULTANT



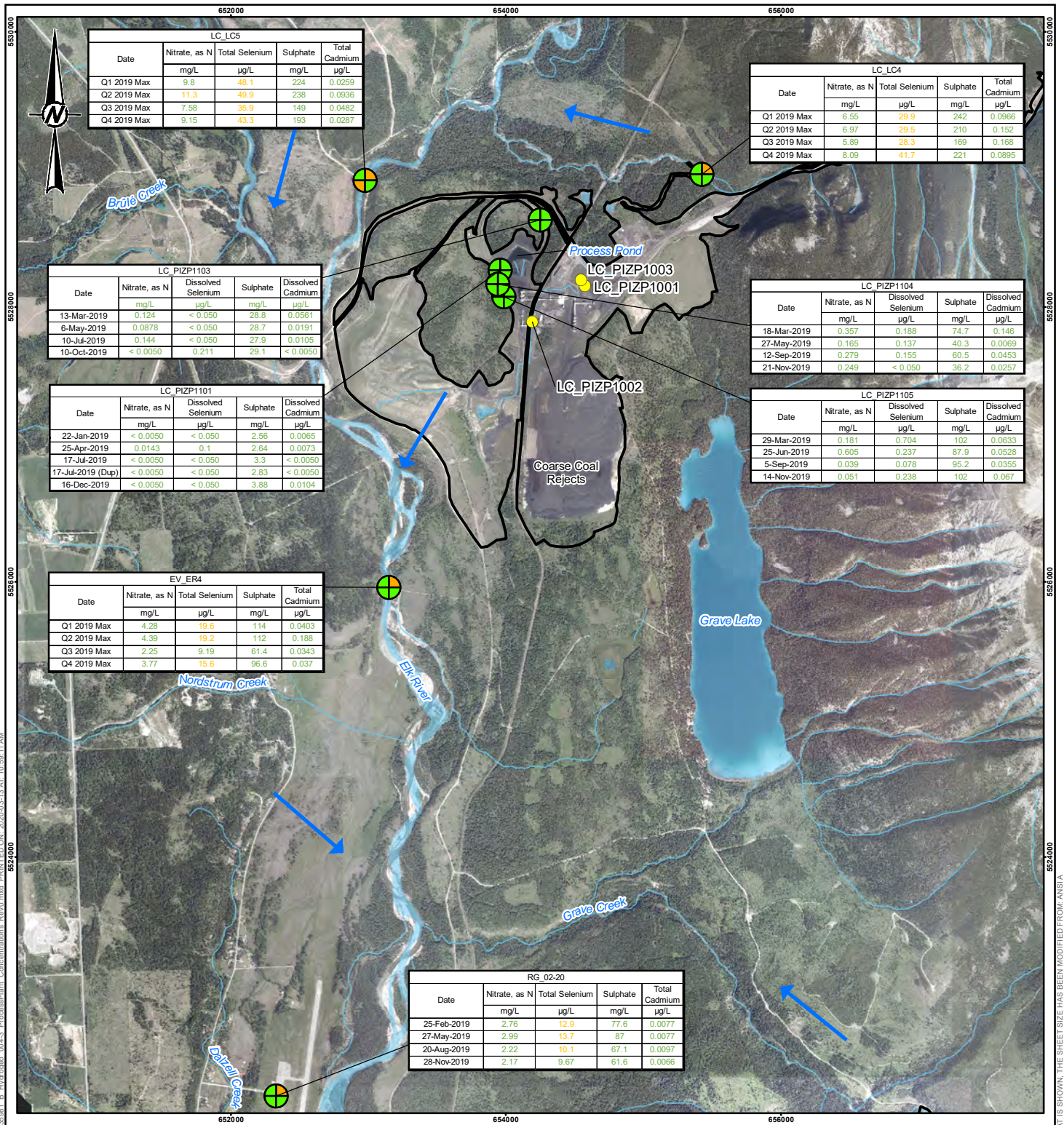
YYYY-MM-DD 2020-03-13

DESIGNED	MS
PREPARED	CN/PS
REVIEWED	LO
APPROVED	JM

PROJECT NO. 19135981	PHASE 3	REV. 0	FIGURE 4-2
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PATH: I:\CLIENTS\TECK_COAL\19135981\MapInfo\Products\003_Basin\Hydro\topo\19135981_B_Hydrotopo_0142_DryCreek_GW_Monitoring_Rev0.mxd PRINTED ON: 2020-03-13 AT: 10:56:39 AM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSIA 25mm



LC_LC5				
Date	Nitrate, as N mg/L	Total Selenium µg/L	Sulphate mg/L	Total Cadmium µg/L
Q1 2019 Max	9.8	48.1	224	0.0259
Q2 2019 Max	11.3	49.9	238	0.0936
Q3 2019 Max	7.58	35.9	149	0.0482
Q4 2019 Max	9.15	43.3	193	0.0287

LC_LC4				
Date	Nitrate, as N mg/L	Total Selenium µg/L	Sulphate mg/L	Total Cadmium µg/L
Q1 2019 Max	6.55	29.9	242	0.0966
Q2 2019 Max	6.97	29.5	210	0.152
Q3 2019 Max	5.89	28.3	169	0.168
Q4 2019 Max	8.09	41.7	221	0.0895

LC_PIZP103				
Date	Nitrate, as N mg/L	Dissolved Selenium µg/L	Sulphate mg/L	Dissolved Cadmium µg/L
13-Mar-2019	0.124	< 0.050	28.6	0.0561
6-May-2019	0.0878	< 0.050	28.7	0.0191
10-Jul-2019	0.144	< 0.050	27.9	0.0105
10-Oct-2019	< 0.0050	0.211	29.1	< 0.0050

LC_PIZP104				
Date	Nitrate, as N mg/L	Dissolved Selenium µg/L	Sulphate mg/L	Dissolved Cadmium µg/L
18-Mar-2019	0.357	0.188	74.7	0.146
27-May-2019	0.165	0.137	40.3	0.0069
12-Sep-2019	0.279	0.155	60.5	0.0453
21-Nov-2019	0.249	< 0.050	36.2	0.0257

LC_PIZP101				
Date	Nitrate, as N mg/L	Dissolved Selenium µg/L	Sulphate mg/L	Dissolved Cadmium µg/L
22-Jan-2019	< 0.0050	< 0.050	2.56	0.0065
25-Apr-2019	0.0143	0.1	2.64	0.0073
17-Jul-2019	< 0.0050	< 0.050	3.3	< 0.0050
17-Jul-2019 (Dup)	< 0.0050	< 0.050	2.83	< 0.0050
16-Dec-2019	< 0.0050	< 0.050	3.88	0.0104

LC_PIZP105				
Date	Nitrate, as N mg/L	Dissolved Selenium µg/L	Sulphate mg/L	Dissolved Cadmium µg/L
29-Mar-2019	0.181	0.704	102	0.0633
25-Jun-2019	0.605	0.237	87.9	0.0528
5-Sep-2019	0.039	0.078	95.2	0.0355
14-Nov-2019	0.051	0.238	102	0.067

EV_ER4				
Date	Nitrate, as N mg/L	Total Selenium µg/L	Sulphate mg/L	Total Cadmium µg/L
Q1 2019 Max	4.28	19.6	114	0.0403
Q2 2019 Max	4.39	19.2	112	0.188
Q3 2019 Max	2.25	9.19	61.4	0.0343
Q4 2019 Max	3.77	15.6	96.6	0.037

RG_02-20				
Date	Nitrate, as N mg/L	Total Selenium µg/L	Sulphate mg/L	Total Cadmium µg/L
25-Feb-2019	2.76	12.9	77.6	0.0077
27-May-2019	2.99	13.7	87	0.0077
20-Aug-2019	2.22	10.1	67.1	0.0097
28-Nov-2019	2.17	9.67	61.6	0.0066

LEGEND

- BELOW PRIMARY SCREENING CRITERIA
- ABOVE AT LEAST ONE OF THE PRIMARY SCREENING CRITERIA
- SELENIUM CONCENTRATION ABOVE AT LEAST ONE OF THE SECONDARY SCREENING CRITERIA
- LCO GW MONITORING PROGRAM - QUARTERLY WATER LEVEL ONLY
- CONCEPTUAL GROUNDWATER FLOW DIRECTION
- WATERCOURSE
- PROJECT OPERATIONAL BOUNDARY
- WATERBODY

SULPHATE SELENIUM
 NITRATE-NITROGEN CADMIUM

0 500 1,000

 1:40,000 METRES

NOTE(S)
 SURFACE WATER CONCENTRATIONS WERE COMPARED TO STANDARDS DESCRIBED IN TABLES 3-3 AND 3-4.

REFERENCE(S)
 HYDROLOGY, PROJECT DATA, AND 2018 ORTHOPHOTO OBTAINED FROM TECK COAL LIMITED.
 PROJECTION: UTM ZONE 11 DATUM: NAD 83

CLIENT
TECK COAL LIMITED

PROJECT
**TECK LINE CREEK OPERATIONS
 ANNUAL GROUNDWATER MONITORING PROGRAM**

TITLE
**LCO PROCESS PLANT AREA SPATIAL DISTRIBUTION OF
 SELECTED GROUNDWATER ANALYTICAL DATA**

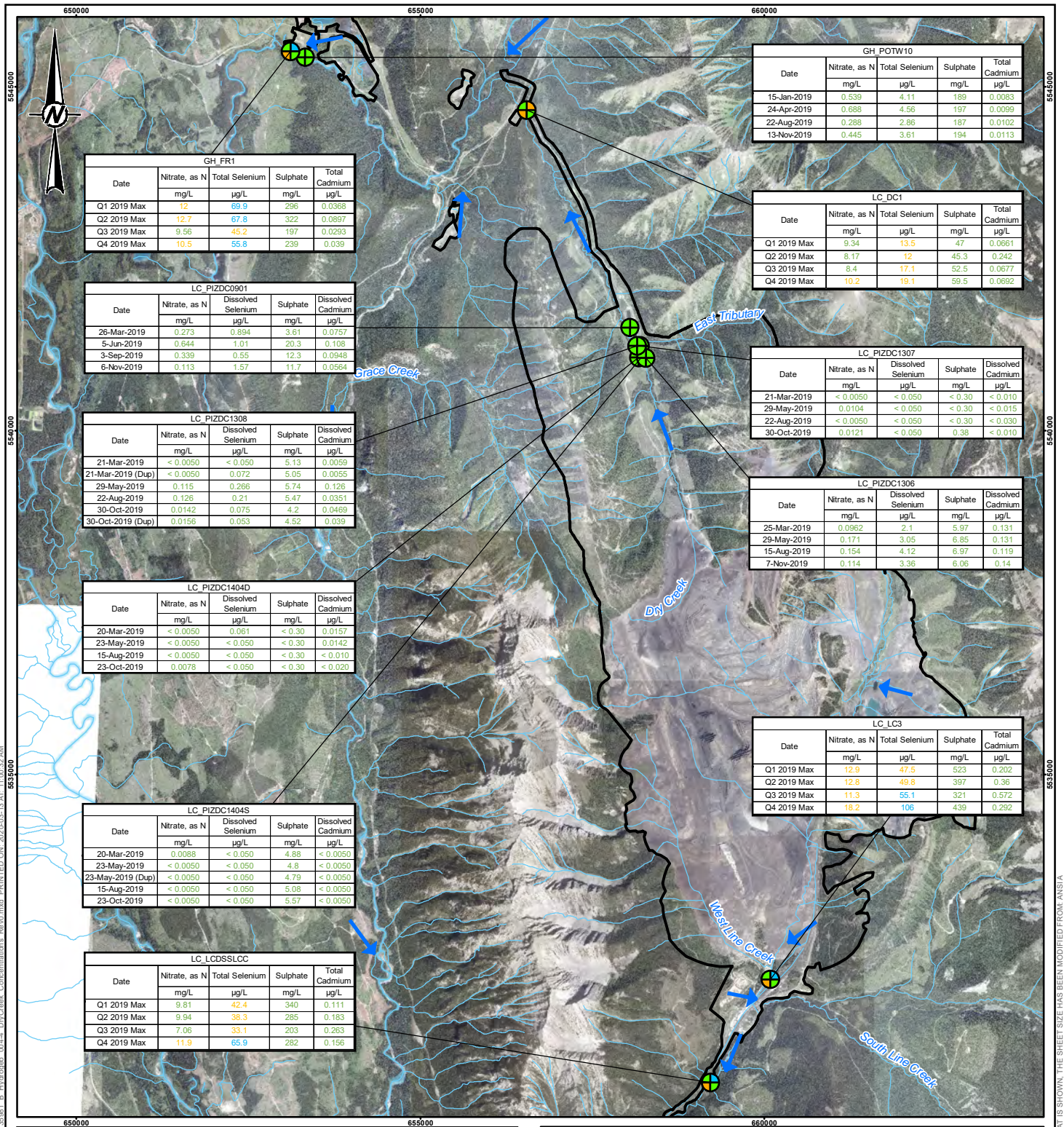
CONSULTANT	YYYY-MM-DD	2020-03-13
DESIGNED	MS	
PREPARED	CN	
REVIEWED	LO	
APPROVED	JM	



PROJECT NO.	PHASE	REV.	FIGURE
19135981	3	0	4-3

PATH: I:\CLIENTS\TECK_COAL\19135981\Map\Plant\Concentrations_Rev0.mxd PRINTED ON: 2020-03-13 AT: 10:59:11 AM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSIA 25mm



GH_FR1				
Date	Nitrate, as N mg/L	Total Selenium µg/L	Sulphate mg/L	Total Cadmium µg/L
Q1 2019 Max	12	69.9	296	0.0368
Q2 2019 Max	12.7	67.8	322	0.0897
Q3 2019 Max	9.56	45.2	197	0.0293
Q4 2019 Max	10.5	55.8	239	0.039

GH_POTW10				
Date	Nitrate, as N mg/L	Total Selenium µg/L	Sulphate mg/L	Total Cadmium µg/L
15-Jan-2019	0.539	4.11	189	0.0063
24-Apr-2019	0.688	4.56	197	0.0099
22-Aug-2019	0.288	2.86	187	0.0102
13-Nov-2019	0.445	3.61	194	0.0113

LC_PIZDC0901				
Date	Nitrate, as N mg/L	Dissolved Selenium µg/L	Sulphate mg/L	Dissolved Cadmium µg/L
26-Mar-2019	0.273	0.894	3.61	0.0757
5-Jun-2019	0.644	1.01	20.3	0.108
3-Sep-2019	0.339	0.55	12.3	0.0948
6-Nov-2019	0.113	1.57	11.7	0.0564

LC_DC1				
Date	Nitrate, as N mg/L	Total Selenium µg/L	Sulphate mg/L	Total Cadmium µg/L
Q1 2019 Max	9.34	13.5	47	0.0661
Q2 2019 Max	8.17	12	45.3	0.242
Q3 2019 Max	8.4	17.1	52.5	0.0677
Q4 2019 Max	10.2	19.1	59.5	0.0692

LC_PIZDC1308				
Date	Nitrate, as N mg/L	Dissolved Selenium µg/L	Sulphate mg/L	Dissolved Cadmium µg/L
21-Mar-2019	< 0.0050	< 0.050	5.13	0.0059
21-Mar-2019 (Dup)	< 0.0050	0.072	5.05	0.0055
29-May-2019	0.115	0.266	5.74	0.126
22-Aug-2019	0.126	0.21	5.47	0.0351
30-Oct-2019	0.0142	0.075	4.2	0.0469
30-Oct-2019 (Dup)	0.0156	0.053	4.52	0.039

LC_PIZDC1307				
Date	Nitrate, as N mg/L	Dissolved Selenium µg/L	Sulphate mg/L	Dissolved Cadmium µg/L
21-Mar-2019	< 0.0050	< 0.050	< 0.30	< 0.010
29-May-2019	0.0104	< 0.050	< 0.30	< 0.015
22-Aug-2019	< 0.0050	< 0.050	< 0.30	< 0.030
30-Oct-2019	0.0121	< 0.050	0.38	< 0.010

LC_PIZDC1404D				
Date	Nitrate, as N mg/L	Dissolved Selenium µg/L	Sulphate mg/L	Dissolved Cadmium µg/L
20-Mar-2019	< 0.0050	0.061	< 0.30	0.0157
23-May-2019	< 0.0050	< 0.050	< 0.30	0.0142
15-Aug-2019	< 0.0050	< 0.050	< 0.30	< 0.010
23-Oct-2019	0.0078	< 0.050	< 0.30	< 0.020

LC_PIZDC1306				
Date	Nitrate, as N mg/L	Dissolved Selenium µg/L	Sulphate mg/L	Dissolved Cadmium µg/L
25-Mar-2019	0.0962	2.1	5.97	0.131
29-May-2019	0.171	3.05	6.85	0.131
15-Aug-2019	0.154	4.12	6.97	0.119
7-Nov-2019	0.114	3.36	6.06	0.14

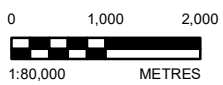
LC_PIZDC1404S				
Date	Nitrate, as N mg/L	Dissolved Selenium µg/L	Sulphate mg/L	Dissolved Cadmium µg/L
20-Mar-2019	0.0088	< 0.050	4.85	< 0.0050
23-May-2019	< 0.0050	< 0.050	4.8	< 0.0050
23-May-2019 (Dup)	< 0.0050	< 0.050	4.79	< 0.0050
15-Aug-2019	< 0.0050	< 0.050	5.06	< 0.0050
23-Oct-2019	< 0.0050	< 0.050	5.57	< 0.0050

LC_LC3				
Date	Nitrate, as N mg/L	Total Selenium µg/L	Sulphate mg/L	Total Cadmium µg/L
Q1 2019 Max	12.9	47.5	523	0.202
Q2 2019 Max	12.8	49.8	397	0.36
Q3 2019 Max	11.3	55.1	321	0.572
Q4 2019 Max	18.2	106	439	0.292

LC_LCDSILCC				
Date	Nitrate, as N mg/L	Total Selenium µg/L	Sulphate mg/L	Total Cadmium µg/L
Q1 2019 Max	9.61	42.4	340	0.111
Q2 2019 Max	9.94	38.3	285	0.183
Q3 2019 Max	7.06	33.1	203	0.263
Q4 2019 Max	11.9	65.9	282	0.156

- LEGEND**
- BELOW PRIMARY SCREENING CRITERIA
 - ABOVE AT LEAST ONE OF THE PRIMARY SCREENING CRITERIA
 - SELENIUM CONCENTRATION ABOVE AT LEAST ONE OF THE SECONDARY SCREENING CRITERIA
 - CONCEPTUAL GROUNDWATER FLOW DIRECTION
 - WATERCOURSE
 - PROJECT OPERATIONAL BOUNDARY
 - WATERBODY

SULPHATE ⊕ SELENIUM
 NITRATE-NITROGEN ⊕ CADMIUM



NOTE(S)
 SURFACE WATER CONCENTRATIONS WERE COMPARED TO STANDARDS DESCRIBED IN TABLES 3-3 AND 3-4.

REFERENCE(S)
 HYDROLOGY, PROJECT DATA, AND 2018 ORTHOPHO TO OBTAINED FROM TECK COAL LIMITED.
 PROJECTION: UTM ZONE 11 DATUM: NAD 83

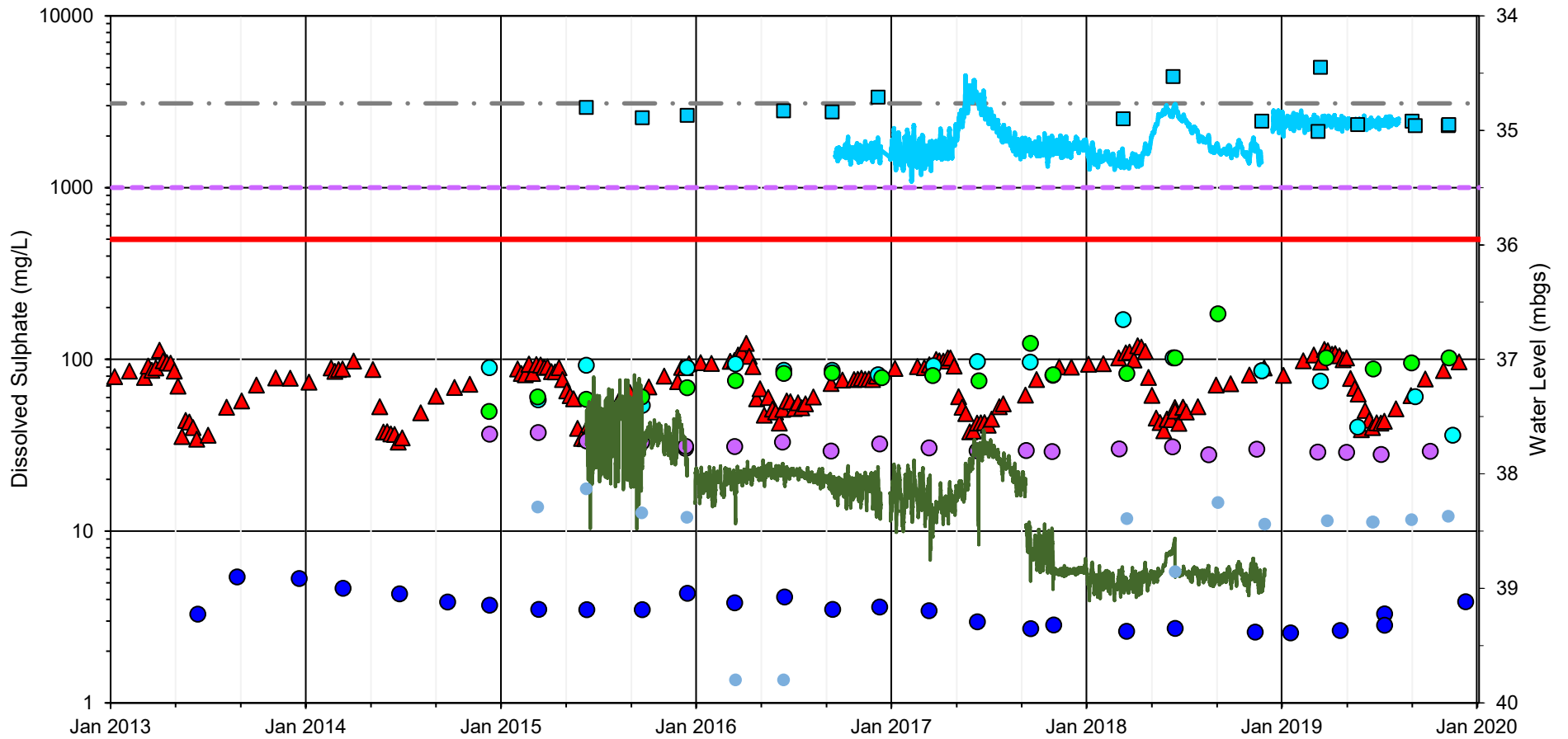
CLIENT
TECK COAL LIMITED

PROJECT
**TECK LINE CREEK OPERATIONS
 ANNUAL GROUNDWATER MONITORING PROGRAM**

TITLE
**LCO DRY CREEK AREA SPATIAL DISTRIBUTION OF SELECTED
 GROUNDWATER ANALYTICAL DATA**

CONSULTANT	DATE
GOLDER	2020-03-13
DESIGNED	MS
PREPARED	CN
REVIEWED	LO
APPROVED	JM

PROJECT NO.	PHASE	REV.	FIGURE
19135981	3	0	4-4



GROUNDWATER MONITORING POINTS

- LC_PIZP1101
- LC_PIZP1103
- LC_PIZP1104
- LC_PIZP1104 Manual Water Level
- LC_PIZP1105
- LC_PIZP1105 Transducer Water Level
- LC_PIZP1105 Manual Water Level
- LC_PIZP1105
- LC_PIZP1104 Transducer Water Level
- LC_PIZP1105 Transducer Water Level

SURFACE WATER MONITORING POINT

- ▲ EV_ER4

HEALTH CANADA GUIDELINE

- Drinking Water

BC CONTAMINATED SITE REGULATIONS

- Drinking Water
- Aquatic Life
- Livestock

NOTES

1. NO BC CSR IRRIGATION FOR DISSOLVED SULPHATE.
2. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 X RDL

CLIENT

TECK COAL LIMITED
LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

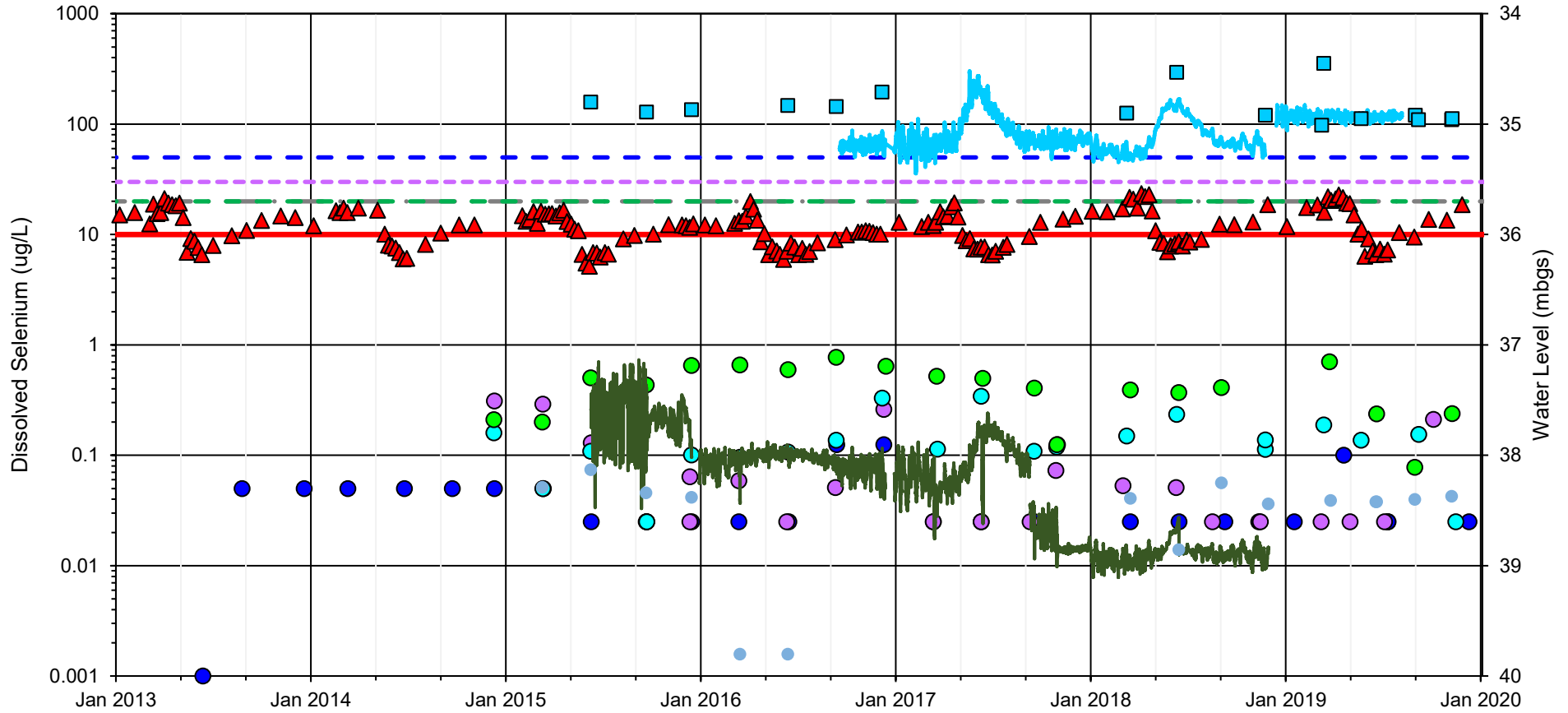
PROCESS PLANT AREA TIME SERIES PLOTS:
DISSOLVED SULPHATE

PROJECT NO.
19135981

PHASE
3

REV
A

FIGURE
4-5a



GROUNDWATER MONITORING POINTS

- LC_PIZP1101
- LC_PIZP1103
- LC_PIZP1104
- LC_PIZP1104 Manual Water Level
- LC_PIZP1105
- LC_PIZP1105 Manual Water Level
- LC_PIZP1105
- LC_PIZP1104 Transducer Water Level
- LC_PIZP1105 Transducer Water Level

SURFACE WATER MONITORING POINT

- ▲ EV_ER4

HEALTH CANADA GUIDELINE

- Drinking Water

BC CONTAMINATED SITE REGULATIONS

- Drinking Water
- Aquatic Life
- Livestock
- Irrigation

NOTES
 1. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 X RDL

CLIENT
 TECK COAL LIMITED
 LINE CREEK OPERATIONS

CONSULTANT

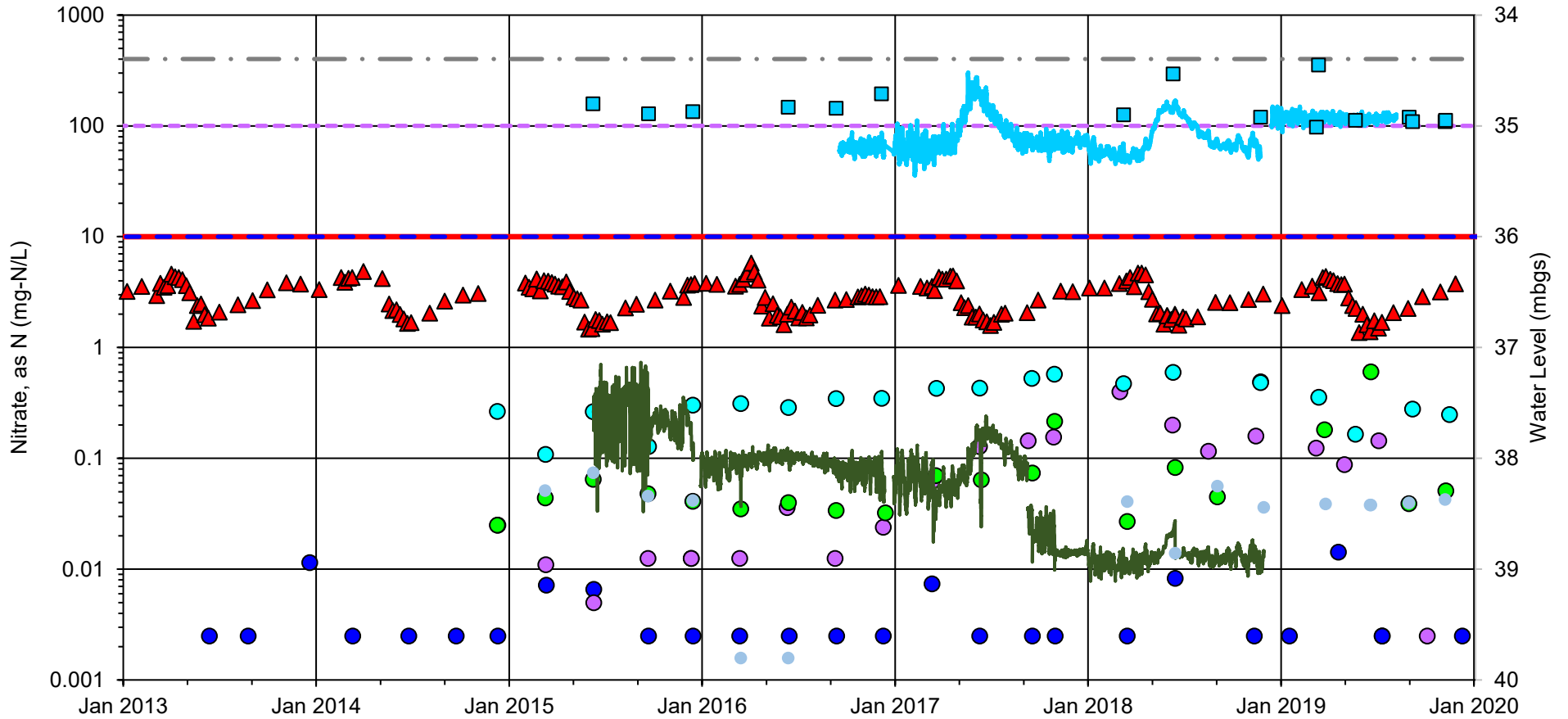


YYYY-MM-DD 2020-03-13
 PREPARED KF
 DESIGNED KF
 REVIEWED LO
 APPROVED JM

PROJECT
 TECK LINE CREEK OPERATIONS
 ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE
**PROCESS PLANT AREA TIME SERIES PLOTS:
 DISSOLVED SELENIUM**

PROJECT NO. 19135981 PHASE 3 REV A FIGURE 4-5b



GROUNDWATER MONITORING POINTS

- LC_PIZP1101
- LC_PIZP1103
- LC_PIZP1104
- LC_PIZP1104 Manual Water Level
- LC_PIZP1105 Manual Water Level
- LC_PIZP1105
- LC_PIZP1104 Transducer Water Level
- LC_PIZP1105 Transducer Water Level

SURFACE WATER MONITORING POINT

- ▲ EV_ER4

HEALTH CANADA GUIDELINE

- Drinking Water

BC CONTAMINATED SITE REGULATIONS

- Drinking Water
- Aquatic Life
- Livestock

NOTES

1. NO BC CSR IRRIGATION FOR DISSOLVED NITRATE.
2. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 X RDL

CLIENT

TECK COAL LIMITED
LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

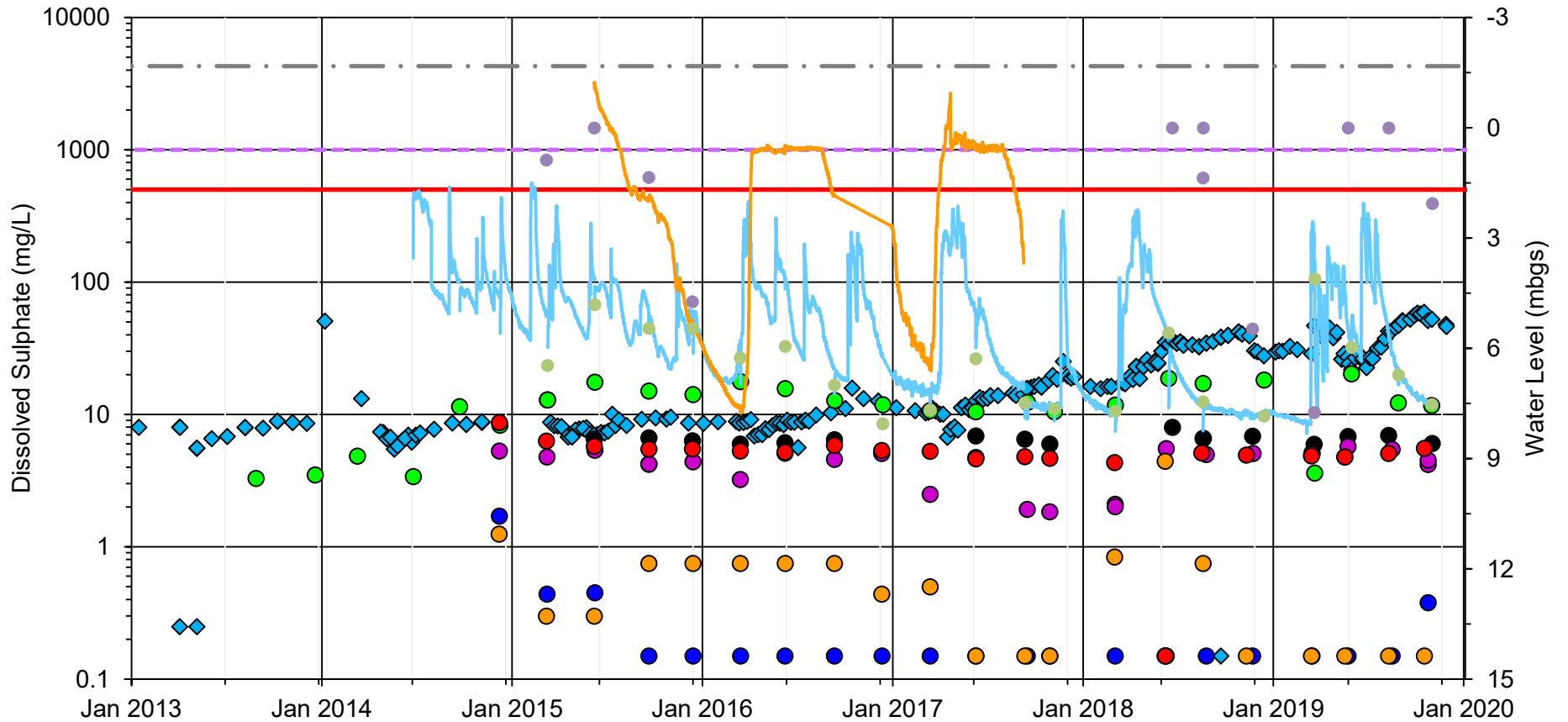
PROCESS PLANT AREA TIME SERIES PLOTS:
DISSOLVED NITRATE

PROJECT NO.
19135981

PHASE
3

REV
A

FIGURE
4-5c



GROUNDWATER MONITORING POINTS

- LC_PIZDC1306
- LC_PIZDC1307
- LC_PIZDC1308
- LC_PIZDC0901
- LC_PIZDC1404D
- LC_PIZDC1404S
- LC_PIZDC0901 Transducer Water Level
- LC_PIZDC1306 Transducer Water Level
- LC_PIZDC0901 Manual Water Level
- LC_PIZDC1306 Manual Water Level

SURFACE WATER MONITORING POINT

- ◆ LC_DC1

BC CONTAMINATED SITE REGULATIONS

- Drinking Water
- Aquatic Life
- Livestock

NOTES

1. NO BC CSR IRRIGATION FOR DISSOLVED SULPHATE.
2. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 X RDL

CLIENT

TECK COAL LIMITED
LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

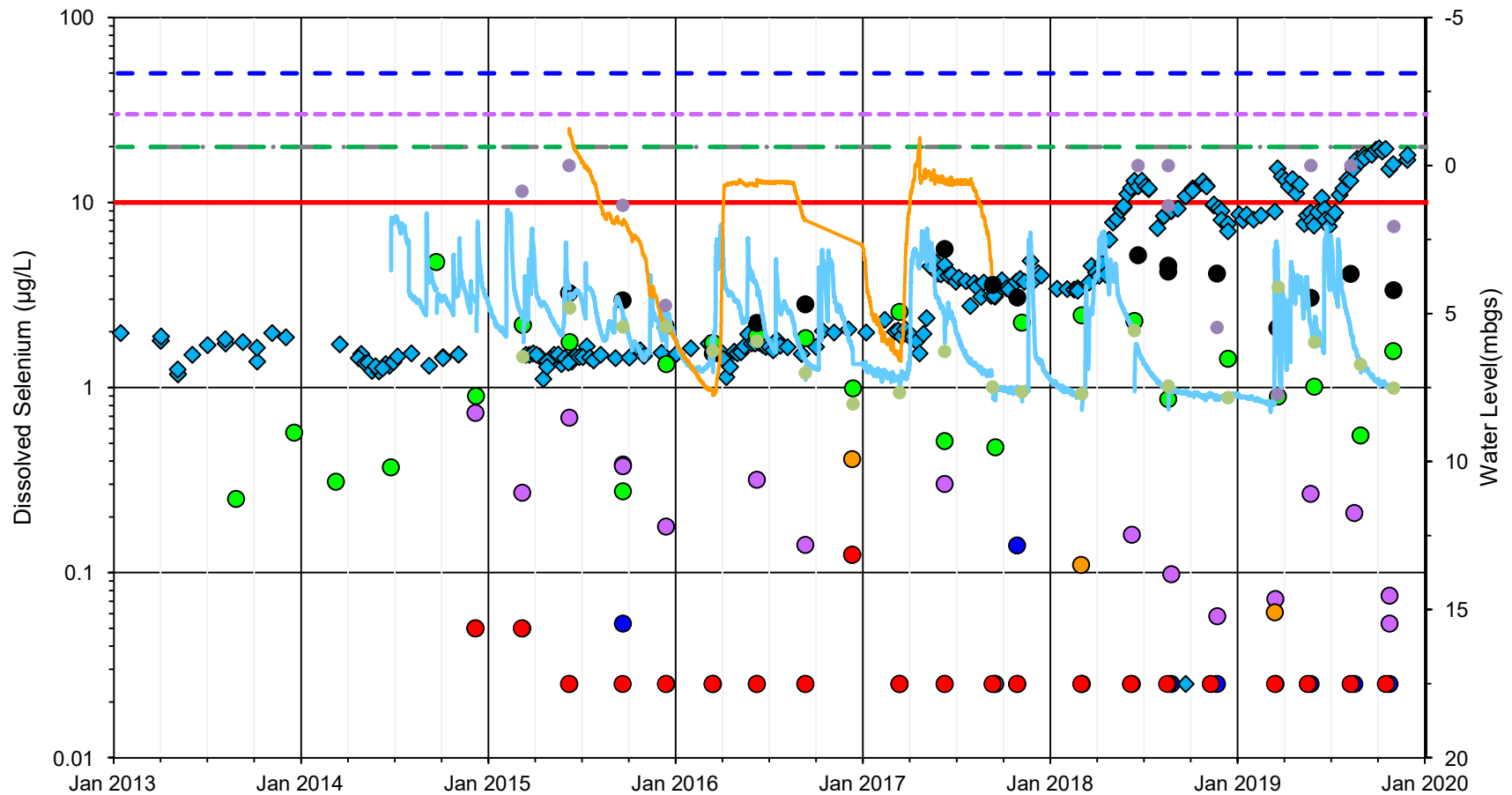
DRY CREEK AREA TIME SERIES PLOTS :
DISSOLVED SULPHATE

PROJECT NO.
19135981

PHASE
3

REV
A

FIGURE
4-6a



GROUNDWATER MONITORING POINTS

- LC_PIZDC1306
- LC_PIZDC1307
- LC_PIZDC1308
- LC_PIZDC0901
- LC_PIZDC1404D
- LC_PIZDC1404S
- LC_PIZDC0901 Transducer Water Level
- LC_PIZDC1306 Transducer Water Level
- LC_PIZDC0901 Manual Water Level
- LC_PIZDC1306 Manual Water Level

SURFACE WATER MONITORING POINT

- ◆ LC_DC1

HEALTH CANADA GUIDELINE

- Drinking Water

BC CONTAMINATED SITE REGULATIONS

- Drinking Water
- Aquatic Life
- Livestock
- Irrigation

NOTES

- NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

CLIENT

TECK COAL LIMITED
LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

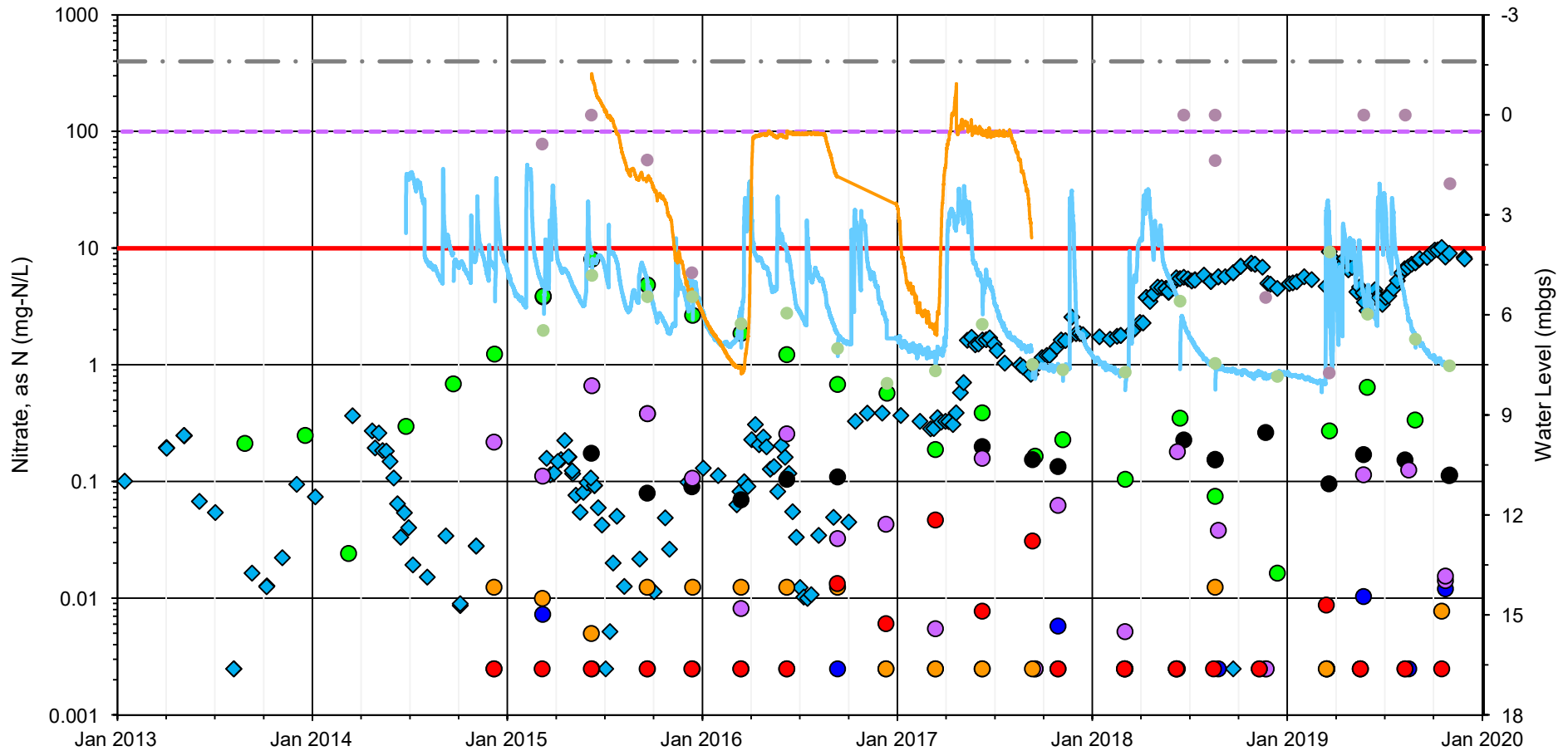
DRY CREEK AREA TIME SERIES PLOTS :
DISSOLVED SELENIUM

PROJECT NO.
19135981

PHASE
3

REV
A

FIGURE
4-6b



GROUNDWATER MONITORING POINTS

- LC_PIZDC1306
- LC_PIZDC1307
- LC_PIZDC1308
- LC_PIZDC0901
- LC_PIZDC1404D
- LC_PIZDC1404S
- LC_PIZDC0901 Transducer Water Level
- LC_PIZDC1306 Transducer Water Level
- LC_PIZDC0901 Manual Water Level
- LC_PIZDC1306 Manual Water Level

SURFACE WATER MONITORING POINT

- ◆ LC_DC1

BC CONTAMINATED SITE REGULATIONS

- Drinking Water
- - - Aquatic Life
- - - Livestock

NOTES

1. NO BC CSR IRRIGATION FOR DISSOLVED NITRATE.
2. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

CLIENT

TECK COAL LIMITED
LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

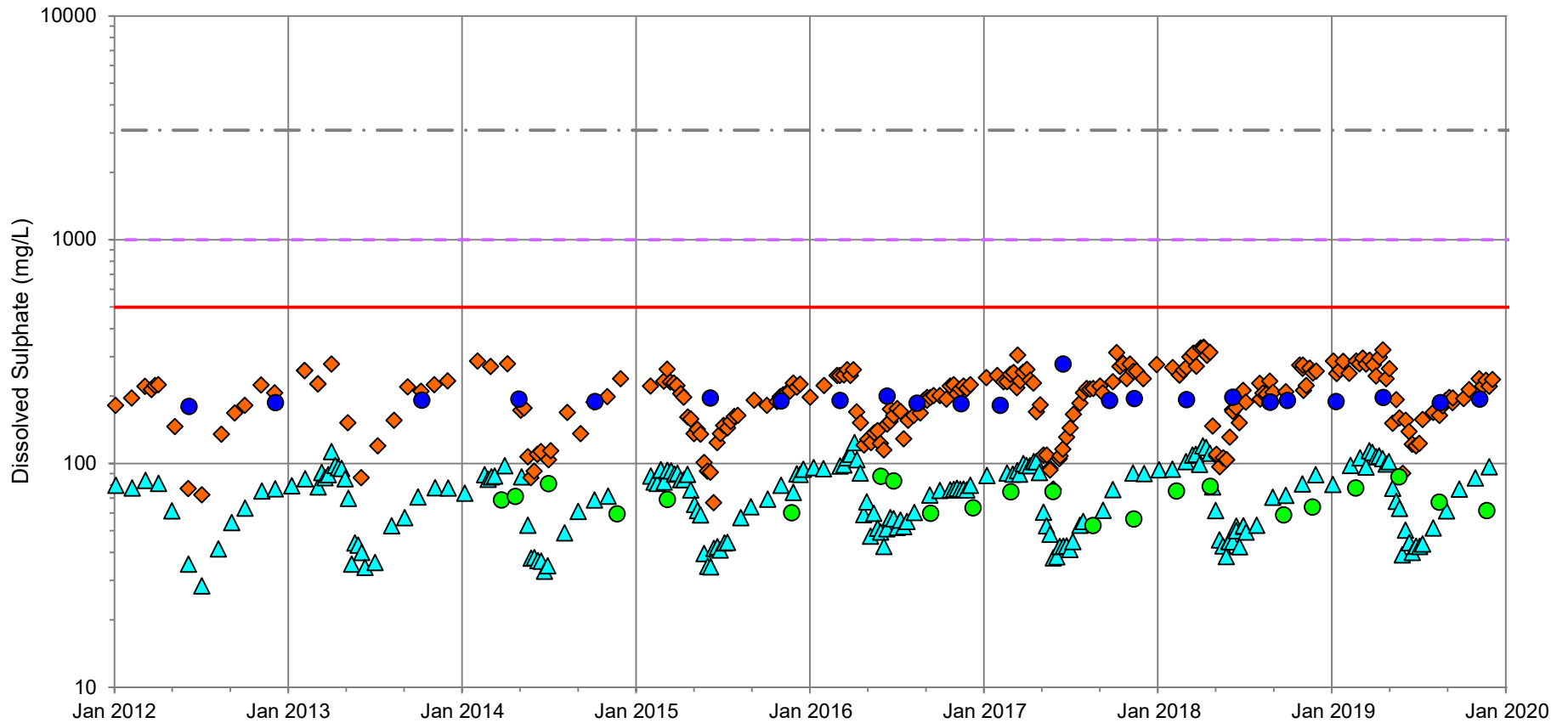
DRY CREEK AREA TIME SERIES PLOTS :
DISSOLVED NITRATE

PROJECT NO.
19135981

PHASE
3

REV
A

FIGURE
4-6c



SURFACE WATER MONITORING POINTS

▲ EV_ER4 ◆ GH_FRI

GROUNDWATER MONITORING POINTS

● GH_POTW10 ● RG_02-20

BC CONTAMINATED SITE REGULATIONS

— Drinking Water
 - - - Aquatic Life
 - - - Livestock

NOTES

1. NO BC CSR IRRIGATION FOR DISSOLVED SULPHATE.
2. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

CLIENT

TECK COAL LIMITED
 LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

PROJECT

TECK LINE CREEK OPERATIONS
 ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

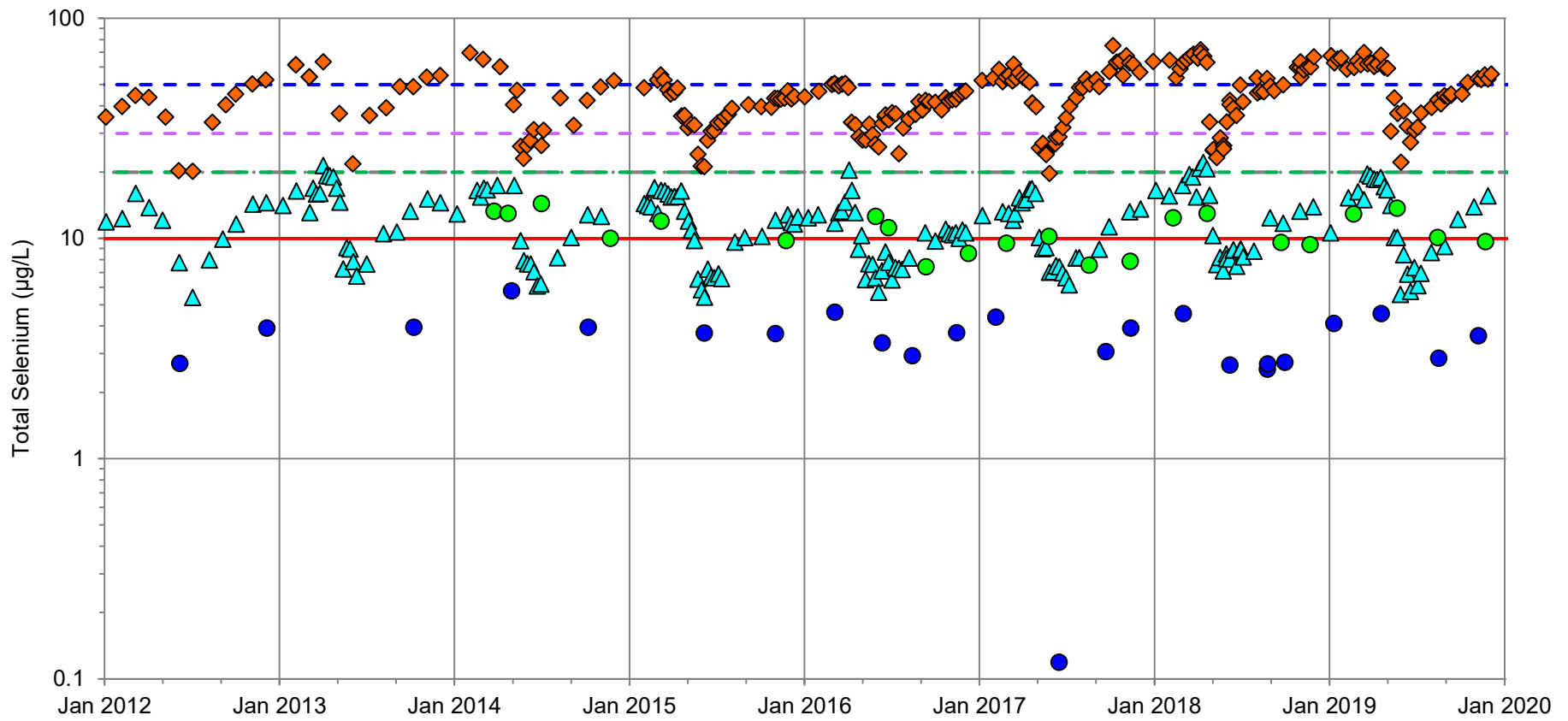
**OUTSIDE LCO AREA TIME SERIES PLOTS :
 DISSOLVED SULPHATE**

PROJECT NO.
 19135981

PHASE
 3

REV
 A

FIGURE
 4-7a



SURFACE WATER MONITORING POINTS

▲ EV_ER4 ◆ GH_FRI

GROUNDWATER MONITORING POINTS

● GH_POTW10 ● RG_02-20

HEALTH CANADA GUIDELINE

— Drinking Water

BC CONTAMINATED SITE REGULATIONS

— Irrigation
 — Drinking Water
 — Aquatic Life
 — Livestock

NOTES
 1. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

CLIENT
 TECK COAL LIMITED
 LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

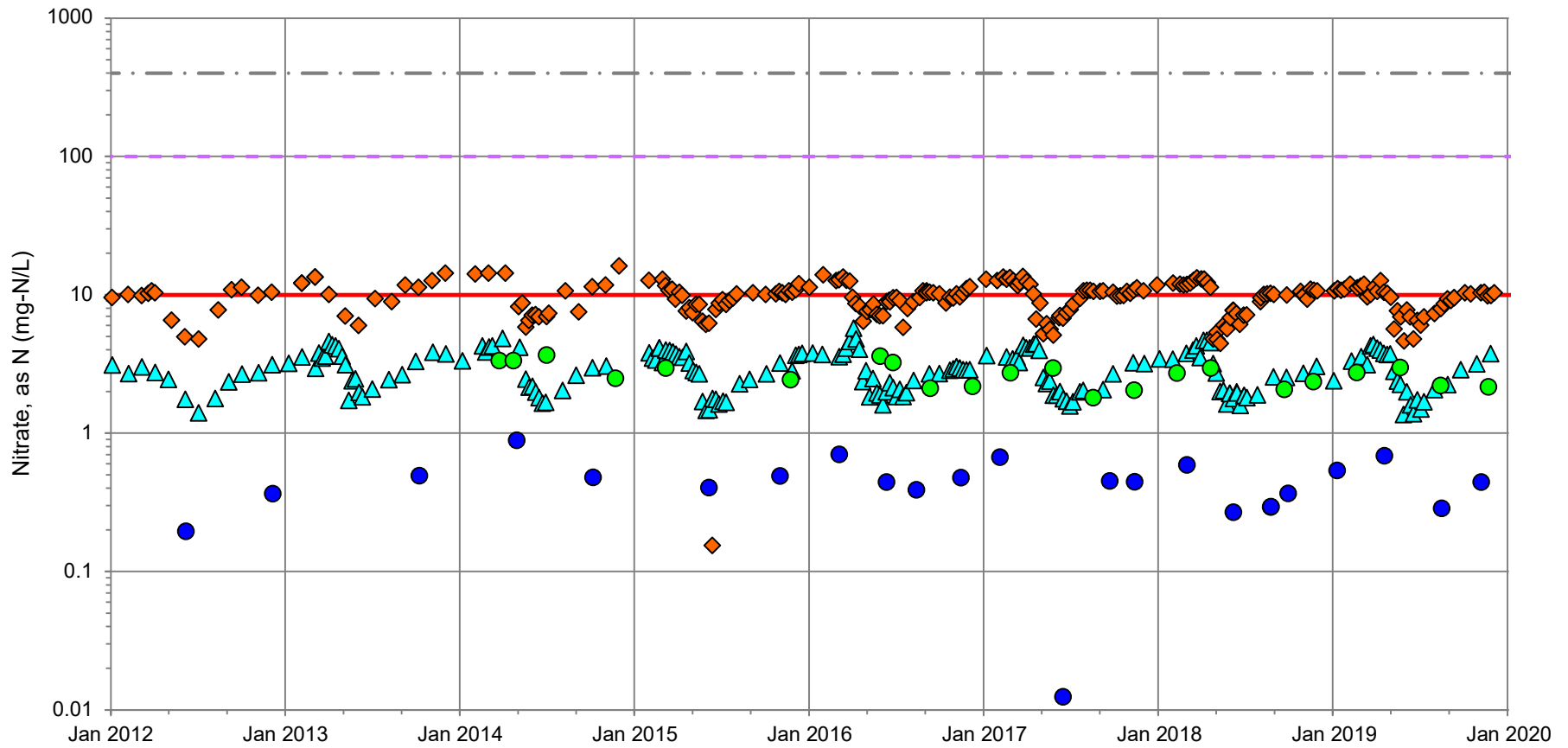
PROJECT
 TECK LINE CREEK OPERATIONS
 ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE
**OUTSIDE LCO AREA TIME SERIES PLOTS :
 TOTAL SELENIUM**

PROJECT NO. 19135981	PHASE 3	REV A
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FIGURE
4-7b

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4/NA



SURFACE WATER MONITORING POINTS

▲ EV_ER4 ◆ GH_FRI

GROUNDWATER MONITORING POINTS

● GH_POTW10 ● RG_02-20

BC CONTAMINATED SITE REGULATIONS

— Drinking Water
 - - - Aquatic Life
 - - - Livestock

NOTES

1. NO BC CSR IRRIGATION FOR DISSOLVED NITRATE.
2. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

CLIENT

TECK COAL LIMITED
 LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

PROJECT

TECK LINE CREEK OPERATIONS
 ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

**OUTSITE LCO AREA TIME SERIES PLOTS :
 DISSOLVED NITRATE**

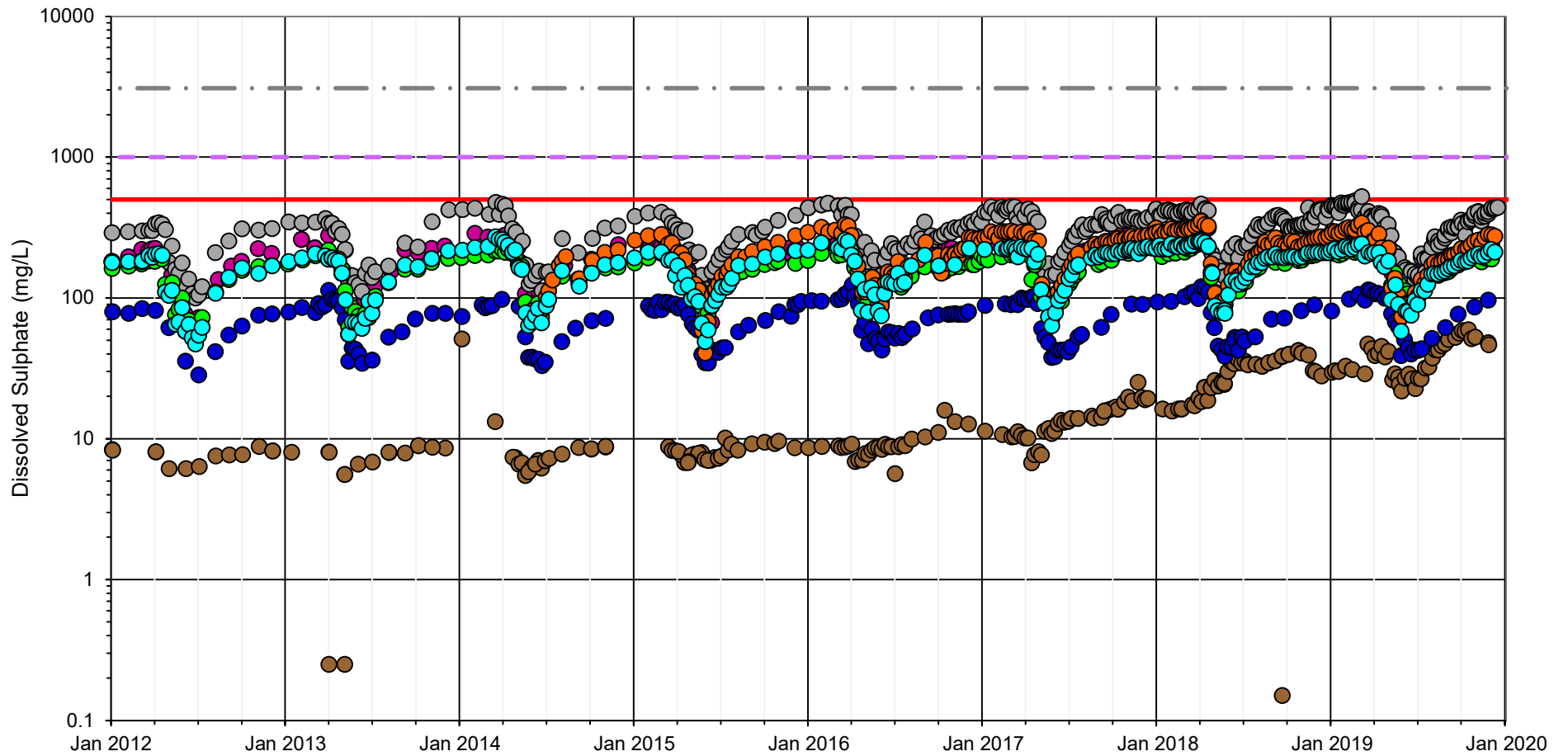
PROJECT NO.
19135981

PHASE
3

REV
A

FIGURE
4-7c

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4/NA



SURFACE WATER MONITORING POINTS

- DC 1
- EV_ER4
- LC_LC4
- LC_LCDSSLCC
- GH_FR1
- LC_LC3
- LC_LC5

BC CONTAMINATED SITE REGULATIONS

- Drinking Water
- - Aquatic Life
- - Livestock

NOTES

1. NO BC CSR IRRIGATION FOR DISSOLVED SULPHATE.
2. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

CLIENT

TECK COAL LIMITED
LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

**SURFACE WATER STATIONS TIME SERIES PLOTS :
DISSOLVED SULPHATE**

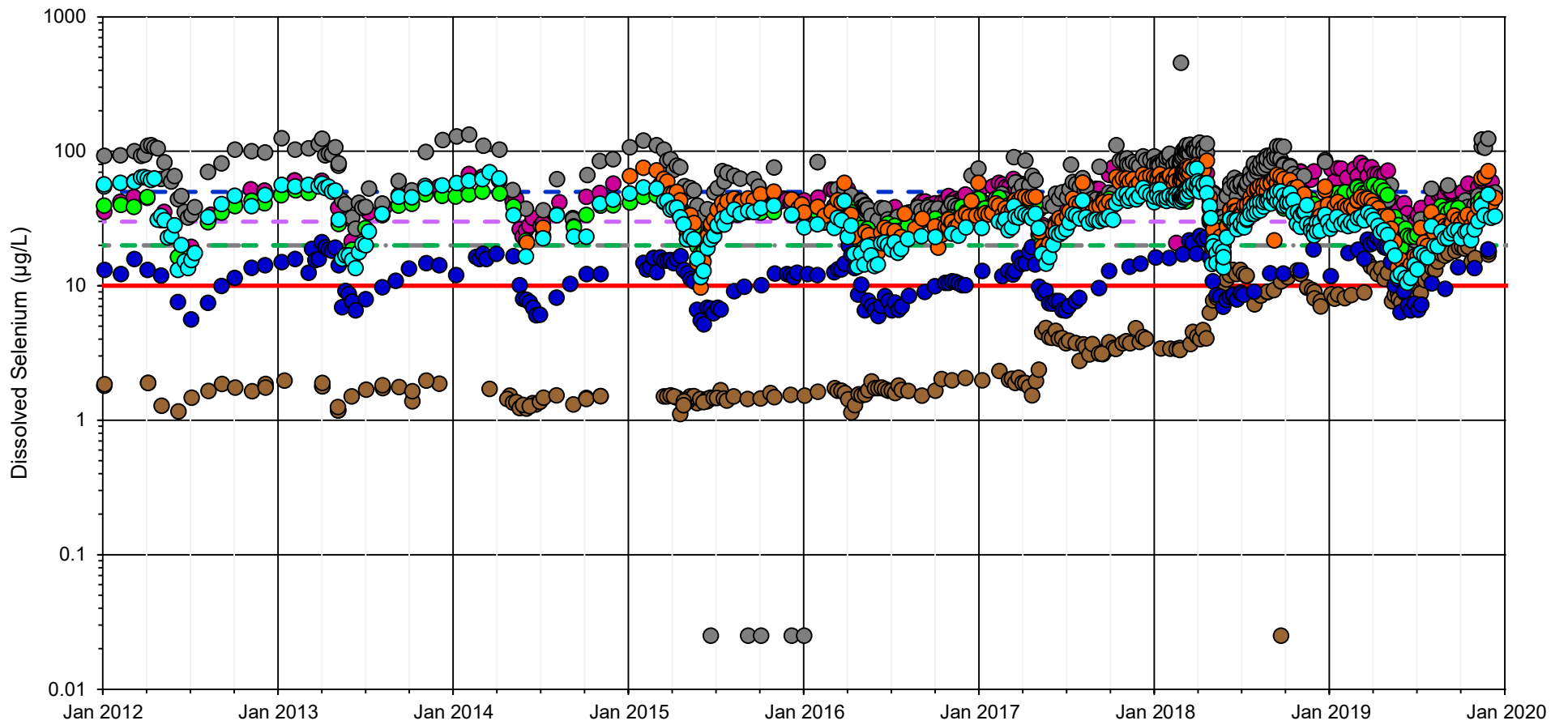
PROJECT NO.
19135981

PHASE
3

REV
A

FIGURE
4-8a

1 in IF THIS REQUIREMENT DOES NOT MATCH PRINT OR SCREEN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4/NA



SURFACE WATER MONITORING POINTS

- DC 1
- EV_ER4
- LC_LC4
- LC_LCDSSLCC
- GH_FR1
- LC_LC3
- LC_LC5

HEALTH CANADA GUIDELINE

- Drinking Water

BC CONTAMINATED SITE REGULATIONS

- Drinking Water
- Aquatic Life
- Livestock
- Irrigation

NOTES

- NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

CLIENT

TECK COAL LIMITED
LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

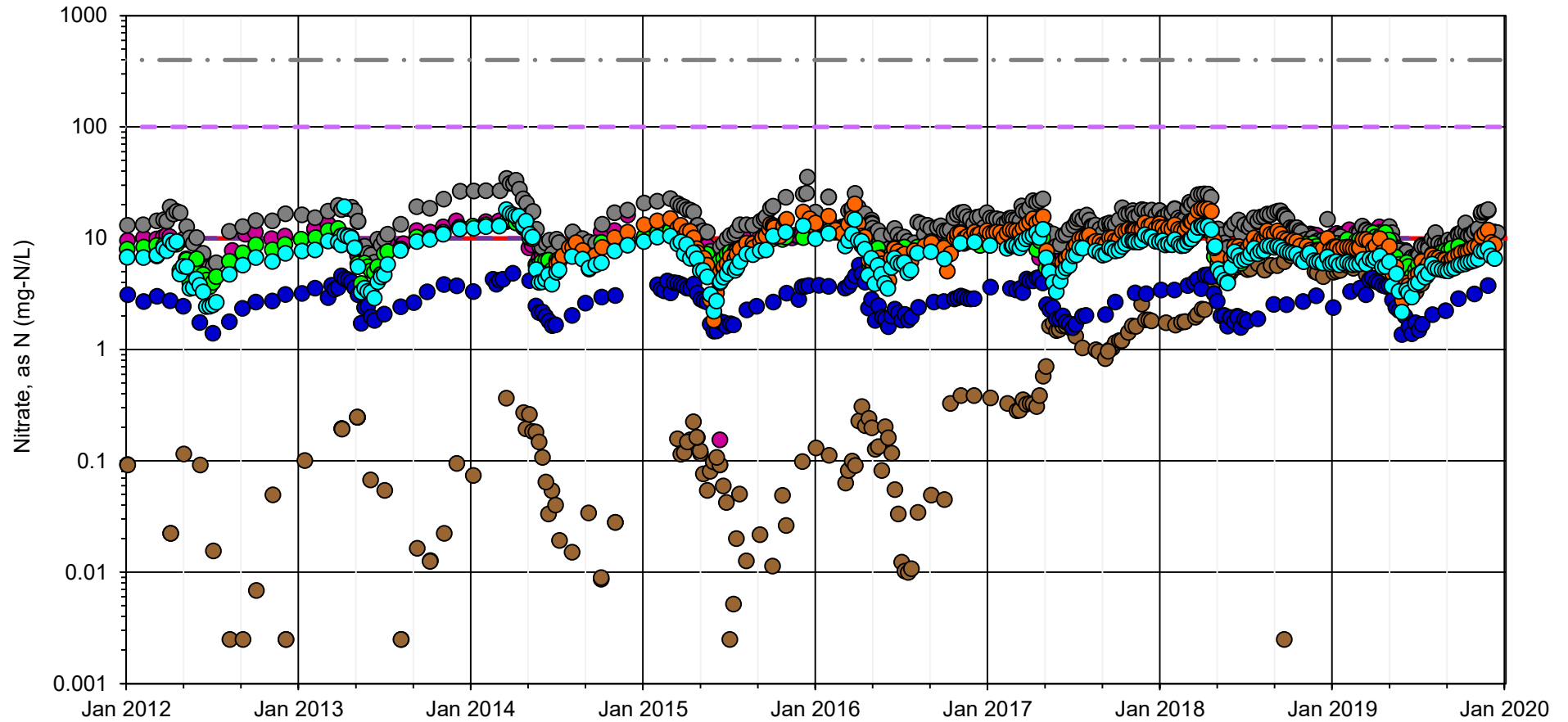
**SURFACE WATER STATIONS TIME SERIES PLOTS :
DISSOLVED SELENIUM**

PROJECT NO.
19135981

PHASE
3

REV
A

FIGURE
4-8b



SURFACE WATER MONITORING POINTS

- DC 1
- EV_ER4
- LC_LC4
- LC_LCDSSLCC
- GH_FR1
- LC_LC3
- LC_LC5

BC CONTAMINATED SITE REGULATIONS

- Drinking Water
- Aquatic Life
- Livestock

NOTES

1. NO BC CSR IRRIGATION FOR DISSOLVED NITRATE.
2. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

CLIENT

TECK COAL LIMITED
LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

**SURFACE WATER STATIONS TIME SERIES PLOTS :
DISSOLVED NITRATE**

PROJECT NO.
19135981

PHASE
3

REV
A

FIGURE
4-8c

1 in IF THIS MEASUREMENT DOES NOT MATCH POINT TO SHOW, THE SHEET SIZE HAS BEEN MODIFIED FROM A4/NA

APPENDIX A

**QA/QC of Samples including
Duplicates and Field Blanks**

Table A-1:
Site Specific Groundwater Monitoring: 2019 Annual Report
Teck Coal Limited - Line Creek Operations

Table A1. Duplicate Samples Collected As Part of LCO 2019 Groundwater Monitoring

Analyte	Detection Limit Pri.	Detection Limit Dup.	Units	Location:		Primary vs. Duplicate	Category1
				Sample ID:			
				Date Sampled:			
				Sample Type:			
LC_PIZDC1308		LC_PIZDC1308					
LC_PIZDC1308_WG_Q1-2019_NP		WG_Q1-2019_CC1					
2019-03-21		2019-03-21					
Primary		Secondary					
ACIDITY TO pH 8.3 (As CaCO3)	1	1	mg/l	4.5	8	56.00%	Pass-1
ALKALINITY, BICARBONATE (As CaCO3), lab measured.	1	1	mg/l	326	321	1.55%	Pass
ALKALINITY, CARBONATE (As CaCO3), lab measured.	1	1	mg/l	<1.0	<1	0.00%	Pass
ALKALINITY, HYDROXIDE (As CaCO3), lab measured.	1	1	mg/l	<1.0	<1	0.00%	Pass
ALKALINITY, TOTAL (As CaCO3), lab measured.	1	1	mg/l	326	321	1.55%	Pass
ALUMINIUM, D	0.003	0.003	mg/l	<0.0030	<0.003	0.00%	Pass
ALUMINIUM, T	0.003	0.003	mg/l	0.0483	0.0951	65.27%	Fail
ANTIMONY, D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
ANTIMONY, T	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
ARSENIC, D	0.0001	0.0001	mg/l	0.00038	0.00039	2.60%	Pass
ARSENIC, T	0.0001	0.0001	mg/l	0.00041	0.00044	7.06%	Pass
BARIUM, D	0.0001	0.0001	mg/l	0.558	0.57	2.13%	Pass
BARIUM, T	0.0001	0.0001	mg/l	0.573	0.571	0.35%	Pass
BERYLLIUM, D	0.00002	0.00002	mg/l	<0.000020	<2e-005	0.00%	Pass
BERYLLIUM, T	0.00002	0.00002	mg/l	<0.000020	<2e-005	0.00%	Pass
BISMUTH, D	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
BISMUTH, T	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
BORON, D	0.01	0.01	mg/l	0.012	0.011	8.70%	Pass
BORON, T	0.01	0.01	mg/l	0.012	0.012	0.00%	Pass
BROMIDE, D	0.05	0.05	mg/l	<0.050	<0.050	0.00%	Pass
Cadmium, D	0.000005	0.000005	mg/l	0.0000059	5.5e-006	7.02%	Pass
Cadmium, T	0.000005	0.000005	mg/l	0.0000481	5.87e-005	19.85%	Pass
CALCIUM, D	0.05	0.05	mg/l	81.5	82.4	1.10%	Pass
CALCIUM, T	0.05	0.05	mg/l	82.1	84	2.29%	Pass
CARBON, DISSOLVED ORGANIC, D	0.5	0.5	mg/l	2.02	1.92	5.08%	Pass
CHLORIDE, D	0.5	0.5	mg/l	0.74	0.72	2.74%	Pass
CHROMIUM, D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
CHROMIUM, T	0.0001	0.0001	mg/l	0.00017	0.00024	34.15%	Pass-1
COBALT, D	0.0001	0.0001	mg/l	0.00167	0.00169	1.19%	Pass
COBALT, T	0.0001	0.0001	mg/l	0.00170	0.00174	2.33%	Pass
CONDUCTIVITY, LAB	2	2	us/cm	570	562	1.41%	Pass
COPPER, D	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass
COPPER, T	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass
FLUORIDE, D	0.02	0.02	mg/l	0.219	0.21	4.20%	Pass
Hardness, Total or Dissolved CaCO3	0.5	0.5	mg/l	313	320	2.21%	Pass
ION BALANCE	100	100	%	98.4	102	3.59%	Pass
IRON, D	0.01	0.01	mg/l	1.44	1.45	0.69%	Pass
IRON, T	0.01	0.01	mg/l	1.41	1.45	2.80%	Pass
LEAD, D	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
LEAD, T	0.00005	0.00005	mg/l	0.000059	8.8e-005	39.46%	Pass-1
LITHIUM, D	0.001	0.001	mg/l	0.0131	0.0129	1.54%	Pass
LITHIUM, T	0.001	0.001	mg/l	0.0126	0.0136	7.63%	Pass
MAGNESIUM, D	0.1	0.1	mg/l	26.6	27.8	4.41%	Pass
MAGNESIUM, T	0.1	0.1	mg/l	27.5	27.5	0.00%	Pass
MAJOR ANION SUM	0	0	meq/l	6.66	6.56	1.51%	Pass
MAJOR CATION SUM	0	0	meq/l	6.55	6.69	2.11%	Pass
MANGANESE, D	0.0001	0.0001	mg/l	0.117	0.12	2.53%	Pass
MANGANESE, T	0.0001	0.0001	mg/l	0.117	0.119	1.69%	Pass
MERCURY, D	0.000005	0.000005	mg/l	<0.0000050	<5e-006	0.00%	Pass
MOLYBDENUM, D	0.00005	0.00005	mg/l	0.00403	0.00397	1.50%	Pass
MOLYBDENUM, T	0.00005	0.00005	mg/l	0.00387	0.00414	6.74%	Pass
Nickel, D	0.0005	0.0005	mg/l	0.00330	0.00336	1.80%	Pass
Nickel, T	0.0005	0.0005	mg/l	0.00362	0.00369	1.92%	Pass
NITRATE NITROGEN (NO3), AS N	0.005	0.005	mg/l	<0.0050	<0.005	0.00%	Pass
NITRITE NITROGEN (NO2), AS N	0.001	0.001	mg/l	0.0021	0.0016	27.03%	Pass-1
NITROGEN, AMMONIA (AS N)	0.005	0.005	mg/l	0.0336	0.0132	87.18%	Fail
ORTHO-PHOSPHATE	0.001	0.001	mg/l	<0.0010	<0.001	0.00%	Pass
OXIDATION-REDUCTION POTENTIAL, LAB	1000	1000	mv	328	377	13.90%	Pass
pH, LAB	0.1	0.1	ph units	8.00	8.06	0.75%	Pass
PHOSPHORUS	0.002	0.002	mg/l	0.0083	0.0077	7.50%	Pass
POTASSIUM, D	0.05	0.05	mg/l	2.58	2.62	1.54%	Pass
POTASSIUM, T	0.05	0.05	mg/l	2.59	2.62	1.15%	Pass
Selenium, D	0.05	0.05	ug/l	<0.050	0.072	36.07%	Pass-1
Selenium, T	0.05	0.05	ug/l	0.065	0.097	39.51%	Pass-1
SILICON, D	0.05	0.05	mg/l	4.31	4.5	4.31%	Pass
SILICON, T	0.1	0.1	mg/l	4.62	4.8	3.82%	Pass
SILVER, D	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass
SILVER, T	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass
SODIUM, D	0.05	0.05	mg/l	3.36	3.38	0.59%	Pass
SODIUM, T	0.05	0.05	mg/l	3.31	3.53	6.43%	Pass
STRONTIUM, D	0.0002	0.0002	mg/l	0.120	0.121	0.83%	Pass
STRONTIUM, T	0.0002	0.0002	mg/l	0.117	0.12	2.53%	Pass
Sulphate (as SO4), D	0.3	0.3	mg/l	5.13	5.05	1.57%	Pass
THALLIUM, D	0.00001	0.00001	mg/l	0.000037	3.4e-005	8.45%	Pass
THALLIUM, T	0.00001	0.00001	mg/l	0.000040	3.9e-005	2.53%	Pass
TIN, D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
TIN, T	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
TITANIUM, D	0.01	0.01	mg/l	<0.010	<0.01	0.00%	Pass
TITANIUM, T	0.01	0.01	mg/l	<0.010	<0.01	0.00%	Pass
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	20	20	mg/l	301	305	1.32%	Pass
TOTAL KJELDAHL NITROGEN	0.05	0.05	mg/l	0.101	0.107	5.77%	Pass
TOTAL ORGANIC CARBON, T	0.5	0.5	mg/l	1.85	1.67	10.23%	Pass
TOTAL SUSPENDED SOLIDS, LAB	1	1	mg/l	4.7	5.7	19.23%	Pass
TURBIDITY, LAB	0.1	0.1	ntu	19.5	19.6	0.51%	Pass
URANIUM, D	0.00001	0.00001	mg/l	0.00107	0.00111	3.67%	Pass
URANIUM, T	0.00001	0.00001	mg/l	0.00114	0.00114	0.00%	Pass
VANADIUM, D	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass
VANADIUM, T	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass
ZINC, D	0.001	0.001	mg/l	0.0030	0.0028	6.90%	Pass
ZINC, T	0.003	0.003	mg/l	0.0032	0.0033	3.08%	Pass

RPD Control Limits

Pass - RPD <= 20%
 Pass-1 - RPD > 20%, Analysis results < 5 times Detection Limit
 Pass-2 - RPD > 20% and RPD <= 50%, Analysis result > 5 times Detection Limit and < 999 times Detection Limit

Exceeds RPD Control Limits

**Table A-1:
Site Specific Groundwater Monitoring: 2019 Annual Report
Teck Coal Limited - Line Creek Operations**

Table 1 (continued). Duplicate Samples Collected As Part of LCO 2019 Groundwater Monitoring

Analyte	Detection Limit Pri.	Detection Limit Dup.	Units	Location:		Primary vs. Duplicate	Category1
				Sample ID:			
				Date Sampled:			
				Sample Type:			
LC_PIZDC1308		LC_PIZDC1308					
LC_PIZDC1308_WG_Q4-2019_NP		WG_Q4-2019_CC1					
2019-10-30		2019-10-30					
Primary		Secondary					
ACIDITY TO pH 8.3 (As CaCO3)	1	1	mg/l	<1.0	2.3	78.79%	Pass-1
ALKALINITY, BICARBONATE (As CaCO3), lab measured.	1	1	mg/l	329	324	1.53%	Pass
ALKALINITY, CARBONATE (As CaCO3), lab measured.	1	1	mg/l	<1.0	<1	0.00%	Pass
ALKALINITY, HYDROXIDE (As CaCO3), lab measured.	1	1	mg/l	<1.0	<1	0.00%	Pass
ALKALINITY, TOTAL (As CaCO3), lab measured.	1	1	mg/l	329	324	1.53%	Pass
ALUMINIUM, D	0.003	0.003	mg/l	<0.0030	<0.003	0.00%	Pass
ALUMINIUM, T	0.003	0.003	mg/l	0.0275	0.0622	77.37%	Fail
ANTIMONY, D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
ANTIMONY, T	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
ARSENIC, D	0.0001	0.0001	mg/l	0.00012	0.00014	15.38%	Pass
ARSENIC, T	0.0001	0.0001	mg/l	0.00023	0.00023	0.00%	Pass
BARIUM, D	0.0001	0.0001	mg/l	0.385	0.389	1.03%	Pass
BARIUM, T	0.0001	0.0001	mg/l	0.386	0.392	1.54%	Pass
BERYLLIUM, D	0.00002	0.00002	mg/l	<0.000020	<2e-005	0.00%	Pass
BERYLLIUM, T	0.00002	0.00002	mg/l	<0.000020	<2e-005	0.00%	Pass
BISMUTH, D	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
BISMUTH, T	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
BORON, D	0.01	0.01	mg/l	0.013	0.013	0.00%	Pass
BORON, T	0.01	0.01	mg/l	0.014	0.012	15.38%	Pass
BROMIDE, D	0.05	0.05	mg/l	<0.050	<0.05	0.00%	Pass
Cadmium, D	0.000005	0.000005	mg/l	0.0000469	3.9e-005	18.39%	Pass
Cadmium, T	0.000005	0.000005	mg/l	0.000114	0.000123	7.59%	Pass
CALCIUM, D	0.05	0.05	mg/l	69.5	71.9	3.39%	Pass
CALCIUM, T	0.05	0.05	mg/l	81.6	73.1	10.99%	Pass
CARBON, DISSOLVED ORGANIC, D	0.5	0.5	mg/l	2.12	1.9	10.95%	Pass
CHLORIDE, D	0.5	0.5	mg/l	1.03	1.09	5.66%	Pass
CHROMIUM, D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
CHROMIUM, T	0.0001	0.0001	mg/l	0.00012	0.00017	34.48%	Pass-1
COBALT, D	0.0001	0.0001	mg/l	0.00090	0.00009	0.00%	Pass
COBALT, T	0.0001	0.0001	mg/l	0.00087	0.00088	1.14%	Pass
CONDUCTIVITY, LAB	2	2	us/cm	526	526	0.00%	Pass
COPPER, D	0.0002	0.0002	mg/l	0.00025	0.00022	12.77%	Pass
COPPER, T	0.0005	0.0005	mg/l	0.00054	0.00067	21.49%	Pass-1
FLUORIDE, D	0.02	0.02	mg/l	0.235	0.202	15.10%	Pass
Hardness, Total or Dissolved CaCO3	0.5	0.5	mg/l	286	290	1.39%	Pass
ION BALANCE	100	100	%	89.7	92.2	2.75%	Pass
IRON, D	0.01	0.01	mg/l	0.206	0.203	1.47%	Pass
IRON, T	0.01	0.01	mg/l	0.343	0.355	3.44%	Pass
LEAD, D	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
LEAD, T	0.00005	0.00005	mg/l	0.000149	0.000154	3.30%	Pass
LITHIUM, D	0.001	0.001	mg/l	0.0182	0.0183	0.55%	Pass
LITHIUM, T	0.001	0.001	mg/l	0.0198	0.0172	14.05%	Pass
MAGNESIUM, D	0.1	0.1	mg/l	27.3	26.9	1.48%	Pass
MAGNESIUM, T	0.1	0.1	mg/l	25.1	24.9	0.80%	Pass
MAJOR ANION SUM	0	0	meq/l	6.70	6.62	1.20%	Pass
MAJOR CATION SUM	0	0	meq/l	6.01	6.1	1.49%	Pass
MANGANESE, D	0.0001	0.0001	mg/l	0.0804	0.0812	0.99%	Pass
MANGANESE, T	0.0001	0.0001	mg/l	0.0709	0.0704	0.71%	Pass
MERCURY, D	0.000005	0.000005	mg/l	<0.0000050	<5e-006	0.00%	Pass
MOLYBDENUM, D	0.00005	0.00005	mg/l	0.00630	0.00631	0.16%	Pass
MOLYBDENUM, T	0.00005	0.00005	mg/l	0.00489	0.00444	9.65%	Pass
Nickel, D	0.0005	0.0005	mg/l	0.00167	0.00168	0.60%	Pass
Nickel, T	0.0005	0.0005	mg/l	0.00172	0.00171	0.58%	Pass
NITRATE NITROGEN (NO3), AS N	0.005	0.005	mg/l	0.0142	0.0156	9.40%	Pass
NITRITE NITROGEN (NO2), AS N	0.001	0.001	mg/l	<0.0010	<0.001	0.00%	Pass
NITROGEN, AMMONIA (AS N)	0.005	0.005	mg/l	0.0378	0.0413	8.85%	Pass
ORTHO-PHOSPHATE	0.001	0.001	mg/l	<0.0010	<0.001	0.00%	Pass
OXIDATION-REDUCTION POTENTIAL, LAB	1000	1000	mv	439	276	45.59%	Pass-1
pH, LAB	0.1	0.1	ph units	8.09	8.11	0.25%	Pass
PHOSPHORUS	0.002	0.002	mg/l	0.0037	0.0034	8.45%	Pass
POTASSIUM, D	0.05	0.05	mg/l	2.69	2.67	0.75%	Pass
POTASSIUM, T	0.05	0.05	mg/l	2.53	2.51	0.79%	Pass
Selenium, D	0.05	0.05	ug/l	0.075	0.053	34.38%	Pass-1
Selenium, T	0.05	0.05	ug/l	0.073	0.051	35.48%	Pass-1
SILICON, D	0.05	0.05	mg/l	4.45	4.43	0.45%	Pass
SILICON, T	0.1	0.1	mg/l	4.68	4.64	0.86%	Pass
SILVER, D	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass
SILVER, T	0.00001	0.00001	mg/l	0.000014	<1e-005	33.33%	Pass-1
SODIUM, D	0.05	0.05	mg/l	4.97	4.97	0.00%	Pass
SODIUM, T	0.05	0.05	mg/l	5.07	5.04	0.59%	Pass
STRONTIUM, D	0.0002	0.0002	mg/l	0.106	0.105	0.95%	Pass
STRONTIUM, T	0.0002	0.0002	mg/l	0.104	0.0956	8.42%	Pass
Sulphate (as SO4), D	0.3	0.3	mg/l	4.20	4.52	7.34%	Pass
THALLIUM, D	0.00001	0.00001	mg/l	0.000029	2.7e-005	7.14%	Pass
THALLIUM, T	0.00001	0.00001	mg/l	0.000032	3.1e-005	3.17%	Pass
TIN, D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
TIN, T	0.0001	0.0001	mg/l	<0.00010	0.00021	70.97%	Pass-1
TITANIUM, D	0.01	0.01	mg/l	<0.010	<0.01	0.00%	Pass
TITANIUM, T	0.01	0.01	mg/l	<0.010	<0.01	0.00%	Pass
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	20	20	mg/l	322	324	0.62%	Pass
TOTAL KJELDAHL NITROGEN	0.05	0.05	mg/l	0.092	0.08	13.95%	Pass
TOTAL ORGANIC CARBON, T	0.5	0.5	mg/l	2.06	2.08	0.97%	Pass
TOTAL SUSPENDED SOLIDS, LAB	1	1	mg/l	5.6	6.5	14.88%	Pass
TURBIDITY, LAB	0.1	0.1	ntu	7.49	7.04	6.19%	Pass
URANIUM, D	0.00001	0.00001	mg/l	0.000887	0.000884	0.34%	Pass
URANIUM, T	0.00001	0.00001	mg/l	0.00103	0.00095	8.08%	Pass
VANADIUM, D	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass
VANADIUM, T	0.0005	0.0005	mg/l	<0.00050	0.00055	9.52%	Pass
ZINC, D	0.001	0.001	mg/l	0.0018	0.0018	0.00%	Pass
ZINC, T	0.003	0.003	mg/l	<0.0030	0.003	0.00%	Pass

RPD Control Limits

Pass - RPD <= 20%

Pass-1 - RPD > 20%, Analysis results < 5 times Detection Limit

Pass-2 - RPD > 20% and RPD <= 50%, Analysis result > 5 times Detection Limit and < 999 times Detection Limit

Exceeds RPD Control Limits

**Table A-1:
Site Specific Groundwater Monitoring: 2019 Annual Report
Teck Coal Limited - Line Creek Operations**

Table 1 (continued). Duplicate Samples Collected As Part of LCO 2019 Groundwater Monitoring

Analyte	Location:		LC PIZDC1404S		LC PIZDC1404S		Primary vs. Duplicate	Category1
	Sample ID:		LC_PIZDC1404S_WG_Q2-2019_NP		WG_Q2-2019_CC1			
	Date Sampled:		2019-05-23		2019-05-23			
	Sample Type:		Primary		Secondary			
Analyte	Detection Limit Pri.	Detection Limit Dup.	Units	1.5	2.4	46.15%	Pass-1	
ACIDITY TO pH 8.3 (As CaCO3)	1	1	mg/l	1.5	2.4	46.15%	Pass-1	
ALKALINITY, BICARBONATE (As CaCO3), lab measured.	1	1	mg/l	206	197	4.47%	Pass	
ALKALINITY, CARBONATE (As CaCO3), lab measured.	1	1	mg/l	4.2	5	17.39%	Pass	
ALKALINITY, HYDROXIDE (As CaCO3), lab measured.	1	1	mg/l	<1.0	<1	0.00%	Pass	
ALKALINITY, TOTAL (As CaCO3), lab measured.	1	1	mg/l	211	202	4.36%	Pass	
ALUMINIUM, D	0.003	0.003	mg/l	<0.0030	<0.003	0.00%	Pass	
ALUMINIUM, T	0.003	0.003	mg/l	0.0081	0.007	14.57%	Pass	
ANTIMONY, D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass	
ANTIMONY, T	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass	
ARSENIC, D	0.0001	0.0001	mg/l	0.00187	0.00188	0.53%	Pass	
ARSENIC, T	0.0001	0.0001	mg/l	0.00216	0.00214	0.93%	Pass	
BARIUM, D	0.0001	0.0001	mg/l	0.240	0.233	2.96%	Pass	
BARIUM, T	0.0001	0.0001	mg/l	0.237	0.238	0.42%	Pass	
BERYLLIUM, D	0.00002	0.00002	mg/l	<0.000020	<2e-005	0.00%	Pass	
BERYLLIUM, T	0.00002	0.00002	mg/l	<0.000020	<2e-005	0.00%	Pass	
BISMUTH, D	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass	
BISMUTH, T	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass	
BORON, D	0.01	0.01	mg/l	<0.010	<0.01	0.00%	Pass	
BORON, T	0.01	0.01	mg/l	<0.010	<0.01	0.00%	Pass	
BROMIDE, D	0.05	0.05	mg/l	<0.050	<0.05	0.00%	Pass	
Cadmium, D	0.000005	0.000005	mg/l	<0.0000050	<5e-006	0.00%	Pass	
Cadmium, T	0.000005	0.000005	mg/l	<0.0000050	<5e-006	0.00%	Pass	
CALCIUM, D	0.05	0.05	mg/l	51.5	51.4	0.19%	Pass	
CALCIUM, T	0.05	0.05	mg/l	50.6	49.9	1.39%	Pass	
CARBON, DISSOLVED ORGANIC, D	0.5	0.5	mg/l	2.12	2.74	25.51%	Pass-1	
CHLORIDE, D	0.5	0.5	mg/l	<0.50	<0.5	0.00%	Pass	
CHROMIUM, D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass	
CHROMIUM, T	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass	
COBALT, D	0.0001	0.0001	mg/l	0.00030	0.0003	0.00%	Pass	
COBALT, T	0.0001	0.0001	mg/l	0.00038	0.0004	5.13%	Pass	
CONDUCTIVITY, LAB	2	2	us/cm	370	369	0.27%	Pass	
COPPER, D	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass	
COPPER, T	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass	
FLUORIDE, D	0.02	0.02	mg/l	0.145	0.148	2.05%	Pass	
Hardness, Total or Dissolved CaCO3	0.5	0.5	mg/l	209	206	1.45%	Pass	
ION BALANCE	100	100	%	99.8	103	3.16%	Pass	
IRON, D	0.01	0.01	mg/l	0.919	0.905	1.54%	Pass	
IRON, T	0.01	0.01	mg/l	1.20	1.25	4.08%	Pass	
LEAD, D	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass	
LEAD, T	0.00005	0.00005	mg/l	0.000076	6.9e-005	9.66%	Pass	
LITHIUM, D	0.001	0.001	mg/l	0.0053	0.0052	1.90%	Pass	
LITHIUM, T	0.001	0.001	mg/l	0.0051	0.005	1.98%	Pass	
MAGNESIUM, D	0.1	0.1	mg/l	19.5	18.9	3.13%	Pass	
MAGNESIUM, T	0.1	0.1	mg/l	18.7	18.7	0.00%	Pass	
MAJOR ANION SUM	0	0	meq/l	4.32	4.14	4.26%	Pass	
MAJOR CATION SUM	0	0	meq/l	4.31	4.25	1.40%	Pass	
MANGANESE, D	0.0001	0.0001	mg/l	0.0294	0.0289	1.72%	Pass	
MANGANESE, T	0.0001	0.0001	mg/l	0.0335	0.0346	3.23%	Pass	
MERCURY, D	0.000005	0.000005	mg/l	<0.0000050	<5e-006	0.00%	Pass	
MOLYBDENUM, D	0.00005	0.00005	mg/l	0.00342	0.00322	6.02%	Pass	
MOLYBDENUM, T	0.00005	0.00005	mg/l	0.00349	0.00341	2.32%	Pass	
Nickel, D	0.0005	0.0005	mg/l	0.00132	0.00126	4.65%	Pass	
Nickel, T	0.0005	0.0005	mg/l	0.00134	0.00131	2.26%	Pass	
NITRATE NITROGEN (NO3), AS N	0.005	0.005	mg/l	<0.0050	<0.005	0.00%	Pass	
NITRITE NITROGEN (NO2), AS N	0.001	0.001	mg/l	<0.0010	<0.001	0.00%	Pass	
NITROGEN, AMMONIA (AS N)	0.005	0.005	mg/l	<0.0050	0.0052	166.78%	Pass-1	
ORTHO-PHOSPHATE	0.001	0.001	mg/l	<0.0010	0.001	0.00%	Pass	
OXIDATION-REDUCTION POTENTIAL, LAB	1000	1000	mv	396	362	8.97%	Pass	
pH, LAB	0.1	0.1	ph units	8.41	8.43	0.24%	Pass	
PHOSPHORUS	0.002	0.002	mg/l	0.0068	0.0062	9.23%	Pass	
POTASSIUM, D	0.05	0.05	mg/l	1.62	1.59	1.87%	Pass	
POTASSIUM, T	0.05	0.05	mg/l	1.49	1.49	0.00%	Pass	
Selenium, D	0.05	0.05	ug/l	<0.050	<0.05	0.00%	Pass	
Selenium, T	0.05	0.05	ug/l	<0.050	<0.05	0.00%	Pass	
SILICON, D	0.05	0.05	mg/l	3.35	3.33	0.60%	Pass	
SILICON, T	0.1	0.1	mg/l	3.57	3.58	0.28%	Pass	
SILVER, D	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass	
SILVER, T	0.00001	0.00001	mg/l	0.000012	<1e-005	18.18%	Pass	
SODIUM, D	0.05	0.05	mg/l	1.02	1	1.98%	Pass	
SODIUM, T	0.05	0.05	mg/l	1.08	1.07	0.93%	Pass	
STRONTIUM, D	0.0002	0.0002	mg/l	0.0474	0.0482	1.67%	Pass	
STRONTIUM, T	0.0002	0.0002	mg/l	0.0470	0.0487	3.55%	Pass	
Sulphate (as SO4), D	0.3	0.3	mg/l	4.80	4.79	0.21%	Pass	
THALLIUM, D	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass	
THALLIUM, T	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass	
TIN, D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass	
TIN, T	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass	
TITANIUM, D	0.01	0.01	mg/l	<0.010	<0.01	0.00%	Pass	
TITANIUM, T	0.01	0.01	mg/l	<0.010	<0.01	0.00%	Pass	
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	20	20	mg/l	182	171	6.23%	Pass	
TOTAL KJELDAHL NITROGEN	0.05	0.05	mg/l	<0.050	<0.05	0.00%	Pass	
TOTAL ORGANIC CARBON, T	0.5	0.5	mg/l	2.41	2.65	9.49%	Pass	
TOTAL SUSPENDED SOLIDS, LAB	1	1	mg/l	2.6	3.1	17.54%	Pass	
TURBIDITY, LAB	0.1	0.1	ntu	10.3	10.7	3.81%	Pass	
URANIUM, D	0.00001	0.00001	mg/l	0.000589	0.000585	0.68%	Pass	
URANIUM, T	0.00001	0.00001	mg/l	0.000616	0.000608	1.31%	Pass	
VANADIUM, D	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass	
VANADIUM, T	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass	
ZINC, D	0.001	0.001	mg/l	<0.0010	<0.001	0.00%	Pass	
ZINC, T	0.003	0.003	mg/l	<0.0030	<0.003	0.00%	Pass	

RPD Control Limits

Pass - RPD ≤ 20%

Pass-1 - RPD > 20%, Analysis results < 5 times Detection Limit

Pass-2 - RPD > 20% and RPD ≤ 50%, Analysis result > 5 times Detection Limit and < 999 times Detection Limit

Exceeds RPD Control Limits

**Table A-1:
Site Specific Groundwater Monitoring: 2019 Annual Report
Teck Coal Limited - Line Creek Operations**

Table 1 (continued). Duplicate Samples Collected As Part of LCO 2019 Groundwater Monitoring

Analyte	Detection Limit Pri.	Detection Limit Dup.	Units	Location:		Primary vs. Duplicate	Category 1
				Sample ID:			
				Date Sampled:			
Sample Type:		LC PIZP1101	LC PIZP1101				
				LC PIZP1101_WG_Q3-2019_N	WG_Q3-2019_CC		
				2019-07-17	2019-07-17		
				Primary	Secondary		
ACIDITY TO pH 8.3 (As CaCO ₃)	1	1	mg/l	<1.0	<1	0.00%	Pass
ALKALINITY_BICARBONATE (As CaCO ₃), lab measured.	1	1	mg/l	161	156	3.15%	Pass
ALKALINITY_CARBOANATE (As CaCO ₃), lab measured.	1	1	mg/l	4.4	5.2	16.67%	Pass
ALKALINITY_HYDROXIDE (As CaCO ₃), lab measured.	1	1	mg/l	<1.0	<1	0.00%	Pass
ALKALINITY_TOTAL (As CaCO ₃), lab measured.	1	1	mg/l	166	161	3.06%	Pass
ALUMINIUM_D	0.003	0.003	mg/l	<0.0030	<0.003	0.00%	Pass
ALUMINIUM_T	0.003	0.003	mg/l	0.102	0.0994	2.58%	Pass
ANTIMONY_D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
ANTIMONY_T	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
ARSENIC_D	0.0001	0.0001	mg/l	0.00132	0.00133	0.75%	Pass
ARSENIC_T	0.0001	0.0001	mg/l	0.00153	0.0015	1.98%	Pass
BARIUM_D	0.0001	0.0001	mg/l	0.453	0.453	0.00%	Pass
BARIUM_T	0.0001	0.0001	mg/l	0.474	0.466	1.70%	Pass
BERYLLIUM_D	0.00002	0.00002	mg/l	<0.000020	<2e-005	0.00%	Pass
BERYLLIUM_T	0.00002	0.00002	mg/l	<0.000020	<2e-005	0.00%	Pass
BISMUTH_D	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
BISMUTH_T	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
BORON_D	0.01	0.01	mg/l	0.023	0.022	4.44%	Pass
BORON_T	0.01	0.01	mg/l	0.019	0.02	5.13%	Pass
BROMIDE_D	0.05	0.05	mg/l	0.076	<0.05	41.27%	Pass-1
Cadmium_D	0.000005	0.000005	mg/l	<0.0000050	<5e-006	0.00%	Pass
Cadmium_T	0.000005	0.000005	mg/l	0.0000229	2.13e-005	7.24%	Pass
CALCIUM_D	0.05	0.05	mg/l	26.5	26.3	0.76%	Pass
CALCIUM_T	0.05	0.05	mg/l	28.0	27.8	0.72%	Pass
CARBON_DISSOLVED ORGANIC, D	0.5	0.5	mg/l	<0.50	<0.5	0.00%	Pass
CHLORIDE_D	0.5	0.5	mg/l	0.60	0.5	18.18%	Pass
CHROMIUM_D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
CHROMIUM_T	0.0001	0.0001	mg/l	0.00019	0.00018	5.41%	Pass
COBALT_D	0.0001	0.0001	mg/l	0.00020	0.0002	0.00%	Pass
COBALT_T	0.0001	0.0001	mg/l	0.00024	0.00024	0.00%	Pass
CONDUCTIVITY, LAB	2	2	us/cm	312	313	0.32%	Pass
COPPER_D	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass
COPPER_T	0.0005	0.0005	mg/l	0.00058	<0.0005	14.81%	Pass
FLUORIDE_D	0.02	0.02	mg/l	1.82	1.74	4.49%	Pass
Hardness, Total or Dissolved CaCO ₃	0.5	0.5	mg/l	123	121	1.64%	Pass
ION BALANCE	100	100	%	94.4	96.4	2.10%	Pass
IRON_D	0.01	0.01	mg/l	0.260	0.252	3.13%	Pass
IRON_T	0.01	0.01	mg/l	0.500	0.48	4.08%	Pass
LEAD_D	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
LEAD_T	0.00005	0.00005	mg/l	0.000193	0.000112	53.11%	Pass-1
LITHIUM_D	0.001	0.001	mg/l	0.0092	0.009	2.20%	Pass
LITHIUM_T	0.001	0.001	mg/l	0.0089	0.0089	0.00%	Pass
MAGNESIUM_D	0.1	0.1	mg/l	13.9	13.5	2.92%	Pass
MAGNESIUM_T	0.1	0.1	mg/l	14.5	14.8	2.05%	Pass
MAJOR ANION SUM	0	0	meq/l	3.49	3.38	3.20%	Pass
MAJOR CATION SUM	0	0	meq/l	3.30	3.26	1.22%	Pass
MANGANESE_D	0.0001	0.0001	mg/l	0.227	0.222	2.23%	Pass
MANGANESE_T	0.0001	0.0001	mg/l	0.240	0.24	0.00%	Pass
MERCURY_D	0.000005	0.000005	mg/l	<0.0000050	<5e-006	0.00%	Pass
MERCURY_T	0.000005	0.000005	mg/l	<0.0000050	<5e-006	0.00%	Pass
MOLYBDENUM_D	0.00005	0.00005	mg/l	0.0112	0.0112	0.00%	Pass
MOLYBDENUM_T	0.00005	0.00005	mg/l	0.0105	0.0106	0.95%	Pass
Nickel_D	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass
Nickel_T	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass
NITRATE NITROGEN (NO ₃), AS N	0.005	0.005	mg/l	<0.0050	<0.005	0.00%	Pass
NITRITE NITROGEN (NO ₂), AS N	0.001	0.001	mg/l	<0.0010	<0.001	0.00%	Pass
NITROGEN_AMMONIA (AS N)	0.005	0.005	mg/l	0.0169	0.0162	4.23%	Pass
ORTHO-PHOSPHATE	0.001	0.001	mg/l	0.0090	0.0095	5.41%	Pass
OXIDATION-REDUCTION POTENTIAL, LAB	1000	1000	mv	306	310	1.30%	Pass
pH, LAB	0.1	0.1	ph units	8.42	8.44	0.24%	Pass
PHOSPHORUS	0.002	0.002	mg/l	0.0301	0.0309	2.62%	Pass
POTASSIUM_D	0.05	0.05	mg/l	0.749	0.72	3.95%	Pass
POTASSIUM_T	0.05	0.05	mg/l	0.756	0.776	2.61%	Pass
Selenium_D	0.05	0.05	ug/l	<0.050	<0.05	0.00%	Pass
Selenium_T	0.05	0.05	ug/l	<0.050	<0.05	0.00%	Pass
SILICON_D	0.05	0.05	mg/l	3.56	3.44	3.43%	Pass
SILICON_T	0.1	0.1	mg/l	3.74	3.61	3.54%	Pass
SILVER_D	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass
SILVER_T	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass
SODIUM_D	0.05	0.05	mg/l	18.2	18.2	0.00%	Pass
SODIUM_T	0.05	0.05	mg/l	19.1	19.3	1.04%	Pass
STRONTIUM_D	0.0002	0.0002	mg/l	0.213	0.215	0.93%	Pass
STRONTIUM_T	0.0002	0.0002	mg/l	0.209	0.21	0.48%	Pass
Sulphate (as SO ₄), D	0.3	0.3	mg/l	3.30	2.83	15.33%	Pass
THALLIUM_D	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass
THALLIUM_T	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass
TIN_D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
TIN_T	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass
TITANIUM_D	0.01	0.01	mg/l	<0.010	<0.01	0.00%	Pass
TITANIUM_T	0.01	0.01	mg/l	<0.010	<0.01	0.00%	Pass
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	20	20	mg/l	159	158	0.63%	Pass
TOTAL KJELDAHL NITROGEN	0.05	0.05	mg/l	<0.050	<0.05	0.00%	Pass
TOTAL ORGANIC CARBON, T	0.5	0.5	mg/l	<0.50	<0.5	0.00%	Pass
TOTAL SUSPENDED SOLIDS, LAB	1	1	mg/l	6.2	5.3	15.65%	Pass
TURBIDITY, LAB	0.1	0.1	ntu	8.45	8.2	3.00%	Pass
URANIUM_D	0.00001	0.00001	mg/l	0.00139	0.00142	2.14%	Pass
URANIUM_T	0.00001	0.00001	mg/l	0.00141	0.00143	1.41%	Pass
VANADIUM_D	0.0005	0.0005	mg/l	<0.00050	<0.0005	0.00%	Pass
VANADIUM_T	0.0005	0.0005	mg/l	0.00082	0.00087	5.92%	Pass
ZINC_D	0.001	0.001	mg/l	<0.0010	<0.001	0.00%	Pass
ZINC_T	0.003	0.003	mg/l	0.0033	<0.003	9.52%	Pass

RPD Control Limits

- Pass - RPD <= 20%
- Pass-1 - RPD > 20%, Analysis results < 5 times Detection Limit
- Pass-2 - RPD > 20% and RPD <= 50%, Analysis result > 5 times Detection Limit and < 999 times Detection Limit

Exceeds RPD Control Limits

Table A2. Field Blank Samples Collected As Part of LCO 2019 Groundwater Monitoring

		Location:	LC_PLZDC1404D
		Sample Date:	2019-03-20
		Sample ID:	WG_Q1-2019_MT1
		Sample Type:	Field Blank
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	2.1
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0
Alkalinity, Total as CaCO3	N	mg/L	< 1.0
Aluminum	D	mg/L	< 0.0030
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N	mg/L	1.05
Anion Sum	N	meq/L	< 0
Anion/Cation Ratio	N	%	0
Antimony	D	mg/L	< 0.00010
Antimony	T	mg/L	< 0.00010
Arsenic	D	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium	D	mg/L	< 0.00010
Barium	T	mg/L	< 0.00010
Beryllium	D	mg/L	< 0.000020
Beryllium	T	mg/L	< 0.000020
Bismuth	D	mg/L	< 0.000050
Bismuth	T	mg/L	< 0.000050
Boron	D	mg/L	< 0.010
Boron	T	mg/L	< 0.010
Bromide	D	mg/L	< 0.050
Cadmium	D	mg/L	< 0.0000050
Cadmium	T	mg/L	< 0.0000050
Calcium	D	mg/L	< 0.050
Calcium	T	mg/L	< 0.050
Cation Sum	N	meq/L	< 0
Chloride	D	mg/L	< 0.50
Chromium	D	mg/L	< 0.00010
Chromium	T	mg/L	0.0004
Cobalt	D	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	< 2.0
Copper	D	mg/L	< 0.00050
Copper	T	mg/L	< 0.00050
Dissolved Organic Carbon	D	mg/L	< 0.50
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	0
Iron	D	mg/L	< 0.010
Iron	T	mg/L	< 0.010
Lead	D	mg/L	< 0.000050
Lead	T	mg/L	< 0.000050
Lithium	D	mg/L	< 0.0010
Lithium	T	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.10
Magnesium	T	mg/L	< 0.10
Manganese	D	mg/L	< 0.00010
Manganese	T	mg/L	< 0.00010
Mercury	D	mg/L	< 0.0000050
Mercury	T	mg/L	< 0.0000050
Molybdenum	D	mg/L	< 0.000050
Molybdenum	T	mg/L	< 0.000050
Nickel	D	mg/L	< 0.00050
Nickel	T	mg/L	< 0.00050
Nitrate as N	N	mg/L	< 0.0050
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	4.76
Oxidation-Reduction Potential	N	mV	431
pH	N	pH units	5.48
Phosphorus	N	mg/L	< 0.0020
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium	D	ug/L	< 0.050
Selenium	T	ug/L	< 0.050
Silicon	D	mg/L	< 0.050
Silicon	T	mg/L	< 0.10
Silver	D	mg/L	< 0.000010
Silver	T	mg/L	< 0.000010
Sodium	D	mg/L	< 0.050
Sodium	T	mg/L	< 0.050
Strontium	D	mg/L	< 0.00020
Strontium	T	mg/L	< 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	D	mg/L	< 0.000010
Thallium	T	mg/L	< 0.000010
Tin	D	mg/L	< 0.00010
Tin	T	mg/L	< 0.00010
Titanium	D	mg/L	< 0.010
Titanium	T	mg/L	< 0.010
Total Dissolved Solids	N	mg/L	< 10
Total Organic Carbon	T	mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	D	mg/L	< 0.000010
Uranium	T	mg/L	< 0.000010
Vanadium	D	mg/L	< 0.00050
Vanadium	T	mg/L	< 0.00050
Zinc	D	mg/L	< 0.0010
Zinc	T	mg/L	< 0.0030

Table 2 continued. Field Blank Collected As Part of LCO 2019 Groundwater Monitoring

		Location:	LC_P1ZDC1404D
		Sample Date:	2019-05-23
		Sample ID:	WG_Q2-2019_MT1
		Sample Type:	Field Blank
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	1.8
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0
Alkalinity, Total as CaCO3	N	mg/L	< 1.0
Aluminum	D	mg/L	< 0.0030
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N	mg/L	< 0.0050
Anion Sum	N	meq/L	< 0
Anion/Cation Ratio	N	%	0
Antimony	D	mg/L	< 0.00010
Antimony	T	mg/L	< 0.00010
Arsenic	D	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium	D	mg/L	< 0.00010
Barium	T	mg/L	< 0.00010
Beryllium	D	mg/L	< 0.000020
Beryllium	T	mg/L	< 0.000020
Bismuth	D	mg/L	< 0.000050
Bismuth	T	mg/L	< 0.000050
Boron	D	mg/L	< 0.010
Boron	T	mg/L	< 0.010
Bromide	D	mg/L	< 0.050
Cadmium	D	mg/L	< 0.0000050
Cadmium	T	mg/L	< 0.0000050
Calcium	D	mg/L	< 0.050
Calcium	T	mg/L	< 0.050
Cation Sum	N	meq/L	< 0
Chloride	D	mg/L	< 0.50
Chromium	D	mg/L	< 0.00010
Chromium	T	mg/L	< 0.00010
Cobalt	D	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	< 2.0
Copper	D	mg/L	< 0.00050
Copper	T	mg/L	< 0.00050
Dissolved Organic Carbon	D	mg/L	< 0.50
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	0
Iron	D	mg/L	< 0.010
Iron	T	mg/L	< 0.010
Lead	D	mg/L	< 0.000050
Lead	T	mg/L	< 0.000050
Lithium	D	mg/L	< 0.0010
Lithium	T	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.10
Magnesium	T	mg/L	< 0.10
Manganese	D	mg/L	< 0.00010
Manganese	T	mg/L	< 0.00010
Mercury	D	mg/L	< 0.0000050
Mercury	T	mg/L	< 0.0000050
Molybdenum	D	mg/L	< 0.000050
Molybdenum	T	mg/L	< 0.000050
Nickel	D	mg/L	< 0.00050
Nickel	T	mg/L	< 0.00050
Nitrate as N	N	mg/L	< 0.0050
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	< 0.050
Oxidation-Reduction Potential	N	mV	450
pH	N	pH units	5.14
Phosphorus	N	mg/L	< 0.0020
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium	D	ug/L	< 0.050
Selenium	T	ug/L	< 0.050
Silicon	D	mg/L	< 0.050
Silicon	T	mg/L	< 0.10
Silver	D	mg/L	< 0.000010
Silver	T	mg/L	< 0.000010
Sodium	D	mg/L	< 0.050
Sodium	T	mg/L	< 0.050
Strontium	D	mg/L	< 0.00020
Strontium	T	mg/L	< 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	D	mg/L	< 0.000010
Thallium	T	mg/L	< 0.000010
Tin	D	mg/L	< 0.00010
Tin	T	mg/L	< 0.00010
Titanium	D	mg/L	< 0.010
Titanium	T	mg/L	< 0.010
Total Dissolved Solids	N	mg/L	< 1.0
Total Organic Carbon	T	mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	D	mg/L	< 0.000010
Uranium	T	mg/L	< 0.000010
Vanadium	D	mg/L	< 0.00050
Vanadium	T	mg/L	< 0.00050
Zinc	D	mg/L	< 0.0010
Zinc	T	mg/L	< 0.0030

Table 2 continued. Field Blank Collected As Part of LCO 2019 Groundwater Monitoring

		Location:	LC_P1ZDC1404S
		Sample Date:	2019-08-15
		Sample ID:	WG_03-2019_010
		Sample Type:	Field Blank
Parameter	Fraction	Unit	Result
Acidity as CaCO ₃ , pH 8.3	N	mg/L	< 1.0
Alkalinity, Bicarbonate (HCO ₃) as CaCO ₃	N	mg/L	< 1.0
Alkalinity, Carbonate (CO ₃) as CaCO ₃	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO ₃	N	mg/L	< 1.0
Alkalinity, Total as CaCO ₃	N	mg/L	< 1.0
Aluminum	D	mg/L	< 0.0030
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N	mg/L	0.0075
Anion Sum	N	meq/L	< 0
Anion/Cation Ratio	N	%	0
Antimony	D	mg/L	< 0.00010
Antimony	T	mg/L	< 0.00010
Arsenic	D	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium	D	mg/L	< 0.00010
Barium	T	mg/L	< 0.00010
Beryllium	D	mg/L	< 0.000020
Beryllium	T	mg/L	< 0.000020
Bismuth	D	mg/L	< 0.000050
Bismuth	T	mg/L	< 0.000050
Boron	D	mg/L	< 0.010
Boron	T	mg/L	< 0.010
Bromide	D	mg/L	< 0.050
Cadmium	D	mg/L	< 0.0000050
Cadmium	T	mg/L	< 0.0000050
Calcium	D	mg/L	< 0.050
Calcium	T	mg/L	< 0.050
Cation Sum	N	meq/L	< 0
Chloride	D	mg/L	< 0.50
Chromium	D	mg/L	< 0.00010
Chromium	T	mg/L	< 0.00010
Cobalt	D	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	< 2.0
Copper	D	mg/L	< 0.00050
Copper	T	mg/L	< 0.00050
Dissolved Organic Carbon	D	mg/L	< 0.50
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	0
Iron	D	mg/L	< 0.010
Iron	T	mg/L	< 0.010
Lead	D	mg/L	< 0.000050
Lead	T	mg/L	0.000064
Lithium	D	mg/L	< 0.0010
Lithium	T	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.10
Magnesium	T	mg/L	< 0.10
Manganese	D	mg/L	< 0.00010
Manganese	T	mg/L	< 0.00010
Mercury	D	mg/L	< 0.0000050
Mercury	T	mg/L	< 0.0000050
Molybdenum	D	mg/L	< 0.000050
Molybdenum	T	mg/L	< 0.000050
Nickel	D	mg/L	< 0.00050
Nickel	T	mg/L	< 0.00050
Nitrate as N	N	mg/L	< 0.0050
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	< 0.050
Oxidation-Reduction Potential	N	mV	503
pH	N	pH units	5.7
Phosphorus	N	mg/L	< 0.0020
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium	D	ug/L	< 0.050
Selenium	T	ug/L	< 0.050
Silicon	D	mg/L	< 0.050
Silicon	T	mg/L	< 0.10
Silver	D	mg/L	< 0.000010
Silver	T	mg/L	< 0.000010
Sodium	D	mg/L	< 0.050
Sodium	T	mg/L	< 0.050
Strontium	D	mg/L	< 0.00020
Strontium	T	mg/L	< 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	D	mg/L	< 0.000010
Thallium	T	mg/L	< 0.000010
Tin	D	mg/L	< 0.00010
Tin	T	mg/L	< 0.00010
Titanium	D	mg/L	< 0.010
Titanium	T	mg/L	< 0.010
Total Dissolved Solids	N	mg/L	< 10
Total Organic Carbon	T	mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	D	mg/L	< 0.000010
Uranium	T	mg/L	< 0.000010
Vanadium	D	mg/L	< 0.00050
Vanadium	T	mg/L	< 0.00050
Zinc	D	mg/L	< 0.0010
Zinc	T	mg/L	< 0.0030

Table 2 continued. Field Blank Collected As Part of LCO 2019 Groundwater Monitoring

		Location:	LC_PIZP1103
		Sample Date:	2019-10-10
		Sample ID:	WG_04-2019_004
		Sample Type:	FB
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	1.5
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0
Alkalinity, Total as CaCO3	N	mg/L	< 1.0
Aluminum	D	mg/L	< 0.0030
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N	mg/L	< 0.0050
Anion Sum	N	meq/L	< 0
Anion/Cation Ratio	N	%	0
Antimony	D	mg/L	< 0.00010
Antimony	T	mg/L	< 0.00010
Arsenic	D	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium	D	mg/L	0.00029
Barium	T	mg/L	< 0.00010
Beryllium	D	mg/L	< 0.000020
Beryllium	T	mg/L	< 0.000020
Bismuth	D	mg/L	< 0.000050
Bismuth	T	mg/L	< 0.000050
Boron	D	mg/L	< 0.010
Boron	T	mg/L	< 0.010
Bromide	D	mg/L	< 0.050
Cadmium	D	mg/L	< 0.0000050
Cadmium	T	mg/L	< 0.0000050
Calcium	D	mg/L	0.063
Calcium	T	mg/L	< 0.050
Cation Sum	N	meq/L	< 0
Chloride	D	mg/L	< 0.50
Chromium	D	mg/L	< 0.00010
Chromium	T	mg/L	< 0.00010
Cobalt	D	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	< 2.0
Copper	D	mg/L	< 0.00020
Copper	T	mg/L	< 0.00050
Dissolved Organic Carbon	D	mg/L	< 0.50
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	0
Iron	D	mg/L	< 0.010
Iron	T	mg/L	< 0.010
Lead	D	mg/L	< 0.000050
Lead	T	mg/L	< 0.000050
Lithium	D	mg/L	< 0.0010
Lithium	T	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.10
Magnesium	T	mg/L	< 0.10
Manganese	D	mg/L	< 0.00010
Manganese	T	mg/L	0.0001
Mercury	D	mg/L	< 0.0000050
Mercury	T	mg/L	< 0.0000050
Molybdenum	D	mg/L	< 0.000050
Molybdenum	T	mg/L	< 0.000050
Nickel	D	mg/L	< 0.00050
Nickel	T	mg/L	< 0.00050
Nitrate as N	N	mg/L	< 0.0050
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	< 0.050
Oxidation-Reduction Potential	N	mV	344
pH	N	pH units	5.62
Phosphorus	N	mg/L	< 0.0020
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium	D	ug/L	< 0.050
Selenium	T	ug/L	< 0.050
Silicon	D	mg/L	0.227
Silicon	T	mg/L	< 0.10
Silver	D	mg/L	< 0.000010
Silver	T	mg/L	< 0.000010
Sodium	D	mg/L	0.233
Sodium	T	mg/L	< 0.050
Strontium	D	mg/L	< 0.00020
Strontium	T	mg/L	< 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	D	mg/L	< 0.000010
Thallium	T	mg/L	< 0.000010
Tin	D	mg/L	0.00075
Tin	T	mg/L	0.00012
Titanium	D	mg/L	< 0.010
Titanium	T	mg/L	< 0.010
Total Dissolved Solids	N	mg/L	< 1.0
Total Organic Carbon	T	mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	D	mg/L	< 0.000010
Uranium	T	mg/L	< 0.000010
Vanadium	D	mg/L	< 0.00050
Vanadium	T	mg/L	< 0.00050
Zinc	D	mg/L	< 0.0010
Zinc	T	mg/L	< 0.0030

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Table A3. Trip Blanks Part of LCO 2019 Groundwater Monitoring

		Location:	LC_TBLANK
		Sample Date:	2019-03-20
		Sample ID:	WG_Q1-2019_RD1
		Sample Type:	TB
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	2.2
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0
Alkalinity, Total as CaCO3	N	mg/L	< 1.0
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N	mg/L	0.292
Anion Sum	N	meq/L	< 0
Anion/Cation Ratio	N	%	55
Antimony	T	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium	T	mg/L	< 0.00010
Beryllium	T	mg/L	< 0.000020
Bismuth	T	mg/L	< 0.000050
Boron	T	mg/L	< 0.010
Bromide	D	mg/L	< 0.050
Cadmium	T	mg/L	< 0.0000050
Calcium	D	mg/L	< 0.050
Calcium	T	mg/L	< 0.050
Cation Sum	N	meq/L	< 0
Chloride	D	mg/L	< 0.50
Chromium	T	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	2.7
Copper	T	mg/L	< 0.00050
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	344
Iron	T	mg/L	0.022
Lead	T	mg/L	< 0.000050
Lithium	T	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.0050
Magnesium	T	mg/L	< 0.10
Manganese	T	mg/L	0.00014
Mercury	T	mg/L	< 0.0000050
Molybdenum	T	mg/L	< 0.000050
Nickel	T	mg/L	< 0.00050
Nitrate as N	N	mg/L	0.125
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	0.301
Oxidation-Reduction Potential	N	mV	423
pH	N	pH units	5.01
Phosphorus	N	mg/L	0.0033
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium	T	ug/L	< 0.050
Silicon	T	mg/L	< 0.10
Silver	T	mg/L	< 0.000010
Sodium	D	mg/L	< 0.050
Sodium	T	mg/L	< 0.050
Strontium	T	mg/L	< 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	T	mg/L	< 0.000010
Tin	T	mg/L	< 0.00010
Titanium	T	mg/L	< 0.010
Total Dissolved Solids	N	mg/L	< 10
Total Organic Carbon	T	mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	T	mg/L	< 0.000010
Vanadium	T	mg/L	< 0.00050
Zinc	T	mg/L	< 0.0030

Site Specific Groundwater Monitoring: 2019 Annual Report
Teck Coal Limited - Line Creek Operations

Table A3 continued. Trip Blanks Part of LCO 2019 Groundwater Monitoring

		Location:	LC_TBLANK
		Sample Date:	2019-05-23
		Sample ID:	WG_Q2-2019_RD1
		Sample Type:	TB
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	1.2
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0
Alkalinity, Total as CaCO3	N	mg/L	< 1.0
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N	mg/L	0.0334
Anion Sum	N	meq/L	< 0
Anion/Cation Ratio	N	%	0
Antimony	T	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium	T	mg/L	< 0.00010
Beryllium	T	mg/L	< 0.000020
Bismuth	T	mg/L	< 0.000050
Boron	T	mg/L	< 0.010
Bromide	D	mg/L	< 0.050
Cadmium	T	mg/L	< 0.0000050
Calcium	D	mg/L	< 0.050
Calcium	T	mg/L	< 0.050
Cation Sum	N	meq/L	< 0
Chloride	D	mg/L	< 0.50
Chromium	T	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	< 2.0
Copper	T	mg/L	< 0.00050
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	0
Iron	T	mg/L	< 0.010
Lead	T	mg/L	< 0.000050
Lithium	T	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.0050
Magnesium	T	mg/L	< 0.10
Manganese	T	mg/L	< 0.00010
Mercury	T	mg/L	< 0.0000050
Molybdenum	T	mg/L	< 0.000050
Nickel	T	mg/L	< 0.00050
Nitrate as N	N	mg/L	< 0.0050
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	< 0.050
Oxidation-Reduction Potential	N	mV	407
pH	N	pH units	5.35
Phosphorus	N	mg/L	< 0.0020
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium	T	ug/L	< 0.050
Silicon	T	mg/L	< 0.10
Silver	T	mg/L	< 0.000010
Sodium	D	mg/L	< 0.050
Sodium	T	mg/L	< 0.050
Strontium	T	mg/L	< 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	T	mg/L	< 0.000010
Tin	T	mg/L	< 0.00010
Titanium	T	mg/L	< 0.010
Total Dissolved Solids	N	mg/L	< 10
Total Organic Carbon	T	mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	T	mg/L	< 0.000010
Vanadium	T	mg/L	< 0.00050
Zinc	T	mg/L	< 0.0030

Site Specific Groundwater Monitoring: 2019 Annual Report
Teck Coal Limited - Line Creek Operations

Table A3 continued. Trip Blanks Part of LCO 2019 Groundwater Monitoring

		Location:	LC_TBLANK
		Sample Date:	2019-07-17
		Sample ID:	WG_Q3-2019_RD
		Sample Type:	TB
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	1.6
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0
Alkalinity, Total as CaCO3	N	mg/L	< 1.0
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N	mg/L	< 0.0050
Anion Sum	N	meq/L	< 0
Anion/Cation Ratio	N	%	0
Antimony	T	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium	T	mg/L	< 0.00010
Beryllium	T	mg/L	< 0.000020
Bismuth	T	mg/L	< 0.000050
Boron	T	mg/L	< 0.010
Bromide	D	mg/L	< 0.050
Cadmium	T	mg/L	< 0.0000050
Calcium	D	mg/L	< 0.050
Calcium	T	mg/L	< 0.050
Cation Sum	N	meq/L	< 0
Chloride	D	mg/L	< 0.50
Chromium	T	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	< 2.0
Copper	T	mg/L	< 0.00050
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	0
Iron	T	mg/L	< 0.010
Lead	T	mg/L	< 0.000050
Lithium	T	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.0050
Magnesium	T	mg/L	< 0.10
Manganese	T	mg/L	< 0.00010
Mercury	T	mg/L	< 0.0000050
Molybdenum	T	mg/L	< 0.000050
Nickel	T	mg/L	< 0.00050
Nitrate as N	N	mg/L	< 0.0050
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	< 0.050
Oxidation-Reduction Potential	N	mV	449
pH	N	pH units	5.57
Phosphorus	N	mg/L	< 0.0020
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium	T	ug/L	< 0.050
Silicon	T	mg/L	< 0.10
Silver	T	mg/L	< 0.000010
Sodium	D	mg/L	< 0.050
Sodium	T	mg/L	< 0.050
Strontium	T	mg/L	< 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	T	mg/L	< 0.000010
Tin	T	mg/L	< 0.00010
Titanium	T	mg/L	< 0.010
Total Dissolved Solids	N	mg/L	< 10
Total Organic Carbon	T	mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	T	mg/L	< 0.000010
Vanadium	T	mg/L	< 0.00050
Zinc	T	mg/L	< 0.0030

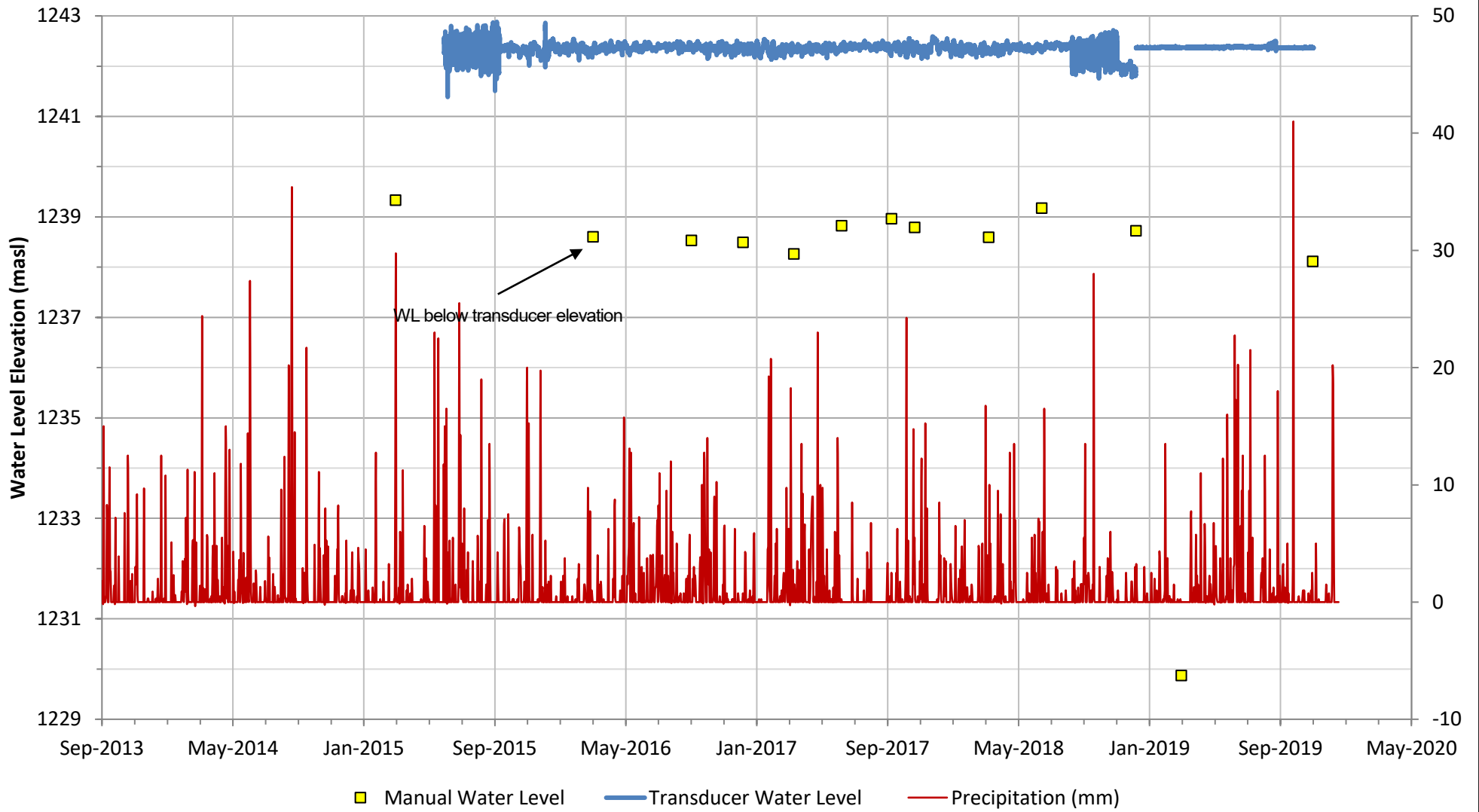
Site Specific Groundwater Monitoring: 2019 Annual Report
Teck Coal Limited - Line Creek Operations

Table A3 continued. Trip Blanks Part of LCO 2019 Groundwater Monitoring

		Location:	LC_TBLANK
		Sample Date:	2019-11-06
		Sample ID:	WG_Q4-2019_006
		Sample Type:	TB
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	1.5
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0
Alkalinity, Total as CaCO3	N	mg/L	< 1.0
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N	mg/L	0.0069
Anion Sum	N	meq/L	< 0
Anion/Cation Ratio	N	%	0
Antimony	T	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium	T	mg/L	< 0.00010
Beryllium	T	mg/L	< 0.000020
Bismuth	T	mg/L	< 0.000050
Boron	T	mg/L	< 0.010
Bromide	D	mg/L	< 0.050
Cadmium	T	mg/L	< 0.0000050
Calcium	D	mg/L	< 0.050
Calcium	T	mg/L	< 0.050
Cation Sum	N	meq/L	< 0
Chloride	D	mg/L	< 0.50
Chromium	T	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	< 2.0
Copper	T	mg/L	< 0.00050
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	0
Iron	T	mg/L	< 0.010
Lead	T	mg/L	< 0.000050
Lithium	T	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.0050
Magnesium	T	mg/L	< 0.10
Manganese	T	mg/L	< 0.00010
Mercury	T	mg/L	< 0.0000050
Molybdenum	T	mg/L	< 0.000050
Nickel	T	mg/L	< 0.00050
Nitrate as N	N	mg/L	< 0.0050
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	< 0.050
Oxidation-Reduction Potential	N	mV	448
pH	N	pH units	5.49
Phosphorus	N	mg/L	< 0.0020
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium	T	ug/L	< 0.050
Silicon	T	mg/L	< 0.10
Silver	T	mg/L	< 0.000010
Sodium	D	mg/L	< 0.050
Sodium	T	mg/L	< 0.050
Strontium	T	mg/L	< 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	T	mg/L	< 0.000010
Tin	T	mg/L	< 0.00010
Titanium	T	mg/L	< 0.010
Total Dissolved Solids	N	mg/L	< 10
Total Organic Carbon	T	mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	T	mg/L	< 0.000010
Vanadium	T	mg/L	< 0.00050
Zinc	T	mg/L	< 0.0030

APPENDIX B

Groundwater Elevations



NOTES

1. Transducer is located at or above the water level in the well, no continuous water level data available. Level data plotted at elevation of logger.
2. Precipitation data obtained from the LCO Plant Weather Station

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020-02-19
PREPARED	SI
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

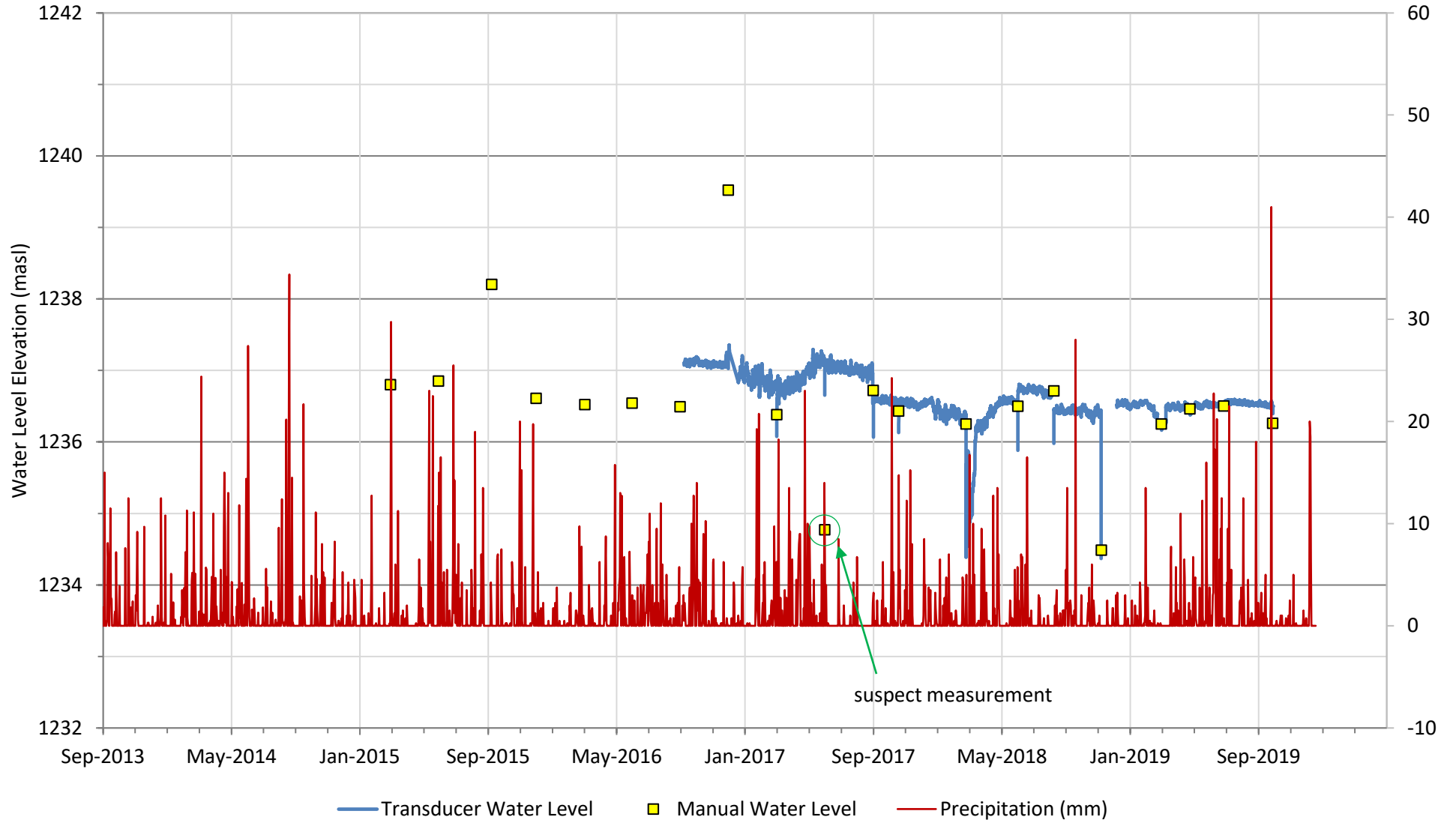
**PROCESS PLANT GROUNDWATER ELEVATIONS:
LC_PIZP1001**

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
B1a



NOTES

1. Precipitation data obtained from the LCO Plant Weather Station

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020-02-19
PREPARED	SI
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

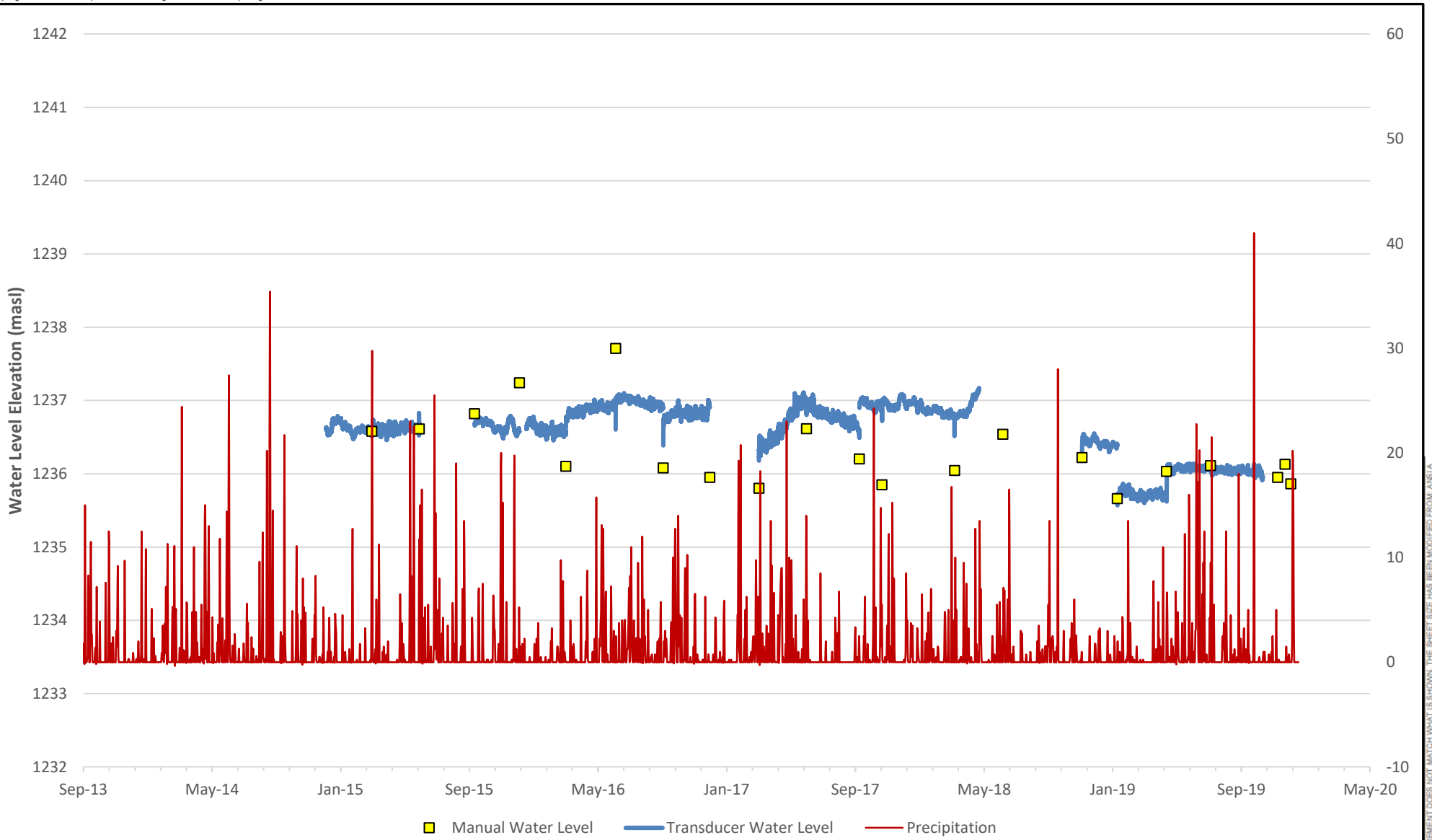
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LC_P1ZP1103**

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
B1b



NOTES

1. Precipitation data obtained from the LCO Plant Weather Station

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020-02-19
PREPARED	SI
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

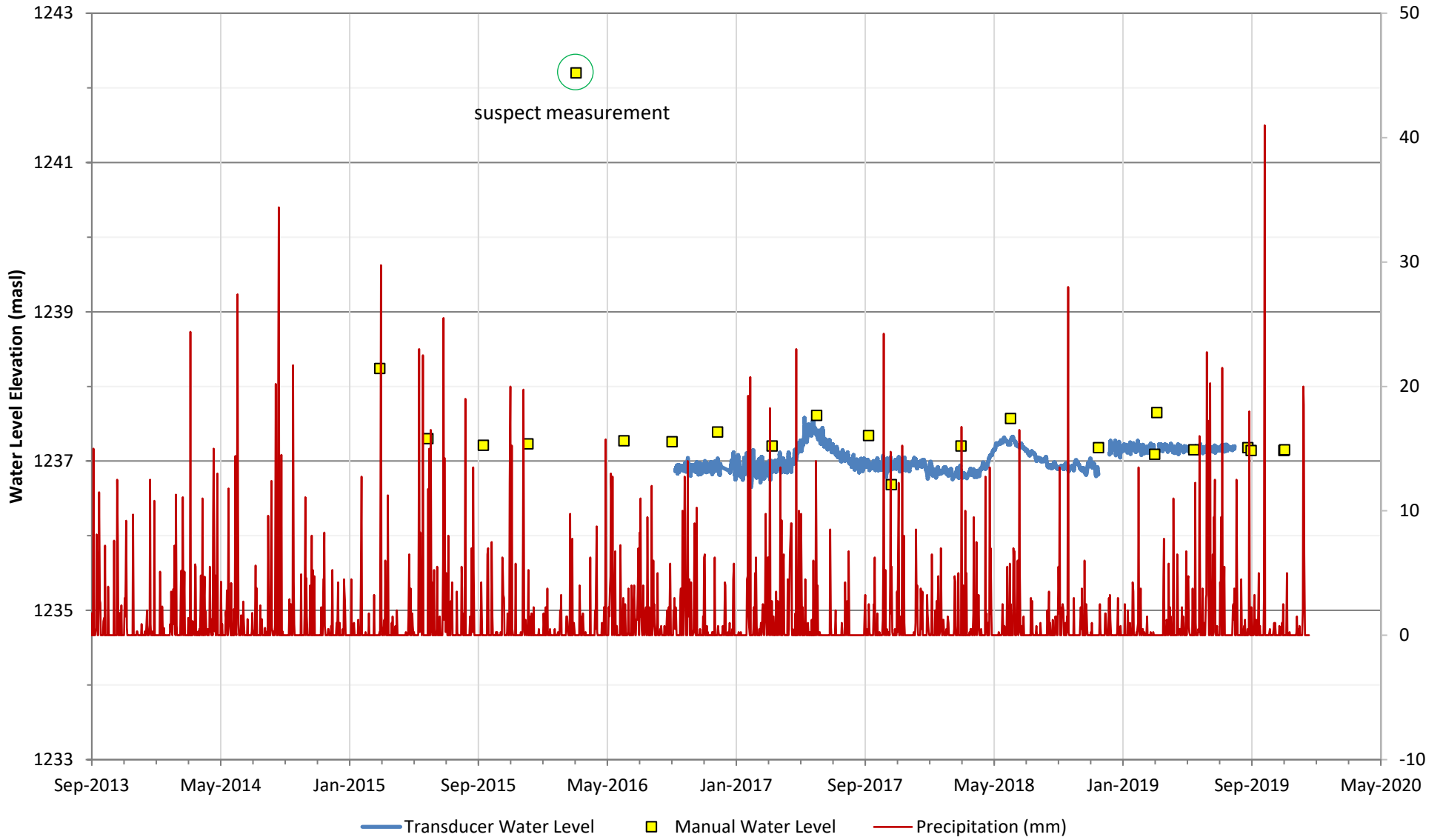
**PROCESS PLANT GROUNDWATER ELEVATIONS:
LC_PIZP1101**

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
B1c



NOTES

1. Precipitation data obtained from the LCO Plant Weather Station

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020-02-19
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DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

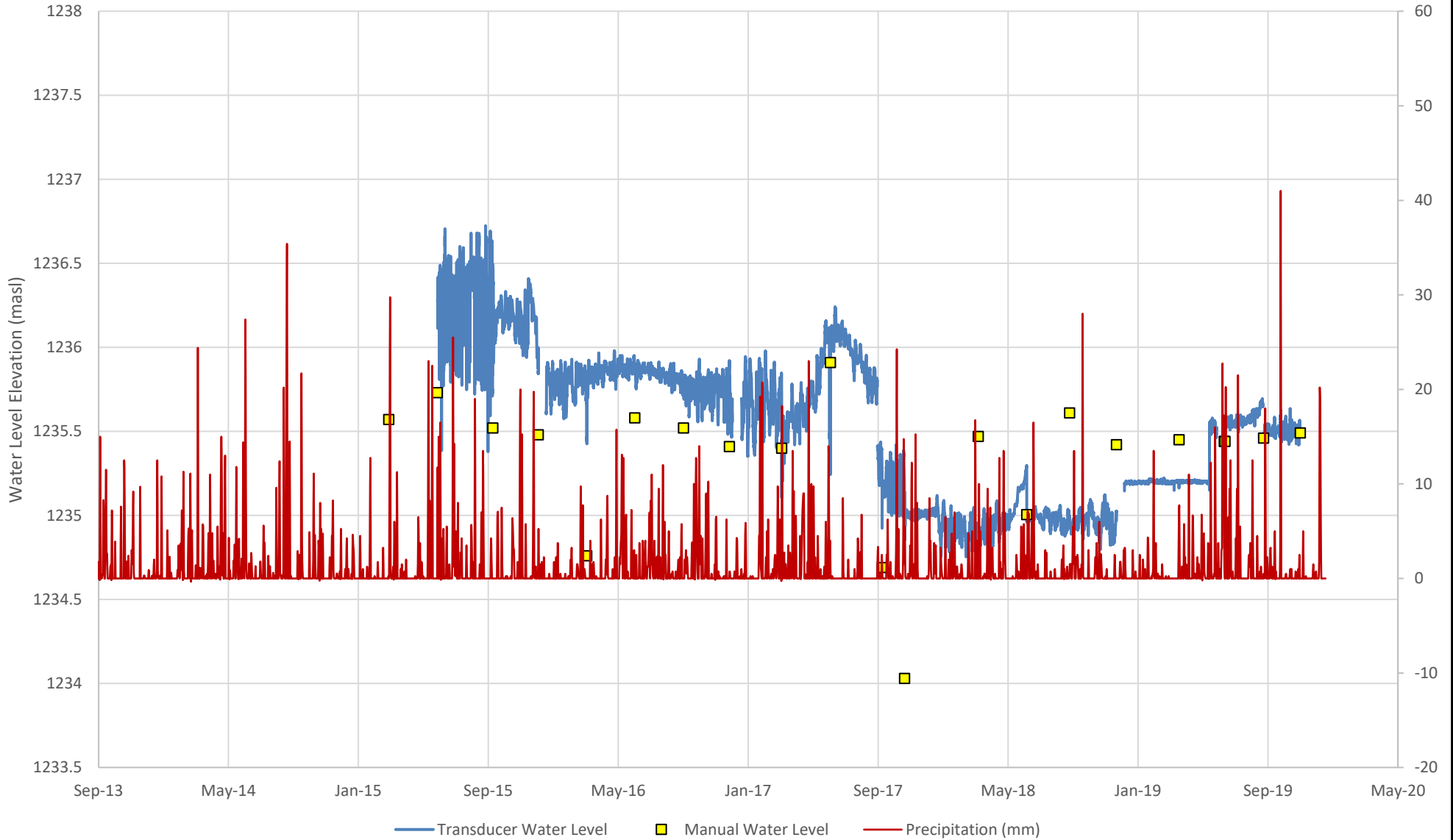
**PROCESS PLANT GROUNDWATER ELEVATIONS:
LC_PIZP1104**

PROJECT NO.
19135891

PHASE
1000

REV
0

FIGURE
B1d



NOTES

1. Transducer is located at or above the water level in the well, no continuous water level data available
2. Precipitation data obtained from the LCO Plant Weather Station

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2019-02-12
PREPARED	SI
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

**PROCESS PLANT GROUNDWATER ELEVATIONS:
LC_PIZP1105**

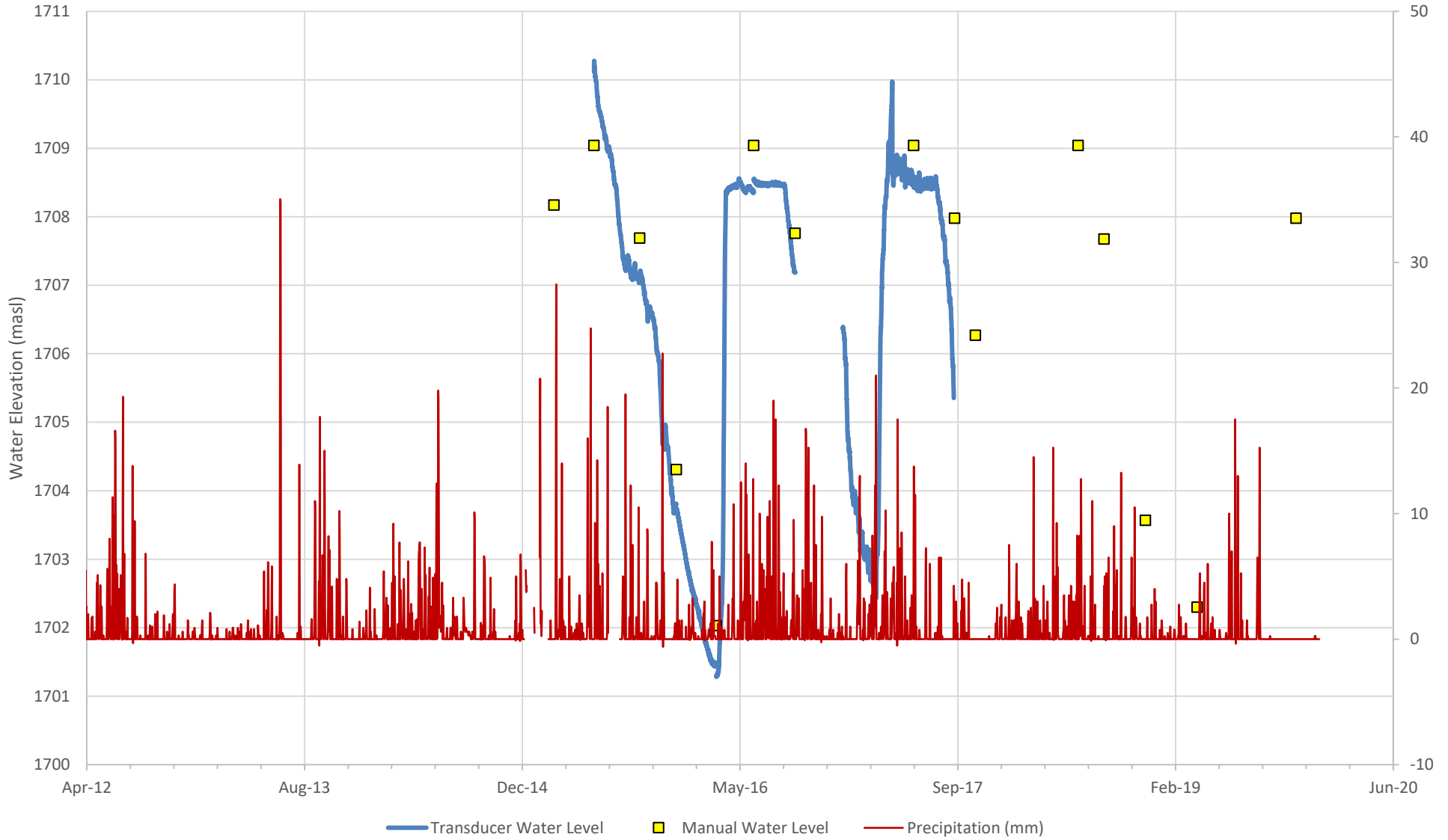
PROJECT NO.
19115529

PHASE
1000

REV
0

FIGURE
B1e

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI/A



NOTES

During periods of high water level, well is under flowing artesian conditions and manual water level measurements are not possible

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020-02-19
PREPARED	SI
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

DRY CREEK GROUNDWATER ELEVATIONS: LC_PIZDC1306

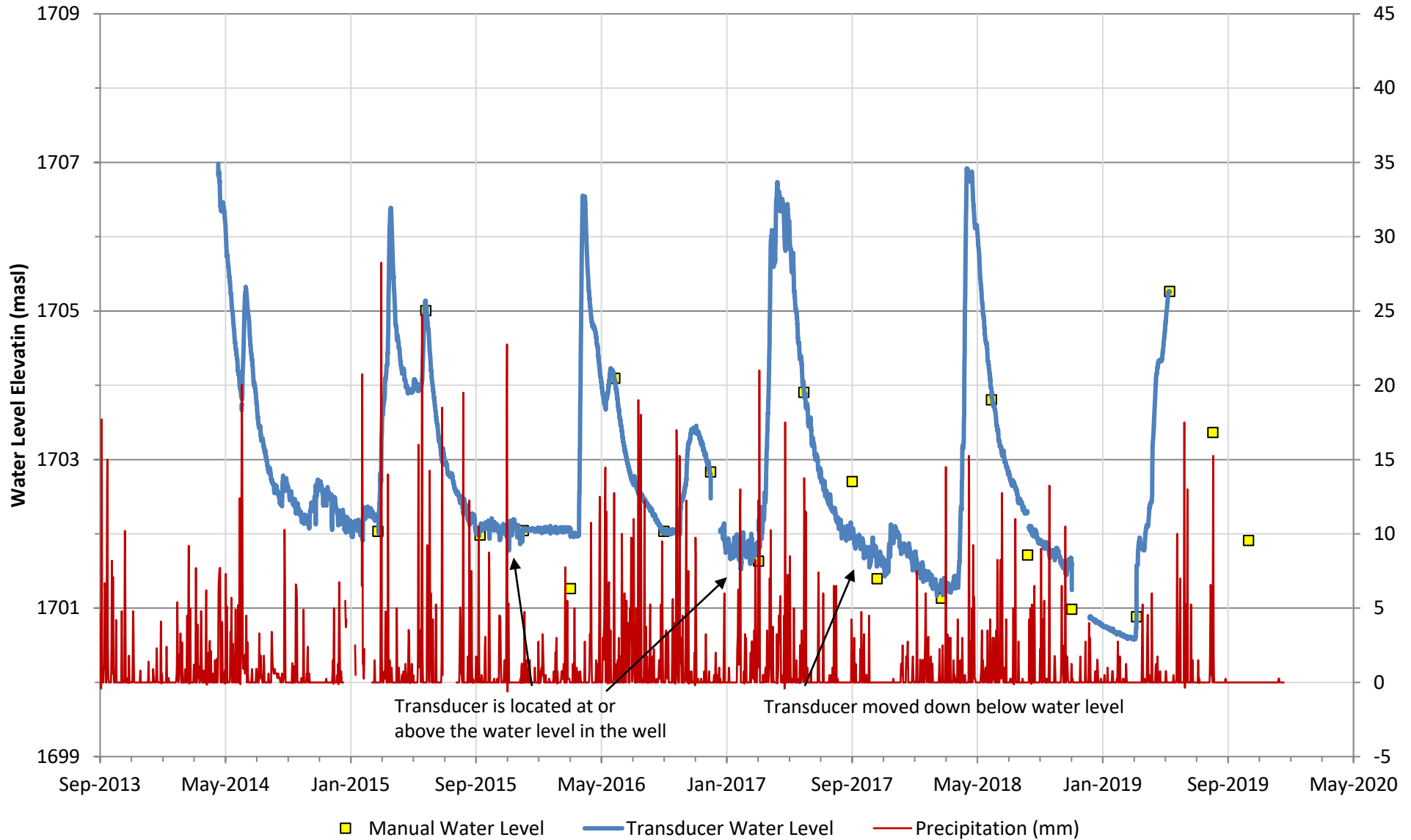
PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
B2a

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI/A



NOTES
 Transducer is located at or above the water level in the well, no continuous water level data available

CLIENT
 TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD 2020-02-19
 PREPARED SI
 DESIGNED NH
 REVIEWED LO
 APPROVED MJM

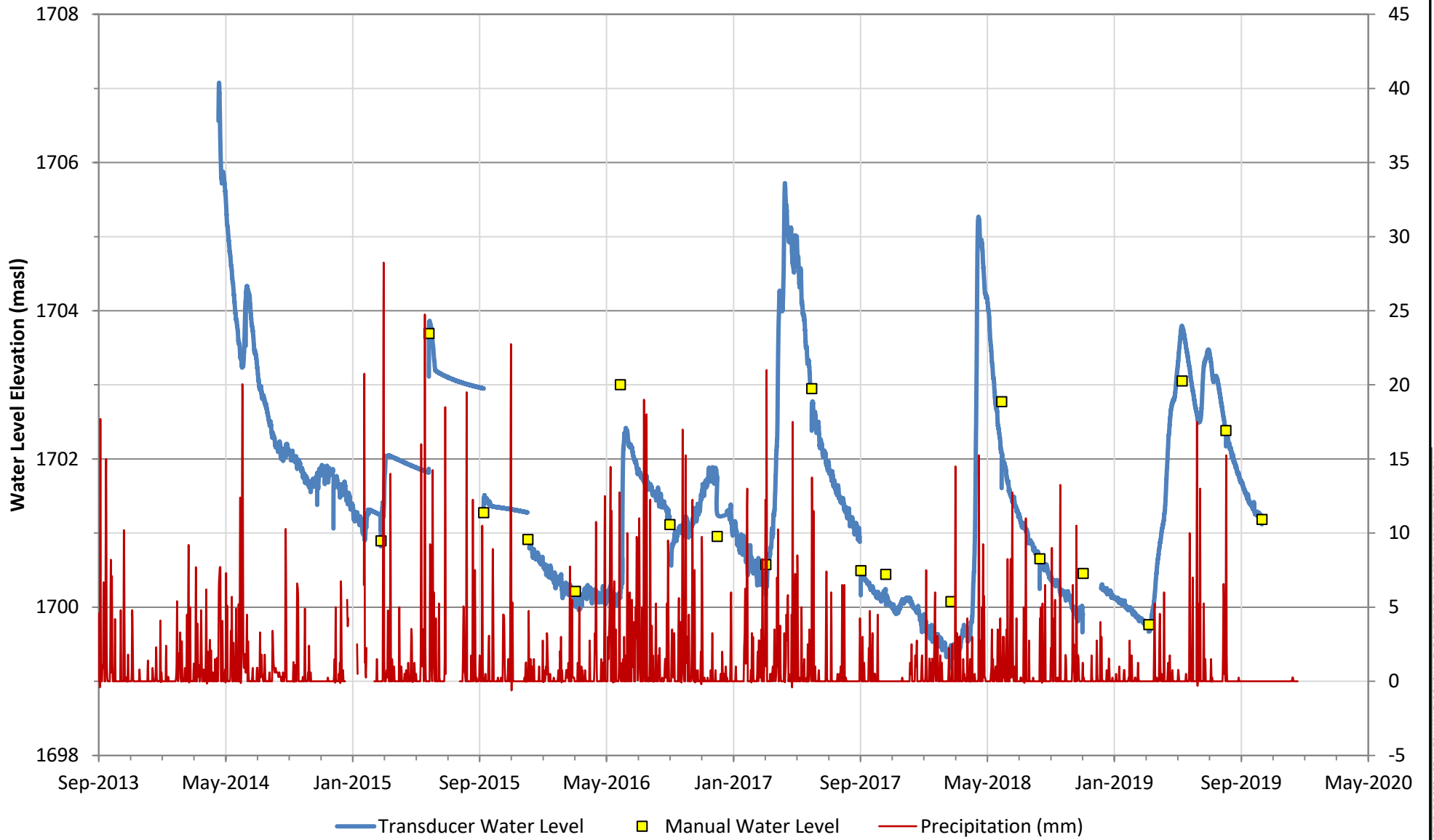
PROJECT
 TECK LINE CREEK OPERATIONS
 ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE
 DRY CREEK GROUNDWATER ELEVATIONS:
 LC_PIZDC1404S (SHALLOW)

PROJECT NO. 19135981 **PHASE** 1000 **REV** 0

FIGURE
 B2b

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4/NA/A



NOTES

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020-02-19
PREPARED	SI
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

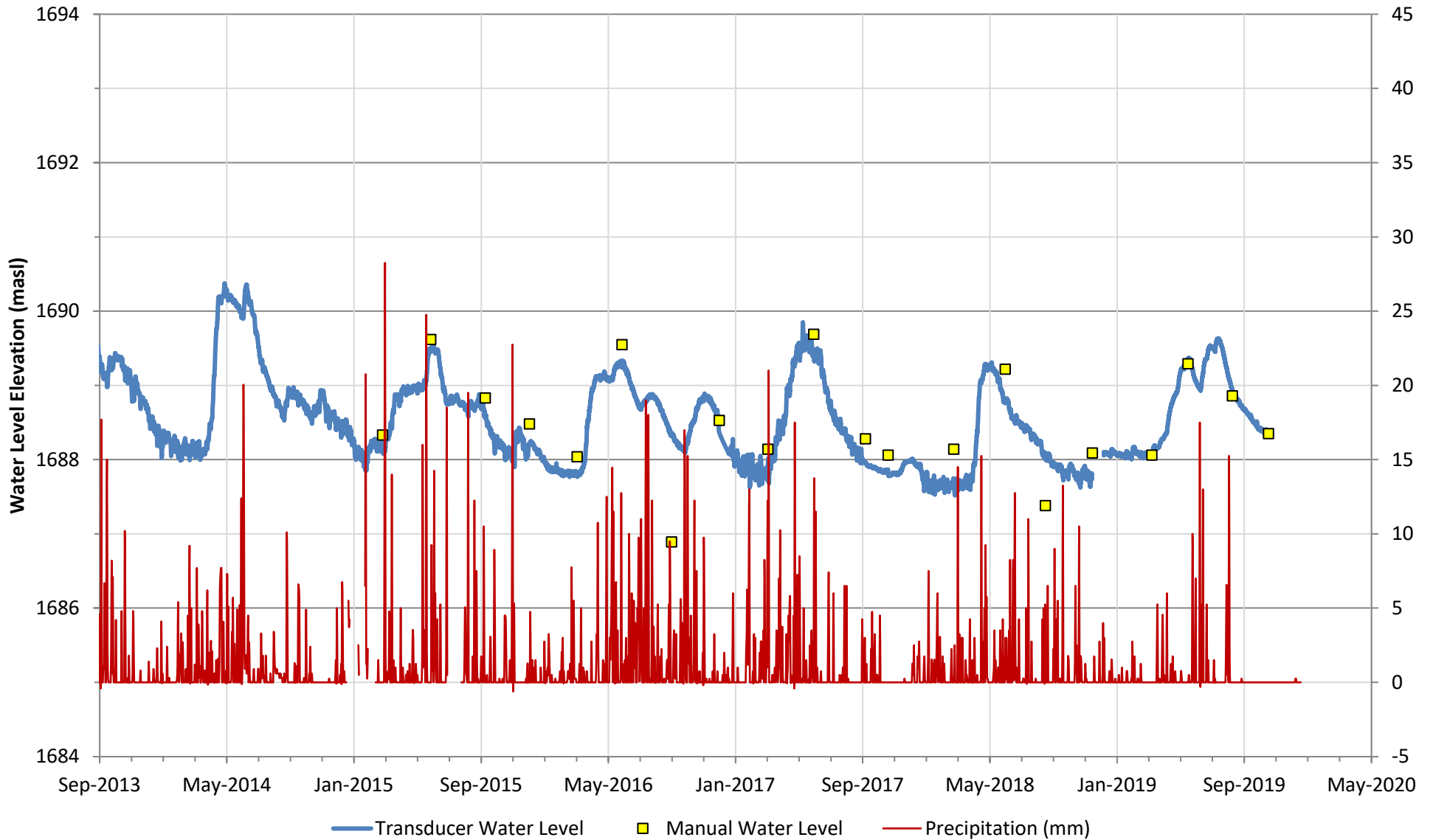
**DRY CREEK GROUNDWATER ELEVATIONS:
LC_PIZDC1404D (DEEP)**

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
B2c



NOTES

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020-02-19
PREPARED	SI
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

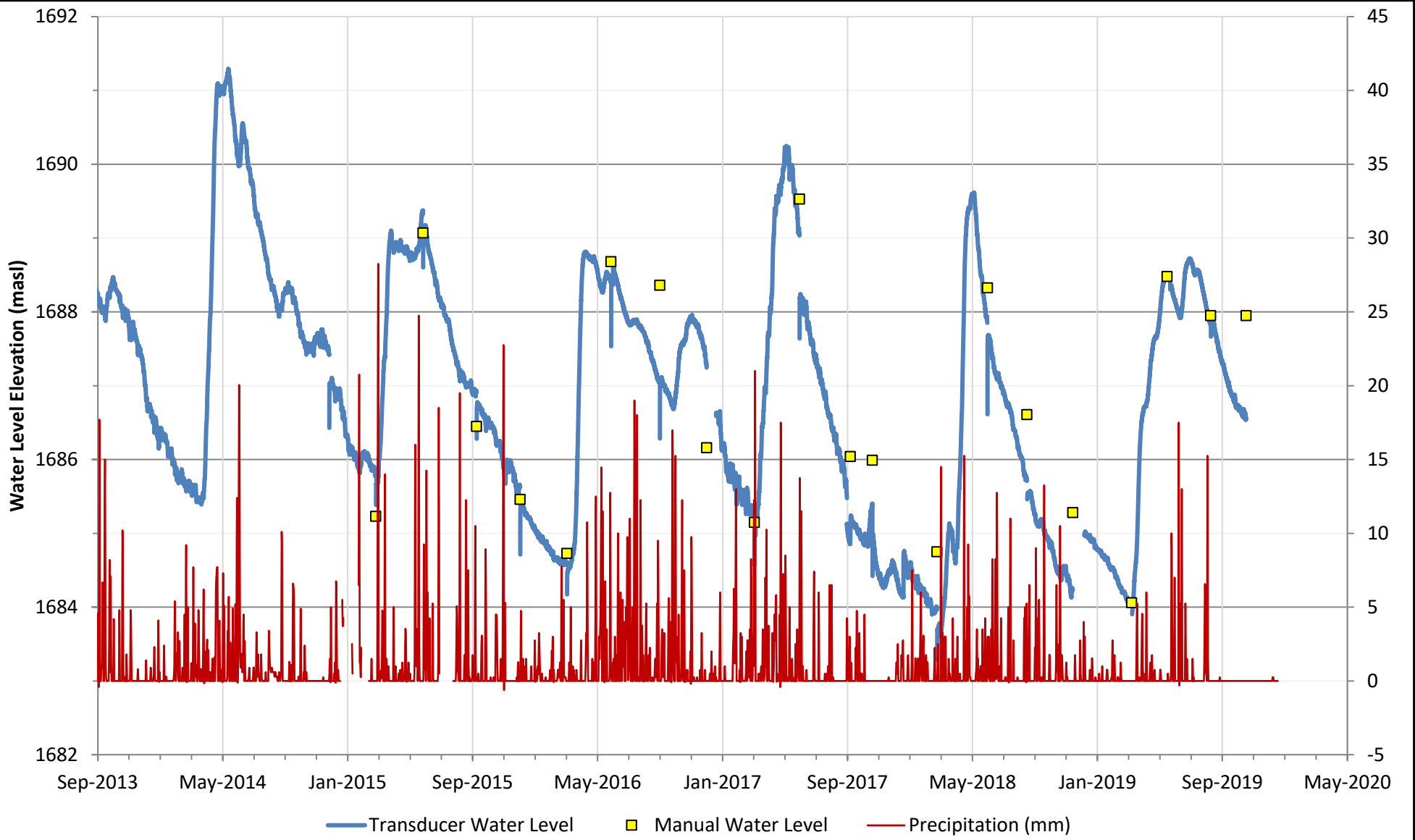
**DRY CREEK GROUNDWATER ELEVATIONS:
LC_PIZDC1308 (SHALLOW)**

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
B2d



NOTES

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020-02-19
PREPARED	SI
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

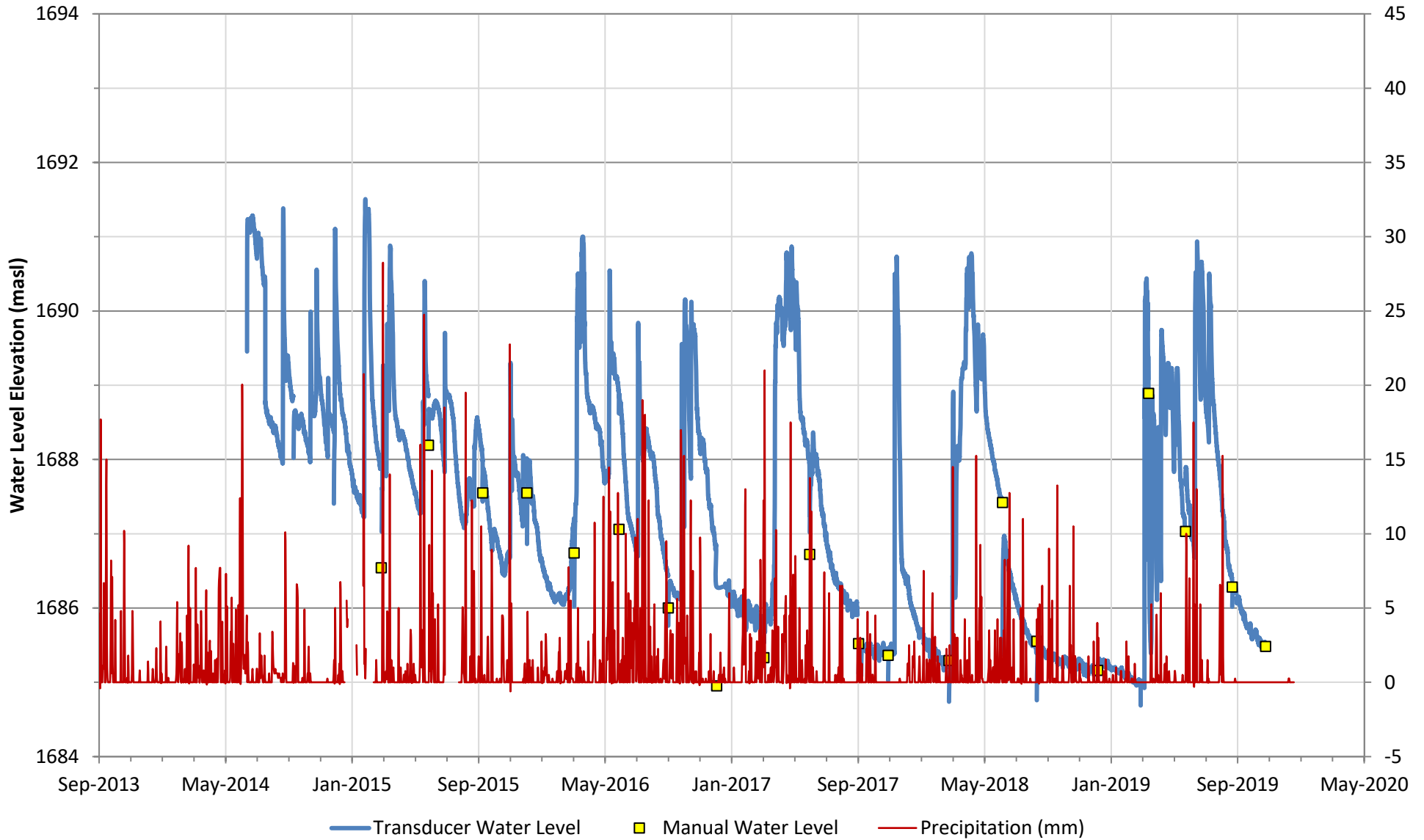
**DRY CREEK GROUNDWATER ELEVATIONS:
LC_PIZDC1307 (DEEP)**

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
B2e



NOTES

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD 2020-02-19

PREPARED SI

DESIGNED NH

REVIEWED LO

APPROVED MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

DRY CREEK GROUNDWATER ELEVATIONS: LC_PIZDC0901

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
B2f

APPENDIX C

**Full Suite of Analytes Compared to
British Columbia Contaminated Site
Regulation Standards**

Table with columns: Location, Sample Date, and various analytical parameters (Chemical Name, Unit, BC CSR, etc.) grouped into sections like Field Measured, Conventional Parameters, Major Ions, Nutrients, Dissolved Metals, and Total Metals. Data points are provided for four sample dates: 2019-02-25, 2019-05-27, 2019-08-20, and 2019-11-28.

Notes:
µS/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric turbidity Units; TCU = true colour unit
QA/QC = quality assurance/quality control; FDA = Field Duplicate Available; FD = Field Duplicate
Standards from the Contaminated Sites Regulation (CSR), enacted in 1997, updated January 2019, and includes B.C. Regs. 11/2019 and 13/2019 amendments.

Table with columns: Chemical Name, Unit, BC CSR AW-F, BC CSR DW, BC CSR IW, BC CSR LW, Location (GH POTW10), Sample Date (2019-01-15, 2019-04-24, 2019-08-22, 2019-11-13). Rows include Field Measured, Conventional Parameters, Major Ions, Nutrients, Dissolved Metals, and Total Metals.

Notes:
µS/cm = microSiemen per centimetre; °C = degrees Celsius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric turbidity Units; TCU = true colour unit
QA/QC = quality assurance/quality control; FDA = Field Duplicate Available; FD = Field Duplicate
Standards from the Contaminated Sites Regulation (CSR), enacted in 1997, updated January 2019, and includes B.C. Regs. 11/2019 and 13/2019 amendments.
AW-F = groundwater flow to surface water used by freshwater aquatic life; DW = groundwater used for drinking water, IW = groundwater used for irrigation; LW = groundwater used for livestock watering
An interim background groundwater estimate of 20 µg/L for cobalt was used to screen the data consistent with ENV Technical Bulletin 3 Regional Background Concentrations for Select Inorganic Substances in Groundwater dated 24 September 2018.
< Indicates parameter was below laboratory equipment detection limit.
- In results column indicates parameter was not analyzed. In guideline column indicates no guideline.
^a = standard is hardness dependent; ^b = standard is chloride dependent; ^c = standard is pH dependent
Underline - concentration exceeds BC CSR IW
Italicized - concentration exceeds BC CSR DW
Grey Highlight - concentration exceeds one or more guidelines

APPENDIX D

**Dry Creek Area: Additional
Hydrogeological Information**

**Table D1:
Monitoring Well Construction Details**

Teck Well Name	Golder Well Name	Northing	Easting	Ground Elevation	Measuring Point (PVC Stick Up)	Depth to Bottom of Borehole	Depth to Bottom of the Well	Depth to Top of Sand Pack	Depth to Bottom of Sand Pack	Depth to Top of Screen	Depth to Base of Screen	Depth to Top of Highly Consolidated Till	Depth to Bedrock
		[m]	[m]	[masl]	[mbgs]	[mbgs]	[mbgs]	[mbgs]	[mbgs]	[mbgs]	[mbgs]	[mbgs]	[mbgs]
LC_PIZDC1401	MW14-04D	5,541,064	658,195	1705.36	-1.57	35.36	35.25	30.53	35.36	32.21	35.25	4.00	Not Encountered
LC_PIZDC1402	MW14-04S	5,541,069	658,192	1705.36	-1.14	12.75	12.75	7.72	12.75	9.53	12.57	4.00	Not Encountered
LC_PIZDC1301	MW13-6D	5,540,961	658,302	1710.58	-0.90	28.96	25.31	21.03	25.91	22.20	25.26	10.70	25.91
LC_PIZDC1302	MW13-6S	5,540,963	658,302	1710.56	-0.90	13.72	10.63	8.23	10.67	9.05	10.58	10.70	Not Encountered
LC_PIZDC1303	MW13-5D	5,540,989	658,271	1705.57	-0.90	32.00	31.64	28.65	32.00	28.53	31.59	7.30	Not Encountered
LC_PIZDC1304	MW13-5S	5,540,992	658,272	1705.57	-0.85	16.76	16.69	13.11	16.76	15.11	16.64	7.60	Not Encountered
LC_PIZDC1305	MW13-3D	5,541,056	658,278	1708.17	-0.95	27.43	25.62	23.62	27.43	23.58	25.57	3.00	24.40
LC_PIZDC1306	MW13-3S	5,541,059	658,278	1708.15	-0.90	16.76	16.46	13.72	16.76	14.42	16.41	6.90	Not Encountered
LC_PIZDC1307	MW13-1D	5,541,230	658,169	1690.51	-0.71	35.05	34.60	31.70	35.05	32.56	34.55	6.10	Not Encountered
LC_PIZDC1308	MW13-1S	5,541,232	658,168	1690.42	-0.95	19.81	9.01	4.72	9.45	5.90	8.96	7.60	Not Encountered
LC_PIZDC1309	MW13-2D	5,541,079	658,248	1700.76	-1.20	25.91	24.74	19.35	25.91	19.86	24.59	4.60	25.60
LC_PIZDC1310	MW13-2S	5,541,077	658,249	1700.72	-1.00	12.65	12.58	9.45	12.65	10.54	12.53	4.60	Not Encountered

Note: Coordinates are provided in UTM NAD83.

m - meters

masl - meters above sea level

mags - meters above ground surface

mbgs - metres below ground surface

**Table D2:
Single Well Analysis Results**

Teck Well Name	Golder Well Name	Stick up	Screen Top	Screen Bottom	Screen Length	Water Level	Screened Lithology	Aquifer Type	Method	Flow Model	Approximate Radius of Influence	Assumed Storativity	Skin	Transmissivity	Hydraulic Conductivity	Analysis Figures
		(mbgs)	(mbgs)	(mbgs)	[m]	(mbgs)						Unitless	Unitless	[m ² /s]	[m/s]	
LC_PIZDC1401	MW14-04D	-1.57	32.21	35.25	3.04	-0.90	CLAYEY SILT, sandy, gravelly to GRAVEL and SAND	Semi-confined	Transient	1 shell	< 10 m	1E-03	-1.0	1.E-07	4.E-08	Appendix V
LC_PIZDC1402	MW14-04S	-1.14	9.53	12.57	3.04	-1.14	CLAYEY SILT, sandy, gravelly	Confined	Transient	1 shell	< 10 m	1E-03	-0.4	2.E-07	5.E-08	Appendix V

Notes: m²/s - metres squared/second
 m - metres
 mbgs - metres below ground surface
 n/a - not applicable
 MW14-04S was experiencing artesian conditions and was overflowing the top of the standpipe prior to the start of testing.
 MW14-04D was experiencing artesian conditions prior to the start of testing, with the static water level above ground level and within the PVC stickup.



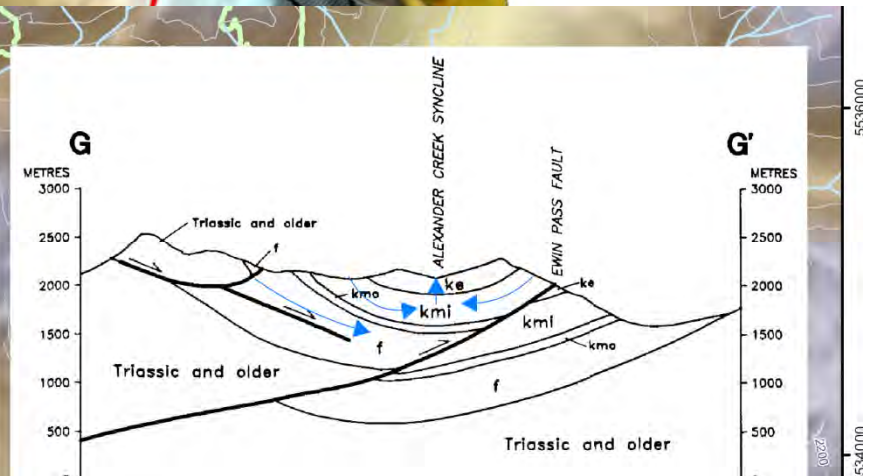
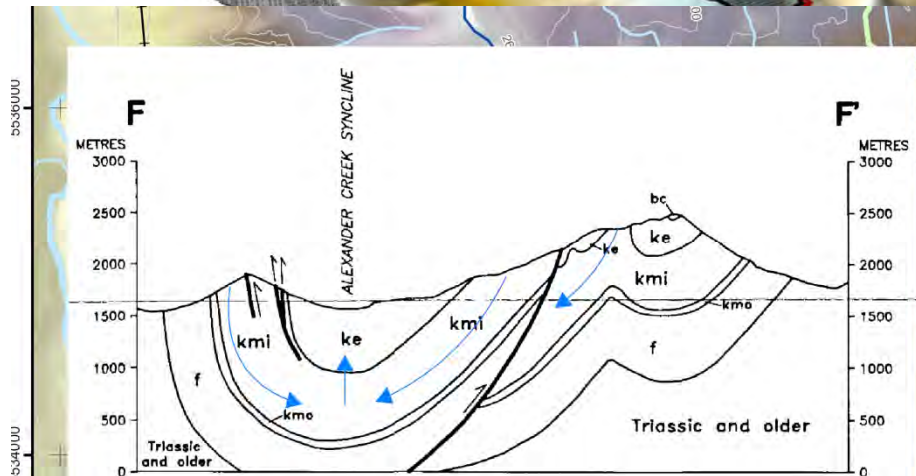
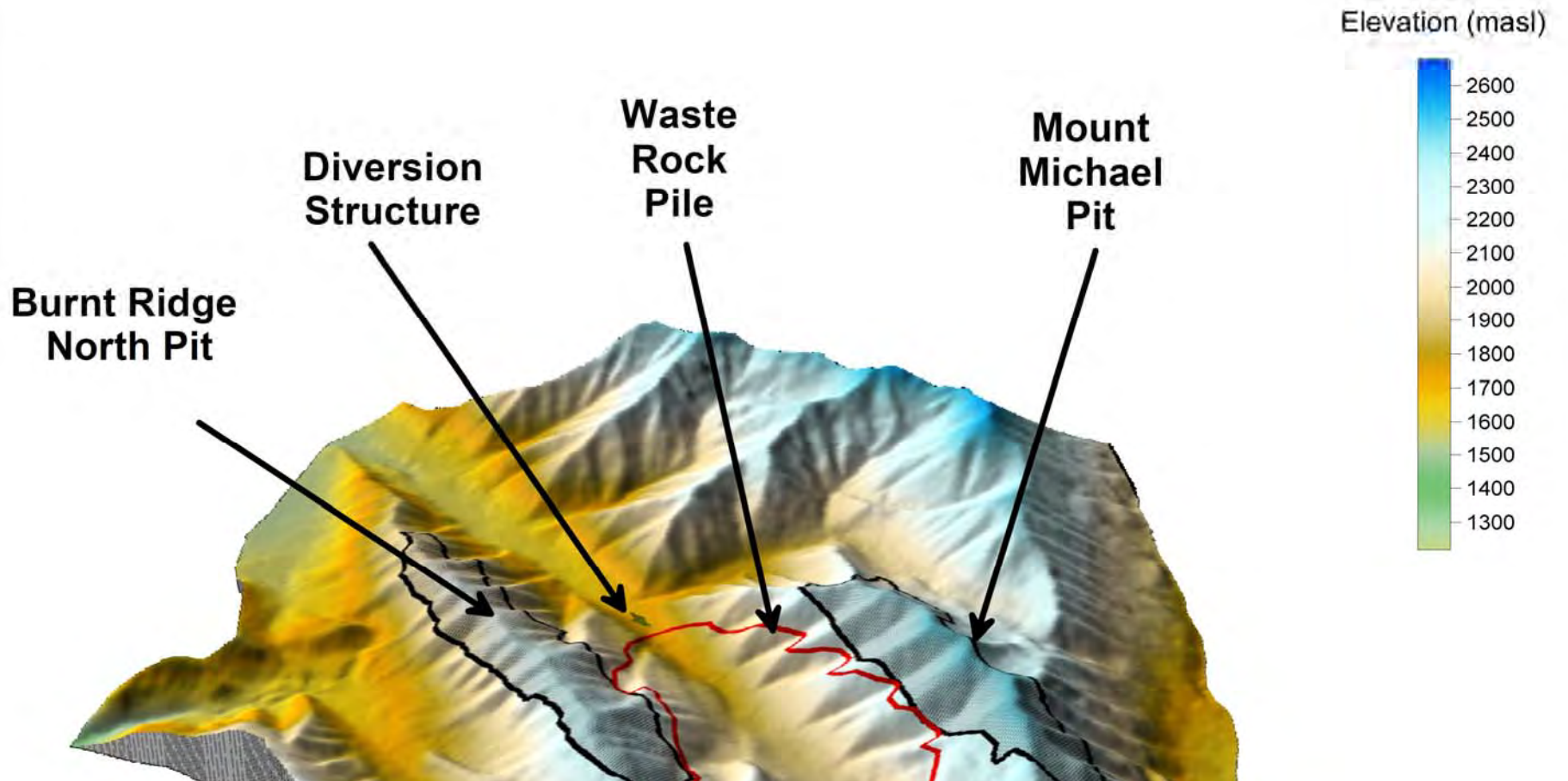
TECK COAL – DRY CREEK

2013 HYDROGEOLOGY PROGRAM

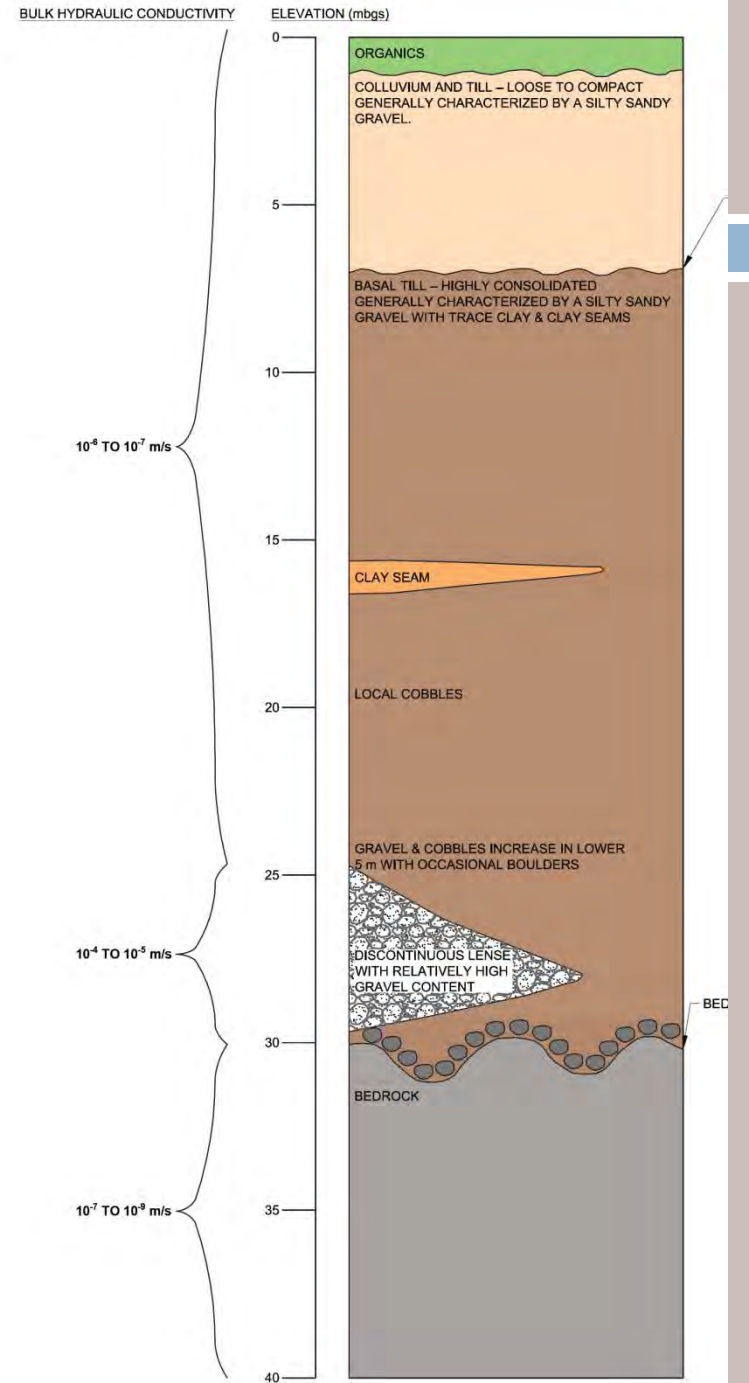
UPDATE

6 NOVEMBER 2013

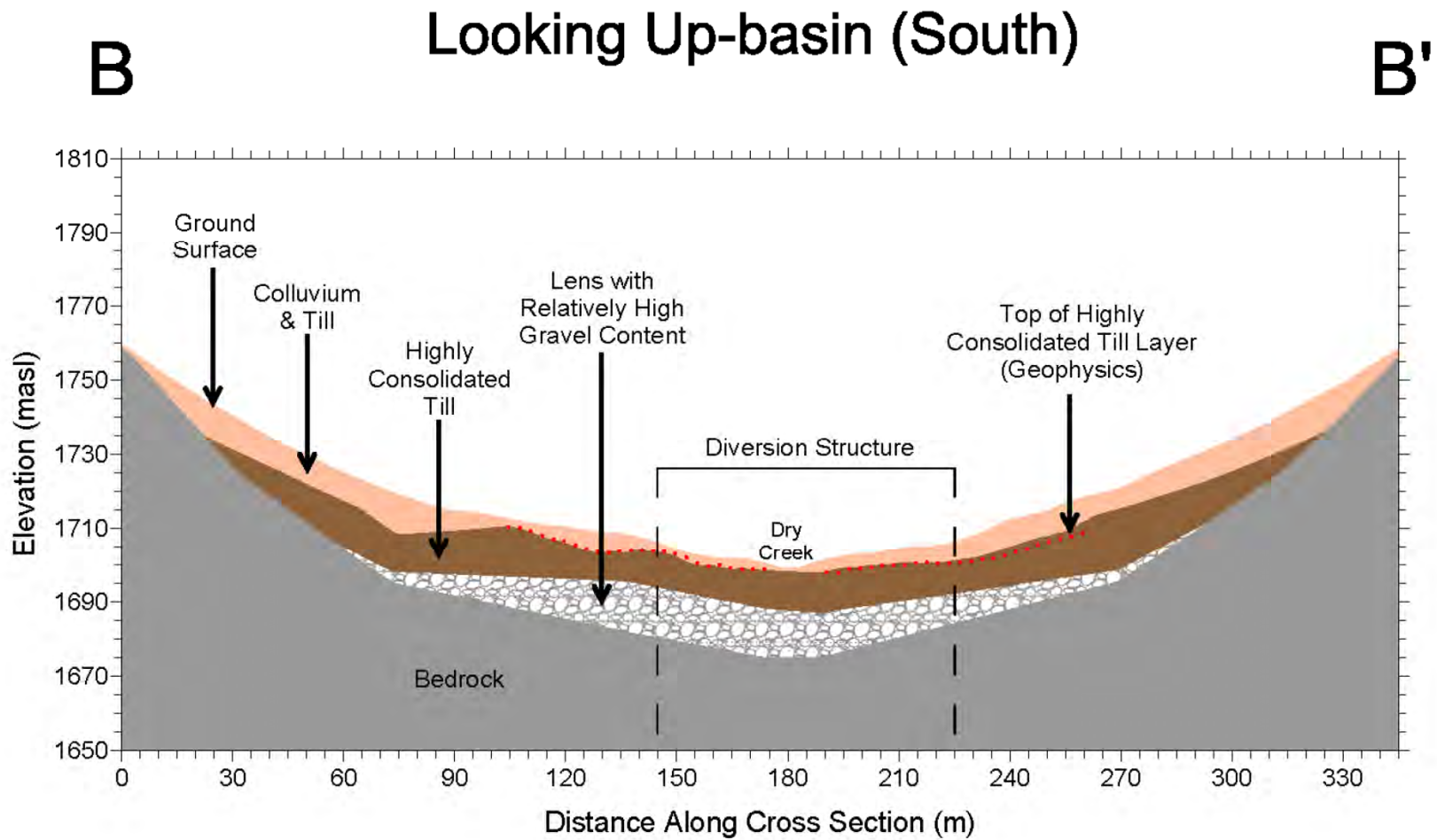
In Support of Dry Creek Water Management System



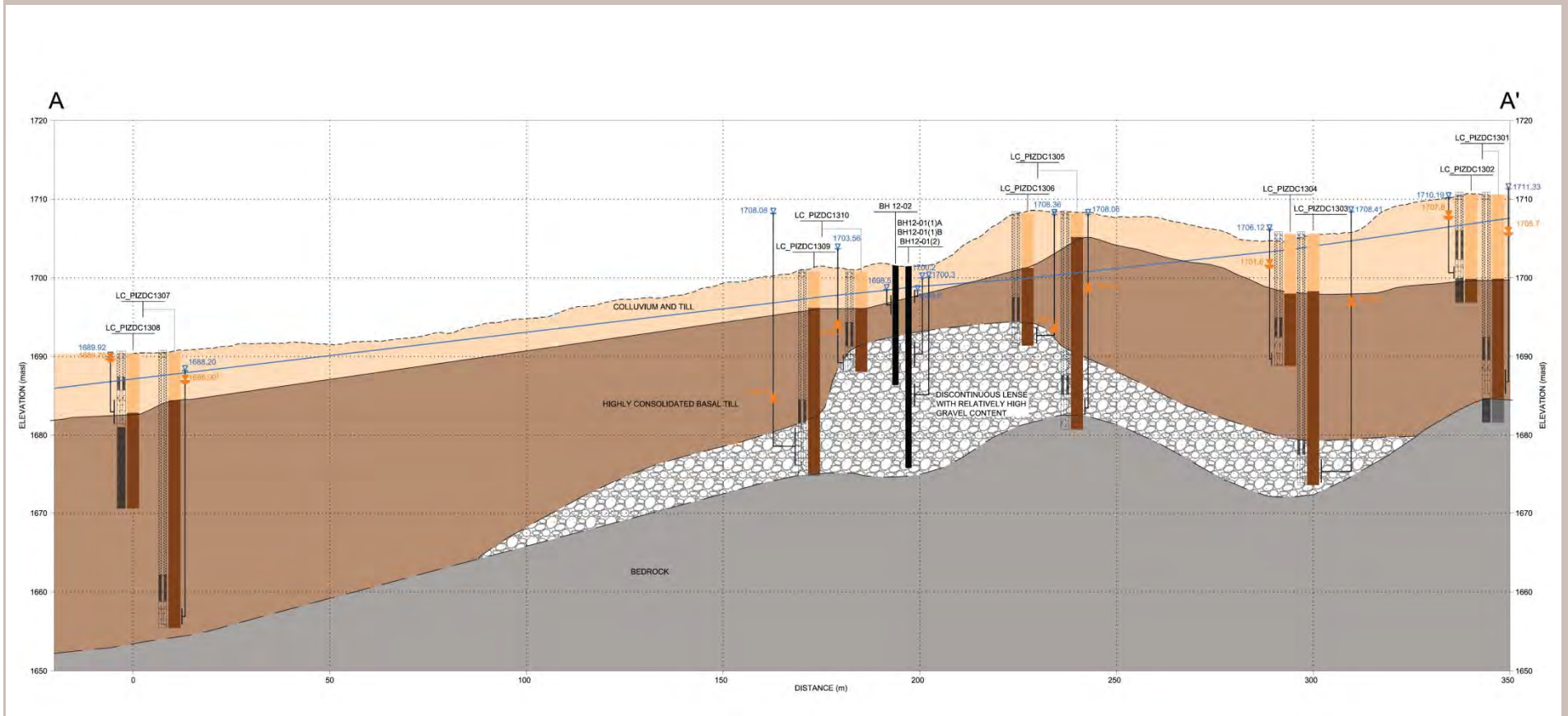
Hydrostratigraphic Column

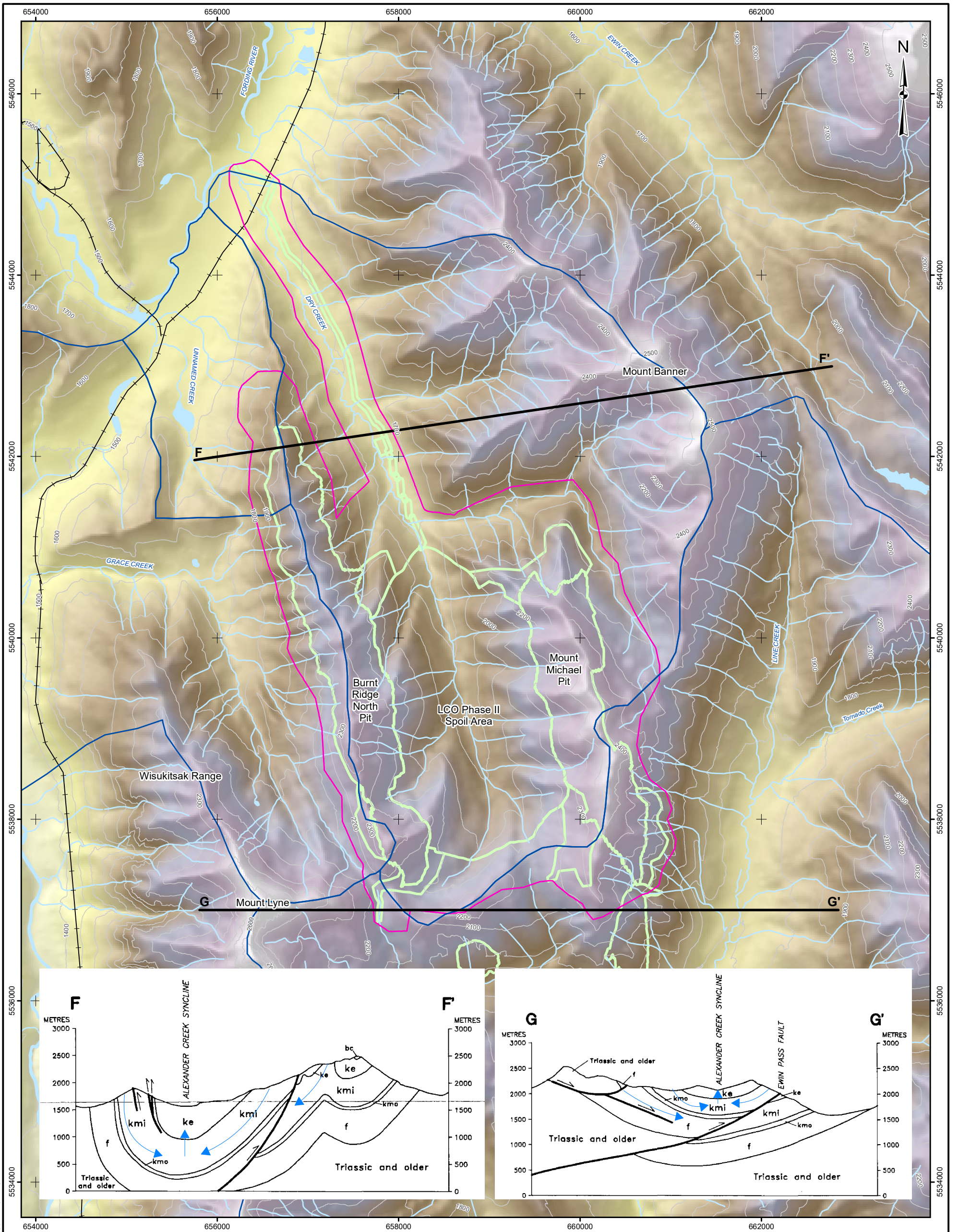


Valley-Transverse Cross-Section



Valley-Longitudinal Cross-Section





- LEGEND**
- CONTOUR (100 m INTERVAL)
 - CROSS SECTION
 - SCHEMATIC FOR REGIONAL GROUNDWATER FLOW PATTERN
 - WATERCOURSE
 - LOCAL WATERSHED
 - OPERATIONAL BOUNDARY FOR LINE CREEK PHASE II PROJECT
 - WATERBODY

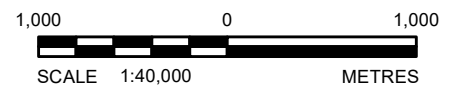
- GEOLOGICAL FORMATIONS:**
- bc: BLAIRMORE GROUP (CRETACEOUS), CADOMIN FORMATION – CONGLOMERATE.
 - ke: KOOTENAY GROUP, ELK FORMATION JURASSIC AND CRETACEOUS) - SANDSTONE, SILTSTONE, MUDSTONE, MINOR COAL, CONGLOMERATE LOCALLY.
 - kmi: KOOTENAY GROUP, MIST MOUNTAIN FORMATION (JURASSIC AND CRETACEOUS) – SILTSTONE, MUDSTONE, SANDSTONE, COAL, CONGLOMERATE LOCALLY.
 - kmo: KOOTENAY GROUP, MORRISSEY FORMATION (JURASSIC AND CRETACEOUS) – SANDSTONE, LOCALLY CONGLOMERATIC MINOR CARBONACEOUS SHALE AND COAL.
 - f: FERNIE FORMATION (JURASSIC) – SHALE, SILTSTONE AND SANDSTONE.


NOTE:
Deviations in regional flow pattern due to small scale heterogeneities not included on the schematic.

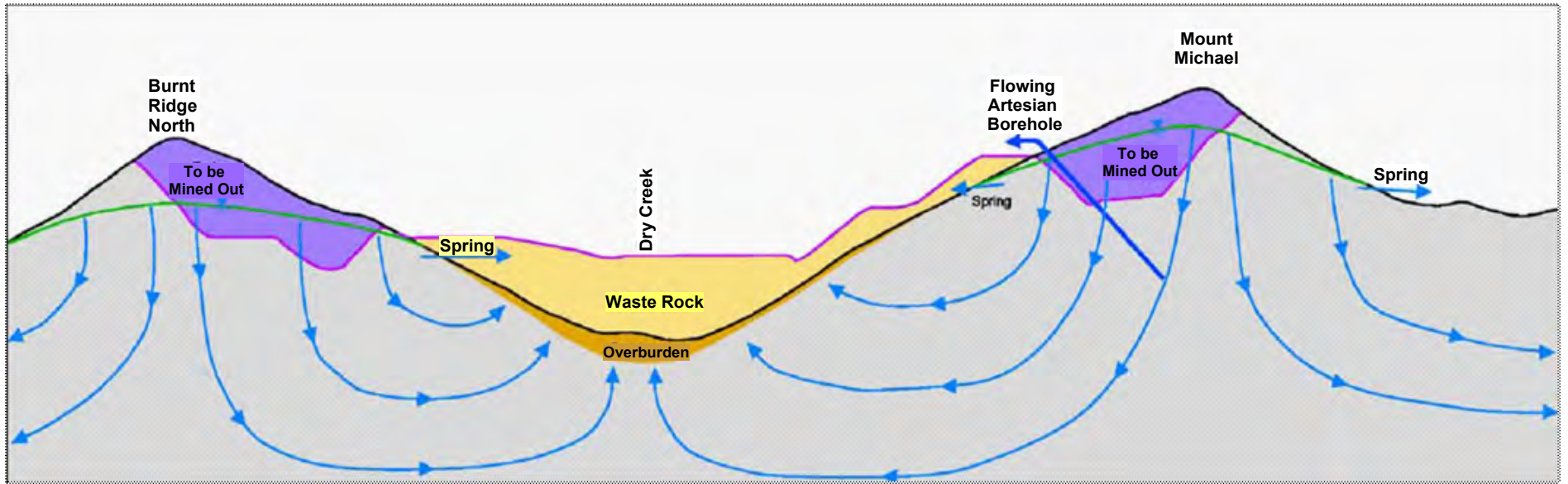
REFERENCE

Hydrography data obtained from GeoGratis. Elevation data obtained from Teck Coal Limited. Cross section data obtained from Province of British Columbia, Ministry of Energy, Mines and Petroleum Resources. Mineral Resources Division. Bulletin 82: Geology and Rank Distribution of the Elk Valley Coalfield, Southern British Columbia (82 G/15, 82J/2, 6, 7, 10, 11). D.A. Grieve. 1993, Pg. 189 Appendix 3.
Projection: UTM Zone 11 Datum: NAD 83


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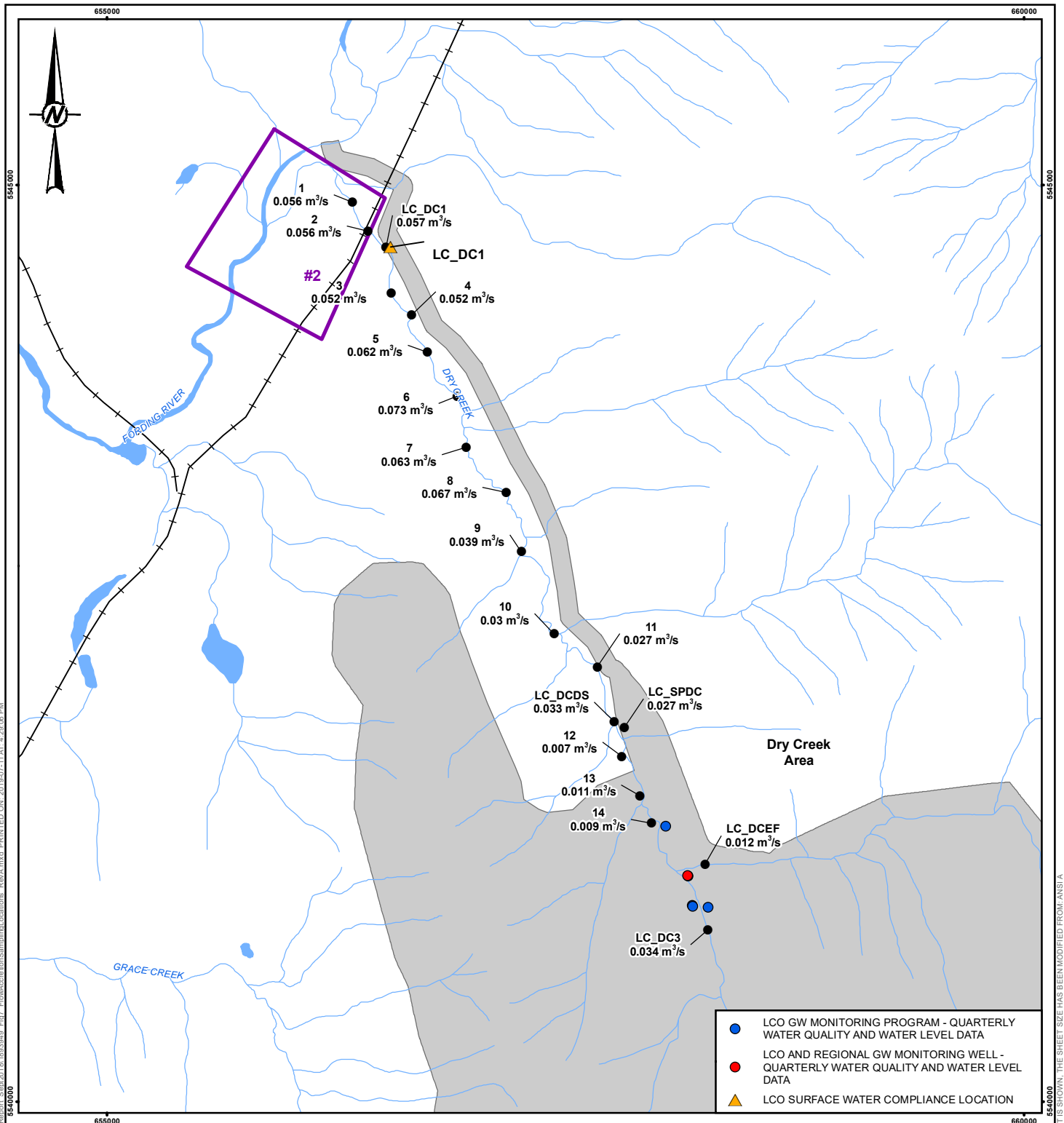


PROJECT		TECK LINE CREEK OPERATIONS ANNUAL GROUNDWATER MONITORING PROGRAM	
TITLE		CONCEPTUAL GROUNDWATER MODEL	
PROJECT No.	13-1348-0017	SCALE AS SHOWN	REV. 0
DESIGN	NS 30 Sep. 2013		FIGURE: 5
GIS	AB 04 Oct. 2013		
CHECK			
REVIEW			



DRAFT

PROJECT		TECK LINE CREEK OPERATIONS ANNUAL GROUNDWATER MONITORING PROGRAM			
TITLE		Conceptual Groundwater Flow Patterns (Cross-Section View)			
PROJECT		19115529		FILE No. 19115529	
DESIGN	NS	03/10/13	SCALE:	AS SHOWN	REV. 0
SURFER					
CHECK					
REVIEW					
 <p>Golder Associates Calgary, Alberta</p>			FIGURE: 6		



- LCO GW MONITORING PROGRAM - QUARTERLY WATER QUALITY AND WATER LEVEL DATA
- LCO AND REGIONAL GW MONITORING WELL - QUARTERLY WATER QUALITY AND WATER LEVEL DATA
- ▲ LCO SURFACE WATER COMPLIANCE LOCATION

LEGEND

- FLOW ACCRETION SAMPLING LOCATION
- CANADIAN PACIFIC RAILWAY
- WATERCOURSE
- KEY AREA IN THE REGIONAL GROUNDWATER MONITORING PROGRAM
- LINE CREEK OPERATIONS
- WATERBODY

DRAFT



REFERENCE(S)

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CLIENT
TECK COAL LIMITED

PROJECT
TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE
NOVEMBER 2018 FLOW ACCRETION STUDY RESULTS

CONSULTANT
YYYY-MM-DD 2019-07-11



DESIGNED	LM
PREPARED	PS
REVIEWED	
APPROVED	

PROJECT NO. 1893949	PHASE 2000	REV. A	FIGURE 7
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PATH: I:\CLIENTS\TECK_COAL\1893949\MapData\Hydrology\GroundwaterMonitoring\Report_Summary\18_0933949_Ep77_FlowAccretionSamplingLocations_RevA.mxd PRINTED ON: 2019-07-11 AT: 4:29:06 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI/A

APPENDIX E

Statistical Analysis Results

Table E1. Mann-Kendall Q1 Results Summary

Parameter	LC_PIZP1104			LC_PIZP1105			LC_PIZDC0901			LC_PIZP1306			RG_02-20		
	Coefficient of Variation	Confidence Factor	Q1 Trend	Coefficient of Variation	Confidence Factor	Q1 Trend	Coefficient of Variation	Confidence Factor	Q1 Trend	Coefficient of Variation	Confidence Factor	Q1 Trend	Coefficient of Variation	Confidence Factor	Q1 Trend
Nitrate, as N (mg-N/L)	0.42	88.3%	No Trend	0.89	59.2%	No Trend	1.47	50.0%	No Trend	*Insufficient data (<4 data points in Q1)	0.08	82.1%	Stable		
Sulphate (mg/L)	0.44	59.2%	No Trend	0.19	99.2%	Increasing	0.51	64.0%	Stable		0.06	95.8%	Increasing		
Cadmium (µg/L)	1.3	59.2%	No Trend	0.4	95.8%	Increasing	0.33	64.0%	No Trend		1.4	75.8%	No Trend		
Selenium (µg/L)	0.44	99.2%	Increasing	0.41	75.8%	No Trend	0.54	64.0%	No Trend		0.13	59.2%	Stable		

Notes:
 LC_PIZP1104, LC_PIZP1105, LC_PIZDC0901 and LC_PIZP1306 analyzed for dissolved metals (i.e. cadmium and selenium)
 RG_02-20 analyzed for total metals (i.e. cadmium and selenium)

Table E2. Mann-Kendall Q4 Results Summary

Parameter	LC_PIZP1104			LC_PIZP1105			LC_PIZDC0901			LC_PIZP1306			RG_02-20		
	Coefficient of Variation	Confidence Factor	Q4 Trend	Coefficient of Variation	Confidence Factor	Q4 Trend	Coefficient of Variation	Confidence Factor	Q4 Trend	Coefficient of Variation	Confidence Factor	Q4 Trend	Coefficient of Variation	Confidence Factor	Q4 Trend
Nitrate, as N (mg-N/L)	0.35	64.0%	No Trend	1.10	88.3%	No Trend	1.3	76.5%	No Trend	0.5	62.5%	No Trend	0.08	93.2%	Prob. Decreasing
Sulphate (mg/L)	0.26	97.2%	Decreasing	0.25	99.2%	Increasing	0.45	86.4%	No Trend	0.06	37.5%	Stable	0.04	76.5%	No Trend
Cadmium (µg/L)	0.37	93.2%	Prob. Increasing	0.5	75.8%	No Trend	0.36	64.0%	Stable	0.1	83.3%	No Trend	1.6	93.2%	Prob. Decreasing
Selenium (µg/L)	0.7	76.5%	Stable	0.68	59.2%	Stable	0.33	99.2%	Increasing	0.3	83.3%	No Trend	0.09	76.5%	Stable

Notes:
 LC_PIZP1104, LC_PIZP1105, LC_PIZDC0901 and LC_PIZP1306 analyzed for dissolved metals (i.e. cadmium and selenium)
 RG_02-20 analyzed for total metals (i.e. cadmium and selenium)

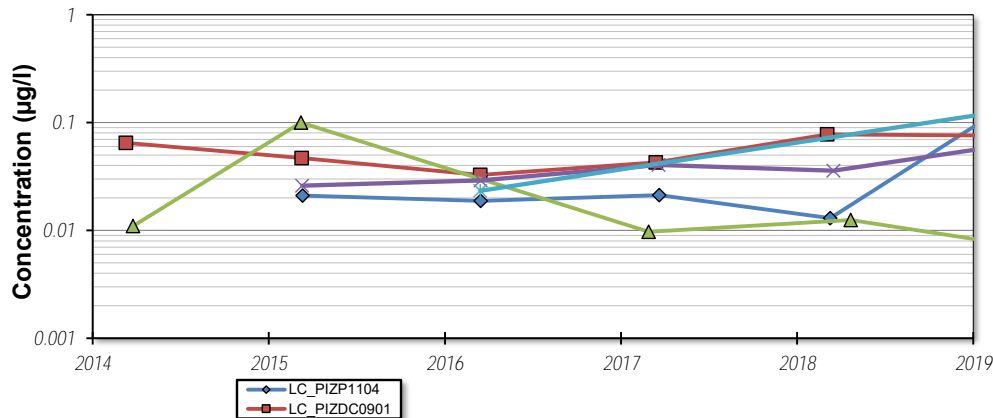
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **18-Feb-20**
 Facility Name: **Golder**
 Conducted By: **Kurt Forsch**

Job ID: **19135981**
 Constituent: **Cadmium**
 Concentration Units: **µg/l**

Sampling Point ID: **LC_PIZP1104 LC_PIZDC0901 RG_02-20 LC_PIZP1105 LC_PIZDC1306**

Sampling Event	Sampling Date	CADMIUM CONCENTRATION (µg/l)				
		LC_PIZP1104	LC_PIZDC0901	RG_02-20	LC_PIZP1105	LC_PIZDC1306
1	13-Mar-15	0.021				
2	17-Mar-16	0.0188				
3	23-Mar-17	0.0212				
4	13-Mar-18	0.013				
5	18-Mar-19	0.146				
6	11-Mar-14		0.065			
7	11-Mar-15		0.047			
8	16-Mar-16		0.0327			
9	16-Mar-17		0.0427			
10	7-Mar-18		0.0777			
11	26-Mar-19		0.0757			
12	26-Mar-14			0.011		
13	10-Mar-15			0.1		
14	1-Mar-17			0.0097		
15	25-Apr-18			0.0125		
16	25-Feb-19			0.0077		
17	12-Mar-15				0.026	
18	17-Mar-16				0.0291	
19	22-Mar-17				0.0404	
20	20-Mar-18				0.0358	
21	29-Mar-19				0.0633	
22	16-Mar-16					0.0233
23	25-Mar-19					0.131
24						
25						
Coefficient of Variation:		1.30	0.33	1.43	0.38	0.99
Mann-Kendall Statistic (S):		2	3	-4	8	1
Confidence Factor:		59.2%	64.0%	75.8%	95.8%	
Concentration Trend:		No Trend	No Trend	No Trend	Increasing	



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

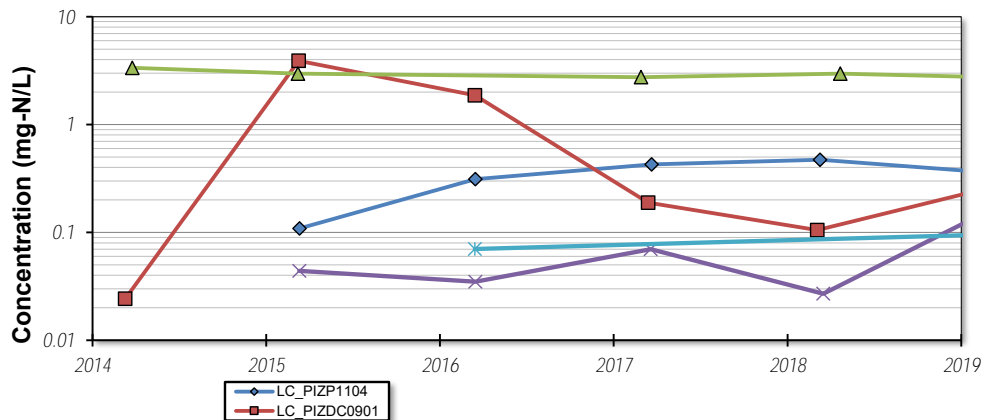
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **18-Feb-20** Job ID: **19135981**
 Facility Name: **Golder** Constituent: **Nitrate, as N**
 Conducted By: **Kurt Forsch** Concentration Units: **mg-N/L**

Sampling Point ID: **LC_PIZP1104 LC_PIZDC0901 RG_02-20 LC_PIZP1105 LC_PIZDC1306**

Sampling Event	Sampling Date	NITRATE, AS N CONCENTRATION (mg-N/L)				
		LC_PIZP1104	LC_PIZDC0901	RG_02-20	LC_PIZP1105	LC_PIZDC1306
1	13-Mar-15	0.109				
2	17-Mar-16	0.312				
3	23-Mar-17	0.428				
4	13-Mar-18	0.472				
5	18-Mar-19	0.357				
6	11-Mar-14		0.0243			
7	11-Mar-15		3.9			
8	16-Mar-16		1.87			
9	16-Mar-17		0.189			
10	7-Mar-18		0.105			
11	26-Mar-19		0.273			
12	26-Mar-14			3.36		
13	10-Mar-15			2.97		
14	1-Mar-17			2.75		
15	25-Apr-18			2.97		
16	25-Feb-19			2.76		
17	12-Mar-15				0.044	
18	17-Mar-16				0.035	
19	22-Mar-17				0.07	
20	20-Mar-18				0.027	
21	29-Mar-19				0.181	
22	16-Mar-16					0.0702
23	25-Mar-19					0.0962
24						
25						
Coefficient of Variation:		0.42	1.47	0.08	0.89	0.22
Mann-Kendall Statistic (S):		6	-1	-5	2	1
Confidence Factor:		88.3%	50.0%	82.1%	59.2%	
Concentration Trend:		No Trend	No Trend	Stable	No Trend	



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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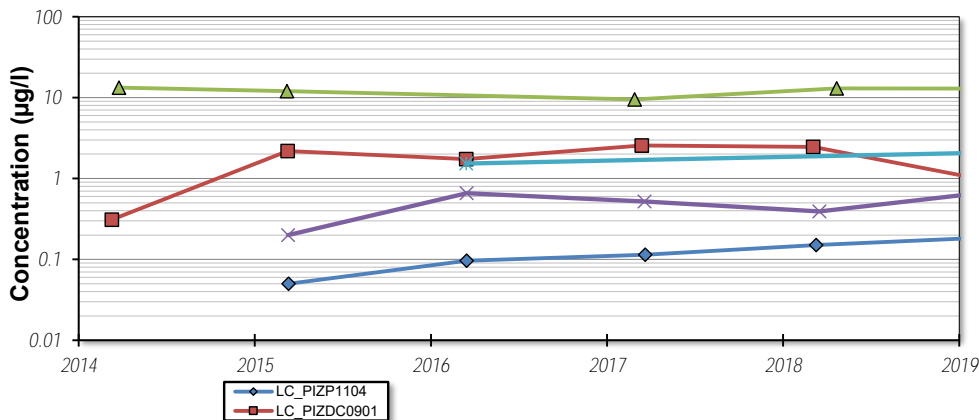
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **18-Feb-20**
 Facility Name: **Golder**
 Conducted By: **Kurt Forsch**

Job ID: **19135981**
 Constituent: **Selenium**
 Concentration Units: **µg/l**

Sampling Point ID: **LC_PIZP1104 LC_PIZDC0901 RG_02-20 LC_PIZP1105 LC_PIZDC1306**

Sampling Event	Sampling Date	SELENIUM CONCENTRATION (µg/l)				
		LC_PIZP1104	LC_PIZDC0901	RG_02-20	LC_PIZP1105	LC_PIZDC1306
1	13-Mar-15	0.05				
2	17-Mar-16	0.096				
3	23-Mar-17	0.114				
4	13-Mar-18	0.15				
5	18-Mar-19	0.188				
6	11-Mar-14		0.31			
7	11-Mar-15		2.18			
8	16-Mar-16		1.74			
9	16-Mar-17		2.56			
10	7-Mar-18		2.46			
11	26-Mar-19		0.894			
12	26-Mar-14			13.3		
13	10-Mar-15			12		
14	1-Mar-17			9.5		
15	25-Apr-18			13		
16	25-Feb-19			12.9		
17	12-Mar-15				0.2	
18	17-Mar-16				0.657	
19	22-Mar-17				0.521	
20	20-Mar-18				0.391	
21	29-Mar-19				0.704	
22	16-Mar-16					1.53
23	25-Mar-19					2.1
24						
25						
Coefficient of Variation:		0.44	0.54	0.13	0.41	0.22
Mann-Kendall Statistic (S):		10	3	-2	4	1
Confidence Factor:		99.2%	64.0%	59.2%	75.8%	
Concentration Trend:		Increasing	No Trend	Stable	No Trend	



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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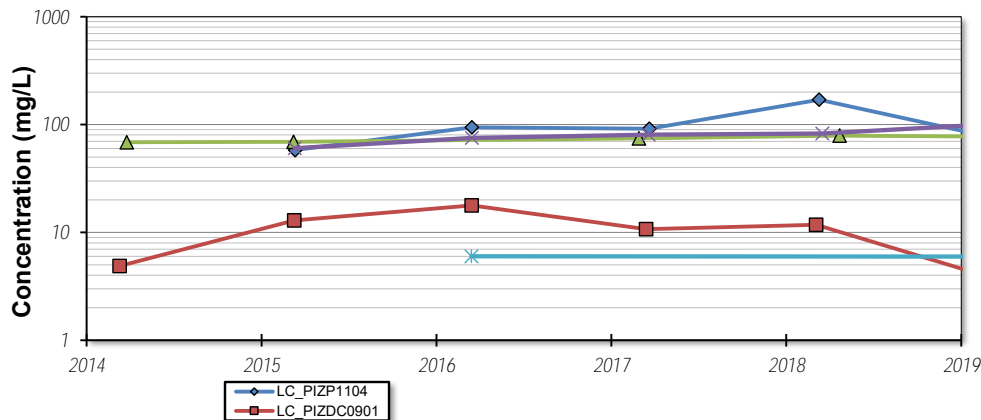
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **18-Feb-20**
 Facility Name: **Golder**
 Conducted By: **Kurt Forsch**

Job ID: **19135981**
 Constituent: **Sulphate**
 Concentration Units: **mg/L**

Sampling Point ID: **LC_PIZP1104** | **LC_PIZDC0901** | **RG_02-20** | **LC_PIZP1105** | **LC_PIZDC1306**

Sampling Event	Sampling Date	SULPHATE CONCENTRATION (mg/L)				
1	13-Mar-15	58.1				
2	17-Mar-16	94.1				
3	23-Mar-17	91.8				
4	13-Mar-18	170				
5	18-Mar-19	74.7				
6	11-Mar-14		4.87			
7	11-Mar-15		12.9			
8	16-Mar-16		17.8			
9	16-Mar-17		10.7			
10	7-Mar-18		11.8			
11	26-Mar-19		3.61			
12	26-Mar-14			68.6		
13	10-Mar-15			69.1		
14	1-Mar-17			74.6		
15	25-Apr-18			78.9		
16	25-Feb-19			77.6		
17	12-Mar-15				60.4	
18	17-Mar-16				75.3	
19	22-Mar-17				80.4	
20	20-Mar-18				82.7	
21	29-Mar-19				102	
22	16-Mar-16					6.01
23	25-Mar-19					5.97
24						
25						
Coefficient of Variation:		0.44	0.51	0.06	0.19	0.00
Mann-Kendall Statistic (S):		2	-3	8	10	-1
Confidence Factor:		59.2%	64.0%	95.8%	99.2%	
Concentration Trend:		No Trend	Stable	Increasing	Increasing	



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

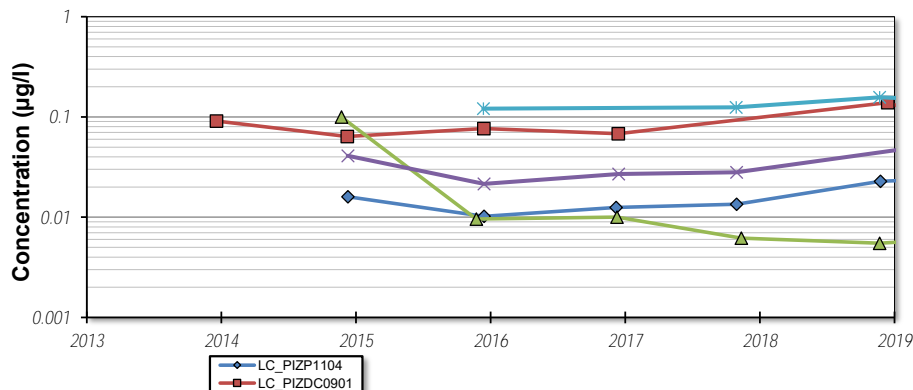
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 18-Feb-20	Job ID: 19135981
Facility Name: Golder	Constituent: Cadmium
Conducted By: Kurt Forsch	Concentration Units: µg/l

Sampling Point ID: **LC_PIZP1104** | **LC_PIZDC0901** | **RG_02-20** | **LC_PIZP1105** | **LC_PIZDC1306**

Sampling Event	Sampling Date	CADMIUM CONCENTRATION (µg/l)				
		LC_PIZP1104	LC_PIZDC0901	RG_02-20	LC_PIZP1105	LC_PIZDC1306
1	11-Dec-14	0.016				
2	17-Dec-15	0.0102				
3	9-Dec-16	0.0125				
4	2-Nov-17	0.0135				
5	28-Nov-18	0.0228				
6	21-Nov-19	0.0257				
7	19-Dec-13		0.091			
8	10-Dec-14		0.064			
9	16-Dec-15		0.0767			
10	15-Dec-16		0.068			
11	18-Dec-18		0.139			
12	6-Nov-19		0.0564			
13	24-Nov-14			0.1		
14	26-Nov-15			0.0096		
15	12-Dec-16			0.01		
16	15-Nov-17			0.0062		
17	26-Nov-18			0.0055		
18	28-Nov-19			0.0066		
19	11-Dec-14				0.041	
20	17-Dec-15				0.0215	
21	16-Dec-16				0.027	
22	2-Nov-17				0.028	
23	14-Nov-19				0.067	
24	15-Dec-15					0.121
25	1-Nov-17					0.125
26	26-Nov-18					0.157
27	7-Nov-19					0.14
28						
29						
30						
Coefficient of Variation:		0.37	0.36	1.64	0.50	0.12
Mann-Kendall Statistic (S):		9	-3	-9	4	4
Confidence Factor:		93.2%	64.0%	93.2%	75.8%	83.3%
Concentration Trend:		Prob. Increasing	Stable	Prob. Decreasing	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

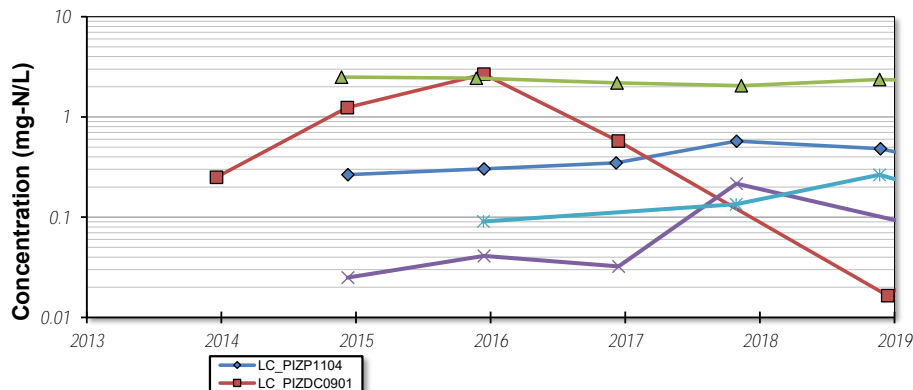
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **18-Feb-20** Job ID: **19135981**
 Facility Name: **Golder** Constituent: **Nitrate, as N**
 Conducted By: **Kurt Forsch** Concentration Units: **mg-N/L**

Sampling Point ID: **LC_PIZP1104** **LC_PIZDC0901** **RG_02-20** **LC_PIZP1105** **LC_PIZDC1306**

Sampling Event	Sampling Date	NITRATE, AS N CONCENTRATION (mg-N/L)				
1	11-Dec-14	0.266				
2	17-Dec-15	0.303				
3	9-Dec-16	0.348				
4	2-Nov-17	0.574				
5	28-Nov-18	0.483				
6	21-Nov-19	0.249				
7	19-Dec-13		0.25			
8	10-Dec-14		1.24			
9	16-Dec-15		2.67			
10	15-Dec-16		0.575			
11	18-Dec-18		0.0165			
12	6-Nov-19		0.113			
13	24-Nov-14			2.5		
14	26-Nov-15			2.44		
15	12-Dec-16			2.19		
16	15-Nov-17			2.05		
17	26-Nov-18			2.37		
18	28-Nov-19			2.17		
19	11-Dec-14				0.025	
20	17-Dec-15				0.041	
21	16-Dec-16				0.0323	
22	2-Nov-17				0.216	
23	14-Nov-19				0.051	
24	15-Dec-15					0.0906
25	1-Nov-17					0.135
26	26-Nov-18					0.265
27	7-Nov-19					0.114
28						
29						
30						
Coefficient of Variation:		0.35	1.25	0.08	1.10	0.52
Mann-Kendall Statistic (S):		3	-5	-9	6	2
Confidence Factor:		64.0%	76.5%	93.2%	88.3%	62.5%
Concentration Trend:		No Trend	No Trend	Prob. Decreasing	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

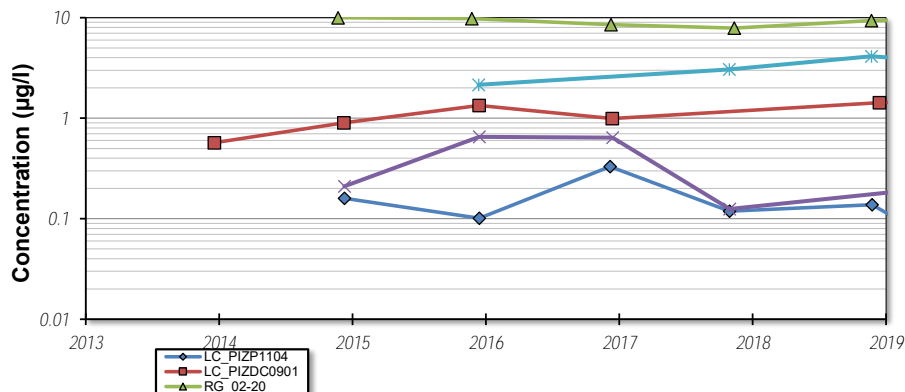
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 18-Feb-20	Job ID: 19135981
Facility Name: Golder	Constituent: Selenium
Conducted By: Kurt Forsch	Concentration Units: µg/l

Sampling Point ID: **LC_PIZP1104** | **LC_PIZDC0901** | **RG_02-20** | **LC_PIZP1105** | **LC_PIZDC1306**

Sampling Event	Sampling Date	SELENIUM CONCENTRATION (µg/l)				
		LC_PIZP1104	LC_PIZDC0901	RG_02-20	LC_PIZP1105	LC_PIZDC1306
1	11-Dec-14	0.16				
2	17-Dec-15	0.101				
3	9-Dec-16	0.33				
4	2-Nov-17	0.119				
5	28-Nov-18	0.138				
6	21-Nov-19	0.025				
7	19-Dec-13		0.57			
8	10-Dec-14		0.9			
9	16-Dec-15		1.34			
10	15-Dec-16		0.99			
11	18-Dec-18		1.43			
12	6-Nov-19		1.57			
13	24-Nov-14			10		
14	26-Nov-15			9.79		
15	12-Dec-16			8.54		
16	15-Nov-17			7.88		
17	26-Nov-18			9.36		
18	28-Nov-19			9.67		
19	11-Dec-14				0.21	
20	17-Dec-15				0.652	
21	16-Dec-16				0.64	
22	2-Nov-17				0.125	
23	14-Nov-19				0.238	
24	15-Dec-15					2.15
25	1-Nov-17					3.06
26	26-Nov-18					4.13
27	7-Nov-19					3.36
28						
29						
30						
Coefficient of Variation:		0.70	0.33	0.09	0.68	0.26
Mann-Kendall Statistic (S):		-5	13	-5	-2	4
Confidence Factor:		76.5%	99.2%	76.5%	59.2%	83.3%
Concentration Trend:		Stable	Increasing	Stable	Stable	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

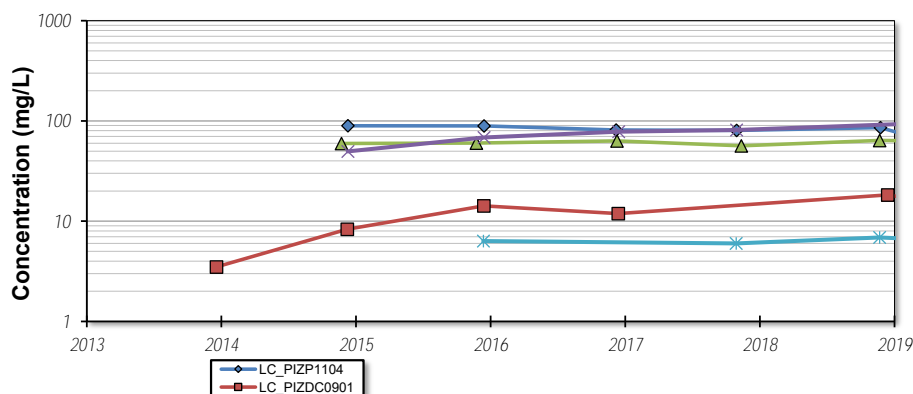
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 18-Feb-20	Job ID: 19135981
Facility Name: Golder	Constituent: Sulphate
Conducted By: Kurt Forsch	Concentration Units: mg/L

Sampling Point ID: **LC_PIZP1104** | **LC_PIZDC0901** | **RG_02-20** | **LC_PIZP1105** | **LC_PIZDC1306**

Sampling Event	Sampling Date	SULPHATE CONCENTRATION (mg/L)				
1	11-Dec-14	89.5				
2	17-Dec-15	89.4				
3	9-Dec-16	81.4				
4	2-Nov-17	80.6				
5	28-Nov-18	85.7				
6	21-Nov-19	36.2				
7	19-Dec-13		3.5			
8	10-Dec-14		8.31			
9	16-Dec-15		14.2			
10	15-Dec-16		11.9			
11	18-Dec-18		18.3			
12	6-Nov-19		11.7			
13	24-Nov-14			59.6		
14	26-Nov-15			60.2		
15	12-Dec-16			63.3		
16	15-Nov-17			56.5		
17	26-Nov-18			63.9		
18	28-Nov-19			61.6		
19	11-Dec-14				49.7	
20	17-Dec-15				68.4	
21	16-Dec-16				78.1	
22	2-Nov-17				81.3	
23	14-Nov-19				102	
24	15-Dec-15					6.33
25	1-Nov-17					6
26	26-Nov-18					6.88
27	7-Nov-19					6.06
28						
29						
30						
Coefficient of Variation:		0.26	0.45	0.04	0.25	0.06
Mann-Kendall Statistic (S):		-11	7	5	10	0
Confidence Factor:		97.2%	86.4%	76.5%	99.2%	37.5%
Concentration Trend:		Decreasing	No Trend	No Trend	Increasing	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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Table E3. Upper Control Limit Summary - Process Plant Area & Downgradient Location

Location Description	Upper Control Limit for RG_02-20			Upper Control Limit for LC_PIZP1104			Upper Control Limit LC_PIZP1105		
	Downgradient of Plant Site			Phase I - Process Plant			Phase I - Process Plant		
Parameter	2018	2019	% Change	2018	2019	% Change	2018	2019	% Change
Nitrate, as N (mg-N/L)	6.457	6.415	-0.7%	0.973	0.951	-2.3%	NC	0.674	NC
Sulphate (mg/L)	655.202	645.258	-1.5%	257.365	249.368	-3.1%	NC	267.235	NC
Cadmium (µg/L)	0.122	0.119	-2.3%	0.0498	0.165	231.3%	NC	0.115	NC
Selenium (µg/L)	24.927	25.116	0.8%	0.484	0.481	-0.6%	NC	1.201	NC

Notes:

LC_PIZP1104 and LC_PIZP1105 analyzed for dissolved metals (i.e. cadmium and Selenium)

RG_02-20 analyzed for total metals (i.e. cadmium and selenium)

Highlighted cell shown an increase in the Upper Control Limit from 2018 to 2019

The significant increase in the upper control limit for cadmium at LC_PIZP1104 is attributed to the elevated March 2019 concentration of 0.146 ug/L; this value should be excluded during calculation of the 2020 upper control limit.

Table E4. Upper Control Limit Summary - Dry Creek Area

Location Description	LC_PIZDC0901			LC_PIZDC1306		
	Phase II - Dry Creek			Phase II - Dry Creek		
Parameter	2018	2019	% Change	2018	2019	% Change
Nitrate, as N (mg-N/L)	9.274	9.112	-1.7%	NC	0.408	NC
Sulphate (mg/L)	30.766	32.179	4.6%	NC	14.532	NC
Cadmium (µg/L)	0.214	0.215	0.7%	NC	0.52	NC
Selenium (µg/L)	6.102	6.005	-1.6%	NC	8.986	NC

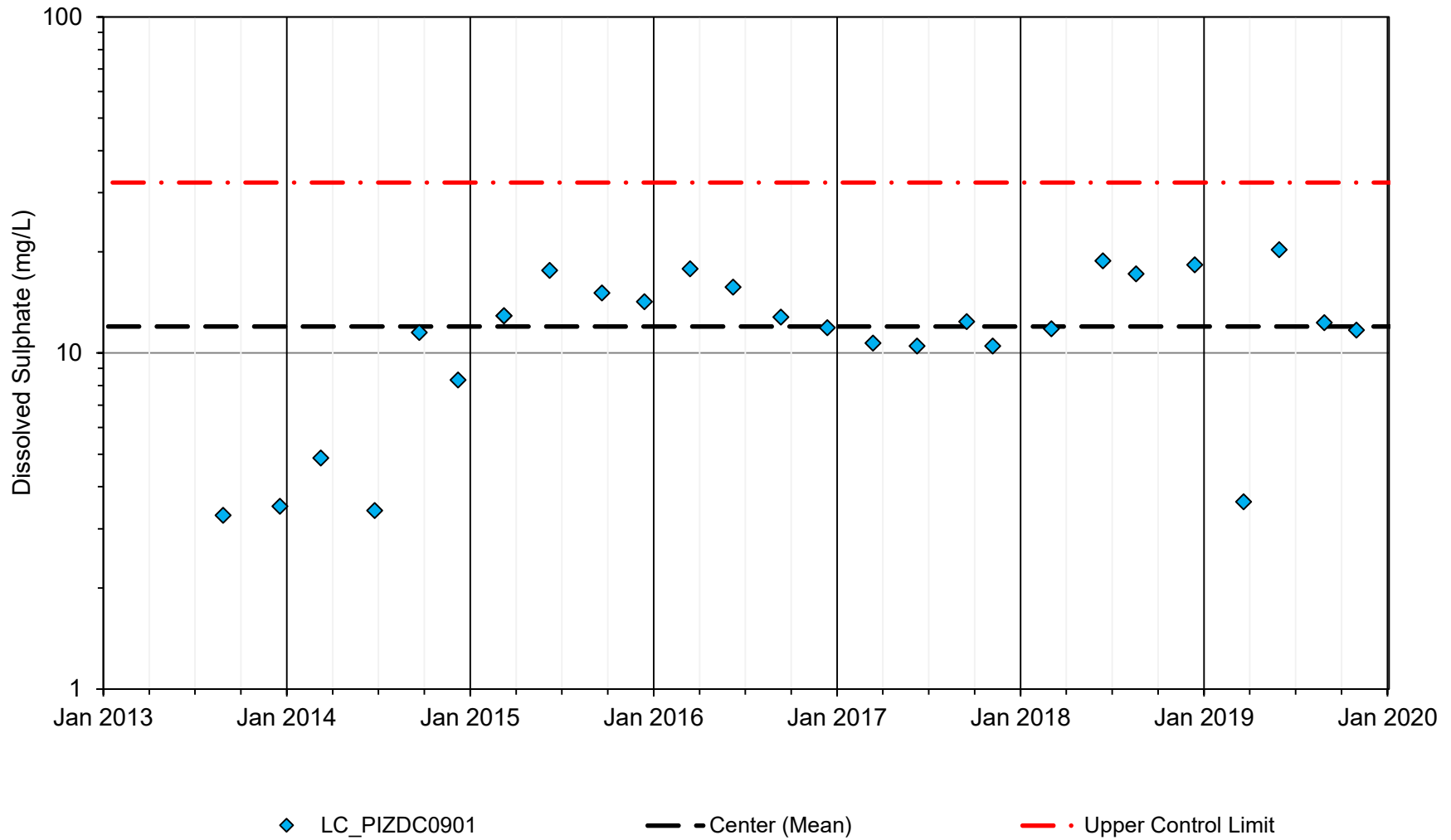
Notes:

LC_PIZP1104 and LC_PIZP1105 analyzed for dissolved metals (i.e. cadmium and Selenium)

RG_02-20 analyzed for total metals (i.e. cadmium and selenium)

NC - not calculated

Highlighted cell shown an increase in the Upper Control Limit from 2018 to 2019



NOTES

Lower Control Limit = 1.336 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 32.179 mg/L (99.7 percentile of data set)

CLIENT

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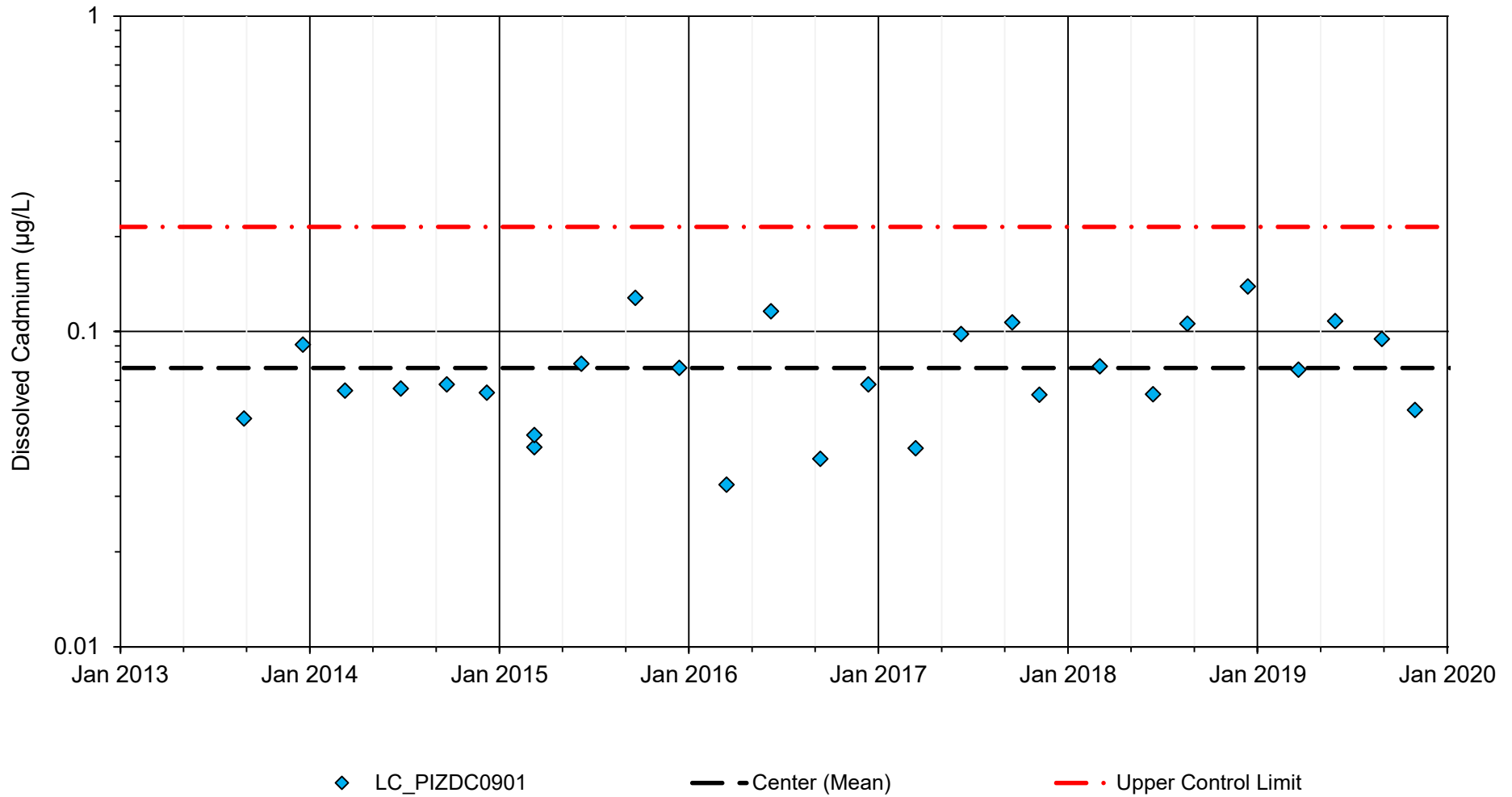
LC_PIZDC0901 Dissolved Sulphate Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E1a



NOTES

Lower Control Limit = 0.013 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.215 mg/L (99.7 percentile of data set)

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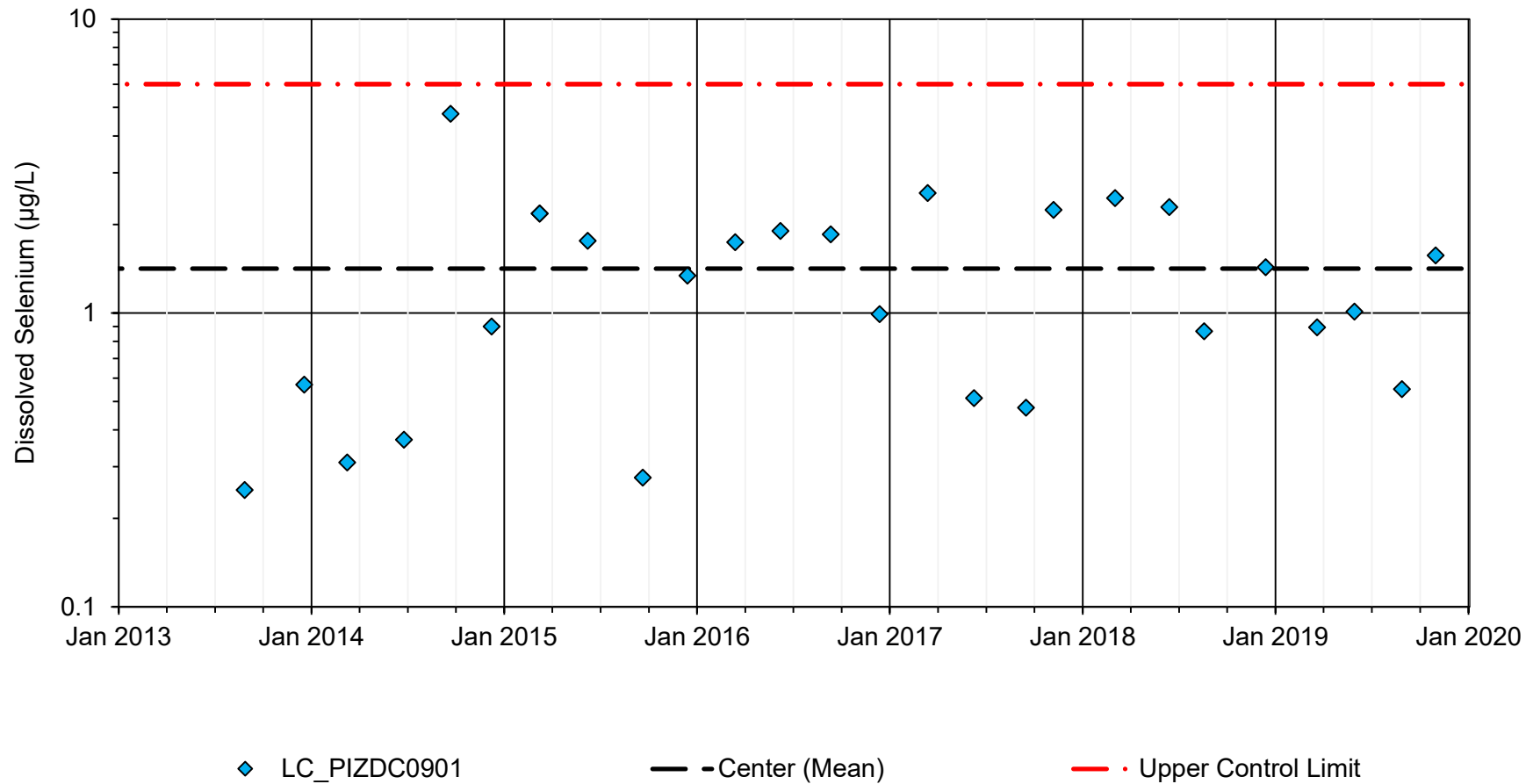
LC_PIZDC0901 Dissolved Cadmium Control Charting

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PHASE
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REV
0

FIGURE
E1b



NOTES

Lower Control Limit = 0.609 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 6.005 mg/L (99.7 percentile of data set)

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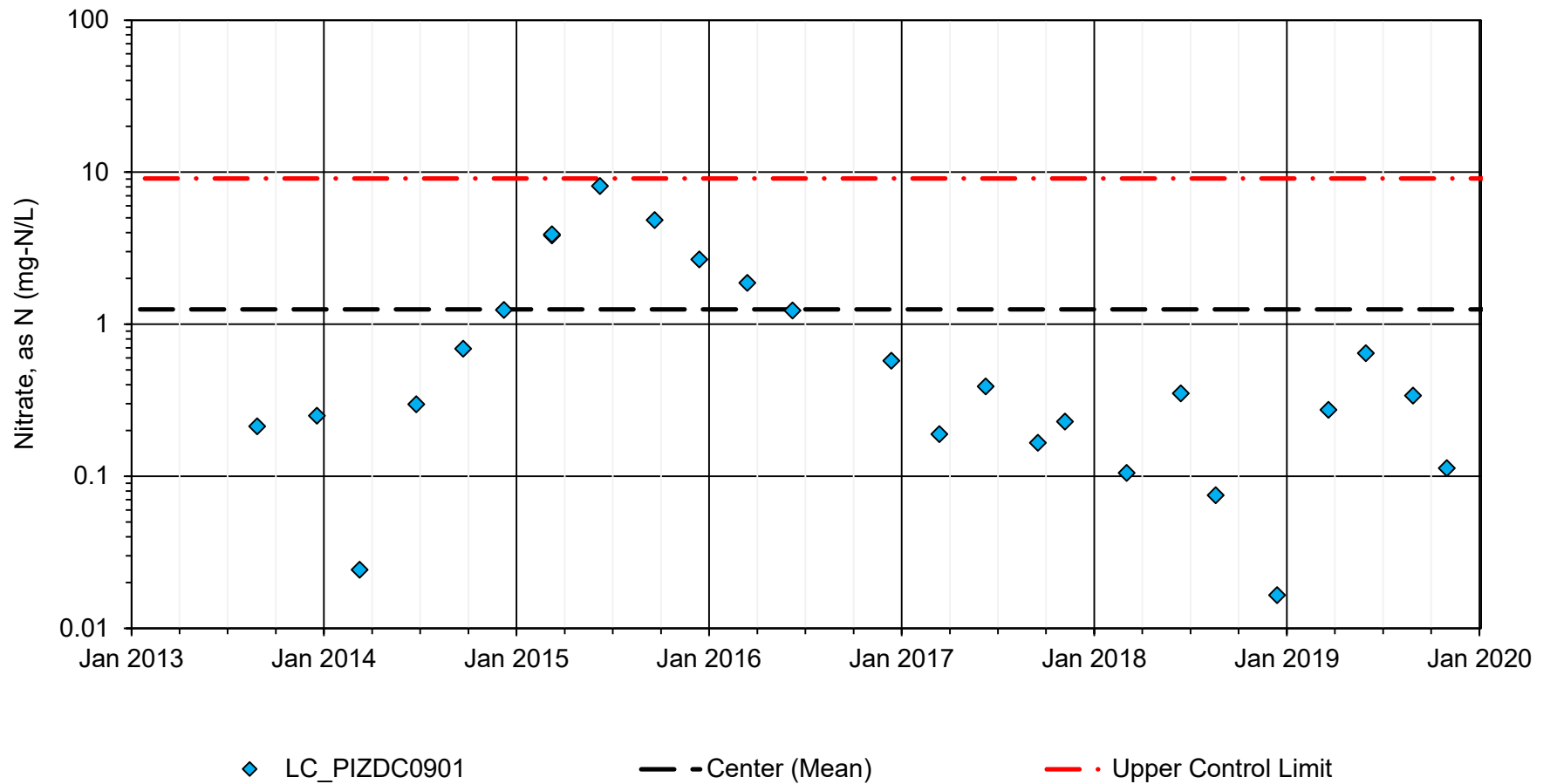
LC_PIZDC0901 Dissolved Selenium Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E1c



NOTES

Lower Control Limit = 1.034 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 9.112 mg/L (99.7 percentile of data set)

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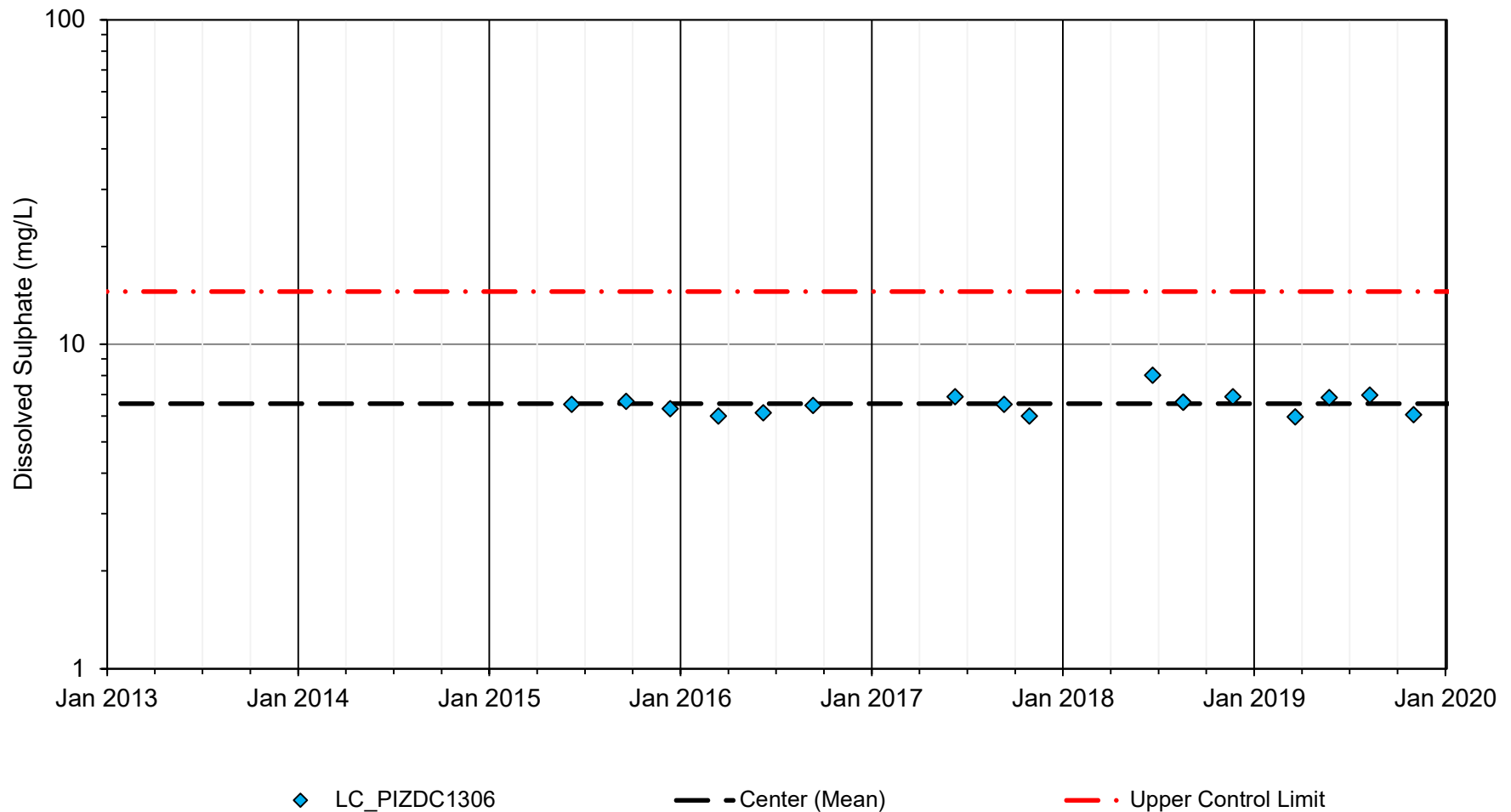
LC_PIZDC0901 Dissolved Nitrate Control Charting

PROJECT NO. 19135981

PHASE 1000

REV 0

FIGURE E1d



NOTES

Lower Control Limit = 0.270 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 14.532 mg/L (99.7 percentile of data set)

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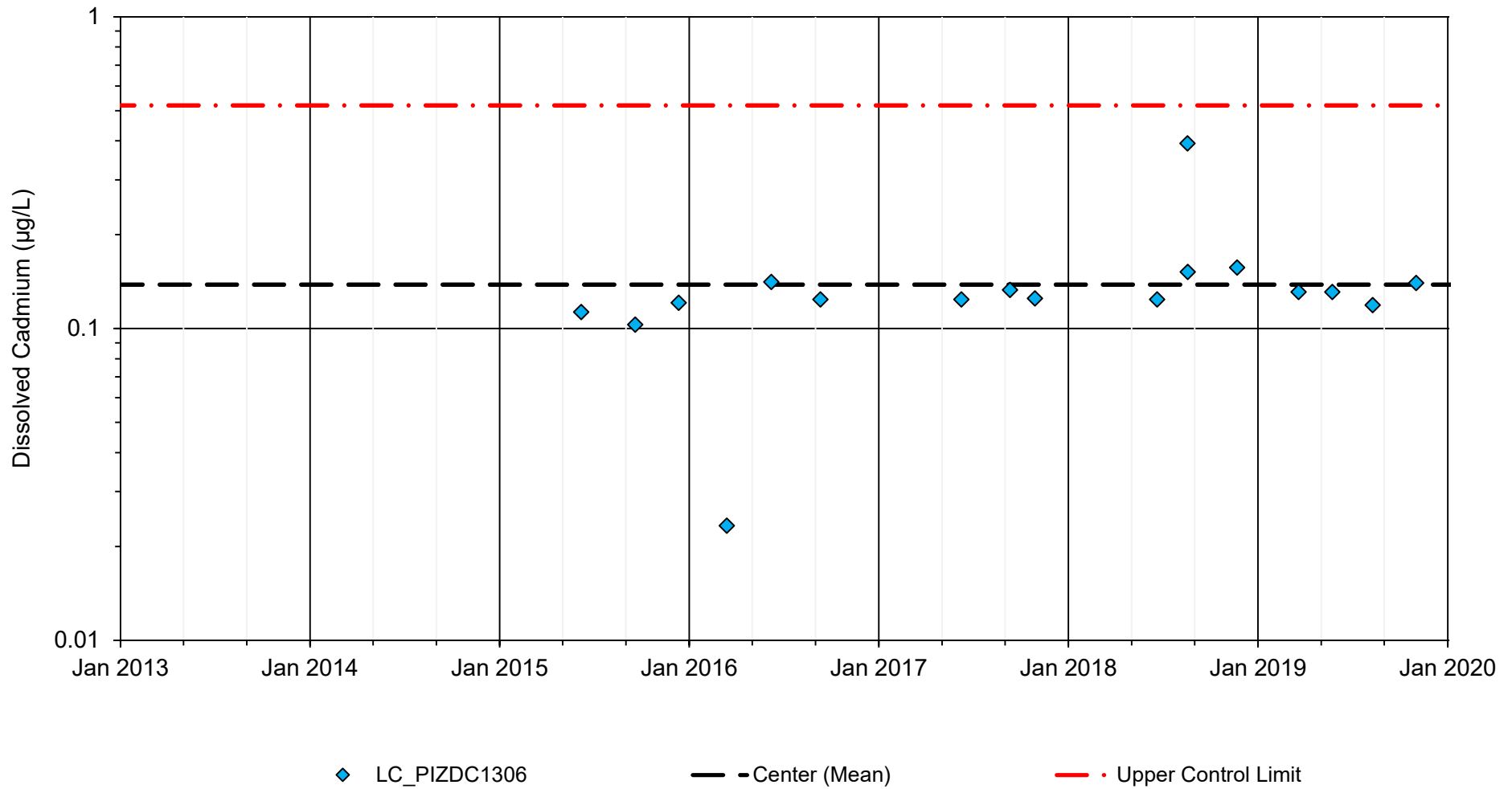
LC_PIZDC1306 Dissolved Sulphate Control Charting

PROJECT NO.
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PHASE
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REV
0

FIGURE
E2a



NOTES

Lower Control Limit = 0.015 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.520 mg/L (99.7 percentile of data set)

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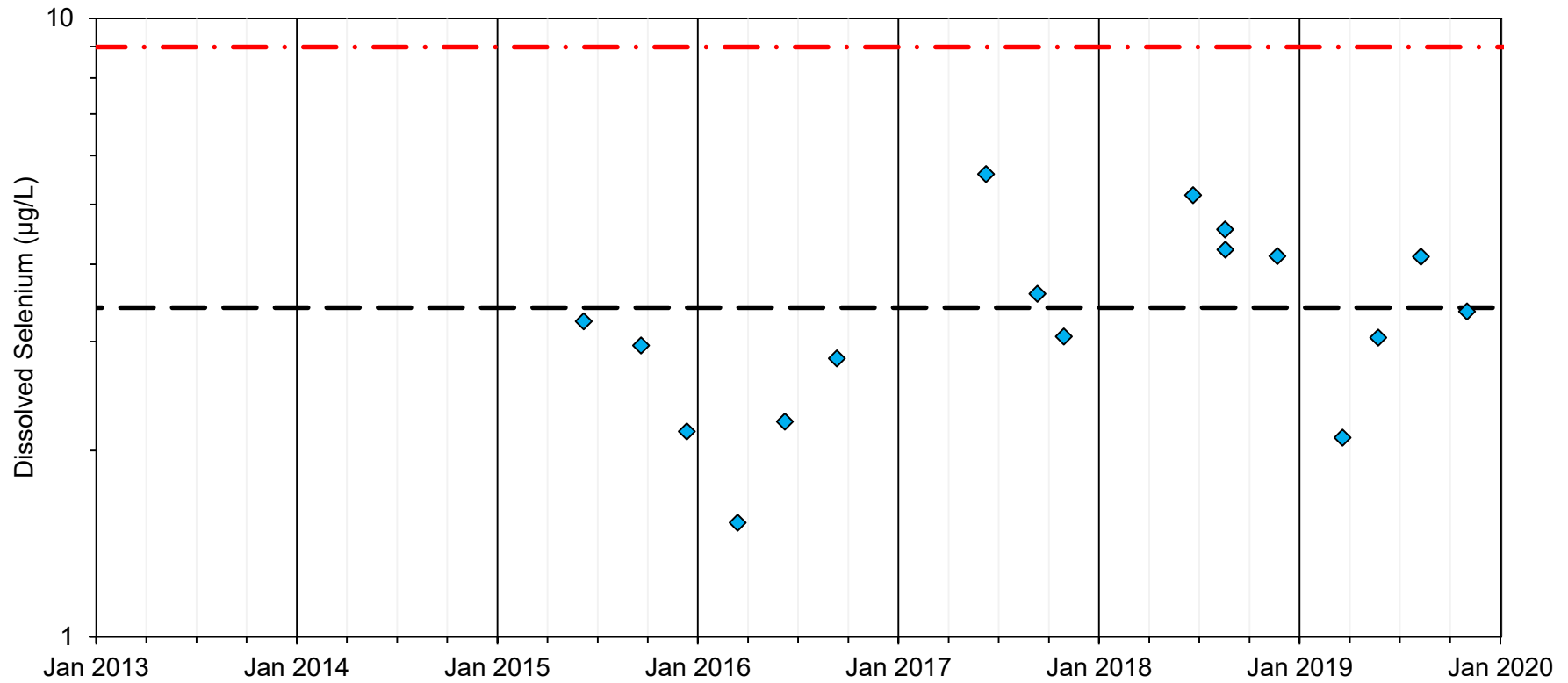
LC_PIZDC1306 Dissolved Cadmium Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E2b



◆ LC_PIZDC1306

— - Center (Mean)

— · Upper Control Limit

NOTES

Lower Control Limit = 0.474 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 8.986 mg/L (99.7 percentile of data set)

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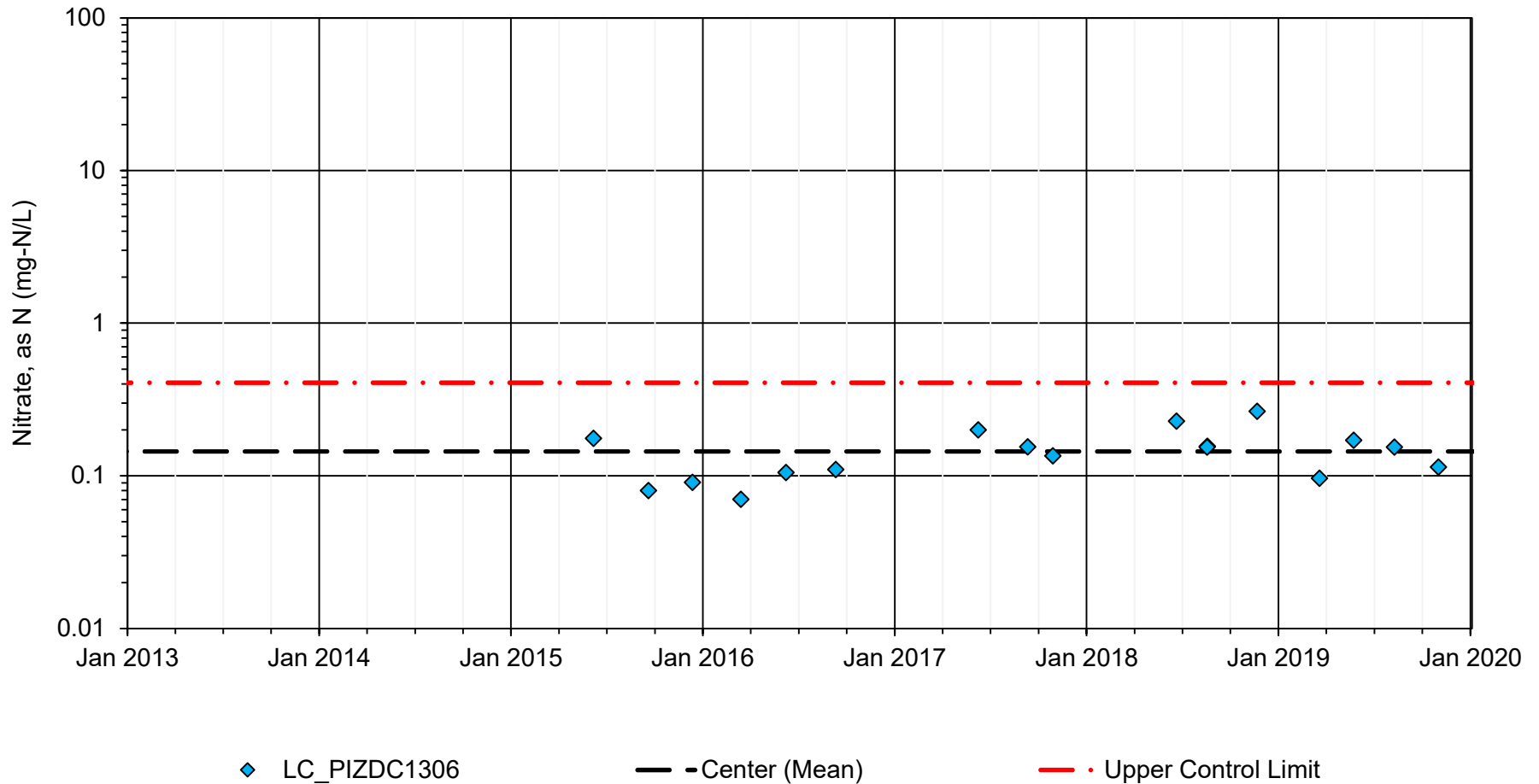
LC_PIZDC1306 Dissolved Selenium Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E2c



NOTES

Lower Control Limit = 0.036 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.408 mg/L (99.7 percentile of data set)

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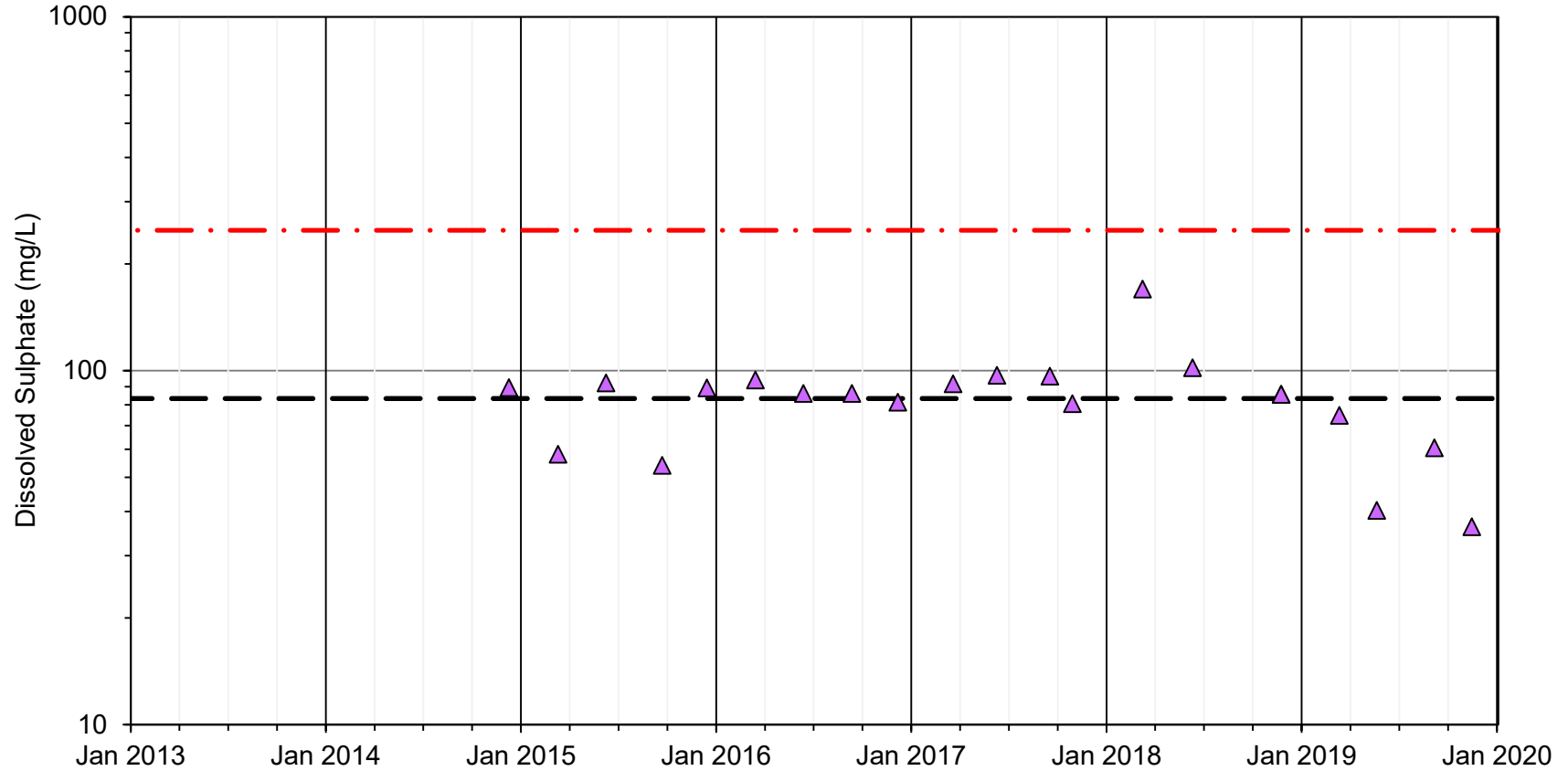
LC_PIZDC1306 Dissolved Nitrate Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E2d



▲ LC_PIZP1104
 - Center
 Upper Control Limit

NOTES

Lower Control Limit = 2.848 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 249.368 mg/L (99.7 percentile of data set)

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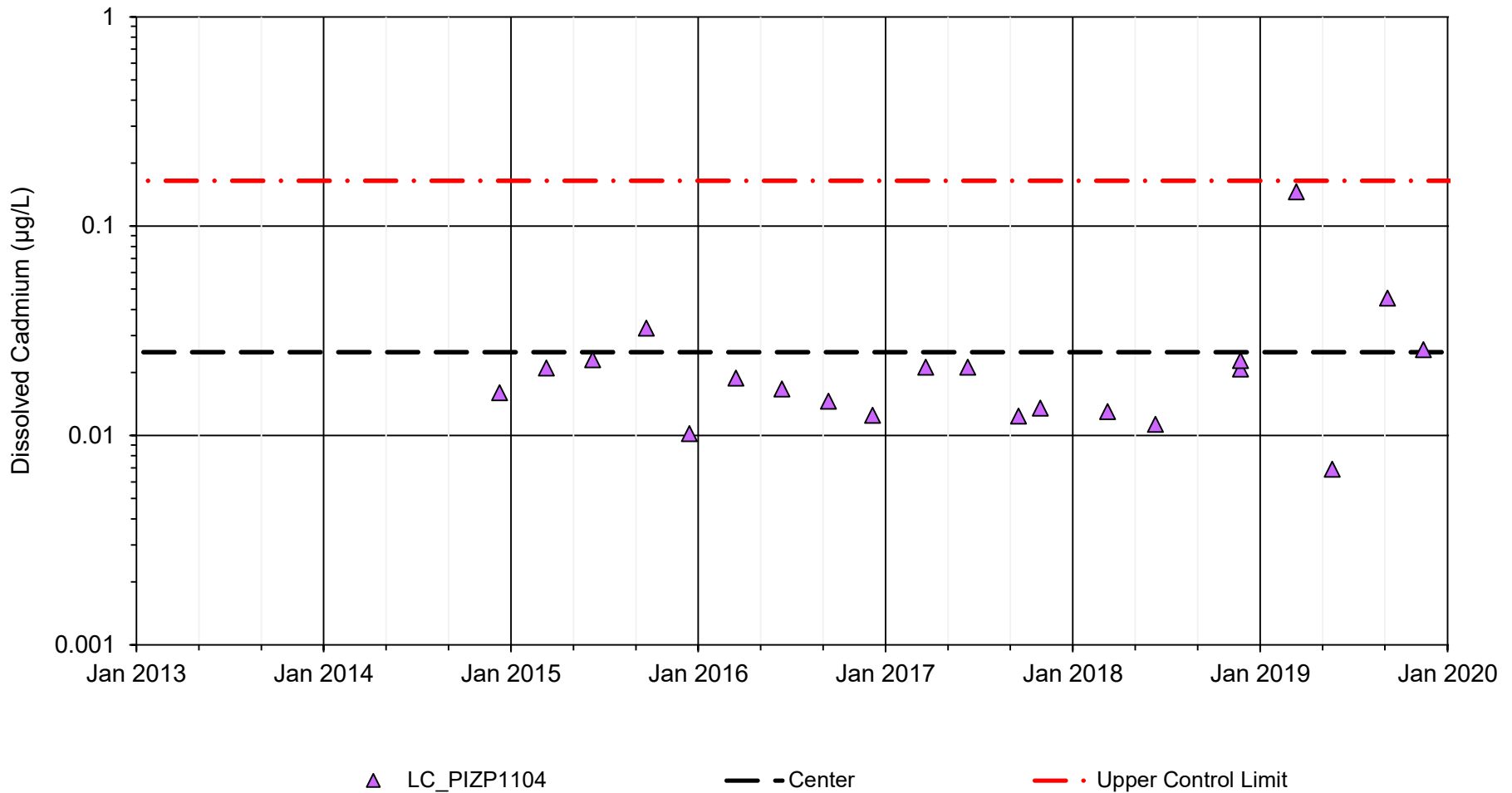
LC_PIZP1104 Dissolved Sulphate Control

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E3a



NOTES

Lower Control Limit = 0.012 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.165 mg/L (99.7 percentile of data set)

CLIENT

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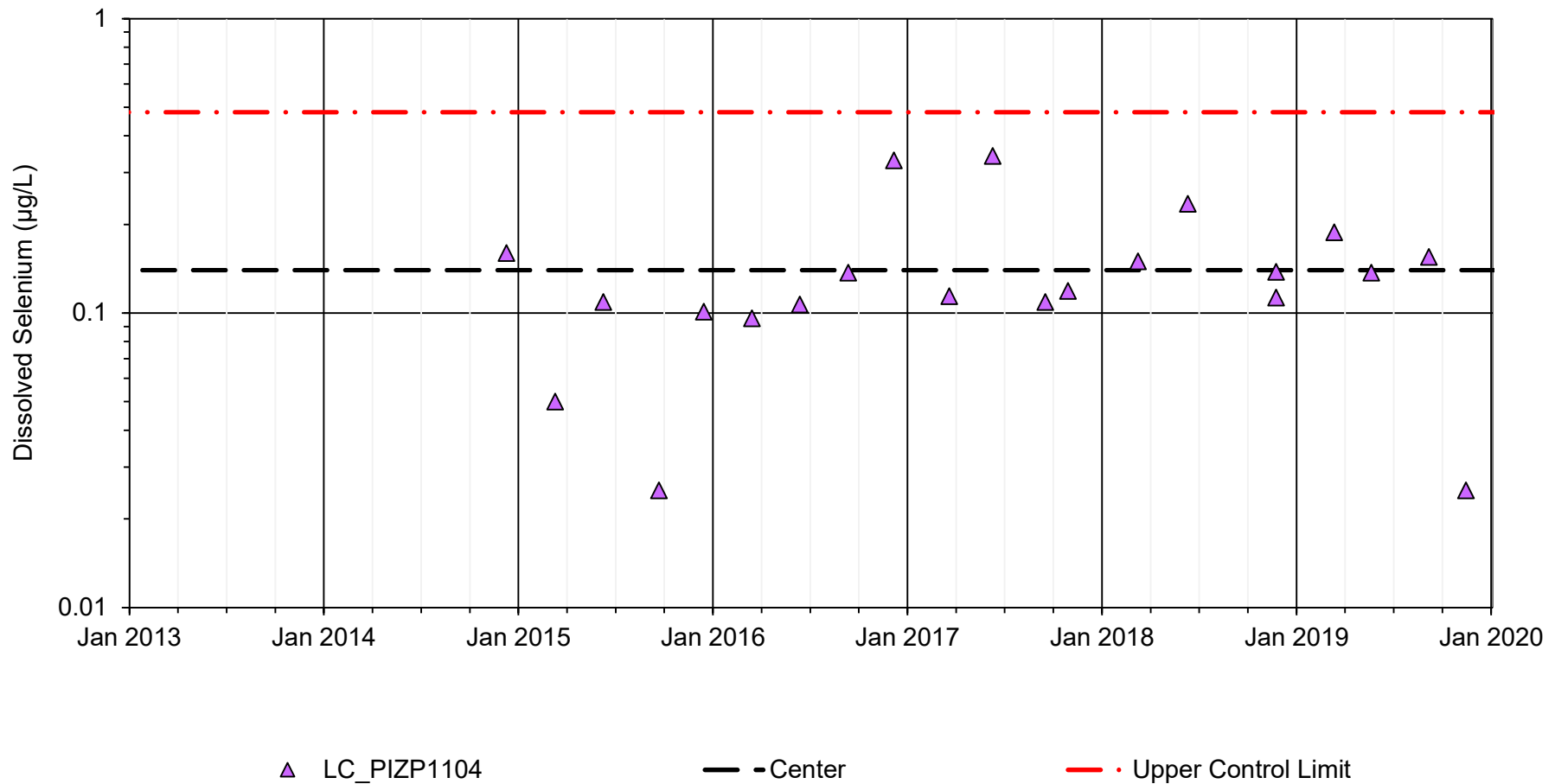
LC_PIZP1104 Dissolved Cadmium Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E3b



NOTES

Lower Control Limit = 0.031 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.481 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

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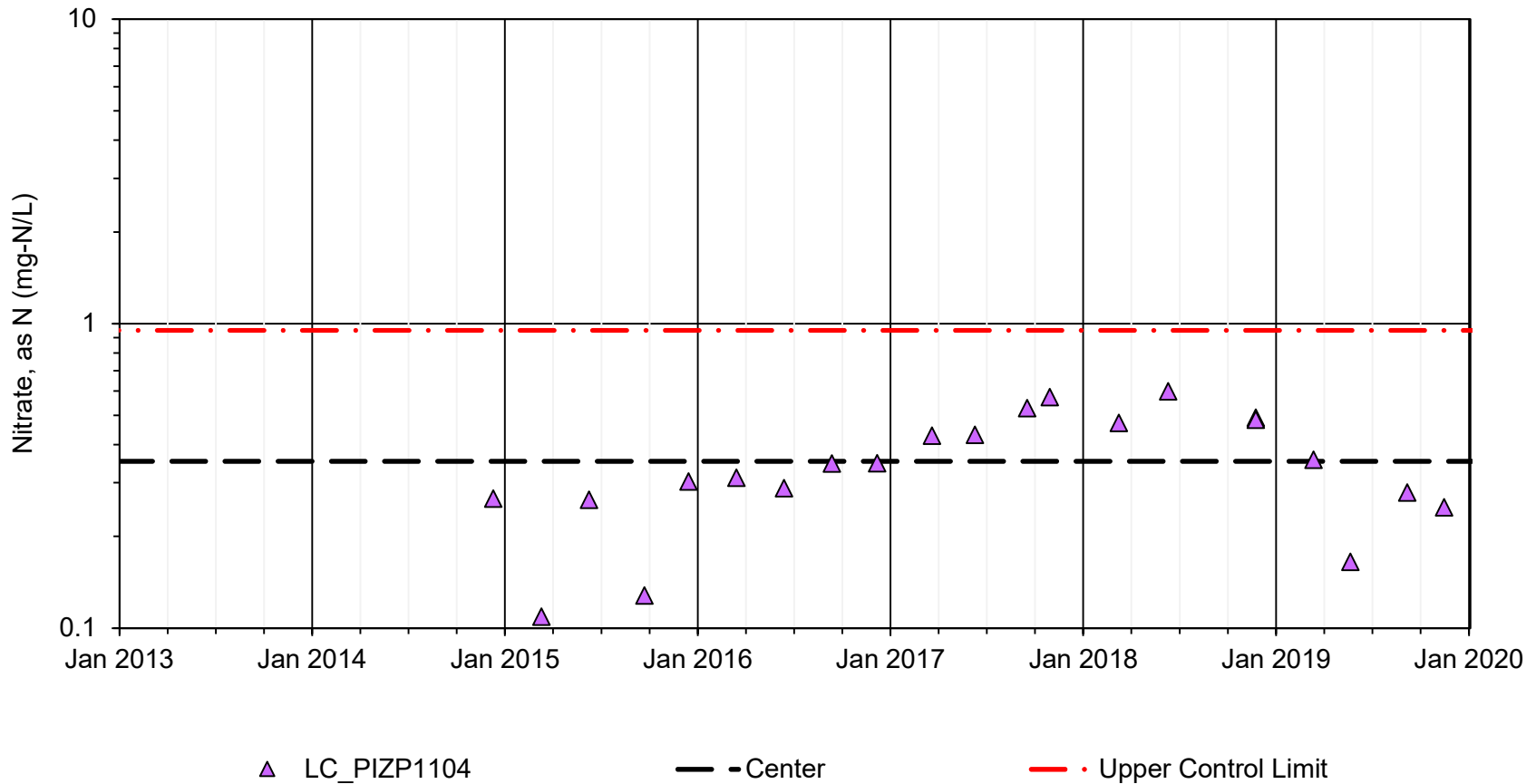
LC_PIZP1104 Dissolved Selenium Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
A

FIGURE
E3c



NOTES

Lower Control Limit = 0.074 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.951 mg/L (99.7 percentile of data set)

CLIENT

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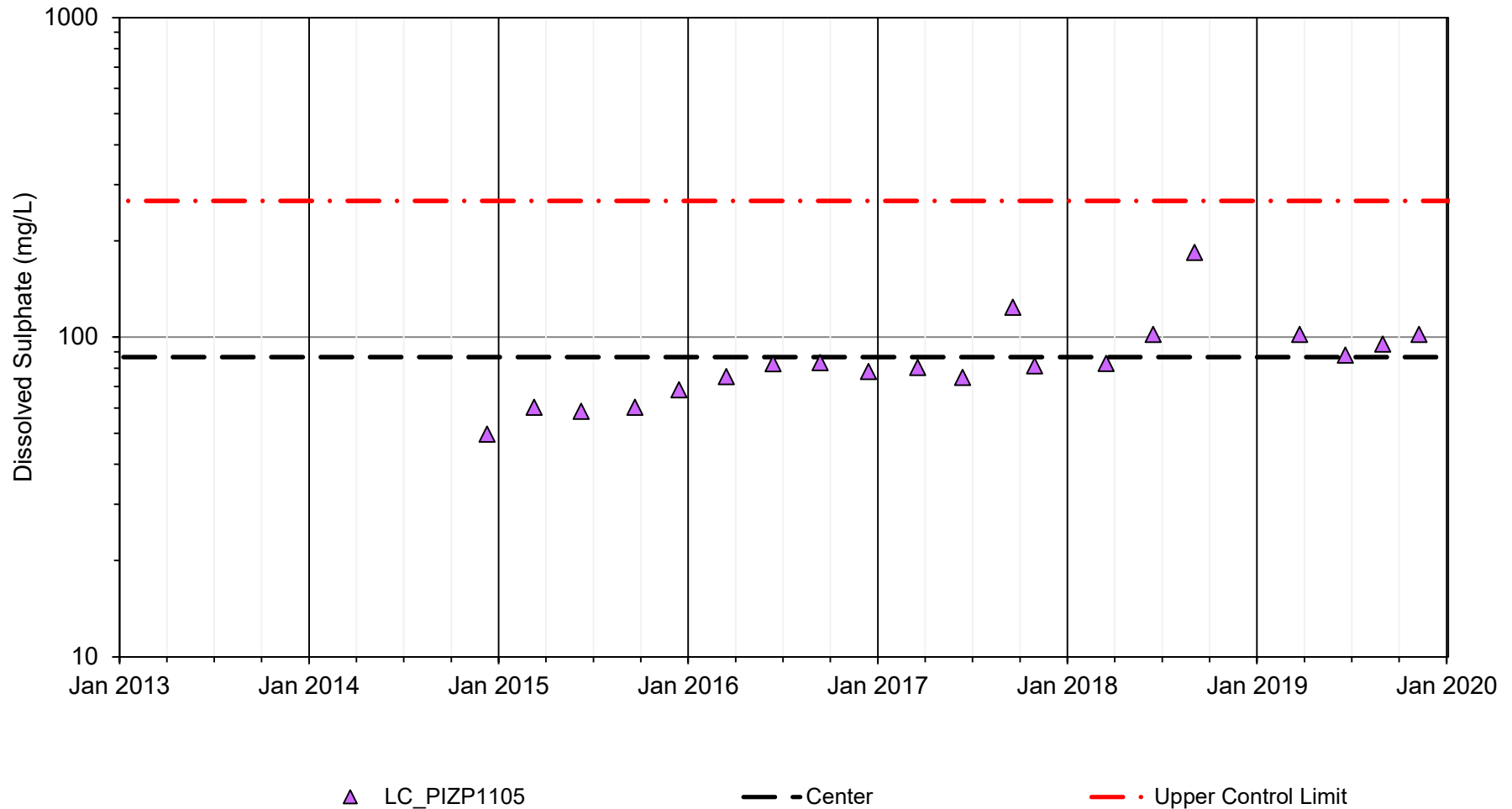
LC_PIZP1104 Dissolved Nitrate Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E3d



NOTES

Lower Control Limit = 11.475 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 267.235 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD 2020-02-21

PREPARED KF

DESIGNED NH

REVIEWED LO

APPROVED MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

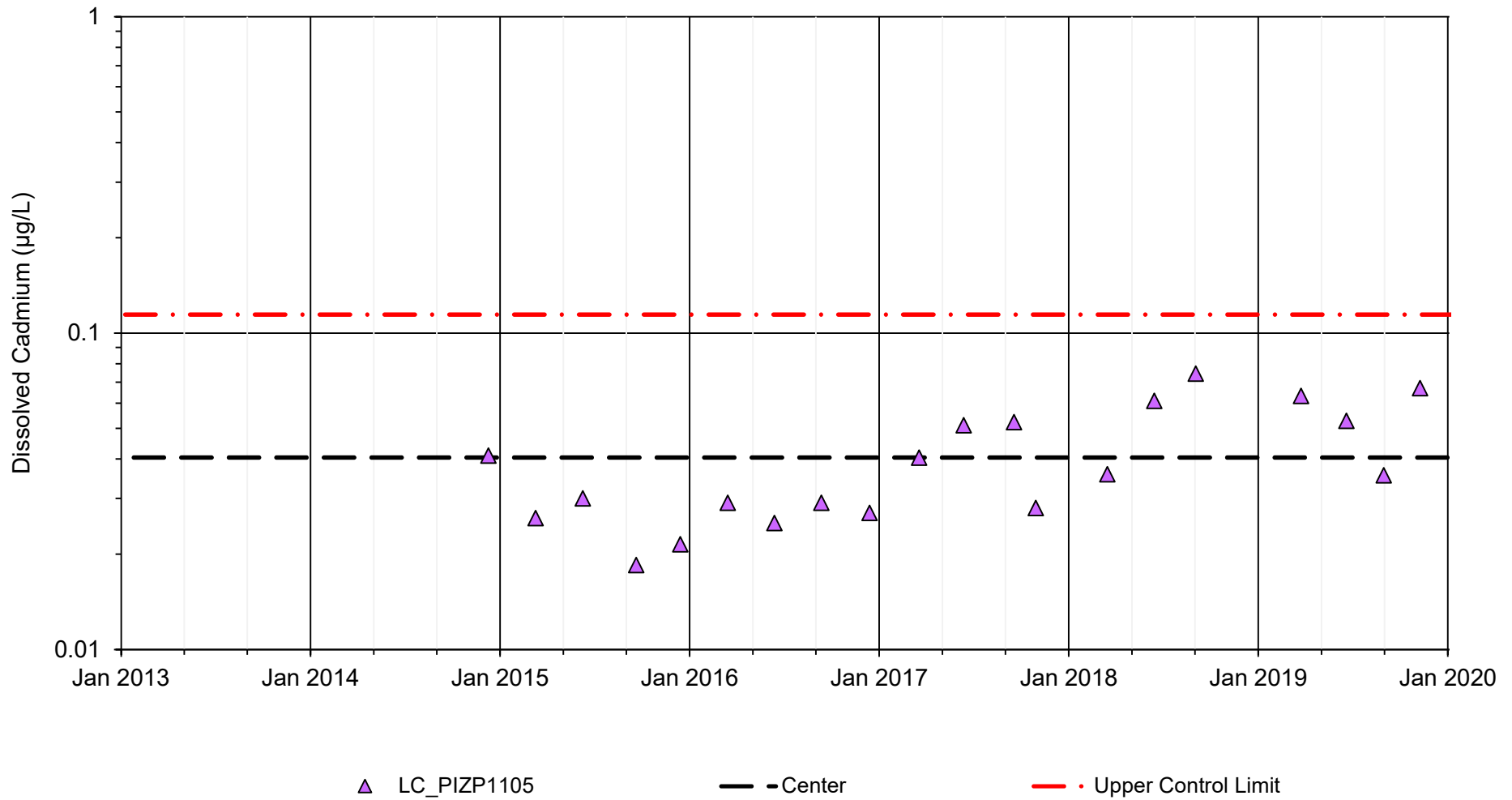
LC_PIZP1105 Dissolved Sulphate Control

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
4a



NOTES

Lower Control Limit = 0.012 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.115 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD 2020-02-21

PREPARED KF

DESIGNED NH

REVIEWED LO

APPROVED MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

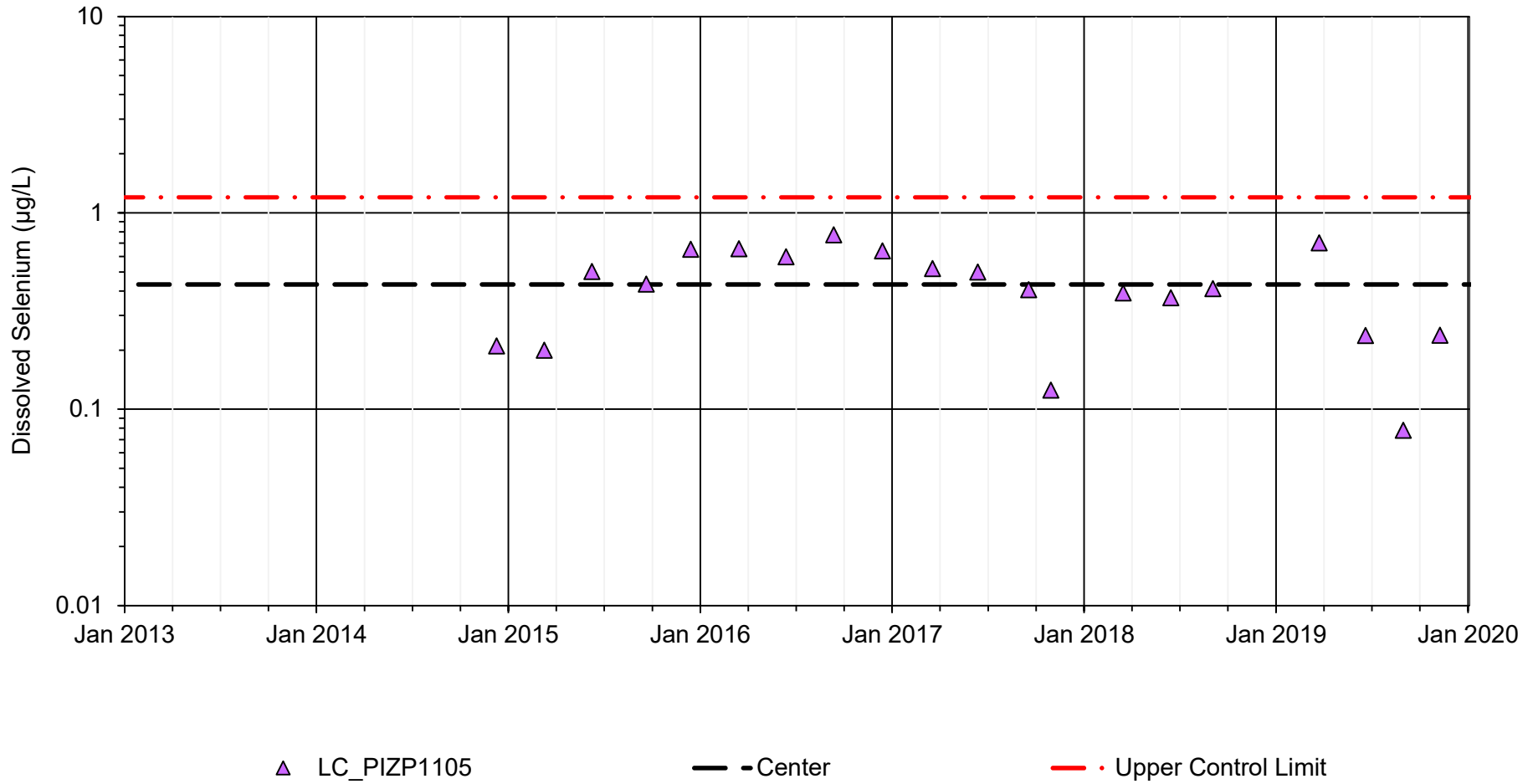
LC_PIZP1105 Dissolved Cadmium Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
4b



NOTES

Lower Control Limit = 0.102 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 1.201 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD 2020-02-21

PREPARED KF

DESIGNED NH

REVIEWED LO

APPROVED MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

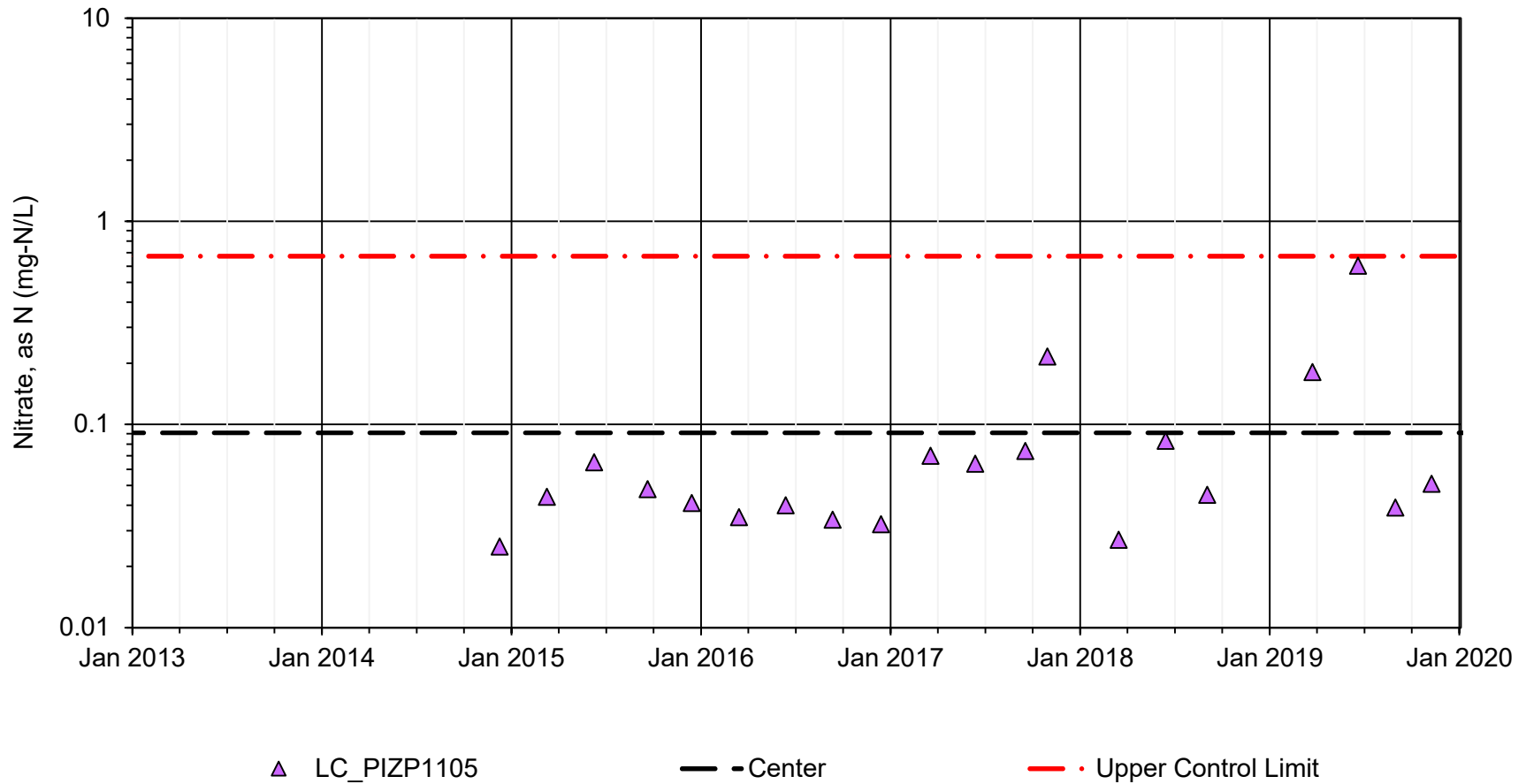
LC_PIZP1105 Dissolved Selenium Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
A

FIGURE
4c



NOTES

Lower Control Limit = 0.051 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.674 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD 2020-02-21

PREPARED KF

DESIGNED NH

REVIEWED LO

APPROVED MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

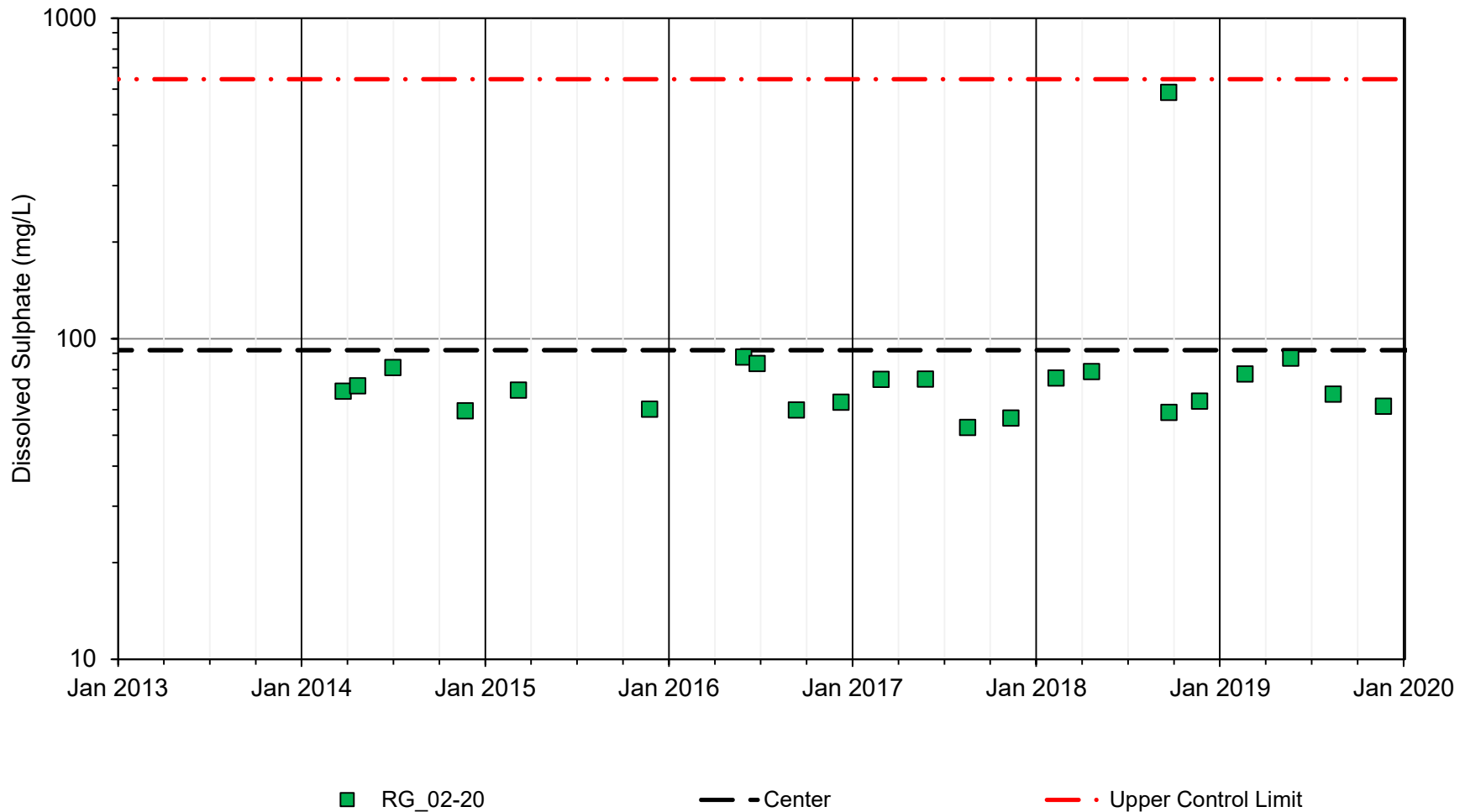
LC_PIZP1105 Dissolved Nitrate Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
4d



NOTES

Lower Control Limit = 29.532 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 645.258 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD 2020-02-21

PREPARED KF

DESIGNED NH

REVIEWED LO

APPROVED MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

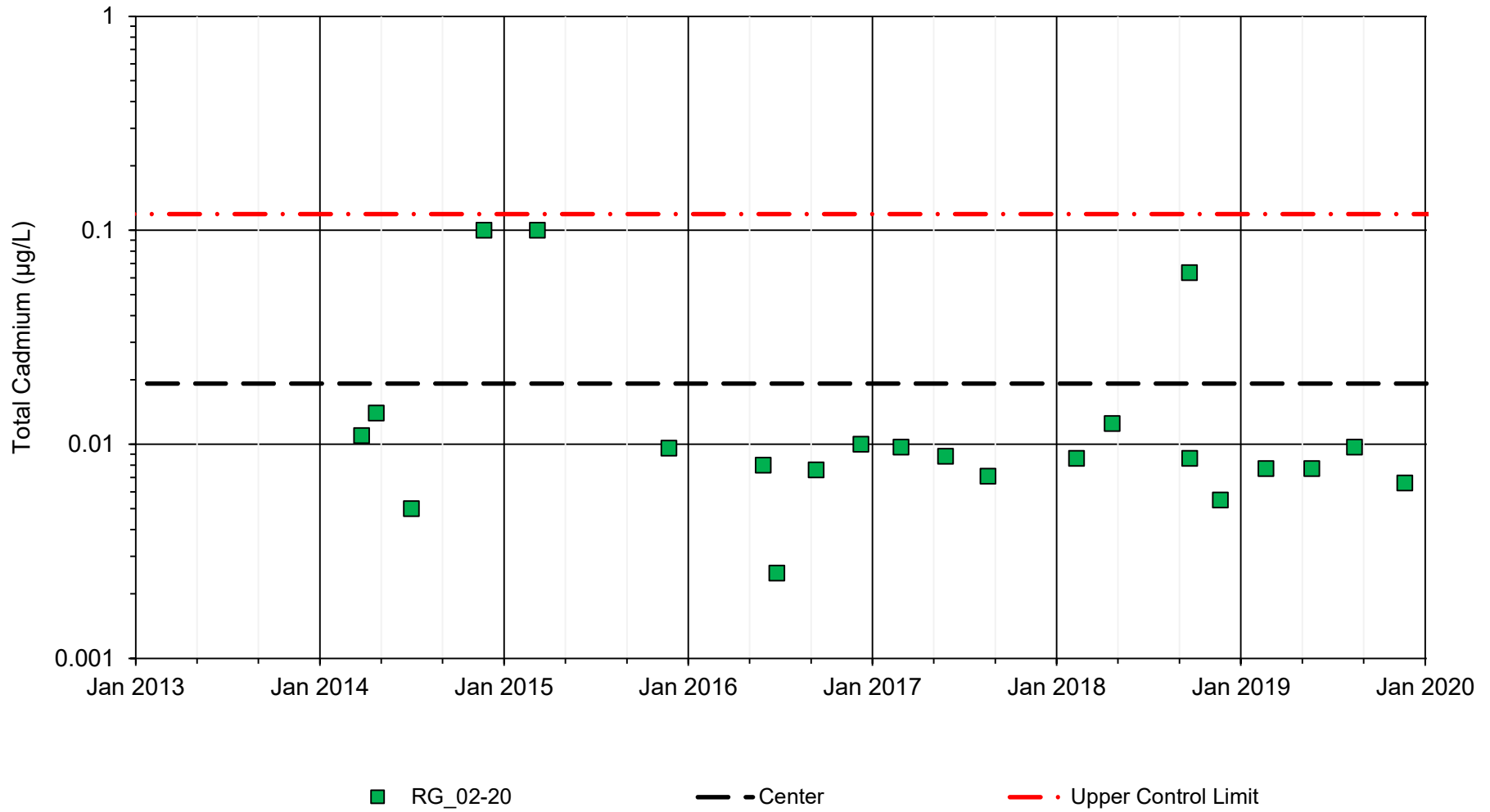
RG_02-20 Dissolved Sulphate Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E5a



NOTES

Lower Control Limit = 0.012 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.119 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD 2020-02-21

PREPARED KF

DESIGNED NH

REVIEWED LO

APPROVED MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

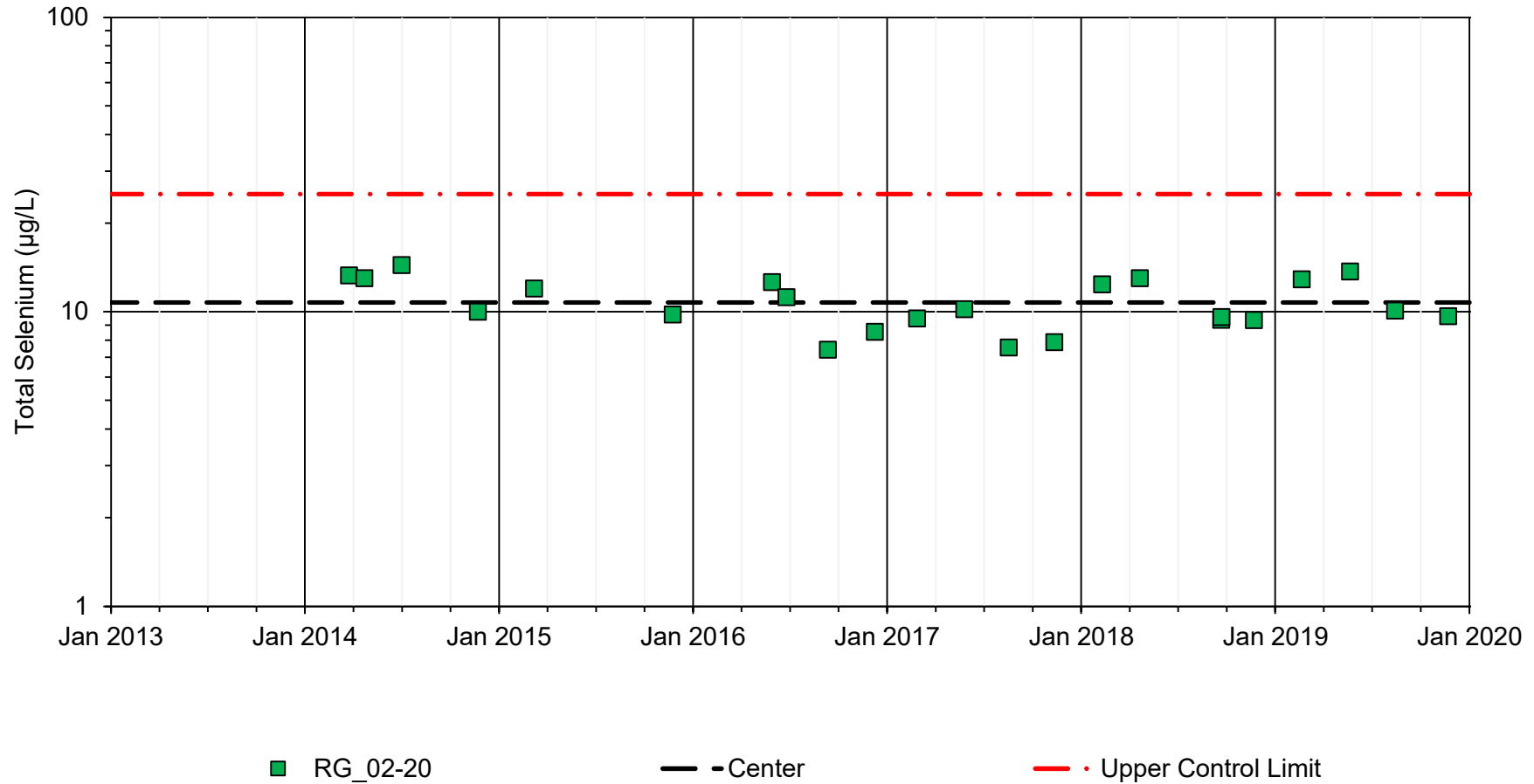
RG_02-20 Total Cadmium Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E5b



NOTES

Lower Control Limit = 1.202 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 25.116 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD 2020-02-21

PREPARED KF

DESIGNED NH

REVIEWED LO

APPROVED MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

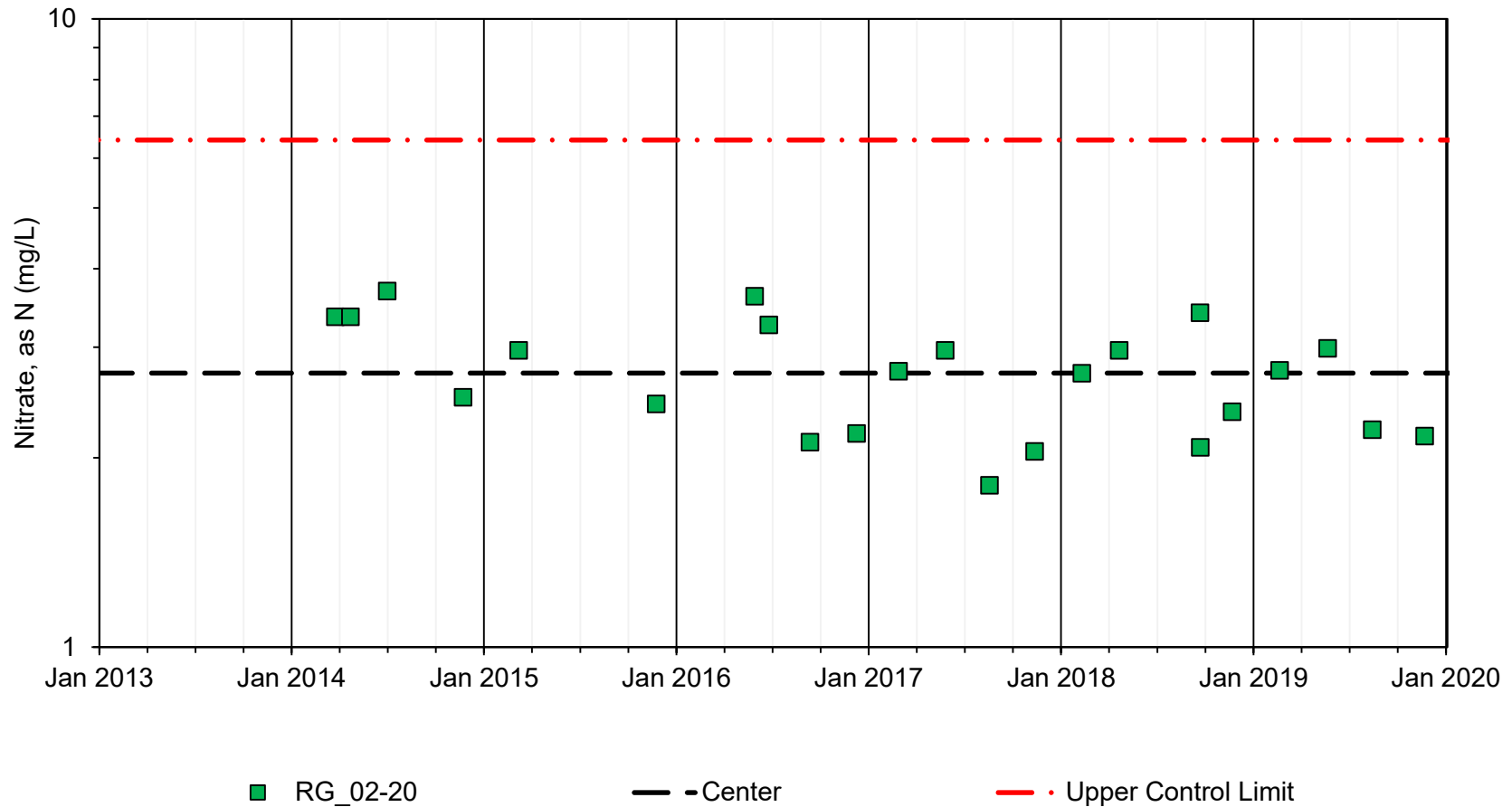
RG_02-20 Total Selenium Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E5c



NOTES

Lower Control Limit = 0.420 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 6.415 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD 2020-02-21

PREPARED KF

DESIGNED NH

REVIEWED LO

APPROVED MJM

PROJECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

RG_02-20 Dissolved Nitrate Control Charting

PROJECT NO.
19135981

PHASE
1000

REV
0

FIGURE
E5d

APPENDIX F

Borehole Logs

WELL LITHOLOGY & CONSTRUCTION FORM

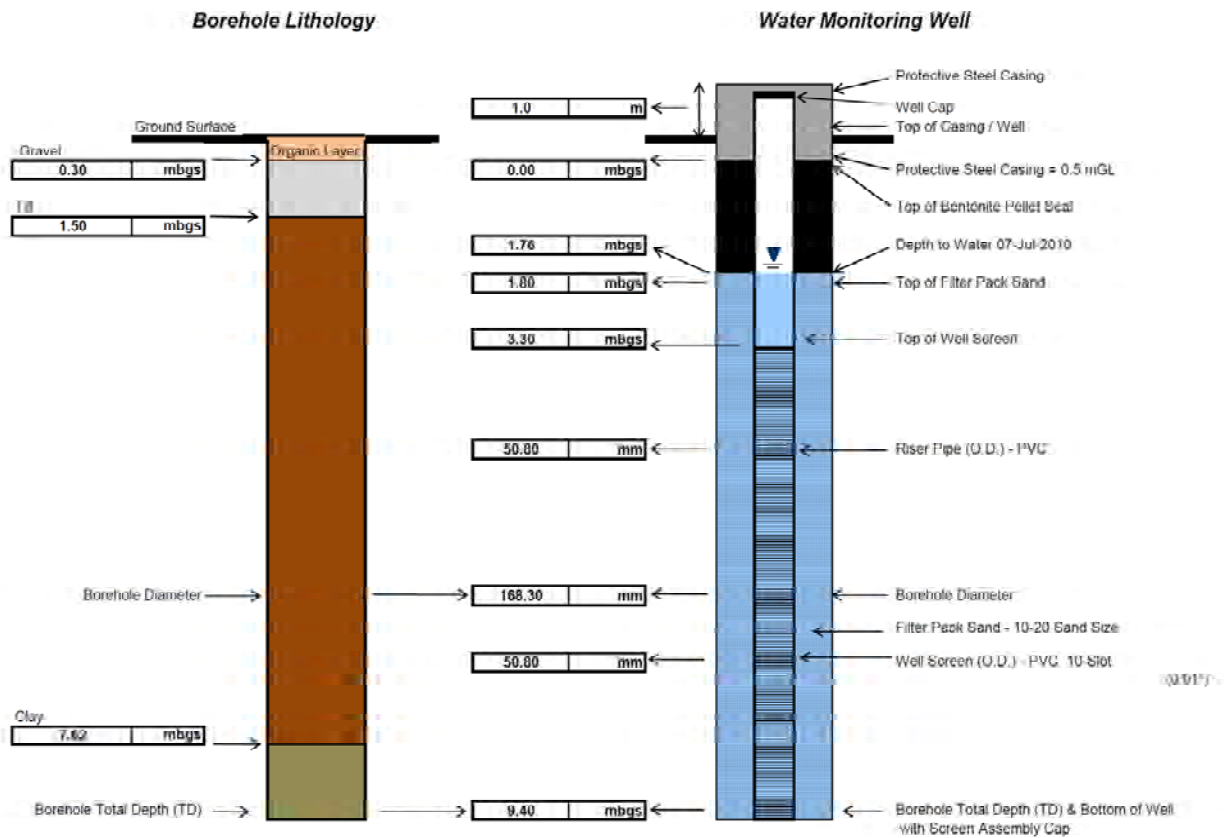
Well Number:
GA-DC1-A

Project Number:	0913490005-1109-1002
Project Name:	Teck Coal Line Creek Operations
Location:	Elk Valley, British Columbia, Canada
Site Area:	Dry Creek

Completion Date:	31-Oct-09
Drill Contractor:	Beck Drilling
Drilling Method:	ODEX
Personnel:	Tim Crowell

Well Summary Table		
Northing	658048	NAD83
Easting	5541500	NAD83
Ground Elevation	1692	masl
Top of Casing Elevation	1693	masl
Water Level Elevation	1690	masl

Input Parameters	
Datum Reference:	mbgs
Diameter Units:	mm



Note:
 mbgs = metres below ground surface
 mm = millimetres
 masl = metres above sea level

REFERENCE

PIEZOMETERS INSTALLED BY GOLDER IN FALL 2009

PROJECT	LINE CREEK OPERATIONS PHASE II			
TITLE	GA-DC1-A - OVERBURDEN MONITORING WELL LITHOLOGY LOG & WELL CONSTRUCTION DIAGRAM			
Teck	PROJECT No.	09-1349-0005	FILE No.	Lithology & Construction
	DESIGN	TC	28 Jul 2010	SCALE AS SHOWN
	WP	TC	28 Jul 2011	REV. 0
	CHECK	GJ	26 Oct 2011	FIGURE: C7.2-4
	REVIEW	SDL	08 Nov 2011	

DATA ENTRY: VI

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC_PIZDC1306

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: August 18, 2013

DATUM: UTM Zone 11
(Nad 83)
Elev = 1708.15 masl

N: 5541058.793 E: 658278.011

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m		HYDRAULIC CONDUCTIVITY, k, cm/s		ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	NUMBER	TYPE	20	40	60	80		
0	Sonic Rig - SR152 Boart Longyear Group	Ground Surface	1708.14								Stickup = 0.9 m Cement WL = 0.21 meters above ground surface on 21 Aug 2013
0.00		SILTY GRAVEL, angular to sub-angular, poorly-graded, some sand, trace clay, low plasticity, w-PL, moist, loose to compact	0.00								
1											
2											
3											
4											
5											
6											
7		Gravelly CLAYEY SILT, some angular to sub-angular, poorly-graded gravel, some sand, low to medium plasticity, dark brown to black, w-PL, moist, compact to dense	1701.29 6.86								Bentonite Plug
7.6		--- Compact below 7.6 m									
8											
9											
10											

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS.GPJ CALGARY.GDT 10/11/13

DEPTH SCALE

1 : 50



LOGGED: RQ

CHECKED:

DATA ENTRY: VI

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC_PIZDC1306

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: August 18, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5541058.793 E: 658278.011

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m		HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20	40	60	80			10 ⁻⁶
10	Sonic Rig - SRT152 Boart Long Year Group	<p>Gravelly CLAYEY SILT, some angular to sub-angular, poorly-graded gravel, some sand, low to medium plasticity, dark brown to black, w-PL, moist, compact to dense (<i>continued</i>) --- Boulder (>300 mm in diameter) at 10.4 m</p> <p>Silty SANDY GRAVEL, angular to sub-angular, trace clay, occasional cobbles, dark brown to black, w-PL, moist, dense to very dense</p>												<p>Bentonite Plug</p> <p>Bentonite Seal</p> <p>10/20 Colorado Silica Sand</p> <p>Slotted Screen Section</p>
11														
12														
13														
14														
15														
16														
17		<p>--- Boulder at 16.8 m</p> <p>End of MONITORING WELL.</p> <p>Notes: WL = water level. masl = metres above sea level.</p>												
18														
19														
20														

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS.GPJ CALGARY.GDT 10/11/13

DEPTH SCALE

1 : 50



LOGGED: RQ

CHECKED:

DATA ENTRY: VI

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC_PIZDC1307

SHEET 1 OF 4

LOCATION: See Location Plan

BORING DATE: August 19, 2013

DATUM: UTM Zone 11
(Nad 83)
Elev = 1690.51 masl

N: 5541229.978 E: 658168.873

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20		40		60				80	
0		Ground Surface FILL	[Cross-hatch]	1690.50 0.00											Stickup= 0.71 m		
1		ORGANIC SOIL, black	[Wavy lines]	1689.74 0.76											Cement		
2		GRAVEL and SAND, sub-angular to angular (up to 100 mm in diameter), some silt, w<PL, compact to dense	[Gravel symbols]	1689.13 1.37											▽ *WL=2.31 mbgs 24 Aug 2013		
3		SILTY GRAVEL, sub-rounded to sub-angular (up to 50 mm in diameter), some sand, trace clay, w~PL, wet, compact	[Gravel symbols]	1687.15 3.35											Bentonite Plug		
4																	
5	Sonic Rig - SR152 Boart Longyear Group																
6		SILTY GRAVEL, angular to sub-angular, some sand, trace clay, local cobbles, w~PL, moist, very dense	[Gravel symbols]	1684.41 6.10													
7																	
8																	
9		GRAVELY SILT, sub-rounded to sub-angular, trace sand, trace clay, w~PL, wet, very dense	[Gravel symbols]	1681.97 8.53													
10		CONTINUED NEXT PAGE															

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS.GPJ CALGARY.GDT 10/11/13

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED:

DATA ENTRY: VI

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC_PIZDC1307


SHEET 2 OF 4

LOCATION: See Location Plan

BORING DATE: August 19, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5541229.978 E: 658168.873

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION			
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT						
								20		40		60				80		10 ⁻⁶
10		GRAVELLY SILT, sub-rounded to sub-angular, trace sand, trace clay, w<PL, wet, very dense (continued)																
11																		
12				--- w<PL, moist to dry below 12.2 m														
13																		
14		SILTY GRAVEL, sub-rounded to sub-angular, some sand, trace clay, w<PL, moist, dense		1676.79 13.72														
15	Sonic Rig - SR152 Boart Longyear Group																	
16																		
17		--- Gravel is sub-angular to angular, w<PL, wet below 16.8 m																
18																		
19		--- Gravel is sub-rounded to sub-angular, moist to locally dry, loose below 18.3 m																
20				1670.69 19.81														
		CONTINUED NEXT PAGE																

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS.GPJ CALGARY.GDT 10/11/13

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED:

DATA ENTRY: VI

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC_PIZDC1307

SHEET 3 OF 4

LOCATION: See Location Plan

BORING DATE: August 19, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5541229.978 E: 658168.873

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20 40 60 80 nat V. + Q - ● rem V. ⊕ U - ○				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³ Wp ——— W ——— WI					
20		SANDY SILT, some sub-rounded to sub-angular gravel, localized sub-rounded to sub-angular cobbles (up to 150 mm in diameter), brown to dark brown, w~PL, moist, compact to dense, stiff (continued)															
21																	
22																	
23																	
24																	
25	Sonic Rig - SR152 Boart Longyear Group																
26		SANDY GRAVEL, sub-angular to angular (up to 100 mm in diameter), some silt, light brown to grey, w<PL, dry, very loose															
27		SANDY SILT, some sub-rounded to sub-angular gravel, localized sub-rounded to sub-angular cobbles (up to 100 mm in diameter), brown to dark brown, w~PL, moist, very dense, stiff															
28																	
29																	
30		SILT, some sand, some sub-rounded to sub-angular gravel (<30 mm in diameter), brown to dark brown, w~PL, wet, compact to dense, firm															
		CONTINUED NEXT PAGE															

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS.GPJ CALGARY.GDT 10/11/13

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED:

DATA ENTRY: VI

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC_PIZDC1307



SHEET 4 OF 4

LOCATION: See Location Plan

BORING DATE: August 19, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5541229.978 E: 658168.873

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	NUMBER	TYPE	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
						20		40		60		80			
30	Sonic Rig - SR152 Boart Long Year Group					10 20 30 40				10 20 30 40					
31		SILTY GRAVEL, sub-rounded to sub-angular (<50 mm in diameter), localized clay, w<PL, dry, very dense, hard --- Localized zones of increased clay, very dry				1660.33 30.18				1660.33 30.18					Bentonite Seal
32		SILT, some sand, some sub-angular to angular gravel, localized boulders, dark brown, w<PL, moist, dense				1658.50 32.00				1658.50 32.00					10/20 Colorado Silica Sand
33						1655.45 35.05				1655.45 35.05					Slotted Screen Section
34		End of MONITORING WELL.				1655.45 35.05				1655.45 35.05					
35		Notes: WL= water level. masl = metres above sea level. * WL measured while LC_PIZDC1309 was flowing at surface. mbgs= metres below ground surface.				1655.45 35.05				1655.45 35.05					
36						1655.45 35.05				1655.45 35.05					
37						1655.45 35.05				1655.45 35.05					
38						1655.45 35.05				1655.45 35.05					
39						1655.45 35.05				1655.45 35.05					
40						1655.45 35.05				1655.45 35.05					

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS.GPJ CALGARY.GDT 10/11/13

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED:

DATA ENTRY: VI

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC_PIZDC1308

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: August 21, 2013

DATUM: UTM Zone 11
(Nad 83)
Elev = 1690.42 masl

N: 5541232.317 E: 658167.9

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴	10 ⁻³
0		Ground Surface FILL		1690.42 0.00											Stickup= 0.95 m		
1		ORGANIC SOIL, black		1689.65 0.76											Cement		
2		SANDY GRAVEL, sub-angular to angular (up to 100 mm in diameter), some silt, w<PL, dry, very loose		1688.59 1.83											*WL=0.50 mbgs 24 Aug 2013		
3		SILTY GRAVEL, sub-rounded to sub-angular (up to 50 mm in diameter), some sand, trace clay, w~PL, wet, loose		1688.28 2.13										Bentonite Plug			
5		SILTY GRAVEL, angular to sub-angular, some sand, trace clay, local cobbles, w~PL, moist to wet, compact		1685.84 4.57											Bentonite Seal		
6		--- Localized dry loose gravel zone (looks like pad fill material, fresh, dry, powdery, likely sloughed into hole) from 5.5 to 5.8 m													10/20 Colorado Silica Sand		
7		--- Localized dry loose gravel zone (looks like pad fill material, fresh, dry, powdery, likely sloughed into hole) from 6.6 to 6.7 m															
8		GRAVELLY SILT, sub-rounded to sub-angular, trace sand, trace clay, w~PL, wet, dense to very dense		1682.80 7.62											Slotted Screen Section		
9		--- Decrease in gravel and clay content below 8.5 m													Bentonite Seal		
		CONTINUED NEXT PAGE															

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS.GPJ CALGARY.GDT 10/11/13

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED:

DATA ENTRY: VI

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC_PIZDC1308

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: August 21, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5541232.317 E: 658167.9

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION				
		DESCRIPTION	STRATA PILOT	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT								
							20		40		60		80			10 ⁻⁶		10 ⁻⁵	
10	Sonic Rig - SR152 Beart Long Year Group						nat V. + Q - ● rem V. ⊕ U - ○				Wp ----- W ----- WI								
11																			
12							1678.22 12.19	GRAVELLY SILT, sub-rounded to sub-angular, trace sand, trace clay, local cobbles, w<PL, moist, very dense											
13							1676.70 13.72												
14							GRAVELLY SILT, sub-rounded to sub-angular, some sand, trace clay, brown to dark brown, w<PL, moist, very dense												
15																			
16	1673.65 16.76																		
17	SILTY GRAVEL, sub-angular to angular, some sand, trace clay, w~PL, moist, dense																		
18																			
19	Notes: WL= water level. masl = metres above sea level. * WL measured while LC_PIZDC1309 was flowing at surface. mbgs= metres below ground surface.																		
20													End of MONITORING WELL.						
20	1670.60 19.81																		

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS.GPJ CALGARY.GDT 10/11/13

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED:

DATA ENTRY: JPG

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC-PIZDC1401

SHEET 1 OF 4

LOCATION: See Location Plan, West side of Dry Creek

BORING DATE: April 26, 2014

DATUM: Local

LC_PIZDC1404D

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20	40	60	80	10 ⁻⁶	10 ⁻⁵		
0		Ground Surface		0.00											Stickup = 1.57 m Bentonite Grout
		TOPSOIL – (OL) Gravelly ORGANIC SILT, angular, some sand, roots and rootlets, black, moist, loose		0.30											
		(ML) SANDY SILT, light brown, moist, compact													
1		TILL – (ML) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, dark brown, cohesive, w<PL, very soft to soft		0.91											
2															
3															
4		--- Becoming grey, firm at 4.0 m													
5		--- Water in cutting starting at 5.5 m													
6		(GP) GRAVEL, fine to coarse-grained, dark grey, wet, dense		6.10											
7		TILL – (ML) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, w>PL, soft		6.74											
		--- w<PL, very stiff from 7.3 to 8.8 m													
8															
9		--- w>PL, soft at 8.8 m													
10															

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS. APPENDIX.GPJ CALGARY.GDT 10/30/14

DEPTH SCALE
1 : 50



LOGGED: DE
CHECKED: JT

DATA ENTRY: JPG

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC-PIZDC1401

SHEET 2 OF 4

LOCATION: See Location Plan, West side of Dry Creek

BORING DATE: April 26, 2014

DATUM: Local

LC_PIZDC1404D

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	NUMBER	TYPE	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
						ELEV. DEPTH (m)		BLOWS/0.3m		10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³		Wp ----- W ----- Wi			
10		TILL - (ML) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, w>PL, soft (<i>continued</i>)	[Hatched Pattern]			10	20	30	40						
11															
12															
13		(GM) Sandy SILTY GRAVEL, angular, grey, moist, dense	[Circular Pattern]	12.80											
14															
15	DR-24 - Air Rotary Sierra Drilling & Blasting Ltd.	TILL - (ML) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, w<PL, soft	[Hatched Pattern]	15.24											
16															
17															
18		--- Boulder at 17.7 m													
19															
20															

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS. APPENDIX.GPJ CALGARY.GDT 10/30/14

DEPTH SCALE

1 : 50



LOGGED: DE

CHECKED: JT

DATA ENTRY: JPG

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC-PIZDC1401

SHEET 3 OF 4

LOCATION: See Location Plan, West side of Dry Creek

BORING DATE: April 26, 2014

DATUM: Local

LC_PIZDC1404D

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION			
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT						
								20		40		60				80		10 ⁻⁶
20		<p>TILL - (ML) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, w<PL, soft (<i>continued</i>)</p> <p style="text-align: center;">--- Cobble / boulder content increasing (possible silty gravel layers) at 24.1 m</p> <p style="text-align: center;">--- Cobbles decreasing at 25.9 m</p> <p style="text-align: center;">CONTINUED NEXT PAGE</p>																
21																		
22																		
23																		
24																		
25	DR-24 - Air Rotary Sierra Drilling & Blasting Ltd.																	
26																		
27																		
28																		
29																		
30																		

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS. APPENDIX.GPJ CALGARY.GDT 10/30/14

DEPTH SCALE

1 : 50



LOGGED: DE

CHECKED: JT

DATA ENTRY: JPG

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC-PIZDC1401

SHEET 4 OF 4

LOCATION: See Location Plan, West side of Dry Creek

BORING DATE: April 26, 2014

DATUM: Local

LC_PIZDC1404D

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER TYPE				
30	DR-24 - Air Rotary Sierra Drilling & Blasting Ltd.	TILL - (ML) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, w<PL, soft (continued)							Bentonite Pellet Plug
31									Colorado Silica Sand
32									
33		(GP) SANDY GRAVEL, fine to medium-grained, sub-angular with trace sub-rounded, some silt, dark grey, wet, dense		32.31					Slotted Section
34									
35									Colorado Silica Sand
36		End of MONITORING WELL.		35.36					
37		NOTES: Standpipe installed to 35.3 m.							
38									
39									
40									

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS APPENDIX.GPJ CALGARY.GDT 10/30/14

DEPTH SCALE

1 : 50



LOGGED: DE

CHECKED: JT

DATA ENTRY: JPG

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC-PIZDC1402

SHEET 1 OF 2

LOCATION: See Location Plan, West side of Dry Creek

BORING DATE: April 25, 2014

DATUM: Local

LC_PIZDC1404S

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT				
							20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³		
							nat V. + Q - ● rem V. ⊕ U - ○				Wp ----- W ----- WI					
							10	20	30	40	10	20	30	40		
0		Ground Surface		0.00												Stickup = 1.14 m
		TOPSOIL - (OL) Gravelly ORGANIC SILT, angular, some sand, roots and rootlets, black, moist, loose		0.30												
		(ML) SANDY SILT, light brown, moist, compact														
1		TILL - (MH) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, dark brown, cohesive, w<PL, very soft to soft		0.91												
2																
3																
4		--- Becoming grey, firm at 4.0 m														
5																
6		TILL - (MH) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, cohesive, w<PL, soft to firm		5.64												
7																
8																
9																
10																
		CONTINUED NEXT PAGE														

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS. APPENDIX.GPJ CALGARY.GDT 10/30/14

DEPTH SCALE
1 : 50



LOGGED: DE
CHECKED: JT

DATA ENTRY: JPG

PROJECT No.: 13-1345-0010

RECORD OF MONITORING WELL: LC-PIZDC1402

SHEET 2 OF 2

LOCATION: See Location Plan, West side of Dry Creek

BORING DATE: April 25, 2014

DATUM: Local

LC_PIZDC1404S

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20		40		60				80	
10	DR-24 - Air Rotary 150 mm Casing Sierra Drilling & Blasting Ltd.	TILL - (MH) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, cohesive, w<PL, soft to firm <i>(continued)</i> --- Becoming firm to stiff at 10.2 m															
11																	
12		(GP-GM) GRAVEL, sub-angular, trace sub-rounded, fine-grained, some silt to silty, dark grey, wet, compact		11.89												Slotted Section	
13	End of MONITORING WELL.		12.75												Colorado Silica Sand		
14	NOTES: Standpipe installed to 12.6 m.																
15																	
16																	
17																	
18																	
19																	
20																	

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010_BH LOGS APPENDIX.GPJ CALGARY.GDT 10/30/14

DEPTH SCALE

1 : 50



LOGGED: DE

CHECKED: JT

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-01
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54656.9090, Y - 27929.7910	ELEVATION: 1287.025 m
SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube <input type="checkbox"/> No Recovery <input checked="" type="checkbox"/> SPT Test (N) <input type="checkbox"/> Grab Sample <input type="checkbox"/> Split-Pen <input type="checkbox"/> Core	
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite <input type="checkbox"/> Pea Gravel <input type="checkbox"/> Slough <input type="checkbox"/> Grout <input type="checkbox"/> Drill Cuttings <input type="checkbox"/> Sand	

Depth (m)	STANDARD PEN (N)		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	ELEVATION (m)
	20	40							
0				Fine-grained Sand - trace fines, trace gravel, dense, light brown, moist				Top of Pipe Elevation - 1287.025 m	
1								50 mm PVC, Schedule 40 Monitoring Well, 10 Slot Well Screen with Steel Stick Up Casing Protector	1286
2									1285
3				...trace coarse-grained sand, slight moisture increase					1284
4									1283
5				...some cobbles		A1			1282
6				...some gravel, medium brown					1281
6				Sand - some gravel, trace cobbles, trace fines, dense, medium brown, moist					1280
7				...trace fines, gravelly, light brown					1279
7				...no cobbles, medium brown					1278
8				...trace cobbles					1277
9									1276
10									1275

BOREHOLE LOGS.GPJ 10/03/23 12:46 PM (BOREHOLE LOG)



AMEC Earth & Environmental
Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH
REVIEWED BY: RH
Fig. No: 1

COMPLETION DEPTH: 56.40 m
COMPLETION DATE: 1/20/10

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-01
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54656.9090, Y - 27929.7910	ELEVATION: 1287.025 m

SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube	<input type="checkbox"/> No Recovery	<input checked="" type="checkbox"/> SPT Test (N)	<input type="checkbox"/> Grab Sample	<input type="checkbox"/> Split-Pen	<input type="checkbox"/> Core
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite	<input type="checkbox"/> Pea Gravel	<input type="checkbox"/> Slough	<input type="checkbox"/> Grout	<input type="checkbox"/> Drill Cuttings	<input type="checkbox"/> Sand

Depth (m)	STANDARD PEN (N)			SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
	20	40	60								
10											
11											1276
12											1275
13											1274
14											1273
15											1272
16											1271
17											1270
18											1269
19											1268
20					...cobbley						

DRAFT

BOREHOLE LOGS.GPJ 10/03/23 12:46 PM (BOREHOLE LOG)

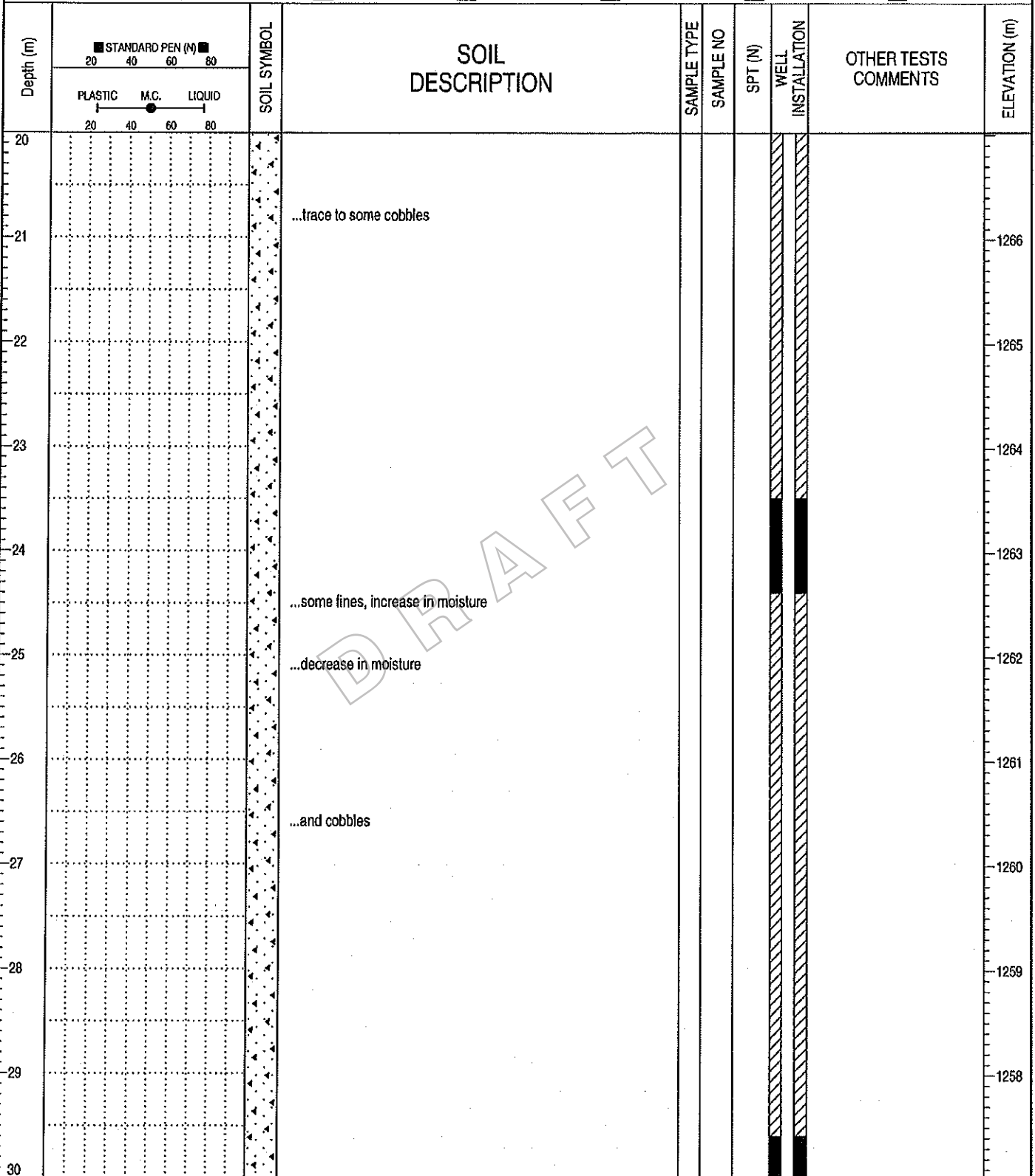


AMEC Earth & Environmental
Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH
REVIEWED BY: RH
Fig. No: 1

COMPLETION DEPTH: 56.40 m
COMPLETION DATE: 1/20/10

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-01
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54656.9090, Y - 27929.7910	ELEVATION: 1287.025 m
SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube <input type="checkbox"/> No Recovery <input checked="" type="checkbox"/> SPT Test (N) <input type="checkbox"/> Grab Sample <input type="checkbox"/> Split-Pen <input type="checkbox"/> Core	
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite <input type="checkbox"/> Pea Gravel <input type="checkbox"/> Slough <input type="checkbox"/> Grout <input type="checkbox"/> Drill Cuttings <input type="checkbox"/> Sand	



BOREHOLE LOGS.GPJ 10/02/23 12:46 PM (BOREHOLE LOG)



AMEC Earth & Environmental
Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH

REVIEWED BY: RH

Fig. No: 1

COMPLETION DEPTH: 56.40 m

COMPLETION DATE: 1/20/10

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-01
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54656.9090, Y - 27929.7910	ELEVATION: 1287.025 m
SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube <input type="checkbox"/> No Recovery <input checked="" type="checkbox"/> SPT Test (N) <input type="checkbox"/> Grab Sample <input type="checkbox"/> Split-Pen <input type="checkbox"/> Core	
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite <input type="checkbox"/> Pea Gravel <input type="checkbox"/> Slough <input type="checkbox"/> Grout <input type="checkbox"/> Drill Cuttings <input type="checkbox"/> Sand	

Depth (m)	STANDARD PEN (N) 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
31		...trace fines, gravelly, light brown							1256
32		...some fines							1255
33		...trace fines							1254
34									1253
35									1252
36									1251
37		...ivory-white sand ...no ivory-white sand, trace fines							1250
38									1249
39									1248
40									

DRAFT

BOREHOLE LOGS.GPJ 10/03/23 12:46 PM (BOREHOLE LOG)



AMEC Earth & Environmental
Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH
REVIEWED BY: RH
Fig. No: 1

COMPLETION DEPTH: 56.40 m
COMPLETION DATE: 1/20/10
Page 4 of 6

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-01
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54656.9090, Y - 27929.7910	ELEVATION: 1287.025 m
SAMPLE TYPE	<input type="checkbox"/> Shelby Tube <input type="checkbox"/> No Recovery <input checked="" type="checkbox"/> SPT Test (N) <input type="checkbox"/> Grab Sample <input type="checkbox"/> Split-Pen <input type="checkbox"/> Core	
BACKFILL TYPE	<input type="checkbox"/> Bentonite <input type="checkbox"/> Pea Gravel <input type="checkbox"/> Slough <input type="checkbox"/> Grout <input checked="" type="checkbox"/> Drill Cuttings <input type="checkbox"/> Sand	

Depth (m)	STANDARD PEN (N) 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
41									1245
42									1244
43									1243
44									1242
45									1241
46									1240
47									1239
48									1238
49									
50									

DRAFT

BOREHOLE LOGS.GPJ 10/03/23 12:46 PM (BOREHOLE LOG)

	AMEC Earth & Environmental Medicine Hat, Alberta T1A 8G3	LOGGED BY: RH	COMPLETION DEPTH: 56.40 m
		REVIEWED BY: RH	COMPLETION DATE: 1/20/10
		Fig. No: 1	Page 5 of 6

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-01
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54656.9090, Y - 27929.7910	ELEVATION: 1287.025 m

SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube	<input type="checkbox"/> No Recovery	<input checked="" type="checkbox"/> SPT Test (N)	<input type="checkbox"/> Grab Sample	<input type="checkbox"/> Split-Pen	<input type="checkbox"/> Core
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite	<input type="checkbox"/> Pea Gravel	<input type="checkbox"/> Slough	<input type="checkbox"/> Grout	<input type="checkbox"/> Drill Cuttings	<input type="checkbox"/> Sand

Depth (m)	STANDARD PEN (N) 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
51									1235
52									1234
53									1233
54			Coarse-grained Sand - trace gravel, some fines, dense, medium brown, wet						1232
55									1231
56			END OF BOREHOLE AT 56.4 m		A2				1230
57									1229
58									1228
59									
60									

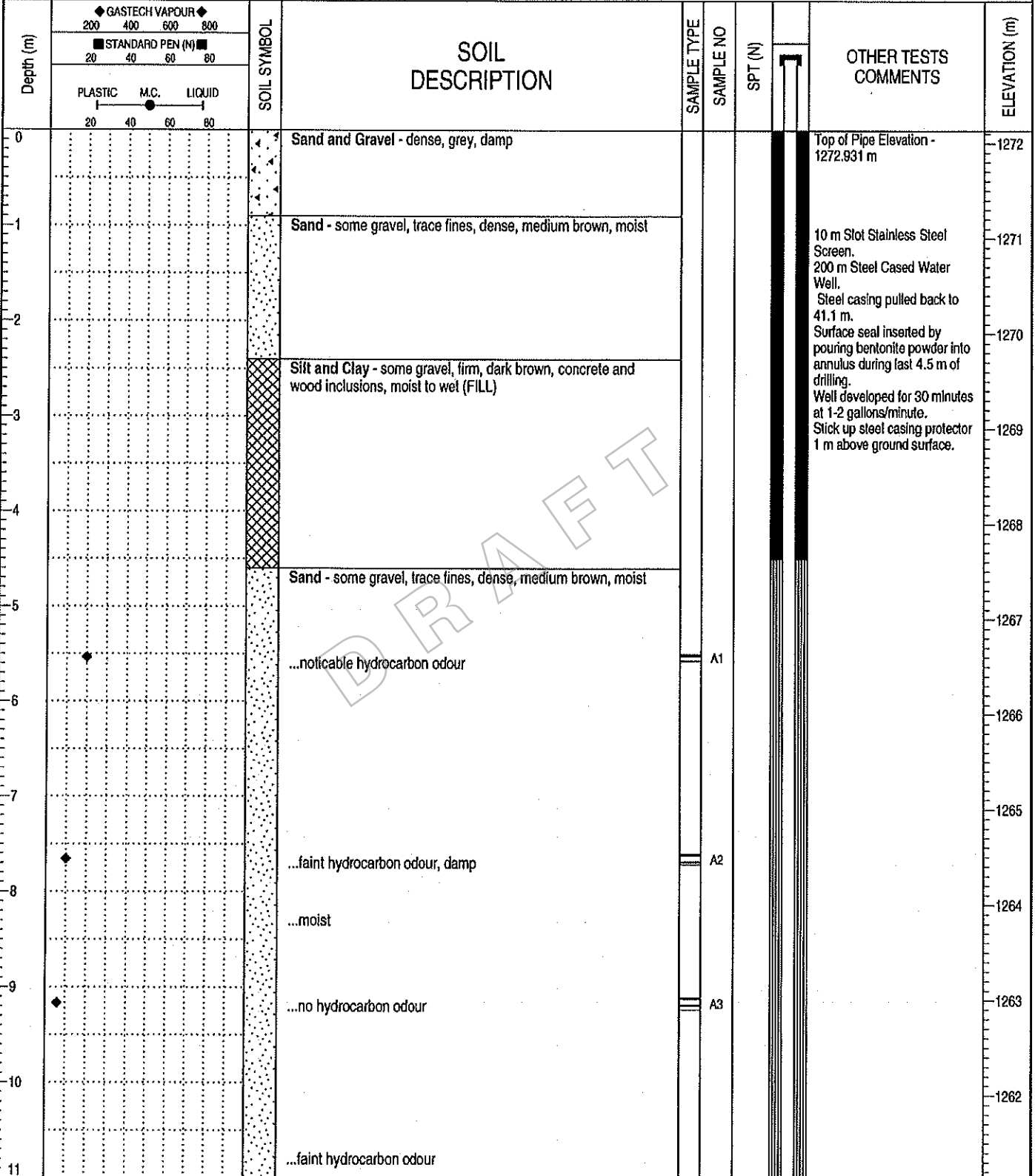
DRAFT

BOREHOLE LOGS.GPJ_10/03/23 12:46 PM (BOREHOLE LOG)

	AMEC Earth & Environmental Medicine Hat, Alberta T1A 8G3	LOGGED BY: RH	COMPLETION DEPTH: 56.40 m
		REVIEWED BY: RH	COMPLETION DATE: 1/20/10
		Fig. No: 1	Page 6 of 6

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-02
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X-54273.7949, Y- 27669.2550	ELEVATION: 1272.131 m

SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube	<input type="checkbox"/> No Recovery	<input checked="" type="checkbox"/> SPT Test (N)	<input type="checkbox"/> Grab Sample	<input type="checkbox"/> Split-Pen	<input type="checkbox"/> Core
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite	<input type="checkbox"/> Pea Gravel	<input type="checkbox"/> Slough	<input type="checkbox"/> Grout	<input checked="" type="checkbox"/> Drill Cuttings	<input type="checkbox"/> Sand



BOREHOLE LOGS.GPJ 19/03/23 12:27 PM (BOREHOLE LOG)



AMEC Earth & Environmental
Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH
REVIEWED BY: RH
Fig. No: 2

COMPLETION DEPTH: 43.60 m
COMPLETION DATE: 1/21/10

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-02
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X-54273.7949,Y- 27669.2550	ELEVATION: 1272.131 m

SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube	<input type="checkbox"/> No Recovery	<input checked="" type="checkbox"/> SPT Test (N)	<input type="checkbox"/> Grab Sample	<input type="checkbox"/> Split-Pen	<input type="checkbox"/> Core
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite	<input type="checkbox"/> Pea Gravel	<input type="checkbox"/> Slough	<input type="checkbox"/> Grout	<input checked="" type="checkbox"/> Drill Cuttings	<input type="checkbox"/> Sand

Depth (m)	GASTECH VAPOUR			SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
	200	400	600								
11					...noticeable hydrocarbon odour						-1261
12											-1260
13						A4					-1259
14					...no hydrocarbon odour	A5					-1258
15											-1257
16											-1256
17					...noticeable hydrocarbon odour	A6					-1255
18					...some cobbles						-1254
19					...no hydrocarbon odour	A7					-1253
20					...cobbley						-1252
21											-1251
22											-1250

BOREHOLE LOGS.GPJ 10/03/23 12:27 PM (BOREHOLE LOG)

DRAFT



AMEC Earth & Environmental
Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH
REVIEWED BY: RH
Fig. No: 2

COMPLETION DEPTH: 43.60 m
COMPLETION DATE: 1/21/10

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-02
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X-54273.7949, Y- 27669.2550	ELEVATION: 1272.131 m
SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube <input type="checkbox"/> No Recovery <input checked="" type="checkbox"/> SPT Test (N) <input type="checkbox"/> Grab Sample <input type="checkbox"/> Split-Pen <input type="checkbox"/> Core	
BACKFILL TYPE	<input type="checkbox"/> Bentonite <input type="checkbox"/> Pea Gravel <input type="checkbox"/> Slough <input type="checkbox"/> Grout <input type="checkbox"/> Drill Cuttings <input type="checkbox"/> Sand	

Depth (m)	◆ GASTECH VAPOUR ◆ 200 400 600 800 ■ STANDARD PEN (N) ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80			SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)	
	DRAFT											
22												1250
23	◆						A8					1249
24												1248
25					...fine-grained sand, some gravel							1247
26					...no hydrocarbon odour ...noticeable hydrocarbon odour							1246
27												1245
28												1244
29												1243
30												1242
31												1241
32												1240
33												1240

BOREHOLE LOGS.GPJ 10/03/23 12:27 PM (BOREHOLE LOG)

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-02
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X-54273.7949, Y- 27669.2550	ELEVATION: 1272.131 m
SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube <input type="checkbox"/> No Recovery <input checked="" type="checkbox"/> SPT Test (N) <input type="checkbox"/> Grab Sample <input type="checkbox"/> Split-Pen <input type="checkbox"/> Core	
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite <input type="checkbox"/> Pea Gravel <input type="checkbox"/> Slough <input type="checkbox"/> Grout <input type="checkbox"/> Drill Cuttings <input type="checkbox"/> Sand	

Depth (m)	◆ GASTECH VAPOUR ◆ 200 400 600 800 ■ STANDARD PEN (N) ■ 20 40 60 80 PLASTIC M.C. LIQUID 20 40 60 80		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
33										1239
34										1238
35										1237
36										1236
37										1235
38				...no hydrocarbon odour						1234
39										1233
40										1232
41				Coarse-grained Sand and Gravel - (angular gravel), silty, dense, medium brown, wet						1231
42										1230
43										1229
44				END OF BOREHOLE AT 43.6 m						

DRAFT

BOREHOLE LOGS.GPJ 10/03/23 12:27 PM (BOREHOLE LOG)

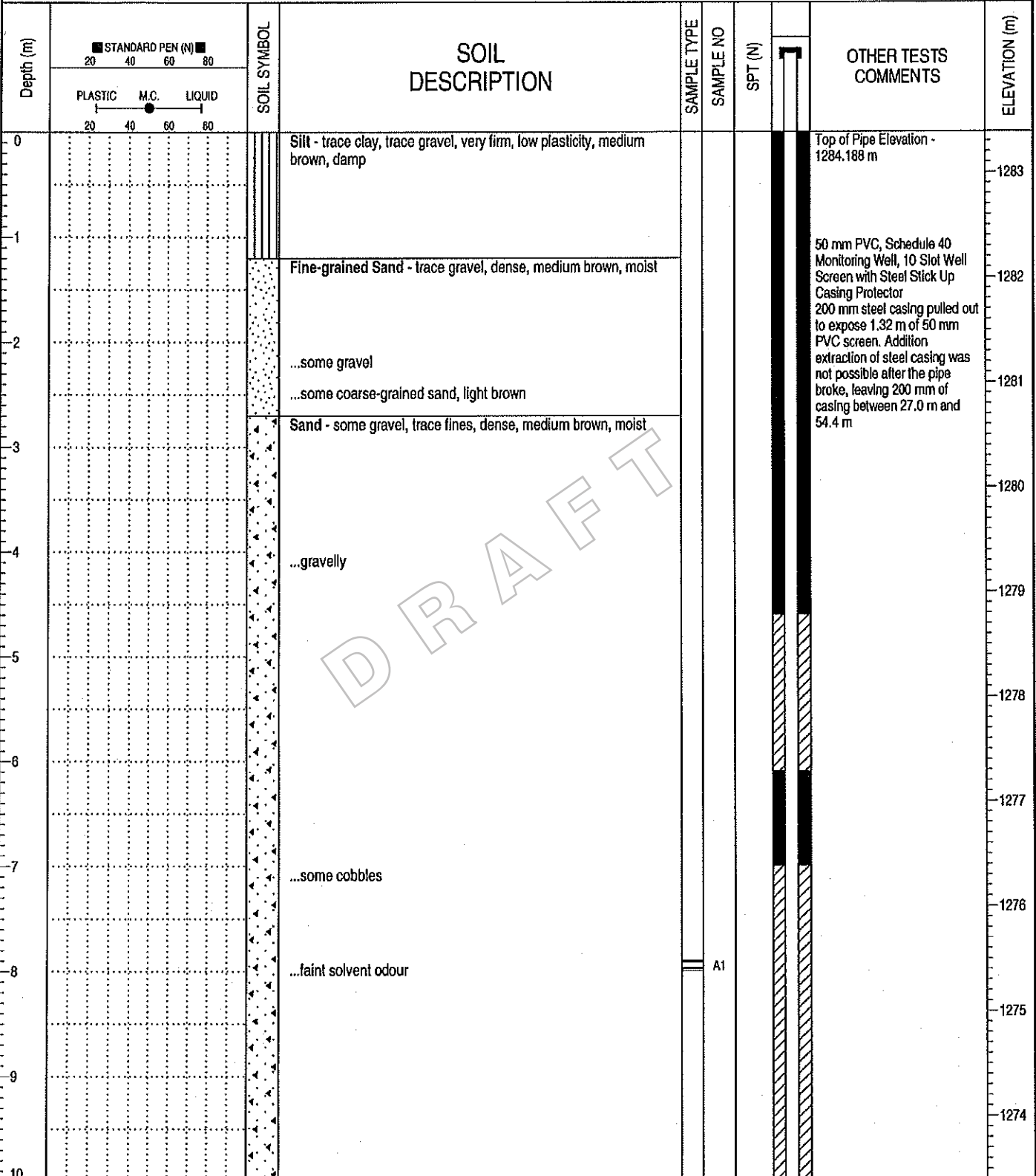


AMEC Earth & Environmental
Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH
REVIEWED BY: RH
Fig. No: 2

COMPLETION DEPTH: 43.60 m
COMPLETION DATE: 1/21/10

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-03
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54627.1430, Y - 27968.0540	ELEVATION: 1283.388 m
SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube <input type="checkbox"/> No Recovery <input checked="" type="checkbox"/> SPT Test (N) <input type="checkbox"/> Grab Sample <input type="checkbox"/> Split-Pen <input type="checkbox"/> Core	
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite <input type="checkbox"/> Pea Gravel <input type="checkbox"/> Slough <input type="checkbox"/> Grout <input type="checkbox"/> Drill Cuttings <input type="checkbox"/> Sand	



BOREHOLE LOGS.GPJ 10/03/23 12:47 PM (BOREHOLE LOG)



AMEC Earth & Environmental
 Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH
 REVIEWED BY: RH
 Fig. No: 3

COMPLETION DEPTH: 55.80 m
 COMPLETION DATE: 1/22/10

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-03
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54627.1430, Y - 27968.0540	ELEVATION: 1283.388 m
SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube <input type="checkbox"/> No Recovery <input checked="" type="checkbox"/> SPT Test (N) <input type="checkbox"/> Grab Sample <input type="checkbox"/> Split-Pen <input type="checkbox"/> Core	
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite <input type="checkbox"/> Pea Gravel <input type="checkbox"/> Slough <input type="checkbox"/> Grout <input type="checkbox"/> Drill Cuttings <input type="checkbox"/> Sand	

Depth (m)	STANDARD PEN (N)		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
	PLASTIC	M.C.								
10				...and gravel						1273
11				...gravelly						1272
12										1271
13										1270
14				...some gravel, damp						1269
15										1268
16										1267
17				...trace gravel						1266
18										1265
19				...some gravel, moist						1264
20										

DRAFT

BOREHOLE LOGS.GPJ 10/03/23 12:47 PM (BOREHOLE LOG)



AMEC Earth & Environmental
Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH
REVIEWED BY: RH
Fig. No: 3

COMPLETION DEPTH: 55.80 m
COMPLETION DATE: 1/22/10
Page 2 of 6

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-03
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54627.1430, Y - 27968.0540	ELEVATION: 1283.388 m

SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube	<input type="checkbox"/> No Recovery	<input checked="" type="checkbox"/> SPT Test (N)	<input type="checkbox"/> Grab Sample	<input type="checkbox"/> Split-Pen	<input type="checkbox"/> Core
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite	<input type="checkbox"/> Pea Gravel	<input type="checkbox"/> Slough	<input type="checkbox"/> Grout	<input type="checkbox"/> Drill Cuttings	<input type="checkbox"/> Sand

Depth (m)	STANDARD PEN (N)		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
	20	40								
20										1263
21										1262
22										1261
23				...trace gravel, some fines						1260
24										1259
25										1258
26										1257
27										1256
28				...trace fines						1255
29				...some gravel						1254
30										

DRAFT

BOREHOLE LOGS.GPJ 10/03/23 12:47 PM (BOREHOLE LOG)



AMEC Earth & Environmental
Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH
REVIEWED BY: RH
Fig. No: 3

COMPLETION DEPTH: 55.80 m
COMPLETION DATE: 1/22/10
Page 3 of 6

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-03
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54627.1430, Y - 27968.0540	ELEVATION: 1283.388 m
SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube <input type="checkbox"/> No Recovery <input checked="" type="checkbox"/> SPT Test (N) <input type="checkbox"/> Grab Sample <input type="checkbox"/> Split-Pen <input type="checkbox"/> Core	
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite <input type="checkbox"/> Pea Gravel <input type="checkbox"/> Slough <input type="checkbox"/> Grout <input type="checkbox"/> Drill Cuttings <input type="checkbox"/> Sand	

Depth (m)	STANDARD PEN (N)		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
	20	40								
30										1253
31				...some cobbles						1252
32										1251
33										1250
34										1249
35				...some fines						1248
36										1247
37				...trace fines						1246
38										1245
39										1244
40										1244

BOREHOLE LOGS.GPJ 10/03/23 12:47 PM (BOREHOLE LOG)

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AMEC Earth & Environmental
Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH
REVIEWED BY: RH
Fig. No: 3


COMPLETION DEPTH: 55.80 m
COMPLETION DATE: 1/22/10

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-03
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54627.1430, Y - 27968.0540	ELEVATION: 1283.388 m
SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube <input type="checkbox"/> No Recovery <input checked="" type="checkbox"/> SPT Test (N) <input type="checkbox"/> Grab Sample <input type="checkbox"/> Split-Pen <input type="checkbox"/> Core	
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite <input type="checkbox"/> Pea Gravel <input type="checkbox"/> Slough <input type="checkbox"/> Grout <input type="checkbox"/> Drill Cuttings <input type="checkbox"/> Sand	

Depth (m)	STANDARD PEN (N)		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
	PLASTIC	M.C.								
40										1243
41				...grey, damp						1242
42				...medium brown						1241
43										1240
44										1239
45										1238
46				...cobbly						1237
47										1236
48										1235
49										1234
50										

DRAFT

BOREHOLE LOGS.GPJ, 10/03/23 12:47 PM (BOREHOLE LOG)

	AMEC Earth & Environmental Medicine Hat, Alberta T1A 8G3	LOGGED BY: RH	COMPLETION DEPTH: 55.80 m
		REVIEWED BY: RH	COMPLETION DATE: 1/22/10
		Fig. No: 3	Page 5 of 6

CLIENT: Teck Coal Ltd.	PROJECT: Soil and Groundwater Assessment	BOREHOLE NO: MW10-03
DRILLER: J.R. Drilling	LOCATION: Line Creek Mine, Sparwood, B.C.	PROJECT NO: BX05973
DRILL/METHOD: Air Rotary	BOREHOLE LOCATION: X - 54627.1430, Y - 27968.0540	ELEVATION: 1283.388 m

SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube	<input type="checkbox"/> No Recovery	<input checked="" type="checkbox"/> SPT Test (N)	<input type="checkbox"/> Grab Sample	<input type="checkbox"/> Split-Pen	<input type="checkbox"/> Core
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite	<input type="checkbox"/> Pea Gravel	<input type="checkbox"/> Slough	<input type="checkbox"/> Grout	<input type="checkbox"/> Drill Cuttings	<input type="checkbox"/> Sand

Depth (m)	STANDARD PEN (N)		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
	PLASTIC	M.C.								
50										1233
51										1232
52										1231
53										1230
54				Gravel - some sand, trace fines, dense, medium brown, wet						1229
55				Coarse-grained Sand - some gravel, some fines, dense, medium brown, wet						1228
56				END OF BOREHOLE AT 57.8 m						1227
57										1226
58										1225
59										1224
60										

BOREHOLE LOGS.GPJ 10/03/23 12:47 PM (BOREHOLE LOG)



AMEC Earth & Environmental
Medicine Hat, Alberta T1A 8G3

LOGGED BY: RH

REVIEWED BY: RH

Fig. No: 3

COMPLETION DEPTH: 55.80 m

COMPLETION DATE: 1/22/10

CLIENT: Teck Coal Ltd.		PROJECT: GW Assessment - Effluent Ponds		BOREHOLE NO: MW11(P)-01	
DRILLER: JR Drilling		LOCATION: Teck - LCO		PROJECT NO: BX06169	
DRILL/METHOD: DR-12/ Air Rotary		BOREHOLE LOCATION: Refer to site plan		ELEVATION: 1266.06 m	
SAMPLE TYPE		<input checked="" type="checkbox"/> Shelby Tube	<input checked="" type="checkbox"/> No Recovery	<input checked="" type="checkbox"/> SPT Test (N)	<input checked="" type="checkbox"/> Grab Sample
BACKFILL TYPE		<input checked="" type="checkbox"/> Bentonite	<input type="checkbox"/> Pea Gravel	<input type="checkbox"/> Slough	<input type="checkbox"/> Grout
				<input checked="" type="checkbox"/> Split-Pen	<input type="checkbox"/> Core
				<input checked="" type="checkbox"/> Drill Cuttings	<input type="checkbox"/> Sand

Depth (m)	GASTECH VAPOUR			SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
	200	400	600								
0					SAND, silty, some gravel, trace clay, loose, compact, medium brown, dry					Top of casing (TOC) elevation is 1267.06 mASL. Stick-up = 1.0 m. Depth to groundwater was 30.81 m from TOC 23 November 2011 (1236.25 mASL). 150 mm steel casing installed from surface to 33.5 m. A 50 mm Schedule 40 slotted PVC screen was installed from 37.5 m to 40.5 m. K = 7.4 x 10 ⁻⁴ m/s	1265
1					-gravelly						1264
2					SILT, sandy, some cobbles, some gravel, compact, grey brown, damp						1263
3											1262
4											1261
5											1260
6					SILTY SAND, some gravel, compact, medium brown, dry						1259
7											1258
8											1257
9					SILT, some cobbles, trace FG sand, firm, medium brown, damp						1256
10											1255
11											1254
12											1253
13											1252
14											1251
15											1250
16											1249
17										1248	
18					-damp					1247	
19										1246	
20										1245	
21					-dry					1244	
22										1243	
23										1242	
24										1241	
25										1240	
26										1239	
27										1238	
28					-damp					1237	
29										1236	
30										1235	
31										1234	
32										1233	
33										1232	
34					SAND AND GRAVEL, dense, brown grey, moist (sub-rounded gravel)					1231	
35										1230	
36					CG SAND, some gravel, dense, brown grey, wet (sub rounded to sub angular)					1229	
37										1228	
38										1227	
39										1226	
40					-wet					1225	
41										1224	
42					END OF HOLE AT 41.2 m					1223	
43					Borehole wet at completion. Monitoring well installed.					1222	

BX06169 - BOREHOLE LOGS - SEPTEMBER 30, 2011, GPJ 12:01:04 03:30 PM (BOREHOLE LOG)

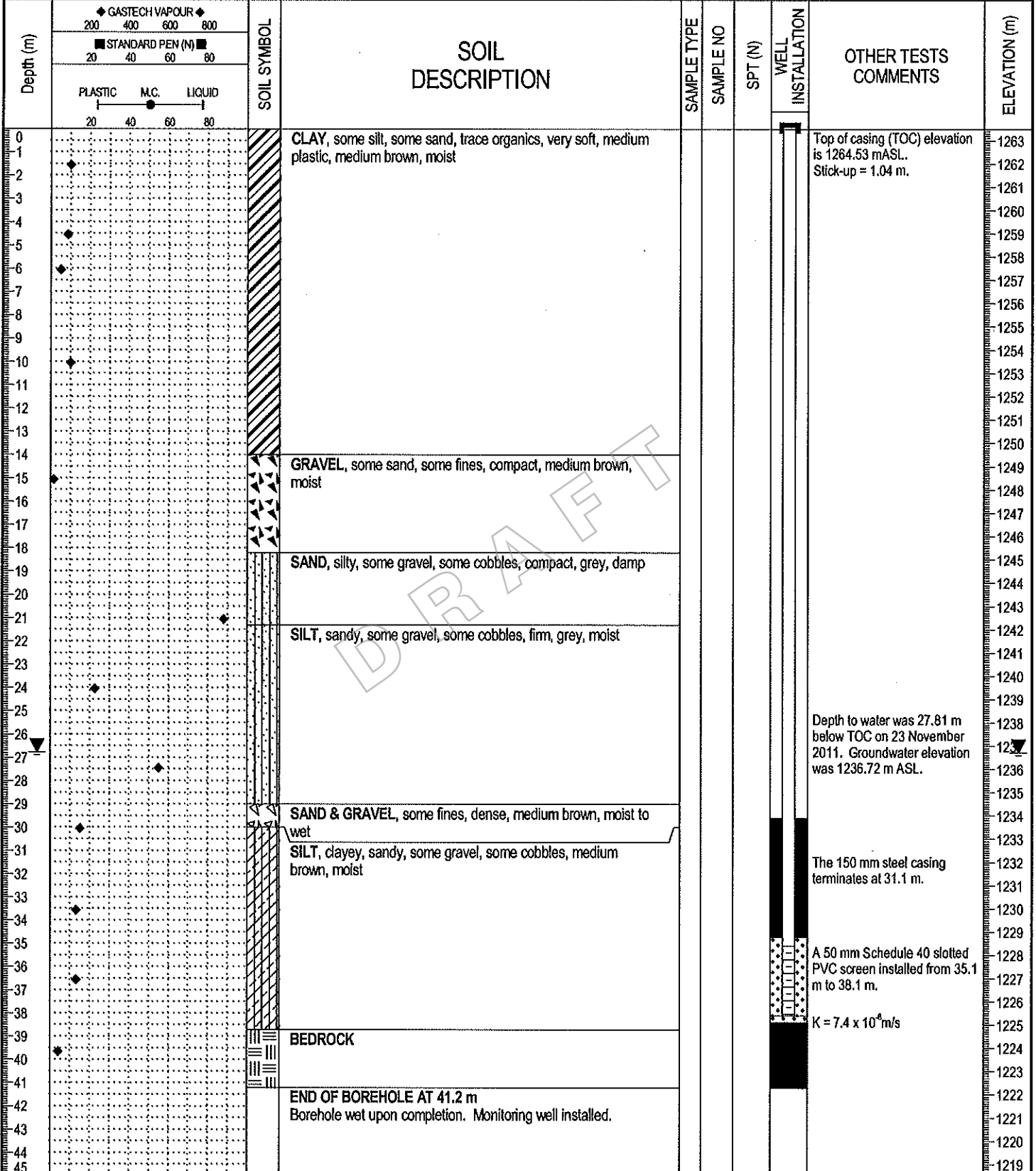


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Medicine Hat, Alberta

LOGGED BY: RH
REVIEWED BY: LH

COMPLETION DEPTH: 40.50 m
COMPLETION DATE: 11/15/11

CLIENT: Teck Coal Ltd.	PROJECT: GW Assessment - Effluent Ponds	BOREHOLE NO: MW11(P)-03
DRILLER: JR Drilling	LOCATION: Teck - LCO	PROJECT NO: BX06169
DRILL/METHOD: DR-12/Air Rotary	BOREHOLE LOCATION: Refer to site plan	ELEVATION: 1263.49 m
SAMPLE TYPE	<input checked="" type="checkbox"/> Shelby Tube <input checked="" type="checkbox"/> No Recovery <input checked="" type="checkbox"/> SPT Test (N) <input checked="" type="checkbox"/> Grab Sample <input checked="" type="checkbox"/> Split-Pen <input checked="" type="checkbox"/> Core	
BACKFILL TYPE	<input checked="" type="checkbox"/> Bentonite <input checked="" type="checkbox"/> Pea Gravel <input checked="" type="checkbox"/> Slough <input checked="" type="checkbox"/> Grout <input checked="" type="checkbox"/> Drill Cuttings <input checked="" type="checkbox"/> Sand	



BX06169 - BOREHOLE LOGS - SEPTEMBER 30, 2011.GPJ 12/01/04 03:30 PM (BOREHOLE LOG)



AMEC Environment & Infrastructure
Medicine Hat, Alberta

LOGGED BY: RH
REVIEWED BY: LH

COMPLETION DEPTH: 41.20 m
COMPLETION DATE: 11/18/11

CLIENT: Teck Coal Ltd.		PROJECT: GW Assessment - Effluent Ponds		BOREHOLE NO: MW11(P)-04	
DRILLER: JR Drilling		LOCATION: Teck - LCO		PROJECT NO: BX06169	
DRILL/METHOD: DR-12/Air Rotary		BOREHOLE LOCATION: Refer to site plan		ELEVATION: 1271.15 m	
SAMPLE TYPE		<input checked="" type="checkbox"/> Shelby Tube	<input type="checkbox"/> No Recovery	<input checked="" type="checkbox"/> SPT Test (N)	<input type="checkbox"/> Grab Sample
BACKFILL TYPE		<input checked="" type="checkbox"/> Bentonite	<input type="checkbox"/> Pea Gravel	<input type="checkbox"/> Slough	<input type="checkbox"/> Grout
				<input checked="" type="checkbox"/> Split-Pen	<input type="checkbox"/> Core
				<input checked="" type="checkbox"/> Drill Cuttings	<input type="checkbox"/> Sand

Depth (m)	SOIL SYMBOL			SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
	◆ GASTECH VAPOUR	■ STANDARD PEN (N)	PLASTIC M.C. LIQUID							
0				CLAY, trace silt, trace sand, some cobbles, firm, medium plastic, medium brown, moist					Top of casing (TOC) elevation is 1272.10 mASL. Stick-up = 0.95 m.	1270
1										1269
2										1268
3										1267
4										1266
5										1266
6										1265
7				-some reddish-pink fragments (fractured cobbles)						1264
8				-cobbly (6.7 to 7.3 m)						1263
9				SILT, some cobbles, some sand, trace clay, firm, light brown, damp						1262
10										1261
11				-moist						1260
12				-sandy						1259
13				-some sand						1258
14										1257
15				-sandy						1256
16				-cobbly						1255
17										1254
18										1253
19										1252
20										1251
21										1250
22				-some cobbles						1249
23										1248
24										1247
25				-some sand						1246
26				-30 cm seam of silty sand, moist						1245
27										1244
28										1243
29										1242
30										1241
31				SAND & GRAVEL, silty, some cobbles, dense, medium brown, moist						1240
32										1239
33										1238
34										1237
35				SILT, some cobbles, some sand, trace clay, firm, dark brown, wet					Steel casing terminates at 30.8 m. Depth to groundwater 34.88 m from TOC on 23 November 2011 (1237.25 mASL). A 50 mm Schedule 40 slotted PVC screen installed from 33.8 m to 36.8 m. K = 3.4 x 10 ⁻⁴ m/s	1236
36				SAND & GRAVEL, silty, some cobbles, dense, medium brown, wet						1235
37				SILT, some cobbles, some sand, trace clay, firm, dark brown, wet						1234
38										1233
39										1232
40										1231
41				END OF BOREHOLE AT 38.1 m						1230
42				Borehole wet upon completion. Monitoring well installed.						1229
43										1228
44										1227
45										1227

BX06169 - BOREHOLE LOGS - SEPTEMBER 30, 2011, GPJ 12/01/04 03:30 PM (BOREHOLE LOG)



AMEC Environment & Infrastructure
Medicine Hat, Alberta

LOGGED BY: RH
REVIEWED BY: LH

COMPLETION DEPTH: 38.10 m
COMPLETION DATE: 11/21/11

CLIENT: Teck Coal Ltd.		PROJECT: GW Assessment - Effluent Ponds		BOREHOLE NO: MW11(P)-05	
DRILLER: JR Drilling		LOCATION: Teck - LCO		PROJECT NO: BX06169	
DRILL/METHOD: DR-12/Air Rotary		BOREHOLE LOCATION: Refer to site plan		ELEVATION: 1272.94 m	
SAMPLE TYPE		<input checked="" type="checkbox"/> Shelby Tube	<input checked="" type="checkbox"/> No Recovery	<input checked="" type="checkbox"/> SPT Test (N)	<input checked="" type="checkbox"/> Grab Sample
BACKFILL TYPE		<input checked="" type="checkbox"/> Bentonite	<input checked="" type="checkbox"/> Pea Gravel	<input checked="" type="checkbox"/> Slough	<input checked="" type="checkbox"/> Grout
				<input checked="" type="checkbox"/> Split-Pen	<input checked="" type="checkbox"/> Core
				<input checked="" type="checkbox"/> Drill Cuttings	<input checked="" type="checkbox"/> Sand

Depth (m)	SOIL SYMBOL			SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
	◆ GASTECH VAPOUR ◆ 200 400 600 800	■ STANDARD PEN (N) ■ 20 40 60 80	PLASTIC M.C. LIQUID 20 40 60 80							
0				CLAY, trace silt, trace sand, some cobbles, firm, medium plastic, medium brown, moist					Top of casing (TOC) elevation is 1273.86 mASL. Stick-up = 0.92 m.	1272
1										1271
2										1270
3										1269
4										1268
5										1267
6				-cobbley						1266
7										1265
8										1264
9				SILT, some cobbles, some sand, trace clay, firm, orange brown, damp						1263
10				-30 cm seam of silty sand, moist						1262
11				-cobbley, medium brown						1261
12										1260
13										1259
14										1258
15										1257
16										1256
17										1255
18										1254
19										1253
20										1252
21										1251
22				-boulder						1250
23										1249
24										1248
25				-sandy, light brown						1247
26										1246
27										1245
28										1244
29										1243
30										1242
31										1241
32										1240
33										1239
34										1238
35										1237
36										1236
37										1235
38				SAND & GRAVEL, some fines, some cobbles, dense, medium brown, damp					A 50 mm Schedule 40 slotted PVC screen was installed from 35.1 m to 38.1 m. Depth to groundwater is 38.35 m from TOC on 23 November 2011 (1235.51 mASL). K - n/a	1235
39				BEDROCK						1234
40										1233
41				END OF BOREHOLE AT 40.5 m						1232
42				Borehole wet upon completion. Monitoring well installed.						1231
43										1230
44										1229
45										

BX06169 - BOREHOLE LOGS - SEPTEMBER 30, 2011, GPJ 12/01/04 03:30 PM (BOREHOLE LOG)



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Medicine Hat, Alberta

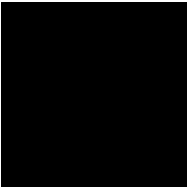
LOGGED BY: RH
REVIEWED BY: LH

COMPLETION DEPTH: 40.50 m
COMPLETION DATE: 11/22/11

APPENDIX G

Laboratory Certificates of Analysis

Q1 – COAs



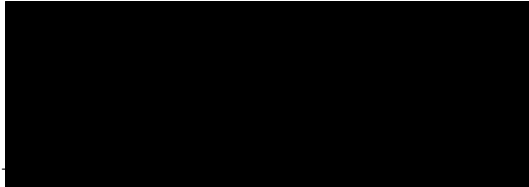
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 24-JAN-19
Report Date: 31-JAN-19 17:11 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2224637
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190122 GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2224637-1 LC_PIZP1101_WG_Q1-2019_N							
Sampled By: KC/DT on 22-JAN-19 @ 13:45							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	0.68		0.50	mg/L		28-JAN-19	R4474012
Total Kjeldahl Nitrogen	0.059		0.050	mg/L		28-JAN-19	R4472307
Mercury (Hg)-Total	0.00240		0.00050	ug/L		30-JAN-19	R4477027
Total Organic Carbon	1.10		0.50	mg/L		28-JAN-19	R4474012
EPH Testing for teck Coal							
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	24-JAN-19	26-JAN-19	R4471449
EPH19-32	<0.25		0.25	mg/L	24-JAN-19	26-JAN-19	R4471449
Surrogate: 2-Bromobenzotrifluoride	87.7		50-150	%	24-JAN-19	26-JAN-19	R4471449
Sum of EPH (10-32)							
EPH (C10-C32)	<0.50		0.50	mg/L		28-JAN-19	
TEH (C10-C30)							
TEH (C10-C30)	<0.25		0.25	mg/L	24-JAN-19	26-JAN-19	R4471449
Surrogate: 2-Bromobenzotrifluoride	87.7		50-150	%	24-JAN-19	26-JAN-19	R4471449
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	25-JAN-19	25-JAN-19	R4470687
Dissolved Metals Filtration Location	LAB					25-JAN-19	R4469769
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	28-JAN-19	29-JAN-19	R4474867
Dissolved Mercury Filtration Location	LAB					28-JAN-19	R4473172
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					25-JAN-19	R4469769
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	25-JAN-19	25-JAN-19	R4470687
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	25-JAN-19	25-JAN-19	R4470687
Arsenic (As)-Dissolved	0.00095		0.00010	mg/L	25-JAN-19	25-JAN-19	R4470687
Barium (Ba)-Dissolved	0.495		0.00010	mg/L	25-JAN-19	25-JAN-19	R4470687
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	25-JAN-19	25-JAN-19	R4470687
Boron (B)-Dissolved	0.021		0.010	mg/L	25-JAN-19	25-JAN-19	R4470687
Cadmium (Cd)-Dissolved	0.0065		0.0050	ug/L	25-JAN-19	25-JAN-19	R4470687
Calcium (Ca)-Dissolved	26.3		0.050	mg/L	25-JAN-19	25-JAN-19	R4470687
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	25-JAN-19	25-JAN-19	R4470687
Cobalt (Co)-Dissolved	0.24		0.10	ug/L	25-JAN-19	25-JAN-19	R4470687
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	25-JAN-19	25-JAN-19	R4470687
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	25-JAN-19	25-JAN-19	R4470687
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	25-JAN-19	25-JAN-19	R4470687
Lithium (Li)-Dissolved	0.0096		0.0010	mg/L	25-JAN-19	25-JAN-19	R4470687
Magnesium (Mg)-Dissolved	15.3		0.10	mg/L	25-JAN-19	25-JAN-19	R4470687
Manganese (Mn)-Dissolved	0.250		0.00010	mg/L	25-JAN-19	25-JAN-19	R4470687
Molybdenum (Mo)-Dissolved	0.0124		0.000050	mg/L	25-JAN-19	25-JAN-19	R4470687
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	25-JAN-19	25-JAN-19	R4470687
Potassium (K)-Dissolved	0.800		0.050	mg/L	25-JAN-19	25-JAN-19	R4470687
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	25-JAN-19	25-JAN-19	R4470687
Silicon (Si)-Dissolved	3.56		0.050	mg/L	25-JAN-19	25-JAN-19	R4470687
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	25-JAN-19	25-JAN-19	R4470687
Sodium (Na)-Dissolved	19.2		0.050	mg/L	25-JAN-19	25-JAN-19	R4470687
Strontium (Sr)-Dissolved	0.236		0.00020	mg/L	25-JAN-19	25-JAN-19	R4470687
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	25-JAN-19	25-JAN-19	R4470687
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	25-JAN-19	25-JAN-19	R4470687
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	25-JAN-19	25-JAN-19	R4470687
Uranium (U)-Dissolved	0.00144		0.000010	mg/L	25-JAN-19	25-JAN-19	R4470687

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2224637-1 LC_PIZP1101_WG_Q1-2019_N							
Sampled By: KC/DT on 22-JAN-19 @ 13:45							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	25-JAN-19	25-JAN-19	R4470687
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	25-JAN-19	25-JAN-19	R4470687
Hardness							
Hardness (as CaCO3)	129		0.50	mg/L		28-JAN-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.036		0.020	ug/L		25-JAN-19	R4470687
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.779		0.0030	mg/L		25-JAN-19	R4470687
Antimony (Sb)-Total	0.00021		0.00010	mg/L		25-JAN-19	R4470687
Arsenic (As)-Total	0.00132		0.00010	mg/L		25-JAN-19	R4470687
Barium (Ba)-Total	0.475		0.00010	mg/L		25-JAN-19	R4470687
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		25-JAN-19	R4470687
Boron (B)-Total	0.022		0.010	mg/L		25-JAN-19	R4470687
Cadmium (Cd)-Total	0.0884		0.0050	ug/L		25-JAN-19	R4470687
Calcium (Ca)-Total	29.5		0.050	mg/L		25-JAN-19	R4470687
Chromium (Cr)-Total	0.00110		0.00010	mg/L		25-JAN-19	R4470687
Cobalt (Co)-Total	0.49		0.10	ug/L		25-JAN-19	R4470687
Copper (Cu)-Total	0.00222		0.00050	mg/L		25-JAN-19	R4470687
Iron (Fe)-Total	0.825		0.010	mg/L		25-JAN-19	R4470687
Lead (Pb)-Total	0.000417		0.000050	mg/L		25-JAN-19	R4470687
Lithium (Li)-Total	0.0102		0.0010	mg/L		25-JAN-19	R4470687
Magnesium (Mg)-Total	15.7		0.10	mg/L		25-JAN-19	R4470687
Manganese (Mn)-Total	0.274		0.00010	mg/L		25-JAN-19	R4470687
Molybdenum (Mo)-Total	0.0115		0.000050	mg/L		25-JAN-19	R4470687
Nickel (Ni)-Total	0.00128		0.00050	mg/L		25-JAN-19	R4470687
Potassium (K)-Total	1.03		0.050	mg/L		25-JAN-19	R4470687
Selenium (Se)-Total	0.165		0.050	ug/L		25-JAN-19	R4470687
Silicon (Si)-Total	5.00		0.10	mg/L		25-JAN-19	R4470687
Silver (Ag)-Total	0.000028		0.000010	mg/L		28-JAN-19	R4473187
Sodium (Na)-Total	18.5		0.050	mg/L		25-JAN-19	R4470687
Strontium (Sr)-Total	0.229		0.00020	mg/L		25-JAN-19	R4470687
Thallium (Tl)-Total	0.000039		0.000010	mg/L		25-JAN-19	R4470687
Tin (Sn)-Total	<0.00010		0.00010	mg/L		25-JAN-19	R4470687
Titanium (Ti)-Total	0.012		0.010	mg/L		25-JAN-19	R4470687
Uranium (U)-Total	0.00148		0.000010	mg/L		25-JAN-19	R4470687
Vanadium (V)-Total	0.00223		0.00050	mg/L		25-JAN-19	R4470687
Zinc (Zn)-Total	0.0051		0.0030	mg/L		25-JAN-19	R4470687
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		29-JAN-19	R4476569
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	161		1.0	mg/L		30-JAN-19	R4477672
Alkalinity, Carbonate (as CaCO3)	7.8		1.0	mg/L		30-JAN-19	R4477672
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		30-JAN-19	R4477672
Alkalinity, Total (as CaCO3)	168		1.0	mg/L		30-JAN-19	R4477672
Ammonia, Total (as N)							
Ammonia as N	0.0339		0.0050	mg/L		31-JAN-19	R4481150
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-JAN-19	R4467957
Chloride in Water by IC							
Chloride (Cl)	0.74		0.50	mg/L		24-JAN-19	R4467957

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2224637-1 LC_PIZP1101_WG_Q1-2019_N							
Sampled By: KC/DT on 22-JAN-19 @ 13:45							
Matrix: WG							
Electrical Conductivity (EC)							
Conductivity (@ 25C)	293		2.0	uS/cm		30-JAN-19	R4477672
Fluoride in Water by IC							
Fluoride (F)	1.69		0.020	mg/L		24-JAN-19	R4467957
Ion Balance Calculation							
Cation - Anion Balance	-1.3			%		30-JAN-19	
Anion Sum	3.53			meq/L		30-JAN-19	
Cation Sum	3.44			meq/L		30-JAN-19	
Ion Balance Calculation							
Ion Balance	97.5		-100	%		30-JAN-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		24-JAN-19	R4467957
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		24-JAN-19	R4467957
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0083		0.0010	mg/L		24-JAN-19	R4467047
Oxidation redution potential by elect.							
ORP	311		-1000	mV		28-JAN-19	R4472149
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0664		0.0020	mg/L		29-JAN-19	R4475330
Sulfate in Water by IC							
Sulfate (SO4)	2.56		0.30	mg/L		24-JAN-19	R4467957
Total Dissolved Solids							
Total Dissolved Solids	197	DLHC	20	mg/L		28-JAN-19	R4474975
Total Suspended Solids							
Total Suspended Solids	5.5		1.0	mg/L		28-JAN-19	R4474974
Turbidity							
Turbidity	14.1		0.10	NTU		25-JAN-19	R4469547
pH							
pH	8.51		0.10	pH		30-JAN-19	R4477672

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
EPH(10-32)-CALC-CL	Water	Sum of EPH (10-32)	Sum of EPH - Auto Calculated
The sum of EPH(C10-C19) and EPH(C19-C32)			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.	
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
		This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.	
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	
		Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:	
		Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]	
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
		This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.	
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
		This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.	
		It is recommended that this analysis be conducted in the field.	
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.	
PH-CL	Water	pH	APHA 4500 H-Electrode
		pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)	
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
		A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).	
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TEH-BC-VA-CL	Water	EPH (C10-C19) & EPH (C19-C32)	BCMOE EPH GCFID
Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).			
TEH-WATER-VA-CL	Water	TEH (C10-C30)	EPA 3510/8000-GC-FID
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190122 GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2224637

Report Date: 31-JAN-19

Page 1 of 11

Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4476569							
WG2979271-14	LCS							
Acidity (as CaCO3)			97.1		%		85-115	29-JAN-19
WG2979271-13	MB							
Acidity (as CaCO3)			<1.0		mg/L		2	29-JAN-19
ALK-MAN-CL								
	Water							
Batch	R4477672							
WG2979616-8	LCS							
Alkalinity, Total (as CaCO3)			101.0		%		85-115	30-JAN-19
WG2979616-7	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	30-JAN-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4470687							
WG2977395-2	LCS							
Beryllium (Be)-Dissolved			86.9		%		80-120	25-JAN-19
WG2977395-1	MB	LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	25-JAN-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4470687							
WG2977359-2	LCS							
Beryllium (Be)-Total			91.6		%		80-120	25-JAN-19
WG2977359-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	25-JAN-19
BR-L-IC-N-CL								
	Water							
Batch	R4467957							
WG2976931-14	LCS							
Bromide (Br)			102.3		%		85-115	24-JAN-19
WG2976931-13	MB							
Bromide (Br)			<0.050		mg/L		0.05	24-JAN-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4474012							
WG2978867-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	28-JAN-19
C-TOT-ORG-LOW-CL								
	Water							

Quality Control Report

Workorder: L2224637

Report Date: 31-JAN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL Water								
Batch	R4474012							
WG2978867-6	LCS							
Total Organic Carbon			100.8		%		80-120	28-JAN-19
WG2978867-5	MB							
Total Organic Carbon			<0.50		mg/L		0.5	28-JAN-19
CL-IC-N-CL Water								
Batch	R4467957							
WG2976931-14	LCS							
Chloride (Cl)			98.1		%		90-110	24-JAN-19
WG2976931-13	MB							
Chloride (Cl)			<0.50		mg/L		0.5	24-JAN-19
EC-L-PCT-CL Water								
Batch	R4477672							
WG2979616-7	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	30-JAN-19
F-IC-N-CL Water								
Batch	R4467957							
WG2976931-14	LCS							
Fluoride (F)			101.7		%		90-110	24-JAN-19
WG2976931-13	MB							
Fluoride (F)			<0.020		mg/L		0.02	24-JAN-19
HG-D-CVAA-VA Water								
Batch	R4474867							
WG2978498-3	DUP	L2224637-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	29-JAN-19
WG2978498-2	LCS							
Mercury (Hg)-Dissolved			106.6		%		80-120	29-JAN-19
WG2978498-1	MB	LF						
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	29-JAN-19
HG-T-U-CVAF-VA Water								
Batch	R4477027							
WG2979827-3	DUP	L2224637-1						
Mercury (Hg)-Total		0.00240	0.00238		ug/L	0.8	20	30-JAN-19
WG2979827-2	LCS							
Mercury (Hg)-Total			99.6		%		80-120	30-JAN-19
WG2979827-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	30-JAN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4470687							
WG2977395-2	LCS							
Aluminum (Al)-Dissolved			102.2		%		80-120	25-JAN-19
Antimony (Sb)-Dissolved			102.5		%		80-120	25-JAN-19
Arsenic (As)-Dissolved			98.8		%		80-120	25-JAN-19
Barium (Ba)-Dissolved			101.8		%		80-120	25-JAN-19
Bismuth (Bi)-Dissolved			103.8		%		80-120	25-JAN-19
Boron (B)-Dissolved			94.1		%		80-120	25-JAN-19
Cadmium (Cd)-Dissolved			99.5		%		80-120	25-JAN-19
Calcium (Ca)-Dissolved			92.5		%		80-120	25-JAN-19
Chromium (Cr)-Dissolved			104.7		%		80-120	25-JAN-19
Cobalt (Co)-Dissolved			99.7		%		80-120	25-JAN-19
Copper (Cu)-Dissolved			97.0		%		80-120	25-JAN-19
Iron (Fe)-Dissolved			89.4		%		80-120	25-JAN-19
Lead (Pb)-Dissolved			104.3		%		80-120	25-JAN-19
Lithium (Li)-Dissolved			88.7		%		80-120	25-JAN-19
Magnesium (Mg)-Dissolved			99.2		%		80-120	25-JAN-19
Manganese (Mn)-Dissolved			96.9		%		80-120	25-JAN-19
Molybdenum (Mo)-Dissolved			99.4		%		80-120	25-JAN-19
Nickel (Ni)-Dissolved			99.2		%		80-120	25-JAN-19
Potassium (K)-Dissolved			103.0		%		80-120	25-JAN-19
Selenium (Se)-Dissolved			96.0		%		80-120	25-JAN-19
Silicon (Si)-Dissolved			99.2		%		60-140	25-JAN-19
Silver (Ag)-Dissolved			97.5		%		80-120	25-JAN-19
Sodium (Na)-Dissolved			101.7		%		80-120	25-JAN-19
Strontium (Sr)-Dissolved			101.3		%		80-120	25-JAN-19
Thallium (Tl)-Dissolved			96.2		%		80-120	25-JAN-19
Tin (Sn)-Dissolved			97.3		%		80-120	25-JAN-19
Titanium (Ti)-Dissolved			96.0		%		80-120	25-JAN-19
Uranium (U)-Dissolved			107.1		%		80-120	25-JAN-19
Vanadium (V)-Dissolved			102.2		%		80-120	25-JAN-19
Zinc (Zn)-Dissolved			94.5		%		80-120	25-JAN-19
WG2977395-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	25-JAN-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	25-JAN-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	25-JAN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4470687							
WG2977395-1	MB	LF						
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	25-JAN-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	25-JAN-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	25-JAN-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	25-JAN-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	25-JAN-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	25-JAN-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	25-JAN-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	25-JAN-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	25-JAN-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	25-JAN-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	25-JAN-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	25-JAN-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	25-JAN-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	25-JAN-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	25-JAN-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	25-JAN-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	25-JAN-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	25-JAN-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	25-JAN-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	25-JAN-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	25-JAN-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	25-JAN-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	25-JAN-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	25-JAN-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	25-JAN-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	25-JAN-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	25-JAN-19
MET-T-CCMS-VA								
	Water							
Batch	R4470687							
WG2977359-2	LCS							
Aluminum (Al)-Total			96.8		%		80-120	25-JAN-19
Antimony (Sb)-Total			106.4		%		80-120	25-JAN-19
Arsenic (As)-Total			97.0		%		80-120	25-JAN-19
Barium (Ba)-Total			95.2		%		80-120	25-JAN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4470687							
WG2977359-2	LCS							
Bismuth (Bi)-Total			95.9		%		80-120	25-JAN-19
Boron (B)-Total			95.0		%		80-120	25-JAN-19
Cadmium (Cd)-Total			95.5		%		80-120	25-JAN-19
Calcium (Ca)-Total			94.3		%		80-120	25-JAN-19
Chromium (Cr)-Total			96.6		%		80-120	25-JAN-19
Cobalt (Co)-Total			94.0		%		80-120	25-JAN-19
Copper (Cu)-Total			93.8		%		80-120	25-JAN-19
Iron (Fe)-Total			91.3		%		80-120	25-JAN-19
Lead (Pb)-Total			101.1		%		80-120	25-JAN-19
Lithium (Li)-Total			92.9		%		80-120	25-JAN-19
Magnesium (Mg)-Total			95.2		%		80-120	25-JAN-19
Manganese (Mn)-Total			93.8		%		80-120	25-JAN-19
Molybdenum (Mo)-Total			101.1		%		80-120	25-JAN-19
Nickel (Ni)-Total			96.1		%		80-120	25-JAN-19
Potassium (K)-Total			99.8		%		80-120	25-JAN-19
Selenium (Se)-Total			95.4		%		80-120	25-JAN-19
Silicon (Si)-Total			100.7		%		80-120	25-JAN-19
Silver (Ag)-Total			97.3		%		80-120	25-JAN-19
Sodium (Na)-Total			103.6		%		80-120	25-JAN-19
Strontium (Sr)-Total			104.0		%		80-120	25-JAN-19
Thallium (Tl)-Total			89.8		%		80-120	25-JAN-19
Tin (Sn)-Total			97.2		%		80-120	25-JAN-19
Titanium (Ti)-Total			92.8		%		80-120	25-JAN-19
Uranium (U)-Total			100.8		%		80-120	25-JAN-19
Vanadium (V)-Total			97.4		%		80-120	25-JAN-19
Zinc (Zn)-Total			96.4		%		80-120	25-JAN-19
WG2977359-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	25-JAN-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	25-JAN-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	25-JAN-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	25-JAN-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	25-JAN-19
Boron (B)-Total			<0.010		mg/L		0.01	25-JAN-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	25-JAN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4470687							
WG2977359-1	MB							
Calcium (Ca)-Total			<0.050		mg/L		0.05	25-JAN-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	25-JAN-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	25-JAN-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	25-JAN-19
Iron (Fe)-Total			<0.010		mg/L		0.01	25-JAN-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	25-JAN-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	25-JAN-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	25-JAN-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	25-JAN-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	25-JAN-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	25-JAN-19
Potassium (K)-Total			<0.050		mg/L		0.05	25-JAN-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	25-JAN-19
Silicon (Si)-Total			<0.10		mg/L		0.1	25-JAN-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	25-JAN-19
Sodium (Na)-Total			<0.050		mg/L		0.05	25-JAN-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	25-JAN-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	25-JAN-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	25-JAN-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	25-JAN-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	25-JAN-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	25-JAN-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	25-JAN-19
NH3-L-F-CL		Water						
Batch	R4481150							
WG2980995-6	LCS							
Ammonia as N			98.7		%		85-115	31-JAN-19
WG2980995-5	MB							
Ammonia as N			<0.0050		mg/L		0.005	31-JAN-19
NO2-L-IC-N-CL		Water						
Batch	R4467957							
WG2976931-14	LCS							
Nitrite (as N)			103.5		%		90-110	24-JAN-19
WG2976931-13	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	24-JAN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch	R4467957							
WG2976931-14	LCS							
Nitrate (as N)			99.0		%		90-110	24-JAN-19
WG2976931-13	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	24-JAN-19
ORP-CL	Water							
Batch	R4472149							
WG2978334-5	CRM	CL-ORP						
ORP			222		mV		210-230	28-JAN-19
P-T-L-COL-CL	Water							
Batch	R4475330							
WG2979247-6	LCS							
Phosphorus (P)-Total			100.0		%		80-120	29-JAN-19
WG2979247-5	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	29-JAN-19
PH-CL	Water							
Batch	R4477672							
WG2979616-8	LCS							
pH			7.03		pH		6.9-7.1	30-JAN-19
PO4-DO-L-COL-CL	Water							
Batch	R4467047							
WG2976256-22	LCS							
Orthophosphate-Dissolved (as P)			104.9		%		80-120	24-JAN-19
WG2976256-21	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	24-JAN-19
SO4-IC-N-CL	Water							
Batch	R4467957							
WG2976931-14	LCS							
Sulfate (SO4)			98.7		%		90-110	24-JAN-19
WG2976931-13	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	24-JAN-19
SOLIDS-TDS-CL	Water							
Batch	R4474975							
WG2978410-8	LCS							
Total Dissolved Solids			103.0		%		85-115	28-JAN-19
WG2978410-7	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL								
	Water							
Batch	R4474975							
WG2978410-7 MB								
Total Dissolved Solids			<10		mg/L		10	28-JAN-19
TEH-BC-VA-CL								
	Water							
Batch	R4471449							
WG2976233-2 LCS								
EPH10-19			104.9		%		50-150	25-JAN-19
EPH19-32			101.7		%		50-150	25-JAN-19
WG2976233-1 MB								
EPH10-19			<0.25		mg/L		0.25	25-JAN-19
EPH19-32			<0.25		mg/L		0.25	25-JAN-19
Surrogate: 2-Bromobenzotrifluoride			88.6		%		50-150	25-JAN-19
TEH-WATER-VA-CL								
	Water							
Batch	R4471449							
WG2976233-2 LCS								
TEH (C10-C30)			103.8		%		50-150	25-JAN-19
WG2976233-1 MB								
TEH (C10-C30)			<0.25		mg/L		0.25	25-JAN-19
Surrogate: 2-Bromobenzotrifluoride			88.6		%		50-150	25-JAN-19
TKN-L-F-CL								
	Water							
Batch	R4472307							
WG2977134-2 LCS								
Total Kjeldahl Nitrogen			90.5		%		75-125	28-JAN-19
WG2977134-6 LCS								
Total Kjeldahl Nitrogen			96.2		%		75-125	28-JAN-19
WG2977134-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	28-JAN-19
WG2977134-5 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	28-JAN-19
TSS-L-CL								
	Water							
Batch	R4474974							
WG2978097-4 LCS								
Total Suspended Solids			91.1		%		85-115	28-JAN-19
WG2978097-3 MB								
Total Suspended Solids			<1.0		mg/L		1	28-JAN-19
TURBIDITY-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch	R4469547							
WG2977363-12 DUP		L2224637-1						
Turbidity		14.1	14.0		NTU	0.7	15	25-JAN-19
WG2977363-11 LCS								
Turbidity			96.5		%		85-115	25-JAN-19
WG2977363-10 MB								
Turbidity			<0.10		NTU		0.1	25-JAN-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	22-JAN-19 13:45	28-JAN-19 10:00	0.25	140	hours	EHTR-FM
pH	1	22-JAN-19 13:45	30-JAN-19 09:00	0.25	187	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2224637 were received on 24-JAN-19 09:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

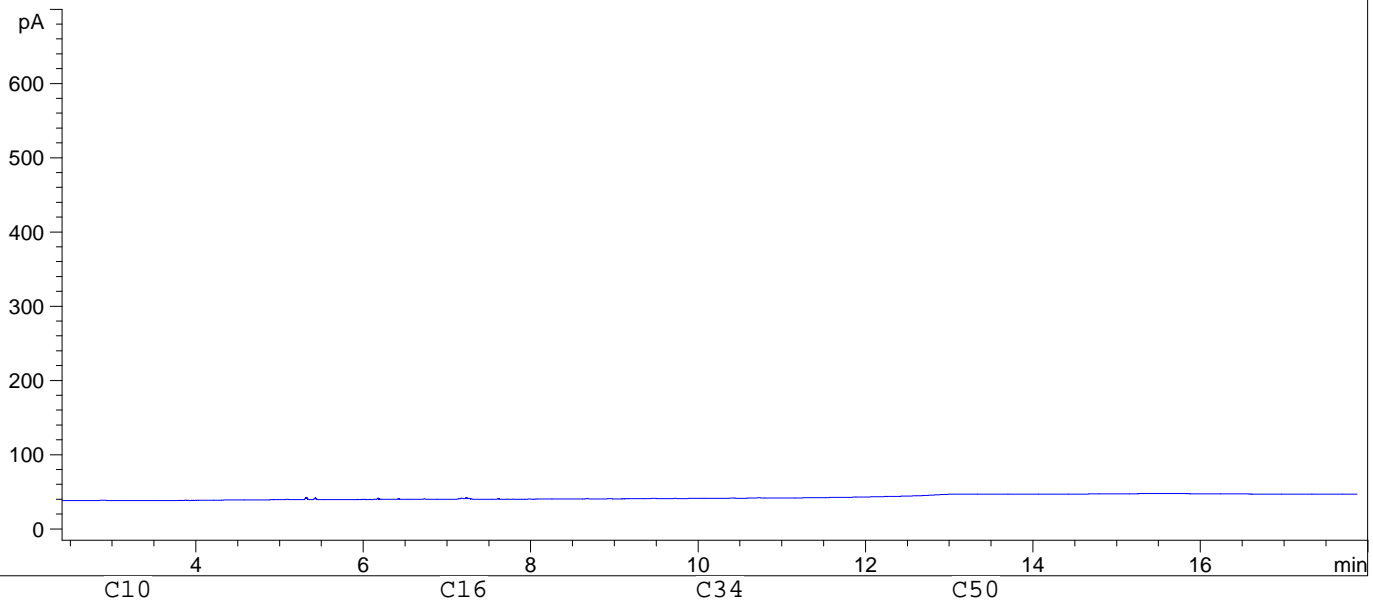
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

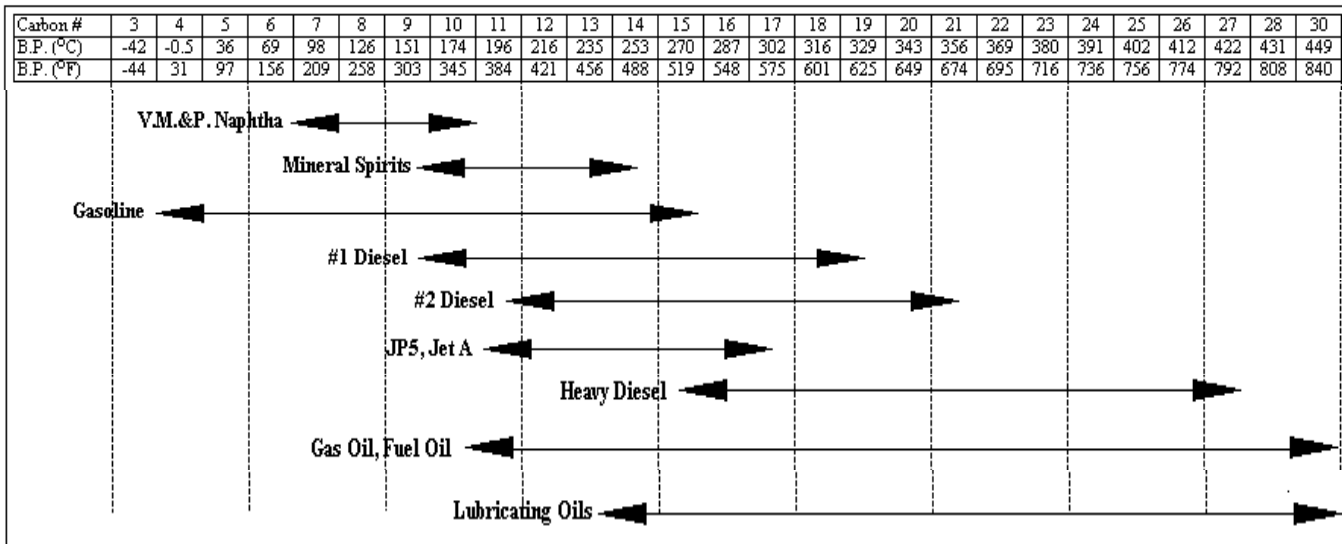


Sample ID: L2224637-1 V4
 Injection Date: 1/26/2019
 Injection Time: 12:12:28 AM
 Instrument ID: HP9
 Operator:

FID2 B, (A190125_SE_DA_TI_SIG2000016.D)



Boiling Point Distribution Range for Petroleum Based Fuel Products



Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII.


=====
 Error 41276 occurred in Command IF in macro PeakSumRpt
 at line 366 in file C:\CHEM32\CORE\REPORT.MCX:
 Undefined symbol: RPT_PSRecalcNeeded
 =====

COC ID:	20190122 GW			TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO	
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary		Report Format / Distribution
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets		Excel
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com		PDF
Address	Box 2003			Address	2559 29 Street NE		EDD
	15km North Hwy 43						
City	Sparwood	Province	BC	City	Calgary	Province	AB
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada
Phone Number	250-425-3196			Phone Number	403 407 1794		PO number
							VPO00608129

SAMPLE DETAILS **ANALYSIS REQUESTED** Filtered - P: Field, L: Lab, FL: Field & Lab, N: None

Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ETL	RESERV.	ANALYSIS							
L2224637-COFC								N	NONE	ALS_Package-DOC							
L2224637-COFC								N	NAHS04	ALS_Package-EPH							
								N	NONE	HG-D-CVAF-VA							
								N	HCL	HG-T-CVAF-VA							
								N	NONE	TECKCOAL-MET-D-VA							
								N	HNO3	TECKCOAL-MET-T-VA							
								N	NONE	TECKCOAL-ROUTINE-VA							
								N	H2SO4	ALS_Package-TKN/TOC							
LC_P1ZP1101_WG_Q1-2019_N	LC_P1ZP1101	WG		2019/01/22	13:45	G	9										

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
PLEASE FORWARD METALS SAMPLES TO ALS BURNABY FOR ANALYSIS	D.Tymstra/K.Campbell	24-Jan	<i>[Signature]</i>	1/24/19
SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #	Date/Time	
Regular (default) <input checked="" type="checkbox"/>	K. Campbell/D. Tymstra			
Priority (2-3 business days) - 50% surcharge	Sampler's Signature			
Emergency (1 Business Day) - 100% surcharge				January 24, 2019
For Emergency <1 Day, ASAP or Weekend - Contact ALS				<i>[Signature]</i>



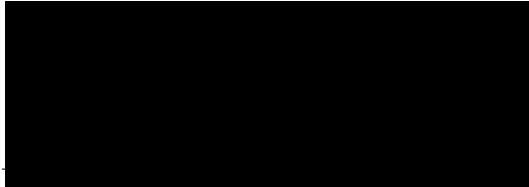
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 15-MAR-19
Report Date: 23-MAR-19 17:30 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2244708
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190314GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5, Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2244708-1 LC_PIZP1103_WG_Q1-2019_NP							
Sampled By: KC/DT on 13-MAR-19 @ 14:40							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.00		0.50	mg/L		22-MAR-19	R4579791
Total Kjeldahl Nitrogen	0.214		0.050	mg/L		18-MAR-19	R4574290
Total Organic Carbon	0.96		0.50	mg/L		22-MAR-19	R4579791
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	20-MAR-19	20-MAR-19	R4573617
Dissolved Metals Filtration Location	FIELD					20-MAR-19	R4573166
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	20-MAR-19	20-MAR-19	R4572627
Dissolved Mercury Filtration Location	FIELD					20-MAR-19	R4573789
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					20-MAR-19	R4573166
Aluminum (Al)-Dissolved	0.156		0.0030	mg/L	20-MAR-19	20-MAR-19	R4573617
Antimony (Sb)-Dissolved	0.00014		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Arsenic (As)-Dissolved	0.00065		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Barium (Ba)-Dissolved	0.0663		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	20-MAR-19	20-MAR-19	R4573617
Boron (B)-Dissolved	0.492		0.010	mg/L	20-MAR-19	20-MAR-19	R4573617
Cadmium (Cd)-Dissolved	0.0561		0.0050	ug/L	20-MAR-19	20-MAR-19	R4573617
Calcium (Ca)-Dissolved	28.4		0.050	mg/L	20-MAR-19	20-MAR-19	R4573617
Chromium (Cr)-Dissolved	0.00032		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Cobalt (Co)-Dissolved	0.37		0.10	ug/L	20-MAR-19	20-MAR-19	R4573617
Copper (Cu)-Dissolved	0.00727		0.00050	mg/L	20-MAR-19	20-MAR-19	R4573617
Iron (Fe)-Dissolved	0.106		0.010	mg/L	20-MAR-19	20-MAR-19	R4573617
Lead (Pb)-Dissolved	0.000627		0.000050	mg/L	20-MAR-19	20-MAR-19	R4573617
Lithium (Li)-Dissolved	0.112		0.0010	mg/L	20-MAR-19	20-MAR-19	R4573617
Magnesium (Mg)-Dissolved	14.9		0.10	mg/L	20-MAR-19	20-MAR-19	R4573617
Manganese (Mn)-Dissolved	0.242		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Molybdenum (Mo)-Dissolved	0.0123		0.000050	mg/L	20-MAR-19	20-MAR-19	R4573617
Nickel (Ni)-Dissolved	0.00204		0.00050	mg/L	20-MAR-19	20-MAR-19	R4573617
Potassium (K)-Dissolved	1.65		0.050	mg/L	20-MAR-19	20-MAR-19	R4573617
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	20-MAR-19	20-MAR-19	R4573617
Silicon (Si)-Dissolved	4.31		0.050	mg/L	20-MAR-19	20-MAR-19	R4573617
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	20-MAR-19	20-MAR-19	R4573617
Sodium (Na)-Dissolved	141		0.050	mg/L	20-MAR-19	20-MAR-19	R4573617
Strontium (Sr)-Dissolved	0.775		0.00020	mg/L	20-MAR-19	20-MAR-19	R4573617
Thallium (Tl)-Dissolved	0.000023		0.000010	mg/L	20-MAR-19	20-MAR-19	R4573617
Tin (Sn)-Dissolved	0.00035		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	20-MAR-19	20-MAR-19	R4573617
Uranium (U)-Dissolved	0.00198		0.000010	mg/L	20-MAR-19	20-MAR-19	R4573617
Vanadium (V)-Dissolved	0.00081		0.00050	mg/L	20-MAR-19	20-MAR-19	R4573617
Zinc (Zn)-Dissolved	0.0161		0.0010	mg/L	20-MAR-19	20-MAR-19	R4573617
Hardness							
Hardness (as CaCO3)	132		0.50	mg/L		20-MAR-19	
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.5		1.0	mg/L		20-MAR-19	R4573472
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	411		1.0	mg/L		18-MAR-19	R4568644
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		18-MAR-19	R4568644
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		18-MAR-19	R4568644

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2244708-1 LC_PIZP1103_WG_Q1-2019_NP							
Sampled By: KC/DT on 13-MAR-19 @ 14:40							
Matrix: WG							
Alkalinity (Species) by Manual Titration							
Alkalinity, Total (as CaCO3)	411		1.0	mg/L		18-MAR-19	R4568644
Ammonia, Total (as N)							
Ammonia as N	0.109		0.0050	mg/L		22-MAR-19	R4578388
Bromide in Water by IC (Low Level)							
Bromide (Br)	0.095		0.050	mg/L		15-MAR-19	R4568169
Chloride in Water by IC							
Chloride (Cl)	4.12		0.50	mg/L		15-MAR-19	R4568169
Electrical Conductivity (EC)							
Conductivity (@ 25C)	791		2.0	uS/cm		18-MAR-19	R4568644
Fluoride in Water by IC							
Fluoride (F)	0.462		0.020	mg/L		15-MAR-19	R4568169
Ion Balance Calculation							
Ion Balance	98.6		-100	%		21-MAR-19	
Ion Balance Calculation							
Cation - Anion Balance	-0.7			%		21-MAR-19	
Anion Sum	8.95			meq/L		21-MAR-19	
Cation Sum	8.83			meq/L		21-MAR-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.124		0.0050	mg/L		15-MAR-19	R4568169
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0012		0.0010	mg/L		15-MAR-19	R4568169
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0360		0.0010	mg/L		15-MAR-19	R4567831
Oxidation reduction potential by elect.							
ORP	308		-1000	mV		19-MAR-19	R4571747
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0433		0.0020	mg/L		17-MAR-19	R4568177
Sulfate in Water by IC							
Sulfate (SO4)	28.8		0.30	mg/L		15-MAR-19	R4568169
Total Dissolved Solids							
Total Dissolved Solids	480		20	mg/L		20-MAR-19	R4576969
Total Suspended Solids							
Total Suspended Solids	5.5		1.0	mg/L		19-MAR-19	R4573311
Turbidity							
Turbidity	13.9		0.10	NTU		15-MAR-19	R4567851
pH							
pH	8.25		0.10	pH		18-MAR-19	R4568644

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190314GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2244708

Report Date: 23-MAR-19

Page 1 of 9

Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4573472							
WG3010407-16	LCS							
Acidity (as CaCO3)			103.0		%		85-115	20-MAR-19
WG3010407-15	MB							
Acidity (as CaCO3)			1.9		mg/L		2	20-MAR-19
ALK-MAN-CL								
	Water							
Batch	R4568644							
WG3008501-8	LCS							
Alkalinity, Total (as CaCO3)			94.8		%		85-115	18-MAR-19
WG3008501-7	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	18-MAR-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4573617							
WG3010225-3	DUP	L2244708-1						
Beryllium (Be)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	20-MAR-19
WG3010225-2	LCS							
Beryllium (Be)-Dissolved			97.6		%		80-120	20-MAR-19
WG3010225-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	20-MAR-19
BR-L-IC-N-CL								
	Water							
Batch	R4568169							
WG3007985-6	LCS							
Bromide (Br)			101.2		%		85-115	15-MAR-19
WG3007985-5	MB							
Bromide (Br)			<0.050		mg/L		0.05	15-MAR-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4579791							
WG3012539-14	LCS							
Dissolved Organic Carbon			87.3		%		80-120	22-MAR-19
WG3012539-13	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	22-MAR-19
C-TOT-ORG-LOW-CL								
	Water							
Batch	R4579791							
WG3012539-14	LCS							
Total Organic Carbon			88.5		%		80-120	22-MAR-19
WG3012539-13	MB							
Total Organic Carbon			<0.50		mg/L		0.5	22-MAR-19
CL-IC-N-CL								
	Water							

Quality Control Report

Workorder: L2244708

Report Date: 23-MAR-19

Page 2 of 9

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-CL								
Batch R4568169								
WG3007985-6	LCS							
Chloride (Cl)			100.0		%		90-110	15-MAR-19
WG3007985-5	MB							
Chloride (Cl)			<0.50		mg/L		0.5	15-MAR-19
EC-L-PCT-CL								
Batch R4568644								
WG3008501-8	LCS							
Conductivity (@ 25C)			100.7		%		90-110	18-MAR-19
WG3008501-7	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	18-MAR-19
F-IC-N-CL								
Batch R4568169								
WG3007985-6	LCS							
Fluoride (F)			105.8		%		90-110	15-MAR-19
WG3007985-5	MB							
Fluoride (F)			<0.020		mg/L		0.02	15-MAR-19
HG-D-CVAA-VA								
Batch R4572627								
WG3010527-2	LCS							
Mercury (Hg)-Dissolved			101.5		%		80-120	20-MAR-19
WG3010527-1	MB	NP						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	20-MAR-19
WG3010527-4	MS	L2244708-1						
Mercury (Hg)-Dissolved			98.3		%		70-130	20-MAR-19
MET-D-CCMS-VA								
Batch R4573617								
WG3010225-3	DUP	L2244708-1						
Aluminum (Al)-Dissolved			0.156	0.158	mg/L	1.3	20	20-MAR-19
Antimony (Sb)-Dissolved			0.00014	0.00014	mg/L	1.5	20	20-MAR-19
Arsenic (As)-Dissolved			0.00065	0.00064	mg/L	1.9	20	20-MAR-19
Barium (Ba)-Dissolved			0.0663	0.0646	mg/L	2.5	20	20-MAR-19
Bismuth (Bi)-Dissolved			<0.000050	<0.000050	mg/L	RPD-NA	20	20-MAR-19
Boron (B)-Dissolved			0.492	0.497	mg/L	1.1	20	20-MAR-19
Cadmium (Cd)-Dissolved			0.0000561	0.0000578	mg/L	3.0	20	20-MAR-19
Calcium (Ca)-Dissolved			28.4	28.0	mg/L	1.2	20	20-MAR-19
Chromium (Cr)-Dissolved			0.00032	0.00031	mg/L	4.5	20	20-MAR-19

Quality Control Report

Workorder: L2244708

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4573617							
WG3010225-3	DUP	L2244708-1						
Cobalt (Co)-Dissolved		0.00037	0.00037		mg/L	1.1	20	20-MAR-19
Copper (Cu)-Dissolved		0.00727	0.00709		mg/L	2.6	20	20-MAR-19
Iron (Fe)-Dissolved		0.106	0.105		mg/L	0.9	20	20-MAR-19
Lead (Pb)-Dissolved		0.000627	0.000632		mg/L	0.8	20	20-MAR-19
Lithium (Li)-Dissolved		0.112	0.114		mg/L	1.9	20	20-MAR-19
Magnesium (Mg)-Dissolved		14.9	14.6		mg/L	1.8	20	20-MAR-19
Manganese (Mn)-Dissolved		0.242	0.239		mg/L	1.4	20	20-MAR-19
Molybdenum (Mo)-Dissolved		0.0123	0.0119		mg/L	3.0	20	20-MAR-19
Nickel (Ni)-Dissolved		0.00204	0.00201		mg/L	1.3	20	20-MAR-19
Potassium (K)-Dissolved		1.65	1.63		mg/L	1.1	20	20-MAR-19
Selenium (Se)-Dissolved		<0.000050	0.000059	RPD-NA	mg/L	N/A	20	20-MAR-19
Silicon (Si)-Dissolved		4.31	4.30		mg/L	0.2	20	20-MAR-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-MAR-19
Sodium (Na)-Dissolved		141	143		mg/L	1.7	20	20-MAR-19
Strontium (Sr)-Dissolved		0.775	0.777		mg/L	0.3	20	20-MAR-19
Thallium (Tl)-Dissolved		0.000023	0.000020		mg/L	14	20	20-MAR-19
Tin (Sn)-Dissolved		0.00035	0.00035		mg/L	1.4	20	20-MAR-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	20-MAR-19
Uranium (U)-Dissolved		0.00198	0.00203		mg/L	2.5	20	20-MAR-19
Vanadium (V)-Dissolved		0.00081	0.00094		mg/L	15	20	20-MAR-19
Zinc (Zn)-Dissolved		0.0161	0.0159		mg/L	1.2	20	20-MAR-19
WG3010225-2	LCS							
Aluminum (Al)-Dissolved			100.4		%		80-120	20-MAR-19
Antimony (Sb)-Dissolved			97.2		%		80-120	20-MAR-19
Arsenic (As)-Dissolved			95.5		%		80-120	20-MAR-19
Barium (Ba)-Dissolved			97.7		%		80-120	20-MAR-19
Bismuth (Bi)-Dissolved			96.6		%		80-120	20-MAR-19
Boron (B)-Dissolved			91.2		%		80-120	20-MAR-19
Cadmium (Cd)-Dissolved			95.9		%		80-120	20-MAR-19
Calcium (Ca)-Dissolved			97.4		%		80-120	20-MAR-19
Chromium (Cr)-Dissolved			96.6		%		80-120	20-MAR-19
Cobalt (Co)-Dissolved			97.1		%		80-120	20-MAR-19
Copper (Cu)-Dissolved			96.0		%		80-120	20-MAR-19
Iron (Fe)-Dissolved			90.3		%		80-120	20-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4573617							
WG3010225-2	LCS							
Lead (Pb)-Dissolved			95.8		%		80-120	20-MAR-19
Lithium (Li)-Dissolved			93.6		%		80-120	20-MAR-19
Magnesium (Mg)-Dissolved			105.5		%		80-120	20-MAR-19
Manganese (Mn)-Dissolved			96.4		%		80-120	20-MAR-19
Molybdenum (Mo)-Dissolved			100.4		%		80-120	20-MAR-19
Nickel (Ni)-Dissolved			97.5		%		80-120	20-MAR-19
Potassium (K)-Dissolved			95.3		%		80-120	20-MAR-19
Selenium (Se)-Dissolved			89.9		%		80-120	20-MAR-19
Silicon (Si)-Dissolved			93.9		%		60-140	20-MAR-19
Silver (Ag)-Dissolved			99.6		%		80-120	20-MAR-19
Sodium (Na)-Dissolved			100.7		%		80-120	20-MAR-19
Strontium (Sr)-Dissolved			95.7		%		80-120	20-MAR-19
Thallium (Tl)-Dissolved			95.7		%		80-120	20-MAR-19
Tin (Sn)-Dissolved			96.7		%		80-120	20-MAR-19
Titanium (Ti)-Dissolved			96.4		%		80-120	20-MAR-19
Uranium (U)-Dissolved			97.8		%		80-120	20-MAR-19
Vanadium (V)-Dissolved			99.5		%		80-120	20-MAR-19
Zinc (Zn)-Dissolved			97.4		%		80-120	20-MAR-19
WG3010225-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	20-MAR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-MAR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-MAR-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	20-MAR-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-MAR-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-MAR-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-MAR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-MAR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4573617							
WG3010225-1	MB	NP						
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-MAR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-MAR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-MAR-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	20-MAR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-MAR-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-MAR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-MAR-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	20-MAR-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-MAR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-MAR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-MAR-19
NH3-L-F-CL								
	Water							
Batch	R4578388							
WG3012133-6	LCS							
Ammonia as N			107.3		%		85-115	21-MAR-19
WG3012133-5	MB							
Ammonia as N			<0.0050		mg/L		0.005	21-MAR-19
NO2-L-IC-N-CL								
	Water							
Batch	R4568169							
WG3007985-6	LCS							
Nitrite (as N)			104.4		%		90-110	15-MAR-19
WG3007985-5	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	15-MAR-19
NO3-L-IC-N-CL								
	Water							
Batch	R4568169							
WG3007985-6	LCS							
Nitrate (as N)			99.3		%		90-110	15-MAR-19
WG3007985-5	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	15-MAR-19
ORP-CL	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL		Water						
Batch	R4574290							
WG3010655-2	LCS							
Total Kjeldahl Nitrogen			98.4		%		75-125	18-MAR-19
WG3010655-6	LCS							
Total Kjeldahl Nitrogen			100.6		%		75-125	18-MAR-19
WG3010655-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	18-MAR-19
WG3010655-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	18-MAR-19
WG3010655-9	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	18-MAR-19
TSS-L-CL		Water						
Batch	R4573311							
WG3009094-11	LCS							
Total Suspended Solids			95.7		%		85-115	19-MAR-19
WG3009094-10	MB							
Total Suspended Solids			<1.0		mg/L		1	19-MAR-19
TURBIDITY-CL		Water						
Batch	R4567851							
WG3007620-5	LCS							
Turbidity			95.5		%		85-115	15-MAR-19
WG3007620-4	MB							
Turbidity			<0.10		NTU		0.1	15-MAR-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	13-MAR-19 14:40	19-MAR-19 10:00	0.25	139	hours	EHTR-FM
pH	1	13-MAR-19 14:40	18-MAR-19 09:00	0.25	114	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2244708 were received on 15-MAR-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.


COC ID:	20190314 GW	TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO		LABORATORY		OTHER INFO	
Facility Name / Job#	Line Creek Operation	Lab Name	ALS Calgary	Report Format / Distribution	Excel PDF EDD
Project Manager	Chris Blurton	Lab Contact	Lyudmyla Shvets	Email 1:	chris.blurton@teck.com
Email	Chris.Blurton@teck.com	Email	Lyudmyla.Shvets@ALSGlobal.com	Email 2:	teckcoal@equisonline.com
Address	Box 2003	Address	2559 29 Street NE	Email 3:	drake.tymstra@teck.com
	15km North Hwy 43			Email 4:	klrsten.campbell@teck.com
City	Sparwood	Province	BC	City	Calgary
Postal Code	V0B 2G0	Country	Canada	Province	AB
Phone Number	250-425-3196	Postal Code	T1Y 7B5	Country	Canada
		Phone Number	403 407 1794	PO number	11709608724

SAMPLE DETAILS Filtered - F: Field, L: Lab, FT: Field & Lab, N: None

Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS REQUESTED							
								ALS_Package-DOC	HC-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC	FIN	PRESERV.
LC_P1ZP1103_WG_Q1-2019_NP	LC_P1ZP1103	WG		2019/03/13	14:40	G	5	1	1	1	1	1	1	N	NONE
														N	NONE
														N	NONE
														N	HNO3
														N	NONE
														N	H2SO4

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
PLEASE FORWARD METALS SAMPLES TO ALS BURNABY FOR ANALYSIS	D.Tymstra/K.Campbell	14-Mar	<i>D/C</i>	2019/03/15 9:00
SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #	Date/Time	
Regular (default) X	K. Campbell/D. Tymstra		March 14, 2019	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature			
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

8°C



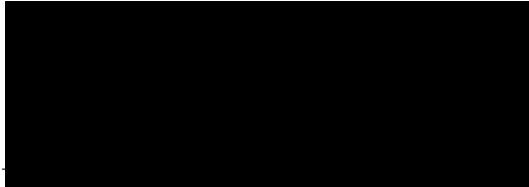
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 19-MAR-19
Report Date: 26-MAR-19 16:49 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2246028
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190318 GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2246028-1 LC_PIZP1104_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D. TYMST on 18-MAR-19 @ 14:10							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.30		0.50	mg/L		25-MAR-19	R4583410
Total Kjeldahl Nitrogen	0.365		0.050	mg/L		22-MAR-19	R4579707
Total Organic Carbon	2.36		0.50	mg/L		25-MAR-19	R4583410
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	20-MAR-19	20-MAR-19	R4575455
Dissolved Metals Filtration Location	LAB					20-MAR-19	R4574188
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	20-MAR-19	20-MAR-19	R4572627
Dissolved Mercury Filtration Location	LAB					20-MAR-19	R4574371
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					20-MAR-19	R4574188
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	20-MAR-19	20-MAR-19	R4575455
Antimony (Sb)-Dissolved	0.00012		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Arsenic (As)-Dissolved	0.00037		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Barium (Ba)-Dissolved	0.246		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	20-MAR-19	20-MAR-19	R4575455
Boron (B)-Dissolved	0.026		0.010	mg/L	20-MAR-19	20-MAR-19	R4575455
Cadmium (Cd)-Dissolved	0.146		0.0050	ug/L	20-MAR-19	20-MAR-19	R4575455
Calcium (Ca)-Dissolved	139		0.050	mg/L	20-MAR-19	20-MAR-19	R4575455
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Cobalt (Co)-Dissolved	1.25		0.10	ug/L	20-MAR-19	20-MAR-19	R4575455
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	20-MAR-19	20-MAR-19	R4575455
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	20-MAR-19	20-MAR-19	R4575455
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	20-MAR-19	20-MAR-19	R4575455
Lithium (Li)-Dissolved	0.0231		0.0010	mg/L	20-MAR-19	20-MAR-19	R4575455
Magnesium (Mg)-Dissolved	48.3		0.10	mg/L	20-MAR-19	20-MAR-19	R4575455
Manganese (Mn)-Dissolved	0.580		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Molybdenum (Mo)-Dissolved	0.00225		0.000050	mg/L	20-MAR-19	20-MAR-19	R4575455
Nickel (Ni)-Dissolved	0.00273		0.00050	mg/L	20-MAR-19	20-MAR-19	R4575455
Potassium (K)-Dissolved	2.68		0.050	mg/L	20-MAR-19	20-MAR-19	R4575455
Selenium (Se)-Dissolved	0.188		0.050	ug/L	20-MAR-19	20-MAR-19	R4575455
Silicon (Si)-Dissolved	4.45		0.050	mg/L	20-MAR-19	20-MAR-19	R4575455
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	20-MAR-19	20-MAR-19	R4575455
Sodium (Na)-Dissolved	16.3		0.050	mg/L	20-MAR-19	20-MAR-19	R4575455
Strontium (Sr)-Dissolved	0.506		0.00020	mg/L	20-MAR-19	20-MAR-19	R4575455
Thallium (Tl)-Dissolved	0.000041		0.000010	mg/L	20-MAR-19	20-MAR-19	R4575455
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	20-MAR-19	20-MAR-19	R4575455
Uranium (U)-Dissolved	0.00347		0.000010	mg/L	20-MAR-19	20-MAR-19	R4575455
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	20-MAR-19	20-MAR-19	R4575455
Zinc (Zn)-Dissolved	0.0031		0.0010	mg/L	20-MAR-19	20-MAR-19	R4575455
Hardness							
Hardness (as CaCO3)	546		0.50	mg/L		21-MAR-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.200		0.020	ug/L		20-MAR-19	R4575549
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	2.20		0.0030	mg/L		20-MAR-19	R4575549
Antimony (Sb)-Total	0.00039		0.00010	mg/L		20-MAR-19	R4575549
Arsenic (As)-Total	0.00295		0.00010	mg/L		20-MAR-19	R4575549

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2246028-1 LC_PIZP1104_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D. TYMST on 18-MAR-19 @ 14:10							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.300		0.00010	mg/L		20-MAR-19	R4575549
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		20-MAR-19	R4575549
Boron (B)-Total	0.027		0.010	mg/L		20-MAR-19	R4575549
Cadmium (Cd)-Total	0.532		0.0050	ug/L		20-MAR-19	R4575549
Calcium (Ca)-Total	141		0.050	mg/L		20-MAR-19	R4575549
Chromium (Cr)-Total	0.00634		0.00010	mg/L		20-MAR-19	R4575549
Cobalt (Co)-Total	3.21		0.10	ug/L		20-MAR-19	R4575549
Copper (Cu)-Total	0.0112		0.00050	mg/L		20-MAR-19	R4575549
Iron (Fe)-Total	5.68		0.010	mg/L		20-MAR-19	R4575549
Lead (Pb)-Total	0.00301		0.000050	mg/L		20-MAR-19	R4575549
Lithium (Li)-Total	0.0228		0.0010	mg/L		20-MAR-19	R4575549
Magnesium (Mg)-Total	46.6		0.10	mg/L		20-MAR-19	R4575549
Manganese (Mn)-Total	0.786		0.00010	mg/L		20-MAR-19	R4575549
Molybdenum (Mo)-Total	0.00299		0.000050	mg/L		20-MAR-19	R4575549
Nickel (Ni)-Total	0.00925		0.00050	mg/L		20-MAR-19	R4575549
Potassium (K)-Total	3.64		0.050	mg/L		20-MAR-19	R4575549
Selenium (Se)-Total	0.459		0.050	ug/L		20-MAR-19	R4575549
Silicon (Si)-Total	7.84		0.10	mg/L		20-MAR-19	R4575549
Silver (Ag)-Total	0.000078		0.000010	mg/L		20-MAR-19	R4575549
Sodium (Na)-Total	16.8		0.050	mg/L		20-MAR-19	R4575549
Strontium (Sr)-Total	0.509		0.00020	mg/L		20-MAR-19	R4575549
Thallium (Tl)-Total	0.000132		0.000010	mg/L		20-MAR-19	R4575549
Tin (Sn)-Total	0.00036		0.00010	mg/L		20-MAR-19	R4575549
Titanium (Ti)-Total	0.018		0.010	mg/L		20-MAR-19	R4575549
Uranium (U)-Total	0.00401		0.000010	mg/L		20-MAR-19	R4575549
Vanadium (V)-Total	0.00853		0.00050	mg/L		20-MAR-19	R4575549
Zinc (Zn)-Total	0.0353		0.0030	mg/L		20-MAR-19	R4575549
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	7.8		1.0	mg/L		21-MAR-19	R4577053
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	245		1.0	mg/L		21-MAR-19	R4576808
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		21-MAR-19	R4576808
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		21-MAR-19	R4576808
Alkalinity, Total (as CaCO3)	245		1.0	mg/L		21-MAR-19	R4576808
Ammonia, Total (as N)							
Ammonia as N	0.0130		0.0050	mg/L		26-MAR-19	R4583214
Bromide in Water by IC (Low Level)							
Bromide (Br)	2.70	DLHC	0.25	mg/L		20-MAR-19	R4573050
Chloride in Water by IC							
Chloride (Cl)	203	DLHC	2.5	mg/L		20-MAR-19	R4573050
Electrical Conductivity (EC)							
Conductivity (@ 25C)	1180		2.0	uS/cm		21-MAR-19	R4576808
Fluoride in Water by IC							
Fluoride (F)	0.24	DLHC	0.10	mg/L		20-MAR-19	R4573050
Ion Balance Calculation							
Ion Balance	95.8		-100	%		25-MAR-19	
Ion Balance Calculation							
Cation - Anion Balance	-2.1			%		25-MAR-19	
Anion Sum	12.2			meq/L		25-MAR-19	
Cation Sum	11.7			meq/L		25-MAR-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2246028-1 LC_PIZP1104_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D. TYMST on 18-MAR-19 @ 14:10							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.357	DLHC	0.025	mg/L		20-MAR-19	R4573050
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		20-MAR-19	R4573050
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0015		0.0010	mg/L		19-MAR-19	R4573068
Oxidation redution potential by elect.							
ORP	403		-1000	mV		22-MAR-19	R4580133
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.414	DLHC	0.025	mg/L		20-MAR-19	R4573249
Sulfate in Water by IC							
Sulfate (SO4)	74.7	DLHC	1.5	mg/L		20-MAR-19	R4573050
Total Dissolved Solids							
Total Dissolved Solids	819	DLHC	20	mg/L		22-MAR-19	R4580198
Total Suspended Solids							
Total Suspended Solids	304		1.0	mg/L		24-MAR-19	R4581413
Turbidity							
Turbidity	176		0.10	NTU		19-MAR-19	R4572968
pH							
pH	7.96		0.10	pH		21-MAR-19	R4576808

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
SFPL	DOC/D-METAL/D-HG FILTERED AND PRESERVED AT THE LAB - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190318 GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2246028

Report Date: 26-MAR-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4577053							
WG3011635-5	LCS							
Acidity (as CaCO3)			108.0		%		85-115	21-MAR-19
WG3011635-4	MB							
Acidity (as CaCO3)			2.0		mg/L		2	21-MAR-19
ALK-MAN-CL								
	Water							
Batch	R4576808							
WG3011311-14	LCS							
Alkalinity, Total (as CaCO3)			96.1		%		85-115	21-MAR-19
WG3011311-13	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	21-MAR-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4575455							
WG3010577-2	LCS							
Beryllium (Be)-Dissolved			97.6		%		80-120	20-MAR-19
WG3010577-1	MB	LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	20-MAR-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4575549							
WG3010482-2	LCS							
Beryllium (Be)-Total			90.5		%		80-120	20-MAR-19
WG3010482-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	20-MAR-19
BR-L-IC-N-CL								
	Water							
Batch	R4573050							
WG3010231-10	LCS							
Bromide (Br)			98.3		%		85-115	20-MAR-19
WG3010231-2	LCS							
Bromide (Br)			105.5		%		85-115	20-MAR-19
WG3010231-6	LCS							
Bromide (Br)			100.2		%		85-115	20-MAR-19
WG3010231-1	MB							
Bromide (Br)			<0.050		mg/L		0.05	20-MAR-19
WG3010231-5	MB							
Bromide (Br)			<0.050		mg/L		0.05	20-MAR-19
WG3010231-9	MB							
Bromide (Br)			<0.050		mg/L		0.05	20-MAR-19
C-DIS-ORG-LOW-CL								
	Water							

Quality Control Report

Workorder: L2246028

Report Date: 26-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4583410							
WG3014296-3	DUP	L2246028-1						
Dissolved Organic Carbon		1.30	1.38		mg/L	5.6	20	25-MAR-19
WG3014296-2	LCS							
Dissolved Organic Carbon			98.9		%		80-120	25-MAR-19
WG3014296-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	25-MAR-19
C-TOT-ORG-LOW-CL								
	Water							
Batch	R4583410							
WG3014296-3	DUP	L2246028-1						
Total Organic Carbon		2.36	2.60		mg/L	9.5	20	25-MAR-19
WG3014296-2	LCS							
Total Organic Carbon			102.9		%		80-120	25-MAR-19
WG3014296-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	25-MAR-19
CL-IC-N-CL								
	Water							
Batch	R4573050							
WG3010231-10	LCS							
Chloride (Cl)			96.8		%		90-110	20-MAR-19
WG3010231-2	LCS							
Chloride (Cl)			102.2		%		90-110	20-MAR-19
WG3010231-6	LCS							
Chloride (Cl)			96.8		%		90-110	20-MAR-19
WG3010231-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	20-MAR-19
WG3010231-5	MB							
Chloride (Cl)			<0.50		mg/L		0.5	20-MAR-19
WG3010231-9	MB							
Chloride (Cl)			<0.50		mg/L		0.5	20-MAR-19
EC-L-PCT-CL								
	Water							
Batch	R4576808							
WG3011311-14	LCS							
Conductivity (@ 25C)			102.2		%		90-110	21-MAR-19
WG3011311-13	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	21-MAR-19
F-IC-N-CL								
	Water							

Quality Control Report

Workorder: L2246028

Report Date: 26-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-CL								
Water								
Batch	R4573050							
WG3010231-10	LCS							
Fluoride (F)			103.2		%		90-110	20-MAR-19
WG3010231-2	LCS							
Fluoride (F)			107.7		%		90-110	20-MAR-19
WG3010231-6	LCS							
Fluoride (F)			99.5		%		90-110	20-MAR-19
WG3010231-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	20-MAR-19
WG3010231-5	MB							
Fluoride (F)			<0.020		mg/L		0.02	20-MAR-19
WG3010231-9	MB							
Fluoride (F)			<0.020		mg/L		0.02	20-MAR-19
HG-D-CVAA-VA								
Water								
Batch	R4572627							
WG3010678-2	LCS							
Mercury (Hg)-Dissolved			101.1		%		80-120	20-MAR-19
WG3010678-1	MB	LF						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	20-MAR-19
MET-D-CCMS-VA								
Water								
Batch	R4575455							
WG3010577-2	LCS							
Aluminum (Al)-Dissolved			101.9		%		80-120	20-MAR-19
Antimony (Sb)-Dissolved			96.5		%		80-120	20-MAR-19
Arsenic (As)-Dissolved			94.1		%		80-120	20-MAR-19
Barium (Ba)-Dissolved			99.4		%		80-120	20-MAR-19
Bismuth (Bi)-Dissolved			104.3		%		80-120	20-MAR-19
Boron (B)-Dissolved			94.6		%		80-120	20-MAR-19
Cadmium (Cd)-Dissolved			96.4		%		80-120	20-MAR-19
Calcium (Ca)-Dissolved			100.3		%		80-120	20-MAR-19
Chromium (Cr)-Dissolved			101.6		%		80-120	20-MAR-19
Cobalt (Co)-Dissolved			101.6		%		80-120	20-MAR-19
Copper (Cu)-Dissolved			99.2		%		80-120	20-MAR-19
Iron (Fe)-Dissolved			98.7		%		80-120	20-MAR-19
Lead (Pb)-Dissolved			98.5		%		80-120	20-MAR-19
Lithium (Li)-Dissolved			98.2		%		80-120	20-MAR-19
Magnesium (Mg)-Dissolved			102.4		%		80-120	20-MAR-19
Manganese (Mn)-Dissolved			103.2		%		80-120	20-MAR-19

Quality Control Report

Workorder: L2246028

Report Date: 26-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4575455							
WG3010577-2	LCS							
Molybdenum (Mo)-Dissolved			98.6		%		80-120	20-MAR-19
Nickel (Ni)-Dissolved			99.9		%		80-120	20-MAR-19
Potassium (K)-Dissolved			96.9		%		80-120	20-MAR-19
Selenium (Se)-Dissolved			95.2		%		80-120	20-MAR-19
Silicon (Si)-Dissolved			94.2		%		60-140	20-MAR-19
Silver (Ag)-Dissolved			99.1		%		80-120	20-MAR-19
Sodium (Na)-Dissolved			109.0		%		80-120	20-MAR-19
Strontium (Sr)-Dissolved			100.5		%		80-120	20-MAR-19
Thallium (Tl)-Dissolved			101.0		%		80-120	20-MAR-19
Tin (Sn)-Dissolved			92.1		%		80-120	20-MAR-19
Titanium (Ti)-Dissolved			95.2		%		80-120	20-MAR-19
Uranium (U)-Dissolved			102.2		%		80-120	20-MAR-19
Vanadium (V)-Dissolved			103.6		%		80-120	20-MAR-19
Zinc (Zn)-Dissolved			101.4		%		80-120	20-MAR-19
WG3010577-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	20-MAR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-MAR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-MAR-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	20-MAR-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-MAR-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-MAR-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-MAR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-MAR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-MAR-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-MAR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-MAR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-MAR-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4575455							
WG3010577-1	MB	LF						
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	20-MAR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-MAR-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-MAR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-MAR-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	20-MAR-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-MAR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-MAR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-MAR-19
MET-T-CCMS-VA								
	Water							
Batch	R4575549							
WG3010482-2	LCS							
Aluminum (Al)-Total			105.6		%		80-120	20-MAR-19
Antimony (Sb)-Total			102.1		%		80-120	20-MAR-19
Arsenic (As)-Total			100.1		%		80-120	20-MAR-19
Barium (Ba)-Total			102.0		%		80-120	20-MAR-19
Bismuth (Bi)-Total			97.2		%		80-120	20-MAR-19
Boron (B)-Total			92.7		%		80-120	20-MAR-19
Cadmium (Cd)-Total			102.4		%		80-120	20-MAR-19
Calcium (Ca)-Total			93.7		%		80-120	20-MAR-19
Chromium (Cr)-Total			101.4		%		80-120	20-MAR-19
Cobalt (Co)-Total			103.3		%		80-120	20-MAR-19
Copper (Cu)-Total			99.9		%		80-120	20-MAR-19
Iron (Fe)-Total			99.0		%		80-120	20-MAR-19
Lead (Pb)-Total			100.1		%		80-120	20-MAR-19
Lithium (Li)-Total			90.4		%		80-120	20-MAR-19
Magnesium (Mg)-Total			101.1		%		80-120	20-MAR-19
Manganese (Mn)-Total			98.4		%		80-120	20-MAR-19
Molybdenum (Mo)-Total			104.2		%		80-120	20-MAR-19
Nickel (Ni)-Total			99.9		%		80-120	20-MAR-19
Potassium (K)-Total			99.6		%		80-120	20-MAR-19
Selenium (Se)-Total			99.1		%		80-120	20-MAR-19

Quality Control Report

Workorder: L2246028

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4575549							
WG3010482-2 LCS								
Silicon (Si)-Total			100.1		%		80-120	20-MAR-19
Silver (Ag)-Total			99.9		%		80-120	20-MAR-19
Sodium (Na)-Total			112.1		%		80-120	20-MAR-19
Strontium (Sr)-Total			104.7		%		80-120	20-MAR-19
Thallium (Tl)-Total			96.5		%		80-120	20-MAR-19
Tin (Sn)-Total			100.5		%		80-120	20-MAR-19
Titanium (Ti)-Total			96.0		%		80-120	20-MAR-19
Uranium (U)-Total			108.4		%		80-120	20-MAR-19
Vanadium (V)-Total			103.1		%		80-120	20-MAR-19
Zinc (Zn)-Total			93.4		%		80-120	20-MAR-19
WG3010482-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	20-MAR-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	20-MAR-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	20-MAR-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	20-MAR-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	20-MAR-19
Boron (B)-Total			<0.010		mg/L		0.01	20-MAR-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	20-MAR-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	20-MAR-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	20-MAR-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	20-MAR-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	20-MAR-19
Iron (Fe)-Total			<0.010		mg/L		0.01	20-MAR-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	20-MAR-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	20-MAR-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	20-MAR-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	20-MAR-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	20-MAR-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	20-MAR-19
Potassium (K)-Total			<0.050		mg/L		0.05	20-MAR-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	20-MAR-19
Silicon (Si)-Total			<0.10		mg/L		0.1	20-MAR-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	20-MAR-19
Sodium (Na)-Total			<0.050		mg/L		0.05	20-MAR-19

Quality Control Report

Workorder: L2246028

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4575549							
WG3010482-1	MB							
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	20-MAR-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	20-MAR-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	20-MAR-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	20-MAR-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	20-MAR-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	20-MAR-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	20-MAR-19
NH3-L-F-CL		Water						
Batch	R4583214							
WG3014241-6	LCS							
Ammonia as N			99.7		%		85-115	25-MAR-19
WG3014241-5	MB							
Ammonia as N			<0.0050		mg/L		0.005	25-MAR-19
NO2-L-IC-N-CL		Water						
Batch	R4573050							
WG3010231-10	LCS							
Nitrite (as N)			103.8		%		90-110	20-MAR-19
WG3010231-2	LCS							
Nitrite (as N)			106.5		%		90-110	20-MAR-19
WG3010231-6	LCS							
Nitrite (as N)			103.8		%		90-110	20-MAR-19
WG3010231-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	20-MAR-19
WG3010231-5	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	20-MAR-19
WG3010231-9	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	20-MAR-19
NO3-L-IC-N-CL		Water						
Batch	R4573050							
WG3010231-10	LCS							
Nitrate (as N)			97.2		%		90-110	20-MAR-19
WG3010231-2	LCS							
Nitrate (as N)			102.6		%		90-110	20-MAR-19
WG3010231-6	LCS							
Nitrate (as N)			96.9		%		90-110	20-MAR-19
WG3010231-1	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL Water								
Batch	R4573050							
WG3010231-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	20-MAR-19
WG3010231-5	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	20-MAR-19
WG3010231-9	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	20-MAR-19
ORP-CL Water								
Batch	R4580133							
WG3012840-11	CRM	CL-ORP						
ORP			227		mV		210-230	22-MAR-19
P-T-L-COL-CL Water								
Batch	R4573249							
WG3010318-6	LCS							
Phosphorus (P)-Total			104.5		%		80-120	20-MAR-19
WG3010318-5	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	20-MAR-19
PH-CL Water								
Batch	R4576808							
WG3011311-14	LCS							
pH			7.01		pH		6.9-7.1	21-MAR-19
PO4-DO-L-COL-CL Water								
Batch	R4573068							
WG3009685-9	DUP	L2246028-1						
Orthophosphate-Dissolved (as P)		0.0015	0.0018		mg/L	16	20	19-MAR-19
WG3009685-4	LCS							
Orthophosphate-Dissolved (as P)			101.0		%		80-120	19-MAR-19
WG3009685-3	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	19-MAR-19
SO4-IC-N-CL Water								
Batch	R4573050							
WG3010231-10	LCS							
Sulfate (SO4)			98.4		%		90-110	20-MAR-19
WG3010231-2	LCS							
Sulfate (SO4)			103.3		%		90-110	20-MAR-19
WG3010231-6	LCS							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-CL		Water						
Batch	R4573050							
WG3010231-6	LCS							
Sulfate (SO4)			98.3		%		90-110	20-MAR-19
WG3010231-1	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	20-MAR-19
WG3010231-5	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	20-MAR-19
WG3010231-9	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	20-MAR-19
SOLIDS-TDS-CL		Water						
Batch	R4580198							
WG3012112-5	LCS							
Total Dissolved Solids			100.6		%		85-115	22-MAR-19
WG3012112-4	MB							
Total Dissolved Solids			<10		mg/L		10	22-MAR-19
TKN-L-F-CL		Water						
Batch	R4579707							
WG3011627-2	LCS							
Total Kjeldahl Nitrogen			100.3		%		75-125	22-MAR-19
WG3011627-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	22-MAR-19
TSS-L-CL		Water						
Batch	R4581413							
WG3013127-2	LCS							
Total Suspended Solids			93.6		%		85-115	24-MAR-19
WG3013127-1	MB							
Total Suspended Solids			<1.0		mg/L		1	24-MAR-19
TURBIDITY-CL		Water						
Batch	R4572968							
WG3009726-8	LCS							
Turbidity			95.0		%		85-115	19-MAR-19
WG3009726-7	MB							
Turbidity			<0.10		NTU		0.1	19-MAR-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	18-MAR-19 14:10	22-MAR-19 13:30	0.25	95	hours	EHTR-FM
pH	1	18-MAR-19 14:10	21-MAR-19 14:00	0.25	72	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2246028 were received on 19-MAR-19 09:00.


ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

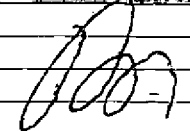
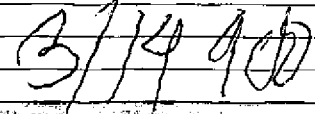
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

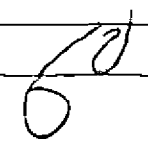
COC ID: **20190318 GW** TURNAROUND TIME: RUSH:


PROJECT/CLIENT INFO					LABORATORY					OTHER INFO			
Facility Name / Job#	Lite Creek Operation				Lab Name	ALS Calgary				Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton				Lab Contact	Lyudmyla Shvets				Email 1:	chris.blurton@teck.com		
Email	Chris.Blurton@teck.com				Email	Lyudmyla.Shvets@ALSGlobal.com				Email 2:	teckcoal@equisonline.com		
Address	Box 2003				Address	2559 29 Street NE				Email 3:	drake.tymstra@teck.com		
	15km North Hwy 43									Email 4:	kirsten.campbell@teck.com		
City	Sparwood		Province	BC	City	Calgary		Province	AB	PO number	25000608129		
Postal Code	V0B 2G0		Country	Canada	Postal Code	T1Y 7B5		Country	Canada				
Phone Number	250-425-3196				Phone Number	403 407 1794							

SAMPLE DETAILS							ANALYSIS REQUESTED						Filtered - F; Field; L; Lab; FI; Field & Lab; N; None								
Sample ID	Sample Location (sys_loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS_Package-DOC	HG-D-CVA-F-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC								
 L2246028-COFC																					
LC_PIZP1104_WG_Q1-2019_NP	LC_PIZP1104	WG		2019/03/18	14:10	G	6	1	1	1	1	1	1								

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
PLEASE FORWARD METALS SAMPLES TO MINERURBY FOR ANALYSIS	D.Tymstra/K.Campbell	0-Jan		March 18, 2019 

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Sampler's Signature	Mobile #	Date/Time
Regular (default) <input checked="" type="checkbox"/>	K. Campbell/D. Tymstra			
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				





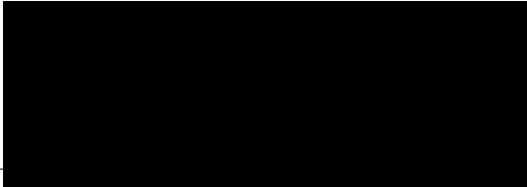
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 22-MAR-19
Report Date: 04-APR-19 08:27 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2247956
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190320 DC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-1 LC_PIZDC1404D_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 12:35							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.22		0.50	mg/L		31-MAR-19	R4587852
Total Kjeldahl Nitrogen	3.75		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon	38.1		5.0	mg/L		31-MAR-19	R4587852
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	27-MAR-19	27-MAR-19	R4585680
Dissolved Metals Filtration Location	FIELD					27-MAR-19	R4585748
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4585074
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.000050	mg/L	27-MAR-19	27-MAR-19	R4585481
Dissolved Mercury Filtration Location	FIELD					27-MAR-19	R4585281
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					27-MAR-19	R4585748
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4585074
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	27-MAR-19	27-MAR-19	R4585680
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Arsenic (As)-Dissolved	0.00215		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Barium (Ba)-Dissolved	4.45		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	27-MAR-19	27-MAR-19	R4585680
Boron (B)-Dissolved	0.024		0.010	mg/L	27-MAR-19	27-MAR-19	R4585680
Cadmium (Cd)-Dissolved	0.0157		0.0050	ug/L	27-MAR-19	27-MAR-19	R4585680
Calcium (Ca)-Dissolved	63.7		0.050	mg/L	27-MAR-19	27-MAR-19	R4585680
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Cobalt (Co)-Dissolved	0.27		0.10	ug/L	27-MAR-19	27-MAR-19	R4585680
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-19	27-MAR-19	R4585680
Iron (Fe)-Dissolved	2.21		0.010	mg/L	27-MAR-19	27-MAR-19	R4585680
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	27-MAR-19	27-MAR-19	R4585680
Lithium (Li)-Dissolved	0.593		0.0010	mg/L	27-MAR-19	27-MAR-19	R4585680
Magnesium (Mg)-Dissolved	37.7		0.10	mg/L	27-MAR-19	27-MAR-19	R4585680
Manganese (Mn)-Dissolved	0.0219		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Molybdenum (Mo)-Dissolved	0.0194		0.000050	mg/L	27-MAR-19	27-MAR-19	R4585680
Nickel (Ni)-Dissolved	0.00109		0.00050	mg/L	27-MAR-19	27-MAR-19	R4585680
Potassium (K)-Dissolved	26.7		0.050	mg/L	27-MAR-19	27-MAR-19	R4585680
Selenium (Se)-Dissolved	0.061		0.050	ug/L	27-MAR-19	27-MAR-19	R4585680
Silicon (Si)-Dissolved	2.73		0.050	mg/L	27-MAR-19	27-MAR-19	R4585680
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	27-MAR-19	27-MAR-19	R4585680
Sodium (Na)-Dissolved	33.2		0.050	mg/L	27-MAR-19	27-MAR-19	R4585680
Strontium (Sr)-Dissolved	0.236		0.00020	mg/L	27-MAR-19	27-MAR-19	R4585680
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	27-MAR-19	27-MAR-19	R4585680
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	27-MAR-19	27-MAR-19	R4585680
Uranium (U)-Dissolved	0.000154		0.000010	mg/L	27-MAR-19	27-MAR-19	R4585680
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-19	27-MAR-19	R4585680
Zinc (Zn)-Dissolved	0.0028		0.0010	mg/L	27-MAR-19	27-MAR-19	R4585680
Hardness							
Hardness (as CaCO3)	314		0.50	mg/L		27-MAR-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.081		0.020	ug/L		26-MAR-19	R4585048
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.648		0.0030	mg/L		26-MAR-19	R4585048

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-1 LC_PIZDC1404D_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 12:35							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Antimony (Sb)-Total	0.00028		0.00010	mg/L		26-MAR-19	R4585048
Arsenic (As)-Total	0.00247		0.00010	mg/L		26-MAR-19	R4585048
Barium (Ba)-Total	4.19		0.00010	mg/L		26-MAR-19	R4585048
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Boron (B)-Total	0.026		0.010	mg/L		26-MAR-19	R4585048
Cadmium (Cd)-Total	0.173		0.0050	ug/L		26-MAR-19	R4585048
Calcium (Ca)-Total	58.6		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	0.00230		0.00010	mg/L		26-MAR-19	R4585048
Cobalt (Co)-Total	0.94		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	0.00505		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	3.51		0.010	mg/L		26-MAR-19	R4585048
Lead (Pb)-Total	0.00194		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	0.560		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total	38.2		0.10	mg/L		26-MAR-19	R4585048
Manganese (Mn)-Total	0.0461		0.00010	mg/L		26-MAR-19	R4585048
Molybdenum (Mo)-Total	0.0182		0.000050	mg/L		26-MAR-19	R4585048
Nickel (Ni)-Total	0.00489		0.00050	mg/L		26-MAR-19	R4585048
Potassium (K)-Total	25.3		0.050	mg/L		26-MAR-19	R4585048
Selenium (Se)-Total	0.100		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total	3.90		0.10	mg/L		26-MAR-19	R4585048
Silver (Ag)-Total	0.000049		0.000010	mg/L		26-MAR-19	R4585048
Sodium (Na)-Total	35.2		0.050	mg/L		26-MAR-19	R4585048
Strontium (Sr)-Total	0.228		0.00020	mg/L		26-MAR-19	R4585048
Thallium (Tl)-Total	0.000036		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total	0.00026		0.00010	mg/L		26-MAR-19	R4585048
Titanium (Ti)-Total	0.014		0.010	mg/L		26-MAR-19	R4585048
Uranium (U)-Total	0.000314		0.000010	mg/L		26-MAR-19	R4585048
Vanadium (V)-Total	0.00475		0.00050	mg/L		26-MAR-19	R4585048
Zinc (Zn)-Total	0.0251		0.0030	mg/L		26-MAR-19	R4585048
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.2		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	413		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Total (as CaCO3)	413		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N)							
Ammonia as N	2.36	DLHC	0.050	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)							
Bromide (Br)	0.059		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC)							
Conductivity (@ 25C)	705		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC							
Fluoride (F)	0.187		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation							
Ion Balance	103		-100	%		28-MAR-19	
Ion Balance Calculation							
Cation - Anion Balance	1.5			%		28-MAR-19	
Anion Sum	8.27			meq/L		28-MAR-19	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-1 LC_PIZDC1404D_WG_Q1-2019_NP Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 12:35 Matrix: WG							
Ion Balance Calculation							
Cation Sum	8.52			meq/L		28-MAR-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect.							
ORP	345		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.252	DLHC	0.025	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids							
Total Dissolved Solids	388	DLHC	20	mg/L		27-MAR-19	R4586266
Total Suspended Solids							
Total Suspended Solids	128		1.0	mg/L		26-MAR-19	R4585537
Turbidity							
Turbidity	119		0.10	NTU		22-MAR-19	R4580128
pH							
pH	8.29		0.10	pH		27-MAR-19	R4585726
L2247956-2 LC_PIZDC1404S_WG_Q1-2019_NP Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 13:05 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.70		0.50	mg/L		31-MAR-19	R4587852
Total Kjeldahl Nitrogen	0.134		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon	2.31		0.50	mg/L		29-MAR-19	R4587742
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	26-MAR-19	26-MAR-19	R4585048
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.000050	mg/L	27-MAR-19	27-MAR-19	R4585481
Dissolved Mercury Filtration Location	FIELD					27-MAR-19	R4585281
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Dissolved Metals Filtration Location	FIELD					27-MAR-19	R4585563
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	26-MAR-19	26-MAR-19	R4585048
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Arsenic (As)-Dissolved	0.00143		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Barium (Ba)-Dissolved	0.226		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Boron (B)-Dissolved	<0.010		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	26-MAR-19	26-MAR-19	R4585048
Calcium (Ca)-Dissolved	48.2		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cobalt (Co)-Dissolved	0.28		0.10	ug/L	26-MAR-19	26-MAR-19	R4585048
Copper (Cu)-Dissolved	0.00159	DTC	0.00050	mg/L	27-MAR-19	27-MAR-19	R4585893
Iron (Fe)-Dissolved	0.654		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Lead (Pb)-Dissolved	0.000056		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-2 LC_PIZDC1404S_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 13:05							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Lithium (Li)-Dissolved	0.0057		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Magnesium (Mg)-Dissolved	17.9		0.10	mg/L	26-MAR-19	26-MAR-19	R4585048
Manganese (Mn)-Dissolved	0.0251		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Molybdenum (Mo)-Dissolved	0.00322		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Nickel (Ni)-Dissolved	0.00131		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Potassium (K)-Dissolved	3.83		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	26-MAR-19	26-MAR-19	R4585048
Silicon (Si)-Dissolved	3.38		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Sodium (Na)-Dissolved	1.52		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Strontium (Sr)-Dissolved	0.0445		0.00020	mg/L	26-MAR-19	26-MAR-19	R4585048
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Uranium (U)-Dissolved	0.000648		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Zinc (Zn)-Dissolved	0.0033		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Hardness							
Hardness (as CaCO3)	194		0.50	mg/L		27-MAR-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		26-MAR-19	R4585048
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0148		0.0030	mg/L		26-MAR-19	R4585048
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Arsenic (As)-Total	0.00166		0.00010	mg/L		26-MAR-19	R4585048
Barium (Ba)-Total	0.230		0.00010	mg/L		26-MAR-19	R4585048
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Boron (B)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		26-MAR-19	R4585048
Calcium (Ca)-Total	49.2		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	0.00039		0.00010	mg/L		26-MAR-19	R4585048
Cobalt (Co)-Total	0.32		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	0.800		0.010	mg/L		26-MAR-19	R4585048
Lead (Pb)-Total	0.000220		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	0.0060		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total	18.3		0.10	mg/L		26-MAR-19	R4585048
Manganese (Mn)-Total	0.0280		0.00010	mg/L		26-MAR-19	R4585048
Molybdenum (Mo)-Total	0.00340		0.000050	mg/L		26-MAR-19	R4585048
Nickel (Ni)-Total	0.00140		0.00050	mg/L		26-MAR-19	R4585048
Potassium (K)-Total	3.41		0.050	mg/L		26-MAR-19	R4585048
Selenium (Se)-Total	<0.050		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total	3.62		0.10	mg/L		26-MAR-19	R4585048
Silver (Ag)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Sodium (Na)-Total	1.48		0.050	mg/L		26-MAR-19	R4585048
Strontium (Sr)-Total	0.0461		0.00020	mg/L		26-MAR-19	R4585048
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Uranium (U)-Total	0.000687		0.000010	mg/L		26-MAR-19	R4585048
Vanadium (V)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-2 LC_PIZDC1404S_WG_Q1-2019_NP Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 13:05 Matrix: WG							
Total Metals in Water by CRC ICPMS							
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		26-MAR-19	R4585048
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.3		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	201		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Total (as CaCO3)	201		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N)							
Ammonia as N	0.0146		0.0050	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC)							
Conductivity (@ 25C)	360		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC							
Fluoride (F)	0.153		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation							
Cation - Anion Balance	-0.7			%		28-MAR-19	
Anion Sum	4.13			meq/L		28-MAR-19	
Cation Sum	4.07			meq/L		28-MAR-19	
Ion Balance Calculation							
Ion Balance	98.6		-100	%		28-MAR-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0088		0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0015		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect.							
ORP	413		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0097		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC							
Sulfate (SO4)	4.88		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids							
Total Dissolved Solids	199	DLHC	20	mg/L		27-MAR-19	R4586266
Total Suspended Solids							
Total Suspended Solids	4.2		1.0	mg/L		26-MAR-19	R4585537
Turbidity							
Turbidity	7.41		0.10	NTU		22-MAR-19	R4580128
pH							
pH	8.29		0.10	pH		27-MAR-19	R4585726
L2247956-3 WG_Q1-2019_MT1 Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 12:40 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		29-MAR-19	R4587742
Total Kjeldahl Nitrogen	4.76		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon	<0.50		0.50	mg/L		29-MAR-19	R4587742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-3 WG_Q1-2019_MT1							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 12:40							
Matrix: WG							
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	01-APR-19	01-APR-19	R4588535
Dissolved Metals Filtration Location	LAB					01-APR-19	R4588563
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	01-APR-19	01-APR-19	R4588409
Dissolved Mercury Filtration Location	LAB					01-APR-19	R4588563
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					01-APR-19	R4588563
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	01-APR-19	01-APR-19	R4588535
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19	01-APR-19	R4588535
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19	01-APR-19	R4588535
Barium (Ba)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19	01-APR-19	R4588535
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	01-APR-19	01-APR-19	R4588535
Boron (B)-Dissolved	<0.010		0.010	mg/L	01-APR-19	01-APR-19	R4588535
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	01-APR-19	01-APR-19	R4588535
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L	01-APR-19	01-APR-19	R4588535
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19	01-APR-19	R4588535
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	01-APR-19	01-APR-19	R4588535
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	01-APR-19	01-APR-19	R4588535
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	01-APR-19	01-APR-19	R4588535
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	01-APR-19	01-APR-19	R4588535
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	01-APR-19	01-APR-19	R4588535
Magnesium (Mg)-Dissolved	<0.10		0.10	mg/L	01-APR-19	01-APR-19	R4588535
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19	01-APR-19	R4588535
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L	01-APR-19	01-APR-19	R4588535
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	01-APR-19	01-APR-19	R4588535
Potassium (K)-Dissolved	<0.050		0.050	mg/L	01-APR-19	01-APR-19	R4588535
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	01-APR-19	01-APR-19	R4588535
Silicon (Si)-Dissolved	<0.050		0.050	mg/L	01-APR-19	01-APR-19	R4588535
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	01-APR-19	01-APR-19	R4588535
Sodium (Na)-Dissolved	<0.050		0.050	mg/L	01-APR-19	01-APR-19	R4588535
Strontium (Sr)-Dissolved	<0.00020		0.00020	mg/L	01-APR-19	01-APR-19	R4588535
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	01-APR-19	01-APR-19	R4588535
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19	01-APR-19	R4588535
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	01-APR-19	01-APR-19	R4588535
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L	01-APR-19	01-APR-19	R4588535
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	01-APR-19	01-APR-19	R4588535
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	01-APR-19	01-APR-19	R4588535
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		02-APR-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		26-MAR-19	R4585048
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		26-MAR-19	R4583050
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		26-MAR-19	R4585048
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Arsenic (As)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Barium (Ba)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Boron (B)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-3 WG_Q1-2019_MT1							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 12:40							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		26-MAR-19	R4585048
Calcium (Ca)-Total	<0.050		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	0.00040	RRV	0.00010	mg/L		27-MAR-19	R4585464
Cobalt (Co)-Total	<0.10		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Lead (Pb)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	<0.0010		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total	<0.10		0.10	mg/L		26-MAR-19	R4585048
Manganese (Mn)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Potassium (K)-Total	<0.050		0.050	mg/L		26-MAR-19	R4585048
Selenium (Se)-Total	<0.050		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total	<0.10		0.10	mg/L		26-MAR-19	R4585048
Silver (Ag)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Sodium (Na)-Total	<0.050		0.050	mg/L		26-MAR-19	R4585048
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		26-MAR-19	R4585048
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Vanadium (V)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		26-MAR-19	R4585048
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.1		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N)							
Ammonia as N	1.05	RRV	0.010	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC)							
Conductivity (@ 25C)	<2.0		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation							
Ion Balance	0.0		-100	%		02-APR-19	
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		02-APR-19	
Anion Sum	<0.10			meq/L		02-APR-19	
Cation Sum	<0.10			meq/L		02-APR-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		22-MAR-19	R4580126

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-3 WG_Q1-2019_MT1 Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 12:40 Matrix: WG							
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect.							
ORP	431		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total							
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		27-MAR-19	R4586266
Total Suspended Solids							
Total Suspended Solids	<1.0		1.0	mg/L		26-MAR-19	R4585537
Turbidity							
Turbidity	<0.10		0.10	NTU		22-MAR-19	R4580128
pH							
pH	5.48		0.10	pH		27-MAR-19	R4585726
L2247956-4 WG_Q1-2019_RD1 Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 15:30 Matrix: WG							
Miscellaneous Parameters							
Hardness (as CaCO3)	<0.50		0.50	mg/L		29-MAR-19	
Total Kjeldahl Nitrogen	0.301		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon	<0.50		0.50	mg/L		29-MAR-19	R4587742
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		26-MAR-19	R4585048
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		26-MAR-19	R4583050
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		27-MAR-19	R4585464
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Arsenic (As)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Barium (Ba)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Boron (B)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		26-MAR-19	R4585048
Calcium (Ca)-Total	<0.050		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Cobalt (Co)-Total	<0.10		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	0.022	RRV	0.010	mg/L		27-MAR-19	R4585464
Lead (Pb)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	<0.0010		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total	<0.10		0.10	mg/L		26-MAR-19	R4585048
Manganese (Mn)-Total	0.00014	RRV	0.00010	mg/L		27-MAR-19	R4585464
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Potassium (K)-Total	<0.050		0.050	mg/L		26-MAR-19	R4585048
Selenium (Se)-Total	<0.050		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total	<0.10		0.10	mg/L		26-MAR-19	R4585048
Silver (Ag)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Sodium (Na)-Total	<0.050		0.050	mg/L		26-MAR-19	R4585048

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-4 WG_Q1-2019_RD1							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 15:30							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		26-MAR-19	R4585048
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Vanadium (V)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		26-MAR-19	R4585048
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.2		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N)							
Ammonia as N	0.292	RRV	0.0050	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		22-MAR-19	R4580126
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					28-MAR-19	R4586824
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L		28-MAR-19	R4586986
Magnesium (Mg)-Dissolved	<0.0050		0.0050	mg/L		28-MAR-19	R4586986
Potassium (K)-Dissolved	<0.050		0.050	mg/L		28-MAR-19	R4586986
Sodium (Na)-Dissolved	<0.050		0.050	mg/L		28-MAR-19	R4586986
Electrical Conductivity (EC)							
Conductivity (@ 25C)	2.7		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation							
Cation - Anion Balance	55.0			%		29-MAR-19	
Anion Sum	<0.10			meq/L		29-MAR-19	
Cation Sum	<0.10			meq/L		29-MAR-19	
Ion Balance Calculation							
Ion Balance	344	RRV	-100	%		29-MAR-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.125	RRV	0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect.							
ORP	423		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0033		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		27-MAR-19	R4586266
Total Suspended Solids							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-4 WG_Q1-2019_RD1 Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-19 @ 15:30 Matrix: WG							
Total Suspended Solids							
Total Suspended Solids	<1.0		1.0	mg/L		26-MAR-19	R4585537
Turbidity							
Turbidity	<0.10		0.10	NTU		22-MAR-19	R4580128
pH							
pH	5.01		0.10	pH		27-MAR-19	R4585726
L2247956-5 LC_PIZDC1307_WG_Q1-2019_NP Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-19 @ 15:15 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.74		0.50	mg/L		29-MAR-19	R4587742
Total Kjeldahl Nitrogen	0.284		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon	1.62		0.50	mg/L		29-MAR-19	R4587742
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	26-MAR-19	26-MAR-19	R4585048
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	27-MAR-19	27-MAR-19	R4585481
Dissolved Mercury Filtration Location	FIELD					27-MAR-19	R4585281
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	26-MAR-19	26-MAR-19	R4585048
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Arsenic (As)-Dissolved	0.00095		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Barium (Ba)-Dissolved	1.42		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Boron (B)-Dissolved	0.023		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cadmium (Cd)-Dissolved	<0.010	DLM	0.010	ug/L	26-MAR-19	26-MAR-19	R4585048
Calcium (Ca)-Dissolved	39.3		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	26-MAR-19	26-MAR-19	R4585048
Copper (Cu)-Dissolved	0.00578		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Iron (Fe)-Dissolved	0.124		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Lead (Pb)-Dissolved	0.000234		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Lithium (Li)-Dissolved	0.0752		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Magnesium (Mg)-Dissolved	20.8		0.10	mg/L	26-MAR-19	26-MAR-19	R4585048
Manganese (Mn)-Dissolved	0.00927		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Molybdenum (Mo)-Dissolved	0.0314		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Nickel (Ni)-Dissolved	0.00069		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Potassium (K)-Dissolved	5.23		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	26-MAR-19	26-MAR-19	R4585048
Silicon (Si)-Dissolved	2.68		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Sodium (Na)-Dissolved	14.7		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Strontium (Sr)-Dissolved	0.137		0.00020	mg/L	26-MAR-19	26-MAR-19	R4585048
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Uranium (U)-Dissolved	0.000056		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Zinc (Zn)-Dissolved	0.0079		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-5 LC_PIZDC1307_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-19 @ 15:15							
Matrix: WG							
Hardness							
Hardness (as CaCO3)	184		0.50	mg/L		27-MAR-19	
Total Metals in Water							
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.3		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	224		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Total (as CaCO3)	224		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N)							
Ammonia as N	0.0980		0.0050	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC)							
Conductivity (@ 25C)	396		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC							
Fluoride (F)	0.602		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation							
Cation - Anion Balance	-0.6			%		28-MAR-19	
Anion Sum	4.51			meq/L		28-MAR-19	
Cation Sum	4.45			meq/L		28-MAR-19	
Ion Balance Calculation							
Ion Balance	98.7		-100	%		28-MAR-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0018		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect.							
ORP	441		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0454		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids							
Total Dissolved Solids	207	DLHC	20	mg/L		27-MAR-19	R4586266
Total Suspended Solids							
Total Suspended Solids	23.2		1.0	mg/L		28-MAR-19	R4587072
Turbidity							
Turbidity	40.2		0.10	NTU		22-MAR-19	R4580128
pH							
pH	8.27		0.10	pH		27-MAR-19	R4585726
L2247956-6 LC_PIZDC1308_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-19 @ 12:30							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.02		0.50	mg/L		29-MAR-19	R4587742
Total Kjeldahl Nitrogen	0.101		0.050	mg/L		27-MAR-19	R4586513

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-6 LC_PIZDC1308_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-19 @ 12:30							
Matrix: WG							
Total Organic Carbon	1.85		0.50	mg/L		29-MAR-19	R4587742
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	26-MAR-19	26-MAR-19	R4585048
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.000050	mg/L	27-MAR-19	27-MAR-19	R4585481
Dissolved Mercury Filtration Location	FIELD					27-MAR-19	R4585281
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	26-MAR-19	26-MAR-19	R4585048
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Arsenic (As)-Dissolved	0.00038		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Barium (Ba)-Dissolved	0.558		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Boron (B)-Dissolved	0.012		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cadmium (Cd)-Dissolved	0.0059		0.0050	ug/L	26-MAR-19	26-MAR-19	R4585048
Calcium (Ca)-Dissolved	81.5		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cobalt (Co)-Dissolved	1.67		0.10	ug/L	26-MAR-19	26-MAR-19	R4585048
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Iron (Fe)-Dissolved	1.44		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Lithium (Li)-Dissolved	0.0131		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Magnesium (Mg)-Dissolved	26.6		0.10	mg/L	26-MAR-19	26-MAR-19	R4585048
Manganese (Mn)-Dissolved	0.117		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Molybdenum (Mo)-Dissolved	0.00403		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Nickel (Ni)-Dissolved	0.00330		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Potassium (K)-Dissolved	2.58		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	26-MAR-19	26-MAR-19	R4585048
Silicon (Si)-Dissolved	4.31		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Sodium (Na)-Dissolved	3.36		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Strontium (Sr)-Dissolved	0.120		0.00020	mg/L	26-MAR-19	26-MAR-19	R4585048
Thallium (Tl)-Dissolved	0.000037		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Uranium (U)-Dissolved	0.00107		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Zinc (Zn)-Dissolved	0.0030		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Hardness							
Hardness (as CaCO3)	313		0.50	mg/L		27-MAR-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		26-MAR-19	R4585048
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0483		0.0030	mg/L		26-MAR-19	R4585048
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Arsenic (As)-Total	0.00041		0.00010	mg/L		26-MAR-19	R4585048
Barium (Ba)-Total	0.573		0.00010	mg/L		26-MAR-19	R4585048
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Boron (B)-Total	0.012		0.010	mg/L		26-MAR-19	R4585048
Cadmium (Cd)-Total	0.0481		0.0050	ug/L		26-MAR-19	R4585048

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-6 LC_PIZDC1308_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-19 @ 12:30							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Calcium (Ca)-Total	82.1		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	0.00017		0.00010	mg/L		26-MAR-19	R4585048
Cobalt (Co)-Total	1.70		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	1.41		0.010	mg/L		26-MAR-19	R4585048
Lead (Pb)-Total	0.000059		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	0.0126		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total	27.5		0.10	mg/L		26-MAR-19	R4585048
Manganese (Mn)-Total	0.117		0.00010	mg/L		26-MAR-19	R4585048
Molybdenum (Mo)-Total	0.00387		0.000050	mg/L		26-MAR-19	R4585048
Nickel (Ni)-Total	0.00362		0.00050	mg/L		26-MAR-19	R4585048
Potassium (K)-Total	2.59		0.050	mg/L		26-MAR-19	R4585048
Selenium (Se)-Total	0.065		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total	4.62		0.10	mg/L		26-MAR-19	R4585048
Silver (Ag)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Sodium (Na)-Total	3.31		0.050	mg/L		26-MAR-19	R4585048
Strontium (Sr)-Total	0.117		0.00020	mg/L		26-MAR-19	R4585048
Thallium (Tl)-Total	0.000040		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Uranium (U)-Total	0.00114		0.000010	mg/L		26-MAR-19	R4585048
Vanadium (V)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Zinc (Zn)-Total	0.0032		0.0030	mg/L		26-MAR-19	R4585048
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	4.5		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	326		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Total (as CaCO3)	326		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N)							
Ammonia as N	0.0336		0.0050	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC							
Chloride (Cl)	0.74		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC)							
Conductivity (@ 25C)	570		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC							
Fluoride (F)	0.219		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation							
Ion Balance	98.4		-100	%		28-MAR-19	
Ion Balance Calculation							
Cation - Anion Balance	-0.8			%		28-MAR-19	
Anion Sum	6.66			meq/L		28-MAR-19	
Cation Sum	6.55			meq/L		28-MAR-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0021		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-6 LC_PIZDC1308_WG_Q1-2019_NP Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-19 @ 12:30 Matrix: WG							
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect.							
ORP	328		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0083		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC							
Sulfate (SO4)	5.13		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids							
Total Dissolved Solids	301	DLHC	20	mg/L		27-MAR-19	R4586266
Total Suspended Solids							
Total Suspended Solids	4.7		1.0	mg/L		28-MAR-19	R4587072
Turbidity							
Turbidity	19.5		0.10	NTU		22-MAR-19	R4580128
pH							
pH	8.00		0.10	pH		27-MAR-19	R4585726
L2247956-7 WG_Q1-2019_CC1 Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-19 @ 12:35 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.92		0.50	mg/L		29-MAR-19	R4587742
Total Kjeldahl Nitrogen	0.107		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon	1.67		0.50	mg/L		29-MAR-19	R4587742
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	26-MAR-19	26-MAR-19	R4585048
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	27-MAR-19	27-MAR-19	R4585481
Dissolved Mercury Filtration Location	FIELD					27-MAR-19	R4585281
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	26-MAR-19	26-MAR-19	R4585048
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Arsenic (As)-Dissolved	0.00039		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Barium (Ba)-Dissolved	0.570		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Boron (B)-Dissolved	0.011		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cadmium (Cd)-Dissolved	0.0055		0.0050	ug/L	26-MAR-19	26-MAR-19	R4585048
Calcium (Ca)-Dissolved	82.4		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cobalt (Co)-Dissolved	1.69		0.10	ug/L	26-MAR-19	26-MAR-19	R4585048
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Iron (Fe)-Dissolved	1.45		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Lithium (Li)-Dissolved	0.0129		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Magnesium (Mg)-Dissolved	27.8		0.10	mg/L	26-MAR-19	26-MAR-19	R4585048
Manganese (Mn)-Dissolved	0.120		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Molybdenum (Mo)-Dissolved	0.00397		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Nickel (Ni)-Dissolved	0.00336		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Potassium (K)-Dissolved	2.62		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Selenium (Se)-Dissolved	0.072		0.050	ug/L	26-MAR-19	26-MAR-19	R4585048

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-7 WG_Q1-2019_CC1							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-19 @ 12:35							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Silicon (Si)-Dissolved	4.50		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Sodium (Na)-Dissolved	3.38		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Strontium (Sr)-Dissolved	0.121		0.00020	mg/L	26-MAR-19	26-MAR-19	R4585048
Thallium (Tl)-Dissolved	0.000034		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Uranium (U)-Dissolved	0.00111		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Zinc (Zn)-Dissolved	0.0028		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Hardness							
Hardness (as CaCO3)	320		0.50	mg/L		27-MAR-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		26-MAR-19	R4585048
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		26-MAR-19	R4583050
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0951		0.0030	mg/L		26-MAR-19	R4585048
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Arsenic (As)-Total	0.00044		0.00010	mg/L		26-MAR-19	R4585048
Barium (Ba)-Total	0.571		0.00010	mg/L		26-MAR-19	R4585048
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Boron (B)-Total	0.012		0.010	mg/L		26-MAR-19	R4585048
Cadmium (Cd)-Total	0.0587		0.0050	ug/L		26-MAR-19	R4585048
Calcium (Ca)-Total	84.0		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	0.00024		0.00010	mg/L		26-MAR-19	R4585048
Cobalt (Co)-Total	1.74		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	1.45		0.010	mg/L		26-MAR-19	R4585048
Lead (Pb)-Total	0.000088		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	0.0136		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total	27.5		0.10	mg/L		26-MAR-19	R4585048
Manganese (Mn)-Total	0.119		0.00010	mg/L		26-MAR-19	R4585048
Molybdenum (Mo)-Total	0.00414		0.000050	mg/L		26-MAR-19	R4585048
Nickel (Ni)-Total	0.00369		0.00050	mg/L		26-MAR-19	R4585048
Potassium (K)-Total	2.62		0.050	mg/L		26-MAR-19	R4585048
Selenium (Se)-Total	0.097		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total	4.80		0.10	mg/L		26-MAR-19	R4585048
Silver (Ag)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Sodium (Na)-Total	3.53		0.050	mg/L		26-MAR-19	R4585048
Strontium (Sr)-Total	0.120		0.00020	mg/L		26-MAR-19	R4585048
Thallium (Tl)-Total	0.000039		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Uranium (U)-Total	0.00114		0.000010	mg/L		26-MAR-19	R4585048
Vanadium (V)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Zinc (Zn)-Total	0.0033		0.0030	mg/L		26-MAR-19	R4585048
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	8.0		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-7 WG_Q1-2019_CC1							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-19 @ 12:35							
Matrix: WG							
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	321		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Total (as CaCO3)	321		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N)							
Ammonia as N	0.0132		0.0050	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC							
Chloride (Cl)	0.72		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC)							
Conductivity (@ 25C)	562		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC							
Fluoride (F)	0.210		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation							
Ion Balance	102		-100	%		28-MAR-19	
Ion Balance Calculation							
Cation - Anion Balance	1.0			%		28-MAR-19	
Anion Sum	6.56			meq/L		28-MAR-19	
Cation Sum	6.69			meq/L		28-MAR-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0016		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect.							
ORP	377		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0077		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC							
Sulfate (SO4)	5.05		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids							
Total Dissolved Solids	305	DLHC	20	mg/L		27-MAR-19	R4586266
Total Suspended Solids							
Total Suspended Solids	5.7		1.0	mg/L		28-MAR-19	R4587072
Turbidity							
Turbidity	19.6		0.10	NTU		22-MAR-19	R4580128
pH							
pH	8.06		0.10	pH		27-MAR-19	R4585726

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
LPML	ALL T-METAL SUBSAMPLED AND PRESERVED AT THE LAB DUE TO SAMPLES NOT RECEIVED - Lab-Preserved for Total Metals. Sample received with pH > 2 and preserved at the lab. Total Metals results may be biased low.
SFPL	-3 DOC/DMETAL/DHG FILTERED AND PRESERVED AT THE LAB ; -4 D CATIONS FILTERED AND PRESERVED AT THE LAB. - Sample was Filtered and Preserved at the laboratory

Qualifiers for Individual Samples Listed:

Sample Number	Client ID	Qualifier	Description
L2247956-3	WG_Q1-2019_MT1	WSMD	Water sample(s) for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-CL	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.</p>			
PH-CL	Water	pH	APHA 4500 H-Electrode
<p>pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)</p>			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.</p>			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
<p>A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).</p>			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
<p>Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.</p>			
<p>Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:</p>			
<p style="text-align: center;">Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]</p>			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
<p>This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.</p>			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
<p>This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.</p>			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
<p>This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.</p>			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190320 DC GW

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2247956

Report Date: 04-APR-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4586355							
WG3015263-6	DUP	L2247956-6						
Acidity (as CaCO3)		4.5	5.9	J	mg/L	1.4	2	27-MAR-19
WG3015263-2	LCS							
Acidity (as CaCO3)			99.8		%		85-115	27-MAR-19
WG3015263-5	LCS							
Acidity (as CaCO3)			100.2		%		85-115	27-MAR-19
WG3015263-1	MB							
Acidity (as CaCO3)			1.9		mg/L		2	27-MAR-19
WG3015263-4	MB							
Acidity (as CaCO3)			1.9		mg/L		2	27-MAR-19
ALK-MAN-CL								
	Water							
Batch	R4585726							
WG3015272-10	LCS							
Alkalinity, Total (as CaCO3)			96.7		%		85-115	27-MAR-19
WG3015272-3	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	27-MAR-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4585048							
WG3014029-10	LCS							
Beryllium (Be)-Dissolved			98.3		%		80-120	26-MAR-19
WG3014029-9	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	26-MAR-19
Batch	R4585680							
WG3015553-2	LCS							
Beryllium (Be)-Dissolved			97.0		%		80-120	27-MAR-19
WG3015553-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	27-MAR-19
Batch	R4588535							
WG3018795-3	DUP	L2247956-3						
Beryllium (Be)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	01-APR-19
WG3018795-2	LCS							
Beryllium (Be)-Dissolved			96.6		%		80-120	01-APR-19
WG3018795-1	MB	LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	01-APR-19
BE-T-L-CCMS-VA								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BE-T-L-CCMS-VA								
Water								
Batch	R4585048							
WG3014083-3	DUP	L2247956-3						
Beryllium (Be)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	26-MAR-19
WG3014083-2	LCS							
Beryllium (Be)-Total			93.5		%		80-120	26-MAR-19
WG3014083-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	26-MAR-19
WG3014083-4	MS	L2247956-2						
Beryllium (Be)-Total			97.7		%		70-130	26-MAR-19
BR-L-IC-N-CL								
Water								
Batch	R4580126							
WG3012854-11	DUP	L2247956-4						
Bromide (Br)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	22-MAR-19
WG3012854-10	LCS							
Bromide (Br)			94.4		%		85-115	22-MAR-19
WG3012854-6	LCS							
Bromide (Br)			103.1		%		85-115	22-MAR-19
WG3012854-9	MB							
Bromide (Br)			<0.050		mg/L		0.05	22-MAR-19
C-DIS-ORG-LOW-CL								
Water								
Batch	R4587742							
WG3017967-2	LCS							
Dissolved Organic Carbon			94.8		%		80-120	29-MAR-19
WG3017967-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	29-MAR-19
Batch	R4587852							
WG3018065-2	LCS							
Dissolved Organic Carbon			92.0		%		80-120	31-MAR-19
WG3018065-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	31-MAR-19
C-TOT-ORG-LOW-CL								
Water								
Batch	R4587742							
WG3017967-2	LCS							
Total Organic Carbon			96.8		%		80-120	29-MAR-19
WG3017967-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	29-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL	Water							
Batch	R4587852							
WG3018065-2 LCS								
Total Organic Carbon			94.0		%		80-120	31-MAR-19
WG3018065-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	31-MAR-19
CL-IC-N-CL	Water							
Batch	R4580126							
WG3012854-11 DUP		L2247956-4						
Chloride (Cl)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	22-MAR-19
WG3012854-10 LCS								
Chloride (Cl)			101.4		%		90-110	22-MAR-19
WG3012854-6 LCS								
Chloride (Cl)			100.6		%		90-110	22-MAR-19
WG3012854-5 MB								
Chloride (Cl)			<0.50		mg/L		0.5	22-MAR-19
WG3012854-9 MB								
Chloride (Cl)			<0.50		mg/L		0.5	22-MAR-19
EC-L-PCT-CL	Water							
Batch	R4585726							
WG3015272-10 LCS								
Conductivity (@ 25C)			101.9		%		90-110	27-MAR-19
WG3015272-3 MB								
Conductivity (@ 25C)			<2.0		uS/cm		2	27-MAR-19
F-IC-N-CL	Water							
Batch	R4580126							
WG3012854-11 DUP		L2247956-4						
Fluoride (F)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	22-MAR-19
WG3012854-10 LCS								
Fluoride (F)			108.1		%		90-110	22-MAR-19
WG3012854-6 LCS								
Fluoride (F)			107.3		%		90-110	22-MAR-19
WG3012854-5 MB								
Fluoride (F)			<0.020		mg/L		0.02	22-MAR-19
WG3012854-9 MB								
Fluoride (F)			<0.020		mg/L		0.02	22-MAR-19
HG-D-CVAA-VA	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA								
Water								
Batch	R4585481							
WG3015166-2	LCS							
Mercury (Hg)-Dissolved			100.5		%		80-120	27-MAR-19
WG3015166-1	MB	NP						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	27-MAR-19
Batch	R4588409							
WG3018795-2	LCS							
Mercury (Hg)-Dissolved			97.5		%		80-120	01-APR-19
WG3018795-1	MB	LF						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	01-APR-19
HG-T-CVAA-VA								
Water								
Batch	R4583050							
WG3014115-2	LCS							
Mercury (Hg)-Total			99.5		%		80-120	26-MAR-19
WG3014115-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	26-MAR-19
MET-D-CCMS-CL								
Water								
Batch	R4586986							
WG3016985-10	LCS	TMRM						
Calcium (Ca)-Dissolved			101.3		%		80-120	28-MAR-19
Magnesium (Mg)-Dissolved			101.1		%		80-120	28-MAR-19
Potassium (K)-Dissolved			100.5		%		80-120	28-MAR-19
Sodium (Na)-Dissolved			99.2		%		80-120	28-MAR-19
WG3016985-14	LCS	TMRM						
Calcium (Ca)-Dissolved			105.2		%		80-120	28-MAR-19
Magnesium (Mg)-Dissolved			96.4		%		80-120	28-MAR-19
Potassium (K)-Dissolved			98.8		%		80-120	28-MAR-19
Sodium (Na)-Dissolved			99.5		%		80-120	28-MAR-19
WG3016985-13	MB							
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	28-MAR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	28-MAR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	28-MAR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	28-MAR-19
WG3016985-9	MB							
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	28-MAR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	28-MAR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	28-MAR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	28-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4585048							
WG3014029-10 LCS								
Aluminum (Al)-Dissolved			98.8		%		80-120	26-MAR-19
Antimony (Sb)-Dissolved			92.5		%		80-120	26-MAR-19
Arsenic (As)-Dissolved			97.7		%		80-120	26-MAR-19
Barium (Ba)-Dissolved			99.8		%		80-120	26-MAR-19
Bismuth (Bi)-Dissolved			98.6		%		80-120	26-MAR-19
Boron (B)-Dissolved			91.2		%		80-120	26-MAR-19
Cadmium (Cd)-Dissolved			99.7		%		80-120	26-MAR-19
Calcium (Ca)-Dissolved			95.9		%		80-120	26-MAR-19
Chromium (Cr)-Dissolved			101.8		%		80-120	26-MAR-19
Cobalt (Co)-Dissolved			96.6		%		80-120	26-MAR-19
Copper (Cu)-Dissolved			97.4		%		80-120	26-MAR-19
Iron (Fe)-Dissolved			94.4		%		80-120	26-MAR-19
Lead (Pb)-Dissolved			97.5		%		80-120	26-MAR-19
Lithium (Li)-Dissolved			97.0		%		80-120	26-MAR-19
Magnesium (Mg)-Dissolved			100.1		%		80-120	26-MAR-19
Manganese (Mn)-Dissolved			102.0		%		80-120	26-MAR-19
Molybdenum (Mo)-Dissolved			95.2		%		80-120	26-MAR-19
Nickel (Ni)-Dissolved			99.4		%		80-120	26-MAR-19
Potassium (K)-Dissolved			96.5		%		80-120	26-MAR-19
Selenium (Se)-Dissolved			88.8		%		80-120	26-MAR-19
Silicon (Si)-Dissolved			95.7		%		60-140	26-MAR-19
Silver (Ag)-Dissolved			92.0		%		80-120	26-MAR-19
Sodium (Na)-Dissolved			102.8		%		80-120	26-MAR-19
Strontium (Sr)-Dissolved			101.3		%		80-120	26-MAR-19
Thallium (Tl)-Dissolved			97.6		%		80-120	26-MAR-19
Tin (Sn)-Dissolved			92.8		%		80-120	26-MAR-19
Titanium (Ti)-Dissolved			91.0		%		80-120	26-MAR-19
Uranium (U)-Dissolved			100.8		%		80-120	26-MAR-19
Vanadium (V)-Dissolved			100.2		%		80-120	26-MAR-19
Zinc (Zn)-Dissolved			102.0		%		80-120	26-MAR-19
WG3014029-9 MB		NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	26-MAR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	26-MAR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	26-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4585048							
WG3014029-9	MB	NP						
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	26-MAR-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	26-MAR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	26-MAR-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	26-MAR-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	26-MAR-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	26-MAR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	26-MAR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	26-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	26-MAR-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	26-MAR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	26-MAR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	26-MAR-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	26-MAR-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	26-MAR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	26-MAR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	26-MAR-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	26-MAR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	26-MAR-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	26-MAR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	26-MAR-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	26-MAR-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	26-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	26-MAR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	26-MAR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	26-MAR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	26-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	26-MAR-19
Batch	R4585680							
WG3015553-2	LCS							
Aluminum (Al)-Dissolved			101.1		%		80-120	27-MAR-19
Antimony (Sb)-Dissolved			96.4		%		80-120	27-MAR-19
Arsenic (As)-Dissolved			98.9		%		80-120	27-MAR-19
Barium (Ba)-Dissolved			98.0		%		80-120	27-MAR-19
Bismuth (Bi)-Dissolved			99.1		%		80-120	27-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4585680							
WG3015553-2	LCS							
Boron (B)-Dissolved			90.7		%		80-120	27-MAR-19
Cadmium (Cd)-Dissolved			100.0		%		80-120	27-MAR-19
Calcium (Ca)-Dissolved			98.8		%		80-120	27-MAR-19
Chromium (Cr)-Dissolved			99.8		%		80-120	27-MAR-19
Cobalt (Co)-Dissolved			97.7		%		80-120	27-MAR-19
Copper (Cu)-Dissolved			98.3		%		80-120	27-MAR-19
Iron (Fe)-Dissolved			96.1		%		80-120	27-MAR-19
Lead (Pb)-Dissolved			96.6		%		80-120	27-MAR-19
Lithium (Li)-Dissolved			95.9		%		80-120	27-MAR-19
Magnesium (Mg)-Dissolved			106.7		%		80-120	27-MAR-19
Manganese (Mn)-Dissolved			99.6		%		80-120	27-MAR-19
Molybdenum (Mo)-Dissolved			97.1		%		80-120	27-MAR-19
Nickel (Ni)-Dissolved			99.4		%		80-120	27-MAR-19
Potassium (K)-Dissolved			96.4		%		80-120	27-MAR-19
Selenium (Se)-Dissolved			103.7		%		80-120	27-MAR-19
Silicon (Si)-Dissolved			93.1		%		60-140	27-MAR-19
Silver (Ag)-Dissolved			98.4		%		80-120	27-MAR-19
Sodium (Na)-Dissolved			99.3		%		80-120	27-MAR-19
Strontium (Sr)-Dissolved			96.1		%		80-120	27-MAR-19
Thallium (Tl)-Dissolved			92.8		%		80-120	27-MAR-19
Tin (Sn)-Dissolved			94.6		%		80-120	27-MAR-19
Titanium (Ti)-Dissolved			97.6		%		80-120	27-MAR-19
Uranium (U)-Dissolved			94.3		%		80-120	27-MAR-19
Vanadium (V)-Dissolved			100.3		%		80-120	27-MAR-19
Zinc (Zn)-Dissolved			97.1		%		80-120	27-MAR-19
WG3015553-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	27-MAR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-MAR-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	27-MAR-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	27-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4585680							
WG3015553-1	MB	NP						
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-MAR-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-MAR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	27-MAR-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-MAR-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-MAR-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	27-MAR-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	27-MAR-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	27-MAR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-MAR-19
Batch	R4585893							
WG3015435-2	LCS							
Aluminum (Al)-Dissolved			99.3		%		80-120	27-MAR-19
Antimony (Sb)-Dissolved			90.9		%		80-120	27-MAR-19
Arsenic (As)-Dissolved			96.3		%		80-120	27-MAR-19
Barium (Ba)-Dissolved			93.4		%		80-120	27-MAR-19
Bismuth (Bi)-Dissolved			95.1		%		80-120	27-MAR-19
Boron (B)-Dissolved			92.2		%		80-120	27-MAR-19
Cadmium (Cd)-Dissolved			96.5		%		80-120	27-MAR-19
Calcium (Ca)-Dissolved			93.4		%		80-120	27-MAR-19
Chromium (Cr)-Dissolved			97.5		%		80-120	27-MAR-19
Cobalt (Co)-Dissolved			95.8		%		80-120	27-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4585893							
WG3015435-2	LCS							
Copper (Cu)-Dissolved			94.9		%		80-120	27-MAR-19
Iron (Fe)-Dissolved			97.3		%		80-120	27-MAR-19
Lead (Pb)-Dissolved			95.9		%		80-120	27-MAR-19
Lithium (Li)-Dissolved			90.8		%		80-120	27-MAR-19
Magnesium (Mg)-Dissolved			100.9		%		80-120	27-MAR-19
Manganese (Mn)-Dissolved			98.1		%		80-120	27-MAR-19
Molybdenum (Mo)-Dissolved			92.1		%		80-120	27-MAR-19
Nickel (Ni)-Dissolved			95.4		%		80-120	27-MAR-19
Potassium (K)-Dissolved			97.0		%		80-120	27-MAR-19
Selenium (Se)-Dissolved			97.6		%		80-120	27-MAR-19
Silicon (Si)-Dissolved			94.2		%		60-140	27-MAR-19
Silver (Ag)-Dissolved			88.7		%		80-120	27-MAR-19
Sodium (Na)-Dissolved			100.1		%		80-120	27-MAR-19
Strontium (Sr)-Dissolved			100.3		%		80-120	27-MAR-19
Thallium (Tl)-Dissolved			94.4		%		80-120	27-MAR-19
Tin (Sn)-Dissolved			91.8		%		80-120	27-MAR-19
Titanium (Ti)-Dissolved			88.1		%		80-120	27-MAR-19
Uranium (U)-Dissolved			97.3		%		80-120	27-MAR-19
Vanadium (V)-Dissolved			97.6		%		80-120	27-MAR-19
Zinc (Zn)-Dissolved			91.8		%		80-120	27-MAR-19
WG3015435-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	27-MAR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-MAR-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	27-MAR-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	27-MAR-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-MAR-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4585893							
WG3015435-1	MB	NP						
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-MAR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	27-MAR-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-MAR-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-MAR-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	27-MAR-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	27-MAR-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	27-MAR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-MAR-19
Batch	R4588535							
WG3018795-3	DUP	L2247956-3						
Aluminum (Al)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	01-APR-19
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Barium (Ba)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-APR-19
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	01-APR-19
Cadmium (Cd)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	01-APR-19
Calcium (Ca)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	01-APR-19
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Copper (Cu)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-APR-19
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	01-APR-19
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-APR-19
Lithium (Li)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-APR-19
Magnesium (Mg)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	01-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4588535							
WG3018795-3	DUP	L2247956-3						
Manganese (Mn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Molybdenum (Mo)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-APR-19
Nickel (Ni)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-APR-19
Potassium (K)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	01-APR-19
Selenium (Se)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-APR-19
Silicon (Si)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	01-APR-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-APR-19
Sodium (Na)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	01-APR-19
Strontium (Sr)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	01-APR-19
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-APR-19
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	01-APR-19
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-APR-19
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-APR-19
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-APR-19
WG3018795-2	LCS							
Aluminum (Al)-Dissolved			98.9		%		80-120	01-APR-19
Antimony (Sb)-Dissolved			96.8		%		80-120	01-APR-19
Arsenic (As)-Dissolved			96.2		%		80-120	01-APR-19
Barium (Ba)-Dissolved			96.8		%		80-120	01-APR-19
Bismuth (Bi)-Dissolved			105.9		%		80-120	01-APR-19
Boron (B)-Dissolved			94.3		%		80-120	01-APR-19
Cadmium (Cd)-Dissolved			98.5		%		80-120	01-APR-19
Calcium (Ca)-Dissolved			96.1		%		80-120	01-APR-19
Chromium (Cr)-Dissolved			99.5		%		80-120	01-APR-19
Cobalt (Co)-Dissolved			97.6		%		80-120	01-APR-19
Copper (Cu)-Dissolved			98.0		%		80-120	01-APR-19
Iron (Fe)-Dissolved			93.3		%		80-120	01-APR-19
Lead (Pb)-Dissolved			101.2		%		80-120	01-APR-19
Lithium (Li)-Dissolved			92.1		%		80-120	01-APR-19
Magnesium (Mg)-Dissolved			97.4		%		80-120	01-APR-19
Manganese (Mn)-Dissolved			99.7		%		80-120	01-APR-19
Molybdenum (Mo)-Dissolved			99.3		%		80-120	01-APR-19
Nickel (Ni)-Dissolved			98.1		%		80-120	01-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4588535							
WG3018795-2	LCS							
Potassium (K)-Dissolved			95.8		%		80-120	01-APR-19
Selenium (Se)-Dissolved			104.2		%		80-120	01-APR-19
Silicon (Si)-Dissolved			99.1		%		60-140	01-APR-19
Silver (Ag)-Dissolved			99.1		%		80-120	01-APR-19
Sodium (Na)-Dissolved			103.6		%		80-120	01-APR-19
Strontium (Sr)-Dissolved			95.8		%		80-120	01-APR-19
Thallium (Tl)-Dissolved			102.8		%		80-120	01-APR-19
Tin (Sn)-Dissolved			96.3		%		80-120	01-APR-19
Titanium (Ti)-Dissolved			90.8		%		80-120	01-APR-19
Uranium (U)-Dissolved			98.3		%		80-120	01-APR-19
Vanadium (V)-Dissolved			99.4		%		80-120	01-APR-19
Zinc (Zn)-Dissolved			98.6		%		80-120	01-APR-19
WG3018795-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	01-APR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	01-APR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	01-APR-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	01-APR-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	01-APR-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	01-APR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	01-APR-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	01-APR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	01-APR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	01-APR-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	01-APR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	01-APR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	01-APR-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	01-APR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	01-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4588535							
WG3018795-1	MB	LF						
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	01-APR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	01-APR-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	01-APR-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	01-APR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	01-APR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	01-APR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	01-APR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	01-APR-19
MET-T-CCMS-VA								
	Water							
Batch	R4585048							
WG3014083-3	DUP	L2247956-3						
Aluminum (Al)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	26-MAR-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
Barium (Ba)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-MAR-19
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	26-MAR-19
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	26-MAR-19
Calcium (Ca)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	26-MAR-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-MAR-19
Iron (Fe)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	26-MAR-19
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-MAR-19
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	26-MAR-19
Magnesium (Mg)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	26-MAR-19
Manganese (Mn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-MAR-19
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-MAR-19
Potassium (K)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	26-MAR-19
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-MAR-19
Silicon (Si)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	26-MAR-19
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-MAR-19
Sodium (Na)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	26-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4585048							
WG3014083-3 DUP		L2247956-3						
Strontium (Sr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	26-MAR-19
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-MAR-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	26-MAR-19
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-MAR-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-MAR-19
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	26-MAR-19
WG3014083-2 LCS								
Aluminum (Al)-Total			104.0		%		80-120	26-MAR-19
Antimony (Sb)-Total			99.8		%		80-120	26-MAR-19
Arsenic (As)-Total			95.6		%		80-120	26-MAR-19
Barium (Ba)-Total			101.7		%		80-120	26-MAR-19
Bismuth (Bi)-Total			97.2		%		80-120	26-MAR-19
Boron (B)-Total			91.8		%		80-120	26-MAR-19
Cadmium (Cd)-Total			99.0		%		80-120	26-MAR-19
Calcium (Ca)-Total			94.3		%		80-120	26-MAR-19
Chromium (Cr)-Total			99.9		%		80-120	26-MAR-19
Cobalt (Co)-Total			96.8		%		80-120	26-MAR-19
Copper (Cu)-Total			95.6		%		80-120	26-MAR-19
Iron (Fe)-Total			94.3		%		80-120	26-MAR-19
Lead (Pb)-Total			96.3		%		80-120	26-MAR-19
Lithium (Li)-Total			93.3		%		80-120	26-MAR-19
Magnesium (Mg)-Total			98.8		%		80-120	26-MAR-19
Manganese (Mn)-Total			101.2		%		80-120	26-MAR-19
Molybdenum (Mo)-Total			92.2		%		80-120	26-MAR-19
Nickel (Ni)-Total			96.4		%		80-120	26-MAR-19
Potassium (K)-Total			98.5		%		80-120	26-MAR-19
Selenium (Se)-Total			91.5		%		80-120	26-MAR-19
Silicon (Si)-Total			97.2		%		80-120	26-MAR-19
Silver (Ag)-Total			97.1		%		80-120	26-MAR-19
Sodium (Na)-Total			101.7		%		80-120	26-MAR-19
Strontium (Sr)-Total			99.4		%		80-120	26-MAR-19
Thallium (Tl)-Total			97.3		%		80-120	26-MAR-19
Tin (Sn)-Total			97.4		%		80-120	26-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4585048							
WG3014083-2	LCS							
Titanium (Ti)-Total			96.2		%		80-120	26-MAR-19
Uranium (U)-Total			102.0		%		80-120	26-MAR-19
Vanadium (V)-Total			98.4		%		80-120	26-MAR-19
Zinc (Zn)-Total			100.5		%		80-120	26-MAR-19
WG3014083-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	26-MAR-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	26-MAR-19
Boron (B)-Total			<0.010		mg/L		0.01	26-MAR-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	26-MAR-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	26-MAR-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	26-MAR-19
Iron (Fe)-Total			<0.010		mg/L		0.01	26-MAR-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	26-MAR-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	26-MAR-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	26-MAR-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	26-MAR-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	26-MAR-19
Potassium (K)-Total			<0.050		mg/L		0.05	26-MAR-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	26-MAR-19
Silicon (Si)-Total			<0.10		mg/L		0.1	26-MAR-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	26-MAR-19
Sodium (Na)-Total			<0.050		mg/L		0.05	26-MAR-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	26-MAR-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	26-MAR-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	26-MAR-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	26-MAR-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	26-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4585048							
WG3014083-1	MB							
Zinc (Zn)-Total			<0.0030		mg/L		0.003	26-MAR-19
WG3014083-4	MS	L2247956-2						
Aluminum (Al)-Total			98.0		%		70-130	26-MAR-19
Antimony (Sb)-Total			98.8		%		70-130	26-MAR-19
Arsenic (As)-Total			100.1		%		70-130	26-MAR-19
Barium (Ba)-Total			N/A	MS-B	%		-	26-MAR-19
Bismuth (Bi)-Total			99.2		%		70-130	26-MAR-19
Boron (B)-Total			102.3		%		70-130	26-MAR-19
Cadmium (Cd)-Total			101.4		%		70-130	26-MAR-19
Calcium (Ca)-Total			N/A	MS-B	%		-	26-MAR-19
Chromium (Cr)-Total			102.9		%		70-130	26-MAR-19
Cobalt (Co)-Total			95.0		%		70-130	26-MAR-19
Copper (Cu)-Total			96.7		%		70-130	26-MAR-19
Iron (Fe)-Total			96.4		%		70-130	26-MAR-19
Lead (Pb)-Total			97.4		%		70-130	26-MAR-19
Lithium (Li)-Total			94.9		%		70-130	26-MAR-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	26-MAR-19
Manganese (Mn)-Total			N/A	MS-B	%		-	26-MAR-19
Molybdenum (Mo)-Total			95.1		%		70-130	26-MAR-19
Nickel (Ni)-Total			98.2		%		70-130	26-MAR-19
Potassium (K)-Total			95.7		%		70-130	26-MAR-19
Selenium (Se)-Total			99.6		%		70-130	26-MAR-19
Silicon (Si)-Total			90.8		%		70-130	26-MAR-19
Silver (Ag)-Total			101.9		%		70-130	26-MAR-19
Sodium (Na)-Total			96.8		%		70-130	26-MAR-19
Strontium (Sr)-Total			N/A	MS-B	%		-	26-MAR-19
Thallium (Tl)-Total			98.0		%		70-130	26-MAR-19
Tin (Sn)-Total			98.7		%		70-130	26-MAR-19
Titanium (Ti)-Total			97.7		%		70-130	26-MAR-19
Uranium (U)-Total			104.4		%		70-130	26-MAR-19
Vanadium (V)-Total			103.8		%		70-130	26-MAR-19
Zinc (Zn)-Total			98.7		%		70-130	26-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4585464							
WG3014886-3 DUP		L2247956-4						
Aluminum (Al)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-MAR-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Barium (Ba)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAR-19
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-MAR-19
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	27-MAR-19
Calcium (Ca)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-MAR-19
Chromium (Cr)-Total		<0.00010	0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-19
Iron (Fe)-Total		0.022	0.024		mg/L	9.0	20	27-MAR-19
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAR-19
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-19
Magnesium (Mg)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	27-MAR-19
Manganese (Mn)-Total		0.00014	0.00016		mg/L	14	20	27-MAR-19
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAR-19
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-19
Potassium (K)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-MAR-19
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAR-19
Silicon (Si)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	27-MAR-19
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-MAR-19
Sodium (Na)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-MAR-19
Strontium (Sr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	27-MAR-19
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-MAR-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-MAR-19
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-MAR-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-19
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-MAR-19
WG3014886-2 LCS								
Aluminum (Al)-Total			100.1		%		80-120	27-MAR-19
Antimony (Sb)-Total			101.3		%		80-120	27-MAR-19
Arsenic (As)-Total			96.5		%		80-120	27-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4585464							
WG3014886-2	LCS							
Barium (Ba)-Total			104.8		%		80-120	27-MAR-19
Bismuth (Bi)-Total			103.0		%		80-120	27-MAR-19
Boron (B)-Total			95.6		%		80-120	27-MAR-19
Cadmium (Cd)-Total			99.6		%		80-120	27-MAR-19
Calcium (Ca)-Total			98.8		%		80-120	27-MAR-19
Chromium (Cr)-Total			96.2		%		80-120	27-MAR-19
Cobalt (Co)-Total			97.8		%		80-120	27-MAR-19
Copper (Cu)-Total			97.7		%		80-120	27-MAR-19
Iron (Fe)-Total			92.3		%		80-120	27-MAR-19
Lead (Pb)-Total			103.8		%		80-120	27-MAR-19
Lithium (Li)-Total			94.7		%		80-120	27-MAR-19
Magnesium (Mg)-Total			103.2		%		80-120	27-MAR-19
Manganese (Mn)-Total			99.4		%		80-120	27-MAR-19
Molybdenum (Mo)-Total			100.7		%		80-120	27-MAR-19
Nickel (Ni)-Total			99.4		%		80-120	27-MAR-19
Potassium (K)-Total			94.3		%		80-120	27-MAR-19
Selenium (Se)-Total			94.5		%		80-120	27-MAR-19
Silicon (Si)-Total			96.4		%		80-120	27-MAR-19
Silver (Ag)-Total			100.2		%		80-120	27-MAR-19
Sodium (Na)-Total			98.7		%		80-120	27-MAR-19
Strontium (Sr)-Total			97.9		%		80-120	27-MAR-19
Thallium (Tl)-Total			104.6		%		80-120	27-MAR-19
Tin (Sn)-Total			97.2		%		80-120	27-MAR-19
Titanium (Ti)-Total			94.9		%		80-120	27-MAR-19
Uranium (U)-Total			101.8		%		80-120	27-MAR-19
Vanadium (V)-Total			99.0		%		80-120	27-MAR-19
Zinc (Zn)-Total			98.1		%		80-120	27-MAR-19
WG3014886-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	27-MAR-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	27-MAR-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	27-MAR-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	27-MAR-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	27-MAR-19
Boron (B)-Total			<0.010		mg/L		0.01	27-MAR-19

Quality Control Report

Workorder: L2247956

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4585464							
WG3014886-1	MB							
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	27-MAR-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	27-MAR-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	27-MAR-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	27-MAR-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	27-MAR-19
Iron (Fe)-Total			<0.010		mg/L		0.01	27-MAR-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	27-MAR-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	27-MAR-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	27-MAR-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	27-MAR-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	27-MAR-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	27-MAR-19
Potassium (K)-Total			<0.050		mg/L		0.05	27-MAR-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	27-MAR-19
Silicon (Si)-Total			<0.10		mg/L		0.1	27-MAR-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	27-MAR-19
Sodium (Na)-Total			<0.050		mg/L		0.05	27-MAR-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	27-MAR-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	27-MAR-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	27-MAR-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	27-MAR-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	27-MAR-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	27-MAR-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	27-MAR-19
NH3-L-F-CL								
	Water							
Batch	R4586901							
WG3017089-2	LCS							
Ammonia as N			108.3		%		85-115	28-MAR-19
WG3017089-1	MB							
Ammonia as N			<0.0050		mg/L		0.005	28-MAR-19
NO2-L-IC-N-CL								
	Water							
Batch	R4580126							
WG3012854-11	DUP	L2247956-4						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	22-MAR-19
WG3012854-10	LCS							

Quality Control Report

Workorder: L2247956

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-CL								
Water								
Batch	R4580126							
WG3012854-10	LCS							
Nitrite (as N)			105.6		%		90-110	22-MAR-19
WG3012854-6	LCS							
Nitrite (as N)			104.0		%		90-110	22-MAR-19
WG3012854-5	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	22-MAR-19
WG3012854-9	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	22-MAR-19
NO3-L-IC-N-CL								
Water								
Batch	R4580126							
WG3012854-11	DUP	L2247956-4						
Nitrate (as N)		0.125	0.136		mg/L	8.9	20	22-MAR-19
WG3012854-10	LCS							
Nitrate (as N)			99.5		%		90-110	22-MAR-19
WG3012854-6	LCS							
Nitrate (as N)			99.5		%		90-110	22-MAR-19
WG3012854-5	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	22-MAR-19
WG3012854-9	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	22-MAR-19
ORP-CL								
Water								
Batch	R4585058							
WG3014746-17	CRM	CL-ORP						
ORP			222		mV		210-230	26-MAR-19
WG3014746-18	DUP	L2247956-3						
ORP		431	439	J	mV	7.6	15	26-MAR-19
P-T-L-COL-CL								
Water								
Batch	R4584910							
WG3014693-30	LCS							
Phosphorus (P)-Total			97.1		%		80-120	27-MAR-19
WG3014693-29	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	27-MAR-19
PH-CL								
Water								
Batch	R4585726							
WG3015272-10	LCS							
pH			7.05		pH		6.9-7.1	27-MAR-19
Water								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-L-COL-CL								
	Water							
Batch	R4580026							
WG3012698-14	LCS							
Orthophosphate-Dissolved (as P)			100.6		%		80-120	22-MAR-19
WG3012698-18	LCS							
Orthophosphate-Dissolved (as P)			102.1		%		80-120	22-MAR-19
WG3012698-13	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	22-MAR-19
WG3012698-17	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	22-MAR-19
SO4-IC-N-CL								
	Water							
Batch	R4580126							
WG3012854-11	DUP	L2247956-4						
Sulfate (SO4)		<0.30	<0.30	RPD-NA	mg/L	N/A	20	22-MAR-19
WG3012854-10	LCS							
Sulfate (SO4)			103.9		%		90-110	22-MAR-19
WG3012854-6	LCS							
Sulfate (SO4)			102.0		%		90-110	22-MAR-19
WG3012854-5	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	22-MAR-19
WG3012854-9	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	22-MAR-19
SOLIDS-TDS-CL								
	Water							
Batch	R4586266							
WG3014764-6	DUP	L2247956-7						
Total Dissolved Solids		305	323		mg/L	5.9	20	27-MAR-19
WG3014764-5	LCS							
Total Dissolved Solids			103.4		%		85-115	27-MAR-19
WG3014764-4	MB							
Total Dissolved Solids			<10		mg/L		10	27-MAR-19
TKN-L-F-CL								
	Water							
Batch	R4586513							
WG3016508-2	LCS							
Total Kjeldahl Nitrogen			93.7		%		75-125	27-MAR-19
WG3016508-6	LCS							
Total Kjeldahl Nitrogen			93.3		%		75-125	27-MAR-19
WG3016508-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	27-MAR-19
WG3016508-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	27-MAR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-L-CL								
Water								
Batch	R4585537							
WG3015159-6	LCS							
Total Suspended Solids			94.6		%		85-115	26-MAR-19
WG3015159-5	MB							
Total Suspended Solids			<1.0		mg/L		1	26-MAR-19
Batch	R4587072							
WG3016295-2	LCS							
Total Suspended Solids			93.9		%		85-115	28-MAR-19
WG3016295-1	MB							
Total Suspended Solids			<1.0		mg/L		1	28-MAR-19
TURBIDITY-CL								
Water								
Batch	R4580128							
WG3012842-9	DUP	L2247956-7						
Turbidity		19.6	19.2		NTU	2.1	15	22-MAR-19
WG3012842-5	LCS							
Turbidity			94.0		%		85-115	22-MAR-19
WG3012842-8	LCS							
Turbidity			95.5		%		85-115	22-MAR-19
WG3012842-4	MB							
Turbidity			<0.10		NTU		0.1	22-MAR-19
WG3012842-7	MB							
Turbidity			<0.10		NTU		0.1	22-MAR-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.							
	1	20-MAR-19 12:35	26-MAR-19 09:45	0.25	141	hours	EHTR-FM
	2	20-MAR-19 13:05	26-MAR-19 09:45	0.25	141	hours	EHTR-FM
	3	20-MAR-19 12:40	26-MAR-19 09:45	0.25	141	hours	EHTR-FM
	4	20-MAR-19 15:30	26-MAR-19 09:45	0.25	138	hours	EHTR-FM
	5	21-MAR-19 15:15	26-MAR-19 09:45	0.25	114	hours	EHTR-FM
	6	21-MAR-19 12:30	26-MAR-19 09:45	0.25	117	hours	EHTR-FM
	7	21-MAR-19 12:35	26-MAR-19 09:45	0.25	117	hours	EHTR-FM
pH							
	1	20-MAR-19 12:35	27-MAR-19 09:00	0.25	164	hours	EHTR-FM
	2	20-MAR-19 13:05	27-MAR-19 09:00	0.25	164	hours	EHTR-FM
	3	20-MAR-19 12:40	27-MAR-19 09:00	0.25	164	hours	EHTR-FM
	4	20-MAR-19 15:30	27-MAR-19 09:00	0.25	162	hours	EHTR-FM
	5	21-MAR-19 15:15	27-MAR-19 09:00	0.25	138	hours	EHTR-FM
	6	21-MAR-19 12:30	27-MAR-19 09:00	0.25	140	hours	EHTR-FM
	7	21-MAR-19 12:35	27-MAR-19 09:00	0.25	140	hours	EHTR-FM

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2247956 were received on 22-MAR-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: 20190320 DC GW		TURNAROUND TIME:			RUSH:							
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO					
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	chris.blurton@teck.com			
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@eguisonline.com			
Address	Box 2003			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com			
	15km North Hwy 43							Email 4:	kirsten.campbell@teck.com			
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	V1000608129			
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada					
Phone Number	250-425-3196			Phone Number	403 407 1794							

SAMPLE DETAILS

ANALYSIS REQUESTED

Filtered - F: Field, L: Lab, PLE: Field & Lab, N: None

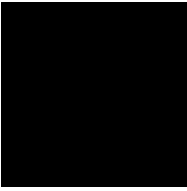


Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC	HG-T-CVAF-VA						
LC_PIZDC1404D_WG_Q1-2019_NP	LC_PIZDC1404D	WG		2019/03/20	12:35	G	6	1	1	1	1	1	1							
LC_PIZDC1404S_WG_Q1-2019_NP	LC_PIZDC1404S	WG		2019/03/20	13:05	G	6	1	1	1	1	1	1							
WG_Q1-2019_MT1	LC_PIZDC1404D	WG		2019/03/20	12:40	G	7	1	1	1	1	1	1	1						
WG_Q1-2019_RD1	LC_TBLANK	WG		2019/03/20	15:30	G	4			1	1	1	1							
LC_PIZDC1307_WG_Q1-2019_NP	LC_PIZDC1307	WG		2019/03/21	13:15	G	6	1	1	1	1	1	1							
LC_PIZDC1308_WG_Q1-2019_NP	LC_PIZDC1308	WG		2019/03/21	12:30	G	6	1	1	1	1	1	1							
WG_Q1-2019_CC1	LC_PIZDC1308	WG		2019/03/21	12:35	G	7	1	1	1	1	1	1							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
DEFINITE FORWARD MEASUREMENTS TO AL SUBSTRATE FOR ANALYSIS	D.Tymstra/K.Campbell	0-Jan	<i>WLC</i>	2019/01/20 09:00

SERVICE REQUEST (rush = subject to availability)	Regular (default) <input checked="" type="checkbox"/> X	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS
Sampler's Name	K. Campbell/D. Tymstra		Mobile #	
Sampler's Signature			Date/Time	

8°C




TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 26-MAR-19
Report Date: 02-APR-19 19:28 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2249288
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190325 DC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2249288-1 LC_PIZDC1306_WG_Q1-2019_NP							
Sampled By: KC/DT on 25-MAR-19 @ 13:35							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	4.24	DTC	0.50	mg/L		01-APR-19	R4588903
Total Kjeldahl Nitrogen	0.212		0.050	mg/L		01-APR-19	R4588920
Total Organic Carbon	2.11	DTC	0.50	mg/L		01-APR-19	R4588903
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	28-MAR-19	28-MAR-19	R4586690
Dissolved Metals Filtration Location	FIELD					28-MAR-19	R4585946
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	28-MAR-19	29-MAR-19	R4586910
Dissolved Mercury Filtration Location	FIELD					28-MAR-19	R4586498
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					28-MAR-19	R4585946
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	28-MAR-19	28-MAR-19	R4586690
Antimony (Sb)-Dissolved	0.00020		0.00010	mg/L	28-MAR-19	28-MAR-19	R4586690
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-19	28-MAR-19	R4586690
Barium (Ba)-Dissolved	0.176		0.00010	mg/L	28-MAR-19	28-MAR-19	R4586690
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	28-MAR-19	28-MAR-19	R4586690
Boron (B)-Dissolved	0.011		0.010	mg/L	28-MAR-19	28-MAR-19	R4586690
Cadmium (Cd)-Dissolved	0.131		0.0050	ug/L	28-MAR-19	28-MAR-19	R4586690
Calcium (Ca)-Dissolved	66.3		0.050	mg/L	28-MAR-19	28-MAR-19	R4586690
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-19	28-MAR-19	R4586690
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	28-MAR-19	28-MAR-19	R4586690
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-19	28-MAR-19	R4586690
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	28-MAR-19	28-MAR-19	R4586690
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	28-MAR-19	28-MAR-19	R4586690
Lithium (Li)-Dissolved	0.0198		0.0010	mg/L	28-MAR-19	28-MAR-19	R4586690
Magnesium (Mg)-Dissolved	23.2		0.10	mg/L	28-MAR-19	28-MAR-19	R4586690
Manganese (Mn)-Dissolved	0.00044		0.00010	mg/L	28-MAR-19	28-MAR-19	R4586696
Molybdenum (Mo)-Dissolved	0.00192		0.000050	mg/L	28-MAR-19	28-MAR-19	R4586690
Nickel (Ni)-Dissolved	0.00117		0.00050	mg/L	28-MAR-19	28-MAR-19	R4586690
Potassium (K)-Dissolved	2.12		0.050	mg/L	28-MAR-19	28-MAR-19	R4586690
Selenium (Se)-Dissolved	2.10		0.050	ug/L	28-MAR-19	28-MAR-19	R4586690
Silicon (Si)-Dissolved	2.89		0.050	mg/L	28-MAR-19	28-MAR-19	R4586690
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	28-MAR-19	28-MAR-19	R4586690
Sodium (Na)-Dissolved	1.29		0.050	mg/L	28-MAR-19	28-MAR-19	R4586690
Strontium (Sr)-Dissolved	0.0706		0.00020	mg/L	28-MAR-19	28-MAR-19	R4586690
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	28-MAR-19	28-MAR-19	R4586690
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-19	28-MAR-19	R4586690
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	28-MAR-19	28-MAR-19	R4586690
Uranium (U)-Dissolved	0.000922		0.000010	mg/L	28-MAR-19	28-MAR-19	R4586690
Vanadium (V)-Dissolved	0.00055		0.00050	mg/L	28-MAR-19	28-MAR-19	R4586690
Zinc (Zn)-Dissolved	0.0039		0.0010	mg/L	28-MAR-19	28-MAR-19	R4586690
Hardness							
Hardness (as CaCO3)	261		0.50	mg/L		29-MAR-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		28-MAR-19	R4586645
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0957		0.0030	mg/L		28-MAR-19	R4586645
Antimony (Sb)-Total	0.00023		0.00010	mg/L		28-MAR-19	R4586645
Arsenic (As)-Total	<0.00010		0.00010	mg/L		28-MAR-19	R4586645

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2249288-1 LC_PIZDC1306_WG_Q1-2019_NP							
Sampled By: KC/DT on 25-MAR-19 @ 13:35							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.174		0.00010	mg/L		28-MAR-19	R4586645
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		28-MAR-19	R4586645
Boron (B)-Total	0.011		0.010	mg/L		28-MAR-19	R4586645
Cadmium (Cd)-Total	0.161		0.0050	ug/L		28-MAR-19	R4586645
Calcium (Ca)-Total	69.3		0.050	mg/L		28-MAR-19	R4586645
Chromium (Cr)-Total	0.00062		0.00010	mg/L		28-MAR-19	R4586645
Cobalt (Co)-Total	0.15		0.10	ug/L		28-MAR-19	R4586645
Copper (Cu)-Total	0.00098		0.00050	mg/L		28-MAR-19	R4586645
Iron (Fe)-Total	0.071		0.010	mg/L		28-MAR-19	R4586645
Lead (Pb)-Total	0.000114		0.000050	mg/L		28-MAR-19	R4586645
Lithium (Li)-Total	0.0211		0.0010	mg/L		28-MAR-19	R4586645
Magnesium (Mg)-Total	22.6		0.10	mg/L		28-MAR-19	R4586645
Manganese (Mn)-Total	0.00356		0.00010	mg/L		28-MAR-19	R4586645
Molybdenum (Mo)-Total	0.00208		0.000050	mg/L		28-MAR-19	R4586645
Nickel (Ni)-Total	0.00164		0.00050	mg/L		28-MAR-19	R4586645
Potassium (K)-Total	2.21		0.050	mg/L		28-MAR-19	R4586645
Selenium (Se)-Total	1.94		0.050	ug/L		28-MAR-19	R4586645
Silicon (Si)-Total	3.18		0.10	mg/L		28-MAR-19	R4586645
Silver (Ag)-Total	<0.000010		0.000010	mg/L		28-MAR-19	R4586645
Sodium (Na)-Total	1.32		0.050	mg/L		28-MAR-19	R4586645
Strontium (Sr)-Total	0.0760		0.00020	mg/L		28-MAR-19	R4586645
Thallium (Tl)-Total	0.000016		0.000010	mg/L		28-MAR-19	R4586645
Tin (Sn)-Total	<0.00010		0.00010	mg/L		28-MAR-19	R4586645
Titanium (Ti)-Total	<0.010		0.010	mg/L		28-MAR-19	R4586645
Uranium (U)-Total	0.00101		0.000010	mg/L		28-MAR-19	R4586645
Vanadium (V)-Total	0.00118		0.00050	mg/L		28-MAR-19	R4586645
Zinc (Zn)-Total	0.0043		0.0030	mg/L		28-MAR-19	R4586645
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	3.6		1.0	mg/L		01-APR-19	R4588356
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	278		1.0	mg/L		29-MAR-19	R4587296
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		29-MAR-19	R4587296
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		29-MAR-19	R4587296
Alkalinity, Total (as CaCO3)	278		1.0	mg/L		29-MAR-19	R4587296
Ammonia, Total (as N)							
Ammonia as N	0.0177		0.0050	mg/L		01-APR-19	R4588516
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		28-MAR-19	R4587103
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		28-MAR-19	R4587103
Electrical Conductivity (EC)							
Conductivity (@ 25C)	476		2.0	uS/cm		29-MAR-19	R4587296
Fluoride in Water by IC							
Fluoride (F)	0.187		0.020	mg/L		28-MAR-19	R4587103
Ion Balance Calculation							
Cation - Anion Balance	-3.3			%		01-APR-19	
Anion Sum	5.70			meq/L		01-APR-19	
Cation Sum	5.33			meq/L		01-APR-19	
Ion Balance Calculation							
Ion Balance	93.5		-100	%		01-APR-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2249288-1 LC_PIZDC1306_WG_Q1-2019_NP							
Sampled By: KC/DT on 25-MAR-19 @ 13:35							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0962		0.0050	mg/L		28-MAR-19	R4587103
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		28-MAR-19	R4587103
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0021		0.0010	mg/L		27-MAR-19	R4586141
Oxidation redution potential by elect.							
ORP	379		-1000	mV		29-MAR-19	R4587545
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0131		0.0020	mg/L		02-APR-19	R4589156
Sulfate in Water by IC							
Sulfate (SO4)	5.97		0.30	mg/L		28-MAR-19	R4587103
Total Dissolved Solids							
Total Dissolved Solids	287	DLHC	20	mg/L		01-APR-19	R4589098
Total Suspended Solids							
Total Suspended Solids	4.6		1.0	mg/L		01-APR-19	R4588984
Turbidity							
Turbidity	2.04		0.10	NTU		27-MAR-19	R4586139
pH							
pH	7.85		0.10	pH		29-MAR-19	R4587296

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
LPML	Lab-Preserved for Total Metals. Sample received with pH > 2 and preserved at the lab. Total Metals results may be biased low.

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190325 DC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2249288

Report Date: 02-APR-19

Page 1 of 10

Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4588356							
WG3018528-5	LCS							
Acidity (as CaCO3)			94.4		%		85-115	01-APR-19
WG3018528-4	MB							
Acidity (as CaCO3)			2.0		mg/L		2	01-APR-19
ALK-MAN-CL								
	Water							
Batch	R4587296							
WG3017301-11	LCS							
Alkalinity, Total (as CaCO3)			95.8		%		85-115	29-MAR-19
WG3017301-10	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	29-MAR-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4586690							
WG3015865-2	LCS							
Beryllium (Be)-Dissolved			96.7		%		80-120	28-MAR-19
WG3015865-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	28-MAR-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4586645							
WG3015886-2	LCS							
Beryllium (Be)-Total			105.4		%		80-120	28-MAR-19
WG3015886-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	28-MAR-19
BR-L-IC-N-CL								
	Water							
Batch	R4587103							
WG3017245-2	LCS							
Bromide (Br)			99.1		%		85-115	28-MAR-19
WG3017245-1	MB							
Bromide (Br)			<0.050		mg/L		0.05	28-MAR-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4588903							
WG3019137-2	LCS							
Dissolved Organic Carbon			97.1		%		80-120	01-APR-19
WG3019137-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	01-APR-19
WG3019137-4	MS	L2249288-1						
Dissolved Organic Carbon			92.6		%		70-130	01-APR-19
C-TOT-ORG-LOW-CL								
	Water							

Quality Control Report

Workorder: L2249288

Report Date: 02-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL								
Water								
Batch	R4588903							
WG3019137-2	LCS							
Total Organic Carbon			99.2		%		80-120	01-APR-19
WG3019137-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	01-APR-19
WG3019137-4	MS	L2249288-1						
Total Organic Carbon			93.1		%		70-130	01-APR-19
CL-IC-N-CL								
Water								
Batch	R4587103							
WG3017245-2	LCS							
Chloride (Cl)			98.2		%		90-110	28-MAR-19
WG3017245-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	28-MAR-19
EC-L-PCT-CL								
Water								
Batch	R4587296							
WG3017301-11	LCS							
Conductivity (@ 25C)			100.7		%		90-110	29-MAR-19
WG3017301-10	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	29-MAR-19
F-IC-N-CL								
Water								
Batch	R4587103							
WG3017245-2	LCS							
Fluoride (F)			99.97		%		90-110	28-MAR-19
WG3017245-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	28-MAR-19
HG-D-CVAA-VA								
Water								
Batch	R4586910							
WG3016524-2	LCS							
Mercury (Hg)-Dissolved			96.5		%		80-120	29-MAR-19
WG3016524-1	MB	NP						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	29-MAR-19
MET-D-CCMS-VA								
Water								
Batch	R4586690							
WG3015865-2	LCS							
Aluminum (Al)-Dissolved			100.7		%		80-120	28-MAR-19
Antimony (Sb)-Dissolved			96.2		%		80-120	28-MAR-19
Arsenic (As)-Dissolved			100.7		%		80-120	28-MAR-19
Barium (Ba)-Dissolved			101.1		%		80-120	28-MAR-19

Quality Control Report

Workorder: L2249288

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4586690							
WG3015865-2	LCS							
Bismuth (Bi)-Dissolved			98.5		%		80-120	28-MAR-19
Boron (B)-Dissolved			91.3		%		80-120	28-MAR-19
Cadmium (Cd)-Dissolved			103.1		%		80-120	28-MAR-19
Calcium (Ca)-Dissolved			98.1		%		80-120	28-MAR-19
Chromium (Cr)-Dissolved			102.0		%		80-120	28-MAR-19
Cobalt (Co)-Dissolved			98.1		%		80-120	28-MAR-19
Copper (Cu)-Dissolved			100.2		%		80-120	28-MAR-19
Iron (Fe)-Dissolved			99.6		%		80-120	28-MAR-19
Lead (Pb)-Dissolved			102.4		%		80-120	28-MAR-19
Lithium (Li)-Dissolved			99.8		%		80-120	28-MAR-19
Magnesium (Mg)-Dissolved			97.5		%		80-120	28-MAR-19
Manganese (Mn)-Dissolved			101.9		%		80-120	28-MAR-19
Molybdenum (Mo)-Dissolved			94.8		%		80-120	28-MAR-19
Nickel (Ni)-Dissolved			97.1		%		80-120	28-MAR-19
Potassium (K)-Dissolved			100.5		%		80-120	28-MAR-19
Selenium (Se)-Dissolved			96.6		%		80-120	28-MAR-19
Silicon (Si)-Dissolved			93.2		%		60-140	28-MAR-19
Silver (Ag)-Dissolved			96.6		%		80-120	28-MAR-19
Sodium (Na)-Dissolved			102.9		%		80-120	28-MAR-19
Strontium (Sr)-Dissolved			101.7		%		80-120	28-MAR-19
Thallium (Tl)-Dissolved			98.6		%		80-120	28-MAR-19
Tin (Sn)-Dissolved			97.8		%		80-120	28-MAR-19
Titanium (Ti)-Dissolved			96.9		%		80-120	28-MAR-19
Uranium (U)-Dissolved			103.6		%		80-120	28-MAR-19
Vanadium (V)-Dissolved			102.2		%		80-120	28-MAR-19
Zinc (Zn)-Dissolved			107.5		%		80-120	28-MAR-19
WG3015865-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	28-MAR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	28-MAR-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	28-MAR-19

Quality Control Report

Workorder: L2249288

Report Date: 02-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4586690							
WG3015865-1	MB	NP						
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	28-MAR-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	28-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	28-MAR-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	28-MAR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	28-MAR-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	28-MAR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	28-MAR-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	28-MAR-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	28-MAR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	28-MAR-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	28-MAR-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	28-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	28-MAR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	28-MAR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	28-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	28-MAR-19
MET-T-CCMS-VA								
	Water							
Batch	R4586645							
WG3015886-2	LCS							
Aluminum (Al)-Total			104.6		%		80-120	28-MAR-19
Antimony (Sb)-Total			105.3		%		80-120	28-MAR-19
Arsenic (As)-Total			99.8		%		80-120	28-MAR-19
Barium (Ba)-Total			103.2		%		80-120	28-MAR-19
Bismuth (Bi)-Total			102.7		%		80-120	28-MAR-19
Boron (B)-Total			104.2		%		80-120	28-MAR-19
Cadmium (Cd)-Total			98.8		%		80-120	28-MAR-19
Calcium (Ca)-Total			104.6		%		80-120	28-MAR-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4586645							
WG3015886-2	LCS							
Chromium (Cr)-Total			103.3		%		80-120	28-MAR-19
Cobalt (Co)-Total			102.7		%		80-120	28-MAR-19
Copper (Cu)-Total			99.3		%		80-120	28-MAR-19
Iron (Fe)-Total			104.3		%		80-120	28-MAR-19
Lead (Pb)-Total			103.5		%		80-120	28-MAR-19
Lithium (Li)-Total			107.9		%		80-120	28-MAR-19
Magnesium (Mg)-Total			98.6		%		80-120	28-MAR-19
Manganese (Mn)-Total			102.3		%		80-120	28-MAR-19
Molybdenum (Mo)-Total			96.3		%		80-120	28-MAR-19
Nickel (Ni)-Total			101.7		%		80-120	28-MAR-19
Potassium (K)-Total			102.0		%		80-120	28-MAR-19
Selenium (Se)-Total			99.7		%		80-120	28-MAR-19
Silicon (Si)-Total			100.5		%		80-120	28-MAR-19
Silver (Ag)-Total			94.8		%		80-120	28-MAR-19
Sodium (Na)-Total			104.8		%		80-120	28-MAR-19
Strontium (Sr)-Total			104.2		%		80-120	28-MAR-19
Thallium (Tl)-Total			101.7		%		80-120	28-MAR-19
Tin (Sn)-Total			93.7		%		80-120	28-MAR-19
Titanium (Ti)-Total			95.7		%		80-120	28-MAR-19
Uranium (U)-Total			106.1		%		80-120	28-MAR-19
Vanadium (V)-Total			102.8		%		80-120	28-MAR-19
Zinc (Zn)-Total			100.2		%		80-120	28-MAR-19
WG3015886-1		MB						
Aluminum (Al)-Total			<0.0030		mg/L		0.003	28-MAR-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	28-MAR-19
Boron (B)-Total			<0.010		mg/L		0.01	28-MAR-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	28-MAR-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	28-MAR-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	28-MAR-19

Quality Control Report

Workorder: L2249288

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4586645							
WG3015886-1	MB							
Iron (Fe)-Total			<0.010		mg/L		0.01	28-MAR-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	28-MAR-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	28-MAR-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	28-MAR-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	28-MAR-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	28-MAR-19
Potassium (K)-Total			<0.050		mg/L		0.05	28-MAR-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	28-MAR-19
Silicon (Si)-Total			<0.10		mg/L		0.1	28-MAR-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	28-MAR-19
Sodium (Na)-Total			<0.050		mg/L		0.05	28-MAR-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	28-MAR-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	28-MAR-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	28-MAR-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	28-MAR-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	28-MAR-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	28-MAR-19
NH3-L-F-CL		Water						
Batch	R4588516							
WG3018743-6	LCS							
Ammonia as N			103.8		%		85-115	01-APR-19
WG3018743-5	MB							
Ammonia as N			<0.0050		mg/L		0.005	01-APR-19
NO2-L-IC-N-CL		Water						
Batch	R4587103							
WG3017245-2	LCS							
Nitrite (as N)			104.4		%		90-110	28-MAR-19
WG3017245-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	28-MAR-19
NO3-L-IC-N-CL		Water						

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch	R4587103							
WG3017245-2	LCS							
Nitrate (as N)			98.6		%		90-110	28-MAR-19
WG3017245-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	28-MAR-19
ORP-CL	Water							
Batch	R4587545							
WG3017615-3	CRM	CL-ORP						
ORP			221		mV		210-230	29-MAR-19
P-T-L-COL-CL	Water							
Batch	R4589156							
WG3019346-2	LCS							
Phosphorus (P)-Total			112.1		%		80-120	02-APR-19
WG3019346-1	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	02-APR-19
PH-CL	Water							
Batch	R4587296							
WG3017301-11	LCS							
pH			7.02		pH		6.9-7.1	29-MAR-19
PO4-DO-L-COL-CL	Water							
Batch	R4586141							
WG3016148-6	LCS							
Orthophosphate-Dissolved (as P)			102.6		%		80-120	27-MAR-19
WG3016148-5	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	27-MAR-19
SO4-IC-N-CL	Water							
Batch	R4587103							
WG3017245-2	LCS							
Sulfate (SO4)			98.1		%		90-110	28-MAR-19
WG3017245-1	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	28-MAR-19
SOLIDS-TDS-CL	Water							
Batch	R4589098							
WG3018235-5	LCS							
Total Dissolved Solids			101.1		%		85-115	01-APR-19
WG3018235-4	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL		Water						
Batch	R4589098							
WG3018235-4 MB								
Total Dissolved Solids			<10		mg/L		10	01-APR-19
TKN-L-F-CL		Water						
Batch	R4588920							
WG3019217-10 LCS								
Total Kjeldahl Nitrogen			92.5		%		75-125	01-APR-19
WG3019217-14 LCS								
Total Kjeldahl Nitrogen			99.4		%		75-125	01-APR-19
WG3019217-17 LCS								
Total Kjeldahl Nitrogen			96.1		%		75-125	01-APR-19
WG3019217-2 LCS								
Total Kjeldahl Nitrogen			95.1		%		75-125	01-APR-19
WG3019217-6 LCS								
Total Kjeldahl Nitrogen			92.8		%		75-125	01-APR-19
WG3019217-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-13 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-16 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-5 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-9 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
TSS-L-CL		Water						
Batch	R4588984							
WG3018262-16 LCS								
Total Suspended Solids			95.4		%		85-115	01-APR-19
WG3018262-15 MB								
Total Suspended Solids			<1.0		mg/L		1	01-APR-19
TURBIDITY-CL		Water						
Batch	R4586139							
WG3015732-8 LCS								
Turbidity			96.5		%		85-115	27-MAR-19
WG3015732-7 MB								
Turbidity			<0.10		NTU		0.1	27-MAR-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	25-MAR-19 13:35	29-MAR-19 14:20	0.25	97	hours	EHTR-FM
pH	1	25-MAR-19 13:35	29-MAR-19 14:00	0.25	96	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2249288 were received on 26-MAR-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: **20190325 DC GW** TURNAROUND TIME: RUSH:


PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	chris.blurton@teck.com		
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		
Address	Box 2003			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com		
	15km North Hwy 43							Email 4:	kirsten.campbell@teck.com		
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	KPO00608129		
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada				
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS								ANALYSIS REQUESTED													
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC								
LC_P1ZDC1306_WG_Q1-2019_NP	LC_P1ZDC1306	WG		2019/03/25	13:35	G	6	1	1	1	1	1	1								

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS PLEASE FORWARD METALS SAMPLES TO ALS BY AIRWAY FOR ANALYSIS	RELINQUISHED BY/AFFILIATION D.Tymstra/K.Campbell	DATE/TIME 25-Mar	ACCEPTED BY/AFFILIATION <i>DK</i>	DATE/TIME 2019/3/26 0900
--	--	----------------------------	---	---------------------------------------

SERVICE REQUEST (rush = subject to availability) Regular (default) <input checked="" type="checkbox"/> X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	Sampler's Name K. Campbell/D. Tymstra	Mobile # 	Date/Time March 25, 2019
	Sampler's Signature 		

900



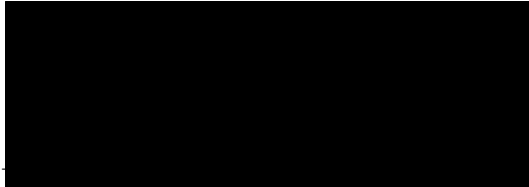
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 27-MAR-19
Report Date: 04-APR-19 14:31 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2249785
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: PIZDC0901-03-26
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2249785-1 LC_PIZDC0901_WG_Q1-2019_NP							
Sampled By: KC/DT on 26-MAR-19 @ 14:30							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	5.14		0.50	mg/L		02-APR-19	R4589160
Total Kjeldahl Nitrogen	0.309		0.050	mg/L		01-APR-19	R4588920
Mercury (Hg)-Total	0.0000064		0.0000050	mg/L		29-MAR-19	R4587492
Total Organic Carbon	4.65		0.50	mg/L		02-APR-19	R4589160
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	29-MAR-19	29-MAR-19	R4587845
Dissolved Metals Filtration Location	LAB					29-MAR-19	R4587055
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	29-MAR-19	29-MAR-19	R4587492
Dissolved Mercury Filtration Location	LAB					29-MAR-19	R4587335
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					29-MAR-19	R4587055
Aluminum (Al)-Dissolved	0.0054		0.0030	mg/L	29-MAR-19	29-MAR-19	R4587845
Antimony (Sb)-Dissolved	0.00020		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Arsenic (As)-Dissolved	0.00033		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Barium (Ba)-Dissolved	0.115		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	29-MAR-19	29-MAR-19	R4587845
Boron (B)-Dissolved	<0.010		0.010	mg/L	29-MAR-19	29-MAR-19	R4587845
Cadmium (Cd)-Dissolved	0.0757		0.0050	ug/L	29-MAR-19	29-MAR-19	R4587845
Calcium (Ca)-Dissolved	53.8		0.050	mg/L	29-MAR-19	29-MAR-19	R4587845
Chromium (Cr)-Dissolved	0.00010		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	29-MAR-19	29-MAR-19	R4587845
Copper (Cu)-Dissolved	0.00308		0.00050	mg/L	29-MAR-19	29-MAR-19	R4587845
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	29-MAR-19	29-MAR-19	R4587845
Lead (Pb)-Dissolved	0.000079		0.000050	mg/L	29-MAR-19	29-MAR-19	R4587845
Lithium (Li)-Dissolved	0.0016		0.0010	mg/L	29-MAR-19	29-MAR-19	R4587845
Magnesium (Mg)-Dissolved	14.2		0.10	mg/L	29-MAR-19	29-MAR-19	R4587845
Manganese (Mn)-Dissolved	0.00062		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Molybdenum (Mo)-Dissolved	0.00101		0.000050	mg/L	29-MAR-19	29-MAR-19	R4587845
Nickel (Ni)-Dissolved	0.00135		0.00050	mg/L	29-MAR-19	29-MAR-19	R4587845
Potassium (K)-Dissolved	1.13		0.050	mg/L	29-MAR-19	29-MAR-19	R4587845
Selenium (Se)-Dissolved	0.894		0.050	ug/L	29-MAR-19	29-MAR-19	R4587845
Silicon (Si)-Dissolved	3.20		0.050	mg/L	29-MAR-19	29-MAR-19	R4587845
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	29-MAR-19	29-MAR-19	R4587845
Sodium (Na)-Dissolved	5.70		0.050	mg/L	29-MAR-19	29-MAR-19	R4587845
Strontium (Sr)-Dissolved	0.208		0.00020	mg/L	29-MAR-19	29-MAR-19	R4587845
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	29-MAR-19	29-MAR-19	R4587845
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	29-MAR-19	29-MAR-19	R4587845
Uranium (U)-Dissolved	0.00288		0.000010	mg/L	29-MAR-19	29-MAR-19	R4587845
Vanadium (V)-Dissolved	0.00055		0.00050	mg/L	29-MAR-19	29-MAR-19	R4587845
Zinc (Zn)-Dissolved	0.0044		0.0010	mg/L	29-MAR-19	29-MAR-19	R4587845
Hardness							
Hardness (as CaCO3)	193		0.50	mg/L		01-APR-19	
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	5.4		1.0	mg/L		02-APR-19	R4589092
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	206		1.0	mg/L		01-APR-19	R4588394
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		01-APR-19	R4588394

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2249785-1 LC_PIZDC0901_WG_Q1-2019_NP Sampled By: KC/DT on 26-MAR-19 @ 14:30 Matrix: WG							
Alkalinity (Species) by Manual Titration							
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		01-APR-19	R4588394
Alkalinity, Total (as CaCO3)	206		1.0	mg/L		01-APR-19	R4588394
Ammonia, Total (as N)							
Ammonia as N	0.0061		0.0050	mg/L		02-APR-19	R4589133
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		29-MAR-19	R4587103
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		29-MAR-19	R4587103
Electrical Conductivity (EC)							
Conductivity (@ 25C)	355		2.0	uS/cm		01-APR-19	R4588394
Fluoride in Water by IC							
Fluoride (F)	0.144		0.020	mg/L		29-MAR-19	R4587103
Ion Balance Calculation							
Cation - Anion Balance	-1.0			%		03-APR-19	
Anion Sum	4.21			meq/L		03-APR-19	
Cation Sum	4.13			meq/L		03-APR-19	
Ion Balance Calculation							
Ion Balance	98.1		-100	%		03-APR-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.273		0.0050	mg/L		29-MAR-19	R4587103
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		29-MAR-19	R4587103
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0172	HTD	0.0050	mg/L		01-APR-19	R4586807
Oxidation redution potential by elect.							
ORP	419		-1000	mV		01-APR-19	R4588349
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0173		0.0020	mg/L		01-APR-19	R4588866
Sulfate in Water by IC							
Sulfate (SO4)	3.61		0.30	mg/L		29-MAR-19	R4587103
Total Dissolved Solids							
Total Dissolved Solids	207	DLHC	20	mg/L		02-APR-19	R4589842
Total Suspended Solids							
Total Suspended Solids	2.5	HTD	1.0	mg/L		03-APR-19	R4590295
Turbidity							
Turbidity	6.69		0.10	NTU		28-MAR-19	R4586678
pH							
pH	7.94		0.10	pH		01-APR-19	R4588394

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Individual Samples Listed:

Sample Number	Client ID	Qualifier	Description
L2249785-1	LC_PIZDC0901_WG_Q1-201	SFPL	DOC, DISSOLVED METALS LAB FILTER/PRESERVE - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.	
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
		Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.	
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	
		Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:	
		Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]	
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
		This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.	
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
		This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.	
		It is recommended that this analysis be conducted in the field.	
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.	
PH-CL	Water	pH	APHA 4500 H-Electrode
		pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)	
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
		A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).	
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	
		Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

PIZDC0901-03-26

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2249785

Report Date: 04-APR-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4589092							
WG3019383-11	LCS							
Acidity (as CaCO3)			104.4		%		85-115	02-APR-19
WG3019383-10	MB							
Acidity (as CaCO3)			1.8		mg/L		2	02-APR-19
ALK-MAN-CL								
	Water							
Batch	R4588394							
WG3018523-14	LCS							
Alkalinity, Total (as CaCO3)			93.2		%		85-115	01-APR-19
WG3018523-13	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	01-APR-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4587845							
WG3017114-3	DUP	L2249785-1						
Beryllium (Be)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	29-MAR-19
WG3017114-2	LCS							
Beryllium (Be)-Dissolved			94.0		%		80-120	29-MAR-19
WG3017114-1	MB	LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	29-MAR-19
BR-L-IC-N-CL								
	Water							
Batch	R4587103							
WG3017245-21	LCS							
Bromide (Br)			98.7		%		85-115	29-MAR-19
WG3017245-20	MB							
Bromide (Br)			<0.050		mg/L		0.05	29-MAR-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4589160							
WG3019580-2	LCS							
Dissolved Organic Carbon			100.4		%		80-120	02-APR-19
WG3019580-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	02-APR-19
C-TOT-ORG-LOW-CL								
	Water							
Batch	R4589160							
WG3019580-2	LCS							
Total Organic Carbon			104.5		%		80-120	02-APR-19
WG3019580-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	02-APR-19
CL-IC-N-CL								
	Water							

Quality Control Report

Workorder: L2249785

Report Date: 04-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
CL-IC-N-CL									
Water									
Batch R4587103									
WG3017245-21 LCS									
Chloride (Cl)			101.2		%		90-110	29-MAR-19	
WG3017245-20 MB									
Chloride (Cl)			<0.50		mg/L		0.5	29-MAR-19	
EC-L-PCT-CL									
Water									
Batch R4588394									
WG3018523-14 LCS									
Conductivity (@ 25C)			101.4		%		90-110	01-APR-19	
WG3018523-13 MB									
Conductivity (@ 25C)			<2.0		uS/cm		2	01-APR-19	
F-IC-N-CL									
Water									
Batch R4587103									
WG3017245-21 LCS									
Fluoride (F)			103.6		%		90-110	29-MAR-19	
WG3017245-20 MB									
Fluoride (F)			<0.020		mg/L		0.02	29-MAR-19	
HG-D-CVAA-VA									
Water									
Batch R4587492									
WG3017504-2 LCS									
Mercury (Hg)-Dissolved			98.9		%		80-120	29-MAR-19	
WG3017504-1 MB									
Mercury (Hg)-Dissolved		NP	<0.000005C		mg/L		0.000005	29-MAR-19	
HG-T-CVAA-VA									
Water									
Batch R4587492									
WG3017644-2 LCS									
Mercury (Hg)-Total			101.7		%		80-120	29-MAR-19	
WG3017644-1 MB									
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	29-MAR-19	
MET-D-CCMS-VA									
Water									
Batch R4587845									
WG3017114-3 DUP									
Aluminum (Al)-Dissolved		L2249785-1	0.0054	0.0044	J	mg/L	0.0011	0.006	29-MAR-19
Antimony (Sb)-Dissolved			0.00020	0.00020		mg/L	3.6	20	29-MAR-19
Arsenic (As)-Dissolved			0.00033	0.00033		mg/L	1.7	20	29-MAR-19
Barium (Ba)-Dissolved			0.115	0.119		mg/L	3.5	20	29-MAR-19
Bismuth (Bi)-Dissolved			<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-MAR-19
Boron (B)-Dissolved			<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-MAR-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4587845							
WG3017114-3	DUP	L2249785-1						
Cadmium (Cd)-Dissolved		0.0000757	0.0000666		mg/L	13	20	29-MAR-19
Calcium (Ca)-Dissolved		53.8	52.9		mg/L	1.8	20	29-MAR-19
Chromium (Cr)-Dissolved		0.00010	0.00011		mg/L	8.8	20	29-MAR-19
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-MAR-19
Copper (Cu)-Dissolved		0.00308	0.00313		mg/L	1.6	20	29-MAR-19
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-MAR-19
Lead (Pb)-Dissolved		0.000079	0.000079		mg/L	0.1	20	29-MAR-19
Lithium (Li)-Dissolved		0.0016	0.0016		mg/L	0.2	20	29-MAR-19
Magnesium (Mg)-Dissolved		14.2	14.7		mg/L	3.9	20	29-MAR-19
Manganese (Mn)-Dissolved		0.00062	0.00067		mg/L	7.2	20	29-MAR-19
Molybdenum (Mo)-Dissolved		0.00101	0.00100		mg/L	0.8	20	29-MAR-19
Nickel (Ni)-Dissolved		0.00135	0.00138		mg/L	2.1	20	29-MAR-19
Potassium (K)-Dissolved		1.13	1.16		mg/L	2.7	20	29-MAR-19
Selenium (Se)-Dissolved		0.000894	0.000859		mg/L	3.9	20	29-MAR-19
Silicon (Si)-Dissolved		3.20	3.30		mg/L	3.0	20	29-MAR-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	29-MAR-19
Sodium (Na)-Dissolved		5.70	5.87		mg/L	3.0	20	29-MAR-19
Strontium (Sr)-Dissolved		0.208	0.213		mg/L	2.4	20	29-MAR-19
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	29-MAR-19
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-MAR-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-MAR-19
Uranium (U)-Dissolved		0.00288	0.00295		mg/L	2.3	20	29-MAR-19
Vanadium (V)-Dissolved		0.00055	0.00058		mg/L	4.3	20	29-MAR-19
Zinc (Zn)-Dissolved		0.0044	0.0042		mg/L	5.1	20	29-MAR-19
WG3017114-2	LCS							
Aluminum (Al)-Dissolved			97.9		%		80-120	29-MAR-19
Antimony (Sb)-Dissolved			93.0		%		80-120	29-MAR-19
Arsenic (As)-Dissolved			99.3		%		80-120	29-MAR-19
Barium (Ba)-Dissolved			99.1		%		80-120	29-MAR-19
Bismuth (Bi)-Dissolved			96.4		%		80-120	29-MAR-19
Boron (B)-Dissolved			92.4		%		80-120	29-MAR-19
Cadmium (Cd)-Dissolved			97.9		%		80-120	29-MAR-19
Calcium (Ca)-Dissolved			96.1		%		80-120	29-MAR-19
Chromium (Cr)-Dissolved			98.8		%		80-120	29-MAR-19

Quality Control Report

Workorder: L2249785

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4587845							
WG3017114-2	LCS							
Cobalt (Co)-Dissolved			97.8		%		80-120	29-MAR-19
Copper (Cu)-Dissolved			96.6		%		80-120	29-MAR-19
Iron (Fe)-Dissolved			101.2		%		80-120	29-MAR-19
Lead (Pb)-Dissolved			97.8		%		80-120	29-MAR-19
Lithium (Li)-Dissolved			96.8		%		80-120	29-MAR-19
Magnesium (Mg)-Dissolved			99.2		%		80-120	29-MAR-19
Manganese (Mn)-Dissolved			98.6		%		80-120	29-MAR-19
Molybdenum (Mo)-Dissolved			96.9		%		80-120	29-MAR-19
Nickel (Ni)-Dissolved			98.2		%		80-120	29-MAR-19
Potassium (K)-Dissolved			99.1		%		80-120	29-MAR-19
Selenium (Se)-Dissolved			101.6		%		80-120	29-MAR-19
Silicon (Si)-Dissolved			104.5		%		60-140	29-MAR-19
Silver (Ag)-Dissolved			97.2		%		80-120	29-MAR-19
Sodium (Na)-Dissolved			102.5		%		80-120	29-MAR-19
Strontium (Sr)-Dissolved			97.7		%		80-120	29-MAR-19
Thallium (Tl)-Dissolved			94.4		%		80-120	29-MAR-19
Tin (Sn)-Dissolved			96.8		%		80-120	29-MAR-19
Titanium (Ti)-Dissolved			95.6		%		80-120	29-MAR-19
Uranium (U)-Dissolved			104.0		%		80-120	29-MAR-19
Vanadium (V)-Dissolved			99.4		%		80-120	29-MAR-19
Zinc (Zn)-Dissolved			90.3		%		80-120	29-MAR-19
WG3017114-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	29-MAR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	29-MAR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	29-MAR-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	29-MAR-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	29-MAR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	29-MAR-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	29-MAR-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	29-MAR-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	29-MAR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	29-MAR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	29-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	29-MAR-19

Quality Control Report

Workorder: L2249785

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch R4587103								
WG3017245-20 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	29-MAR-19
ORP-CL	Water							
Batch R4588349								
WG3018610-7 CRM		CL-ORP						
ORP			225		mV		210-230	01-APR-19
PH-CL	Water							
Batch R4588394								
WG3018523-14 LCS								
pH			7.00		pH		6.9-7.1	01-APR-19
PO4-DO-L-COL-CL	Water							
Batch R4586807								
WG3016552-6 LCS								
Orthophosphate-Dissolved (as P)			100.2		%		80-120	28-MAR-19
WG3016552-5 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	28-MAR-19
SO4-IC-N-CL	Water							
Batch R4587103								
WG3017245-21 LCS								
Sulfate (SO4)			102.3		%		90-110	29-MAR-19
WG3017245-20 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	29-MAR-19
SOLIDS-TDS-CL	Water							
Batch R4589842								
WG3019407-2 LCS								
Total Dissolved Solids			96.2		%		85-115	02-APR-19
WG3019407-1 MB								
Total Dissolved Solids			<10		mg/L		10	02-APR-19
TKN-L-F-CL	Water							
Batch R4588920								
WG3019217-10 LCS								
Total Kjeldahl Nitrogen			92.5		%		75-125	01-APR-19
WG3019217-14 LCS								
Total Kjeldahl Nitrogen			99.4		%		75-125	01-APR-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL								
	Water							
Batch	R4588920							
WG3019217-17	LCS							
Total Kjeldahl Nitrogen			96.1		%		75-125	01-APR-19
WG3019217-2	LCS							
Total Kjeldahl Nitrogen			95.1		%		75-125	01-APR-19
WG3019217-6	LCS							
Total Kjeldahl Nitrogen			92.8		%		75-125	01-APR-19
WG3019217-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-13	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-16	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-9	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
TSS-L-CL								
	Water							
Batch	R4590295							
WG3019060-4	LCS							
Total Suspended Solids			94.9		%		85-115	03-APR-19
WG3019060-3	MB							
Total Suspended Solids			<1.0		mg/L		1	03-APR-19
TURBIDITY-CL								
	Water							
Batch	R4586678							
WG3016737-9	DUP	L2249785-1						
Turbidity		6.69	6.74		NTU	0.7	15	28-MAR-19
WG3016737-8	LCS							
Turbidity			96.5		%		85-115	28-MAR-19
WG3016737-7	MB							
Turbidity			<0.10		NTU		0.1	28-MAR-19

Quality Control Report

Workorder: L2249785

Report Date: 04-APR-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2249785

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	26-MAR-19 14:30	01-APR-19 09:15	0.25	139	hours	EHTR-FM
Total Suspended Solids	1	26-MAR-19 14:30	03-APR-19 15:10	7	8	days	EHT
pH	1	26-MAR-19 14:30	01-APR-19 09:00	0.25	138	hours	EHTR-FM
Anions and Nutrients							
Orthophosphate-Dissolved (as P)	1	26-MAR-19 14:30	01-APR-19 10:00	3	6	days	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2249785 were received on 27-MAR-19 11:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

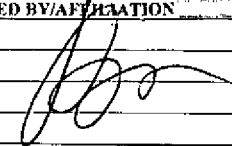
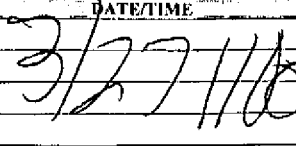
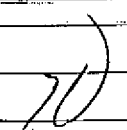
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

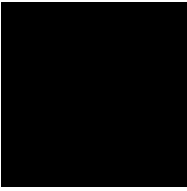
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: **PIZDC0901-03-26** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	chris.blurton@teck.com	x	x
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com	x	x
Address	Box 2003			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com	x	x
	15km North Hwy 43							Email 4:	kirsten.campbell@teck.com	x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	VPO00608129		
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada				
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PH	PRESERV.	ANALYSIS	PH	N	N	N	N	N	N
LC_PIZDC0901_WG_Q1-2019_NP	LC_PIZDC0901	WG		2019/02/26	14:30	G	6										

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
PLEASE FORWARD METALS SAMPLES TO WLS BURNABY FOR ANALYSIS	D.Tymstra/K.Campbell	0-Jan		
SERVICE REQUEST (rush - subject to availability)				
<input type="checkbox"/> Regular (default) X <input type="checkbox"/> Priority (2-3 business days) - 50% surcharge <input type="checkbox"/> Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	Sampler's Name K. Campbell/D. Tymstra	Mobile #	Date/Time	
	Sampler's Signature			



TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0


Date Received: 02-APR-19
Report Date: 12-APR-19 15:17 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis

Lab Work Order #: L2252304
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190331-GW1105
Legal Site Desc:


Comments: TSS expired on L2252304-1.



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2252304-1 LC_PIZP1105_WG_Q1-2019_N							
Sampled By: K.Campbell/D.Tymstra on 31-MAR-19 @ 12:10							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.27		0.50	mg/L		07-APR-19	R4592050
Total Kjeldahl Nitrogen	3.56	DLHC	0.25	mg/L		09-APR-19	R4593207
Total Organic Carbon	3.5	DLM	2.5	mg/L		07-APR-19	R4592050
EPH Testing for teck Coal							
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	04-APR-19	05-APR-19	R4590695
EPH19-32	<0.25		0.25	mg/L	04-APR-19	05-APR-19	R4590695
Surrogate: 2-Bromobenzotrifluoride	81.1		60-140	%	04-APR-19	05-APR-19	R4590695
Sum of EPH (10-32)							
EPH (C10-C32)	<0.50		0.50	mg/L		08-APR-19	
TEH (C10-C30)							
TEH (C10-C30)	<0.25		0.25	mg/L	04-APR-19	05-APR-19	R4590695
Surrogate: 2-Bromobenzotrifluoride	81.1		60-140	%	04-APR-19	05-APR-19	R4590695
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	04-APR-19	04-APR-19	R4590585
Dissolved Metals Filtration Location	LAB					04-APR-19	R4590085
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	03-APR-19	04-APR-19	R4590205
Dissolved Mercury Filtration Location	LAB					03-APR-19	R4589970
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					04-APR-19	R4590085
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	04-APR-19	04-APR-19	R4590585
Antimony (Sb)-Dissolved	0.00059		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Barium (Ba)-Dissolved	0.0897		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	04-APR-19	04-APR-19	R4590585
Boron (B)-Dissolved	0.018		0.010	mg/L	04-APR-19	04-APR-19	R4590585
Cadmium (Cd)-Dissolved	0.0633		0.0050	ug/L	04-APR-19	04-APR-19	R4590585
Calcium (Ca)-Dissolved	159		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	04-APR-19	04-APR-19	R4590585
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	04-APR-19	04-APR-19	R4590585
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	04-APR-19	04-APR-19	R4590585
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	04-APR-19	04-APR-19	R4590585
Lithium (Li)-Dissolved	0.0160		0.0010	mg/L	04-APR-19	04-APR-19	R4590585
Magnesium (Mg)-Dissolved	48.6		0.10	mg/L	04-APR-19	04-APR-19	R4590585
Manganese (Mn)-Dissolved	0.00308		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Molybdenum (Mo)-Dissolved	0.000338		0.000050	mg/L	04-APR-19	04-APR-19	R4590585
Nickel (Ni)-Dissolved	0.00117		0.00050	mg/L	04-APR-19	04-APR-19	R4590585
Potassium (K)-Dissolved	1.72		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Selenium (Se)-Dissolved	0.704		0.050	ug/L	04-APR-19	04-APR-19	R4590585
Silicon (Si)-Dissolved	4.68		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	04-APR-19	04-APR-19	R4590585
Sodium (Na)-Dissolved	13.4		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Strontium (Sr)-Dissolved	0.351		0.00020	mg/L	04-APR-19	04-APR-19	R4590585
Thallium (Tl)-Dissolved	0.000031		0.000010	mg/L	04-APR-19	04-APR-19	R4590585
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	04-APR-19	04-APR-19	R4590585
Uranium (U)-Dissolved	0.000481		0.000010	mg/L	04-APR-19	04-APR-19	R4590585
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	04-APR-19	04-APR-19	R4590585

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2252304-1 LC_PIZP1105_WG_Q1-2019_N							
Sampled By: K.Campbell/D.Tymstra on 31-MAR-19 @ 12:10							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Zinc (Zn)-Dissolved	0.0019		0.0010	mg/L	04-APR-19	04-APR-19	R4590585
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	597		0.50	mg/L		04-APR-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	2.12		0.10	ug/L		03-APR-19	R4590053
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.00050	DLM	0.00050	mg/L		04-APR-19	R4590205
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	26.9		0.015	mg/L		03-APR-19	R4590053
Antimony (Sb)-Total	0.00171		0.00050	mg/L		03-APR-19	R4590053
Arsenic (As)-Total	0.0165		0.00050	mg/L		03-APR-19	R4590053
Barium (Ba)-Total	1.14		0.00050	mg/L		03-APR-19	R4590053
Bismuth (Bi)-Total	0.00050		0.00025	mg/L		03-APR-19	R4590053
Boron (B)-Total	<0.050	DLA	0.050	mg/L		03-APR-19	R4590053
Cadmium (Cd)-Total	4.77		0.025	ug/L		03-APR-19	R4590053
Calcium (Ca)-Total	436		0.25	mg/L		03-APR-19	R4590053
Chromium (Cr)-Total	0.0536		0.00050	mg/L		03-APR-19	R4590053
Cobalt (Co)-Total	35.5		0.50	ug/L		03-APR-19	R4590053
Copper (Cu)-Total	0.0683		0.0025	mg/L		03-APR-19	R4590053
Iron (Fe)-Total	57.6		0.050	mg/L		03-APR-19	R4590053
Lead (Pb)-Total	0.0298		0.00025	mg/L		03-APR-19	R4590053
Lithium (Li)-Total	0.0613		0.0050	mg/L		03-APR-19	R4590053
Magnesium (Mg)-Total	114		0.10	mg/L		03-APR-19	R4590053
Manganese (Mn)-Total	3.76		0.00050	mg/L		03-APR-19	R4590053
Molybdenum (Mo)-Total	0.00209		0.00025	mg/L		03-APR-19	R4590053
Nickel (Ni)-Total	0.0731		0.0025	mg/L		03-APR-19	R4590053
Potassium (K)-Total	6.58		0.25	mg/L		03-APR-19	R4590053
Selenium (Se)-Total	2.66		0.25	ug/L		03-APR-19	R4590053
Silicon (Si)-Total	36.5		0.50	mg/L		03-APR-19	R4590053
Silver (Ag)-Total	0.000943		0.000050	mg/L		03-APR-19	R4590053
Sodium (Na)-Total	14.3		0.25	mg/L		03-APR-19	R4590053
Strontium (Sr)-Total	0.687		0.0010	mg/L		03-APR-19	R4590053
Thallium (Tl)-Total	0.00143		0.000050	mg/L		03-APR-19	R4590053
Tin (Sn)-Total	0.00112		0.00050	mg/L		03-APR-19	R4590053
Titanium (Ti)-Total	0.076		0.010	mg/L		03-APR-19	R4590053
Uranium (U)-Total	0.00380		0.000050	mg/L		03-APR-19	R4590053
Vanadium (V)-Total	0.0688		0.0025	mg/L		03-APR-19	R4590053
Zinc (Zn)-Total	0.413		0.015	mg/L		03-APR-19	R4590053
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	78.6		1.0	mg/L		04-APR-19	R4591262
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	407		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Total (as CaCO3)	407		1.0	mg/L		04-APR-19	R4590642
Ammonia, Total (as N)							
Ammonia as N	0.0558		0.0050	mg/L		08-APR-19	R4593180
Bromide in Water by IC (Low Level)							
Bromide (Br)	1.47	DLHC	0.25	mg/L		02-APR-19	R4589962
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2252304-1 LC_PIZP1105_WG_Q1-2019_N Sampled By: K.Campbell/D.Tymstra on 31-MAR-19 @ 12:10 Matrix: WG							
Chloride in Water by IC Chloride (Cl)	118	DLHC	2.5	mg/L		02-APR-19	R4589962
Electrical Conductivity (EC) Conductivity (@ 25C)	1090		2.0	uS/cm		04-APR-19	R4590642
Fluoride in Water by IC Fluoride (F)	0.37	DLHC	0.10	mg/L		02-APR-19	R4589962
Ion Balance Calculation Cation - Anion Balance	-4.0			%		05-APR-19	
Anion Sum	13.6			meq/L		05-APR-19	
Cation Sum	12.6			meq/L		05-APR-19	
Ion Balance Calculation Ion Balance	92.3		-100	%		05-APR-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.181	DLHC	0.025	mg/L		02-APR-19	R4589962
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		02-APR-19	R4589962
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0086		0.0010	mg/L		02-APR-19	R4589516
Oxidation redution potential by elect. ORP	402		-1000	mV		08-APR-19	R4592437
Phosphorus (P)-Total Phosphorus (P)-Total	5.70	DLM	0.20	mg/L		10-APR-19	R4594666
Sulfate in Water by IC Sulfate (SO4)	102	DLHC	1.5	mg/L		02-APR-19	R4589962
Total Dissolved Solids Total Dissolved Solids	648	DLHC	20	mg/L		05-APR-19	R4591741
Total Suspended Solids Total Suspended Solids	4990	DLHC	10	mg/L		08-APR-19	R4593055
Turbidity Turbidity	3530		0.10	NTU		02-APR-19	R4589370
pH pH	7.51		0.10	pH		04-APR-19	R4590642
L2252304-2 LC_PIZP1105_WG_Q1-2019_NP Sampled By: K.Campbell/D.Tymstra on 31-MAR-19 @ 12:10 Matrix: WG							
Miscellaneous Parameters Hardness (as CaCO3)	606		0.50	mg/L		04-APR-19	
Sulfate (SO4)	99.1	DLHC	1.5	mg/L		02-APR-19	R4589962
Turbidity	>4000		0.10	NTU		02-APR-19	R4589370
pH	7.58		0.10	pH		04-APR-19	R4590642
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	406		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Total (as CaCO3)	406		1.0	mg/L		04-APR-19	R4590642
Dissolved Metals in Water Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	04-APR-19	04-APR-19	R4590585
Dissolved Metals Filtration Location	LAB					04-APR-19	R4590085
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	LAB					04-APR-19	R4590085
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	04-APR-19	04-APR-19	R4590585

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2252304-2 LC_PIZP1105_WG_Q1-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 31-MAR-19 @ 12:10							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Antimony (Sb)-Dissolved	0.00059		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Barium (Ba)-Dissolved	0.0913		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	04-APR-19	04-APR-19	R4590585
Boron (B)-Dissolved	0.018		0.010	mg/L	04-APR-19	04-APR-19	R4590585
Cadmium (Cd)-Dissolved	0.0736		0.0050	ug/L	04-APR-19	04-APR-19	R4590585
Calcium (Ca)-Dissolved	164		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	04-APR-19	04-APR-19	R4590585
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	04-APR-19	04-APR-19	R4590585
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	04-APR-19	04-APR-19	R4590585
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	04-APR-19	04-APR-19	R4590585
Lithium (Li)-Dissolved	0.0163		0.0010	mg/L	04-APR-19	04-APR-19	R4590585
Magnesium (Mg)-Dissolved	47.9		0.10	mg/L	04-APR-19	04-APR-19	R4590585
Manganese (Mn)-Dissolved	0.00383		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Molybdenum (Mo)-Dissolved	0.000330		0.000050	mg/L	04-APR-19	04-APR-19	R4590585
Nickel (Ni)-Dissolved	0.00124		0.00050	mg/L	04-APR-19	04-APR-19	R4590585
Potassium (K)-Dissolved	1.73		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Selenium (Se)-Dissolved	0.616		0.050	ug/L	04-APR-19	04-APR-19	R4590585
Silicon (Si)-Dissolved	4.76		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	04-APR-19	04-APR-19	R4590585
Sodium (Na)-Dissolved	13.5		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Strontium (Sr)-Dissolved	0.338		0.00020	mg/L	04-APR-19	04-APR-19	R4590585
Thallium (Tl)-Dissolved	0.000031		0.000010	mg/L	04-APR-19	04-APR-19	R4590585
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	04-APR-19	04-APR-19	R4590585
Uranium (U)-Dissolved	0.000486		0.000010	mg/L	04-APR-19	04-APR-19	R4590585
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	04-APR-19	04-APR-19	R4590585
Zinc (Zn)-Dissolved	0.0022		0.0010	mg/L	04-APR-19	04-APR-19	R4590585

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
SFPL	DOC/D-METAL/D-HG FILTERED AND PRESERVED AT THE LAB - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
EPH(10-32)-CALC-CL	Water	Sum of EPH (10-32)	Sum of EPH - Auto Calculated
The sum of EPH(C10-C19) and EPH(C19-C32)			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Weston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TEH-BC-VA-CL	Water	EPH (C10-C19) & EPH (C19-C32)	BCMOE EPH GCFID
Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).			
TEH-WATER-VA-CL	Water	TEH (C10-C30)	BC Lab Manual
Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190331-GW1105

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2252304

Report Date: 12-APR-19

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Client: TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4591262							
WG3020902-14	LCS							
Acidity (as CaCO3)			103.1		%		85-115	04-APR-19
WG3020902-13	MB							
Acidity (as CaCO3)			1.9		mg/L		2	04-APR-19
ALK-MAN-CL								
	Water							
Batch	R4590642							
WG3020908-8	LCS							
Alkalinity, Total (as CaCO3)			95.9		%		85-115	04-APR-19
WG3020908-7	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	04-APR-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4590585							
WG3020629-2	LCS							
Beryllium (Be)-Dissolved			101.2		%		80-120	04-APR-19
WG3020629-1	MB	LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	04-APR-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4590053							
WG3020527-2	LCS							
Beryllium (Be)-Total			102.9		%		80-120	03-APR-19
WG3020527-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	03-APR-19
BR-L-IC-N-CL								
	Water							
Batch	R4589962							
WG3020459-10	LCS							
Bromide (Br)			103.7		%		85-115	02-APR-19
WG3020459-14	LCS							
Bromide (Br)			102.0		%		85-115	02-APR-19
WG3020459-2	LCS							
Bromide (Br)			100.1		%		85-115	02-APR-19
WG3020459-6	LCS							
Bromide (Br)			105.7		%		85-115	02-APR-19
WG3020459-1	MB							
Bromide (Br)			<0.050		mg/L		0.05	02-APR-19
WG3020459-13	MB							
Bromide (Br)			<0.050		mg/L		0.05	02-APR-19
WG3020459-5	MB							

Quality Control Report

Workorder: L2252304

Report Date: 12-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-L-IC-N-CL	Water							
Batch	R4589962							
WG3020459-5	MB							
Bromide (Br)			<0.050		mg/L		0.05	02-APR-19
WG3020459-9	MB							
Bromide (Br)			<0.050		mg/L		0.05	02-APR-19
C-DIS-ORG-LOW-CL	Water							
Batch	R4592050							
WG3022932-6	LCS							
Dissolved Organic Carbon			102.4		%		80-120	07-APR-19
WG3022932-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	07-APR-19
C-TOT-ORG-LOW-CL	Water							
Batch	R4592050							
WG3022932-6	LCS							
Total Organic Carbon			102.4		%		80-120	07-APR-19
WG3022932-5	MB							
Total Organic Carbon			<0.50		mg/L		0.5	07-APR-19
CL-IC-N-CL	Water							
Batch	R4589962							
WG3020459-10	LCS							
Chloride (Cl)			102.9		%		90-110	02-APR-19
WG3020459-14	LCS							
Chloride (Cl)			102.4		%		90-110	02-APR-19
WG3020459-2	LCS							
Chloride (Cl)			100.9		%		90-110	02-APR-19
WG3020459-6	LCS							
Chloride (Cl)			102.0		%		90-110	02-APR-19
WG3020459-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	02-APR-19
WG3020459-13	MB							
Chloride (Cl)			<0.50		mg/L		0.5	02-APR-19
WG3020459-5	MB							
Chloride (Cl)			<0.50		mg/L		0.5	02-APR-19
WG3020459-9	MB							
Chloride (Cl)			<0.50		mg/L		0.5	02-APR-19
EC-L-PCT-CL	Water							

Quality Control Report

Workorder: L2252304

Report Date: 12-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-L-PCT-CL								
Batch	R4590642							
WG3020908-8	LCS							
Conductivity (@ 25C)			102.8		%		90-110	04-APR-19
WG3020908-7	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	04-APR-19
F-IC-N-CL								
Batch	R4589962							
WG3020459-10	LCS							
Fluoride (F)			108.3		%		90-110	02-APR-19
WG3020459-14	LCS							
Fluoride (F)			107.5		%		90-110	02-APR-19
WG3020459-2	LCS							
Fluoride (F)			106.7		%		90-110	02-APR-19
WG3020459-6	LCS							
Fluoride (F)			106.6		%		90-110	02-APR-19
WG3020459-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	02-APR-19
WG3020459-13	MB							
Fluoride (F)			<0.020		mg/L		0.02	02-APR-19
WG3020459-5	MB							
Fluoride (F)			<0.020		mg/L		0.02	02-APR-19
WG3020459-9	MB							
Fluoride (F)			<0.020		mg/L		0.02	02-APR-19
HG-D-CVAA-VA								
Batch	R4590205							
WG3020481-6	LCS							
Mercury (Hg)-Dissolved			100.3		%		80-120	04-APR-19
WG3020481-5	MB	LF						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	04-APR-19
WG3020481-8	MS	L2252304-1						
Mercury (Hg)-Dissolved			81.5		%		70-130	04-APR-19
HG-T-CVAA-VA								
Batch	R4590205							
WG3020636-6	LCS							
Mercury (Hg)-Total			100.3		%		80-120	04-APR-19
WG3020636-5	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	04-APR-19
MET-D-CCMS-VA								
	Water							

Quality Control Report

Workorder: L2252304

Report Date: 12-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4590585							
WG3020629-2	LCS							
Aluminum (Al)-Dissolved			107.3		%		80-120	04-APR-19
Antimony (Sb)-Dissolved			93.2		%		80-120	04-APR-19
Arsenic (As)-Dissolved			104.1		%		80-120	04-APR-19
Barium (Ba)-Dissolved			106.4		%		80-120	04-APR-19
Bismuth (Bi)-Dissolved			98.8		%		80-120	04-APR-19
Boron (B)-Dissolved			97.3		%		80-120	04-APR-19
Cadmium (Cd)-Dissolved			103.4		%		80-120	04-APR-19
Calcium (Ca)-Dissolved			102.2		%		80-120	04-APR-19
Chromium (Cr)-Dissolved			103.2		%		80-120	04-APR-19
Cobalt (Co)-Dissolved			102.8		%		80-120	04-APR-19
Copper (Cu)-Dissolved			102.0		%		80-120	04-APR-19
Iron (Fe)-Dissolved			104.8		%		80-120	04-APR-19
Lead (Pb)-Dissolved			99.96		%		80-120	04-APR-19
Lithium (Li)-Dissolved			100.7		%		80-120	04-APR-19
Magnesium (Mg)-Dissolved			101.4		%		80-120	04-APR-19
Manganese (Mn)-Dissolved			99.2		%		80-120	04-APR-19
Molybdenum (Mo)-Dissolved			100.7		%		80-120	04-APR-19
Nickel (Ni)-Dissolved			102.0		%		80-120	04-APR-19
Potassium (K)-Dissolved			103.8		%		80-120	04-APR-19
Selenium (Se)-Dissolved			99.9		%		80-120	04-APR-19
Silicon (Si)-Dissolved			99.1		%		60-140	04-APR-19
Silver (Ag)-Dissolved			97.3		%		80-120	04-APR-19
Sodium (Na)-Dissolved			104.5		%		80-120	04-APR-19
Strontium (Sr)-Dissolved			96.3		%		80-120	04-APR-19
Thallium (Tl)-Dissolved			100.6		%		80-120	04-APR-19
Tin (Sn)-Dissolved			96.4		%		80-120	04-APR-19
Titanium (Ti)-Dissolved			96.1		%		80-120	04-APR-19
Uranium (U)-Dissolved			100.3		%		80-120	04-APR-19
Vanadium (V)-Dissolved			103.8		%		80-120	04-APR-19
Zinc (Zn)-Dissolved			100.5		%		80-120	04-APR-19
WG3020629-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	04-APR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	04-APR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	04-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4590585							
WG3020629-1	MB	LF						
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	04-APR-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	04-APR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	04-APR-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	04-APR-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	04-APR-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	04-APR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	04-APR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	04-APR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	04-APR-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	04-APR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	04-APR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	04-APR-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	04-APR-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	04-APR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	04-APR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	04-APR-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	04-APR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	04-APR-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	04-APR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	04-APR-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	04-APR-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	04-APR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	04-APR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	04-APR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	04-APR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	04-APR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	04-APR-19
MET-T-CCMS-VA								
	Water							
Batch	R4590053							
WG3020527-2	LCS							
Aluminum (Al)-Total			101.5		%		80-120	03-APR-19
Antimony (Sb)-Total			101.5		%		80-120	03-APR-19
Arsenic (As)-Total			101.5		%		80-120	03-APR-19
Barium (Ba)-Total			107.1		%		80-120	03-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4590053							
WG3020527-2	LCS							
Bismuth (Bi)-Total			101.9		%		80-120	03-APR-19
Boron (B)-Total			96.1		%		80-120	03-APR-19
Cadmium (Cd)-Total			102.3		%		80-120	03-APR-19
Calcium (Ca)-Total			102.1		%		80-120	03-APR-19
Chromium (Cr)-Total			97.8		%		80-120	03-APR-19
Cobalt (Co)-Total			101.6		%		80-120	03-APR-19
Copper (Cu)-Total			100.0		%		80-120	03-APR-19
Iron (Fe)-Total			97.6		%		80-120	03-APR-19
Lead (Pb)-Total			108.0		%		80-120	03-APR-19
Lithium (Li)-Total			98.8		%		80-120	03-APR-19
Magnesium (Mg)-Total			100.8		%		80-120	03-APR-19
Manganese (Mn)-Total			101.5		%		80-120	03-APR-19
Molybdenum (Mo)-Total			104.2		%		80-120	03-APR-19
Nickel (Ni)-Total			100.9		%		80-120	03-APR-19
Potassium (K)-Total			99.7		%		80-120	03-APR-19
Selenium (Se)-Total			102.2		%		80-120	03-APR-19
Silicon (Si)-Total			102.3		%		80-120	03-APR-19
Silver (Ag)-Total			101.8		%		80-120	03-APR-19
Sodium (Na)-Total			104.1		%		80-120	03-APR-19
Strontium (Sr)-Total			104.5		%		80-120	03-APR-19
Thallium (Tl)-Total			107.3		%		80-120	03-APR-19
Tin (Sn)-Total			99.3		%		80-120	03-APR-19
Titanium (Ti)-Total			94.8		%		80-120	03-APR-19
Uranium (U)-Total			108.8		%		80-120	03-APR-19
Vanadium (V)-Total			103.0		%		80-120	03-APR-19
Zinc (Zn)-Total			99.6		%		80-120	03-APR-19
WG3020527-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	03-APR-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	03-APR-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	03-APR-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	03-APR-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	03-APR-19
Boron (B)-Total			<0.010		mg/L		0.01	03-APR-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	03-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4590053							
WG3020527-1	MB							
Calcium (Ca)-Total			<0.050		mg/L		0.05	03-APR-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	03-APR-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	03-APR-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	03-APR-19
Iron (Fe)-Total			<0.010		mg/L		0.01	03-APR-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	03-APR-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	03-APR-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	03-APR-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	03-APR-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	03-APR-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	03-APR-19
Potassium (K)-Total			<0.050		mg/L		0.05	03-APR-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	03-APR-19
Silicon (Si)-Total			<0.10		mg/L		0.1	03-APR-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	03-APR-19
Sodium (Na)-Total			<0.050		mg/L		0.05	03-APR-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	03-APR-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	03-APR-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	03-APR-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	03-APR-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	03-APR-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	03-APR-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	03-APR-19
NH3-L-F-CL		Water						
Batch	R4593180							
WG3023842-6	LCS							
Ammonia as N			102.3		%		85-115	08-APR-19
WG3023842-5	MB							
Ammonia as N			<0.0050		mg/L		0.005	08-APR-19
NO2-L-IC-N-CL		Water						
Batch	R4589962							
WG3020459-10	LCS							
Nitrite (as N)			105.7		%		90-110	02-APR-19
WG3020459-14	LCS							
Nitrite (as N)			102.3		%		90-110	02-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-CL								
	Water							
Batch	R4589962							
WG3020459-2	LCS							
Nitrite (as N)			104.1		%		90-110	02-APR-19
WG3020459-6	LCS							
Nitrite (as N)			104.8		%		90-110	02-APR-19
WG3020459-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	02-APR-19
WG3020459-13	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	02-APR-19
WG3020459-5	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	02-APR-19
WG3020459-9	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	02-APR-19
NO3-L-IC-N-CL								
	Water							
Batch	R4589962							
WG3020459-10	LCS							
Nitrate (as N)			103.0		%		90-110	02-APR-19
WG3020459-14	LCS							
Nitrate (as N)			103.0		%		90-110	02-APR-19
WG3020459-2	LCS							
Nitrate (as N)			101.1		%		90-110	02-APR-19
WG3020459-6	LCS							
Nitrate (as N)			102.2		%		90-110	02-APR-19
WG3020459-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	02-APR-19
WG3020459-13	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	02-APR-19
WG3020459-5	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	02-APR-19
WG3020459-9	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	02-APR-19
ORP-CL								
	Water							
Batch	R4592437							
WG3023310-5	CRM	CL-ORP						
ORP			223		mV		210-230	08-APR-19
P-T-L-COL-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-CL								
Water								
Batch R4594666								
WG3025174-6 LCS								
Phosphorus (P)-Total			113.9		%		80-120	10-APR-19
WG3025174-5 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	10-APR-19
PH-CL								
Water								
Batch R4590642								
WG3020908-8 LCS								
pH			6.99		pH		6.9-7.1	04-APR-19
PO4-DO-L-COL-CL								
Water								
Batch R4589516								
WG3020018-10 LCS								
Orthophosphate-Dissolved (as P)			101.6		%		80-120	02-APR-19
WG3020018-9 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	02-APR-19
SO4-IC-N-CL								
Water								
Batch R4589962								
WG3020459-10 LCS								
Sulfate (SO4)			103.9		%		90-110	02-APR-19
WG3020459-14 LCS								
Sulfate (SO4)			103.4		%		90-110	02-APR-19
WG3020459-2 LCS								
Sulfate (SO4)			101.8		%		90-110	02-APR-19
WG3020459-6 LCS								
Sulfate (SO4)			102.9		%		90-110	02-APR-19
WG3020459-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	02-APR-19
WG3020459-13 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	02-APR-19
WG3020459-5 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	02-APR-19
WG3020459-9 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	02-APR-19
SOLIDS-TDS-CL								
Water								
Batch R4591741								
WG3022140-2 LCS								
Total Dissolved Solids			98.1		%		85-115	05-APR-19
WG3022140-1 MB								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL		Water						
Batch	R4591741							
WG3022140-1	MB							
Total Dissolved Solids			<10		mg/L		10	05-APR-19
TEH-BC-VA-CL		Water						
Batch	R4590695							
WG3021286-2	LCS							
EPH10-19			109.0		%		70-130	03-APR-19
EPH19-32			105.2		%		70-130	03-APR-19
WG3021286-4	LCS							
EPH10-19			105.9		%		70-130	05-APR-19
EPH19-32			99.9		%		70-130	05-APR-19
WG3021286-6	LCS							
EPH10-19			117.4		%		70-130	07-APR-19
EPH19-32			113.4		%		70-130	07-APR-19
WG3021286-1	MB							
EPH10-19			<0.25		mg/L		0.25	03-APR-19
EPH19-32			<0.25		mg/L		0.25	03-APR-19
Surrogate: 2-Bromobenzotrifluoride			84.4		%		60-140	03-APR-19
WG3021286-3	MB							
EPH10-19			<0.25		mg/L		0.25	05-APR-19
EPH19-32			<0.25		mg/L		0.25	05-APR-19
Surrogate: 2-Bromobenzotrifluoride			81.7		%		60-140	05-APR-19
WG3021286-5	MB							
EPH10-19			<0.25		mg/L		0.25	07-APR-19
EPH19-32			<0.25		mg/L		0.25	07-APR-19
Surrogate: 2-Bromobenzotrifluoride			83.5		%		60-140	07-APR-19
TEH-WATER-VA-CL		Water						
Batch	R4590695							
WG3021286-2	LCS							
TEH (C10-C30)			108.3		%		70-130	03-APR-19
WG3021286-4	LCS							
TEH (C10-C30)			104.6		%		70-130	05-APR-19
WG3021286-6	LCS							
TEH (C10-C30)			116.4		%		70-130	07-APR-19
WG3021286-1	MB							
TEH (C10-C30)			<0.25		mg/L		0.25	03-APR-19
Surrogate: 2-Bromobenzotrifluoride			84.4		%		60-140	03-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TEH-WATER-VA-CL								
	Water							
Batch	R4590695							
WG3021286-3	MB							
TEH (C10-C30)			<0.25		mg/L		0.25	05-APR-19
Surrogate: 2-Bromobenzotrifluoride			81.7		%		60-140	05-APR-19
WG3021286-5	MB							
TEH (C10-C30)			<0.25		mg/L		0.25	07-APR-19
Surrogate: 2-Bromobenzotrifluoride			83.5		%		60-140	07-APR-19
TKN-L-F-CL								
	Water							
Batch	R4593207							
WG3024281-2	LCS							
Total Kjeldahl Nitrogen			110.0		%		75-125	09-APR-19
WG3024281-5	LCS							
Total Kjeldahl Nitrogen			104.3		%		75-125	09-APR-19
WG3024281-8	LCS							
Total Kjeldahl Nitrogen			111.6		%		75-125	09-APR-19
WG3024281-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	09-APR-19
WG3024281-4	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	09-APR-19
WG3024281-7	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	09-APR-19
TSS-L-CL								
	Water							
Batch	R4593055							
WG3022914-6	LCS							
Total Suspended Solids			95.5		%		85-115	08-APR-19
WG3022914-5	MB							
Total Suspended Solids			<1.0		mg/L		1	08-APR-19
TURBIDITY-CL								
	Water							
Batch	R4589370							
WG3019545-28	DUP	L2252304-1						
Turbidity		3530	3530		NTU	0.1	15	02-APR-19
WG3019545-11	LCS							
Turbidity			96.5		%		85-115	02-APR-19
WG3019545-10	MB							
Turbidity			<0.10		NTU		0.1	02-APR-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	31-MAR-19 12:10	08-APR-19 11:35	0.25	192	hours	EHTR-FM
Total Suspended Solids	1	31-MAR-19 12:10	08-APR-19 07:30	7	8	days	EHT
pH	1	31-MAR-19 12:10	04-APR-19 09:00	0.25	93	hours	EHTR-FM
	2	31-MAR-19 12:10	04-APR-19 09:00	0.25	93	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2252304 were received on 02-APR-19 09:10.

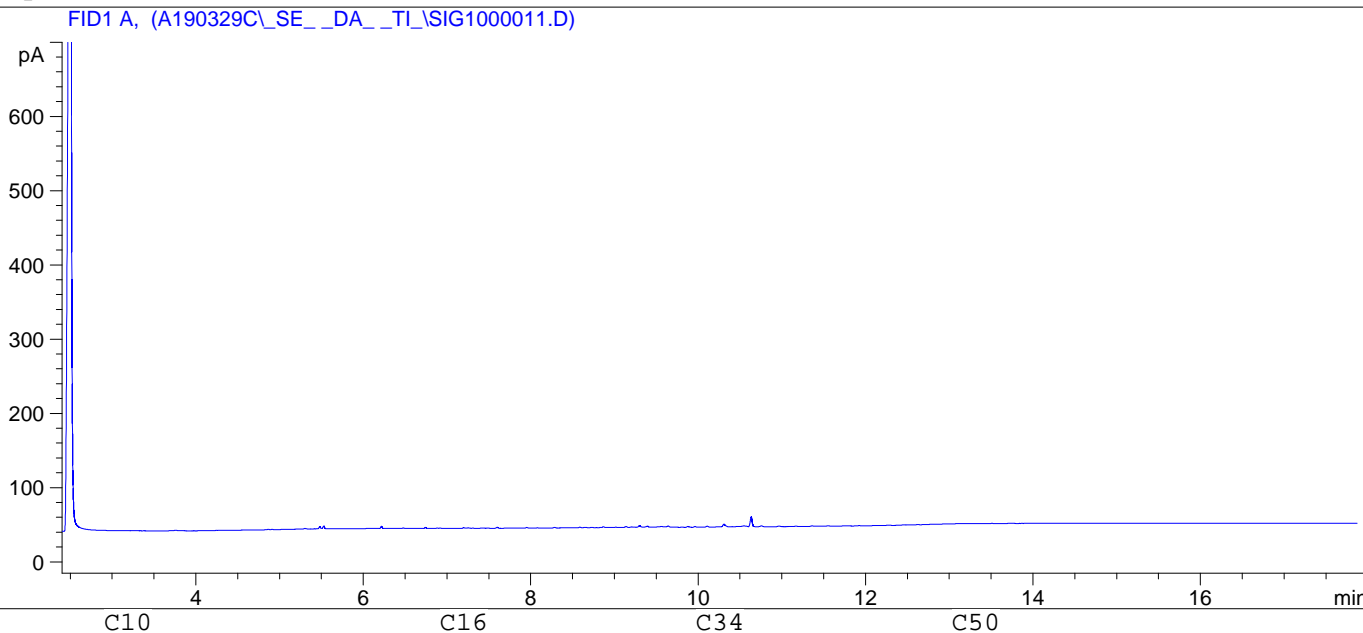
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

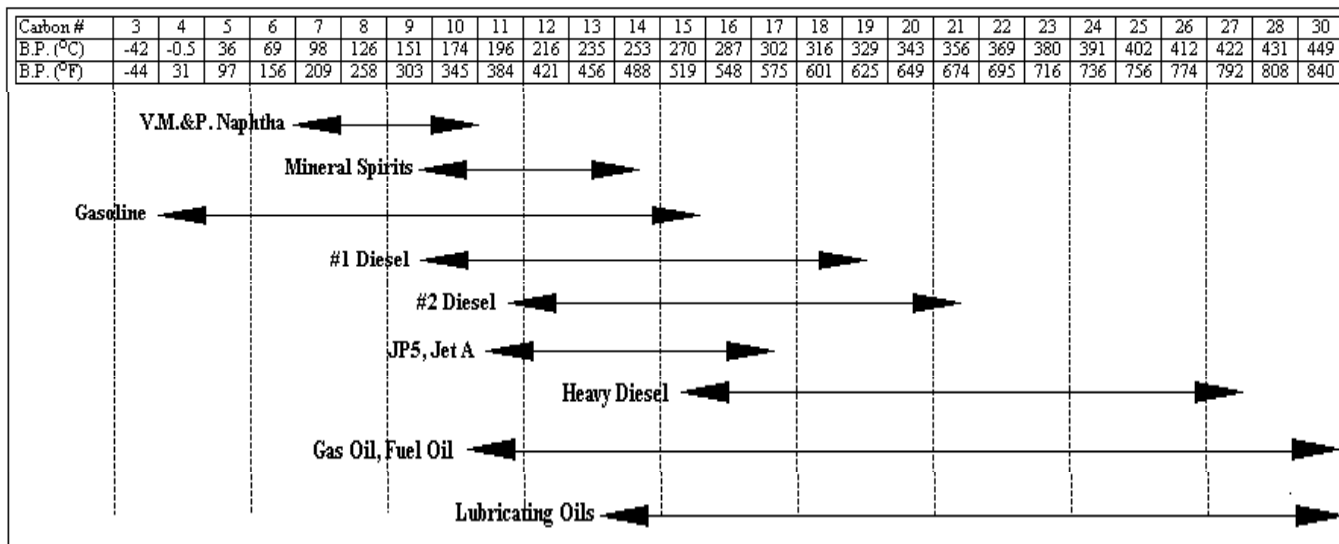
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Sample ID: L2252304-1 V4
 Injection Date: 4/5/2019
 Injection Time: 4:21:48 PM
 Instrument ID: HP9
 Operator:



Boiling Point Distribution Range for Petroleum Based Fuel Products



Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII.

Summed Peaks Report

=====
 =====
 Final Summed Peaks Report
 =====

COC ID: **20190331-GW1105** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	chris.blurton@teck.com	x	x
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com	x	x
Address	Box 2003 15km North Hwy 43			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com	x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 4:	irsten.campbell@teck.com	x	x
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	PO number	VPO00608129		
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS							ANALYSIS REQUESTED									
Sample ID	Sample Location (sys_loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC	ALS_package-EPH	**Routine Bottle (pH, ALK-T, Turb, Sulphate)	Filtered - F: Field, L: Lab, FL: Field & Lab, N: None
LC_PIZP1105_WG_Q1-2019_N	LC_PIZP1105	WG		2019/03/31	12:10	G	8	1	1	1	1	1	1	2		
LC_PIZP1105_WG_Q1-2019_NP	LC_PIZP1105	WG		2019/03/31	12:10	G	2			1					1	




L2252304-COFC

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
<p>Small Sample (100ml N and NP)</p> <p>***If possible, please pre-arrange for pH, total alkalinity, turbidity, and Sulphate</p>	D.Tymstra/K.Campbell	31-Mar		31/2 9:10
<p>SERVICE REQUEST (rush - subject to availability)</p> <p>Regular (default) <input checked="" type="checkbox"/> X</p> <p>Priority (2-3 business days) - 50% surcharge</p> <p>Emergency (1 Business Day) - 100% surcharge</p> <p>For Emergency <1 Day, ASAP or Weekend - Contact ALS</p>	<p>Sampler's Name</p> <p>K. Campbell/D. Tymstra</p>	<p>Sampler's Signature</p>	<p>Mobile #</p>	<p>Date/Time</p> <p>March 31, 2019</p>

gc

Q2 – COAs



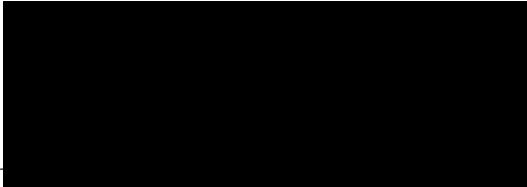
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 26-APR-19
Report Date: 03-MAY-19 16:22 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2263743
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190425 Q2 GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2263743-1 LC_PIZP1101_WG_Q2-2019_N							
Sampled By: K.Campbell/D.Tymstra on 25-APR-19 @ 15:00							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	0.93		0.50	mg/L		02-MAY-19	R4621972
Total Kjeldahl Nitrogen	0.054		0.050	mg/L		03-MAY-19	R4622466
Total Organic Carbon	0.88		0.50	mg/L		02-MAY-19	R4621972
EPH Testing for teck Coal							
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	29-APR-19	30-APR-19	R4621551
EPH19-32	<0.25		0.25	mg/L	29-APR-19	30-APR-19	R4621551
Surrogate: 2-Bromobenzotrifluoride	87.4		60-140	%	29-APR-19	30-APR-19	R4621551
Sum of EPH (10-32)							
EPH (C10-C32)	<0.50		0.50	mg/L		02-MAY-19	
TEH (C10-C30)							
TEH (C10-C30)	<0.25		0.25	mg/L	29-APR-19	30-APR-19	R4621551
Surrogate: 2-Bromobenzotrifluoride	87.4		60-140	%	29-APR-19	30-APR-19	R4621551
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	29-APR-19	29-APR-19	R4617288
Dissolved Metals Filtration Location	LAB					29-APR-19	R4616015
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	29-APR-19	29-APR-19	R4616373
Dissolved Mercury Filtration Location	LAB					29-APR-19	R4615387
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					01-MAY-19	R4618698
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	29-APR-19	29-APR-19	R4617288
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Arsenic (As)-Dissolved	0.00100		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Barium (Ba)-Dissolved	0.437		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	29-APR-19	29-APR-19	R4617288
Boron (B)-Dissolved	0.031		0.010	mg/L	29-APR-19	29-APR-19	R4617288
Cadmium (Cd)-Dissolved	0.0073		0.0050	ug/L	29-APR-19	29-APR-19	R4617288
Calcium (Ca)-Dissolved	28.5		0.050	mg/L	29-APR-19	29-APR-19	R4617288
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Cobalt (Co)-Dissolved	0.21		0.10	ug/L	29-APR-19	29-APR-19	R4617288
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	29-APR-19	29-APR-19	R4617288
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	29-APR-19	29-APR-19	R4617288
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	29-APR-19	29-APR-19	R4617288
Lithium (Li)-Dissolved	0.0104		0.0010	mg/L	29-APR-19	29-APR-19	R4617288
Magnesium (Mg)-Dissolved	14.9		0.10	mg/L	29-APR-19	29-APR-19	R4617288
Manganese (Mn)-Dissolved	0.240		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Molybdenum (Mo)-Dissolved	0.0107		0.000050	mg/L	29-APR-19	29-APR-19	R4617288
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	29-APR-19	29-APR-19	R4617288
Potassium (K)-Dissolved	0.727		0.050	mg/L	29-APR-19	29-APR-19	R4617288
Selenium (Se)-Dissolved	0.10		0.050	ug/L	01-MAY-19	01-MAY-19	R4619723
Silicon (Si)-Dissolved	3.39		0.050	mg/L	29-APR-19	29-APR-19	R4617288
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	29-APR-19	29-APR-19	R4617288
Sodium (Na)-Dissolved	19.2		0.050	mg/L	29-APR-19	29-APR-19	R4617288
Strontium (Sr)-Dissolved	0.219		0.00020	mg/L	29-APR-19	29-APR-19	R4617288
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	29-APR-19	29-APR-19	R4617288
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	29-APR-19	29-APR-19	R4617288
Uranium (U)-Dissolved	0.00131		0.000010	mg/L	29-APR-19	29-APR-19	R4617288
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	29-APR-19	29-APR-19	R4617288

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2263743-1 LC_PIZP1101_WG_Q2-2019_N							
Sampled By: K.Campbell/D.Tymstra on 25-APR-19 @ 15:00							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	29-APR-19	29-APR-19	R4617288
Hardness							
Hardness (as CaCO3)	133		0.50	mg/L		01-MAY-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		30-APR-19	R4618346
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		30-APR-19	R4618027
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.507		0.0030	mg/L		30-APR-19	R4618346
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		30-APR-19	R4618346
Arsenic (As)-Total	0.00120		0.00010	mg/L		30-APR-19	R4618346
Barium (Ba)-Total	0.450		0.00010	mg/L		30-APR-19	R4618346
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		30-APR-19	R4618346
Boron (B)-Total	0.021		0.010	mg/L		30-APR-19	R4618346
Cadmium (Cd)-Total	0.0494		0.0050	ug/L		30-APR-19	R4618346
Calcium (Ca)-Total	29.4		0.050	mg/L		30-APR-19	R4618346
Chromium (Cr)-Total	0.00064		0.00010	mg/L		30-APR-19	R4618346
Cobalt (Co)-Total	0.37		0.10	ug/L		30-APR-19	R4618346
Copper (Cu)-Total	0.00118		0.00050	mg/L		30-APR-19	R4618346
Iron (Fe)-Total	0.642		0.010	mg/L		30-APR-19	R4618346
Lead (Pb)-Total	0.000210		0.000050	mg/L		30-APR-19	R4618346
Lithium (Li)-Total	0.0098		0.0010	mg/L		30-APR-19	R4618346
Magnesium (Mg)-Total	15.3		0.10	mg/L		30-APR-19	R4618346
Manganese (Mn)-Total	0.265		0.00010	mg/L		30-APR-19	R4618346
Molybdenum (Mo)-Total	0.0106		0.000050	mg/L		30-APR-19	R4618346
Nickel (Ni)-Total	0.00077		0.00050	mg/L		30-APR-19	R4618346
Potassium (K)-Total	0.867		0.050	mg/L		30-APR-19	R4618346
Selenium (Se)-Total	0.112		0.050	ug/L		30-APR-19	R4618346
Silicon (Si)-Total	4.53		0.10	mg/L		30-APR-19	R4618346
Silver (Ag)-Total	0.000017		0.000010	mg/L		01-MAY-19	R4618641
Sodium (Na)-Total	18.7		0.050	mg/L		30-APR-19	R4618346
Strontium (Sr)-Total	0.219		0.00020	mg/L		30-APR-19	R4618346
Thallium (Tl)-Total	0.000021		0.000010	mg/L		30-APR-19	R4618346
Tin (Sn)-Total	<0.00010		0.00010	mg/L		30-APR-19	R4618346
Titanium (Ti)-Total	<0.015	DLM	0.015	mg/L		30-APR-19	R4618346
Uranium (U)-Total	0.00152		0.000010	mg/L		30-APR-19	R4618346
Vanadium (V)-Total	0.00148		0.00050	mg/L		30-APR-19	R4618346
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		30-APR-19	R4618346
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		01-MAY-19	R4621368
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	226		1.0	mg/L		01-MAY-19	R4621319
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		01-MAY-19	R4621319
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		01-MAY-19	R4621319
Alkalinity, Total (as CaCO3)	226		1.0	mg/L		01-MAY-19	R4621319
Ammonia, Total (as N)							
Ammonia as N	0.0272		0.0050	mg/L		02-MAY-19	R4622394
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		26-APR-19	R4614460
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2263743-1 LC_PIZP1101_WG_Q2-2019_N							
Sampled By: K.Campbell/D.Tymstra on 25-APR-19 @ 15:00							
Matrix: WG							
Chloride in Water by IC							
Chloride (Cl)	0.72		0.50	mg/L		26-APR-19	R4614460
Electrical Conductivity (EC)							
Conductivity (@ 25C)	297		2.0	uS/cm		01-MAY-19	R4621319
Fluoride in Water by IC							
Fluoride (F)	1.71		0.020	mg/L		26-APR-19	R4614460
Ion Balance Calculation							
Cation - Anion Balance	-14.3			%		02-MAY-19	
Anion Sum	4.69			meq/L		02-MAY-19	
Cation Sum	3.51			meq/L		02-MAY-19	
Ion Balance Calculation							
Ion Balance	75.0		-100	%		03-MAY-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0143		0.0050	mg/L		26-APR-19	R4614460
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		26-APR-19	R4614460
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0079		0.0010	mg/L		27-APR-19	R4616689
Oxidation redution potential by elect.							
ORP	303		-1000	mV		01-MAY-19	R4619972
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0230		0.0020	mg/L		02-MAY-19	R4621768
Sulfate in Water by IC							
Sulfate (SO4)	2.64		0.30	mg/L		26-APR-19	R4614460
Total Dissolved Solids							
Total Dissolved Solids	165	DLHC	20	mg/L		01-MAY-19	R4621312
Total Suspended Solids							
Total Suspended Solids	9.8		1.0	mg/L		01-MAY-19	R4620566
Turbidity							
Turbidity	22.4		0.10	NTU		26-APR-19	R4615246
pH							
pH	8.24		0.10	pH		01-MAY-19	R4621319

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
SFPL	DOC/D-METAL/D-HG FILTERED AND PRESERVED AT THE LAB - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
EPH(10-32)-CALC-CL	Water	Sum of EPH (10-32)	Sum of EPH - Auto Calculated
The sum of EPH(C10-C19) and EPH(C19-C32)			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TEH-BC-VA-CL	Water	EPH (C10-C19) & EPH (C19-C32)	BCMOE EPH GCFID
Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).			
TEH-WATER-VA-CL	Water	TEH (C10-C30)	BC Lab Manual
Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190425 Q2 GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample
 mg/kg wwt - milligrams per kilogram based on wet weight of sample
 mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
 mg/L - unit of concentration based on volume, parts per million.
 < - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2263743

Report Date: 03-MAY-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4621368							
WG3039891-11	LCS							
Acidity (as CaCO3)			104.7		%		85-115	01-MAY-19
WG3039891-10	MB							
Acidity (as CaCO3)			<1.0		mg/L		2	01-MAY-19
ALK-MAN-CL								
	Water							
Batch	R4621319							
WG3039864-14	LCS							
Alkalinity, Total (as CaCO3)			103.9		%		85-115	01-MAY-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4617288							
WG3037123-2	LCS							
Beryllium (Be)-Dissolved			98.3		%		80-120	29-APR-19
WG3037123-1	MB	LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	29-APR-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4618346							
WG3037775-2	LCS							
Beryllium (Be)-Total			99.7		%		80-120	30-APR-19
WG3037775-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	30-APR-19
BR-L-IC-N-CL								
	Water							
Batch	R4614460							
WG3036288-2	LCS							
Bromide (Br)			102.8		%		85-115	26-APR-19
WG3036288-1	MB							
Bromide (Br)			<0.050		mg/L		0.05	26-APR-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4621972							
WG3040853-2	LCS							
Dissolved Organic Carbon			103.0		%		80-120	03-MAY-19
WG3040853-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	02-MAY-19
C-TOT-ORG-LOW-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL	Water							
Batch	R4621972							
WG3040853-2	LCS							
Total Organic Carbon			96.3		%		80-120	02-MAY-19
WG3040853-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	02-MAY-19
CL-IC-N-CL	Water							
Batch	R4614460							
WG3036288-2	LCS							
Chloride (Cl)			101.2		%		90-110	26-APR-19
WG3036288-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	26-APR-19
EC-L-PCT-CL	Water							
Batch	R4621319							
WG3039864-14	LCS							
Conductivity (@ 25C)			98.0		%		90-110	01-MAY-19
F-IC-N-CL	Water							
Batch	R4614460							
WG3036288-2	LCS							
Fluoride (F)			106.7		%		90-110	26-APR-19
WG3036288-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	26-APR-19
HG-D-CVAA-VA	Water							
Batch	R4616373							
WG3037077-6	LCS							
Mercury (Hg)-Dissolved			97.0		%		80-120	29-APR-19
WG3037077-5	MB	LF						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	29-APR-19
HG-T-CVAA-VA	Water							
Batch	R4618027							
WG3037671-2	LCS							
Mercury (Hg)-Total			99.1		%		80-120	30-APR-19
WG3037671-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	30-APR-19
MET-D-CCMS-VA	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4617288							
WG3037123-2	LCS							
Aluminum (Al)-Dissolved			107.7		%		80-120	29-APR-19
Antimony (Sb)-Dissolved			94.7		%		80-120	29-APR-19
Arsenic (As)-Dissolved			99.1		%		80-120	29-APR-19
Barium (Ba)-Dissolved			95.8		%		80-120	29-APR-19
Bismuth (Bi)-Dissolved			92.8		%		80-120	29-APR-19
Boron (B)-Dissolved			93.0		%		80-120	29-APR-19
Cadmium (Cd)-Dissolved			94.3		%		80-120	29-APR-19
Calcium (Ca)-Dissolved			98.0		%		80-120	29-APR-19
Chromium (Cr)-Dissolved			103.4		%		80-120	29-APR-19
Cobalt (Co)-Dissolved			101.1		%		80-120	29-APR-19
Copper (Cu)-Dissolved			100.3		%		80-120	29-APR-19
Iron (Fe)-Dissolved			93.6		%		80-120	29-APR-19
Lead (Pb)-Dissolved			92.4		%		80-120	29-APR-19
Lithium (Li)-Dissolved			99.5		%		80-120	29-APR-19
Magnesium (Mg)-Dissolved			108.6		%		80-120	29-APR-19
Manganese (Mn)-Dissolved			102.9		%		80-120	29-APR-19
Molybdenum (Mo)-Dissolved			96.2		%		80-120	29-APR-19
Nickel (Ni)-Dissolved			101.4		%		80-120	29-APR-19
Potassium (K)-Dissolved			99.2		%		80-120	29-APR-19
Silicon (Si)-Dissolved			98.9		%		60-140	29-APR-19
Silver (Ag)-Dissolved			93.6		%		80-120	29-APR-19
Sodium (Na)-Dissolved			111.2		%		80-120	29-APR-19
Strontium (Sr)-Dissolved			101.5		%		80-120	29-APR-19
Thallium (Tl)-Dissolved			93.2		%		80-120	29-APR-19
Tin (Sn)-Dissolved			93.4		%		80-120	29-APR-19
Titanium (Ti)-Dissolved			98.0		%		80-120	29-APR-19
Uranium (U)-Dissolved			95.5		%		80-120	29-APR-19
Vanadium (V)-Dissolved			103.0		%		80-120	29-APR-19
Zinc (Zn)-Dissolved			101.3		%		80-120	29-APR-19
WG3037123-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	29-APR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	29-APR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	29-APR-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	29-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4617288							
WG3037123-1	MB	LF						
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	29-APR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	29-APR-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	29-APR-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	29-APR-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	29-APR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	29-APR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	29-APR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	29-APR-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	29-APR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	29-APR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	29-APR-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	29-APR-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	29-APR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	29-APR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	29-APR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	29-APR-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	29-APR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	29-APR-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	29-APR-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	29-APR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	29-APR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	29-APR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	29-APR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	29-APR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	29-APR-19
Batch	R4619723							
WG3038619-3	DUP	L2263743-1						
Aluminum (Al)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	01-MAY-19
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-MAY-19
Arsenic (As)-Dissolved		0.00100	0.00094		mg/L	0.6	20	01-MAY-19
Barium (Ba)-Dissolved		0.437	0.452		mg/L	2.4	20	01-MAY-19
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-MAY-19
Boron (B)-Dissolved		0.031	0.022		mg/L	2.2	20	01-MAY-19
Cadmium (Cd)-Dissolved		0.0000073	0.0000094		mg/L	14	20	01-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4619723							
WG3038619-3	DUP	L2263743-1						
Calcium (Ca)-Dissolved		28.5	26.8		mg/L	3.6	20	01-MAY-19
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-MAY-19
Cobalt (Co)-Dissolved		0.00021	0.00021		mg/L	5.0	20	01-MAY-19
Copper (Cu)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-MAY-19
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	01-MAY-19
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-MAY-19
Lithium (Li)-Dissolved		0.0104	0.0101		mg/L	2.9	20	01-MAY-19
Magnesium (Mg)-Dissolved		14.9	14.7		mg/L	0.3	20	01-MAY-19
Manganese (Mn)-Dissolved		0.240	0.235		mg/L	0.3	20	01-MAY-19
Molybdenum (Mo)-Dissolved		0.0107	0.0116		mg/L	2.4	20	01-MAY-19
Nickel (Ni)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-MAY-19
Potassium (K)-Dissolved		0.727	0.721		mg/L	0.6	20	01-MAY-19
Selenium (Se)-Dissolved		0.000100	0.000051	J	mg/L	0.000049	0.0001	01-MAY-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-MAY-19
Sodium (Na)-Dissolved		19.2	19.0		mg/L	0.5	20	01-MAY-19
Strontium (Sr)-Dissolved		0.219	0.222		mg/L	3.0	20	01-MAY-19
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-MAY-19
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-MAY-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	01-MAY-19
Uranium (U)-Dissolved		0.00131	0.00140		mg/L	1.3	20	01-MAY-19
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-MAY-19
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-MAY-19
WG3038619-2	LCS							
Aluminum (Al)-Dissolved			109.5		%		80-120	01-MAY-19
Antimony (Sb)-Dissolved			97.6		%		80-120	01-MAY-19
Arsenic (As)-Dissolved			105.4		%		80-120	01-MAY-19
Barium (Ba)-Dissolved			110.0		%		80-120	01-MAY-19
Bismuth (Bi)-Dissolved			98.1		%		80-120	01-MAY-19
Boron (B)-Dissolved			99.1		%		80-120	01-MAY-19
Cadmium (Cd)-Dissolved			105.7		%		80-120	01-MAY-19
Calcium (Ca)-Dissolved			99.9		%		80-120	01-MAY-19
Chromium (Cr)-Dissolved			104.0		%		80-120	01-MAY-19
Cobalt (Co)-Dissolved			103.9		%		80-120	01-MAY-19
Copper (Cu)-Dissolved			102.4		%		80-120	01-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4619723							
WG3038619-2	LCS							
Iron (Fe)-Dissolved			100.4		%		80-120	01-MAY-19
Lead (Pb)-Dissolved			97.7		%		80-120	01-MAY-19
Lithium (Li)-Dissolved			98.0		%		80-120	01-MAY-19
Magnesium (Mg)-Dissolved			107.6		%		80-120	01-MAY-19
Manganese (Mn)-Dissolved			105.1		%		80-120	01-MAY-19
Molybdenum (Mo)-Dissolved			98.2		%		80-120	01-MAY-19
Nickel (Ni)-Dissolved			104.3		%		80-120	01-MAY-19
Potassium (K)-Dissolved			100.8		%		80-120	01-MAY-19
Selenium (Se)-Dissolved			101.7		%		80-120	01-MAY-19
Silicon (Si)-Dissolved			101.3		%		60-140	01-MAY-19
Silver (Ag)-Dissolved			96.2		%		80-120	01-MAY-19
Sodium (Na)-Dissolved			109.7		%		80-120	01-MAY-19
Strontium (Sr)-Dissolved			101.9		%		80-120	01-MAY-19
Thallium (Tl)-Dissolved			97.7		%		80-120	01-MAY-19
Tin (Sn)-Dissolved			97.0		%		80-120	01-MAY-19
Titanium (Ti)-Dissolved			103.6		%		80-120	01-MAY-19
Uranium (U)-Dissolved			99.8		%		80-120	01-MAY-19
Vanadium (V)-Dissolved			106.6		%		80-120	01-MAY-19
Zinc (Zn)-Dissolved			106.6		%		80-120	01-MAY-19
WG3038619-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	01-MAY-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	01-MAY-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	01-MAY-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	01-MAY-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	01-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	01-MAY-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	01-MAY-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	01-MAY-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	01-MAY-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	01-MAY-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	01-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	01-MAY-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	01-MAY-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	01-MAY-19

Quality Control Report

Workorder: L2263743

Report Date: 03-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4619723							
WG3038619-1	MB	LF						
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	01-MAY-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	01-MAY-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	01-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	01-MAY-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	01-MAY-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	01-MAY-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	01-MAY-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	01-MAY-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	01-MAY-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	01-MAY-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	01-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	01-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	01-MAY-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	01-MAY-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	01-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	01-MAY-19
MET-T-CCMS-VA								
	Water							
Batch	R4618346							
WG3037775-2	LCS							
Aluminum (Al)-Total			99.8		%		80-120	30-APR-19
Antimony (Sb)-Total			104.1		%		80-120	30-APR-19
Arsenic (As)-Total			100.6		%		80-120	30-APR-19
Barium (Ba)-Total			102.8		%		80-120	30-APR-19
Bismuth (Bi)-Total			96.4		%		80-120	30-APR-19
Boron (B)-Total			95.7		%		80-120	30-APR-19
Cadmium (Cd)-Total			100.8		%		80-120	30-APR-19
Calcium (Ca)-Total			102.0		%		80-120	30-APR-19
Chromium (Cr)-Total			100.4		%		80-120	30-APR-19
Cobalt (Co)-Total			98.7		%		80-120	30-APR-19
Copper (Cu)-Total			98.3		%		80-120	30-APR-19
Iron (Fe)-Total			101.2		%		80-120	30-APR-19
Lead (Pb)-Total			97.8		%		80-120	30-APR-19
Lithium (Li)-Total			97.6		%		80-120	30-APR-19
Magnesium (Mg)-Total			100.4		%		80-120	30-APR-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4618346							
WG3037775-2 LCS								
Manganese (Mn)-Total			103.3		%		80-120	30-APR-19
Molybdenum (Mo)-Total			100.3		%		80-120	30-APR-19
Nickel (Ni)-Total			97.8		%		80-120	30-APR-19
Potassium (K)-Total			98.4		%		80-120	30-APR-19
Selenium (Se)-Total			101.6		%		80-120	30-APR-19
Silicon (Si)-Total			99.1		%		80-120	30-APR-19
Silver (Ag)-Total			104.0		%		80-120	30-APR-19
Sodium (Na)-Total			101.0		%		80-120	30-APR-19
Strontium (Sr)-Total			102.5		%		80-120	30-APR-19
Thallium (Tl)-Total			99.0		%		80-120	30-APR-19
Tin (Sn)-Total			98.2		%		80-120	30-APR-19
Titanium (Ti)-Total			92.6		%		80-120	30-APR-19
Uranium (U)-Total			103.4		%		80-120	30-APR-19
Vanadium (V)-Total			102.7		%		80-120	30-APR-19
Zinc (Zn)-Total			99.2		%		80-120	30-APR-19
WG3037775-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	30-APR-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	30-APR-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	30-APR-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	30-APR-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	30-APR-19
Boron (B)-Total			<0.010		mg/L		0.01	30-APR-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	30-APR-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	30-APR-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	30-APR-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	30-APR-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	30-APR-19
Iron (Fe)-Total			<0.010		mg/L		0.01	30-APR-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	30-APR-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	30-APR-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	30-APR-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	30-APR-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	30-APR-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	30-APR-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4618346							
WG3037775-1	MB							
Potassium (K)-Total			<0.050		mg/L		0.05	30-APR-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	30-APR-19
Silicon (Si)-Total			<0.10		mg/L		0.1	30-APR-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	30-APR-19
Sodium (Na)-Total			<0.050		mg/L		0.05	30-APR-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	30-APR-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	30-APR-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	30-APR-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	30-APR-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	30-APR-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	30-APR-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	30-APR-19
NH3-L-F-CL								
	Water							
Batch	R4622394							
WG3040909-6	LCS							
Ammonia as N			91.2		%		85-115	02-MAY-19
WG3040909-5	MB							
Ammonia as N			<0.0050		mg/L		0.005	02-MAY-19
NO2-L-IC-N-CL								
	Water							
Batch	R4614460							
WG3036288-2	LCS							
Nitrite (as N)			105.3		%		90-110	26-APR-19
WG3036288-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	26-APR-19
NO3-L-IC-N-CL								
	Water							
Batch	R4614460							
WG3036288-2	LCS							
Nitrate (as N)			100.8		%		90-110	26-APR-19
WG3036288-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	26-APR-19
ORP-CL								
	Water							
Batch	R4619972							
WG3039361-3	CRM	CL-ORP						
ORP			225		mV		210-230	01-MAY-19

Quality Control Report

Workorder: L2263743

Report Date: 03-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-CL	Water							
Batch	R4621768							
WG3040492-14 LCS								
Phosphorus (P)-Total			101.5		%		80-120	02-MAY-19
WG3040492-13 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	02-MAY-19
PH-CL	Water							
Batch	R4621319							
WG3039864-14 LCS								
pH			6.99		pH		6.9-7.1	01-MAY-19
PO4-DO-L-COL-CL	Water							
Batch	R4616689							
WG3036341-6 LCS								
Orthophosphate-Dissolved (as P)			100.2		%		80-120	27-APR-19
WG3036341-5 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	27-APR-19
SO4-IC-N-CL	Water							
Batch	R4614460							
WG3036288-2 LCS								
Sulfate (SO4)			101.4		%		90-110	26-APR-19
WG3036288-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	26-APR-19
SOLIDS-TDS-CL	Water							
Batch	R4621312							
WG3038811-5 LCS								
Total Dissolved Solids			95.6		%		85-115	01-MAY-19
WG3038811-4 MB								
Total Dissolved Solids			<10		mg/L		10	01-MAY-19
TEH-BC-VA-CL	Water							
Batch	R4621551							
WG3037288-2 LCS								
EPH10-19			119.3		%		70-130	02-MAY-19
EPH19-32			119.5		%		70-130	02-MAY-19
WG3037288-1 MB								
EPH10-19			<0.25		mg/L		0.25	02-MAY-19
EPH19-32			<0.25		mg/L		0.25	02-MAY-19
Surrogate: 2-Bromobenzotrifluoride			80.3		%		60-140	02-MAY-19
TEH-WATER-VA-CL	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TEH-WATER-VA-CL								
Water								
Batch	R4621551							
WG3037288-2	LCS							
TEH (C10-C30)			119.1		%		70-130	02-MAY-19
WG3037288-1	MB							
TEH (C10-C30)			<0.25		mg/L		0.25	02-MAY-19
Surrogate: 2-Bromobenzotrifluoride			80.3		%		60-140	02-MAY-19
TKN-L-F-CL								
Water								
Batch	R4622466							
WG3041319-3	DUP	L2263743-1						
Total Kjeldahl Nitrogen		0.054	<0.050	RPD-NA	mg/L	N/A	20	03-MAY-19
WG3041319-10	LCS							
Total Kjeldahl Nitrogen			97.7		%		75-125	03-MAY-19
WG3041319-2	LCS							
Total Kjeldahl Nitrogen			104.8		%		75-125	03-MAY-19
WG3041319-6	LCS							
Total Kjeldahl Nitrogen			102.5		%		75-125	03-MAY-19
WG3041319-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	03-MAY-19
WG3041319-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	03-MAY-19
WG3041319-9	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	03-MAY-19
TSS-L-CL								
Water								
Batch	R4620566							
WG3038792-5	LCS							
Total Suspended Solids			104.5		%		85-115	01-MAY-19
WG3038792-4	MB							
Total Suspended Solids			<1.0		mg/L		1	01-MAY-19
TURBIDITY-CL								
Water								
Batch	R4615246							
WG3036085-18	DUP	L2263743-1						
Turbidity		22.4	22.7		NTU	1.3	15	26-APR-19
WG3036085-17	LCS							
Turbidity			97.0		%		85-115	26-APR-19
WG3036085-16	MB							
Turbidity			<0.10		NTU		0.1	26-APR-19

Quality Control Report

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2263743

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	25-APR-19 15:00	01-MAY-19 10:45	0.25	140	hours	EHTR-FM
pH	1	25-APR-19 15:00	01-MAY-19 10:00	0.25	139	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2263743 were received on 26-APR-19 09:00.

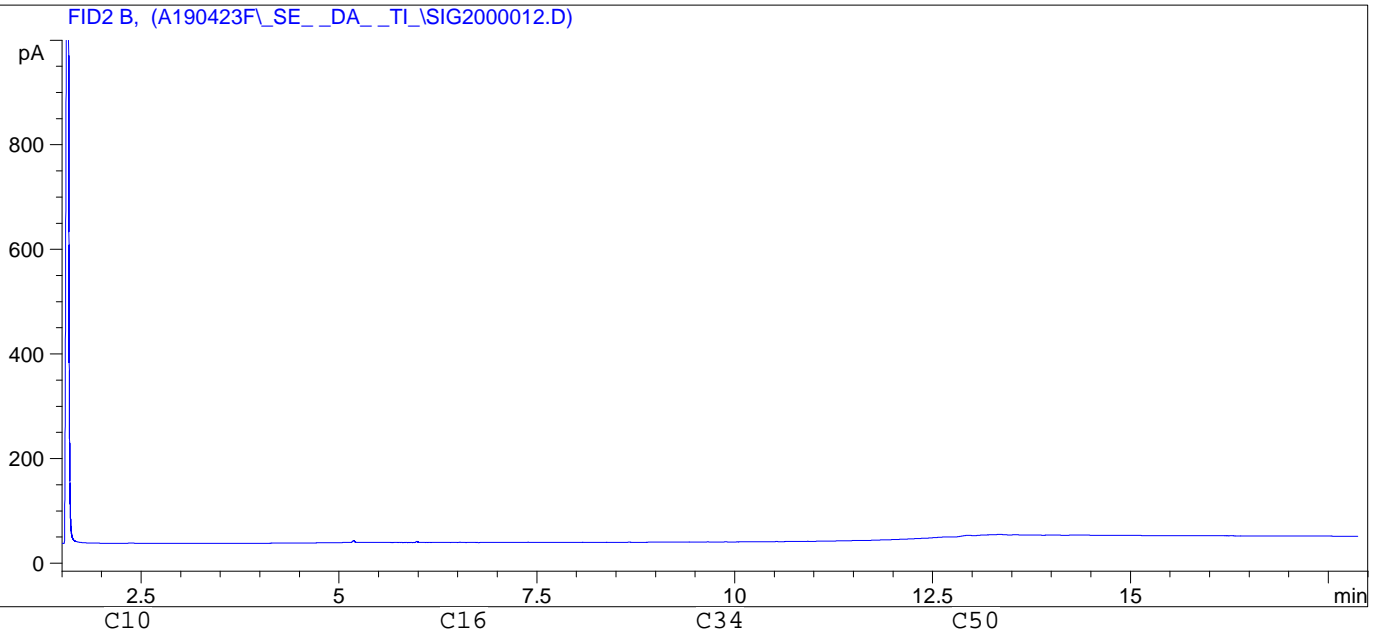
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

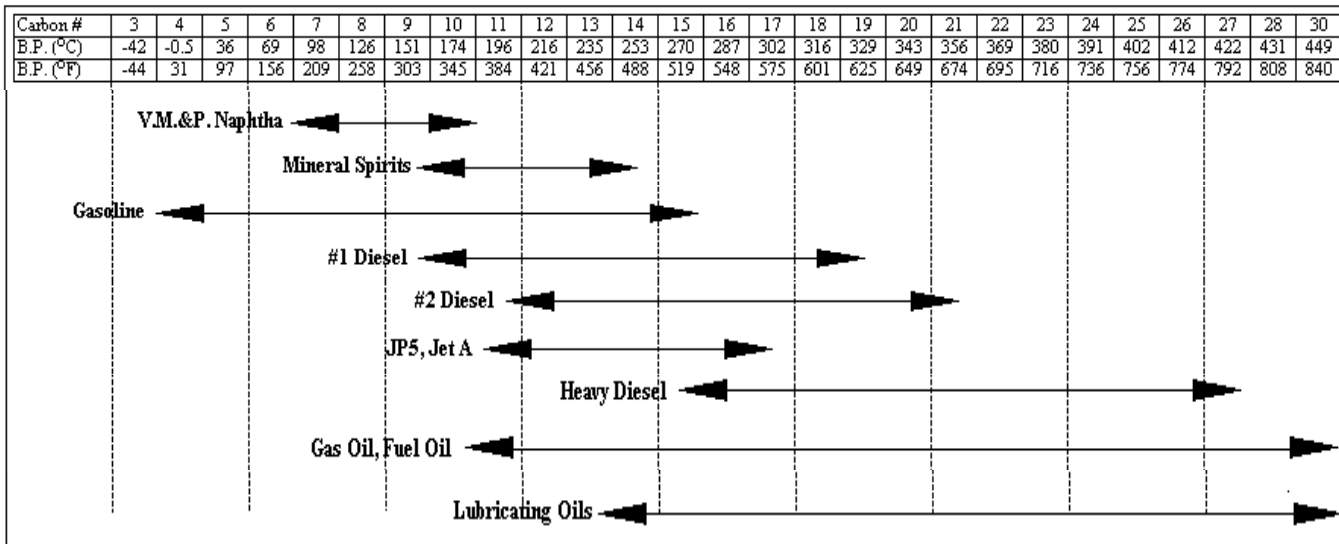
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



Sample ID: L2263743-1 V4
 Injection Date: 4/30/2019
 Injection Time: 9:54:57 PM
 Instrument ID: HP9
 Operator:



Boiling Point Distribution Range for Petroleum Based Fuel Products



Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII.

Summed Peaks Report

=====
 =====
 Final Summed Peaks Report
 =====

COC ID: **20190425 Q2 GW** TURNAROUND TIME: RUSH:


PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	chris.blurton@teck.com	x	x
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		x
Address	Box 2003			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com	x	x
	15km North Hwy 43							Email 4:	klrsten.campbell@teck.com	x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	VPO00608129		
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada				
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS Package-DOC	ALS Package-EPI	HG-D-CVAF-VA	HG-T-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS Package-TKN/TOC	Priority	Filtered By: Metal, TKN, VA, Field & Lab
L2263743-COFC																	
LC_PIZP1101_WG_Q2-2019_N	LC_PIZP1101	WG		2019/04/25	15:00	G	9	1	2	1	1	1	1	1	1		

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
DO NOT FORWARD THESE SAMPLES TO A-SH LAB FOR ANALYSIS	D.Tymstra/K.Campbell	25-Apr	DK	4/26/19

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #
Regular (default) <input checked="" type="checkbox"/> X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	K. Campbell/D. Tymstra	
	Sampler's Signature	Date/Time
		April 25, 2019

DK



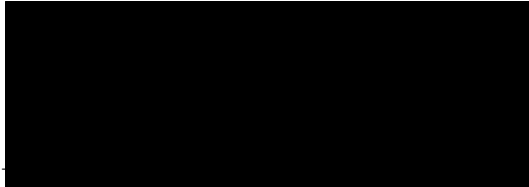
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 07-MAY-19
Report Date: 16-MAY-19 15:53 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2268822
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190506 LC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2268822-1 LC_PIZP1103_WG_Q2-2019_NP							
Sampled By: KC/DT on 06-MAY-19 @ 14:55							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	0.61		0.50	mg/L		11-MAY-19	R4631433
Total Kjeldahl Nitrogen	0.150		0.050	mg/L		13-MAY-19	R4634306
Total Organic Carbon	0.85		0.50	mg/L		11-MAY-19	R4631433
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	09-MAY-19	09-MAY-19	R4629586
Dissolved Metals Filtration Location	FIELD					09-MAY-19	R4628847
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	09-MAY-19	10-MAY-19	R4630750
Dissolved Mercury Filtration Location	FIELD					09-MAY-19	R4629707
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					09-MAY-19	R4628847
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	09-MAY-19	09-MAY-19	R4629586
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Arsenic (As)-Dissolved	0.00076		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Barium (Ba)-Dissolved	0.0609		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	09-MAY-19	09-MAY-19	R4629586
Boron (B)-Dissolved	0.570		0.010	mg/L	09-MAY-19	09-MAY-19	R4629586
Cadmium (Cd)-Dissolved	0.0191		0.0050	ug/L	09-MAY-19	09-MAY-19	R4629586
Calcium (Ca)-Dissolved	26.6		0.050	mg/L	09-MAY-19	09-MAY-19	R4629586
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Cobalt (Co)-Dissolved	0.27		0.10	ug/L	09-MAY-19	09-MAY-19	R4629586
Copper (Cu)-Dissolved	0.00274		0.00050	mg/L	09-MAY-19	09-MAY-19	R4629586
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	09-MAY-19	09-MAY-19	R4629586
Lead (Pb)-Dissolved	0.000135		0.000050	mg/L	09-MAY-19	09-MAY-19	R4629586
Lithium (Li)-Dissolved	0.116		0.0010	mg/L	09-MAY-19	09-MAY-19	R4629586
Magnesium (Mg)-Dissolved	14.5		0.10	mg/L	09-MAY-19	09-MAY-19	R4629586
Manganese (Mn)-Dissolved	0.237		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Molybdenum (Mo)-Dissolved	0.0127		0.000050	mg/L	09-MAY-19	09-MAY-19	R4629586
Nickel (Ni)-Dissolved	0.00118		0.00050	mg/L	09-MAY-19	09-MAY-19	R4629586
Potassium (K)-Dissolved	1.65		0.050	mg/L	09-MAY-19	09-MAY-19	R4629586
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	09-MAY-19	09-MAY-19	R4629586
Silicon (Si)-Dissolved	4.32		0.050	mg/L	09-MAY-19	09-MAY-19	R4629586
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	09-MAY-19	09-MAY-19	R4629586
Sodium (Na)-Dissolved	147		0.050	mg/L	09-MAY-19	09-MAY-19	R4629586
Strontium (Sr)-Dissolved	0.801		0.00020	mg/L	09-MAY-19	09-MAY-19	R4629586
Thallium (Tl)-Dissolved	0.000014		0.000010	mg/L	09-MAY-19	09-MAY-19	R4629586
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	09-MAY-19	09-MAY-19	R4629586
Uranium (U)-Dissolved	0.00199		0.000010	mg/L	09-MAY-19	09-MAY-19	R4629586
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	09-MAY-19	09-MAY-19	R4629586
Zinc (Zn)-Dissolved	0.0065		0.0010	mg/L	09-MAY-19	09-MAY-19	R4629586
Hardness							
Hardness (as CaCO3)	126		0.50	mg/L		09-MAY-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		09-MAY-19	R4629586
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0532		0.0030	mg/L		09-MAY-19	R4629586
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		09-MAY-19	R4629586
Arsenic (As)-Total	0.00060		0.00010	mg/L		09-MAY-19	R4629586

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2268822-1 LC_PIZP1103_WG_Q2-2019_NP							
Sampled By: KC/DT on 06-MAY-19 @ 14:55							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.0607		0.00010	mg/L		09-MAY-19	R4629586
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		09-MAY-19	R4629586
Boron (B)-Total	0.593		0.010	mg/L		09-MAY-19	R4629586
Cadmium (Cd)-Total	0.0239		0.0050	ug/L		09-MAY-19	R4629586
Calcium (Ca)-Total	28.8		0.050	mg/L		09-MAY-19	R4629586
Chromium (Cr)-Total	0.00017		0.00010	mg/L		09-MAY-19	R4629586
Cobalt (Co)-Total	0.31		0.10	ug/L		09-MAY-19	R4629586
Copper (Cu)-Total	0.00417		0.00050	mg/L		09-MAY-19	R4629586
Iron (Fe)-Total	0.050		0.010	mg/L		09-MAY-19	R4629586
Lead (Pb)-Total	0.000281		0.000050	mg/L		09-MAY-19	R4629586
Lithium (Li)-Total	0.126		0.0010	mg/L		09-MAY-19	R4629586
Magnesium (Mg)-Total	15.1		0.10	mg/L		09-MAY-19	R4629586
Manganese (Mn)-Total	0.257		0.00010	mg/L		09-MAY-19	R4629586
Molybdenum (Mo)-Total	0.0122		0.000050	mg/L		09-MAY-19	R4629586
Nickel (Ni)-Total	0.00136		0.00050	mg/L		09-MAY-19	R4629586
Potassium (K)-Total	1.66		0.050	mg/L		09-MAY-19	R4629586
Selenium (Se)-Total	<0.050		0.050	ug/L		09-MAY-19	R4629586
Silicon (Si)-Total	4.46		0.10	mg/L		09-MAY-19	R4629586
Silver (Ag)-Total	<0.000010		0.000010	mg/L		09-MAY-19	R4629586
Sodium (Na)-Total	147		0.050	mg/L		09-MAY-19	R4629586
Strontium (Sr)-Total	0.778		0.00020	mg/L		09-MAY-19	R4629586
Thallium (Tl)-Total	0.000018		0.000010	mg/L		09-MAY-19	R4629586
Tin (Sn)-Total	0.00013		0.00010	mg/L		09-MAY-19	R4629586
Titanium (Ti)-Total	<0.010		0.010	mg/L		09-MAY-19	R4629586
Uranium (U)-Total	0.00212		0.000010	mg/L		09-MAY-19	R4629586
Vanadium (V)-Total	<0.00050		0.00050	mg/L		09-MAY-19	R4629586
Zinc (Zn)-Total	0.0083		0.0030	mg/L		09-MAY-19	R4629586
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		10-MAY-19	R4630886
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	396		1.0	mg/L		14-MAY-19	R4633250
Alkalinity, Carbonate (as CaCO3)	5.4		1.0	mg/L		14-MAY-19	R4633250
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		14-MAY-19	R4633250
Alkalinity, Total (as CaCO3)	401		1.0	mg/L		14-MAY-19	R4633250
Ammonia, Total (as N)							
Ammonia as N	0.0974		0.0050	mg/L		12-MAY-19	R4631441
Bromide in Water by IC (Low Level)							
Bromide (Br)	0.077		0.050	mg/L		07-MAY-19	R4628106
Chloride in Water by IC							
Chloride (Cl)	4.28		0.50	mg/L		07-MAY-19	R4628106
Electrical Conductivity (EC)							
Conductivity (@ 25C)	759		2.0	uS/cm		10-MAY-19	R4633250
Fluoride in Water by IC							
Fluoride (F)	0.456		0.020	mg/L		07-MAY-19	R4628106
Ion Balance Calculation							
Cation - Anion Balance	1.2			%		14-MAY-19	
Anion Sum	8.76			meq/L		14-MAY-19	
Cation Sum	8.97			meq/L		14-MAY-19	
Ion Balance Calculation							
Ion Balance	102		-100	%		14-MAY-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2268822-1 LC_PIZP1103_WG_Q2-2019_NP							
Sampled By: KC/DT on 06-MAY-19 @ 14:55							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0878		0.0050	mg/L		07-MAY-19	R4628106
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0011		0.0010	mg/L		07-MAY-19	R4628106
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0399		0.0010	mg/L		08-MAY-19	R4629111
Oxidation redution potential by elect.							
ORP	379		-1000	mV		10-MAY-19	R4630830
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0390		0.0020	mg/L		13-MAY-19	R4633090
Sulfate in Water by IC							
Sulfate (SO4)	28.7		0.30	mg/L		07-MAY-19	R4628106
Total Dissolved Solids							
Total Dissolved Solids	460	DLHC	20	mg/L		09-MAY-19	R4630819
Total Suspended Solids							
Total Suspended Solids	2.9		1.0	mg/L		09-MAY-19	R4630822
Turbidity							
Turbidity	3.36		0.10	NTU		08-MAY-19	R4628909
pH							
pH	8.34		0.10	pH		14-MAY-19	R4633250

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190506 LC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2268822

Report Date: 16-MAY-19

Page 1 of 10

Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4630886							
WG3046959-3	DUP	L2268822-1						
Acidity (as CaCO3)		<1.0	<1.0	RPD-NA	mg/L	N/A	20	10-MAY-19
WG3046959-2	LCS							
Acidity (as CaCO3)			100.6		%		85-115	10-MAY-19
WG3046959-1	MB							
Acidity (as CaCO3)			1.7		mg/L		2	10-MAY-19
ALK-MAN-CL								
	Water							
Batch	R4633250							
WG3047929-11	LCS							
Alkalinity, Total (as CaCO3)			99.7		%		85-115	10-MAY-19
WG3047929-10	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	10-MAY-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4629586							
WG3045024-2	LCS							
Beryllium (Be)-Dissolved			99.0		%		80-120	09-MAY-19
WG3045024-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	09-MAY-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4629586							
WG3045013-2	LCS							
Beryllium (Be)-Total			98.8		%		80-120	09-MAY-19
WG3045013-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	09-MAY-19
BR-L-IC-N-CL								
	Water							
Batch	R4628106							
WG3044326-14	LCS							
Bromide (Br)			104.8		%		85-115	07-MAY-19
WG3044326-13	MB							
Bromide (Br)			<0.050		mg/L		0.05	07-MAY-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4631433							
WG3047619-6	LCS							
Dissolved Organic Carbon			99.8		%		80-120	11-MAY-19
WG3047619-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	11-MAY-19
C-TOT-ORG-LOW-CL								
	Water							

Quality Control Report

Workorder: L2268822

Report Date: 16-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL								
Water								
Batch R4631433								
WG3047619-6 LCS								
Total Organic Carbon			106.0		%		80-120	11-MAY-19
WG3047619-5 MB								
Total Organic Carbon			<0.50		mg/L		0.5	11-MAY-19
CL-IC-N-CL								
Water								
Batch R4628106								
WG3044326-14 LCS								
Chloride (Cl)			103.8		%		90-110	07-MAY-19
WG3044326-13 MB								
Chloride (Cl)			<0.50		mg/L		0.5	07-MAY-19
EC-L-PCT-CL								
Water								
Batch R4633250								
WG3047929-11 LCS								
Conductivity (@ 25C)			101.6		%		90-110	10-MAY-19
WG3047929-10 MB								
Conductivity (@ 25C)			<2.0		uS/cm		2	10-MAY-19
F-IC-N-CL								
Water								
Batch R4628106								
WG3044326-14 LCS								
Fluoride (F)			107.9		%		90-110	07-MAY-19
WG3044326-13 MB								
Fluoride (F)			<0.020		mg/L		0.02	07-MAY-19
HG-D-CVAA-VA								
Water								
Batch R4630750								
WG3045837-2 LCS								
Mercury (Hg)-Dissolved			106.7		%		80-120	10-MAY-19
WG3045837-1 MB								
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	10-MAY-19
MET-D-CCMS-VA								
Water								
Batch R4629586								
WG3045024-2 LCS								
Aluminum (Al)-Dissolved			102.6		%		80-120	09-MAY-19
Antimony (Sb)-Dissolved			100.6		%		80-120	09-MAY-19
Arsenic (As)-Dissolved			98.7		%		80-120	09-MAY-19
Barium (Ba)-Dissolved			100.1		%		80-120	09-MAY-19
Bismuth (Bi)-Dissolved			94.9		%		80-120	09-MAY-19
Boron (B)-Dissolved			100.5		%		80-120	09-MAY-19

Quality Control Report

Workorder: L2268822

Report Date: 16-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4629586							
WG3045024-2	LCS							
Cadmium (Cd)-Dissolved			98.4		%		80-120	09-MAY-19
Calcium (Ca)-Dissolved			96.6		%		80-120	09-MAY-19
Chromium (Cr)-Dissolved			103.8		%		80-120	09-MAY-19
Cobalt (Co)-Dissolved			99.2		%		80-120	09-MAY-19
Copper (Cu)-Dissolved			98.3		%		80-120	09-MAY-19
Iron (Fe)-Dissolved			96.4		%		80-120	09-MAY-19
Lead (Pb)-Dissolved			94.4		%		80-120	09-MAY-19
Lithium (Li)-Dissolved			96.6		%		80-120	09-MAY-19
Magnesium (Mg)-Dissolved			99.2		%		80-120	09-MAY-19
Manganese (Mn)-Dissolved			99.6		%		80-120	09-MAY-19
Molybdenum (Mo)-Dissolved			99.9		%		80-120	09-MAY-19
Nickel (Ni)-Dissolved			97.9		%		80-120	09-MAY-19
Potassium (K)-Dissolved			99.96		%		80-120	09-MAY-19
Selenium (Se)-Dissolved			98.7		%		80-120	09-MAY-19
Silicon (Si)-Dissolved			104.4		%		60-140	09-MAY-19
Silver (Ag)-Dissolved			96.5		%		80-120	09-MAY-19
Sodium (Na)-Dissolved			102.3		%		80-120	09-MAY-19
Strontium (Sr)-Dissolved			97.9		%		80-120	09-MAY-19
Thallium (Tl)-Dissolved			96.5		%		80-120	09-MAY-19
Tin (Sn)-Dissolved			96.0		%		80-120	09-MAY-19
Titanium (Ti)-Dissolved			101.3		%		80-120	09-MAY-19
Uranium (U)-Dissolved			97.8		%		80-120	09-MAY-19
Vanadium (V)-Dissolved			102.6		%		80-120	09-MAY-19
Zinc (Zn)-Dissolved			101.5		%		80-120	09-MAY-19
WG3045024-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	09-MAY-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	09-MAY-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	09-MAY-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	09-MAY-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	09-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	09-MAY-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	09-MAY-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	09-MAY-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	09-MAY-19

Quality Control Report

Workorder: L2268822

Report Date: 16-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4629586							
WG3045024-1	MB	NP						
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	09-MAY-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	09-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	09-MAY-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	09-MAY-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	09-MAY-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	09-MAY-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	09-MAY-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	09-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	09-MAY-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	09-MAY-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	09-MAY-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	09-MAY-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	09-MAY-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	09-MAY-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	09-MAY-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	09-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	09-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	09-MAY-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	09-MAY-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	09-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	09-MAY-19
MET-T-CCMS-VA								
	Water							
Batch	R4629586							
WG3045013-2	LCS							
Aluminum (Al)-Total			99.4		%		80-120	09-MAY-19
Antimony (Sb)-Total			99.3		%		80-120	09-MAY-19
Arsenic (As)-Total			96.1		%		80-120	09-MAY-19
Barium (Ba)-Total			98.2		%		80-120	09-MAY-19
Bismuth (Bi)-Total			93.2		%		80-120	09-MAY-19
Boron (B)-Total			99.98		%		80-120	09-MAY-19
Cadmium (Cd)-Total			96.3		%		80-120	09-MAY-19
Calcium (Ca)-Total			98.2		%		80-120	09-MAY-19
Chromium (Cr)-Total			99.2		%		80-120	09-MAY-19
Cobalt (Co)-Total			97.2		%		80-120	09-MAY-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4629586							
WG3045013-2	LCS							
Copper (Cu)-Total			97.3		%		80-120	09-MAY-19
Iron (Fe)-Total			93.9		%		80-120	09-MAY-19
Lead (Pb)-Total			94.8		%		80-120	09-MAY-19
Lithium (Li)-Total			97.8		%		80-120	09-MAY-19
Magnesium (Mg)-Total			99.5		%		80-120	09-MAY-19
Manganese (Mn)-Total			96.4		%		80-120	09-MAY-19
Molybdenum (Mo)-Total			98.8		%		80-120	09-MAY-19
Nickel (Ni)-Total			96.5		%		80-120	09-MAY-19
Potassium (K)-Total			97.7		%		80-120	09-MAY-19
Selenium (Se)-Total			97.5		%		80-120	09-MAY-19
Silicon (Si)-Total			99.5		%		80-120	09-MAY-19
Silver (Ag)-Total			95.9		%		80-120	09-MAY-19
Sodium (Na)-Total			101.7		%		80-120	09-MAY-19
Strontium (Sr)-Total			97.7		%		80-120	09-MAY-19
Thallium (Tl)-Total			94.6		%		80-120	09-MAY-19
Tin (Sn)-Total			96.5		%		80-120	09-MAY-19
Titanium (Ti)-Total			93.8		%		80-120	09-MAY-19
Uranium (U)-Total			96.7		%		80-120	09-MAY-19
Vanadium (V)-Total			100.5		%		80-120	09-MAY-19
Zinc (Zn)-Total			102.4		%		80-120	09-MAY-19
WG3045013-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	09-MAY-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	09-MAY-19
Boron (B)-Total			<0.010		mg/L		0.01	09-MAY-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	09-MAY-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	09-MAY-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	09-MAY-19
Iron (Fe)-Total			<0.010		mg/L		0.01	09-MAY-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	09-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch R4629586								
WG3045013-1 MB								
Lithium (Li)-Total			<0.0010		mg/L		0.001	09-MAY-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	09-MAY-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	09-MAY-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	09-MAY-19
Potassium (K)-Total			<0.050		mg/L		0.05	09-MAY-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	09-MAY-19
Silicon (Si)-Total			<0.10		mg/L		0.1	09-MAY-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	09-MAY-19
Sodium (Na)-Total			<0.050		mg/L		0.05	09-MAY-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	09-MAY-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	09-MAY-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	09-MAY-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	09-MAY-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	09-MAY-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	09-MAY-19
NH3-L-F-CL		Water						
Batch R4631441								
WG3047629-6 LCS								
Ammonia as N			103.7		%		85-115	12-MAY-19
WG3047629-5 MB								
Ammonia as N			<0.0050		mg/L		0.005	12-MAY-19
NO2-L-IC-N-CL		Water						
Batch R4628106								
WG3044326-14 LCS								
Nitrite (as N)			107.8		%		90-110	07-MAY-19
WG3044326-13 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	07-MAY-19
NO3-L-IC-N-CL		Water						
Batch R4628106								
WG3044326-14 LCS								
Nitrate (as N)			103.1		%		90-110	07-MAY-19
WG3044326-13 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	07-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ORP-CL	Water							
Batch	R4630830							
WG3046888-1	CRM	CL-ORP						
ORP			227		mV		210-230	10-MAY-19
WG3046888-2	DUP	L2268822-1						
ORP		379	369	J	mV	9.4	15	10-MAY-19
P-T-L-COL-CL	Water							
Batch	R4633090							
WG3048451-26	LCS							
Phosphorus (P)-Total			101.4		%		80-120	13-MAY-19
WG3048451-25	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	13-MAY-19
PH-CL	Water							
Batch	R4633250							
WG3047929-11	LCS							
pH			7.01		pH		6.9-7.1	10-MAY-19
PO4-DO-L-COL-CL	Water							
Batch	R4629111							
WG3044829-14	LCS							
Orthophosphate-Dissolved (as P)			99.5		%		80-120	08-MAY-19
WG3044829-13	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	08-MAY-19
SO4-IC-N-CL	Water							
Batch	R4628106							
WG3044326-14	LCS							
Sulfate (SO4)			104.7		%		90-110	07-MAY-19
WG3044326-13	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	07-MAY-19
SOLIDS-TDS-CL	Water							
Batch	R4630819							
WG3045301-11	LCS							
Total Dissolved Solids			95.2		%		85-115	09-MAY-19
WG3045301-10	MB							
Total Dissolved Solids			<10		mg/L		10	09-MAY-19
TKN-L-F-CL	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL		Water						
Batch	R4634306							
WG3048885-10	LCS							
Total Kjeldahl Nitrogen			93.1		%		75-125	13-MAY-19
WG3048885-2	LCS							
Total Kjeldahl Nitrogen			93.2		%		75-125	13-MAY-19
WG3048885-6	LCS							
Total Kjeldahl Nitrogen			93.9		%		75-125	13-MAY-19
WG3048885-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	13-MAY-19
WG3048885-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	13-MAY-19
WG3048885-9	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	13-MAY-19
TSS-L-CL		Water						
Batch	R4630822							
WG3045205-2	LCS							
Total Suspended Solids			91.2		%		85-115	09-MAY-19
WG3045205-1	MB							
Total Suspended Solids			<1.0		mg/L		1	09-MAY-19
TURBIDITY-CL		Water						
Batch	R4628909							
WG3044789-11	LCS							
Turbidity			94.5		%		85-115	08-MAY-19
WG3044789-10	MB							
Turbidity			<0.10		NTU		0.1	08-MAY-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	06-MAY-19 14:55	10-MAY-19 09:55	0.25	91	hours	EHTR-FM
pH	1	06-MAY-19 14:55	14-MAY-19 09:00	0.25	186	hours	EHTR-FM

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2268822 were received on 07-MAY-19 09:10.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: **20190506 LC GW** TURNAROUND TIME: RUSH:

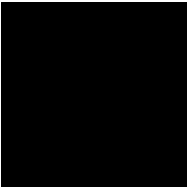
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	chris.blurton@teck.com	x	x
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		x
Address	Box 2003			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com	x	x
	15km North Hwy 43							Email 4:	kirsten.campbell@teck.com	x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	VPO00608129		
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada				
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS							ANALYSIS REQUESTED						Filtered - P: Field, L: Lab, F: Field & Lab, S: None				
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Ycs/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC				
LC_PIZP1103_WG_Q2-2019_NP	LC_PIZP1103	WG		2019/05/06	14:55	G	6	1	1	1	1	1	1				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS PLT VSI FORWARDED WITH SAMPLES TO ALS RI RSNBY FOR ANALYSIS	RELINQUISHED BY/AFFILIATION D.Tymstra/K.Campbell	DATE/TIME 6-May	ACCEPTED BY/AFFILIATION 	DATE/TIME 5/7 9:10
---	---	--------------------	-----------------------------	-----------------------

SERVICE REQUEST (rush - subject to availability)	Regular (default) X	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS	Sampler's Name K. Campbell/D. Tymstra	Mobile #	Sampler's Signature	Date/Time May 6, 2019
--	---------------------	--	---	---	--	----------	---------------------	--------------------------

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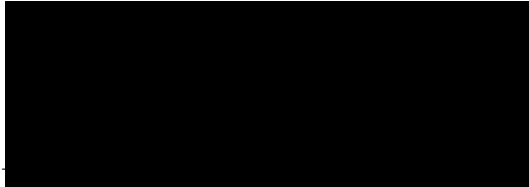
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 24-MAY-19
Report Date: 04-JUN-19 15:43 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2278988
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190523 DC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-1 LC_PIZDC1404D_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 12:35							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.12		0.50	mg/L		29-MAY-19	R4651071
Total Kjeldahl Nitrogen	3.24		0.050	mg/L		30-MAY-19	R4651431
Total Organic Carbon	8.50		0.50	mg/L		29-MAY-19	R4651071
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	27-MAY-19	27-MAY-19	R4645515
Dissolved Metals Filtration Location	FIELD					27-MAY-19	R4644591
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	29-MAY-19	29-MAY-19	R4647372
Dissolved Mercury Filtration Location	FIELD					29-MAY-19	R4646871
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					27-MAY-19	R4644591
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	27-MAY-19	27-MAY-19	R4645515
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Arsenic (As)-Dissolved	0.00239		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Barium (Ba)-Dissolved	4.45		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Boron (B)-Dissolved	0.023		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Cadmium (Cd)-Dissolved	0.0142		0.0050	ug/L	27-MAY-19	27-MAY-19	R4645515
Calcium (Ca)-Dissolved	61.8		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Cobalt (Co)-Dissolved	0.18		0.10	ug/L	27-MAY-19	27-MAY-19	R4645515
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Iron (Fe)-Dissolved	1.94		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Lithium (Li)-Dissolved	0.725		0.0010	mg/L	27-MAY-19	27-MAY-19	R4645515
Magnesium (Mg)-Dissolved	44.2		0.10	mg/L	27-MAY-19	27-MAY-19	R4645515
Manganese (Mn)-Dissolved	0.0187		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Molybdenum (Mo)-Dissolved	0.0241		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Nickel (Ni)-Dissolved	0.00083		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Potassium (K)-Dissolved	29.7		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	27-MAY-19	27-MAY-19	R4645515
Silicon (Si)-Dissolved	2.66		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	27-MAY-19	27-MAY-19	R4645515
Sodium (Na)-Dissolved	42.3		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Strontium (Sr)-Dissolved	0.263		0.00020	mg/L	27-MAY-19	27-MAY-19	R4645515
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	27-MAY-19	27-MAY-19	R4645515
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Uranium (U)-Dissolved	0.000066		0.000010	mg/L	27-MAY-19	27-MAY-19	R4645515
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Zinc (Zn)-Dissolved	0.0034		0.0010	mg/L	27-MAY-19	27-MAY-19	R4645515
Hardness							
Hardness (as CaCO3)	336		0.50	mg/L		28-MAY-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.105		0.020	ug/L		27-MAY-19	R4645127
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.618		0.0030	mg/L		27-MAY-19	R4645127
Antimony (Sb)-Total	0.00038		0.00010	mg/L		27-MAY-19	R4645127
Arsenic (As)-Total	0.00403		0.00010	mg/L		27-MAY-19	R4645127

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-1 LC_PIZDC1404D_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 12:35							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	4.66		0.00010	mg/L		27-MAY-19	R4645127
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Boron (B)-Total	0.024		0.010	mg/L		27-MAY-19	R4645127
Cadmium (Cd)-Total	0.259		0.0050	ug/L		27-MAY-19	R4645127
Calcium (Ca)-Total	62.2		0.050	mg/L		27-MAY-19	R4645127
Chromium (Cr)-Total	0.00242		0.00010	mg/L		27-MAY-19	R4645127
Cobalt (Co)-Total	1.06		0.10	ug/L		27-MAY-19	R4645127
Copper (Cu)-Total	0.0202		0.00050	mg/L		27-MAY-19	R4645127
Iron (Fe)-Total	5.75		0.010	mg/L		27-MAY-19	R4645127
Lead (Pb)-Total	0.00333		0.000050	mg/L		27-MAY-19	R4645127
Lithium (Li)-Total	0.698		0.0010	mg/L		27-MAY-19	R4645127
Magnesium (Mg)-Total	43.5		0.10	mg/L		27-MAY-19	R4645127
Manganese (Mn)-Total	0.0500		0.00010	mg/L		27-MAY-19	R4645127
Molybdenum (Mo)-Total	0.0228		0.000050	mg/L		27-MAY-19	R4645127
Nickel (Ni)-Total	0.00481		0.00050	mg/L		27-MAY-19	R4645127
Potassium (K)-Total	26.6		0.050	mg/L		27-MAY-19	R4645127
Selenium (Se)-Total	<0.15	DLB	0.15	ug/L		27-MAY-19	R4645127
Silicon (Si)-Total	3.95		0.10	mg/L		27-MAY-19	R4645127
Silver (Ag)-Total	0.000052		0.000010	mg/L		27-MAY-19	R4645127
Sodium (Na)-Total	43.7		0.050	mg/L		27-MAY-19	R4645127
Strontium (Sr)-Total	0.263		0.00020	mg/L		27-MAY-19	R4645127
Thallium (Tl)-Total	0.000039		0.000010	mg/L		27-MAY-19	R4645127
Tin (Sn)-Total	0.00040		0.00010	mg/L		27-MAY-19	R4645127
Titanium (Ti)-Total	0.010		0.010	mg/L		27-MAY-19	R4645127
Uranium (U)-Total	0.000237		0.000010	mg/L		27-MAY-19	R4645127
Vanadium (V)-Total	0.00530		0.00050	mg/L		27-MAY-19	R4645127
Zinc (Zn)-Total	0.0454		0.0030	mg/L		27-MAY-19	R4645127
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.5		1.0	mg/L		30-MAY-19	R4653065
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	444		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Carbonate (as CaCO3)	5.4		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Total (as CaCO3)	449		1.0	mg/L		30-MAY-19	R4653055
Ammonia, Total (as N)							
Ammonia as N	2.61	DLHC	0.050	mg/L		01-JUN-19	R4653519
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-MAY-19	R4644755
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		24-MAY-19	R4644755
Electrical Conductivity (EC)							
Conductivity (@ 25C)	755		2.0	uS/cm		30-MAY-19	R4653055
Fluoride in Water by IC							
Fluoride (F)	0.220		0.020	mg/L		24-MAY-19	R4644755
Ion Balance Calculation							
Ion Balance	105		-100	%		31-MAY-19	
Ion Balance Calculation							
Cation - Anion Balance	2.4			%		31-MAY-19	
Anion Sum	8.99			meq/L		31-MAY-19	
Cation Sum	9.43			meq/L		31-MAY-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-1 LC_PIZDC1404D_WG_Q2-2019_NP Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 12:35 Matrix: WG							
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050		0.0050	mg/L		24-MAY-19	R4644755
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		24-MAY-19	R4644755
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		25-MAY-19	R4644179
Oxidation redution potential by elect. ORP	404		-1000	mV		29-MAY-19	R4648826
Phosphorus (P)-Total Phosphorus (P)-Total	0.163	DLHC	0.010	mg/L		30-MAY-19	R4651380
Sulfate in Water by IC Sulfate (SO4)	<0.30		0.30	mg/L		24-MAY-19	R4644755
Total Dissolved Solids Total Dissolved Solids	403	DLHC	20	mg/L		29-MAY-19	R4651218
Total Suspended Solids Total Suspended Solids	46.7		1.0	mg/L		30-MAY-19	R4652806
Turbidity Turbidity	58.5		0.10	NTU		24-MAY-19	R4643908
pH pH	8.34		0.10	pH		30-MAY-19	R4653055
L2278988-2 LC_PIZDC1404S_WG_Q2-2019_NP Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 11:20 Matrix: WG							
Miscellaneous Parameters Dissolved Organic Carbon	2.12		0.50	mg/L		30-MAY-19	R4651987
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		31-MAY-19	R4651431
Total Organic Carbon	2.41		0.50	mg/L		30-MAY-19	R4651987
Dissolved Metals in Water Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	27-MAY-19	27-MAY-19	R4645515
Dissolved Metals Filtration Location	FIELD					27-MAY-19	R4644591
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	29-MAY-19	29-MAY-19	R4647372
Dissolved Mercury Filtration Location	FIELD					29-MAY-19	R4646871
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					27-MAY-19	R4644591
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	27-MAY-19	27-MAY-19	R4645515
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Arsenic (As)-Dissolved	0.00187		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Barium (Ba)-Dissolved	0.240		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Boron (B)-Dissolved	<0.010		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	27-MAY-19	27-MAY-19	R4645515
Calcium (Ca)-Dissolved	51.5		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Cobalt (Co)-Dissolved	0.30		0.10	ug/L	27-MAY-19	27-MAY-19	R4645515
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Iron (Fe)-Dissolved	0.919		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Lithium (Li)-Dissolved	0.0053		0.0010	mg/L	27-MAY-19	27-MAY-19	R4645515
Magnesium (Mg)-Dissolved	19.5		0.10	mg/L	27-MAY-19	27-MAY-19	R4645515
Manganese (Mn)-Dissolved	0.0294		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-2 LC_PIZDC1404S_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 11:20							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	0.00342		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Nickel (Ni)-Dissolved	0.00132		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Potassium (K)-Dissolved	1.62		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	27-MAY-19	27-MAY-19	R4645515
Silicon (Si)-Dissolved	3.35		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	27-MAY-19	27-MAY-19	R4645515
Sodium (Na)-Dissolved	1.02		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Strontium (Sr)-Dissolved	0.0474		0.00020	mg/L	27-MAY-19	27-MAY-19	R4645515
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	27-MAY-19	27-MAY-19	R4645515
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Uranium (U)-Dissolved	0.000589		0.000010	mg/L	27-MAY-19	27-MAY-19	R4645515
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	27-MAY-19	27-MAY-19	R4645515
Hardness							
Hardness (as CaCO3)	209		0.50	mg/L		28-MAY-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		27-MAY-19	R4645127
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0081		0.0030	mg/L		27-MAY-19	R4645127
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Arsenic (As)-Total	0.00216		0.00010	mg/L		27-MAY-19	R4645127
Barium (Ba)-Total	0.237		0.00010	mg/L		27-MAY-19	R4645127
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Boron (B)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		27-MAY-19	R4645127
Calcium (Ca)-Total	50.6		0.050	mg/L		27-MAY-19	R4645127
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Cobalt (Co)-Total	0.38		0.10	ug/L		27-MAY-19	R4645127
Copper (Cu)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Iron (Fe)-Total	1.20		0.010	mg/L		27-MAY-19	R4645127
Lead (Pb)-Total	0.000076		0.000050	mg/L		27-MAY-19	R4645127
Lithium (Li)-Total	0.0051		0.0010	mg/L		27-MAY-19	R4645127
Magnesium (Mg)-Total	18.7		0.10	mg/L		27-MAY-19	R4645127
Manganese (Mn)-Total	0.0335		0.00010	mg/L		27-MAY-19	R4645127
Molybdenum (Mo)-Total	0.00349		0.000050	mg/L		27-MAY-19	R4645127
Nickel (Ni)-Total	0.00134		0.00050	mg/L		27-MAY-19	R4645127
Potassium (K)-Total	1.49		0.050	mg/L		27-MAY-19	R4645127
Selenium (Se)-Total	<0.050		0.050	ug/L		27-MAY-19	R4645127
Silicon (Si)-Total	3.57		0.10	mg/L		27-MAY-19	R4645127
Silver (Ag)-Total	0.000012		0.000010	mg/L		27-MAY-19	R4645127
Sodium (Na)-Total	1.08		0.050	mg/L		27-MAY-19	R4645127
Strontium (Sr)-Total	0.0470		0.00020	mg/L		27-MAY-19	R4645127
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127
Tin (Sn)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Titanium (Ti)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Uranium (U)-Total	0.000616		0.000010	mg/L		27-MAY-19	R4645127
Vanadium (V)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		27-MAY-19	R4645127
Routine for Teck Coal							
Acidity by Automatic Titration							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-2 LC_PIZDC1404S_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 11:20							
Matrix: WG							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.5		1.0	mg/L		30-MAY-19	R4653065
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	206		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Carbonate (as CaCO3)	4.2		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Total (as CaCO3)	211		1.0	mg/L		30-MAY-19	R4653055
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		01-JUN-19	R4653519
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-MAY-19	R4644755
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		24-MAY-19	R4644755
Electrical Conductivity (EC)							
Conductivity (@ 25C)	370		2.0	uS/cm		30-MAY-19	R4653055
Fluoride in Water by IC							
Fluoride (F)	0.145		0.020	mg/L		24-MAY-19	R4644755
Ion Balance Calculation							
Ion Balance	99.8		-100	%		31-MAY-19	
Ion Balance Calculation							
Cation - Anion Balance	-0.1			%		31-MAY-19	
Anion Sum	4.32			meq/L		31-MAY-19	
Cation Sum	4.31			meq/L		31-MAY-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		24-MAY-19	R4644755
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		24-MAY-19	R4644755
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		25-MAY-19	R4644179
Oxidation redution potential by elect.							
ORP	396		-1000	mV		29-MAY-19	R4648826
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0068		0.0020	mg/L		30-MAY-19	R4651380
Sulfate in Water by IC							
Sulfate (SO4)	4.80		0.30	mg/L		24-MAY-19	R4644755
Total Dissolved Solids							
Total Dissolved Solids	182	DLHC	20	mg/L		29-MAY-19	R4651218
Total Suspended Solids							
Total Suspended Solids	2.6		1.0	mg/L		30-MAY-19	R4652806
Turbidity							
Turbidity	10.3		0.10	NTU		24-MAY-19	R4643908
pH							
pH	8.41		0.10	pH		30-MAY-19	R4653055
L2278988-3 WG_Q2-2019_RD1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 14:00							
Matrix: WG							
Miscellaneous Parameters							
Hardness (as CaCO3)	<0.50		0.50	mg/L		30-MAY-19	
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		30-MAY-19	R4651431
Total Organic Carbon	<0.50		0.50	mg/L		29-MAY-19	R4651071
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		27-MAY-19	R4645127

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-3 WG_Q2-2019_RD1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 14:00							
Matrix: WG							
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		29-MAY-19	R4647372
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		27-MAY-19	R4645127
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Arsenic (As)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Barium (Ba)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Boron (B)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		27-MAY-19	R4645127
Calcium (Ca)-Total	<0.050		0.050	mg/L		27-MAY-19	R4645127
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Cobalt (Co)-Total	<0.10		0.10	ug/L		27-MAY-19	R4645127
Copper (Cu)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Iron (Fe)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Lead (Pb)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Lithium (Li)-Total	<0.0010		0.0010	mg/L		27-MAY-19	R4645127
Magnesium (Mg)-Total	<0.10		0.10	mg/L		27-MAY-19	R4645127
Manganese (Mn)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Potassium (K)-Total	<0.050		0.050	mg/L		27-MAY-19	R4645127
Selenium (Se)-Total	<0.050		0.050	ug/L		27-MAY-19	R4645127
Silicon (Si)-Total	<0.10		0.10	mg/L		27-MAY-19	R4645127
Silver (Ag)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127
Sodium (Na)-Total	<0.050		0.050	mg/L		27-MAY-19	R4645127
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		27-MAY-19	R4645127
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127
Tin (Sn)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Titanium (Ti)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Uranium (U)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127
Vanadium (V)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		27-MAY-19	R4645127
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.2		1.0	mg/L		30-MAY-19	R4653065
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Ammonia, Total (as N)							
Ammonia as N	0.0334	RRV	0.0050	mg/L		01-JUN-19	R4653519
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-MAY-19	R4644755
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		24-MAY-19	R4644755
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					29-MAY-19	R4648570
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L		29-MAY-19	R4648827
Magnesium (Mg)-Dissolved	<0.0050		0.0050	mg/L		29-MAY-19	R4648827
Potassium (K)-Dissolved	<0.050		0.050	mg/L		29-MAY-19	R4648827
Sodium (Na)-Dissolved	<0.050		0.050	mg/L		29-MAY-19	R4648827

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-3 WG_Q2-2019_RD1 Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 14:00 Matrix: WG							
Electrical Conductivity (EC)							
Conductivity (@ 25C)	<2.0		2.0	uS/cm		30-MAY-19	R4653055
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		24-MAY-19	R4644755
Ion Balance Calculation							
Ion Balance	0.0		-100	%		31-MAY-19	
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		31-MAY-19	
Anion Sum	<0.10			meq/L		31-MAY-19	
Cation Sum	<0.10			meq/L		31-MAY-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		24-MAY-19	R4644755
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		24-MAY-19	R4644755
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		25-MAY-19	R4644179
Oxidation redution potential by elect.							
ORP	407		-1000	mV		29-MAY-19	R4648826
Phosphorus (P)-Total							
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		30-MAY-19	R4651380
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		24-MAY-19	R4644755
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		29-MAY-19	R4651218
Total Suspended Solids							
Total Suspended Solids	<1.0		1.0	mg/L		30-MAY-19	R4652806
Turbidity							
Turbidity	<0.10		0.10	NTU		24-MAY-19	R4643908
pH							
pH	5.35		0.10	pH		30-MAY-19	R4653055
L2278988-4 WG_Q2-2019_CC1 Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 11:25 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.74		0.50	mg/L		29-MAY-19	R4651071
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		30-MAY-19	R4651431
Total Organic Carbon	2.65		0.50	mg/L		29-MAY-19	R4651071
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	27-MAY-19	27-MAY-19	R4645515
Dissolved Metals Filtration Location	FIELD					27-MAY-19	R4644591
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	29-MAY-19	29-MAY-19	R4647372
Dissolved Mercury Filtration Location	FIELD					29-MAY-19	R4646871
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					27-MAY-19	R4644591
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	27-MAY-19	27-MAY-19	R4645515
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Arsenic (As)-Dissolved	0.00188		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Barium (Ba)-Dissolved	0.233		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Boron (B)-Dissolved	<0.010		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-4 WG_Q2-2019_CC1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 11:25							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	27-MAY-19	27-MAY-19	R4645515
Calcium (Ca)-Dissolved	51.4		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Cobalt (Co)-Dissolved	0.30		0.10	ug/L	27-MAY-19	27-MAY-19	R4645515
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Iron (Fe)-Dissolved	0.905		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Lithium (Li)-Dissolved	0.0052		0.0010	mg/L	27-MAY-19	27-MAY-19	R4645515
Magnesium (Mg)-Dissolved	18.9		0.10	mg/L	27-MAY-19	27-MAY-19	R4645515
Manganese (Mn)-Dissolved	0.0289		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Molybdenum (Mo)-Dissolved	0.00322		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Nickel (Ni)-Dissolved	0.00126		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Potassium (K)-Dissolved	1.59		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	27-MAY-19	27-MAY-19	R4645515
Silicon (Si)-Dissolved	3.33		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	27-MAY-19	27-MAY-19	R4645515
Sodium (Na)-Dissolved	1.00		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Strontium (Sr)-Dissolved	0.0482		0.00020	mg/L	27-MAY-19	27-MAY-19	R4645515
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	27-MAY-19	27-MAY-19	R4645515
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Uranium (U)-Dissolved	0.000585		0.000010	mg/L	27-MAY-19	27-MAY-19	R4645515
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	27-MAY-19	27-MAY-19	R4645515
Hardness							
Hardness (as CaCO3)	206		0.50	mg/L		28-MAY-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		27-MAY-19	R4645127
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0070		0.0030	mg/L		27-MAY-19	R4645127
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Arsenic (As)-Total	0.00214		0.00010	mg/L		27-MAY-19	R4645127
Barium (Ba)-Total	0.238		0.00010	mg/L		27-MAY-19	R4645127
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Boron (B)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		27-MAY-19	R4645127
Calcium (Ca)-Total	49.9		0.050	mg/L		27-MAY-19	R4645127
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Cobalt (Co)-Total	0.40		0.10	ug/L		27-MAY-19	R4645127
Copper (Cu)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Iron (Fe)-Total	1.25		0.010	mg/L		27-MAY-19	R4645127
Lead (Pb)-Total	0.000069		0.000050	mg/L		27-MAY-19	R4645127
Lithium (Li)-Total	0.0050		0.0010	mg/L		27-MAY-19	R4645127
Magnesium (Mg)-Total	18.7		0.10	mg/L		27-MAY-19	R4645127
Manganese (Mn)-Total	0.0346		0.00010	mg/L		27-MAY-19	R4645127
Molybdenum (Mo)-Total	0.00341		0.000050	mg/L		27-MAY-19	R4645127
Nickel (Ni)-Total	0.00131		0.00050	mg/L		27-MAY-19	R4645127
Potassium (K)-Total	1.49		0.050	mg/L		27-MAY-19	R4645127
Selenium (Se)-Total	<0.050		0.050	ug/L		27-MAY-19	R4645127
Silicon (Si)-Total	3.58		0.10	mg/L		27-MAY-19	R4645127
Silver (Ag)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-4 WG_Q2-2019_CC1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 11:25							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Sodium (Na)-Total	1.07		0.050	mg/L		27-MAY-19	R4645127
Strontium (Sr)-Total	0.0487		0.00020	mg/L		27-MAY-19	R4645127
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127
Tin (Sn)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Titanium (Ti)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Uranium (U)-Total	0.000608		0.000010	mg/L		27-MAY-19	R4645127
Vanadium (V)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		27-MAY-19	R4645127
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.4		1.0	mg/L		30-MAY-19	R4653065
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	197		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Carbonate (as CaCO3)	5.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Total (as CaCO3)	202		1.0	mg/L		30-MAY-19	R4653055
Ammonia, Total (as N)							
Ammonia as N	0.0552		0.0050	mg/L		01-JUN-19	R4653519
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-MAY-19	R4644755
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		24-MAY-19	R4644755
Electrical Conductivity (EC)							
Conductivity (@ 25C)	369		2.0	uS/cm		30-MAY-19	R4653055
Fluoride in Water by IC							
Fluoride (F)	0.148		0.020	mg/L		24-MAY-19	R4644755
Ion Balance Calculation							
Cation - Anion Balance	1.4			%		31-MAY-19	
Anion Sum	4.14			meq/L		31-MAY-19	
Cation Sum	4.25			meq/L		31-MAY-19	
Ion Balance Calculation							
Ion Balance	103		-100	%		31-MAY-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		24-MAY-19	R4644755
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		24-MAY-19	R4644755
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0010		0.0010	mg/L		25-MAY-19	R4644179
Oxidation redution potential by elect.							
ORP	362		-1000	mV		29-MAY-19	R4648826
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0062		0.0020	mg/L		30-MAY-19	R4651380
Sulfate in Water by IC							
Sulfate (SO4)	4.79		0.30	mg/L		24-MAY-19	R4644755
Total Dissolved Solids							
Total Dissolved Solids	171	DLHC	20	mg/L		29-MAY-19	R4651218
Total Suspended Solids							
Total Suspended Solids	3.1		1.0	mg/L		30-MAY-19	R4652806
Turbidity							
Turbidity	10.7		0.10	NTU		24-MAY-19	R4643908
pH							
pH	8.43		0.10	pH		30-MAY-19	R4653055

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-4 WG_Q2-2019_CC1 Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 11:25 Matrix: WG							
L2278988-5 WG_Q2-2019_MT1 Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 12:40 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		29-MAY-19	R4651071
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		30-MAY-19	R4651431
Total Organic Carbon	<0.50		0.50	mg/L		29-MAY-19	R4651071
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	26-MAY-19	28-MAY-19	R4646589
Dissolved Metals Filtration Location	LAB					26-MAY-19	R4644293
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	30-MAY-19	30-MAY-19	R4650432
Dissolved Mercury Filtration Location	LAB					30-MAY-19	R4650746
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					29-MAY-19	R4646735
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	26-MAY-19	28-MAY-19	R4646589
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	26-MAY-19	28-MAY-19	R4646589
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	26-MAY-19	28-MAY-19	R4646589
Barium (Ba)-Dissolved	<0.00010		0.00010	mg/L	26-MAY-19	28-MAY-19	R4646589
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	26-MAY-19	28-MAY-19	R4646589
Boron (B)-Dissolved	<0.010		0.010	mg/L	26-MAY-19	28-MAY-19	R4646589
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	26-MAY-19	28-MAY-19	R4646589
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L	26-MAY-19	28-MAY-19	R4646589
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	26-MAY-19	28-MAY-19	R4646589
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	26-MAY-19	28-MAY-19	R4646589
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	29-MAY-19	29-MAY-19	R4647134
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	26-MAY-19	28-MAY-19	R4646589
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	26-MAY-19	28-MAY-19	R4646589
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	26-MAY-19	28-MAY-19	R4646589
Magnesium (Mg)-Dissolved	<0.10		0.10	mg/L	26-MAY-19	28-MAY-19	R4646589
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L	26-MAY-19	28-MAY-19	R4646589
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L	26-MAY-19	28-MAY-19	R4646589
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	26-MAY-19	28-MAY-19	R4646589
Potassium (K)-Dissolved	<0.050		0.050	mg/L	26-MAY-19	28-MAY-19	R4646589
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	26-MAY-19	28-MAY-19	R4646589
Silicon (Si)-Dissolved	<0.050		0.050	mg/L	26-MAY-19	28-MAY-19	R4646589
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	26-MAY-19	28-MAY-19	R4646589
Sodium (Na)-Dissolved	<0.050		0.050	mg/L	26-MAY-19	28-MAY-19	R4646589
Strontium (Sr)-Dissolved	<0.00020		0.00020	mg/L	26-MAY-19	28-MAY-19	R4646589
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	26-MAY-19	28-MAY-19	R4646589
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	26-MAY-19	28-MAY-19	R4646589
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	26-MAY-19	28-MAY-19	R4646589
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L	26-MAY-19	28-MAY-19	R4646589
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	26-MAY-19	28-MAY-19	R4646589
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	26-MAY-19	28-MAY-19	R4646589
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		29-MAY-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		27-MAY-19	R4645127
Total Mercury in Water by CVAAS or CVAFS							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-5 WG_Q2-2019_MT1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 12:40							
Matrix: WG							
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		29-MAY-19	R4647372
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		27-MAY-19	R4645127
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Arsenic (As)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Barium (Ba)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Boron (B)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		27-MAY-19	R4645127
Calcium (Ca)-Total	<0.050		0.050	mg/L		27-MAY-19	R4645127
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Cobalt (Co)-Total	<0.10		0.10	ug/L		27-MAY-19	R4645127
Copper (Cu)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Iron (Fe)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Lead (Pb)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Lithium (Li)-Total	<0.0010		0.0010	mg/L		27-MAY-19	R4645127
Magnesium (Mg)-Total	<0.10		0.10	mg/L		27-MAY-19	R4645127
Manganese (Mn)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Potassium (K)-Total	<0.050		0.050	mg/L		27-MAY-19	R4645127
Selenium (Se)-Total	<0.050		0.050	ug/L		27-MAY-19	R4645127
Silicon (Si)-Total	<0.10		0.10	mg/L		27-MAY-19	R4645127
Silver (Ag)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127
Sodium (Na)-Total	<0.050		0.050	mg/L		27-MAY-19	R4645127
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		27-MAY-19	R4645127
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127
Tin (Sn)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Titanium (Ti)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Uranium (U)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127
Vanadium (V)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		27-MAY-19	R4645127
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.8		1.0	mg/L		30-MAY-19	R4653065
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		01-JUN-19	R4653519
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-MAY-19	R4644755
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		24-MAY-19	R4644755
Electrical Conductivity (EC)							
Conductivity (@ 25C)	<2.0		2.0	uS/cm		30-MAY-19	R4653055
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		24-MAY-19	R4644755
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		31-MAY-19	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-5 WG_Q2-2019_MT1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 12:40							
Matrix: WG							
Ion Balance Calculation							
Anion Sum	<0.10			meq/L		31-MAY-19	
Cation Sum	<0.10			meq/L		31-MAY-19	
Ion Balance Calculation							
Ion Balance	0.0		-100	%		31-MAY-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		24-MAY-19	R4644755
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		24-MAY-19	R4644755
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		25-MAY-19	R4644179
Oxidation reduction potential by elect.							
ORP	450		-1000	mV		29-MAY-19	R4648826
Phosphorus (P)-Total							
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		30-MAY-19	R4651380
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		24-MAY-19	R4644755
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		29-MAY-19	R4651218
Total Suspended Solids							
Total Suspended Solids	<1.0		1.0	mg/L		30-MAY-19	R4652806
Turbidity							
Turbidity	<0.10		0.10	NTU		24-MAY-19	R4643908
pH							
pH	5.14		0.10	pH		30-MAY-19	R4653055

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
SFPL	-5 DOC/D-METAL/D-HG FILTERED AND PRESERVED AT THE LAB - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-CL	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
		A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).	
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	
		Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:	
		Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]	
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.	
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
		This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.	
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
		This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.	

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190523 DC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

*mg/kg - milligrams per kilogram based on dry weight of sample
 mg/kg wwt - milligrams per kilogram based on wet weight of sample
 mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
 mg/L - unit of concentration based on volume, parts per million.*

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2278988

Report Date: 04-JUN-19

Page 1 of 19

Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0
 Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4653065							
WG3063812-11	LCS							
Acidity (as CaCO3)			106.0		%		85-115	30-MAY-19
WG3063812-8	LCS							
Acidity (as CaCO3)			104.2		%		85-115	30-MAY-19
WG3063812-10	MB							
Acidity (as CaCO3)			<1.0		mg/L		2	30-MAY-19
WG3063812-7	MB							
Acidity (as CaCO3)			1.1		mg/L		2	30-MAY-19
ALK-MAN-CL								
	Water							
Batch	R4653055							
WG3063840-15	DUP	L2278988-1						
Alkalinity, Total (as CaCO3)		449	438		mg/L	2.6	20	30-MAY-19
WG3063840-14	LCS							
Alkalinity, Total (as CaCO3)			97.5		%		85-115	30-MAY-19
WG3063840-13	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	30-MAY-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4645515							
WG3059149-3	DUP	L2278988-2						
Beryllium (Be)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	27-MAY-19
WG3059149-2	LCS							
Beryllium (Be)-Dissolved			98.2		%		80-120	27-MAY-19
WG3059149-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	27-MAY-19
WG3059149-4	MS	L2278988-1						
Beryllium (Be)-Dissolved			99.9		%		70-130	27-MAY-19
Batch	R4646589							
WG3058816-2	LCS							
Beryllium (Be)-Dissolved			98.1		%		80-120	28-MAY-19
WG3058816-1	MB	LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	28-MAY-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4645127							
WG3058750-3	DUP	L2278988-1						
Beryllium (Be)-Total		0.000105	0.000105		mg/L	0.0	20	27-MAY-19
WG3058750-2	LCS							
Beryllium (Be)-Total			101.3		%		80-120	27-MAY-19
WG3058750-1	MB							

Quality Control Report

Workorder: L2278988

Report Date: 04-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BE-T-L-CCMS-VA								
Batch R4645127								
WG3058750-1 MB								
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	27-MAY-19
WG3058750-4 MS		L2278988-2						
Beryllium (Be)-Total			96.3		%		70-130	27-MAY-19
BR-L-IC-N-CL								
Batch R4644755								
WG3059401-11 DUP		L2278988-3						
Bromide (Br)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	24-MAY-19
WG3059401-10 LCS								
Bromide (Br)			99.2		%		85-115	24-MAY-19
WG3059401-9 MB								
Bromide (Br)			<0.050		mg/L		0.05	24-MAY-19
WG3059401-12 MS		L2278988-3						
Bromide (Br)			98.8		%		75-125	24-MAY-19
C-DIS-ORG-LOW-CL								
Batch R4651071								
WG3062916-2 LCS								
Dissolved Organic Carbon			91.1		%		80-120	29-MAY-19
WG3062916-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	29-MAY-19
Batch R4651987								
WG3063861-2 LCS								
Dissolved Organic Carbon			99.2		%		80-120	30-MAY-19
WG3063861-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	30-MAY-19
C-TOT-ORG-LOW-CL								
Batch R4651071								
WG3062916-2 LCS								
Total Organic Carbon			95.4		%		80-120	29-MAY-19
WG3062916-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	29-MAY-19
Batch R4651987								
WG3063861-2 LCS								
Total Organic Carbon			100.5		%		80-120	30-MAY-19
WG3063861-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	30-MAY-19
CL-IC-N-CL								
Batch R4651071								

Quality Control Report

Workorder: L2278988

Report Date: 04-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-CL								
Water								
Batch	R4644755							
WG3059401-11	DUP	L2278988-3						
Chloride (Cl)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	24-MAY-19
WG3059401-10	LCS							
Chloride (Cl)			99.2		%		90-110	24-MAY-19
WG3059401-9	MB							
Chloride (Cl)			<0.50		mg/L		0.5	24-MAY-19
WG3059401-12	MS	L2278988-3						
Chloride (Cl)			98.9		%		75-125	24-MAY-19
EC-L-PCT-CL								
Water								
Batch	R4653055							
WG3063840-15	DUP	L2278988-1						
Conductivity (@ 25C)		755	751		uS/cm	0.5	10	30-MAY-19
WG3063840-14	LCS							
Conductivity (@ 25C)			104.6		%		90-110	30-MAY-19
WG3063840-13	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	30-MAY-19
F-IC-N-CL								
Water								
Batch	R4644755							
WG3059401-11	DUP	L2278988-3						
Fluoride (F)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	24-MAY-19
WG3059401-10	LCS							
Fluoride (F)			102.3		%		90-110	24-MAY-19
WG3059401-9	MB							
Fluoride (F)			<0.020		mg/L		0.02	24-MAY-19
WG3059401-12	MS	L2278988-3						
Fluoride (F)			102.8		%		75-125	24-MAY-19
HG-D-CVAA-VA								
Water								
Batch	R4647372							
WG3061239-2	LCS							
Mercury (Hg)-Dissolved			101.1		%		80-120	29-MAY-19
WG3061239-1	MB	NP						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	29-MAY-19
Batch	R4650432							
WG3062778-6	LCS							
Mercury (Hg)-Dissolved			100.7		%		80-120	30-MAY-19
WG3062778-5	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	30-MAY-19
HG-T-CVAA-VA								
Water								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-VA		Water						
Batch	R4647372							
WG3061243-2	LCS							
Mercury (Hg)-Total			100.9		%		80-120	29-MAY-19
WG3061243-1	MB							
Mercury (Hg)-Total			<0.00005C		mg/L		0.000005	29-MAY-19
MET-D-CCMS-VA		Water						
Batch	R4645515							
WG3059149-3	DUP	L2278988-2						
Aluminum (Al)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-MAY-19
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAY-19
Arsenic (As)-Dissolved		0.00187	0.00183		mg/L	2.2	20	27-MAY-19
Barium (Ba)-Dissolved		0.240	0.232		mg/L	3.4	20	27-MAY-19
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAY-19
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-MAY-19
Cadmium (Cd)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	27-MAY-19
Calcium (Ca)-Dissolved		51.5	53.3		mg/L	3.5	20	27-MAY-19
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAY-19
Cobalt (Co)-Dissolved		0.00030	0.00031		mg/L	4.6	20	27-MAY-19
Copper (Cu)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAY-19
Iron (Fe)-Dissolved		0.919	0.911		mg/L	0.8	20	27-MAY-19
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAY-19
Lithium (Li)-Dissolved		0.0053	0.0052		mg/L	2.3	20	27-MAY-19
Magnesium (Mg)-Dissolved		19.5	18.8		mg/L	3.5	20	27-MAY-19
Manganese (Mn)-Dissolved		0.0294	0.0290		mg/L	1.7	20	27-MAY-19
Molybdenum (Mo)-Dissolved		0.00342	0.00326		mg/L	4.7	20	27-MAY-19
Nickel (Ni)-Dissolved		0.00132	0.00121		mg/L	9.1	20	27-MAY-19
Potassium (K)-Dissolved		1.62	1.59		mg/L	1.9	20	27-MAY-19
Selenium (Se)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAY-19
Silicon (Si)-Dissolved		3.35	3.34		mg/L	0.4	20	27-MAY-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-MAY-19
Sodium (Na)-Dissolved		1.02	0.985		mg/L	3.2	20	27-MAY-19
Strontium (Sr)-Dissolved		0.0474	0.0471		mg/L	0.7	20	27-MAY-19
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-MAY-19
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAY-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-MAY-19
Uranium (U)-Dissolved		0.000589	0.000583		mg/L	1.0	20	27-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4645515							
WG3059149-3	DUP	L2278988-2						
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAY-19
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAY-19
WG3059149-2	LCS							
Aluminum (Al)-Dissolved			105.9		%		80-120	27-MAY-19
Antimony (Sb)-Dissolved			102.3		%		80-120	27-MAY-19
Arsenic (As)-Dissolved			103.8		%		80-120	27-MAY-19
Barium (Ba)-Dissolved			103.8		%		80-120	27-MAY-19
Bismuth (Bi)-Dissolved			102.7		%		80-120	27-MAY-19
Boron (B)-Dissolved			98.9		%		80-120	27-MAY-19
Cadmium (Cd)-Dissolved			104.7		%		80-120	27-MAY-19
Calcium (Ca)-Dissolved			99.2		%		80-120	27-MAY-19
Chromium (Cr)-Dissolved			105.3		%		80-120	27-MAY-19
Cobalt (Co)-Dissolved			102.9		%		80-120	27-MAY-19
Copper (Cu)-Dissolved			101.2		%		80-120	27-MAY-19
Iron (Fe)-Dissolved			96.7		%		80-120	27-MAY-19
Lead (Pb)-Dissolved			99.1		%		80-120	27-MAY-19
Lithium (Li)-Dissolved			98.1		%		80-120	27-MAY-19
Magnesium (Mg)-Dissolved			109.1		%		80-120	27-MAY-19
Manganese (Mn)-Dissolved			106.9		%		80-120	27-MAY-19
Molybdenum (Mo)-Dissolved			108.6		%		80-120	27-MAY-19
Nickel (Ni)-Dissolved			103.6		%		80-120	27-MAY-19
Potassium (K)-Dissolved			105.5		%		80-120	27-MAY-19
Selenium (Se)-Dissolved			99.4		%		80-120	27-MAY-19
Silicon (Si)-Dissolved			104.4		%		60-140	27-MAY-19
Silver (Ag)-Dissolved			107.5		%		80-120	27-MAY-19
Sodium (Na)-Dissolved			104.1		%		80-120	27-MAY-19
Strontium (Sr)-Dissolved			105.3		%		80-120	27-MAY-19
Thallium (Tl)-Dissolved			100.1		%		80-120	27-MAY-19
Tin (Sn)-Dissolved			103.3		%		80-120	27-MAY-19
Titanium (Ti)-Dissolved			97.6		%		80-120	27-MAY-19
Uranium (U)-Dissolved			97.7		%		80-120	27-MAY-19
Vanadium (V)-Dissolved			105.0		%		80-120	27-MAY-19
Zinc (Zn)-Dissolved			99.4		%		80-120	27-MAY-19
WG3059149-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	27-MAY-19

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MET-D-CCMS-VA								
	Water							
Batch	R4645515							
WG3059149-1	MB	NP						
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-MAY-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-MAY-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-MAY-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	27-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-MAY-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	27-MAY-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	27-MAY-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	27-MAY-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-MAY-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-MAY-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	27-MAY-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-MAY-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	27-MAY-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	27-MAY-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-MAY-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-MAY-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-MAY-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-MAY-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	27-MAY-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	27-MAY-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	27-MAY-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	27-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	27-MAY-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-MAY-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-MAY-19
WG3059149-4	MS	L2278988-1						
Aluminum (Al)-Dissolved			98.9		%		70-130	27-MAY-19
Antimony (Sb)-Dissolved			102.6		%		70-130	27-MAY-19
Arsenic (As)-Dissolved			100.3		%		70-130	27-MAY-19
Barium (Ba)-Dissolved			N/A	MS-B	%		-	27-MAY-19

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MET-D-CCMS-VA								
	Water							
Batch	R4645515							
WG3059149-4	MS	L2278988-1						
Bismuth (Bi)-Dissolved			83.7		%		70-130	27-MAY-19
Boron (B)-Dissolved			97.8		%		70-130	27-MAY-19
Cadmium (Cd)-Dissolved			101.0		%		70-130	27-MAY-19
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	27-MAY-19
Chromium (Cr)-Dissolved			98.7		%		70-130	27-MAY-19
Cobalt (Co)-Dissolved			95.4		%		70-130	27-MAY-19
Copper (Cu)-Dissolved			92.5		%		70-130	27-MAY-19
Iron (Fe)-Dissolved			97.8		%		70-130	27-MAY-19
Lead (Pb)-Dissolved			93.3		%		70-130	27-MAY-19
Lithium (Li)-Dissolved			N/A	MS-B	%		-	27-MAY-19
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	27-MAY-19
Manganese (Mn)-Dissolved			97.0		%		70-130	27-MAY-19
Molybdenum (Mo)-Dissolved			N/A	MS-B	%		-	27-MAY-19
Nickel (Ni)-Dissolved			93.9		%		70-130	27-MAY-19
Potassium (K)-Dissolved			N/A	MS-B	%		-	27-MAY-19
Selenium (Se)-Dissolved			97.6		%		70-130	27-MAY-19
Silicon (Si)-Dissolved			90.5		%		70-130	27-MAY-19
Silver (Ag)-Dissolved			99.6		%		70-130	27-MAY-19
Sodium (Na)-Dissolved			N/A	MS-B	%		-	27-MAY-19
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	27-MAY-19
Thallium (Tl)-Dissolved			92.8		%		70-130	27-MAY-19
Tin (Sn)-Dissolved			100.4		%		70-130	27-MAY-19
Titanium (Ti)-Dissolved			96.5		%		70-130	27-MAY-19
Uranium (U)-Dissolved			95.7		%		70-130	27-MAY-19
Vanadium (V)-Dissolved			101.8		%		70-130	27-MAY-19
Zinc (Zn)-Dissolved			96.8		%		70-130	27-MAY-19
Batch	R4646589							
WG3058816-2	LCS							
Aluminum (Al)-Dissolved			107.7		%		80-120	28-MAY-19
Antimony (Sb)-Dissolved			95.7		%		80-120	28-MAY-19
Arsenic (As)-Dissolved			100.7		%		80-120	28-MAY-19
Barium (Ba)-Dissolved			107.3		%		80-120	28-MAY-19
Bismuth (Bi)-Dissolved			101.5		%		80-120	28-MAY-19
Boron (B)-Dissolved			94.1		%		80-120	28-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4646589							
WG3058816-2	LCS							
Cadmium (Cd)-Dissolved			102.1		%		80-120	28-MAY-19
Calcium (Ca)-Dissolved			97.7		%		80-120	28-MAY-19
Chromium (Cr)-Dissolved			103.0		%		80-120	28-MAY-19
Cobalt (Co)-Dissolved			101.6		%		80-120	28-MAY-19
Iron (Fe)-Dissolved			99.96		%		80-120	28-MAY-19
Lead (Pb)-Dissolved			102.9		%		80-120	28-MAY-19
Lithium (Li)-Dissolved			95.9		%		80-120	28-MAY-19
Magnesium (Mg)-Dissolved			97.6		%		80-120	28-MAY-19
Manganese (Mn)-Dissolved			105.3		%		80-120	28-MAY-19
Molybdenum (Mo)-Dissolved			99.0		%		80-120	28-MAY-19
Nickel (Ni)-Dissolved			100.8		%		80-120	28-MAY-19
Potassium (K)-Dissolved			110.4		%		80-120	28-MAY-19
Selenium (Se)-Dissolved			100.3		%		80-120	28-MAY-19
Silicon (Si)-Dissolved			108.7		%		60-140	28-MAY-19
Silver (Ag)-Dissolved			98.8		%		80-120	28-MAY-19
Sodium (Na)-Dissolved			106.4		%		80-120	28-MAY-19
Strontium (Sr)-Dissolved			98.0		%		80-120	28-MAY-19
Thallium (Tl)-Dissolved			101.7		%		80-120	28-MAY-19
Tin (Sn)-Dissolved			98.9		%		80-120	28-MAY-19
Titanium (Ti)-Dissolved			99.97		%		80-120	28-MAY-19
Uranium (U)-Dissolved			100.9		%		80-120	28-MAY-19
Vanadium (V)-Dissolved			102.6		%		80-120	28-MAY-19
Zinc (Zn)-Dissolved			101.3		%		80-120	28-MAY-19
WG3058816-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	28-MAY-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	28-MAY-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	28-MAY-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	28-MAY-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	28-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	28-MAY-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	28-MAY-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	28-MAY-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	28-MAY-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	28-MAY-19

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MET-D-CCMS-VA								
	Water							
Batch	R4646589							
WG3058816-1	MB	LF						
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	28-MAY-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	28-MAY-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	28-MAY-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	28-MAY-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	28-MAY-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	28-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	28-MAY-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	28-MAY-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	28-MAY-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	28-MAY-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	28-MAY-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	28-MAY-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	28-MAY-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	28-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	28-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	28-MAY-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	28-MAY-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	28-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	28-MAY-19
Batch	R4647134							
WG3061071-2	LCS							
Aluminum (Al)-Dissolved			102.8		%		80-120	29-MAY-19
Antimony (Sb)-Dissolved			95.3		%		80-120	29-MAY-19
Arsenic (As)-Dissolved			101.8		%		80-120	29-MAY-19
Barium (Ba)-Dissolved			113.2		%		80-120	29-MAY-19
Bismuth (Bi)-Dissolved			108.6		%		80-120	29-MAY-19
Boron (B)-Dissolved			98.5		%		80-120	29-MAY-19
Cadmium (Cd)-Dissolved			104.2		%		80-120	29-MAY-19
Calcium (Ca)-Dissolved			103.9		%		80-120	29-MAY-19
Chromium (Cr)-Dissolved			105.4		%		80-120	29-MAY-19
Cobalt (Co)-Dissolved			103.3		%		80-120	29-MAY-19
Copper (Cu)-Dissolved			101.3		%		80-120	29-MAY-19
Iron (Fe)-Dissolved			96.2		%		80-120	29-MAY-19
Lead (Pb)-Dissolved			101.5		%		80-120	29-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4647134							
WG3061071-2	LCS							
Lithium (Li)-Dissolved			100.0		%		80-120	29-MAY-19
Magnesium (Mg)-Dissolved			102.2		%		80-120	29-MAY-19
Manganese (Mn)-Dissolved			103.7		%		80-120	29-MAY-19
Molybdenum (Mo)-Dissolved			104.4		%		80-120	29-MAY-19
Nickel (Ni)-Dissolved			101.7		%		80-120	29-MAY-19
Potassium (K)-Dissolved			106.3		%		80-120	29-MAY-19
Selenium (Se)-Dissolved			101.4		%		80-120	29-MAY-19
Silicon (Si)-Dissolved			104.7		%		60-140	29-MAY-19
Silver (Ag)-Dissolved			102.6		%		80-120	29-MAY-19
Sodium (Na)-Dissolved			107.0		%		80-120	29-MAY-19
Strontium (Sr)-Dissolved			101.6		%		80-120	29-MAY-19
Thallium (Tl)-Dissolved			101.5		%		80-120	29-MAY-19
Tin (Sn)-Dissolved			100.5		%		80-120	29-MAY-19
Titanium (Ti)-Dissolved			101.5		%		80-120	29-MAY-19
Uranium (U)-Dissolved			95.2		%		80-120	29-MAY-19
Vanadium (V)-Dissolved			107.1		%		80-120	29-MAY-19
Zinc (Zn)-Dissolved			100.9		%		80-120	29-MAY-19
WG3061071-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	29-MAY-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	29-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	29-MAY-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	29-MAY-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	29-MAY-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	29-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	29-MAY-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	29-MAY-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	29-MAY-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	29-MAY-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4647134							
WG3061071-1 MB		LF						
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	29-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	29-MAY-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	29-MAY-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	29-MAY-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	29-MAY-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	29-MAY-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	29-MAY-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	29-MAY-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	29-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	29-MAY-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	29-MAY-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	29-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	29-MAY-19
MET-T-CCMS-VA								
	Water							
Batch	R4645127							
WG3058750-3 DUP		L2278988-1						
Aluminum (Al)-Total		0.618	0.627		mg/L	1.5	20	27-MAY-19
Antimony (Sb)-Total		0.00038	0.00039		mg/L	3.4	20	27-MAY-19
Arsenic (As)-Total		0.00403	0.00400		mg/L	0.8	20	27-MAY-19
Barium (Ba)-Total		4.66	4.56		mg/L	2.1	20	27-MAY-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAY-19
Boron (B)-Total		0.024	0.024		mg/L	1.1	20	27-MAY-19
Cadmium (Cd)-Total		0.000259	0.000243		mg/L	6.3	20	27-MAY-19
Calcium (Ca)-Total		62.2	62.3		mg/L	0.2	20	27-MAY-19
Chromium (Cr)-Total		0.00242	0.00243		mg/L	0.5	20	27-MAY-19
Cobalt (Co)-Total		0.00106	0.00110		mg/L	3.8	20	27-MAY-19
Copper (Cu)-Total		0.0202	0.0202		mg/L	0.3	20	27-MAY-19
Iron (Fe)-Total		5.75	5.80		mg/L	0.9	20	27-MAY-19
Lead (Pb)-Total		0.00333	0.00328		mg/L	1.5	20	27-MAY-19
Lithium (Li)-Total		0.698	0.711		mg/L	1.9	20	27-MAY-19
Magnesium (Mg)-Total		43.5	43.5		mg/L	0.0	20	27-MAY-19
Manganese (Mn)-Total		0.0500	0.0510		mg/L	1.9	20	27-MAY-19
Molybdenum (Mo)-Total		0.0228	0.0230		mg/L	0.7	20	27-MAY-19

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MET-T-CCMS-VA								
	Water							
Batch	R4645127							
WG3058750-3	DUP	L2278988-1						
Nickel (Ni)-Total		0.00481	0.00486		mg/L	1.1	20	27-MAY-19
Potassium (K)-Total		26.6	26.6		mg/L	0.0	20	27-MAY-19
Selenium (Se)-Total		<0.00015	<0.00015	RPD-NA	mg/L	N/A	20	27-MAY-19
Silicon (Si)-Total		3.95	3.93		mg/L	0.5	20	27-MAY-19
Silver (Ag)-Total		0.000052	0.000055		mg/L	6.9	20	27-MAY-19
Sodium (Na)-Total		43.7	44.8		mg/L	2.6	20	27-MAY-19
Strontium (Sr)-Total		0.263	0.265		mg/L	0.8	20	27-MAY-19
Thallium (Tl)-Total		0.000039	0.000043		mg/L	10	20	27-MAY-19
Tin (Sn)-Total		0.00040	0.00038		mg/L	3.2	20	27-MAY-19
Titanium (Ti)-Total		0.010	0.010		mg/L	0.7	20	27-MAY-19
Uranium (U)-Total		0.000237	0.000243		mg/L	2.7	20	27-MAY-19
Vanadium (V)-Total		0.00530	0.00527		mg/L	0.5	20	27-MAY-19
Zinc (Zn)-Total		0.0454	0.0452		mg/L	0.5	20	27-MAY-19
WG3058750-2	LCS							
Aluminum (Al)-Total			101.2		%		80-120	27-MAY-19
Antimony (Sb)-Total			101.9		%		80-120	27-MAY-19
Arsenic (As)-Total			99.4		%		80-120	27-MAY-19
Barium (Ba)-Total			103.8		%		80-120	27-MAY-19
Bismuth (Bi)-Total			103.1		%		80-120	27-MAY-19
Boron (B)-Total			99.5		%		80-120	27-MAY-19
Cadmium (Cd)-Total			99.3		%		80-120	27-MAY-19
Calcium (Ca)-Total			99.5		%		80-120	27-MAY-19
Chromium (Cr)-Total			99.8		%		80-120	27-MAY-19
Cobalt (Co)-Total			99.8		%		80-120	27-MAY-19
Copper (Cu)-Total			100.6		%		80-120	27-MAY-19
Iron (Fe)-Total			92.6		%		80-120	27-MAY-19
Lead (Pb)-Total			99.5		%		80-120	27-MAY-19
Lithium (Li)-Total			95.5		%		80-120	27-MAY-19
Magnesium (Mg)-Total			100.2		%		80-120	27-MAY-19
Manganese (Mn)-Total			99.7		%		80-120	27-MAY-19
Molybdenum (Mo)-Total			104.8		%		80-120	27-MAY-19
Nickel (Ni)-Total			99.3		%		80-120	27-MAY-19
Potassium (K)-Total			96.8		%		80-120	27-MAY-19
Selenium (Se)-Total			96.7		%		80-120	27-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4645127							
WG3058750-2 LCS								
Silicon (Si)-Total			100.1		%		80-120	27-MAY-19
Silver (Ag)-Total			100.0		%		80-120	27-MAY-19
Sodium (Na)-Total			110.3		%		80-120	27-MAY-19
Strontium (Sr)-Total			101.0		%		80-120	27-MAY-19
Thallium (Tl)-Total			99.2		%		80-120	27-MAY-19
Tin (Sn)-Total			102.5		%		80-120	27-MAY-19
Titanium (Ti)-Total			97.1		%		80-120	27-MAY-19
Uranium (U)-Total			99.98		%		80-120	27-MAY-19
Vanadium (V)-Total			101.6		%		80-120	27-MAY-19
Zinc (Zn)-Total			101.7		%		80-120	27-MAY-19
WG3058750-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	27-MAY-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	27-MAY-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	27-MAY-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	27-MAY-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	27-MAY-19
Boron (B)-Total			<0.010		mg/L		0.01	27-MAY-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	27-MAY-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	27-MAY-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	27-MAY-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	27-MAY-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	27-MAY-19
Iron (Fe)-Total			<0.010		mg/L		0.01	27-MAY-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	27-MAY-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	27-MAY-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	27-MAY-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	27-MAY-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	27-MAY-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	27-MAY-19
Potassium (K)-Total			<0.050		mg/L		0.05	27-MAY-19
Selenium (Se)-Total			0.000073	MB-LOR	mg/L		0.00005	27-MAY-19
Silicon (Si)-Total			<0.10		mg/L		0.1	27-MAY-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	27-MAY-19
Sodium (Na)-Total			<0.050		mg/L		0.05	27-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4645127							
WG3058750-1	MB							
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	27-MAY-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	27-MAY-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	27-MAY-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	27-MAY-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	27-MAY-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	27-MAY-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	27-MAY-19
WG3058750-4	MS	L2278988-2						
Aluminum (Al)-Total			98.3		%		70-130	27-MAY-19
Antimony (Sb)-Total			97.0		%		70-130	27-MAY-19
Arsenic (As)-Total			99.9		%		70-130	27-MAY-19
Barium (Ba)-Total			N/A	MS-B	%		-	27-MAY-19
Bismuth (Bi)-Total			90.1		%		70-130	27-MAY-19
Boron (B)-Total			99.0		%		70-130	27-MAY-19
Cadmium (Cd)-Total			106.8		%		70-130	27-MAY-19
Calcium (Ca)-Total			N/A	MS-B	%		-	27-MAY-19
Chromium (Cr)-Total			95.5		%		70-130	27-MAY-19
Cobalt (Co)-Total			92.5		%		70-130	27-MAY-19
Copper (Cu)-Total			92.8		%		70-130	27-MAY-19
Iron (Fe)-Total			92.9		%		70-130	27-MAY-19
Lead (Pb)-Total			91.5		%		70-130	27-MAY-19
Lithium (Li)-Total			92.3		%		70-130	27-MAY-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	27-MAY-19
Manganese (Mn)-Total			N/A	MS-B	%		-	27-MAY-19
Molybdenum (Mo)-Total			98.0		%		70-130	27-MAY-19
Nickel (Ni)-Total			93.7		%		70-130	27-MAY-19
Potassium (K)-Total			101.0		%		70-130	27-MAY-19
Selenium (Se)-Total			98.4		%		70-130	27-MAY-19
Silicon (Si)-Total			91.5		%		70-130	27-MAY-19
Silver (Ag)-Total			94.0		%		70-130	27-MAY-19
Sodium (Na)-Total			105.8		%		70-130	27-MAY-19
Strontium (Sr)-Total			N/A	MS-B	%		-	27-MAY-19
Thallium (Tl)-Total			92.5		%		70-130	27-MAY-19
Tin (Sn)-Total			99.2		%		70-130	27-MAY-19

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MET-T-CCMS-VA								
	Water							
Batch	R4645127							
WG3058750-4	MS	L2278988-2						
Titanium (Ti)-Total			99.3		%		70-130	27-MAY-19
Uranium (U)-Total			92.0		%		70-130	27-MAY-19
Vanadium (V)-Total			98.3		%		70-130	27-MAY-19
Zinc (Zn)-Total			96.1		%		70-130	27-MAY-19
NH3-L-F-CL								
	Water							
Batch	R4653519							
WG3065030-10	LCS							
Ammonia as N			95.2		%		85-115	01-JUN-19
WG3065030-9	MB							
Ammonia as N			<0.0050		mg/L		0.005	01-JUN-19
NO2-L-IC-N-CL								
	Water							
Batch	R4644755							
WG3059401-11	DUP	L2278988-3						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	24-MAY-19
WG3059401-10	LCS							
Nitrite (as N)			102.1		%		90-110	24-MAY-19
WG3059401-9	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	24-MAY-19
WG3059401-12	MS	L2278988-3						
Nitrite (as N)			101.6		%		75-125	24-MAY-19
NO3-L-IC-N-CL								
	Water							
Batch	R4644755							
WG3059401-11	DUP	L2278988-3						
Nitrate (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	24-MAY-19
WG3059401-10	LCS							
Nitrate (as N)			99.4		%		90-110	24-MAY-19
WG3059401-9	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	24-MAY-19
WG3059401-12	MS	L2278988-3						
Nitrate (as N)			99.0		%		75-125	24-MAY-19
ORP-CL								
	Water							
Batch	R4648826							
WG3061974-5	CRM	CL-ORP						
ORP			226		mV		210-230	29-MAY-19
P-T-L-COL-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-CL Water								
Batch	R4651380							
WG3063247-6	LCS							
Phosphorus (P)-Total			107.6		%		80-120	30-MAY-19
WG3063247-5	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	30-MAY-19
PH-CL Water								
Batch	R4653055							
WG3063840-15	DUP	L2278988-1						
pH		8.34	8.34	J	pH	0.00	0.2	30-MAY-19
WG3063840-14	LCS							
pH			7.01		pH		6.9-7.1	30-MAY-19
PO4-DO-L-COL-CL Water								
Batch	R4644179							
WG3058443-14	DUP	L2278988-5						
Orthophosphate-Dissolved (as P)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-MAY-19
WG3058443-10	LCS							
Orthophosphate-Dissolved (as P)			100.0		%		80-120	25-MAY-19
WG3058443-13	LCS							
Orthophosphate-Dissolved (as P)			100.0		%		80-120	25-MAY-19
WG3058443-2	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	25-MAY-19
WG3058443-3	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	25-MAY-19
SO4-IC-N-CL Water								
Batch	R4644755							
WG3059401-11	DUP	L2278988-3						
Sulfate (SO4)		<0.30	<0.30	RPD-NA	mg/L	N/A	20	24-MAY-19
WG3059401-10	LCS							
Sulfate (SO4)			99.7		%		90-110	24-MAY-19
WG3059401-9	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	24-MAY-19
WG3059401-12	MS	L2278988-3						
Sulfate (SO4)			99.0		%		75-125	24-MAY-19
SOLIDS-TDS-CL Water								
Batch	R4651218							
WG3061435-8	LCS							
Total Dissolved Solids			94.9		%		85-115	29-MAY-19
WG3061435-7	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL								
Batch	R4651218							
WG3061435-7 MB								
Total Dissolved Solids			<10		mg/L		10	29-MAY-19
TKN-L-F-CL								
Batch	R4651431							
WG3063294-8 DUP		L2278988-2						
Total Kjeldahl Nitrogen		<0.050	<0.050	RPD-NA	mg/L	N/A	20	31-MAY-19
WG3063294-2 LCS								
Total Kjeldahl Nitrogen			95.2		%		75-125	30-MAY-19
WG3063294-5 LCS								
Total Kjeldahl Nitrogen			96.7		%		75-125	30-MAY-19
WG3063294-7 LCS								
Total Kjeldahl Nitrogen			93.0		%		75-125	30-MAY-19
WG3063294-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	30-MAY-19
WG3063294-4 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	30-MAY-19
WG3063294-6 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	30-MAY-19
WG3063294-9 MS		L2278988-2						
Total Kjeldahl Nitrogen			95.6		%		70-130	31-MAY-19
TSS-L-CL								
Batch	R4652806							
WG3063292-4 LCS								
Total Suspended Solids			96.6		%		85-115	30-MAY-19
WG3063292-6 LCS								
Total Suspended Solids			94.8		%		85-115	30-MAY-19
WG3063292-3 MB								
Total Suspended Solids			<1.0		mg/L		1	30-MAY-19
WG3063292-5 MB								
Total Suspended Solids			<1.0		mg/L		1	30-MAY-19
TURBIDITY-CL								
Batch	R4643908							
WG3058386-14 LCS								
Turbidity			98.5		%		85-115	24-MAY-19
WG3058386-13 MB								
Turbidity			<0.10		NTU		0.1	24-MAY-19

Quality Control Report

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Report Date: 04-JUN-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2278988

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	23-MAY-19 12:35	29-MAY-19 15:10	0.25	147	hours	EHTR-FM
	2	23-MAY-19 11:20	29-MAY-19 15:10	0.25	148	hours	EHTR-FM
	3	23-MAY-19 14:00	29-MAY-19 15:10	0.25	145	hours	EHTR-FM
	4	23-MAY-19 11:25	29-MAY-19 15:10	0.25	148	hours	EHTR-FM
	5	23-MAY-19 12:40	29-MAY-19 15:10	0.25	146	hours	EHTR-FM
pH	1	23-MAY-19 12:35	30-MAY-19 16:00	0.25	171	hours	EHTR-FM
	2	23-MAY-19 11:20	30-MAY-19 16:00	0.25	173	hours	EHTR-FM
	3	23-MAY-19 14:00	30-MAY-19 16:00	0.25	170	hours	EHTR-FM
	4	23-MAY-19 11:25	30-MAY-19 16:00	0.25	173	hours	EHTR-FM
	5	23-MAY-19 12:40	30-MAY-19 16:00	0.25	171	hours	EHTR-FM

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2278988 were received on 24-MAY-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: **20190523 DC GW** TURNAROUND TIME: RUSH:


PROJECT/CLIENT INFO				LABORATORY				OTHER INFO					
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD	
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	chris.blurton@teck.com		x	x	x
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com				
Address	Box 2003			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com		x	x	x
	15km North Hwy 43							Email 4:	kirsten.campbell@teck.com		x	x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	K2000608129				
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada						
Phone Number	250-425-3196			Phone Number	403 407 1794								

SAMPLE DETAILS								ANALYSIS REQUESTED											
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PH	Y	Y	Y	N	N	N	N				
								PRESERVE	H2SO4	HCL	HNO3	HNO3	NONE	H2SO4	HCL				
								ANALYSIS	ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC	HG-T-CVAF-VA				
LC_P1ZDC1404D_WG_Q2-2019_NP	LC_P1ZDC1404D	WG		2019/05/23	12:35	G	6		1	1	1	1	1	1					
LC_P1ZDC1404S_WG_Q2-2019_NP	LC_P1ZDC1404S	WG		2019/05/23	11:20	G	6		1	1	1	1	1	1					
WG_Q2-2019_RD1	LC_TBLANK	WG		2019/05/23	14:00	G	4				1	1	1	1					
WG_Q2-2019_CC1	LC_P1ZDC1404S	WG		2019/05/23	11:25	G	6		1	1	1	1	1	1					
WG_Q2-2019_MT1	LC_P1ZDC1404D	WG		2019/05/23	12:40	G	7		1	1	1	1	1	1	1				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
PLEASE FORWARD THIS SAMPLE TO ALS BURNABY FOR ANALYSIS	D.Tymstra/K.Campbell	23-May		5/24 9:00

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #	Sampler's Signature	Date/Time
Regular (default) <input checked="" type="checkbox"/> Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	K. Campbell/D. Tymstra			May 23, 2019

50



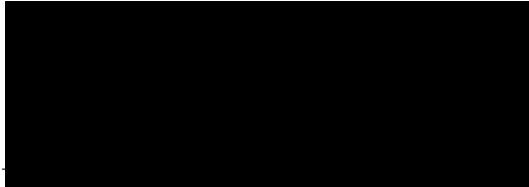
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 28-MAY-19
Report Date: 04-JUN-19 16:38 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2280642
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190527 PIZP 1104
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2280642-1 LC_PIZP1104_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 27-MAY-19 @ 11:50							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.08		0.50	mg/L		29-MAY-19	R4653370
Total Kjeldahl Nitrogen	0.134		0.050	mg/L		02-JUN-19	R4653955
Total Organic Carbon	0.99		0.50	mg/L		29-MAY-19	R4653370
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	31-MAY-19	31-MAY-19	R4652862
Dissolved Metals Filtration Location	FIELD					31-MAY-19	R4651587
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	30-MAY-19	01-JUN-19	R4653301
Dissolved Mercury Filtration Location	FIELD					30-MAY-19	R4651538
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					31-MAY-19	R4651587
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	31-MAY-19	31-MAY-19	R4652862
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Arsenic (As)-Dissolved	0.00121		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Barium (Ba)-Dissolved	0.314		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	31-MAY-19	31-MAY-19	R4652862
Boron (B)-Dissolved	0.024		0.010	mg/L	31-MAY-19	31-MAY-19	R4652862
Cadmium (Cd)-Dissolved	0.0069		0.0050	ug/L	31-MAY-19	31-MAY-19	R4652862
Calcium (Ca)-Dissolved	128		0.050	mg/L	31-MAY-19	31-MAY-19	R4652862
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Cobalt (Co)-Dissolved	1.68		0.10	ug/L	31-MAY-19	31-MAY-19	R4652862
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	31-MAY-19	31-MAY-19	R4652862
Iron (Fe)-Dissolved	1.73		0.010	mg/L	31-MAY-19	31-MAY-19	R4652862
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	31-MAY-19	31-MAY-19	R4652862
Lithium (Li)-Dissolved	0.0184		0.0010	mg/L	31-MAY-19	31-MAY-19	R4652862
Magnesium (Mg)-Dissolved	44.2		0.10	mg/L	31-MAY-19	31-MAY-19	R4652862
Manganese (Mn)-Dissolved	1.07		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Molybdenum (Mo)-Dissolved	0.00246		0.000050	mg/L	31-MAY-19	31-MAY-19	R4652862
Nickel (Ni)-Dissolved	0.00256		0.00050	mg/L	31-MAY-19	31-MAY-19	R4652862
Potassium (K)-Dissolved	2.51		0.050	mg/L	31-MAY-19	31-MAY-19	R4652862
Selenium (Se)-Dissolved	0.137		0.050	ug/L	31-MAY-19	31-MAY-19	R4652862
Silicon (Si)-Dissolved	4.98		0.050	mg/L	31-MAY-19	31-MAY-19	R4652862
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	31-MAY-19	31-MAY-19	R4652862
Sodium (Na)-Dissolved	13.4		0.050	mg/L	31-MAY-19	31-MAY-19	R4652862
Strontium (Sr)-Dissolved	0.461		0.00020	mg/L	31-MAY-19	31-MAY-19	R4652862
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	31-MAY-19	31-MAY-19	R4652862
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	31-MAY-19	31-MAY-19	R4652862
Uranium (U)-Dissolved	0.00366		0.000010	mg/L	31-MAY-19	31-MAY-19	R4652862
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	31-MAY-19	31-MAY-19	R4652862
Zinc (Zn)-Dissolved	0.0071		0.0010	mg/L	31-MAY-19	31-MAY-19	R4652862
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	501		0.50	mg/L		03-JUN-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		31-MAY-19	R4653185
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.110		0.0030	mg/L		31-MAY-19	R4653185
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		31-MAY-19	R4653185
Arsenic (As)-Total	0.00139		0.00010	mg/L		31-MAY-19	R4653185

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2280642-1 LC_PIZP1104_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 27-MAY-19 @ 11:50							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.330		0.00010	mg/L		31-MAY-19	R4653185
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		31-MAY-19	R4653185
Boron (B)-Total	0.021		0.010	mg/L		31-MAY-19	R4653185
Cadmium (Cd)-Total	0.0271		0.0050	ug/L		31-MAY-19	R4653185
Calcium (Ca)-Total	134		0.050	mg/L		31-MAY-19	R4653185
Chromium (Cr)-Total	0.00080		0.00010	mg/L		31-MAY-19	R4653185
Cobalt (Co)-Total	1.49		0.10	ug/L		31-MAY-19	R4653185
Copper (Cu)-Total	0.00297		0.00050	mg/L		31-MAY-19	R4653185
Iron (Fe)-Total	2.53		0.010	mg/L		31-MAY-19	R4653185
Lead (Pb)-Total	0.000203		0.000050	mg/L		31-MAY-19	R4653185
Lithium (Li)-Total	0.0180		0.0010	mg/L		31-MAY-19	R4653185
Magnesium (Mg)-Total	45.5		0.10	mg/L		31-MAY-19	R4653185
Manganese (Mn)-Total	0.883		0.00010	mg/L		31-MAY-19	R4653185
Molybdenum (Mo)-Total	0.00208		0.000050	mg/L		31-MAY-19	R4653185
Nickel (Ni)-Total	0.00267		0.00050	mg/L		31-MAY-19	R4653185
Potassium (K)-Total	2.39		0.050	mg/L		31-MAY-19	R4653185
Selenium (Se)-Total	0.070		0.050	ug/L		31-MAY-19	R4653185
Silicon (Si)-Total	5.02		0.10	mg/L		31-MAY-19	R4653185
Silver (Ag)-Total	<0.000010		0.000010	mg/L		31-MAY-19	R4653185
Sodium (Na)-Total	12.7		0.050	mg/L		31-MAY-19	R4653185
Strontium (Sr)-Total	0.436		0.00020	mg/L		31-MAY-19	R4653185
Thallium (Tl)-Total	0.000015		0.000010	mg/L		31-MAY-19	R4653185
Tin (Sn)-Total	<0.00010		0.00010	mg/L		31-MAY-19	R4653185
Titanium (Ti)-Total	<0.010		0.010	mg/L		31-MAY-19	R4653185
Uranium (U)-Total	0.00387		0.000010	mg/L		31-MAY-19	R4653185
Vanadium (V)-Total	0.00051		0.00050	mg/L		31-MAY-19	R4653185
Zinc (Zn)-Total	0.0076		0.0030	mg/L		31-MAY-19	R4653185
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	12.2		1.0	mg/L		03-JUN-19	R4656522
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	267		1.0	mg/L		03-JUN-19	R4656666
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		03-JUN-19	R4656666
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		03-JUN-19	R4656666
Alkalinity, Total (as CaCO3)	267		1.0	mg/L		03-JUN-19	R4656666
Ammonia, Total (as N)							
Ammonia as N	0.0151		0.0050	mg/L		03-JUN-19	R4656091
Bromide in Water by IC (Low Level)							
Bromide (Br)	2.34		0.050	mg/L		29-MAY-19	R4650451
Chloride in Water by IC							
Chloride (Cl)	181		0.50	mg/L		29-MAY-19	R4650451
Electrical Conductivity (EC)							
Conductivity (@ 25C)	1070		2.0	uS/cm		03-JUN-19	R4656666
Fluoride in Water by IC							
Fluoride (F)	0.364		0.020	mg/L		29-MAY-19	R4650451
Ion Balance Calculation							
Cation - Anion Balance	-2.4			%		04-JUN-19	
Anion Sum	11.3			meq/L		04-JUN-19	
Cation Sum	10.8			meq/L		04-JUN-19	
Ion Balance Calculation							
Ion Balance	95.3		-100	%		04-JUN-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2280642-1 LC_PIZP1104_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 27-MAY-19 @ 11:50							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.165		0.0050	mg/L		29-MAY-19	R4650451
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0019		0.0010	mg/L		29-MAY-19	R4650451
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0010		0.0010	mg/L		29-MAY-19	R4651439
Oxidation redution potential by elect.							
ORP	317		-1000	mV		03-JUN-19	R4655009
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0576		0.0020	mg/L		31-MAY-19	R4654027
Sulfate in Water by IC							
Sulfate (SO4)	40.3		0.30	mg/L		29-MAY-19	R4650451
Total Dissolved Solids							
Total Dissolved Solids	838	DLHC	20	mg/L		01-JUN-19	R4654421
Total Suspended Solids							
Total Suspended Solids	17.7		1.0	mg/L		03-JUN-19	R4655806
Turbidity							
Turbidity	26.4		0.10	NTU		30-MAY-19	R4652366
pH							
pH	8.10		0.10	pH		03-JUN-19	R4656666

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190527 PIZP 1104

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2280642

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4656522							
WG3066693-5	LCS							
Acidity (as CaCO3)			104.2		%		85-115	03-JUN-19
WG3066693-4	MB							
Acidity (as CaCO3)			1.0		mg/L		2	03-JUN-19
ALK-MAN-CL								
	Water							
Batch	R4656666							
WG3066728-2	LCS							
Alkalinity, Total (as CaCO3)			102.1		%		85-115	03-JUN-19
WG3066728-1	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	03-JUN-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4652862							
WG3063547-2	LCS							
Beryllium (Be)-Dissolved			106.4		%		80-120	31-MAY-19
WG3063547-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	31-MAY-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4653185							
WG3063362-2	LCS							
Beryllium (Be)-Total			95.1		%		80-120	31-MAY-19
WG3063362-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	31-MAY-19
BR-L-IC-N-CL								
	Water							
Batch	R4650451							
WG3062671-2	LCS							
Bromide (Br)			101.3		%		85-115	29-MAY-19
WG3062671-1	MB							
Bromide (Br)			<0.050		mg/L		0.05	29-MAY-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4653370							
WG3064875-2	LCS							
Dissolved Organic Carbon			102.5		%		80-120	31-MAY-19
WG3064875-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	31-MAY-19
C-TOT-ORG-LOW-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL								
Water								
Batch R4653370								
WG3064875-2 LCS								
Total Organic Carbon			105.5		%		80-120	31-MAY-19
WG3064875-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	31-MAY-19
CL-IC-N-CL								
Water								
Batch R4650451								
WG3062671-2 LCS								
Chloride (Cl)			99.9		%		90-110	29-MAY-19
WG3062671-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	29-MAY-19
EC-L-PCT-CL								
Water								
Batch R4656666								
WG3066728-2 LCS								
Conductivity (@ 25C)			100.5		%		90-110	03-JUN-19
WG3066728-1 MB								
Conductivity (@ 25C)			<2.0		uS/cm		2	03-JUN-19
F-IC-N-CL								
Water								
Batch R4650451								
WG3062671-2 LCS								
Fluoride (F)			104.9		%		90-110	29-MAY-19
WG3062671-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	29-MAY-19
HG-D-CVAA-VA								
Water								
Batch R4653301								
WG3063459-6 LCS								
Mercury (Hg)-Dissolved			104.1		%		80-120	01-JUN-19
WG3063459-5 MB								
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	01-JUN-19
MET-D-CCMS-VA								
Water								
Batch R4652862								
WG3063547-2 LCS								
Aluminum (Al)-Dissolved			106.8		%		80-120	31-MAY-19
Antimony (Sb)-Dissolved			99.9		%		80-120	31-MAY-19
Arsenic (As)-Dissolved			103.8		%		80-120	31-MAY-19
Barium (Ba)-Dissolved			100.2		%		80-120	31-MAY-19
Bismuth (Bi)-Dissolved			103.6		%		80-120	31-MAY-19
Boron (B)-Dissolved			102.6		%		80-120	31-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4652862							
WG3063547-2	LCS							
Cadmium (Cd)-Dissolved			105.4		%		80-120	31-MAY-19
Calcium (Ca)-Dissolved			102.0		%		80-120	31-MAY-19
Chromium (Cr)-Dissolved			104.2		%		80-120	31-MAY-19
Cobalt (Co)-Dissolved			105.3		%		80-120	31-MAY-19
Copper (Cu)-Dissolved			102.8		%		80-120	31-MAY-19
Iron (Fe)-Dissolved			104.8		%		80-120	31-MAY-19
Lead (Pb)-Dissolved			105.3		%		80-120	31-MAY-19
Lithium (Li)-Dissolved			103.6		%		80-120	31-MAY-19
Magnesium (Mg)-Dissolved			102.2		%		80-120	31-MAY-19
Manganese (Mn)-Dissolved			108.7		%		80-120	31-MAY-19
Molybdenum (Mo)-Dissolved			104.0		%		80-120	31-MAY-19
Nickel (Ni)-Dissolved			105.5		%		80-120	31-MAY-19
Potassium (K)-Dissolved			105.0		%		80-120	31-MAY-19
Selenium (Se)-Dissolved			98.7		%		80-120	31-MAY-19
Silicon (Si)-Dissolved			103.8		%		60-140	31-MAY-19
Silver (Ag)-Dissolved			103.1		%		80-120	31-MAY-19
Sodium (Na)-Dissolved			105.8		%		80-120	31-MAY-19
Strontium (Sr)-Dissolved			105.2		%		80-120	31-MAY-19
Thallium (Tl)-Dissolved			107.9		%		80-120	31-MAY-19
Tin (Sn)-Dissolved			100.8		%		80-120	31-MAY-19
Titanium (Ti)-Dissolved			100.4		%		80-120	31-MAY-19
Uranium (U)-Dissolved			106.9		%		80-120	31-MAY-19
Vanadium (V)-Dissolved			105.8		%		80-120	31-MAY-19
Zinc (Zn)-Dissolved			107.7		%		80-120	31-MAY-19
WG3063547-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	31-MAY-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	31-MAY-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	31-MAY-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	31-MAY-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	31-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	31-MAY-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	31-MAY-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	31-MAY-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	31-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4652862							
WG3063547-1	MB	NP						
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	31-MAY-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	31-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	31-MAY-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	31-MAY-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	31-MAY-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	31-MAY-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	31-MAY-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	31-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	31-MAY-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	31-MAY-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	31-MAY-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	31-MAY-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	31-MAY-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	31-MAY-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	31-MAY-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	31-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	31-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	31-MAY-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	31-MAY-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	31-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	31-MAY-19
MET-T-CCMS-VA								
	Water							
Batch	R4653185							
WG3063362-2	LCS							
Aluminum (Al)-Total			100.9		%		80-120	31-MAY-19
Antimony (Sb)-Total			113.0		%		80-120	31-MAY-19
Arsenic (As)-Total			102.9		%		80-120	31-MAY-19
Barium (Ba)-Total			108.6		%		80-120	31-MAY-19
Bismuth (Bi)-Total			107.8		%		80-120	31-MAY-19
Boron (B)-Total			93.2		%		80-120	31-MAY-19
Cadmium (Cd)-Total			104.2		%		80-120	31-MAY-19
Calcium (Ca)-Total			98.0		%		80-120	31-MAY-19
Chromium (Cr)-Total			103.0		%		80-120	31-MAY-19
Cobalt (Co)-Total			103.9		%		80-120	31-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4653185							
WG3063362-2	LCS							
Copper (Cu)-Total			102.2		%		80-120	31-MAY-19
Iron (Fe)-Total			95.4		%		80-120	31-MAY-19
Lead (Pb)-Total			105.8		%		80-120	31-MAY-19
Lithium (Li)-Total			94.1		%		80-120	31-MAY-19
Magnesium (Mg)-Total			102.7		%		80-120	31-MAY-19
Manganese (Mn)-Total			103.5		%		80-120	31-MAY-19
Molybdenum (Mo)-Total			102.3		%		80-120	31-MAY-19
Nickel (Ni)-Total			103.8		%		80-120	31-MAY-19
Potassium (K)-Total			102.6		%		80-120	31-MAY-19
Selenium (Se)-Total			99.9		%		80-120	31-MAY-19
Silicon (Si)-Total			107.1		%		80-120	31-MAY-19
Silver (Ag)-Total			102.8		%		80-120	31-MAY-19
Sodium (Na)-Total			106.3		%		80-120	31-MAY-19
Strontium (Sr)-Total			97.9		%		80-120	31-MAY-19
Thallium (Tl)-Total			108.2		%		80-120	31-MAY-19
Tin (Sn)-Total			99.7		%		80-120	31-MAY-19
Titanium (Ti)-Total			104.1		%		80-120	31-MAY-19
Uranium (U)-Total			105.5		%		80-120	31-MAY-19
Vanadium (V)-Total			103.2		%		80-120	31-MAY-19
Zinc (Zn)-Total			105.0		%		80-120	31-MAY-19
WG3063362-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	31-MAY-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	31-MAY-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	31-MAY-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	31-MAY-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	31-MAY-19
Boron (B)-Total			<0.010		mg/L		0.01	31-MAY-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	31-MAY-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	31-MAY-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	31-MAY-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	31-MAY-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	31-MAY-19
Iron (Fe)-Total			<0.010		mg/L		0.01	31-MAY-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	31-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4653185							
WG3063362-1	MB							
Lithium (Li)-Total			<0.0010		mg/L		0.001	31-MAY-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	31-MAY-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	31-MAY-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	31-MAY-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	31-MAY-19
Potassium (K)-Total			<0.050		mg/L		0.05	31-MAY-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	31-MAY-19
Silicon (Si)-Total			<0.10		mg/L		0.1	31-MAY-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	31-MAY-19
Sodium (Na)-Total			<0.050		mg/L		0.05	31-MAY-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	31-MAY-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	31-MAY-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	31-MAY-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	31-MAY-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	31-MAY-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	31-MAY-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	31-MAY-19
NH3-L-F-CL		Water						
Batch	R4656091							
WG3067027-10	LCS							
Ammonia as N			94.8		%		85-115	03-JUN-19
WG3067027-9	MB							
Ammonia as N			<0.0050		mg/L		0.005	03-JUN-19
NO2-L-IC-N-CL		Water						
Batch	R4650451							
WG3062671-2	LCS							
Nitrite (as N)			102.8		%		90-110	29-MAY-19
WG3062671-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	29-MAY-19
NO3-L-IC-N-CL		Water						
Batch	R4650451							
WG3062671-2	LCS							
Nitrate (as N)			100.0		%		90-110	29-MAY-19
WG3062671-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	29-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL		Water						
Batch	R4653955							
WG3065563-14	LCS							
Total Kjeldahl Nitrogen			90.8		%		75-125	02-JUN-19
WG3065563-2	LCS							
Total Kjeldahl Nitrogen			90.9		%		75-125	02-JUN-19
WG3065563-5	LCS							
Total Kjeldahl Nitrogen			91.8		%		75-125	02-JUN-19
WG3065563-8	LCS							
Total Kjeldahl Nitrogen			90.7		%		75-125	02-JUN-19
WG3065563-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	02-JUN-19
WG3065563-10	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	02-JUN-19
WG3065563-13	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	02-JUN-19
WG3065563-4	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	02-JUN-19
WG3065563-7	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	02-JUN-19
TSS-L-CL		Water						
Batch	R4655806							
WG3066198-5	LCS							
Total Suspended Solids			104.0		%		85-115	03-JUN-19
WG3066198-4	MB							
Total Suspended Solids			<1.0		mg/L		1	03-JUN-19
TURBIDITY-CL		Water						
Batch	R4652366							
WG3063857-8	LCS							
Turbidity			99.5		%		85-115	30-MAY-19
WG3063857-7	MB							
Turbidity			<0.10		NTU		0.1	30-MAY-19

Quality Control Report

Workorder: L2280642

Report Date: 04-JUN-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Quality Control Report

Workorder: L2280642

Report Date: 04-JUN-19

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	27-MAY-19 11:50	03-JUN-19 14:30	0.25	171	hours	EHTR-FM
pH	1	27-MAY-19 11:50	03-JUN-19 09:00	0.25	165	hours	EHTR-FM

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2280642 were received on 28-MAY-19 09:15.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: **20190527 PIZP 1104** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	chris.blurton@teck.com	x	x
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		x
Address	Box 2003			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com	x	x
	15km North Hwy 43							Email 4:	kirsten.campbell@teck.com	x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	VPO00608129		
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada				
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS **ANALYSIS REQUESTED** Filtered - F: Field, L: Lab, FL: Field & Lab, N: None

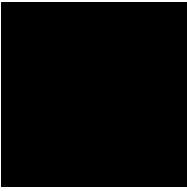
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS REQUESTED													
								ALS_Package-DOC	HG-D-CVA-F-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC								
LC_PIZP1104_WG_Q2-2019_NP	LC_PIZP1104	WG		2019/05/27	11:50	G	6	1	1	1	1	1	1								

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS PLEASE FORWARD METALS SAMPLES TO ALS BURNABY FOR ANALYSIS.	RELINQUISHED BY/AFFILIATION D.Tymstra/K.Campbell	DATE/TIME 27-May	ACCEPTED BY/AFFILIATION [Signature]	DATE/TIME 0915
---	--	----------------------------	---	--------------------------

SERVICE REQUEST (rush - subject to availability)

Regular (default) <input checked="" type="checkbox"/>	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS
Sampler's Name	K. Campbell/D. Tymstra		Mobile #
Sampler's Signature		Date/Time	May 27, 2019

80c



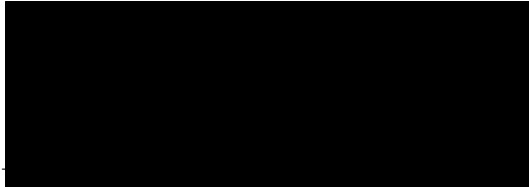
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 30-MAY-19
Report Date: 13-JUN-19 16:53 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2282430
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190529 DC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-1 LC_PIZDC1306_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @ 13:00							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.35		0.50	mg/L		03-JUN-19	R4656949
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		05-JUN-19	R4659365
Total Organic Carbon	1.43		0.50	mg/L		04-JUN-19	R4656949
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	03-JUN-19	04-JUN-19	R4655992
Dissolved Metals Filtration Location	FIELD					03-JUN-19	R4654109
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	03-JUN-19	04-JUN-19	R4655189
Dissolved Mercury Filtration Location	FIELD					03-JUN-19	R4654427
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					03-JUN-19	R4654109
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	03-JUN-19	04-JUN-19	R4655992
Antimony (Sb)-Dissolved	0.00021		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Barium (Ba)-Dissolved	0.187		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	03-JUN-19	04-JUN-19	R4655992
Boron (B)-Dissolved	0.010		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Cadmium (Cd)-Dissolved	0.131		0.0050	ug/L	03-JUN-19	04-JUN-19	R4655992
Calcium (Ca)-Dissolved	70.9		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	03-JUN-19	04-JUN-19	R4655992
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	03-JUN-19	04-JUN-19	R4655992
Lithium (Li)-Dissolved	0.0130		0.0010	mg/L	03-JUN-19	04-JUN-19	R4655992
Magnesium (Mg)-Dissolved	25.8		0.10	mg/L	03-JUN-19	04-JUN-19	R4655992
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Molybdenum (Mo)-Dissolved	0.00197		0.000050	mg/L	03-JUN-19	04-JUN-19	R4655992
Nickel (Ni)-Dissolved	0.00126		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Potassium (K)-Dissolved	2.29		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Selenium (Se)-Dissolved	3.05		0.050	ug/L	03-JUN-19	04-JUN-19	R4655992
Silicon (Si)-Dissolved	2.99		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Sodium (Na)-Dissolved	0.892		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Strontium (Sr)-Dissolved	0.0711		0.00020	mg/L	03-JUN-19	04-JUN-19	R4655992
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Uranium (U)-Dissolved	0.000900		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Vanadium (V)-Dissolved	0.00060		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Zinc (Zn)-Dissolved	0.0050		0.0010	mg/L	03-JUN-19	04-JUN-19	R4655992
Hardness							
Hardness (as CaCO3)	283		0.50	mg/L		04-JUN-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		03-JUN-19	R4654414
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0047		0.0030	mg/L		03-JUN-19	R4654414
Antimony (Sb)-Total	0.00020		0.00010	mg/L		03-JUN-19	R4654414
Arsenic (As)-Total	<0.00010		0.00010	mg/L		03-JUN-19	R4654414

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-1 LC_PIZDC1306_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @ 13:00							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.174		0.00010	mg/L		03-JUN-19	R4654414
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		03-JUN-19	R4654414
Boron (B)-Total	0.010		0.010	mg/L		03-JUN-19	R4654414
Cadmium (Cd)-Total	0.121		0.0050	ug/L		03-JUN-19	R4654414
Calcium (Ca)-Total	63.9		0.050	mg/L		03-JUN-19	R4654414
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		03-JUN-19	R4654414
Cobalt (Co)-Total	<0.10		0.10	ug/L		03-JUN-19	R4654414
Copper (Cu)-Total	<0.00050		0.00050	mg/L		03-JUN-19	R4654414
Iron (Fe)-Total	<0.010		0.010	mg/L		03-JUN-19	R4654414
Lead (Pb)-Total	0.000079		0.000050	mg/L		03-JUN-19	R4654414
Lithium (Li)-Total	0.0116		0.0010	mg/L		03-JUN-19	R4654414
Magnesium (Mg)-Total	24.4		0.10	mg/L		03-JUN-19	R4654414
Manganese (Mn)-Total	0.00020		0.00010	mg/L		03-JUN-19	R4654414
Molybdenum (Mo)-Total	0.00201		0.000050	mg/L		03-JUN-19	R4654414
Nickel (Ni)-Total	0.00107		0.00050	mg/L		03-JUN-19	R4654414
Potassium (K)-Total	2.05		0.050	mg/L		03-JUN-19	R4654414
Selenium (Se)-Total	2.86		0.050	ug/L		03-JUN-19	R4654414
Silicon (Si)-Total	3.16		0.10	mg/L		03-JUN-19	R4654414
Silver (Ag)-Total	<0.000010		0.000010	mg/L		03-JUN-19	R4654414
Sodium (Na)-Total	0.852		0.050	mg/L		03-JUN-19	R4654414
Strontium (Sr)-Total	0.0692		0.00020	mg/L		03-JUN-19	R4654414
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		03-JUN-19	R4654414
Tin (Sn)-Total	<0.00010		0.00010	mg/L		03-JUN-19	R4654414
Titanium (Ti)-Total	<0.010		0.010	mg/L		03-JUN-19	R4654414
Uranium (U)-Total	0.000834		0.000010	mg/L		03-JUN-19	R4654414
Vanadium (V)-Total	0.00070		0.00050	mg/L		03-JUN-19	R4654414
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		03-JUN-19	R4654414
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	4.9		1.0	mg/L		06-JUN-19	R4660564
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	253		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Carbonate (as CaCO3)	4.4		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Total (as CaCO3)	257		1.0	mg/L		06-JUN-19	R4661465
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		05-JUN-19	R4660309
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		31-MAY-19	R4654463
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		31-MAY-19	R4654463
Electrical Conductivity (EC)							
Conductivity (@ 25C)	480		2.0	uS/cm		06-JUN-19	R4661465
Fluoride in Water by IC							
Fluoride (F)	0.147		0.020	mg/L		31-MAY-19	R4654463
Ion Balance Calculation							
Ion Balance	109		-100	%		07-JUN-19	
Ion Balance Calculation							
Cation - Anion Balance	4.1			%		07-JUN-19	
Anion Sum	5.30			meq/L		07-JUN-19	
Cation Sum	5.76			meq/L		07-JUN-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-1 LC_PIZDC1306_WG_Q2-2019_NP Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @ 13:00 Matrix: WG							
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.171		0.0050	mg/L		31-MAY-19	R4654463
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		31-MAY-19	R4654463
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0019		0.0010	mg/L		31-MAY-19	R4653118
Oxidation redution potential by elect. ORP	384		-1000	mV		05-JUN-19	R4659791
Phosphorus (P)-Total Phosphorus (P)-Total	0.0022		0.0020	mg/L		04-JUN-19	R4658959
Sulfate in Water by IC Sulfate (SO4)	6.85		0.30	mg/L		31-MAY-19	R4654463
Total Dissolved Solids Total Dissolved Solids	247	DLHC	20	mg/L		04-JUN-19	R4659889
Total Suspended Solids Total Suspended Solids	1.2		1.0	mg/L		05-JUN-19	R4660306
Turbidity Turbidity	0.44		0.10	NTU		31-MAY-19	R4653349
pH pH	8.36		0.10	pH		06-JUN-19	R4661465
L2282430-2 LC_PIZDC1307_WG_Q2-2019_NP Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @ 11:20 Matrix: WG							
Miscellaneous Parameters Dissolved Organic Carbon	1.60		0.50	mg/L		03-JUN-19	R4656949
Total Kjeldahl Nitrogen	0.117		0.050	mg/L		05-JUN-19	R4659365
Total Organic Carbon	1.43		0.50	mg/L		04-JUN-19	R4656949
Dissolved Metals in Water Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	03-JUN-19	04-JUN-19	R4655992
Dissolved Metals Filtration Location	FIELD					03-JUN-19	R4654109
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	03-JUN-19	04-JUN-19	R4655189
Dissolved Mercury Filtration Location	FIELD					03-JUN-19	R4654427
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					03-JUN-19	R4654109
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	03-JUN-19	04-JUN-19	R4655992
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Arsenic (As)-Dissolved	0.00160		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Barium (Ba)-Dissolved	1.55		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	03-JUN-19	04-JUN-19	R4655992
Boron (B)-Dissolved	0.023		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Cadmium (Cd)-Dissolved	<0.015	DLM	0.015	ug/L	03-JUN-19	04-JUN-19	R4655992
Calcium (Ca)-Dissolved	42.5		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	03-JUN-19	04-JUN-19	R4655992
Copper (Cu)-Dissolved	0.00100		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Iron (Fe)-Dissolved	0.874		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	03-JUN-19	04-JUN-19	R4655992
Lithium (Li)-Dissolved	0.0802		0.0010	mg/L	03-JUN-19	04-JUN-19	R4655992
Magnesium (Mg)-Dissolved	22.2		0.10	mg/L	03-JUN-19	04-JUN-19	R4655992
Manganese (Mn)-Dissolved	0.00966		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-2 LC_PIZDC1307_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @ 11:20							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	0.0318		0.000050	mg/L	03-JUN-19	04-JUN-19	R4655992
Nickel (Ni)-Dissolved	0.00116		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Potassium (K)-Dissolved	5.37		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	03-JUN-19	04-JUN-19	R4655992
Silicon (Si)-Dissolved	2.82		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Sodium (Na)-Dissolved	14.8		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Strontium (Sr)-Dissolved	0.141		0.00020	mg/L	03-JUN-19	04-JUN-19	R4655992
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Uranium (U)-Dissolved	0.000035		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Zinc (Zn)-Dissolved	0.0079		0.0010	mg/L	03-JUN-19	04-JUN-19	R4655992
Hardness							
Hardness (as CaCO3)	197		0.50	mg/L		04-JUN-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		03-JUN-19	R4654414
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0210		0.0030	mg/L		03-JUN-19	R4654414
Antimony (Sb)-Total	0.00100		0.00010	mg/L		03-JUN-19	R4654414
Arsenic (As)-Total	0.00177		0.00010	mg/L		03-JUN-19	R4654414
Barium (Ba)-Total	1.42		0.00010	mg/L		03-JUN-19	R4654414
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		03-JUN-19	R4654414
Boron (B)-Total	0.023		0.010	mg/L		03-JUN-19	R4654414
Cadmium (Cd)-Total	<0.020	DLM	0.020	ug/L		03-JUN-19	R4654414
Calcium (Ca)-Total	39.3		0.050	mg/L		03-JUN-19	R4654414
Chromium (Cr)-Total	0.00037		0.00010	mg/L		03-JUN-19	R4654414
Cobalt (Co)-Total	<0.10		0.10	ug/L		03-JUN-19	R4654414
Copper (Cu)-Total	0.00114		0.00050	mg/L		03-JUN-19	R4654414
Iron (Fe)-Total	1.37		0.010	mg/L		03-JUN-19	R4654414
Lead (Pb)-Total	0.000180		0.000050	mg/L		03-JUN-19	R4654414
Lithium (Li)-Total	0.0738		0.0010	mg/L		03-JUN-19	R4654414
Magnesium (Mg)-Total	21.2		0.10	mg/L		03-JUN-19	R4654414
Manganese (Mn)-Total	0.00997		0.00010	mg/L		03-JUN-19	R4654414
Molybdenum (Mo)-Total	0.0326		0.000050	mg/L		03-JUN-19	R4654414
Nickel (Ni)-Total	0.00112		0.00050	mg/L		03-JUN-19	R4654414
Potassium (K)-Total	5.22		0.050	mg/L		03-JUN-19	R4654414
Selenium (Se)-Total	<0.050		0.050	ug/L		03-JUN-19	R4654414
Silicon (Si)-Total	3.08		0.10	mg/L		03-JUN-19	R4654414
Silver (Ag)-Total	<0.000010		0.000010	mg/L		03-JUN-19	R4654414
Sodium (Na)-Total	14.8		0.050	mg/L		03-JUN-19	R4654414
Strontium (Sr)-Total	0.135		0.00020	mg/L		03-JUN-19	R4654414
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		03-JUN-19	R4654414
Tin (Sn)-Total	<0.00010		0.00010	mg/L		03-JUN-19	R4654414
Titanium (Ti)-Total	<0.010		0.010	mg/L		03-JUN-19	R4654414
Uranium (U)-Total	0.000039		0.000010	mg/L		03-JUN-19	R4654414
Vanadium (V)-Total	<0.00050		0.00050	mg/L		03-JUN-19	R4654414
Zinc (Zn)-Total	0.0095		0.0030	mg/L		03-JUN-19	R4654414
Routine for Teck Coal							
Acidity by Automatic Titration							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-2 LC_PIZDC1307_WG_Q2-2019_NP Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @ 11:20 Matrix: WG							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.1		1.0	mg/L		06-JUN-19	R4660564
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	212		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Carbonate (as CaCO3)	8.2		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Total (as CaCO3)	220		1.0	mg/L		06-JUN-19	R4661465
Ammonia, Total (as N)							
Ammonia as N	0.0963		0.0050	mg/L		05-JUN-19	R4660309
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		31-MAY-19	R4654463
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		31-MAY-19	R4654463
Electrical Conductivity (EC)							
Conductivity (@ 25C)	402		2.0	uS/cm		06-JUN-19	R4661465
Fluoride in Water by IC							
Fluoride (F)	0.575		0.020	mg/L		31-MAY-19	R4654463
Ion Balance Calculation							
Ion Balance	108		-100	%		07-JUN-19	
Ion Balance Calculation							
Cation - Anion Balance	3.7			%		07-JUN-19	
Anion Sum	4.44			meq/L		07-JUN-19	
Cation Sum	4.78			meq/L		07-JUN-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0104		0.0050	mg/L		31-MAY-19	R4654463
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		31-MAY-19	R4654463
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		31-MAY-19	R4653118
Oxidation redution potential by elect.							
ORP	279		-1000	mV		05-JUN-19	R4659791
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0154		0.0020	mg/L		04-JUN-19	R4658959
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		31-MAY-19	R4654463
Total Dissolved Solids							
Total Dissolved Solids	209	DLHC	20	mg/L		04-JUN-19	R4659889
Total Suspended Solids							
Total Suspended Solids	2.5		1.0	mg/L		05-JUN-19	R4660306
Turbidity							
Turbidity	7.60		0.10	NTU		31-MAY-19	R4653349
pH							
pH	8.46		0.10	pH		06-JUN-19	R4661465
L2282430-3 LC_PIZDC1308_WG_Q2-2019_NP Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @ 10:50 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.36		0.50	mg/L		03-JUN-19	R4656949
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		05-JUN-19	R4659365
Total Organic Carbon	2.06		0.50	mg/L		03-JUN-19	R4656949
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	12-JUN-19	13-JUN-19	R4667451

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-3 LC_PIZDC1308_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @ 10:50							
Matrix: WG							
Diss. Be (low) in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					12-JUN-19	R4666746
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	03-JUN-19	04-JUN-19	R4655189
Dissolved Mercury Filtration Location	FIELD					03-JUN-19	R4654427
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					12-JUN-19	R4666746
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	12-JUN-19	13-JUN-19	R4667451
Antimony (Sb)-Dissolved	0.00010		0.00010	mg/L	12-JUN-19	13-JUN-19	R4667451
Arsenic (As)-Dissolved	0.00013		0.00010	mg/L	12-JUN-19	13-JUN-19	R4667451
Barium (Ba)-Dissolved	0.303		0.00010	mg/L	12-JUN-19	13-JUN-19	R4667451
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	12-JUN-19	13-JUN-19	R4667451
Boron (B)-Dissolved	<0.010		0.010	mg/L	12-JUN-19	13-JUN-19	R4667451
Cadmium (Cd)-Dissolved	0.126		0.0050	ug/L	12-JUN-19	13-JUN-19	R4667451
Calcium (Ca)-Dissolved	85.9		0.050	mg/L	12-JUN-19	13-JUN-19	R4667451
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	12-JUN-19	13-JUN-19	R4667451
Cobalt (Co)-Dissolved	0.44		0.10	ug/L	12-JUN-19	13-JUN-19	R4667451
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	12-JUN-19	13-JUN-19	R4667451
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	12-JUN-19	13-JUN-19	R4667451
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	12-JUN-19	13-JUN-19	R4667451
Lithium (Li)-Dissolved	0.0075		0.0010	mg/L	12-JUN-19	13-JUN-19	R4667451
Magnesium (Mg)-Dissolved	27.8		0.10	mg/L	12-JUN-19	13-JUN-19	R4667451
Manganese (Mn)-Dissolved	0.0152		0.00010	mg/L	12-JUN-19	13-JUN-19	R4667451
Molybdenum (Mo)-Dissolved	0.00167		0.000050	mg/L	12-JUN-19	13-JUN-19	R4667451
Nickel (Ni)-Dissolved	0.00144		0.00050	mg/L	12-JUN-19	13-JUN-19	R4667451
Potassium (K)-Dissolved	1.81		0.050	mg/L	12-JUN-19	13-JUN-19	R4667451
Selenium (Se)-Dissolved	0.266		0.050	ug/L	12-JUN-19	13-JUN-19	R4667451
Silicon (Si)-Dissolved	4.85		0.050	mg/L	12-JUN-19	13-JUN-19	R4667451
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	12-JUN-19	13-JUN-19	R4667451
Sodium (Na)-Dissolved	1.63		0.050	mg/L	12-JUN-19	13-JUN-19	R4667451
Strontium (Sr)-Dissolved	0.0946		0.00020	mg/L	12-JUN-19	13-JUN-19	R4667451
Thallium (Tl)-Dissolved	0.000025		0.000010	mg/L	12-JUN-19	13-JUN-19	R4667451
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	12-JUN-19	13-JUN-19	R4667451
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	12-JUN-19	13-JUN-19	R4667451
Uranium (U)-Dissolved	0.00125		0.000010	mg/L	12-JUN-19	13-JUN-19	R4667451
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	12-JUN-19	13-JUN-19	R4667451
Zinc (Zn)-Dissolved	0.0020		0.0010	mg/L	12-JUN-19	13-JUN-19	R4667451
Hardness							
Hardness (as CaCO3)	329		0.50	mg/L		13-JUN-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		03-JUN-19	R4654414
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0271		0.0030	mg/L		03-JUN-19	R4654414
Antimony (Sb)-Total	0.00012		0.00010	mg/L		03-JUN-19	R4654414
Arsenic (As)-Total	0.00024		0.00010	mg/L		03-JUN-19	R4654414
Barium (Ba)-Total	0.307		0.00010	mg/L		03-JUN-19	R4654414
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		03-JUN-19	R4654414
Boron (B)-Total	0.010		0.010	mg/L		03-JUN-19	R4654414
Cadmium (Cd)-Total	0.216		0.0050	ug/L		03-JUN-19	R4654414
Calcium (Ca)-Total	90.6		0.050	mg/L		03-JUN-19	R4654414
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		03-JUN-19	R4654414
Cobalt (Co)-Total	0.51		0.10	ug/L		03-JUN-19	R4654414

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-3 LC_PIZDC1308_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @ 10:50							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Copper (Cu)-Total	0.00057		0.00050	mg/L		03-JUN-19	R4654414
Iron (Fe)-Total	0.394		0.010	mg/L		03-JUN-19	R4654414
Lead (Pb)-Total	0.000138		0.000050	mg/L		03-JUN-19	R4654414
Lithium (Li)-Total	0.0078		0.0010	mg/L		03-JUN-19	R4654414
Magnesium (Mg)-Total	28.1		0.10	mg/L		03-JUN-19	R4654414
Manganese (Mn)-Total	0.0167		0.00010	mg/L		03-JUN-19	R4654414
Molybdenum (Mo)-Total	0.00174		0.000050	mg/L		03-JUN-19	R4654414
Nickel (Ni)-Total	0.00157		0.00050	mg/L		03-JUN-19	R4654414
Potassium (K)-Total	1.83		0.050	mg/L		03-JUN-19	R4654414
Selenium (Se)-Total	0.204		0.050	ug/L		03-JUN-19	R4654414
Silicon (Si)-Total	5.15		0.10	mg/L		03-JUN-19	R4654414
Silver (Ag)-Total	<0.000010		0.000010	mg/L		03-JUN-19	R4654414
Sodium (Na)-Total	1.70		0.050	mg/L		03-JUN-19	R4654414
Strontium (Sr)-Total	0.0959		0.00020	mg/L		03-JUN-19	R4654414
Thallium (Tl)-Total	0.000030		0.000010	mg/L		03-JUN-19	R4654414
Tin (Sn)-Total	<0.00010		0.00010	mg/L		03-JUN-19	R4654414
Titanium (Ti)-Total	<0.010		0.010	mg/L		03-JUN-19	R4654414
Uranium (U)-Total	0.00126		0.000010	mg/L		03-JUN-19	R4654414
Vanadium (V)-Total	<0.00050		0.00050	mg/L		03-JUN-19	R4654414
Zinc (Zn)-Total	0.0033		0.0030	mg/L		03-JUN-19	R4654414
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	5.2		1.0	mg/L		06-JUN-19	R4660564
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	325		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Total (as CaCO3)	325		1.0	mg/L		06-JUN-19	R4661465
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		05-JUN-19	R4660309
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		31-MAY-19	R4654463
Chloride in Water by IC							
Chloride (Cl)	1.41		0.50	mg/L		31-MAY-19	R4654463
Electrical Conductivity (EC)							
Conductivity (@ 25C)	595		2.0	uS/cm		06-JUN-19	R4661465
Fluoride in Water by IC							
Fluoride (F)	0.146		0.020	mg/L		31-MAY-19	R4654463
Ion Balance Calculation							
Cation - Anion Balance	0.1			%		13-JUN-19	
Anion Sum	6.67			meq/L		13-JUN-19	
Cation Sum	6.69			meq/L		13-JUN-19	
Ion Balance Calculation							
Ion Balance	100		-100	%		13-JUN-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.115		0.0050	mg/L		31-MAY-19	R4654463
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		31-MAY-19	R4654463
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		31-MAY-19	R4653118
Oxidation redution potential by elect.							
ORP	422		-1000	mV		05-JUN-19	R4659791

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-3 LC_PIZDC1308_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @ 10:50							
Matrix: WG							
Phosphorus (P)-Total							
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		04-JUN-19	R4658959
Sulfate in Water by IC							
Sulfate (SO4)	5.74		0.30	mg/L		31-MAY-19	R4654463
Total Dissolved Solids							
Total Dissolved Solids	322	DLHC	20	mg/L		04-JUN-19	R4659889
Total Suspended Solids							
Total Suspended Solids	1.9		1.0	mg/L		05-JUN-19	R4660306
Turbidity							
Turbidity	3.53		0.10	NTU		31-MAY-19	R4653349
pH							
pH	8.24		0.10	pH		06-JUN-19	R4661465

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
EXTEMP10	13C - Samples Received with temperature >10 Degrees C

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<p>Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.</p>			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
<p>Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.</p>			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
<p>Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.</p>			
<p>Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:</p>			
<p>Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]</p>			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
<p>Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.</p>			
<p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
<p>Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.</p>			
<p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
<p>This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.</p>			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
<p>This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.</p>			
<p>It is recommended that this analysis be conducted in the field.</p>			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.</p>			
PH-CL	Water	pH	APHA 4500 H-Electrode
<p>pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)</p>			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.</p>			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
<p>A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).</p>			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190529 DC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2282430

Report Date: 13-JUN-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4660564							
WG3070034-5	LCS							
Acidity (as CaCO3)			100.4		%		85-115	06-JUN-19
WG3070034-4	MB							
Acidity (as CaCO3)			<1.0		mg/L		2	06-JUN-19
ALK-MAN-CL								
	Water							
Batch	R4661465							
WG3070902-8	LCS							
Alkalinity, Total (as CaCO3)			99.4		%		85-115	06-JUN-19
WG3070902-7	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	06-JUN-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4655992							
WG3065732-3	DUP	L2282430-2						
Beryllium (Be)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	04-JUN-19
WG3065732-2	LCS							
Beryllium (Be)-Dissolved			102.5		%		80-120	04-JUN-19
WG3065732-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	04-JUN-19
WG3065732-4	MS	L2282430-1						
Beryllium (Be)-Dissolved			104.5		%		70-130	04-JUN-19
Batch	R4667451							
WG3075593-3	DUP	L2282430-3						
Beryllium (Be)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	13-JUN-19
WG3075593-2	LCS							
Beryllium (Be)-Dissolved			98.2		%		80-120	13-JUN-19
WG3075593-1	MB	LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	13-JUN-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4654414							
WG3065193-2	LCS							
Beryllium (Be)-Total			98.6		%		80-120	03-JUN-19
WG3065193-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	03-JUN-19
BR-L-IC-N-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-L-IC-N-CL	Water							
Batch	R4654463							
WG3066229-2	LCS							
Bromide (Br)			101.9		%		85-115	31-MAY-19
WG3066229-1	MB							
Bromide (Br)			<0.050		mg/L		0.05	31-MAY-19
C-DIS-ORG-LOW-CL	Water							
Batch	R4656949							
WG3067080-2	LCS							
Dissolved Organic Carbon			95.7		%		80-120	03-JUN-19
WG3067080-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	03-JUN-19
C-TOT-ORG-LOW-CL	Water							
Batch	R4656949							
WG3067080-2	LCS							
Total Organic Carbon			98.5		%		80-120	03-JUN-19
WG3067080-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	03-JUN-19
CL-IC-N-CL	Water							
Batch	R4654463							
WG3066229-2	LCS							
Chloride (Cl)			100.7		%		90-110	31-MAY-19
WG3066229-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	31-MAY-19
EC-L-PCT-CL	Water							
Batch	R4661465							
WG3070902-8	LCS							
Conductivity (@ 25C)			103.9		%		90-110	06-JUN-19
WG3070902-7	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	06-JUN-19
F-IC-N-CL	Water							
Batch	R4654463							
WG3066229-2	LCS							
Fluoride (F)			103.6		%		90-110	31-MAY-19
WG3066229-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	31-MAY-19
HG-D-CVAA-VA	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA								
Water								
Batch	R4655189							
WG3066173-2	LCS							
Mercury (Hg)-Dissolved			102.6		%		80-120	04-JUN-19
WG3066173-1	MB	NP						
Mercury (Hg)-Dissolved			<0.000050		mg/L		0.000005	04-JUN-19
MET-D-CCMS-VA								
Water								
Batch	R4655992							
WG3065732-3	DUP	L2282430-2						
Aluminum (Al)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	04-JUN-19
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-JUN-19
Arsenic (As)-Dissolved		0.00160	0.00161		mg/L	0.6	20	04-JUN-19
Barium (Ba)-Dissolved		1.55	1.51		mg/L	2.6	20	04-JUN-19
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-JUN-19
Boron (B)-Dissolved		0.023	0.023		mg/L	0.4	20	04-JUN-19
Cadmium (Cd)-Dissolved		<0.000015	<0.000015	RPD-NA	mg/L	N/A	20	04-JUN-19
Calcium (Ca)-Dissolved		42.5	41.7		mg/L	1.7	20	04-JUN-19
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-JUN-19
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-JUN-19
Copper (Cu)-Dissolved		0.00100	0.00097		mg/L	3.3	20	04-JUN-19
Iron (Fe)-Dissolved		0.874	0.869		mg/L	0.6	20	04-JUN-19
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-JUN-19
Lithium (Li)-Dissolved		0.0802	0.0790		mg/L	1.5	20	04-JUN-19
Magnesium (Mg)-Dissolved		22.2	21.7		mg/L	2.4	20	04-JUN-19
Manganese (Mn)-Dissolved		0.00966	0.00980		mg/L	1.4	20	04-JUN-19
Molybdenum (Mo)-Dissolved		0.0318	0.0308		mg/L	3.2	20	04-JUN-19
Nickel (Ni)-Dissolved		0.00116	0.00109		mg/L	6.3	20	04-JUN-19
Potassium (K)-Dissolved		5.37	5.31		mg/L	1.1	20	04-JUN-19
Selenium (Se)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-JUN-19
Silicon (Si)-Dissolved		2.82	2.79		mg/L	1.2	20	04-JUN-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	04-JUN-19
Sodium (Na)-Dissolved		14.8	14.6		mg/L	1.0	20	04-JUN-19
Strontium (Sr)-Dissolved		0.141	0.137		mg/L	2.7	20	04-JUN-19
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	04-JUN-19
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-JUN-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	04-JUN-19
Uranium (U)-Dissolved		0.000035	0.000035		mg/L	0.3	20	04-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4655992							
WG3065732-3	DUP	L2282430-2						
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	04-JUN-19
Zinc (Zn)-Dissolved		0.0079	0.0076		mg/L	4.7	20	04-JUN-19
WG3065732-2	LCS							
Aluminum (Al)-Dissolved			104.1		%		80-120	04-JUN-19
Antimony (Sb)-Dissolved			94.6		%		80-120	04-JUN-19
Arsenic (As)-Dissolved			104.0		%		80-120	04-JUN-19
Barium (Ba)-Dissolved			102.9		%		80-120	04-JUN-19
Bismuth (Bi)-Dissolved			100.1		%		80-120	04-JUN-19
Boron (B)-Dissolved			100.5		%		80-120	04-JUN-19
Cadmium (Cd)-Dissolved			101.7		%		80-120	04-JUN-19
Calcium (Ca)-Dissolved			102.9		%		80-120	04-JUN-19
Chromium (Cr)-Dissolved			102.1		%		80-120	04-JUN-19
Cobalt (Co)-Dissolved			101.1		%		80-120	04-JUN-19
Copper (Cu)-Dissolved			101.3		%		80-120	04-JUN-19
Iron (Fe)-Dissolved			96.8		%		80-120	04-JUN-19
Lead (Pb)-Dissolved			103.3		%		80-120	04-JUN-19
Lithium (Li)-Dissolved			101.6		%		80-120	04-JUN-19
Magnesium (Mg)-Dissolved			102.5		%		80-120	04-JUN-19
Manganese (Mn)-Dissolved			105.5		%		80-120	04-JUN-19
Molybdenum (Mo)-Dissolved			95.9		%		80-120	04-JUN-19
Nickel (Ni)-Dissolved			104.6		%		80-120	04-JUN-19
Potassium (K)-Dissolved			102.2		%		80-120	04-JUN-19
Selenium (Se)-Dissolved			97.7		%		80-120	04-JUN-19
Silicon (Si)-Dissolved			101.1		%		60-140	04-JUN-19
Silver (Ag)-Dissolved			98.2		%		80-120	04-JUN-19
Sodium (Na)-Dissolved			103.3		%		80-120	04-JUN-19
Strontium (Sr)-Dissolved			94.1		%		80-120	04-JUN-19
Thallium (Tl)-Dissolved			101.1		%		80-120	04-JUN-19
Tin (Sn)-Dissolved			97.2		%		80-120	04-JUN-19
Titanium (Ti)-Dissolved			98.6		%		80-120	04-JUN-19
Uranium (U)-Dissolved			104.3		%		80-120	04-JUN-19
Vanadium (V)-Dissolved			103.7		%		80-120	04-JUN-19
Zinc (Zn)-Dissolved			101.0		%		80-120	04-JUN-19
WG3065732-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	04-JUN-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4655992							
WG3065732-1 MB		NP						
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	04-JUN-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	04-JUN-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	04-JUN-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	04-JUN-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	04-JUN-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	04-JUN-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	04-JUN-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	04-JUN-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	04-JUN-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	04-JUN-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	04-JUN-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	04-JUN-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	04-JUN-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	04-JUN-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	04-JUN-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	04-JUN-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	04-JUN-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	04-JUN-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	04-JUN-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	04-JUN-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	04-JUN-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	04-JUN-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	04-JUN-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	04-JUN-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	04-JUN-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	04-JUN-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	04-JUN-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	04-JUN-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	04-JUN-19
WG3065732-4 MS		L2282430-1						
Aluminum (Al)-Dissolved			101.2		%		70-130	04-JUN-19
Antimony (Sb)-Dissolved			96.6		%		70-130	04-JUN-19
Arsenic (As)-Dissolved			104.6		%		70-130	04-JUN-19
Barium (Ba)-Dissolved			N/A	MS-B	%		-	04-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4655992							
WG3065732-4 MS		L2282430-1						
Bismuth (Bi)-Dissolved			89.3		%		70-130	04-JUN-19
Boron (B)-Dissolved			98.4		%		70-130	04-JUN-19
Cadmium (Cd)-Dissolved			99.8		%		70-130	04-JUN-19
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	04-JUN-19
Chromium (Cr)-Dissolved			97.4		%		70-130	04-JUN-19
Cobalt (Co)-Dissolved			96.2		%		70-130	04-JUN-19
Copper (Cu)-Dissolved			95.4		%		70-130	04-JUN-19
Iron (Fe)-Dissolved			98.7		%		70-130	04-JUN-19
Lead (Pb)-Dissolved			96.8		%		70-130	04-JUN-19
Lithium (Li)-Dissolved			100.4		%		70-130	04-JUN-19
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	04-JUN-19
Manganese (Mn)-Dissolved			96.7		%		70-130	04-JUN-19
Molybdenum (Mo)-Dissolved			93.2		%		70-130	04-JUN-19
Nickel (Ni)-Dissolved			99.7		%		70-130	04-JUN-19
Potassium (K)-Dissolved			93.9		%		70-130	04-JUN-19
Selenium (Se)-Dissolved			101.6		%		70-130	04-JUN-19
Silicon (Si)-Dissolved			94.5		%		70-130	04-JUN-19
Silver (Ag)-Dissolved			97.7		%		70-130	04-JUN-19
Sodium (Na)-Dissolved			96.2		%		70-130	04-JUN-19
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	04-JUN-19
Thallium (Tl)-Dissolved			95.2		%		70-130	04-JUN-19
Tin (Sn)-Dissolved			96.1		%		70-130	04-JUN-19
Titanium (Ti)-Dissolved			95.2		%		70-130	04-JUN-19
Uranium (U)-Dissolved			97.1		%		70-130	04-JUN-19
Vanadium (V)-Dissolved			102.7		%		70-130	04-JUN-19
Zinc (Zn)-Dissolved			99.3		%		70-130	04-JUN-19
Batch	R4667451							
WG3075593-3 DUP		L2282430-3						
Aluminum (Al)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	13-JUN-19
Antimony (Sb)-Dissolved		0.00010	0.00010		mg/L	1.0	20	13-JUN-19
Arsenic (As)-Dissolved		0.00013	0.00012		mg/L	10	20	13-JUN-19
Barium (Ba)-Dissolved		0.303	0.301		mg/L	0.5	20	13-JUN-19
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-JUN-19
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4667451							
WG3075593-3	DUP	L2282430-3						
Cadmium (Cd)-Dissolved		0.000126	0.000128		mg/L	1.8	20	13-JUN-19
Calcium (Ca)-Dissolved		85.9	84.9		mg/L	1.1	20	13-JUN-19
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-JUN-19
Cobalt (Co)-Dissolved		0.00044	0.00041		mg/L	5.2	20	13-JUN-19
Copper (Cu)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-JUN-19
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-JUN-19
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-JUN-19
Lithium (Li)-Dissolved		0.0075	0.0077		mg/L	2.1	20	13-JUN-19
Magnesium (Mg)-Dissolved		27.8	27.2		mg/L	2.2	20	13-JUN-19
Manganese (Mn)-Dissolved		0.0152	0.0151		mg/L	0.7	20	13-JUN-19
Molybdenum (Mo)-Dissolved		0.00167	0.00170		mg/L	1.5	20	13-JUN-19
Nickel (Ni)-Dissolved		0.00144	0.00144		mg/L	0.4	20	13-JUN-19
Potassium (K)-Dissolved		1.81	1.84		mg/L	1.5	20	13-JUN-19
Selenium (Se)-Dissolved		0.000266	0.000259		mg/L	2.9	20	13-JUN-19
Silicon (Si)-Dissolved		4.85	4.92		mg/L	1.4	20	13-JUN-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-JUN-19
Sodium (Na)-Dissolved		1.63	1.59		mg/L	2.5	20	13-JUN-19
Strontium (Sr)-Dissolved		0.0946	0.0969		mg/L	2.4	20	13-JUN-19
Thallium (Tl)-Dissolved		0.000025	0.000028		mg/L	10	20	13-JUN-19
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-JUN-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-JUN-19
Uranium (U)-Dissolved		0.00125	0.00131		mg/L	4.7	20	13-JUN-19
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-JUN-19
Zinc (Zn)-Dissolved		0.0020	0.0021		mg/L	6.1	20	13-JUN-19
WG3075593-2	LCS							
Aluminum (Al)-Dissolved			101.8		%		80-120	13-JUN-19
Antimony (Sb)-Dissolved			97.8		%		80-120	13-JUN-19
Arsenic (As)-Dissolved			100.3		%		80-120	13-JUN-19
Barium (Ba)-Dissolved			99.8		%		80-120	13-JUN-19
Bismuth (Bi)-Dissolved			91.6		%		80-120	13-JUN-19
Boron (B)-Dissolved			96.8		%		80-120	13-JUN-19
Cadmium (Cd)-Dissolved			99.9		%		80-120	13-JUN-19
Calcium (Ca)-Dissolved			96.1		%		80-120	13-JUN-19
Chromium (Cr)-Dissolved			98.3		%		80-120	13-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4667451							
WG3075593-2	LCS							
Cobalt (Co)-Dissolved			96.9		%		80-120	13-JUN-19
Copper (Cu)-Dissolved			97.2		%		80-120	13-JUN-19
Iron (Fe)-Dissolved			93.4		%		80-120	13-JUN-19
Lead (Pb)-Dissolved			93.9		%		80-120	13-JUN-19
Lithium (Li)-Dissolved			97.5		%		80-120	13-JUN-19
Magnesium (Mg)-Dissolved			106.4		%		80-120	13-JUN-19
Manganese (Mn)-Dissolved			100.7		%		80-120	13-JUN-19
Molybdenum (Mo)-Dissolved			100.2		%		80-120	13-JUN-19
Nickel (Ni)-Dissolved			97.1		%		80-120	13-JUN-19
Potassium (K)-Dissolved			95.9		%		80-120	13-JUN-19
Selenium (Se)-Dissolved			106.0		%		80-120	13-JUN-19
Silicon (Si)-Dissolved			103.1		%		60-140	13-JUN-19
Silver (Ag)-Dissolved			95.6		%		80-120	13-JUN-19
Sodium (Na)-Dissolved			99.9		%		80-120	13-JUN-19
Strontium (Sr)-Dissolved			100.7		%		80-120	13-JUN-19
Thallium (Tl)-Dissolved			89.3		%		80-120	13-JUN-19
Tin (Sn)-Dissolved			97.9		%		80-120	13-JUN-19
Titanium (Ti)-Dissolved			99.1		%		80-120	13-JUN-19
Uranium (U)-Dissolved			95.8		%		80-120	13-JUN-19
Vanadium (V)-Dissolved			99.5		%		80-120	13-JUN-19
Zinc (Zn)-Dissolved			102.8		%		80-120	13-JUN-19
WG3075593-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	13-JUN-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	13-JUN-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	13-JUN-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	13-JUN-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	13-JUN-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	13-JUN-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	13-JUN-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	13-JUN-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	13-JUN-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	13-JUN-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	13-JUN-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	13-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4667451							
WG3075593-1	MB	LF						
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	13-JUN-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	13-JUN-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	13-JUN-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	13-JUN-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	13-JUN-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	13-JUN-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	13-JUN-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	13-JUN-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	13-JUN-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	13-JUN-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	13-JUN-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	13-JUN-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	13-JUN-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	13-JUN-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	13-JUN-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	13-JUN-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	13-JUN-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	13-JUN-19
MET-T-CCMS-VA								
	Water							
Batch	R4654414							
WG3065193-2	LCS							
Aluminum (Al)-Total			102.9		%		80-120	03-JUN-19
Antimony (Sb)-Total			103.8		%		80-120	03-JUN-19
Arsenic (As)-Total			99.7		%		80-120	03-JUN-19
Barium (Ba)-Total			103.4		%		80-120	03-JUN-19
Bismuth (Bi)-Total			102.6		%		80-120	03-JUN-19
Boron (B)-Total			91.8		%		80-120	03-JUN-19
Cadmium (Cd)-Total			102.9		%		80-120	03-JUN-19
Calcium (Ca)-Total			97.8		%		80-120	03-JUN-19
Chromium (Cr)-Total			101.8		%		80-120	03-JUN-19
Cobalt (Co)-Total			100.5		%		80-120	03-JUN-19
Copper (Cu)-Total			100.6		%		80-120	03-JUN-19
Iron (Fe)-Total			97.7		%		80-120	03-JUN-19
Lead (Pb)-Total			100.7		%		80-120	03-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4654414							
WG3065193-2	LCS							
Lithium (Li)-Total			95.4		%		80-120	03-JUN-19
Magnesium (Mg)-Total			107.9		%		80-120	03-JUN-19
Manganese (Mn)-Total			102.3		%		80-120	03-JUN-19
Molybdenum (Mo)-Total			103.5		%		80-120	03-JUN-19
Nickel (Ni)-Total			101.7		%		80-120	03-JUN-19
Potassium (K)-Total			99.6		%		80-120	03-JUN-19
Selenium (Se)-Total			99.4		%		80-120	03-JUN-19
Silicon (Si)-Total			107.5		%		80-120	03-JUN-19
Silver (Ag)-Total			98.2		%		80-120	03-JUN-19
Sodium (Na)-Total			105.1		%		80-120	03-JUN-19
Strontium (Sr)-Total			101.6		%		80-120	03-JUN-19
Thallium (Tl)-Total			101.0		%		80-120	03-JUN-19
Tin (Sn)-Total			99.8		%		80-120	03-JUN-19
Titanium (Ti)-Total			102.0		%		80-120	03-JUN-19
Uranium (U)-Total			97.7		%		80-120	03-JUN-19
Vanadium (V)-Total			103.3		%		80-120	03-JUN-19
Zinc (Zn)-Total			96.0		%		80-120	03-JUN-19
WG3065193-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	03-JUN-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	03-JUN-19
Boron (B)-Total			<0.010		mg/L		0.01	03-JUN-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	03-JUN-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	03-JUN-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	03-JUN-19
Iron (Fe)-Total			<0.010		mg/L		0.01	03-JUN-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	03-JUN-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	03-JUN-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	03-JUN-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	03-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch R4654414								
WG3065193-1 MB								
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	03-JUN-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	03-JUN-19
Potassium (K)-Total			<0.050		mg/L		0.05	03-JUN-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	03-JUN-19
Silicon (Si)-Total			<0.10		mg/L		0.1	03-JUN-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	03-JUN-19
Sodium (Na)-Total			<0.050		mg/L		0.05	03-JUN-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	03-JUN-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	03-JUN-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	03-JUN-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	03-JUN-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	03-JUN-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	03-JUN-19
NH3-L-F-CL		Water						
Batch R4660309								
WG3069488-14 LCS								
Ammonia as N			97.9		%		85-115	05-JUN-19
WG3069488-13 MB								
Ammonia as N			<0.0050		mg/L		0.005	05-JUN-19
NO2-L-IC-N-CL		Water						
Batch R4654463								
WG3066229-2 LCS								
Nitrite (as N)			100.7		%		90-110	31-MAY-19
WG3066229-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	31-MAY-19
NO3-L-IC-N-CL		Water						
Batch R4654463								
WG3066229-2 LCS								
Nitrate (as N)			100.4		%		90-110	31-MAY-19
WG3066229-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	31-MAY-19
ORP-CL		Water						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL		Water						
Batch	R4659889							
WG3067059-11 LCS								
Total Dissolved Solids			95.0		%		85-115	04-JUN-19
WG3067059-8 LCS								
Total Dissolved Solids			95.4		%		85-115	04-JUN-19
WG3067059-10 MB								
Total Dissolved Solids			<10		mg/L		10	04-JUN-19
WG3067059-7 MB								
Total Dissolved Solids			<10		mg/L		10	04-JUN-19
TKN-L-F-CL		Water						
Batch	R4659365							
WG3068573-10 LCS								
Total Kjeldahl Nitrogen			96.4		%		75-125	05-JUN-19
WG3068573-14 LCS								
Total Kjeldahl Nitrogen			94.5		%		75-125	05-JUN-19
WG3068573-17 LCS								
Total Kjeldahl Nitrogen			96.1		%		75-125	05-JUN-19
WG3068573-2 LCS								
Total Kjeldahl Nitrogen			98.1		%		75-125	05-JUN-19
WG3068573-6 LCS								
Total Kjeldahl Nitrogen			98.7		%		75-125	05-JUN-19
WG3068573-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	05-JUN-19
WG3068573-13 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	05-JUN-19
WG3068573-16 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	05-JUN-19
WG3068573-5 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	05-JUN-19
WG3068573-9 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	05-JUN-19
TSS-L-CL		Water						
Batch	R4660306							
WG3068648-11 LCS								
Total Suspended Solids			96.0		%		85-115	05-JUN-19
WG3068648-10 MB								
Total Suspended Solids			<1.0		mg/L		1	05-JUN-19
TURBIDITY-CL		Water						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch	R4653349							
WG3064559-20	LCS							
Turbidity			95.0		%		85-115	31-MAY-19
WG3064559-23	LCS							
Turbidity			96.5		%		85-115	31-MAY-19
WG3064559-19	MB							
Turbidity			<0.10		NTU		0.1	31-MAY-19
WG3064559-22	MB							
Turbidity			<0.10		NTU		0.1	31-MAY-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	29-MAY-19 13:00	05-JUN-19 14:00	0.25	169	hours	EHTR-FM
	2	29-MAY-19 11:20	05-JUN-19 14:00	0.25	171	hours	EHTR-FM
	3	29-MAY-19 10:50	05-JUN-19 14:00	0.25	171	hours	EHTR-FM
pH	1	29-MAY-19 13:00	06-JUN-19 15:00	0.25	194	hours	EHTR-FM
	2	29-MAY-19 11:20	06-JUN-19 15:00	0.25	196	hours	EHTR-FM
	3	29-MAY-19 10:50	06-JUN-19 15:00	0.25	196	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2282430 were received on 30-MAY-19 09:15.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: **20190529 DC GW** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	chris.blurton@teck.com		
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		
Address	Box 2003			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com		
	15km North Hwy 43							Email 4:	kirsten.campbell@teck.com		
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number	PQ000608L29		
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada				
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS

ANALYSIS REQUESTED

Filtered - F: Field, L: Lab, FL: Field & Lab, N: None




L2282430-COFC

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS REQUESTED												
								ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC	ALS_Package-EPH	HG-T-CVAF-VA					
LC_P1ZDC1306_WG_Q2-2019_NP	LC_P1ZDC1306	WG		2019/05/29	13:00	G	6	1	1	1	1	1	1							
LC_P1ZDC1307_WG_Q2-2019_NP	LC_P1ZDC1307	WG		2019/05/29	11:20	G	6	1	1	1	1	1	1							
LC_P1ZDC1308_WG_Q2-2019_NP	LC_P1ZDC1308	WG		2019/05/29	10:50	G	6	1	1	1	1	1	1							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
SEE ASSY FORWARD MATERIALS SAMPLES TO ALS BUREAU FOR ANALYSIS	D.Tymstra/K.Campbell	0-Jan	<i>[Signature]</i>	5/30 9:15

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #	Sampler's Signature	Date/Time
Regular (default) <input checked="" type="checkbox"/> Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	K. Campbell/D. Tymstra		<i>[Signature]</i>	May 29, 2019

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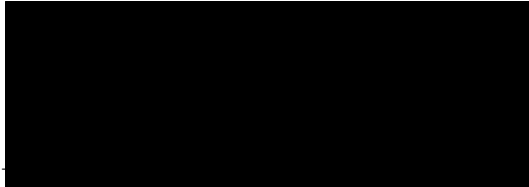
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 07-JUN-19
Report Date: 17-JUN-19 11:37 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2287498
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190605 PIZDC0901
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2287498-1 LC_PIZDC0901_WG_Q2-2019_NP							
Sampled By: KC/DT on 05-JUN-19 @ 11:30							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.60		0.50	mg/L		13-JUN-19	R4670030
Total Kjeldahl Nitrogen	0.242		0.050	mg/L		16-JUN-19	R4671467
Total Organic Carbon	3.66		0.50	mg/L		13-JUN-19	R4670030
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	09-JUN-19	09-JUN-19	R4662987
Dissolved Metals Filtration Location	LAB					09-JUN-19	R4662133
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	11-JUN-19	11-JUN-19	R4663363
Dissolved Mercury Filtration Location	LAB					11-JUN-19	R4663219
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					09-JUN-19	R4662133
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	09-JUN-19	09-JUN-19	R4662987
Antimony (Sb)-Dissolved	0.00017		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Arsenic (As)-Dissolved	0.00030		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Barium (Ba)-Dissolved	0.178		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	09-JUN-19	09-JUN-19	R4662987
Boron (B)-Dissolved	<0.010		0.010	mg/L	09-JUN-19	09-JUN-19	R4662987
Cadmium (Cd)-Dissolved	0.108		0.0050	ug/L	09-JUN-19	09-JUN-19	R4662987
Calcium (Ca)-Dissolved	103		0.050	mg/L	09-JUN-19	09-JUN-19	R4662987
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	09-JUN-19	09-JUN-19	R4662987
Copper (Cu)-Dissolved	0.00857		0.00050	mg/L	09-JUN-19	09-JUN-19	R4662987
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	09-JUN-19	09-JUN-19	R4662987
Lead (Pb)-Dissolved	0.000458		0.000050	mg/L	09-JUN-19	09-JUN-19	R4662987
Lithium (Li)-Dissolved	0.0023		0.0010	mg/L	09-JUN-19	09-JUN-19	R4662987
Magnesium (Mg)-Dissolved	27.7		0.10	mg/L	09-JUN-19	09-JUN-19	R4662987
Manganese (Mn)-Dissolved	0.00057		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Molybdenum (Mo)-Dissolved	0.000630		0.000050	mg/L	09-JUN-19	09-JUN-19	R4662987
Nickel (Ni)-Dissolved	0.00085		0.00050	mg/L	09-JUN-19	09-JUN-19	R4662987
Potassium (K)-Dissolved	1.38		0.050	mg/L	09-JUN-19	09-JUN-19	R4662987
Selenium (Se)-Dissolved	1.01		0.050	ug/L	09-JUN-19	09-JUN-19	R4662987
Silicon (Si)-Dissolved	5.68		0.050	mg/L	09-JUN-19	09-JUN-19	R4662987
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	09-JUN-19	09-JUN-19	R4662987
Sodium (Na)-Dissolved	4.43		0.050	mg/L	09-JUN-19	09-JUN-19	R4662987
Strontium (Sr)-Dissolved	0.251		0.00020	mg/L	09-JUN-19	09-JUN-19	R4662987
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	09-JUN-19	09-JUN-19	R4662987
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	09-JUN-19	09-JUN-19	R4662987
Uranium (U)-Dissolved	0.00323		0.000010	mg/L	09-JUN-19	09-JUN-19	R4662987
Vanadium (V)-Dissolved	0.00083		0.00050	mg/L	09-JUN-19	09-JUN-19	R4662987
Zinc (Zn)-Dissolved	0.0184		0.0010	mg/L	09-JUN-19	09-JUN-19	R4662987
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	372		0.50	mg/L		11-JUN-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		11-JUN-19	R4663601
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.308		0.0030	mg/L		11-JUN-19	R4663601
Antimony (Sb)-Total	0.00029		0.00010	mg/L		11-JUN-19	R4663601
Arsenic (As)-Total	0.00052		0.00010	mg/L		11-JUN-19	R4663601

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2287498-1 LC_PIZDC0901_WG_Q2-2019_NP							
Sampled By: KC/DT on 05-JUN-19 @ 11:30							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.217		0.00010	mg/L		11-JUN-19	R4663601
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		11-JUN-19	R4663601
Boron (B)-Total	<0.010		0.010	mg/L		11-JUN-19	R4663601
Cadmium (Cd)-Total	0.361		0.0050	ug/L		11-JUN-19	R4663601
Calcium (Ca)-Total	108		0.050	mg/L		11-JUN-19	R4663601
Chromium (Cr)-Total	0.00073		0.00010	mg/L		11-JUN-19	R4663601
Cobalt (Co)-Total	0.81		0.10	ug/L		11-JUN-19	R4663601
Copper (Cu)-Total	0.00964		0.00050	mg/L		11-JUN-19	R4663601
Iron (Fe)-Total	0.357		0.010	mg/L		11-JUN-19	R4663601
Lead (Pb)-Total	0.00129		0.000050	mg/L		11-JUN-19	R4663601
Lithium (Li)-Total	0.0024		0.0010	mg/L		11-JUN-19	R4663601
Magnesium (Mg)-Total	30.2		0.10	mg/L		11-JUN-19	R4663601
Manganese (Mn)-Total	0.0948		0.00010	mg/L		11-JUN-19	R4663601
Molybdenum (Mo)-Total	0.000640		0.000050	mg/L		11-JUN-19	R4663601
Nickel (Ni)-Total	0.00245		0.00050	mg/L		11-JUN-19	R4663601
Potassium (K)-Total	1.37		0.050	mg/L		11-JUN-19	R4663601
Selenium (Se)-Total	0.947		0.050	ug/L		11-JUN-19	R4663601
Silicon (Si)-Total	6.18		0.10	mg/L		11-JUN-19	R4663601
Silver (Ag)-Total	0.000016		0.000010	mg/L		11-JUN-19	R4663601
Sodium (Na)-Total	4.67		0.050	mg/L		11-JUN-19	R4663601
Strontium (Sr)-Total	0.286		0.00020	mg/L		11-JUN-19	R4663601
Thallium (Tl)-Total	0.000020		0.000010	mg/L		11-JUN-19	R4663601
Tin (Sn)-Total	<0.00010		0.00010	mg/L		11-JUN-19	R4663601
Titanium (Ti)-Total	0.011		0.010	mg/L		11-JUN-19	R4663601
Uranium (U)-Total	0.00320		0.000010	mg/L		11-JUN-19	R4663601
Vanadium (V)-Total	0.00245		0.00050	mg/L		11-JUN-19	R4663601
Zinc (Zn)-Total	0.0239		0.0030	mg/L		11-JUN-19	R4663601
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	5.2		1.0	mg/L		13-JUN-19	R4670146
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	356		1.0	mg/L		13-JUN-19	R4670171
Alkalinity, Carbonate (as CaCO3)	14.4		1.0	mg/L		13-JUN-19	R4670171
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		13-JUN-19	R4670171
Alkalinity, Total (as CaCO3)	370		1.0	mg/L		13-JUN-19	R4670171
Ammonia, Total (as N)							
Ammonia as N	0.0097		0.0050	mg/L		13-JUN-19	R4670451
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		07-JUN-19	R4663920
Chloride in Water by IC							
Chloride (Cl)	0.69		0.50	mg/L		07-JUN-19	R4663920
Electrical Conductivity (EC)							
Conductivity (@ 25C)	672		2.0	uS/cm		13-JUN-19	R4670171
Fluoride in Water by IC							
Fluoride (F)	0.107		0.020	mg/L		07-JUN-19	R4663920
Ion Balance Calculation							
Ion Balance	97.0		-100	%		14-JUN-19	
Ion Balance Calculation							
Cation - Anion Balance	-1.5			%		14-JUN-19	
Anion Sum	7.89			meq/L		14-JUN-19	
Cation Sum	7.66			meq/L		14-JUN-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2287498-1 LC_PIZDC0901_WG_Q2-2019_NP							
Sampled By: KC/DT on 05-JUN-19 @ 11:30							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.644		0.0050	mg/L		07-JUN-19	R4663920
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		07-JUN-19	R4663920
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0169		0.0010	mg/L		08-JUN-19	R4661969
Oxidation redution potential by elect.							
ORP	340		-1000	mV		12-JUN-19	R4667329
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.041	DLM	0.020	mg/L		12-JUN-19	R4666206
Sulfate in Water by IC							
Sulfate (SO4)	20.3		0.30	mg/L		07-JUN-19	R4663920
Total Dissolved Solids							
Total Dissolved Solids	388	DLHC	20	mg/L		11-JUN-19	R4667930
Total Suspended Solids							
Total Suspended Solids	12.0		1.0	mg/L		11-JUN-19	R4665072
Turbidity							
Turbidity	12.9		0.10	NTU		08-JUN-19	R4662406
pH							
pH	8.37		0.10	pH		13-JUN-19	R4670171

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Individual Samples Listed:

Lab Sample ID	Client Sample ID	Qualifier	Description
L2287498-1	LC_PIZDC0901_WG_Q2-2019	SFPL	DOC/DIS METALS LAB FILTER/PRESERVE - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190605 PIZDC0901

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample
 mg/kg wwt - milligrams per kilogram based on wet weight of sample
 mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
 mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2287498

Report Date: 17-JUN-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4670146							
WG3077278-8	LCS							
Acidity (as CaCO3)			98.6		%		85-115	13-JUN-19
WG3077278-7	MB							
Acidity (as CaCO3)			<1.0		mg/L		2	13-JUN-19
ALK-MAN-CL								
	Water							
Batch	R4670171							
WG3077251-5	LCS							
Alkalinity, Total (as CaCO3)			101.8		%		85-115	13-JUN-19
WG3077251-4	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	13-JUN-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4662987							
WG3071987-2	LCS							
Beryllium (Be)-Dissolved			98.6		%		80-120	09-JUN-19
WG3071987-1	MB	LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	09-JUN-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4663601							
WG3072892-2	LCS							
Beryllium (Be)-Total			101.6		%		80-120	11-JUN-19
WG3072892-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	11-JUN-19
BR-L-IC-N-CL								
	Water							
Batch	R4663920							
WG3074230-14	LCS							
Bromide (Br)			103.8		%		85-115	07-JUN-19
WG3074230-13	MB							
Bromide (Br)			<0.050		mg/L		0.05	07-JUN-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4670030							
WG3077463-3	DUP	L2287498-1						
Dissolved Organic Carbon		2.60	2.57		mg/L	0.9	20	13-JUN-19
WG3077463-2	LCS							
Dissolved Organic Carbon			94.8		%		80-120	13-JUN-19
WG3077463-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	13-JUN-19
C-TOT-ORG-LOW-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL								
Water								
Batch	R4670030							
WG3077463-3	DUP	L2287498-1						
Total Organic Carbon		3.66	3.89		mg/L	6.2	20	13-JUN-19
WG3077463-2	LCS							
Total Organic Carbon			98.1		%		80-120	13-JUN-19
WG3077463-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	13-JUN-19
CL-IC-N-CL								
Water								
Batch	R4663920							
WG3074230-14	LCS							
Chloride (Cl)			102.7		%		90-110	07-JUN-19
WG3074230-13	MB							
Chloride (Cl)			<0.50		mg/L		0.5	07-JUN-19
EC-L-PCT-CL								
Water								
Batch	R4670171							
WG3077251-5	LCS							
Conductivity (@ 25C)			102.2		%		90-110	13-JUN-19
WG3077251-4	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	13-JUN-19
F-IC-N-CL								
Water								
Batch	R4663920							
WG3074230-14	LCS							
Fluoride (F)			105.1		%		90-110	07-JUN-19
WG3074230-13	MB							
Fluoride (F)			<0.020		mg/L		0.02	07-JUN-19
HG-D-CVAA-VA								
Water								
Batch	R4663363							
WG3073328-2	LCS							
Mercury (Hg)-Dissolved			97.9		%		80-120	11-JUN-19
WG3073328-1	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	11-JUN-19
MET-D-CCMS-VA								
Water								
Batch	R4662987							
WG3071987-2	LCS							
Aluminum (Al)-Dissolved			107.0		%		80-120	09-JUN-19
Antimony (Sb)-Dissolved			99.7		%		80-120	09-JUN-19
Arsenic (As)-Dissolved			101.2		%		80-120	09-JUN-19
Barium (Ba)-Dissolved			104.4		%		80-120	09-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4662987							
WG3071987-2	LCS							
Bismuth (Bi)-Dissolved			97.7		%		80-120	09-JUN-19
Boron (B)-Dissolved			93.8		%		80-120	09-JUN-19
Cadmium (Cd)-Dissolved			104.0		%		80-120	09-JUN-19
Calcium (Ca)-Dissolved			103.8		%		80-120	09-JUN-19
Chromium (Cr)-Dissolved			103.1		%		80-120	09-JUN-19
Cobalt (Co)-Dissolved			102.9		%		80-120	09-JUN-19
Copper (Cu)-Dissolved			100.9		%		80-120	09-JUN-19
Iron (Fe)-Dissolved			105.9		%		80-120	09-JUN-19
Lead (Pb)-Dissolved			99.5		%		80-120	09-JUN-19
Lithium (Li)-Dissolved			100.8		%		80-120	09-JUN-19
Magnesium (Mg)-Dissolved			102.0		%		80-120	09-JUN-19
Manganese (Mn)-Dissolved			101.7		%		80-120	09-JUN-19
Molybdenum (Mo)-Dissolved			101.2		%		80-120	09-JUN-19
Nickel (Ni)-Dissolved			102.3		%		80-120	09-JUN-19
Potassium (K)-Dissolved			108.9		%		80-120	09-JUN-19
Selenium (Se)-Dissolved			101.8		%		80-120	09-JUN-19
Silicon (Si)-Dissolved			108.4		%		60-140	09-JUN-19
Silver (Ag)-Dissolved			98.7		%		80-120	09-JUN-19
Sodium (Na)-Dissolved			105.5		%		80-120	09-JUN-19
Strontium (Sr)-Dissolved			99.0		%		80-120	09-JUN-19
Thallium (Tl)-Dissolved			97.5		%		80-120	09-JUN-19
Tin (Sn)-Dissolved			100.2		%		80-120	09-JUN-19
Titanium (Ti)-Dissolved			102.9		%		80-120	09-JUN-19
Uranium (U)-Dissolved			99.0		%		80-120	09-JUN-19
Vanadium (V)-Dissolved			105.0		%		80-120	09-JUN-19
Zinc (Zn)-Dissolved			102.2		%		80-120	09-JUN-19
WG3071987-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	09-JUN-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	09-JUN-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	09-JUN-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	09-JUN-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	09-JUN-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	09-JUN-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	09-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4662987							
WG3071987-1	MB	LF						
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	09-JUN-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	09-JUN-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	09-JUN-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	09-JUN-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	09-JUN-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	09-JUN-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	09-JUN-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	09-JUN-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	09-JUN-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	09-JUN-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	09-JUN-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	09-JUN-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	09-JUN-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	09-JUN-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	09-JUN-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	09-JUN-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	09-JUN-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	09-JUN-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	09-JUN-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	09-JUN-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	09-JUN-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	09-JUN-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	09-JUN-19
MET-T-CCMS-VA								
	Water							
Batch	R4663601							
WG3072892-2	LCS							
Aluminum (Al)-Total			106.5		%		80-120	11-JUN-19
Antimony (Sb)-Total			107.2		%		80-120	11-JUN-19
Arsenic (As)-Total			105.9		%		80-120	11-JUN-19
Barium (Ba)-Total			109.8		%		80-120	11-JUN-19
Bismuth (Bi)-Total			106.2		%		80-120	11-JUN-19
Boron (B)-Total			98.4		%		80-120	11-JUN-19
Cadmium (Cd)-Total			107.0		%		80-120	11-JUN-19
Calcium (Ca)-Total			102.0		%		80-120	11-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4663601							
WG3072892-2	LCS							
Chromium (Cr)-Total			107.6		%		80-120	11-JUN-19
Cobalt (Co)-Total			106.9		%		80-120	11-JUN-19
Copper (Cu)-Total			107.2		%		80-120	11-JUN-19
Iron (Fe)-Total			91.5		%		80-120	11-JUN-19
Lead (Pb)-Total			98.9		%		80-120	11-JUN-19
Lithium (Li)-Total			100.2		%		80-120	11-JUN-19
Magnesium (Mg)-Total			107.9		%		80-120	11-JUN-19
Manganese (Mn)-Total			110.3		%		80-120	11-JUN-19
Molybdenum (Mo)-Total			102.6		%		80-120	11-JUN-19
Nickel (Ni)-Total			106.9		%		80-120	11-JUN-19
Potassium (K)-Total			102.9		%		80-120	11-JUN-19
Selenium (Se)-Total			103.0		%		80-120	11-JUN-19
Silicon (Si)-Total			105.4		%		80-120	11-JUN-19
Silver (Ag)-Total			99.0		%		80-120	11-JUN-19
Sodium (Na)-Total			113.6		%		80-120	11-JUN-19
Strontium (Sr)-Total			98.7		%		80-120	11-JUN-19
Thallium (Tl)-Total			99.98		%		80-120	11-JUN-19
Tin (Sn)-Total			100.5		%		80-120	11-JUN-19
Titanium (Ti)-Total			101.3		%		80-120	11-JUN-19
Uranium (U)-Total			101.2		%		80-120	11-JUN-19
Vanadium (V)-Total			108.7		%		80-120	11-JUN-19
Zinc (Zn)-Total			110.8		%		80-120	11-JUN-19
WG3072892-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	11-JUN-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	11-JUN-19
Boron (B)-Total			<0.010		mg/L		0.01	11-JUN-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	11-JUN-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	11-JUN-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	11-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch R4663601								
WG3072892-1 MB								
Iron (Fe)-Total			<0.010		mg/L		0.01	11-JUN-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	11-JUN-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	11-JUN-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	11-JUN-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	11-JUN-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	11-JUN-19
Potassium (K)-Total			<0.050		mg/L		0.05	11-JUN-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	11-JUN-19
Silicon (Si)-Total			<0.10		mg/L		0.1	11-JUN-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	11-JUN-19
Sodium (Na)-Total			<0.050		mg/L		0.05	11-JUN-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	11-JUN-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	11-JUN-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	11-JUN-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	11-JUN-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	11-JUN-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	11-JUN-19
NH3-L-F-CL		Water						
Batch R4670451								
WG3077545-10 LCS								
Ammonia as N			98.9		%		85-115	13-JUN-19
WG3077545-9 MB								
Ammonia as N			<0.0050		mg/L		0.005	13-JUN-19
NO2-L-IC-N-CL		Water						
Batch R4663920								
WG3074230-14 LCS								
Nitrite (as N)			105.4		%		90-110	07-JUN-19
WG3074230-13 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	07-JUN-19
NO3-L-IC-N-CL		Water						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch	R4663920							
WG3074230-14	LCS							
Nitrate (as N)			103.2		%		90-110	07-JUN-19
WG3074230-13	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	07-JUN-19
ORP-CL	Water							
Batch	R4667329							
WG3075443-5	CRM	CL-ORP						
ORP			228		mV		210-230	12-JUN-19
P-T-L-COL-CL	Water							
Batch	R4666206							
WG3075446-6	LCS							
Phosphorus (P)-Total			101.7		%		80-120	12-JUN-19
WG3075446-5	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	12-JUN-19
PH-CL	Water							
Batch	R4670171							
WG3077251-5	LCS							
pH			7.01		pH		6.9-7.1	13-JUN-19
PO4-DO-L-COL-CL	Water							
Batch	R4661969							
WG3071832-8	LCS							
Orthophosphate-Dissolved (as P)			99.96		%		80-120	08-JUN-19
WG3071832-2	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	08-JUN-19
SO4-IC-N-CL	Water							
Batch	R4663920							
WG3074230-14	LCS							
Sulfate (SO4)			103.9		%		90-110	07-JUN-19
WG3074230-13	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	07-JUN-19
SOLIDS-TDS-CL	Water							
Batch	R4667930							
WG3073552-12	DUP	L2287498-1						
Total Dissolved Solids		388	382		mg/L	1.6	20	11-JUN-19
WG3073552-11	LCS							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL		Water						
Batch	R4667930							
WG3073552-11 LCS								
Total Dissolved Solids			96.4		%		85-115	11-JUN-19
WG3073552-10 MB								
Total Dissolved Solids			<10		mg/L		10	11-JUN-19
TKN-L-F-CL		Water						
Batch	R4671467							
WG3079095-10 LCS								
Total Kjeldahl Nitrogen			101.7		%		75-125	16-JUN-19
WG3079095-14 LCS								
Total Kjeldahl Nitrogen			100.2		%		75-125	16-JUN-19
WG3079095-17 LCS								
Total Kjeldahl Nitrogen			98.6		%		75-125	16-JUN-19
WG3079095-2 LCS								
Total Kjeldahl Nitrogen			101.5		%		75-125	16-JUN-19
WG3079095-21 LCS								
Total Kjeldahl Nitrogen			102.2		%		75-125	16-JUN-19
WG3079095-25 LCS								
Total Kjeldahl Nitrogen			98.7		%		75-125	16-JUN-19
WG3079095-6 LCS								
Total Kjeldahl Nitrogen			102.0		%		75-125	16-JUN-19
WG3079095-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
WG3079095-13 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
WG3079095-16 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
WG3079095-24 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
WG3079095-5 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
WG3079095-9 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
TSS-L-CL		Water						
Batch	R4665072							
WG3073472-14 LCS								
Total Suspended Solids			95.4		%		85-115	11-JUN-19
WG3073472-13 MB								
Total Suspended Solids			<1.0		mg/L		1	11-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch	R4662406							
WG3071711-6	DUP	L2287498-1						
Turbidity		12.9	12.8		NTU	0.8	15	08-JUN-19
WG3071711-5	LCS							
Turbidity			96.5		%		85-115	08-JUN-19
WG3071711-4	MB							
Turbidity			<0.10		NTU		0.1	08-JUN-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	05-JUN-19 11:30	12-JUN-19 13:45	0.25	170	hours	EHTR-FM
pH	1	05-JUN-19 11:30	13-JUN-19 17:00	0.25	198	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2287498 were received on 07-JUN-19 08:45.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Teck

COC ID: 20190605 PIZDC0901

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	chris.blurton@teck.com			
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSglobal.com			Email 2:	teckcoal@equisonline.com			
Address	Box 2003			Address	2559 29 Street NE			Email 3:	drako.tymstra@teck.com			
	15km North Hwy 43							Email 4:	klrsten.campbell@teck.com			
City	Sparwood	Province	BC	City	Calgary	Province	AB	PO number		PO00608129		
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada					
Phone Number	250-425-3196			Phone Number	403 407 1794							

SAMPLE DETAILS

ANALYSIS REQUESTED

Filtered - F: Field, L: Lab, FL: Field & Lab, N: None



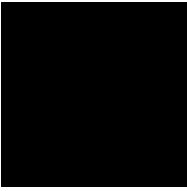
L2287498-COFC

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS Package-TKN/TOC						
LC_PIZDC0901_WG_Q2-2019_NP	LC_PIZDC0901	WG		2019/06/05	11:30	G	6	1	1	1	1	1	1						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
REGULAR (default) X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	D.Tymstra/K.Campbell	6-Jun		6/7 8:45

SERVICE REQUEST (Push - subject to availability)			
Regular (default) X	Sampler's Name	K. Campbell/D. Tymstra	Mobile #
	Sampler's Signature		Date/Time
			June 6, 2019

12°C



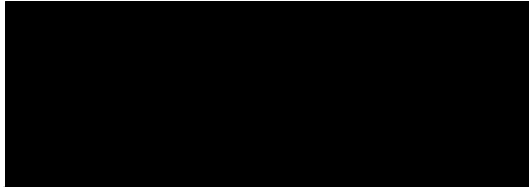
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 26-JUN-19
Report Date: 29-JUN-19 17:01 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis

Lab Work Order #: L2299337
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190625 PIZP1105
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5, Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2299337-1 LC_PIZP1105_WG_Q2-2019_N							
Sampled By: KC/DT on 25-JUN-19 @ 12:55							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.75		0.50	mg/L		27-JUN-19	R4690146
Total Kjeldahl Nitrogen	<0.050	TKNI	0.050	mg/L		29-JUN-19	R4691176
Total Organic Carbon	8.00		0.50	mg/L		27-JUN-19	R4690146
EPH Testing for teck Coal							
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	27-JUN-19	27-JUN-19	R4690683
EPH19-32	<0.25		0.25	mg/L	27-JUN-19	27-JUN-19	R4690683
Surrogate: 2-Bromobenzotrifluoride	101.4		60-140	%	27-JUN-19	27-JUN-19	R4690683
Sum of EPH (10-32)							
EPH (C10-C32)	<0.50		0.50	mg/L		28-JUN-19	
TEH (C10-C30)							
TEH (C10-C30)	<0.25		0.25	mg/L	27-JUN-19	27-JUN-19	R4690683
Surrogate: 2-Bromobenzotrifluoride	101.4		60-140	%	27-JUN-19	27-JUN-19	R4690683
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	27-JUN-19	28-JUN-19	R4690521
Dissolved Metals Filtration Location	LAB					27-JUN-19	R4689740
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	28-JUN-19	29-JUN-19	R4691014
Dissolved Mercury Filtration Location	LAB					28-JUN-19	R4690603
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					27-JUN-19	R4689740
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	27-JUN-19	28-JUN-19	R4690521
Antimony (Sb)-Dissolved	0.00038		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Barium (Ba)-Dissolved	0.0895		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	27-JUN-19	28-JUN-19	R4690521
Boron (B)-Dissolved	0.022		0.010	mg/L	27-JUN-19	28-JUN-19	R4690521
Cadmium (Cd)-Dissolved	0.0528		0.0050	ug/L	27-JUN-19	28-JUN-19	R4690521
Calcium (Ca)-Dissolved	174		0.050	mg/L	27-JUN-19	28-JUN-19	R4690521
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	27-JUN-19	28-JUN-19	R4690521
Copper (Cu)-Dissolved	0.00502		0.00050	mg/L	27-JUN-19	28-JUN-19	R4690521
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	27-JUN-19	28-JUN-19	R4690521
Lead (Pb)-Dissolved	0.000270		0.000050	mg/L	27-JUN-19	28-JUN-19	R4690521
Lithium (Li)-Dissolved	0.0168		0.0010	mg/L	27-JUN-19	28-JUN-19	R4690521
Magnesium (Mg)-Dissolved	54.7		0.10	mg/L	27-JUN-19	28-JUN-19	R4690521
Manganese (Mn)-Dissolved	0.0108		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Molybdenum (Mo)-Dissolved	0.000230		0.000050	mg/L	27-JUN-19	28-JUN-19	R4690521
Nickel (Ni)-Dissolved	0.00097		0.00050	mg/L	27-JUN-19	28-JUN-19	R4690521
Potassium (K)-Dissolved	1.85		0.050	mg/L	27-JUN-19	28-JUN-19	R4690521
Selenium (Se)-Dissolved	0.237		0.050	ug/L	27-JUN-19	28-JUN-19	R4690521
Silicon (Si)-Dissolved	5.18		0.050	mg/L	27-JUN-19	28-JUN-19	R4690521
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	27-JUN-19	28-JUN-19	R4690521
Sodium (Na)-Dissolved	14.4		0.050	mg/L	27-JUN-19	28-JUN-19	R4690521
Strontium (Sr)-Dissolved	0.371		0.00020	mg/L	27-JUN-19	28-JUN-19	R4690521
Thallium (Tl)-Dissolved	0.000021		0.000010	mg/L	27-JUN-19	28-JUN-19	R4690521
Tin (Sn)-Dissolved	0.00138		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	27-JUN-19	28-JUN-19	R4690521
Uranium (U)-Dissolved	0.000495		0.000010	mg/L	27-JUN-19	28-JUN-19	R4690521
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-JUN-19	28-JUN-19	R4690521

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2299337-1 LC_PIZP1105_WG_Q2-2019_N							
Sampled By: KC/DT on 25-JUN-19 @ 12:55							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Zinc (Zn)-Dissolved	0.0075		0.0010	mg/L	27-JUN-19	28-JUN-19	R4690521
Hardness							
Hardness (as CaCO3)	660		0.50	mg/L		28-JUN-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.261		0.020	ug/L		28-JUN-19	R4690272
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		28-JUN-19	R4690685
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	3.16		0.0030	mg/L		28-JUN-19	R4690272
Antimony (Sb)-Total	0.00098		0.00010	mg/L		28-JUN-19	R4690272
Arsenic (As)-Total	0.00262		0.00010	mg/L		28-JUN-19	R4690272
Barium (Ba)-Total	0.204		0.00010	mg/L		28-JUN-19	R4690272
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		28-JUN-19	R4690272
Boron (B)-Total	0.026		0.010	mg/L		28-JUN-19	R4690272
Cadmium (Cd)-Total	0.476		0.0050	ug/L		28-JUN-19	R4690272
Calcium (Ca)-Total	198		0.050	mg/L		28-JUN-19	R4690272
Chromium (Cr)-Total	0.00608		0.00010	mg/L		28-JUN-19	R4690272
Cobalt (Co)-Total	3.47		0.10	ug/L		28-JUN-19	R4690272
Copper (Cu)-Total	0.00723		0.00050	mg/L		28-JUN-19	R4690272
Iron (Fe)-Total	6.92		0.010	mg/L		28-JUN-19	R4690272
Lead (Pb)-Total	0.00305		0.000050	mg/L		28-JUN-19	R4690272
Lithium (Li)-Total	0.0222		0.0010	mg/L		28-JUN-19	R4690272
Magnesium (Mg)-Total	59.3		0.10	mg/L		28-JUN-19	R4690272
Manganese (Mn)-Total	0.423		0.00010	mg/L		28-JUN-19	R4690272
Molybdenum (Mo)-Total	0.000885		0.000050	mg/L		28-JUN-19	R4690272
Nickel (Ni)-Total	0.00830		0.00050	mg/L		28-JUN-19	R4690272
Potassium (K)-Total	2.59		0.050	mg/L		28-JUN-19	R4690272
Selenium (Se)-Total	0.412		0.050	ug/L		28-JUN-19	R4690272
Silicon (Si)-Total	8.72		0.10	mg/L		28-JUN-19	R4690272
Silver (Ag)-Total	0.000094		0.000010	mg/L		28-JUN-19	R4690272
Sodium (Na)-Total	14.0		0.050	mg/L		28-JUN-19	R4690272
Strontium (Sr)-Total	0.427		0.00020	mg/L		28-JUN-19	R4690272
Thallium (Tl)-Total	0.000171		0.000010	mg/L		28-JUN-19	R4690272
Tin (Sn)-Total	0.00112		0.00010	mg/L		28-JUN-19	R4690272
Titanium (Ti)-Total	0.020		0.010	mg/L		28-JUN-19	R4690272
Uranium (U)-Total	0.000843		0.000010	mg/L		28-JUN-19	R4690272
Vanadium (V)-Total	0.00957		0.00050	mg/L		28-JUN-19	R4690272
Zinc (Zn)-Total	0.0458		0.0030	mg/L		28-JUN-19	R4690272
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	33.8		1.0	mg/L		29-JUN-19	R4691195
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	416		1.0	mg/L		28-JUN-19	R4690699
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		28-JUN-19	R4690699
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		28-JUN-19	R4690699
Alkalinity, Total (as CaCO3)	416		1.0	mg/L		28-JUN-19	R4690699
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		26-JUN-19	R4690275
Bromide in Water by IC (Low Level)							
Bromide (Br)	1.74	DLHC	0.25	mg/L		26-JUN-19	R4689274
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2299337-1 LC_PIZP1105_WG_Q2-2019_N							
Sampled By: KC/DT on 25-JUN-19 @ 12:55							
Matrix: WG							
Chloride in Water by IC							
Chloride (Cl)	118	DLHC	2.5	mg/L		26-JUN-19	R4689274
Electrical Conductivity (EC)							
Conductivity (@ 25C)	1120		2.0	uS/cm		28-JUN-19	R4690699
Fluoride in Water by IC							
Fluoride (F)	<0.10	DLHC	0.10	mg/L		26-JUN-19	R4689274
Ion Balance Calculation							
Cation - Anion Balance	1.2			%		29-JUN-19	
Anion Sum	13.5			meq/L		29-JUN-19	
Cation Sum	13.9			meq/L		29-JUN-19	
Ion Balance Calculation							
Ion Balance	103		-100	%		29-JUN-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.605	DLHC	0.025	mg/L		26-JUN-19	R4689274
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		26-JUN-19	R4689274
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		27-JUN-19	R4690046
Oxidation redution potential by elect.							
ORP	427		-1000	mV		29-JUN-19	R4691029
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.534	DLHC	0.050	mg/L		28-JUN-19	R4690636
Sulfate in Water by IC							
Sulfate (SO4)	87.9	DLHC	1.5	mg/L		26-JUN-19	R4689274
Total Dissolved Solids							
Total Dissolved Solids	730	DLHC	20	mg/L		27-JUN-19	R4690723
Total Suspended Solids							
Total Suspended Solids	404	DLHC	2.0	mg/L		27-JUN-19	R4690217
Turbidity							
Turbidity	302		0.10	NTU		27-JUN-19	R4690672
pH							
pH	7.57		0.10	pH		28-JUN-19	R4690699

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
EPH(10-32)-CALC-CL	Water	Sum of EPH (10-32)	Sum of EPH - Auto Calculated
The sum of EPH(C10-C19) and EPH(C19-C32)			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TEH-BC-VA-CL	Water	EPH (C10-C19) & EPH (C19-C32)	BCMOE EPH GCFID
Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).			
TEH-WATER-VA-CL	Water	TEH (C10-C30)	BC Lab Manual
Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190625 PIZP1105

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2299337

Report Date: 29-JUN-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4691195							
WG3092424-5	LCS							
Acidity (as CaCO3)			106.0		%		85-115	29-JUN-19
WG3092424-4	MB							
Acidity (as CaCO3)			<1.0		mg/L		2	29-JUN-19
ALK-MAN-CL								
	Water							
Batch	R4690699							
WG3091910-5	LCS							
Alkalinity, Total (as CaCO3)			101.6		%		85-115	28-JUN-19
WG3091910-4	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	28-JUN-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4690121							
WG3090770-2	LCS							
Beryllium (Be)-Dissolved			97.0		%		80-120	27-JUN-19
WG3090770-1	MB	LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	27-JUN-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4690272							
WG3090764-2	LCS							
Beryllium (Be)-Total			105.3		%		80-120	28-JUN-19
WG3090764-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	28-JUN-19
BR-L-IC-N-CL								
	Water							
Batch	R4689274							
WG3090221-10	LCS							
Bromide (Br)			96.9		%		85-115	26-JUN-19
WG3090221-9	MB							
Bromide (Br)			<0.050		mg/L		0.05	26-JUN-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4690146							
WG3091367-6	LCS							
Dissolved Organic Carbon			103.9		%		80-120	27-JUN-19
WG3091367-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	27-JUN-19
WG3091367-8	MS	L2299337-1						
Dissolved Organic Carbon			96.3		%		70-130	27-JUN-19
C-TOT-ORG-LOW-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL								
Batch R4690146								
WG3091367-6	LCS							
Total Organic Carbon			109.0		%		80-120	27-JUN-19
WG3091367-5	MB							
Total Organic Carbon			<0.50		mg/L		0.5	27-JUN-19
WG3091367-8	MS	L2299337-1						
Total Organic Carbon			86.2		%		70-130	27-JUN-19
CL-IC-N-CL								
Batch R4689274								
WG3090221-10	LCS							
Chloride (Cl)			99.7		%		90-110	26-JUN-19
WG3090221-9	MB							
Chloride (Cl)			<0.50		mg/L		0.5	26-JUN-19
EC-L-PCT-CL								
Batch R4690699								
WG3091910-5	LCS							
Conductivity (@ 25C)			92.5		%		90-110	28-JUN-19
WG3091910-4	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	28-JUN-19
F-IC-N-CL								
Batch R4689274								
WG3090221-10	LCS							
Fluoride (F)			101.5		%		90-110	26-JUN-19
WG3090221-9	MB							
Fluoride (F)			<0.020		mg/L		0.02	26-JUN-19
HG-D-CVAA-VA								
Batch R4691014								
WG3091802-10	LCS							
Mercury (Hg)-Dissolved			98.3		%		80-120	29-JUN-19
WG3091802-9	MB	LF						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	29-JUN-19
WG3091802-12	MS	L2299337-1						
Mercury (Hg)-Dissolved			99.6		%		70-130	29-JUN-19
HG-T-CVAA-VA								
Batch R4690685								
WG3091852-2	LCS							
Mercury (Hg)-Total			102.9		%		80-120	28-JUN-19
WG3091852-1	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-VA		Water						
Batch	R4690685							
WG3091852-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	28-JUN-19
MET-D-CCMS-VA		Water						
Batch	R4690121							
WG3090770-2	LCS							
Aluminum (Al)-Dissolved			104.5		%		80-120	27-JUN-19
Antimony (Sb)-Dissolved			89.2		%		80-120	27-JUN-19
Arsenic (As)-Dissolved			97.4		%		80-120	27-JUN-19
Barium (Ba)-Dissolved			100.0		%		80-120	27-JUN-19
Bismuth (Bi)-Dissolved			104.9		%		80-120	27-JUN-19
Boron (B)-Dissolved			101.1		%		80-120	27-JUN-19
Cadmium (Cd)-Dissolved			99.6		%		80-120	27-JUN-19
Calcium (Ca)-Dissolved			99.7		%		80-120	27-JUN-19
Chromium (Cr)-Dissolved			99.4		%		80-120	27-JUN-19
Cobalt (Co)-Dissolved			99.1		%		80-120	27-JUN-19
Copper (Cu)-Dissolved			99.98		%		80-120	27-JUN-19
Iron (Fe)-Dissolved			98.4		%		80-120	27-JUN-19
Lead (Pb)-Dissolved			100.4		%		80-120	27-JUN-19
Lithium (Li)-Dissolved			96.4		%		80-120	27-JUN-19
Magnesium (Mg)-Dissolved			103.8		%		80-120	27-JUN-19
Manganese (Mn)-Dissolved			100.3		%		80-120	27-JUN-19
Molybdenum (Mo)-Dissolved			91.3		%		80-120	27-JUN-19
Nickel (Ni)-Dissolved			97.7		%		80-120	27-JUN-19
Potassium (K)-Dissolved			98.0		%		80-120	27-JUN-19
Selenium (Se)-Dissolved			98.6		%		80-120	27-JUN-19
Silicon (Si)-Dissolved			103.6		%		60-140	27-JUN-19
Silver (Ag)-Dissolved			89.6		%		80-120	27-JUN-19
Sodium (Na)-Dissolved			101.6		%		80-120	27-JUN-19
Strontium (Sr)-Dissolved			93.3		%		80-120	27-JUN-19
Thallium (Tl)-Dissolved			100.0		%		80-120	27-JUN-19
Tin (Sn)-Dissolved			91.6		%		80-120	27-JUN-19
Titanium (Ti)-Dissolved			98.6		%		80-120	27-JUN-19
Uranium (U)-Dissolved			100.8		%		80-120	27-JUN-19
Vanadium (V)-Dissolved			99.5		%		80-120	27-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4690121							
WG3090770-2	LCS							
Zinc (Zn)-Dissolved			97.8		%		80-120	27-JUN-19
WG3090770-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	27-JUN-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-JUN-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-JUN-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-JUN-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	27-JUN-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-JUN-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	27-JUN-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	27-JUN-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	27-JUN-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-JUN-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-JUN-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-JUN-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	27-JUN-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-JUN-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	27-JUN-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	27-JUN-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-JUN-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-JUN-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-JUN-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-JUN-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-JUN-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	27-JUN-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	27-JUN-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	27-JUN-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	27-JUN-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-JUN-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	27-JUN-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-JUN-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-JUN-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-JUN-19
MET-T-CCMS-VA								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4690272							
WG3090764-2	LCS							
Aluminum (Al)-Total			100.9		%		80-120	28-JUN-19
Antimony (Sb)-Total			108.7		%		80-120	28-JUN-19
Arsenic (As)-Total			98.4		%		80-120	28-JUN-19
Barium (Ba)-Total			97.7		%		80-120	28-JUN-19
Bismuth (Bi)-Total			105.2		%		80-120	28-JUN-19
Boron (B)-Total			103.1		%		80-120	28-JUN-19
Cadmium (Cd)-Total			98.0		%		80-120	28-JUN-19
Calcium (Ca)-Total			102.5		%		80-120	28-JUN-19
Chromium (Cr)-Total			100.8		%		80-120	28-JUN-19
Cobalt (Co)-Total			99.5		%		80-120	28-JUN-19
Copper (Cu)-Total			98.4		%		80-120	28-JUN-19
Iron (Fe)-Total			98.1		%		80-120	28-JUN-19
Lead (Pb)-Total			100.3		%		80-120	28-JUN-19
Lithium (Li)-Total			103.0		%		80-120	28-JUN-19
Magnesium (Mg)-Total			106.2		%		80-120	28-JUN-19
Manganese (Mn)-Total			101.0		%		80-120	28-JUN-19
Molybdenum (Mo)-Total			101.7		%		80-120	28-JUN-19
Nickel (Ni)-Total			98.4		%		80-120	28-JUN-19
Potassium (K)-Total			98.6		%		80-120	28-JUN-19
Selenium (Se)-Total			95.3		%		80-120	28-JUN-19
Silicon (Si)-Total			99.2		%		80-120	28-JUN-19
Silver (Ag)-Total			99.3		%		80-120	28-JUN-19
Sodium (Na)-Total			104.8		%		80-120	28-JUN-19
Strontium (Sr)-Total			105.7		%		80-120	28-JUN-19
Thallium (Tl)-Total			101.0		%		80-120	28-JUN-19
Tin (Sn)-Total			100.3		%		80-120	28-JUN-19
Titanium (Ti)-Total			98.9		%		80-120	28-JUN-19
Uranium (U)-Total			108.8		%		80-120	28-JUN-19
Vanadium (V)-Total			102.0		%		80-120	28-JUN-19
Zinc (Zn)-Total			99.9		%		80-120	28-JUN-19
WG3090764-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	28-JUN-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	28-JUN-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	28-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4690272							
WG3090764-1	MB							
Barium (Ba)-Total			<0.00010		mg/L		0.0001	28-JUN-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	28-JUN-19
Boron (B)-Total			<0.010		mg/L		0.01	28-JUN-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	28-JUN-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	28-JUN-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	28-JUN-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	28-JUN-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	28-JUN-19
Iron (Fe)-Total			<0.010		mg/L		0.01	28-JUN-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	28-JUN-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	28-JUN-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	28-JUN-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	28-JUN-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	28-JUN-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	28-JUN-19
Potassium (K)-Total			<0.050		mg/L		0.05	28-JUN-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	28-JUN-19
Silicon (Si)-Total			<0.10		mg/L		0.1	28-JUN-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	28-JUN-19
Sodium (Na)-Total			<0.050		mg/L		0.05	28-JUN-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	28-JUN-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	28-JUN-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	28-JUN-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	28-JUN-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	28-JUN-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	28-JUN-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	28-JUN-19
NH3-L-F-CL		Water						
Batch	R4690275							
WG3089974-26	LCS							
Ammonia as N			90.9		%		85-115	26-JUN-19
WG3089974-25	MB							
Ammonia as N			<0.0050		mg/L		0.005	26-JUN-19
NO2-L-IC-N-CL		Water						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-CL	Water							
Batch	R4689274							
WG3090221-10	LCS							
Nitrite (as N)			100.7		%		90-110	26-JUN-19
WG3090221-9	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	26-JUN-19
NO3-L-IC-N-CL	Water							
Batch	R4689274							
WG3090221-10	LCS							
Nitrate (as N)			99.1		%		90-110	26-JUN-19
WG3090221-9	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	26-JUN-19
ORP-CL	Water							
Batch	R4691029							
WG3092345-10	CRM	CL-ORP						
ORP			226		mV		210-230	29-JUN-19
WG3092345-6	DUP	L2299337-1						
ORP		427	429	J	mV	2.8	15	29-JUN-19
P-T-L-COL-CL	Water							
Batch	R4690636							
WG3091825-6	LCS							
Phosphorus (P)-Total			97.8		%		80-120	28-JUN-19
WG3091825-5	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	28-JUN-19
PH-CL	Water							
Batch	R4690699							
WG3091910-5	LCS							
pH			7.03		pH		6.9-7.1	28-JUN-19
PO4-DO-L-COL-CL	Water							
Batch	R4690046							
WG3090479-52	LCS							
Orthophosphate-Dissolved (as P)			105.2		%		80-120	27-JUN-19
WG3090479-13	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	27-JUN-19
SO4-IC-N-CL	Water							

Quality Control Report

Workorder: L2299337

Report Date: 29-JUN-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-CL								
Batch	R4689274							
WG3090221-10	LCS							
Sulfate (SO4)			98.7		%		90-110	26-JUN-19
WG3090221-9	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	26-JUN-19
SOLIDS-TDS-CL								
Batch	R4690723							
WG3090084-8	LCS							
Total Dissolved Solids			95.7		%		85-115	27-JUN-19
WG3090084-7	MB							
Total Dissolved Solids			<10		mg/L		10	27-JUN-19
TEH-BC-VA-CL								
Batch	R4690683							
WG3091895-2	LCS							
EPH10-19			123.5		%		70-130	27-JUN-19
EPH19-32			128.2		%		70-130	27-JUN-19
WG3091895-1	MB							
EPH10-19			<0.25		mg/L		0.25	27-JUN-19
EPH19-32			<0.25		mg/L		0.25	27-JUN-19
Surrogate: 2-Bromobenzotrifluoride			77.1		%		60-140	27-JUN-19
TEH-WATER-VA-CL								
Batch	R4690683							
WG3091895-2	LCS							
TEH (C10-C30)			124.7		%		70-130	27-JUN-19
WG3091895-1	MB							
TEH (C10-C30)			<0.25		mg/L		0.25	27-JUN-19
Surrogate: 2-Bromobenzotrifluoride			77.1		%		60-140	27-JUN-19
TKN-L-F-CL								
Batch	R4691176							
WG3092420-13	LCS							
Total Kjeldahl Nitrogen			85.3		%		75-125	29-JUN-19
WG3092420-17	LCS							
Total Kjeldahl Nitrogen			95.5		%		75-125	29-JUN-19
WG3092420-2	LCS							
Total Kjeldahl Nitrogen			90.3		%		75-125	29-JUN-19
WG3092420-5	LCS							
Total Kjeldahl Nitrogen			87.5		%		75-125	29-JUN-19
WG3092420-9	LCS							

Quality Control Report

Workorder: L2299337

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL		Water						
Batch	R4691176							
WG3092420-9	LCS							
Total Kjeldahl Nitrogen			85.9		%		75-125	29-JUN-19
WG3092420-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	29-JUN-19
WG3092420-12	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	29-JUN-19
WG3092420-16	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	29-JUN-19
WG3092420-4	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	29-JUN-19
WG3092420-8	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	29-JUN-19
TSS-L-CL		Water						
Batch	R4690217							
WG3090604-10	LCS							
Total Suspended Solids			103.1		%		85-115	27-JUN-19
WG3090604-9	MB							
Total Suspended Solids			<1.0		mg/L		1	27-JUN-19
TURBIDITY-CL		Water						
Batch	R4690672							
WG3090633-23	LCS							
Turbidity			95.0		%		85-115	27-JUN-19
WG3090633-22	MB							
Turbidity			<0.10		NTU		0.1	27-JUN-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2299337

Report Date: 29-JUN-19

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	25-JUN-19 12:55	29-JUN-19 09:00	0.25	92	hours	EHTR-FM
pH	1	25-JUN-19 12:55	28-JUN-19 11:00	0.25	70	hours	EHTR-FM

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2299337 were received on 26-JUN-19 08:55.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

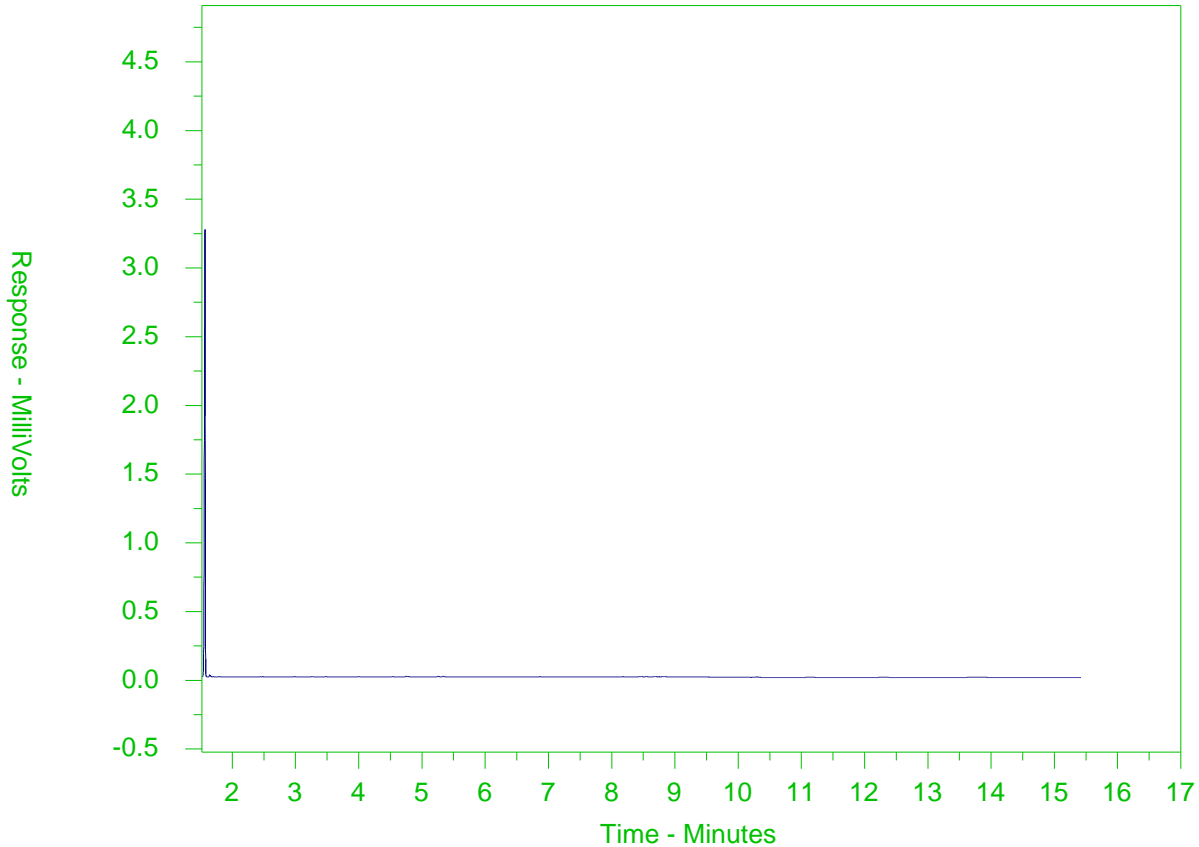
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2299337-1
 Client Sample ID: LC_PIZP1105_WG_Q2-2019_N



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34	nC50	
174°C	287°C		481°C	575°C	
346°F	549°F		898°F	1067°F	
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →		
← Diesel/ Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

COC ID: 20190625 PIZP1105 TURNAROUND TIME: 2-3 days RUSH: Y

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	chris.blurton@teck.com		x	x
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		x	x
Address	Box 2003 15km North Hwy 43			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com		x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 4:	kirsten.campbell@teck.com		x	x
Postal Code	V0B 2G0		Country	Canada	Postal Code	T1Y 7B5		Country	Canada		PO number: 1'P000608129	
Phone Number	250-425-3196			Phone Number	403 407 1794							

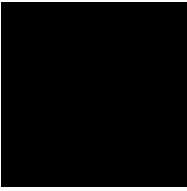
SAMPLE DETAILS							ANALYSIS REQUESTED								Filtered - F: Field, L: Lab, FI: Field & Lab, N: None				
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS_Package-DOC	ALS_Package-EPH	HG-D-CVAF-VA	HG-T-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC				
LC_PIZP1105_WG_Q2-2019_N	LC_PIZP1105	WG		2019/06/25	12:55	G	9	1	2	1	1	1	1	1	1				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION D.Tymstra/K.Campbell	DATE/TIME 25-Jun	ACCEPTED BY/AFFILIATION <i>DM</i>	DATE/TIME 6/26 855
--	---	---------------------	--------------------------------------	-----------------------

SERVICE REQUEST (rush subject to availability)	Regular (default)	Priority (2-3 business days) - 50% surcharge	Emergency (1 Business Day) - 100% surcharge	For Emergency <1 Day, ASAP or Weekend - Contact ALS	Sampler's Name K. Campbell/D. Tymstra	Mobile #	Sampler's Signature	Date/Time June 25, 2019
--	-------------------	--	---	---	--	----------	---------------------	----------------------------

10 °C

Q3 – COAs



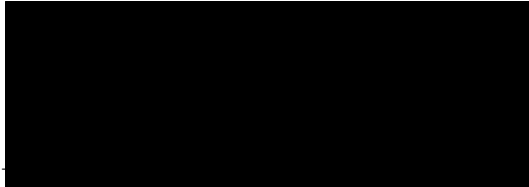
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 18-JUL-19
Report Date: 26-JUL-19 12:27 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2312625
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190717 PIZP1101
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-1 LC_PIZP1101_WG_Q3-2019_N							
Sampled By: KC/DT on 17-JUL-19 @ 12:50							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		20-JUL-19	R4719877
Total Kjeldahl Nitrogen	<0.050	TKNI	0.050	mg/L		23-JUL-19	R4720840
Total Organic Carbon	<0.50		0.50	mg/L		20-JUL-19	R4719877
EPH Testing for teck Coal							
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	20-JUL-19	20-JUL-19	R4714615
EPH19-32	<0.25		0.25	mg/L	20-JUL-19	20-JUL-19	R4714615
Surrogate: 2-Bromobenzotrifluoride	85.8		60-140	%	20-JUL-19	20-JUL-19	R4714615
Sum of EPH (10-32)							
EPH (C10-C32)	<0.50		0.50	mg/L		21-JUL-19	
TEH (C10-C30)							
TEH (C10-C30)	<0.25		0.25	mg/L	20-JUL-19	20-JUL-19	R4714615
Surrogate: 2-Bromobenzotrifluoride	85.8		60-140	%	20-JUL-19	20-JUL-19	R4714615
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	19-JUL-19	20-JUL-19	R4719796
Dissolved Metals Filtration Location	FIELD					19-JUL-19	R4718548
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	21-JUL-19	22-JUL-19	R4720276
Dissolved Mercury Filtration Location	FIELD					21-JUL-19	R4719406
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					19-JUL-19	R4718548
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	19-JUL-19	20-JUL-19	R4719796
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Arsenic (As)-Dissolved	0.00132		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Barium (Ba)-Dissolved	0.453		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	19-JUL-19	20-JUL-19	R4719796
Boron (B)-Dissolved	0.023		0.010	mg/L	19-JUL-19	20-JUL-19	R4719796
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	19-JUL-19	20-JUL-19	R4719796
Calcium (Ca)-Dissolved	26.5		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Cobalt (Co)-Dissolved	0.20		0.10	ug/L	19-JUL-19	20-JUL-19	R4719796
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	19-JUL-19	20-JUL-19	R4719796
Iron (Fe)-Dissolved	0.260		0.010	mg/L	19-JUL-19	20-JUL-19	R4719796
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	19-JUL-19	20-JUL-19	R4719796
Lithium (Li)-Dissolved	0.0092		0.0010	mg/L	19-JUL-19	20-JUL-19	R4719796
Magnesium (Mg)-Dissolved	13.9		0.10	mg/L	19-JUL-19	20-JUL-19	R4719796
Manganese (Mn)-Dissolved	0.227		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Molybdenum (Mo)-Dissolved	0.0112		0.000050	mg/L	19-JUL-19	20-JUL-19	R4719796
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	19-JUL-19	20-JUL-19	R4719796
Potassium (K)-Dissolved	0.749		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	19-JUL-19	20-JUL-19	R4719796
Silicon (Si)-Dissolved	3.56		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	19-JUL-19	20-JUL-19	R4719796
Sodium (Na)-Dissolved	18.2		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Strontium (Sr)-Dissolved	0.213		0.00020	mg/L	19-JUL-19	20-JUL-19	R4719796
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	19-JUL-19	20-JUL-19	R4719796
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	19-JUL-19	20-JUL-19	R4719796
Uranium (U)-Dissolved	0.00139		0.000010	mg/L	19-JUL-19	20-JUL-19	R4719796
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	19-JUL-19	20-JUL-19	R4719796

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-1 LC_PIZP1101_WG_Q3-2019_N							
Sampled By: KC/DT on 17-JUL-19 @ 12:50							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	19-JUL-19	20-JUL-19	R4719796
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	123		0.50	mg/L		23-JUL-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		22-JUL-19	R4720253
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		21-JUL-19	R4719457
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.102		0.0030	mg/L		22-JUL-19	R4720253
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Arsenic (As)-Total	0.00153		0.00010	mg/L		22-JUL-19	R4720253
Barium (Ba)-Total	0.474		0.00010	mg/L		22-JUL-19	R4720253
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		22-JUL-19	R4720253
Boron (B)-Total	0.019		0.010	mg/L		22-JUL-19	R4720253
Cadmium (Cd)-Total	0.0229		0.0050	ug/L		22-JUL-19	R4720253
Calcium (Ca)-Total	28.0		0.050	mg/L		22-JUL-19	R4720253
Chromium (Cr)-Total	0.00019		0.00010	mg/L		22-JUL-19	R4720253
Cobalt (Co)-Total	0.24		0.10	ug/L		22-JUL-19	R4720253
Copper (Cu)-Total	0.00058		0.00050	mg/L		22-JUL-19	R4720253
Iron (Fe)-Total	0.500		0.010	mg/L		22-JUL-19	R4720253
Lead (Pb)-Total	0.000193		0.000050	mg/L		22-JUL-19	R4720253
Lithium (Li)-Total	0.0089		0.0010	mg/L		22-JUL-19	R4720253
Magnesium (Mg)-Total	14.5		0.10	mg/L		22-JUL-19	R4720253
Manganese (Mn)-Total	0.240		0.00010	mg/L		22-JUL-19	R4720253
Molybdenum (Mo)-Total	0.0105		0.000050	mg/L		22-JUL-19	R4720253
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		22-JUL-19	R4720253
Potassium (K)-Total	0.756		0.050	mg/L		22-JUL-19	R4720253
Selenium (Se)-Total	<0.050		0.050	ug/L		22-JUL-19	R4720253
Silicon (Si)-Total	3.74		0.10	mg/L		22-JUL-19	R4720253
Silver (Ag)-Total	<0.000010		0.000010	mg/L		22-JUL-19	R4720253
Sodium (Na)-Total	19.1		0.050	mg/L		22-JUL-19	R4720253
Strontium (Sr)-Total	0.209		0.00020	mg/L		22-JUL-19	R4720253
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		22-JUL-19	R4720253
Tin (Sn)-Total	<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Titanium (Ti)-Total	<0.010		0.010	mg/L		22-JUL-19	R4720253
Uranium (U)-Total	0.00141		0.000010	mg/L		22-JUL-19	R4720253
Vanadium (V)-Total	0.00082		0.00050	mg/L		22-JUL-19	R4720253
Zinc (Zn)-Total	0.0033		0.0030	mg/L		22-JUL-19	R4720253
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723855
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	161		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Carbonate (as CaCO3)	4.4		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Total (as CaCO3)	166		1.0	mg/L		23-JUL-19	R4723837
Ammonia, Total (as N)							
Ammonia as N	0.0169		0.0050	mg/L		23-JUL-19	R4723816
Bromide in Water by IC (Low Level)							
Bromide (Br)	0.076		0.050	mg/L		18-JUL-19	R4718872
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-1 LC_PIZP1101_WG_Q3-2019_N Sampled By: KC/DT on 17-JUL-19 @ 12:50 Matrix: WG							
Chloride in Water by IC Chloride (Cl)	0.60		0.50	mg/L		25-JUL-19	R4718872
Electrical Conductivity (EC) Conductivity (@ 25C)	312		2.0	uS/cm		23-JUL-19	R4723837
Fluoride in Water by IC Fluoride (F)	1.82		0.020	mg/L		25-JUL-19	R4718872
Ion Balance Calculation Ion Balance	94.4		-100	%		25-JUL-19	
Ion Balance Calculation Cation - Anion Balance	-2.9			%		25-JUL-19	
Anion Sum	3.49			meq/L		25-JUL-19	
Cation Sum	3.30			meq/L		25-JUL-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050	HTD	0.0050	mg/L		25-JUL-19	R4718872
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010	HTD	0.0010	mg/L		25-JUL-19	R4718872
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0090		0.0010	mg/L		18-JUL-19	R4718231
Oxidation redution potential by elect. ORP	306		-1000	mV		22-JUL-19	R4720463
Phosphorus (P)-Total Phosphorus (P)-Total	0.0301		0.0020	mg/L		22-JUL-19	R4720267
Sulfate in Water by IC Sulfate (SO4)	3.30		0.30	mg/L		25-JUL-19	R4718872
Total Dissolved Solids Total Dissolved Solids	159	DLHC	20	mg/L		23-JUL-19	R4723901
Total Suspended Solids Total Suspended Solids	6.2		1.0	mg/L		24-JUL-19	R4726150
Turbidity Turbidity	8.45		0.10	NTU		18-JUL-19	R4715512
pH pH	8.42		0.10	pH		23-JUL-19	R4723837
L2312625-2 WG_Q3-2019_CC Sampled By: KC/DT on 17-JUL-19 @ 12:55 Matrix: WG							
Miscellaneous Parameters Dissolved Organic Carbon	<0.50		0.50	mg/L		20-JUL-19	R4719877
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		23-JUL-19	R4720840
Total Organic Carbon	<0.50		0.50	mg/L		20-JUL-19	R4719877
Dissolved Metals in Water Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	19-JUL-19	20-JUL-19	R4719796
Dissolved Metals Filtration Location	FIELD					19-JUL-19	R4718548
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	21-JUL-19	22-JUL-19	R4720276
Dissolved Mercury Filtration Location	FIELD					21-JUL-19	R4719406
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					19-JUL-19	R4718548
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	19-JUL-19	20-JUL-19	R4719796
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Arsenic (As)-Dissolved	0.00133		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Barium (Ba)-Dissolved	0.453		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-2 WG_Q3-2019_CC							
Sampled By: KC/DT on 17-JUL-19 @ 12:55							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	19-JUL-19	20-JUL-19	R4719796
Boron (B)-Dissolved	0.022		0.010	mg/L	19-JUL-19	20-JUL-19	R4719796
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	19-JUL-19	20-JUL-19	R4719796
Calcium (Ca)-Dissolved	26.3		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Cobalt (Co)-Dissolved	0.20		0.10	ug/L	19-JUL-19	20-JUL-19	R4719796
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	19-JUL-19	20-JUL-19	R4719796
Iron (Fe)-Dissolved	0.252		0.010	mg/L	19-JUL-19	20-JUL-19	R4719796
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	19-JUL-19	20-JUL-19	R4719796
Lithium (Li)-Dissolved	0.0090		0.0010	mg/L	19-JUL-19	20-JUL-19	R4719796
Magnesium (Mg)-Dissolved	13.5		0.10	mg/L	19-JUL-19	20-JUL-19	R4719796
Manganese (Mn)-Dissolved	0.222		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Molybdenum (Mo)-Dissolved	0.0112		0.000050	mg/L	19-JUL-19	20-JUL-19	R4719796
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	19-JUL-19	20-JUL-19	R4719796
Potassium (K)-Dissolved	0.720		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	19-JUL-19	20-JUL-19	R4719796
Silicon (Si)-Dissolved	3.44		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	19-JUL-19	20-JUL-19	R4719796
Sodium (Na)-Dissolved	18.2		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Strontium (Sr)-Dissolved	0.215		0.00020	mg/L	19-JUL-19	20-JUL-19	R4719796
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	19-JUL-19	20-JUL-19	R4719796
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	19-JUL-19	20-JUL-19	R4719796
Uranium (U)-Dissolved	0.00142		0.000010	mg/L	19-JUL-19	20-JUL-19	R4719796
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	19-JUL-19	20-JUL-19	R4719796
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	19-JUL-19	20-JUL-19	R4719796
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	121		0.50	mg/L		23-JUL-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		22-JUL-19	R4720253
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		21-JUL-19	R4719457
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0994		0.0030	mg/L		22-JUL-19	R4720253
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Arsenic (As)-Total	0.00150		0.00010	mg/L		22-JUL-19	R4720253
Barium (Ba)-Total	0.466		0.00010	mg/L		22-JUL-19	R4720253
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		22-JUL-19	R4720253
Boron (B)-Total	0.020		0.010	mg/L		22-JUL-19	R4720253
Cadmium (Cd)-Total	0.0213		0.0050	ug/L		22-JUL-19	R4720253
Calcium (Ca)-Total	27.8		0.050	mg/L		22-JUL-19	R4720253
Chromium (Cr)-Total	0.00018		0.00010	mg/L		22-JUL-19	R4720253
Cobalt (Co)-Total	0.24		0.10	ug/L		22-JUL-19	R4720253
Copper (Cu)-Total	<0.00050		0.00050	mg/L		22-JUL-19	R4720253
Iron (Fe)-Total	0.480		0.010	mg/L		22-JUL-19	R4720253
Lead (Pb)-Total	0.000112		0.000050	mg/L		22-JUL-19	R4720253
Lithium (Li)-Total	0.0089		0.0010	mg/L		22-JUL-19	R4720253
Magnesium (Mg)-Total	14.8		0.10	mg/L		22-JUL-19	R4720253
Manganese (Mn)-Total	0.240		0.00010	mg/L		22-JUL-19	R4720253
Molybdenum (Mo)-Total	0.0106		0.000050	mg/L		22-JUL-19	R4720253
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		22-JUL-19	R4720253

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-2 WG_Q3-2019_CC							
Sampled By: KC/DT on 17-JUL-19 @ 12:55							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Potassium (K)-Total	0.776		0.050	mg/L		22-JUL-19	R4720253
Selenium (Se)-Total	<0.050		0.050	ug/L		22-JUL-19	R4720253
Silicon (Si)-Total	3.61		0.10	mg/L		22-JUL-19	R4720253
Silver (Ag)-Total	<0.000010		0.000010	mg/L		22-JUL-19	R4720253
Sodium (Na)-Total	19.3		0.050	mg/L		22-JUL-19	R4720253
Strontium (Sr)-Total	0.210		0.00020	mg/L		22-JUL-19	R4720253
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		22-JUL-19	R4720253
Tin (Sn)-Total	<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Titanium (Ti)-Total	<0.010		0.010	mg/L		22-JUL-19	R4720253
Uranium (U)-Total	0.00143		0.000010	mg/L		22-JUL-19	R4720253
Vanadium (V)-Total	0.00087		0.00050	mg/L		22-JUL-19	R4720253
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		22-JUL-19	R4720253
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723855
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	156		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Carbonate (as CaCO3)	5.2		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Total (as CaCO3)	161		1.0	mg/L		23-JUL-19	R4723837
Ammonia, Total (as N)							
Ammonia as N	0.0162		0.0050	mg/L		23-JUL-19	R4723816
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		18-JUL-19	R4718872
Chloride in Water by IC							
Chloride (Cl)	0.50		0.50	mg/L		18-JUL-19	R4718872
Electrical Conductivity (EC)							
Conductivity (@ 25C)	313		2.0	uS/cm		23-JUL-19	R4723837
Fluoride in Water by IC							
Fluoride (F)	1.74		0.020	mg/L		18-JUL-19	R4718872
Ion Balance Calculation							
Cation - Anion Balance	-1.9			%		24-JUL-19	
Anion Sum	3.38			meq/L		24-JUL-19	
Cation Sum	3.26			meq/L		24-JUL-19	
Ion Balance Calculation							
Ion Balance	96.4		-100	%		24-JUL-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-JUL-19	R4718872
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-JUL-19	R4718872
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0095		0.0010	mg/L		18-JUL-19	R4718231
Oxidation redution potential by elect.							
ORP	310		-1000	mV		22-JUL-19	R4720463
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0309		0.0020	mg/L		22-JUL-19	R4720267
Sulfate in Water by IC							
Sulfate (SO4)	2.83		0.30	mg/L		18-JUL-19	R4718872
Total Dissolved Solids							
Total Dissolved Solids	158	DLHC	20	mg/L		23-JUL-19	R4723901
Total Suspended Solids							
Total Suspended Solids	5.3		1.0	mg/L		24-JUL-19	R4726150

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-2 WG_Q3-2019_CC Sampled By: KC/DT on 17-JUL-19 @ 12:55 Matrix: WG							
Turbidity Turbidity	8.20		0.10	NTU		18-JUL-19	R4715512
pH pH	8.44		0.10	pH		23-JUL-19	R4723837
L2312625-3 WG_Q3-2019_RD Sampled By: KC/DT on 17-JUL-19 @ 13:20 Matrix: WG							
Miscellaneous Parameters							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		23-JUL-19	R4720840
Total Organic Carbon	<0.50		0.50	mg/L		20-JUL-19	R4719877
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		24-JUL-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		22-JUL-19	R4720253
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		21-JUL-19	R4719457
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		22-JUL-19	R4720253
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Arsenic (As)-Total	<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Barium (Ba)-Total	<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		22-JUL-19	R4720253
Boron (B)-Total	<0.010		0.010	mg/L		22-JUL-19	R4720253
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		22-JUL-19	R4720253
Calcium (Ca)-Total	<0.050		0.050	mg/L		22-JUL-19	R4720253
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Cobalt (Co)-Total	<0.10		0.10	ug/L		22-JUL-19	R4720253
Copper (Cu)-Total	<0.00050		0.00050	mg/L		22-JUL-19	R4720253
Iron (Fe)-Total	<0.010		0.010	mg/L		22-JUL-19	R4720253
Lead (Pb)-Total	<0.000050		0.000050	mg/L		22-JUL-19	R4720253
Lithium (Li)-Total	<0.0010		0.0010	mg/L		22-JUL-19	R4720253
Magnesium (Mg)-Total	<0.10		0.10	mg/L		22-JUL-19	R4720253
Manganese (Mn)-Total	<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		22-JUL-19	R4720253
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		22-JUL-19	R4720253
Potassium (K)-Total	<0.050		0.050	mg/L		22-JUL-19	R4720253
Selenium (Se)-Total	<0.050		0.050	ug/L		22-JUL-19	R4720253
Silicon (Si)-Total	<0.10		0.10	mg/L		22-JUL-19	R4720253
Silver (Ag)-Total	<0.000010		0.000010	mg/L		22-JUL-19	R4720253
Sodium (Na)-Total	<0.050		0.050	mg/L		22-JUL-19	R4720253
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		22-JUL-19	R4720253
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		22-JUL-19	R4720253
Tin (Sn)-Total	<0.00010		0.00010	mg/L		24-JUL-19	R4723949
Titanium (Ti)-Total	<0.010		0.010	mg/L		22-JUL-19	R4720253
Uranium (U)-Total	<0.000010		0.000010	mg/L		22-JUL-19	R4720253
Vanadium (V)-Total	<0.00050		0.00050	mg/L		22-JUL-19	R4720253
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		22-JUL-19	R4720253
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.6		1.0	mg/L		23-JUL-19	R4723855
Alkalinity (Species) by Manual Titration							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-3 WG_Q3-2019_RD							
Sampled By: KC/DT on 17-JUL-19 @ 13:20							
Matrix: WG							
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		23-JUL-19	R4723816
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		18-JUL-19	R4718872
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		18-JUL-19	R4718872
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					18-JUL-19	R4715573
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L		18-JUL-19	R4714794
Magnesium (Mg)-Dissolved	<0.0050		0.0050	mg/L		18-JUL-19	R4714794
Potassium (K)-Dissolved	<0.050		0.050	mg/L		18-JUL-19	R4714794
Sodium (Na)-Dissolved	<0.050		0.050	mg/L		18-JUL-19	R4714794
Electrical Conductivity (EC)							
Conductivity (@ 25C)	<2.0		2.0	uS/cm		23-JUL-19	R4723837
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		18-JUL-19	R4718872
Ion Balance Calculation							
Ion Balance	0.0		-100	%		24-JUL-19	
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		24-JUL-19	
Anion Sum	<0.10			meq/L		24-JUL-19	
Cation Sum	<0.10			meq/L		24-JUL-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		18-JUL-19	R4718872
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		18-JUL-19	R4718872
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-JUL-19	R4718231
Oxidation redution potential by elect.							
ORP	449		-1000	mV		22-JUL-19	R4720463
Phosphorus (P)-Total							
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		22-JUL-19	R4720267
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		18-JUL-19	R4718872
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		23-JUL-19	R4723901
Total Suspended Solids							
Total Suspended Solids	<1.0		1.0	mg/L		24-JUL-19	R4726150
Turbidity							
Turbidity	<0.10		0.10	NTU		18-JUL-19	R4715512
pH							
pH	5.57		0.10	pH		23-JUL-19	R4723837

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
EPH(10-32)-CALC-CL	Water	Sum of EPH (10-32)	Sum of EPH - Auto Calculated
The sum of EPH(C10-C19) and EPH(C19-C32)			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<p>Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.</p>			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
<p>Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.</p>			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
<p>Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.</p>			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
<p>Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.</p>			
<p>Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:</p>			
<p>Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]</p>			
MET-D-CCMS-CL	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
<p>Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.</p>			
<p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
<p>Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.</p>			
<p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
<p>Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.</p>			
<p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
<p>This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.</p>			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
<p>This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.</p>			
<p>It is recommended that this analysis be conducted in the field.</p>			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.</p>			
PH-CL	Water	pH	APHA 4500 H-Electrode
<p>pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)</p>			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
<p>This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.</p>			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TEH-BC-VA-CL	Water	EPH (C10-C19) & EPH (C19-C32)	BCMOE EPH GCFID
Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).			
TEH-WATER-VA-CL	Water	TEH (C10-C30)	BC Lab Manual
Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190717 PIZP1101

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2312625

Report Date: 26-JUL-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4723855							
WG3113907-11	LCS							
Acidity (as CaCO3)			97.3		%		85-115	23-JUL-19
WG3113907-14	LCS							
Acidity (as CaCO3)			98.5		%		85-115	23-JUL-19
WG3113907-10	MB							
Acidity (as CaCO3)			1.6		mg/L		2	23-JUL-19
WG3113907-13	MB							
Acidity (as CaCO3)			1.6		mg/L		2	23-JUL-19
ALK-MAN-CL								
	Water							
Batch	R4723837							
WG3113843-20	LCS							
Alkalinity, Total (as CaCO3)			101.2		%		85-115	23-JUL-19
WG3113843-19	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	23-JUL-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4719796							
WG3110420-2	LCS							
Beryllium (Be)-Dissolved			99.7		%		80-120	20-JUL-19
WG3110420-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	20-JUL-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4720253							
WG3110273-2	LCS							
Beryllium (Be)-Total			89.6		%		80-120	22-JUL-19
WG3110273-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	22-JUL-19
BR-L-IC-N-CL								
	Water							
Batch	R4718872							
WG3110543-10	LCS							
Bromide (Br)			91.9		%		85-115	18-JUL-19
WG3110543-9	MB							
Bromide (Br)			<0.050		mg/L		0.05	18-JUL-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4719877							
WG3111750-10	LCS							
Dissolved Organic Carbon			97.8		%		80-120	20-JUL-19
WG3111750-9	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL	Water							
Batch	R4719877							
WG3111750-9 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	20-JUL-19
C-TOT-ORG-LOW-CL	Water							
Batch	R4719877							
WG3111750-10 LCS								
Total Organic Carbon			99.2		%		80-120	20-JUL-19
WG3111750-9 MB								
Total Organic Carbon			<0.50		mg/L		0.5	20-JUL-19
CL-IC-N-CL	Water							
Batch	R4718872							
WG3110543-10 LCS								
Chloride (Cl)			95.0		%		90-110	18-JUL-19
WG3110543-9 MB								
Chloride (Cl)			<0.50		mg/L		0.5	18-JUL-19
EC-L-PCT-CL	Water							
Batch	R4723837							
WG3113843-20 LCS								
Conductivity (@ 25C)			103.7		%		90-110	23-JUL-19
WG3113843-19 MB								
Conductivity (@ 25C)			<2.0		uS/cm		2	23-JUL-19
F-IC-N-CL	Water							
Batch	R4718872							
WG3110543-10 LCS								
Fluoride (F)			94.4		%		90-110	18-JUL-19
WG3110543-9 MB								
Fluoride (F)			<0.020		mg/L		0.02	18-JUL-19
HG-D-CVAA-VA	Water							
Batch	R4720276							
WG3111236-6 LCS								
Mercury (Hg)-Dissolved			101.4		%		80-120	22-JUL-19
WG3111236-5 MB								
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	22-JUL-19
HG-T-CVAA-VA	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-VA								
	Water							
Batch	R4719457							
WG3111270-2	LCS							
Mercury (Hg)-Total			93.6		%		80-120	21-JUL-19
WG3111270-1	MB							
Mercury (Hg)-Total			<0.000050		mg/L		0.000005	21-JUL-19
MET-D-CCMS-CL								
	Water							
Batch	R4714794							
WG3109072-2	LCS	TMRM						
Calcium (Ca)-Dissolved			98.9		%		80-120	18-JUL-19
Magnesium (Mg)-Dissolved			96.9		%		80-120	18-JUL-19
Potassium (K)-Dissolved			110.7		%		80-120	18-JUL-19
Sodium (Na)-Dissolved			96.2		%		80-120	18-JUL-19
WG3109072-1	MB							
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	18-JUL-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	18-JUL-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	18-JUL-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	18-JUL-19
MET-D-CCMS-VA								
	Water							
Batch	R4719796							
WG3110420-2	LCS							
Aluminum (Al)-Dissolved			99.7		%		80-120	20-JUL-19
Antimony (Sb)-Dissolved			93.8		%		80-120	20-JUL-19
Arsenic (As)-Dissolved			101.1		%		80-120	20-JUL-19
Barium (Ba)-Dissolved			102.8		%		80-120	20-JUL-19
Bismuth (Bi)-Dissolved			101.4		%		80-120	20-JUL-19
Boron (B)-Dissolved			92.2		%		80-120	20-JUL-19
Cadmium (Cd)-Dissolved			99.5		%		80-120	20-JUL-19
Calcium (Ca)-Dissolved			95.9		%		80-120	20-JUL-19
Chromium (Cr)-Dissolved			98.0		%		80-120	20-JUL-19
Cobalt (Co)-Dissolved			101.2		%		80-120	20-JUL-19
Copper (Cu)-Dissolved			98.5		%		80-120	20-JUL-19
Iron (Fe)-Dissolved			96.4		%		80-120	20-JUL-19
Lead (Pb)-Dissolved			101.4		%		80-120	20-JUL-19
Lithium (Li)-Dissolved			96.9		%		80-120	20-JUL-19
Magnesium (Mg)-Dissolved			97.6		%		80-120	20-JUL-19
Manganese (Mn)-Dissolved			101.1		%		80-120	20-JUL-19
Molybdenum (Mo)-Dissolved			97.3		%		80-120	20-JUL-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4719796							
WG3110420-2	LCS							
Nickel (Ni)-Dissolved			102.1		%		80-120	20-JUL-19
Potassium (K)-Dissolved			106.9		%		80-120	20-JUL-19
Selenium (Se)-Dissolved			98.6		%		80-120	20-JUL-19
Silicon (Si)-Dissolved			103.0		%		60-140	20-JUL-19
Silver (Ag)-Dissolved			98.8		%		80-120	20-JUL-19
Sodium (Na)-Dissolved			106.0		%		80-120	20-JUL-19
Strontium (Sr)-Dissolved			95.6		%		80-120	20-JUL-19
Thallium (Tl)-Dissolved			97.7		%		80-120	20-JUL-19
Tin (Sn)-Dissolved			96.1		%		80-120	20-JUL-19
Titanium (Ti)-Dissolved			97.3		%		80-120	20-JUL-19
Uranium (U)-Dissolved			94.6		%		80-120	20-JUL-19
Vanadium (V)-Dissolved			101.6		%		80-120	20-JUL-19
Zinc (Zn)-Dissolved			97.4		%		80-120	20-JUL-19
WG3110420-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	20-JUL-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-JUL-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-JUL-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	20-JUL-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-JUL-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-JUL-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-JUL-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-JUL-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-JUL-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-JUL-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-JUL-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-JUL-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-JUL-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	20-JUL-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4719796							
WG3110420-1	MB	NP						
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-JUL-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-JUL-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-JUL-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	20-JUL-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-JUL-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-JUL-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-JUL-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-JUL-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-JUL-19
MET-T-CCMS-VA								
	Water							
Batch	R4720253							
WG3110273-2	LCS							
Aluminum (Al)-Total			103.2		%		80-120	22-JUL-19
Antimony (Sb)-Total			105.2		%		80-120	22-JUL-19
Arsenic (As)-Total			99.4		%		80-120	22-JUL-19
Barium (Ba)-Total			97.4		%		80-120	22-JUL-19
Bismuth (Bi)-Total			111.4		%		80-120	22-JUL-19
Boron (B)-Total			92.3		%		80-120	22-JUL-19
Cadmium (Cd)-Total			97.9		%		80-120	22-JUL-19
Calcium (Ca)-Total			97.8		%		80-120	22-JUL-19
Chromium (Cr)-Total			100.3		%		80-120	22-JUL-19
Cobalt (Co)-Total			99.9		%		80-120	22-JUL-19
Copper (Cu)-Total			93.0		%		80-120	22-JUL-19
Iron (Fe)-Total			91.6		%		80-120	22-JUL-19
Lead (Pb)-Total			106.5		%		80-120	22-JUL-19
Lithium (Li)-Total			93.9		%		80-120	22-JUL-19
Magnesium (Mg)-Total			98.2		%		80-120	22-JUL-19
Manganese (Mn)-Total			99.0		%		80-120	22-JUL-19
Molybdenum (Mo)-Total			96.9		%		80-120	22-JUL-19
Nickel (Ni)-Total			96.6		%		80-120	22-JUL-19
Potassium (K)-Total			103.3		%		80-120	22-JUL-19
Selenium (Se)-Total			98.4		%		80-120	22-JUL-19
Silicon (Si)-Total			98.1		%		80-120	22-JUL-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4720253							
WG3110273-2 LCS								
Silver (Ag)-Total			103.1		%		80-120	22-JUL-19
Sodium (Na)-Total			107.2		%		80-120	22-JUL-19
Strontium (Sr)-Total			98.9		%		80-120	22-JUL-19
Thallium (Tl)-Total			105.8		%		80-120	22-JUL-19
Tin (Sn)-Total			99.3		%		80-120	22-JUL-19
Titanium (Ti)-Total			100.7		%		80-120	22-JUL-19
Uranium (U)-Total			105.3		%		80-120	22-JUL-19
Vanadium (V)-Total			99.7		%		80-120	22-JUL-19
Zinc (Zn)-Total			100.1		%		80-120	22-JUL-19
WG3110273-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	22-JUL-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	22-JUL-19
Boron (B)-Total			<0.010		mg/L		0.01	22-JUL-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	22-JUL-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	22-JUL-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	22-JUL-19
Iron (Fe)-Total			<0.010		mg/L		0.01	22-JUL-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	22-JUL-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	22-JUL-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	22-JUL-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	22-JUL-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	22-JUL-19
Potassium (K)-Total			<0.050		mg/L		0.05	22-JUL-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	22-JUL-19
Silicon (Si)-Total			<0.10		mg/L		0.1	22-JUL-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	22-JUL-19
Sodium (Na)-Total			<0.050		mg/L		0.05	22-JUL-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	22-JUL-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4720253							
WG3110273-1	MB							
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	22-JUL-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	22-JUL-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	22-JUL-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	22-JUL-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	22-JUL-19
Batch	R4723949							
WG3113409-2	LCS							
Aluminum (Al)-Total			100.2		%		80-120	24-JUL-19
Antimony (Sb)-Total			98.5		%		80-120	24-JUL-19
Arsenic (As)-Total			99.8		%		80-120	24-JUL-19
Barium (Ba)-Total			102.6		%		80-120	24-JUL-19
Bismuth (Bi)-Total			102.5		%		80-120	24-JUL-19
Boron (B)-Total			99.7		%		80-120	24-JUL-19
Cadmium (Cd)-Total			101.2		%		80-120	24-JUL-19
Calcium (Ca)-Total			103.8		%		80-120	24-JUL-19
Chromium (Cr)-Total			101.1		%		80-120	24-JUL-19
Cobalt (Co)-Total			99.3		%		80-120	24-JUL-19
Copper (Cu)-Total			98.5		%		80-120	24-JUL-19
Iron (Fe)-Total			98.8		%		80-120	24-JUL-19
Lead (Pb)-Total			98.6		%		80-120	24-JUL-19
Lithium (Li)-Total			98.4		%		80-120	24-JUL-19
Magnesium (Mg)-Total			107.3		%		80-120	24-JUL-19
Manganese (Mn)-Total			102.7		%		80-120	24-JUL-19
Molybdenum (Mo)-Total			97.8		%		80-120	24-JUL-19
Nickel (Ni)-Total			100.2		%		80-120	24-JUL-19
Potassium (K)-Total			106.7		%		80-120	24-JUL-19
Selenium (Se)-Total			99.8		%		80-120	24-JUL-19
Silicon (Si)-Total			107.7		%		80-120	24-JUL-19
Silver (Ag)-Total			99.7		%		80-120	24-JUL-19
Sodium (Na)-Total			109.9		%		80-120	24-JUL-19
Strontium (Sr)-Total			96.8		%		80-120	24-JUL-19
Thallium (Tl)-Total			99.0		%		80-120	24-JUL-19
Tin (Sn)-Total			97.4		%		80-120	24-JUL-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4723949							
WG3113409-2	LCS							
Titanium (Ti)-Total			101.2		%		80-120	24-JUL-19
Uranium (U)-Total			104.6		%		80-120	24-JUL-19
Vanadium (V)-Total			103.2		%		80-120	24-JUL-19
Zinc (Zn)-Total			101.4		%		80-120	24-JUL-19
WG3113409-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	24-JUL-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	24-JUL-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	24-JUL-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	24-JUL-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	24-JUL-19
Boron (B)-Total			<0.010		mg/L		0.01	24-JUL-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	24-JUL-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	24-JUL-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	24-JUL-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	24-JUL-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	24-JUL-19
Iron (Fe)-Total			<0.010		mg/L		0.01	24-JUL-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	24-JUL-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	24-JUL-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	24-JUL-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	24-JUL-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	24-JUL-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	24-JUL-19
Potassium (K)-Total			<0.050		mg/L		0.05	24-JUL-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	24-JUL-19
Silicon (Si)-Total			<0.10		mg/L		0.1	24-JUL-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	24-JUL-19
Sodium (Na)-Total			<0.050		mg/L		0.05	24-JUL-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	24-JUL-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	24-JUL-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	24-JUL-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	24-JUL-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	24-JUL-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	24-JUL-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch	R4723949							
WG3113409-1 MB								
Zinc (Zn)-Total			<0.0030		mg/L		0.003	24-JUL-19
NH3-L-F-CL	Water							
Batch	R4723816							
WG3113380-10 LCS								
Ammonia as N			106.4		%		85-115	23-JUL-19
WG3113380-9 MB								
Ammonia as N			<0.0050		mg/L		0.005	23-JUL-19
NO2-L-IC-N-CL	Water							
Batch	R4718872							
WG3110543-10 LCS								
Nitrite (as N)			98.2		%		90-110	18-JUL-19
WG3110543-9 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	18-JUL-19
NO3-L-IC-N-CL	Water							
Batch	R4718872							
WG3110543-10 LCS								
Nitrate (as N)			96.5		%		90-110	18-JUL-19
WG3110543-9 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	18-JUL-19
ORP-CL	Water							
Batch	R4720463							
WG3112467-5 CRM		CL-ORP						
ORP			227		mV		210-230	22-JUL-19
P-T-L-COL-CL	Water							
Batch	R4720267							
WG3112048-17 LCS								
Phosphorus (P)-Total			108.0		%		80-120	22-JUL-19
WG3112048-4 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	22-JUL-19
PH-CL	Water							
Batch	R4723837							
WG3113843-20 LCS								
pH			7.03		pH		6.9-7.1	23-JUL-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-L-COL-CL	Water							
Batch	R4718231							
WG3109249-10 LCS								
Orthophosphate-Dissolved (as P)			103.8		%		80-120	18-JUL-19
WG3109249-9 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	18-JUL-19
SO4-IC-N-CL	Water							
Batch	R4718872							
WG3110543-10 LCS								
Sulfate (SO4)			96.5		%		90-110	18-JUL-19
WG3110543-9 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	18-JUL-19
SOLIDS-TDS-CL	Water							
Batch	R4723901							
WG3112552-5 LCS								
Total Dissolved Solids			94.8		%		85-115	23-JUL-19
WG3112552-8 LCS								
Total Dissolved Solids			101.2		%		85-115	23-JUL-19
WG3112552-4 MB								
Total Dissolved Solids			<10		mg/L		10	23-JUL-19
WG3112552-7 MB								
Total Dissolved Solids			<10		mg/L		10	23-JUL-19
TEH-BC-VA-CL	Water							
Batch	R4714615							
WG3108827-16 LCS								
EPH10-19			94.3		%		70-130	20-JUL-19
EPH19-32			96.1		%		70-130	20-JUL-19
WG3108827-4 LCS								
EPH10-19			87.9		%		70-130	18-JUL-19
EPH19-32			86.3		%		70-130	18-JUL-19
WG3108827-15 MB								
EPH10-19			<0.25		mg/L		0.25	20-JUL-19
EPH19-32			<0.25		mg/L		0.25	20-JUL-19
Surrogate: 2-Bromobenzotrifluoride			72.7		%		60-140	20-JUL-19
WG3108827-3 MB								
EPH10-19			<0.25		mg/L		0.25	18-JUL-19
EPH19-32			<0.25		mg/L		0.25	18-JUL-19
Surrogate: 2-Bromobenzotrifluoride			82.0		%		60-140	18-JUL-19
TEH-WATER-VA-CL	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TEH-WATER-VA-CL		Water						
Batch	R4714615							
WG3108827-16	LCS							
TEH (C10-C30)			94.7		%		70-130	20-JUL-19
WG3108827-4	LCS							
TEH (C10-C30)			87.5		%		70-130	18-JUL-19
WG3108827-15	MB							
TEH (C10-C30)			<0.25		mg/L		0.25	20-JUL-19
Surrogate: 2-Bromobenzotrifluoride			72.7		%		60-140	20-JUL-19
WG3108827-3	MB							
TEH (C10-C30)			<0.25		mg/L		0.25	18-JUL-19
Surrogate: 2-Bromobenzotrifluoride			82.0		%		60-140	18-JUL-19
TKN-L-F-CL		Water						
Batch	R4720840							
WG3112859-10	LCS							
Total Kjeldahl Nitrogen			97.1		%		75-125	23-JUL-19
WG3112859-14	LCS							
Total Kjeldahl Nitrogen			98.9		%		75-125	23-JUL-19
WG3112859-18	LCS							
Total Kjeldahl Nitrogen			98.9		%		75-125	23-JUL-19
WG3112859-2	LCS							
Total Kjeldahl Nitrogen			102.9		%		75-125	23-JUL-19
WG3112859-22	LCS							
Total Kjeldahl Nitrogen			98.4		%		75-125	23-JUL-19
WG3112859-26	LCS							
Total Kjeldahl Nitrogen			103.7		%		75-125	23-JUL-19
WG3112859-6	LCS							
Total Kjeldahl Nitrogen			99.0		%		75-125	23-JUL-19
WG3112859-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-JUL-19
WG3112859-13	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-JUL-19
WG3112859-17	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-JUL-19
WG3112859-21	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-JUL-19
WG3112859-25	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-JUL-19
WG3112859-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-JUL-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL	Water							
Batch	R4720840							
WG3112859-9 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-JUL-19
TSS-L-CL	Water							
Batch	R4726150							
WG3112600-8 LCS								
Total Suspended Solids			96.1		%		85-115	24-JUL-19
WG3112600-7 MB								
Total Suspended Solids			<1.0		mg/L		1	24-JUL-19
TURBIDITY-CL	Water							
Batch	R4715512							
WG3108836-11 LCS								
Turbidity			95.0		%		85-115	18-JUL-19
WG3108836-10 MB								
Turbidity			<0.10		NTU		0.1	18-JUL-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	17-JUL-19 12:50	22-JUL-19 12:10	0.25	119	hours	EHTR-FM
	2	17-JUL-19 12:55	22-JUL-19 12:10	0.25	119	hours	EHTR-FM
	3	17-JUL-19 13:20	22-JUL-19 12:10	0.25	119	hours	EHTR-FM
pH	1	17-JUL-19 12:50	23-JUL-19 09:00	0.25	140	hours	EHTR-FM
	2	17-JUL-19 12:55	23-JUL-19 09:00	0.25	140	hours	EHTR-FM
	3	17-JUL-19 13:20	23-JUL-19 09:00	0.25	140	hours	EHTR-FM

Anions and Nutrients

Nitrate in Water by IC (Low Level)	1	17-JUL-19 12:50	25-JUL-19 09:44	3	8	days	EHT
Nitrite in Water by IC (Low Level)	1	17-JUL-19 12:50	25-JUL-19 09:44	3	8	days	EHT

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2312625 were received on 18-JUL-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

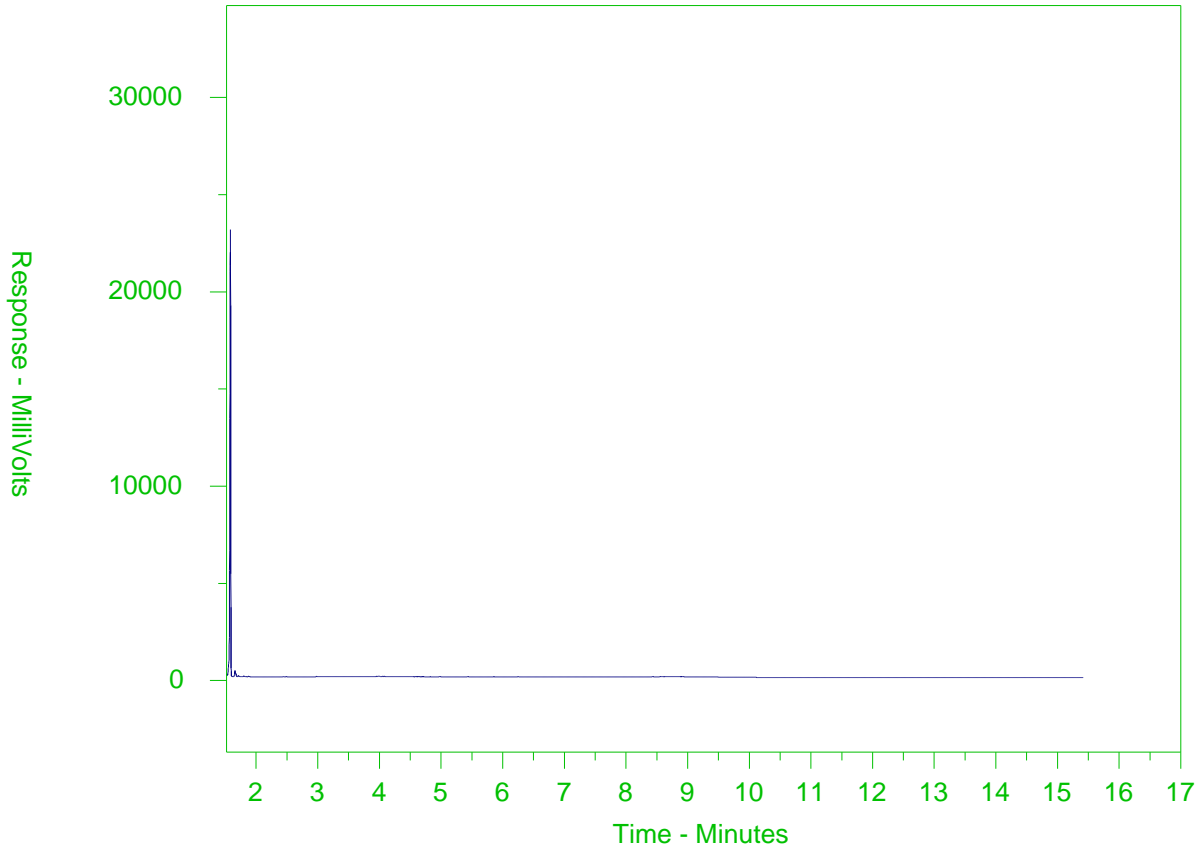
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2312625-1
 Client Sample ID: LC_PIZP1101_WG_Q3-2019_N



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34	nC50	
174°C	287°C		481°C	575°C	
346°F	549°F		898°F	1067°F	
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →		
← Diesel/ Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

COC ID: **20190717 PIZP1101** TURNAROUND TIME: RUSH:


PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyta Shvets			Email 1:	chris.blurton@teck.com		x	x
Email	Chris.Blurton@teck.com			Email	Lyudmyta.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		x	x
Address	Box 2003 15km North Hwy 43			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com		x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 4:	kirsten.campbell@teck.com		x	x
Postal Code	V0B 2G0		Country	Canada	Postal Code	T1Y 7B5		Country	Canada		PO number: VPO00608129	
Phone Number	250-425-3196			Phone Number	403 407 1794							

SAMPLE DETAILS								ANALYSIS REQUESTED										
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	YES		YES		YES	N	N	N			
								H2SO4	NAHSO4	HCL	HCL	HNO3	HNO3	NONE	H2SO4			
								ALS_Package-DOC	ALS_Package-EPH	HG-D-CVAF-VA	HG-T-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC			
LC_PIZP1101_WG_Q3-2019_N	LC_PIZP1101	WG		2019/07/17	12:50	G	9	1	2	1	1	1	1	1	1			
WG_Q3-2019_CC	LC_PIZP1101	WG		2019/07/17	12:55	G	7	1		1	1	1	1	1	1			
WG_Q3-2019_RD	LC_TBLANK	WG		2019/07/17	13:20	G	4			1		1	1	1	1			

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS PLEASE FORWARD REQUISITION TO ALS BY EMAIL FOR ANALYSIS	RELINQUISHED BY/AFFILIATION D.Tymstra/K.Campbell	DATE/TIME 17-Jul	ACCEPTED BY/AFFILIATION <i>[Signature]</i>	DATE/TIME 09:00
--	---	---------------------	---	--------------------

SERVICE REQUEST (rush - subject to availability)	Sampler's Name K. Campbell/D. Tymstra	Mobile #
Regular (default) <input checked="" type="checkbox"/>	Sampler's Signature <i>[Signature]</i>	Date/Time July 17, 2019
Priority (2-3 business days) - 50% surcharge		
Emergency (1 Business Day) - 100% surcharge		
For Emergency <1 Day, ASAP or Weekend - Contact ALS		

[Handwritten Signature]



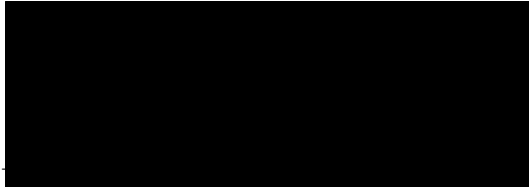
TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 16-AUG-19
Report Date: 24-AUG-19 13:01 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2330360
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190815- DC GROUND
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-1 LC_PIZDC1306_WG_Q3-2019_NP							
Sampled By: KC/DT on 15-AUG-19 @ 11:55							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.96		0.50	mg/L		17-AUG-19	R4758969
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		23-AUG-19	R4767149
Total Organic Carbon	1.82		0.50	mg/L		17-AUG-19	R4758969
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	18-AUG-19	19-AUG-19	R4759365
Dissolved Metals Filtration Location	FIELD					18-AUG-19	R4758455
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	22-AUG-19	22-AUG-19	R4763368
Dissolved Mercury Filtration Location	FIELD					22-AUG-19	R4765151
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-AUG-19	R4758455
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	18-AUG-19	19-AUG-19	R4759365
Antimony (Sb)-Dissolved	0.00021		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Barium (Ba)-Dissolved	0.167		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Boron (B)-Dissolved	0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cadmium (Cd)-Dissolved	0.119		0.0050	ug/L	18-AUG-19	19-AUG-19	R4759365
Calcium (Ca)-Dissolved	65.0		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	18-AUG-19	19-AUG-19	R4759365
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Lithium (Li)-Dissolved	0.0106		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Magnesium (Mg)-Dissolved	23.9		0.10	mg/L	18-AUG-19	19-AUG-19	R4759365
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Molybdenum (Mo)-Dissolved	0.00178		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Nickel (Ni)-Dissolved	0.00088		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Potassium (K)-Dissolved	2.05		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Selenium (Se)-Dissolved	4.12		0.050	ug/L	18-AUG-19	19-AUG-19	R4759365
Silicon (Si)-Dissolved	3.03		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Sodium (Na)-Dissolved	0.762		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Strontium (Sr)-Dissolved	0.0643		0.00020	mg/L	18-AUG-19	19-AUG-19	R4759365
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Uranium (U)-Dissolved	0.000756		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Vanadium (V)-Dissolved	0.00057		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Zinc (Zn)-Dissolved	0.0027		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Hardness							
Hardness (as CaCO3)	261		0.50	mg/L		20-AUG-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		19-AUG-19	R4761148
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0036		0.0030	mg/L		19-AUG-19	R4761148
Antimony (Sb)-Total	0.00021		0.00010	mg/L		19-AUG-19	R4761148
Arsenic (As)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-1 LC_PIZDC1306_WG_Q3-2019_NP							
Sampled By: KC/DT on 15-AUG-19 @ 11:55							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.162		0.00010	mg/L		19-AUG-19	R4761148
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		19-AUG-19	R4761148
Boron (B)-Total	0.011		0.010	mg/L		19-AUG-19	R4761148
Cadmium (Cd)-Total	0.121		0.0050	ug/L		19-AUG-19	R4761148
Calcium (Ca)-Total	58.3		0.050	mg/L		19-AUG-19	R4761148
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Cobalt (Co)-Total	<0.10		0.10	ug/L		19-AUG-19	R4761148
Copper (Cu)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Iron (Fe)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Lead (Pb)-Total	<0.000050		0.000050	mg/L		19-AUG-19	R4761148
Lithium (Li)-Total	0.0093		0.0010	mg/L		19-AUG-19	R4761148
Magnesium (Mg)-Total	22.6		0.10	mg/L		19-AUG-19	R4761148
Manganese (Mn)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Molybdenum (Mo)-Total	0.00200		0.000050	mg/L		19-AUG-19	R4761148
Nickel (Ni)-Total	0.00108		0.00050	mg/L		19-AUG-19	R4761148
Potassium (K)-Total	1.96		0.050	mg/L		19-AUG-19	R4761148
Selenium (Se)-Total	3.83		0.050	ug/L		19-AUG-19	R4761148
Silicon (Si)-Total	3.02		0.10	mg/L		19-AUG-19	R4761148
Silver (Ag)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Sodium (Na)-Total	0.743		0.050	mg/L		19-AUG-19	R4761148
Strontium (Sr)-Total	0.0656		0.00020	mg/L		19-AUG-19	R4761148
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Tin (Sn)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Titanium (Ti)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Uranium (U)-Total	0.000790		0.000010	mg/L		19-AUG-19	R4761148
Vanadium (V)-Total	0.00062		0.00050	mg/L		19-AUG-19	R4761148
Zinc (Zn)-Total	0.0038		0.0030	mg/L		19-AUG-19	R4761148
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	8.7		1.0	mg/L		16-AUG-19	R4758799
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	256		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Total (as CaCO3)	256		1.0	mg/L		19-AUG-19	R4759679
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		21-AUG-19	R4763232
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		17-AUG-19	R4758315
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		17-AUG-19	R4758315
Electrical Conductivity (EC)							
Conductivity (@ 25C)	462		2.0	uS/cm		19-AUG-19	R4759679
Fluoride in Water by IC							
Fluoride (F)	0.184		0.020	mg/L		17-AUG-19	R4758315
Ion Balance Calculation							
Ion Balance	100		-100	%		20-AUG-19	
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		20-AUG-19	
Anion Sum	5.29			meq/L		20-AUG-19	
Cation Sum	5.29			meq/L		20-AUG-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-1 LC_PIZDC1306_WG_Q3-2019_NP Sampled By: KC/DT on 15-AUG-19 @ 11:55 Matrix: WG							
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.154		0.0050	mg/L		17-AUG-19	R4758315
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-19	R4758315
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0014		0.0010	mg/L		17-AUG-19	R4758793
Oxidation redution potential by elect. ORP	403		-1000	mV		22-AUG-19	R4765275
Phosphorus (P)-Total Phosphorus (P)-Total	<0.0020		0.0020	mg/L		21-AUG-19	R4762516
Sulfate in Water by IC Sulfate (SO4)	6.97		0.30	mg/L		17-AUG-19	R4758315
Total Dissolved Solids Total Dissolved Solids	243	DLHC	20	mg/L		22-AUG-19	R4766512
Total Suspended Solids Total Suspended Solids	<1.0		1.0	mg/L		22-AUG-19	R4767427
Turbidity Turbidity	0.13		0.10	NTU		16-AUG-19	R4757865
pH pH	8.13		0.10	pH		19-AUG-19	R4759679
L2330360-2 LC_PIZDC1404D_WG_Q3-2019_NP Sampled By: KC/DT on 15-AUG-19 @ 12:20 Matrix: WG							
Miscellaneous Parameters Dissolved Organic Carbon	1.91		0.50	mg/L		17-AUG-19	R4758969
Total Kjeldahl Nitrogen	2.73		0.050	mg/L		23-AUG-19	R4767149
Total Organic Carbon	1.92		0.50	mg/L		17-AUG-19	R4758969
Dissolved Metals in Water Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	18-AUG-19	19-AUG-19	R4759365
Dissolved Metals Filtration Location	FIELD					18-AUG-19	R4758455
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	22-AUG-19	22-AUG-19	R4763368
Dissolved Mercury Filtration Location	FIELD					22-AUG-19	R4765151
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					18-AUG-19	R4758455
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	18-AUG-19	19-AUG-19	R4759365
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Arsenic (As)-Dissolved	0.00201		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Barium (Ba)-Dissolved	4.39		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Boron (B)-Dissolved	0.024		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cadmium (Cd)-Dissolved	<0.010	DLM	0.010	ug/L	18-AUG-19	19-AUG-19	R4759365
Calcium (Ca)-Dissolved	61.0		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cobalt (Co)-Dissolved	0.14		0.10	ug/L	18-AUG-19	19-AUG-19	R4759365
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Iron (Fe)-Dissolved	2.02		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Lithium (Li)-Dissolved	0.746		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Magnesium (Mg)-Dissolved	44.6		0.10	mg/L	18-AUG-19	19-AUG-19	R4759365
Manganese (Mn)-Dissolved	0.0181		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-2 LC_PIZDC1404D_WG_Q3-2019_NP							
Sampled By: KC/DT on 15-AUG-19 @ 12:20							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	0.0225		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Potassium (K)-Dissolved	27.0		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	18-AUG-19	19-AUG-19	R4759365
Silicon (Si)-Dissolved	2.84		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Sodium (Na)-Dissolved	43.1		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Strontium (Sr)-Dissolved	0.244		0.00020	mg/L	18-AUG-19	19-AUG-19	R4759365
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Uranium (U)-Dissolved	0.000072		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Zinc (Zn)-Dissolved	0.0028		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Hardness							
Hardness (as CaCO3)	336		0.50	mg/L		20-AUG-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		19-AUG-19	R4761148
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0184		0.0030	mg/L		19-AUG-19	R4761148
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Arsenic (As)-Total	0.00183		0.00010	mg/L		19-AUG-19	R4761148
Barium (Ba)-Total	4.21		0.00010	mg/L		19-AUG-19	R4761148
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		19-AUG-19	R4761148
Boron (B)-Total	0.023		0.010	mg/L		19-AUG-19	R4761148
Cadmium (Cd)-Total	<0.020	DLM	0.020	ug/L		19-AUG-19	R4761148
Calcium (Ca)-Total	56.8		0.050	mg/L		19-AUG-19	R4761148
Chromium (Cr)-Total	0.00020		0.00010	mg/L		19-AUG-19	R4761148
Cobalt (Co)-Total	0.17		0.10	ug/L		19-AUG-19	R4761148
Copper (Cu)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Iron (Fe)-Total	2.25		0.010	mg/L		19-AUG-19	R4761148
Lead (Pb)-Total	0.000090		0.000050	mg/L		19-AUG-19	R4761148
Lithium (Li)-Total	0.661		0.0010	mg/L		19-AUG-19	R4761148
Magnesium (Mg)-Total	41.8		0.10	mg/L		19-AUG-19	R4761148
Manganese (Mn)-Total	0.0189		0.00010	mg/L		19-AUG-19	R4761148
Molybdenum (Mo)-Total	0.0240		0.000050	mg/L		19-AUG-19	R4761148
Nickel (Ni)-Total	0.00080		0.00050	mg/L		19-AUG-19	R4761148
Potassium (K)-Total	25.3		0.050	mg/L		19-AUG-19	R4761148
Selenium (Se)-Total	<0.050		0.050	ug/L		19-AUG-19	R4761148
Silicon (Si)-Total	2.94		0.10	mg/L		19-AUG-19	R4761148
Silver (Ag)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Sodium (Na)-Total	42.5		0.050	mg/L		19-AUG-19	R4761148
Strontium (Sr)-Total	0.250		0.00020	mg/L		19-AUG-19	R4761148
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Tin (Sn)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Titanium (Ti)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Uranium (U)-Total	0.000075		0.000010	mg/L		19-AUG-19	R4761148
Vanadium (V)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Zinc (Zn)-Total	0.0047		0.0030	mg/L		19-AUG-19	R4761148
Routine for Teck Coal							
Acidity by Automatic Titration							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-2 LC_PIZDC1404D_WG_Q3-2019_NP Sampled By: KC/DT on 15-AUG-19 @ 12:20 Matrix: WG							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.1		1.0	mg/L		16-AUG-19	R4758799
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	456		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Carbonate (as CaCO3)	4.4		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Total (as CaCO3)	460		1.0	mg/L		19-AUG-19	R4759679
Ammonia, Total (as N)							
Ammonia as N	2.72	DLHC	0.050	mg/L		21-AUG-19	R4763232
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		17-AUG-19	R4758315
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		17-AUG-19	R4758315
Electrical Conductivity (EC)							
Conductivity (@ 25C)	774		2.0	uS/cm		19-AUG-19	R4759679
Fluoride in Water by IC							
Fluoride (F)	0.245		0.020	mg/L		17-AUG-19	R4758315
Ion Balance Calculation							
Cation - Anion Balance	1.0			%		20-AUG-19	
Anion Sum	9.21			meq/L		20-AUG-19	
Cation Sum	9.39			meq/L		20-AUG-19	
Ion Balance Calculation							
Ion Balance	102		-100	%		20-AUG-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-19	R4758315
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-19	R4758315
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-19	R4758793
Oxidation redution potential by elect.							
ORP	431		-1000	mV		22-AUG-19	R4765275
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0113		0.0020	mg/L		21-AUG-19	R4762516
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		17-AUG-19	R4758315
Total Dissolved Solids							
Total Dissolved Solids	436	DLHC	20	mg/L		22-AUG-19	R4766512
Total Suspended Solids							
Total Suspended Solids	2.5		1.0	mg/L		22-AUG-19	R4767427
Turbidity							
Turbidity	18.2		0.10	NTU		16-AUG-19	R4757865
pH							
pH	8.29		0.10	pH		19-AUG-19	R4759679
L2330360-3 LC_PIZDC1404S_WG_Q3-2019_NP Sampled By: KC/DT on 15-AUG-19 @ 10:15 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.53		0.50	mg/L		17-AUG-19	R4758969
Total Kjeldahl Nitrogen	0.067		0.050	mg/L		23-AUG-19	R4767149
Total Organic Carbon	2.58		0.50	mg/L		17-AUG-19	R4758969
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	18-AUG-19	19-AUG-19	R4759365

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-3 LC_PIZDC1404S_WG_Q3-2019_NP							
Sampled By: KC/DT on 15-AUG-19 @ 10:15							
Matrix: WG							
Diss. Be (low) in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-AUG-19	R4758455
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	22-AUG-19	22-AUG-19	R4763368
Dissolved Mercury Filtration Location	FIELD					22-AUG-19	R4765151
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-AUG-19	R4758455
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	18-AUG-19	19-AUG-19	R4759365
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Arsenic (As)-Dissolved	0.00152		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Barium (Ba)-Dissolved	0.214		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Boron (B)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	18-AUG-19	19-AUG-19	R4759365
Calcium (Ca)-Dissolved	50.6		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cobalt (Co)-Dissolved	0.29		0.10	ug/L	18-AUG-19	19-AUG-19	R4759365
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Iron (Fe)-Dissolved	0.790		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Lithium (Li)-Dissolved	0.0064		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Magnesium (Mg)-Dissolved	18.5		0.10	mg/L	18-AUG-19	19-AUG-19	R4759365
Manganese (Mn)-Dissolved	0.0245		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Molybdenum (Mo)-Dissolved	0.00307		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Nickel (Ni)-Dissolved	0.00108		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Potassium (K)-Dissolved	1.53		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	18-AUG-19	19-AUG-19	R4759365
Silicon (Si)-Dissolved	3.60		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Sodium (Na)-Dissolved	0.966		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Strontium (Sr)-Dissolved	0.0424		0.00020	mg/L	18-AUG-19	19-AUG-19	R4759365
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Uranium (U)-Dissolved	0.000548		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Zinc (Zn)-Dissolved	0.0014		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Hardness							
Hardness (as CaCO3)	203		0.50	mg/L		20-AUG-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		19-AUG-19	R4761148
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0056		0.0030	mg/L		19-AUG-19	R4761148
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Arsenic (As)-Total	0.00171		0.00010	mg/L		19-AUG-19	R4761148
Barium (Ba)-Total	0.217		0.00010	mg/L		19-AUG-19	R4761148
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		19-AUG-19	R4761148
Boron (B)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		19-AUG-19	R4761148
Calcium (Ca)-Total	46.1		0.050	mg/L		19-AUG-19	R4761148
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Cobalt (Co)-Total	0.33		0.10	ug/L		19-AUG-19	R4761148

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-3 LC_PIZDC1404S_WG_Q3-2019_NP							
Sampled By: KC/DT on 15-AUG-19 @ 10:15							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Copper (Cu)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Iron (Fe)-Total	0.936		0.010	mg/L		19-AUG-19	R4761148
Lead (Pb)-Total	<0.000050		0.000050	mg/L		19-AUG-19	R4761148
Lithium (Li)-Total	0.0051		0.0010	mg/L		19-AUG-19	R4761148
Magnesium (Mg)-Total	18.0		0.10	mg/L		19-AUG-19	R4761148
Manganese (Mn)-Total	0.0254		0.00010	mg/L		19-AUG-19	R4761148
Molybdenum (Mo)-Total	0.00345		0.000050	mg/L		19-AUG-19	R4761148
Nickel (Ni)-Total	0.00133		0.00050	mg/L		19-AUG-19	R4761148
Potassium (K)-Total	1.44		0.050	mg/L		19-AUG-19	R4761148
Selenium (Se)-Total	<0.050		0.050	ug/L		19-AUG-19	R4761148
Silicon (Si)-Total	3.57		0.10	mg/L		19-AUG-19	R4761148
Silver (Ag)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Sodium (Na)-Total	0.935		0.050	mg/L		19-AUG-19	R4761148
Strontium (Sr)-Total	0.0448		0.00020	mg/L		19-AUG-19	R4761148
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Tin (Sn)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Titanium (Ti)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Uranium (U)-Total	0.000594		0.000010	mg/L		19-AUG-19	R4761148
Vanadium (V)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		19-AUG-19	R4761148
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.1		1.0	mg/L		16-AUG-19	R4758799
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	200		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Total (as CaCO3)	200		1.0	mg/L		19-AUG-19	R4759679
Ammonia, Total (as N)							
Ammonia as N	0.0104		0.0050	mg/L		21-AUG-19	R4763232
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		17-AUG-19	R4758315
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		17-AUG-19	R4758315
Electrical Conductivity (EC)							
Conductivity (@ 25C)	361		2.0	uS/cm		19-AUG-19	R4759679
Fluoride in Water by IC							
Fluoride (F)	0.157		0.020	mg/L		17-AUG-19	R4758315
Ion Balance Calculation							
Ion Balance	102		-100	%		20-AUG-19	
Ion Balance Calculation							
Cation - Anion Balance	0.9			%		20-AUG-19	
Anion Sum	4.10			meq/L		20-AUG-19	
Cation Sum	4.17			meq/L		20-AUG-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-19	R4758315
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-19	R4758315
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-19	R4758793
Oxidation redution potential by elect.							
ORP	439		-1000	mV		22-AUG-19	R4765275

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-3 LC_PIZDC1404S_WG_Q3-2019_NP Sampled By: KC/DT on 15-AUG-19 @ 10:15 Matrix: WG							
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0049		0.0020	mg/L		21-AUG-19	R4762516
Sulfate in Water by IC							
Sulfate (SO4)	5.08		0.30	mg/L		17-AUG-19	R4758315
Total Dissolved Solids							
Total Dissolved Solids	197	DLHC	20	mg/L		22-AUG-19	R4766512
Total Suspended Solids							
Total Suspended Solids	1.5		1.0	mg/L		22-AUG-19	R4767427
Turbidity							
Turbidity	7.12		0.10	NTU		16-AUG-19	R4757865
pH							
pH	8.18		0.10	pH		19-AUG-19	R4759679
L2330360-4 WG_Q3-2019_010 Sampled By: KC/DT on 15-AUG-19 @ 10:20 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		17-AUG-19	R4758969
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		23-AUG-19	R4767149
Total Organic Carbon	<0.50		0.50	mg/L		17-AUG-19	R4758969
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	18-AUG-19	19-AUG-19	R4759365
Dissolved Metals Filtration Location	LAB					18-AUG-19	R4758455
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	22-AUG-19	22-AUG-19	R4763368
Dissolved Mercury Filtration Location	LAB					22-AUG-19	R4765151
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					18-AUG-19	R4758455
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	18-AUG-19	19-AUG-19	R4759365
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Barium (Ba)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4761588
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Boron (B)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	18-AUG-19	19-AUG-19	R4759365
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	18-AUG-19	19-AUG-19	R4759365
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Magnesium (Mg)-Dissolved	<0.10		0.10	mg/L	18-AUG-19	19-AUG-19	R4759365
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Potassium (K)-Dissolved	<0.050		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	18-AUG-19	19-AUG-19	R4759365
Silicon (Si)-Dissolved	<0.050		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Sodium (Na)-Dissolved	<0.050		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Strontium (Sr)-Dissolved	<0.00020		0.00020	mg/L	18-AUG-19	19-AUG-19	R4759365

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-4 WG_Q3-2019_010							
Sampled By: KC/DT on 15-AUG-19 @ 10:20							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		21-AUG-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		19-AUG-19	R4761148
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		21-AUG-19	R4762020
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		19-AUG-19	R4761148
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Arsenic (As)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Barium (Ba)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		19-AUG-19	R4761148
Boron (B)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		19-AUG-19	R4761148
Calcium (Ca)-Total	<0.050		0.050	mg/L		19-AUG-19	R4761148
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Cobalt (Co)-Total	<0.10		0.10	ug/L		19-AUG-19	R4761148
Copper (Cu)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Iron (Fe)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Lead (Pb)-Total	0.000064	RRV	0.000050	mg/L		21-AUG-19	R4762202
Lithium (Li)-Total	<0.0010		0.0010	mg/L		19-AUG-19	R4761148
Magnesium (Mg)-Total	<0.10		0.10	mg/L		19-AUG-19	R4761148
Manganese (Mn)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		19-AUG-19	R4761148
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Potassium (K)-Total	<0.050		0.050	mg/L		19-AUG-19	R4761148
Selenium (Se)-Total	<0.050		0.050	ug/L		19-AUG-19	R4761148
Silicon (Si)-Total	<0.10		0.10	mg/L		19-AUG-19	R4761148
Silver (Ag)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Sodium (Na)-Total	<0.050		0.050	mg/L		19-AUG-19	R4761148
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		19-AUG-19	R4761148
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Tin (Sn)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Titanium (Ti)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Uranium (U)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Vanadium (V)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		19-AUG-19	R4761148
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		16-AUG-19	R4758799
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19	R4759679

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-4 WG_Q3-2019_010							
Sampled By: KC/DT on 15-AUG-19 @ 10:20							
Matrix: WG							
Ammonia, Total (as N)							
Ammonia as N	0.0075	RRV	0.0050	mg/L		21-AUG-19	R4763232
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		17-AUG-19	R4758315
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		17-AUG-19	R4758315
Electrical Conductivity (EC)							
Conductivity (@ 25C)	<2.0		2.0	uS/cm		19-AUG-19	R4759679
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		17-AUG-19	R4758315
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		21-AUG-19	
Anion Sum	<0.10			meq/L		21-AUG-19	
Cation Sum	<0.10			meq/L		21-AUG-19	
Ion Balance Calculation							
Ion Balance	0.0		-100	%		21-AUG-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-19	R4758315
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-19	R4758315
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-19	R4758793
Oxidation redution potential by elect.							
ORP	503		-1000	mV		22-AUG-19	R4765275
Phosphorus (P)-Total							
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		21-AUG-19	R4762516
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		17-AUG-19	R4758315
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		22-AUG-19	R4766512
Total Suspended Solids							
Total Suspended Solids	<1.0		1.0	mg/L		22-AUG-19	R4767427
Turbidity							
Turbidity	<0.10		0.10	NTU		16-AUG-19	R4757865
pH							
pH	5.70		0.10	pH		19-AUG-19	R4759679

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Individual Samples Listed:

Lab Sample ID	Client Sample ID	Qualifier	Description
L2330360-4	WG_Q3-2019_010	SFPL	Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<p>A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).</p>			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
<p>Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.</p>			
<p>Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:</p>			
<p style="text-align: center;">Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]</p>			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
<p>This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.</p>			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
<p>This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.</p>			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
<p>This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.</p>			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190815- DC GROUND

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2330360

Report Date: 24-AUG-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4758799							
WG3136554-17	LCS							
Acidity (as CaCO3)			101.4		%		85-115	16-AUG-19
WG3136554-16	MB							
Acidity (as CaCO3)			<1.0		mg/L		2	16-AUG-19
ALK-MAN-CL								
	Water							
Batch	R4759679							
WG3137615-11	LCS							
Alkalinity, Total (as CaCO3)			100.7		%		85-115	19-AUG-19
WG3137615-10	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	19-AUG-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4759365							
WG3136269-2	LCS							
Beryllium (Be)-Dissolved			100.8		%		80-120	19-AUG-19
WG3136269-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	19-AUG-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4761148							
WG3136729-2	LCS							
Beryllium (Be)-Total			97.3		%		80-120	19-AUG-19
WG3136729-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	19-AUG-19
BR-L-IC-N-CL								
	Water							
Batch	R4758315							
WG3135964-3	DUP	L2330360-1						
Bromide (Br)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-AUG-19
WG3135964-2	LCS							
Bromide (Br)			102.8		%		85-115	17-AUG-19
WG3135964-1	MB							
Bromide (Br)			<0.050		mg/L		0.05	17-AUG-19
WG3135964-4	MS	L2330360-1						
Bromide (Br)			116.9		%		75-125	17-AUG-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4758969							
WG3136485-10	LCS							
Dissolved Organic Carbon			108.8		%		80-120	17-AUG-19
WG3136485-9	MB							

Quality Control Report

Workorder: L2330360

Report Date: 24-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL	Water							
Batch	R4758969							
WG3136485-9 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	17-AUG-19
C-TOT-ORG-LOW-CL	Water							
Batch	R4758969							
WG3136485-10 LCS								
Total Organic Carbon			112.0		%		80-120	17-AUG-19
WG3136485-9 MB								
Total Organic Carbon			<0.50		mg/L		0.5	17-AUG-19
CL-IC-N-CL	Water							
Batch	R4758315							
WG3135964-3 DUP		L2330360-1						
Chloride (Cl)		<0.50	<0.50	RPD-NA	mg/L	N/A	20	17-AUG-19
WG3135964-2 LCS								
Chloride (Cl)			104.0		%		90-110	17-AUG-19
WG3135964-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	17-AUG-19
WG3135964-4 MS		L2330360-1						
Chloride (Cl)			112.5		%		75-125	17-AUG-19
EC-L-PCT-CL	Water							
Batch	R4759679							
WG3137615-11 LCS								
Conductivity (@ 25C)			101.5		%		90-110	19-AUG-19
WG3137615-10 MB								
Conductivity (@ 25C)			<2.0		uS/cm		2	19-AUG-19
F-IC-N-CL	Water							
Batch	R4758315							
WG3135964-3 DUP		L2330360-1						
Fluoride (F)		0.184	0.186		mg/L	0.6	20	17-AUG-19
WG3135964-2 LCS								
Fluoride (F)			108.6		%		90-110	17-AUG-19
WG3135964-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-AUG-19
WG3135964-4 MS		L2330360-1						
Fluoride (F)			120.4		%		75-125	17-AUG-19
HG-D-CVAA-VA	Water							

Quality Control Report

Workorder: L2330360

Report Date: 24-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA								
Batch R4763368								
WG3140308-7 DUP		L2330360-4						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	22-AUG-19
WG3140308-2 LCS								
Mercury (Hg)-Dissolved			97.5		%		80-120	22-AUG-19
WG3140308-6 LCS								
Mercury (Hg)-Dissolved			97.1		%		80-120	22-AUG-19
WG3140308-1 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	22-AUG-19
WG3140308-5 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	22-AUG-19
WG3140308-8 MS		L2330360-3						
Mercury (Hg)-Dissolved			95.4		%		70-130	22-AUG-19
HG-T-CVAA-VA								
Batch R4762020								
WG3138690-34 DUP		L2330360-4						
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	21-AUG-19
WG3138690-2 LCS								
Mercury (Hg)-Total			98.6		%		80-120	21-AUG-19
WG3138690-1 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	21-AUG-19
MET-D-CCMS-VA								
Batch R4759365								
WG3136269-2 LCS								
Aluminum (Al)-Dissolved			100.1		%		80-120	19-AUG-19
Antimony (Sb)-Dissolved			94.0		%		80-120	19-AUG-19
Arsenic (As)-Dissolved			97.6		%		80-120	19-AUG-19
Barium (Ba)-Dissolved			99.1		%		80-120	19-AUG-19
Bismuth (Bi)-Dissolved			96.0		%		80-120	19-AUG-19
Boron (B)-Dissolved			100.6		%		80-120	19-AUG-19
Cadmium (Cd)-Dissolved			98.6		%		80-120	19-AUG-19
Calcium (Ca)-Dissolved			105.5		%		80-120	19-AUG-19
Chromium (Cr)-Dissolved			101.5		%		80-120	19-AUG-19
Cobalt (Co)-Dissolved			99.4		%		80-120	19-AUG-19
Copper (Cu)-Dissolved			97.9		%		80-120	19-AUG-19
Iron (Fe)-Dissolved			97.1		%		80-120	19-AUG-19
Lead (Pb)-Dissolved			94.8		%		80-120	19-AUG-19
Lithium (Li)-Dissolved			102.1		%		80-120	19-AUG-19

Quality Control Report

Workorder: L2330360

Report Date: 24-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4759365							
WG3136269-2	LCS							
Magnesium (Mg)-Dissolved			105.0		%		80-120	19-AUG-19
Manganese (Mn)-Dissolved			96.1		%		80-120	19-AUG-19
Molybdenum (Mo)-Dissolved			95.0		%		80-120	19-AUG-19
Nickel (Ni)-Dissolved			98.7		%		80-120	19-AUG-19
Potassium (K)-Dissolved			102.6		%		80-120	19-AUG-19
Selenium (Se)-Dissolved			104.6		%		80-120	19-AUG-19
Silicon (Si)-Dissolved			103.9		%		60-140	19-AUG-19
Silver (Ag)-Dissolved			94.2		%		80-120	19-AUG-19
Sodium (Na)-Dissolved			104.8		%		80-120	19-AUG-19
Strontium (Sr)-Dissolved			96.5		%		80-120	19-AUG-19
Thallium (Tl)-Dissolved			90.8		%		80-120	19-AUG-19
Tin (Sn)-Dissolved			95.5		%		80-120	19-AUG-19
Titanium (Ti)-Dissolved			104.9		%		80-120	19-AUG-19
Uranium (U)-Dissolved			91.5		%		80-120	19-AUG-19
Vanadium (V)-Dissolved			100.8		%		80-120	19-AUG-19
Zinc (Zn)-Dissolved			98.6		%		80-120	19-AUG-19
WG3136269-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-AUG-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-AUG-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	19-AUG-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	19-AUG-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	19-AUG-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-AUG-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	19-AUG-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-AUG-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4759365							
WG3136269-1	MB	NP						
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	19-AUG-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-AUG-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-AUG-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-AUG-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	19-AUG-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	19-AUG-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-AUG-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	19-AUG-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-AUG-19
MET-T-CCMS-VA								
	Water							
Batch	R4761148							
WG3136729-2	LCS							
Aluminum (Al)-Total			102.2		%		80-120	19-AUG-19
Antimony (Sb)-Total			104.8		%		80-120	19-AUG-19
Arsenic (As)-Total			99.6		%		80-120	19-AUG-19
Barium (Ba)-Total			101.2		%		80-120	19-AUG-19
Bismuth (Bi)-Total			97.6		%		80-120	19-AUG-19
Boron (B)-Total			94.3		%		80-120	19-AUG-19
Cadmium (Cd)-Total			101.8		%		80-120	19-AUG-19
Calcium (Ca)-Total			97.5		%		80-120	19-AUG-19
Chromium (Cr)-Total			98.9		%		80-120	19-AUG-19
Cobalt (Co)-Total			99.2		%		80-120	19-AUG-19
Copper (Cu)-Total			98.4		%		80-120	19-AUG-19
Iron (Fe)-Total			95.7		%		80-120	19-AUG-19
Lead (Pb)-Total			100.5		%		80-120	19-AUG-19
Lithium (Li)-Total			92.9		%		80-120	19-AUG-19
Magnesium (Mg)-Total			101.3		%		80-120	19-AUG-19
Manganese (Mn)-Total			98.5		%		80-120	19-AUG-19
Molybdenum (Mo)-Total			104.8		%		80-120	19-AUG-19
Nickel (Ni)-Total			96.9		%		80-120	19-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4761148							
WG3136729-2	LCS							
Potassium (K)-Total			98.9		%		80-120	19-AUG-19
Selenium (Se)-Total			95.1		%		80-120	19-AUG-19
Silicon (Si)-Total			104.8		%		80-120	19-AUG-19
Silver (Ag)-Total			99.4		%		80-120	19-AUG-19
Sodium (Na)-Total			105.7		%		80-120	19-AUG-19
Strontium (Sr)-Total			104.1		%		80-120	19-AUG-19
Thallium (Tl)-Total			100.0		%		80-120	19-AUG-19
Tin (Sn)-Total			101.8		%		80-120	19-AUG-19
Titanium (Ti)-Total			97.6		%		80-120	19-AUG-19
Uranium (U)-Total			99.4		%		80-120	19-AUG-19
Vanadium (V)-Total			102.3		%		80-120	19-AUG-19
Zinc (Zn)-Total			103.3		%		80-120	19-AUG-19
WG3136729-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	19-AUG-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	19-AUG-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	19-AUG-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	19-AUG-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	19-AUG-19
Boron (B)-Total			<0.010		mg/L		0.01	19-AUG-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	19-AUG-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	19-AUG-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	19-AUG-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	19-AUG-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	19-AUG-19
Iron (Fe)-Total			<0.010		mg/L		0.01	19-AUG-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	19-AUG-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	19-AUG-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	19-AUG-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	19-AUG-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	19-AUG-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	19-AUG-19
Potassium (K)-Total			<0.050		mg/L		0.05	19-AUG-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	19-AUG-19
Silicon (Si)-Total			<0.10		mg/L		0.1	19-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4761148							
WG3136729-1	MB							
Silver (Ag)-Total			<0.000010		mg/L		0.00001	19-AUG-19
Sodium (Na)-Total			<0.050		mg/L		0.05	19-AUG-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	19-AUG-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	19-AUG-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	19-AUG-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	19-AUG-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	19-AUG-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	19-AUG-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	19-AUG-19
Batch	R4762202							
WG3138607-2	LCS							
Aluminum (Al)-Total			98.5		%		80-120	21-AUG-19
Antimony (Sb)-Total			103.2		%		80-120	21-AUG-19
Arsenic (As)-Total			99.4		%		80-120	21-AUG-19
Barium (Ba)-Total			103.5		%		80-120	21-AUG-19
Bismuth (Bi)-Total			101.4		%		80-120	21-AUG-19
Boron (B)-Total			95.1		%		80-120	21-AUG-19
Cadmium (Cd)-Total			98.4		%		80-120	21-AUG-19
Calcium (Ca)-Total			98.0		%		80-120	21-AUG-19
Chromium (Cr)-Total			98.8		%		80-120	21-AUG-19
Cobalt (Co)-Total			98.5		%		80-120	21-AUG-19
Copper (Cu)-Total			100.2		%		80-120	21-AUG-19
Iron (Fe)-Total			92.0		%		80-120	21-AUG-19
Lead (Pb)-Total			101.1		%		80-120	21-AUG-19
Lithium (Li)-Total			92.1		%		80-120	21-AUG-19
Magnesium (Mg)-Total			103.8		%		80-120	21-AUG-19
Manganese (Mn)-Total			97.6		%		80-120	21-AUG-19
Molybdenum (Mo)-Total			104.3		%		80-120	21-AUG-19
Nickel (Ni)-Total			100.0		%		80-120	21-AUG-19
Potassium (K)-Total			103.1		%		80-120	21-AUG-19
Selenium (Se)-Total			99.2		%		80-120	21-AUG-19
Silicon (Si)-Total			107.5		%		80-120	21-AUG-19
Silver (Ag)-Total			99.6		%		80-120	21-AUG-19
Sodium (Na)-Total			97.5		%		80-120	21-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4762202							
WG3138607-2 LCS								
Strontium (Sr)-Total			99.2		%		80-120	21-AUG-19
Thallium (Tl)-Total			101.3		%		80-120	21-AUG-19
Tin (Sn)-Total			100.9		%		80-120	21-AUG-19
Titanium (Ti)-Total			96.8		%		80-120	21-AUG-19
Uranium (U)-Total			93.1		%		80-120	21-AUG-19
Vanadium (V)-Total			100.2		%		80-120	21-AUG-19
Zinc (Zn)-Total			98.0		%		80-120	21-AUG-19
WG3138607-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	21-AUG-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	21-AUG-19
Boron (B)-Total			<0.010		mg/L		0.01	21-AUG-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	21-AUG-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	21-AUG-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	21-AUG-19
Iron (Fe)-Total			<0.010		mg/L		0.01	21-AUG-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	21-AUG-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	21-AUG-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	21-AUG-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	21-AUG-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	21-AUG-19
Potassium (K)-Total			<0.050		mg/L		0.05	21-AUG-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	21-AUG-19
Silicon (Si)-Total			<0.10		mg/L		0.1	21-AUG-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	21-AUG-19
Sodium (Na)-Total			<0.050		mg/L		0.05	21-AUG-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	21-AUG-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	21-AUG-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	21-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4762202							
WG3138607-1	MB							
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	21-AUG-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	21-AUG-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	21-AUG-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	21-AUG-19
NH3-L-F-CL								
	Water							
Batch	R4763232							
WG3140078-18	LCS							
Ammonia as N			104.7		%		85-115	21-AUG-19
WG3140078-17	MB							
Ammonia as N			<0.0050		mg/L		0.005	21-AUG-19
NO2-L-IC-N-CL								
	Water							
Batch	R4758315							
WG3135964-3	DUP	L2330360-1						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-AUG-19
WG3135964-2	LCS							
Nitrite (as N)			105.6		%		90-110	17-AUG-19
WG3135964-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	17-AUG-19
WG3135964-4	MS	L2330360-1						
Nitrite (as N)			115.2		%		75-125	17-AUG-19
NO3-L-IC-N-CL								
	Water							
Batch	R4758315							
WG3135964-3	DUP	L2330360-1						
Nitrate (as N)		0.154	0.156		mg/L	0.9	20	17-AUG-19
WG3135964-2	LCS							
Nitrate (as N)			104.8		%		90-110	17-AUG-19
WG3135964-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	17-AUG-19
WG3135964-4	MS	L2330360-1						
Nitrate (as N)			112.6		%		75-125	17-AUG-19
ORP-CL								
	Water							
Batch	R4765275							
WG3140983-1	CRM	CL-ORP						
ORP			224		mV		210-230	22-AUG-19
P-T-L-COL-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-CL								
Water								
Batch R4762516								
WG3139338-18 LCS								
Phosphorus (P)-Total			101.8		%		80-120	21-AUG-19
WG3139338-17 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	21-AUG-19
PH-CL								
Water								
Batch R4759679								
WG3137615-11 LCS								
pH			7.01		pH		6.9-7.1	19-AUG-19
PO4-DO-L-COL-CL								
Water								
Batch R4758793								
WG3135788-2 LCS								
Orthophosphate-Dissolved (as P)			100.8		%		80-120	17-AUG-19
WG3135788-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	17-AUG-19
SO4-IC-N-CL								
Water								
Batch R4758315								
WG3135964-3 DUP								
Sulfate (SO4)		L2330360-1	6.99		mg/L	0.3	20	17-AUG-19
		6.97						
WG3135964-2 LCS								
Sulfate (SO4)			104.8		%		90-110	17-AUG-19
WG3135964-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	17-AUG-19
WG3135964-4 MS								
Sulfate (SO4)		L2330360-1	111.3		%		75-125	17-AUG-19
SOLIDS-TDS-CL								
Water								
Batch R4766512								
WG3140081-5 LCS								
Total Dissolved Solids			102.7		%		85-115	22-AUG-19
WG3140081-4 MB								
Total Dissolved Solids			<10		mg/L		10	22-AUG-19
TKN-L-F-CL								
Water								
Batch R4767149								
WG3141709-18 LCS								
Total Kjeldahl Nitrogen			107.1		%		75-125	23-AUG-19
WG3141709-22 LCS								
Total Kjeldahl Nitrogen			99.5		%		75-125	23-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL		Water						
Batch	R4767149							
WG3141709-26	LCS							
Total Kjeldahl Nitrogen			106.7		%		75-125	23-AUG-19
WG3141709-30	LCS							
Total Kjeldahl Nitrogen			99.6		%		75-125	23-AUG-19
WG3141709-17	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-AUG-19
WG3141709-21	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-AUG-19
WG3141709-25	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-AUG-19
WG3141709-29	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-AUG-19
TSS-L-CL		Water						
Batch	R4767427							
WG3140528-2	LCS							
Total Suspended Solids			95.0		%		85-115	22-AUG-19
WG3140528-1	MB							
Total Suspended Solids			<1.0		mg/L		1	22-AUG-19
TURBIDITY-CL		Water						
Batch	R4757865							
WG3135342-17	LCS							
Turbidity			96.0		%		85-115	16-AUG-19
WG3135342-16	MB							
Turbidity			<0.10		NTU		0.1	16-AUG-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	15-AUG-19 11:55	22-AUG-19 13:30	0.25	170	hours	EHTR-FM
	2	15-AUG-19 12:20	22-AUG-19 13:30	0.25	169	hours	EHTR-FM
	3	15-AUG-19 10:15	22-AUG-19 13:30	0.25	171	hours	EHTR-FM
	4	15-AUG-19 10:20	22-AUG-19 13:30	0.25	171	hours	EHTR-FM
pH	1	15-AUG-19 11:55	19-AUG-19 12:00	0.25	96	hours	EHTR-FM
	2	15-AUG-19 12:20	19-AUG-19 12:00	0.25	96	hours	EHTR-FM
	3	15-AUG-19 10:15	19-AUG-19 12:00	0.25	98	hours	EHTR-FM
	4	15-AUG-19 10:20	19-AUG-19 12:00	0.25	98	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2330360 were received on 16-AUG-19 08:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: 20190815- DC GROUND WATER

TURNAROUND TIME:

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Carla Froyman Parker			Lab Contact	Lyudmyla Shvets			Email 1:	carla.froymanparker@teck.com		x	x
Email	Carla.FroymanParker@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com			x
Address	Box 2003			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com		x	x
	15km North Hwy 43							Email 4:	kirsten.campbell@teck.com		x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5:	kennedy.allen@teck.com		x	x
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	PO number	VPO00608129			
Phone Number	250-425-3196			Phone Number	403 407 1794							

SAMPLE DETAILS

ANALYSIS REQUESTED

Filtered - F: Field, L: Lab, FL: Field & Lab, N: None

Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS REQUESTED											
								ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TICN/TOC	HG-T-CVAF-VA					
LC_PIZDC1306_WG_Q3-2019_NP	LC_PIZDC1306	WG		2019/08/15	11:55	G	6	1	1	1	1	1	1						
LC_PIZDC1404D_WG_Q3-2019_NP	LC_PIZDC1404D	WG		2019/08/15	12:20	G	6	1	1	1	1	1	1						
LC_PIZDC1404S_WG_Q3-2019_NP	LC_PIZDC1404S	WG		2019/08/15	10:15	G	6	1	1	1	1	1	1						
WG_Q3-2019_010	LC_PIZDC1404S	WG		2019/08/15	10:20	G	7	1	1	1	1	1	1						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

RELINQUISHED BY/AFFILIATION

DATE/TIME

ACCEPTED BY/AFFILIATION

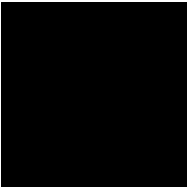
DATE/TIME

<p>PLEASE FORWARD THE SAMPLES TO ALSCALGARY FOR ANALYSIS</p>	<p>D.Tymstra/K.Campbell</p>	<p>15-Aug</p>	<p><i>BM</i></p>	<p>8/16 8:30</p>
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SERVICE REQUEST (rush - subject to availability)

<p>Regular (default) <input checked="" type="checkbox"/></p> <p>Priority (2-3 business days) - 50% surcharge</p> <p>Emergency (1 Business Day) - 100% surcharge</p> <p>For Emergency <1 Day, ASAP or Weekend - Contact ALS</p>	<p>Sampler's Name</p> <p>K. Campbell/D. Tymstra</p>	<p>Mobile #</p>	<p>Date/Time</p> <p>August 15, 2019</p>
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70C



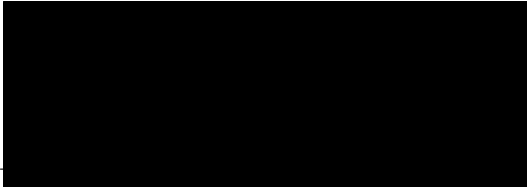
TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 24-AUG-19
Report Date: 03-SEP-19 17:34 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2335330
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190822- DC GROUND
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2335330-1 LC_PIZDC1307_WG_Q3-2019_NP							
Sampled By: KC/DT on 22-AUG-19 @ 11:42							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.95		0.50	mg/L		26-AUG-19	R4769509
Total Kjeldahl Nitrogen	0.143		0.050	mg/L		31-AUG-19	R4779015
Total Organic Carbon	2.02		0.50	mg/L		26-AUG-19	R4769509
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	28-AUG-19	29-AUG-19	R4777713
Dissolved Metals Filtration Location	FIELD					28-AUG-19	R4773492
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	30-AUG-19	31-AUG-19	R4778864
Dissolved Mercury Filtration Location	FIELD					30-AUG-19	R4778073
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					28-AUG-19	R4773492
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	28-AUG-19	29-AUG-19	R4777713
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Arsenic (As)-Dissolved	0.00152		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Barium (Ba)-Dissolved	1.37		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Boron (B)-Dissolved	0.024		0.010	mg/L	28-AUG-19	29-AUG-19	R4777713
Cadmium (Cd)-Dissolved	<0.030	DLM	0.030	ug/L	28-AUG-19	29-AUG-19	R4777713
Calcium (Ca)-Dissolved	38.7		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	28-AUG-19	29-AUG-19	R4777713
Copper (Cu)-Dissolved	0.00051		0.00050	mg/L	28-AUG-19	29-AUG-19	R4777713
Iron (Fe)-Dissolved	0.735		0.010	mg/L	28-AUG-19	29-AUG-19	R4777713
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Lithium (Li)-Dissolved	0.0781		0.0010	mg/L	28-AUG-19	29-AUG-19	R4777713
Magnesium (Mg)-Dissolved	20.9		0.10	mg/L	28-AUG-19	29-AUG-19	R4777713
Manganese (Mn)-Dissolved	0.00887		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Molybdenum (Mo)-Dissolved	0.0342		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Nickel (Ni)-Dissolved	0.00101		0.00050	mg/L	28-AUG-19	29-AUG-19	R4777713
Potassium (K)-Dissolved	5.25		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	28-AUG-19	29-AUG-19	R4777713
Silicon (Si)-Dissolved	2.92		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Sodium (Na)-Dissolved	14.3		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Strontium (Sr)-Dissolved	0.138		0.00020	mg/L	28-AUG-19	29-AUG-19	R4777713
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	28-AUG-19	29-AUG-19	R4777713
Uranium (U)-Dissolved	0.000026		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	28-AUG-19	29-AUG-19	R4777713
Zinc (Zn)-Dissolved	0.0046		0.0010	mg/L	28-AUG-19	29-AUG-19	R4777713
Hardness							
Hardness (as CaCO3)	183		0.50	mg/L		29-AUG-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		29-AUG-19	R4776911
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0250		0.0030	mg/L		29-AUG-19	R4776911
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		29-AUG-19	R4776911
Arsenic (As)-Total	0.00152		0.00010	mg/L		29-AUG-19	R4776911

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2335330-1 LC_PIZDC1307_WG_Q3-2019_NP							
Sampled By: KC/DT on 22-AUG-19 @ 11:42							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	1.39		0.00010	mg/L		29-AUG-19	R4776911
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		29-AUG-19	R4776911
Boron (B)-Total	0.021		0.010	mg/L		29-AUG-19	R4776911
Cadmium (Cd)-Total	<0.020	DLM	0.020	ug/L		29-AUG-19	R4776911
Calcium (Ca)-Total	40.3		0.050	mg/L		29-AUG-19	R4776911
Chromium (Cr)-Total	0.00017		0.00010	mg/L		29-AUG-19	R4776911
Cobalt (Co)-Total	<0.10		0.10	ug/L		29-AUG-19	R4776911
Copper (Cu)-Total	0.00053		0.00050	mg/L		29-AUG-19	R4776911
Iron (Fe)-Total	1.08		0.010	mg/L		29-AUG-19	R4776911
Lead (Pb)-Total	0.000123		0.000050	mg/L		29-AUG-19	R4776911
Lithium (Li)-Total	0.0774		0.0010	mg/L		29-AUG-19	R4776911
Magnesium (Mg)-Total	21.0		0.10	mg/L		29-AUG-19	R4776911
Manganese (Mn)-Total	0.00947		0.00010	mg/L		29-AUG-19	R4776911
Molybdenum (Mo)-Total	0.0326		0.000050	mg/L		29-AUG-19	R4776911
Nickel (Ni)-Total	0.00121		0.00050	mg/L		29-AUG-19	R4776911
Potassium (K)-Total	5.01		0.050	mg/L		29-AUG-19	R4776911
Selenium (Se)-Total	<0.050		0.050	ug/L		29-AUG-19	R4776911
Silicon (Si)-Total	2.89		0.10	mg/L		29-AUG-19	R4776911
Silver (Ag)-Total	0.000011		0.000010	mg/L		29-AUG-19	R4776911
Sodium (Na)-Total	13.7		0.050	mg/L		29-AUG-19	R4776911
Strontium (Sr)-Total	0.138		0.00020	mg/L		29-AUG-19	R4776911
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		29-AUG-19	R4776911
Tin (Sn)-Total	0.00013		0.00010	mg/L		29-AUG-19	R4776911
Titanium (Ti)-Total	<0.010		0.010	mg/L		29-AUG-19	R4776911
Uranium (U)-Total	0.000028		0.000010	mg/L		29-AUG-19	R4776911
Vanadium (V)-Total	<0.00050		0.00050	mg/L		29-AUG-19	R4776911
Zinc (Zn)-Total	0.0098		0.0030	mg/L		29-AUG-19	R4776911
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.6		1.0	mg/L		26-AUG-19	R4769704
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	223		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Carbonate (as CaCO3)	3.8		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Total (as CaCO3)	227		1.0	mg/L		27-AUG-19	R4771848
Ammonia, Total (as N)							
Ammonia as N	0.119		0.0050	mg/L		28-AUG-19	R4776248
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-AUG-19	R4772848
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		24-AUG-19	R4772848
Electrical Conductivity (EC)							
Conductivity (@ 25C)	383		2.0	uS/cm		27-AUG-19	R4771848
Fluoride in Water by IC							
Fluoride (F)	0.599		0.020	mg/L		24-AUG-19	R4772848
Ion Balance Calculation							
Cation - Anion Balance	-1.2			%		29-AUG-19	
Anion Sum	4.57			meq/L		29-AUG-19	
Cation Sum	4.46			meq/L		29-AUG-19	
Ion Balance Calculation							
Ion Balance	97.6		-100	%		29-AUG-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2335330-1 LC_PIZDC1307_WG_Q3-2019_NP Sampled By: KC/DT on 22-AUG-19 @ 11:42 Matrix: WG							
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050		0.0050	mg/L		24-AUG-19	R4772848
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		24-AUG-19	R4772848
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		24-AUG-19	R4767870
Oxidation redution potential by elect. ORP	345		-1000	mV		28-AUG-19	R4775407
Phosphorus (P)-Total Phosphorus (P)-Total	0.0088		0.0020	mg/L		25-AUG-19	R4768451
Sulfate in Water by IC Sulfate (SO4)	<0.30		0.30	mg/L		24-AUG-19	R4772848
Total Dissolved Solids Total Dissolved Solids	198	DLHC	20	mg/L		28-AUG-19	R4777452
Total Suspended Solids Total Suspended Solids	3.3		1.0	mg/L		28-AUG-19	R4777613
Turbidity Turbidity	9.55		0.10	NTU		24-AUG-19	R4768077
pH pH	8.31		0.10	pH		27-AUG-19	R4771848
L2335330-2 LC_PIZDC1308_WG_Q3-2019_NP Sampled By: KC/DT on 22-AUG-19 @ 10:43 Matrix: WG							
Miscellaneous Parameters Dissolved Organic Carbon	3.76		0.50	mg/L		26-AUG-19	R4769509
Total Kjeldahl Nitrogen	0.141		0.050	mg/L		31-AUG-19	R4779015
Total Organic Carbon	3.89		0.50	mg/L		26-AUG-19	R4769509
Dissolved Metals in Water Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	28-AUG-19	29-AUG-19	R4777713
Dissolved Metals Filtration Location	FIELD					28-AUG-19	R4773492
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	30-AUG-19	31-AUG-19	R4778864
Dissolved Mercury Filtration Location	FIELD					30-AUG-19	R4778073
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					30-AUG-19	R4777879
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	28-AUG-19	29-AUG-19	R4777713
Antimony (Sb)-Dissolved	0.00012		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Arsenic (As)-Dissolved	0.00016		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Barium (Ba)-Dissolved	0.305		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Boron (B)-Dissolved	0.011		0.010	mg/L	28-AUG-19	29-AUG-19	R4777713
Cadmium (Cd)-Dissolved	0.0351		0.0050	ug/L	28-AUG-19	29-AUG-19	R4777713
Calcium (Ca)-Dissolved	100		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Cobalt (Co)-Dissolved	0.25		0.10	ug/L	28-AUG-19	29-AUG-19	R4777713
Copper (Cu)-Dissolved	0.00170	DTC	0.00050	mg/L	30-AUG-19	30-AUG-19	R4778439
Iron (Fe)-Dissolved	0.056		0.010	mg/L	28-AUG-19	29-AUG-19	R4777713
Lead (Pb)-Dissolved	0.000092		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Lithium (Li)-Dissolved	0.0083		0.0010	mg/L	28-AUG-19	29-AUG-19	R4777713
Magnesium (Mg)-Dissolved	29.9		0.10	mg/L	28-AUG-19	29-AUG-19	R4777713
Manganese (Mn)-Dissolved	0.00919		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2335330-2 LC_PIZDC1308_WG_Q3-2019_NP							
Sampled By: KC/DT on 22-AUG-19 @ 10:43							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	0.00164		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Nickel (Ni)-Dissolved	0.00144		0.00050	mg/L	28-AUG-19	29-AUG-19	R4777713
Potassium (K)-Dissolved	2.07		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Selenium (Se)-Dissolved	0.210	DTSE	0.050	ug/L	28-AUG-19	29-AUG-19	R4777713
Silicon (Si)-Dissolved	5.32		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Sodium (Na)-Dissolved	1.66		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Strontium (Sr)-Dissolved	0.107		0.00020	mg/L	28-AUG-19	29-AUG-19	R4777713
Thallium (Tl)-Dissolved	0.000019		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	28-AUG-19	29-AUG-19	R4777713
Uranium (U)-Dissolved	0.00151		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	28-AUG-19	29-AUG-19	R4777713
Zinc (Zn)-Dissolved	0.0041		0.0010	mg/L	28-AUG-19	29-AUG-19	R4777713
Hardness							
Hardness (as CaCO3)	374		0.50	mg/L		30-AUG-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		29-AUG-19	R4776911
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0123		0.0030	mg/L		30-AUG-19	R4777995
Antimony (Sb)-Total	0.00017		0.00010	mg/L		29-AUG-19	R4776911
Arsenic (As)-Total	0.00022		0.00010	mg/L		29-AUG-19	R4776911
Barium (Ba)-Total	0.298		0.00010	mg/L		29-AUG-19	R4776911
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		29-AUG-19	R4776911
Boron (B)-Total	0.010		0.010	mg/L		29-AUG-19	R4776911
Cadmium (Cd)-Total	0.138		0.0050	ug/L		29-AUG-19	R4776911
Calcium (Ca)-Total	102		0.050	mg/L		29-AUG-19	R4776911
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		29-AUG-19	R4776911
Cobalt (Co)-Total	0.27		0.10	ug/L		29-AUG-19	R4776911
Copper (Cu)-Total	0.00055		0.00050	mg/L		29-AUG-19	R4776911
Iron (Fe)-Total	0.327		0.010	mg/L		29-AUG-19	R4776911
Lead (Pb)-Total	0.000300		0.000050	mg/L		29-AUG-19	R4776911
Lithium (Li)-Total	0.0084		0.0010	mg/L		29-AUG-19	R4776911
Magnesium (Mg)-Total	30.1		0.10	mg/L		29-AUG-19	R4776911
Manganese (Mn)-Total	0.00935		0.00010	mg/L		29-AUG-19	R4776911
Molybdenum (Mo)-Total	0.00153		0.000050	mg/L		29-AUG-19	R4776911
Nickel (Ni)-Total	0.00151		0.00050	mg/L		29-AUG-19	R4776911
Potassium (K)-Total	2.03		0.050	mg/L		29-AUG-19	R4776911
Selenium (Se)-Total	0.142		0.050	ug/L		29-AUG-19	R4776911
Silicon (Si)-Total	5.27		0.10	mg/L		29-AUG-19	R4776911
Silver (Ag)-Total	<0.000010		0.000010	mg/L		29-AUG-19	R4776911
Sodium (Na)-Total	1.63		0.050	mg/L		29-AUG-19	R4776911
Strontium (Sr)-Total	0.105		0.00020	mg/L		29-AUG-19	R4776911
Thallium (Tl)-Total	0.000023		0.000010	mg/L		29-AUG-19	R4776911
Tin (Sn)-Total	<0.00010		0.00010	mg/L		30-AUG-19	R4777995
Titanium (Ti)-Total	<0.010		0.010	mg/L		29-AUG-19	R4776911
Uranium (U)-Total	0.00159		0.000010	mg/L		29-AUG-19	R4776911
Vanadium (V)-Total	<0.00050		0.00050	mg/L		29-AUG-19	R4776911
Zinc (Zn)-Total	0.0078		0.0030	mg/L		29-AUG-19	R4776911
Routine for Teck Coal							
Acidity by Automatic Titration							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2335330-2 LC_PIZDC1308_WG_Q3-2019_NP							
Sampled By: KC/DT on 22-AUG-19 @ 10:43							
Matrix: WG							
Acidity by Automatic Titration							
Acidity (as CaCO3)	22.9		1.0	mg/L		26-AUG-19	R4769704
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	378		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Total (as CaCO3)	378		1.0	mg/L		27-AUG-19	R4771848
Ammonia, Total (as N)							
Ammonia as N	0.0076		0.0050	mg/L		28-AUG-19	R4776248
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-AUG-19	R4772848
Chloride in Water by IC							
Chloride (Cl)	1.74		0.50	mg/L		24-AUG-19	R4772848
Electrical Conductivity (EC)							
Conductivity (@ 25C)	648		2.0	uS/cm		27-AUG-19	R4771848
Fluoride in Water by IC							
Fluoride (F)	0.178		0.020	mg/L		24-AUG-19	R4772848
Ion Balance Calculation							
Ion Balance	98.2		-100	%		30-AUG-19	
Ion Balance Calculation							
Cation - Anion Balance	-0.9			%		30-AUG-19	
Anion Sum	7.73			meq/L		30-AUG-19	
Cation Sum	7.59			meq/L		30-AUG-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.126		0.0050	mg/L		24-AUG-19	R4772848
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0017		0.0010	mg/L		24-AUG-19	R4772848
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0018		0.0010	mg/L		24-AUG-19	R4767870
Oxidation redution potential by elect.							
ORP	358		-1000	mV		28-AUG-19	R4775407
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0033		0.0020	mg/L		25-AUG-19	R4768451
Sulfate in Water by IC							
Sulfate (SO4)	5.47		0.30	mg/L		24-AUG-19	R4772848
Total Dissolved Solids							
Total Dissolved Solids	365	DLHC	20	mg/L		28-AUG-19	R4777452
Total Suspended Solids							
Total Suspended Solids	1.6		1.0	mg/L		28-AUG-19	R4777613
Turbidity							
Turbidity	2.60		0.10	NTU		24-AUG-19	R4768077
pH							
pH	8.16		0.10	pH		27-AUG-19	R4771848

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
DTSE	Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190822- DC GROUND

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2335330

Report Date: 03-SEP-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4769704							
WG3144261-8	LCS							
Acidity (as CaCO3)			106.2		%		85-115	26-AUG-19
WG3144261-7	MB							
Acidity (as CaCO3)			<1.0		mg/L		2	26-AUG-19
ALK-MAN-CL								
	Water							
Batch	R4771848							
WG3145505-8	LCS							
Alkalinity, Total (as CaCO3)			100.3		%		85-115	27-AUG-19
WG3145505-7	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	27-AUG-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4777713							
WG3146226-2	LCS							
Beryllium (Be)-Dissolved			102.6		%		80-120	29-AUG-19
WG3146226-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	29-AUG-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4776911							
WG3146677-3	DUP	L2335330-2						
Beryllium (Be)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	29-AUG-19
WG3146677-2	LCS							
Beryllium (Be)-Total			98.7		%		80-120	29-AUG-19
WG3146677-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	29-AUG-19
WG3146677-4	MS	L2335330-1						
Beryllium (Be)-Total			96.5		%		70-130	29-AUG-19
BR-L-IC-N-CL								
	Water							
Batch	R4772848							
WG3146055-2	LCS							
Bromide (Br)			103.4		%		85-115	24-AUG-19
WG3146055-1	MB							
Bromide (Br)			<0.050		mg/L		0.05	24-AUG-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4769509							
WG3144493-2	LCS							
Dissolved Organic Carbon			101.4		%		80-120	26-AUG-19
WG3144493-1	MB							

Quality Control Report

Workorder: L2335330

Report Date: 03-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL	Water							
Batch	R4769509							
WG3144493-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	26-AUG-19
C-TOT-ORG-LOW-CL	Water							
Batch	R4769509							
WG3144493-2 LCS								
Total Organic Carbon			103.9		%		80-120	26-AUG-19
WG3144493-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	26-AUG-19
CL-IC-N-CL	Water							
Batch	R4772848							
WG3146055-2 LCS								
Chloride (Cl)			103.1		%		90-110	24-AUG-19
WG3146055-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	24-AUG-19
EC-L-PCT-CL	Water							
Batch	R4771848							
WG3145505-8 LCS								
Conductivity (@ 25C)			99.4		%		90-110	27-AUG-19
WG3145505-7 MB								
Conductivity (@ 25C)			<2.0		uS/cm		2	27-AUG-19
F-IC-N-CL	Water							
Batch	R4772848							
WG3146055-2 LCS								
Fluoride (F)			107.5		%		90-110	24-AUG-19
WG3146055-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	24-AUG-19
HG-D-CVAA-VA	Water							
Batch	R4777943							
WG3148445-2 LCS								
Mercury (Hg)-Dissolved			97.6		%		80-120	31-AUG-19
WG3148445-1 MB		NP						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	31-AUG-19
Batch	R4778864							
WG3148445-4 MS		L2335330-2						
Mercury (Hg)-Dissolved			92.1		%		70-130	31-AUG-19

Quality Control Report

Workorder: L2335330

Report Date: 03-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4777713							
WG3146226-2	LCS							
Aluminum (Al)-Dissolved			101.6		%		80-120	29-AUG-19
Antimony (Sb)-Dissolved			103.7		%		80-120	29-AUG-19
Arsenic (As)-Dissolved			98.9		%		80-120	29-AUG-19
Barium (Ba)-Dissolved			99.6		%		80-120	29-AUG-19
Bismuth (Bi)-Dissolved			104.3		%		80-120	29-AUG-19
Boron (B)-Dissolved			101.4		%		80-120	29-AUG-19
Cadmium (Cd)-Dissolved			96.1		%		80-120	29-AUG-19
Calcium (Ca)-Dissolved			102.1		%		80-120	29-AUG-19
Chromium (Cr)-Dissolved			99.98		%		80-120	29-AUG-19
Cobalt (Co)-Dissolved			100.1		%		80-120	29-AUG-19
Copper (Cu)-Dissolved			99.6		%		80-120	29-AUG-19
Iron (Fe)-Dissolved			96.8		%		80-120	29-AUG-19
Lead (Pb)-Dissolved			101.8		%		80-120	29-AUG-19
Lithium (Li)-Dissolved			101.1		%		80-120	29-AUG-19
Magnesium (Mg)-Dissolved			107.1		%		80-120	29-AUG-19
Manganese (Mn)-Dissolved			99.8		%		80-120	29-AUG-19
Molybdenum (Mo)-Dissolved			104.4		%		80-120	29-AUG-19
Nickel (Ni)-Dissolved			100.2		%		80-120	29-AUG-19
Potassium (K)-Dissolved			105.6		%		80-120	29-AUG-19
Selenium (Se)-Dissolved			99.2		%		80-120	29-AUG-19
Silicon (Si)-Dissolved			111.8		%		60-140	29-AUG-19
Silver (Ag)-Dissolved			101.3		%		80-120	29-AUG-19
Sodium (Na)-Dissolved			104.2		%		80-120	29-AUG-19
Strontium (Sr)-Dissolved			103.8		%		80-120	29-AUG-19
Thallium (Tl)-Dissolved			103.4		%		80-120	29-AUG-19
Tin (Sn)-Dissolved			97.1		%		80-120	29-AUG-19
Titanium (Ti)-Dissolved			99.0		%		80-120	29-AUG-19
Uranium (U)-Dissolved			109.2		%		80-120	29-AUG-19
Vanadium (V)-Dissolved			99.6		%		80-120	29-AUG-19
Zinc (Zn)-Dissolved			97.6		%		80-120	29-AUG-19
WG3146226-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	29-AUG-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	29-AUG-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	29-AUG-19

Quality Control Report

Workorder: L2335330

Report Date: 03-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4777713							
WG3146226-1	MB	NP						
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	29-AUG-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	29-AUG-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	29-AUG-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	29-AUG-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	29-AUG-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	29-AUG-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	29-AUG-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	29-AUG-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	29-AUG-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	29-AUG-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	29-AUG-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	29-AUG-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	29-AUG-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	29-AUG-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	29-AUG-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	29-AUG-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	29-AUG-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	29-AUG-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	29-AUG-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	29-AUG-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	29-AUG-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	29-AUG-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	29-AUG-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	29-AUG-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	29-AUG-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	29-AUG-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	29-AUG-19
Batch	R4778439							
WG3148072-2	LCS							
Aluminum (Al)-Dissolved			105.1		%		80-120	30-AUG-19
Antimony (Sb)-Dissolved			94.8		%		80-120	30-AUG-19
Arsenic (As)-Dissolved			97.6		%		80-120	30-AUG-19
Barium (Ba)-Dissolved			103.4		%		80-120	30-AUG-19
Bismuth (Bi)-Dissolved			98.8		%		80-120	30-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4778439							
WG3148072-2	LCS							
Boron (B)-Dissolved			101.6		%		80-120	30-AUG-19
Cadmium (Cd)-Dissolved			97.5		%		80-120	30-AUG-19
Calcium (Ca)-Dissolved			102.4		%		80-120	30-AUG-19
Chromium (Cr)-Dissolved			101.0		%		80-120	30-AUG-19
Cobalt (Co)-Dissolved			100.0		%		80-120	30-AUG-19
Copper (Cu)-Dissolved			99.6		%		80-120	30-AUG-19
Iron (Fe)-Dissolved			102.6		%		80-120	30-AUG-19
Lead (Pb)-Dissolved			97.6		%		80-120	30-AUG-19
Lithium (Li)-Dissolved			106.3		%		80-120	30-AUG-19
Magnesium (Mg)-Dissolved			103.9		%		80-120	30-AUG-19
Manganese (Mn)-Dissolved			102.8		%		80-120	30-AUG-19
Molybdenum (Mo)-Dissolved			99.9		%		80-120	30-AUG-19
Nickel (Ni)-Dissolved			99.5		%		80-120	30-AUG-19
Potassium (K)-Dissolved			102.2		%		80-120	30-AUG-19
Selenium (Se)-Dissolved			102.4		%		80-120	30-AUG-19
Silicon (Si)-Dissolved			105.3		%		60-140	30-AUG-19
Silver (Ag)-Dissolved			95.1		%		80-120	30-AUG-19
Sodium (Na)-Dissolved			107.6		%		80-120	30-AUG-19
Strontium (Sr)-Dissolved			102.4		%		80-120	30-AUG-19
Thallium (Tl)-Dissolved			99.8		%		80-120	30-AUG-19
Tin (Sn)-Dissolved			95.5		%		80-120	30-AUG-19
Titanium (Ti)-Dissolved			98.3		%		80-120	30-AUG-19
Uranium (U)-Dissolved			99.96		%		80-120	30-AUG-19
Vanadium (V)-Dissolved			101.6		%		80-120	30-AUG-19
Zinc (Zn)-Dissolved			96.9		%		80-120	30-AUG-19
WG3148072-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	30-AUG-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	30-AUG-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	30-AUG-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	30-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4778439							
WG3148072-1	MB	NP						
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	30-AUG-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	30-AUG-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	30-AUG-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	30-AUG-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	30-AUG-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	30-AUG-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	30-AUG-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	30-AUG-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	30-AUG-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	30-AUG-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	30-AUG-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	30-AUG-19
MET-T-CCMS-VA								
	Water							
Batch	R4776911							
WG3146677-3	DUP	L2335330-2						
Antimony (Sb)-Total		0.00017	0.00018		mg/L	2.2	20	29-AUG-19
Arsenic (As)-Total		0.00022	0.00021		mg/L	6.4	20	29-AUG-19
Barium (Ba)-Total		0.298	0.294		mg/L	1.3	20	29-AUG-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-AUG-19
Boron (B)-Total		0.010	0.011		mg/L	2.2	20	29-AUG-19
Cadmium (Cd)-Total		0.000138	0.000131		mg/L	5.8	20	29-AUG-19
Calcium (Ca)-Total		102	103		mg/L	1.3	20	29-AUG-19
Chromium (Cr)-Total		<0.00010	0.00018	RPD-NA	mg/L	N/A	20	29-AUG-19
Cobalt (Co)-Total		0.00027	0.00028		mg/L	3.3	20	29-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4776911							
WG3146677-3 DUP		L2335330-2						
Copper (Cu)-Total		0.00055	0.00064		mg/L	15	20	29-AUG-19
Iron (Fe)-Total		0.327	0.332		mg/L	1.4	20	29-AUG-19
Lead (Pb)-Total		0.000300	0.000302		mg/L	0.7	20	29-AUG-19
Lithium (Li)-Total		0.0084	0.0086		mg/L	1.3	20	29-AUG-19
Magnesium (Mg)-Total		30.1	29.5		mg/L	2.0	20	29-AUG-19
Manganese (Mn)-Total		0.00935	0.00942		mg/L	0.7	20	29-AUG-19
Molybdenum (Mo)-Total		0.00153	0.00156		mg/L	2.1	20	29-AUG-19
Nickel (Ni)-Total		0.00151	0.00154		mg/L	1.8	20	29-AUG-19
Potassium (K)-Total		2.03	2.02		mg/L	0.7	20	29-AUG-19
Selenium (Se)-Total		0.000142	0.000139		mg/L	2.1	20	29-AUG-19
Silicon (Si)-Total		5.27	5.39		mg/L	2.3	20	29-AUG-19
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	29-AUG-19
Sodium (Na)-Total		1.63	1.65		mg/L	1.1	20	29-AUG-19
Strontium (Sr)-Total		0.105	0.105		mg/L	0.5	20	29-AUG-19
Thallium (Tl)-Total		0.000023	0.000024		mg/L	6.4	20	29-AUG-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-AUG-19
Uranium (U)-Total		0.00159	0.00160		mg/L	0.6	20	29-AUG-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	29-AUG-19
Zinc (Zn)-Total		0.0078	0.0090		mg/L	14	20	29-AUG-19
WG3146677-2 LCS								
Aluminum (Al)-Total			104.3		%		80-120	29-AUG-19
Antimony (Sb)-Total			97.8		%		80-120	29-AUG-19
Arsenic (As)-Total			95.3		%		80-120	29-AUG-19
Barium (Ba)-Total			97.1		%		80-120	29-AUG-19
Bismuth (Bi)-Total			98.0		%		80-120	29-AUG-19
Boron (B)-Total			88.3		%		80-120	29-AUG-19
Cadmium (Cd)-Total			97.6		%		80-120	29-AUG-19
Calcium (Ca)-Total			96.2		%		80-120	29-AUG-19
Chromium (Cr)-Total			95.6		%		80-120	29-AUG-19
Cobalt (Co)-Total			97.3		%		80-120	29-AUG-19
Copper (Cu)-Total			96.4		%		80-120	29-AUG-19
Iron (Fe)-Total			98.2		%		80-120	29-AUG-19
Lead (Pb)-Total			96.7		%		80-120	29-AUG-19
Lithium (Li)-Total			97.5		%		80-120	29-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4776911							
WG3146677-2 LCS								
Magnesium (Mg)-Total			98.5		%		80-120	29-AUG-19
Manganese (Mn)-Total			96.6		%		80-120	29-AUG-19
Molybdenum (Mo)-Total			94.4		%		80-120	29-AUG-19
Nickel (Ni)-Total			96.4		%		80-120	29-AUG-19
Potassium (K)-Total			98.0		%		80-120	29-AUG-19
Selenium (Se)-Total			92.9		%		80-120	29-AUG-19
Silicon (Si)-Total			103.8		%		80-120	29-AUG-19
Silver (Ag)-Total			94.0		%		80-120	29-AUG-19
Sodium (Na)-Total			99.1		%		80-120	29-AUG-19
Strontium (Sr)-Total			99.7		%		80-120	29-AUG-19
Thallium (Tl)-Total			95.0		%		80-120	29-AUG-19
Tin (Sn)-Total			94.3		%		80-120	29-AUG-19
Titanium (Ti)-Total			96.8		%		80-120	29-AUG-19
Uranium (U)-Total			96.7		%		80-120	29-AUG-19
Vanadium (V)-Total			98.7		%		80-120	29-AUG-19
Zinc (Zn)-Total			97.4		%		80-120	29-AUG-19
WG3146677-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	29-AUG-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	29-AUG-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	29-AUG-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	29-AUG-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	29-AUG-19
Boron (B)-Total			<0.010		mg/L		0.01	29-AUG-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	29-AUG-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	29-AUG-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	29-AUG-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	29-AUG-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	29-AUG-19
Iron (Fe)-Total			<0.010		mg/L		0.01	29-AUG-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	29-AUG-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	29-AUG-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	29-AUG-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	29-AUG-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	29-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4776911							
WG3146677-1 MB								
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	29-AUG-19
Potassium (K)-Total			<0.050		mg/L		0.05	29-AUG-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	29-AUG-19
Silicon (Si)-Total			<0.10		mg/L		0.1	29-AUG-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	29-AUG-19
Sodium (Na)-Total			<0.050		mg/L		0.05	29-AUG-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	29-AUG-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	29-AUG-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	29-AUG-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	29-AUG-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	29-AUG-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	29-AUG-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	29-AUG-19
WG3146677-4 MS		L2335330-1						
Aluminum (Al)-Total			97.5		%		70-130	29-AUG-19
Antimony (Sb)-Total			96.5		%		70-130	29-AUG-19
Arsenic (As)-Total			98.5		%		70-130	29-AUG-19
Barium (Ba)-Total			N/A	MS-B	%		-	29-AUG-19
Bismuth (Bi)-Total			95.3		%		70-130	29-AUG-19
Boron (B)-Total			84.1		%		70-130	29-AUG-19
Cadmium (Cd)-Total			98.2		%		70-130	29-AUG-19
Calcium (Ca)-Total			N/A	MS-B	%		-	29-AUG-19
Chromium (Cr)-Total			97.7		%		70-130	29-AUG-19
Cobalt (Co)-Total			95.9		%		70-130	29-AUG-19
Copper (Cu)-Total			95.1		%		70-130	29-AUG-19
Iron (Fe)-Total			93.9		%		70-130	29-AUG-19
Lead (Pb)-Total			97.0		%		70-130	29-AUG-19
Lithium (Li)-Total			87.4		%		70-130	29-AUG-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	29-AUG-19
Manganese (Mn)-Total			94.8		%		70-130	29-AUG-19
Molybdenum (Mo)-Total			N/A	MS-B	%		-	29-AUG-19
Nickel (Ni)-Total			94.5		%		70-130	29-AUG-19
Potassium (K)-Total			N/A	MS-B	%		-	29-AUG-19
Selenium (Se)-Total			97.8		%		70-130	29-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4776911							
WG3146677-4 MS		L2335330-1						
Silicon (Si)-Total			91.8		%		70-130	29-AUG-19
Silver (Ag)-Total			96.4		%		70-130	29-AUG-19
Sodium (Na)-Total			N/A	MS-B	%		-	29-AUG-19
Strontium (Sr)-Total			N/A	MS-B	%		-	29-AUG-19
Thallium (Tl)-Total			96.1		%		70-130	29-AUG-19
Tin (Sn)-Total			94.4		%		70-130	29-AUG-19
Titanium (Ti)-Total			98.5		%		70-130	29-AUG-19
Uranium (U)-Total			98.7		%		70-130	29-AUG-19
Vanadium (V)-Total			99.7		%		70-130	29-AUG-19
Zinc (Zn)-Total			97.1		%		70-130	29-AUG-19
Batch	R4777995							
WG3147976-3 DUP		L2335330-2						
Aluminum (Al)-Total		0.0123	0.0131		mg/L	6.2	20	30-AUG-19
Antimony (Sb)-Total		0.00017	0.00014		mg/L	3.0	20	30-AUG-19
Arsenic (As)-Total		0.00022	0.00022		mg/L	3.0	20	30-AUG-19
Barium (Ba)-Total		0.298	0.301		mg/L	3.2	20	30-AUG-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-AUG-19
Boron (B)-Total		0.010	0.011		mg/L	0.1	20	30-AUG-19
Cadmium (Cd)-Total		0.000138	0.000136		mg/L	2.9	20	30-AUG-19
Calcium (Ca)-Total		102	101		mg/L	0.3	20	30-AUG-19
Chromium (Cr)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-AUG-19
Cobalt (Co)-Total		0.00027	0.00028		mg/L	2.1	20	30-AUG-19
Copper (Cu)-Total		0.00055	0.00051	RPD-NA	mg/L	N/A	20	30-AUG-19
Iron (Fe)-Total		0.327	0.313		mg/L	0.2	20	30-AUG-19
Lead (Pb)-Total		0.000300	0.000278		mg/L	0.2	20	30-AUG-19
Lithium (Li)-Total		0.0084	0.0084		mg/L	0.3	20	30-AUG-19
Magnesium (Mg)-Total		30.1	28.2		mg/L	0.3	20	30-AUG-19
Manganese (Mn)-Total		0.00935	0.00932		mg/L	2.3	20	30-AUG-19
Molybdenum (Mo)-Total		0.00153	0.00143		mg/L	2.8	20	30-AUG-19
Nickel (Ni)-Total		0.00151	0.00151		mg/L	8.2	20	30-AUG-19
Potassium (K)-Total		2.03	2.03		mg/L	0.2	20	30-AUG-19
Silicon (Si)-Total		5.27	5.32		mg/L	0.2	20	30-AUG-19
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	30-AUG-19
Sodium (Na)-Total		1.63	1.63		mg/L	0.2	20	30-AUG-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4777995							
WG3147976-3	DUP	L2335330-2						
Strontium (Sr)-Total		0.105	0.101		mg/L	2.6	20	30-AUG-19
Thallium (Tl)-Total		0.000023	0.000023		mg/L	1.6	20	30-AUG-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-AUG-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	30-AUG-19
Uranium (U)-Total		0.00159	0.00170		mg/L	1.4	20	30-AUG-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-AUG-19
Zinc (Zn)-Total		0.0078	0.0073		mg/L	3.1	20	30-AUG-19
WG3147976-2	LCS							
Aluminum (Al)-Total			112.7		%		80-120	30-AUG-19
Antimony (Sb)-Total			100.9		%		80-120	30-AUG-19
Arsenic (As)-Total			104.2		%		80-120	30-AUG-19
Barium (Ba)-Total			108.8		%		80-120	30-AUG-19
Bismuth (Bi)-Total			102.4		%		80-120	30-AUG-19
Boron (B)-Total			96.0		%		80-120	30-AUG-19
Cadmium (Cd)-Total			105.5		%		80-120	30-AUG-19
Calcium (Ca)-Total			101.4		%		80-120	30-AUG-19
Chromium (Cr)-Total			108.5		%		80-120	30-AUG-19
Cobalt (Co)-Total			108.5		%		80-120	30-AUG-19
Copper (Cu)-Total			104.3		%		80-120	30-AUG-19
Iron (Fe)-Total			106.6		%		80-120	30-AUG-19
Lead (Pb)-Total			103.9		%		80-120	30-AUG-19
Lithium (Li)-Total			102.1		%		80-120	30-AUG-19
Magnesium (Mg)-Total			104.3		%		80-120	30-AUG-19
Manganese (Mn)-Total			106.1		%		80-120	30-AUG-19
Molybdenum (Mo)-Total			100.2		%		80-120	30-AUG-19
Nickel (Ni)-Total			105.1		%		80-120	30-AUG-19
Potassium (K)-Total			105.6		%		80-120	30-AUG-19
Selenium (Se)-Total			108.4		%		80-120	30-AUG-19
Silicon (Si)-Total			109.0		%		80-120	30-AUG-19
Silver (Ag)-Total			99.5		%		80-120	30-AUG-19
Sodium (Na)-Total			103.8		%		80-120	30-AUG-19
Strontium (Sr)-Total			102.3		%		80-120	30-AUG-19
Thallium (Tl)-Total			101.9		%		80-120	30-AUG-19
Tin (Sn)-Total			99.7		%		80-120	30-AUG-19

Quality Control Report

Workorder: L2335330

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4777995							
WG3147976-2	LCS							
Titanium (Ti)-Total			100.1		%		80-120	30-AUG-19
Uranium (U)-Total			108.2		%		80-120	30-AUG-19
Vanadium (V)-Total			109.2		%		80-120	30-AUG-19
Zinc (Zn)-Total			107.3		%		80-120	30-AUG-19
WG3147976-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	30-AUG-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	30-AUG-19
Boron (B)-Total			<0.010		mg/L		0.01	30-AUG-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	30-AUG-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	30-AUG-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	30-AUG-19
Iron (Fe)-Total			<0.010		mg/L		0.01	30-AUG-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	30-AUG-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	30-AUG-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	30-AUG-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	30-AUG-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	30-AUG-19
Potassium (K)-Total			<0.050		mg/L		0.05	30-AUG-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	30-AUG-19
Silicon (Si)-Total			<0.10		mg/L		0.1	30-AUG-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	30-AUG-19
Sodium (Na)-Total			<0.050		mg/L		0.05	30-AUG-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	30-AUG-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	30-AUG-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	30-AUG-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	30-AUG-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	30-AUG-19

Quality Control Report

Workorder: L2335330

Report Date: 03-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch	R4777995							
WG3147976-1 MB								
Zinc (Zn)-Total			<0.0030		mg/L		0.003	30-AUG-19
NH3-L-F-CL	Water							
Batch	R4776248							
WG3145855-42 LCS								
Ammonia as N			104.8		%		85-115	28-AUG-19
WG3145855-41 MB								
Ammonia as N			<0.0050		mg/L		0.005	28-AUG-19
NO2-L-IC-N-CL	Water							
Batch	R4772848							
WG3146055-2 LCS								
Nitrite (as N)			106.0		%		90-110	24-AUG-19
WG3146055-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	24-AUG-19
NO3-L-IC-N-CL	Water							
Batch	R4772848							
WG3146055-2 LCS								
Nitrate (as N)			103.0		%		90-110	24-AUG-19
WG3146055-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	24-AUG-19
ORP-CL	Water							
Batch	R4775407							
WG3146400-3 CRM		CL-ORP						
ORP			228		mV		210-230	28-AUG-19
P-T-L-COL-CL	Water							
Batch	R4768451							
WG3142895-14 LCS								
Phosphorus (P)-Total			112.5		%		80-120	25-AUG-19
WG3142895-13 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	25-AUG-19
PH-CL	Water							
Batch	R4771848							
WG3145505-8 LCS								
pH			7.00		pH		6.9-7.1	27-AUG-19

Quality Control Report

Workorder: L2335330

Report Date: 03-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-L-COL-CL	Water							
Batch	R4767870							
WG3142434-8 LCS								
Orthophosphate-Dissolved (as P)			100.3		%		80-120	24-AUG-19
WG3142434-7 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	24-AUG-19
SO4-IC-N-CL	Water							
Batch	R4772848							
WG3146055-2 LCS								
Sulfate (SO4)			102.6		%		90-110	24-AUG-19
WG3146055-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	24-AUG-19
SOLIDS-TDS-CL	Water							
Batch	R4777452							
WG3145045-8 LCS								
Total Dissolved Solids			99.1		%		85-115	28-AUG-19
WG3145045-7 MB								
Total Dissolved Solids			<10		mg/L		10	28-AUG-19
TKN-L-F-CL	Water							
Batch	R4779015							
WG3149449-11 DUP		L2335330-1						
Total Kjeldahl Nitrogen		0.143	0.144		mg/L	0.4	20	31-AUG-19
WG3149449-10 LCS								
Total Kjeldahl Nitrogen			91.4		%		75-125	31-AUG-19
WG3149449-14 LCS								
Total Kjeldahl Nitrogen			92.0		%		75-125	31-AUG-19
WG3149449-18 LCS								
Total Kjeldahl Nitrogen			97.6		%		75-125	31-AUG-19
WG3149449-2 LCS								
Total Kjeldahl Nitrogen			92.3		%		75-125	31-AUG-19
WG3149449-22 LCS								
Total Kjeldahl Nitrogen			97.6		%		75-125	31-AUG-19
WG3149449-6 LCS								
Total Kjeldahl Nitrogen			91.8		%		75-125	31-AUG-19
WG3149449-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19
WG3149449-13 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19
WG3149449-17 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19

Quality Control Report

Workorder: L2335330

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL								
Water								
Batch	R4779015							
WG3149449-21 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19
WG3149449-5 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19
WG3149449-9 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19
WG3149449-12 MS		L2335330-1						
Total Kjeldahl Nitrogen			102.5		%		70-130	31-AUG-19
TSS-L-CL								
Water								
Batch	R4777613							
WG3144790-8 LCS								
Total Suspended Solids			91.0		%		85-115	28-AUG-19
WG3144790-7 MB								
Total Suspended Solids			<1.0		mg/L		1	28-AUG-19
TURBIDITY-CL								
Water								
Batch	R4768077							
WG3142660-11 LCS								
Turbidity			95.0		%		85-115	24-AUG-19
WG3142660-10 MB								
Turbidity			<0.10		NTU		0.1	24-AUG-19

Quality Control Report

Workorder: L2335330

Report Date: 03-SEP-19

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Legend:

Limit ALS Control Limit (Data Quality Objectives)
DUP Duplicate
RPD Relative Percent Difference
N/A Not Available
LCS Laboratory Control Sample
SRM Standard Reference Material
MS Matrix Spike
MSD Matrix Spike Duplicate
ADE Average Desorption Efficiency
MB Method Blank
IRM Internal Reference Material
CRM Certified Reference Material
CCV Continuing Calibration Verification
CVS Calibration Verification Standard
LCSD Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2335330

Report Date: 03-SEP-19

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	22-AUG-19 11:42	28-AUG-19 10:45	0.25	143	hours	EHTR-FM
	2	22-AUG-19 10:43	28-AUG-19 10:45	0.25	144	hours	EHTR-FM
pH	1	22-AUG-19 11:42	27-AUG-19 12:00	0.25	120	hours	EHTR-FM
	2	22-AUG-19 10:43	27-AUG-19 12:00	0.25	121	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2335330 were received on 24-AUG-19 08:10.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

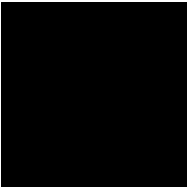
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: 20190822- DC GROUND WATER		TURNAROUND TIME:		RUSH:							
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO					
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary		Report Format / Distribution	Excel	PDF	EDD	
Project Manager	Carla Froyman Parker			Lab Contact	Lyudmyla Shvets		Email 1:	carla.froymanparker@teck.com	*	*	
Email	Carla.FroymanParker@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com		Email 2:	teckcoal@equisonline.com		*	
Address	Box 2003			Address	2559 29 Street NE		Email 3:	drake.tymstra@teck.com	*	*	
	15km North Hwy 43						Email 4:	kirsten.campbell@teck.com	*	*	
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5:	kennedy.allen@teck.com	*	*
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	PO number	VPO00608129		
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Mater	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Y	Y	Y	N	N	N				
								H2SO4	HCl	HNO3	HNO3	NONE	H2SO4	HCL			
								ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC	HG-T-CVAF-VA			
LC_PIZDC1307_WG_Q3-2019_NP	LC_PIZDC1307	WG		8/22/2019	11:42	G	6	1	1	1	1	1	1				
LC_PIZDC1308_WG_Q3-2019_NP	LC_PIZDC1308	WG		8/22/2019	10:43	G	6	1	1	1	1	1	1				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
PLEASE FORWARD ME DATA SHEETS TO NUMBERS BY FOR ANALYSIS		D.Tymstra/K.Campbell		22-Aug		DK		8/24 08/10	
SERVICE REQUEST (rush - subject to availability)		Sampler's Name		Mobile #		Sampler's Signature		Date/Time	
Regular (default) X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS		K. Campbell/D. Tymstra						August 22, 2019	

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TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 04-SEP-19
Report Date: 11-SEP-19 17:13 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2341172
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190903 PIZDC0901
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2341172-1 LC_PIZDC0901_WG_Q3-2019_NP							
Sampled By: KC/DT on 03-SEP-19 @ 11:35							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.47		0.50	mg/L		09-SEP-19	R4790198
Total Kjeldahl Nitrogen	0.358		0.050	mg/L		06-SEP-19	R4784825
Total Organic Carbon	2.57		0.50	mg/L		09-SEP-19	R4790198
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	06-SEP-19	07-SEP-19	R4784963
Dissolved Metals Filtration Location	FIELD					06-SEP-19	R4784374
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	08-SEP-19	09-SEP-19	R4790938
Dissolved Mercury Filtration Location	FIELD					08-SEP-19	R4787929
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					06-SEP-19	R4784374
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	06-SEP-19	07-SEP-19	R4784963
Antimony (Sb)-Dissolved	0.00019		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Arsenic (As)-Dissolved	0.00022		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Barium (Ba)-Dissolved	0.241		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	06-SEP-19	07-SEP-19	R4784963
Boron (B)-Dissolved	<0.010		0.010	mg/L	06-SEP-19	07-SEP-19	R4784963
Cadmium (Cd)-Dissolved	0.0948		0.0050	ug/L	06-SEP-19	07-SEP-19	R4784963
Calcium (Ca)-Dissolved	101		0.050	mg/L	06-SEP-19	07-SEP-19	R4784963
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	06-SEP-19	07-SEP-19	R4784963
Copper (Cu)-Dissolved	0.00065		0.00050	mg/L	06-SEP-19	07-SEP-19	R4784963
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	06-SEP-19	07-SEP-19	R4784963
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	06-SEP-19	07-SEP-19	R4784963
Lithium (Li)-Dissolved	0.0030		0.0010	mg/L	06-SEP-19	07-SEP-19	R4784963
Magnesium (Mg)-Dissolved	30.5		0.10	mg/L	06-SEP-19	07-SEP-19	R4784963
Manganese (Mn)-Dissolved	0.00017		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Molybdenum (Mo)-Dissolved	0.000545		0.000050	mg/L	06-SEP-19	07-SEP-19	R4784963
Nickel (Ni)-Dissolved	0.00141		0.00050	mg/L	06-SEP-19	07-SEP-19	R4784963
Potassium (K)-Dissolved	1.46		0.050	mg/L	06-SEP-19	07-SEP-19	R4784963
Selenium (Se)-Dissolved	0.550		0.050	ug/L	06-SEP-19	07-SEP-19	R4784963
Silicon (Si)-Dissolved	7.01		0.050	mg/L	06-SEP-19	07-SEP-19	R4784963
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	06-SEP-19	07-SEP-19	R4784963
Sodium (Na)-Dissolved	3.45		0.050	mg/L	06-SEP-19	07-SEP-19	R4784963
Strontium (Sr)-Dissolved	0.178		0.00020	mg/L	06-SEP-19	07-SEP-19	R4784963
Thallium (Tl)-Dissolved	0.000011		0.000010	mg/L	06-SEP-19	07-SEP-19	R4784963
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	06-SEP-19	07-SEP-19	R4784963
Uranium (U)-Dissolved	0.00207		0.000010	mg/L	06-SEP-19	07-SEP-19	R4784963
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	06-SEP-19	07-SEP-19	R4784963
Zinc (Zn)-Dissolved	0.0019		0.0010	mg/L	06-SEP-19	07-SEP-19	R4784963
Hardness							
Hardness (as CaCO3)	377		0.50	mg/L		08-SEP-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		07-SEP-19	R4786437
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0663		0.0030	mg/L		07-SEP-19	R4786437
Antimony (Sb)-Total	0.00023		0.00010	mg/L		07-SEP-19	R4786437
Arsenic (As)-Total	0.00027		0.00010	mg/L		07-SEP-19	R4786437

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2341172-1 LC_PIZDC0901_WG_Q3-2019_NP							
Sampled By: KC/DT on 03-SEP-19 @ 11:35							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.257		0.00010	mg/L		07-SEP-19	R4786437
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		07-SEP-19	R4786437
Boron (B)-Total	<0.010		0.010	mg/L		07-SEP-19	R4786437
Cadmium (Cd)-Total	0.152		0.0050	ug/L		07-SEP-19	R4786437
Calcium (Ca)-Total	104		0.050	mg/L		07-SEP-19	R4786437
Chromium (Cr)-Total	0.00022		0.00010	mg/L		07-SEP-19	R4786437
Cobalt (Co)-Total	0.22		0.10	ug/L		07-SEP-19	R4786437
Copper (Cu)-Total	0.00077		0.00050	mg/L		07-SEP-19	R4786437
Iron (Fe)-Total	0.112		0.010	mg/L		07-SEP-19	R4786437
Lead (Pb)-Total	0.000115		0.000050	mg/L		07-SEP-19	R4786437
Lithium (Li)-Total	0.0031		0.0010	mg/L		07-SEP-19	R4786437
Magnesium (Mg)-Total	29.7		0.10	mg/L		07-SEP-19	R4786437
Manganese (Mn)-Total	0.0179		0.00010	mg/L		07-SEP-19	R4786437
Molybdenum (Mo)-Total	0.000538		0.000050	mg/L		07-SEP-19	R4786437
Nickel (Ni)-Total	0.00178		0.00050	mg/L		07-SEP-19	R4786437
Potassium (K)-Total	1.37		0.050	mg/L		07-SEP-19	R4786437
Selenium (Se)-Total	0.471		0.050	ug/L		07-SEP-19	R4786437
Silicon (Si)-Total	6.59		0.10	mg/L		07-SEP-19	R4786437
Silver (Ag)-Total	<0.000010		0.000010	mg/L		07-SEP-19	R4786437
Sodium (Na)-Total	3.06		0.050	mg/L		07-SEP-19	R4786437
Strontium (Sr)-Total	0.178		0.00020	mg/L		07-SEP-19	R4786437
Thallium (Tl)-Total	0.000016		0.000010	mg/L		07-SEP-19	R4786437
Tin (Sn)-Total	0.00011		0.00010	mg/L		07-SEP-19	R4786437
Titanium (Ti)-Total	<0.010		0.010	mg/L		07-SEP-19	R4786437
Uranium (U)-Total	0.00204		0.000010	mg/L		07-SEP-19	R4786437
Vanadium (V)-Total	0.00073		0.00050	mg/L		07-SEP-19	R4786437
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		07-SEP-19	R4786437
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	12.4	RRV	1.0	mg/L		05-SEP-19	R4785468
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	377		1.0	mg/L		05-SEP-19	R4784875
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		05-SEP-19	R4784875
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		05-SEP-19	R4784875
Alkalinity, Total (as CaCO3)	377		1.0	mg/L		05-SEP-19	R4784875
Ammonia, Total (as N)							
Ammonia as N	0.0066		0.0050	mg/L		06-SEP-19	R4786970
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		04-SEP-19	R4785017
Chloride in Water by IC							
Chloride (Cl)	0.72		0.50	mg/L		04-SEP-19	R4785017
Electrical Conductivity (EC)							
Conductivity (@ 25C)	650		2.0	uS/cm		05-SEP-19	R4784875
Fluoride in Water by IC							
Fluoride (F)	0.087		0.020	mg/L		04-SEP-19	R4785017
Ion Balance Calculation							
Cation - Anion Balance	-0.8			%		08-SEP-19	
Anion Sum	7.83			meq/L		08-SEP-19	
Cation Sum	7.71			meq/L		08-SEP-19	
Ion Balance Calculation							
Ion Balance	98.5		-100	%		08-SEP-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2341172-1 LC_PIZDC0901_WG_Q3-2019_NP							
Sampled By: KC/DT on 03-SEP-19 @ 11:35							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.339		0.0050	mg/L		04-SEP-19	R4785017
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		04-SEP-19	R4785017
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0110		0.0010	mg/L		04-SEP-19	R4783210
Oxidation redution potential by elect.							
ORP	403		-1000	mV		04-SEP-19	R4783621
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0116		0.0020	mg/L		07-SEP-19	R4787208
Sulfate in Water by IC							
Sulfate (SO4)	12.3		0.30	mg/L		04-SEP-19	R4785017
Total Dissolved Solids							
Total Dissolved Solids	387	DLHC	20	mg/L		04-SEP-19	R4783683
Total Suspended Solids							
Total Suspended Solids	4.2		1.0	mg/L		09-SEP-19	R4793008
Turbidity							
Turbidity	3.73		0.10	NTU		04-SEP-19	R4783219
pH							
pH	8.27		0.10	pH		05-SEP-19	R4784875

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		with stannous chloride, and analyzed by CVAAS or CVAFS.	
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	
		Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:	
		Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]	
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
		This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.	
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
		This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.	
		It is recommended that this analysis be conducted in the field.	
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.	
PH-CL	Water	pH	APHA 4500 H-Electrode
		pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)	
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
		A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).	
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	
		Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190903 PIZDC0901

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

*mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.*

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2341172

Report Date: 11-SEP-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4785468							
WG3154179-11	LCS							
Acidity (as CaCO3)			109.7		%		85-115	05-SEP-19
WG3154179-10	MB							
Acidity (as CaCO3)			1.5		mg/L		2	05-SEP-19
ALK-MAN-CL								
	Water							
Batch	R4784875							
WG3154107-14	LCS							
Alkalinity, Total (as CaCO3)			101.6		%		85-115	05-SEP-19
WG3154107-13	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	05-SEP-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4784963							
WG3153796-2	LCS							
Beryllium (Be)-Dissolved			95.1		%		80-120	07-SEP-19
WG3153796-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	07-SEP-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4786437							
WG3153810-2	LCS							
Beryllium (Be)-Total			97.5		%		80-120	07-SEP-19
WG3153810-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	07-SEP-19
BR-L-IC-N-CL								
	Water							
Batch	R4785017							
WG3154490-10	LCS							
Bromide (Br)			102.0		%		85-115	04-SEP-19
WG3154490-9	MB							
Bromide (Br)			<0.050		mg/L		0.05	04-SEP-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4790198							
WG3155689-2	LCS							
Dissolved Organic Carbon			95.4		%		80-120	09-SEP-19
WG3155689-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	09-SEP-19
WG3155689-4	MS	L2341172-1						
Dissolved Organic Carbon			106.8		%		70-130	09-SEP-19
C-TOT-ORG-LOW-CL								
	Water							

Quality Control Report

Workorder: L2341172

Report Date: 11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL								
Water								
Batch	R4790198							
WG3155689-2	LCS							
Total Organic Carbon			97.2		%		80-120	09-SEP-19
WG3155689-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	09-SEP-19
WG3155689-4	MS	L2341172-1						
Total Organic Carbon			104.6		%		70-130	09-SEP-19
CL-IC-N-CL								
Water								
Batch	R4785017							
WG3154490-10	LCS							
Chloride (Cl)			102.0		%		90-110	04-SEP-19
WG3154490-9	MB							
Chloride (Cl)			<0.50		mg/L		0.5	04-SEP-19
EC-L-PCT-CL								
Water								
Batch	R4784875							
WG3154107-14	LCS							
Conductivity (@ 25C)			99.9		%		90-110	05-SEP-19
WG3154107-13	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	05-SEP-19
F-IC-N-CL								
Water								
Batch	R4785017							
WG3154490-10	LCS							
Fluoride (F)			109.1		%		90-110	04-SEP-19
WG3154490-9	MB							
Fluoride (F)			<0.020		mg/L		0.02	04-SEP-19
HG-D-CVAA-VA								
Water								
Batch	R4790938							
WG3155401-2	LCS							
Mercury (Hg)-Dissolved			96.9		%		80-120	09-SEP-19
WG3155401-1	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	09-SEP-19
MET-D-CCMS-VA								
Water								
Batch	R4784963							
WG3153796-2	LCS							
Aluminum (Al)-Dissolved			100.0		%		80-120	07-SEP-19
Antimony (Sb)-Dissolved			90.7		%		80-120	07-SEP-19
Arsenic (As)-Dissolved			100.1		%		80-120	07-SEP-19
Barium (Ba)-Dissolved			100.9		%		80-120	07-SEP-19

Quality Control Report

Workorder: L2341172

Report Date: 11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4784963							
WG3153796-2	LCS							
Bismuth (Bi)-Dissolved			91.3		%		80-120	07-SEP-19
Boron (B)-Dissolved			94.4		%		80-120	07-SEP-19
Cadmium (Cd)-Dissolved			97.8		%		80-120	07-SEP-19
Calcium (Ca)-Dissolved			97.1		%		80-120	07-SEP-19
Chromium (Cr)-Dissolved			98.6		%		80-120	07-SEP-19
Cobalt (Co)-Dissolved			97.7		%		80-120	07-SEP-19
Copper (Cu)-Dissolved			97.6		%		80-120	07-SEP-19
Iron (Fe)-Dissolved			94.6		%		80-120	07-SEP-19
Lead (Pb)-Dissolved			93.8		%		80-120	07-SEP-19
Lithium (Li)-Dissolved			88.5		%		80-120	07-SEP-19
Magnesium (Mg)-Dissolved			102.3		%		80-120	07-SEP-19
Manganese (Mn)-Dissolved			101.9		%		80-120	07-SEP-19
Molybdenum (Mo)-Dissolved			95.9		%		80-120	07-SEP-19
Nickel (Ni)-Dissolved			97.6		%		80-120	07-SEP-19
Potassium (K)-Dissolved			100.3		%		80-120	07-SEP-19
Selenium (Se)-Dissolved			94.4		%		80-120	07-SEP-19
Silicon (Si)-Dissolved			103.5		%		60-140	07-SEP-19
Silver (Ag)-Dissolved			92.9		%		80-120	07-SEP-19
Sodium (Na)-Dissolved			103.7		%		80-120	07-SEP-19
Strontium (Sr)-Dissolved			100.1		%		80-120	07-SEP-19
Thallium (Tl)-Dissolved			93.6		%		80-120	07-SEP-19
Tin (Sn)-Dissolved			91.3		%		80-120	07-SEP-19
Titanium (Ti)-Dissolved			92.5		%		80-120	07-SEP-19
Uranium (U)-Dissolved			102.6		%		80-120	07-SEP-19
Vanadium (V)-Dissolved			100.0		%		80-120	07-SEP-19
Zinc (Zn)-Dissolved			100.1		%		80-120	07-SEP-19
WG3153796-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	07-SEP-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	07-SEP-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	07-SEP-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	07-SEP-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	07-SEP-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	07-SEP-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	07-SEP-19

Quality Control Report

Workorder: L2341172

Report Date: 11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4784963							
WG3153796-1	MB	NP						
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	07-SEP-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	07-SEP-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	07-SEP-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	07-SEP-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	07-SEP-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	07-SEP-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	07-SEP-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	07-SEP-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	07-SEP-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	07-SEP-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	07-SEP-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	07-SEP-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	07-SEP-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	07-SEP-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	07-SEP-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	07-SEP-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	07-SEP-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	07-SEP-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	07-SEP-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	07-SEP-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	07-SEP-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	07-SEP-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	07-SEP-19
MET-T-CCMS-VA								
	Water							
Batch	R4786437							
WG3153810-2	LCS							
Aluminum (Al)-Total			107.0		%		80-120	07-SEP-19
Antimony (Sb)-Total			99.5		%		80-120	07-SEP-19
Arsenic (As)-Total			105.4		%		80-120	07-SEP-19
Barium (Ba)-Total			102.3		%		80-120	07-SEP-19
Bismuth (Bi)-Total			98.6		%		80-120	07-SEP-19
Boron (B)-Total			95.4		%		80-120	07-SEP-19
Cadmium (Cd)-Total			105.3		%		80-120	07-SEP-19
Calcium (Ca)-Total			102.2		%		80-120	07-SEP-19

Quality Control Report

Workorder: L2341172

Report Date: 11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4786437							
WG3153810-2	LCS							
Chromium (Cr)-Total			106.2		%		80-120	07-SEP-19
Cobalt (Co)-Total			105.8		%		80-120	07-SEP-19
Copper (Cu)-Total			103.8		%		80-120	07-SEP-19
Iron (Fe)-Total			103.2		%		80-120	07-SEP-19
Lead (Pb)-Total			101.4		%		80-120	07-SEP-19
Lithium (Li)-Total			93.2		%		80-120	07-SEP-19
Magnesium (Mg)-Total			106.4		%		80-120	07-SEP-19
Manganese (Mn)-Total			101.0		%		80-120	07-SEP-19
Molybdenum (Mo)-Total			102.3		%		80-120	07-SEP-19
Nickel (Ni)-Total			104.2		%		80-120	07-SEP-19
Potassium (K)-Total			108.0		%		80-120	07-SEP-19
Selenium (Se)-Total			108.8		%		80-120	07-SEP-19
Silicon (Si)-Total			102.2		%		80-120	07-SEP-19
Silver (Ag)-Total			104.9		%		80-120	07-SEP-19
Sodium (Na)-Total			107.4		%		80-120	07-SEP-19
Strontium (Sr)-Total			100.2		%		80-120	07-SEP-19
Thallium (Tl)-Total			98.1		%		80-120	07-SEP-19
Tin (Sn)-Total			101.1		%		80-120	07-SEP-19
Titanium (Ti)-Total			102.3		%		80-120	07-SEP-19
Uranium (U)-Total			93.0		%		80-120	07-SEP-19
Vanadium (V)-Total			107.9		%		80-120	07-SEP-19
Zinc (Zn)-Total			107.4		%		80-120	07-SEP-19
WG3153810-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	07-SEP-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	07-SEP-19
Boron (B)-Total			<0.010		mg/L		0.01	07-SEP-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	07-SEP-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	07-SEP-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	07-SEP-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4786437							
WG3153810-1	MB							
Iron (Fe)-Total			<0.010		mg/L		0.01	07-SEP-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	07-SEP-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	07-SEP-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	07-SEP-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	07-SEP-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	07-SEP-19
Potassium (K)-Total			<0.050		mg/L		0.05	07-SEP-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	07-SEP-19
Silicon (Si)-Total			<0.10		mg/L		0.1	07-SEP-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	07-SEP-19
Sodium (Na)-Total			<0.050		mg/L		0.05	07-SEP-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	07-SEP-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	07-SEP-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	07-SEP-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	07-SEP-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	07-SEP-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	07-SEP-19
NH3-L-F-CL		Water						
Batch	R4786970							
WG3154352-18	LCS							
Ammonia as N			109.2		%		85-115	06-SEP-19
WG3154352-17	MB							
Ammonia as N			<0.0050		mg/L		0.005	06-SEP-19
NO2-L-IC-N-CL		Water						
Batch	R4785017							
WG3154490-10	LCS							
Nitrite (as N)			104.7		%		90-110	04-SEP-19
WG3154490-9	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	04-SEP-19
NO3-L-IC-N-CL		Water						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch	R4785017							
WG3154490-10	LCS							
Nitrate (as N)			103.0		%		90-110	04-SEP-19
WG3154490-9	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	04-SEP-19
ORP-CL	Water							
Batch	R4783621							
WG3152195-11	CRM	CL-ORP						
ORP			225		mV		210-230	04-SEP-19
P-T-L-COL-CL	Water							
Batch	R4787208							
WG3155059-6	LCS							
Phosphorus (P)-Total			99.8		%		80-120	07-SEP-19
WG3155059-5	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	07-SEP-19
PH-CL	Water							
Batch	R4784875							
WG3154107-14	LCS							
pH			7.03		pH		6.9-7.1	05-SEP-19
PO4-DO-L-COL-CL	Water							
Batch	R4783210							
WG3152121-12	LCS							
Orthophosphate-Dissolved (as P)			98.0		%		80-120	04-SEP-19
WG3152121-6	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	04-SEP-19
SO4-IC-N-CL	Water							
Batch	R4785017							
WG3154490-10	LCS							
Sulfate (SO4)			101.0		%		90-110	04-SEP-19
WG3154490-9	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	04-SEP-19
SOLIDS-TDS-CL	Water							
Batch	R4783683							
WG3151269-11	LCS							
Total Dissolved Solids			100.9		%		85-115	04-SEP-19
WG3151269-10	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL		Water						
Batch	R4783683							
WG3151269-10 MB								
Total Dissolved Solids			<10		mg/L		10	04-SEP-19
TKN-L-F-CL		Water						
Batch	R4784825							
WG3154145-10 LCS								
Total Kjeldahl Nitrogen			99.1		%		75-125	06-SEP-19
WG3154145-12 LCS								
Total Kjeldahl Nitrogen			94.4		%		75-125	06-SEP-19
WG3154145-2 LCS								
Total Kjeldahl Nitrogen			97.3		%		75-125	06-SEP-19
WG3154145-4 LCS								
Total Kjeldahl Nitrogen			98.5		%		75-125	06-SEP-19
WG3154145-6 LCS								
Total Kjeldahl Nitrogen			96.0		%		75-125	06-SEP-19
WG3154145-8 LCS								
Total Kjeldahl Nitrogen			93.0		%		75-125	06-SEP-19
WG3154145-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	06-SEP-19
WG3154145-11 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	06-SEP-19
WG3154145-3 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	06-SEP-19
WG3154145-5 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	06-SEP-19
WG3154145-7 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	06-SEP-19
WG3154145-9 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	06-SEP-19
TSS-L-CL		Water						
Batch	R4793008							
WG3154618-14 LCS								
Total Suspended Solids			96.4		%		85-115	09-SEP-19
WG3154618-13 MB								
Total Suspended Solids			<1.0		mg/L		1	09-SEP-19
TURBIDITY-CL		Water						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch	R4783219							
WG3152189-15	LCS							
Turbidity			96.5		%		85-115	04-SEP-19
WG3152189-13	MB							
Turbidity			<0.10		NTU		0.1	04-SEP-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	03-SEP-19 11:35	04-SEP-19 17:00	0.25	30	hours	EHTR-FM
pH	1	03-SEP-19 11:35	05-SEP-19 12:00	0.25	48	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2341172 were received on 04-SEP-19 08:40.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: **20190903 PIZDC0901** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Carla Froyman Parker			Lab Contact	Lyudmyla Shvets			Email 1:	carla.froymanparker@teck.com	x	x
Email	Carla.FroymanParker@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		x
Address	Box 2003 15km North Hwy 43			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com	x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 4:	kirsten.campbell@teck.com	x	x
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	Email 5:	kennedy.allen@teck.com	x	x
Phone Number	250-425-3196			Phone Number	403 407 1794			PO number	1PO00608129		

SAMPLE DETAILS								ANALYSIS REQUESTED												
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS Package-DOC	HG-D-CVAE-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS Package-TKN/TOC	Y	Y	Y	N	N	N	
LC_PIZDC0901_WG_Q3-2019_NP	LC_PIZDC0901	WG		9/3/2019	11:35	G	6	1	1	1	1	1	1	1						




L2341172-COFC

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	D.Tymstra/K.Campbell	3-Sep	DK	8:40 AM

SERVICE REQUEST (rush subject to availability)	Sampler's Name	Mobile #	Date/Time
Regular (default) X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	K. Campbell/D. Tymstra		September 3, 2019

9°C



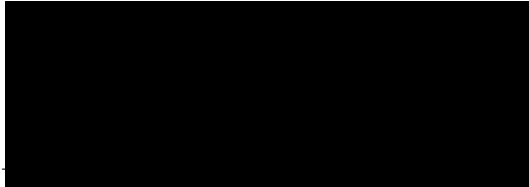
TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
Box 2003 15km North Hwy 43
Sparwood BC V0B 2G0

Date Received: 06-SEP-19
Report Date: 16-SEP-19 08:48 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2342753
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190905 ERX
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342753-1 LC_ERX_WG_2019_1OF2_NP							
Sampled By: KC/DT on 05-SEP-19 @ 12:01							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.97		0.50	mg/L		11-SEP-19	R4801270
Total Kjeldahl Nitrogen	0.267		0.050	mg/L		10-SEP-19	R4795109
Mercury (Hg)-Total	0.00093		0.00050	ug/L		11-SEP-19	R4799468
Total Organic Carbon	3.01		0.50	mg/L		11-SEP-19	R4801270
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	09-SEP-19	11-SEP-19	R4801415
Dissolved Metals Filtration Location	FIELD					09-SEP-19	R4790692
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	10-SEP-19	11-SEP-19	R4795914
Dissolved Mercury Filtration Location	FIELD					10-SEP-19	R4793989
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					09-SEP-19	R4790692
Aluminum (Al)-Dissolved	0.0033		0.0030	mg/L	09-SEP-19	11-SEP-19	R4801415
Antimony (Sb)-Dissolved	0.00019		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Arsenic (As)-Dissolved	0.00055		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Barium (Ba)-Dissolved	0.180		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Boron (B)-Dissolved	0.041		0.010	mg/L	09-SEP-19	11-SEP-19	R4801415
Cadmium (Cd)-Dissolved	0.0135		0.0050	ug/L	09-SEP-19	11-SEP-19	R4801415
Calcium (Ca)-Dissolved	87.8		0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Chromium (Cr)-Dissolved	0.00012		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	09-SEP-19	11-SEP-19	R4801415
Copper (Cu)-Dissolved	0.00080		0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	09-SEP-19	11-SEP-19	R4801415
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Lithium (Li)-Dissolved	0.0214		0.0010	mg/L	09-SEP-19	11-SEP-19	R4801415
Magnesium (Mg)-Dissolved	29.9		0.10	mg/L	09-SEP-19	11-SEP-19	R4801415
Manganese (Mn)-Dissolved	0.00209		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Molybdenum (Mo)-Dissolved	0.00249		0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Nickel (Ni)-Dissolved	0.00059		0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Potassium (K)-Dissolved	2.43		0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Selenium (Se)-Dissolved	0.821		0.050	ug/L	09-SEP-19	11-SEP-19	R4801415
Silicon (Si)-Dissolved	6.86		0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	09-SEP-19	11-SEP-19	R4801415
Sodium (Na)-Dissolved	9.00		0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Strontium (Sr)-Dissolved	0.499		0.00020	mg/L	09-SEP-19	11-SEP-19	R4801415
Thallium (Tl)-Dissolved	0.000026		0.000010	mg/L	09-SEP-19	11-SEP-19	R4801415
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	09-SEP-19	11-SEP-19	R4801415
Uranium (U)-Dissolved	0.00149		0.000010	mg/L	09-SEP-19	11-SEP-19	R4801415
Vanadium (V)-Dissolved	0.00122		0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	09-SEP-19	11-SEP-19	R4801415
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	342		0.50	mg/L		12-SEP-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		11-SEP-19	R4797110
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		11-SEP-19	R4795914
Total Metals in Water by CRC ICPMS							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342753-1 LC_ERX_WG_2019_1OF2_NP							
Sampled By: KC/DT on 05-SEP-19 @ 12:01							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.194		0.0030	mg/L		11-SEP-19	R4797110
Antimony (Sb)-Total	0.00021		0.00010	mg/L		11-SEP-19	R4797110
Arsenic (As)-Total	0.00062		0.00010	mg/L		11-SEP-19	R4797110
Barium (Ba)-Total	0.162		0.00010	mg/L		11-SEP-19	R4797110
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		11-SEP-19	R4797110
Boron (B)-Total	0.041		0.010	mg/L		11-SEP-19	R4797110
Cadmium (Cd)-Total	0.0777		0.0050	ug/L		11-SEP-19	R4797110
Calcium (Ca)-Total	78.5		0.050	mg/L		11-SEP-19	R4797110
Chromium (Cr)-Total	0.00040		0.00010	mg/L		11-SEP-19	R4797110
Cobalt (Co)-Total	0.12		0.10	ug/L		11-SEP-19	R4797110
Copper (Cu)-Total	0.00126		0.00050	mg/L		11-SEP-19	R4797110
Iron (Fe)-Total	0.114		0.010	mg/L		11-SEP-19	R4797110
Lead (Pb)-Total	0.000131		0.000050	mg/L		11-SEP-19	R4797110
Lithium (Li)-Total	0.0206		0.0010	mg/L		11-SEP-19	R4797110
Magnesium (Mg)-Total	29.5		0.10	mg/L		11-SEP-19	R4797110
Manganese (Mn)-Total	0.00454		0.00010	mg/L		11-SEP-19	R4797110
Molybdenum (Mo)-Total	0.00221		0.000050	mg/L		11-SEP-19	R4797110
Nickel (Ni)-Total	0.00095		0.00050	mg/L		11-SEP-19	R4797110
Potassium (K)-Total	2.21		0.050	mg/L		11-SEP-19	R4797110
Selenium (Se)-Total	0.840		0.050	ug/L		11-SEP-19	R4797110
Silicon (Si)-Total	7.47		0.10	mg/L		11-SEP-19	R4797110
Silver (Ag)-Total	<0.000010		0.000010	mg/L		11-SEP-19	R4797110
Sodium (Na)-Total	8.33		0.050	mg/L		11-SEP-19	R4797110
Strontium (Sr)-Total	0.452		0.00020	mg/L		11-SEP-19	R4797110
Thallium (Tl)-Total	0.000032		0.000010	mg/L		11-SEP-19	R4797110
Tin (Sn)-Total	<0.00010		0.00010	mg/L		11-SEP-19	R4797110
Titanium (Ti)-Total	<0.010		0.010	mg/L		11-SEP-19	R4797110
Uranium (U)-Total	0.00150		0.000010	mg/L		11-SEP-19	R4797110
Vanadium (V)-Total	0.00161		0.00050	mg/L		11-SEP-19	R4797110
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		11-SEP-19	R4797110
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		08-SEP-19	R4789448
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	233		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Carbonate (as CaCO3)	6.8		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Total (as CaCO3)	240		1.0	mg/L		08-SEP-19	R4789379
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		10-SEP-19	R4797611
Bromide in Water by IC (Low Level)							
Bromide (Br)	0.456		0.050	mg/L		06-SEP-19	R4789491
Chloride in Water by IC							
Chloride (Cl)	47.6		0.50	mg/L		06-SEP-19	R4789491
Electrical Conductivity (EC)							
Conductivity (@ 25C)	579		2.0	uS/cm		08-SEP-19	R4789379
Fluoride in Water by IC							
Fluoride (F)	0.244		0.020	mg/L		06-SEP-19	R4789491
Ion Balance Calculation							
Ion Balance	110		-100	%		12-SEP-19	
Ion Balance Calculation							
Cation - Anion Balance	4.7			%		12-SEP-19	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342753-1 LC_ERX_WG_2019_1OF2_NP							
Sampled By: KC/DT on 05-SEP-19 @ 12:01							
Matrix: WG							
Ion Balance Calculation							
Anion Sum	6.64			meq/L		12-SEP-19	
Cation Sum	7.29			meq/L		12-SEP-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		06-SEP-19	R4789491
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		06-SEP-19	R4789491
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0015		0.0010	mg/L		06-SEP-19	R4785668
Oxidation redution potential by elect.							
ORP	269		-1000	mV		06-SEP-19	R4785653
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0150		0.0020	mg/L		10-SEP-19	R4794549
Sulfate in Water by IC							
Sulfate (SO4)	23.5		0.30	mg/L		06-SEP-19	R4789491
Total Dissolved Solids							
Total Dissolved Solids	393	DLHC	20	mg/L		09-SEP-19	R4793289
Total Suspended Solids							
Total Suspended Solids	6.1		1.0	mg/L		11-SEP-19	R4801248
Turbidity							
Turbidity	4.28		0.10	NTU		06-SEP-19	R4785610
pH							
pH	8.39		0.10	pH		08-SEP-19	R4789379
L2342753-2 LC_PIZP1105_WG_2019-Q3_N							
Sampled By: KC/DT on 05-SEP-19 @ 14:14							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	0.86		0.50	mg/L		13-SEP-19	R4807350
Total Kjeldahl Nitrogen	2.86	DLM	0.10	mg/L		10-SEP-19	R4795109
Total Organic Carbon	16.9	DLM	5.0	mg/L		13-SEP-19	R4807350
EPH Testing for teck Coal							
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	06-SEP-19	08-SEP-19	R4787774
EPH19-32	<0.25		0.25	mg/L	06-SEP-19	08-SEP-19	R4787774
Surrogate: 2-Bromobenzotrifluoride	89.9		60-140	%	06-SEP-19	08-SEP-19	R4787774
Sum of EPH (10-32)							
EPH (C10-C32)	<0.50		0.50	mg/L		08-SEP-19	
TEH (C10-C30)							
TEH (C10-C30)	<0.25		0.25	mg/L	06-SEP-19	08-SEP-19	R4787774
Surrogate: 2-Bromobenzotrifluoride	89.9		60-140	%	06-SEP-19	08-SEP-19	R4787774
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	09-SEP-19	11-SEP-19	R4801415
Dissolved Metals Filtration Location	FIELD					09-SEP-19	R4790692
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	10-SEP-19	11-SEP-19	R4795914
Dissolved Mercury Filtration Location	FIELD					10-SEP-19	R4793989
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					09-SEP-19	R4790692
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	09-SEP-19	11-SEP-19	R4801415
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342753-2 LC_PIZP1105_WG_2019-Q3_N							
Sampled By: KC/DT on 05-SEP-19 @ 14:14							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Barium (Ba)-Dissolved	0.108		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Boron (B)-Dissolved	0.021		0.010	mg/L	09-SEP-19	11-SEP-19	R4801415
Cadmium (Cd)-Dissolved	0.0355		0.0050	ug/L	09-SEP-19	11-SEP-19	R4801415
Calcium (Ca)-Dissolved	181		0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	09-SEP-19	11-SEP-19	R4801415
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	09-SEP-19	11-SEP-19	R4801415
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Lithium (Li)-Dissolved	0.0178		0.0010	mg/L	09-SEP-19	11-SEP-19	R4801415
Magnesium (Mg)-Dissolved	58.1		0.10	mg/L	09-SEP-19	11-SEP-19	R4801415
Manganese (Mn)-Dissolved	0.00280		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Molybdenum (Mo)-Dissolved	0.000235		0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Nickel (Ni)-Dissolved	0.00067		0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Potassium (K)-Dissolved	2.04		0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Selenium (Se)-Dissolved	0.078		0.050	ug/L	09-SEP-19	11-SEP-19	R4801415
Silicon (Si)-Dissolved	5.13		0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	09-SEP-19	11-SEP-19	R4801415
Sodium (Na)-Dissolved	16.3		0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Strontium (Sr)-Dissolved	0.430		0.00020	mg/L	09-SEP-19	11-SEP-19	R4801415
Thallium (Tl)-Dissolved	0.000022		0.000010	mg/L	09-SEP-19	11-SEP-19	R4801415
Tin (Sn)-Dissolved	0.00044		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	09-SEP-19	11-SEP-19	R4801415
Uranium (U)-Dissolved	0.000558		0.000010	mg/L	09-SEP-19	11-SEP-19	R4801415
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Zinc (Zn)-Dissolved	0.0024		0.0010	mg/L	09-SEP-19	11-SEP-19	R4801415
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	691		0.50	mg/L		12-SEP-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.523		0.020	ug/L		11-SEP-19	R4797110
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	0.000259		0.0000050	mg/L		11-SEP-19	R4795914
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	6.05		0.0030	mg/L		11-SEP-19	R4797110
Antimony (Sb)-Total	0.00064		0.00010	mg/L		11-SEP-19	R4797110
Arsenic (As)-Total	0.00479		0.00010	mg/L		11-SEP-19	R4797110
Barium (Ba)-Total	0.338		0.00010	mg/L		11-SEP-19	R4797110
Bismuth (Bi)-Total	0.000072		0.000050	mg/L		11-SEP-19	R4797110
Boron (B)-Total	0.029		0.010	mg/L		11-SEP-19	R4797110
Cadmium (Cd)-Total	2.62		0.0050	ug/L		11-SEP-19	R4797110
Calcium (Ca)-Total	419		0.050	mg/L		11-SEP-19	R4797110
Chromium (Cr)-Total	0.0115		0.00010	mg/L		11-SEP-19	R4797110
Cobalt (Co)-Total	7.79		0.10	ug/L		11-SEP-19	R4797110
Copper (Cu)-Total	0.0110		0.00050	mg/L		11-SEP-19	R4797110
Iron (Fe)-Total	10.8		0.010	mg/L		11-SEP-19	R4797110
Lead (Pb)-Total	0.00445		0.000050	mg/L		11-SEP-19	R4797110
Lithium (Li)-Total	0.0254		0.0010	mg/L		11-SEP-19	R4797110
Magnesium (Mg)-Total	90.3		0.10	mg/L		11-SEP-19	R4797110
Manganese (Mn)-Total	1.51		0.00010	mg/L		11-SEP-19	R4797110
Molybdenum (Mo)-Total	0.00123		0.000050	mg/L		11-SEP-19	R4797110

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342753-2 LC_PIZP1105_WG_2019-Q3_N							
Sampled By: KC/DT on 05-SEP-19 @ 14:14							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Nickel (Ni)-Total	0.0151		0.00050	mg/L		11-SEP-19	R4797110
Potassium (K)-Total	3.51		0.050	mg/L		11-SEP-19	R4797110
Selenium (Se)-Total	0.487		0.050	ug/L		11-SEP-19	R4797110
Silicon (Si)-Total	14.7		0.10	mg/L		11-SEP-19	R4797110
Silver (Ag)-Total	0.000123		0.000010	mg/L		11-SEP-19	R4797110
Sodium (Na)-Total	14.8		0.050	mg/L		11-SEP-19	R4797110
Strontium (Sr)-Total	0.661		0.00020	mg/L		11-SEP-19	R4797110
Thallium (Tl)-Total	0.000246		0.000010	mg/L		11-SEP-19	R4797110
Tin (Sn)-Total	0.00031		0.00010	mg/L		11-SEP-19	R4797110
Titanium (Ti)-Total	0.055		0.010	mg/L		11-SEP-19	R4797110
Uranium (U)-Total	0.000709		0.000010	mg/L		11-SEP-19	R4797110
Vanadium (V)-Total	0.0164		0.00050	mg/L		11-SEP-19	R4797110
Zinc (Zn)-Total	0.0927		0.0030	mg/L		11-SEP-19	R4797110
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	123		1.0	mg/L		08-SEP-19	R4789448
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	492		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Total (as CaCO3)	492		1.0	mg/L		08-SEP-19	R4789379
Ammonia, Total (as N)							
Ammonia as N	0.0050		0.0050	mg/L		10-SEP-19	R4797611
Bromide in Water by IC (Low Level)							
Bromide (Br)	1.52	DLHC	0.25	mg/L		06-SEP-19	R4789491
Chloride in Water by IC							
Chloride (Cl)	125	DLHC	2.5	mg/L		06-SEP-19	R4789491
Electrical Conductivity (EC)							
Conductivity (@ 25C)	1140		2.0	uS/cm		08-SEP-19	R4789379
Fluoride in Water by IC							
Fluoride (F)	0.31	DLHC	0.10	mg/L		06-SEP-19	R4789491
Ion Balance Calculation							
Cation - Anion Balance	-2.6			%		12-SEP-19	
Anion Sum	15.4			meq/L		12-SEP-19	
Cation Sum	14.6			meq/L		12-SEP-19	
Ion Balance Calculation							
Ion Balance	94.9		-100	%		12-SEP-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.039	DLHC	0.025	mg/L		06-SEP-19	R4789491
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		06-SEP-19	R4789491
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0102		0.0010	mg/L		06-SEP-19	R4785668
Oxidation redution potential by elect.							
ORP	296		-1000	mV		06-SEP-19	R4785653
Phosphorus (P)-Total							
Phosphorus (P)-Total	4.71	DLHC	0.50	mg/L		10-SEP-19	R4794549
Sulfate in Water by IC							
Sulfate (SO4)	95.2	DLHC	1.5	mg/L		06-SEP-19	R4789491
Total Dissolved Solids							
Total Dissolved Solids	869	DLHC	20	mg/L		09-SEP-19	R4793289
Total Suspended Solids							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342753-2 LC_PIZP1105_WG_2019-Q3_N Sampled By: KC/DT on 05-SEP-19 @ 14:14 Matrix: WG							
Total Suspended Solids Total Suspended Solids	3270	DLHC	8.0	mg/L		11-SEP-19	R4801248
Turbidity Turbidity	3320		0.10	NTU		06-SEP-19	R4785610
pH pH	7.92		0.10	pH		08-SEP-19	R4789379

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
EPH(10-32)-CALC-CL	Water	Sum of EPH (10-32)	Sum of EPH - Auto Calculated
The sum of EPH(C10-C19) and EPH(C19-C32)			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Weston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TEH-BC-VA-CL	Water	EPH (C10-C19) & EPH (C19-C32)	BCMOE EPH GCFID
Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).			
TEH-WATER-VA-CL	Water	TEH (C10-C30)	BC Lab Manual
Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190905 ERX

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample
 mg/kg wwt - milligrams per kilogram based on wet weight of sample
 mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
 mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2342753

Report Date: 16-SEP-19

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Client: TECK COAL LIMITED (LINE CREEK)
 Box 2003 15km North Hwy 43
 Sparwood BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4789448							
WG3155958-11	LCS							
Acidity (as CaCO3)			102.6		%		85-115	08-SEP-19
WG3155958-10	MB							
Acidity (as CaCO3)			1.2		mg/L		2	08-SEP-19
ALK-MAN-CL								
	Water							
Batch	R4789379							
WG3155938-8	LCS							
Alkalinity, Total (as CaCO3)			100.7		%		85-115	08-SEP-19
WG3155938-7	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	08-SEP-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4801415							
WG3156352-2	LCS							
Beryllium (Be)-Dissolved			96.1		%		80-120	11-SEP-19
WG3156352-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	11-SEP-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4797110							
WG3156061-2	LCS							
Beryllium (Be)-Total			89.7		%		80-120	11-SEP-19
WG3156061-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	11-SEP-19
BR-L-IC-N-CL								
	Water							
Batch	R4789491							
WG3156041-6	LCS							
Bromide (Br)			100.5		%		85-115	06-SEP-19
WG3156041-5	MB							
Bromide (Br)			<0.050		mg/L		0.05	06-SEP-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4801270							
WG3159660-2	LCS							
Dissolved Organic Carbon			103.6		%		80-120	11-SEP-19
WG3159660-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL	Water							
Batch	R4807350							
WG3161810-2 LCS								
Dissolved Organic Carbon			106.2		%		80-120	13-SEP-19
WG3161810-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	13-SEP-19
C-TOT-ORG-LOW-CL	Water							
Batch	R4801270							
WG3159660-2 LCS								
Total Organic Carbon			105.7		%		80-120	11-SEP-19
WG3159660-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	11-SEP-19
Batch	R4807350							
WG3161810-2 LCS								
Total Organic Carbon			113.2		%		80-120	13-SEP-19
WG3161810-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	13-SEP-19
CL-IC-N-CL	Water							
Batch	R4789491							
WG3156041-6 LCS								
Chloride (Cl)			101.0		%		90-110	06-SEP-19
WG3156041-5 MB								
Chloride (Cl)			<0.50		mg/L		0.5	06-SEP-19
EC-L-PCT-CL	Water							
Batch	R4789379							
WG3155938-8 LCS								
Conductivity (@ 25C)			98.7		%		90-110	08-SEP-19
WG3155938-7 MB								
Conductivity (@ 25C)			<2.0		uS/cm		2	08-SEP-19
F-IC-N-CL	Water							
Batch	R4789491							
WG3156041-6 LCS								
Fluoride (F)			103.0		%		90-110	06-SEP-19
WG3156041-5 MB								
Fluoride (F)			<0.020		mg/L		0.02	06-SEP-19
HG-D-CVAA-VA	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA		Water						
Batch	R4795914							
WG3157152-2	LCS							
Mercury (Hg)-Dissolved			99.2		%		80-120	11-SEP-19
WG3157152-1	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	11-SEP-19
HG-T-CVAA-VA		Water						
Batch	R4795914							
WG3157912-2	LCS							
Mercury (Hg)-Total			99.0		%		80-120	11-SEP-19
WG3157912-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	11-SEP-19
HG-T-U-CVAF-VA		Water						
Batch	R4799468							
WG3158996-2	LCS							
Mercury (Hg)-Total			84.4		%		80-120	11-SEP-19
WG3158996-1	MB							
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	11-SEP-19
MET-D-CCMS-VA		Water						
Batch	R4801415							
WG3156352-2	LCS							
Aluminum (Al)-Dissolved			99.1		%		80-120	11-SEP-19
Antimony (Sb)-Dissolved			92.7		%		80-120	11-SEP-19
Arsenic (As)-Dissolved			97.1		%		80-120	11-SEP-19
Barium (Ba)-Dissolved			102.9		%		80-120	11-SEP-19
Bismuth (Bi)-Dissolved			95.1		%		80-120	11-SEP-19
Boron (B)-Dissolved			95.8		%		80-120	11-SEP-19
Cadmium (Cd)-Dissolved			95.8		%		80-120	11-SEP-19
Calcium (Ca)-Dissolved			99.0		%		80-120	11-SEP-19
Chromium (Cr)-Dissolved			99.2		%		80-120	11-SEP-19
Cobalt (Co)-Dissolved			98.5		%		80-120	11-SEP-19
Copper (Cu)-Dissolved			98.9		%		80-120	11-SEP-19
Iron (Fe)-Dissolved			100.4		%		80-120	11-SEP-19
Lead (Pb)-Dissolved			96.1		%		80-120	11-SEP-19
Lithium (Li)-Dissolved			90.5		%		80-120	11-SEP-19
Magnesium (Mg)-Dissolved			93.9		%		80-120	11-SEP-19
Manganese (Mn)-Dissolved			96.5		%		80-120	11-SEP-19
Molybdenum (Mo)-Dissolved			96.1		%		80-120	11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4801415							
WG3156352-2	LCS							
Nickel (Ni)-Dissolved			95.6		%		80-120	11-SEP-19
Potassium (K)-Dissolved			98.3		%		80-120	11-SEP-19
Selenium (Se)-Dissolved			99.4		%		80-120	11-SEP-19
Silicon (Si)-Dissolved			97.1		%		60-140	11-SEP-19
Silver (Ag)-Dissolved			93.8		%		80-120	11-SEP-19
Sodium (Na)-Dissolved			100.6		%		80-120	11-SEP-19
Strontium (Sr)-Dissolved			95.4		%		80-120	11-SEP-19
Thallium (Tl)-Dissolved			95.6		%		80-120	11-SEP-19
Tin (Sn)-Dissolved			96.2		%		80-120	11-SEP-19
Titanium (Ti)-Dissolved			96.7		%		80-120	11-SEP-19
Uranium (U)-Dissolved			97.0		%		80-120	11-SEP-19
Vanadium (V)-Dissolved			100.0		%		80-120	11-SEP-19
Zinc (Zn)-Dissolved			96.5		%		80-120	11-SEP-19
WG3156352-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	11-SEP-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	11-SEP-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	11-SEP-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	11-SEP-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	11-SEP-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	11-SEP-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	11-SEP-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	11-SEP-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	11-SEP-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	11-SEP-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	11-SEP-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	11-SEP-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	11-SEP-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	11-SEP-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	11-SEP-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	11-SEP-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	11-SEP-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	11-SEP-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	11-SEP-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4801415							
WG3156352-1	MB	NP						
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	11-SEP-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	11-SEP-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	11-SEP-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	11-SEP-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	11-SEP-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	11-SEP-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	11-SEP-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	11-SEP-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	11-SEP-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	11-SEP-19
MET-T-CCMS-VA								
	Water							
Batch	R4796861							
WG3156061-2	LCS							
Sodium (Na)-Total			112.9		%		80-120	11-SEP-19
Batch								
R4797110								
WG3156061-2	LCS							
Aluminum (Al)-Total			101.7		%		80-120	11-SEP-19
Antimony (Sb)-Total			98.8		%		80-120	11-SEP-19
Arsenic (As)-Total			100.6		%		80-120	11-SEP-19
Barium (Ba)-Total			104.3		%		80-120	11-SEP-19
Bismuth (Bi)-Total			94.2		%		80-120	11-SEP-19
Boron (B)-Total			111.4		%		80-120	11-SEP-19
Cadmium (Cd)-Total			93.5		%		80-120	11-SEP-19
Calcium (Ca)-Total			105.3		%		80-120	11-SEP-19
Chromium (Cr)-Total			100.6		%		80-120	11-SEP-19
Cobalt (Co)-Total			94.1		%		80-120	11-SEP-19
Copper (Cu)-Total			90.7		%		80-120	11-SEP-19
Iron (Fe)-Total			97.6		%		80-120	11-SEP-19
Lead (Pb)-Total			94.1		%		80-120	11-SEP-19
Lithium (Li)-Total			86.7		%		80-120	11-SEP-19
Magnesium (Mg)-Total			114.7		%		80-120	11-SEP-19
Manganese (Mn)-Total			103.1		%		80-120	11-SEP-19
Molybdenum (Mo)-Total			97.5		%		80-120	11-SEP-19
Nickel (Ni)-Total			94.4		%		80-120	11-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4797110							
WG3156061-2	LCS							
Potassium (K)-Total			111.7		%		80-120	11-SEP-19
Selenium (Se)-Total			102.9		%		80-120	11-SEP-19
Silicon (Si)-Total			101.6		%		80-120	11-SEP-19
Silver (Ag)-Total			96.2		%		80-120	11-SEP-19
Strontium (Sr)-Total			112.3		%		80-120	11-SEP-19
Thallium (Tl)-Total			96.3		%		80-120	11-SEP-19
Tin (Sn)-Total			96.8		%		80-120	11-SEP-19
Titanium (Ti)-Total			102.0		%		80-120	11-SEP-19
Uranium (U)-Total			96.2		%		80-120	11-SEP-19
Vanadium (V)-Total			98.6		%		80-120	11-SEP-19
Zinc (Zn)-Total			100.7		%		80-120	11-SEP-19
WG3156061-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	11-SEP-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	11-SEP-19
Boron (B)-Total			<0.010		mg/L		0.01	11-SEP-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	11-SEP-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	11-SEP-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	11-SEP-19
Iron (Fe)-Total			<0.010		mg/L		0.01	11-SEP-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	11-SEP-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	11-SEP-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	11-SEP-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	11-SEP-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	11-SEP-19
Potassium (K)-Total			<0.050		mg/L		0.05	11-SEP-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	11-SEP-19
Silicon (Si)-Total			<0.10		mg/L		0.1	11-SEP-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	11-SEP-19

Quality Control Report

Workorder: L2342753

Report Date: 16-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4797110							
WG3156061-1	MB							
Sodium (Na)-Total			<0.050		mg/L		0.05	11-SEP-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	11-SEP-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	11-SEP-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	11-SEP-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	11-SEP-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	11-SEP-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	11-SEP-19
NH3-L-F-CL								
	Water							
Batch	R4797611							
WG3157258-10	LCS							
Ammonia as N			109.2		%		85-115	10-SEP-19
WG3157258-9	MB							
Ammonia as N			<0.0050		mg/L		0.005	10-SEP-19
NO2-L-IC-N-CL								
	Water							
Batch	R4789491							
WG3156041-6	LCS							
Nitrite (as N)			102.4		%		90-110	06-SEP-19
WG3156041-5	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	06-SEP-19
NO3-L-IC-N-CL								
	Water							
Batch	R4789491							
WG3156041-6	LCS							
Nitrate (as N)			101.4		%		90-110	06-SEP-19
WG3156041-5	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	06-SEP-19
ORP-CL								
	Water							
Batch	R4785653							
WG3154603-5	CRM	CL-ORP						
ORP			226		mV		210-230	06-SEP-19
P-T-L-COL-CL								
	Water							
Batch	R4794549							
WG3157489-67	LCS							
Phosphorus (P)-Total			95.6		%		80-120	10-SEP-19
WG3157489-65	MB							

Quality Control Report

Workorder: L2342753

Report Date: 16-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-CL	Water							
Batch	R4794549							
WG3157489-65 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	10-SEP-19
PH-CL	Water							
Batch	R4789379							
WG3155938-8 LCS								
pH			7.03		pH		6.9-7.1	08-SEP-19
PO4-DO-L-COL-CL	Water							
Batch	R4785668							
WG3154558-6 LCS								
Orthophosphate-Dissolved (as P)			99.2		%		80-120	06-SEP-19
WG3154558-5 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	06-SEP-19
SO4-IC-N-CL	Water							
Batch	R4789491							
WG3156041-6 LCS								
Sulfate (SO4)			101.2		%		90-110	06-SEP-19
WG3156041-5 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	06-SEP-19
SOLIDS-TDS-CL	Water							
Batch	R4793289							
WG3155681-5 LCS								
Total Dissolved Solids			96.6		%		85-115	09-SEP-19
WG3155681-4 MB								
Total Dissolved Solids			<10		mg/L		10	09-SEP-19
TEH-BC-VA-CL	Water							
Batch	R4787774							
WG3154202-2 LCS								
EPH10-19			87.2		%		70-130	06-SEP-19
EPH19-32			91.0		%		70-130	06-SEP-19
WG3154202-1 MB								
EPH10-19			<0.25		mg/L		0.25	06-SEP-19
EPH19-32			<0.25		mg/L		0.25	06-SEP-19
Surrogate: 2-Bromobenzotrifluoride			77.2		%		60-140	06-SEP-19
TEH-WATER-VA-CL	Water							

Quality Control Report

Workorder: L2342753

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TEH-WATER-VA-CL		Water						
Batch	R4787774							
WG3154202-2	LCS							
TEH (C10-C30)			88.0		%		70-130	06-SEP-19
WG3154202-1	MB							
TEH (C10-C30)			<0.25		mg/L		0.25	06-SEP-19
Surrogate: 2-Bromobenzotrifluoride			77.2		%		60-140	06-SEP-19
TKN-L-F-CL		Water						
Batch	R4795109							
WG3157524-10	LCS							
Total Kjeldahl Nitrogen			106.3		%		75-125	10-SEP-19
WG3157524-14	LCS							
Total Kjeldahl Nitrogen			106.5		%		75-125	10-SEP-19
WG3157524-18	LCS							
Total Kjeldahl Nitrogen			103.0		%		75-125	11-SEP-19
WG3157524-2	LCS							
Total Kjeldahl Nitrogen			105.8		%		75-125	10-SEP-19
WG3157524-6	LCS							
Total Kjeldahl Nitrogen			104.9		%		75-125	10-SEP-19
WG3157524-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	10-SEP-19
WG3157524-13	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	10-SEP-19
WG3157524-17	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	11-SEP-19
WG3157524-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	10-SEP-19
WG3157524-9	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	10-SEP-19
TSS-L-CL		Water						
Batch	R4801248							
WG3158841-4	LCS							
Total Suspended Solids			97.7		%		85-115	11-SEP-19
WG3158841-3	MB							
Total Suspended Solids			<1.0		mg/L		1	11-SEP-19
TURBIDITY-CL		Water						
Batch	R4785610							
WG3154591-8	LCS							
Turbidity			94.0		%		85-115	06-SEP-19
WG3154591-7	MB							

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch	R4785610							
WG3154591-7	MB							
Turbidity			<0.10		NTU		0.1	06-SEP-19

Quality Control Report

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Quality Control Report

Workorder: L2342753

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	05-SEP-19 12:01	06-SEP-19 15:30	0.25	28	hours	EHTR-FM
	2	05-SEP-19 14:14	06-SEP-19 15:30	0.25	25	hours	EHTR-FM
pH	1	05-SEP-19 12:01	08-SEP-19 09:00	0.25	69	hours	EHTR-FM
	2	05-SEP-19 14:14	08-SEP-19 09:00	0.25	67	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2342753 were received on 06-SEP-19 09:50.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

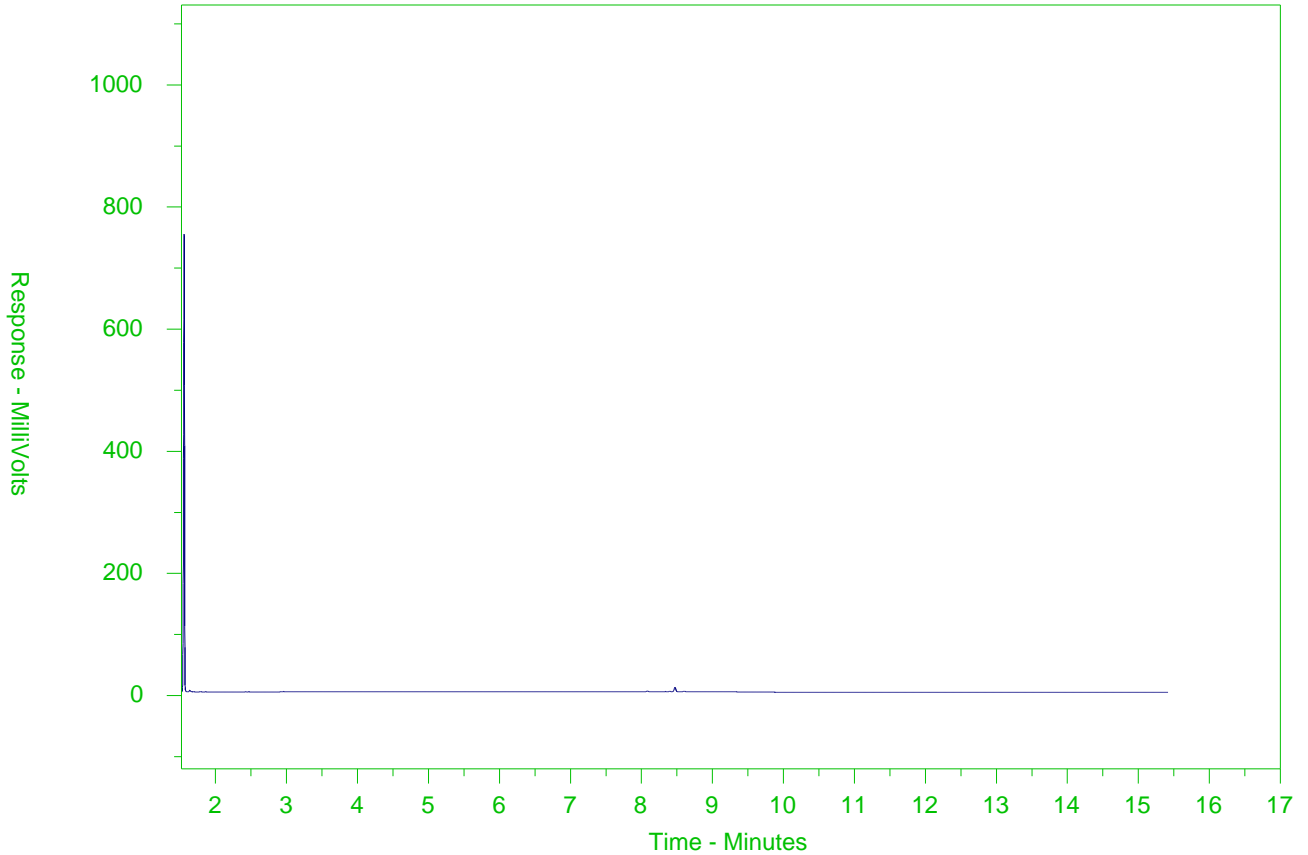
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2342753-2
 Client Sample ID: LC_PIZP1105_WG_2019-Q3_N



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34	nC50	
174°C	287°C		481°C	575°C	
346°F	549°F		898°F	1067°F	
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →		
← Diesel/ Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.


COC ID:	20190905 ERX and PIZP1105	TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO		LABORATORY		OTHER INFO	
Facility Name / Job#	Line Creek Operation	Lab Name	ALS Calgary	Report Format / Distribution	Excel PDF EDD
Project Manager	Carla Froyman Parker	Lab Contact	Lyudmyla Shvets	Email 1:	carla.froymanparker@teck.com
Email	Carla.FroymanParker@teck.com	Email	Lyudmyla.Shvets@ALSGlobal.com	Email 2:	teckcoal@equisonline.com
Address	Box 2003	Address	2559 29 Street NE	Email 3:	drake.tymstra@teck.com
	15km North Hwy 43			Email 4:	kirsten.campbell@teck.com
City	Sparwood	Province	BC	City	Calgary
Postal Code	V0B 2G0	Country	Canada	Province	AB
Phone Number	250-425-3196	Postal Code	T1Y 7B5	Country	Canada
		Phone Number	403 407 1794	PO number	VPO00608129

SAMPLE DETAILS								ANALYSIS REQUESTED												
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Ycs/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N
								H2SO4	HCl	HNO3	HNO3	NONE	H2SO4	NONE	HCl	NAHSO4				
								ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC	HG-T-U-CVAF-VA	HG-T-CVAF-VA	ALS_Package-EPH				
LC_ERX_WG_2019_10D_NP	LC_ERX	WG		9/5/2019	12:01	G	8	1	1	1	1	1	1	1	1					
LC_PIZP1105_WG_2019-Q3_N	LC_PIZP1105	WG		9/5/2019	14:14	G	9	1	1	1	1	1	1	1	1	2				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
REGULAR TURNAROUND TIMES APPLIED TO THIS ANALYSIS FOR ANALYSIS	D.Tymstra/K.Campbell	5-Sep	<i>[Signature]</i>	9/6/2019

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #
Regular (default) <input checked="" type="checkbox"/>	K. Campbell/D. Tymstra	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature	Date/Time
Emergency (1 Business Day) - 100% surcharge		September 5, 2019
For Emergency <1 Day, ASAP or Weekend - Contact ALS		

60



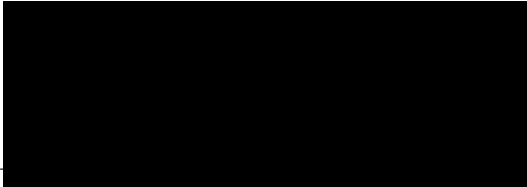
TECK COAL LIMITED (LINE CREEK)
ATTN: CHRIS BLURTON
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 13-SEP-19
Report Date: 20-SEP-19 16:54 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2346868
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190912- LC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2346868-1 LC_PIZP1104_WG_Q3-2019_NP							
Sampled By: KC/DT on 12-SEP-19 @ 14:19							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		18-SEP-19	R4822478
Total Kjeldahl Nitrogen	0.149		0.050	mg/L		17-SEP-19	R4819105
Total Organic Carbon	1.24		0.50	mg/L		18-SEP-19	R4822478
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	16-SEP-19	17-SEP-19	R4816494
Dissolved Metals Filtration Location	LAB					16-SEP-19	R4809388
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	18-SEP-19	19-SEP-19	R4821972
Dissolved Mercury Filtration Location	LAB					18-SEP-19	R4821370
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					16-SEP-19	R4809388
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	16-SEP-19	17-SEP-19	R4816494
Antimony (Sb)-Dissolved	0.00014		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Arsenic (As)-Dissolved	0.00032		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Barium (Ba)-Dissolved	0.282		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	16-SEP-19	17-SEP-19	R4816494
Boron (B)-Dissolved	0.024		0.010	mg/L	16-SEP-19	17-SEP-19	R4816494
Cadmium (Cd)-Dissolved	0.0453		0.0050	ug/L	16-SEP-19	17-SEP-19	R4816494
Calcium (Ca)-Dissolved	141		0.050	mg/L	16-SEP-19	17-SEP-19	R4816494
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Cobalt (Co)-Dissolved	1.07		0.10	ug/L	16-SEP-19	17-SEP-19	R4816494
Copper (Cu)-Dissolved	0.00053		0.00050	mg/L	16-SEP-19	17-SEP-19	R4816494
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	16-SEP-19	17-SEP-19	R4816494
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	16-SEP-19	17-SEP-19	R4816494
Lithium (Li)-Dissolved	0.0225		0.0010	mg/L	16-SEP-19	17-SEP-19	R4816494
Magnesium (Mg)-Dissolved	48.6		0.10	mg/L	16-SEP-19	17-SEP-19	R4816494
Manganese (Mn)-Dissolved	0.584		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Molybdenum (Mo)-Dissolved	0.00177		0.000050	mg/L	16-SEP-19	17-SEP-19	R4816494
Nickel (Ni)-Dissolved	0.00280		0.00050	mg/L	16-SEP-19	17-SEP-19	R4816494
Potassium (K)-Dissolved	2.82		0.050	mg/L	16-SEP-19	17-SEP-19	R4816494
Selenium (Se)-Dissolved	0.155		0.050	ug/L	16-SEP-19	17-SEP-19	R4816494
Silicon (Si)-Dissolved	4.72		0.050	mg/L	16-SEP-19	17-SEP-19	R4816494
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	16-SEP-19	17-SEP-19	R4816494
Sodium (Na)-Dissolved	15.6		0.050	mg/L	16-SEP-19	17-SEP-19	R4816494
Strontium (Sr)-Dissolved	0.473		0.00020	mg/L	16-SEP-19	17-SEP-19	R4816494
Thallium (Tl)-Dissolved	0.000016		0.000010	mg/L	16-SEP-19	17-SEP-19	R4816494
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	16-SEP-19	17-SEP-19	R4816494
Uranium (U)-Dissolved	0.00366		0.000010	mg/L	16-SEP-19	17-SEP-19	R4816494
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	16-SEP-19	17-SEP-19	R4816494
Zinc (Zn)-Dissolved	0.0106		0.0010	mg/L	16-SEP-19	17-SEP-19	R4816494
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	552		0.50	mg/L		17-SEP-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		16-SEP-19	R4812049
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.210		0.0030	mg/L		16-SEP-19	R4812049
Antimony (Sb)-Total	0.00019		0.00010	mg/L		16-SEP-19	R4812049
Arsenic (As)-Total	0.00070		0.00010	mg/L		16-SEP-19	R4812049

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2346868-1 LC_PIZP1104_WG_Q3-2019_NP							
Sampled By: KC/DT on 12-SEP-19 @ 14:19							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.293		0.00010	mg/L		16-SEP-19	R4812049
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		16-SEP-19	R4812049
Boron (B)-Total	0.026		0.010	mg/L		16-SEP-19	R4812049
Cadmium (Cd)-Total	0.0734		0.0050	ug/L		16-SEP-19	R4812049
Calcium (Ca)-Total	151		0.050	mg/L		16-SEP-19	R4812049
Chromium (Cr)-Total	0.00081		0.00010	mg/L		16-SEP-19	R4812049
Cobalt (Co)-Total	1.15		0.10	ug/L		16-SEP-19	R4812049
Copper (Cu)-Total	0.00221		0.00050	mg/L		16-SEP-19	R4812049
Iron (Fe)-Total	0.945		0.010	mg/L		16-SEP-19	R4812049
Lead (Pb)-Total	0.000407		0.000050	mg/L		16-SEP-19	R4812049
Lithium (Li)-Total	0.0240		0.0010	mg/L		16-SEP-19	R4812049
Magnesium (Mg)-Total	45.5		0.10	mg/L		16-SEP-19	R4812049
Manganese (Mn)-Total	0.564		0.00010	mg/L		16-SEP-19	R4812049
Molybdenum (Mo)-Total	0.00158		0.000050	mg/L		16-SEP-19	R4812049
Nickel (Ni)-Total	0.00298		0.00050	mg/L		16-SEP-19	R4812049
Potassium (K)-Total	2.84		0.050	mg/L		16-SEP-19	R4812049
Selenium (Se)-Total	0.322		0.050	ug/L		16-SEP-19	R4812049
Silicon (Si)-Total	4.95		0.10	mg/L		16-SEP-19	R4812049
Silver (Ag)-Total	<0.000010		0.000010	mg/L		16-SEP-19	R4812049
Sodium (Na)-Total	14.7		0.050	mg/L		16-SEP-19	R4812049
Strontium (Sr)-Total	0.477		0.00020	mg/L		16-SEP-19	R4812049
Thallium (Tl)-Total	0.000023		0.000010	mg/L		16-SEP-19	R4812049
Tin (Sn)-Total	<0.00010		0.00010	mg/L		16-SEP-19	R4812049
Titanium (Ti)-Total	<0.010		0.010	mg/L		16-SEP-19	R4812049
Uranium (U)-Total	0.00365		0.000010	mg/L		16-SEP-19	R4812049
Vanadium (V)-Total	0.00085		0.00050	mg/L		16-SEP-19	R4812049
Zinc (Zn)-Total	0.0131		0.0030	mg/L		16-SEP-19	R4812049
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	12.2		1.0	mg/L		16-SEP-19	R4813488
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	250		1.0	mg/L		16-SEP-19	R4813455
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		16-SEP-19	R4813455
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		16-SEP-19	R4813455
Alkalinity, Total (as CaCO3)	250		1.0	mg/L		16-SEP-19	R4813455
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		20-SEP-19	R4828712
Bromide in Water by IC (Low Level)							
Bromide (Br)	2.30	DLHC	0.25	mg/L		13-SEP-19	R4812009
Chloride in Water by IC							
Chloride (Cl)	198	DLHC	2.5	mg/L		13-SEP-19	R4812009
Electrical Conductivity (EC)							
Conductivity (@ 25C)	1140		2.0	uS/cm		16-SEP-19	R4813455
Fluoride in Water by IC							
Fluoride (F)	0.28	DLHC	0.10	mg/L		13-SEP-19	R4812009
Ion Balance Calculation							
Ion Balance	99.3		-100	%		17-SEP-19	
Ion Balance Calculation							
Cation - Anion Balance	-0.3			%		17-SEP-19	
Anion Sum	11.9			meq/L		17-SEP-19	
Cation Sum	11.8			meq/L		17-SEP-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2346868-1 LC_PIZP1104_WG_Q3-2019_NP							
Sampled By: KC/DT on 12-SEP-19 @ 14:19							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.279	DLHC	0.025	mg/L		13-SEP-19	R4812009
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		13-SEP-19	R4812009
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-19	R4806504
Oxidation redution potential by elect.							
ORP	338		-1000	mV		13-SEP-19	R4806851
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0378		0.0020	mg/L		19-SEP-19	R4824051
Sulfate in Water by IC							
Sulfate (SO4)	60.5	DLHC	1.5	mg/L		13-SEP-19	R4812009
Total Dissolved Solids							
Total Dissolved Solids	975	DLHC	20	mg/L		18-SEP-19	R4823505
Total Suspended Solids							
Total Suspended Solids	16.2		1.0	mg/L		18-SEP-19	R4823272
Turbidity							
Turbidity	21.1		0.10	NTU		13-SEP-19	R4806565
pH							
pH	8.03		0.10	pH		16-SEP-19	R4813455

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Qualifiers for Individual Samples Listed:

Lab Sample ID	Client Sample ID	Qualifier	Description
L2346868-1	LC_PIZP1104_WG_Q3-2019_	SFPL	DOC/DIS METALS LAB FILTER/PRESERVE - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20190912- LC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample
 mg/kg wwt - milligrams per kilogram based on wet weight of sample
 mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
 mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2346868

Report Date: 20-SEP-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0
 Contact: CHRIS BLURTON

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4813488							
WG3163597-2	LCS							
Acidity (as CaCO3)			102.0		%		85-115	16-SEP-19
WG3163597-1	MB							
Acidity (as CaCO3)			1.6		mg/L		2	16-SEP-19
ALK-MAN-CL								
	Water							
Batch	R4813455							
WG3163607-2	LCS							
Alkalinity, Total (as CaCO3)			103.0		%		85-115	16-SEP-19
WG3163607-1	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	16-SEP-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4816494							
WG3162600-2	LCS							
Beryllium (Be)-Dissolved			100.8		%		80-120	17-SEP-19
WG3162600-1	MB	LF						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	17-SEP-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4812049							
WG3162194-2	LCS							
Beryllium (Be)-Total			110.9		%		80-120	16-SEP-19
WG3162194-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	16-SEP-19
BR-L-IC-N-CL								
	Water							
Batch	R4812009							
WG3163268-10	LCS							
Bromide (Br)			96.6		%		85-115	13-SEP-19
WG3163268-9	MB							
Bromide (Br)			<0.050		mg/L		0.05	13-SEP-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4822478							
WG3166371-2	LCS							
Dissolved Organic Carbon			96.4		%		80-120	18-SEP-19
WG3166371-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	18-SEP-19
C-TOT-ORG-LOW-CL								
	Water							

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL								
Water								
Batch R4822478								
WG3166371-2 LCS								
Total Organic Carbon			107.0		%		80-120	18-SEP-19
WG3166371-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	18-SEP-19
CL-IC-N-CL								
Water								
Batch R4812009								
WG3163268-10 LCS								
Chloride (Cl)			97.5		%		90-110	13-SEP-19
WG3163268-9 MB								
Chloride (Cl)			<0.50		mg/L		0.5	13-SEP-19
EC-L-PCT-CL								
Water								
Batch R4813455								
WG3163607-2 LCS								
Conductivity (@ 25C)			97.8		%		90-110	16-SEP-19
WG3163607-1 MB								
Conductivity (@ 25C)			<2.0		uS/cm		2	16-SEP-19
F-IC-N-CL								
Water								
Batch R4812009								
WG3163268-10 LCS								
Fluoride (F)			107.0		%		90-110	13-SEP-19
WG3163268-9 MB								
Fluoride (F)			<0.020		mg/L		0.02	13-SEP-19
HG-D-CVAA-VA								
Water								
Batch R4821972								
WG3165929-2 LCS								
Mercury (Hg)-Dissolved			99.4		%		80-120	19-SEP-19
WG3165929-1 MB								
Mercury (Hg)-Dissolved			<0.000005C	LF	mg/L		0.000005	19-SEP-19
MET-D-CCMS-VA								
Water								
Batch R4816494								
WG3162600-2 LCS								
Aluminum (Al)-Dissolved			103.8		%		80-120	17-SEP-19
Antimony (Sb)-Dissolved			97.3		%		80-120	17-SEP-19
Arsenic (As)-Dissolved			98.2		%		80-120	17-SEP-19
Barium (Ba)-Dissolved			99.4		%		80-120	17-SEP-19
Bismuth (Bi)-Dissolved			94.6		%		80-120	17-SEP-19
Boron (B)-Dissolved			100.8		%		80-120	17-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4816494							
WG3162600-2	LCS							
Cadmium (Cd)-Dissolved			95.2		%		80-120	17-SEP-19
Calcium (Ca)-Dissolved			96.7		%		80-120	17-SEP-19
Chromium (Cr)-Dissolved			101.1		%		80-120	17-SEP-19
Cobalt (Co)-Dissolved			98.5		%		80-120	17-SEP-19
Copper (Cu)-Dissolved			99.5		%		80-120	17-SEP-19
Iron (Fe)-Dissolved			100.4		%		80-120	17-SEP-19
Lead (Pb)-Dissolved			97.2		%		80-120	17-SEP-19
Lithium (Li)-Dissolved			98.3		%		80-120	17-SEP-19
Magnesium (Mg)-Dissolved			104.2		%		80-120	17-SEP-19
Manganese (Mn)-Dissolved			101.6		%		80-120	17-SEP-19
Molybdenum (Mo)-Dissolved			94.6		%		80-120	17-SEP-19
Nickel (Ni)-Dissolved			100.4		%		80-120	17-SEP-19
Potassium (K)-Dissolved			102.0		%		80-120	17-SEP-19
Selenium (Se)-Dissolved			97.5		%		80-120	17-SEP-19
Silicon (Si)-Dissolved			103.2		%		60-140	17-SEP-19
Silver (Ag)-Dissolved			100.5		%		80-120	17-SEP-19
Sodium (Na)-Dissolved			104.6		%		80-120	17-SEP-19
Strontium (Sr)-Dissolved			98.2		%		80-120	17-SEP-19
Thallium (Tl)-Dissolved			99.6		%		80-120	17-SEP-19
Tin (Sn)-Dissolved			97.1		%		80-120	17-SEP-19
Titanium (Ti)-Dissolved			99.8		%		80-120	17-SEP-19
Uranium (U)-Dissolved			101.5		%		80-120	17-SEP-19
Vanadium (V)-Dissolved			101.6		%		80-120	17-SEP-19
Zinc (Zn)-Dissolved			104.6		%		80-120	17-SEP-19
WG3162600-1	MB	LF						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-SEP-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-SEP-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-SEP-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	17-SEP-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	17-SEP-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-SEP-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	17-SEP-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	17-SEP-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-SEP-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4816494							
WG3162600-1	MB	LF						
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	17-SEP-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	17-SEP-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-SEP-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-SEP-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	17-SEP-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-SEP-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	17-SEP-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	17-SEP-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	17-SEP-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-SEP-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	17-SEP-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-SEP-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-SEP-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-SEP-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	17-SEP-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	17-SEP-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	17-SEP-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	17-SEP-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	17-SEP-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	17-SEP-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-SEP-19
MET-T-CCMS-VA								
	Water							
Batch	R4812049							
WG3162194-2	LCS							
Aluminum (Al)-Total			104.1		%		80-120	16-SEP-19
Antimony (Sb)-Total			105.0		%		80-120	16-SEP-19
Arsenic (As)-Total			101.7		%		80-120	16-SEP-19
Barium (Ba)-Total			105.4		%		80-120	16-SEP-19
Bismuth (Bi)-Total			100.4		%		80-120	16-SEP-19
Boron (B)-Total			113.0		%		80-120	16-SEP-19
Cadmium (Cd)-Total			104.1		%		80-120	16-SEP-19
Calcium (Ca)-Total			113.8		%		80-120	16-SEP-19
Chromium (Cr)-Total			100.6		%		80-120	16-SEP-19
Cobalt (Co)-Total			103.4		%		80-120	16-SEP-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4812049							
WG3162194-2	LCS							
Copper (Cu)-Total			101.3		%		80-120	16-SEP-19
Iron (Fe)-Total			98.2		%		80-120	16-SEP-19
Lead (Pb)-Total			105.8		%		80-120	16-SEP-19
Lithium (Li)-Total			113.1		%		80-120	16-SEP-19
Magnesium (Mg)-Total			103.1		%		80-120	16-SEP-19
Manganese (Mn)-Total			102.0		%		80-120	16-SEP-19
Molybdenum (Mo)-Total			101.6		%		80-120	16-SEP-19
Nickel (Ni)-Total			101.2		%		80-120	16-SEP-19
Potassium (K)-Total			106.0		%		80-120	16-SEP-19
Selenium (Se)-Total			99.8		%		80-120	16-SEP-19
Silicon (Si)-Total			102.2		%		80-120	16-SEP-19
Silver (Ag)-Total			104.8		%		80-120	16-SEP-19
Sodium (Na)-Total			105.8		%		80-120	16-SEP-19
Strontium (Sr)-Total			103.1		%		80-120	16-SEP-19
Thallium (Tl)-Total			104.0		%		80-120	16-SEP-19
Tin (Sn)-Total			102.6		%		80-120	16-SEP-19
Titanium (Ti)-Total			98.7		%		80-120	16-SEP-19
Uranium (U)-Total			114.4		%		80-120	16-SEP-19
Vanadium (V)-Total			104.1		%		80-120	16-SEP-19
Zinc (Zn)-Total			103.6		%		80-120	16-SEP-19
WG3162194-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	16-SEP-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	16-SEP-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	16-SEP-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	16-SEP-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	16-SEP-19
Boron (B)-Total			<0.010		mg/L		0.01	16-SEP-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	16-SEP-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	16-SEP-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	16-SEP-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	16-SEP-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	16-SEP-19
Iron (Fe)-Total			<0.010		mg/L		0.01	16-SEP-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	16-SEP-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4812049							
WG3162194-1	MB							
Lithium (Li)-Total			<0.0010		mg/L		0.001	16-SEP-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	16-SEP-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	16-SEP-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	16-SEP-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	16-SEP-19
Potassium (K)-Total			<0.050		mg/L		0.05	16-SEP-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	16-SEP-19
Silicon (Si)-Total			<0.10		mg/L		0.1	16-SEP-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	16-SEP-19
Sodium (Na)-Total			<0.050		mg/L		0.05	16-SEP-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	16-SEP-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	16-SEP-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	16-SEP-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	16-SEP-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	16-SEP-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	16-SEP-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	16-SEP-19
NH3-L-F-CL								
	Water							
Batch	R4828712							
WG3168424-2	LCS							
Ammonia as N			110.2		%		85-115	20-SEP-19
WG3168424-1	MB							
Ammonia as N			<0.0050		mg/L		0.005	20-SEP-19
NO2-L-IC-N-CL								
	Water							
Batch	R4812009							
WG3163268-10	LCS							
Nitrite (as N)			98.4		%		90-110	13-SEP-19
WG3163268-9	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	13-SEP-19
NO3-L-IC-N-CL								
	Water							
Batch	R4812009							
WG3163268-10	LCS							
Nitrate (as N)			97.9		%		90-110	13-SEP-19
WG3163268-9	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	13-SEP-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL		Water						
Batch	R4819105							
WG3164332-14	LCS							
Total Kjeldahl Nitrogen			100.4		%		75-125	17-SEP-19
WG3164332-18	LCS							
Total Kjeldahl Nitrogen			98.6		%		75-125	17-SEP-19
WG3164332-2	LCS							
Total Kjeldahl Nitrogen			97.2		%		75-125	17-SEP-19
WG3164332-22	LCS							
Total Kjeldahl Nitrogen			97.7		%		75-125	17-SEP-19
WG3164332-26	LCS							
Total Kjeldahl Nitrogen			96.4		%		75-125	17-SEP-19
WG3164332-30	LCS							
Total Kjeldahl Nitrogen			97.5		%		75-125	17-SEP-19
WG3164332-34	LCS							
Total Kjeldahl Nitrogen			97.2		%		75-125	17-SEP-19
WG3164332-6	LCS							
Total Kjeldahl Nitrogen			97.0		%		75-125	17-SEP-19
WG3164332-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-13	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-17	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-21	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-25	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-29	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-33	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-9	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
TSS-L-CL		Water						
Batch	R4823272							
WG3164429-6	LCS							
Total Suspended Solids			93.5		%		85-115	18-SEP-19
WG3164429-5	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-L-CL	Water							
Batch	R4823272							
WG3164429-5 MB								
Total Suspended Solids			<1.0		mg/L		1	18-SEP-19
TURBIDITY-CL	Water							
Batch	R4806565							
WG3161381-26 LCS								
Turbidity			96.5		%		85-115	13-SEP-19
WG3161381-25 MB								
Turbidity			<0.10		NTU		0.1	13-SEP-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	12-SEP-19 14:19	13-SEP-19 18:45	0.25	28	hours	EHTR-FM
pH	1	12-SEP-19 14:19	16-SEP-19 13:00	0.25	95	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2346868 were received on 13-SEP-19 08:50.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

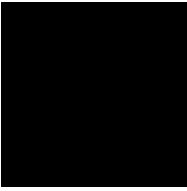
COC ID: 20190912- LC GW		TURNAROUND TIME:			RUSH:				
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO		
Facility Name / Job# Line Creek Operation				Lab Name ALS Calgary			Report Format / Distribution		
Project Manager Chris Blurton				Lab Contact Lyudmyla Shvets			Excel PDF EDD		
Email Chris.Blurton@teck.com				Email Lyudmyla.Shvets@ALSGlobal.com			Email 1: carla.froymanparker@teck.com		
Address Box 2003				Address 2559 29 Street NE			Email 2: teckcoal@equisonline.com		
15km North Hwy 43							Email 3: drake.tymstra@teck.com		
City Sparwood		Province BC		City Calgary		Province AB		Email 4: kirsten.campbell@teck.com	
Postal Code V0B 2G0		Country Canada		Postal Code T1Y 7B5		Country Canada		Email 4: kennedy.allen@teck.com	
Phone Number 250-425-3196				Phone Number 403 407 1794			PO number 4010068129		

SAMPLE DETAILS								ANALYSIS REQUESTED						Filter: F: Field, L: Lab, FL: Field & Lab, N: None					
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC						
LC_PIZP1104_WG_Q3-2019_NP	LC_PIZP1104	WG		2019/09/12	14:19	G	6	1	1	1	1	1	1						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
PLEASE FORWARD ALL LAB SAMPLES TO ALSHQ (NABY FOR ANALYSIS)	D.Tymstra/K.Campbell	0-Jan	<i>DK</i>	9/13 0850

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #
Regular (default) X	K. Campbell/D. Tymstra	
Priority (2-3 business days) - 50% surcharge	Sampler's Signature	Date/Time
Emergency (1 Business Day) - 100% surcharge		
For Emergency <1 Day, ASAP or Weekend - Contact ALS		

99



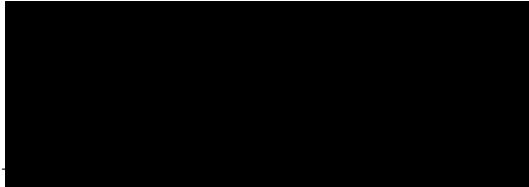
TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 11-OCT-19
Report Date: 22-OCT-19 17:10 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2364506
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191010 LC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-1 LC_PIZP1103_WG_Q4-2019_NP							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.62		0.50	mg/L		19-OCT-19	R4874992
Total Kjeldahl Nitrogen	0.298		0.050	mg/L		17-OCT-19	R4872902
Total Organic Carbon	2.86		0.50	mg/L		19-OCT-19	R4874992
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	15-OCT-19	17-OCT-19	R4872734
Dissolved Metals Filtration Location	FIELD					15-OCT-19	R4870254
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	17-OCT-19	17-OCT-19	R4872448
Dissolved Mercury Filtration Location	FIELD					17-OCT-19	R4872405
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					15-OCT-19	R4870254
Aluminum (Al)-Dissolved	0.0036		0.0030	mg/L	15-OCT-19	17-OCT-19	R4872734
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Arsenic (As)-Dissolved	0.00071		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Barium (Ba)-Dissolved	0.0684		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Boron (B)-Dissolved	0.480		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	15-OCT-19	17-OCT-19	R4872734
Calcium (Ca)-Dissolved	28.9		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Chromium (Cr)-Dissolved	0.00015		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cobalt (Co)-Dissolved	0.91		0.10	ug/L	15-OCT-19	17-OCT-19	R4872734
Copper (Cu)-Dissolved	0.00040		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Iron (Fe)-Dissolved	0.077		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Lithium (Li)-Dissolved	0.117		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Magnesium (Mg)-Dissolved	16.1		0.10	mg/L	15-OCT-19	17-OCT-19	R4872734
Manganese (Mn)-Dissolved	0.558		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Molybdenum (Mo)-Dissolved	0.00993		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Nickel (Ni)-Dissolved	0.00245		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Potassium (K)-Dissolved	1.66		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Selenium (Se)-Dissolved	0.211	DTSE	0.050	ug/L	15-OCT-19	17-OCT-19	R4872734
Silicon (Si)-Dissolved	4.45		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Sodium (Na)-Dissolved	137		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Strontium (Sr)-Dissolved	0.787		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Tin (Sn)-Dissolved	0.00217	DTMF	0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Uranium (U)-Dissolved	0.00196		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Zinc (Zn)-Dissolved	0.0013		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Hardness							
Hardness (as CaCO3)	139		0.50	mg/L		18-OCT-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		17-OCT-19	R4874512
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.189		0.0030	mg/L		17-OCT-19	R4874512
Antimony (Sb)-Total	0.00025		0.00010	mg/L		17-OCT-19	R4874512
Arsenic (As)-Total	0.00092		0.00010	mg/L		17-OCT-19	R4874512

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-1 LC_PIZP1103_WG_Q4-2019_NP							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.0698		0.00010	mg/L		17-OCT-19	R4874512
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		17-OCT-19	R4874512
Boron (B)-Total	0.547		0.010	mg/L		17-OCT-19	R4874512
Cadmium (Cd)-Total	0.0317		0.0050	ug/L		17-OCT-19	R4874512
Calcium (Ca)-Total	30.1		0.050	mg/L		17-OCT-19	R4874512
Chromium (Cr)-Total	0.00048		0.00010	mg/L		17-OCT-19	R4874512
Cobalt (Co)-Total	1.13		0.10	ug/L		17-OCT-19	R4874512
Copper (Cu)-Total	0.00270		0.00050	mg/L		17-OCT-19	R4874512
Iron (Fe)-Total	0.313		0.010	mg/L		17-OCT-19	R4874512
Lead (Pb)-Total	0.000635		0.000050	mg/L		17-OCT-19	R4874512
Lithium (Li)-Total	0.122		0.0010	mg/L		17-OCT-19	R4874512
Magnesium (Mg)-Total	17.1		0.10	mg/L		17-OCT-19	R4874512
Manganese (Mn)-Total	0.563		0.00010	mg/L		17-OCT-19	R4874512
Molybdenum (Mo)-Total	0.00892		0.000050	mg/L		17-OCT-19	R4874512
Nickel (Ni)-Total	0.00314		0.00050	mg/L		17-OCT-19	R4874512
Potassium (K)-Total	1.76		0.050	mg/L		17-OCT-19	R4874512
Selenium (Se)-Total	<0.050		0.050	ug/L		17-OCT-19	R4874512
Silicon (Si)-Total	4.61		0.10	mg/L		17-OCT-19	R4874512
Silver (Ag)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Sodium (Na)-Total	142		0.050	mg/L		17-OCT-19	R4874512
Strontium (Sr)-Total	0.822		0.00020	mg/L		17-OCT-19	R4874512
Thallium (Tl)-Total	0.000011		0.000010	mg/L		17-OCT-19	R4874512
Tin (Sn)-Total	0.00125		0.00010	mg/L		17-OCT-19	R4874512
Titanium (Ti)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Uranium (U)-Total	0.00147		0.000010	mg/L		17-OCT-19	R4874512
Vanadium (V)-Total	0.00056		0.00050	mg/L		17-OCT-19	R4874512
Zinc (Zn)-Total	0.0136		0.0030	mg/L		17-OCT-19	R4874512
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.1		1.0	mg/L		16-OCT-19	R4873457
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	406		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Total (as CaCO3)	406		1.0	mg/L		16-OCT-19	R4873462
Ammonia, Total (as N)							
Ammonia as N	0.0667		0.0050	mg/L		20-OCT-19	R4875988
Bromide in Water by IC (Low Level)							
Bromide (Br)	0.146		0.050	mg/L		13-OCT-19	R4870507
Chloride in Water by IC							
Chloride (Cl)	3.25		0.50	mg/L		13-OCT-19	R4870507
Electrical Conductivity (EC)							
Conductivity (@ 25C)	720		2.0	uS/cm		16-OCT-19	R4873462
Fluoride in Water by IC							
Fluoride (F)	0.429		0.020	mg/L		13-OCT-19	R4870507
Ion Balance Calculation							
Cation - Anion Balance	-0.2			%		18-OCT-19	
Anion Sum	8.82			meq/L		18-OCT-19	
Cation Sum	8.78			meq/L		18-OCT-19	
Ion Balance Calculation							
Ion Balance	99.6		-100	%		18-OCT-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-1 LC_PIZP1103_WG_Q4-2019_NP Sampled By: KC/DT on 10-OCT-19 @ 13:25 Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-OCT-19	R4870507
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0011		0.0010	mg/L		13-OCT-19	R4870507
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0132		0.0010	mg/L		11-OCT-19	R4867889
Oxidation redution potential by elect.							
ORP	203		-1000	mV		13-OCT-19	R4868484
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0520		0.0020	mg/L		13-OCT-19	R4868369
Sulfate in Water by IC							
Sulfate (SO4)	29.1		0.30	mg/L		13-OCT-19	R4870507
Total Dissolved Solids							
Total Dissolved Solids	478	DLHC	20	mg/L		16-OCT-19	R4872764
Total Suspended Solids							
Total Suspended Solids	19.9		1.0	mg/L		16-OCT-19	R4872935
Turbidity							
Turbidity	13.6		0.10	NTU		11-OCT-19	R4867979
pH							
pH	8.07		0.10	pH		16-OCT-19	R4873462
L2364506-2 WG_Q4-2019_004 Sampled By: KC/DT on 10-OCT-19 @ 13:25 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		19-OCT-19	R4874992
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		17-OCT-19	R4872902
Total Organic Carbon	<0.50		0.50	mg/L		19-OCT-19	R4874992
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	15-OCT-19	17-OCT-19	R4872734
Dissolved Metals Filtration Location	FIELD					15-OCT-19	R4870254
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	17-OCT-19	17-OCT-19	R4872448
Dissolved Mercury Filtration Location	FIELD					17-OCT-19	R4872405
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-OCT-19	R4873642
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	18-OCT-19	18-OCT-19	R4874176
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Barium (Ba)-Dissolved	0.00029	RRV	0.00010	mg/L	18-OCT-19	18-OCT-19	R4874176
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Boron (B)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	15-OCT-19	17-OCT-19	R4872734
Calcium (Ca)-Dissolved	0.063	RRV	0.050	mg/L	18-OCT-19	18-OCT-19	R4874176
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	15-OCT-19	17-OCT-19	R4872734
Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Magnesium (Mg)-Dissolved	<0.10		0.10	mg/L	15-OCT-19	17-OCT-19	R4872734
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-2	WG_Q4-2019_004						
Sampled By:	KC/DT on 10-OCT-19 @ 13:25						
Matrix:	WG						
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Potassium (K)-Dissolved	<0.050		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	15-OCT-19	17-OCT-19	R4872734
Silicon (Si)-Dissolved	0.227	RRV	0.050	mg/L	18-OCT-19	18-OCT-19	R4874176
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Sodium (Na)-Dissolved	0.233	RRV	0.050	mg/L	18-OCT-19	18-OCT-19	R4874176
Strontium (Sr)-Dissolved	<0.00020		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Tin (Sn)-Dissolved	0.00075	RRV	0.00010	mg/L	18-OCT-19	18-OCT-19	R4874176
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		21-OCT-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		17-OCT-19	R4874512
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		17-OCT-19	R4872448
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		17-OCT-19	R4874512
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Arsenic (As)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Barium (Ba)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		17-OCT-19	R4874512
Boron (B)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		17-OCT-19	R4874512
Calcium (Ca)-Total	<0.050		0.050	mg/L		17-OCT-19	R4874512
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Cobalt (Co)-Total	<0.10		0.10	ug/L		17-OCT-19	R4874512
Copper (Cu)-Total	<0.00050		0.00050	mg/L		17-OCT-19	R4874512
Iron (Fe)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Lead (Pb)-Total	<0.000050		0.000050	mg/L		17-OCT-19	R4874512
Lithium (Li)-Total	<0.0010		0.0010	mg/L		17-OCT-19	R4874512
Magnesium (Mg)-Total	<0.10		0.10	mg/L		17-OCT-19	R4874512
Manganese (Mn)-Total	0.00010	RRV	0.00010	mg/L		19-OCT-19	R4876507
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		17-OCT-19	R4874512
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		17-OCT-19	R4874512
Potassium (K)-Total	<0.050		0.050	mg/L		17-OCT-19	R4874512
Selenium (Se)-Total	<0.050		0.050	ug/L		17-OCT-19	R4874512
Silicon (Si)-Total	<0.10		0.10	mg/L		17-OCT-19	R4874512
Silver (Ag)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Sodium (Na)-Total	<0.050		0.050	mg/L		17-OCT-19	R4874512
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		17-OCT-19	R4874512
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Tin (Sn)-Total	0.00012	RRV	0.00010	mg/L		19-OCT-19	R4876507
Titanium (Ti)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Uranium (U)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Vanadium (V)-Total	<0.00050		0.00050	mg/L		17-OCT-19	R4874512
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		17-OCT-19	R4874512

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-2 WG_Q4-2019_004							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.5		1.0	mg/L		16-OCT-19	R4873457
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		20-OCT-19	R4875988
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		13-OCT-19	R4870507
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-OCT-19	R4870507
Electrical Conductivity (EC)							
Conductivity (@ 25C)	<2.0		2.0	uS/cm		16-OCT-19	R4873462
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-OCT-19	R4870507
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		22-OCT-19	
Anion Sum	<0.10			meq/L		22-OCT-19	
Cation Sum	<0.10			meq/L		22-OCT-19	
Ion Balance Calculation							
Ion Balance	0.0		-100	%		22-OCT-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-OCT-19	R4870507
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-OCT-19	R4870507
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		11-OCT-19	R4867889
Oxidation redution potential by elect.							
ORP	344		-1000	mV		13-OCT-19	R4868484
Phosphorus (P)-Total							
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		13-OCT-19	R4868369
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		13-OCT-19	R4870507
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		16-OCT-19	R4872764
Total Suspended Solids							
Total Suspended Solids	<1.0		1.0	mg/L		16-OCT-19	R4872935
Turbidity							
Turbidity	<0.10		0.10	NTU		11-OCT-19	R4867979
pH							
pH	5.62		0.10	pH		16-OCT-19	R4873462

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
DTSE	Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20191010 LC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2364506

Report Date: 22-OCT-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4873457							
WG3193534-2	LCS							
Acidity (as CaCO3)			102.8		%		85-115	16-OCT-19
WG3193534-1	MB							
Acidity (as CaCO3)			1.4		mg/L		2	16-OCT-19
ALK-MAN-CL								
	Water							
Batch	R4873462							
WG3193596-2	LCS							
Alkalinity, Total (as CaCO3)			101.5		%		85-115	16-OCT-19
WG3193596-1	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	16-OCT-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4872734							
WG3191229-2	LCS							
Beryllium (Be)-Dissolved			96.9		%		80-120	17-OCT-19
WG3191229-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	17-OCT-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4874512							
WG3191741-3	DUP	L2364506-2						
Beryllium (Be)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	17-OCT-19
WG3191741-2	LCS							
Beryllium (Be)-Total			94.9		%		80-120	17-OCT-19
WG3191741-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	17-OCT-19
WG3191741-4	MS	L2364506-1						
Beryllium (Be)-Total			103.2		%		70-130	17-OCT-19
BR-L-IC-N-CL								
	Water							
Batch	R4870507							
WG3191321-10	LCS							
Bromide (Br)			100.7		%		85-115	12-OCT-19
WG3191321-14	LCS							
Bromide (Br)			100.6		%		85-115	13-OCT-19
WG3191321-13	MB							
Bromide (Br)			<0.050		mg/L		0.05	13-OCT-19
WG3191321-9	MB							
Bromide (Br)			<0.050		mg/L		0.05	12-OCT-19
C-DIS-ORG-LOW-CL								
	Water							

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL	Water							
Batch	R4874992							
WG3196054-6	LCS							
Dissolved Organic Carbon			105.6		%		80-120	19-OCT-19
WG3196054-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	19-OCT-19
C-TOT-ORG-LOW-CL	Water							
Batch	R4874992							
WG3196054-6	LCS							
Total Organic Carbon			106.4		%		80-120	19-OCT-19
WG3196054-5	MB							
Total Organic Carbon			<0.50		mg/L		0.5	19-OCT-19
CL-IC-N-CL	Water							
Batch	R4870507							
WG3191321-10	LCS							
Chloride (Cl)			102.9		%		90-110	12-OCT-19
WG3191321-14	LCS							
Chloride (Cl)			102.1		%		90-110	13-OCT-19
WG3191321-13	MB							
Chloride (Cl)			<0.50		mg/L		0.5	13-OCT-19
WG3191321-9	MB							
Chloride (Cl)			<0.50		mg/L		0.5	12-OCT-19
EC-L-PCT-CL	Water							
Batch	R4873462							
WG3193596-2	LCS							
Conductivity (@ 25C)			94.4		%		90-110	16-OCT-19
WG3193596-1	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	16-OCT-19
F-IC-N-CL	Water							
Batch	R4870507							
WG3191321-10	LCS							
Fluoride (F)			107.7		%		90-110	12-OCT-19
WG3191321-14	LCS							
Fluoride (F)			108.8		%		90-110	13-OCT-19
WG3191321-13	MB							
Fluoride (F)			<0.020		mg/L		0.02	13-OCT-19
WG3191321-9	MB							
Fluoride (F)			<0.020		mg/L		0.02	12-OCT-19
HG-D-CVAA-VA	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA		Water						
Batch	R4872448							
WG3193123-2	LCS							
Mercury (Hg)-Dissolved			98.3		%		80-120	17-OCT-19
WG3193123-1	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	17-OCT-19
HG-T-CVAA-VA		Water						
Batch	R4872448							
WG3193221-2	LCS							
Mercury (Hg)-Total			97.5		%		80-120	17-OCT-19
WG3193221-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	17-OCT-19
MET-D-CCMS-VA		Water						
Batch	R4872734							
WG3191229-2	LCS							
Aluminum (Al)-Dissolved			98.7		%		80-120	17-OCT-19
Antimony (Sb)-Dissolved			97.5		%		80-120	17-OCT-19
Arsenic (As)-Dissolved			97.6		%		80-120	17-OCT-19
Barium (Ba)-Dissolved			97.9		%		80-120	17-OCT-19
Bismuth (Bi)-Dissolved			100.9		%		80-120	17-OCT-19
Boron (B)-Dissolved			92.6		%		80-120	17-OCT-19
Cadmium (Cd)-Dissolved			99.5		%		80-120	17-OCT-19
Calcium (Ca)-Dissolved			99.4		%		80-120	17-OCT-19
Chromium (Cr)-Dissolved			97.0		%		80-120	17-OCT-19
Cobalt (Co)-Dissolved			99.3		%		80-120	17-OCT-19
Copper (Cu)-Dissolved			98.1		%		80-120	17-OCT-19
Iron (Fe)-Dissolved			97.9		%		80-120	17-OCT-19
Lead (Pb)-Dissolved			102.6		%		80-120	17-OCT-19
Lithium (Li)-Dissolved			95.9		%		80-120	17-OCT-19
Magnesium (Mg)-Dissolved			99.1		%		80-120	17-OCT-19
Manganese (Mn)-Dissolved			99.9		%		80-120	17-OCT-19
Molybdenum (Mo)-Dissolved			99.7		%		80-120	17-OCT-19
Nickel (Ni)-Dissolved			98.1		%		80-120	17-OCT-19
Potassium (K)-Dissolved			97.6		%		80-120	17-OCT-19
Selenium (Se)-Dissolved			103.4		%		80-120	17-OCT-19
Silicon (Si)-Dissolved			97.1		%		60-140	17-OCT-19
Silver (Ag)-Dissolved			96.2		%		80-120	17-OCT-19
Sodium (Na)-Dissolved			102.2		%		80-120	17-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4872734							
WG3191229-2	LCS							
Strontium (Sr)-Dissolved			99.95		%		80-120	17-OCT-19
Thallium (Tl)-Dissolved			101.4		%		80-120	17-OCT-19
Tin (Sn)-Dissolved			98.9		%		80-120	17-OCT-19
Titanium (Ti)-Dissolved			97.3		%		80-120	17-OCT-19
Uranium (U)-Dissolved			101.2		%		80-120	17-OCT-19
Vanadium (V)-Dissolved			98.9		%		80-120	17-OCT-19
Zinc (Zn)-Dissolved			97.8		%		80-120	17-OCT-19
WG3191229-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-OCT-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	17-OCT-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-OCT-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	17-OCT-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	17-OCT-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	17-OCT-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-OCT-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-OCT-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	17-OCT-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-OCT-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	17-OCT-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	17-OCT-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-OCT-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	17-OCT-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-OCT-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-OCT-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-OCT-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	17-OCT-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	17-OCT-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4872734							
WG3191229-1	MB	NP						
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	17-OCT-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	17-OCT-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	17-OCT-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-OCT-19
Batch	R4874176							
WG3194439-2	LCS							
Aluminum (Al)-Dissolved			106.4		%		80-120	18-OCT-19
Antimony (Sb)-Dissolved			106.0		%		80-120	18-OCT-19
Arsenic (As)-Dissolved			106.8		%		80-120	18-OCT-19
Barium (Ba)-Dissolved			107.7		%		80-120	18-OCT-19
Bismuth (Bi)-Dissolved			103.6		%		80-120	18-OCT-19
Boron (B)-Dissolved			102.5		%		80-120	18-OCT-19
Cadmium (Cd)-Dissolved			107.0		%		80-120	18-OCT-19
Calcium (Ca)-Dissolved			101.0		%		80-120	18-OCT-19
Chromium (Cr)-Dissolved			108.1		%		80-120	18-OCT-19
Cobalt (Co)-Dissolved			106.2		%		80-120	18-OCT-19
Copper (Cu)-Dissolved			104.8		%		80-120	18-OCT-19
Iron (Fe)-Dissolved			103.1		%		80-120	18-OCT-19
Lead (Pb)-Dissolved			103.4		%		80-120	18-OCT-19
Lithium (Li)-Dissolved			99.8		%		80-120	18-OCT-19
Magnesium (Mg)-Dissolved			108.4		%		80-120	18-OCT-19
Manganese (Mn)-Dissolved			106.6		%		80-120	18-OCT-19
Molybdenum (Mo)-Dissolved			108.8		%		80-120	18-OCT-19
Nickel (Ni)-Dissolved			108.9		%		80-120	18-OCT-19
Potassium (K)-Dissolved			104.8		%		80-120	18-OCT-19
Selenium (Se)-Dissolved			105.2		%		80-120	18-OCT-19
Silicon (Si)-Dissolved			106.3		%		60-140	18-OCT-19
Silver (Ag)-Dissolved			103.6		%		80-120	18-OCT-19
Sodium (Na)-Dissolved			106.8		%		80-120	18-OCT-19
Strontium (Sr)-Dissolved			103.8		%		80-120	18-OCT-19
Thallium (Tl)-Dissolved			102.4		%		80-120	18-OCT-19
Tin (Sn)-Dissolved			105.9		%		80-120	18-OCT-19
Titanium (Ti)-Dissolved			102.6		%		80-120	18-OCT-19
Uranium (U)-Dissolved			104.0		%		80-120	18-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4874176							
WG3194439-2	LCS							
Vanadium (V)-Dissolved			108.8		%		80-120	18-OCT-19
Zinc (Zn)-Dissolved			106.5		%		80-120	18-OCT-19
WG3194439-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	18-OCT-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	18-OCT-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-OCT-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	18-OCT-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	18-OCT-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	18-OCT-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	18-OCT-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	18-OCT-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	18-OCT-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	18-OCT-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	18-OCT-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	18-OCT-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	18-OCT-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	18-OCT-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	18-OCT-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	18-OCT-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	18-OCT-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	18-OCT-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	18-OCT-19

MET-T-CCMS-VA

Water

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4874512							
WG3191741-3 DUP		L2364506-2						
Aluminum (Al)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-OCT-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Barium (Ba)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Calcium (Ca)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Chromium (Cr)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Iron (Fe)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-OCT-19
Magnesium (Mg)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-OCT-19
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Potassium (K)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Silicon (Si)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-OCT-19
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Sodium (Na)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Strontium (Sr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	17-OCT-19
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-OCT-19
WG3191741-2 LCS								
Aluminum (Al)-Total			108.5		%		80-120	17-OCT-19
Antimony (Sb)-Total			99.6		%		80-120	17-OCT-19
Arsenic (As)-Total			99.5		%		80-120	17-OCT-19
Barium (Ba)-Total			98.6		%		80-120	17-OCT-19
Bismuth (Bi)-Total			96.0		%		80-120	17-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4874512							
WG3191741-2	LCS							
Boron (B)-Total			96.3		%		80-120	17-OCT-19
Cadmium (Cd)-Total			99.0		%		80-120	17-OCT-19
Calcium (Ca)-Total			96.8		%		80-120	17-OCT-19
Chromium (Cr)-Total			101.4		%		80-120	17-OCT-19
Cobalt (Co)-Total			100.9		%		80-120	17-OCT-19
Copper (Cu)-Total			98.9		%		80-120	17-OCT-19
Iron (Fe)-Total			98.9		%		80-120	17-OCT-19
Lead (Pb)-Total			96.9		%		80-120	17-OCT-19
Lithium (Li)-Total			95.9		%		80-120	17-OCT-19
Magnesium (Mg)-Total			101.5		%		80-120	17-OCT-19
Manganese (Mn)-Total			103.9		%		80-120	17-OCT-19
Molybdenum (Mo)-Total			98.0		%		80-120	17-OCT-19
Nickel (Ni)-Total			101.0		%		80-120	17-OCT-19
Potassium (K)-Total			103.2		%		80-120	17-OCT-19
Selenium (Se)-Total			97.5		%		80-120	17-OCT-19
Silicon (Si)-Total			94.9		%		80-120	17-OCT-19
Silver (Ag)-Total			96.8		%		80-120	17-OCT-19
Sodium (Na)-Total			102.4		%		80-120	17-OCT-19
Strontium (Sr)-Total			99.3		%		80-120	17-OCT-19
Thallium (Tl)-Total			96.2		%		80-120	17-OCT-19
Tin (Sn)-Total			98.9		%		80-120	17-OCT-19
Titanium (Ti)-Total			97.6		%		80-120	17-OCT-19
Uranium (U)-Total			99.98		%		80-120	17-OCT-19
Vanadium (V)-Total			102.2		%		80-120	17-OCT-19
Zinc (Zn)-Total			98.5		%		80-120	17-OCT-19
WG3191741-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	17-OCT-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	17-OCT-19
Boron (B)-Total			<0.010		mg/L		0.01	17-OCT-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	17-OCT-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	17-OCT-19

Quality Control Report

Workorder: L2364506

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4874512							
WG3191741-1 MB								
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	17-OCT-19
Iron (Fe)-Total			<0.010		mg/L		0.01	17-OCT-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	17-OCT-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	17-OCT-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	17-OCT-19
Manganese (Mn)-Total			0.00018	B	mg/L		0.0001	17-OCT-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	17-OCT-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	17-OCT-19
Potassium (K)-Total			<0.050		mg/L		0.05	17-OCT-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	17-OCT-19
Silicon (Si)-Total			<0.10		mg/L		0.1	17-OCT-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	17-OCT-19
Sodium (Na)-Total			<0.050		mg/L		0.05	17-OCT-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	17-OCT-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	17-OCT-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	17-OCT-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	17-OCT-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	17-OCT-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	17-OCT-19
WG3191741-4 MS		L2364506-1						
Aluminum (Al)-Total			108.8		%		70-130	17-OCT-19
Antimony (Sb)-Total			97.0		%		70-130	17-OCT-19
Arsenic (As)-Total			102.9		%		70-130	17-OCT-19
Barium (Ba)-Total			N/A	MS-B	%		-	17-OCT-19
Bismuth (Bi)-Total			90.1		%		70-130	17-OCT-19
Boron (B)-Total			N/A	MS-B	%		-	17-OCT-19
Cadmium (Cd)-Total			96.7		%		70-130	17-OCT-19
Calcium (Ca)-Total			N/A	MS-B	%		-	17-OCT-19
Chromium (Cr)-Total			102.3		%		70-130	17-OCT-19
Cobalt (Co)-Total			101.1		%		70-130	17-OCT-19
Copper (Cu)-Total			96.6		%		70-130	17-OCT-19

Quality Control Report

Workorder: L2364506

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4874512							
WG3191741-4 MS		L2364506-1						
Iron (Fe)-Total			98.7		%		70-130	17-OCT-19
Lead (Pb)-Total			90.6		%		70-130	17-OCT-19
Lithium (Li)-Total			N/A	MS-B	%		-	17-OCT-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	17-OCT-19
Manganese (Mn)-Total			N/A	MS-B	%		-	17-OCT-19
Molybdenum (Mo)-Total			101.6		%		70-130	17-OCT-19
Nickel (Ni)-Total			99.2		%		70-130	17-OCT-19
Potassium (K)-Total			104.7		%		70-130	17-OCT-19
Selenium (Se)-Total			99.0		%		70-130	17-OCT-19
Silicon (Si)-Total			96.1		%		70-130	17-OCT-19
Silver (Ag)-Total			95.8		%		70-130	17-OCT-19
Sodium (Na)-Total			N/A	MS-B	%		-	17-OCT-19
Strontium (Sr)-Total			N/A	MS-B	%		-	17-OCT-19
Thallium (Tl)-Total			91.3		%		70-130	17-OCT-19
Tin (Sn)-Total			97.9		%		70-130	17-OCT-19
Titanium (Ti)-Total			104.6		%		70-130	17-OCT-19
Uranium (U)-Total			96.0		%		70-130	17-OCT-19
Vanadium (V)-Total			107.0		%		70-130	17-OCT-19
Zinc (Zn)-Total			97.5		%		70-130	17-OCT-19
Batch	R4876507							
WG3195649-2 LCS								
Aluminum (Al)-Total			98.9		%		80-120	19-OCT-19
Antimony (Sb)-Total			103.1		%		80-120	19-OCT-19
Arsenic (As)-Total			96.3		%		80-120	19-OCT-19
Barium (Ba)-Total			97.1		%		80-120	19-OCT-19
Bismuth (Bi)-Total			97.1		%		80-120	19-OCT-19
Boron (B)-Total			92.8		%		80-120	19-OCT-19
Cadmium (Cd)-Total			96.9		%		80-120	19-OCT-19
Calcium (Ca)-Total			100.0		%		80-120	19-OCT-19
Chromium (Cr)-Total			96.5		%		80-120	19-OCT-19
Cobalt (Co)-Total			98.1		%		80-120	19-OCT-19
Copper (Cu)-Total			96.3		%		80-120	19-OCT-19
Iron (Fe)-Total			96.4		%		80-120	19-OCT-19
Lead (Pb)-Total			97.7		%		80-120	19-OCT-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4876507							
WG3195649-2	LCS							
Lithium (Li)-Total			91.7		%		80-120	19-OCT-19
Magnesium (Mg)-Total			97.0		%		80-120	19-OCT-19
Manganese (Mn)-Total			98.6		%		80-120	19-OCT-19
Molybdenum (Mo)-Total			100.1		%		80-120	19-OCT-19
Nickel (Ni)-Total			99.2		%		80-120	19-OCT-19
Potassium (K)-Total			97.9		%		80-120	19-OCT-19
Selenium (Se)-Total			99.9		%		80-120	19-OCT-19
Silicon (Si)-Total			99.4		%		80-120	19-OCT-19
Silver (Ag)-Total			96.1		%		80-120	19-OCT-19
Sodium (Na)-Total			104.9		%		80-120	19-OCT-19
Strontium (Sr)-Total			106.5		%		80-120	19-OCT-19
Thallium (Tl)-Total			97.4		%		80-120	19-OCT-19
Tin (Sn)-Total			98.9		%		80-120	19-OCT-19
Titanium (Ti)-Total			93.0		%		80-120	19-OCT-19
Uranium (U)-Total			97.1		%		80-120	19-OCT-19
Vanadium (V)-Total			99.3		%		80-120	19-OCT-19
Zinc (Zn)-Total			94.3		%		80-120	19-OCT-19
WG3195649-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	19-OCT-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Boron (B)-Total			<0.010		mg/L		0.01	19-OCT-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	19-OCT-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	19-OCT-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Iron (Fe)-Total			<0.010		mg/L		0.01	19-OCT-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	19-OCT-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	19-OCT-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	19-OCT-19

Quality Control Report

Workorder: L2364506

Report Date: 22-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4876507							
WG3195649-1	MB							
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Potassium (K)-Total			<0.050		mg/L		0.05	19-OCT-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Silicon (Si)-Total			<0.10		mg/L		0.1	19-OCT-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	19-OCT-19
Sodium (Na)-Total			<0.050		mg/L		0.05	19-OCT-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	19-OCT-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	19-OCT-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	19-OCT-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	19-OCT-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	19-OCT-19
NH3-L-F-CL		Water						
Batch	R4875988							
WG3196193-22	LCS							
Ammonia as N			99.8		%		85-115	20-OCT-19
WG3196193-21	MB							
Ammonia as N			<0.0050		mg/L		0.005	20-OCT-19
NO2-L-IC-N-CL		Water						
Batch	R4870507							
WG3191321-10	LCS							
Nitrite (as N)			104.3		%		90-110	12-OCT-19
WG3191321-14	LCS							
Nitrite (as N)			103.3		%		90-110	13-OCT-19
WG3191321-13	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	13-OCT-19
WG3191321-9	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	12-OCT-19
NO3-L-IC-N-CL		Water						
Batch	R4870507							
WG3191321-10	LCS							
Nitrate (as N)			102.6		%		90-110	12-OCT-19
WG3191321-14	LCS							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL Water								
Batch	R4870507							
WG3191321-14	LCS							
Nitrate (as N)			102.0		%		90-110	13-OCT-19
WG3191321-13	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	13-OCT-19
WG3191321-9	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	12-OCT-19
ORP-CL Water								
Batch	R4868484							
WG3190461-1	CRM	CL-ORP						
ORP			219		mV		210-230	13-OCT-19
P-T-L-COL-CL Water								
Batch	R4868369							
WG3190258-10	LCS							
Phosphorus (P)-Total			100.5		%		80-120	13-OCT-19
WG3190258-9	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	13-OCT-19
PH-CL Water								
Batch	R4873462							
WG3193596-2	LCS							
pH			7.02		pH		6.9-7.1	16-OCT-19
PO4-DO-L-COL-CL Water								
Batch	R4867889							
WG3189621-18	LCS							
Orthophosphate-Dissolved (as P)			102.8		%		80-120	11-OCT-19
WG3189621-17	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	11-OCT-19
SO4-IC-N-CL Water								
Batch	R4870507							
WG3191321-10	LCS							
Sulfate (SO4)			103.0		%		90-110	12-OCT-19
WG3191321-14	LCS							
Sulfate (SO4)			102.2		%		90-110	13-OCT-19
WG3191321-13	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	13-OCT-19
WG3191321-9	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-CL	Water							
Batch	R4870507							
WG3191321-9 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	12-OCT-19
SOLIDS-TDS-CL	Water							
Batch	R4872764							
WG3192050-8 LCS								
Total Dissolved Solids			101.8		%		85-115	16-OCT-19
WG3192050-7 MB								
Total Dissolved Solids			<10		mg/L		10	16-OCT-19
TKN-L-F-CL	Water							
Batch	R4872902							
WG3193743-10 LCS								
Total Kjeldahl Nitrogen			95.9		%		75-125	17-OCT-19
WG3193743-9 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-OCT-19
TSS-L-CL	Water							
Batch	R4872935							
WG3192023-6 LCS								
Total Suspended Solids			95.9		%		85-115	16-OCT-19
WG3192023-5 MB								
Total Suspended Solids			<1.0		mg/L		1	16-OCT-19
TURBIDITY-CL	Water							
Batch	R4867979							
WG3189524-14 LCS								
Turbidity			96.5		%		85-115	11-OCT-19
WG3189524-17 LCS								
Turbidity			96.0		%		85-115	11-OCT-19
WG3189524-13 MB								
Turbidity			<0.10		NTU		0.1	11-OCT-19
WG3189524-16 MB								
Turbidity			<0.10		NTU		0.1	11-OCT-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	10-OCT-19 13:25	13-OCT-19 09:15	0.25	68	hours	EHTR-FM
	2	10-OCT-19 13:25	13-OCT-19 09:15	0.25	68	hours	EHTR-FM
pH	1	10-OCT-19 13:25	16-OCT-19 13:00	0.25	144	hours	EHTR-FM
	2	10-OCT-19 13:25	16-OCT-19 13:00	0.25	144	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2364506 were received on 11-OCT-19 08:40.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

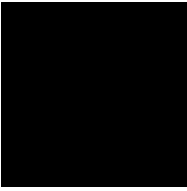
COC ID: 20191010 LC GW		TURNAROUND TIME:			RUSH:				
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO		
Facility Name / Job# Line Creek Operation				Lab Name ALS Calgary			Report Format / Distribution Excel PDF EDD		
Project Manager Carla Froyman Parker				Lab Contact Lyudmyla Shvets			Email 1: carla.froymanparker@teck.com		
Email Carla.froymanparker@teck.com				Email Lyudmyla.Shvets@ALSGlobal.com			Email 2: teckcoal@equisonline.com		
Address Box 2003				Address 2559 29 Street NE			Email 3: drake.tymstra@teck.com		
15km North Hwy 43							Email 4: kristen.campbell@teck.com		
City Sparwood		Province BC	City Calgary		Province AB	Email 4: kennedy.allen@teck.com			
Postal Code V0B 2G0		Country Canada	Postal Code T1Y 7B5		Country Canada	PO number 2000608129			
Phone Number 250-425-3196				Phone Number 403 407 1794					

SAMPLE DETAILS								ANALYSIS REQUESTED										
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS Package-TKN/TOC	HG-T-CVAF-VA				
LC_P1ZP1103_WG_Q4-2019_NP	LC_P1ZP1103	WG		2019/10/10	13:25	G	6	1	1	1	1	1	1	1				
WG_Q4-2019_004	LC_P1ZP1103	WG		2019/10/10	13:25	G	7	1	1	1	1	1	1	1				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
PLEASE FORWARD ALL SAMPLES TO ALS (RWB) FOR ANALYSIS		D.Tymstra/K.Campbell		10-Oct		<i>DK</i>		<i>10/11 0840</i>	
SERVICE REQUEST (rush - subject to availability)		Sampler's Name		K. Campbell/D. Tymstra		Mobile #			
Regular (default) X		Sampler's Signature				Date/Time		October 10, 2019	
Priority (2-3 business days) - 50% surcharge									
Emergency (1 Business Day) - 100% surcharge									
For Emergency <1 Day, ASAP or Weekend - Contact ALS									

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Q4 - COAs



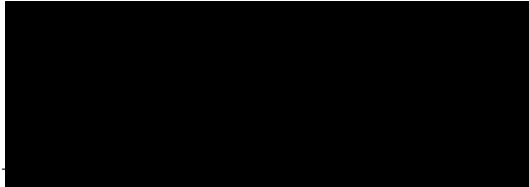
TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 11-OCT-19
Report Date: 22-OCT-19 17:10 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2364506
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191010 LC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-1 LC_PIZP1103_WG_Q4-2019_NP							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.62		0.50	mg/L		19-OCT-19	R4874992
Total Kjeldahl Nitrogen	0.298		0.050	mg/L		17-OCT-19	R4872902
Total Organic Carbon	2.86		0.50	mg/L		19-OCT-19	R4874992
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	15-OCT-19	17-OCT-19	R4872734
Dissolved Metals Filtration Location	FIELD					15-OCT-19	R4870254
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	17-OCT-19	17-OCT-19	R4872448
Dissolved Mercury Filtration Location	FIELD					17-OCT-19	R4872405
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					15-OCT-19	R4870254
Aluminum (Al)-Dissolved	0.0036		0.0030	mg/L	15-OCT-19	17-OCT-19	R4872734
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Arsenic (As)-Dissolved	0.00071		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Barium (Ba)-Dissolved	0.0684		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Boron (B)-Dissolved	0.480		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	15-OCT-19	17-OCT-19	R4872734
Calcium (Ca)-Dissolved	28.9		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Chromium (Cr)-Dissolved	0.00015		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cobalt (Co)-Dissolved	0.91		0.10	ug/L	15-OCT-19	17-OCT-19	R4872734
Copper (Cu)-Dissolved	0.00040		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Iron (Fe)-Dissolved	0.077		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Lithium (Li)-Dissolved	0.117		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Magnesium (Mg)-Dissolved	16.1		0.10	mg/L	15-OCT-19	17-OCT-19	R4872734
Manganese (Mn)-Dissolved	0.558		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Molybdenum (Mo)-Dissolved	0.00993		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Nickel (Ni)-Dissolved	0.00245		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Potassium (K)-Dissolved	1.66		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Selenium (Se)-Dissolved	0.211	DTSE	0.050	ug/L	15-OCT-19	17-OCT-19	R4872734
Silicon (Si)-Dissolved	4.45		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Sodium (Na)-Dissolved	137		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Strontium (Sr)-Dissolved	0.787		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Tin (Sn)-Dissolved	0.00217	DTMF	0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Uranium (U)-Dissolved	0.00196		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Zinc (Zn)-Dissolved	0.0013		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Hardness							
Hardness (as CaCO3)	139		0.50	mg/L		18-OCT-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		17-OCT-19	R4874512
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.189		0.0030	mg/L		17-OCT-19	R4874512
Antimony (Sb)-Total	0.00025		0.00010	mg/L		17-OCT-19	R4874512
Arsenic (As)-Total	0.00092		0.00010	mg/L		17-OCT-19	R4874512

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-1 LC_PIZP1103_WG_Q4-2019_NP							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.0698		0.00010	mg/L		17-OCT-19	R4874512
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		17-OCT-19	R4874512
Boron (B)-Total	0.547		0.010	mg/L		17-OCT-19	R4874512
Cadmium (Cd)-Total	0.0317		0.0050	ug/L		17-OCT-19	R4874512
Calcium (Ca)-Total	30.1		0.050	mg/L		17-OCT-19	R4874512
Chromium (Cr)-Total	0.00048		0.00010	mg/L		17-OCT-19	R4874512
Cobalt (Co)-Total	1.13		0.10	ug/L		17-OCT-19	R4874512
Copper (Cu)-Total	0.00270		0.00050	mg/L		17-OCT-19	R4874512
Iron (Fe)-Total	0.313		0.010	mg/L		17-OCT-19	R4874512
Lead (Pb)-Total	0.000635		0.000050	mg/L		17-OCT-19	R4874512
Lithium (Li)-Total	0.122		0.0010	mg/L		17-OCT-19	R4874512
Magnesium (Mg)-Total	17.1		0.10	mg/L		17-OCT-19	R4874512
Manganese (Mn)-Total	0.563		0.00010	mg/L		17-OCT-19	R4874512
Molybdenum (Mo)-Total	0.00892		0.000050	mg/L		17-OCT-19	R4874512
Nickel (Ni)-Total	0.00314		0.00050	mg/L		17-OCT-19	R4874512
Potassium (K)-Total	1.76		0.050	mg/L		17-OCT-19	R4874512
Selenium (Se)-Total	<0.050		0.050	ug/L		17-OCT-19	R4874512
Silicon (Si)-Total	4.61		0.10	mg/L		17-OCT-19	R4874512
Silver (Ag)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Sodium (Na)-Total	142		0.050	mg/L		17-OCT-19	R4874512
Strontium (Sr)-Total	0.822		0.00020	mg/L		17-OCT-19	R4874512
Thallium (Tl)-Total	0.000011		0.000010	mg/L		17-OCT-19	R4874512
Tin (Sn)-Total	0.00125		0.00010	mg/L		17-OCT-19	R4874512
Titanium (Ti)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Uranium (U)-Total	0.00147		0.000010	mg/L		17-OCT-19	R4874512
Vanadium (V)-Total	0.00056		0.00050	mg/L		17-OCT-19	R4874512
Zinc (Zn)-Total	0.0136		0.0030	mg/L		17-OCT-19	R4874512
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.1		1.0	mg/L		16-OCT-19	R4873457
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	406		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Total (as CaCO3)	406		1.0	mg/L		16-OCT-19	R4873462
Ammonia, Total (as N)							
Ammonia as N	0.0667		0.0050	mg/L		20-OCT-19	R4875988
Bromide in Water by IC (Low Level)							
Bromide (Br)	0.146		0.050	mg/L		13-OCT-19	R4870507
Chloride in Water by IC							
Chloride (Cl)	3.25		0.50	mg/L		13-OCT-19	R4870507
Electrical Conductivity (EC)							
Conductivity (@ 25C)	720		2.0	uS/cm		16-OCT-19	R4873462
Fluoride in Water by IC							
Fluoride (F)	0.429		0.020	mg/L		13-OCT-19	R4870507
Ion Balance Calculation							
Cation - Anion Balance	-0.2			%		18-OCT-19	
Anion Sum	8.82			meq/L		18-OCT-19	
Cation Sum	8.78			meq/L		18-OCT-19	
Ion Balance Calculation							
Ion Balance	99.6		-100	%		18-OCT-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-1 LC_PIZP1103_WG_Q4-2019_NP Sampled By: KC/DT on 10-OCT-19 @ 13:25 Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-OCT-19	R4870507
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0011		0.0010	mg/L		13-OCT-19	R4870507
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0132		0.0010	mg/L		11-OCT-19	R4867889
Oxidation redution potential by elect.							
ORP	203		-1000	mV		13-OCT-19	R4868484
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0520		0.0020	mg/L		13-OCT-19	R4868369
Sulfate in Water by IC							
Sulfate (SO4)	29.1		0.30	mg/L		13-OCT-19	R4870507
Total Dissolved Solids							
Total Dissolved Solids	478	DLHC	20	mg/L		16-OCT-19	R4872764
Total Suspended Solids							
Total Suspended Solids	19.9		1.0	mg/L		16-OCT-19	R4872935
Turbidity							
Turbidity	13.6		0.10	NTU		11-OCT-19	R4867979
pH							
pH	8.07		0.10	pH		16-OCT-19	R4873462
L2364506-2 WG_Q4-2019_004 Sampled By: KC/DT on 10-OCT-19 @ 13:25 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		19-OCT-19	R4874992
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		17-OCT-19	R4872902
Total Organic Carbon	<0.50		0.50	mg/L		19-OCT-19	R4874992
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	15-OCT-19	17-OCT-19	R4872734
Dissolved Metals Filtration Location	FIELD					15-OCT-19	R4870254
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	17-OCT-19	17-OCT-19	R4872448
Dissolved Mercury Filtration Location	FIELD					17-OCT-19	R4872405
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-OCT-19	R4873642
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	18-OCT-19	18-OCT-19	R4874176
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Barium (Ba)-Dissolved	0.00029	RRV	0.00010	mg/L	18-OCT-19	18-OCT-19	R4874176
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Boron (B)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	15-OCT-19	17-OCT-19	R4872734
Calcium (Ca)-Dissolved	0.063	RRV	0.050	mg/L	18-OCT-19	18-OCT-19	R4874176
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	15-OCT-19	17-OCT-19	R4872734
Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Magnesium (Mg)-Dissolved	<0.10		0.10	mg/L	15-OCT-19	17-OCT-19	R4872734
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-2 WG_Q4-2019_004							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Potassium (K)-Dissolved	<0.050		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	15-OCT-19	17-OCT-19	R4872734
Silicon (Si)-Dissolved	0.227	RRV	0.050	mg/L	18-OCT-19	18-OCT-19	R4874176
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Sodium (Na)-Dissolved	0.233	RRV	0.050	mg/L	18-OCT-19	18-OCT-19	R4874176
Strontium (Sr)-Dissolved	<0.00020		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Tin (Sn)-Dissolved	0.00075	RRV	0.00010	mg/L	18-OCT-19	18-OCT-19	R4874176
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		21-OCT-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		17-OCT-19	R4874512
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		17-OCT-19	R4872448
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		17-OCT-19	R4874512
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Arsenic (As)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Barium (Ba)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		17-OCT-19	R4874512
Boron (B)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		17-OCT-19	R4874512
Calcium (Ca)-Total	<0.050		0.050	mg/L		17-OCT-19	R4874512
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Cobalt (Co)-Total	<0.10		0.10	ug/L		17-OCT-19	R4874512
Copper (Cu)-Total	<0.00050		0.00050	mg/L		17-OCT-19	R4874512
Iron (Fe)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Lead (Pb)-Total	<0.000050		0.000050	mg/L		17-OCT-19	R4874512
Lithium (Li)-Total	<0.0010		0.0010	mg/L		17-OCT-19	R4874512
Magnesium (Mg)-Total	<0.10		0.10	mg/L		17-OCT-19	R4874512
Manganese (Mn)-Total	0.00010	RRV	0.00010	mg/L		19-OCT-19	R4876507
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		17-OCT-19	R4874512
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		17-OCT-19	R4874512
Potassium (K)-Total	<0.050		0.050	mg/L		17-OCT-19	R4874512
Selenium (Se)-Total	<0.050		0.050	ug/L		17-OCT-19	R4874512
Silicon (Si)-Total	<0.10		0.10	mg/L		17-OCT-19	R4874512
Silver (Ag)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Sodium (Na)-Total	<0.050		0.050	mg/L		17-OCT-19	R4874512
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		17-OCT-19	R4874512
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Tin (Sn)-Total	0.00012	RRV	0.00010	mg/L		19-OCT-19	R4876507
Titanium (Ti)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Uranium (U)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Vanadium (V)-Total	<0.00050		0.00050	mg/L		17-OCT-19	R4874512
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		17-OCT-19	R4874512

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-2 WG_Q4-2019_004							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.5		1.0	mg/L		16-OCT-19	R4873457
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		20-OCT-19	R4875988
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		13-OCT-19	R4870507
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		13-OCT-19	R4870507
Electrical Conductivity (EC)							
Conductivity (@ 25C)	<2.0		2.0	uS/cm		16-OCT-19	R4873462
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		13-OCT-19	R4870507
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		22-OCT-19	
Anion Sum	<0.10			meq/L		22-OCT-19	
Cation Sum	<0.10			meq/L		22-OCT-19	
Ion Balance Calculation							
Ion Balance	0.0		-100	%		22-OCT-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-OCT-19	R4870507
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		13-OCT-19	R4870507
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		11-OCT-19	R4867889
Oxidation redution potential by elect.							
ORP	344		-1000	mV		13-OCT-19	R4868484
Phosphorus (P)-Total							
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		13-OCT-19	R4868369
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		13-OCT-19	R4870507
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		16-OCT-19	R4872764
Total Suspended Solids							
Total Suspended Solids	<1.0		1.0	mg/L		16-OCT-19	R4872935
Turbidity							
Turbidity	<0.10		0.10	NTU		11-OCT-19	R4867979
pH							
pH	5.62		0.10	pH		16-OCT-19	R4873462

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
DTSE	Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20191010 LC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2364506

Report Date: 22-OCT-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4873457							
WG3193534-2	LCS							
Acidity (as CaCO3)			102.8		%		85-115	16-OCT-19
WG3193534-1	MB							
Acidity (as CaCO3)			1.4		mg/L		2	16-OCT-19
ALK-MAN-CL								
	Water							
Batch	R4873462							
WG3193596-2	LCS							
Alkalinity, Total (as CaCO3)			101.5		%		85-115	16-OCT-19
WG3193596-1	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	16-OCT-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4872734							
WG3191229-2	LCS							
Beryllium (Be)-Dissolved			96.9		%		80-120	17-OCT-19
WG3191229-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	17-OCT-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4874512							
WG3191741-3	DUP	L2364506-2						
Beryllium (Be)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	17-OCT-19
WG3191741-2	LCS							
Beryllium (Be)-Total			94.9		%		80-120	17-OCT-19
WG3191741-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	17-OCT-19
WG3191741-4	MS	L2364506-1						
Beryllium (Be)-Total			103.2		%		70-130	17-OCT-19
BR-L-IC-N-CL								
	Water							
Batch	R4870507							
WG3191321-10	LCS							
Bromide (Br)			100.7		%		85-115	12-OCT-19
WG3191321-14	LCS							
Bromide (Br)			100.6		%		85-115	13-OCT-19
WG3191321-13	MB							
Bromide (Br)			<0.050		mg/L		0.05	13-OCT-19
WG3191321-9	MB							
Bromide (Br)			<0.050		mg/L		0.05	12-OCT-19
C-DIS-ORG-LOW-CL								
	Water							

Quality Control Report

Workorder: L2364506

Report Date: 22-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL	Water							
Batch	R4874992							
WG3196054-6	LCS							
Dissolved Organic Carbon			105.6		%		80-120	19-OCT-19
WG3196054-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	19-OCT-19
C-TOT-ORG-LOW-CL	Water							
Batch	R4874992							
WG3196054-6	LCS							
Total Organic Carbon			106.4		%		80-120	19-OCT-19
WG3196054-5	MB							
Total Organic Carbon			<0.50		mg/L		0.5	19-OCT-19
CL-IC-N-CL	Water							
Batch	R4870507							
WG3191321-10	LCS							
Chloride (Cl)			102.9		%		90-110	12-OCT-19
WG3191321-14	LCS							
Chloride (Cl)			102.1		%		90-110	13-OCT-19
WG3191321-13	MB							
Chloride (Cl)			<0.50		mg/L		0.5	13-OCT-19
WG3191321-9	MB							
Chloride (Cl)			<0.50		mg/L		0.5	12-OCT-19
EC-L-PCT-CL	Water							
Batch	R4873462							
WG3193596-2	LCS							
Conductivity (@ 25C)			94.4		%		90-110	16-OCT-19
WG3193596-1	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	16-OCT-19
F-IC-N-CL	Water							
Batch	R4870507							
WG3191321-10	LCS							
Fluoride (F)			107.7		%		90-110	12-OCT-19
WG3191321-14	LCS							
Fluoride (F)			108.8		%		90-110	13-OCT-19
WG3191321-13	MB							
Fluoride (F)			<0.020		mg/L		0.02	13-OCT-19
WG3191321-9	MB							
Fluoride (F)			<0.020		mg/L		0.02	12-OCT-19
HG-D-CVAA-VA	Water							

Quality Control Report

Workorder: L2364506

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA		Water						
Batch	R4872448							
WG3193123-2	LCS							
Mercury (Hg)-Dissolved			98.3		%		80-120	17-OCT-19
WG3193123-1	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	17-OCT-19
HG-T-CVAA-VA		Water						
Batch	R4872448							
WG3193221-2	LCS							
Mercury (Hg)-Total			97.5		%		80-120	17-OCT-19
WG3193221-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	17-OCT-19
MET-D-CCMS-VA		Water						
Batch	R4872734							
WG3191229-2	LCS							
Aluminum (Al)-Dissolved			98.7		%		80-120	17-OCT-19
Antimony (Sb)-Dissolved			97.5		%		80-120	17-OCT-19
Arsenic (As)-Dissolved			97.6		%		80-120	17-OCT-19
Barium (Ba)-Dissolved			97.9		%		80-120	17-OCT-19
Bismuth (Bi)-Dissolved			100.9		%		80-120	17-OCT-19
Boron (B)-Dissolved			92.6		%		80-120	17-OCT-19
Cadmium (Cd)-Dissolved			99.5		%		80-120	17-OCT-19
Calcium (Ca)-Dissolved			99.4		%		80-120	17-OCT-19
Chromium (Cr)-Dissolved			97.0		%		80-120	17-OCT-19
Cobalt (Co)-Dissolved			99.3		%		80-120	17-OCT-19
Copper (Cu)-Dissolved			98.1		%		80-120	17-OCT-19
Iron (Fe)-Dissolved			97.9		%		80-120	17-OCT-19
Lead (Pb)-Dissolved			102.6		%		80-120	17-OCT-19
Lithium (Li)-Dissolved			95.9		%		80-120	17-OCT-19
Magnesium (Mg)-Dissolved			99.1		%		80-120	17-OCT-19
Manganese (Mn)-Dissolved			99.9		%		80-120	17-OCT-19
Molybdenum (Mo)-Dissolved			99.7		%		80-120	17-OCT-19
Nickel (Ni)-Dissolved			98.1		%		80-120	17-OCT-19
Potassium (K)-Dissolved			97.6		%		80-120	17-OCT-19
Selenium (Se)-Dissolved			103.4		%		80-120	17-OCT-19
Silicon (Si)-Dissolved			97.1		%		60-140	17-OCT-19
Silver (Ag)-Dissolved			96.2		%		80-120	17-OCT-19
Sodium (Na)-Dissolved			102.2		%		80-120	17-OCT-19

Quality Control Report

Workorder: L2364506

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4872734							
WG3191229-2	LCS							
Strontium (Sr)-Dissolved			99.95		%		80-120	17-OCT-19
Thallium (Tl)-Dissolved			101.4		%		80-120	17-OCT-19
Tin (Sn)-Dissolved			98.9		%		80-120	17-OCT-19
Titanium (Ti)-Dissolved			97.3		%		80-120	17-OCT-19
Uranium (U)-Dissolved			101.2		%		80-120	17-OCT-19
Vanadium (V)-Dissolved			98.9		%		80-120	17-OCT-19
Zinc (Zn)-Dissolved			97.8		%		80-120	17-OCT-19
WG3191229-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	17-OCT-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	17-OCT-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-OCT-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	17-OCT-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	17-OCT-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	17-OCT-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-OCT-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-OCT-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	17-OCT-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	17-OCT-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	17-OCT-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	17-OCT-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	17-OCT-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	17-OCT-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-OCT-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-OCT-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	17-OCT-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	17-OCT-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	17-OCT-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19

Quality Control Report

Workorder: L2364506

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4872734							
WG3191229-1	MB	NP						
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	17-OCT-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	17-OCT-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	17-OCT-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-OCT-19
Batch	R4874176							
WG3194439-2	LCS							
Aluminum (Al)-Dissolved			106.4		%		80-120	18-OCT-19
Antimony (Sb)-Dissolved			106.0		%		80-120	18-OCT-19
Arsenic (As)-Dissolved			106.8		%		80-120	18-OCT-19
Barium (Ba)-Dissolved			107.7		%		80-120	18-OCT-19
Bismuth (Bi)-Dissolved			103.6		%		80-120	18-OCT-19
Boron (B)-Dissolved			102.5		%		80-120	18-OCT-19
Cadmium (Cd)-Dissolved			107.0		%		80-120	18-OCT-19
Calcium (Ca)-Dissolved			101.0		%		80-120	18-OCT-19
Chromium (Cr)-Dissolved			108.1		%		80-120	18-OCT-19
Cobalt (Co)-Dissolved			106.2		%		80-120	18-OCT-19
Copper (Cu)-Dissolved			104.8		%		80-120	18-OCT-19
Iron (Fe)-Dissolved			103.1		%		80-120	18-OCT-19
Lead (Pb)-Dissolved			103.4		%		80-120	18-OCT-19
Lithium (Li)-Dissolved			99.8		%		80-120	18-OCT-19
Magnesium (Mg)-Dissolved			108.4		%		80-120	18-OCT-19
Manganese (Mn)-Dissolved			106.6		%		80-120	18-OCT-19
Molybdenum (Mo)-Dissolved			108.8		%		80-120	18-OCT-19
Nickel (Ni)-Dissolved			108.9		%		80-120	18-OCT-19
Potassium (K)-Dissolved			104.8		%		80-120	18-OCT-19
Selenium (Se)-Dissolved			105.2		%		80-120	18-OCT-19
Silicon (Si)-Dissolved			106.3		%		60-140	18-OCT-19
Silver (Ag)-Dissolved			103.6		%		80-120	18-OCT-19
Sodium (Na)-Dissolved			106.8		%		80-120	18-OCT-19
Strontium (Sr)-Dissolved			103.8		%		80-120	18-OCT-19
Thallium (Tl)-Dissolved			102.4		%		80-120	18-OCT-19
Tin (Sn)-Dissolved			105.9		%		80-120	18-OCT-19
Titanium (Ti)-Dissolved			102.6		%		80-120	18-OCT-19
Uranium (U)-Dissolved			104.0		%		80-120	18-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4874176							
WG3194439-2	LCS							
Vanadium (V)-Dissolved			108.8		%		80-120	18-OCT-19
Zinc (Zn)-Dissolved			106.5		%		80-120	18-OCT-19
WG3194439-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	18-OCT-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	18-OCT-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-OCT-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	18-OCT-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	18-OCT-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	18-OCT-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	18-OCT-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	18-OCT-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	18-OCT-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	18-OCT-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	18-OCT-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	18-OCT-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	18-OCT-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	18-OCT-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	18-OCT-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	18-OCT-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	18-OCT-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	18-OCT-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	18-OCT-19

MET-T-CCMS-VA

Water

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4874512							
WG3191741-3 DUP		L2364506-2						
Aluminum (Al)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-OCT-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Barium (Ba)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Calcium (Ca)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Chromium (Cr)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Iron (Fe)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-OCT-19
Magnesium (Mg)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-OCT-19
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Potassium (K)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Silicon (Si)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-OCT-19
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Sodium (Na)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Strontium (Sr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	17-OCT-19
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-OCT-19
WG3191741-2 LCS								
Aluminum (Al)-Total			108.5		%		80-120	17-OCT-19
Antimony (Sb)-Total			99.6		%		80-120	17-OCT-19
Arsenic (As)-Total			99.5		%		80-120	17-OCT-19
Barium (Ba)-Total			98.6		%		80-120	17-OCT-19
Bismuth (Bi)-Total			96.0		%		80-120	17-OCT-19

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MET-T-CCMS-VA								
	Water							
Batch	R4874512							
WG3191741-2	LCS							
Boron (B)-Total			96.3		%		80-120	17-OCT-19
Cadmium (Cd)-Total			99.0		%		80-120	17-OCT-19
Calcium (Ca)-Total			96.8		%		80-120	17-OCT-19
Chromium (Cr)-Total			101.4		%		80-120	17-OCT-19
Cobalt (Co)-Total			100.9		%		80-120	17-OCT-19
Copper (Cu)-Total			98.9		%		80-120	17-OCT-19
Iron (Fe)-Total			98.9		%		80-120	17-OCT-19
Lead (Pb)-Total			96.9		%		80-120	17-OCT-19
Lithium (Li)-Total			95.9		%		80-120	17-OCT-19
Magnesium (Mg)-Total			101.5		%		80-120	17-OCT-19
Manganese (Mn)-Total			103.9		%		80-120	17-OCT-19
Molybdenum (Mo)-Total			98.0		%		80-120	17-OCT-19
Nickel (Ni)-Total			101.0		%		80-120	17-OCT-19
Potassium (K)-Total			103.2		%		80-120	17-OCT-19
Selenium (Se)-Total			97.5		%		80-120	17-OCT-19
Silicon (Si)-Total			94.9		%		80-120	17-OCT-19
Silver (Ag)-Total			96.8		%		80-120	17-OCT-19
Sodium (Na)-Total			102.4		%		80-120	17-OCT-19
Strontium (Sr)-Total			99.3		%		80-120	17-OCT-19
Thallium (Tl)-Total			96.2		%		80-120	17-OCT-19
Tin (Sn)-Total			98.9		%		80-120	17-OCT-19
Titanium (Ti)-Total			97.6		%		80-120	17-OCT-19
Uranium (U)-Total			99.98		%		80-120	17-OCT-19
Vanadium (V)-Total			102.2		%		80-120	17-OCT-19
Zinc (Zn)-Total			98.5		%		80-120	17-OCT-19
WG3191741-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	17-OCT-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	17-OCT-19
Boron (B)-Total			<0.010		mg/L		0.01	17-OCT-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	17-OCT-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	17-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4874512							
WG3191741-1 MB								
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	17-OCT-19
Iron (Fe)-Total			<0.010		mg/L		0.01	17-OCT-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	17-OCT-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	17-OCT-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	17-OCT-19
Manganese (Mn)-Total			0.00018	B	mg/L		0.0001	17-OCT-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	17-OCT-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	17-OCT-19
Potassium (K)-Total			<0.050		mg/L		0.05	17-OCT-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	17-OCT-19
Silicon (Si)-Total			<0.10		mg/L		0.1	17-OCT-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	17-OCT-19
Sodium (Na)-Total			<0.050		mg/L		0.05	17-OCT-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	17-OCT-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	17-OCT-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	17-OCT-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	17-OCT-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	17-OCT-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	17-OCT-19
WG3191741-4 MS		L2364506-1						
Aluminum (Al)-Total			108.8		%		70-130	17-OCT-19
Antimony (Sb)-Total			97.0		%		70-130	17-OCT-19
Arsenic (As)-Total			102.9		%		70-130	17-OCT-19
Barium (Ba)-Total			N/A	MS-B	%		-	17-OCT-19
Bismuth (Bi)-Total			90.1		%		70-130	17-OCT-19
Boron (B)-Total			N/A	MS-B	%		-	17-OCT-19
Cadmium (Cd)-Total			96.7		%		70-130	17-OCT-19
Calcium (Ca)-Total			N/A	MS-B	%		-	17-OCT-19
Chromium (Cr)-Total			102.3		%		70-130	17-OCT-19
Cobalt (Co)-Total			101.1		%		70-130	17-OCT-19
Copper (Cu)-Total			96.6		%		70-130	17-OCT-19

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MET-T-CCMS-VA								
	Water							
Batch	R4874512							
WG3191741-4 MS		L2364506-1						
Iron (Fe)-Total			98.7		%		70-130	17-OCT-19
Lead (Pb)-Total			90.6		%		70-130	17-OCT-19
Lithium (Li)-Total			N/A	MS-B	%		-	17-OCT-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	17-OCT-19
Manganese (Mn)-Total			N/A	MS-B	%		-	17-OCT-19
Molybdenum (Mo)-Total			101.6		%		70-130	17-OCT-19
Nickel (Ni)-Total			99.2		%		70-130	17-OCT-19
Potassium (K)-Total			104.7		%		70-130	17-OCT-19
Selenium (Se)-Total			99.0		%		70-130	17-OCT-19
Silicon (Si)-Total			96.1		%		70-130	17-OCT-19
Silver (Ag)-Total			95.8		%		70-130	17-OCT-19
Sodium (Na)-Total			N/A	MS-B	%		-	17-OCT-19
Strontium (Sr)-Total			N/A	MS-B	%		-	17-OCT-19
Thallium (Tl)-Total			91.3		%		70-130	17-OCT-19
Tin (Sn)-Total			97.9		%		70-130	17-OCT-19
Titanium (Ti)-Total			104.6		%		70-130	17-OCT-19
Uranium (U)-Total			96.0		%		70-130	17-OCT-19
Vanadium (V)-Total			107.0		%		70-130	17-OCT-19
Zinc (Zn)-Total			97.5		%		70-130	17-OCT-19
Batch	R4876507							
WG3195649-2 LCS								
Aluminum (Al)-Total			98.9		%		80-120	19-OCT-19
Antimony (Sb)-Total			103.1		%		80-120	19-OCT-19
Arsenic (As)-Total			96.3		%		80-120	19-OCT-19
Barium (Ba)-Total			97.1		%		80-120	19-OCT-19
Bismuth (Bi)-Total			97.1		%		80-120	19-OCT-19
Boron (B)-Total			92.8		%		80-120	19-OCT-19
Cadmium (Cd)-Total			96.9		%		80-120	19-OCT-19
Calcium (Ca)-Total			100.0		%		80-120	19-OCT-19
Chromium (Cr)-Total			96.5		%		80-120	19-OCT-19
Cobalt (Co)-Total			98.1		%		80-120	19-OCT-19
Copper (Cu)-Total			96.3		%		80-120	19-OCT-19
Iron (Fe)-Total			96.4		%		80-120	19-OCT-19
Lead (Pb)-Total			97.7		%		80-120	19-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4876507							
WG3195649-2	LCS							
Lithium (Li)-Total			91.7		%		80-120	19-OCT-19
Magnesium (Mg)-Total			97.0		%		80-120	19-OCT-19
Manganese (Mn)-Total			98.6		%		80-120	19-OCT-19
Molybdenum (Mo)-Total			100.1		%		80-120	19-OCT-19
Nickel (Ni)-Total			99.2		%		80-120	19-OCT-19
Potassium (K)-Total			97.9		%		80-120	19-OCT-19
Selenium (Se)-Total			99.9		%		80-120	19-OCT-19
Silicon (Si)-Total			99.4		%		80-120	19-OCT-19
Silver (Ag)-Total			96.1		%		80-120	19-OCT-19
Sodium (Na)-Total			104.9		%		80-120	19-OCT-19
Strontium (Sr)-Total			106.5		%		80-120	19-OCT-19
Thallium (Tl)-Total			97.4		%		80-120	19-OCT-19
Tin (Sn)-Total			98.9		%		80-120	19-OCT-19
Titanium (Ti)-Total			93.0		%		80-120	19-OCT-19
Uranium (U)-Total			97.1		%		80-120	19-OCT-19
Vanadium (V)-Total			99.3		%		80-120	19-OCT-19
Zinc (Zn)-Total			94.3		%		80-120	19-OCT-19
WG3195649-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	19-OCT-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Boron (B)-Total			<0.010		mg/L		0.01	19-OCT-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	19-OCT-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	19-OCT-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Iron (Fe)-Total			<0.010		mg/L		0.01	19-OCT-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	19-OCT-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	19-OCT-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	19-OCT-19

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MET-T-CCMS-VA		Water						
Batch	R4876507							
WG3195649-1	MB							
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Potassium (K)-Total			<0.050		mg/L		0.05	19-OCT-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Silicon (Si)-Total			<0.10		mg/L		0.1	19-OCT-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	19-OCT-19
Sodium (Na)-Total			<0.050		mg/L		0.05	19-OCT-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	19-OCT-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	19-OCT-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	19-OCT-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	19-OCT-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	19-OCT-19
NH3-L-F-CL		Water						
Batch	R4875988							
WG3196193-22	LCS							
Ammonia as N			99.8		%		85-115	20-OCT-19
WG3196193-21	MB							
Ammonia as N			<0.0050		mg/L		0.005	20-OCT-19
NO2-L-IC-N-CL		Water						
Batch	R4870507							
WG3191321-10	LCS							
Nitrite (as N)			104.3		%		90-110	12-OCT-19
WG3191321-14	LCS							
Nitrite (as N)			103.3		%		90-110	13-OCT-19
WG3191321-13	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	13-OCT-19
WG3191321-9	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	12-OCT-19
NO3-L-IC-N-CL		Water						
Batch	R4870507							
WG3191321-10	LCS							
Nitrate (as N)			102.6		%		90-110	12-OCT-19
WG3191321-14	LCS							

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NO3-L-IC-N-CL Water								
Batch	R4870507							
WG3191321-14	LCS							
Nitrate (as N)			102.0		%		90-110	13-OCT-19
WG3191321-13	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	13-OCT-19
WG3191321-9	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	12-OCT-19
ORP-CL Water								
Batch	R4868484							
WG3190461-1	CRM	CL-ORP						
ORP			219		mV		210-230	13-OCT-19
P-T-L-COL-CL Water								
Batch	R4868369							
WG3190258-10	LCS							
Phosphorus (P)-Total			100.5		%		80-120	13-OCT-19
WG3190258-9	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	13-OCT-19
PH-CL Water								
Batch	R4873462							
WG3193596-2	LCS							
pH			7.02		pH		6.9-7.1	16-OCT-19
PO4-DO-L-COL-CL Water								
Batch	R4867889							
WG3189621-18	LCS							
Orthophosphate-Dissolved (as P)			102.8		%		80-120	11-OCT-19
WG3189621-17	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	11-OCT-19
SO4-IC-N-CL Water								
Batch	R4870507							
WG3191321-10	LCS							
Sulfate (SO4)			103.0		%		90-110	12-OCT-19
WG3191321-14	LCS							
Sulfate (SO4)			102.2		%		90-110	13-OCT-19
WG3191321-13	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	13-OCT-19
WG3191321-9	MB							

Quality Control Report

Workorder: L2364506

Report Date: 22-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-CL	Water							
Batch	R4870507							
WG3191321-9 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	12-OCT-19
SOLIDS-TDS-CL	Water							
Batch	R4872764							
WG3192050-8 LCS								
Total Dissolved Solids			101.8		%		85-115	16-OCT-19
WG3192050-7 MB								
Total Dissolved Solids			<10		mg/L		10	16-OCT-19
TKN-L-F-CL	Water							
Batch	R4872902							
WG3193743-10 LCS								
Total Kjeldahl Nitrogen			95.9		%		75-125	17-OCT-19
WG3193743-9 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-OCT-19
TSS-L-CL	Water							
Batch	R4872935							
WG3192023-6 LCS								
Total Suspended Solids			95.9		%		85-115	16-OCT-19
WG3192023-5 MB								
Total Suspended Solids			<1.0		mg/L		1	16-OCT-19
TURBIDITY-CL	Water							
Batch	R4867979							
WG3189524-14 LCS								
Turbidity			96.5		%		85-115	11-OCT-19
WG3189524-17 LCS								
Turbidity			96.0		%		85-115	11-OCT-19
WG3189524-13 MB								
Turbidity			<0.10		NTU		0.1	11-OCT-19
WG3189524-16 MB								
Turbidity			<0.10		NTU		0.1	11-OCT-19

Quality Control Report

Workorder: L2364506

Report Date: 22-OCT-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2364506

Report Date: 22-OCT-19

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	10-OCT-19 13:25	13-OCT-19 09:15	0.25	68	hours	EHTR-FM
	2	10-OCT-19 13:25	13-OCT-19 09:15	0.25	68	hours	EHTR-FM
pH	1	10-OCT-19 13:25	16-OCT-19 13:00	0.25	144	hours	EHTR-FM
	2	10-OCT-19 13:25	16-OCT-19 13:00	0.25	144	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2364506 were received on 11-OCT-19 08:40.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

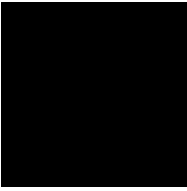
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: 20191010 LC GW		TURNAROUND TIME:			RUSH:						
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Carla Froyman Parker			Lab Contact	Lyudmyla Shvets			Email 1:	carla.froymanparker@teck.com		
Email	Carla.froymanparker@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		
Address	Box 2003 15km North Hwy 43			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com		
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 4:	kirsten.campbell@teck.com		
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	PO number	2000608129		
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS								ANALYSIS REQUESTED										
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS Package-DOC	HIG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS Package-TKN/TOC	HIG-T-CVAF-VA				
LC_P1ZP1103_WG_Q4-2019_NP	LC_P1ZP1103	WG		2019/10/10	13:25	G	6	1	1	1	1	1	1					
WG_Q4-2019_004	LC_P1ZP1103	WG		2019/10/10	13:25	G	7	1	1	1	1	1	1	1				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
PLEASE FORWARD ALL SAMPLES TO ALS (RWAB) FOR ANALYSIS		D.Tymstra/K.Campbell		10-Oct		<i>D/C</i>		<i>10/11 0840</i>	
SERVICE REQUEST (rush - subject to availability)		Sampler's Name		K. Campbell/D. Tymstra		Mobile #			
Regular (default) X		Sampler's Signature				Date/Time		October 10, 2019	
Priority (2-3 business days) - 50% surcharge									
Emergency (1 Business Day) - 100% surcharge									
For Emergency <1 Day, ASAP or Weekend - Contact ALS									

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TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 24-OCT-19
Report Date: 31-OCT-19 16:16 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2371413
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191023 DC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2371413-1 LC_PIZDC1404D_WG_Q4-2019_NP							
Sampled By: KC/DT on 23-OCT-19 @ 12:42							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.54		0.50	mg/L		29-OCT-19	R4889000
Total Kjeldahl Nitrogen	2.93	DLM	0.10	mg/L		25-OCT-19	R4884311
Total Organic Carbon	1.65		0.50	mg/L		28-OCT-19	R4889000
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	25-OCT-19	26-OCT-19	R4888233
Dissolved Metals Filtration Location	FIELD					25-OCT-19	R4884851
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	28-OCT-19	29-OCT-19	R4889334
Dissolved Mercury Filtration Location	FIELD					28-OCT-19	R4888405
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					25-OCT-19	R4884851
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	25-OCT-19	26-OCT-19	R4888233
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Arsenic (As)-Dissolved	0.00238		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Barium (Ba)-Dissolved	4.00		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	25-OCT-19	26-OCT-19	R4888233
Boron (B)-Dissolved	0.023		0.010	mg/L	25-OCT-19	26-OCT-19	R4888233
Cadmium (Cd)-Dissolved	<0.020	DLM	0.020	ug/L	25-OCT-19	26-OCT-19	R4888233
Calcium (Ca)-Dissolved	56.2		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Cobalt (Co)-Dissolved	0.13		0.10	ug/L	25-OCT-19	26-OCT-19	R4888233
Copper (Cu)-Dissolved	0.00080		0.00020	mg/L	25-OCT-19	26-OCT-19	R4888233
Iron (Fe)-Dissolved	1.87		0.010	mg/L	25-OCT-19	26-OCT-19	R4888233
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	25-OCT-19	26-OCT-19	R4888233
Lithium (Li)-Dissolved	0.684		0.0010	mg/L	25-OCT-19	26-OCT-19	R4888233
Magnesium (Mg)-Dissolved	39.9		0.10	mg/L	25-OCT-19	26-OCT-19	R4888233
Manganese (Mn)-Dissolved	0.0186		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Molybdenum (Mo)-Dissolved	0.0232		0.000050	mg/L	25-OCT-19	26-OCT-19	R4888233
Nickel (Ni)-Dissolved	0.00060		0.00050	mg/L	25-OCT-19	26-OCT-19	R4888233
Potassium (K)-Dissolved	25.7		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	25-OCT-19	26-OCT-19	R4888233
Silicon (Si)-Dissolved	2.85		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Sodium (Na)-Dissolved	40.5		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Strontium (Sr)-Dissolved	0.241		0.00020	mg/L	25-OCT-19	26-OCT-19	R4888233
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Tin (Sn)-Dissolved	0.00030		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	25-OCT-19	26-OCT-19	R4888233
Uranium (U)-Dissolved	0.000069		0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	25-OCT-19	26-OCT-19	R4888233
Zinc (Zn)-Dissolved	0.0039		0.0010	mg/L	25-OCT-19	26-OCT-19	R4888233
Hardness							
Hardness (as CaCO3)	304		0.50	mg/L		28-OCT-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.067		0.020	ug/L		26-OCT-19	R4888233
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.330		0.0030	mg/L		26-OCT-19	R4888233
Antimony (Sb)-Total	0.00017		0.00010	mg/L		26-OCT-19	R4888233
Arsenic (As)-Total	0.00303		0.00010	mg/L		26-OCT-19	R4888233

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2371413-1 LC_PIZDC1404D_WG_Q4-2019_NP							
Sampled By: KC/DT on 23-OCT-19 @ 12:42							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	4.24		0.00010	mg/L		26-OCT-19	R4888233
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-OCT-19	R4888233
Boron (B)-Total	0.024		0.010	mg/L		26-OCT-19	R4888233
Cadmium (Cd)-Total	0.178		0.0050	ug/L		26-OCT-19	R4888233
Calcium (Ca)-Total	61.4		0.050	mg/L		26-OCT-19	R4888233
Chromium (Cr)-Total	0.00126		0.00010	mg/L		26-OCT-19	R4888233
Cobalt (Co)-Total	0.61		0.10	ug/L		26-OCT-19	R4888233
Copper (Cu)-Total	0.00401		0.00050	mg/L		26-OCT-19	R4888233
Iron (Fe)-Total	3.97		0.010	mg/L		26-OCT-19	R4888233
Lead (Pb)-Total	0.00206		0.000050	mg/L		26-OCT-19	R4888233
Lithium (Li)-Total	0.735		0.0010	mg/L		26-OCT-19	R4888233
Magnesium (Mg)-Total	43.9		0.10	mg/L		26-OCT-19	R4888233
Manganese (Mn)-Total	0.0375		0.00010	mg/L		26-OCT-19	R4888233
Molybdenum (Mo)-Total	0.0233		0.000050	mg/L		26-OCT-19	R4888233
Nickel (Ni)-Total	0.00312		0.00050	mg/L		26-OCT-19	R4888233
Potassium (K)-Total	26.3		0.050	mg/L		26-OCT-19	R4888233
Selenium (Se)-Total	0.092		0.050	ug/L		26-OCT-19	R4888233
Silicon (Si)-Total	3.45		0.10	mg/L		26-OCT-19	R4888233
Silver (Ag)-Total	0.000028		0.000010	mg/L		26-OCT-19	R4888233
Sodium (Na)-Total	42.5		0.050	mg/L		26-OCT-19	R4888233
Strontium (Sr)-Total	0.254		0.00020	mg/L		26-OCT-19	R4888233
Thallium (Tl)-Total	0.000028		0.000010	mg/L		26-OCT-19	R4888233
Tin (Sn)-Total	0.00051		0.00010	mg/L		26-OCT-19	R4888233
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-OCT-19	R4888233
Uranium (U)-Total	0.000247		0.000010	mg/L		26-OCT-19	R4888233
Vanadium (V)-Total	0.00322		0.00050	mg/L		26-OCT-19	R4888233
Zinc (Zn)-Total	0.0240		0.0030	mg/L		26-OCT-19	R4888233
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		25-OCT-19	R4888065
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	435		1.0	mg/L		25-OCT-19	R4888006
Alkalinity, Carbonate (as CaCO3)	14.0		1.0	mg/L		25-OCT-19	R4888006
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		25-OCT-19	R4888006
Alkalinity, Total (as CaCO3)	449		1.0	mg/L		25-OCT-19	R4888006
Ammonia, Total (as N)							
Ammonia as N	2.86	DLHC	0.050	mg/L		30-OCT-19	R4892248
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-OCT-19	R4884134
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		24-OCT-19	R4884134
Electrical Conductivity (EC)							
Conductivity (@ 25C)	724		2.0	uS/cm		25-OCT-19	R4888006
Fluoride in Water by IC							
Fluoride (F)	0.210		0.020	mg/L		24-OCT-19	R4884134
Ion Balance Calculation							
Cation - Anion Balance	-2.1			%		28-OCT-19	
Anion Sum	8.98			meq/L		28-OCT-19	
Cation Sum	8.60			meq/L		28-OCT-19	
Ion Balance Calculation							
Ion Balance	95.8		-100	%		28-OCT-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2371413-1 LC_PIZDC1404D_WG_Q4-2019_NP Sampled By: KC/DT on 23-OCT-19 @ 12:42 Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0078		0.0050	mg/L		24-OCT-19	R4884134
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		24-OCT-19	R4884134
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0011		0.0010	mg/L		24-OCT-19	R4883326
Oxidation redution potential by elect.							
ORP	465		-1000	mV		24-OCT-19	R4883661
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0567		0.0020	mg/L		25-OCT-19	R4884566
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		24-OCT-19	R4884134
Total Dissolved Solids							
Total Dissolved Solids	408	DLHC	20	mg/L		29-OCT-19	R4889928
Total Suspended Solids							
Total Suspended Solids	47.8		1.0	mg/L		28-OCT-19	R4889096
Turbidity							
Turbidity	44.3		0.10	NTU		24-OCT-19	R4883631
pH							
pH	8.39		0.10	pH		25-OCT-19	R4888006
L2371413-2 LC_PIZDC1404S_WG_Q4-2019_NP Sampled By: KC/DT on 23-OCT-19 @ 13:15 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.88		0.50	mg/L		28-OCT-19	R4889000
Total Kjeldahl Nitrogen	0.137		0.050	mg/L		25-OCT-19	R4884311
Total Organic Carbon	2.02		0.50	mg/L		28-OCT-19	R4889000
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	25-OCT-19	26-OCT-19	R4888233
Dissolved Metals Filtration Location	FIELD					25-OCT-19	R4884851
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	28-OCT-19	29-OCT-19	R4889334
Dissolved Mercury Filtration Location	FIELD					28-OCT-19	R4888405
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					25-OCT-19	R4884851
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	25-OCT-19	26-OCT-19	R4888233
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Arsenic (As)-Dissolved	0.00187		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Barium (Ba)-Dissolved	0.224		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	25-OCT-19	26-OCT-19	R4888233
Boron (B)-Dissolved	<0.010		0.010	mg/L	25-OCT-19	26-OCT-19	R4888233
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	25-OCT-19	26-OCT-19	R4888233
Calcium (Ca)-Dissolved	46.5		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Cobalt (Co)-Dissolved	0.32		0.10	ug/L	25-OCT-19	26-OCT-19	R4888233
Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	25-OCT-19	26-OCT-19	R4888233
Iron (Fe)-Dissolved	0.878		0.010	mg/L	25-OCT-19	26-OCT-19	R4888233
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	25-OCT-19	26-OCT-19	R4888233
Lithium (Li)-Dissolved	0.0060		0.0010	mg/L	25-OCT-19	26-OCT-19	R4888233
Magnesium (Mg)-Dissolved	17.2		0.10	mg/L	25-OCT-19	26-OCT-19	R4888233
Manganese (Mn)-Dissolved	0.0284		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2371413-2 LC_PIZDC1404S_WG_Q4-2019_NP							
Sampled By: KC/DT on 23-OCT-19 @ 13:15							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	0.00326		0.000050	mg/L	25-OCT-19	26-OCT-19	R4888233
Nickel (Ni)-Dissolved	0.00122		0.00050	mg/L	25-OCT-19	26-OCT-19	R4888233
Potassium (K)-Dissolved	1.53		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	25-OCT-19	26-OCT-19	R4888233
Silicon (Si)-Dissolved	3.69		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Sodium (Na)-Dissolved	1.25		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Strontium (Sr)-Dissolved	0.0446		0.00020	mg/L	25-OCT-19	26-OCT-19	R4888233
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Tin (Sn)-Dissolved	0.00020		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	25-OCT-19	26-OCT-19	R4888233
Uranium (U)-Dissolved	0.000570		0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	25-OCT-19	26-OCT-19	R4888233
Zinc (Zn)-Dissolved	0.0010		0.0010	mg/L	25-OCT-19	26-OCT-19	R4888233
Hardness							
Hardness (as CaCO3)	187		0.50	mg/L		28-OCT-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		26-OCT-19	R4888233
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0126		0.0030	mg/L		26-OCT-19	R4888233
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		26-OCT-19	R4888233
Arsenic (As)-Total	0.00187		0.00010	mg/L		26-OCT-19	R4888233
Barium (Ba)-Total	0.239		0.00010	mg/L		26-OCT-19	R4888233
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-OCT-19	R4888233
Boron (B)-Total	<0.010		0.010	mg/L		26-OCT-19	R4888233
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		26-OCT-19	R4888233
Calcium (Ca)-Total	48.8		0.050	mg/L		26-OCT-19	R4888233
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		26-OCT-19	R4888233
Cobalt (Co)-Total	0.35		0.10	ug/L		26-OCT-19	R4888233
Copper (Cu)-Total	<0.00050		0.00050	mg/L		26-OCT-19	R4888233
Iron (Fe)-Total	0.991		0.010	mg/L		26-OCT-19	R4888233
Lead (Pb)-Total	<0.000050		0.000050	mg/L		26-OCT-19	R4888233
Lithium (Li)-Total	0.0064		0.0010	mg/L		26-OCT-19	R4888233
Magnesium (Mg)-Total	18.5		0.10	mg/L		26-OCT-19	R4888233
Manganese (Mn)-Total	0.0293		0.00010	mg/L		26-OCT-19	R4888233
Molybdenum (Mo)-Total	0.00338		0.000050	mg/L		26-OCT-19	R4888233
Nickel (Ni)-Total	0.00135		0.00050	mg/L		26-OCT-19	R4888233
Potassium (K)-Total	1.54		0.050	mg/L		26-OCT-19	R4888233
Selenium (Se)-Total	<0.050		0.050	ug/L		26-OCT-19	R4888233
Silicon (Si)-Total	3.77		0.10	mg/L		26-OCT-19	R4888233
Silver (Ag)-Total	<0.000010		0.000010	mg/L		26-OCT-19	R4888233
Sodium (Na)-Total	1.32		0.050	mg/L		26-OCT-19	R4888233
Strontium (Sr)-Total	0.0463		0.00020	mg/L		26-OCT-19	R4888233
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		26-OCT-19	R4888233
Tin (Sn)-Total	0.00021		0.00010	mg/L		26-OCT-19	R4888233
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-OCT-19	R4888233
Uranium (U)-Total	0.000638		0.000010	mg/L		26-OCT-19	R4888233
Vanadium (V)-Total	<0.00050		0.00050	mg/L		26-OCT-19	R4888233
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		26-OCT-19	R4888233
Routine for Teck Coal							
Acidity by Automatic Titration							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2371413-2 LC_PIZDC1404S_WG_Q4-2019_NP							
Sampled By: KC/DT on 23-OCT-19 @ 13:15							
Matrix: WG							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		25-OCT-19	R4888065
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	190		1.0	mg/L		25-OCT-19	R4888006
Alkalinity, Carbonate (as CaCO3)	3.2		1.0	mg/L		25-OCT-19	R4888006
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		25-OCT-19	R4888006
Alkalinity, Total (as CaCO3)	193		1.0	mg/L		25-OCT-19	R4888006
Ammonia, Total (as N)							
Ammonia as N	0.0110		0.0050	mg/L		30-OCT-19	R4892248
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-OCT-19	R4884134
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		24-OCT-19	R4884134
Electrical Conductivity (EC)							
Conductivity (@ 25C)	330		2.0	uS/cm		25-OCT-19	R4888006
Fluoride in Water by IC							
Fluoride (F)	0.142		0.020	mg/L		24-OCT-19	R4884134
Ion Balance Calculation							
Cation - Anion Balance	-1.4			%		28-OCT-19	
Anion Sum	3.98			meq/L		28-OCT-19	
Cation Sum	3.88			meq/L		28-OCT-19	
Ion Balance Calculation							
Ion Balance	97.3		-100	%		28-OCT-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		24-OCT-19	R4884134
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		24-OCT-19	R4884134
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0013		0.0010	mg/L		24-OCT-19	R4883326
Oxidation redution potential by elect.							
ORP	354		-1000	mV		24-OCT-19	R4883661
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0206		0.0020	mg/L		25-OCT-19	R4884566
Sulfate in Water by IC							
Sulfate (SO4)	5.57		0.30	mg/L		24-OCT-19	R4884134
Total Dissolved Solids							
Total Dissolved Solids	201	DLHC	20	mg/L		29-OCT-19	R4889928
Total Suspended Solids							
Total Suspended Solids	11.0		1.0	mg/L		28-OCT-19	R4889096
Turbidity							
Turbidity	12.9		0.10	NTU		24-OCT-19	R4883631
pH							
pH	8.31		0.10	pH		25-OCT-19	R4888006

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		with stannous chloride, and analyzed by CVAAS or CVAFS.	
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	
		Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:	
		Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]	
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
		This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.	
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
		This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.	
		It is recommended that this analysis be conducted in the field.	
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.	
PH-CL	Water	pH	APHA 4500 H-Electrode
		pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)	
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
		A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).	
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	
		Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20191023 DC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

*mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.*

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2371413

Report Date: 31-OCT-19

Page 1 of 11

Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4888065							
WG3203249-2	LCS							
Acidity (as CaCO3)			97.5		%		85-115	25-OCT-19
WG3203249-1	MB							
Acidity (as CaCO3)			1.2		mg/L		2	25-OCT-19
ALK-MAN-CL								
	Water							
Batch	R4888006							
WG3203253-6	DUP	L2371413-1						
Alkalinity, Total (as CaCO3)		449	465		mg/L	3.6	20	25-OCT-19
WG3203253-11	LCS							
Alkalinity, Total (as CaCO3)			99.5		%		85-115	25-OCT-19
WG3203253-5	LCS							
Alkalinity, Total (as CaCO3)			99.9		%		85-115	25-OCT-19
WG3203253-10	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	25-OCT-19
WG3203253-4	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	25-OCT-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4888233							
WG3201889-2	LCS							
Beryllium (Be)-Dissolved			99.6		%		80-120	26-OCT-19
WG3201889-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	26-OCT-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4888233							
WG3201973-2	LCS							
Beryllium (Be)-Total			105.0		%		80-120	26-OCT-19
WG3201973-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	26-OCT-19
BR-L-IC-N-CL								
	Water							
Batch	R4884134							
WG3201511-10	LCS							
Bromide (Br)			104.6		%		85-115	24-OCT-19
WG3201511-9	MB							
Bromide (Br)			<0.050		mg/L		0.05	24-OCT-19
C-DIS-ORG-LOW-CL								
	Water							

Quality Control Report

Workorder: L2371413

Report Date: 31-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4889000							
WG3204701-2	LCS							
Dissolved Organic Carbon			99.4		%		80-120	28-OCT-19
WG3204701-6	LCS							
Dissolved Organic Carbon			89.1		%		80-120	29-OCT-19
WG3204701-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	28-OCT-19
WG3204701-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	29-OCT-19
C-TOT-ORG-LOW-CL								
	Water							
Batch	R4889000							
WG3204701-2	LCS							
Total Organic Carbon			100.8		%		80-120	28-OCT-19
WG3204701-6	LCS							
Total Organic Carbon			90.9		%		80-120	29-OCT-19
WG3204701-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	28-OCT-19
WG3204701-5	MB							
Total Organic Carbon			<0.50		mg/L		0.5	29-OCT-19
CL-IC-N-CL								
	Water							
Batch	R4884134							
WG3201511-10	LCS							
Chloride (Cl)			102.3		%		90-110	24-OCT-19
WG3201511-9	MB							
Chloride (Cl)			<0.50		mg/L		0.5	24-OCT-19
EC-L-PCT-CL								
	Water							
Batch	R4888006							
WG3203253-6	DUP	L2371413-1						
Conductivity (@ 25C)		724	731		uS/cm	1.0	10	25-OCT-19
WG3203253-11	LCS							
Conductivity (@ 25C)			100.9		%		90-110	25-OCT-19
WG3203253-5	LCS							
Conductivity (@ 25C)			98.8		%		90-110	25-OCT-19
WG3203253-10	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	25-OCT-19
WG3203253-4	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	25-OCT-19
F-IC-N-CL								
	Water							

Quality Control Report

Workorder: L2371413

Report Date: 31-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-CL		Water						
Batch	R4884134							
WG3201511-10	LCS							
Fluoride (F)			103.0		%		90-110	24-OCT-19
WG3201511-9	MB							
Fluoride (F)			<0.020		mg/L		0.02	24-OCT-19
HG-D-CVAA-VA		Water						
Batch	R4889334							
WG3203886-10	LCS							
Mercury (Hg)-Dissolved			100.8		%		80-120	29-OCT-19
WG3203886-9	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	29-OCT-19
MET-D-CCMS-VA		Water						
Batch	R4888233							
WG3201889-2	LCS							
Aluminum (Al)-Dissolved			104.7		%		80-120	26-OCT-19
Antimony (Sb)-Dissolved			96.9		%		80-120	26-OCT-19
Arsenic (As)-Dissolved			105.5		%		80-120	26-OCT-19
Barium (Ba)-Dissolved			102.8		%		80-120	26-OCT-19
Bismuth (Bi)-Dissolved			92.4		%		80-120	26-OCT-19
Boron (B)-Dissolved			109.9		%		80-120	26-OCT-19
Cadmium (Cd)-Dissolved			103.6		%		80-120	26-OCT-19
Calcium (Ca)-Dissolved			103.0		%		80-120	26-OCT-19
Chromium (Cr)-Dissolved			102.0		%		80-120	26-OCT-19
Cobalt (Co)-Dissolved			99.6		%		80-120	26-OCT-19
Copper (Cu)-Dissolved			98.4		%		80-120	26-OCT-19
Iron (Fe)-Dissolved			99.7		%		80-120	26-OCT-19
Lead (Pb)-Dissolved			95.6		%		80-120	26-OCT-19
Lithium (Li)-Dissolved			103.4		%		80-120	26-OCT-19
Magnesium (Mg)-Dissolved			102.5		%		80-120	26-OCT-19
Manganese (Mn)-Dissolved			104.7		%		80-120	26-OCT-19
Molybdenum (Mo)-Dissolved			103.7		%		80-120	26-OCT-19
Nickel (Ni)-Dissolved			100.1		%		80-120	26-OCT-19
Potassium (K)-Dissolved			103.9		%		80-120	26-OCT-19
Selenium (Se)-Dissolved			104.0		%		80-120	26-OCT-19
Silicon (Si)-Dissolved			110.7		%		60-140	26-OCT-19
Silver (Ag)-Dissolved			98.2		%		80-120	26-OCT-19
Sodium (Na)-Dissolved			105.5		%		80-120	26-OCT-19

Quality Control Report

Workorder: L2371413

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4888233							
WG3201889-2	LCS							
Strontium (Sr)-Dissolved			99.2		%		80-120	26-OCT-19
Thallium (Tl)-Dissolved			96.4		%		80-120	26-OCT-19
Tin (Sn)-Dissolved			99.8		%		80-120	26-OCT-19
Titanium (Ti)-Dissolved			106.3		%		80-120	26-OCT-19
Uranium (U)-Dissolved			98.3		%		80-120	26-OCT-19
Vanadium (V)-Dissolved			101.0		%		80-120	26-OCT-19
Zinc (Zn)-Dissolved			103.4		%		80-120	26-OCT-19
WG3201889-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	26-OCT-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	26-OCT-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	26-OCT-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	26-OCT-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	26-OCT-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	26-OCT-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	26-OCT-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	26-OCT-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	26-OCT-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	26-OCT-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	26-OCT-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	26-OCT-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	26-OCT-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	26-OCT-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	26-OCT-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	26-OCT-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	26-OCT-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	26-OCT-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	26-OCT-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-19

Quality Control Report

Workorder: L2371413

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4888233							
WG3201889-1	MB	NP						
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	26-OCT-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	26-OCT-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	26-OCT-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	26-OCT-19
MET-T-CCMS-VA								
	Water							
Batch	R4888233							
WG3201973-2	LCS							
Aluminum (Al)-Total			111.3		%		80-120	26-OCT-19
Antimony (Sb)-Total			111.3		%		80-120	26-OCT-19
Arsenic (As)-Total			109.6		%		80-120	26-OCT-19
Barium (Ba)-Total			107.5		%		80-120	26-OCT-19
Bismuth (Bi)-Total			105.3		%		80-120	26-OCT-19
Boron (B)-Total			112.7		%		80-120	26-OCT-19
Cadmium (Cd)-Total			107.0		%		80-120	26-OCT-19
Calcium (Ca)-Total			103.5		%		80-120	26-OCT-19
Chromium (Cr)-Total			109.3		%		80-120	26-OCT-19
Cobalt (Co)-Total			105.7		%		80-120	26-OCT-19
Copper (Cu)-Total			105.0		%		80-120	26-OCT-19
Iron (Fe)-Total			102.9		%		80-120	26-OCT-19
Lead (Pb)-Total			108.4		%		80-120	26-OCT-19
Lithium (Li)-Total			106.6		%		80-120	26-OCT-19
Magnesium (Mg)-Total			110.2		%		80-120	26-OCT-19
Manganese (Mn)-Total			105.7		%		80-120	26-OCT-19
Molybdenum (Mo)-Total			108.6		%		80-120	26-OCT-19
Nickel (Ni)-Total			107.0		%		80-120	26-OCT-19
Potassium (K)-Total			108.3		%		80-120	26-OCT-19
Selenium (Se)-Total			104.3		%		80-120	26-OCT-19
Silicon (Si)-Total			115.9		%		80-120	26-OCT-19
Silver (Ag)-Total			103.2		%		80-120	26-OCT-19
Sodium (Na)-Total			110.0		%		80-120	26-OCT-19
Strontium (Sr)-Total			104.2		%		80-120	26-OCT-19
Thallium (Tl)-Total			105.1		%		80-120	26-OCT-19
Tin (Sn)-Total			106.7		%		80-120	26-OCT-19
Titanium (Ti)-Total			111.8		%		80-120	26-OCT-19

Quality Control Report

Workorder: L2371413

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4888233							
WG3201973-2	LCS							
Uranium (U)-Total			107.9		%		80-120	26-OCT-19
Vanadium (V)-Total			108.4		%		80-120	26-OCT-19
Zinc (Zn)-Total			104.7		%		80-120	26-OCT-19
WG3201973-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	26-OCT-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	26-OCT-19
Boron (B)-Total			<0.010		mg/L		0.01	26-OCT-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	26-OCT-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	26-OCT-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	26-OCT-19
Iron (Fe)-Total			<0.010		mg/L		0.01	26-OCT-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	26-OCT-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	26-OCT-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	26-OCT-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	26-OCT-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	26-OCT-19
Potassium (K)-Total			<0.050		mg/L		0.05	26-OCT-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	26-OCT-19
Silicon (Si)-Total			<0.10		mg/L		0.1	26-OCT-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	26-OCT-19
Sodium (Na)-Total			<0.050		mg/L		0.05	26-OCT-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	26-OCT-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	26-OCT-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	26-OCT-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	26-OCT-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	26-OCT-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	26-OCT-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-L-F-CL								
Batch R4892248								
WG3206395-3	DUP	L2371413-2						
Ammonia as N		0.0110	0.0129		mg/L	16	20	30-OCT-19
WG3206395-14	LCS							
Ammonia as N			97.6		%		85-115	30-OCT-19
WG3206395-2	LCS							
Ammonia as N			102.4		%		85-115	30-OCT-19
WG3206395-1	MB							
Ammonia as N			<0.0050		mg/L		0.005	30-OCT-19
WG3206395-13	MB							
Ammonia as N			<0.0050		mg/L		0.005	30-OCT-19
WG3206395-4	MS	L2371413-2						
Ammonia as N			117.3		%		75-125	30-OCT-19
NO2-L-IC-N-CL								
Batch R4884134								
WG3201511-10	LCS							
Nitrite (as N)			103.8		%		90-110	24-OCT-19
WG3201511-9	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	24-OCT-19
NO3-L-IC-N-CL								
Batch R4884134								
WG3201511-10	LCS							
Nitrate (as N)			103.0		%		90-110	24-OCT-19
WG3201511-9	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	24-OCT-19
ORP-CL								
Batch R4883661								
WG3200864-5	CRM	CL-ORP						
ORP			222		mV		210-230	24-OCT-19
P-T-L-COL-CL								
Batch R4884566								
WG3201630-18	LCS							
Phosphorus (P)-Total			107.7		%		80-120	25-OCT-19
WG3201630-17	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	25-OCT-19
PH-CL								
Water								

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-CL								
Water								
Batch	R4888006							
WG3203253-6	DUP	L2371413-1						
pH		8.39	8.20	J	pH	0.19	0.2	25-OCT-19
WG3203253-11	LCS							
pH			7.02		pH		6.9-7.1	25-OCT-19
WG3203253-5	LCS							
pH			7.01		pH		6.9-7.1	25-OCT-19
PO4-DO-L-COL-CL								
Water								
Batch	R4883326							
WG3200572-10	LCS							
Orthophosphate-Dissolved (as P)			102.4		%		80-120	24-OCT-19
WG3200572-9	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	24-OCT-19
SO4-IC-N-CL								
Water								
Batch	R4884134							
WG3201511-10	LCS							
Sulfate (SO4)			102.5		%		90-110	24-OCT-19
WG3201511-9	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	24-OCT-19
SOLIDS-TDS-CL								
Water								
Batch	R4889928							
WG3204372-5	LCS							
Total Dissolved Solids			100.7		%		85-115	29-OCT-19
WG3204372-4	MB							
Total Dissolved Solids			<10		mg/L		10	29-OCT-19
TKN-L-F-CL								
Water								
Batch	R4884311							
WG3201558-14	LCS							
Total Kjeldahl Nitrogen			100.3		%		75-125	25-OCT-19
WG3201558-18	LCS							
Total Kjeldahl Nitrogen			98.1		%		75-125	25-OCT-19
WG3201558-13	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	25-OCT-19
WG3201558-17	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	25-OCT-19
TSS-L-CL								
Water								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-L-CL	Water							
Batch	R4889096							
WG3203434-10 LCS								
Total Suspended Solids			95.5		%		85-115	28-OCT-19
WG3203434-9 MB								
Total Suspended Solids			<1.0		mg/L		1	28-OCT-19
TURBIDITY-CL	Water							
Batch	R4883631							
WG3200828-8 LCS								
Turbidity			95.0		%		85-115	24-OCT-19
WG3200828-7 MB								
Turbidity			<0.10		NTU		0.1	24-OCT-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.

Quality Control Report

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation reduction potential by elect.	1	23-OCT-19 12:42	24-OCT-19 17:45	0.25	29	hours	EHTR-FM
	2	23-OCT-19 13:15	24-OCT-19 17:45	0.25	29	hours	EHTR-FM
pH	1	23-OCT-19 12:42	25-OCT-19 09:00	0.25	44	hours	EHTR-FM
	2	23-OCT-19 13:15	25-OCT-19 09:00	0.25	44	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2371413 were received on 24-OCT-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID:	20191023 DC GW			TURNAROUND TIME:		RUSH:				
PROJECT/CLIENT INFO				LABORATORY			OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary		Report Format / Distribution	Excel	PDF	EDD
Project Manager	Carla Froyman Parker			Lab Contact	Lyudmyla Shveits		Email 1:	carla.froymanparker@teck.com		
Email	Carla.FroymanParker@teck.com			Email	Lyudmyla.Shveits@ALSGlobal.com		Email 2:	teckcoal@equisonline.com		
Address	Box 2003 15km North Hwy 43			Address	2559 29 Street NE		Email 3:	drake.tymstra@teck.com		
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 4:	kirsten.campbell@teck.com	
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	Email 5:	kenedy.allen@teck.com	
Phone Number	250-425-3196			Phone Number	403 407.1794		PO number	2099608129		

SAMPLE DETAILS Filtered - F: Field, L: Lab, FL: Field & Lab, N: None

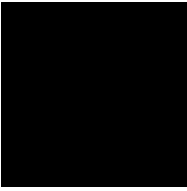


L2371413-COFC

Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS REQUESTED						
								ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC	
LC_PIZDC1404D_WG_Q4-2019_NP	LC_PIZDC1404D	WG		2019/10/23	12:42	G	6	1	1	1	1	1	1	
LC_PIZDC1404S_WG_Q4-2019_NP	LC_PIZDC1404S	WG		2019/10/23	13:15	G	6	1	1	1	1	1	1	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
(400) (401) (402) (403) (404) (405) (406) (407) (408) (409) (410) (411) (412) (413) (414) (415) (416) (417) (418) (419) (420) (421) (422) (423) (424) (425) (426) (427) (428) (429) (430) (431) (432) (433) (434) (435) (436) (437) (438) (439) (440) (441) (442) (443) (444) (445) (446) (447) (448) (449) (450) (451) (452) (453) (454) (455) (456) (457) (458) (459) (460) (461) (462) (463) (464) (465) (466) (467) (468) (469) (470) (471) (472) (473) (474) (475) (476) (477) (478) (479) (480) (481) (482) (483) (484) (485) (486) (487) (488) (489) (490) (491) (492) (493) (494) (495) (496) (497) (498) (499) (500)	D.Tymstra/K.Campbell	23-Oct	<i>DK</i>	10/24 0900
SERVICE REQUEST (rush subject to availability)	Sampler's Name	Mobile #	Sampler's Signature	Date/Time
Regular (default) <input checked="" type="checkbox"/>	K. Campbell/D. Tymstra			October 23, 2019
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

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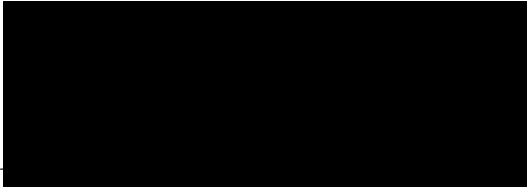
TECK COAL LIMITED (LINE CREEK)
ATTN: Chris Blurton
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 31-OCT-19
Report Date: 06-NOV-19 18:06 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2375126
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191010
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-1 LC_PIZDC1307_WG_Q4-2019_NP							
Sampled By: KC/DT on 30-OCT-19 @ 13:10							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.93		0.50	mg/L		03-NOV-19	R4896761
Total Kjeldahl Nitrogen	0.218		0.050	mg/L		01-NOV-19	R4895549
Total Organic Carbon	2.97		0.50	mg/L		03-NOV-19	R4896761
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	01-NOV-19	03-NOV-19	R4896765
Dissolved Metals Filtration Location	FIELD					01-NOV-19	R4896063
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	04-NOV-19	05-NOV-19	R4898478
Dissolved Mercury Filtration Location	FIELD					04-NOV-19	R4896948
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					01-NOV-19	R4896063
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	01-NOV-19	03-NOV-19	R4896765
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Arsenic (As)-Dissolved	0.00129		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Barium (Ba)-Dissolved	1.41		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Boron (B)-Dissolved	0.022		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Cadmium (Cd)-Dissolved	<0.010	DLM	0.010	ug/L	01-NOV-19	03-NOV-19	R4896765
Calcium (Ca)-Dissolved	36.3		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	01-NOV-19	03-NOV-19	R4896765
Copper (Cu)-Dissolved	0.00027		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Iron (Fe)-Dissolved	0.199		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Lithium (Li)-Dissolved	0.0737		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Magnesium (Mg)-Dissolved	22.2		0.10	mg/L	01-NOV-19	03-NOV-19	R4896765
Manganese (Mn)-Dissolved	0.00860		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Molybdenum (Mo)-Dissolved	0.0316		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Nickel (Ni)-Dissolved	0.00072		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Potassium (K)-Dissolved	5.33		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	01-NOV-19	03-NOV-19	R4896765
Silicon (Si)-Dissolved	2.82		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Sodium (Na)-Dissolved	14.7		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Strontium (Sr)-Dissolved	0.135		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Uranium (U)-Dissolved	0.000027		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Zinc (Zn)-Dissolved	0.0030		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Hardness							
Hardness (as CaCO3)	182		0.50	mg/L		05-NOV-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.029		0.020	ug/L		02-NOV-19	R4897295
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.467		0.0030	mg/L		04-NOV-19	R4898993
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		02-NOV-19	R4897295
Arsenic (As)-Total	0.00161		0.00010	mg/L		02-NOV-19	R4897295

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-1 LC_PIZDC1307_WG_Q4-2019_NP							
Sampled By: KC/DT on 30-OCT-19 @ 13:10							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	1.42		0.00010	mg/L		02-NOV-19	R4897295
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		02-NOV-19	R4897295
Boron (B)-Total	0.024		0.010	mg/L		02-NOV-19	R4897295
Cadmium (Cd)-Total	0.0824		0.0050	ug/L		02-NOV-19	R4897295
Calcium (Ca)-Total	38.7		0.050	mg/L		02-NOV-19	R4897295
Chromium (Cr)-Total	0.00065		0.00010	mg/L		02-NOV-19	R4897295
Cobalt (Co)-Total	0.14		0.10	ug/L		02-NOV-19	R4897295
Copper (Cu)-Total	0.00277		0.00050	mg/L		02-NOV-19	R4897295
Iron (Fe)-Total	1.29		0.010	mg/L		02-NOV-19	R4897295
Lead (Pb)-Total	0.000596		0.000050	mg/L		02-NOV-19	R4897295
Lithium (Li)-Total	0.0815		0.0010	mg/L		02-NOV-19	R4897295
Magnesium (Mg)-Total	19.5		0.10	mg/L		02-NOV-19	R4897295
Manganese (Mn)-Total	0.0130		0.00010	mg/L		02-NOV-19	R4897295
Molybdenum (Mo)-Total	0.0307		0.000050	mg/L		02-NOV-19	R4897295
Nickel (Ni)-Total	0.00140		0.00050	mg/L		02-NOV-19	R4897295
Potassium (K)-Total	4.98		0.050	mg/L		02-NOV-19	R4897295
Selenium (Se)-Total	<0.050		0.050	ug/L		02-NOV-19	R4897295
Silicon (Si)-Total	3.24		0.10	mg/L		02-NOV-19	R4897295
Silver (Ag)-Total	0.000041		0.000010	mg/L		04-NOV-19	R4898993
Sodium (Na)-Total	13.5		0.050	mg/L		02-NOV-19	R4897295
Strontium (Sr)-Total	0.126		0.00020	mg/L		02-NOV-19	R4897295
Thallium (Tl)-Total	0.000013		0.000010	mg/L		02-NOV-19	R4897295
Tin (Sn)-Total	0.00016		0.00010	mg/L		02-NOV-19	R4897295
Titanium (Ti)-Total	<0.010		0.010	mg/L		02-NOV-19	R4897295
Uranium (U)-Total	0.000077		0.000010	mg/L		02-NOV-19	R4897295
Vanadium (V)-Total	0.00122		0.00050	mg/L		02-NOV-19	R4897295
Zinc (Zn)-Total	0.0104		0.0030	mg/L		02-NOV-19	R4897295
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4895745
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	219		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Carbonate (as CaCO3)	4.4		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Total (as CaCO3)	223		1.0	mg/L		01-NOV-19	R4897006
Ammonia, Total (as N)							
Ammonia as N	0.131		0.0050	mg/L		05-NOV-19	R4900036
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		31-OCT-19	R4895623
Chloride in Water by IC							
Chloride (Cl)	0.68		0.50	mg/L		31-OCT-19	R4895623
Electrical Conductivity (EC)							
Conductivity (@ 25C)	355		2.0	uS/cm		01-NOV-19	R4897006
Fluoride in Water by IC							
Fluoride (F)	0.584		0.020	mg/L		31-OCT-19	R4895623
Ion Balance Calculation							
Ion Balance	97.8		-100	%		05-NOV-19	
Ion Balance Calculation							
Cation - Anion Balance	-1.1			%		05-NOV-19	
Anion Sum	4.52			meq/L		05-NOV-19	
Cation Sum	4.42			meq/L		05-NOV-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-1 LC_PIZDC1307_WG_Q4-2019_NP Sampled By: KC/DT on 30-OCT-19 @ 13:10 Matrix: WG							
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.0121		0.0050	mg/L		31-OCT-19	R4895623
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		31-OCT-19	R4895623
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0010		0.0010	mg/L		31-OCT-19	R4893366
Oxidation redution potential by elect. ORP	478		-1000	mV		31-OCT-19	R4893526
Phosphorus (P)-Total Phosphorus (P)-Total	0.0387		0.0020	mg/L		04-NOV-19	R4897866
Sulfate in Water by IC Sulfate (SO4)	0.38		0.30	mg/L		31-OCT-19	R4895623
Total Dissolved Solids Total Dissolved Solids	216	DLHC	20	mg/L		04-NOV-19	R4899012
Total Suspended Solids Total Suspended Solids	24.0		1.0	mg/L		03-NOV-19	R4898646
Turbidity Turbidity	36.2		0.10	NTU		31-OCT-19	R4893412
pH pH	8.31		0.10	pH		01-NOV-19	R4897006
L2375126-2 LC_PIZDC1308_WG_Q4-2019_NP Sampled By: KC/DT on 30-OCT-19 @ 12:28 Matrix: WG							
Miscellaneous Parameters Dissolved Organic Carbon	2.12		0.50	mg/L		03-NOV-19	R4896761
Total Kjeldahl Nitrogen	0.092		0.050	mg/L		01-NOV-19	R4895549
Total Organic Carbon	2.06		0.50	mg/L		03-NOV-19	R4896761
Dissolved Metals in Water Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	01-NOV-19	03-NOV-19	R4896765
Dissolved Metals Filtration Location	FIELD					01-NOV-19	R4896063
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	04-NOV-19	05-NOV-19	R4898478
Dissolved Mercury Filtration Location	FIELD					04-NOV-19	R4896948
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					01-NOV-19	R4896063
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	01-NOV-19	03-NOV-19	R4896765
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Arsenic (As)-Dissolved	0.00012		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Barium (Ba)-Dissolved	0.385		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Boron (B)-Dissolved	0.013		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Cadmium (Cd)-Dissolved	0.0469		0.0050	ug/L	01-NOV-19	03-NOV-19	R4896765
Calcium (Ca)-Dissolved	69.5		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Cobalt (Co)-Dissolved	0.90		0.10	ug/L	01-NOV-19	03-NOV-19	R4896765
Copper (Cu)-Dissolved	0.00025		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Iron (Fe)-Dissolved	0.206		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Lithium (Li)-Dissolved	0.0182		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Magnesium (Mg)-Dissolved	27.3		0.10	mg/L	01-NOV-19	03-NOV-19	R4896765
Manganese (Mn)-Dissolved	0.0804		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-2 LC_PIZDC1308_WG_Q4-2019_NP							
Sampled By: KC/DT on 30-OCT-19 @ 12:28							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	0.00630		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Nickel (Ni)-Dissolved	0.00167		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Potassium (K)-Dissolved	2.69		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Selenium (Se)-Dissolved	0.075		0.050	ug/L	01-NOV-19	03-NOV-19	R4896765
Silicon (Si)-Dissolved	4.45		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Sodium (Na)-Dissolved	4.97		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Strontium (Sr)-Dissolved	0.106		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Thallium (Tl)-Dissolved	0.000029		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Uranium (U)-Dissolved	0.000887		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Zinc (Zn)-Dissolved	0.0018		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Hardness							
Hardness (as CaCO3)	286		0.50	mg/L		04-NOV-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		02-NOV-19	R4897295
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0275		0.0030	mg/L		02-NOV-19	R4897295
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		02-NOV-19	R4897295
Arsenic (As)-Total	0.00023		0.00010	mg/L		02-NOV-19	R4897295
Barium (Ba)-Total	0.386		0.00010	mg/L		02-NOV-19	R4897295
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		02-NOV-19	R4897295
Boron (B)-Total	0.014		0.010	mg/L		02-NOV-19	R4897295
Cadmium (Cd)-Total	0.114		0.0050	ug/L		02-NOV-19	R4897295
Calcium (Ca)-Total	81.6		0.050	mg/L		02-NOV-19	R4897295
Chromium (Cr)-Total	0.00012		0.00010	mg/L		02-NOV-19	R4897295
Cobalt (Co)-Total	0.87		0.10	ug/L		02-NOV-19	R4897295
Copper (Cu)-Total	0.00054		0.00050	mg/L		02-NOV-19	R4897295
Iron (Fe)-Total	0.343		0.010	mg/L		02-NOV-19	R4897295
Lead (Pb)-Total	0.000149		0.000050	mg/L		02-NOV-19	R4897295
Lithium (Li)-Total	0.0198		0.0010	mg/L		02-NOV-19	R4897295
Magnesium (Mg)-Total	25.1		0.10	mg/L		02-NOV-19	R4897295
Manganese (Mn)-Total	0.0709		0.00010	mg/L		02-NOV-19	R4897295
Molybdenum (Mo)-Total	0.00489		0.000050	mg/L		02-NOV-19	R4897295
Nickel (Ni)-Total	0.00172		0.00050	mg/L		02-NOV-19	R4897295
Potassium (K)-Total	2.53		0.050	mg/L		02-NOV-19	R4897295
Selenium (Se)-Total	0.073		0.050	ug/L		02-NOV-19	R4897295
Silicon (Si)-Total	4.68		0.10	mg/L		02-NOV-19	R4897295
Silver (Ag)-Total	0.000014		0.000010	mg/L		02-NOV-19	R4897295
Sodium (Na)-Total	5.07		0.050	mg/L		02-NOV-19	R4897295
Strontium (Sr)-Total	0.104		0.00020	mg/L		02-NOV-19	R4897295
Thallium (Tl)-Total	0.000032		0.000010	mg/L		02-NOV-19	R4897295
Tin (Sn)-Total	<0.00010		0.00010	mg/L		02-NOV-19	R4897295
Titanium (Ti)-Total	<0.010		0.010	mg/L		02-NOV-19	R4897295
Uranium (U)-Total	0.00103		0.000010	mg/L		02-NOV-19	R4897295
Vanadium (V)-Total	<0.00050		0.00050	mg/L		02-NOV-19	R4897295
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		02-NOV-19	R4897295
Routine for Teck Coal							
Acidity by Automatic Titration							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-2 LC_PIZDC1308_WG_Q4-2019_NP Sampled By: KC/DT on 30-OCT-19 @ 12:28 Matrix: WG							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4895745
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	329		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Total (as CaCO3)	329		1.0	mg/L		01-NOV-19	R4897006
Ammonia, Total (as N)							
Ammonia as N	0.0378		0.0050	mg/L		05-NOV-19	R4900036
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		31-OCT-19	R4895623
Chloride in Water by IC							
Chloride (Cl)	1.03		0.50	mg/L		31-OCT-19	R4895623
Electrical Conductivity (EC)							
Conductivity (@ 25C)	526		2.0	uS/cm		01-NOV-19	R4897006
Fluoride in Water by IC							
Fluoride (F)	0.235		0.020	mg/L		31-OCT-19	R4895623
Ion Balance Calculation							
Cation - Anion Balance	-5.4			%		04-NOV-19	
Anion Sum	6.70			meq/L		04-NOV-19	
Cation Sum	6.01			meq/L		04-NOV-19	
Ion Balance Calculation							
Ion Balance	89.7		-100	%		04-NOV-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0142		0.0050	mg/L		31-OCT-19	R4895623
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		31-OCT-19	R4895623
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		31-OCT-19	R4893366
Oxidation redution potential by elect.							
ORP	439		-1000	mV		31-OCT-19	R4893526
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0037		0.0020	mg/L		04-NOV-19	R4897866
Sulfate in Water by IC							
Sulfate (SO4)	4.20		0.30	mg/L		31-OCT-19	R4895623
Total Dissolved Solids							
Total Dissolved Solids	322	DLHC	20	mg/L		04-NOV-19	R4899012
Total Suspended Solids							
Total Suspended Solids	5.6		1.0	mg/L		03-NOV-19	R4898646
Turbidity							
Turbidity	7.49		0.10	NTU		31-OCT-19	R4893412
pH							
pH	8.09		0.10	pH		01-NOV-19	R4897006
L2375126-3 WG_Q4-2019_CC1 Sampled By: KC/DT on 30-OCT-19 @ 12:28 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.90		0.50	mg/L		03-NOV-19	R4896761
Total Kjeldahl Nitrogen	0.080		0.050	mg/L		01-NOV-19	R4895549
Total Organic Carbon	2.08		0.50	mg/L		03-NOV-19	R4896761
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	01-NOV-19	03-NOV-19	R4896765

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-3 WG_Q4-2019_CC1							
Sampled By: KC/DT on 30-OCT-19 @ 12:28							
Matrix: WG							
Diss. Be (low) in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					01-NOV-19	R4896063
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	04-NOV-19	05-NOV-19	R4898478
Dissolved Mercury Filtration Location	FIELD					04-NOV-19	R4896948
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					01-NOV-19	R4896063
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	01-NOV-19	03-NOV-19	R4896765
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Arsenic (As)-Dissolved	0.00014		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Barium (Ba)-Dissolved	0.389		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Boron (B)-Dissolved	0.013		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Cadmium (Cd)-Dissolved	0.0390		0.0050	ug/L	01-NOV-19	03-NOV-19	R4896765
Calcium (Ca)-Dissolved	71.9		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Cobalt (Co)-Dissolved	0.90		0.10	ug/L	01-NOV-19	03-NOV-19	R4896765
Copper (Cu)-Dissolved	0.00022		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Iron (Fe)-Dissolved	0.203		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Lithium (Li)-Dissolved	0.0183		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Magnesium (Mg)-Dissolved	26.9		0.10	mg/L	01-NOV-19	03-NOV-19	R4896765
Manganese (Mn)-Dissolved	0.0812		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Molybdenum (Mo)-Dissolved	0.00631	DTMF	0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Nickel (Ni)-Dissolved	0.00168		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Potassium (K)-Dissolved	2.67		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Selenium (Se)-Dissolved	0.053		0.050	ug/L	01-NOV-19	03-NOV-19	R4896765
Silicon (Si)-Dissolved	4.43		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Sodium (Na)-Dissolved	4.97		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Strontium (Sr)-Dissolved	0.105		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Thallium (Tl)-Dissolved	0.000027		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Uranium (U)-Dissolved	0.000884		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Zinc (Zn)-Dissolved	0.0018		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Hardness							
Hardness (as CaCO3)	290		0.50	mg/L		05-NOV-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		02-NOV-19	R4897295
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		04-NOV-19	R4898268
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0622		0.0030	mg/L		02-NOV-19	R4897295
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		04-NOV-19	R4898993
Arsenic (As)-Total	0.00023		0.00010	mg/L		02-NOV-19	R4897295
Barium (Ba)-Total	0.392		0.00010	mg/L		02-NOV-19	R4897295
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		02-NOV-19	R4897295
Boron (B)-Total	0.012		0.010	mg/L		02-NOV-19	R4897295
Cadmium (Cd)-Total	0.123		0.0050	ug/L		02-NOV-19	R4897295
Calcium (Ca)-Total	73.1		0.050	mg/L		02-NOV-19	R4897295

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-3 WG_Q4-2019_CC1							
Sampled By: KC/DT on 30-OCT-19 @ 12:28							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Chromium (Cr)-Total	0.00017		0.00010	mg/L		02-NOV-19	R4897295
Cobalt (Co)-Total	0.88		0.10	ug/L		02-NOV-19	R4897295
Copper (Cu)-Total	0.00067		0.00050	mg/L		02-NOV-19	R4897295
Iron (Fe)-Total	0.355		0.010	mg/L		02-NOV-19	R4897295
Lead (Pb)-Total	0.000154		0.000050	mg/L		02-NOV-19	R4897295
Lithium (Li)-Total	0.0172		0.0010	mg/L		02-NOV-19	R4897295
Magnesium (Mg)-Total	24.9		0.10	mg/L		02-NOV-19	R4897295
Manganese (Mn)-Total	0.0704		0.00010	mg/L		02-NOV-19	R4897295
Molybdenum (Mo)-Total	0.00444		0.000050	mg/L		02-NOV-19	R4897295
Nickel (Ni)-Total	0.00171		0.00050	mg/L		02-NOV-19	R4897295
Potassium (K)-Total	2.51		0.050	mg/L		02-NOV-19	R4897295
Selenium (Se)-Total	0.051		0.050	ug/L		02-NOV-19	R4897295
Silicon (Si)-Total	4.64		0.10	mg/L		02-NOV-19	R4897295
Silver (Ag)-Total	<0.000010		0.000010	mg/L		02-NOV-19	R4897295
Sodium (Na)-Total	5.04		0.050	mg/L		02-NOV-19	R4897295
Strontium (Sr)-Total	0.0956		0.00020	mg/L		02-NOV-19	R4897295
Thallium (Tl)-Total	0.000031		0.000010	mg/L		02-NOV-19	R4897295
Tin (Sn)-Total	0.00021		0.00010	mg/L		02-NOV-19	R4897295
Titanium (Ti)-Total	<0.010		0.010	mg/L		02-NOV-19	R4897295
Uranium (U)-Total	0.000950		0.000010	mg/L		02-NOV-19	R4897295
Vanadium (V)-Total	0.00055		0.00050	mg/L		02-NOV-19	R4897295
Zinc (Zn)-Total	0.0030		0.0030	mg/L		02-NOV-19	R4897295
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.3		1.0	mg/L		01-NOV-19	R4895745
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	324		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Total (as CaCO3)	324		1.0	mg/L		01-NOV-19	R4897006
Ammonia, Total (as N)							
Ammonia as N	0.0413		0.0050	mg/L		05-NOV-19	R4900036
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		31-OCT-19	R4895623
Chloride in Water by IC							
Chloride (Cl)	1.09		0.50	mg/L		31-OCT-19	R4895623
Electrical Conductivity (EC)							
Conductivity (@ 25C)	526		2.0	uS/cm		01-NOV-19	R4897006
Fluoride in Water by IC							
Fluoride (F)	0.202		0.020	mg/L		31-OCT-19	R4895623
Ion Balance Calculation							
Ion Balance	92.2		-100	%		05-NOV-19	
Ion Balance Calculation							
Cation - Anion Balance	-4.1			%		05-NOV-19	
Anion Sum	6.62			meq/L		05-NOV-19	
Cation Sum	6.10			meq/L		05-NOV-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0156		0.0050	mg/L		31-OCT-19	R4895623
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		31-OCT-19	R4895623
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		31-OCT-19	R4893366

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-3 WG_Q4-2019_CC1							
Sampled By: KC/DT on 30-OCT-19 @ 12:28							
Matrix: WG							
Oxidation redution potential by elect.							
ORP	276		-1000	mV		31-OCT-19	R4893526
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0034		0.0020	mg/L		04-NOV-19	R4897866
Sulfate in Water by IC							
Sulfate (SO4)	4.52		0.30	mg/L		31-OCT-19	R4895623
Total Dissolved Solids							
Total Dissolved Solids	324	DLHC	20	mg/L		04-NOV-19	R4899012
Total Suspended Solids							
Total Suspended Solids	6.5		1.0	mg/L		03-NOV-19	R4898646
Turbidity							
Turbidity	7.04		0.10	NTU		31-OCT-19	R4893412
pH							
pH	8.11		0.10	pH		01-NOV-19	R4897006

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20191010

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2375126

Report Date: 06-NOV-19

Page 1 of 16

Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4895745							
WG3208457-2	LCS							
Acidity (as CaCO3)			100.9		%		85-115	01-NOV-19
WG3208457-5	LCS							
Acidity (as CaCO3)			99.4		%		85-115	01-NOV-19
WG3208457-1	MB							
Acidity (as CaCO3)			1.7		mg/L		2	01-NOV-19
WG3208457-4	MB							
Acidity (as CaCO3)			1.5		mg/L		2	01-NOV-19
ALK-MAN-CL								
	Water							
Batch	R4897006							
WG3209642-9	DUP	L2375126-2						
Alkalinity, Total (as CaCO3)		329	329		mg/L	0.2	20	01-NOV-19
WG3209642-8	LCS							
Alkalinity, Total (as CaCO3)			100.3		%		85-115	01-NOV-19
WG3209642-7	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	01-NOV-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4896765							
WG3208763-2	LCS							
Beryllium (Be)-Dissolved			88.7		%		80-120	03-NOV-19
WG3208763-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	03-NOV-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4897295							
WG3208734-3	DUP	L2375126-1						
Beryllium (Be)-Total		0.000029	0.000024		mg/L	18	20	02-NOV-19
WG3208734-2	LCS							
Beryllium (Be)-Total			98.2		%		80-120	02-NOV-19
WG3208734-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	02-NOV-19
WG3208734-4	MS	L2375126-2						
Beryllium (Be)-Total			99.1		%		70-130	02-NOV-19
BR-L-IC-N-CL								
	Water							
Batch	R4895623							
WG3208339-7	DUP	L2375126-3						
Bromide (Br)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	31-OCT-19
WG3208339-6	LCS							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-L-IC-N-CL								
Batch R4895623								
WG3208339-6	LCS							
Bromide (Br)			104.7		%		85-115	31-OCT-19
WG3208339-5	MB							
Bromide (Br)			<0.050		mg/L		0.05	31-OCT-19
WG3208339-8	MS	L2375126-3						
Bromide (Br)			113.0		%		75-125	31-OCT-19
C-DIS-ORG-LOW-CL								
Batch R4896761								
WG3209597-11	DUP	L2375126-3						
Dissolved Organic Carbon		1.90	1.89		mg/L	0.4	20	03-NOV-19
WG3209597-2	LCS							
Dissolved Organic Carbon			117.7		%		80-120	03-NOV-19
WG3209597-6	LCS							
Dissolved Organic Carbon			94.0		%		80-120	03-NOV-19
WG3209597-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	03-NOV-19
WG3209597-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	03-NOV-19
WG3209597-12	MS	L2375126-3						
Dissolved Organic Carbon			85.7		%		70-130	03-NOV-19
C-TOT-ORG-LOW-CL								
Batch R4896761								
WG3209597-11	DUP	L2375126-3						
Total Organic Carbon		2.08	1.95		mg/L	6.6	20	03-NOV-19
WG3209597-2	LCS							
Total Organic Carbon			101.2		%		80-120	03-NOV-19
WG3209597-6	LCS							
Total Organic Carbon			85.0		%		80-120	03-NOV-19
WG3209597-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	03-NOV-19
WG3209597-5	MB							
Total Organic Carbon			<0.50		mg/L		0.5	03-NOV-19
WG3209597-12	MS	L2375126-3						
Total Organic Carbon			87.4		%		70-130	03-NOV-19
CL-IC-N-CL								
Water								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-CL		Water						
Batch	R4895623							
WG3208339-7	DUP	L2375126-3						
Chloride (Cl)		1.09	1.14		mg/L	4.2	20	31-OCT-19
WG3208339-6	LCS							
Chloride (Cl)			108.3		%		90-110	31-OCT-19
WG3208339-5	MB							
Chloride (Cl)			<0.50		mg/L		0.5	31-OCT-19
WG3208339-8	MS	L2375126-3						
Chloride (Cl)			117.3		%		75-125	31-OCT-19
EC-L-PCT-CL		Water						
Batch	R4897006							
WG3209642-9	DUP	L2375126-2						
Conductivity (@ 25C)		526	526		uS/cm	0.0	10	01-NOV-19
WG3209642-8	LCS							
Conductivity (@ 25C)			94.8		%		90-110	01-NOV-19
WG3209642-7	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	01-NOV-19
F-IC-N-CL		Water						
Batch	R4895623							
WG3208339-7	DUP	L2375126-3						
Fluoride (F)		0.202	0.197		mg/L	2.6	20	31-OCT-19
WG3208339-6	LCS							
Fluoride (F)			109.5		%		90-110	31-OCT-19
WG3208339-5	MB							
Fluoride (F)			<0.020		mg/L		0.02	31-OCT-19
WG3208339-8	MS	L2375126-3						
Fluoride (F)			115.9		%		75-125	31-OCT-19
HG-D-CVAA-VA		Water						
Batch	R4898478							
WG3209761-7	DUP	L2375126-2						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	05-NOV-19
WG3209761-6	LCS							
Mercury (Hg)-Dissolved			95.7		%		80-120	05-NOV-19
WG3209761-5	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	05-NOV-19
WG3209761-8	MS	L2375126-1						
Mercury (Hg)-Dissolved			105.1		%		70-130	05-NOV-19
HG-T-CVAA-VA		Water						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-VA		Water						
Batch	R4898268							
WG3210266-2	LCS							
Mercury (Hg)-Total			91.4		%		80-120	04-NOV-19
WG3210266-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	04-NOV-19
MET-D-CCMS-VA		Water						
Batch	R4896765							
WG3208763-2	LCS							
Aluminum (Al)-Dissolved			104.9		%		80-120	03-NOV-19
Antimony (Sb)-Dissolved			96.6		%		80-120	03-NOV-19
Arsenic (As)-Dissolved			97.0		%		80-120	03-NOV-19
Barium (Ba)-Dissolved			101.4		%		80-120	03-NOV-19
Bismuth (Bi)-Dissolved			95.3		%		80-120	03-NOV-19
Boron (B)-Dissolved			89.0		%		80-120	03-NOV-19
Cadmium (Cd)-Dissolved			98.6		%		80-120	03-NOV-19
Calcium (Ca)-Dissolved			90.7		%		80-120	03-NOV-19
Chromium (Cr)-Dissolved			99.8		%		80-120	03-NOV-19
Cobalt (Co)-Dissolved			97.9		%		80-120	03-NOV-19
Copper (Cu)-Dissolved			98.7		%		80-120	03-NOV-19
Iron (Fe)-Dissolved			99.3		%		80-120	03-NOV-19
Lead (Pb)-Dissolved			94.0		%		80-120	03-NOV-19
Lithium (Li)-Dissolved			86.7		%		80-120	03-NOV-19
Magnesium (Mg)-Dissolved			102.1		%		80-120	03-NOV-19
Manganese (Mn)-Dissolved			101.8		%		80-120	03-NOV-19
Molybdenum (Mo)-Dissolved			97.7		%		80-120	03-NOV-19
Nickel (Ni)-Dissolved			97.3		%		80-120	03-NOV-19
Potassium (K)-Dissolved			100.1		%		80-120	03-NOV-19
Selenium (Se)-Dissolved			100.8		%		80-120	03-NOV-19
Silicon (Si)-Dissolved			104.5		%		60-140	03-NOV-19
Silver (Ag)-Dissolved			96.6		%		80-120	03-NOV-19
Sodium (Na)-Dissolved			104.4		%		80-120	03-NOV-19
Strontium (Sr)-Dissolved			99.1		%		80-120	03-NOV-19
Thallium (Tl)-Dissolved			96.3		%		80-120	03-NOV-19
Tin (Sn)-Dissolved			95.9		%		80-120	03-NOV-19
Titanium (Ti)-Dissolved			98.7		%		80-120	03-NOV-19
Uranium (U)-Dissolved			93.3		%		80-120	03-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4896765							
WG3208763-2	LCS							
Vanadium (V)-Dissolved			100.0		%		80-120	03-NOV-19
Zinc (Zn)-Dissolved			98.3		%		80-120	03-NOV-19
WG3208763-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	03-NOV-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	03-NOV-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	03-NOV-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	03-NOV-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	03-NOV-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	03-NOV-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	03-NOV-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	03-NOV-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	03-NOV-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	03-NOV-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	03-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	03-NOV-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	03-NOV-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	03-NOV-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	03-NOV-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	03-NOV-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	03-NOV-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	03-NOV-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	03-NOV-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	03-NOV-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	03-NOV-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	03-NOV-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	03-NOV-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	03-NOV-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	03-NOV-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	03-NOV-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	03-NOV-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	03-NOV-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	03-NOV-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	03-NOV-19

MET-T-CCMS-VA

Water

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4897295							
WG3208734-3 DUP		L2375126-1						
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	02-NOV-19
Arsenic (As)-Total		0.00161	0.00169		mg/L	5.1	20	02-NOV-19
Barium (Ba)-Total		1.42	1.45		mg/L	1.9	20	02-NOV-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	02-NOV-19
Boron (B)-Total		0.024	0.024		mg/L	0.3	20	02-NOV-19
Cadmium (Cd)-Total		0.0000824	0.0000749		mg/L	9.5	20	02-NOV-19
Calcium (Ca)-Total		38.7	38.9		mg/L	0.5	20	02-NOV-19
Chromium (Cr)-Total		0.00065	0.00055		mg/L	17	20	02-NOV-19
Cobalt (Co)-Total		0.00014	0.00013		mg/L	4.2	20	02-NOV-19
Copper (Cu)-Total		0.00277	0.00283		mg/L	2.4	20	02-NOV-19
Iron (Fe)-Total		1.29	1.29		mg/L	0.4	20	02-NOV-19
Lead (Pb)-Total		0.000596	0.000592		mg/L	0.7	20	02-NOV-19
Lithium (Li)-Total		0.0815	0.0782		mg/L	4.1	20	02-NOV-19
Magnesium (Mg)-Total		19.5	20.0		mg/L	2.8	20	02-NOV-19
Manganese (Mn)-Total		0.0130	0.0127		mg/L	2.3	20	02-NOV-19
Molybdenum (Mo)-Total		0.0307	0.0299		mg/L	2.8	20	02-NOV-19
Nickel (Ni)-Total		0.00140	0.00134		mg/L	4.2	20	02-NOV-19
Potassium (K)-Total		4.98	5.06		mg/L	1.7	20	02-NOV-19
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	02-NOV-19
Silicon (Si)-Total		3.24	3.12		mg/L	3.9	20	02-NOV-19
Sodium (Na)-Total		13.5	13.5		mg/L	0.1	20	02-NOV-19
Strontium (Sr)-Total		0.126	0.124		mg/L	2.0	20	02-NOV-19
Thallium (Tl)-Total		0.000013	<0.000010	RPD-NA	mg/L	N/A	20	02-NOV-19
Tin (Sn)-Total		0.00016	0.00015		mg/L	8.0	20	02-NOV-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	02-NOV-19
Uranium (U)-Total		0.000077	0.000077		mg/L	0.4	20	02-NOV-19
Vanadium (V)-Total		0.00122	0.00105		mg/L	15	20	02-NOV-19
Zinc (Zn)-Total		0.0104	0.0104		mg/L	0.7	20	02-NOV-19
WG3208734-2 LCS								
Aluminum (Al)-Total			98.1		%		80-120	02-NOV-19
Antimony (Sb)-Total			108.8		%		80-120	02-NOV-19
Arsenic (As)-Total			102.2		%		80-120	02-NOV-19
Barium (Ba)-Total			101.9		%		80-120	02-NOV-19
Bismuth (Bi)-Total			101.3		%		80-120	02-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4897295							
WG3208734-2 LCS								
Boron (B)-Total			99.9		%		80-120	02-NOV-19
Cadmium (Cd)-Total			100.4		%		80-120	02-NOV-19
Calcium (Ca)-Total			100.6		%		80-120	02-NOV-19
Chromium (Cr)-Total			97.7		%		80-120	02-NOV-19
Cobalt (Co)-Total			98.2		%		80-120	02-NOV-19
Copper (Cu)-Total			97.7		%		80-120	02-NOV-19
Iron (Fe)-Total			92.8		%		80-120	02-NOV-19
Lead (Pb)-Total			101.5		%		80-120	02-NOV-19
Lithium (Li)-Total			99.6		%		80-120	02-NOV-19
Magnesium (Mg)-Total			97.7		%		80-120	02-NOV-19
Manganese (Mn)-Total			96.1		%		80-120	02-NOV-19
Molybdenum (Mo)-Total			104.1		%		80-120	02-NOV-19
Nickel (Ni)-Total			98.7		%		80-120	02-NOV-19
Potassium (K)-Total			99.0		%		80-120	02-NOV-19
Selenium (Se)-Total			98.3		%		80-120	02-NOV-19
Silicon (Si)-Total			107.4		%		80-120	02-NOV-19
Silver (Ag)-Total			99.9		%		80-120	02-NOV-19
Sodium (Na)-Total			104.1		%		80-120	02-NOV-19
Strontium (Sr)-Total			101.5		%		80-120	02-NOV-19
Thallium (Tl)-Total			100.9		%		80-120	02-NOV-19
Tin (Sn)-Total			100.5		%		80-120	02-NOV-19
Titanium (Ti)-Total			95.1		%		80-120	02-NOV-19
Uranium (U)-Total			104.4		%		80-120	02-NOV-19
Vanadium (V)-Total			102.9		%		80-120	02-NOV-19
Zinc (Zn)-Total			97.8		%		80-120	02-NOV-19
WG3208734-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	02-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	02-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	02-NOV-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	02-NOV-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	02-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4897295							
WG3208734-1 MB								
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	02-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	02-NOV-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	02-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	02-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	02-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	02-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	02-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	02-NOV-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	02-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	02-NOV-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	02-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	02-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	02-NOV-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	02-NOV-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	02-NOV-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	02-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	02-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	02-NOV-19
WG3208734-4 MS		L2375126-2						
Aluminum (Al)-Total			103.2		%		70-130	02-NOV-19
Antimony (Sb)-Total			93.1		%		70-130	02-NOV-19
Arsenic (As)-Total			101.3		%		70-130	02-NOV-19
Barium (Ba)-Total			N/A	MS-B	%		-	02-NOV-19
Bismuth (Bi)-Total			92.4		%		70-130	02-NOV-19
Boron (B)-Total			100.0		%		70-130	02-NOV-19
Cadmium (Cd)-Total			97.1		%		70-130	02-NOV-19
Calcium (Ca)-Total			N/A	MS-B	%		-	02-NOV-19
Chromium (Cr)-Total			98.3		%		70-130	02-NOV-19
Cobalt (Co)-Total			95.0		%		70-130	02-NOV-19
Copper (Cu)-Total			90.3		%		70-130	02-NOV-19

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MET-T-CCMS-VA								
	Water							
Batch	R4897295							
WG3208734-4 MS		L2375126-2						
Iron (Fe)-Total			97.6		%		70-130	02-NOV-19
Lead (Pb)-Total			89.8		%		70-130	02-NOV-19
Lithium (Li)-Total			99.6		%		70-130	02-NOV-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	02-NOV-19
Manganese (Mn)-Total			N/A	MS-B	%		-	02-NOV-19
Molybdenum (Mo)-Total			98.5		%		70-130	02-NOV-19
Nickel (Ni)-Total			90.7		%		70-130	02-NOV-19
Potassium (K)-Total			97.0		%		70-130	02-NOV-19
Selenium (Se)-Total			99.9		%		70-130	02-NOV-19
Silicon (Si)-Total			95.9		%		70-130	02-NOV-19
Silver (Ag)-Total			94.6		%		70-130	02-NOV-19
Sodium (Na)-Total			N/A	MS-B	%		-	02-NOV-19
Strontium (Sr)-Total			N/A	MS-B	%		-	02-NOV-19
Thallium (Tl)-Total			89.0		%		70-130	02-NOV-19
Tin (Sn)-Total			95.7		%		70-130	02-NOV-19
Titanium (Ti)-Total			97.4		%		70-130	02-NOV-19
Uranium (U)-Total			94.6		%		70-130	02-NOV-19
Vanadium (V)-Total			102.1		%		70-130	02-NOV-19
Zinc (Zn)-Total			91.6		%		70-130	02-NOV-19
Batch	R4898993							
WG3210268-5 DUP		L2375126-1						
Aluminum (Al)-Total		0.467	0.509		mg/L	8.7	20	04-NOV-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-NOV-19
Arsenic (As)-Total		0.00161	0.00172		mg/L	1.7	20	04-NOV-19
Barium (Ba)-Total		1.42	1.47		mg/L	3.2	20	04-NOV-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-NOV-19
Boron (B)-Total		0.024	0.026		mg/L	0.2	20	04-NOV-19
Calcium (Ca)-Total		38.7	40.5		mg/L	1.8	20	04-NOV-19
Chromium (Cr)-Total		0.00065	0.00122		mg/L	2.3	20	04-NOV-19
Cobalt (Co)-Total		0.00014	0.00018		mg/L	5.4	20	04-NOV-19
Copper (Cu)-Total		0.00277	0.00311		mg/L	1.3	20	04-NOV-19
Iron (Fe)-Total		1.29	1.45		mg/L	0.7	20	04-NOV-19
Lead (Pb)-Total		0.000596	0.000678		mg/L	0.1	20	04-NOV-19
Lithium (Li)-Total		0.0815	0.0803		mg/L	1.3	20	04-NOV-19

Quality Control Report

Workorder: L2375126

Report Date: 06-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4898993							
WG3210268-5 DUP		L2375126-1						
Magnesium (Mg)-Total		19.5	21.2		mg/L	1.2	20	04-NOV-19
Manganese (Mn)-Total		0.0130	0.0145		mg/L	0.8	20	04-NOV-19
Molybdenum (Mo)-Total		0.0307	0.0326		mg/L	2.0	20	04-NOV-19
Nickel (Ni)-Total		0.00140	0.00171		mg/L	1.6	20	04-NOV-19
Potassium (K)-Total		4.98	5.16		mg/L	2.2	20	04-NOV-19
Selenium (Se)-Total		<0.000050	0.000053		mg/L	5.9	20	04-NOV-19
Silicon (Si)-Total		3.24	4.05		mg/L	1.0	20	04-NOV-19
Silver (Ag)-Total		0.000041	0.000044		mg/L	6.0	20	04-NOV-19
Sodium (Na)-Total		13.5	14.4		mg/L	0.3	20	04-NOV-19
Strontium (Sr)-Total		0.126	0.142		mg/L	2.3	20	04-NOV-19
Thallium (Tl)-Total		0.000013	0.000016		mg/L	15	20	04-NOV-19
Tin (Sn)-Total		0.00016	0.00018		mg/L	5.5	20	04-NOV-19
Uranium (U)-Total		0.000077	0.000094		mg/L	1.6	20	04-NOV-19
Vanadium (V)-Total		0.00122	0.00293		mg/L	7.1	20	04-NOV-19
Zinc (Zn)-Total		0.0104	0.0118		mg/L	2.3	20	04-NOV-19
WG3210268-2 LCS								
Aluminum (Al)-Total			104.0		%		80-120	04-NOV-19
Antimony (Sb)-Total			107.5		%		80-120	04-NOV-19
Arsenic (As)-Total			100.9		%		80-120	04-NOV-19
Barium (Ba)-Total			100.7		%		80-120	04-NOV-19
Bismuth (Bi)-Total			106.8		%		80-120	04-NOV-19
Boron (B)-Total			98.0		%		80-120	04-NOV-19
Cadmium (Cd)-Total			106.3		%		80-120	04-NOV-19
Calcium (Ca)-Total			104.7		%		80-120	04-NOV-19
Chromium (Cr)-Total			103.4		%		80-120	04-NOV-19
Cobalt (Co)-Total			103.8		%		80-120	04-NOV-19
Copper (Cu)-Total			102.2		%		80-120	04-NOV-19
Iron (Fe)-Total			101.5		%		80-120	04-NOV-19
Lead (Pb)-Total			105.4		%		80-120	04-NOV-19
Lithium (Li)-Total			101.9		%		80-120	04-NOV-19
Magnesium (Mg)-Total			103.1		%		80-120	04-NOV-19
Manganese (Mn)-Total			104.9		%		80-120	04-NOV-19
Molybdenum (Mo)-Total			106.1		%		80-120	04-NOV-19
Nickel (Ni)-Total			105.6		%		80-120	04-NOV-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4898993							
WG3210268-2 LCS								
Potassium (K)-Total			98.1		%		80-120	04-NOV-19
Selenium (Se)-Total			109.3		%		80-120	04-NOV-19
Silicon (Si)-Total			106.1		%		80-120	04-NOV-19
Silver (Ag)-Total			104.1		%		80-120	04-NOV-19
Sodium (Na)-Total			110.3		%		80-120	04-NOV-19
Strontium (Sr)-Total			102.8		%		80-120	04-NOV-19
Thallium (Tl)-Total			104.9		%		80-120	04-NOV-19
Tin (Sn)-Total			105.0		%		80-120	04-NOV-19
Titanium (Ti)-Total			104.7		%		80-120	04-NOV-19
Uranium (U)-Total			100.4		%		80-120	04-NOV-19
Vanadium (V)-Total			104.2		%		80-120	04-NOV-19
Zinc (Zn)-Total			105.7		%		80-120	04-NOV-19
WG3210268-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	04-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	04-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	04-NOV-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	04-NOV-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	04-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	04-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	04-NOV-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	04-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	04-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	04-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	04-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	04-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	04-NOV-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	04-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	04-NOV-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
Water								
Batch	R4898993							
WG3210268-1	MB							
Silver (Ag)-Total			<0.000010		mg/L		0.00001	04-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	04-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	04-NOV-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	04-NOV-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	04-NOV-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	04-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	04-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	04-NOV-19
NH3-L-F-CL								
Water								
Batch	R4900036							
WG3211471-14	LCS							
Ammonia as N			113.7		%		85-115	05-NOV-19
WG3211471-13	MB							
Ammonia as N			<0.0050		mg/L		0.005	05-NOV-19
NO2-L-IC-N-CL								
Water								
Batch	R4895623							
WG3208339-7	DUP	L2375126-3						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	31-OCT-19
WG3208339-6	LCS							
Nitrite (as N)			106.9		%		90-110	31-OCT-19
WG3208339-5	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	31-OCT-19
WG3208339-8	MS	L2375126-3						
Nitrite (as N)			117.8		%		75-125	31-OCT-19
NO3-L-IC-N-CL								
Water								
Batch	R4895623							
WG3208339-7	DUP	L2375126-3						
Nitrate (as N)		0.0156	0.0164		mg/L	5.0	20	31-OCT-19
WG3208339-6	LCS							
Nitrate (as N)			108.2		%		90-110	31-OCT-19
WG3208339-5	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	31-OCT-19
WG3208339-8	MS	L2375126-3						
Nitrate (as N)			116.9		%		75-125	31-OCT-19
ORP-CL								
Water								

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ORP-CL								
Water								
Batch	R4893526							
WG3207572-3	CRM	CL-ORP						
ORP			217		mV		210-230	31-OCT-19
WG3207572-4	DUP	L2375126-2						
ORP		439	437	J	mV	1.5	15	31-OCT-19
P-T-L-COL-CL								
Water								
Batch	R4897866							
WG3209926-2	LCS							
Phosphorus (P)-Total			101.3		%		80-120	04-NOV-19
WG3209926-1	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	04-NOV-19
PH-CL								
Water								
Batch	R4897006							
WG3209642-9	DUP	L2375126-2						
pH		8.09	8.10	J	pH	0.01	0.2	01-NOV-19
WG3209642-8	LCS							
pH			7.01		pH		6.9-7.1	01-NOV-19
PO4-DO-L-COL-CL								
Water								
Batch	R4893366							
WG3207287-6	LCS							
Orthophosphate-Dissolved (as P)			100.6		%		80-120	31-OCT-19
WG3207287-5	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	31-OCT-19
SO4-IC-N-CL								
Water								
Batch	R4895623							
WG3208339-7	DUP	L2375126-3						
Sulfate (SO4)		4.52	4.56		mg/L	0.9	20	31-OCT-19
WG3208339-6	LCS							
Sulfate (SO4)			107.9		%		90-110	31-OCT-19
WG3208339-5	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	31-OCT-19
WG3208339-8	MS	L2375126-3						
Sulfate (SO4)			116.0		%		75-125	31-OCT-19
SOLIDS-TDS-CL								
Water								
Batch	R4899012							
WG3209631-8	LCS							
Total Dissolved Solids			101.8		%		85-115	04-NOV-19
WG3209631-7	MB							

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL								
Water								
Batch R4899012								
WG3209631-7 MB								
Total Dissolved Solids			<10		mg/L		10	04-NOV-19
TKN-L-F-CL								
Water								
Batch R4895549								
WG3208229-19 DUP								
Total Kjeldahl Nitrogen		L2375126-2 0.092	0.082		mg/L	12	20	01-NOV-19
WG3208229-14 LCS								
Total Kjeldahl Nitrogen			96.6		%		75-125	01-NOV-19
WG3208229-18 LCS								
Total Kjeldahl Nitrogen			96.9		%		75-125	01-NOV-19
WG3208229-13 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-NOV-19
WG3208229-17 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-NOV-19
WG3208229-20 MS								
Total Kjeldahl Nitrogen		L2375126-2	124.0		%		70-130	01-NOV-19
TSS-L-CL								
Water								
Batch R4898646								
WG3209204-10 LCS								
Total Suspended Solids			94.0		%		85-115	03-NOV-19
WG3209204-9 MB								
Total Suspended Solids			<1.0		mg/L		1	03-NOV-19
TURBIDITY-CL								
Water								
Batch R4893412								
WG3207471-5 LCS								
Turbidity			95.5		%		85-115	31-OCT-19
WG3207471-4 MB								
Turbidity			<0.10		NTU		0.1	31-OCT-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	30-OCT-19 13:10	31-OCT-19 16:45	0.25	28	hours	EHTR-FM
	2	30-OCT-19 12:28	31-OCT-19 16:45	0.25	28	hours	EHTR-FM
	3	30-OCT-19 12:28	31-OCT-19 16:45	0.25	28	hours	EHTR-FM
pH	1	30-OCT-19 13:10	01-NOV-19 11:00	0.25	46	hours	EHTR-FM
	2	30-OCT-19 12:28	01-NOV-19 11:00	0.25	47	hours	EHTR-FM
	3	30-OCT-19 12:28	01-NOV-19 11:00	0.25	47	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2375126 were received on 31-OCT-19 08:50.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: **20191010** TURNAROUND TIME: RUSH:

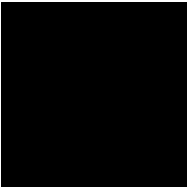
PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line-Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Chris Blurton			Lab Contact	Lyudmyla Shvets			Email 1:	carla.froymanparker@teck.com		
Email	Chris.Blurton@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		
Address	Box 2003			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com		
	15km North Hwy 43							Email 4:	kirstin.campbell@teck.com		
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 4:	kennedy.allen@teck.com		
Postal Code	V0B 2G0		Country	Canada	Postal Code	T1Y 7B5		Country	Canada	PO number	700008129
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS								ANALYSIS REQUESTED									
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC	HG-T-CVAF-VA	Filtered Field, Lab, VLS Field & Lab, VLS		
LC_PIZDC1307_WG_Q4-2019_NP	LC_PIZDC1307	WG		2019/10/30	13:10	G	6	1	1	1	1	1	1				
LC_PIZDC1308_WG_Q4-2019_NP	LC_PIZDC1308	WG		2019/10/30	12:28	G	6	1	1	1	1	1	1				
WG_Q4-2019_CCI	LC_PIZDC1308	WG		2019/10/30	12:28	G	7	1	1	1	1	1	1				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	D.Tymstra/K.Campbell	30-Oct	<i>[Signature]</i>	10/31 8:50

SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Mobile #	Sampler's Signature	Date/Time
Regular (default) <input checked="" type="checkbox"/> X Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	K. Campbell/D. Tymstra			October 30, 2019

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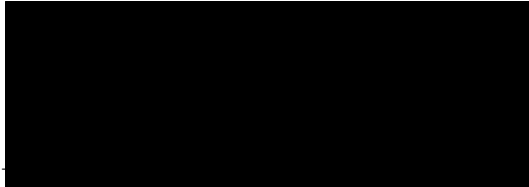
TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 07-NOV-19
Report Date: 17-NOV-19 16:31 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2379297
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191106 - DC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379297-1 LC_PIZDC0901_WG_Q4-2019_NP							
Sampled By: DT/KC on 06-NOV-19 @ 12:16							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	3.38		0.50	mg/L		09-NOV-19	R4904067
Total Kjeldahl Nitrogen	0.149		0.050	mg/L		09-NOV-19	R4903830
Total Organic Carbon	4.73		0.50	mg/L		09-NOV-19	R4904067
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	10-NOV-19	13-NOV-19	R4905405
Dissolved Metals Filtration Location	FIELD					10-NOV-19	R4904078
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	14-NOV-19	15-NOV-19	R4908847
Dissolved Mercury Filtration Location	FIELD					14-NOV-19	R4908407
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					13-NOV-19	R4905671
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	10-NOV-19	13-NOV-19	R4905405
Antimony (Sb)-Dissolved	0.00039		0.00010	mg/L	10-NOV-19	13-NOV-19	R4905405
Arsenic (As)-Dissolved	0.00034		0.00010	mg/L	10-NOV-19	13-NOV-19	R4905405
Barium (Ba)-Dissolved	0.316		0.00010	mg/L	10-NOV-19	13-NOV-19	R4905405
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	10-NOV-19	13-NOV-19	R4905405
Boron (B)-Dissolved	<0.010		0.010	mg/L	10-NOV-19	13-NOV-19	R4905405
Cadmium (Cd)-Dissolved	0.0564		0.0050	ug/L	10-NOV-19	13-NOV-19	R4905405
Calcium (Ca)-Dissolved	104		0.050	mg/L	10-NOV-19	13-NOV-19	R4905405
Chromium (Cr)-Dissolved	0.00012		0.00010	mg/L	10-NOV-19	13-NOV-19	R4905405
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	10-NOV-19	13-NOV-19	R4905405
Copper (Cu)-Dissolved	0.00060		0.00020	mg/L	10-NOV-19	13-NOV-19	R4905405
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	10-NOV-19	13-NOV-19	R4905405
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	10-NOV-19	13-NOV-19	R4905405
Lithium (Li)-Dissolved	0.0033		0.0010	mg/L	10-NOV-19	13-NOV-19	R4905405
Magnesium (Mg)-Dissolved	28.0		0.10	mg/L	10-NOV-19	13-NOV-19	R4905405
Manganese (Mn)-Dissolved	0.00026		0.00010	mg/L	10-NOV-19	13-NOV-19	R4905405
Molybdenum (Mo)-Dissolved	0.000763		0.000050	mg/L	10-NOV-19	13-NOV-19	R4905405
Nickel (Ni)-Dissolved	0.00114		0.00050	mg/L	10-NOV-19	13-NOV-19	R4905405
Potassium (K)-Dissolved	1.61		0.050	mg/L	10-NOV-19	13-NOV-19	R4905405
Selenium (Se)-Dissolved	1.57		0.050	ug/L	10-NOV-19	13-NOV-19	R4905405
Silicon (Si)-Dissolved	6.39		0.050	mg/L	10-NOV-19	13-NOV-19	R4905405
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	10-NOV-19	13-NOV-19	R4905405
Sodium (Na)-Dissolved	3.50		0.050	mg/L	10-NOV-19	13-NOV-19	R4905405
Strontium (Sr)-Dissolved	0.189		0.00020	mg/L	10-NOV-19	13-NOV-19	R4905405
Thallium (Tl)-Dissolved	0.000010		0.000010	mg/L	10-NOV-19	13-NOV-19	R4905405
Tin (Sn)-Dissolved	0.00012		0.00010	mg/L	13-NOV-19	13-NOV-19	R4905910
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	10-NOV-19	13-NOV-19	R4905405
Uranium (U)-Dissolved	0.00255		0.000010	mg/L	10-NOV-19	13-NOV-19	R4905405
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L	10-NOV-19	13-NOV-19	R4905405
Zinc (Zn)-Dissolved	0.0014		0.0010	mg/L	10-NOV-19	13-NOV-19	R4905405
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	375		0.50	mg/L		14-NOV-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	1.92		0.020	ug/L		13-NOV-19	R4905405
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.276		0.0030	mg/L		13-NOV-19	R4905405
Antimony (Sb)-Total	0.00042		0.00010	mg/L		13-NOV-19	R4905405
Arsenic (As)-Total	0.00054		0.00010	mg/L		13-NOV-19	R4905405

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379297-1 LC_PIZDC0901_WG_Q4-2019_NP							
Sampled By: DT/KC on 06-NOV-19 @ 12:16							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.293		0.00010	mg/L		13-NOV-19	R4905405
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		13-NOV-19	R4905405
Boron (B)-Total	0.010		0.010	mg/L		13-NOV-19	R4905405
Cadmium (Cd)-Total	0.105		0.0050	ug/L		13-NOV-19	R4905405
Calcium (Ca)-Total	95.0		0.050	mg/L		13-NOV-19	R4905405
Chromium (Cr)-Total	0.00068		0.00010	mg/L		13-NOV-19	R4905405
Cobalt (Co)-Total	0.39		0.10	ug/L		13-NOV-19	R4905405
Copper (Cu)-Total	0.0998		0.00050	mg/L		13-NOV-19	R4905405
Iron (Fe)-Total	0.423		0.010	mg/L		13-NOV-19	R4905405
Lead (Pb)-Total	0.000346		0.000050	mg/L		13-NOV-19	R4905405
Lithium (Li)-Total	0.0032		0.0010	mg/L		13-NOV-19	R4905405
Magnesium (Mg)-Total	26.7		0.10	mg/L		13-NOV-19	R4905405
Manganese (Mn)-Total	0.0106		0.00010	mg/L		13-NOV-19	R4905405
Molybdenum (Mo)-Total	0.000798		0.000050	mg/L		13-NOV-19	R4905405
Nickel (Ni)-Total	0.00868		0.00050	mg/L		13-NOV-19	R4905405
Potassium (K)-Total	1.60		0.050	mg/L		13-NOV-19	R4905405
Selenium (Se)-Total	1.23		0.050	ug/L		13-NOV-19	R4905405
Silicon (Si)-Total	6.86		0.10	mg/L		13-NOV-19	R4905405
Silver (Ag)-Total	0.000021		0.000010	mg/L		13-NOV-19	R4905405
Sodium (Na)-Total	3.50		0.050	mg/L		13-NOV-19	R4905405
Strontium (Sr)-Total	0.186		0.00020	mg/L		13-NOV-19	R4905405
Thallium (Tl)-Total	0.000027		0.000010	mg/L		13-NOV-19	R4905405
Tin (Sn)-Total	<0.00010		0.00010	mg/L		13-NOV-19	R4905405
Titanium (Ti)-Total	<0.010		0.010	mg/L		13-NOV-19	R4905405
Uranium (U)-Total	0.00272		0.000010	mg/L		13-NOV-19	R4905405
Vanadium (V)-Total	0.00227		0.00050	mg/L		13-NOV-19	R4905405
Zinc (Zn)-Total	0.0062		0.0030	mg/L		13-NOV-19	R4905405
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.7		1.0	mg/L		08-NOV-19	R4903797
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	352		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Total (as CaCO3)	352		1.0	mg/L		08-NOV-19	R4903794
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		13-NOV-19	R4906413
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		08-NOV-19	R4903855
Chloride in Water by IC							
Chloride (Cl)	1.07		0.50	mg/L		08-NOV-19	R4903855
Electrical Conductivity (EC)							
Conductivity (@ 25C)	587		2.0	uS/cm		08-NOV-19	R4903794
Fluoride in Water by IC							
Fluoride (F)	0.126		0.020	mg/L		08-NOV-19	R4903855
Ion Balance Calculation							
Ion Balance	105		-100	%		14-NOV-19	
Ion Balance Calculation							
Cation - Anion Balance	2.5			%		14-NOV-19	
Anion Sum	7.31			meq/L		14-NOV-19	
Cation Sum	7.69			meq/L		14-NOV-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379297-1 LC_PIZDC0901_WG_Q4-2019_NP Sampled By: DT/KC on 06-NOV-19 @ 12:16 Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.113		0.0050	mg/L		08-NOV-19	R4903855
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		08-NOV-19	R4903855
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0165		0.0010	mg/L		08-NOV-19	R4903541
Oxidation redution potential by elect.							
ORP	513		-1000	mV		08-NOV-19	R4903603
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0283		0.0020	mg/L		09-NOV-19	R4903905
Sulfate in Water by IC							
Sulfate (SO4)	11.7		0.30	mg/L		08-NOV-19	R4903855
Total Dissolved Solids							
Total Dissolved Solids	424	DLHC	20	mg/L		12-NOV-19	R4905928
Total Suspended Solids							
Total Suspended Solids	8.0		1.0	mg/L		12-NOV-19	R4905839
Turbidity							
Turbidity	21.3		0.10	NTU		08-NOV-19	R4903594
pH							
pH	8.21		0.10	pH		08-NOV-19	R4903794
L2379297-2 WG_Q4-2019_006 Sampled By: DT/KC on 06-NOV-19 @ 15:43 Matrix: WG							
Miscellaneous Parameters							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		09-NOV-19	R4903830
Total Organic Carbon	<0.50		0.50	mg/L		09-NOV-19	R4904067
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		13-NOV-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		10-NOV-19	R4904882
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		14-NOV-19	R4906863
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		10-NOV-19	R4904882
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Arsenic (As)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Barium (Ba)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		10-NOV-19	R4904882
Boron (B)-Total	<0.010		0.010	mg/L		10-NOV-19	R4904882
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		10-NOV-19	R4904882
Calcium (Ca)-Total	<0.050		0.050	mg/L		10-NOV-19	R4904882
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Cobalt (Co)-Total	<0.10		0.10	ug/L		10-NOV-19	R4904882
Copper (Cu)-Total	<0.00050		0.00050	mg/L		10-NOV-19	R4904882
Iron (Fe)-Total	<0.010		0.010	mg/L		10-NOV-19	R4904882
Lead (Pb)-Total	<0.000050		0.000050	mg/L		10-NOV-19	R4904882
Lithium (Li)-Total	<0.0010		0.0010	mg/L		10-NOV-19	R4904882
Magnesium (Mg)-Total	<0.10		0.10	mg/L		10-NOV-19	R4904882
Manganese (Mn)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		10-NOV-19	R4904882
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		10-NOV-19	R4904882

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379297-2 WG_Q4-2019_006							
Sampled By: DT/KC on 06-NOV-19 @ 15:43							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Potassium (K)-Total	<0.050		0.050	mg/L		10-NOV-19	R4904882
Selenium (Se)-Total	<0.050		0.050	ug/L		10-NOV-19	R4904882
Silicon (Si)-Total	<0.10		0.10	mg/L		10-NOV-19	R4904882
Silver (Ag)-Total	<0.000010		0.000010	mg/L		10-NOV-19	R4904882
Sodium (Na)-Total	<0.050		0.050	mg/L		10-NOV-19	R4904882
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		10-NOV-19	R4904882
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		10-NOV-19	R4904882
Tin (Sn)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Titanium (Ti)-Total	<0.010		0.010	mg/L		10-NOV-19	R4904882
Uranium (U)-Total	<0.000010		0.000010	mg/L		10-NOV-19	R4904882
Vanadium (V)-Total	<0.00050		0.00050	mg/L		10-NOV-19	R4904882
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		10-NOV-19	R4904882
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.5		1.0	mg/L		08-NOV-19	R4903797
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Ammonia, Total (as N)							
Ammonia as N	0.0069	RRV	0.0050	mg/L		13-NOV-19	R4906413
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		08-NOV-19	R4903855
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		08-NOV-19	R4903855
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					12-NOV-19	R4905142
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L		13-NOV-19	R4905147
Magnesium (Mg)-Dissolved	<0.0050		0.0050	mg/L		13-NOV-19	R4905147
Potassium (K)-Dissolved	<0.050		0.050	mg/L		13-NOV-19	R4905147
Sodium (Na)-Dissolved	<0.050		0.050	mg/L		13-NOV-19	R4905147
Electrical Conductivity (EC)							
Conductivity (@ 25C)	<2.0		2.0	uS/cm		08-NOV-19	R4903794
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		08-NOV-19	R4903855
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		13-NOV-19	
Anion Sum	<0.10			meq/L		13-NOV-19	
Cation Sum	<0.10			meq/L		13-NOV-19	
Ion Balance Calculation							
Ion Balance	0.0		-100	%		13-NOV-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		08-NOV-19	R4903855
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		08-NOV-19	R4903855
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		08-NOV-19	R4903541
Oxidation redution potential by elect.							
ORP	448		-1000	mV		08-NOV-19	R4903603
Phosphorus (P)-Total							
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		09-NOV-19	R4903905

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-CL	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20191106 - DC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2379297

Report Date: 17-NOV-19

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Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4903797							
WG3215184-8	LCS							
Acidity (as CaCO3)			100.3		%		85-115	08-NOV-19
WG3215184-7	MB							
Acidity (as CaCO3)			1.5		mg/L		2	08-NOV-19
ALK-MAN-CL								
	Water							
Batch	R4903794							
WG3215187-11	LCS							
Alkalinity, Total (as CaCO3)			97.9		%		85-115	08-NOV-19
WG3215187-10	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	08-NOV-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4905405							
WG3215663-3	DUP	L2379297-1						
Beryllium (Be)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	13-NOV-19
WG3215663-2	LCS							
Beryllium (Be)-Dissolved			93.1		%		80-120	13-NOV-19
WG3215663-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	13-NOV-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4904882							
WG3215533-2	LCS							
Beryllium (Be)-Total			93.2		%		80-120	10-NOV-19
WG3215533-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	10-NOV-19
Batch	R4905405							
WG3215530-2	LCS							
Beryllium (Be)-Total			92.8		%		80-120	13-NOV-19
WG3215530-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	13-NOV-19
BR-L-IC-N-CL								
	Water							
Batch	R4903855							
WG3215339-2	LCS							
Bromide (Br)			96.8		%		85-115	08-NOV-19
WG3215339-1	MB							
Bromide (Br)			<0.050		mg/L		0.05	08-NOV-19
C-DIS-ORG-LOW-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL Water								
Batch	R4904067							
WG3215640-2	LCS							
Dissolved Organic Carbon			101.3		%		80-120	09-NOV-19
WG3215640-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	09-NOV-19
C-TOT-ORG-LOW-CL Water								
Batch	R4904067							
WG3215640-3	DUP	L2379297-2						
Total Organic Carbon			<0.50	RPD-NA	mg/L	N/A	20	09-NOV-19
WG3215640-2	LCS							
Total Organic Carbon			106.8		%		80-120	09-NOV-19
WG3215640-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	09-NOV-19
WG3215640-4	MS	L2379297-2						
Total Organic Carbon			94.2		%		70-130	09-NOV-19
CL-IC-N-CL Water								
Batch	R4903855							
WG3215339-2	LCS							
Chloride (Cl)			100.3		%		90-110	08-NOV-19
WG3215339-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	08-NOV-19
EC-L-PCT-CL Water								
Batch	R4903794							
WG3215187-11	LCS							
Conductivity (@ 25C)			96.2		%		90-110	08-NOV-19
WG3215187-10	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	08-NOV-19
F-IC-N-CL Water								
Batch	R4903855							
WG3215339-2	LCS							
Fluoride (F)			96.7		%		90-110	08-NOV-19
WG3215339-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	08-NOV-19
HG-D-CVAA-VA Water								
Batch	R4908847							
WG3219184-2	LCS							
Mercury (Hg)-Dissolved			101.9		%		80-120	15-NOV-19
WG3219184-1	MB	NP						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
HG-D-CVAA-VA Water									
Batch R4908847									
WG3219184-1 MB		NP							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	15-NOV-19	
HG-T-CVAA-VA Water									
Batch R4906863									
WG3218776-2 LCS									
Mercury (Hg)-Total			95.3		%		80-120	14-NOV-19	
WG3218776-1 MB									
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	14-NOV-19	
MET-D-CCMS-CL Water									
Batch R4905147									
WG3216833-6 LCS									
Calcium (Ca)-Dissolved			109.5		%		80-120	12-NOV-19	
Magnesium (Mg)-Dissolved			118.1		%		80-120	12-NOV-19	
Potassium (K)-Dissolved			111.5		%		80-120	12-NOV-19	
Sodium (Na)-Dissolved			110.1		%		80-120	12-NOV-19	
WG3216833-5 MB									
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	12-NOV-19	
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	12-NOV-19	
Potassium (K)-Dissolved			<0.050		mg/L		0.05	12-NOV-19	
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	12-NOV-19	
MET-D-CCMS-VA Water									
Batch R4905405									
WG3215663-3 DUP		L2379297-1							
Aluminum (Al)-Dissolved			<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	13-NOV-19
Antimony (Sb)-Dissolved			0.00039	0.00039		mg/L	0.5	20	13-NOV-19
Arsenic (As)-Dissolved			0.00034	0.00033		mg/L	2.8	20	13-NOV-19
Barium (Ba)-Dissolved			0.316	0.314		mg/L	0.7	20	13-NOV-19
Bismuth (Bi)-Dissolved			<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-NOV-19
Boron (B)-Dissolved			<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-NOV-19
Cadmium (Cd)-Dissolved			0.0000564	0.0000585		mg/L	3.7	20	13-NOV-19
Calcium (Ca)-Dissolved			104	102		mg/L	2.1	20	13-NOV-19
Chromium (Cr)-Dissolved			0.00012	<0.00010	RPD-NA	mg/L	N/A	20	13-NOV-19
Cobalt (Co)-Dissolved			<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-NOV-19
Copper (Cu)-Dissolved			0.00060	0.00059		mg/L	0.7	20	13-NOV-19
Iron (Fe)-Dissolved			<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4905405							
WG3215663-3	DUP	L2379297-1						
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-NOV-19
Lithium (Li)-Dissolved		0.0033	0.0032		mg/L	2.4	20	13-NOV-19
Magnesium (Mg)-Dissolved		28.0	28.2		mg/L	0.7	20	13-NOV-19
Manganese (Mn)-Dissolved		0.00026	0.00029		mg/L	8.2	20	13-NOV-19
Molybdenum (Mo)-Dissolved		0.000763	0.000784		mg/L	2.6	20	13-NOV-19
Nickel (Ni)-Dissolved		0.00114	0.00117		mg/L	2.4	20	13-NOV-19
Potassium (K)-Dissolved		1.61	1.61		mg/L	0.5	20	13-NOV-19
Selenium (Se)-Dissolved		0.00157	0.00166		mg/L	5.0	20	13-NOV-19
Silicon (Si)-Dissolved		6.39	6.48		mg/L	1.3	20	13-NOV-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-NOV-19
Sodium (Na)-Dissolved		3.50	3.60		mg/L	2.6	20	13-NOV-19
Strontium (Sr)-Dissolved		0.189	0.193		mg/L	1.7	20	13-NOV-19
Thallium (Tl)-Dissolved		0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-NOV-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-NOV-19
Uranium (U)-Dissolved		0.00255	0.00258		mg/L	1.1	20	13-NOV-19
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-NOV-19
Zinc (Zn)-Dissolved		0.0014	0.0014		mg/L	0.2	20	13-NOV-19
WG3215663-2	LCS							
Aluminum (Al)-Dissolved			94.5		%		80-120	13-NOV-19
Antimony (Sb)-Dissolved			92.2		%		80-120	13-NOV-19
Arsenic (As)-Dissolved			93.3		%		80-120	13-NOV-19
Barium (Ba)-Dissolved			96.9		%		80-120	13-NOV-19
Bismuth (Bi)-Dissolved			97.3		%		80-120	13-NOV-19
Boron (B)-Dissolved			94.9		%		80-120	13-NOV-19
Cadmium (Cd)-Dissolved			92.1		%		80-120	13-NOV-19
Calcium (Ca)-Dissolved			99.9		%		80-120	13-NOV-19
Chromium (Cr)-Dissolved			93.7		%		80-120	13-NOV-19
Cobalt (Co)-Dissolved			91.3		%		80-120	13-NOV-19
Copper (Cu)-Dissolved			91.6		%		80-120	13-NOV-19
Iron (Fe)-Dissolved			88.5		%		80-120	13-NOV-19
Lead (Pb)-Dissolved			99.0		%		80-120	13-NOV-19
Lithium (Li)-Dissolved			92.2		%		80-120	13-NOV-19
Magnesium (Mg)-Dissolved			92.0		%		80-120	13-NOV-19
Manganese (Mn)-Dissolved			96.6		%		80-120	13-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4905405							
WG3215663-2	LCS							
Molybdenum (Mo)-Dissolved			95.2		%		80-120	13-NOV-19
Nickel (Ni)-Dissolved			90.9		%		80-120	13-NOV-19
Potassium (K)-Dissolved			93.7		%		80-120	13-NOV-19
Selenium (Se)-Dissolved			98.2		%		80-120	13-NOV-19
Silicon (Si)-Dissolved			101.1		%		60-140	13-NOV-19
Silver (Ag)-Dissolved			94.6		%		80-120	13-NOV-19
Sodium (Na)-Dissolved			96.3		%		80-120	13-NOV-19
Strontium (Sr)-Dissolved			93.4		%		80-120	13-NOV-19
Thallium (Tl)-Dissolved			96.1		%		80-120	13-NOV-19
Titanium (Ti)-Dissolved			89.3		%		80-120	13-NOV-19
Uranium (U)-Dissolved			97.0		%		80-120	13-NOV-19
Vanadium (V)-Dissolved			95.1		%		80-120	13-NOV-19
Zinc (Zn)-Dissolved			88.3		%		80-120	13-NOV-19
WG3215663-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	13-NOV-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	13-NOV-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	13-NOV-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	13-NOV-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	13-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	13-NOV-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	13-NOV-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	13-NOV-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	13-NOV-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	13-NOV-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4905405							
WG3215663-1	MB	NP						
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	13-NOV-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	13-NOV-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	13-NOV-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	13-NOV-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	13-NOV-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	13-NOV-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	13-NOV-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	13-NOV-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	13-NOV-19
Batch	R4905910							
WG3217491-2	LCS							
Aluminum (Al)-Dissolved			100.9		%		80-120	13-NOV-19
Antimony (Sb)-Dissolved			100.9		%		80-120	13-NOV-19
Arsenic (As)-Dissolved			100.1		%		80-120	13-NOV-19
Barium (Ba)-Dissolved			96.8		%		80-120	13-NOV-19
Bismuth (Bi)-Dissolved			101.5		%		80-120	13-NOV-19
Boron (B)-Dissolved			96.6		%		80-120	13-NOV-19
Cadmium (Cd)-Dissolved			99.9		%		80-120	13-NOV-19
Calcium (Ca)-Dissolved			96.9		%		80-120	13-NOV-19
Chromium (Cr)-Dissolved			99.8		%		80-120	13-NOV-19
Cobalt (Co)-Dissolved			100.8		%		80-120	13-NOV-19
Copper (Cu)-Dissolved			98.1		%		80-120	13-NOV-19
Iron (Fe)-Dissolved			95.9		%		80-120	13-NOV-19
Lead (Pb)-Dissolved			98.1		%		80-120	13-NOV-19
Lithium (Li)-Dissolved			96.5		%		80-120	13-NOV-19
Magnesium (Mg)-Dissolved			97.0		%		80-120	13-NOV-19
Manganese (Mn)-Dissolved			97.6		%		80-120	13-NOV-19
Molybdenum (Mo)-Dissolved			104.2		%		80-120	13-NOV-19
Nickel (Ni)-Dissolved			100.3		%		80-120	13-NOV-19
Potassium (K)-Dissolved			103.9		%		80-120	13-NOV-19
Selenium (Se)-Dissolved			98.0		%		80-120	13-NOV-19
Silicon (Si)-Dissolved			100.5		%		60-140	13-NOV-19
Silver (Ag)-Dissolved			101.0		%		80-120	13-NOV-19
Sodium (Na)-Dissolved			104.6		%		80-120	13-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4905910							
WG3217491-2	LCS							
Strontium (Sr)-Dissolved			106.6		%		80-120	13-NOV-19
Thallium (Tl)-Dissolved			97.7		%		80-120	13-NOV-19
Tin (Sn)-Dissolved			99.9		%		80-120	13-NOV-19
Titanium (Ti)-Dissolved			102.7		%		80-120	13-NOV-19
Uranium (U)-Dissolved			100.8		%		80-120	13-NOV-19
Vanadium (V)-Dissolved			99.6		%		80-120	13-NOV-19
Zinc (Zn)-Dissolved			99.2		%		80-120	13-NOV-19
WG3217491-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	13-NOV-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	13-NOV-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	13-NOV-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	13-NOV-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	13-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	13-NOV-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	13-NOV-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	13-NOV-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	13-NOV-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	13-NOV-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	13-NOV-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	13-NOV-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	13-NOV-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	13-NOV-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	13-NOV-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	13-NOV-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4905910							
WG3217491-1	MB	NP						
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	13-NOV-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	13-NOV-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	13-NOV-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	13-NOV-19
MET-T-CCMS-VA								
	Water							
Batch	R4904882							
WG3215533-2	LCS							
Aluminum (Al)-Total			102.2		%		80-120	10-NOV-19
Antimony (Sb)-Total			105.2		%		80-120	10-NOV-19
Arsenic (As)-Total			98.8		%		80-120	10-NOV-19
Barium (Ba)-Total			96.7		%		80-120	10-NOV-19
Bismuth (Bi)-Total			101.0		%		80-120	10-NOV-19
Boron (B)-Total			90.4		%		80-120	10-NOV-19
Cadmium (Cd)-Total			98.2		%		80-120	10-NOV-19
Calcium (Ca)-Total			96.7		%		80-120	10-NOV-19
Chromium (Cr)-Total			99.7		%		80-120	10-NOV-19
Cobalt (Co)-Total			100.9		%		80-120	10-NOV-19
Copper (Cu)-Total			97.0		%		80-120	10-NOV-19
Iron (Fe)-Total			93.0		%		80-120	10-NOV-19
Lead (Pb)-Total			94.8		%		80-120	10-NOV-19
Lithium (Li)-Total			96.4		%		80-120	10-NOV-19
Magnesium (Mg)-Total			99.2		%		80-120	10-NOV-19
Manganese (Mn)-Total			97.8		%		80-120	10-NOV-19
Molybdenum (Mo)-Total			101.8		%		80-120	10-NOV-19
Nickel (Ni)-Total			100.0		%		80-120	10-NOV-19
Potassium (K)-Total			102.1		%		80-120	10-NOV-19
Selenium (Se)-Total			93.2		%		80-120	10-NOV-19
Silicon (Si)-Total			98.1		%		80-120	10-NOV-19
Silver (Ag)-Total			98.0		%		80-120	10-NOV-19
Sodium (Na)-Total			98.6		%		80-120	10-NOV-19
Strontium (Sr)-Total			100.4		%		80-120	10-NOV-19
Thallium (Tl)-Total			96.2		%		80-120	10-NOV-19
Tin (Sn)-Total			98.2		%		80-120	10-NOV-19
Titanium (Ti)-Total			101.6		%		80-120	10-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4904882							
WG3215533-2 LCS								
Uranium (U)-Total			95.9		%		80-120	10-NOV-19
Vanadium (V)-Total			99.8		%		80-120	10-NOV-19
Zinc (Zn)-Total			100.2		%		80-120	10-NOV-19
WG3215533-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	10-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	10-NOV-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	10-NOV-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	10-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	10-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	10-NOV-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	10-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	10-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	10-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	10-NOV-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	10-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	10-NOV-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	10-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	10-NOV-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	10-NOV-19
Tin (Sn)-Total			0.00220	B	mg/L		0.0001	10-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	10-NOV-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	10-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4905405							
WG3215530-2	LCS							
Aluminum (Al)-Total			93.6		%		80-120	13-NOV-19
Antimony (Sb)-Total			98.6		%		80-120	13-NOV-19
Arsenic (As)-Total			93.5		%		80-120	13-NOV-19
Barium (Ba)-Total			92.8		%		80-120	13-NOV-19
Bismuth (Bi)-Total			96.5		%		80-120	13-NOV-19
Boron (B)-Total			94.9		%		80-120	13-NOV-19
Cadmium (Cd)-Total			90.2		%		80-120	13-NOV-19
Calcium (Ca)-Total			94.5		%		80-120	13-NOV-19
Chromium (Cr)-Total			94.8		%		80-120	13-NOV-19
Cobalt (Co)-Total			92.3		%		80-120	13-NOV-19
Copper (Cu)-Total			92.5		%		80-120	13-NOV-19
Iron (Fe)-Total			90.1		%		80-120	13-NOV-19
Lead (Pb)-Total			99.4		%		80-120	13-NOV-19
Lithium (Li)-Total			93.0		%		80-120	13-NOV-19
Magnesium (Mg)-Total			93.0		%		80-120	13-NOV-19
Manganese (Mn)-Total			96.4		%		80-120	13-NOV-19
Molybdenum (Mo)-Total			98.7		%		80-120	13-NOV-19
Nickel (Ni)-Total			91.6		%		80-120	13-NOV-19
Potassium (K)-Total			97.0		%		80-120	13-NOV-19
Selenium (Se)-Total			96.1		%		80-120	13-NOV-19
Silicon (Si)-Total			104.7		%		80-120	13-NOV-19
Silver (Ag)-Total			97.3		%		80-120	13-NOV-19
Sodium (Na)-Total			97.0		%		80-120	13-NOV-19
Strontium (Sr)-Total			96.4		%		80-120	13-NOV-19
Thallium (Tl)-Total			98.1		%		80-120	13-NOV-19
Tin (Sn)-Total			91.9		%		80-120	13-NOV-19
Titanium (Ti)-Total			88.3		%		80-120	13-NOV-19
Uranium (U)-Total			95.2		%		80-120	13-NOV-19
Vanadium (V)-Total			96.2		%		80-120	13-NOV-19
Zinc (Zn)-Total			88.4		%		80-120	13-NOV-19
WG3215530-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4905405							
WG3215530-1	MB							
Barium (Ba)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	13-NOV-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	13-NOV-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	13-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	13-NOV-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	13-NOV-19
Magnesium (Mg)-Total			0.0061	B	mg/L		0.005	13-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	13-NOV-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	13-NOV-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	13-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	13-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	13-NOV-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	13-NOV-19
Tin (Sn)-Total			0.00016	B	mg/L		0.0001	13-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	13-NOV-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	13-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-NOV-19
NH3-L-F-CL		Water						
Batch	R4906413							
WG3217773-26	LCS							
Ammonia as N			102.3		%		85-115	13-NOV-19
WG3217773-25	MB							
Ammonia as N			<0.0050		mg/L		0.005	13-NOV-19
NO2-L-IC-N-CL		Water						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-CL	Water							
Batch	R4903855							
WG3215339-2	LCS							
Nitrite (as N)			98.1		%		90-110	08-NOV-19
WG3215339-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	08-NOV-19
NO3-L-IC-N-CL	Water							
Batch	R4903855							
WG3215339-2	LCS							
Nitrate (as N)			102.3		%		90-110	08-NOV-19
WG3215339-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	08-NOV-19
ORP-CL	Water							
Batch	R4903603							
WG3214902-9	CRM	CL-ORP						
ORP			211		mV		210-230	08-NOV-19
P-T-L-COL-CL	Water							
Batch	R4903905							
WG3215416-18	LCS							
Phosphorus (P)-Total			103.0		%		80-120	09-NOV-19
WG3215416-17	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	09-NOV-19
PH-CL	Water							
Batch	R4903794							
WG3215187-11	LCS							
pH			7.00		pH		6.9-7.1	08-NOV-19
PO4-DO-L-COL-CL	Water							
Batch	R4903541							
WG3214522-2	LCS							
Orthophosphate-Dissolved (as P)			97.6		%		80-120	08-NOV-19
WG3214522-1	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	08-NOV-19
SO4-IC-N-CL	Water							
Batch	R4903855							
WG3215339-2	LCS							
Sulfate (SO4)			100.6		%		90-110	08-NOV-19
WG3215339-1	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-CL								
Water								
Batch R4903855								
WG3215339-1 MB								
Sulfate (SO4)								
			<0.30		mg/L		0.3	08-NOV-19
SOLIDS-TDS-CL								
Water								
Batch R4905928								
WG3216312-2 LCS								
Total Dissolved Solids								
			102.9		%		85-115	12-NOV-19
WG3216312-1 MB								
Total Dissolved Solids								
			<10		mg/L		10	12-NOV-19
TKN-L-F-CL								
Water								
Batch R4903830								
WG3215247-30 LCS								
Total Kjeldahl Nitrogen								
			92.4		%		75-125	09-NOV-19
WG3215247-29 MB								
Total Kjeldahl Nitrogen								
			<0.050		mg/L		0.05	09-NOV-19
TSS-L-CL								
Water								
Batch R4905839								
WG3216494-12 LCS								
Total Suspended Solids								
			96.5		%		85-115	12-NOV-19
WG3216494-11 MB								
Total Suspended Solids								
			<1.0		mg/L		1	12-NOV-19
TURBIDITY-CL								
Water								
Batch R4903594								
WG3214636-2 LCS								
Turbidity								
			97.0		%		85-115	08-NOV-19
WG3214636-1 MB								
Turbidity								
			<0.10		NTU		0.1	08-NOV-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	06-NOV-19 12:16	08-NOV-19 14:00	0.25	50	hours	EHTR-FM
	2	06-NOV-19 15:43	08-NOV-19 14:00	0.25	46	hours	EHTR-FM
pH	1	06-NOV-19 12:16	08-NOV-19 14:00	0.25	50	hours	EHTR-FM
	2	06-NOV-19 15:43	08-NOV-19 14:00	0.25	46	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2379297 were received on 07-NOV-19 09:10.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: **20191106- DC GW** -TURNAROUND TIME: _____ RUSH: _____

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Carla Froyman Parker			Lab Contact	Lyudnyla Shvets			Email 1:	carla.froymanparker@teck.com		
Email	Carla.froymanparker@teck.com			Email	Lyudnyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		
Address	Box 2003 15km North Hwy 43			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com		
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 4:	kirsten.campbell@teck.com		
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	PO number	100966326		
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS							ANALYSIS REQUESTED														
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS_Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKNVTOC	HG-T-CVAF-VA	Other Analysis						
L2379297-COFC																					
LC_PIZDC0901_WG_Q4-2019_NP	LC_PIZDC0901	WG		2019/11/06	12:16	G	6	1	1	1	1	1	1	1							
WG_Q4-2019_006	LC_TBLANK	WG		2019/11/06	15:43	G	4				1	1	1	1							

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS: _____

RELINQUISHED BY/AFFILIATION: **D.Tymstra/K.Campbell** DATE/TIME: **6-Nov**


ACCEPTED BY/AFFILIATION: *[Signature]* DATE/TIME: **11/7 9:10**

SERVICE REQUEST (rush - subject to availability): _____

Regular (default) Priority (2-3 business days) - 50% surcharge
 Emergency (1 Business Day) - 100% surcharge
 For Emergency <1 Day, ASAP or Weekend - Contact ALS

Sampler's Name: **K. Campbell/D. Tymstra** Mobile #: _____

Sampler's Signature: _____ Date/Time: **November 6, 2019**



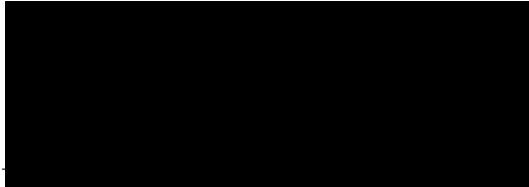
TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
PO BOX 2003
SPARWOOD BC V0B 2G0

Date Received: 08-NOV-19
Report Date: 19-NOV-19 13:53 (MT)
Version: FINAL

Client Phone: 250-425-6111

Certificate of Analysis


Lab Work Order #: L2379566
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191107- DC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379566-1 LC_PIZDC1306_WG_Q4-2019_NP							
Sampled By: KC/DT on 07-NOV-19 @ 12:13							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.58		0.50	mg/L		09-NOV-19	R4904084
Total Kjeldahl Nitrogen	0.110		0.050	mg/L		09-NOV-19	R4903830
Total Organic Carbon	2.25		0.50	mg/L		09-NOV-19	R4904084
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	12-NOV-19	15-NOV-19	R4908769
Dissolved Metals Filtration Location	FIELD					12-NOV-19	R4904883
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	14-NOV-19	15-NOV-19	R4908847
Dissolved Mercury Filtration Location	FIELD					14-NOV-19	R4908407
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					18-NOV-19	R4915381
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	12-NOV-19	15-NOV-19	R4908769
Antimony (Sb)-Dissolved	0.00021		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Barium (Ba)-Dissolved	0.158		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	12-NOV-19	15-NOV-19	R4908769
Boron (B)-Dissolved	0.011		0.010	mg/L	12-NOV-19	15-NOV-19	R4908769
Cadmium (Cd)-Dissolved	0.140		0.0050	ug/L	12-NOV-19	15-NOV-19	R4908769
Calcium (Ca)-Dissolved	61.7		0.050	mg/L	12-NOV-19	15-NOV-19	R4908769
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	12-NOV-19	15-NOV-19	R4908769
Copper (Cu)-Dissolved	0.00228		0.00020	mg/L	12-NOV-19	15-NOV-19	R4908769
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	12-NOV-19	15-NOV-19	R4908769
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	12-NOV-19	15-NOV-19	R4908769
Lithium (Li)-Dissolved	0.0104		0.0010	mg/L	12-NOV-19	15-NOV-19	R4908769
Magnesium (Mg)-Dissolved	22.3		0.10	mg/L	12-NOV-19	15-NOV-19	R4908769
Manganese (Mn)-Dissolved	0.00032		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Molybdenum (Mo)-Dissolved	0.00193		0.000050	mg/L	12-NOV-19	15-NOV-19	R4908769
Nickel (Ni)-Dissolved	0.00124		0.00050	mg/L	12-NOV-19	15-NOV-19	R4908769
Potassium (K)-Dissolved	2.02		0.050	mg/L	12-NOV-19	15-NOV-19	R4908769
Selenium (Se)-Dissolved	3.36		0.050	ug/L	12-NOV-19	15-NOV-19	R4908769
Silicon (Si)-Dissolved	2.81		0.050	mg/L	12-NOV-19	15-NOV-19	R4908769
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	12-NOV-19	15-NOV-19	R4908769
Sodium (Na)-Dissolved	0.710		0.050	mg/L	12-NOV-19	15-NOV-19	R4908769
Strontium (Sr)-Dissolved	0.0678		0.00020	mg/L	12-NOV-19	15-NOV-19	R4908769
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	12-NOV-19	15-NOV-19	R4908769
Tin (Sn)-Dissolved	0.00013		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	12-NOV-19	15-NOV-19	R4908769
Uranium (U)-Dissolved	0.000828		0.000010	mg/L	12-NOV-19	15-NOV-19	R4908769
Vanadium (V)-Dissolved	0.00050		0.00050	mg/L	12-NOV-19	15-NOV-19	R4908769
Zinc (Zn)-Dissolved	0.0195	DTC	0.0010	mg/L	18-NOV-19	18-NOV-19	R4915189
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	246		0.50	mg/L		19-NOV-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		13-NOV-19	R4905405
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.254		0.0030	mg/L		13-NOV-19	R4905405
Antimony (Sb)-Total	0.00022		0.00010	mg/L		13-NOV-19	R4905405
Arsenic (As)-Total	0.00016		0.00010	mg/L		13-NOV-19	R4905405

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379566-1 LC_PIZDC1306_WG_Q4-2019_NP							
Sampled By: KC/DT on 07-NOV-19 @ 12:13							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Barium (Ba)-Total	0.164		0.00010	mg/L		13-NOV-19	R4905405
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		13-NOV-19	R4905405
Boron (B)-Total	0.010		0.010	mg/L		13-NOV-19	R4905405
Cadmium (Cd)-Total	0.149		0.0050	ug/L		13-NOV-19	R4905405
Calcium (Ca)-Total	61.2		0.050	mg/L		13-NOV-19	R4905405
Chromium (Cr)-Total	0.00170		0.00010	mg/L		13-NOV-19	R4905405
Cobalt (Co)-Total	0.27		0.10	ug/L		13-NOV-19	R4905405
Copper (Cu)-Total	0.00542		0.00050	mg/L		13-NOV-19	R4905405
Iron (Fe)-Total	0.159		0.010	mg/L		13-NOV-19	R4905405
Lead (Pb)-Total	0.000373		0.000050	mg/L		13-NOV-19	R4905405
Lithium (Li)-Total	0.0106		0.0010	mg/L		13-NOV-19	R4905405
Magnesium (Mg)-Total	21.7		0.10	mg/L		13-NOV-19	R4905405
Manganese (Mn)-Total	0.00792		0.00010	mg/L		13-NOV-19	R4905405
Molybdenum (Mo)-Total	0.00201		0.000050	mg/L		13-NOV-19	R4905405
Nickel (Ni)-Total	0.00208		0.00050	mg/L		13-NOV-19	R4905405
Potassium (K)-Total	2.13		0.050	mg/L		13-NOV-19	R4905405
Selenium (Se)-Total	2.97		0.050	ug/L		13-NOV-19	R4905405
Silicon (Si)-Total	3.61		0.10	mg/L		13-NOV-19	R4905405
Silver (Ag)-Total	0.000010		0.000010	mg/L		13-NOV-19	R4905405
Sodium (Na)-Total	0.749		0.050	mg/L		13-NOV-19	R4905405
Strontium (Sr)-Total	0.0664		0.00020	mg/L		13-NOV-19	R4905405
Thallium (Tl)-Total	0.000015		0.000010	mg/L		13-NOV-19	R4905405
Tin (Sn)-Total	<0.00010		0.00010	mg/L		13-NOV-19	R4907546
Titanium (Ti)-Total	<0.010		0.010	mg/L		13-NOV-19	R4905405
Uranium (U)-Total	0.000878		0.000010	mg/L		13-NOV-19	R4905405
Vanadium (V)-Total	0.00218		0.00050	mg/L		13-NOV-19	R4905405
Zinc (Zn)-Total	0.0124		0.0030	mg/L		13-NOV-19	R4905405
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.2		1.0	mg/L		08-NOV-19	R4903797
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	260		1.0	mg/L		09-NOV-19	R4904007
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		09-NOV-19	R4904007
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		09-NOV-19	R4904007
Alkalinity, Total (as CaCO3)	260		1.0	mg/L		09-NOV-19	R4904007
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		14-NOV-19	R4909057
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		08-NOV-19	R4903855
Chloride in Water by IC							
Chloride (Cl)	<0.50		0.50	mg/L		08-NOV-19	R4903855
Electrical Conductivity (EC)							
Conductivity (@ 25C)	387		2.0	uS/cm		09-NOV-19	R4904007
Fluoride in Water by IC							
Fluoride (F)	0.128		0.020	mg/L		08-NOV-19	R4903855
Ion Balance Calculation							
Cation - Anion Balance	-3.4			%		19-NOV-19	
Anion Sum	5.34			meq/L		19-NOV-19	
Cation Sum	4.99			meq/L		19-NOV-19	
Ion Balance Calculation							
Ion Balance	93.5		-100	%		19-NOV-19	
Nitrate in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379566-1 LC_PIZDC1306_WG_Q4-2019_NP							
Sampled By: KC/DT on 07-NOV-19 @ 12:13							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.114		0.0050	mg/L		08-NOV-19	R4903855
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		08-NOV-19	R4903855
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0023		0.0010	mg/L		08-NOV-19	R4903541
Oxidation redution potential by elect.							
ORP	430		-1000	mV		08-NOV-19	R4903603
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0132		0.0020	mg/L		09-NOV-19	R4903905
Sulfate in Water by IC							
Sulfate (SO4)	6.06		0.30	mg/L		08-NOV-19	R4903855
Total Dissolved Solids							
Total Dissolved Solids	254	DLHC	20	mg/L		13-NOV-19	R4909193
Total Suspended Solids							
Total Suspended Solids	12.1		1.0	mg/L		13-NOV-19	R4907025
Turbidity							
Turbidity	7.51		0.10	NTU		08-NOV-19	R4903594
pH							
pH	8.00		0.10	pH		09-NOV-19	R4904007

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.	
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	
		Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:	
		Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]	
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
		This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.	
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
		This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.	
		It is recommended that this analysis be conducted in the field.	
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.	
PH-CL	Water	pH	APHA 4500 H-Electrode
		pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)	
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
		A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).	
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20191107- DC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2379566

Report Date: 19-NOV-19

Page 1 of 14

Client: TECK COAL LIMITED (LINE CREEK)
 PO BOX 2003
 SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4903797							
WG3215184-15	DUP	L2379566-1						
Acidity (as CaCO3)		2.2	1.9		mg/L	16	20	08-NOV-19
WG3215184-14	LCS							
Acidity (as CaCO3)			101.6		%		85-115	08-NOV-19
WG3215184-13	MB							
Acidity (as CaCO3)			1.7		mg/L		2	08-NOV-19
ALK-MAN-CL								
	Water							
Batch	R4904007							
WG3215492-9	DUP	L2379566-1						
Alkalinity, Total (as CaCO3)		260	264		mg/L	1.5	20	09-NOV-19
WG3215492-8	LCS							
Alkalinity, Total (as CaCO3)			100.3		%		85-115	09-NOV-19
WG3215492-7	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	09-NOV-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4908769							
WG3216569-2	LCS							
Beryllium (Be)-Dissolved			93.9		%		80-120	15-NOV-19
WG3216569-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	15-NOV-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4905405							
WG3215568-2	LCS							
Beryllium (Be)-Total			94.6		%		80-120	13-NOV-19
WG3215568-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	13-NOV-19
BR-L-IC-N-CL								
	Water							
Batch	R4903855							
WG3215339-10	LCS							
Bromide (Br)			97.6		%		85-115	08-NOV-19
WG3215339-9	MB							
Bromide (Br)			<0.050		mg/L		0.05	08-NOV-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4904084							
WG3215681-6	LCS							
Dissolved Organic Carbon			91.4		%		80-120	09-NOV-19
WG3215681-5	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL	Water							
Batch	R4904084							
WG3215681-5 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	09-NOV-19
C-TOT-ORG-LOW-CL	Water							
Batch	R4904084							
WG3215681-6 LCS								
Total Organic Carbon			97.1		%		80-120	09-NOV-19
WG3215681-5 MB								
Total Organic Carbon			<0.50		mg/L		0.5	09-NOV-19
CL-IC-N-CL	Water							
Batch	R4903855							
WG3215339-10 LCS								
Chloride (Cl)			100.6		%		90-110	08-NOV-19
WG3215339-9 MB								
Chloride (Cl)			<0.50		mg/L		0.5	08-NOV-19
EC-L-PCT-CL	Water							
Batch	R4904007							
WG3215492-9 DUP		L2379566-1						
Conductivity (@ 25C)		387	380		uS/cm	1.8	10	09-NOV-19
WG3215492-8 LCS								
Conductivity (@ 25C)			94.6		%		90-110	09-NOV-19
WG3215492-7 MB								
Conductivity (@ 25C)			<2.0		uS/cm		2	09-NOV-19
F-IC-N-CL	Water							
Batch	R4903855							
WG3215339-10 LCS								
Fluoride (F)			101.8		%		90-110	08-NOV-19
WG3215339-9 MB								
Fluoride (F)			<0.020		mg/L		0.02	08-NOV-19
HG-D-CVAA-VA	Water							
Batch	R4908847							
WG3219184-6 LCS								
Mercury (Hg)-Dissolved			100.8		%		80-120	15-NOV-19
WG3219184-5 MB		NP						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	15-NOV-19
WG3219184-8 MS		L2379566-1						
Mercury (Hg)-Dissolved			99.1		%		70-130	15-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4908769							
WG3216569-2	LCS							
Aluminum (Al)-Dissolved			100.3		%		80-120	15-NOV-19
Antimony (Sb)-Dissolved			95.4		%		80-120	15-NOV-19
Arsenic (As)-Dissolved			96.9		%		80-120	15-NOV-19
Barium (Ba)-Dissolved			96.3		%		80-120	15-NOV-19
Bismuth (Bi)-Dissolved			99.2		%		80-120	15-NOV-19
Boron (B)-Dissolved			95.5		%		80-120	15-NOV-19
Cadmium (Cd)-Dissolved			96.3		%		80-120	15-NOV-19
Calcium (Ca)-Dissolved			97.4		%		80-120	15-NOV-19
Chromium (Cr)-Dissolved			93.4		%		80-120	15-NOV-19
Cobalt (Co)-Dissolved			93.4		%		80-120	15-NOV-19
Copper (Cu)-Dissolved			93.6		%		80-120	15-NOV-19
Iron (Fe)-Dissolved			95.0		%		80-120	15-NOV-19
Lead (Pb)-Dissolved			101.5		%		80-120	15-NOV-19
Lithium (Li)-Dissolved			89.3		%		80-120	15-NOV-19
Magnesium (Mg)-Dissolved			93.0		%		80-120	15-NOV-19
Manganese (Mn)-Dissolved			97.3		%		80-120	15-NOV-19
Molybdenum (Mo)-Dissolved			104.1		%		80-120	15-NOV-19
Nickel (Ni)-Dissolved			93.4		%		80-120	15-NOV-19
Potassium (K)-Dissolved			94.4		%		80-120	15-NOV-19
Selenium (Se)-Dissolved			104.0		%		80-120	15-NOV-19
Silicon (Si)-Dissolved			97.1		%		60-140	15-NOV-19
Silver (Ag)-Dissolved			98.7		%		80-120	15-NOV-19
Sodium (Na)-Dissolved			97.0		%		80-120	15-NOV-19
Strontium (Sr)-Dissolved			101.1		%		80-120	15-NOV-19
Thallium (Tl)-Dissolved			100.8		%		80-120	15-NOV-19
Tin (Sn)-Dissolved			95.2		%		80-120	15-NOV-19
Titanium (Ti)-Dissolved			90.4		%		80-120	15-NOV-19
Uranium (U)-Dissolved			99.6		%		80-120	15-NOV-19
Vanadium (V)-Dissolved			94.3		%		80-120	15-NOV-19
WG3216569-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	15-NOV-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	15-NOV-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	15-NOV-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	15-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4908769							
WG3216569-1	MB	NP						
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	15-NOV-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	15-NOV-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	15-NOV-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	15-NOV-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	15-NOV-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	15-NOV-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	15-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	15-NOV-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	15-NOV-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	15-NOV-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	15-NOV-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	15-NOV-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	15-NOV-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	15-NOV-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	15-NOV-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	15-NOV-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	15-NOV-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	15-NOV-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	15-NOV-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	15-NOV-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	15-NOV-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	15-NOV-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	15-NOV-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	15-NOV-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	15-NOV-19
Batch	R4915189							
WG3221761-2	LCS							
Aluminum (Al)-Dissolved			101.6		%		80-120	18-NOV-19
Antimony (Sb)-Dissolved			96.4		%		80-120	18-NOV-19
Arsenic (As)-Dissolved			96.0		%		80-120	18-NOV-19
Barium (Ba)-Dissolved			97.5		%		80-120	18-NOV-19
Bismuth (Bi)-Dissolved			96.1		%		80-120	18-NOV-19
Boron (B)-Dissolved			92.4		%		80-120	18-NOV-19
Cadmium (Cd)-Dissolved			95.9		%		80-120	18-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4915189							
WG3221761-2	LCS							
Calcium (Ca)-Dissolved			98.3		%		80-120	18-NOV-19
Chromium (Cr)-Dissolved			96.8		%		80-120	18-NOV-19
Cobalt (Co)-Dissolved			95.8		%		80-120	18-NOV-19
Copper (Cu)-Dissolved			94.6		%		80-120	18-NOV-19
Iron (Fe)-Dissolved			86.2		%		80-120	18-NOV-19
Lead (Pb)-Dissolved			98.2		%		80-120	18-NOV-19
Lithium (Li)-Dissolved			100.8		%		80-120	18-NOV-19
Magnesium (Mg)-Dissolved			95.8		%		80-120	18-NOV-19
Manganese (Mn)-Dissolved			97.9		%		80-120	18-NOV-19
Molybdenum (Mo)-Dissolved			98.7		%		80-120	18-NOV-19
Nickel (Ni)-Dissolved			96.4		%		80-120	18-NOV-19
Potassium (K)-Dissolved			99.3		%		80-120	18-NOV-19
Selenium (Se)-Dissolved			93.5		%		80-120	18-NOV-19
Silicon (Si)-Dissolved			101.6		%		60-140	18-NOV-19
Silver (Ag)-Dissolved			96.1		%		80-120	18-NOV-19
Sodium (Na)-Dissolved			99.1		%		80-120	18-NOV-19
Strontium (Sr)-Dissolved			101.9		%		80-120	18-NOV-19
Thallium (Tl)-Dissolved			98.8		%		80-120	18-NOV-19
Tin (Sn)-Dissolved			94.5		%		80-120	18-NOV-19
Titanium (Ti)-Dissolved			97.2		%		80-120	18-NOV-19
Uranium (U)-Dissolved			100.6		%		80-120	18-NOV-19
Vanadium (V)-Dissolved			99.2		%		80-120	18-NOV-19
Zinc (Zn)-Dissolved			92.3		%		80-120	18-NOV-19
WG3221761-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	18-NOV-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-NOV-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	18-NOV-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	18-NOV-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	18-NOV-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-NOV-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	18-NOV-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	18-NOV-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	18-NOV-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	18-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4915189							
WG3221761-1	MB	NP						
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	18-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	18-NOV-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	18-NOV-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	18-NOV-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	18-NOV-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	18-NOV-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	18-NOV-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	18-NOV-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	18-NOV-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	18-NOV-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-NOV-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	18-NOV-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	18-NOV-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	18-NOV-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	18-NOV-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-NOV-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	18-NOV-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	18-NOV-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	18-NOV-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	18-NOV-19
MET-T-CCMS-VA								
	Water							
Batch	R4905405							
WG3215568-2	LCS							
Aluminum (Al)-Total			99.2		%		80-120	13-NOV-19
Antimony (Sb)-Total			96.7		%		80-120	13-NOV-19
Arsenic (As)-Total			94.7		%		80-120	13-NOV-19
Barium (Ba)-Total			99.0		%		80-120	13-NOV-19
Bismuth (Bi)-Total			99.6		%		80-120	13-NOV-19
Boron (B)-Total			101.1		%		80-120	13-NOV-19
Cadmium (Cd)-Total			93.5		%		80-120	13-NOV-19
Calcium (Ca)-Total			97.9		%		80-120	13-NOV-19
Chromium (Cr)-Total			97.3		%		80-120	13-NOV-19
Cobalt (Co)-Total			96.3		%		80-120	13-NOV-19
Copper (Cu)-Total			94.7		%		80-120	13-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4905405							
WG3215568-2	LCS							
Iron (Fe)-Total			92.8		%		80-120	13-NOV-19
Lead (Pb)-Total			98.7		%		80-120	13-NOV-19
Lithium (Li)-Total			96.2		%		80-120	13-NOV-19
Magnesium (Mg)-Total			93.3		%		80-120	13-NOV-19
Manganese (Mn)-Total			99.7		%		80-120	13-NOV-19
Molybdenum (Mo)-Total			99.98		%		80-120	13-NOV-19
Nickel (Ni)-Total			94.5		%		80-120	13-NOV-19
Potassium (K)-Total			100.5		%		80-120	13-NOV-19
Selenium (Se)-Total			91.7		%		80-120	13-NOV-19
Silicon (Si)-Total			103.4		%		80-120	13-NOV-19
Silver (Ag)-Total			99.8		%		80-120	13-NOV-19
Sodium (Na)-Total			101.8		%		80-120	13-NOV-19
Strontium (Sr)-Total			101.0		%		80-120	13-NOV-19
Thallium (Tl)-Total			97.1		%		80-120	13-NOV-19
Titanium (Ti)-Total			94.1		%		80-120	13-NOV-19
Uranium (U)-Total			95.3		%		80-120	13-NOV-19
Vanadium (V)-Total			100.1		%		80-120	13-NOV-19
Zinc (Zn)-Total			89.4		%		80-120	13-NOV-19
WG3215568-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	13-NOV-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	13-NOV-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	13-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	13-NOV-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	13-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4905405							
WG3215568-1	MB							
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	13-NOV-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	13-NOV-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	13-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	13-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	13-NOV-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	13-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	13-NOV-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	13-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-NOV-19
Batch	R4907546							
WG3217443-2	LCS							
Aluminum (Al)-Total			98.7		%		80-120	13-NOV-19
Antimony (Sb)-Total			99.2		%		80-120	13-NOV-19
Arsenic (As)-Total			102.3		%		80-120	13-NOV-19
Barium (Ba)-Total			99.6		%		80-120	13-NOV-19
Bismuth (Bi)-Total			96.2		%		80-120	13-NOV-19
Boron (B)-Total			105.6		%		80-120	13-NOV-19
Cadmium (Cd)-Total			103.3		%		80-120	13-NOV-19
Calcium (Ca)-Total			98.9		%		80-120	13-NOV-19
Chromium (Cr)-Total			104.9		%		80-120	13-NOV-19
Cobalt (Co)-Total			103.1		%		80-120	13-NOV-19
Copper (Cu)-Total			97.2		%		80-120	13-NOV-19
Iron (Fe)-Total			100.9		%		80-120	13-NOV-19
Lead (Pb)-Total			95.9		%		80-120	13-NOV-19
Lithium (Li)-Total			98.9		%		80-120	13-NOV-19
Magnesium (Mg)-Total			97.6		%		80-120	13-NOV-19
Manganese (Mn)-Total			100.8		%		80-120	13-NOV-19
Molybdenum (Mo)-Total			97.3		%		80-120	13-NOV-19
Nickel (Ni)-Total			96.7		%		80-120	13-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch	R4907546							
WG3217443-2 LCS								
Potassium (K)-Total			99.8		%		80-120	13-NOV-19
Selenium (Se)-Total			106.5		%		80-120	13-NOV-19
Silicon (Si)-Total			99.98		%		80-120	13-NOV-19
Silver (Ag)-Total			95.7		%		80-120	13-NOV-19
Sodium (Na)-Total			97.5		%		80-120	13-NOV-19
Strontium (Sr)-Total			92.9		%		80-120	13-NOV-19
Thallium (Tl)-Total			94.9		%		80-120	13-NOV-19
Tin (Sn)-Total			96.8		%		80-120	13-NOV-19
Titanium (Ti)-Total			99.5		%		80-120	13-NOV-19
Uranium (U)-Total			95.5		%		80-120	13-NOV-19
Vanadium (V)-Total			105.6		%		80-120	13-NOV-19
Zinc (Zn)-Total			102.0		%		80-120	13-NOV-19
WG3217443-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	13-NOV-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	13-NOV-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	13-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	13-NOV-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	13-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	13-NOV-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	13-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	13-NOV-19

Quality Control Report

Workorder: L2379566

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4907546							
WG3217443-1	MB							
Silver (Ag)-Total			<0.000010		mg/L		0.00001	13-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	13-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	13-NOV-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	13-NOV-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	13-NOV-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	13-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-NOV-19
NH3-L-F-CL								
	Water							
Batch	R4909057							
WG3219029-10	LCS							
Ammonia as N			99.1		%		85-115	14-NOV-19
WG3219029-9	MB							
Ammonia as N			<0.0050		mg/L		0.005	14-NOV-19
NO2-L-IC-N-CL								
	Water							
Batch	R4903855							
WG3215339-10	LCS							
Nitrite (as N)			97.5		%		90-110	08-NOV-19
WG3215339-9	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	08-NOV-19
NO3-L-IC-N-CL								
	Water							
Batch	R4903855							
WG3215339-10	LCS							
Nitrate (as N)			101.8		%		90-110	08-NOV-19
WG3215339-9	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	08-NOV-19
ORP-CL								
	Water							
Batch	R4903603							
WG3214902-13	CRM	CL-ORP						
ORP			229		mV		210-230	08-NOV-19
P-T-L-COL-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-CL Water								
Batch	R4903905							
WG3215416-10	LCS							
Phosphorus (P)-Total			95.2		%		80-120	09-NOV-19
WG3215416-9	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	09-NOV-19
PH-CL Water								
Batch	R4904007							
WG3215492-9	DUP	L2379566-1						
pH		8.00	7.96	J	pH	0.04	0.2	09-NOV-19
WG3215492-8	LCS							
pH			7.01		pH		6.9-7.1	09-NOV-19
PO4-DO-L-COL-CL Water								
Batch	R4903541							
WG3214522-6	LCS							
Orthophosphate-Dissolved (as P)			101.5		%		80-120	08-NOV-19
WG3214522-5	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	08-NOV-19
SO4-IC-N-CL Water								
Batch	R4903855							
WG3215339-10	LCS							
Sulfate (SO4)			98.9		%		90-110	08-NOV-19
WG3215339-9	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	08-NOV-19
SOLIDS-TDS-CL Water								
Batch	R4909193							
WG3216923-5	LCS							
Total Dissolved Solids			99.5		%		85-115	13-NOV-19
WG3216923-4	MB							
Total Dissolved Solids			<10		mg/L		10	13-NOV-19
TKN-L-F-CL Water								
Batch	R4903830							
WG3215247-42	LCS							
Total Kjeldahl Nitrogen			92.7		%		75-125	09-NOV-19
WG3215247-41	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	09-NOV-19
TSS-L-CL Water								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-L-CL	Water							
Batch	R4907025							
WG3216835-2	LCS							
Total Suspended Solids			95.1		%		85-115	13-NOV-19
WG3216835-1	MB							
Total Suspended Solids			<1.0		mg/L		1	13-NOV-19
TURBIDITY-CL	Water							
Batch	R4903594							
WG3214636-8	LCS							
Turbidity			96.5		%		85-115	08-NOV-19
WG3214636-7	MB							
Turbidity			<0.10		NTU		0.1	08-NOV-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.

Quality Control Report

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	07-NOV-19 12:13	08-NOV-19 16:00	0.25	28	hours	EHTR-FM
pH	1	07-NOV-19 12:13	09-NOV-19 09:00	0.25	45	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2379566 were received on 08-NOV-19 08:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

COC ID: **20191107-DC GW** TURNAROUND TIME: RUSH:


PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Carla Froyman Parker			Lab Contact	Lyudnyla Shvets			Email 1:	carla.froymanparker@teck.com		
Email	Carla.FroymanParker@teck.com			Email	Lyudnyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com		
Address	Box 2003 15km North Hwy 43			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com		
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 4:	kirsten.campbell@teck.com		
Postal Code	V0B 2G0		Country	Canada	Postal Code	T1Y 7B5		Country	Canada	PO number	
Phone Number	250-425-3196			Phone Number	403 407 1794						

SAMPLE DETAILS								ANALYSIS REQUESTED						Filtered 1 Field, 1 Lab, 12 Field & Lab, 8 None				
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS Package-DOC	H2SO4	HCl	HNO3	HNO3	NONE	H2SO4				
LC_PIZDC1306_WG_Q4-2019_NP	LC_PIZDC1306	WG		2019/11/07	12:13	G	6	1	1		1	1	1	1				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS PLEASE FORWARD RELINQUISHED TO US BY FAX FOR ANALYSIS	RELINQUISHED BY/AFFILIATION D.Tymstra/K.Campbell	DATE/TIME 7-Nov	ACCEPTED BY/AFFILIATION <i>[Signature]</i>	DATE/TIME 11/08 8:30
---	---	--------------------	---	-------------------------

SERVICE REQUEST (rush - subject to availability)				
Regular (default) X	Sampler's Name	K. Campbell/D. Tymstra	Mobile #	1
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time	November 7, 2019
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

7C



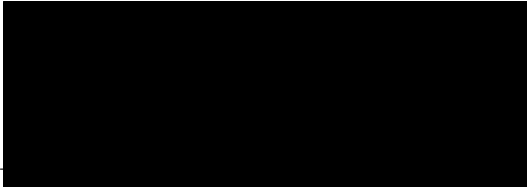
TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
Box 2003 15km North Hwy 43
Sparwood BC V0B 2G0

Date Received: 15-NOV-19
Report Date: 22-NOV-19 15:35 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2382999
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191114-LC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2382999-1 LC_PIZDC1105_WG_Q4-2019_NP							
Sampled By: KC/DT on 14-NOV-19 @ 14:33							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		15-NOV-19	R4912067
Total Kjeldahl Nitrogen	0.266		0.050	mg/L		16-NOV-19	R4912590
Total Organic Carbon	3.08		0.50	mg/L		15-NOV-19	R4912067
EPH Testing for teck Coal							
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	16-NOV-19	16-NOV-19	R4914746
EPH19-32	<0.25		0.25	mg/L	16-NOV-19	16-NOV-19	R4914746
Surrogate: 2-Bromobenzotrifluoride	95.7		60-140	%	16-NOV-19	16-NOV-19	R4914746
Sum of EPH (10-32)							
EPH (C10-C32)	<0.50		0.50	mg/L		18-NOV-19	
TEH (C10-C30)							
TEH (C10-C30)	<0.25		0.25	mg/L	16-NOV-19	16-NOV-19	R4914746
Surrogate: 2-Bromobenzotrifluoride	95.7		60-140	%	16-NOV-19	16-NOV-19	R4914746
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	21-NOV-19	21-NOV-19	R4919320
Dissolved Metals Filtration Location	FIELD					21-NOV-19	R4919178
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	20-NOV-19	21-NOV-19	R4919230
Dissolved Mercury Filtration Location	FIELD					20-NOV-19	R4918294
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					21-NOV-19	R4919178
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	21-NOV-19	21-NOV-19	R4919320
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	21-NOV-19	21-NOV-19	R4919320
Arsenic (As)-Dissolved	0.00010		0.00010	mg/L	21-NOV-19	21-NOV-19	R4919320
Barium (Ba)-Dissolved	0.0928		0.00010	mg/L	21-NOV-19	21-NOV-19	R4919320
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	21-NOV-19	21-NOV-19	R4919320
Boron (B)-Dissolved	0.020		0.010	mg/L	21-NOV-19	21-NOV-19	R4919320
Cadmium (Cd)-Dissolved	0.0670		0.0050	ug/L	21-NOV-19	21-NOV-19	R4919320
Calcium (Ca)-Dissolved	172		0.050	mg/L	21-NOV-19	21-NOV-19	R4919320
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	21-NOV-19	21-NOV-19	R4919320
Cobalt (Co)-Dissolved	0.28		0.10	ug/L	21-NOV-19	21-NOV-19	R4919320
Copper (Cu)-Dissolved	0.00042		0.00020	mg/L	21-NOV-19	21-NOV-19	R4919320
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	21-NOV-19	21-NOV-19	R4919320
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	21-NOV-19	21-NOV-19	R4919320
Lithium (Li)-Dissolved	0.0171		0.0010	mg/L	21-NOV-19	21-NOV-19	R4919320
Magnesium (Mg)-Dissolved	52.4		0.10	mg/L	21-NOV-19	21-NOV-19	R4919320
Manganese (Mn)-Dissolved	0.0747		0.00010	mg/L	21-NOV-19	21-NOV-19	R4919320
Molybdenum (Mo)-Dissolved	0.000331		0.000050	mg/L	21-NOV-19	21-NOV-19	R4919320
Nickel (Ni)-Dissolved	0.00162		0.00050	mg/L	21-NOV-19	21-NOV-19	R4919320
Potassium (K)-Dissolved	1.79		0.050	mg/L	21-NOV-19	21-NOV-19	R4919320
Selenium (Se)-Dissolved	0.238		0.050	ug/L	21-NOV-19	22-NOV-19	R4921469
Silicon (Si)-Dissolved	5.15		0.050	mg/L	21-NOV-19	21-NOV-19	R4919320
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	21-NOV-19	21-NOV-19	R4919320
Sodium (Na)-Dissolved	14.3		0.050	mg/L	21-NOV-19	21-NOV-19	R4919320
Strontium (Sr)-Dissolved	0.391		0.00020	mg/L	21-NOV-19	21-NOV-19	R4919320
Thallium (Tl)-Dissolved	0.000030		0.000010	mg/L	21-NOV-19	21-NOV-19	R4919320
Tin (Sn)-Dissolved	0.00017		0.00010	mg/L	21-NOV-19	21-NOV-19	R4919320
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	21-NOV-19	21-NOV-19	R4919320
Uranium (U)-Dissolved	0.000429		0.000010	mg/L	21-NOV-19	21-NOV-19	R4919320
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	21-NOV-19	21-NOV-19	R4919320

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2382999-1 LC_PIZDC1105_WG_Q4-2019_NP							
Sampled By: KC/DT on 14-NOV-19 @ 14:33							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Zinc (Zn)-Dissolved	0.0052		0.0010	mg/L	21-NOV-19	21-NOV-19	R4919320
Hardness							
Hardness (as CaCO3)	645		0.50	mg/L		22-NOV-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.179		0.020	ug/L		20-NOV-19	R4918528
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	0.0000153		0.0000050	mg/L		20-NOV-19	R4917046
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	2.67		0.0030	mg/L		20-NOV-19	R4918528
Antimony (Sb)-Total	0.00031		0.00010	mg/L		20-NOV-19	R4918528
Arsenic (As)-Total	0.00192		0.00010	mg/L		20-NOV-19	R4918528
Barium (Ba)-Total	0.159		0.00010	mg/L		20-NOV-19	R4918528
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		20-NOV-19	R4918528
Boron (B)-Total	0.027		0.010	mg/L		20-NOV-19	R4918528
Cadmium (Cd)-Total	0.377		0.0050	ug/L		20-NOV-19	R4918528
Calcium (Ca)-Total	183		0.050	mg/L		20-NOV-19	R4918528
Chromium (Cr)-Total	0.00474		0.00010	mg/L		20-NOV-19	R4918528
Cobalt (Co)-Total	1.93		0.10	ug/L		20-NOV-19	R4918528
Copper (Cu)-Total	0.00503		0.00050	mg/L		20-NOV-19	R4918528
Iron (Fe)-Total	4.78		0.010	mg/L		20-NOV-19	R4918528
Lead (Pb)-Total	0.00211		0.000050	mg/L		20-NOV-19	R4918528
Lithium (Li)-Total	0.0221		0.0010	mg/L		20-NOV-19	R4918528
Magnesium (Mg)-Total	55.2		0.10	mg/L		20-NOV-19	R4918528
Manganese (Mn)-Total	0.227		0.00010	mg/L		20-NOV-19	R4918528
Molybdenum (Mo)-Total	0.000765		0.000050	mg/L		20-NOV-19	R4918528
Nickel (Ni)-Total	0.00630		0.00050	mg/L		20-NOV-19	R4918528
Potassium (K)-Total	2.69		0.050	mg/L		20-NOV-19	R4918528
Selenium (Se)-Total	0.444		0.050	ug/L		20-NOV-19	R4918528
Silicon (Si)-Total	9.39		0.10	mg/L		20-NOV-19	R4918528
Silver (Ag)-Total	0.000065		0.000010	mg/L		20-NOV-19	R4918528
Sodium (Na)-Total	15.0		0.050	mg/L		20-NOV-19	R4918528
Strontium (Sr)-Total	0.385		0.00020	mg/L		20-NOV-19	R4918528
Thallium (Tl)-Total	0.000149		0.000010	mg/L		20-NOV-19	R4918528
Tin (Sn)-Total	0.00028		0.00010	mg/L		20-NOV-19	R4918528
Titanium (Ti)-Total	0.016		0.010	mg/L		20-NOV-19	R4918528
Uranium (U)-Total	0.000647		0.000010	mg/L		20-NOV-19	R4918528
Vanadium (V)-Total	0.00804		0.00050	mg/L		20-NOV-19	R4918528
Zinc (Zn)-Total	0.0381		0.0030	mg/L		20-NOV-19	R4918528
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	164		1.0	mg/L		15-NOV-19	R4914627
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	418		1.0	mg/L		15-NOV-19	R4914599
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		15-NOV-19	R4914599
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		15-NOV-19	R4914599
Alkalinity, Total (as CaCO3)	418		1.0	mg/L		15-NOV-19	R4914599
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		16-NOV-19	R4912029
Bromide in Water by IC (Low Level)							
Bromide (Br)	1.64	DLHC	0.25	mg/L		15-NOV-19	R4911969
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2382999-1 LC_PIZDC1105_WG_Q4-2019_NP							
Sampled By: KC/DT on 14-NOV-19 @ 14:33							
Matrix: WG							
Chloride in Water by IC							
Chloride (Cl)	135	DLHC	2.5	mg/L		15-NOV-19	R4911969
Electrical Conductivity (EC)							
Conductivity (@ 25C)	1040		2.0	uS/cm		15-NOV-19	R4914599
Fluoride in Water by IC							
Fluoride (F)	0.32	DLHC	0.10	mg/L		15-NOV-19	R4911969
Ion Balance Calculation							
Ion Balance	94.9		-100	%		22-NOV-19	
Ion Balance Calculation							
Cation - Anion Balance	-2.6			%		22-NOV-19	
Anion Sum	14.3			meq/L		22-NOV-19	
Cation Sum	13.6			meq/L		22-NOV-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.051	DLHC	0.025	mg/L		15-NOV-19	R4911969
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		15-NOV-19	R4911969
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0078		0.0010	mg/L		15-NOV-19	R4910869
Oxidation redution potential by elect.							
ORP	414		-1000	mV		15-NOV-19	R4911508
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.320	DLHC	0.050	mg/L		16-NOV-19	R4915232
Sulfate in Water by IC							
Sulfate (SO4)	102	DLHC	1.5	mg/L		15-NOV-19	R4911969
Total Dissolved Solids							
Total Dissolved Solids	825	DLHC	20	mg/L		17-NOV-19	R4915195
Total Suspended Solids							
Total Suspended Solids	283		1.0	mg/L		18-NOV-19	R4916100
Turbidity							
Turbidity	338		0.10	NTU		15-NOV-19	R4911451
pH							
pH	7.65		0.10	pH		15-NOV-19	R4914599

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
EPH(10-32)-CALC-CL	Water	Sum of EPH (10-32)	Sum of EPH - Auto Calculated
The sum of EPH(C10-C19) and EPH(C19-C32)			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.	
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
		Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.	
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	
		Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:	
		Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]	
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
		This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.	
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
		This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.	
		It is recommended that this analysis be conducted in the field.	
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.	
PH-CL	Water	pH	APHA 4500 H-Electrode
		pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)	
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.	
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
		A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).	
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
		Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
		Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.	
		Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:	
		Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]	
TEH-BC-VA-CL	Water	EPH (C10-C19) & EPH (C19-C32)	BCMOE EPH GCFID
		Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).	
TEH-WATER-VA-CL	Water	TEH (C10-C30)	BC Lab Manual
		Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.	
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
		This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.	
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
		This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.	
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
		This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.	

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20191114-LC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample
 mg/kg wwt - milligrams per kilogram based on wet weight of sample
 mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
 mg/L - unit of concentration based on volume, parts per million.
 < - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2382999

Report Date: 22-NOV-19

Page 1 of 12

Client: TECK COAL LIMITED (LINE CREEK)
 Box 2003 15km North Hwy 43
 Sparwood BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4914627							
WG3221146-5	LCS							
Acidity (as CaCO3)			102.4		%		85-115	15-NOV-19
WG3221146-4	MB							
Acidity (as CaCO3)			1.3		mg/L		2	15-NOV-19
ALK-MAN-CL								
	Water							
Batch	R4914599							
WG3221151-11	LCS							
Alkalinity, Total (as CaCO3)			96.7		%		85-115	15-NOV-19
WG3221151-10	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	15-NOV-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4919320							
WG3224244-2	LCS							
Beryllium (Be)-Dissolved			102.2		%		80-120	21-NOV-19
WG3224244-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	21-NOV-19
WG3224244-4	MS	L2382999-1						
Beryllium (Be)-Dissolved			99.1		%		70-130	21-NOV-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4918528							
WG3222056-2	LCS							
Beryllium (Be)-Total			93.9		%		80-120	20-NOV-19
WG3222056-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	20-NOV-19
BR-L-IC-N-CL								
	Water							
Batch	R4911969							
WG3220375-6	LCS							
Bromide (Br)			101.2		%		85-115	15-NOV-19
WG3220375-5	MB							
Bromide (Br)			<0.050		mg/L		0.05	15-NOV-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4912067							
WG3220408-6	LCS							
Dissolved Organic Carbon			89.2		%		80-120	15-NOV-19
WG3220408-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	15-NOV-19
C-TOT-ORG-LOW-CL								
	Water							

Quality Control Report

Workorder: L2382999

Report Date: 22-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL	Water							
Batch	R4912067							
WG3220408-6	LCS							
Total Organic Carbon			93.8		%		80-120	15-NOV-19
WG3220408-5	MB							
Total Organic Carbon			<0.50		mg/L		0.5	15-NOV-19
CL-IC-N-CL	Water							
Batch	R4911969							
WG3220375-6	LCS							
Chloride (Cl)			100.9		%		90-110	15-NOV-19
WG3220375-5	MB							
Chloride (Cl)			<0.50		mg/L		0.5	15-NOV-19
EC-L-PCT-CL	Water							
Batch	R4914599							
WG3221151-11	LCS							
Conductivity (@ 25C)			92.9		%		90-110	15-NOV-19
WG3221151-10	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	15-NOV-19
F-IC-N-CL	Water							
Batch	R4911969							
WG3220375-6	LCS							
Fluoride (F)			105.6		%		90-110	15-NOV-19
WG3220375-5	MB							
Fluoride (F)			<0.020		mg/L		0.02	15-NOV-19
HG-D-CVAA-VA	Water							
Batch	R4919230							
WG3223800-2	LCS							
Mercury (Hg)-Dissolved			97.6		%		80-120	21-NOV-19
WG3223800-1	MB	NP						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	21-NOV-19
HG-T-CVAA-VA	Water							
Batch	R4917046							
WG3223173-2	LCS							
Mercury (Hg)-Total			97.4		%		80-120	20-NOV-19
WG3223173-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	20-NOV-19
MET-D-CCMS-VA	Water							

Quality Control Report

Workorder: L2382999

Report Date: 22-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4919320							
WG3224244-2	LCS							
Aluminum (Al)-Dissolved			101.5		%		80-120	21-NOV-19
Antimony (Sb)-Dissolved			96.6		%		80-120	21-NOV-19
Arsenic (As)-Dissolved			96.7		%		80-120	21-NOV-19
Barium (Ba)-Dissolved			94.8		%		80-120	21-NOV-19
Bismuth (Bi)-Dissolved			97.0		%		80-120	21-NOV-19
Boron (B)-Dissolved			98.4		%		80-120	21-NOV-19
Cadmium (Cd)-Dissolved			96.8		%		80-120	21-NOV-19
Calcium (Ca)-Dissolved			99.1		%		80-120	21-NOV-19
Chromium (Cr)-Dissolved			99.4		%		80-120	21-NOV-19
Cobalt (Co)-Dissolved			96.6		%		80-120	21-NOV-19
Copper (Cu)-Dissolved			92.9		%		80-120	21-NOV-19
Iron (Fe)-Dissolved			98.8		%		80-120	21-NOV-19
Lead (Pb)-Dissolved			97.6		%		80-120	21-NOV-19
Lithium (Li)-Dissolved			98.0		%		80-120	21-NOV-19
Magnesium (Mg)-Dissolved			96.6		%		80-120	21-NOV-19
Manganese (Mn)-Dissolved			97.9		%		80-120	21-NOV-19
Molybdenum (Mo)-Dissolved			102.8		%		80-120	21-NOV-19
Nickel (Ni)-Dissolved			97.4		%		80-120	21-NOV-19
Potassium (K)-Dissolved			102.2		%		80-120	21-NOV-19
Selenium (Se)-Dissolved			95.4		%		80-120	21-NOV-19
Silicon (Si)-Dissolved			103.7		%		60-140	21-NOV-19
Silver (Ag)-Dissolved			99.1		%		80-120	21-NOV-19
Sodium (Na)-Dissolved			99.5		%		80-120	21-NOV-19
Strontium (Sr)-Dissolved			98.4		%		80-120	21-NOV-19
Thallium (Tl)-Dissolved			99.2		%		80-120	21-NOV-19
Tin (Sn)-Dissolved			99.8		%		80-120	21-NOV-19
Titanium (Ti)-Dissolved			91.0		%		80-120	21-NOV-19
Uranium (U)-Dissolved			98.0		%		80-120	21-NOV-19
Vanadium (V)-Dissolved			100.3		%		80-120	21-NOV-19
Zinc (Zn)-Dissolved			92.6		%		80-120	21-NOV-19
WG3224244-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-NOV-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-NOV-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-NOV-19

Quality Control Report

Workorder: L2382999

Report Date: 22-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4919320							
WG3224244-1	MB	NP						
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	21-NOV-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	21-NOV-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-NOV-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	21-NOV-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	21-NOV-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-NOV-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	21-NOV-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	21-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-NOV-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-NOV-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	21-NOV-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-NOV-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	21-NOV-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	21-NOV-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	21-NOV-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-NOV-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	21-NOV-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	21-NOV-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-NOV-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-NOV-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	21-NOV-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	21-NOV-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	21-NOV-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	21-NOV-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-NOV-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	21-NOV-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-NOV-19
WG3224244-4	MS	L2382999-1						
Aluminum (Al)-Dissolved			98.9		%		70-130	21-NOV-19
Antimony (Sb)-Dissolved			98.5		%		70-130	21-NOV-19
Arsenic (As)-Dissolved			101.0		%		70-130	21-NOV-19
Barium (Ba)-Dissolved			N/A	MS-B	%		-	21-NOV-19
Bismuth (Bi)-Dissolved			90.7		%		70-130	21-NOV-19
Boron (B)-Dissolved			99.9		%		70-130	21-NOV-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4919320							
WG3224244-4 MS		L2382999-1						
Cadmium (Cd)-Dissolved			99.7		%		70-130	21-NOV-19
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	21-NOV-19
Chromium (Cr)-Dissolved			99.8		%		70-130	21-NOV-19
Cobalt (Co)-Dissolved			93.8		%		70-130	21-NOV-19
Copper (Cu)-Dissolved			88.6		%		70-130	21-NOV-19
Iron (Fe)-Dissolved			98.8		%		70-130	21-NOV-19
Lead (Pb)-Dissolved			94.8		%		70-130	21-NOV-19
Lithium (Li)-Dissolved			98.1		%		70-130	21-NOV-19
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	21-NOV-19
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	21-NOV-19
Molybdenum (Mo)-Dissolved			102.9		%		70-130	21-NOV-19
Nickel (Ni)-Dissolved			93.4		%		70-130	21-NOV-19
Potassium (K)-Dissolved			104.4		%		70-130	21-NOV-19
Selenium (Se)-Dissolved			105.7		%		70-130	21-NOV-19
Silicon (Si)-Dissolved			93.4		%		70-130	21-NOV-19
Silver (Ag)-Dissolved			101.0		%		70-130	21-NOV-19
Sodium (Na)-Dissolved			N/A	MS-B	%		-	21-NOV-19
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	21-NOV-19
Thallium (Tl)-Dissolved			93.8		%		70-130	21-NOV-19
Tin (Sn)-Dissolved			101.5		%		70-130	21-NOV-19
Titanium (Ti)-Dissolved			94.5		%		70-130	21-NOV-19
Uranium (U)-Dissolved			96.9		%		70-130	21-NOV-19
Vanadium (V)-Dissolved			101.5		%		70-130	21-NOV-19
Zinc (Zn)-Dissolved			89.4		%		70-130	21-NOV-19
MET-T-CCMS-VA								
	Water							
Batch	R4918528							
WG3222056-2 LCS								
Aluminum (Al)-Total			97.5		%		80-120	20-NOV-19
Antimony (Sb)-Total			91.9		%		80-120	20-NOV-19
Arsenic (As)-Total			98.4		%		80-120	20-NOV-19
Barium (Ba)-Total			98.6		%		80-120	20-NOV-19
Bismuth (Bi)-Total			99.4		%		80-120	20-NOV-19
Boron (B)-Total			96.9		%		80-120	20-NOV-19
Cadmium (Cd)-Total			93.8		%		80-120	20-NOV-19

Quality Control Report

Workorder: L2382999

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4918528							
WG3222056-2	LCS							
Calcium (Ca)-Total			95.6		%		80-120	20-NOV-19
Chromium (Cr)-Total			97.8		%		80-120	20-NOV-19
Cobalt (Co)-Total			96.7		%		80-120	20-NOV-19
Copper (Cu)-Total			96.2		%		80-120	20-NOV-19
Iron (Fe)-Total			90.2		%		80-120	20-NOV-19
Lead (Pb)-Total			99.1		%		80-120	20-NOV-19
Lithium (Li)-Total			95.0		%		80-120	20-NOV-19
Magnesium (Mg)-Total			98.4		%		80-120	20-NOV-19
Manganese (Mn)-Total			98.3		%		80-120	20-NOV-19
Molybdenum (Mo)-Total			92.5		%		80-120	20-NOV-19
Nickel (Ni)-Total			96.7		%		80-120	20-NOV-19
Potassium (K)-Total			97.8		%		80-120	20-NOV-19
Selenium (Se)-Total			97.1		%		80-120	20-NOV-19
Silicon (Si)-Total			99.0		%		80-120	20-NOV-19
Silver (Ag)-Total			91.5		%		80-120	20-NOV-19
Sodium (Na)-Total			102.1		%		80-120	20-NOV-19
Strontium (Sr)-Total			90.3		%		80-120	20-NOV-19
Thallium (Tl)-Total			95.9		%		80-120	20-NOV-19
Tin (Sn)-Total			90.9		%		80-120	20-NOV-19
Titanium (Ti)-Total			92.5		%		80-120	20-NOV-19
Uranium (U)-Total			97.7		%		80-120	20-NOV-19
Vanadium (V)-Total			99.1		%		80-120	20-NOV-19
Zinc (Zn)-Total			98.0		%		80-120	20-NOV-19
WG3222056-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	20-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	20-NOV-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	20-NOV-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	20-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	20-NOV-19

Quality Control Report

Workorder: L2382999

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch R4918528								
WG3222056-1 MB								
Copper (Cu)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	20-NOV-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	20-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	20-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	20-NOV-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	20-NOV-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	20-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	20-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	20-NOV-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	20-NOV-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	20-NOV-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	20-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	20-NOV-19
NH3-L-F-CL		Water						
Batch R4912029								
WG3219851-26 LCS								
Ammonia as N			107.9		%		85-115	16-NOV-19
WG3219851-25 MB								
Ammonia as N			<0.0050		mg/L		0.005	16-NOV-19
NO2-L-IC-N-CL		Water						
Batch R4911969								
WG3220375-6 LCS								
Nitrite (as N)			102.4		%		90-110	15-NOV-19
WG3220375-5 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	15-NOV-19
NO3-L-IC-N-CL		Water						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch	R4911969							
WG3220375-6	LCS							
Nitrate (as N)			101.3		%		90-110	15-NOV-19
WG3220375-5	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	15-NOV-19
ORP-CL	Water							
Batch	R4911508							
WG3220205-3	CRM	CL-ORP						
ORP			214		mV		210-230	15-NOV-19
P-T-L-COL-CL	Water							
Batch	R4915232							
WG3221415-14	LCS							
Phosphorus (P)-Total			90.9		%		80-120	16-NOV-19
WG3221415-13	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	16-NOV-19
PH-CL	Water							
Batch	R4914599							
WG3221151-11	LCS							
pH			7.00		pH		6.9-7.1	15-NOV-19
PO4-DO-L-COL-CL	Water							
Batch	R4910869							
WG3219963-6	LCS							
Orthophosphate-Dissolved (as P)			99.0		%		80-120	15-NOV-19
WG3219963-5	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	15-NOV-19
SO4-IC-N-CL	Water							
Batch	R4911969							
WG3220375-6	LCS							
Sulfate (SO4)			100.9		%		90-110	15-NOV-19
WG3220375-5	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	15-NOV-19
SOLIDS-TDS-CL	Water							
Batch	R4915195							
WG3220685-9	DUP	L2382999-1						
Total Dissolved Solids		825	829		mg/L	0.5	20	17-NOV-19
WG3220685-8	LCS							

Quality Control Report

Workorder: L2382999

Report Date: 22-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL		Water						
Batch	R4915195							
WG3220685-8	LCS							
Total Dissolved Solids			98.4		%		85-115	17-NOV-19
WG3220685-7	MB							
Total Dissolved Solids			<10		mg/L		10	17-NOV-19
TEH-BC-VA-CL		Water						
Batch	R4914746							
WG3220479-2	LCS							
EPH10-19			100.9		%		70-130	16-NOV-19
EPH19-32			91.8		%		70-130	16-NOV-19
WG3220479-1	MB							
EPH10-19			<0.25		mg/L		0.25	16-NOV-19
EPH19-32			<0.25		mg/L		0.25	16-NOV-19
Surrogate: 2-Bromobenzotrifluoride			80.1		%		60-140	16-NOV-19
TEH-WATER-VA-CL		Water						
Batch	R4914746							
WG3220479-2	LCS							
TEH (C10-C30)			98.0		%		70-130	16-NOV-19
WG3220479-1	MB							
TEH (C10-C30)			<0.25		mg/L		0.25	16-NOV-19
Surrogate: 2-Bromobenzotrifluoride			80.1		%		60-140	16-NOV-19
TKN-L-F-CL		Water						
Batch	R4912590							
WG3220521-6	LCS							
Total Kjeldahl Nitrogen			91.3		%		75-125	16-NOV-19
WG3220521-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-NOV-19
TSS-L-CL		Water						
Batch	R4916100							
WG3221140-12	LCS							
Total Suspended Solids			105.3		%		85-115	18-NOV-19
WG3221140-11	MB							
Total Suspended Solids			<1.0		mg/L		1	18-NOV-19
TURBIDITY-CL		Water						
Batch	R4911451							
WG3220150-5	LCS							
Turbidity			94.5		%		85-115	15-NOV-19
WG3220150-4	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch	R4911451							
WG3220150-4	MB							
Turbidity			<0.10		NTU		0.1	15-NOV-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Quality Control Report

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	14-NOV-19 14:33	15-NOV-19 14:30	0.25	24	hours	EHTR-FM
pH	1	14-NOV-19 14:33	15-NOV-19 14:00	0.25	24	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2382999 were received on 15-NOV-19 09:05.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

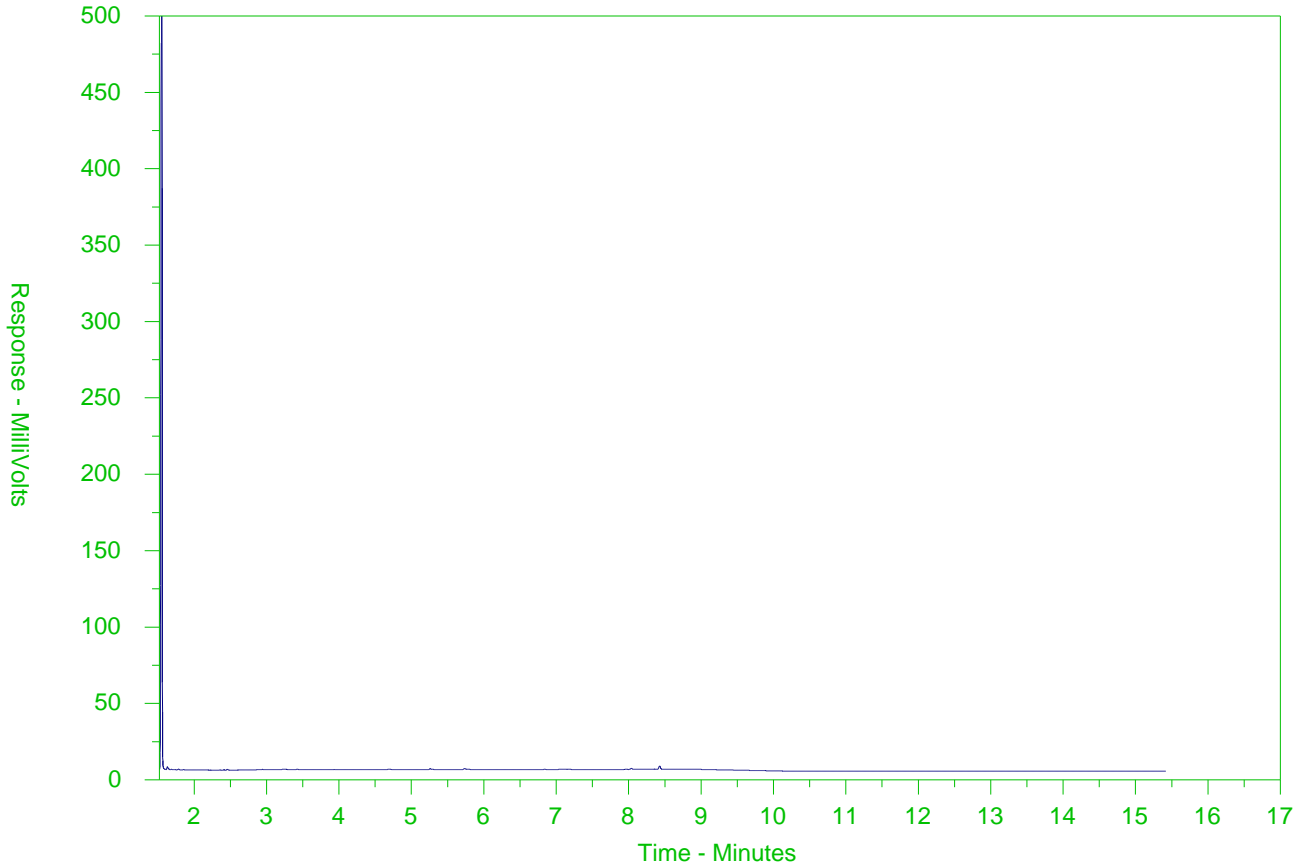
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2382999-1
 Client Sample ID: LC_PIZDC1105_WG_Q4-2019_NP



← F2 →		← F3 →		← F4 →	
nC10	nC16	nC34	nC50		
174°C	287°C	481°C	575°C		
346°F	549°F	898°F	1067°F		
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →		
← Diesel/ Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.


Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

COC ID:	20191114- LC GW	TURNAROUND TIME:		RUSH:	
PROJECT/CLIENT INFO		LABORATORY		OTHER INFO	
Facility Name / Job#	Line Creek Operation	Lab Name	ALS Calgary	Report Format / Distribution	Excel PDF EDD
Project Manager	Carla Froyman Parker	Lab Contact	Lyudmyla Shvets	Email 1:	carla.froymanparker@teck.com
Email	Carla.FroymanParker@teck.com	Email	Lyudmyln.Shvets@ALSGlobal.com	Email 2:	teckcoal@equisonline.com
Address	Box 2003	Address	2559 29 Street NE	Email 3:	drake.tymstra@teck.com
	15km North Hwy 43			Email 4:	kirsten.campbell@teck.com
City	Sparwood	Province	BC	City	Calgary
Postal Code	V0B 2G0	Country	Canada	Province	AB
Phone Number	250-425-3196	Postal Code	T1Y 7B5	Country	Canada
		Phone Number	403 407 1794	PO number	TECK001403120

SAMPLE DETAILS								ANALYSIS REQUESTED											
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	PROPERTY	H2SO4	HCl	HNO3	HNO3	NONE	H2SO4	NaHSO4				
LC_PIZDC1105_WG_Q4-2019_NP	LC_PIZDC1105	WG		2019/11/14	14:33	G	8	ALS_Package-DOC	1	1	1	1	1	1	2				
								HG-D-CVAF-VA											
								TECKCOAL-MET-D-VA											
								TECKCOAL-MET-T-VA											
								TECKCOAL-ROUTINE-VA											
								ALS_Package-TKN/TOC											
								ALS_Package EPH											

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	D.Tymstra/K.Campbell	14-Nov		11/15 4:05
SERVICE REQUEST (rush - subject to availability)	Sampler's Name	Sampler's Signature	Mobile #	Date/Time
Regular (default) X	K. Campbell/D. Tymstra			November 14, 2019
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				

50



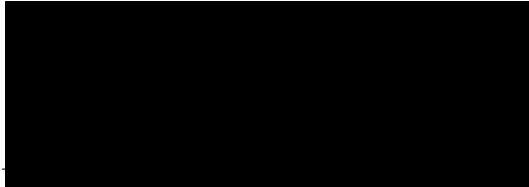
TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
Box 2003 15km North Hwy 43
Sparwood BC V0B 2G0

Date Received: 22-NOV-19
Report Date: 27-NOV-19 17:30 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2386569
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191121ERXPIZP1104
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2386569-1 LC_ERX_WG_2019_20F2_NP							
Sampled By: DT/KC on 20-NOV-19 @ 14:10							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.56		0.50	mg/L		23-NOV-19	R4922038
Total Kjeldahl Nitrogen	0.344		0.050	mg/L		25-NOV-19	R4922734
Total Organic Carbon	2.81		0.50	mg/L		23-NOV-19	R4922038
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	25-NOV-19	26-NOV-19	R4924069
Dissolved Metals Filtration Location	FIELD					25-NOV-19	R4922976
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	26-NOV-19	26-NOV-19	R4923087
Dissolved Mercury Filtration Location	FIELD					26-NOV-19	R4923367
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					25-NOV-19	R4922976
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	25-NOV-19	26-NOV-19	R4924069
Antimony (Sb)-Dissolved	0.00028		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Arsenic (As)-Dissolved	0.00033		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Barium (Ba)-Dissolved	0.289		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	25-NOV-19	26-NOV-19	R4924069
Boron (B)-Dissolved	0.026		0.010	mg/L	25-NOV-19	26-NOV-19	R4924069
Cadmium (Cd)-Dissolved	0.0590		0.0050	ug/L	25-NOV-19	26-NOV-19	R4924069
Calcium (Ca)-Dissolved	143		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	25-NOV-19	26-NOV-19	R4924069
Copper (Cu)-Dissolved	0.00047		0.00020	mg/L	25-NOV-19	26-NOV-19	R4924069
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	25-NOV-19	26-NOV-19	R4924069
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	25-NOV-19	26-NOV-19	R4924069
Lithium (Li)-Dissolved	0.0219		0.0010	mg/L	25-NOV-19	26-NOV-19	R4924069
Magnesium (Mg)-Dissolved	42.4		0.10	mg/L	25-NOV-19	26-NOV-19	R4924069
Manganese (Mn)-Dissolved	0.0118		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Molybdenum (Mo)-Dissolved	0.00434		0.000050	mg/L	25-NOV-19	26-NOV-19	R4924069
Nickel (Ni)-Dissolved	0.00105		0.00050	mg/L	25-NOV-19	26-NOV-19	R4924069
Potassium (K)-Dissolved	2.56		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Selenium (Se)-Dissolved	2.67		0.050	ug/L	25-NOV-19	26-NOV-19	R4924069
Silicon (Si)-Dissolved	6.57		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Sodium (Na)-Dissolved	12.0		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Strontium (Sr)-Dissolved	0.688		0.00020	mg/L	25-NOV-19	26-NOV-19	R4924069
Thallium (Tl)-Dissolved	0.000021		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	25-NOV-19	26-NOV-19	R4924069
Uranium (U)-Dissolved	0.00283		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	25-NOV-19	26-NOV-19	R4924069
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	25-NOV-19	26-NOV-19	R4924069
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	533		0.50	mg/L		26-NOV-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.021		0.020	ug/L		25-NOV-19	R4922859
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		26-NOV-19	R4923087
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.534		0.0030	mg/L		25-NOV-19	R4922859
Antimony (Sb)-Total	0.00028		0.00010	mg/L		25-NOV-19	R4922859

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2386569-1 LC_ERX_WG_2019_20F2_NP							
Sampled By: DT/KC on 20-NOV-19 @ 14:10							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Arsenic (As)-Total	0.00051		0.00010	mg/L		25-NOV-19	R4922859
Barium (Ba)-Total	0.306		0.00010	mg/L		25-NOV-19	R4922859
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		25-NOV-19	R4922859
Boron (B)-Total	0.027		0.010	mg/L		25-NOV-19	R4922859
Cadmium (Cd)-Total	0.127		0.0050	ug/L		25-NOV-19	R4922859
Calcium (Ca)-Total	144		0.050	mg/L		25-NOV-19	R4922859
Chromium (Cr)-Total	0.00076		0.00010	mg/L		25-NOV-19	R4922859
Cobalt (Co)-Total	0.30		0.10	ug/L		25-NOV-19	R4922859
Copper (Cu)-Total	0.00126		0.00050	mg/L		25-NOV-19	R4922859
Iron (Fe)-Total	0.408		0.010	mg/L		25-NOV-19	R4922859
Lead (Pb)-Total	0.000249		0.000050	mg/L		25-NOV-19	R4922859
Lithium (Li)-Total	0.0239		0.0010	mg/L		25-NOV-19	R4922859
Magnesium (Mg)-Total	44.0		0.10	mg/L		25-NOV-19	R4922859
Manganese (Mn)-Total	0.0183		0.00010	mg/L		25-NOV-19	R4922859
Molybdenum (Mo)-Total	0.00380		0.000050	mg/L		25-NOV-19	R4922859
Nickel (Ni)-Total	0.00179		0.00050	mg/L		25-NOV-19	R4922859
Potassium (K)-Total	2.54		0.050	mg/L		25-NOV-19	R4922859
Selenium (Se)-Total	2.79		0.050	ug/L		25-NOV-19	R4922859
Silicon (Si)-Total	7.36		0.10	mg/L		25-NOV-19	R4922859
Silver (Ag)-Total	0.000011		0.000010	mg/L		25-NOV-19	R4922859
Sodium (Na)-Total	11.7		0.050	mg/L		25-NOV-19	R4922859
Strontium (Sr)-Total	0.640		0.00020	mg/L		25-NOV-19	R4922859
Thallium (Tl)-Total	0.000033		0.000010	mg/L		25-NOV-19	R4922859
Tin (Sn)-Total	<0.00010		0.00010	mg/L		25-NOV-19	R4922859
Titanium (Ti)-Total	0.012		0.010	mg/L		25-NOV-19	R4922859
Uranium (U)-Total	0.00277		0.000010	mg/L		25-NOV-19	R4922859
Vanadium (V)-Total	0.00151		0.00050	mg/L		25-NOV-19	R4922859
Zinc (Zn)-Total	0.0045		0.0030	mg/L		25-NOV-19	R4922859
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.9		1.0	mg/L		22-NOV-19	R4920946
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	276		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Total (as CaCO3)	276		1.0	mg/L		22-NOV-19	R4920806
Ammonia, Total (as N)							
Ammonia as N	0.0217		0.0050	mg/L		26-NOV-19	R4922870
Bromide in Water by IC (Low Level)							
Bromide (Br)	1.30	DLHC	0.25	mg/L		22-NOV-19	R4921956
Chloride in Water by IC							
Chloride (Cl)	152	DLHC	2.5	mg/L		22-NOV-19	R4921956
Electrical Conductivity (EC)							
Conductivity (@ 25C)	1050		2.0	uS/cm		22-NOV-19	R4920806
Fluoride in Water by IC							
Fluoride (F)	0.13	DLHC	0.10	mg/L		22-NOV-19	R4921956
Ion Balance Calculation							
Cation - Anion Balance	-2.0			%		26-NOV-19	
Anion Sum	11.7			meq/L		26-NOV-19	
Cation Sum	11.2			meq/L		26-NOV-19	
Ion Balance Calculation							
Ion Balance	96.0		-100	%		26-NOV-19	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2386569-1 LC_ERX_WG_2019_20F2_NP Sampled By: DT/KC on 20-NOV-19 @ 14:10 Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.728	DLHC	0.025	mg/L		22-NOV-19	R4921956
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		22-NOV-19	R4921956
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0014		0.0010	mg/L		22-NOV-19	R4921606
Oxidation redution potential by elect.							
ORP	345		-1000	mV		22-NOV-19	R4921776
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0384		0.0020	mg/L		24-NOV-19	R4922111
Sulfate in Water by IC							
Sulfate (SO4)	89.1	DLHC	1.5	mg/L		22-NOV-19	R4921956
Total Dissolved Solids							
Total Dissolved Solids	691		20	mg/L		22-NOV-19	R4922588
Total Suspended Solids							
Total Suspended Solids	30.7		1.0	mg/L		22-NOV-19	R4921505
Turbidity							
Turbidity	11.8		0.10	NTU		22-NOV-19	R4921777
pH							
pH	8.22		0.10	pH		22-NOV-19	R4920806
L2386569-2 LC_PIZP1104_WG_Q4-2019_NP Sampled By: DT/KC on 21-NOV-19 @ 11:48 Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.84		0.50	mg/L		23-NOV-19	R4922038
Total Kjeldahl Nitrogen	0.206		0.050	mg/L		26-NOV-19	R4922734
Total Organic Carbon	1.81		0.50	mg/L		23-NOV-19	R4922038
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	25-NOV-19	26-NOV-19	R4924069
Dissolved Metals Filtration Location	FIELD					25-NOV-19	R4922976
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	26-NOV-19	26-NOV-19	R4923087
Dissolved Mercury Filtration Location	FIELD					26-NOV-19	R4923367
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					25-NOV-19	R4922976
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	25-NOV-19	26-NOV-19	R4924069
Antimony (Sb)-Dissolved	0.00016		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Arsenic (As)-Dissolved	0.00084		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Barium (Ba)-Dissolved	0.317		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	25-NOV-19	26-NOV-19	R4924069
Boron (B)-Dissolved	0.025		0.010	mg/L	25-NOV-19	26-NOV-19	R4924069
Cadmium (Cd)-Dissolved	0.0257		0.0050	ug/L	25-NOV-19	26-NOV-19	R4924069
Calcium (Ca)-Dissolved	131		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Cobalt (Co)-Dissolved	1.88		0.10	ug/L	25-NOV-19	26-NOV-19	R4924069
Copper (Cu)-Dissolved	0.00168		0.00020	mg/L	25-NOV-19	26-NOV-19	R4924069
Iron (Fe)-Dissolved	0.825		0.010	mg/L	25-NOV-19	26-NOV-19	R4924069
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	25-NOV-19	26-NOV-19	R4924069
Lithium (Li)-Dissolved	0.0167		0.0010	mg/L	25-NOV-19	26-NOV-19	R4924069
Magnesium (Mg)-Dissolved	43.7		0.10	mg/L	25-NOV-19	26-NOV-19	R4924069
Manganese (Mn)-Dissolved	1.10		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2386569-2 LC_PIZP1104_WG_Q4-2019_NP							
Sampled By: DT/KC on 21-NOV-19 @ 11:48							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	0.00302		0.000050	mg/L	25-NOV-19	26-NOV-19	R4924069
Nickel (Ni)-Dissolved	0.00321		0.00050	mg/L	25-NOV-19	26-NOV-19	R4924069
Potassium (K)-Dissolved	2.36		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	25-NOV-19	26-NOV-19	R4924069
Silicon (Si)-Dissolved	4.87		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Sodium (Na)-Dissolved	12.2		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Strontium (Sr)-Dissolved	0.450		0.00020	mg/L	25-NOV-19	26-NOV-19	R4924069
Thallium (Tl)-Dissolved	0.000028		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Tin (Sn)-Dissolved	0.00014		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	25-NOV-19	26-NOV-19	R4924069
Uranium (U)-Dissolved	0.00413		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	25-NOV-19	26-NOV-19	R4924069
Zinc (Zn)-Dissolved	0.0123		0.0010	mg/L	25-NOV-19	26-NOV-19	R4924069
Total Metals in Water							
Hardness							
Hardness (as CaCO3)	508		0.50	mg/L		27-NOV-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.050		0.020	ug/L		26-NOV-19	R4925150
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.601		0.0030	mg/L		26-NOV-19	R4925150
Antimony (Sb)-Total	0.00032		0.00010	mg/L		26-NOV-19	R4925150
Arsenic (As)-Total	0.00190		0.00010	mg/L		26-NOV-19	R4925150
Barium (Ba)-Total	0.346		0.00010	mg/L		26-NOV-19	R4925150
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-NOV-19	R4925150
Boron (B)-Total	0.023		0.010	mg/L		26-NOV-19	R4925150
Cadmium (Cd)-Total	0.182		0.0050	ug/L		26-NOV-19	R4925150
Calcium (Ca)-Total	139		0.050	mg/L		26-NOV-19	R4925150
Chromium (Cr)-Total	0.00186		0.00010	mg/L		26-NOV-19	R4925150
Cobalt (Co)-Total	2.32		0.10	ug/L		26-NOV-19	R4925150
Copper (Cu)-Total	0.0247		0.00050	mg/L		26-NOV-19	R4925150
Iron (Fe)-Total	3.31		0.010	mg/L		26-NOV-19	R4925150
Lead (Pb)-Total	0.00151		0.000050	mg/L		26-NOV-19	R4925150
Lithium (Li)-Total	0.0175		0.0010	mg/L		26-NOV-19	R4925150
Magnesium (Mg)-Total	45.7		0.10	mg/L		26-NOV-19	R4925150
Manganese (Mn)-Total	1.07		0.00010	mg/L		26-NOV-19	R4925150
Molybdenum (Mo)-Total	0.00258		0.000050	mg/L		26-NOV-19	R4925150
Nickel (Ni)-Total	0.00467		0.00050	mg/L		26-NOV-19	R4925150
Potassium (K)-Total	2.50		0.050	mg/L		26-NOV-19	R4925150
Selenium (Se)-Total	0.145		0.050	ug/L		26-NOV-19	R4925150
Silicon (Si)-Total	5.86		0.10	mg/L		26-NOV-19	R4925150
Silver (Ag)-Total	0.000039		0.000010	mg/L		26-NOV-19	R4925150
Sodium (Na)-Total	11.6		0.050	mg/L		26-NOV-19	R4925150
Strontium (Sr)-Total	0.461		0.00020	mg/L		26-NOV-19	R4925150
Thallium (Tl)-Total	0.000062		0.000010	mg/L		26-NOV-19	R4925150
Tin (Sn)-Total	0.00024		0.00010	mg/L		26-NOV-19	R4925150
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-NOV-19	R4925150
Uranium (U)-Total	0.00399		0.000010	mg/L		26-NOV-19	R4925150
Vanadium (V)-Total	0.00250		0.00050	mg/L		26-NOV-19	R4925150
Zinc (Zn)-Total	0.0286		0.0030	mg/L		26-NOV-19	R4925150
Routine for Teck Coal							
Acidity by Automatic Titration							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2386569-2 LC_PIZP1104_WG_Q4-2019_NP							
Sampled By: DT/KC on 21-NOV-19 @ 11:48							
Matrix: WG							
Acidity by Automatic Titration							
Acidity (as CaCO3)	19.5		1.0	mg/L		22-NOV-19	R4920946
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	265		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Total (as CaCO3)	265		1.0	mg/L		22-NOV-19	R4920806
Ammonia, Total (as N)							
Ammonia as N	0.0133		0.0050	mg/L		26-NOV-19	R4922870
Bromide in Water by IC (Low Level)							
Bromide (Br)	2.23	DLHC	0.25	mg/L		22-NOV-19	R4921956
Chloride in Water by IC							
Chloride (Cl)	187	DLHC	2.5	mg/L		22-NOV-19	R4921956
Electrical Conductivity (EC)							
Conductivity (@ 25C)	1060		2.0	uS/cm		22-NOV-19	R4920806
Fluoride in Water by IC							
Fluoride (F)	0.23	DLHC	0.10	mg/L		22-NOV-19	R4921956
Ion Balance Calculation							
Ion Balance	95.3		-100	%		27-NOV-19	
Ion Balance Calculation							
Cation - Anion Balance	-2.4			%		27-NOV-19	
Anion Sum	11.4			meq/L		27-NOV-19	
Cation Sum	10.8			meq/L		27-NOV-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.249	DLHC	0.025	mg/L		22-NOV-19	R4921956
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		22-NOV-19	R4921956
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-NOV-19	R4921606
Oxidation redution potential by elect.							
ORP	303		-1000	mV		22-NOV-19	R4921776
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.155	DLHC	0.010	mg/L		24-NOV-19	R4922111
Sulfate in Water by IC							
Sulfate (SO4)	36.2	DLHC	1.5	mg/L		22-NOV-19	R4921956
Total Dissolved Solids							
Total Dissolved Solids	705		20	mg/L		22-NOV-19	R4922588
Total Suspended Solids							
Total Suspended Solids	82.6		1.0	mg/L		22-NOV-19	R4921505
Turbidity							
Turbidity	48.8		0.10	NTU		22-NOV-19	R4921777
pH							
pH	7.56		0.10	pH		22-NOV-19	R4920806

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20191121ERXPIZP1104

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2386569

Report Date: 27-NOV-19

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Client: TECK COAL LIMITED (LINE CREEK)
 Box 2003 15km North Hwy 43
 Sparwood BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4920946							
WG3225969-6	DUP	L2386569-2						
Acidity (as CaCO3)		19.5	17.8		mg/L	9.0	20	22-NOV-19
WG3225969-5	LCS							
Acidity (as CaCO3)			107.0		%		85-115	22-NOV-19
WG3225969-4	MB							
Acidity (as CaCO3)			1.3		mg/L		2	22-NOV-19
ALK-MAN-CL								
	Water							
Batch	R4920806							
WG3225900-8	LCS							
Alkalinity, Total (as CaCO3)			97.2		%		85-115	22-NOV-19
WG3225900-7	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	22-NOV-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4924069							
WG3227958-2	LCS							
Beryllium (Be)-Dissolved			87.0		%		80-120	26-NOV-19
WG3227958-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	26-NOV-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4922859							
WG3227401-3	DUP	L2386569-1						
Beryllium (Be)-Total		0.000021	0.000023		mg/L	9.6	20	25-NOV-19
WG3227401-2	LCS							
Beryllium (Be)-Total			89.9		%		80-120	25-NOV-19
WG3227401-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	25-NOV-19
Batch	R4925150							
WG3227401-4	MS	L2386569-2						
Beryllium (Be)-Total			90.3		%		70-130	26-NOV-19
BR-L-IC-N-CL								
	Water							
Batch	R4921956							
WG3226696-2	LCS							
Bromide (Br)			106.5		%		85-115	22-NOV-19
WG3226696-1	MB							
Bromide (Br)			<0.050		mg/L		0.05	22-NOV-19
CL-IC-N-CL								
	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-CL								
Batch R4921956								
WG3226696-2	LCS							
Chloride (Cl)			103.0		%		90-110	22-NOV-19
WG3226696-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	22-NOV-19
EC-L-PCT-CL								
Batch R4920806								
WG3225900-8	LCS							
Conductivity (@ 25C)			96.8		%		90-110	22-NOV-19
WG3225900-7	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	22-NOV-19
F-IC-N-CL								
Batch R4921956								
WG3226696-2	LCS							
Fluoride (F)			102.6		%		90-110	22-NOV-19
WG3226696-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	22-NOV-19
HG-D-CVAA-VA								
Batch R4923087								
WG3228390-7	DUP	L2386569-2						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	26-NOV-19
WG3228390-6	LCS							
Mercury (Hg)-Dissolved			97.1		%		80-120	26-NOV-19
WG3228390-5	MB							
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	26-NOV-19
WG3228390-8	MS	L2386569-1						
Mercury (Hg)-Dissolved			75.4		%		70-130	26-NOV-19
HG-T-CVAA-VA								
Batch R4923087								
WG3228056-2	LCS							
Mercury (Hg)-Total			97.6		%		80-120	26-NOV-19
WG3228056-1	MB							
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	26-NOV-19
MET-D-CCMS-VA								
Batch R4924069								
WG3227958-2	LCS							
Aluminum (Al)-Dissolved			96.6		%		80-120	26-NOV-19
Antimony (Sb)-Dissolved			96.3		%		80-120	26-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4924069							
WG3227958-2	LCS							
Arsenic (As)-Dissolved			102.2		%		80-120	26-NOV-19
Barium (Ba)-Dissolved			99.6		%		80-120	26-NOV-19
Bismuth (Bi)-Dissolved			97.8		%		80-120	26-NOV-19
Boron (B)-Dissolved			94.8		%		80-120	26-NOV-19
Cadmium (Cd)-Dissolved			97.8		%		80-120	26-NOV-19
Calcium (Ca)-Dissolved			97.0		%		80-120	26-NOV-19
Chromium (Cr)-Dissolved			99.6		%		80-120	26-NOV-19
Cobalt (Co)-Dissolved			97.6		%		80-120	26-NOV-19
Copper (Cu)-Dissolved			96.3		%		80-120	26-NOV-19
Iron (Fe)-Dissolved			98.5		%		80-120	26-NOV-19
Lead (Pb)-Dissolved			99.2		%		80-120	26-NOV-19
Lithium (Li)-Dissolved			88.3		%		80-120	26-NOV-19
Magnesium (Mg)-Dissolved			93.0		%		80-120	26-NOV-19
Manganese (Mn)-Dissolved			103.2		%		80-120	26-NOV-19
Molybdenum (Mo)-Dissolved			102.2		%		80-120	26-NOV-19
Nickel (Ni)-Dissolved			96.0		%		80-120	26-NOV-19
Potassium (K)-Dissolved			102.4		%		80-120	26-NOV-19
Selenium (Se)-Dissolved			100.2		%		80-120	26-NOV-19
Silicon (Si)-Dissolved			102.1		%		60-140	26-NOV-19
Silver (Ag)-Dissolved			95.7		%		80-120	26-NOV-19
Sodium (Na)-Dissolved			101.4		%		80-120	26-NOV-19
Strontium (Sr)-Dissolved			97.3		%		80-120	26-NOV-19
Thallium (Tl)-Dissolved			97.5		%		80-120	26-NOV-19
Tin (Sn)-Dissolved			98.5		%		80-120	26-NOV-19
Titanium (Ti)-Dissolved			97.0		%		80-120	26-NOV-19
Uranium (U)-Dissolved			99.4		%		80-120	26-NOV-19
Vanadium (V)-Dissolved			100.8		%		80-120	26-NOV-19
Zinc (Zn)-Dissolved			99.9		%		80-120	26-NOV-19
WG3227958-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	26-NOV-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	26-NOV-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	26-NOV-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	26-NOV-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	26-NOV-19

Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4924069							
WG3227958-1	MB	NP						
Boron (B)-Dissolved			<0.010		mg/L		0.01	26-NOV-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	26-NOV-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	26-NOV-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	26-NOV-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	26-NOV-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	26-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	26-NOV-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	26-NOV-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	26-NOV-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	26-NOV-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	26-NOV-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	26-NOV-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	26-NOV-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	26-NOV-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	26-NOV-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	26-NOV-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	26-NOV-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	26-NOV-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	26-NOV-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	26-NOV-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	26-NOV-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	26-NOV-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	26-NOV-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	26-NOV-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	26-NOV-19
MET-T-CCMS-VA								
	Water							
Batch	R4922859							
WG3227401-3	DUP	L2386569-1						
Aluminum (Al)-Total		0.534	0.479		mg/L	11	20	25-NOV-19
Antimony (Sb)-Total		0.00028	0.00026		mg/L	6.6	20	25-NOV-19
Arsenic (As)-Total		0.00051	0.00046		mg/L	9.5	20	25-NOV-19
Barium (Ba)-Total		0.306	0.269		mg/L	13	20	25-NOV-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	25-NOV-19
Boron (B)-Total		0.027	0.025		mg/L	4.9	20	25-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4922859							
WG3227401-3 DUP		L2386569-1						
Calcium (Ca)-Total		144	140		mg/L	2.8	20	25-NOV-19
Chromium (Cr)-Total		0.00076	0.00065		mg/L	16	20	25-NOV-19
Cobalt (Co)-Total		0.00030	0.00027		mg/L	8.9	20	25-NOV-19
Copper (Cu)-Total		0.00126	0.00109		mg/L	15	20	25-NOV-19
Iron (Fe)-Total		0.408	0.402		mg/L	1.4	20	25-NOV-19
Lead (Pb)-Total		0.000249	0.000234		mg/L	6.3	20	25-NOV-19
Lithium (Li)-Total		0.0239	0.0226		mg/L	5.4	20	25-NOV-19
Magnesium (Mg)-Total		44.0	39.0		mg/L	12	20	25-NOV-19
Manganese (Mn)-Total		0.0183	0.0158		mg/L	15	20	25-NOV-19
Molybdenum (Mo)-Total		0.00380	0.00368		mg/L	3.3	20	25-NOV-19
Nickel (Ni)-Total		0.00179	0.00166		mg/L	8.0	20	25-NOV-19
Potassium (K)-Total		2.54	2.27		mg/L	11	20	25-NOV-19
Selenium (Se)-Total		0.00279	0.00261		mg/L	6.5	20	25-NOV-19
Silicon (Si)-Total		7.36	7.56		mg/L	2.6	20	25-NOV-19
Silver (Ag)-Total		0.000011	<0.000010	RPD-NA	mg/L	N/A	20	25-NOV-19
Sodium (Na)-Total		11.7	10.4		mg/L	12	20	25-NOV-19
Strontium (Sr)-Total		0.640	0.616		mg/L	3.9	20	25-NOV-19
Thallium (Tl)-Total		0.000033	0.000033		mg/L	1.1	20	25-NOV-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	25-NOV-19
Titanium (Ti)-Total		0.012	<0.010	RPD-NA	mg/L	N/A	20	25-NOV-19
Uranium (U)-Total		0.00277	0.00264		mg/L	5.2	20	25-NOV-19
Vanadium (V)-Total		0.00151	0.00128		mg/L	17	20	25-NOV-19
Zinc (Zn)-Total		0.0045	0.0040		mg/L	13	20	25-NOV-19
WG3227401-2 LCS								
Aluminum (Al)-Total			99.0		%		80-120	25-NOV-19
Antimony (Sb)-Total			95.9		%		80-120	25-NOV-19
Arsenic (As)-Total			100.1		%		80-120	25-NOV-19
Barium (Ba)-Total			97.6		%		80-120	25-NOV-19
Bismuth (Bi)-Total			97.9		%		80-120	25-NOV-19
Boron (B)-Total			94.2		%		80-120	25-NOV-19
Cadmium (Cd)-Total			98.2		%		80-120	25-NOV-19
Calcium (Ca)-Total			102.0		%		80-120	25-NOV-19
Chromium (Cr)-Total			101.2		%		80-120	25-NOV-19
Cobalt (Co)-Total			99.98		%		80-120	25-NOV-19

Quality Control Report

Workorder: L2386569

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4922859							
WG3227401-2	LCS							
Copper (Cu)-Total			95.9		%		80-120	25-NOV-19
Iron (Fe)-Total			94.1		%		80-120	25-NOV-19
Lead (Pb)-Total			94.5		%		80-120	25-NOV-19
Lithium (Li)-Total			99.1		%		80-120	25-NOV-19
Magnesium (Mg)-Total			96.7		%		80-120	25-NOV-19
Manganese (Mn)-Total			103.4		%		80-120	25-NOV-19
Molybdenum (Mo)-Total			94.2		%		80-120	25-NOV-19
Nickel (Ni)-Total			98.5		%		80-120	25-NOV-19
Potassium (K)-Total			98.8		%		80-120	25-NOV-19
Selenium (Se)-Total			100.3		%		80-120	25-NOV-19
Silicon (Si)-Total			101.4		%		80-120	25-NOV-19
Silver (Ag)-Total			91.0		%		80-120	25-NOV-19
Sodium (Na)-Total			103.5		%		80-120	25-NOV-19
Strontium (Sr)-Total			94.8		%		80-120	25-NOV-19
Thallium (Tl)-Total			94.5		%		80-120	25-NOV-19
Tin (Sn)-Total			92.3		%		80-120	25-NOV-19
Titanium (Ti)-Total			97.3		%		80-120	25-NOV-19
Uranium (U)-Total			96.1		%		80-120	25-NOV-19
Vanadium (V)-Total			101.4		%		80-120	25-NOV-19
Zinc (Zn)-Total			96.2		%		80-120	25-NOV-19
WG3227401-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	25-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	25-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	25-NOV-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	25-NOV-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	25-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	25-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	25-NOV-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	25-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4922859							
WG3227401-1	MB							
Lithium (Li)-Total			<0.0010		mg/L		0.001	25-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	25-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	25-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	25-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	25-NOV-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	25-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	25-NOV-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	25-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	25-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	25-NOV-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	25-NOV-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	25-NOV-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	25-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	25-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	25-NOV-19
Batch	R4925150							
WG3227401-4	MS	L2386569-2						
Aluminum (Al)-Total			N/A	MS-B	%		-	26-NOV-19
Antimony (Sb)-Total			95.1		%		70-130	26-NOV-19
Arsenic (As)-Total			93.9		%		70-130	26-NOV-19
Barium (Ba)-Total			N/A	MS-B	%		-	26-NOV-19
Bismuth (Bi)-Total			86.2		%		70-130	26-NOV-19
Boron (B)-Total			90.1		%		70-130	26-NOV-19
Cadmium (Cd)-Total			93.9		%		70-130	26-NOV-19
Calcium (Ca)-Total			N/A	MS-B	%		-	26-NOV-19
Chromium (Cr)-Total			95.5		%		70-130	26-NOV-19
Cobalt (Co)-Total			89.9		%		70-130	26-NOV-19
Copper (Cu)-Total			N/A	MS-B	%		-	26-NOV-19
Iron (Fe)-Total			N/A	MS-B	%		-	26-NOV-19
Lead (Pb)-Total			87.2		%		70-130	26-NOV-19
Lithium (Li)-Total			87.5		%		70-130	26-NOV-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	26-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4925150							
WG3227401-4	MS	L2386569-2						
Manganese (Mn)-Total			N/A	MS-B	%		-	26-NOV-19
Molybdenum (Mo)-Total			95.0		%		70-130	26-NOV-19
Nickel (Ni)-Total			90.0		%		70-130	26-NOV-19
Potassium (K)-Total			94.1		%		70-130	26-NOV-19
Selenium (Se)-Total			99.6		%		70-130	26-NOV-19
Silicon (Si)-Total			92.8		%		70-130	26-NOV-19
Silver (Ag)-Total			96.5		%		70-130	26-NOV-19
Sodium (Na)-Total			N/A	MS-B	%		-	26-NOV-19
Strontium (Sr)-Total			N/A	MS-B	%		-	26-NOV-19
Thallium (Tl)-Total			86.8		%		70-130	26-NOV-19
Tin (Sn)-Total			93.1		%		70-130	26-NOV-19
Titanium (Ti)-Total			96.8		%		70-130	26-NOV-19
Uranium (U)-Total			89.5		%		70-130	26-NOV-19
Vanadium (V)-Total			96.1		%		70-130	26-NOV-19
Zinc (Zn)-Total			87.0		%		70-130	26-NOV-19
NH3-L-F-CL								
	Water							
Batch	R4922870							
WG3226751-6	LCS							
Ammonia as N			100.7		%		85-115	23-NOV-19
WG3226751-5	MB							
Ammonia as N			<0.0050		mg/L		0.005	23-NOV-19
NO2-L-IC-N-CL								
	Water							
Batch	R4921956							
WG3226696-2	LCS							
Nitrite (as N)			102.6		%		90-110	22-NOV-19
WG3226696-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	22-NOV-19
NO3-L-IC-N-CL								
	Water							
Batch	R4921956							
WG3226696-2	LCS							
Nitrate (as N)			101.1		%		90-110	22-NOV-19
WG3226696-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	22-NOV-19
ORP-CL	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ORP-CL	Water							
Batch	R4921776							
WG3226063-7	CRM	CL-ORP						
ORP			225		mV		210-230	22-NOV-19
P-T-L-COL-CL	Water							
Batch	R4922111							
WG3226900-6	LCS							
Phosphorus (P)-Total			96.5		%		80-120	24-NOV-19
WG3226900-5	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	24-NOV-19
PH-CL	Water							
Batch	R4920806							
WG3225900-8	LCS							
pH			7.01		pH		6.9-7.1	22-NOV-19
PO4-DO-L-COL-CL	Water							
Batch	R4921606							
WG3226122-2	LCS							
Orthophosphate-Dissolved (as P)			110.0		%		80-120	22-NOV-19
WG3226122-1	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	22-NOV-19
SO4-IC-N-CL	Water							
Batch	R4921956							
WG3226696-2	LCS							
Sulfate (SO4)			106.6		%		90-110	22-NOV-19
WG3226696-1	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	22-NOV-19
SOLIDS-TDS-CL	Water							
Batch	R4922588							
WG3225678-5	LCS							
Total Dissolved Solids			96.6		%		85-115	22-NOV-19
WG3225678-4	MB							
Total Dissolved Solids			<10		mg/L		10	22-NOV-19
TKN-L-F-CL	Water							
Batch	R4922734							
WG3227635-3	DUP	L2386569-2						
Total Kjeldahl Nitrogen		0.206	0.184		mg/L	11	20	26-NOV-19
WG3227635-2	LCS							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL								
	Water							
Batch	R4922734							
WG3227635-2	LCS							
Total Kjeldahl Nitrogen			107.2		%		75-125	25-NOV-19
WG3227635-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	25-NOV-19
WG3227635-4	MS	L2386569-2						
Total Kjeldahl Nitrogen			114.7		%		70-130	26-NOV-19
TSS-L-CL								
	Water							
Batch	R4921505							
WG3225798-5	LCS							
Total Suspended Solids			96.6		%		85-115	22-NOV-19
WG3225798-4	MB							
Total Suspended Solids			<1.0		mg/L		1	22-NOV-19
TURBIDITY-CL								
	Water							
Batch	R4921777							
WG3226388-2	LCS							
Turbidity			95.0		%		85-115	22-NOV-19
WG3226388-1	MB							
Turbidity			<0.10		NTU		0.1	22-NOV-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	20-NOV-19 14:10	22-NOV-19 17:50	0.25	52	hours	EHTR-FM
	2	21-NOV-19 11:48	22-NOV-19 17:50	0.25	30	hours	EHTR-FM
pH	1	20-NOV-19 14:10	22-NOV-19 14:00	0.25	48	hours	EHTR-FM
	2	21-NOV-19 11:48	22-NOV-19 14:00	0.25	26	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2386569 were received on 22-NOV-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

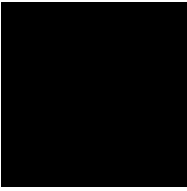
COC ID: **20191121 ERX PIZP1104** TURNAROUND TIME: RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Carla Froyman Parker			Lab Contact	Lyudmyla Shvets			Email 1:	carla.froymanparker@teck.com	x	x	
Email	Carla.FroymanParker@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	teckcoal@equisonline.com			x
Address	Box 2003 15km North Hwy 43			Address	2559 29 Street NE			Email 3:	drake.tymstra@teck.com	x		
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 4:	kirsten.campbell@teck.com	x	x	
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	Email 5:	kennedy.allen@teck.com	x	x	
Phone Number	250-425-3196			Phone Number	403 407 1794			PO number	KPO00648128			

SAMPLE DETAILS								ANALYSIS REQUESTED													
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ALS Package-DOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS Package-TKN/TOC	HG-T-U-CVAF-VA	HG-T-CVAF-VA						
LC_ERX_WG_2019_2of2_NP	LC_ERX	WG		11/20/2019	14:10	G	8	1	1	1	1	1	1	1	1						
LC_PIZP1104_WG_Q4-2019_NP	LC_PIZP1104	WG		11/21/2019	11:48	G	6	1	1	1	1	1	1								



ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
DO NOT USE FOR ANALYSIS	D.Tymstra/K.Campbell	21-Nov	<i>[Signature]</i>	11/22/2019
SERVICE REQUEST (rush - subject to availability)	Sampler's Name	K. Campbell/D. Tymstra	Mobile #	
Regular (default) X	Sampler's Signature		Date/Time	November 21, 2019
Priority (2-3 business days) - 50% surcharge				
Emergency (1 Business Day) - 100% surcharge				
For Emergency <1 Day, ASAP or Weekend - Contact ALS				



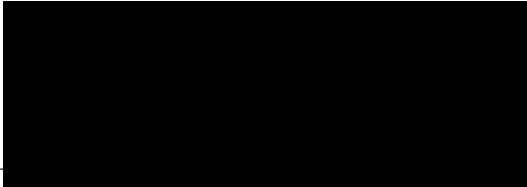
TECK COAL LIMITED (LINE CREEK)
ATTN: Carla Froyman Parker
Box 2003 15km North Hwy 43
Sparwood BC V0B 2G0

Date Received: 17-DEC-19
Report Date: 24-DEC-19 14:43 (MT)
Version: FINAL

Client Phone: 250-425-3196

Certificate of Analysis


Lab Work Order #: L2397341
Project P.O. #: VPO00608129
Job Reference: LINE CREEK OPERATIONS
C of C Numbers: 20191216 LC GW
Legal Site Desc:



Lyudmyla Shvets, B.Sc.
Account Manager

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2397341-1 LC_PIZP1101_WG_Q4-2019_N							
Sampled By: KC/DT on 16-DEC-19 @ 12:57							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		21-DEC-19	R4951855
Total Kjeldahl Nitrogen	0.220		0.050	mg/L		24-DEC-19	R4952977
Total Organic Carbon	2.27		0.50	mg/L		21-DEC-19	R4951855
EPH Testing for teck Coal							
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	20-DEC-19	20-DEC-19	R4950388
EPH19-32	<0.25		0.25	mg/L	20-DEC-19	20-DEC-19	R4950388
Surrogate: 2-Bromobenzotrifluoride	95.0		60-140	%	20-DEC-19	20-DEC-19	R4950388
Sum of EPH (10-32)							
EPH (C10-C32)	<0.50		0.50	mg/L		20-DEC-19	
TEH (C10-C30)							
TEH (C10-C30)	<0.25		0.25	mg/L	20-DEC-19	20-DEC-19	R4950388
Surrogate: 2-Bromobenzotrifluoride	95.0		60-140	%	20-DEC-19	20-DEC-19	R4950388
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	19-DEC-19	20-DEC-19	R4950133
Dissolved Metals Filtration Location	FIELD					19-DEC-19	R4946314
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	19-DEC-19	20-DEC-19	R4949181
Dissolved Mercury Filtration Location	FIELD					19-DEC-19	R4946321
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					19-DEC-19	R4946314
Aluminum (Al)-Dissolved	0.0072		0.0030	mg/L	19-DEC-19	20-DEC-19	R4950133
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	19-DEC-19	20-DEC-19	R4950133
Arsenic (As)-Dissolved	0.00111		0.00010	mg/L	19-DEC-19	20-DEC-19	R4950133
Barium (Ba)-Dissolved	0.434		0.00010	mg/L	19-DEC-19	20-DEC-19	R4950133
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	19-DEC-19	20-DEC-19	R4950133
Boron (B)-Dissolved	0.023		0.010	mg/L	19-DEC-19	20-DEC-19	R4950133
Cadmium (Cd)-Dissolved	0.0104		0.0050	ug/L	19-DEC-19	20-DEC-19	R4950133
Calcium (Ca)-Dissolved	28.6		0.050	mg/L	19-DEC-19	20-DEC-19	R4950133
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	19-DEC-19	20-DEC-19	R4950133
Cobalt (Co)-Dissolved	0.24		0.10	ug/L	19-DEC-19	20-DEC-19	R4950133
Copper (Cu)-Dissolved	0.00161		0.00020	mg/L	19-DEC-19	20-DEC-19	R4950133
Iron (Fe)-Dissolved	0.148		0.010	mg/L	19-DEC-19	20-DEC-19	R4950133
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	19-DEC-19	20-DEC-19	R4950133
Lithium (Li)-Dissolved	0.0105		0.0010	mg/L	19-DEC-19	20-DEC-19	R4950133
Magnesium (Mg)-Dissolved	14.5		0.10	mg/L	19-DEC-19	20-DEC-19	R4950133
Manganese (Mn)-Dissolved	0.246		0.00010	mg/L	19-DEC-19	20-DEC-19	R4950133
Molybdenum (Mo)-Dissolved	0.00984		0.000050	mg/L	19-DEC-19	20-DEC-19	R4950133
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	19-DEC-19	20-DEC-19	R4950133
Potassium (K)-Dissolved	0.849		0.050	mg/L	19-DEC-19	20-DEC-19	R4950133
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	19-DEC-19	20-DEC-19	R4950133
Silicon (Si)-Dissolved	4.02		0.050	mg/L	19-DEC-19	20-DEC-19	R4950133
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	19-DEC-19	20-DEC-19	R4950133
Sodium (Na)-Dissolved	19.5		0.050	mg/L	19-DEC-19	20-DEC-19	R4950133
Strontium (Sr)-Dissolved	0.206		0.00020	mg/L	19-DEC-19	20-DEC-19	R4950133
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	19-DEC-19	20-DEC-19	R4950133
Tin (Sn)-Dissolved	0.00018		0.00010	mg/L	19-DEC-19	20-DEC-19	R4950133
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	19-DEC-19	20-DEC-19	R4950133
Uranium (U)-Dissolved	0.00174		0.000010	mg/L	19-DEC-19	20-DEC-19	R4950133
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	19-DEC-19	20-DEC-19	R4950133

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2397341-1 LC_PIZP1101_WG_Q4-2019_N							
Sampled By: KC/DT on 16-DEC-19 @ 12:57							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Zinc (Zn)-Dissolved	0.0045		0.0010	mg/L	19-DEC-19	20-DEC-19	R4950133
Hardness							
Hardness (as CaCO3)	131		0.50	mg/L		20-DEC-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.058		0.020	ug/L		20-DEC-19	R4950133
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		19-DEC-19	R4945995
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	1.37		0.0030	mg/L		20-DEC-19	R4950133
Antimony (Sb)-Total	0.00019		0.00010	mg/L		20-DEC-19	R4950133
Arsenic (As)-Total	0.00151		0.00010	mg/L		20-DEC-19	R4950133
Barium (Ba)-Total	0.445		0.00010	mg/L		20-DEC-19	R4950133
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		20-DEC-19	R4950133
Boron (B)-Total	0.023		0.010	mg/L		20-DEC-19	R4950133
Cadmium (Cd)-Total	0.120		0.0050	ug/L		20-DEC-19	R4950133
Calcium (Ca)-Total	30.3		0.050	mg/L		20-DEC-19	R4950133
Chromium (Cr)-Total	0.00197		0.00010	mg/L		20-DEC-19	R4950133
Cobalt (Co)-Total	0.64		0.10	ug/L		20-DEC-19	R4950133
Copper (Cu)-Total	0.00387		0.00050	mg/L		20-DEC-19	R4950133
Iron (Fe)-Total	1.25		0.010	mg/L		20-DEC-19	R4950133
Lead (Pb)-Total	0.000723		0.000050	mg/L		20-DEC-19	R4950133
Lithium (Li)-Total	0.0113		0.0010	mg/L		20-DEC-19	R4950133
Magnesium (Mg)-Total	15.0		0.10	mg/L		20-DEC-19	R4950133
Manganese (Mn)-Total	0.266		0.00010	mg/L		20-DEC-19	R4950133
Molybdenum (Mo)-Total	0.00946		0.000050	mg/L		20-DEC-19	R4950133
Nickel (Ni)-Total	0.00207		0.00050	mg/L		20-DEC-19	R4950133
Potassium (K)-Total	1.25		0.050	mg/L		20-DEC-19	R4950133
Selenium (Se)-Total	0.304		0.050	ug/L		20-DEC-19	R4950133
Silicon (Si)-Total	6.97		0.10	mg/L		20-DEC-19	R4950133
Silver (Ag)-Total	0.000048		0.000010	mg/L		20-DEC-19	R4950133
Sodium (Na)-Total	18.1		0.050	mg/L		20-DEC-19	R4950133
Strontium (Sr)-Total	0.202		0.00020	mg/L		20-DEC-19	R4950133
Thallium (Tl)-Total	0.000061		0.000010	mg/L		20-DEC-19	R4950133
Tin (Sn)-Total	0.00029		0.00010	mg/L		20-DEC-19	R4950133
Titanium (Ti)-Total	0.027		0.010	mg/L		20-DEC-19	R4950133
Uranium (U)-Total	0.00180		0.000010	mg/L		20-DEC-19	R4950133
Vanadium (V)-Total	0.00358		0.00050	mg/L		20-DEC-19	R4950133
Zinc (Zn)-Total	0.0098		0.0030	mg/L		20-DEC-19	R4950133
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.9		1.0	mg/L		17-DEC-19	R4945439
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	172		1.0	mg/L		17-DEC-19	R4946155
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		17-DEC-19	R4946155
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		17-DEC-19	R4946155
Alkalinity, Total (as CaCO3)	172		1.0	mg/L		17-DEC-19	R4946155
Ammonia, Total (as N)							
Ammonia as N	0.0182		0.0050	mg/L		22-DEC-19	R4952706
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		17-DEC-19	R4946491
Chloride in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2397341-1 LC_PIZP1101_WG_Q4-2019_N							
Sampled By: KC/DT on 16-DEC-19 @ 12:57							
Matrix: WG							
Chloride in Water by IC							
Chloride (Cl)	0.55		0.50	mg/L		17-DEC-19	R4946491
Electrical Conductivity (EC)							
Conductivity (@ 25C)	291		2.0	uS/cm		17-DEC-19	R4946155
Fluoride in Water by IC							
Fluoride (F)	1.83		0.020	mg/L		17-DEC-19	R4946491
Ion Balance Calculation							
Ion Balance	96.6		-100	%		20-DEC-19	
Ion Balance Calculation							
Cation - Anion Balance	-1.7			%		20-DEC-19	
Anion Sum	3.63			meq/L		20-DEC-19	
Cation Sum	3.51			meq/L		20-DEC-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		17-DEC-19	R4946491
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-DEC-19	R4946491
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0099		0.0010	mg/L		17-DEC-19	R4944992
Oxidation redution potential by elect.							
ORP	282		-1000	mV		19-DEC-19	R4948435
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0610		0.0020	mg/L		18-DEC-19	R4945457
Sulfate in Water by IC							
Sulfate (SO4)	3.88		0.30	mg/L		17-DEC-19	R4946491
Total Dissolved Solids							
Total Dissolved Solids	183	DLHC	20	mg/L		20-DEC-19	R4953146
Total Suspended Solids							
Total Suspended Solids	30.1		1.0	mg/L		20-DEC-19	R4953177
Turbidity							
Turbidity	55.4		0.10	NTU		17-DEC-19	R4945760
pH							
pH	8.06		0.10	pH		17-DEC-19	R4946155

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B
Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.			
EPH(10-32)-CALC-CL	Water	Sum of EPH (10-32)	Sum of EPH - Auto Calculated
The sum of EPH(C10-C19) and EPH(C19-C32)			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
IONBALANCE-BC-CL	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
NH3-L-F-CL	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
NO2-L-IC-N-CL	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-CL	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
ORP-CL	Water	Oxidation reduction potential by elect.	ASTM D1498
This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.			
It is recommended that this analysis be conducted in the field.			
P-T-L-COL-CL	Water	Phosphorus (P)-Total	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-CL	Water	pH	APHA 4500 H-Electrode
pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
SO4-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TDS-CL	Water	Total Dissolved Solids	APHA 2540 C
A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).			
TECKCOAL-IONBAL-CL	Water	Ion Balance Calculation	APHA 1030E

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
TEH-BC-VA-CL	Water	EPH (C10-C19) & EPH (C19-C32)	BCMOE EPH GCFID
Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).			
TEH-WATER-VA-CL	Water	TEH (C10-C30)	BC Lab Manual
Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.			
TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

20191216 LC GW

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample
 mg/kg wwt - milligrams per kilogram based on wet weight of sample
 mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
 mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2397341

Report Date: 24-DEC-19

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Client: TECK COAL LIMITED (LINE CREEK)
 Box 2003 15km North Hwy 43
 Sparwood BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL								
	Water							
Batch	R4945439							
WG3245353-5	LCS							
Acidity (as CaCO3)			98.5		%		85-115	17-DEC-19
WG3245353-4	MB							
Acidity (as CaCO3)			1.6		mg/L		2	17-DEC-19
ALK-MAN-CL								
	Water							
Batch	R4946155							
WG3246260-24	LCS							
Alkalinity, Total (as CaCO3)			105.2		%		85-115	17-DEC-19
WG3246260-23	MB							
Alkalinity, Total (as CaCO3)			1.2	MB-LOR	mg/L		1	17-DEC-19
BE-D-L-CCMS-VA								
	Water							
Batch	R4950133							
WG3246370-2	LCS							
Beryllium (Be)-Dissolved			103.2		%		80-120	20-DEC-19
WG3246370-1	MB	NP						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	20-DEC-19
BE-T-L-CCMS-VA								
	Water							
Batch	R4950133							
WG3246621-2	LCS							
Beryllium (Be)-Total			104.5		%		80-120	20-DEC-19
WG3246621-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	20-DEC-19
BR-L-IC-N-CL								
	Water							
Batch	R4946491							
WG3246516-7	DUP	L2397341-1						
Bromide (Br)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-DEC-19
WG3246516-6	LCS							
Bromide (Br)			109.4		%		85-115	17-DEC-19
WG3246516-5	MB							
Bromide (Br)			<0.050		mg/L		0.05	17-DEC-19
WG3246516-8	MS	L2397341-1						
Bromide (Br)			103.0		%		75-125	17-DEC-19
C-DIS-ORG-LOW-CL								
	Water							
Batch	R4951855							
WG3248161-6	LCS							
Dissolved Organic Carbon			91.2		%		80-120	21-DEC-19
WG3248161-5	MB							

Quality Control Report

Workorder: L2397341

Report Date: 24-DEC-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL Water								
Batch	R4951855							
WG3248161-5	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	21-DEC-19
C-TOT-ORG-LOW-CL Water								
Batch	R4951855							
WG3248161-6	LCS							
Total Organic Carbon			99.4		%		80-120	21-DEC-19
WG3248161-5	MB							
Total Organic Carbon			<0.50		mg/L		0.5	21-DEC-19
CL-IC-N-CL Water								
Batch	R4946491							
WG3246516-7	DUP	L2397341-1						
Chloride (Cl)			0.55		mg/L	5.0	20	17-DEC-19
WG3246516-6	LCS							
Chloride (Cl)			100.8		%		90-110	17-DEC-19
WG3246516-5	MB							
Chloride (Cl)			<0.50		mg/L		0.5	17-DEC-19
WG3246516-8	MS	L2397341-1						
Chloride (Cl)			105.7		%		75-125	17-DEC-19
EC-L-PCT-CL Water								
Batch	R4946155							
WG3246260-24	LCS							
Conductivity (@ 25C)			101.5		%		90-110	17-DEC-19
WG3246260-23	MB							
Conductivity (@ 25C)			<2.0		uS/cm		2	17-DEC-19
F-IC-N-CL Water								
Batch	R4946491							
WG3246516-7	DUP	L2397341-1						
Fluoride (F)			1.83		mg/L	0.1	20	17-DEC-19
WG3246516-6	LCS							
Fluoride (F)			103.1		%		90-110	17-DEC-19
WG3246516-5	MB							
Fluoride (F)			<0.020		mg/L		0.02	17-DEC-19
WG3246516-8	MS	L2397341-1						
Fluoride (F)			N/A	MS-B	%		-	17-DEC-19
HG-D-CVAA-VA Water								

Quality Control Report

Workorder: L2397341

Report Date: 24-DEC-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA		Water						
Batch	R4949181							
WG3246418-2 LCS								
Mercury (Hg)-Dissolved			108.3		%		80-120	20-DEC-19
WG3246418-1 MB								
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	20-DEC-19
HG-T-CVAA-VA		Water						
Batch	R4945995							
WG3245988-2 LCS								
Mercury (Hg)-Total			106.4		%		80-120	19-DEC-19
WG3245988-1 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	19-DEC-19
MET-D-CCMS-VA		Water						
Batch	R4950133							
WG3246370-2 LCS								
Aluminum (Al)-Dissolved			106.1		%		80-120	20-DEC-19
Antimony (Sb)-Dissolved			102.6		%		80-120	20-DEC-19
Arsenic (As)-Dissolved			100.9		%		80-120	20-DEC-19
Barium (Ba)-Dissolved			104.7		%		80-120	20-DEC-19
Bismuth (Bi)-Dissolved			98.4		%		80-120	20-DEC-19
Boron (B)-Dissolved			84.6		%		80-120	20-DEC-19
Cadmium (Cd)-Dissolved			95.1		%		80-120	20-DEC-19
Calcium (Ca)-Dissolved			98.6		%		80-120	20-DEC-19
Chromium (Cr)-Dissolved			98.1		%		80-120	20-DEC-19
Cobalt (Co)-Dissolved			99.4		%		80-120	20-DEC-19
Copper (Cu)-Dissolved			97.3		%		80-120	20-DEC-19
Iron (Fe)-Dissolved			98.4		%		80-120	20-DEC-19
Lead (Pb)-Dissolved			96.8		%		80-120	20-DEC-19
Lithium (Li)-Dissolved			103.5		%		80-120	20-DEC-19
Magnesium (Mg)-Dissolved			99.0		%		80-120	20-DEC-19
Manganese (Mn)-Dissolved			98.5		%		80-120	20-DEC-19
Molybdenum (Mo)-Dissolved			96.7		%		80-120	20-DEC-19
Nickel (Ni)-Dissolved			96.2		%		80-120	20-DEC-19
Potassium (K)-Dissolved			102.0		%		80-120	20-DEC-19
Selenium (Se)-Dissolved			105.6		%		80-120	20-DEC-19
Silicon (Si)-Dissolved			103.8		%		60-140	20-DEC-19
Silver (Ag)-Dissolved			106.1		%		80-120	20-DEC-19
Sodium (Na)-Dissolved			103.7		%		80-120	20-DEC-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4950133							
WG3246370-2	LCS							
Strontium (Sr)-Dissolved			100.7		%		80-120	20-DEC-19
Thallium (Tl)-Dissolved			96.2		%		80-120	20-DEC-19
Tin (Sn)-Dissolved			95.4		%		80-120	20-DEC-19
Titanium (Ti)-Dissolved			93.7		%		80-120	20-DEC-19
Uranium (U)-Dissolved			98.6		%		80-120	20-DEC-19
Vanadium (V)-Dissolved			101.0		%		80-120	20-DEC-19
Zinc (Zn)-Dissolved			99.1		%		80-120	20-DEC-19
WG3246370-1	MB	NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	20-DEC-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-DEC-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-DEC-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-DEC-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-DEC-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-DEC-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	20-DEC-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-DEC-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	20-DEC-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-DEC-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-DEC-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-DEC-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-DEC-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-DEC-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-DEC-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	20-DEC-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-DEC-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-DEC-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-DEC-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	20-DEC-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-DEC-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-DEC-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-DEC-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	20-DEC-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-DEC-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-DEC-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA								
	Water							
Batch	R4950133							
WG3246370-1	MB	NP						
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-DEC-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-DEC-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-DEC-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-DEC-19
MET-T-CCMS-VA								
	Water							
Batch	R4950133							
WG3246621-2	LCS							
Aluminum (Al)-Total			108.4		%		80-120	20-DEC-19
Antimony (Sb)-Total			104.2		%		80-120	20-DEC-19
Arsenic (As)-Total			98.2		%		80-120	20-DEC-19
Barium (Ba)-Total			104.9		%		80-120	20-DEC-19
Bismuth (Bi)-Total			98.6		%		80-120	20-DEC-19
Boron (B)-Total			98.0		%		80-120	20-DEC-19
Cadmium (Cd)-Total			96.8		%		80-120	20-DEC-19
Calcium (Ca)-Total			101.5		%		80-120	20-DEC-19
Chromium (Cr)-Total			99.9		%		80-120	20-DEC-19
Cobalt (Co)-Total			98.2		%		80-120	20-DEC-19
Copper (Cu)-Total			96.6		%		80-120	20-DEC-19
Iron (Fe)-Total			98.3		%		80-120	20-DEC-19
Lead (Pb)-Total			99.8		%		80-120	20-DEC-19
Lithium (Li)-Total			105.5		%		80-120	20-DEC-19
Magnesium (Mg)-Total			102.4		%		80-120	20-DEC-19
Manganese (Mn)-Total			99.0		%		80-120	20-DEC-19
Molybdenum (Mo)-Total			101.0		%		80-120	20-DEC-19
Nickel (Ni)-Total			98.4		%		80-120	20-DEC-19
Potassium (K)-Total			101.2		%		80-120	20-DEC-19
Selenium (Se)-Total			99.4		%		80-120	20-DEC-19
Silicon (Si)-Total			107.2		%		80-120	20-DEC-19
Silver (Ag)-Total			101.0		%		80-120	20-DEC-19
Sodium (Na)-Total			103.2		%		80-120	20-DEC-19
Strontium (Sr)-Total			104.6		%		80-120	20-DEC-19
Thallium (Tl)-Total			100.1		%		80-120	20-DEC-19
Tin (Sn)-Total			95.6		%		80-120	20-DEC-19
Titanium (Ti)-Total			97.8		%		80-120	20-DEC-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA								
	Water							
Batch	R4950133							
WG3246621-2	LCS							
Uranium (U)-Total			101.8		%		80-120	20-DEC-19
Vanadium (V)-Total			101.8		%		80-120	20-DEC-19
Zinc (Zn)-Total			95.3		%		80-120	20-DEC-19
WG3246621-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	20-DEC-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	20-DEC-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	20-DEC-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	20-DEC-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	20-DEC-19
Boron (B)-Total			<0.010		mg/L		0.01	20-DEC-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	20-DEC-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	20-DEC-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	20-DEC-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	20-DEC-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	20-DEC-19
Iron (Fe)-Total			<0.010		mg/L		0.01	20-DEC-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	20-DEC-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	20-DEC-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	20-DEC-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	20-DEC-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	20-DEC-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	20-DEC-19
Potassium (K)-Total			<0.050		mg/L		0.05	20-DEC-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	20-DEC-19
Silicon (Si)-Total			<0.10		mg/L		0.1	20-DEC-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	20-DEC-19
Sodium (Na)-Total			<0.050		mg/L		0.05	20-DEC-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	20-DEC-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	20-DEC-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	20-DEC-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	20-DEC-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	20-DEC-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	20-DEC-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	20-DEC-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-L-F-CL								
Water								
Batch	R4952706							
WG3248179-14	LCS							
Ammonia as N			101.7		%		85-115	22-DEC-19
WG3248179-13	MB							
Ammonia as N			<0.0050		mg/L		0.005	22-DEC-19
NO2-L-IC-N-CL								
Water								
Batch	R4946491							
WG3246516-7	DUP	L2397341-1						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-DEC-19
WG3246516-6	LCS							
Nitrite (as N)			103.5		%		90-110	17-DEC-19
WG3246516-5	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	17-DEC-19
WG3246516-8	MS	L2397341-1						
Nitrite (as N)			108.5		%		75-125	17-DEC-19
NO3-L-IC-N-CL								
Water								
Batch	R4946491							
WG3246516-7	DUP	L2397341-1						
Nitrate (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	17-DEC-19
WG3246516-6	LCS							
Nitrate (as N)			104.5		%		90-110	17-DEC-19
WG3246516-5	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	17-DEC-19
WG3246516-8	MS	L2397341-1						
Nitrate (as N)			105.3		%		75-125	17-DEC-19
ORP-CL								
Water								
Batch	R4948435							
WG3246740-7	CRM	CL-ORP						
ORP			226		mV		210-230	19-DEC-19
P-T-L-COL-CL								
Water								
Batch	R4945457							
WG3245389-14	LCS							
Phosphorus (P)-Total			111.7		%		80-120	18-DEC-19
WG3245389-13	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	18-DEC-19
PH-CL								
Water								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-CL	Water							
Batch	R4946155							
WG3246260-24	LCS							
pH			7.01		pH		6.9-7.1	17-DEC-19
PO4-DO-L-COL-CL	Water							
Batch	R4944992							
WG3244586-6	LCS							
Orthophosphate-Dissolved (as P)			102.4		%		80-120	17-DEC-19
WG3244586-5	MB							
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	17-DEC-19
SO4-IC-N-CL	Water							
Batch	R4946491							
WG3246516-7	DUP	L2397341-1						
Sulfate (SO4)		3.88	3.83		mg/L	1.3	20	17-DEC-19
WG3246516-6	LCS							
Sulfate (SO4)			104.7		%		90-110	17-DEC-19
WG3246516-5	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	17-DEC-19
WG3246516-8	MS	L2397341-1						
Sulfate (SO4)			102.3		%		75-125	17-DEC-19
SOLIDS-TDS-CL	Water							
Batch	R4953146							
WG3247197-2	LCS							
Total Dissolved Solids			99.0		%		85-115	20-DEC-19
WG3247197-1	MB							
Total Dissolved Solids			<10		mg/L		10	20-DEC-19
TEH-BC-VA-CL	Water							
Batch	R4950388							
WG3246426-2	LCS							
EPH10-19			91.7		%		70-130	20-DEC-19
EPH19-32			82.1		%		70-130	20-DEC-19
WG3246426-1	MB							
EPH10-19			<0.25		mg/L		0.25	20-DEC-19
EPH19-32			<0.25		mg/L		0.25	20-DEC-19
Surrogate: 2-Bromobenzotrifluoride			75.8		%		60-140	20-DEC-19
TEH-WATER-VA-CL	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TEH-WATER-VA-CL								
Water								
Batch	R4950388							
WG3246426-2	LCS							
TEH (C10-C30)			89.1		%		70-130	20-DEC-19
WG3246426-1	MB							
TEH (C10-C30)			<0.25		mg/L		0.25	20-DEC-19
Surrogate: 2-Bromobenzotrifluoride			75.8		%		60-140	20-DEC-19
TKN-L-F-CL								
Water								
Batch	R4952977							
WG3247745-7	DUP	L2397341-1						
Total Kjeldahl Nitrogen		0.220	0.220		mg/L	0.0	20	24-DEC-19
WG3247745-2	LCS							
Total Kjeldahl Nitrogen			93.7		%		75-125	20-DEC-19
WG3247745-6	LCS							
Total Kjeldahl Nitrogen			96.3		%		75-125	20-DEC-19
WG3247745-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	20-DEC-19
WG3247745-5	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	20-DEC-19
WG3247745-8	MS	L2397341-1						
Total Kjeldahl Nitrogen			101.9		%		70-130	24-DEC-19
TSS-L-CL								
Water								
Batch	R4953177							
WG3247196-6	LCS							
Total Suspended Solids			99.8		%		85-115	20-DEC-19
WG3247196-5	MB							
Total Suspended Solids			<1.0		mg/L		1	20-DEC-19
TURBIDITY-CL								
Water								
Batch	R4945760							
WG3245360-5	LCS							
Turbidity			100.5		%		85-115	17-DEC-19
WG3245360-4	MB							
Turbidity			<0.10		NTU		0.1	17-DEC-19

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.	1	16-DEC-19 12:57	19-DEC-19 14:30	0.25	73	hours	EHTR-FM
pH	1	16-DEC-19 12:57	17-DEC-19 11:00	0.25	22	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.

Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2397341 were received on 17-DEC-19 08:40.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

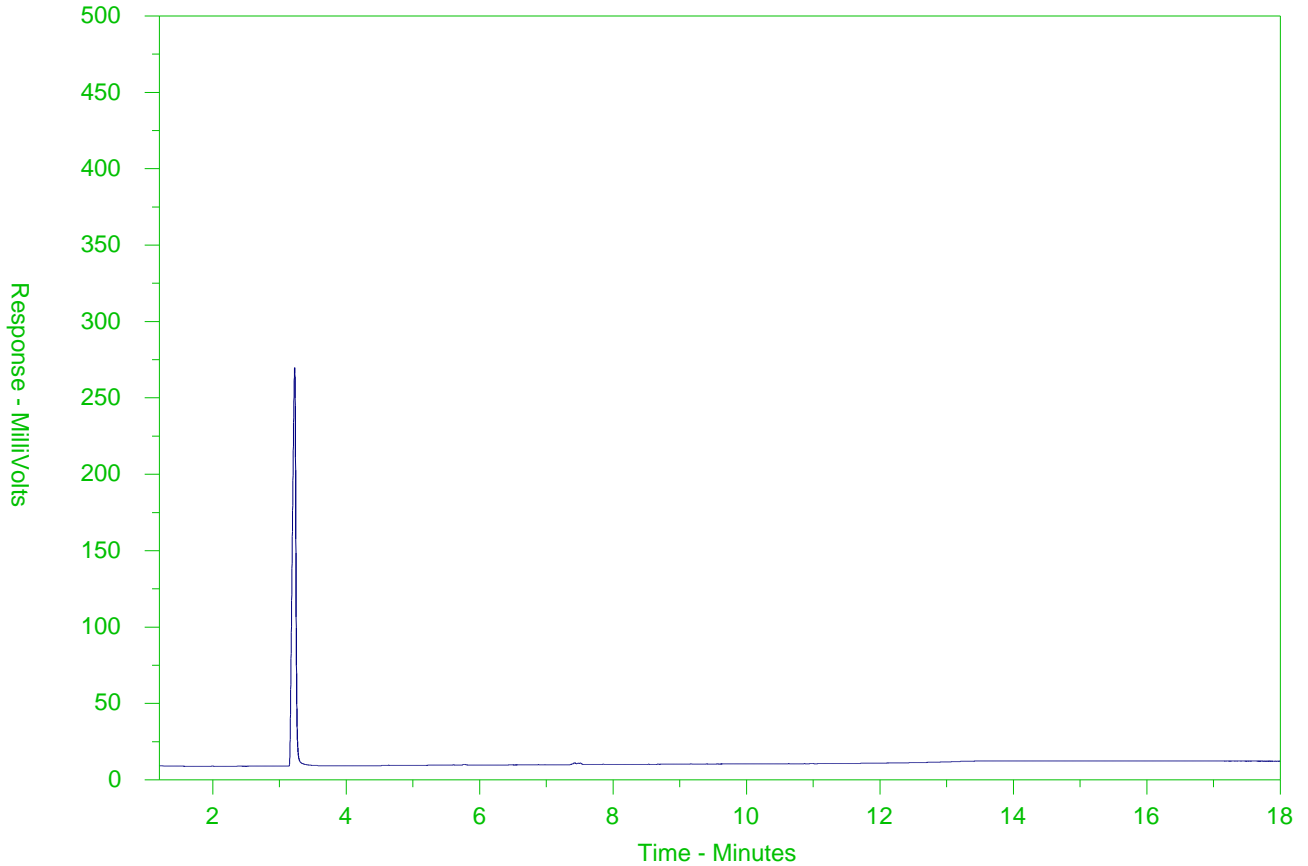
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2397341-1
 Client Sample ID: LC_PIZP1101_WG_Q4-2019_N



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →		
← Diesel/ Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

COC ID: 20191216 LC GW		TURNAROUND TIME:		RUSH:						
PROJECT/CLIENT INFO				LABORATORY		OTHER INFO				
Facility Name / Job#	Line Creek Operation			Lab Name	ALS Calgary		Report Format / Distribution	Excel	PDF	EDD
Project Manager	Carla Froyman Parker			Lab Contact	Lyudmyla Shvets		Email 1:	carla.froymanparker@teck.com	x	
Email	carla.froymanparker@teck.com			Email	Lyudmyln.Shvets@ALSGlobal.com		Email 2:	teckcoal@equisonline.com		x
Address	Box 2003			Address	2559 29 Street NE		Email 3:	drake.lymstra@teck.com	x	
	15km North Hwy 43						Email 4:	kirsten.campbell@teck.com	x	
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 4:	kennedy.allen@teck.com	x
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	PO number	43000608129	
Phone Number	250-425-3196			Phone Number	403 407 1794					

SAMPLE DETAILS								ANALYSIS REQUESTED											
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	H2SO4	NAHSO4	HCl	HCl	HNO3	HNO3	NONE	H2SO4				
								ALS_Package-DOC	ALS_Package-EPH	HG-D-CVAF-VA	HG-T-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA	ALS_Package-TKN/TOC				
L2397341-COFC																			
LC_PIZP1101_WG_Q4-2019_N	LC_PIZP1101	WG		2019/12/16	12:57	G	9	X	X	X	X	X	X	X	X				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS		RELINQUISHED BY/AFFILIATION		DATE/TIME		ACCEPTED BY/AFFILIATION		DATE/TIME	
PLEASE FORWARD ALL SAMPLES TO ALS BERNABY FOR ANALYSIS		D.Tymstra/K.Campbell		16-Dec		<i>R</i>		12/17/19	
SERVICE REQUEST (rush - subject to availability)		Sampler's Name		K. Campbell/D. Tymstra		Mobile #			
Regular (default) X		Sampler's Signature				Date/Time		December 16, 2019	
Priority (2-3 business days) - 50% surcharge									
Emergency (1 Business Day) - 100% surcharge									
For Emergency <1 Day, ASAP or Weekend - Contact ALS									

APPENDIX H

QP Forms

Conflict of Interest Disclosure Statement

A qualified professional ¹ providing services to either the Ministry of Environment and Climate Change Strategy (“ministry”), or to a regulated person for the purpose of obtaining an authorization from the ministry, or pursuant to a requirement imposed under the *Environmental Management Act*, the *Integrated Pest Management Act* or the *Park Act* has a real or perceived conflict of interest when the qualified professional, or their relatives, close associates or personal friends have a financial or other interest in the outcome of the work being performed.

A real or perceived conflict of interest occurs when a qualified professional has

- a) an ownership interest in the regulated person’s business;
- b) an opportunity to influence a decision that leads to financial benefits from the regulated person or their business other than a standard fee for service (e.g. bonuses, stock options, other profit sharing arrangements);
- c) a personal or professional interest in a specific outcome;
- d) the promise of a long term or ongoing business relationship with the regulated person;
- e) a spouse or other family member who will benefit from a specific outcome; or
- f) any other interest that could be perceived as a threat to the independence or objectivity of the qualified professional in performing a duty or function.

Qualified professionals who fulfill regulatory requirements on behalf of regulated persons seeking authorization under ministry legislation must take care in the conduct of their work that potential conflicts of interest within their control are avoided or mitigated. Precise rules in conflict of interest are not possible and professionals must rely on guidance of their professional associations, their common sense, conscience and sense of personal integrity.

This conflict of interest disclosure statement is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Headquarters Office at 1-800-663-7867.

¹Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who

- a) is registered in British Columbia with a professional association, is acting under that organization’s code of ethics, and is subject to disciplinary action by that association, and
- b) through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.



Declaration

I, Margaret Jillian Mitton Name as a member of Engineers and Geoscientists British Columbia declare

Select one of the following:

Absence from conflict of interest

Other than the standard fee I will receive for my professional services, I have no financial or other interest in the outcome of this work application/project/work/etc.. I further declare that should a conflict of interest arise in the future during the course of this work, I will fully disclose the circumstances in writing and without delay to Ministry of Environment and Climate Change Strategy, erring on the side of caution.

Real or perceived conflict of interest

Description and nature of conflict(s):

I will maintain my objectivity, conducting my work in accordance with my Code of Ethics and standards of practice.

In addition, I will take the following steps to mitigate the real or perceived conflict(s) I have disclosed, to ensure the public interest remains paramount:

Further, I acknowledge that this disclosure may be interpreted as a threat to my independence and will be considered by the statutory decision maker accordingly.

Signature:

X M. Jillian Mitton

Print name: Jillian Mitton

Date: March 25, 2020

Witnessed by:

X Lexya Oulton

Print name: Lexya Oulton

Declaration of Competency

The Ministry of Environment and Climate Change Strategy relies on the work, advice, recommendations and in some cases decision making of qualified professionals¹, under government's professional reliance regime. With this comes an assumption that professionals who undertake work in relation to ministry legislation, regulations and codes of practice have the knowledge, experience and objectivity necessary to fulfill this role.

This declaration of competency is collected for the purposes of increasing government transparency and ensuring professional ethics and accountability. It will be disclosed to the public.

1. Name of Qualified Professional Margaret Jillian Mitton

Title Professional Engineer - Practising

2. Are you a registered member of a professional association in B.C.? Yes No

Name of Association: Engineers & Geoscientists British Columbia

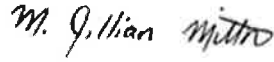
3. Brief description of professional services:

Technical review of groundwater data for Line Creek Operations Site Specific Groundwater Monitoring Program.


Declaration

I declare that I am a qualified professional with the required knowledge, skills and experience to provide expert information, advice and/or recommendations in relation to the specific work described above.

Signature:

X 

Witnessed by:

X 

Print Name: Jillian Mitton

Print Name: Lexya Oulton

Date signed: March 25, 2020

¹Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who

- is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and
- through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.



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Appendix III

Analyte List



APPENDIX III: Analyte List

	Units
Field Parameters	
Temperature	°C
pH	pH unit
<i>Dissolved Oxygen</i>	mg/L
Specific Conductance	µS/cm
Oxidation-Reduction Potential (ORP)	mV
Physical Parameters (laboratory)	
pH	pH unit
Hardness (as CaCO₃)	mg/L
<i>Specific Conductance</i>	µS/cm
<i>Total Suspended Solids</i>	mg/L
<i>Total Dissolved Solids</i>	mg/L
<i>Turbidity</i>	NTU
<i>Alkalinity, total (as CaCO₃)</i>	mg/L
<i>Bicarbonate</i>	mg/L
<i>Carbonate</i>	mg/L
<i>Hydroxide</i>	mg/L
<i>Ammonia (as N)</i>	mg/L
<i>Bromide</i>	mg/L
Chloride	mg/L
<i>Fluoride</i>	mg/L
Nitrate (as N)*	mg/L
Nitrite (as N)	mg/L
Total Kjeldhal Nitrogen	mg/L
<i>Ortho-Phosphate</i>	mg/L
<i>Total Phosphorus</i>	mg/L
Sulphate (SO₄)*	mg/L
Dissolved Metals	
<i>Aluminum</i>	µg/L
<i>Antimony</i>	µg/L
<i>Arsenic</i>	µg/L
<i>Barium</i>	µg/L
<i>Beryllium</i>	µg/L
<i>Bismuth</i>	µg/L
<i>Boron</i>	µg/L
Cadmium*	µg/L
Calcium	µg/L
<i>Chromium</i>	µg/L
<i>Cobalt</i>	µg/L
<i>Copper</i>	µg/L
<i>Iron</i>	µg/L
<i>Lead</i>	µg/L
<i>Lithium</i>	µg/L
Magnesium	µg/L
<i>Manganese</i>	µg/L
<i>Mercury</i>	µg/L
<i>Molybdenum</i>	µg/L
<i>Nickel</i>	µg/L
Potassium	µg/L
Selenium*	µg/L
<i>Silver</i>	µg/L
Sodium	µg/L
<i>Strontium</i>	µg/L
<i>Thallium</i>	µg/L
<i>Tin</i>	µg/L
<i>Titanium</i>	µg/L
<i>Uranium</i>	µg/L
<i>Vanadium</i>	µg/L
<i>Zinc</i>	µg/L
Organics	
Total Organic Carbon	-
Dissolved Organic Carbon	-

BOLD = Included in the Elk Valley Drinking Water Sampling Plan

Underlined = Standards are available in the CSR for AW, IW, or LW; BC WQG AW; or, Guidelines for Canadian Drinking Water Quality DW

Italics = Constituents included in the TG6 "Core List of General Water Quality Analytes and Field Measurements" and above detection limits

* = Constituents of interest (CI)

TG6 = *Technical Guidance 6 Water and Air Baseline Monitoring Document for Mine Proponents and Operators* (BC MoE, 2012).

Appendix IV

Borehole Logs



PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW5

SHEET 1 OF 1







LOCATION: See Location Plan

BORING DATE: August 09, 2011

DATUM: Geodetic

N: 655476 E: 5567514

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20	40	60	80	10 ⁻⁹	10 ⁻⁵		
0		Ground Surface		1785.20											
0.5		Very loose, non-plastic, dry, grey to brown, loose grained to cobble size GRAVEL, non-cohesive with some medium grained, angular to subangular, (with little matrix) (ALLUVIUM)		0.00	1	GRAB									
4		--- Soft, low plasticity, damp, non-cohesive, with more grey CLAY			2	GRAB									
7		Hard layer, angular fragments, low returns GRAVEL		1778.50											
7.5		Very loose, low plasticity, damp, grey to brown, loose grained to cobble size GRAVEL, non-cohesive with some medium grained, angular to subangular (with little matrix) (ALLUVIUM)		8.90	3	GRAB									
9.5		--- Clay becomes dark brown, damp, cohesive and very dense			4	GRAB									
11		Very loose fragments (drill cut-up), wet, massive, light to dark grey, angular BEDROCK		1774.50											
11.5				10.70	5	GRAB									
13		End of BOREHOLE.		1772.40											
13				12.80											

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GBT 12/15/11

DEPTH SCALE

1 : 75



LOGGED: TC

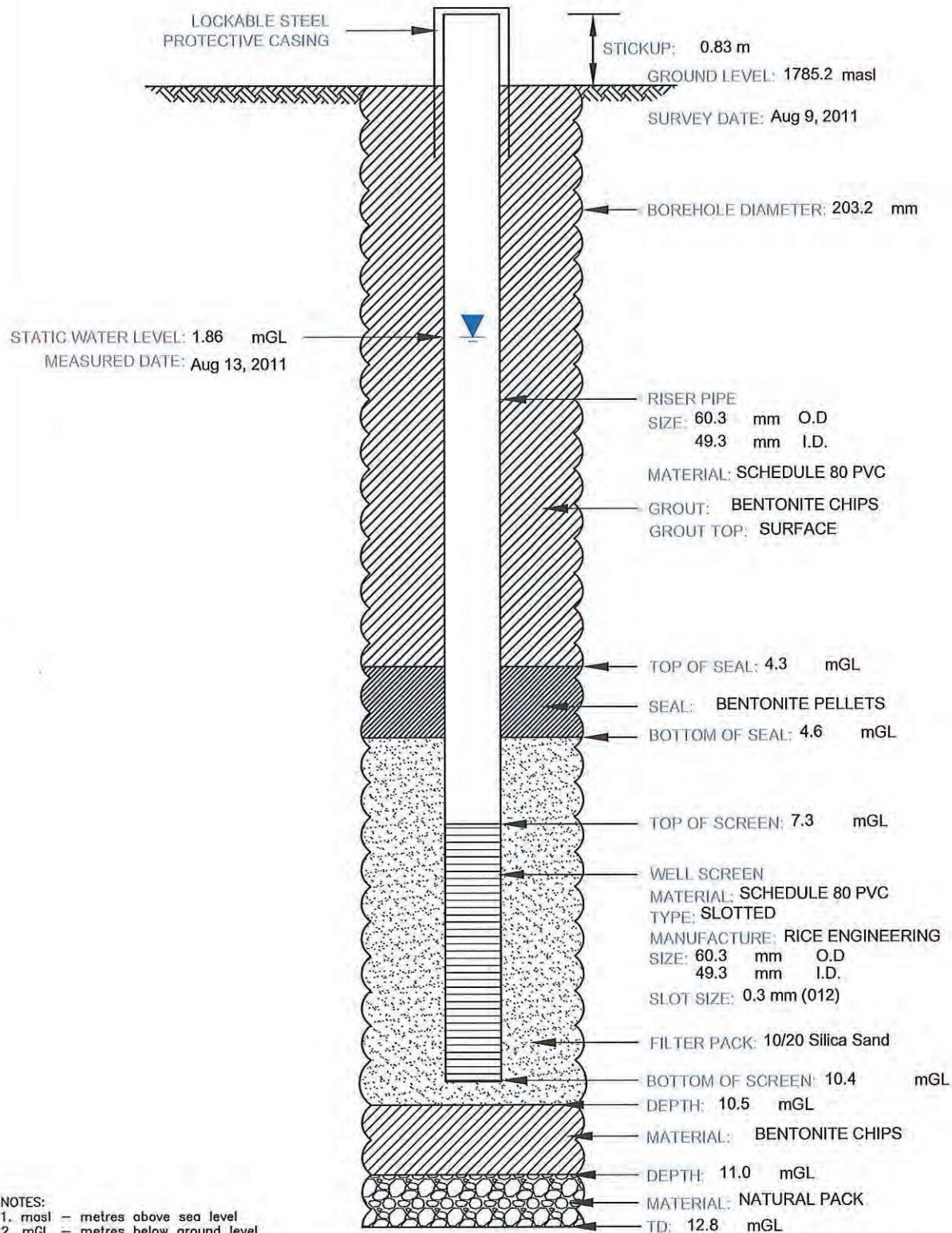
CHECKED: JW

13 Aug 2011
▽

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>Teck Coal Fording River Operations</u>	Spud Date: <u>Aug 9, 2011</u>
H5	Well Name: <u>GA-HMW5</u>	Project Short Title: <u>Teck Coal FRO - Henretta</u>
		Project Number: <u>11.1348.0020-1000-2000</u>
		Site Geologist: <u>T.Crowell</u>
Drilling Method:	Development:	Duration:
Air Rotary	Method: Air Lift	1.75 Hours

SCHEMATIC ONLY--NOT TO SCALE



NOTES:

1. masl - metres above sea level
2. mGL - metres below ground level
3. TD - Total Depth

Golder Associates

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW4

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: August 08, 2011

DATUM: Geodetic

N: 653255 E: 5566821

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴	10 ⁻³
0		Ground Surface		1741.30													
0		Very loose, non-plastic, non-cohesive, dry, fine to medium grained WASTE ROCK mixed with coal fragments		0.00													
1																	
2																	
3																	
3	Barber Rig H24 Air Rotary BECK Drilling & Environmental Services Ltd.					1	GRAB										
4																	
5																	
5				1735.80													
5		Massive, grey, angular BEDROCK, with smaller, white to light brown fragments (limestone)		5.50													
6																	
7						2	GRAB										
8																	
8				1733.10													
8		End of BOREHOLE.		8.20													
9																	
10																	
11																	
12																	
13																	
14																	
15																	

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

13 Aug 2011
V

DEPTH SCALE

1 : 75



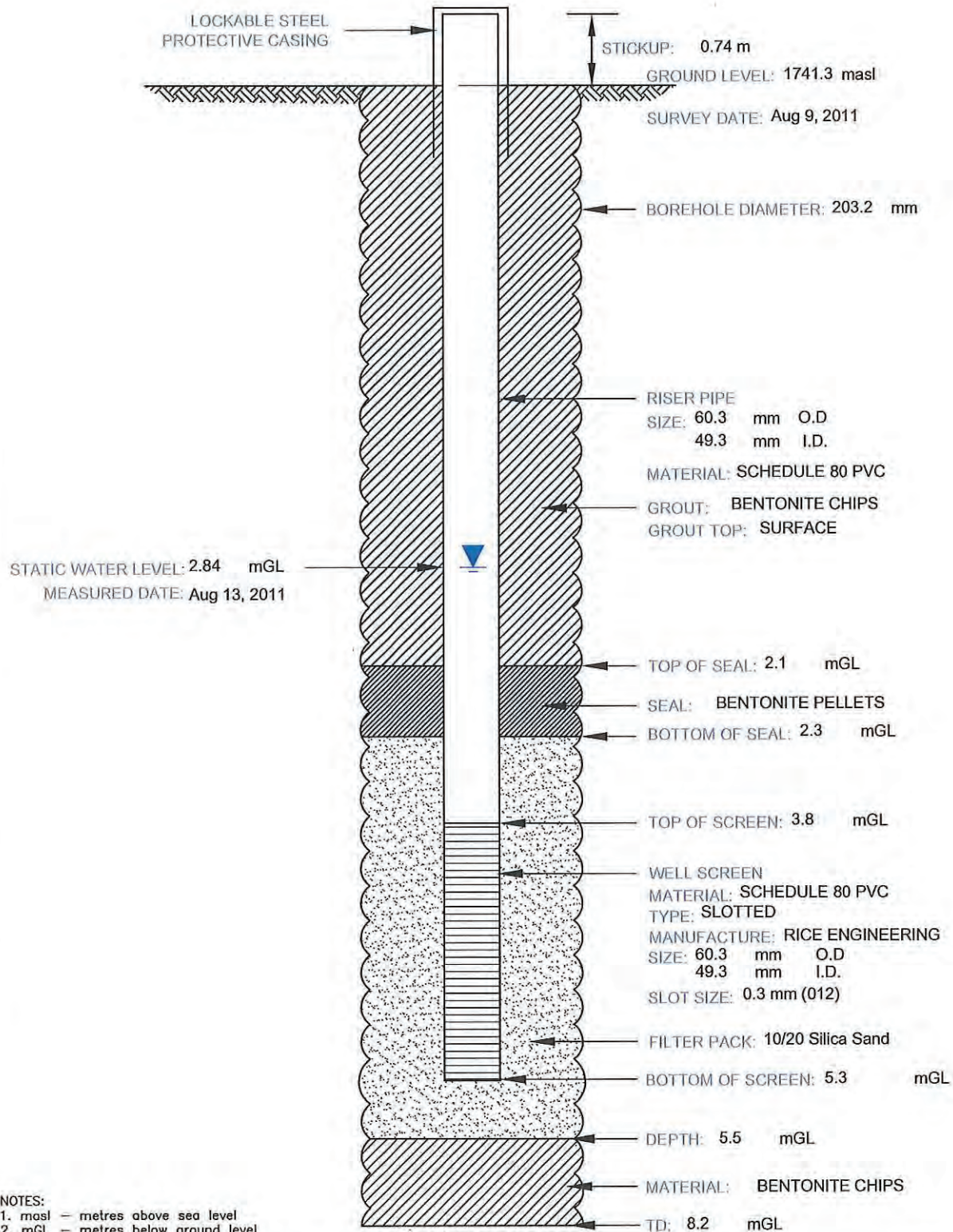
LOGGED: TC

CHECKED: JW

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>Teck Coal Fording River Operations</u>	Spud Date: <u>Aug 8, 2011</u>
H4	Well Name: <u>GA-HMW4</u>	Project Short Title: <u>Teck Coal FRO - Henretta</u>
		Project Number: <u>11.1348.0020-1000-2000</u>
		Site Geologist: <u>T.Crowell</u>
Drilling Method: <u>Air Rotary</u>	Development: <u>Method: Air Lift</u>	Duration: <u>1 Hour</u>

SCHEMATIC ONLY--NOT TO SCALE



NOTES:

1. masl - metres above sea level
2. mGL - metres below ground level
3. TD - Total Depth

Golder Associates

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW3

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: August 12, 2011

DATUM: Geodetic

N: 652810 E: 5566540

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. rem V.	+ ⊕	- ⊖			U - O
0		Ground Surface		1728.20													
		Compacted road materials															
1		Brown and grey, cobble size WASTE ROCK with sandy clay matrix, rock is sub-rounded to subangular, matrix is soft, damp, non-plastic, cohesive, silty, with some very fine grains		0.30													
3					1	GRAB											
6		Hard layer, ROP low, no returns		1722.40	5.00												
7		Brown and grey, cobble size WASTE ROCK with sandy clay matrix, rock is sub-rounded to subangular, matrix is soft, dry, non-plastic, cohesive, silty, with some very fine grains		1721.80	6.40												
9					2	GRAB											
12		Wet, white to grey and brown, cobble size to very coarse grained, round to sub-angular GRAVEL, brown clay matrix, silty		1716.00	12.20												
13					3	GRAB											
15		CONTINUED NEXT PAGE															

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE

1 : 75



LOGGED: TC

CHECKED: JW

13 Aug 2011



PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW3

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: August 12, 2011

DATUM: Geodetic

N: 652810 E: 5566540

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20 40 60 80		nat V. + rem V. ⊕ U - ○		10 ⁻⁹ 10 ⁻⁵ 10 ⁻¹ 10 ³		W _p — W _L			10 20 30 40
15	Barber Rig H24 Air Rotary BECK Drilling & Environmental Services Ltd.	Wet, white to grey and brown, cobble size to very coarse grained, round to sub-angular GRAVEL, brown clay matrix, silty (continued)															
16				3	GRAB												
17																	
18																	
19																	
20																	
21																	
22																	
22		Massive, grey BEDROCK, small drill-broken fragments		1705.60													
23		End of BOREHOLE.		22.60													
24																	
25																	
26																	
27																	
28																	
29																	
30																	

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE

1 : 75



LOGGED: TC

CHECKED: JW

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>Teck Coal Fording River Operations</u>	Spud Date: <u>Aug 12, 2011</u>
H3	Well Name: <u>GA-HMW3</u>	Project Short Title: <u>Teck Coal FRO - Henretta</u>
		Project Number: <u>11.1348.0020-1000-2000</u>
		Site Geologist: <u>T.Crowell</u>

Drilling Method:

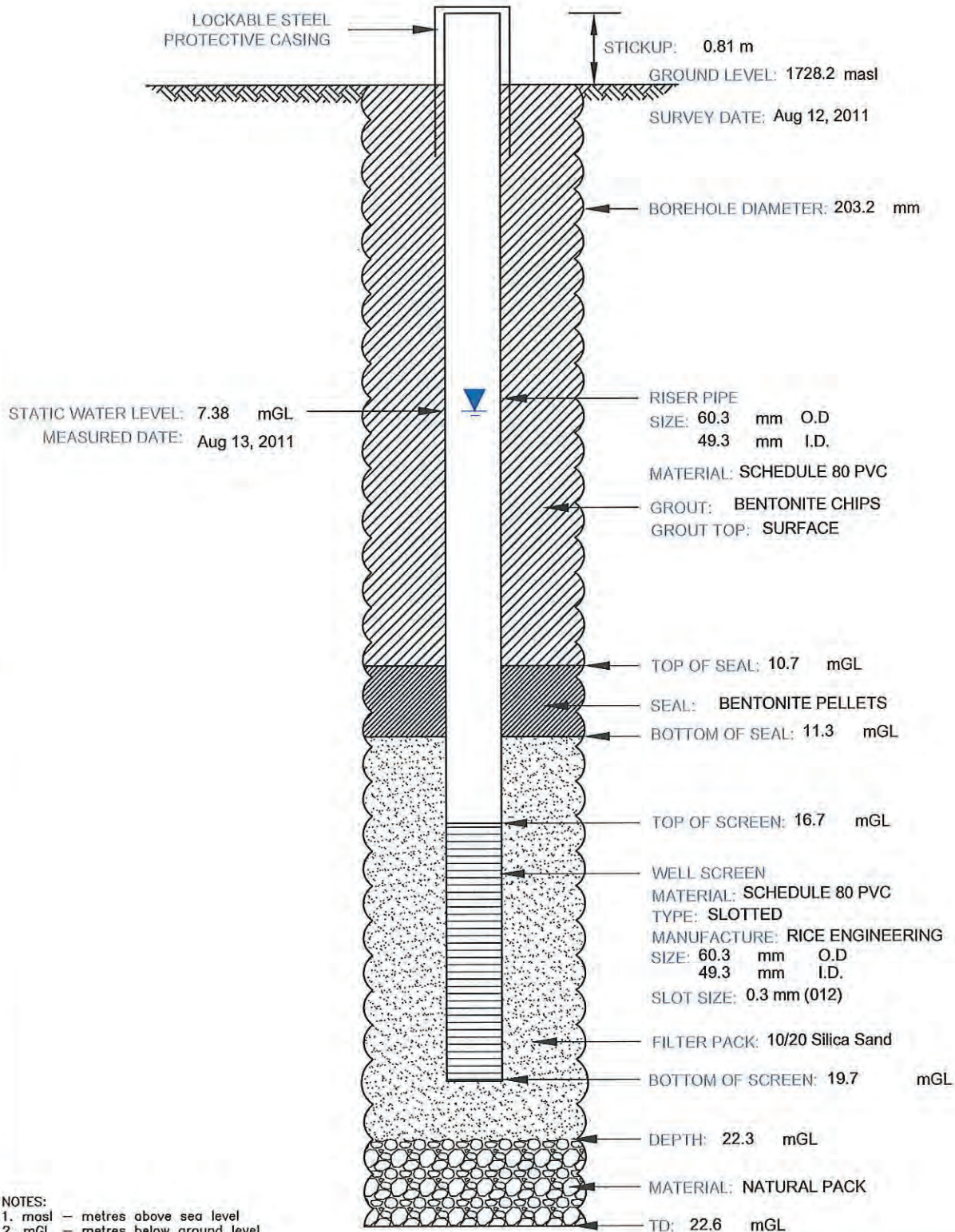
Air Rotary

Development:

Method: Air Lift

Duration: 1 Hour

SCHEMATIC ONLY--NOT TO SCALE



NOTES:

1. masl - metres above sea level
2. mGL - metres below ground level
3. TD - Total Depth

Golder Associates

DATA ENTRY: VI

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW2


SHEET 1 OF 4

LOCATION: See Location Plan

BORING DATE: August 09, 2011

DATUM: Geodetic

N: 652666 E: 5566634

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER TYPE	20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³		
0		Ground Surface		1767.30											
		Compacted road materials													
		Dry, grey to black, angular, coarse grained to cobble sized SPOILS, covered in clay and sand matrix, cohesive to plastic, dark brown to black, silty		0.30											
1															
2															
3					1 GRAB										
4															
5															
6															
7															
8					2 GRAB										
9															
10															
11															
12															
13					3 GRAB										
14															
15															

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BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE
1 : 75



LOGGED: TC
CHECKED: JW

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW2

SHEET 2 OF 4

LOCATION: See Location Plan

BORING DATE: August 09, 2011

DATUM: Geodetic

N: 652668 E: 5566634

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION			
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT							
								20	40	60	80	nat V. +	rem V. ⊕	U -			○	Wp	W
15	Becker Rig H24 Air Rotary BECK Drilling & Environmental Services Ltd.	Dry, grey to black, angular, coarse grained to cobble sized SPOILS, covered in clay and sand matrix, cohesive to plastic, dark brown to black, silty (continued)																	
16																			
17																			
18																			
19																			
20																			
21																			
22																			
23																			
24																			
25																			
26																			
27																			
28		Black, broken COAL LENS		1739.00 27.40															
29		Dry, grey to black, angular, coarse grained to cobble sized SPOILS, covered in clay and sand matrix, cohesive to plastic dark brown to black, silty		1739.40 28.00															
30																			

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020_2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE

1 : 75



LOGGED: TC

CHECKED: JW

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW2

SHEET 3 OF 4

LOCATION: See Location Plan

BORING DATE: August 09, 2011

DATUM: Geodetic

N: 652666 E: 5560634

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER TYPE	BLOWS/0.3m	20	40	60	80	10 ⁻⁹	10 ⁻⁵	10 ⁻¹		
						SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
						nat V. + Q - ● rem V. ⊕ U - ○				Wp — W — Wl					
						20 40 60 80				10 20 30 40					
30				1736.82 30.48											
31		Dry, grey to black, angular, coarse grained to cobble sized SPOILS, covered in clay and sand matrix, cohesive to plastic dark brown to black, silty, smaller fragments			8 GRAF										
32															
33		Dry, grey to black, angular, coarse grained to cobble sized SPOILS, covered in clay and sand matrix, cohesive to plastic dark brown to black, silty		1734.40 32.00											
34															
35															
36															
37															
38															
39															
40															
41															
42															
43															
44		COAL LENS		1723.80 43.50	11 GRAF										
45															

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE

1 : 75



LOGGED: TC

CHECKED: JW

13 Aug 2011



PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW2

SHEET 4 OF 4

LOCATION: See Location Plan

BORING DATE: August 09, 2011

DATUM: Geodetic

N: 652668 E: 5566634

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20 40 60 80		nat V. + Q - rem V. ⊕ U - ⊙		10 ⁰ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³		Wp — Wl			10 20 30 40
45	Saber Rig H24 Air Rotary BECK Drilling & Environmental Services Ltd.	COAL LENS (continued)	[Pattern]														
46					11	GRAB											
47																	
48		BEDROCK, clay fragments trending into grey massive sample	[Pattern]	1719.60 47.70		12	GRAB										
49		End of BOREHOLE.	[Pattern]	1718.60 48.70													
50																	
51																	
52																	
53																	
54																	
55																	
56																	
57																	
58																	
59																	
60																	

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE
1 : 75



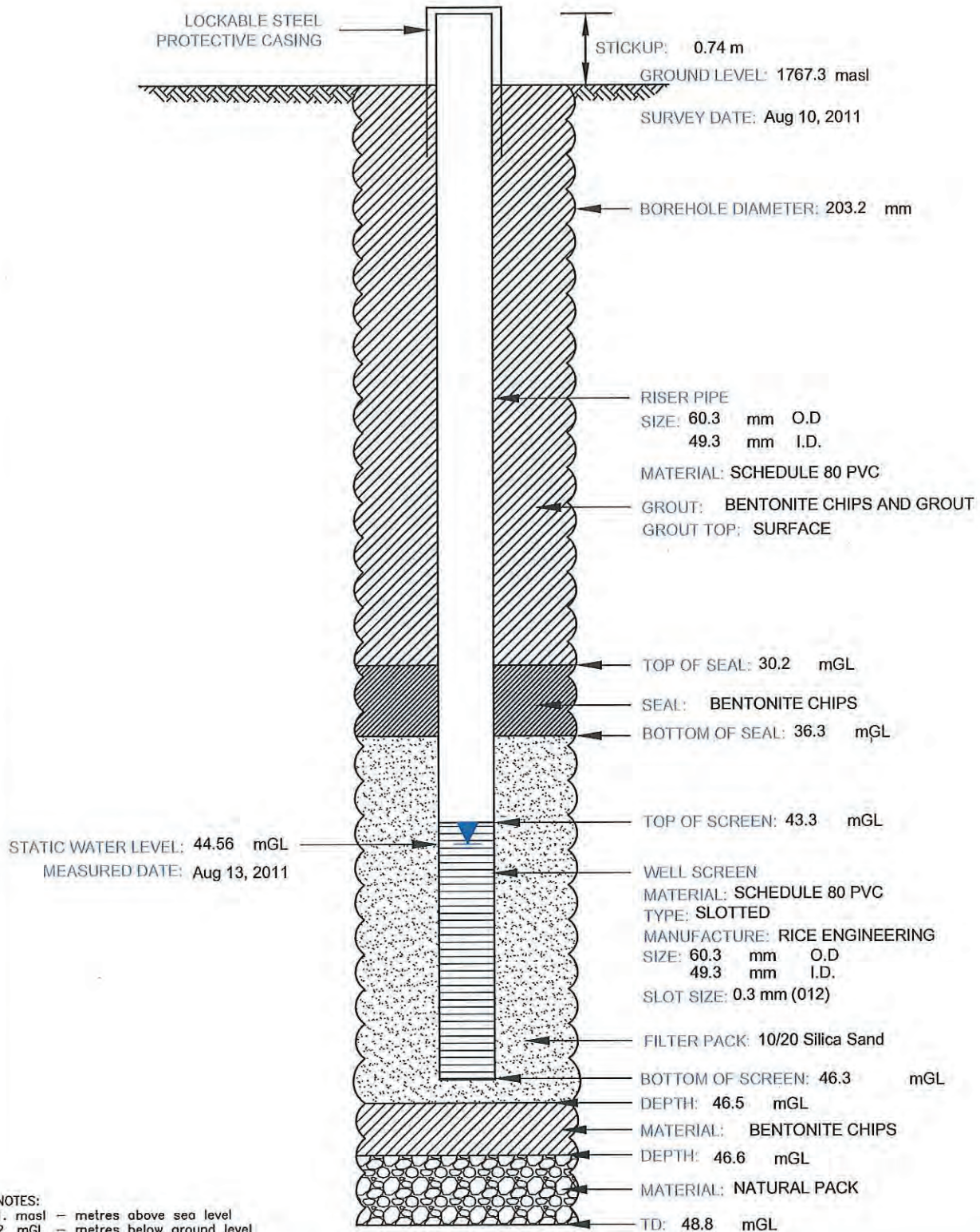
LOGGED: TC
CHECKED: JW

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>Teck Coal Fording River Operations</u>	Spud Date: <u>Aug 9, 2011</u>
H2	Well Name: <u>GA-HMW2</u>	Project Short Title: <u>Teck Coal FRO - Henretta</u>
		Project Number: <u>11.1348.0020-1000-2000</u>
		Site Geologist: <u>T.Crowell</u>

Drilling Method: Air Rotary	Development: Method: Waterra Tubing	Duration: 1 Hour
---------------------------------------	---	-------------------------

SCHEMATIC ONLY--NOT TO SCALE



NOTES:

1. masl - metres above sea level
2. mGL - metres below ground level
3. TD - Total Depth

Golder Associates

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW1D

SHEET 1 OF 4

LOCATION: See Location Plan

BORING DATE: August 10, 2011

DATUM: Geodetic

N: 652437 E: 5566516

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20 40 60 80		nat V. + Q - ● rem V. ⊕ U - ○		10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³		Wp Wl			
0		Ground Surface		1732.20													
0.00		Very loose, non-plastic, non-cohesive, dry to slightly damp, grey to black, variable grain size, mainly coarse grain to cobbles WASTE ROCK, covered in clay and sand matrix, black to dark brown, slightly cohesive with silt.															
1						1	GRAB										
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11		Very hard layer, no returns		1721.60													
10.70																	
12																	
13		COAL LENS		1719.70													
12.50																	
1719.40																	
13		Very hard layer, no returns															
13.10		Increase in matrix material, fine to coarse grained and cobble sized clay returns															
14																	
15																	
1717.60																	
14.60																	

CONTINUED NEXT PAGE

3 Aug 2011

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE

1 : 75



LOGGED: TC

CHECKED: JW

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW1D

SHEET 2 OF 4

LOCATION: See Location Plan

BORING DATE: August 10, 2011

DATUM: Geodetic

N: 652437 E: 5566516

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20	40	60	80	nat V. + Q - ●	rem V. ⊕ U - ○	10 ⁻⁸			10 ⁻⁵
15		Very loose, non-plastic, non-cohesive, dry to slightly damp, grey to black, variable grain size, mainly coarse grained to cobbles WASTE ROCK, covered in clay and sand matrix, black to dark brown, slightly cohesive with silt (continued)					20	40	60	80							
16																	
17																	
18																	
19		--- Moisture content increases from 19.0 to 20.1 m															
20		Hard layer, no returns															
21																	
22		Very loose, non-plastic, non-cohesive, dry to slightly damp, grey to black, variable grain size, mainly coarse grained to cobbles WASTE ROCK, covered in clay and sand matrix, black to dark brown, slightly cohesive with silt					1710.30	21.90									
23																	
24		Massive, grey, very coarse grained to cobble sized, angular to sub-rounded GRAVEL															
25		Soft, plastic, cohesive, brown CLAY, little returns					1707.80	24.40									
26																	
27																	
28																	
29																	
30																	

Barber Rig H24 Air Rotary
BECK Drilling & Environmental Services Ltd.

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

CONTINUED NEXT PAGE

DEPTH SCALE

1 : 75



LOGGED: TC

CHECKED: JW

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW1D

SHEET 3 OF 4

LOCATION: See Location Plan

BORING DATE: August 10, 2011

DATUM: Geodetic

N: 652437 E: 5566516

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER TYPE	BLOWS/0.3m	20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴		
						SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
						nat V. + rem V. ⊕ U - ⊙				Wp ○ W WI					
						20 40 60 80				10 20 30 40					
30		Massive, grey, very loose grained to cobble sized GRAVEL, angular to sub-rounded (continued)		29.90											
31															
32		Hard layer, no returns		1698.70	8	GRAB									
33						33.50									
34		Massive, grey, very loose grained to cobble sized GRAVEL, angular to sub-rounded		1695.60											
35						36.60									
36															
37															
38															
39															
40															
41															
42															
43															
44															
45															

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000.BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE

1 : 75



LOGGED: TC

CHECKED: JW

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW1D

SHEET 4 OF 4


LOCATION: See Location Plan

BORING DATE: August 10, 2011

DATUM: Geodetic

N: 652437 E: 5566516

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		STRATA PLOT	SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION							
		DESCRIPTION	ELEV. DEPTH (m)		NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT											
								20	40	60	80	nat V. +	rem V. ⊕	U -			●	○	Wp	W	WI		
45	Barber Rig H2 & Air Rotary BECK Drilling & Environmental Services Ltd.	Massive, grey, very loose grained to cobble sized GRAVEL, angular to sub-rounded (continued)				10 GRAB																	
46																							
47																							
48																							
49																							
50																							
51																							
52		Black, broken COAL	1680.10 52.10			11 GRAB																	
53		Massive, grey, very loose grained to cobble sized GRAVEL, angular to sub-rounded	1679.20 53.00			12 GRAB																	
54		Massive, grey BEDROCK	1678.30 53.90 1677.00 54.30			13 GRAB																	
55		End of BOREHOLE.																					
56																							
57																							
58																							
59																							
60																							

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE

1 : 75



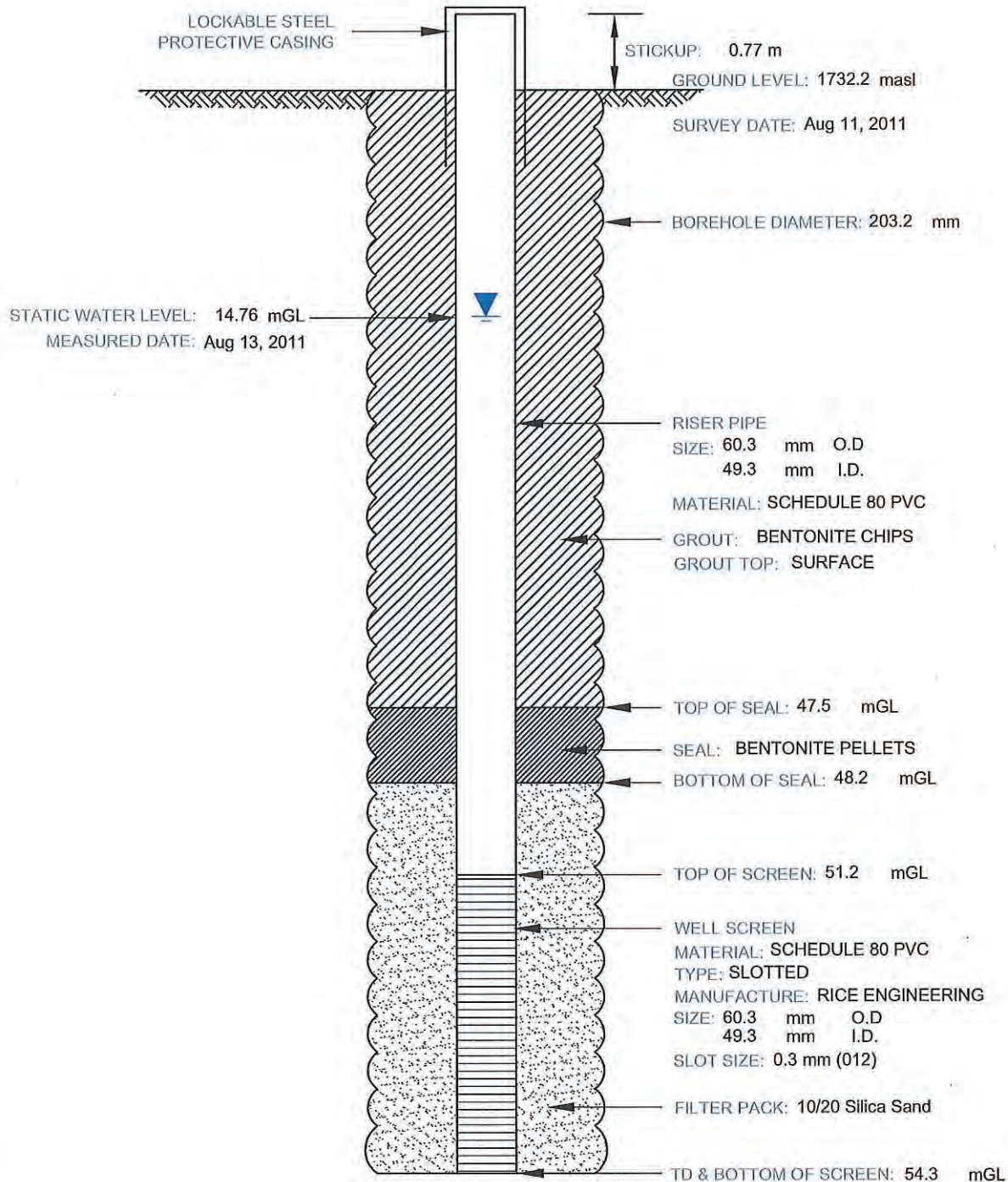
LOGGED: TC

CHECKED: JW

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>Teck Coal Fording River Operations</u>	Spud Date: <u>Aug 10, 2011</u>
H1D	Well Name: <u>GA-HMW1D</u>	Project Short Title: <u>Teck Coal FRO - Henretta</u>
		Project Number: <u>11.1348.0020-1000-2000</u>
Drilling Method: <u>Air Rotary</u>		Development: <u>Method: Air Lift</u>
Duration: <u>1.25 Hours</u>		

SCHEMATIC ONLY--NOT TO SCALE



NOTES:

1. masl - metres above sea level
2. mGL - metres below ground level
3. TD - Total Depth

Golder Associates

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW1S

SHEET 1 OF 3

LOCATION: See Location Plan

BORING DATE: August 11, 2011

DATUM: Geodetic

N: 652441 E: 5566518

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		nat V. + rem V. ⊕ ⊖		Wp				Wi	
0		Ground Surface		1732.30													
		Samples are not logged		0.00													
1																	
2																	
3					1	GRAB											
4																	
5																	
6																	
7																	
8					2	GRAB											
9																	
10																	
11																	
12																	
13					3	GRAB											
14																	
15																	

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE

1 : 75



LOGGED: TC

CHECKED: JW

DATA ENTRY: VI

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW1S

SHEET 2 OF 3

LOCATION: See Location Plan

BORING DATE: August 11, 2011

DATUM: Geodetic

N: 652441 E: 5586518

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20 40 60 80		10 ⁰ 10 ⁻¹ 10 ⁻² 10 ⁻³		nat. V. + Q - ●		rem. V. ⊕ U - ○			Wp
15		Samples are not logged (continued)														▽	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	

Barber Rig H24 Air Rotary
BECK Drilling & Environmental Services Ltd.

Very loose, non-plastic, non-cohesive, dry to slightly damp, grey to black, coarse grained to cobbles sized, WASTE ROCK, covered in clay and sand matrix, matrix is black, slightly cohesive, silty

Massive, grey, very coarse grained to cobble sized GRAVEL, angular to sub-rounded

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE

1 : 75



LOGGED: TC

CHECKED: JW

PROJECT No.: 11.1348.0020.2000

RECORD OF BOREHOLE: GA-HMW1S

SHEET 3 OF 3


LOCATION: See Location Plan

BORING DATE: August 11, 2011

DATUM: Geodetic

N: 652441 E: 5566518

DATA ENTRY: VI

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH		WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵		
30	Barber Rig #24 Air Rotary BECK Drilling & Environmental Services Ltd.	Massive, grey, very coarse grained to cobble sized GRAVEL, angular to sub-rounded (<i>continued</i>) --- Gravel is very large in size (inches across)		1608.80	6	GRAB									
31															
32															
33															
34		BEDROCK End of BOREHOLE.													
35															
36															
37															
38															
39															
40															
41															
42															
43															
44															
45															

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020.2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

DEPTH SCALE

1 : 75



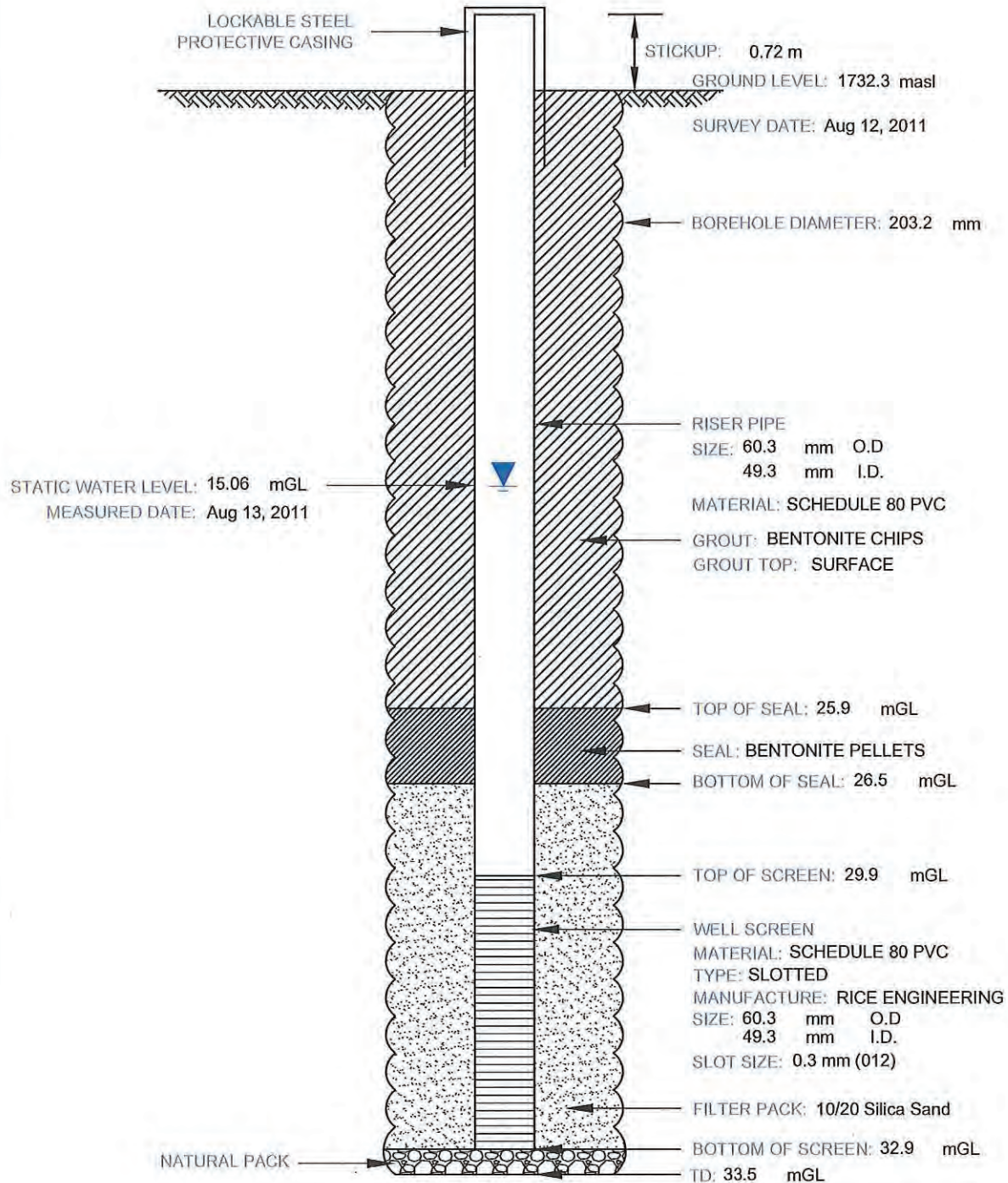
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CHECKED: JW

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>Teck Coal Fording River Operations</u>	Spud Date: <u>Aug 11, 2011</u>
H1S	Well Name: <u>GA-HMW1S</u>	Project Short Title: <u>Teck Coal FRO - Henretta</u>
		Project Number: <u>11.1348.0020-1000-2000</u>
Drilling Method: <u>Air Rotary</u>	Development: <u>Method: Air Lift</u>	Duration: <u>1.25 Hours</u>

SCHEMATIC ONLY--NOT TO SCALE



NOTES:

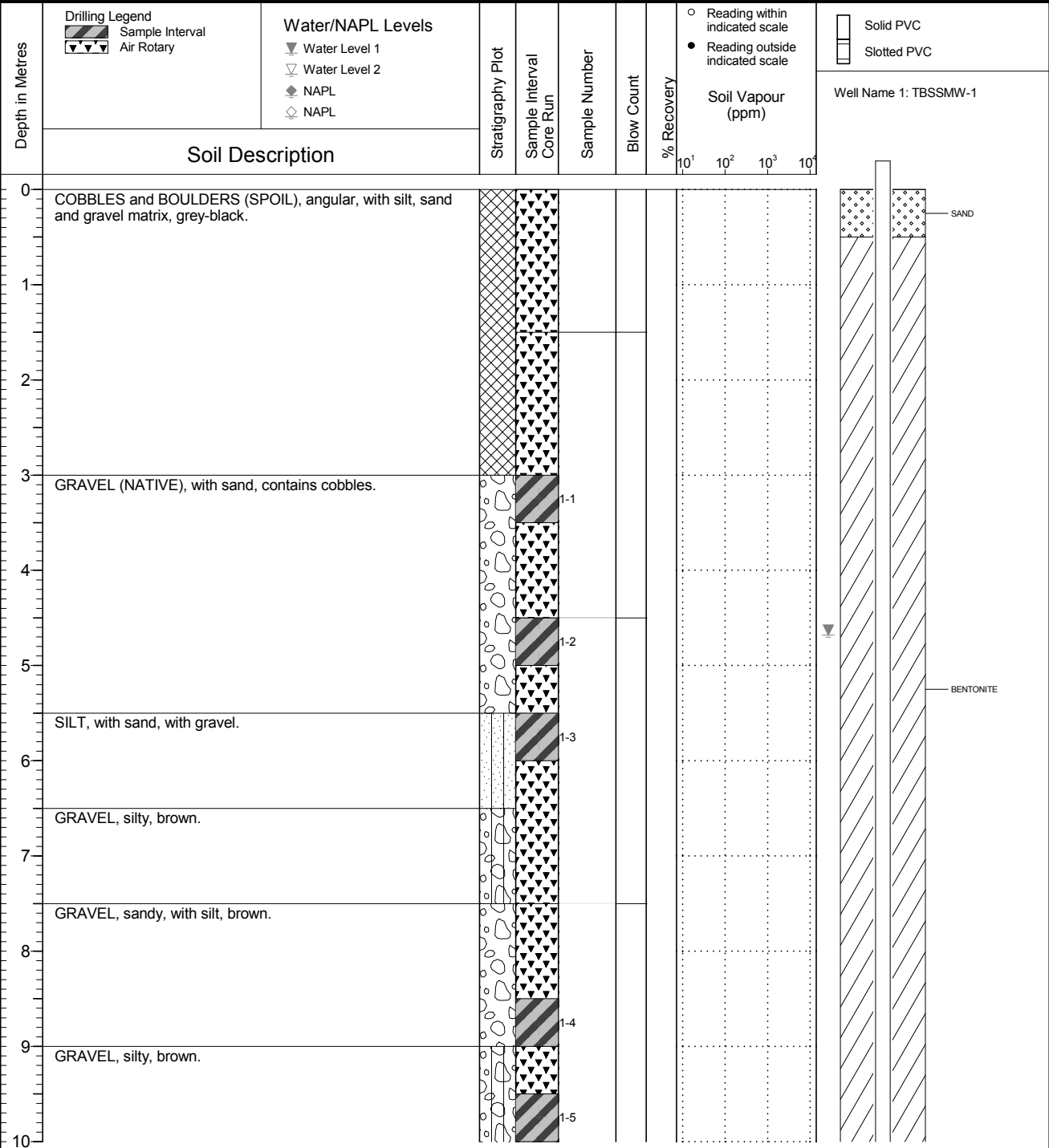
1. masl - metres above sea level
2. mGL - metres below ground level
3. TD - Total Depth

Golder Associates

FINAL

SNC • LAVALIN	Client Teck Coal Limited	Borehole No. : FR_TBSSMW-1
	Location Turnbull, Elkford, BC	PAGE 1 OF 3

Drilling Contractor: Foraco International SA Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): 0.05/0.05	Date Monitored: 2017 08 08 Ground Surface Elev. (m): 1697.039 Top of Casing Elev. (m): 1697.969 Northing: 5565868.179 Easting: 651603.747	Project Number: 648811 Borehole Logged By: SC Date Drilled: 2017 08 02 Log Typed By: VL
--	---	--

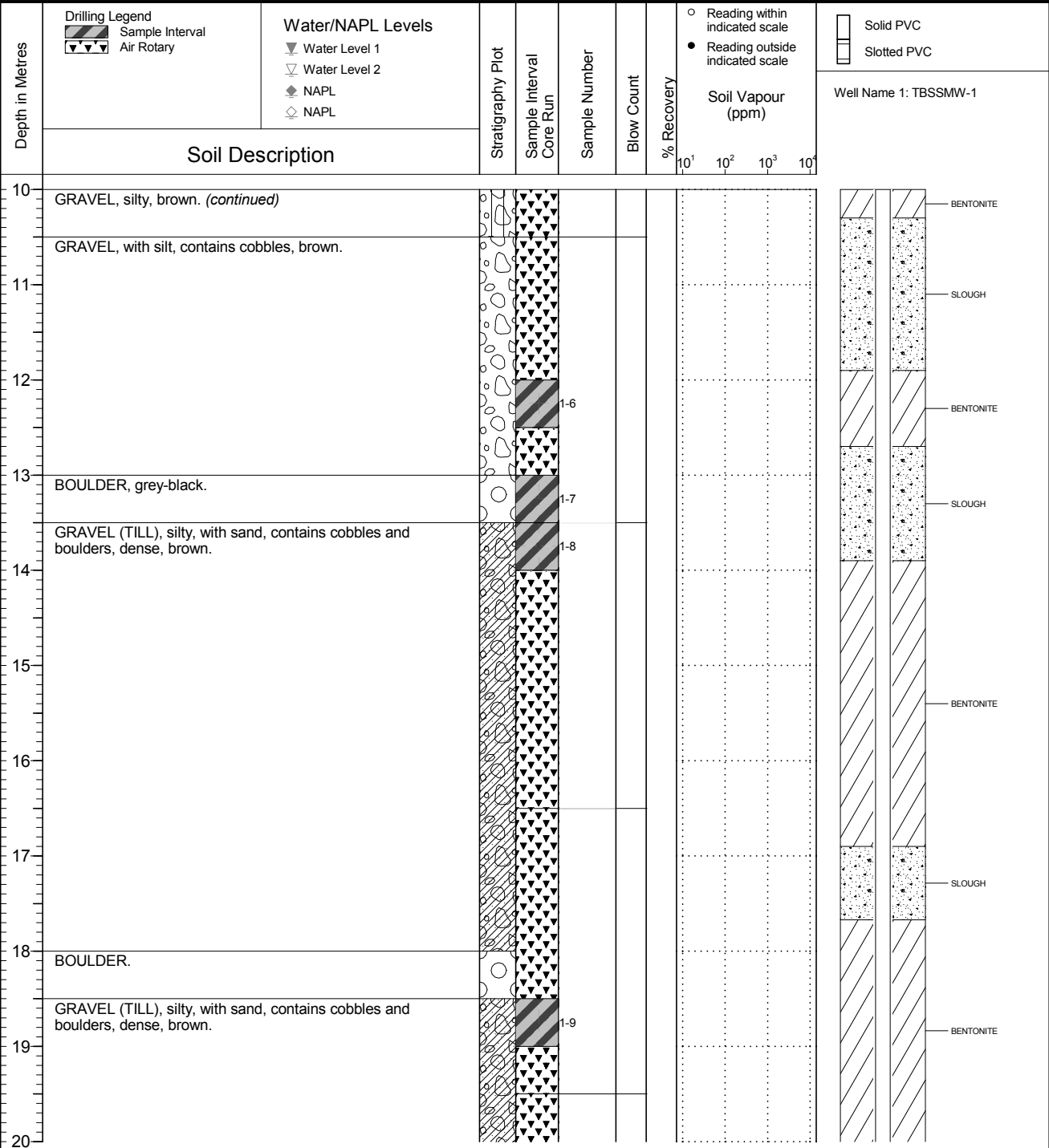


NOTES
 150 mm steel casing to 5.0 m.
 Bolded sample denotes sample analyzed.

FINAL

	Client Teck Coal Limited	Borehole No. : FR_TBSSMW-1
	Location Turnbull, Elkford, BC	PAGE 2 OF 3

Drilling Contractor: Foraco International SA Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): 0.05/0.05	Date Monitored: 2017 08 08 Ground Surface Elev. (m): 1697.039 Top of Casing Elev. (m): 1697.969 Northing: 5565868.179 Easting: 651603.747	Project Number: 648811 Borehole Logged By: SC Date Drilled: 2017 08 02 Log Typed By: VL
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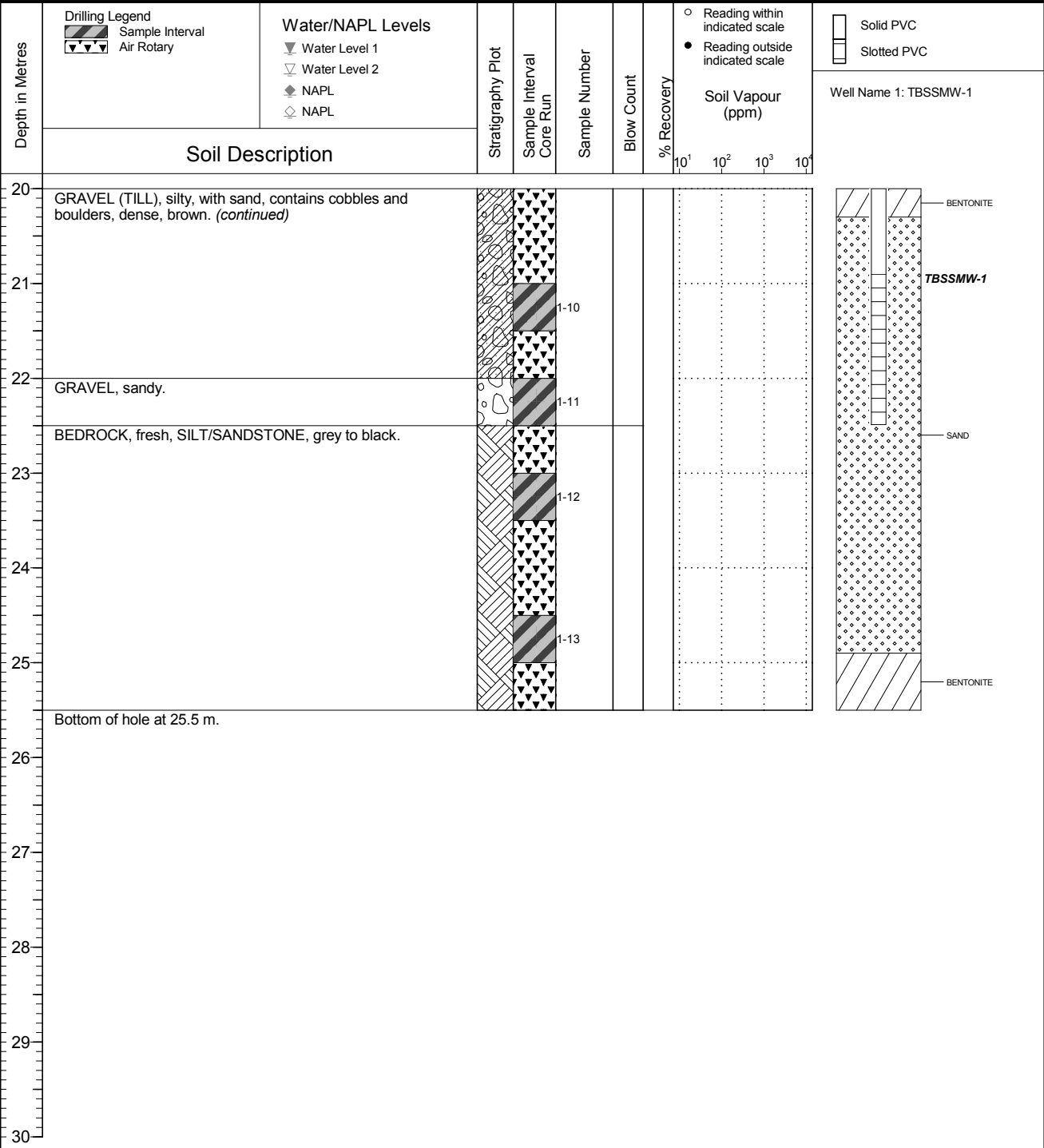


NOTES
 150 mm steel casing to 5.0 m.
 Bolded sample denotes sample analyzed.

FINAL

SNC • LAVALIN	Client Teck Coal Limited	Borehole No. : FR_TBSSMW-1
	Location Turnbull, Elkford, BC	PAGE 3 OF 3

Drilling Contractor: Foraco International SA Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): 0.05/0.05	Date Monitored: 2017 08 08 Ground Surface Elev. (m): 1697.039 Top of Casing Elev. (m): 1697.969 Northing: 5565868.179 Easting: 651603.747	Project Number: 648811 Borehole Logged By: SC Date Drilled: 2017 08 02 Log Typed By: VL
--	---	--

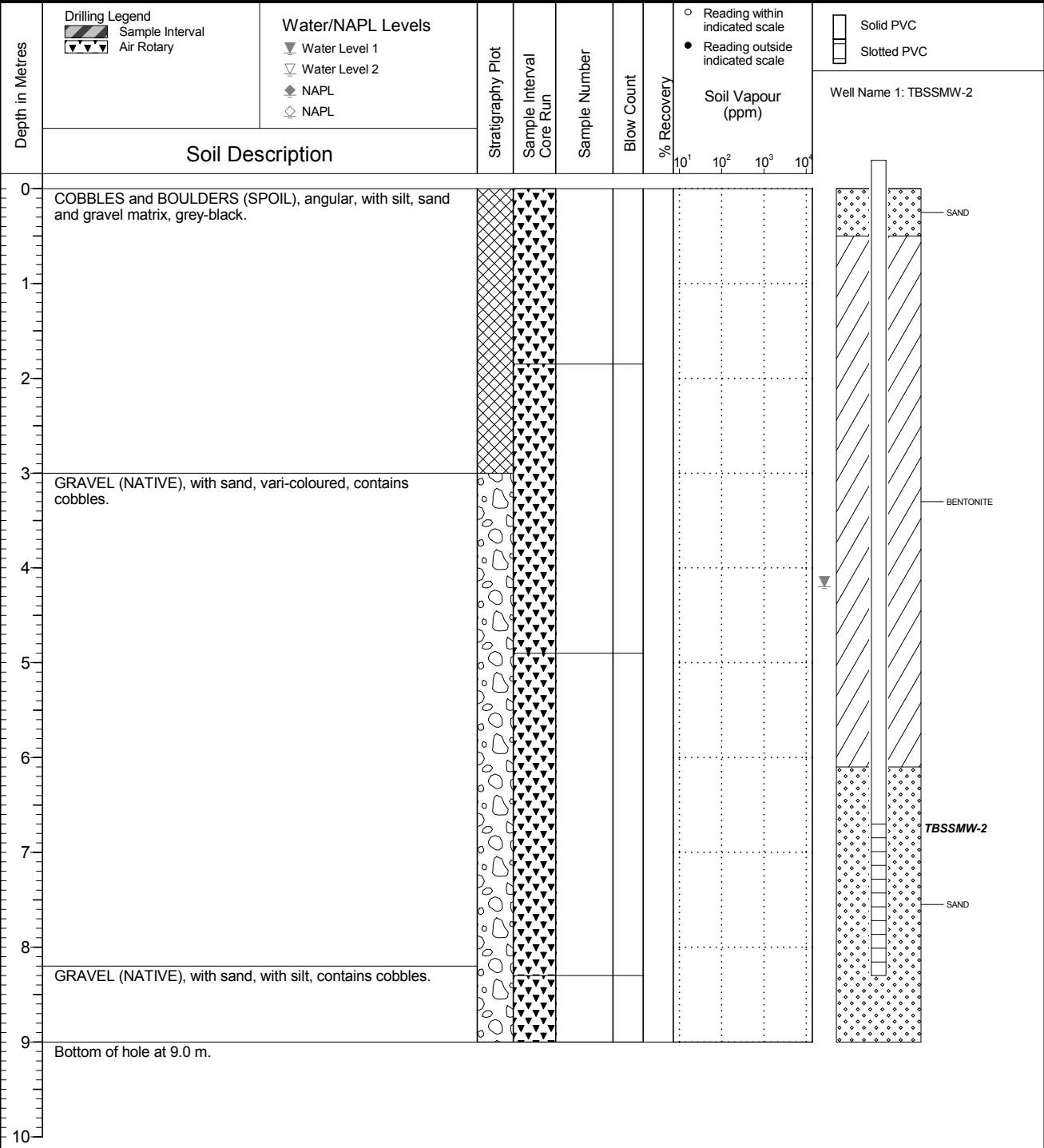


NOTES
 150 mm steel casing to 5.0 m.
 Bolded sample denotes sample analyzed.

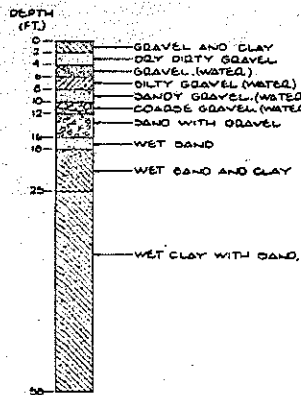
FINAL

SNC • LAVALIN	Client Teck Coal Limited	Borehole No. : FR_TBSSMW-2
	Location Turnbull, Elkford, BC	PAGE 1 OF 1

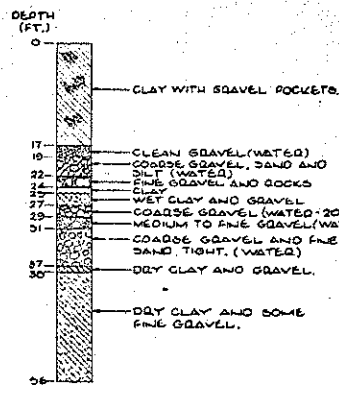
Drilling Contractor: Foraco International SA Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): 0.05/0.05	Date Monitored: 2017 08 08 Ground Surface Elev. (m): 1697.026 Top of Casing Elev. (m): 1697.949 Northing: 5565866.323 Easting: 651604.803	Project Number: 648811 Borehole Logged By: RSW Date Drilled: 2017 08 03 Log Typed By: VL
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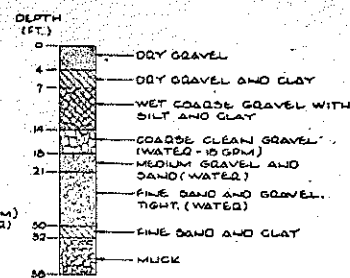
NOTES
 150 mm steel casing to 4.6 m.
 Bolded sample denotes sample analyzed.



TEST HOLE N^o 1



TEST HOLE N^o 2

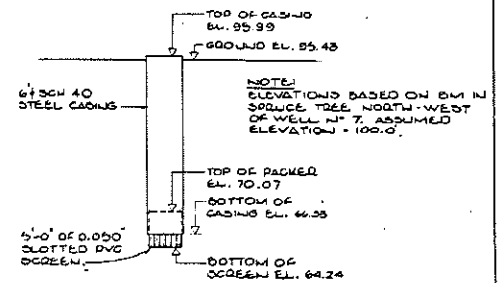


TEST HOLE N^o 3

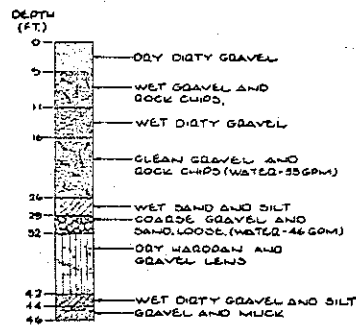
LEGEND

- SILT
- CLAY
- MUCK
- HARDPAN
- SAND
- GRAVEL
- ROCK CHIS
- BEDROCK

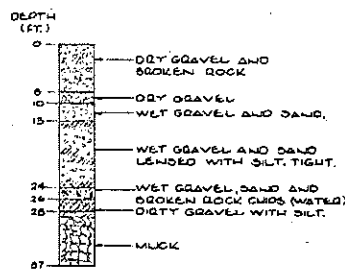
NOTE:
TEST HOLE LOGS PREPARED
BY H & W AQUA WELL DRILLING LTD.



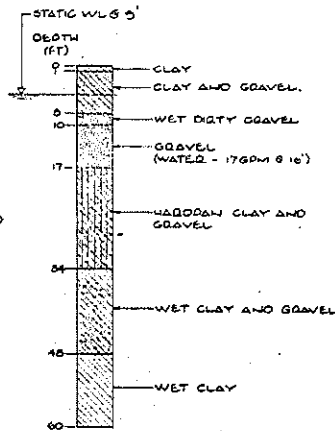
TEST HOLE N^o 8
WELL SCREEN INSTALLATION



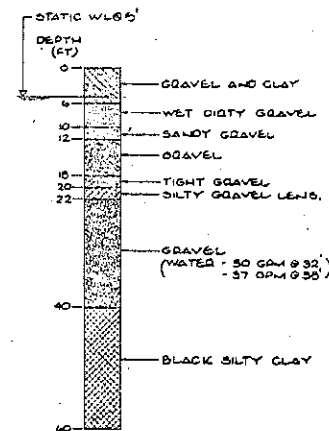
TEST HOLE N^o 4



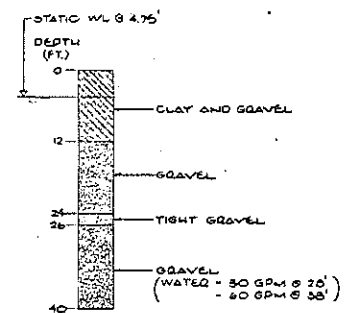
TEST HOLE N^o 5



TEST HOLE N^o 6



TEST HOLE N^o 7



TEST HOLE N^o 8

FIGURE 2

NO.	DATE	BY	CHKD	APPD	DESCRIPTION	NO.	DATE	BY	CHKD	APPD	DESCRIPTION	DESIGNED	JAW	DRAWN	AS	CHECKED	BY	DATE	BY	SCALE	VERT.	HORIZ.	NTS.	DRAWING NO.	SHEET	OF	ISSUE	A
																		JUNE 11, 1976										

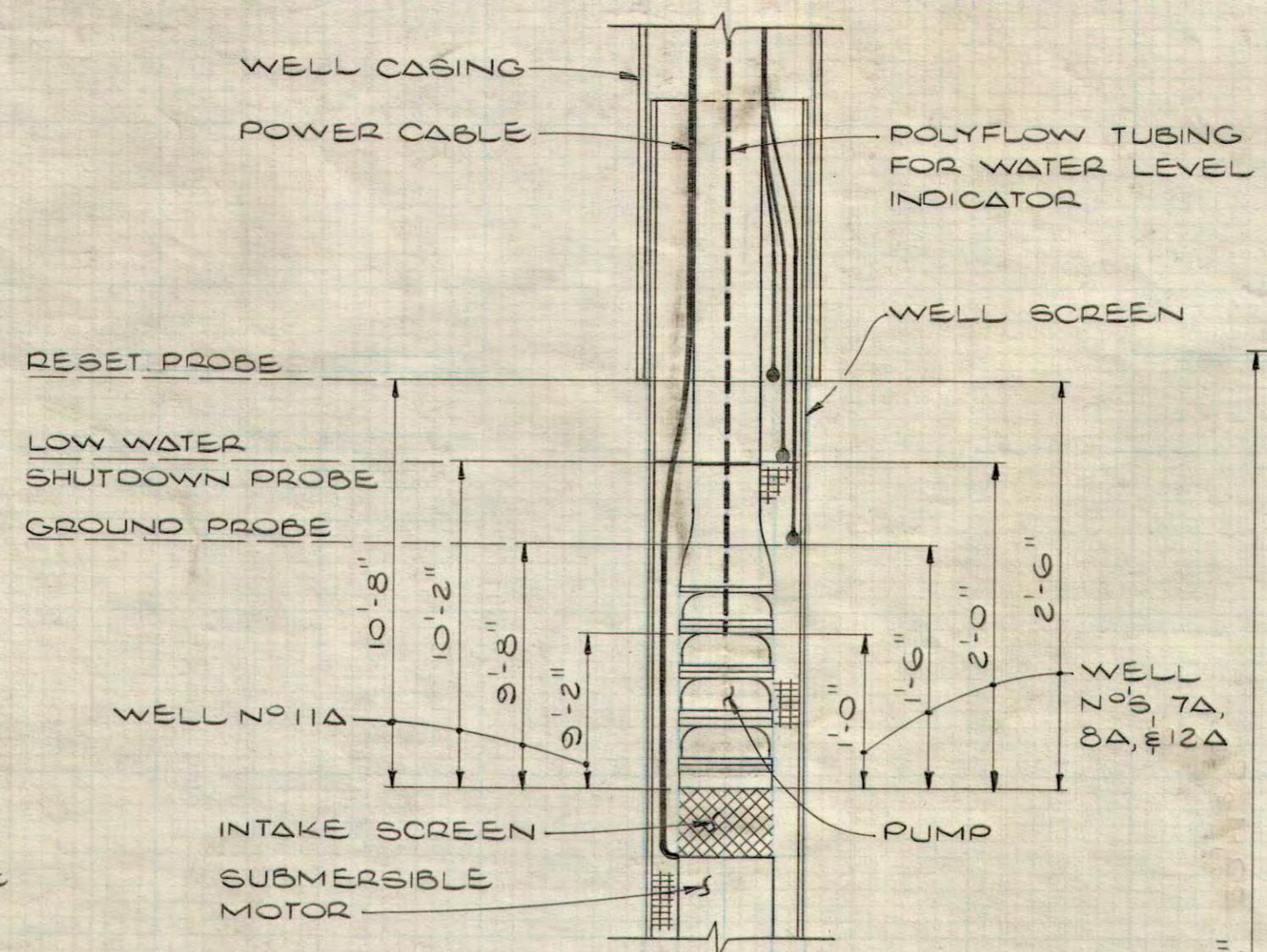
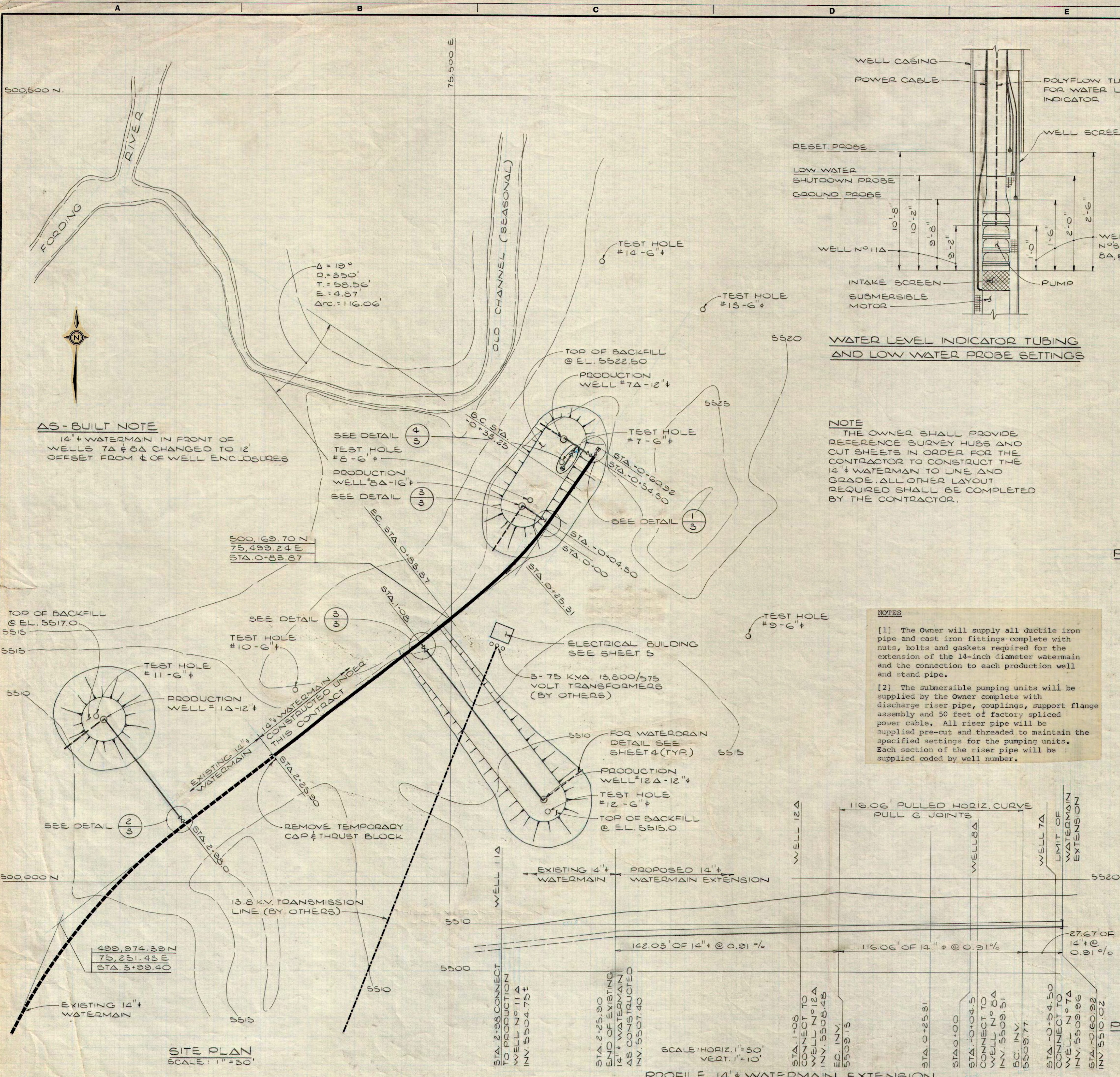
KERR WOOD LEIDAL ASSOCIATES LTD.
CONSULTING ENGINEERS

FORDING COAL LTD.
PRIMARY WATER SUPPLY
TEST HOLE LOGS

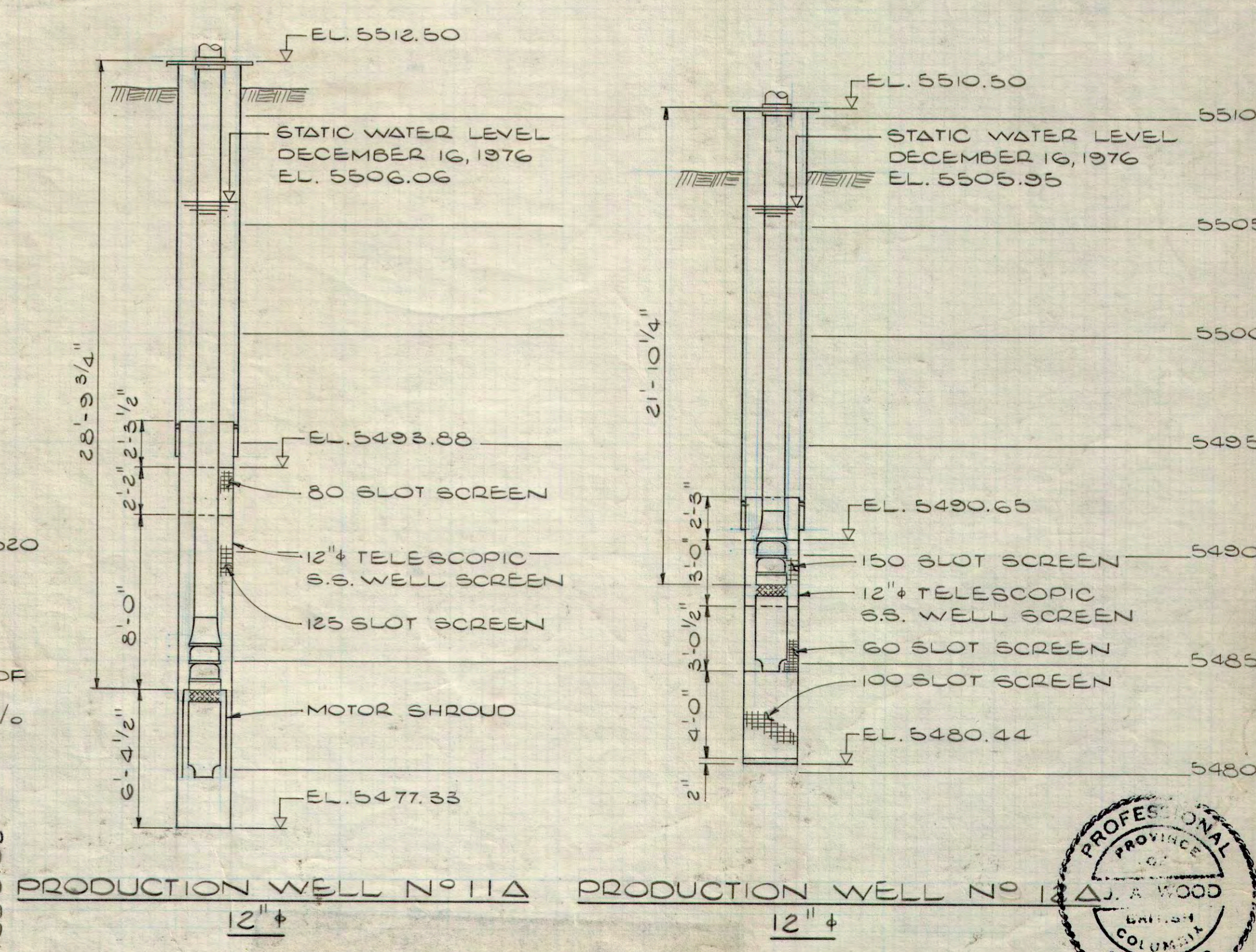
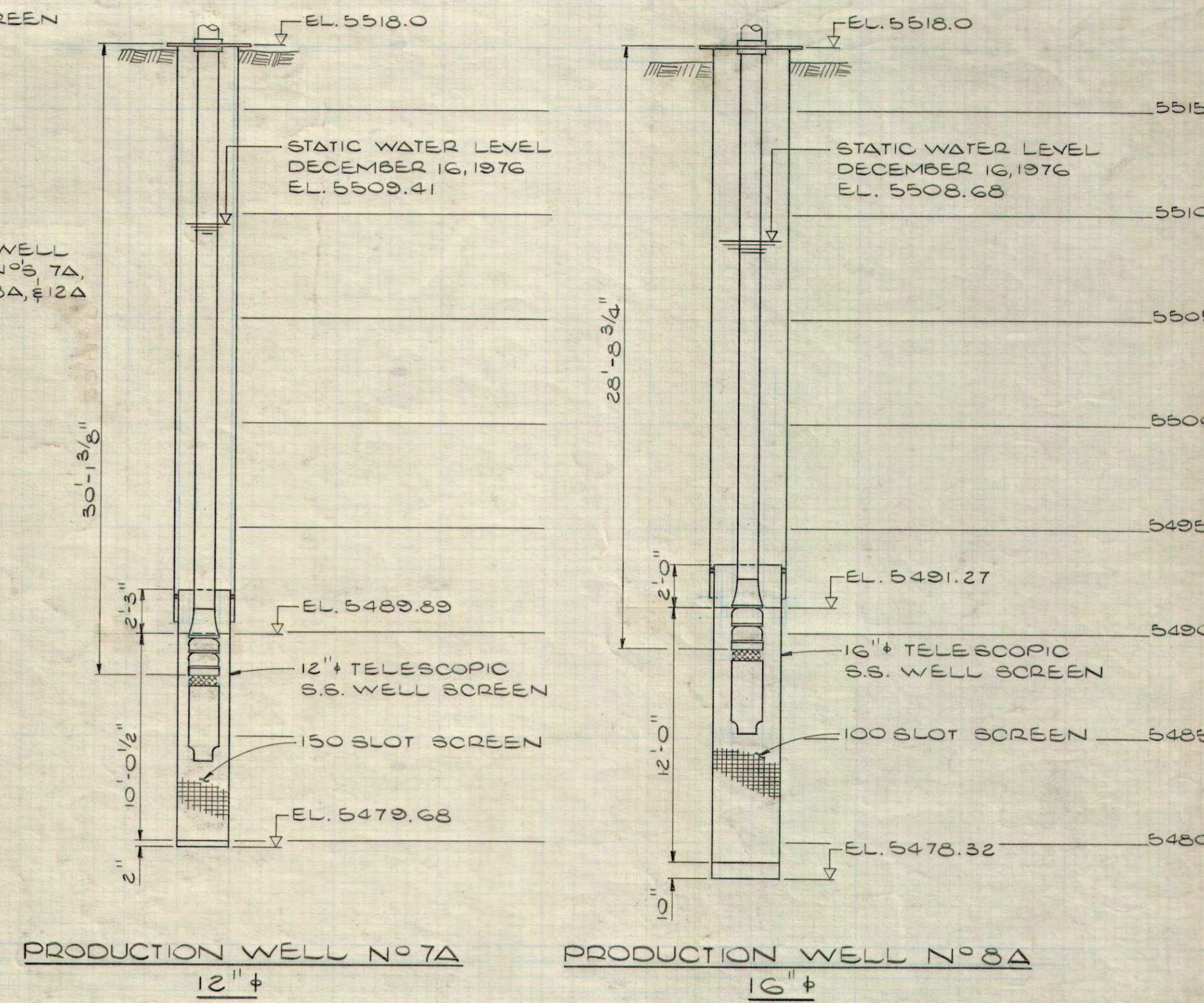
SCALE VERT: 1" = 10' HORIZ: NTS.
DRAWING NO. 0.70.2
SHEET OF ISSUE A

Bill of Material

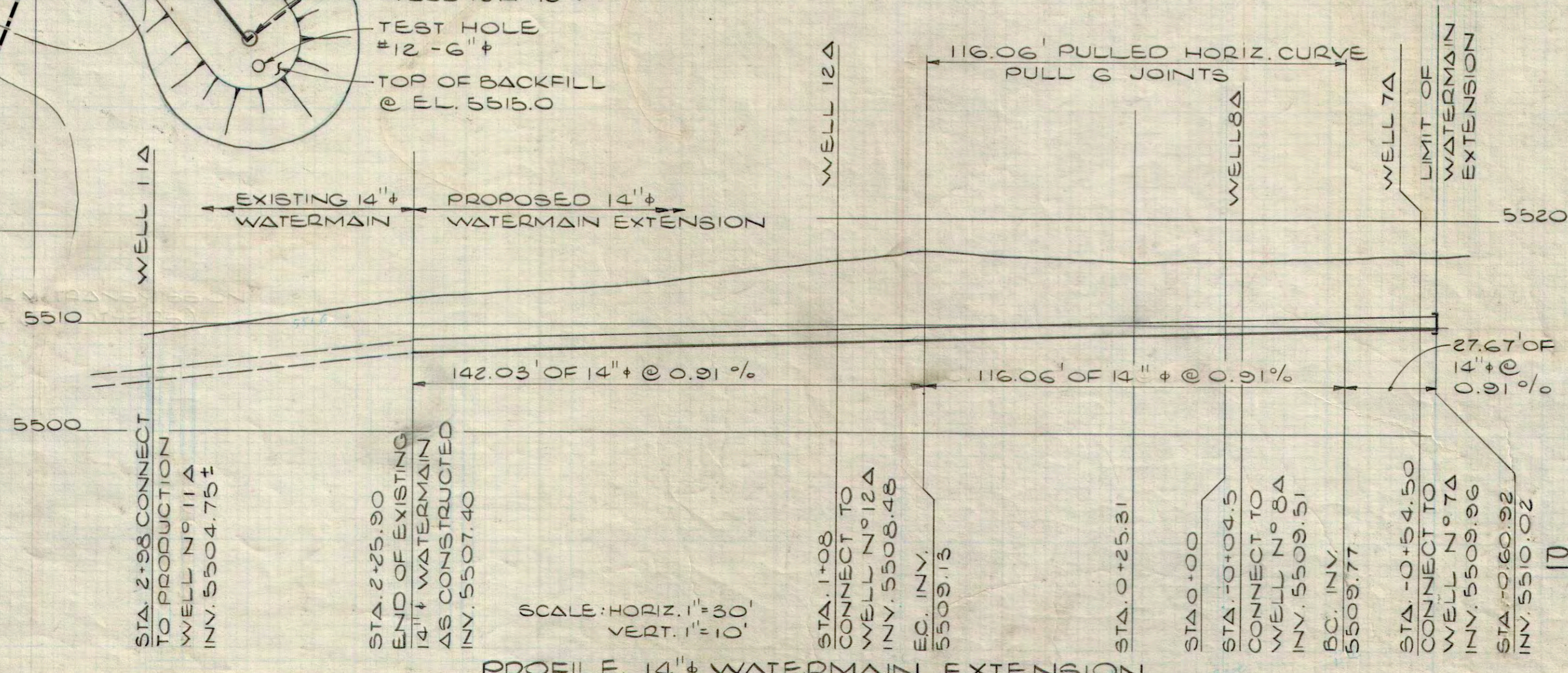
Item No.	No. Req'd	Material	Description	Pattern or Drawing Number	Supplied or Made by	Date Ordered	Requisition No.
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WATER LEVEL INDICATOR TUBING AND LOW WATER PROBE SETTINGS



PROFILE 14" WATERMAIN EXTENSION

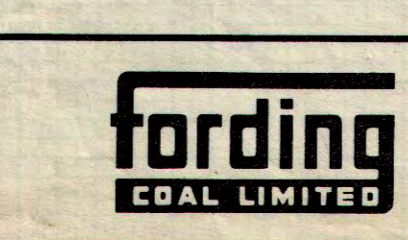


Project No.	
Drawing No.	
Revision	
Reference	

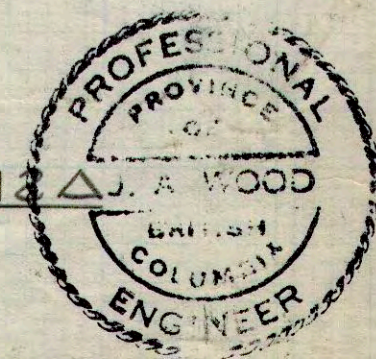
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No.	Made by	Date	Approved	Description												
1	RK	12/4/77		AS CONSTRUCTED												
2	RK	25/4/77		DRAWING NUMBER REVISED												

Revisions	<table border="1"> <tr> <th>No.</th> <th>Made by</th> <th>Date</th> <th>Approved</th> <th>Description</th> </tr> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	No.	Made by	Date	Approved	Description	1				
No.	Made by	Date	Approved	Description							
1											

Drawn by	RK
Checked by	KAS
Design Eng.	
Proj. Eng.	Approved
J.A.W.	Wood Jan 28/77



Function	FORDING COAL YARDS AND SERVICES	Scale	AS SHOWN
Section	PRIMARY WATER SUPPLY	Drawing No.	FC1 A 1523 A
Job	14" WATERMAIN & WELL DET'S		



FINAL



Client
Teck Coal Limited

Location
Turnbull, Elkford, BC

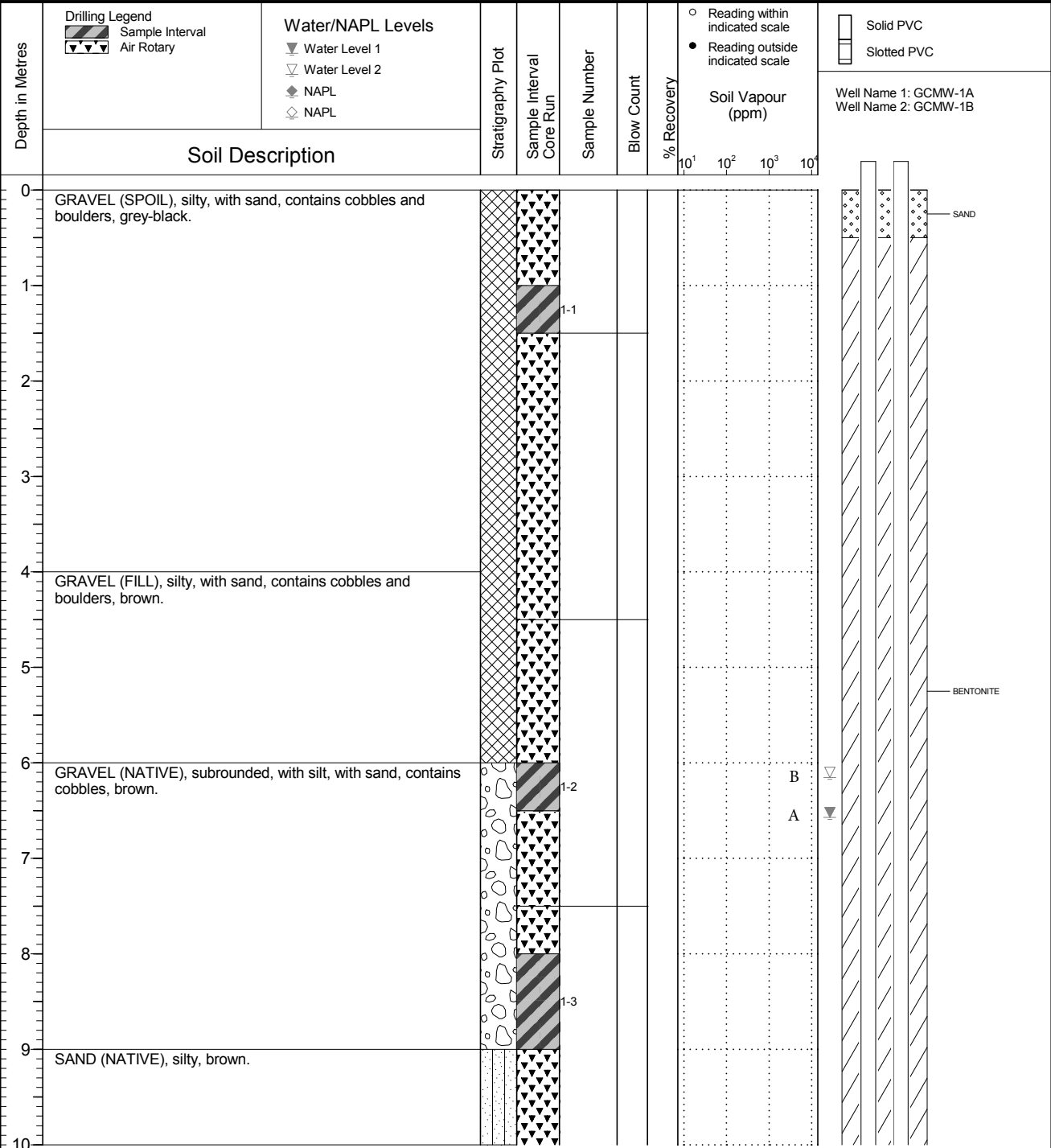
Borehole No. : FR_GCMW-1A/B

PAGE 1 OF 3

Drilling Contractor Foraco International SA
 Drilling Method Dual Rotary
 Borehole Dia. (m) 0.15
 Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2017 08 08
 Ground Surface Elev. (m) 1670.643
 Top of Casing Elev. (m) 1671.355 1671.293
 Northing: 5564000.572 Easting: 650964.694

Project Number: 648811
 Borehole Logged By: SC
 Date Drilled: 2017 08 01
 Log Typed By: VL



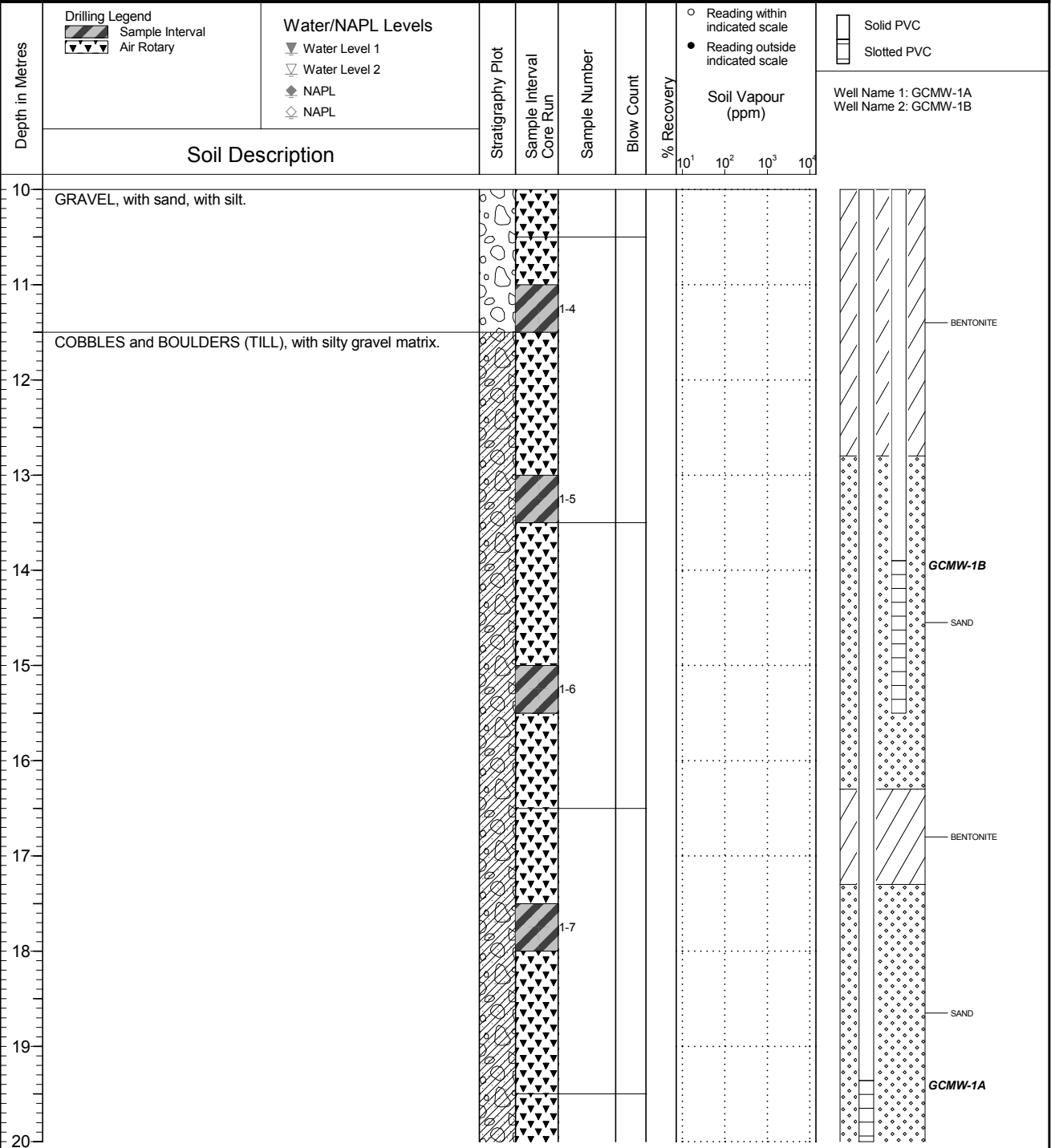
NOTES
 150 mm steel casing to 10.5 m.
 Bolded sample denotes sample analyzed.

SC 2017 09 19 Print Date:2017-12-19

FINAL

SNC • LAVALIN	Client Teck Coal Limited	Borehole No. : FR_GCMW-1A/B
	Location Turnbull, Elkford, BC	PAGE 2 OF 3

Drilling Contractor: Foraco International SA Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): 0.05/0.05	Date Monitored: 2017 08 08 Ground Surface Elev. (m): 1670.643 Top of Casing Elev. (m): 1671.355 1671.293 Northing: 5564000.572 Easting: 650964.694	Project Number: 648811 Borehole Logged By: SC Date Drilled: 2017 08 01 Log Typed By: VL
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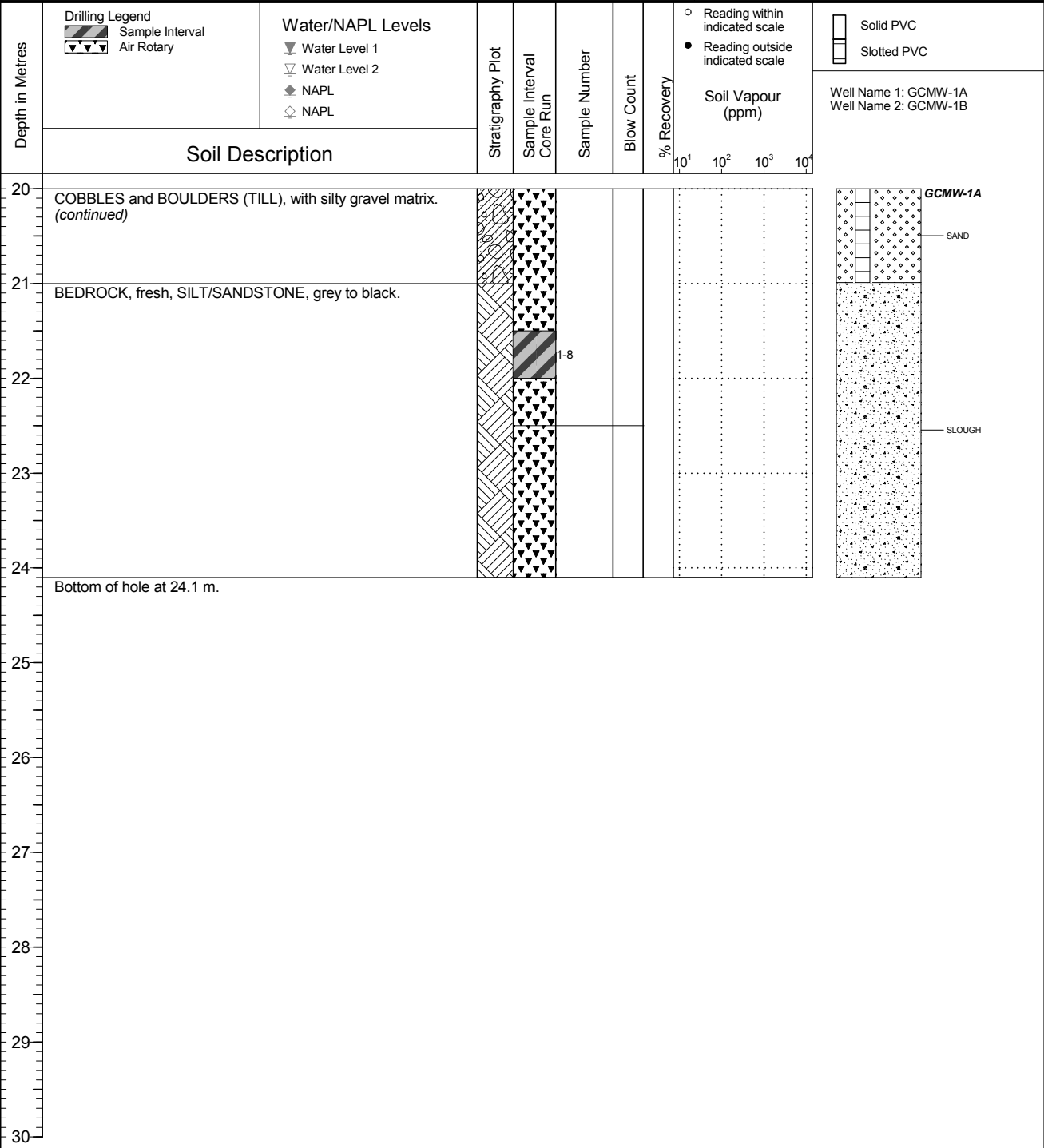
NOTES
 150 mm steel casing to 10.5 m.
 Bolded sample denotes sample analyzed.

SC 2017 09 19 Print Date: 2017-12-19

FINAL

SNC • LAVALIN	Client Teck Coal Limited	Borehole No. : FR_GCMW-1A/B
	Location Turnbull, Elkford, BC	PAGE 3 OF 3

Drilling Contractor: Foraco International SA Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): 0.05/0.05	Date Monitored: 2017 08 08 Ground Surface Elev. (m): 1670.643 Top of Casing Elev. (m): 1671.355 1671.293 Northing: 5564000.572 Easting: 650964.694	Project Number: 648811 Borehole Logged By: SC Date Drilled: 2017 08 01 Log Typed By: VL
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NOTES
 150 mm steel casing to 10.5 m.
 Bolded sample denotes sample analyzed.

FINAL



Client
Teck Coal Limited

Location
Turnbull, Elkford, BC

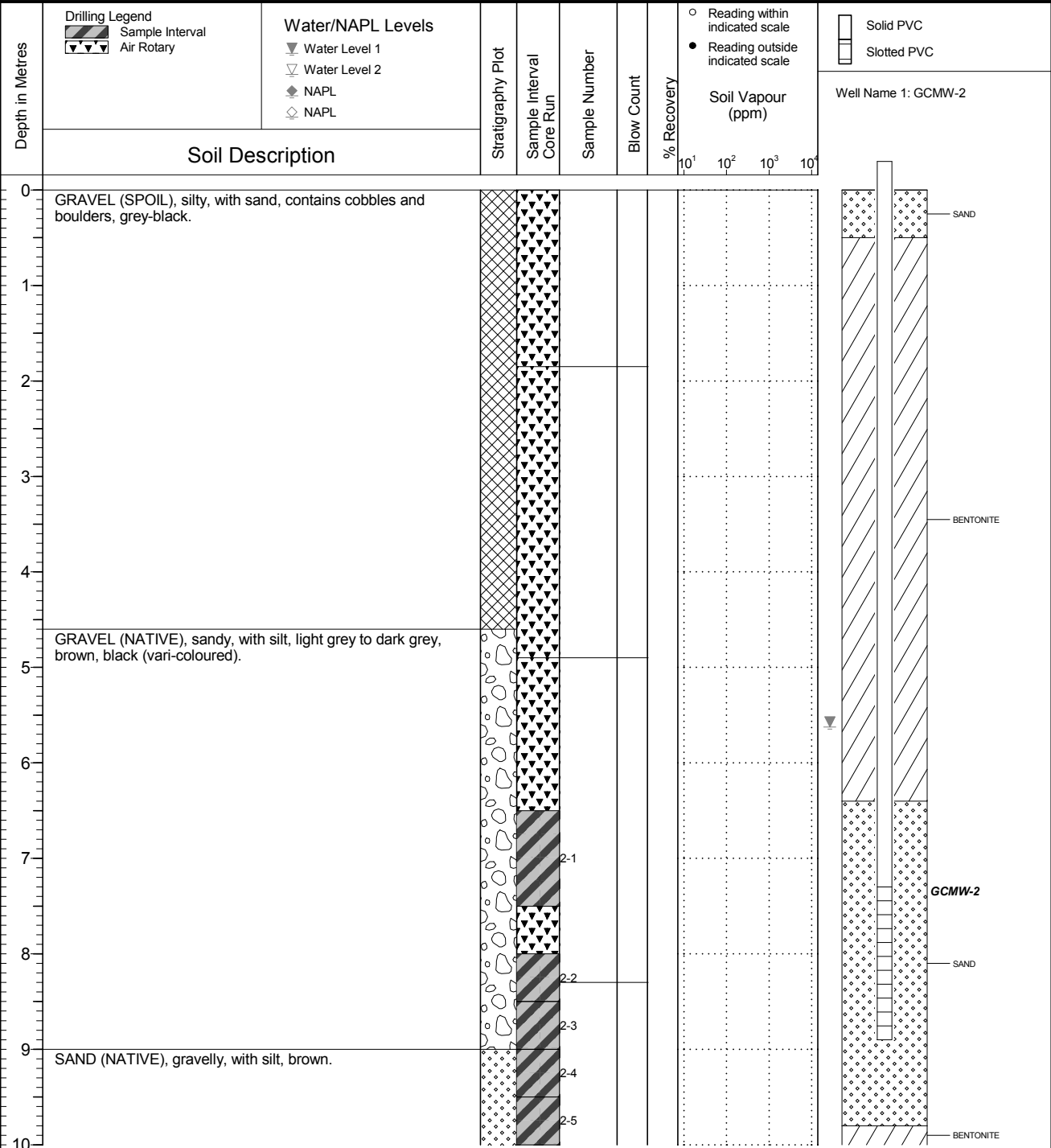
Borehole No. : FR_GCMW-2

PAGE 1 OF 2

Drilling Contractor Foraco International SA
 Drilling Method Dual Rotary
 Borehole Dia. (m) 0.15
 Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2017 08 08
 Ground Surface Elev. (m) 1670.444
 Top of Casing Elev. (m) 1671.342
 Northing: 5563998.165 Easting: 650966.068

Project Number: 648811
 Borehole Logged By: RSW
 Date Drilled: 2017 08 02
 Log Typed By: VL

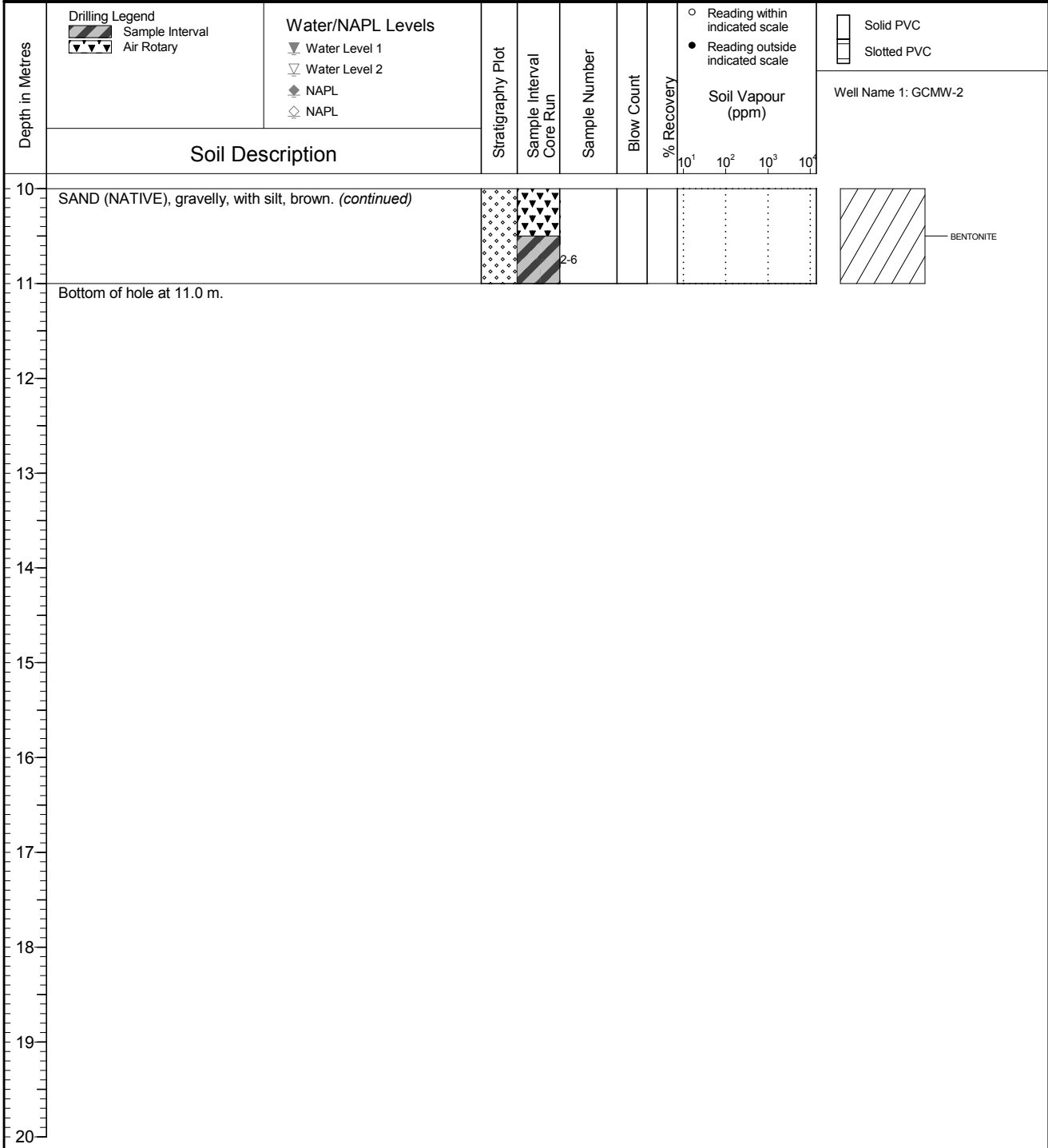


NOTES
 150 mm steel casing to 4.9 m.
 Bolded sample denotes sample analyzed.

FINAL

	Client Teck Coal Limited	Borehole No. : FR_GCMW-2
	Location Turnbull, Elkford, BC	PAGE 2 OF 2

Drilling Contractor: Foraco International SA Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): 0.05/0.05	Date Monitored: 2017 08 08 Ground Surface Elev. (m): 1670.444 Top of Casing Elev. (m): 1671.342 Northing: 5563998.165 Easting: 650966.068	Project Number: 648811 Borehole Logged By: RSW Date Drilled: 2017 08 02 Log Typed By: VL
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NOTES
 150 mm steel casing to 4.9 m.
 Bolded sample denotes sample analyzed.

DATA ENTRY: KJM

PROJECT No.: 09-1349-1007.3102

RECORD OF BOREHOLE: GA-MW-1B

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: September 8, 2010

DATUM: UTM Zone 11
(Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20 40 60 80 nat V. + Q - ● rem V. ⊕ U - ○				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³ Wp ----- W ----- WI 10 20 30 40					
0		Ground Surface Soil Materials	[Symbol]	1652.0 0.0													
1		Soil Materials with light grey gravel	[Symbol]	1651.1 0.9													
2		Loose, dry, dark brown, coarse-grained GRAVEL AND COBBLES, unconsolidated (TILL)	[Symbol]	1650.2 1.8													
3			[Symbol]														
4	Becker Hammer Beck Drilling and Environmental Services Ltd.		[Symbol]														
5			[Symbol]														
6		Loose to dense, wet, dark brown, non-plastic CLAY, large gravel grain-size (TILL)	[Symbol]	1646.5 5.5													
7		Soft, dry, light to medium, brown, weakly plastic, MUDSTONE	[Symbol]	1645.6 6.4													
8		Hard, dry, black, very fine-grained SHALE, no fractures or planes	[Symbol]	1644.7 7.3													
8		End of BOREHOLE.	[Symbol]	1643.8 8.2													
9			[Symbol]														
10			[Symbol]														

BOREHOLE 09-1349-1007-3102_LOGS.GPJ CALGARY.GDT 1/11/16

DEPTH SCALE
1 : 50



LOGGED: TC
CHECKED: JW

FINAL



Client
Teck Coal Ltd.

Borehole No. : FR_BH_NTPNE

Location
Fording River Operations, Elkford, BC

PAGE 2 OF 3

Drilling Contractor Owen's Drilling
 Drilling Method Dual Rotary
 Borehole Dia. (m) 0.15
 Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2018 09 24
 Ground Surface Elev. (m) 1644.168
 Top of Casing Elev. (m) 1645.168
 Northing: 651102.616 Easting: 5562261.871

Project Number: 656139
 Borehole Logged By: BH
 Date Drilled: 2018 09 24
 Log Typed By: VL

Depth in Metres	Soil Description	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Soil Vapour (ppm)				Well Name 1: FR_MW_NTPNE	
							10 ¹	10 ²	10 ³	10 ⁴		
10	SAND and GRAVEL, medium to coarse grained sand, fine subangular gravel (up to 6 mm), well graded, brown, medium dense, dry. <i>(continued)</i>											
11	SAND, fine to coarse grained, some silt, well graded, dark brown to black, loose, dry.											
12	At 12.0 m - moist											
13	SILT, some sand to sandy (fine to medium grained), dark brown to black, soft, non-plastic, moist. SAND and GRAVEL, fine to coarse grained sand, fine gravel, some silt, well graded, dark brown, medium dense, dry.											
14												
15	Between 15.3 m and 15.6 m - moist											
16												
17	At 16.8 m - wet											
18												
19	SAND, fine to medium grained, some subangular gravel (up to 10 mm), some silt to silty, poorly graded, dark brown, medium dense, moist.											
20	BEDROCK, siltstone, dark grey, fresh, weak.											

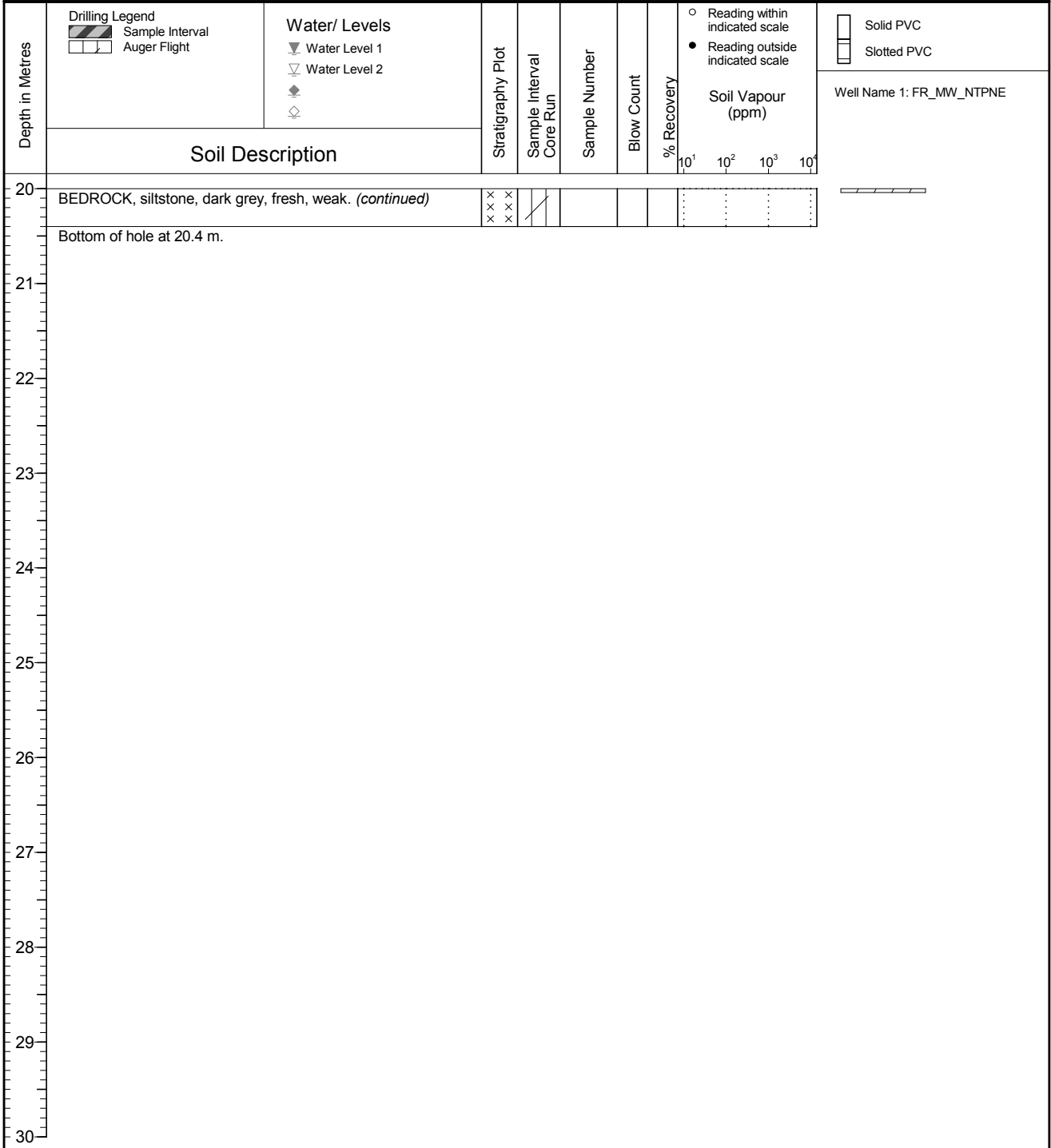
NOTES

QA/QC: BH 2018 12 04 Print Date: 2018-12-19

FINAL

	Client Teck Coal Ltd.	Borehole No. : FR_BH_NTPNE
	Location Fording River Operations, Elkford, BC	PAGE 3 OF 3

Drilling Contractor: Owen's Drilling Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): 0.05/0.05	Date Monitored: 2018 09 24 Ground Surface Elev. (m): 1644.168 Top of Casing Elev. (m): 1645.168 Northing: 651102.616 Easting: 5562261.871	Project Number: 656139 Borehole Logged By: BH Date Drilled: 2018 09 24 Log Typed By: VL
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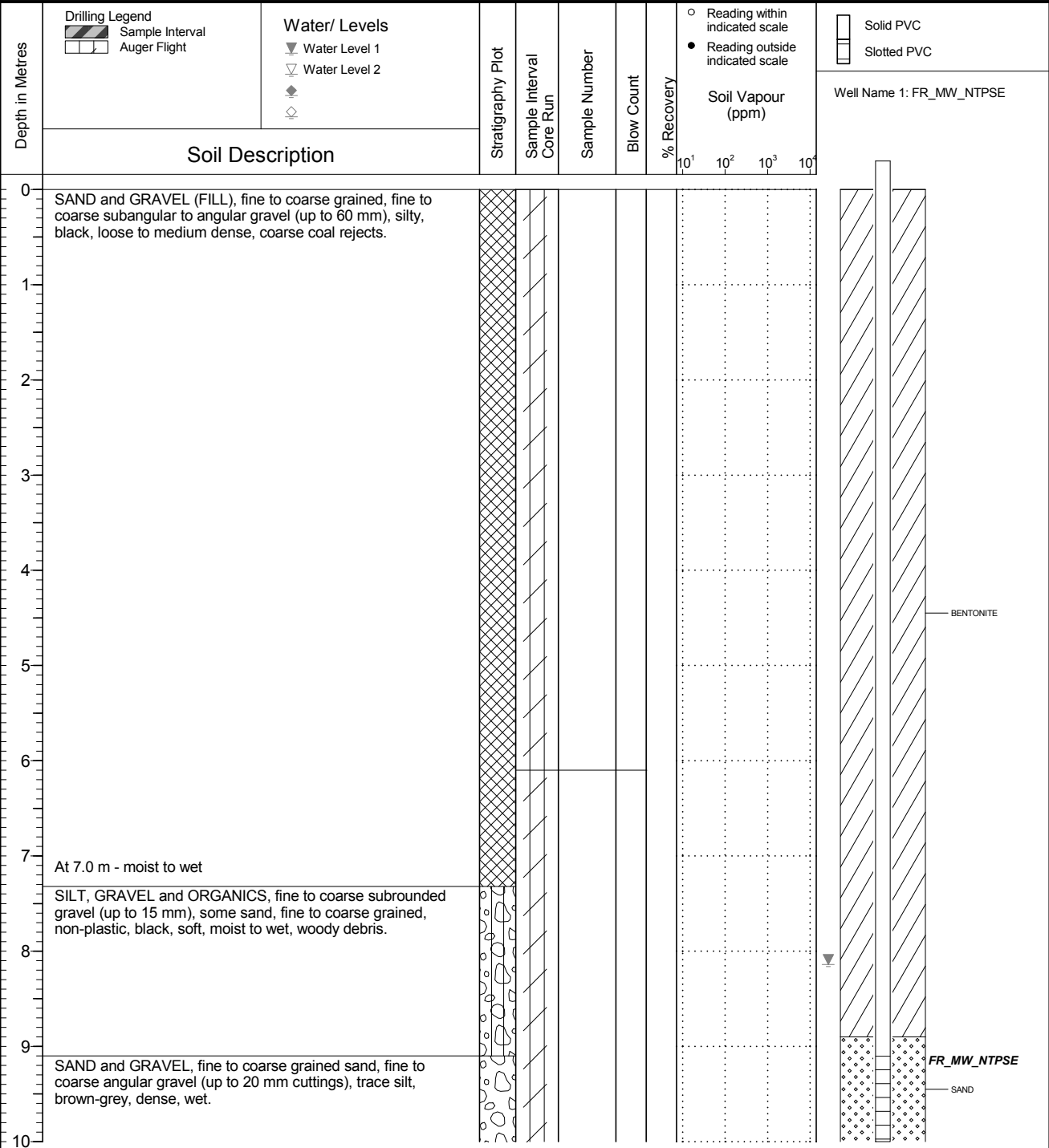


NOTES

FINAL

SNC • LAVALIN	Client Teck Coal Ltd.	Borehole No. : FR_BH_NTPSE
	Location Fording River Operations, Elkford, BC	PAGE 1 OF 2

Drilling Contractor: Owen's Drilling Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): none/none	Date Monitored: 2018 09 24 Ground Surface Elev. (m): 1635.398 Top of Casing Elev. (m): 1636.398 Northing: 650855.432 Easting: 5561252.280	Project Number: 656139 Borehole Logged By: BH Date Drilled: 2018 09 26 Log Typed By: VL
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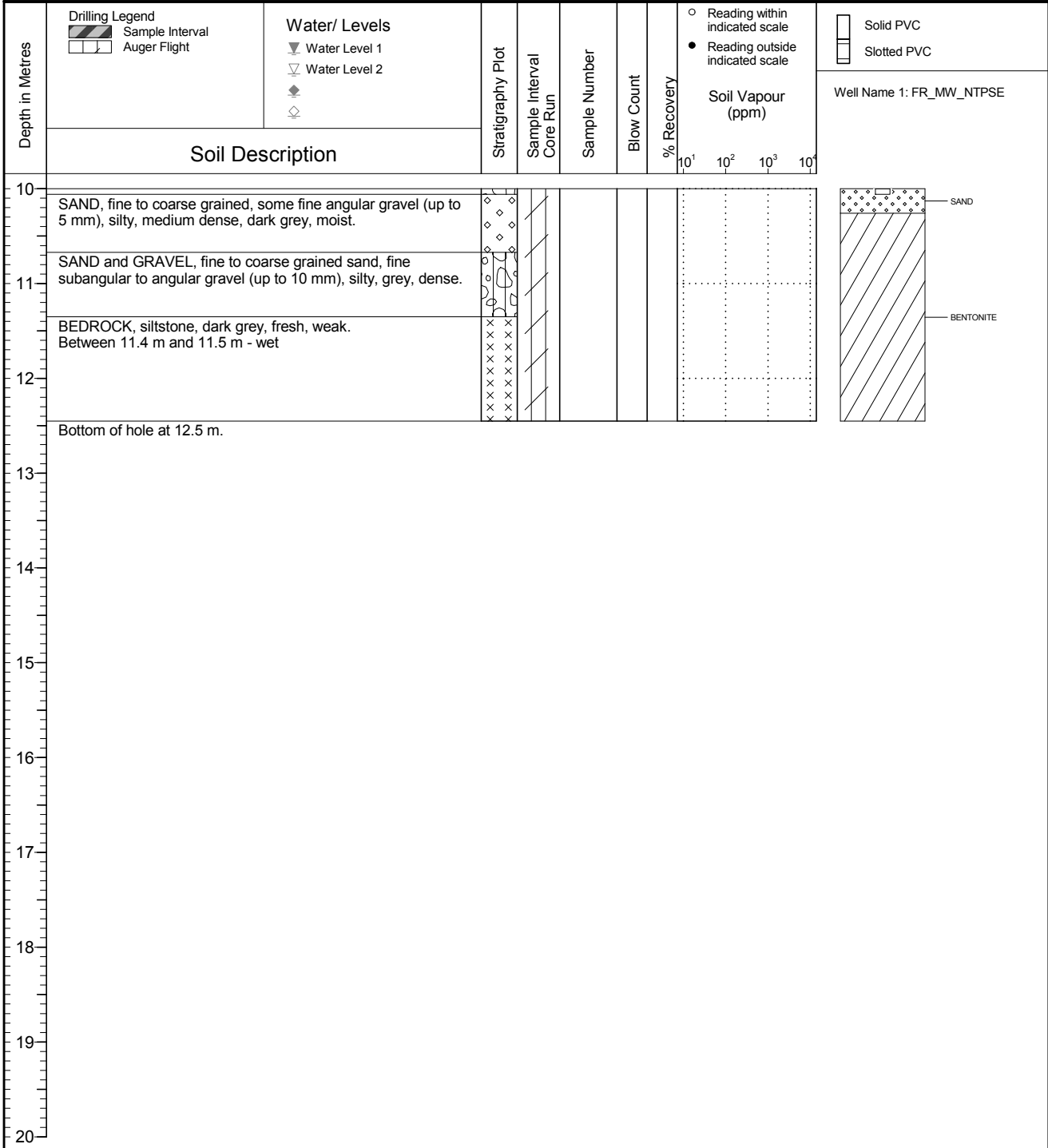
NOTES

QA/QC: BH 2018 12 04 Print Date: 2018-12-19

FINAL

	Client Teck Coal Ltd.	Borehole No. : FR_BH_NTPSE
	Location Fording River Operations, Elkford, BC	PAGE 2 OF 2

Drilling Contractor: Owen's Drilling Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): none/none	Date Monitored: 2018 09 24 Ground Surface Elev. (m): 1635.398 Top of Casing Elev. (m): 1636.398 Northing: 650855.432 Easting: 5561252.280	Project Number: 656139 Borehole Logged By: BH Date Drilled: 2018 09 26 Log Typed By: VL
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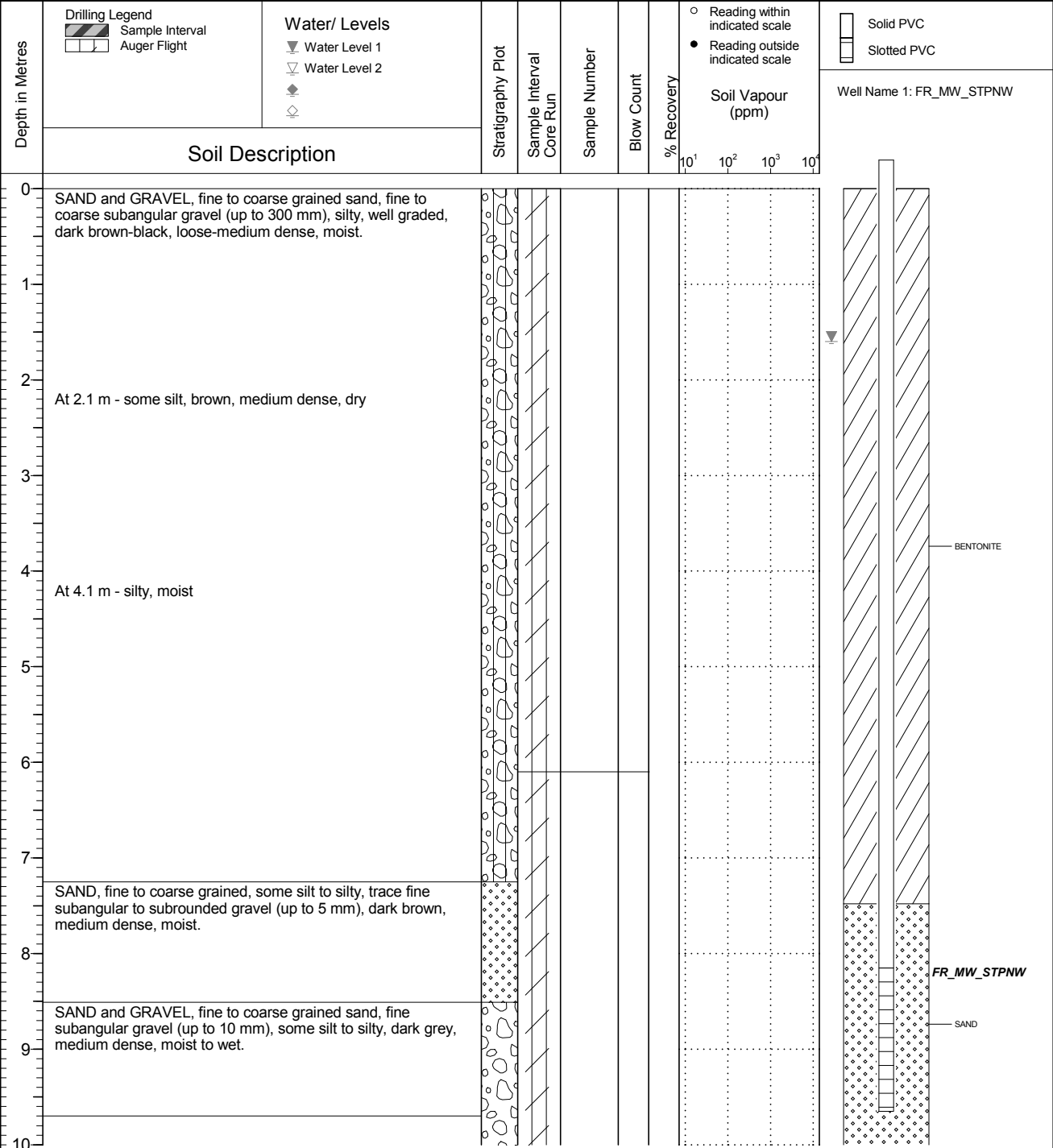


NOTES

FINAL

SNC • LAVALIN	Client Teck Coal Ltd.	Borehole No. : FR_BH_STPNW
	Location Fording River Operations, Elkford, BC	PAGE 1 OF 2

Drilling Contractor: Owen's Drilling Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): 0.05/0.05	Date Monitored: 2018 09 24 Ground Surface Elev. (m): 1621.603 Top of Casing Elev. (m): 1622.603 Northing: 651067.844 Easting: 5560687.270	Project Number: 656139 Borehole Logged By: BH Date Drilled: 2018 09 26 Log Typed By: VL
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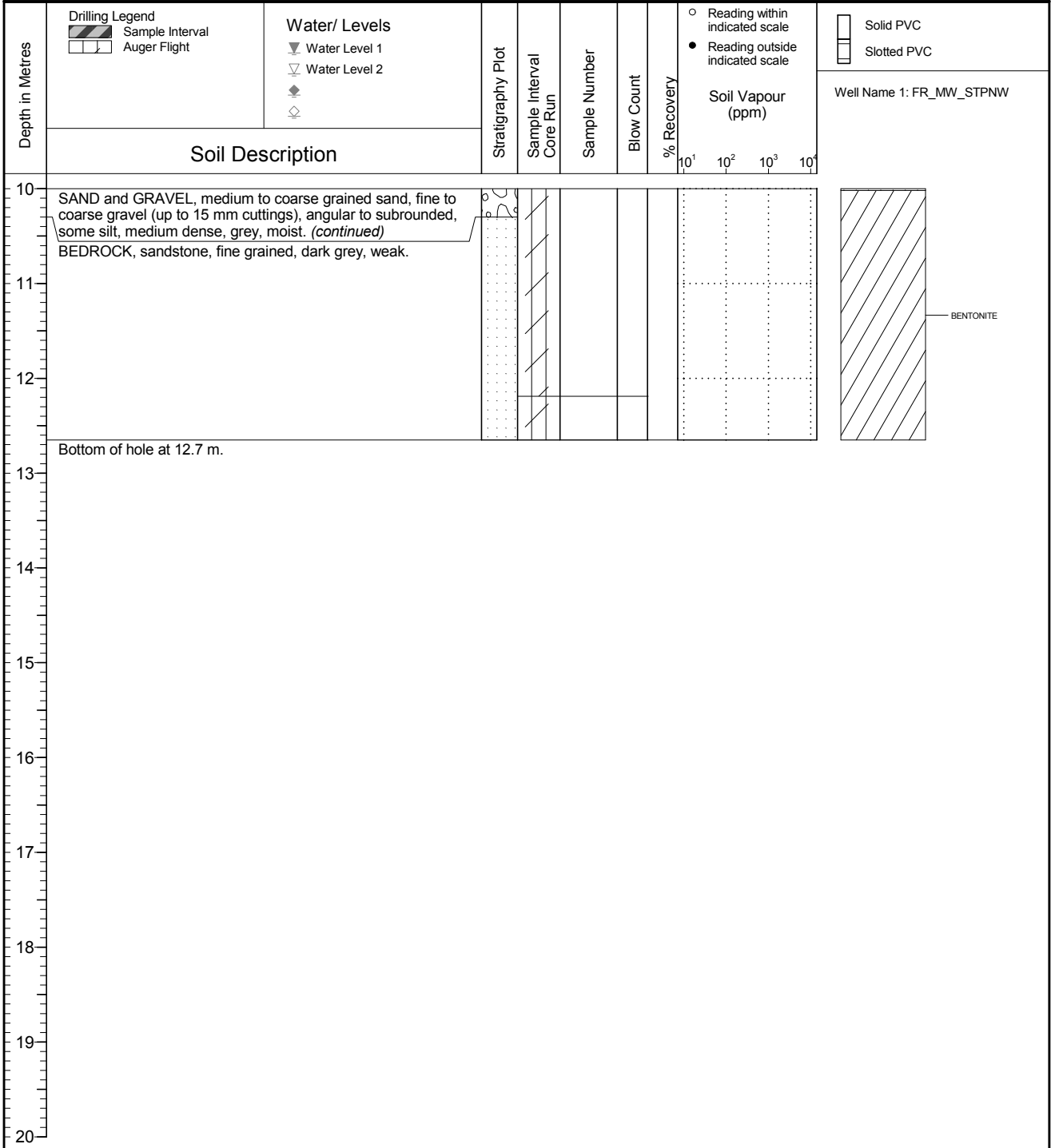


NOTES

FINAL

SNC • LAVALIN	Client Teck Coal Ltd.	Borehole No. : FR_BH_STPNW
	Location Fording River Operations, Elkford, BC	PAGE 2 OF 2

Drilling Contractor: Owen's Drilling Drilling Method: Dual Rotary Borehole Dia. (m): 0.15 Pipe/Slotted Pipe Dia. (m): 0.05/0.05	Date Monitored: 2018 09 24 Ground Surface Elev. (m): 1621.603 Top of Casing Elev. (m): 1622.603 Northing: 651067.844 Easting: 5560687.270	Project Number: 656139 Borehole Logged By: BH Date Drilled: 2018 09 26 Log Typed By: VL
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NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH-STPSW

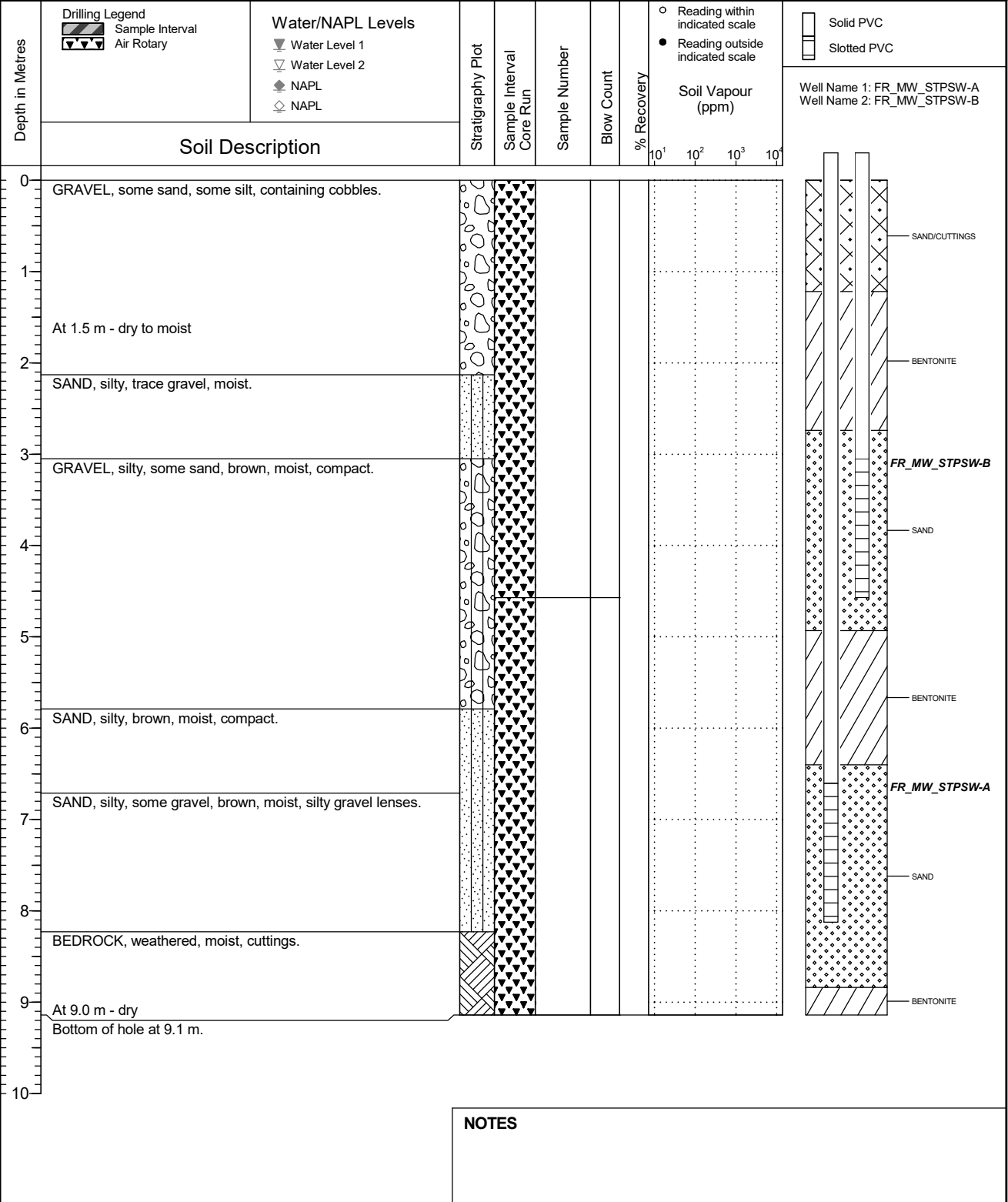
Location
Fording River Operations

PAGE 1 OF 1

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) none/none

Date Monitored n/a
Ground Surface Elev. (m) n/a
Top of Casing Elev. (m) 1607.153 1607.162
Northing: 5559983.144 Easting: 651805.551

Project Number: 664810
Borehole Logged By: SC
Date Drilled: 2019 09 09
Log Typed By: VL



QA/QC: SC 2019 07 26 Print Date: 2020-03-26

NOTES

DATA ENTRY: KJM

PROJECT No.: 09-1324-1039

RECORD OF MONITORING WELL: 09-04A

SHEET 1 OF 1

LOCATION: South Tailings Pond - West (non-channel)

BORING DATE: October 16, 2009

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20 40 60 80 nat V. + Q - ● rem V. ⊕ U - ○				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³ Wp ——— W ——— WI 10 20 30 40					
0	Barber Rig - DR-24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.	Ground Surface	1605.0	0.0											Stickup = 0.91 m		
2		Silty SAND, some gravel, medium grain sand, loose, slightly moist, dark brown	1603.5	1.5											Bentonite Slough Bentonite		
4		Sandy GRAVEL, trace silt, medium gravel, loose, moist, medium brown													Slotted Section		
4		--- Coarse to medium gravel from 2.5 to 3.0 m															
4		--- Very moist from 3.5 to 4.0 m															
6		End of MONITORING WELL.	1600.0	5.0											Slough		

BOREHOLE 09-1324-1039 LOGS.GPJ, CALGARY.GDT 1/11/16

DEPTH SCALE

1 : 100



LOGGED: EA

CHECKED: MB

DATA ENTRY: KJM

PROJECT No.: 09-1324-1039

RECORD OF MONITORING WELL: 09-04B

SHEET 1 OF 1

LOCATION: South Tailings Pond - West (non-channel)

BORING DATE: October 15, 2009

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20 40 60 80 nat V. + Q - ● rem V. ⊕ U - ○				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³ Wp ----- W ----- WI					
0	Barber Rig - DR-24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.	Ground Surface		1605.0											Stickup = 0.64 m Bentonite Slough Bentonite Granular Filter Slotted Section Slough		
		Silty SAND, some gravel, medium grain sand, loose, slightly moist, dark brown		0.0													
2		Sandy GRAVEL, trace silt, medium gravel, loose, moist, medium brown		1603.5	1.5												
		--- Coarse to medium gravel from 2.5 to 3.0 m															
		--- Very moist from 3.5 to 4.0 m															
4																	
			GRAVEL, medium to coarse gravel, loose, saturated, light grey to brown		1599.5	5.5											
6			Sandy GRAVEL, loose, saturated, medium brown		1599.0	6.0											
			BEDROCK, loose, dark grey		1598.5	6.5											
			BEDROCK, loose, dark grey		1598.0	7.0											
8		End of MONITORING WELL.		7.0													
10																	
12																	
14																	
16																	
18																	
20																	

BOREHOLE 09-1324-1039 LOGS.GPJ, CALGARY.GDT 1/11/16

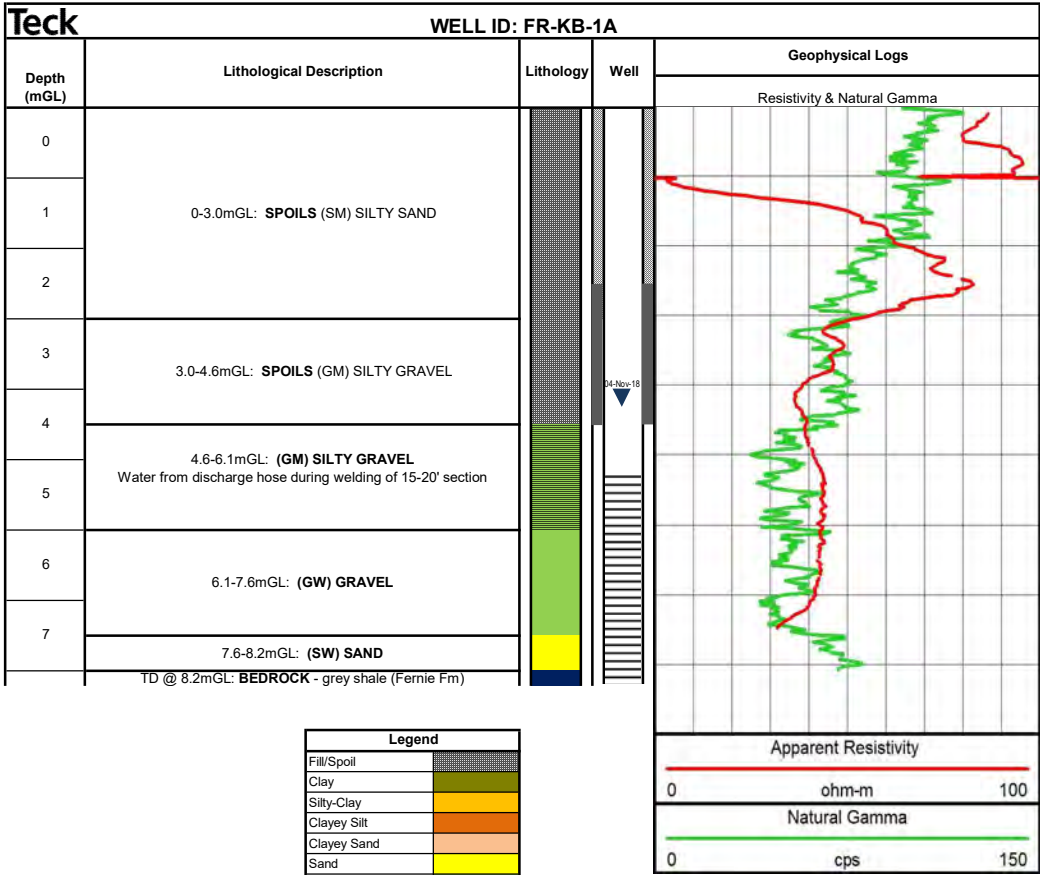
DEPTH SCALE

1 : 100



LOGGED: EA

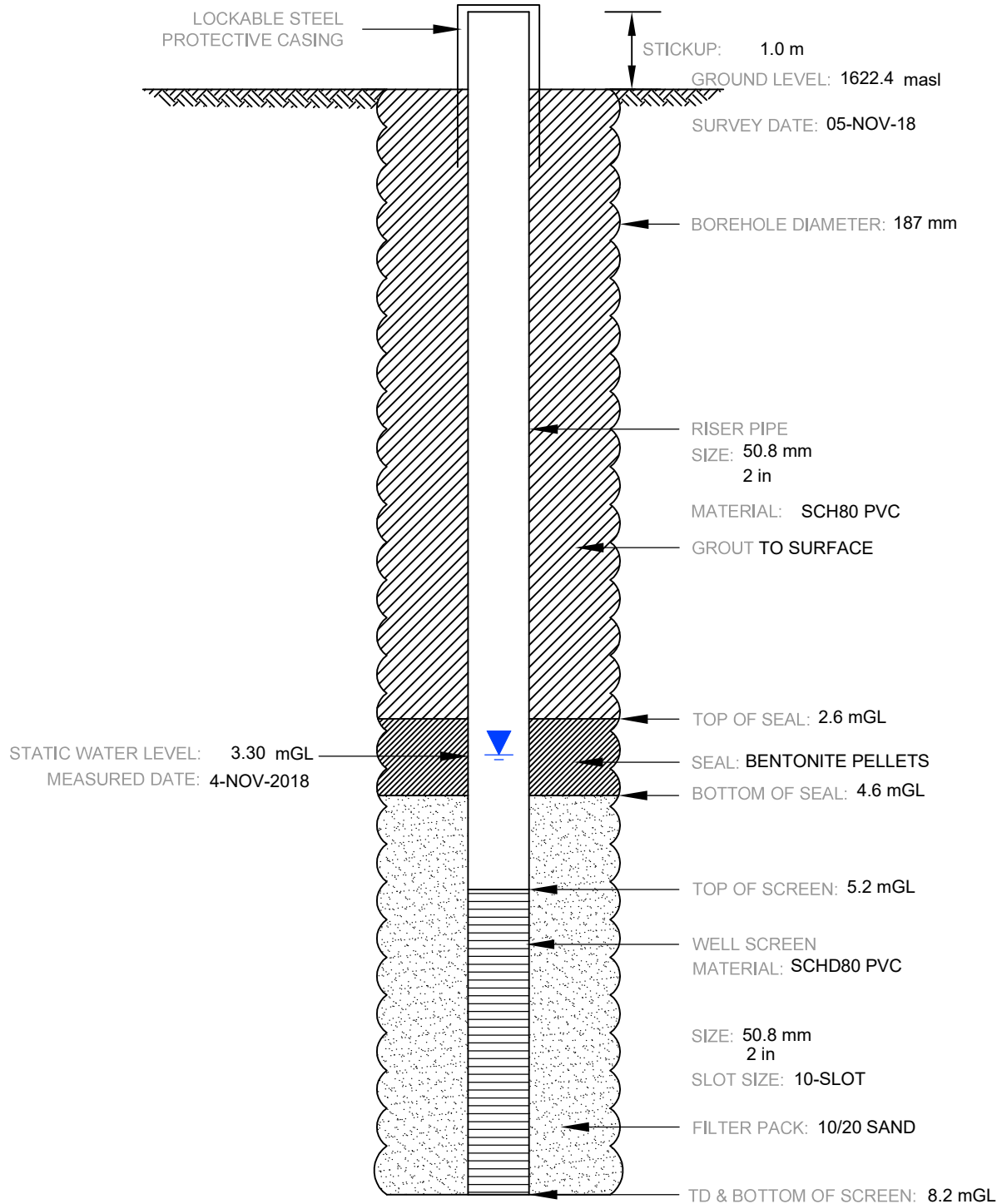
CHECKED: MB



MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>Teck Coal - FORDING RIVER AWTF SOUTH</u>	Spud Date: <u>15-OCT-2018</u>
FR-KB-1A	Well Name: <u>FR-KB-1A</u> (N5559830, E652737)	Project Short Title: <u>AWTF-S</u>
		Project Number: <u>1786270</u>
Drilling Method: Dual Air Rotary	Development: Method: Airlifting	Site Geologist: <u>G. Harding</u>

SCHEMATIC ONLY—NOT TO SCALE



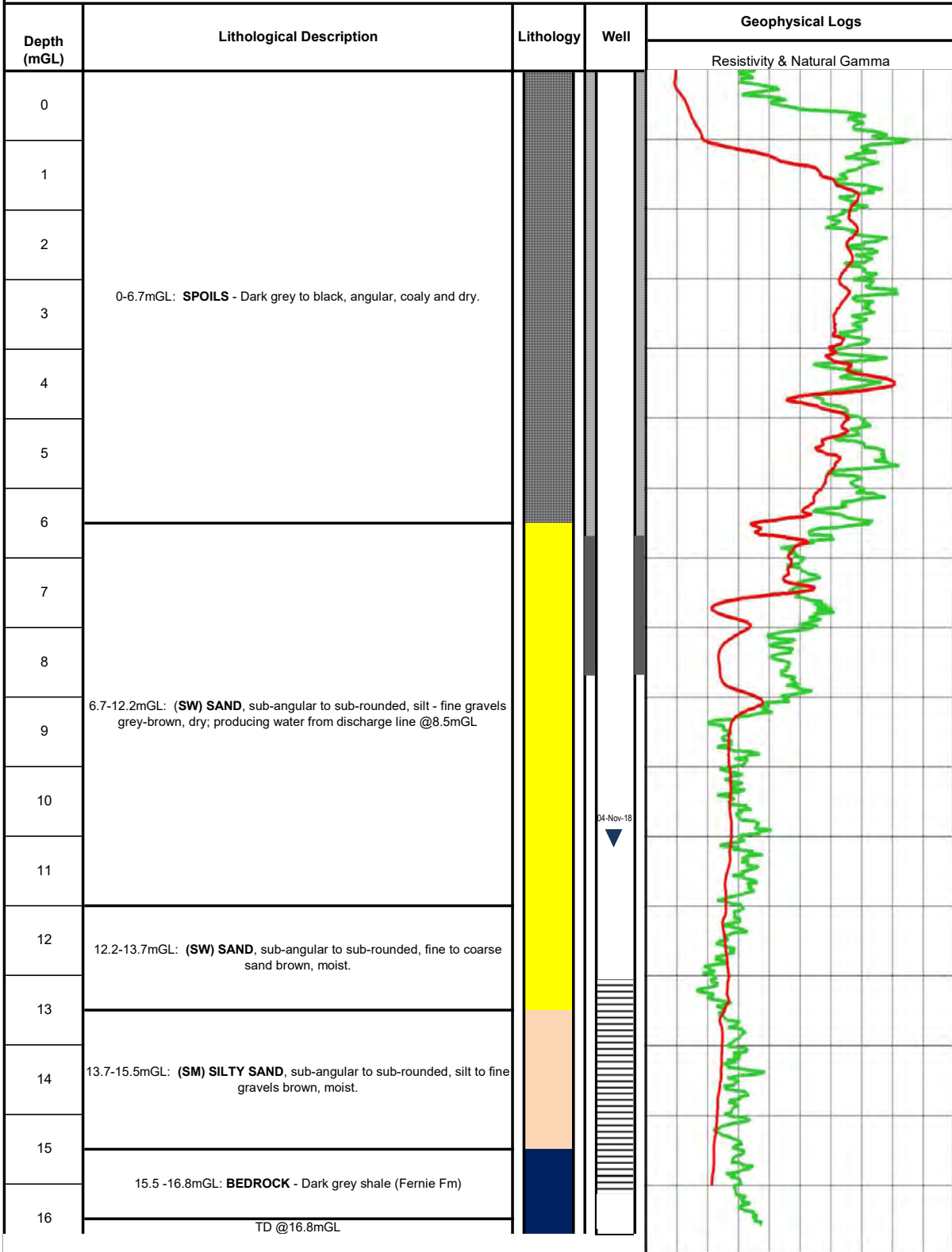
NOTES:

1. masl - metres above sea level
2. mGL - metres below ground level
3. TD - Total Depth

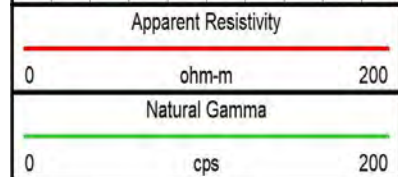
Golder Associates

Teck

WELL ID: FR-KB-2A



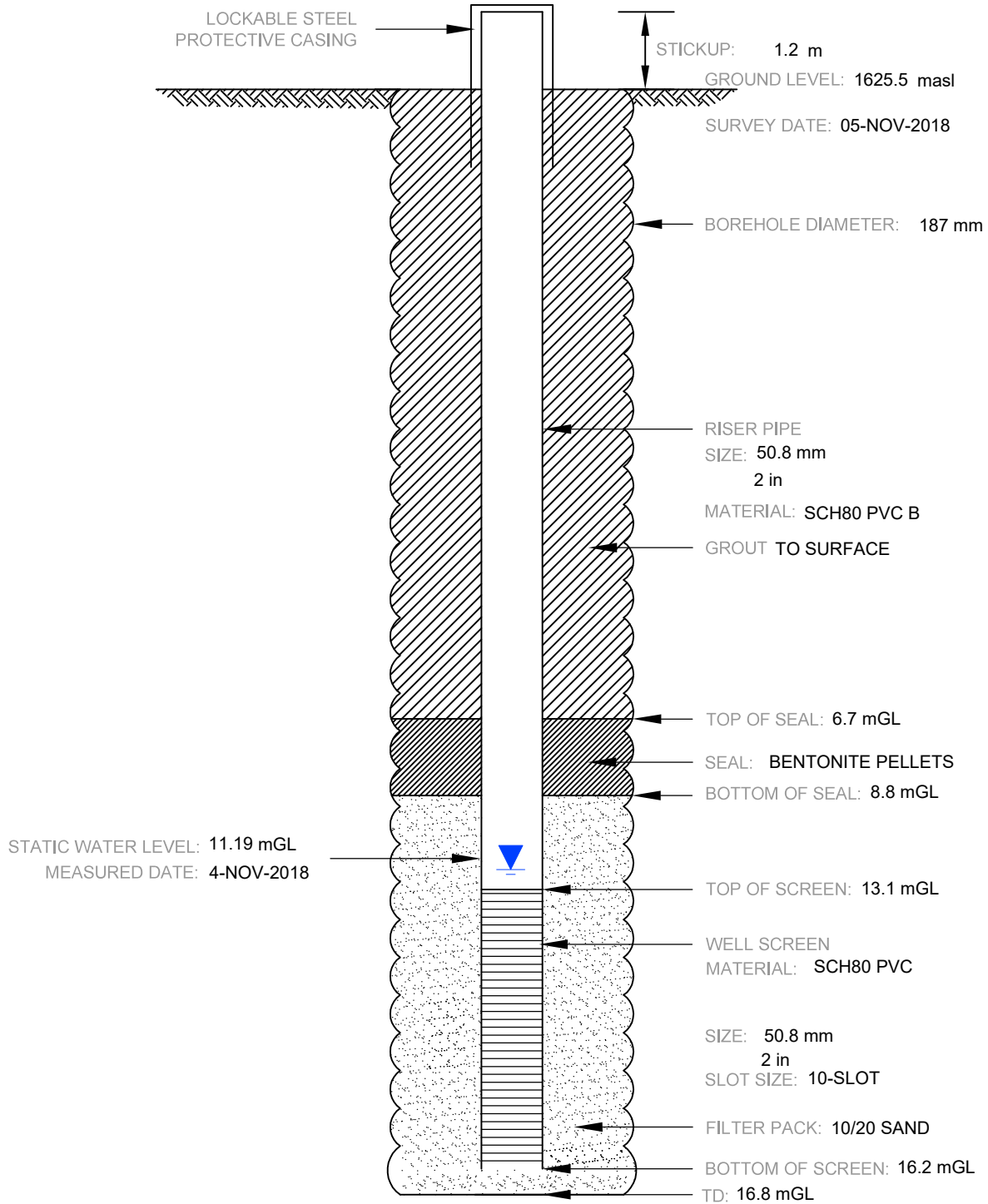
Legend	
Fill/Spoil	
Clay	
Silty-Clay	
Clayey Silt	
Silty Sand	
Sand	
Silty Gravel	
Sand & Gravel	
Gravel	
Bedrock	



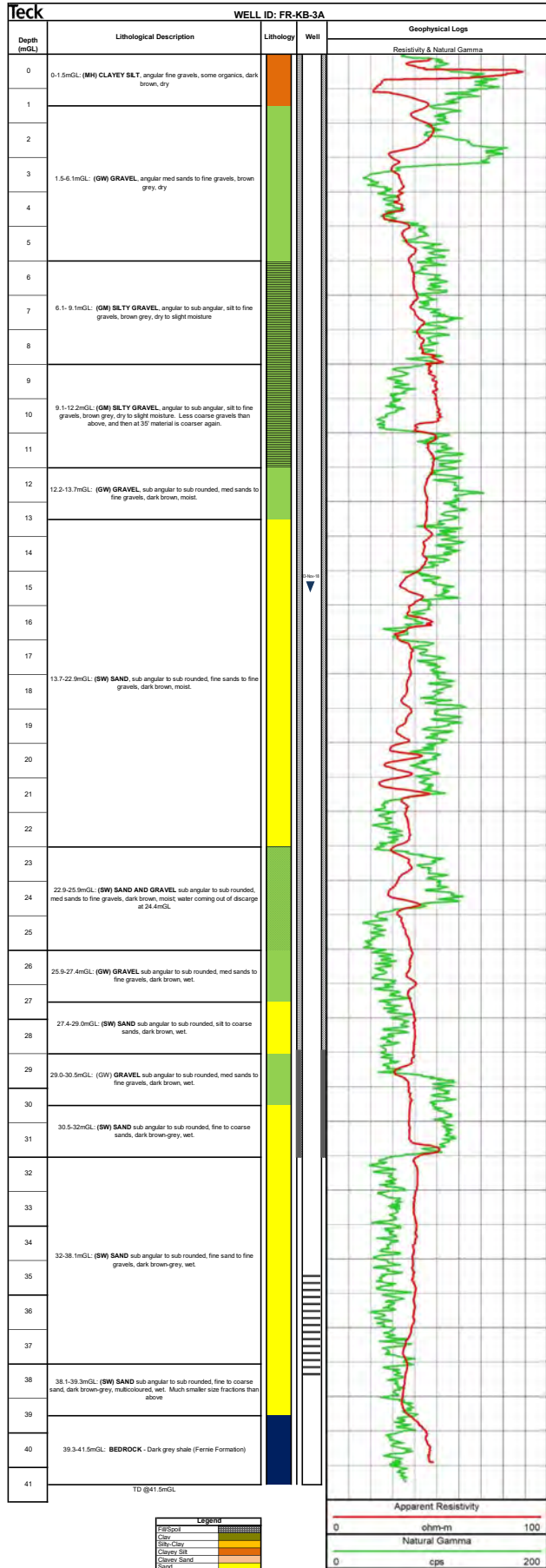
MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>TECK COAL - FORDING RIVER AWTF SOUTH</u>	Spud Date: <u>14-OCT-2018</u>
FR-KB-2A	Well Name: <u>FR-KB-2A</u>	Project Short Title: <u>AWTF-S</u>
		Project Number: <u>1786270</u>
Drilling Method: Dual Air Rotary	Development: Method: Airlifting	Site Geologist: <u>G. Harding</u>

SCHEMATIC ONLY—NOT TO SCALE



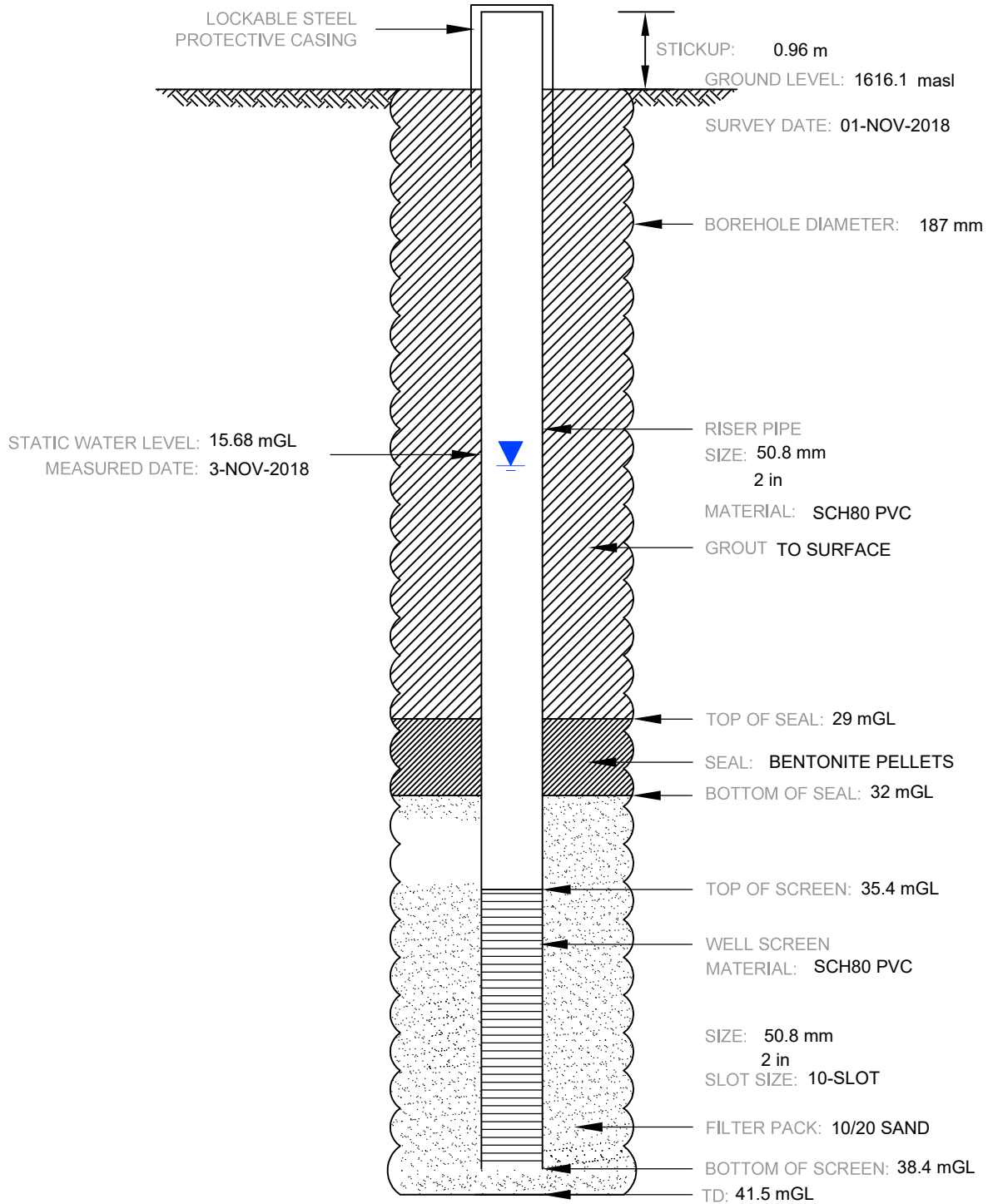
- NOTES:
1. masl - metres above sea level
 2. mGL - metres below ground level
 3. TD - Total Depth



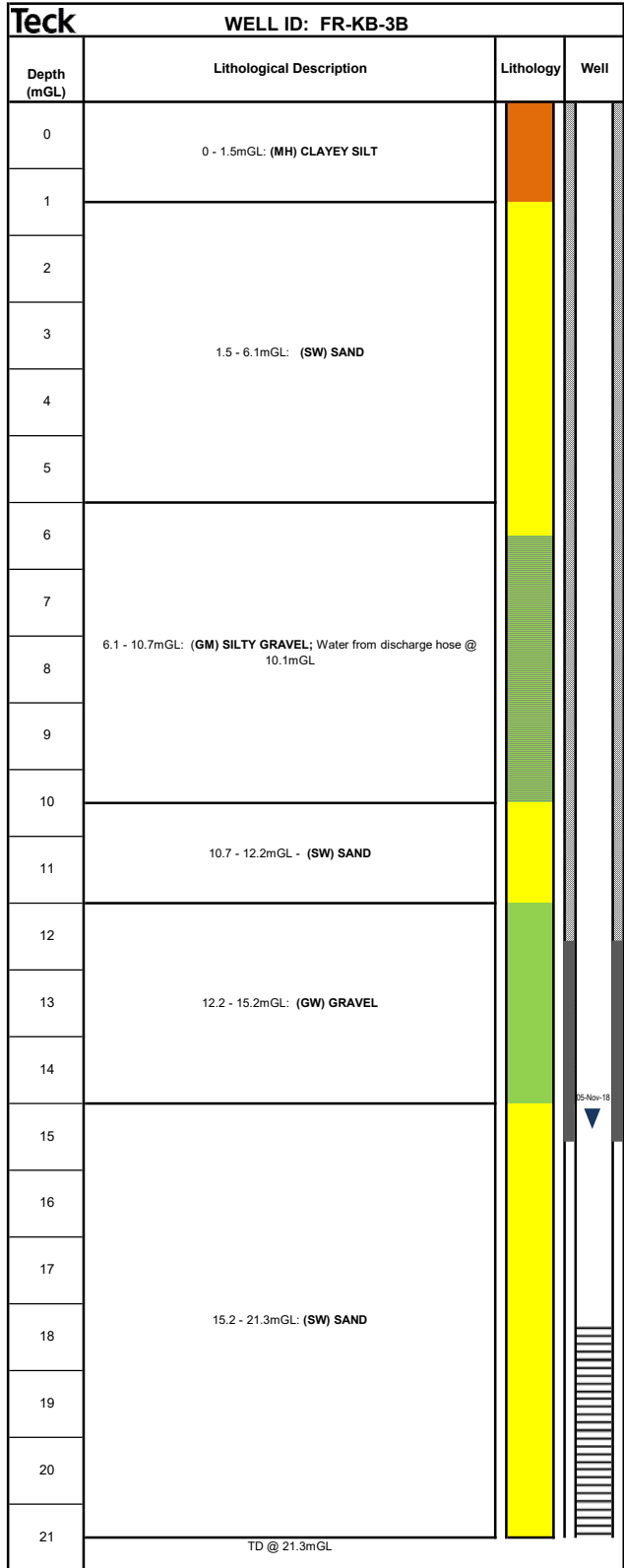
MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>TECK COAL - FORDING RIVER AWTF SOUTH</u>	Spud Date: <u>09-OCT-2018</u>
FR-KB-3A	Well Name: <u>FR-KB-3A</u>	Project Short Title: <u>AWTF-S</u>
		Project Number: <u>1786270</u>
Drilling Method: Dual Air Rotary	Development: Method: Airlifting	Site Geologist: <u>G. Harding</u>

SCHEMATIC ONLY—NOT TO SCALE



- NOTES:
1. masl - metres above sea level
 2. mGL - metres below ground level
 3. TD - Total Depth

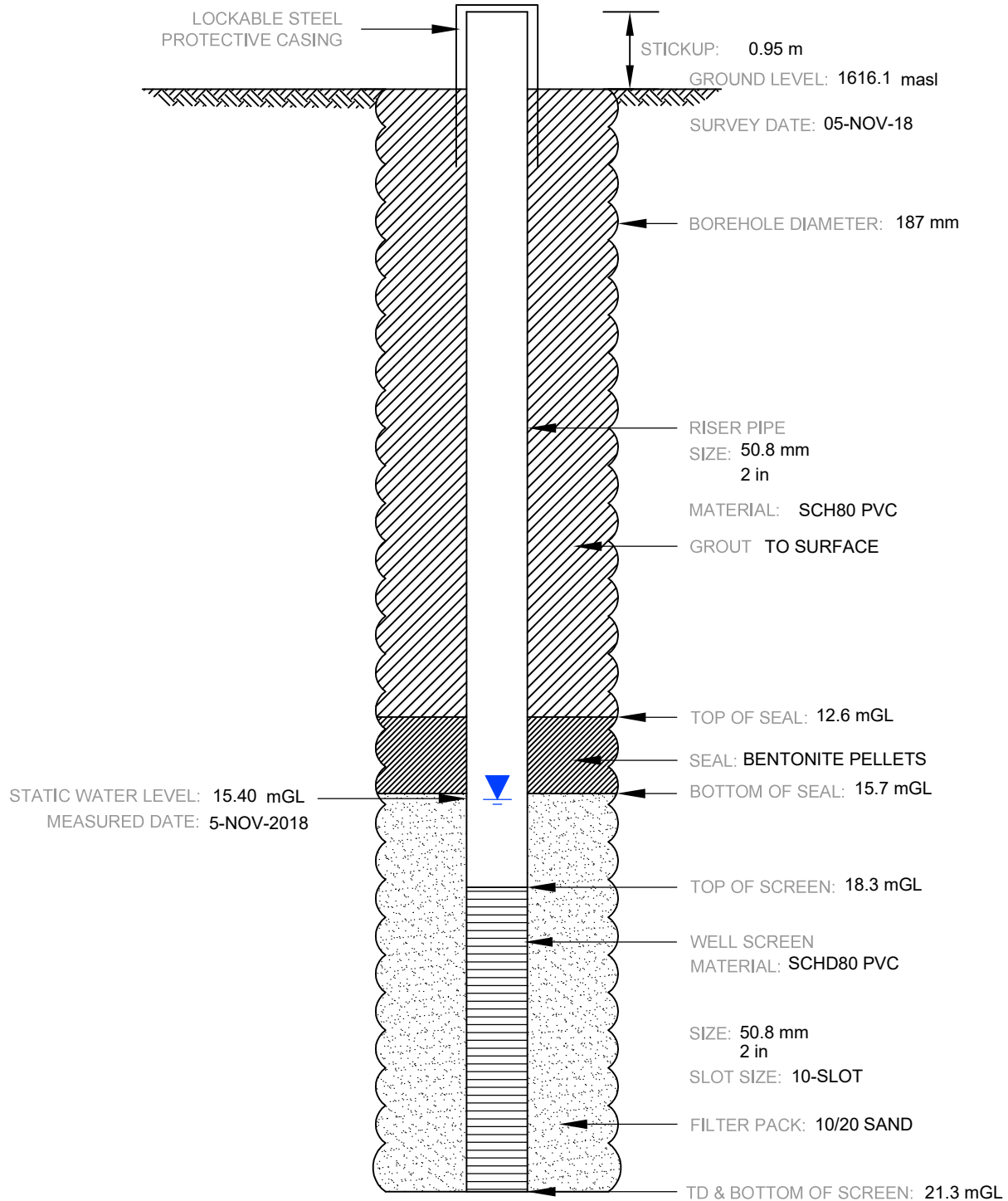


Legend	
Fill/Spoil	[Hatched]
Clay	[Dark Olive]
Silty-Clay	[Orange]
Clayey Silt	[Light Orange]
Clayey Sand	[Light Yellow]
Sand	[Yellow]
Silty Gravel	[Green]
Sand & Gravel	[Light Green]
Gravel	[Light Green]
Bedrock	[Dark Blue]

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>TECK COAL - FORDING RIVER AWTF SOUTH</u>	Spud Date: <u>11-OCT-2018</u>
FR-KB-3B	Well Name: <u>FR-KB-3B</u>	Project Short Title: <u>AWTF-S</u>
		Project Number: <u>1786270</u>
Drilling Method: Dual Air Rotary	Development: Method: Airlifting	Site Geologist: <u>G. Harding</u>

SCHEMATIC ONLY—NOT TO SCALE



- NOTES:
1. masl - metres above sea level
 2. mGL - metres below ground level
 3. TD - Total Depth



Client
Teck Coal Limited

Borehole No. : FR_BH-SK1A

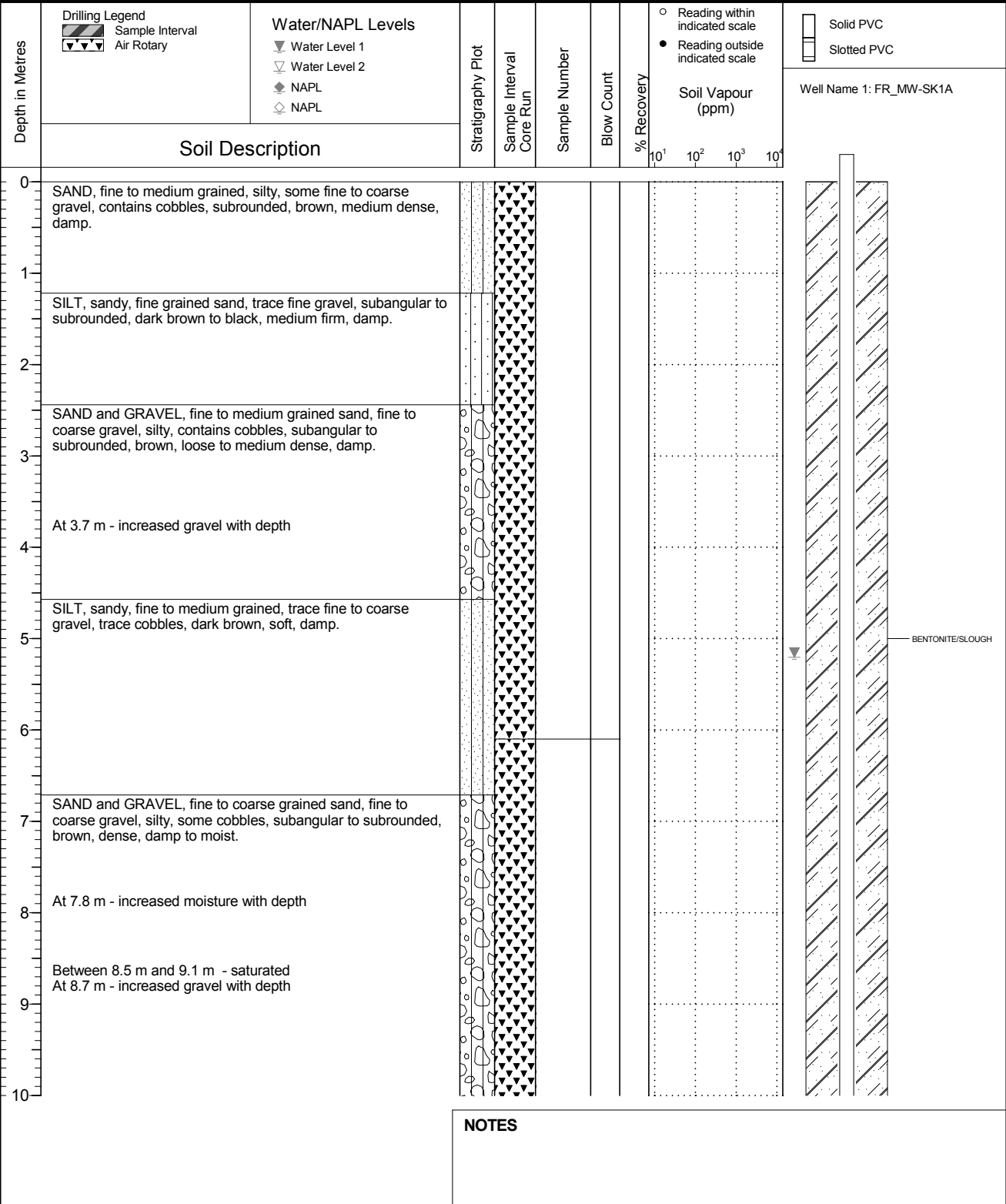
Location
Regional Groundwater Monitoring

PAGE 1 OF 2

Drilling Contractor: JR Drilling
 Drilling Method: Dual Rotary
 Borehole Dia. (m): 0.15
 Pipe/Slotted Pipe Dia. (m): 0.05/0.05

Date Monitored: 2019 03 28
 Ground Surface Elev. (m): 1586.479
 Top of Casing Elev. (m): 1587.429
 Northing: 5558635.101
 Easting: 652680.685

Project Number: 631283
 Borehole Logged By: MCA
 Date Drilled: 2018 12 21
 Log Typed By: VL





Client
Teck Coal Limited

Borehole No. : FR_BH-SK1A

Location
Regional Groundwater Monitoring

PAGE 2 OF 2

Drilling Contractor JR Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 28
Ground Surface Elev. (m) 1586.479
Top of Casing Elev. (m) 1587.429
Northing: 5558635.101 Easting: 652680.685

Project Number: 631283
Borehole Logged By: MCA
Date Drilled: 2018 12 21
Log Typed By: VL

Depth in Metres	Soil Description	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Soil Vapour (ppm)	Drilling Legend		Water/NAPL Levels		Well Name 1: FR_MW-SK1A
								Sample Interval	Air Rotary	Water Level 1	Water Level 2	
10	SAND and GRAVEL, fine to coarse grained sand, fine to coarse gravel, silty, some cobbles, subangular to subrounded, brown, dense, damp to moist. (continued) At 10.7 m - saturated											
11												
12												
13	SAND and GRAVEL, fine to coarse grained sand, fine to coarse gravel, some silt, subangular to subrounded, brown, medium dense to loose, saturated. At 12.3 m - decreased silt with depth											
14												
15	At 14.9 m - trace silt, loose, saturated											
16												
17	Bottom of hole at 16.8 m.											
18												
19												
20												

NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH-SK1B

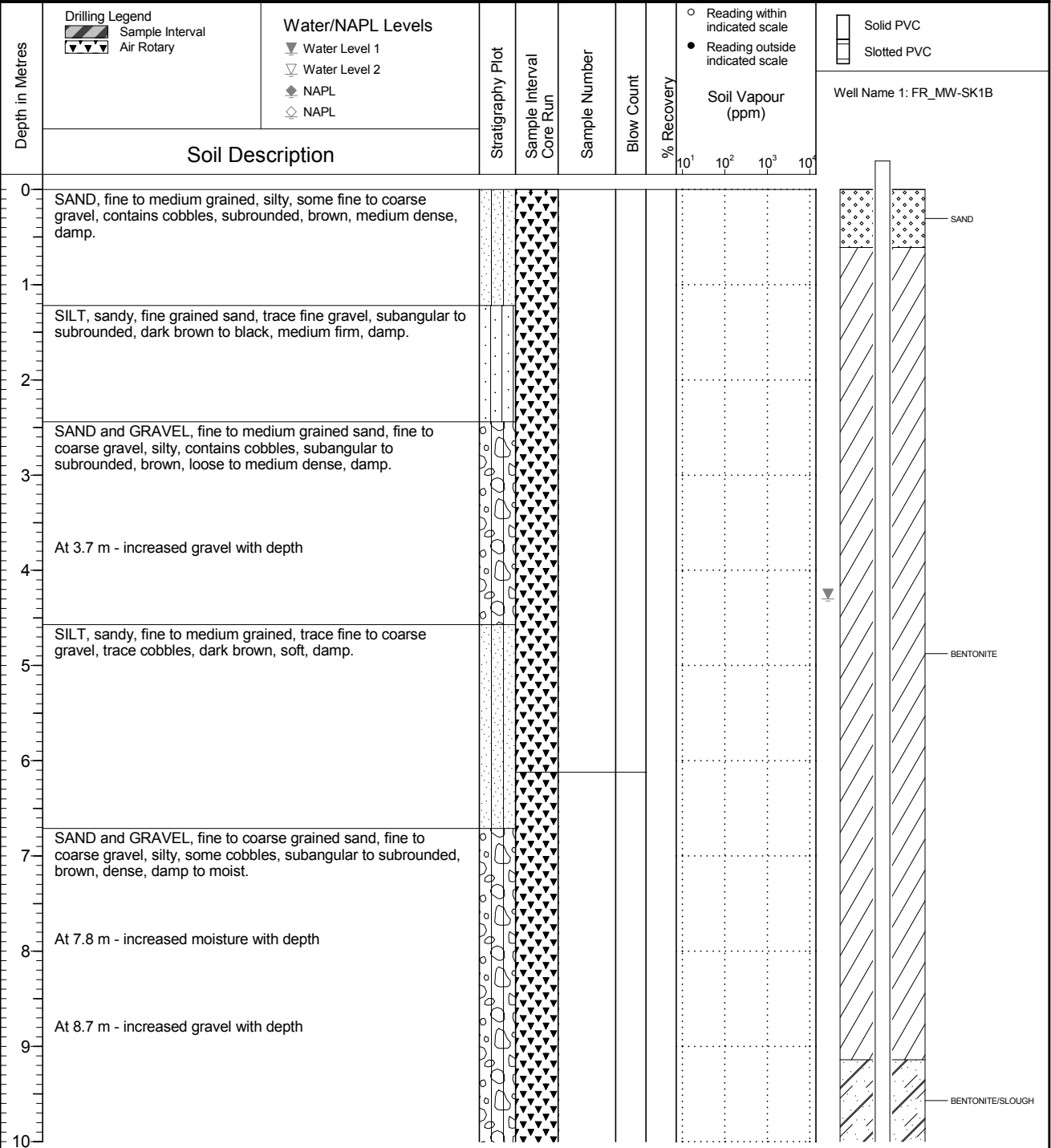
Location
Regional Groundwater Monitoring

PAGE 1 OF 7

Drilling Contractor: JR Drilling
 Drilling Method: Dual Rotary
 Borehole Dia. (m): 0.15
 Pipe/Slotted Pipe Dia. (m): 0.05/0.05

Date Monitored: 2019 03 28
 Ground Surface Elev. (m): 1586.478
 Top of Casing Elev. (m): 1587.540
 Northing: 5558637.329
 Easting: 652680.728

Project Number: 631283
 Borehole Logged By: MCA
 Date Drilled: 2018 12 18
 Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH-SK1B

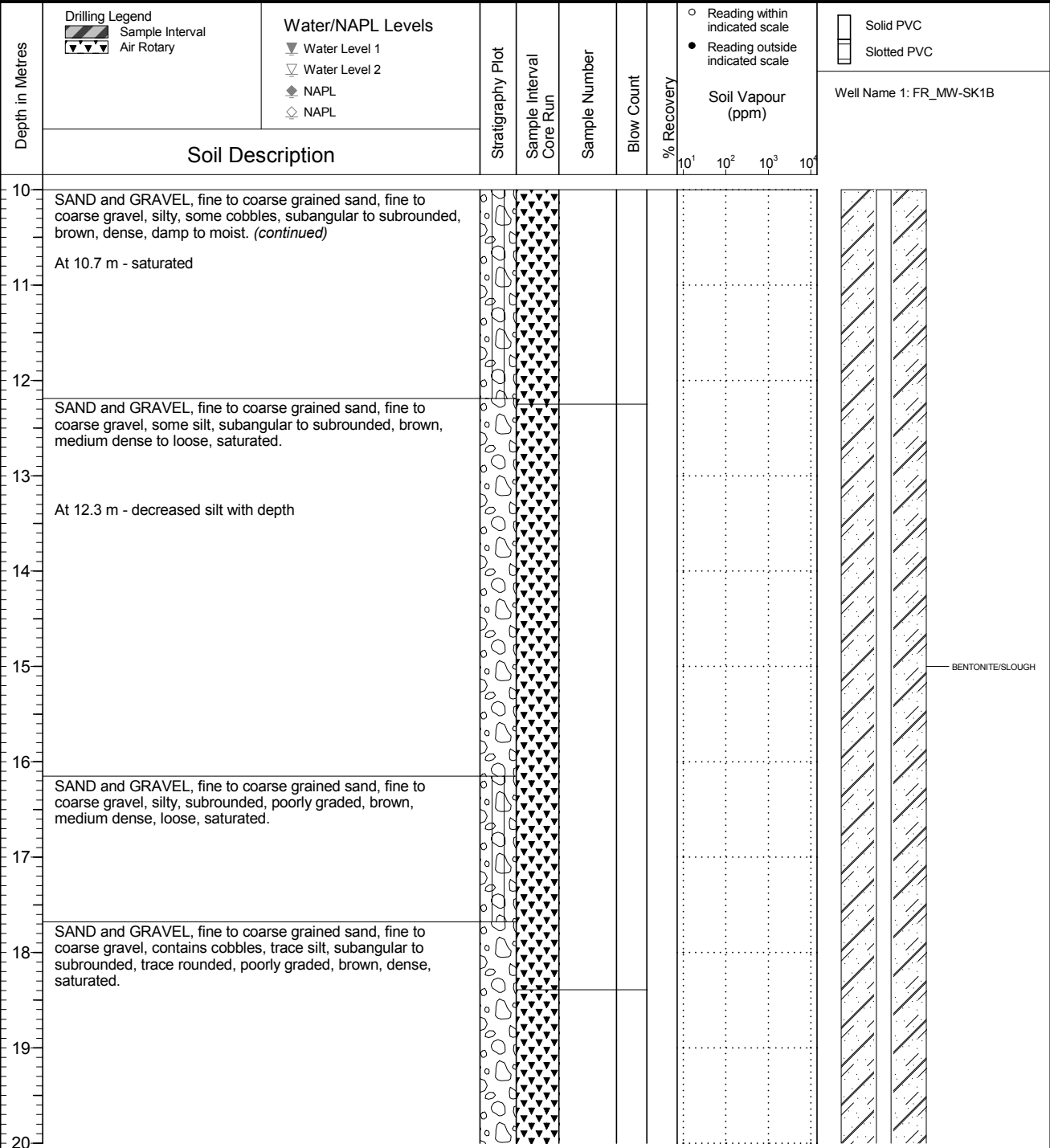
Location
Regional Groundwater Monitoring

PAGE 2 OF 7

Drilling Contractor JR Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 28
Ground Surface Elev. (m) 1586.478
Top of Casing Elev. (m) 1587.540
Northing: 5558637.329 Easting: 652680.728

Project Number: 631283
Borehole Logged By: MCA
Date Drilled: 2018 12 18
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH-SK1B

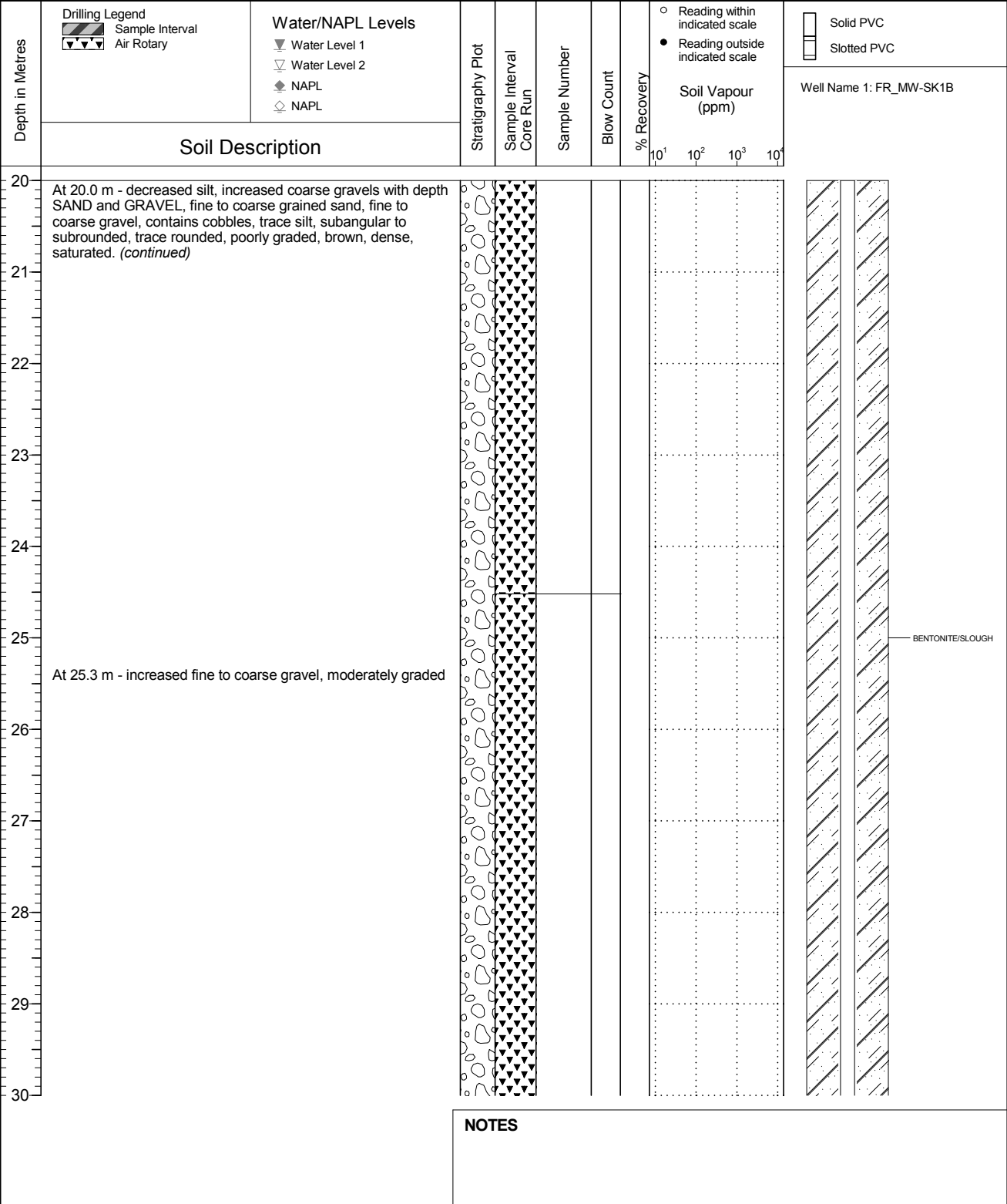
Location
Regional Groundwater Monitoring

PAGE 3 OF 7

Drilling Contractor JR Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 28
Ground Surface Elev. (m) 1586.478
Top of Casing Elev. (m) 1587.540
Northing: 5558637.329 Easting: 652680.728

Project Number: 631283
Borehole Logged By: MCA
Date Drilled: 2018 12 18
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH-SK1B

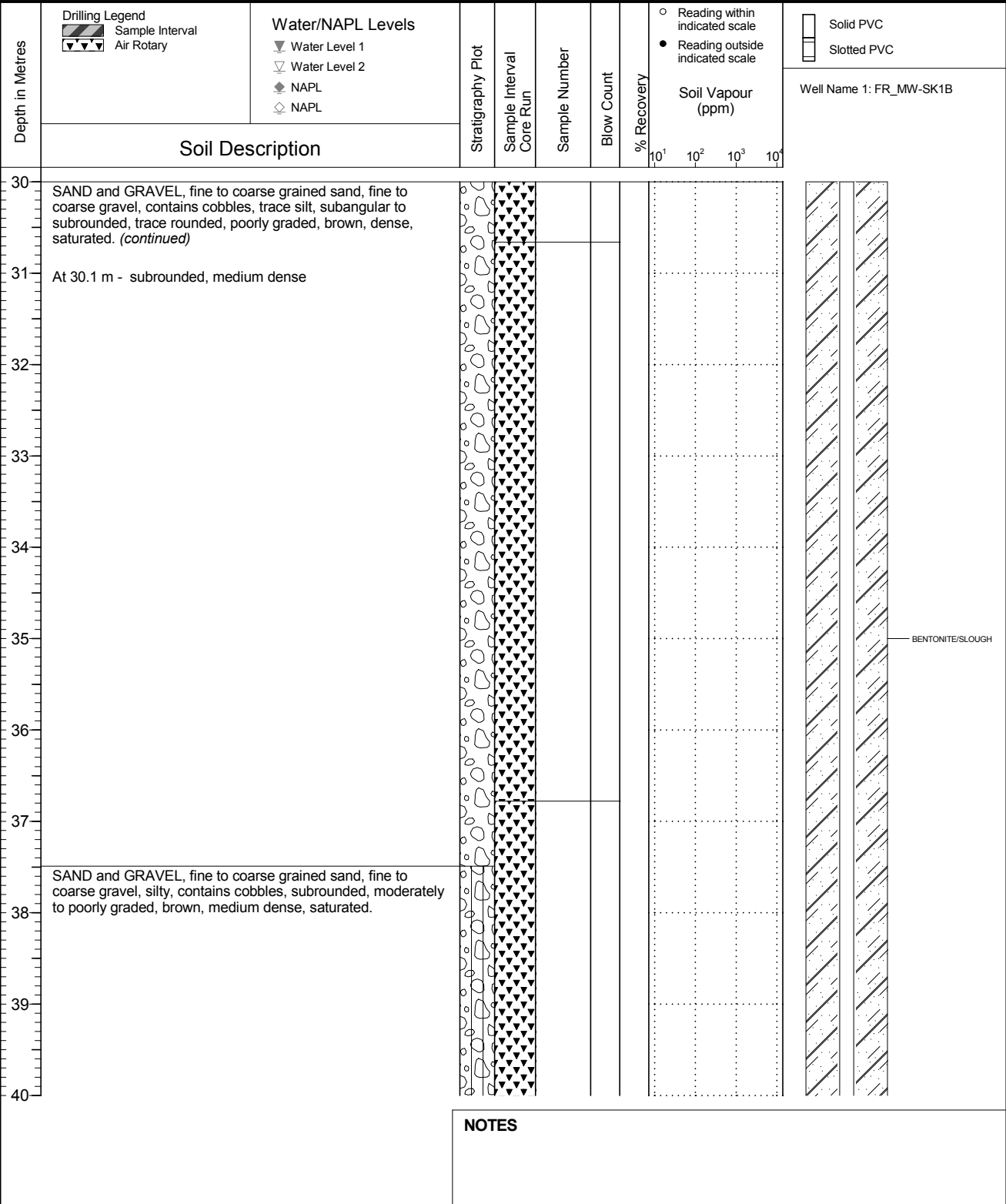
Location
Regional Groundwater Monitoring

PAGE 4 OF 7

Drilling Contractor JR Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 28
Ground Surface Elev. (m) 1586.478
Top of Casing Elev. (m) 1587.540
Northing: 5558637.329 Easting: 652680.728

Project Number: 631283
Borehole Logged By: MCA
Date Drilled: 2018 12 18
Log Typed By: VL





Client
Teck Coal Limited

Borehole No. : FR_BH-SK1B

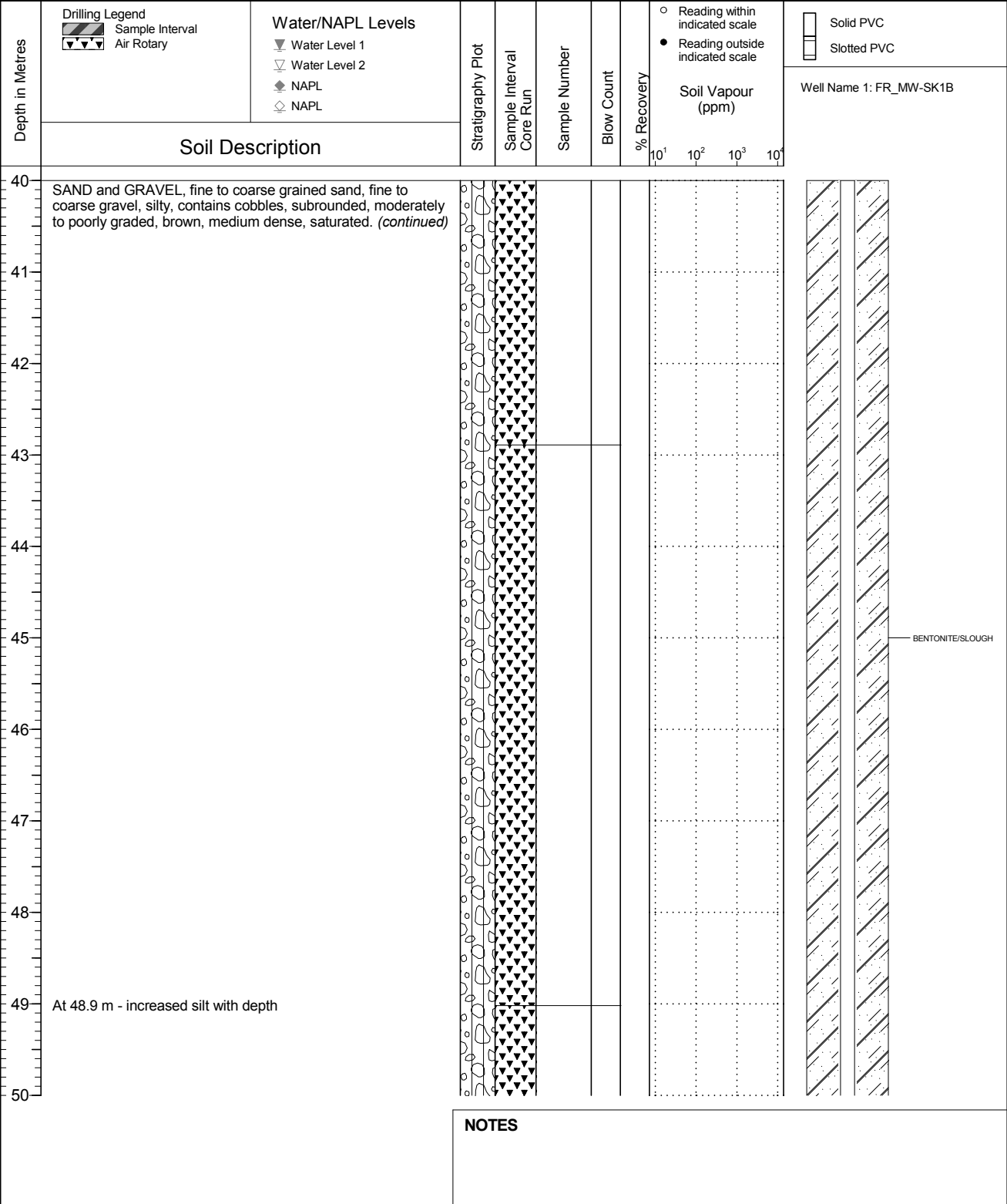
Location
Regional Groundwater Monitoring

PAGE 5 OF 7

Drilling Contractor JR Drilling
 Drilling Method Dual Rotary
 Borehole Dia. (m) 0.15
 Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 28
 Ground Surface Elev. (m) 1586.478
 Top of Casing Elev. (m) 1587.540
 Northing: 5558637.329 Easting: 652680.728

Project Number: 631283
 Borehole Logged By: MCA
 Date Drilled: 2018 12 18
 Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH-SK1B

Location
Regional Groundwater Monitoring

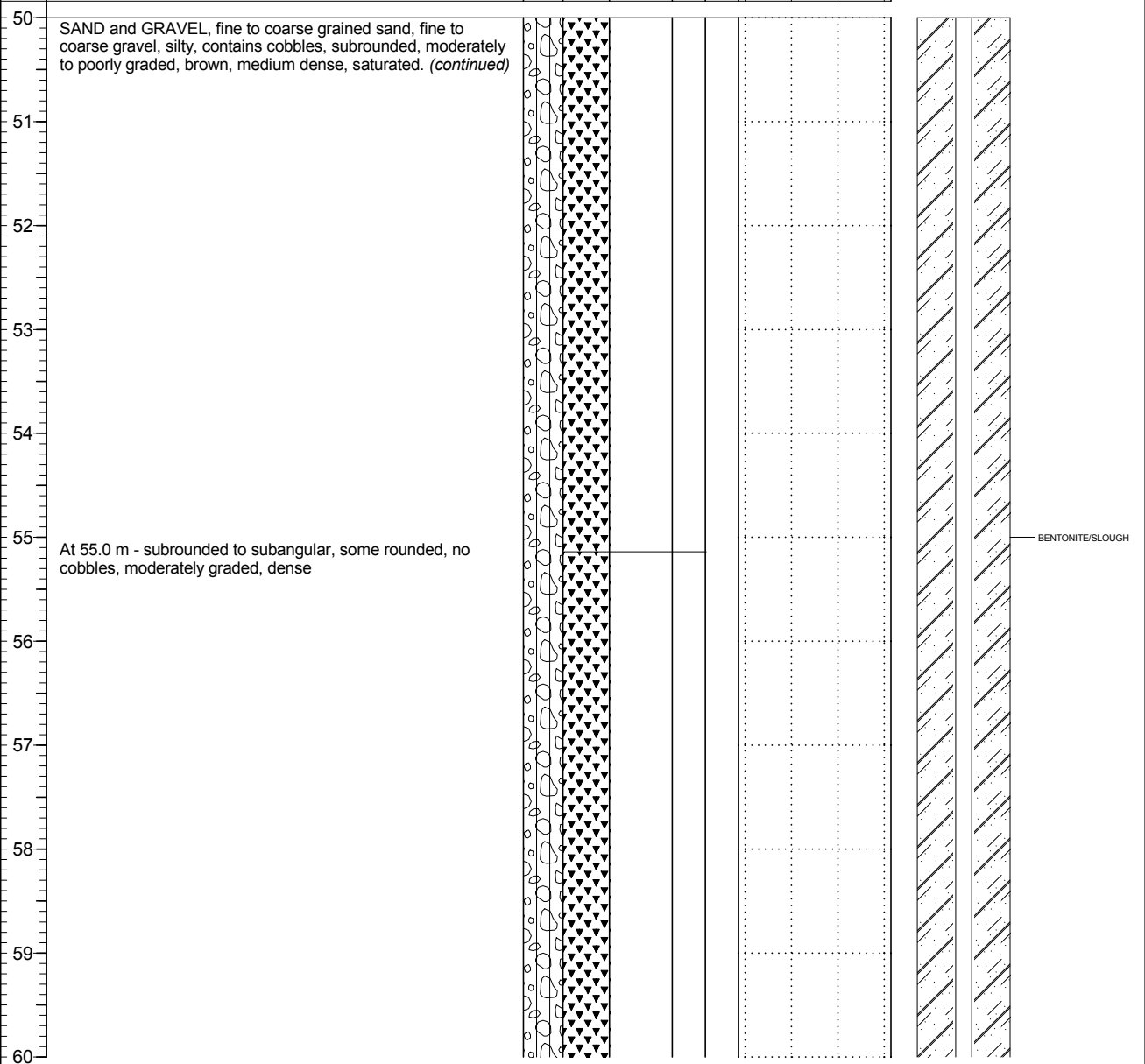
PAGE 6 OF 7

Drilling Contractor JR Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 28
Ground Surface Elev. (m) 1586.478
Top of Casing Elev. (m) 1587.540
Northing: 5558637.329 Easting: 652680.728

Project Number: 631283
Borehole Logged By: MCA
Date Drilled: 2018 12 18
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	Well Name 1: FR_MW-SK1B



NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH-SK1B

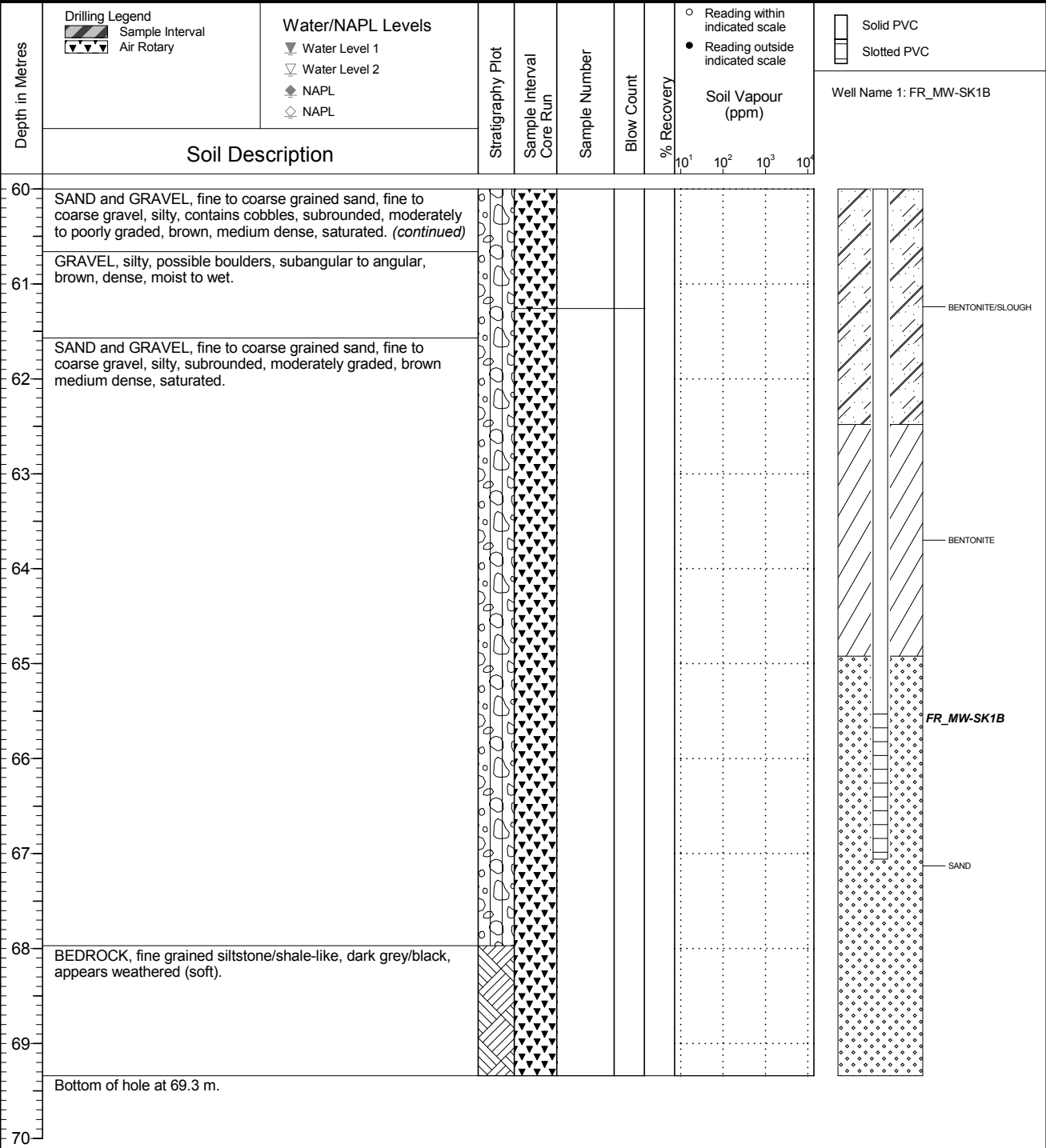
Location
Regional Groundwater Monitoring

PAGE 7 OF 7

Drilling Contractor JR Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 28
Ground Surface Elev. (m) 1586.478
Top of Casing Elev. (m) 1587.540
Northing: 5558637.329 Easting: 652680.728

Project Number: 631283
Borehole Logged By: MCA
Date Drilled: 2018 12 18
Log Typed By: VL



NOTES

DATA ENTRY: KJM

PROJECT No.: 09-1324-1039

RECORD OF MONITORING WELL: 09-01A

SHEET 1 OF 1

LOCATION: East of Old Stream Bed Kilmarnock Alluvium

BORING DATE: October 14, 2009

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20 40 60 80				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³					
0	Barber Rig - DR-24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.	Ground Surface		1584.1											Stickup = 0.85 m Bentonite Granular Filter Slotted Section Oct. 16, 2009 Slough		
		Silty SAND, trace gravel, loose, dry, light brown		1583.6													
		Sandy GRAVEL, trace silt, loose, moist, medium brown		0.5													
2		Clayey SILT, some sand and gravel, soft, low to medium plasticity, moist, medium brown		1582.1													
		Sandy GRAVEL, loose, moist, medium brown		2.0													
		Sandy GRAVEL, loose, moist, medium brown		1581.6													
		Sandy GRAVEL, loose, moist, medium brown		2.5													
4																	
6																	
8																	
8.4		End of MONITORING WELL.		1575.7													
10																	
12																	
14																	
16																	
18																	
20																	

BOREHOLE 09-1324-1039 LOGS.GPJ, CALGARY.GDT 1/11/16

DEPTH SCALE

1 : 100



LOGGED: EA

CHECKED: MB

DATA ENTRY: KJM

PROJECT No.: 09-1324-1039

RECORD OF MONITORING WELL: 09-01B

SHEET 1 OF 2

LOCATION: East of Old Stream Bed Kilmarnock Alluvium

BORING DATE: October 14, 2009

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. rem V.	+ ⊕			- ⊖	Q U
0	Barber Rig - DR-24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.	Ground Surface		1584.1											Stickup = 0.76 m		
		Silty SAND, trace gravel, loose, dry, light brown		1583.6													
		Sandy GRAVEL, trace silt, loose, moist, medium brown		0.5													
2				1582.1													
		Clayey SILT, some sand and gravel, soft, low to medium plasticity, moist, medium brown		2.0													
				1581.6													
				2.5													
4																	
6																	
8																	
10		Coarse GRAVEL, trace sand, loose, saturated, grey to medium brown		1574.1													
				10.0													
12		--- Some silty sand from 12.5 to 13.0 m															
14																	
16																	
18		--- Medium to coarse gravel, light grey to brown from 18.0 to 23.0 m															
20																	

CONTINUED NEXT PAGE

BOREHOLE 09-1324-1039 LOGS.GPJ, CALGARY.GDT 1/11/16

DEPTH SCALE

1 : 100



LOGGED: EA

CHECKED: MB

DATA ENTRY: KJM

PROJECT No.: 09-1324-1039



RECORD OF MONITORING WELL: 09-01B

SHEET 2 OF 2

LOCATION: East of Old Stream Bed Kilmarnock Alluvium

BORING DATE: October 14, 2009

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20 40 60 80 nat V. + Q - ● rem V. ⊕ U - ○				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³ Wp ——— W ——— WI					
20	Barber Rig - DR-24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.	Coarse GRAVEL, trace sand, loose, saturated, grey to medium brown <i>(continued)</i>															
22		---															
24		---															
26		---															
28		---															
29		Silty sand, saturated, medium brown from 28.5 to 29.0 m End of MONITORING WELL.		1555.1 29.0													
30		---															
32		---															
34		---															
36		---															
38		---															
40		---															

Slough

BOREHOLE 09-1324-1039 LOGS.GPJ, CALGARY.GDT 1/11/16



DATA ENTRY: KJM

PROJECT No.: 09-1324-1039

RECORD OF MONITORING WELL: 09-02A

SHEET 1 OF 1

LOCATION: West of Old Stream Bed Kilmarnock Alluvium

BORING DATE: October 15, 2009

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20 40 60 80 nat V. + Q - ● rem V. ⊕ U - ○				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³ Wp ——— W ——— WI					
0	Barber Rig - DR-24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.	Ground Surface		1584.7											Stickup = 0.82 m		
2		Sandy GRAVEL, coarse gravel, medium grain sand, loose, slightly moist, medium grown		0.0												Bentonite	
4		--- Increasing sand content from 1.0 to 1.5 m															
6		--- Decreasing sand content from 3.0 to 3.5 m															
8		--- Moist, some silt from 4.5 to 5.0 m														Slough	
10		--- Trace silt from 6.5 to 7.0 m															
12		--- Coarse to medium gravel, increasing moisture content at 8.0 m														Bentonite Oct. 16, 2009 ▽	
14		End of MONITORING WELL.														Slotted Section	
16																Slough	
18																	
20																	

BOREHOLE 09-1324-1039 LOGS.GPJ, CALGARY.GDT 1/11/16

DEPTH SCALE
1 : 100



LOGGED: EA
CHECKED: MB

DATA ENTRY: KJM

PROJECT No.: 09-1324-1039

RECORD OF MONITORING WELL: 09-02B

SHEET 1 OF 2

LOCATION: West of Old Stream Bed Kilmarnock Alluvium

BORING DATE: October 15, 2009

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20 40 60 80 nat V. + Q - rem V. ⊕ U - ○				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³ Wp ——— W ——— WI					
0		Ground Surface		1584.7											Stickup = 0.67 m		
2		Sandy GRAVEL, coarse gravel, medium grain sand, loose, slightly moist, medium brown		0.0													
		--- Increasing sand content from 1.0 to 1.5 m															
4		--- Decreasing sand content from 3.0 to 3.5 m															
		--- Moist, some silt from 4.5 to 5.0 m															
6		--- Trace silt from 6.5 to 7.0 m															
8		--- Coarse to medium gravel, increasing moisture content at 8.0 m													Oct 16, 2009		
10	Barber Rig - DR-24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.														Slough		
12		GRAVEL, trace sand, coarse to medium gravel, loose, saturated, light grey to brown		1573.2											Bentonite		
				11.5													
		Sandy GRAVEL, trace silt, medium to coarse gravel, medium grain sand, loose, saturated, medium brown		1572.2													
				12.5													
		GRAVEL, trace sand, coarse gravel, loose, saturated, light grey to brown		1571.7													
				13.0													
14																	
16																	
18																	
20																	
		CONTINUED NEXT PAGE															

BOREHOLE 09-1324-1039 LOGS.GPJ, CALGARY.GDT 1/11/16

DEPTH SCALE

1 : 100



LOGGED: EA

CHECKED: MB

DATA ENTRY: KJM

PROJECT No.: 09-1324-1039

RECORD OF MONITORING WELL: 09-02B

SHEET 2 OF 2

LOCATION: West of Old Stream Bed Kilmarnock Alluvium

BORING DATE: October 15, 2009

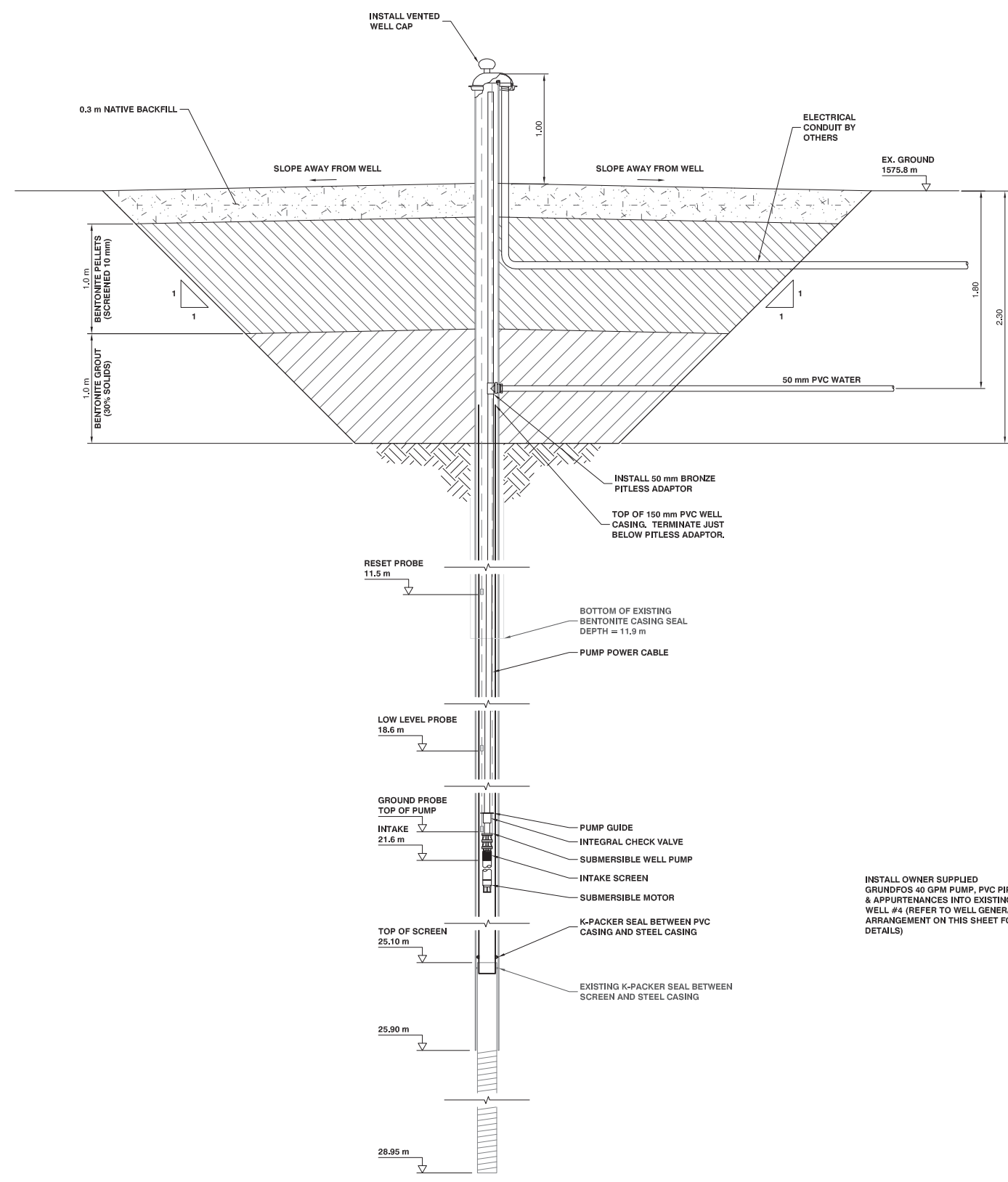
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DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20		40		60				80	
20	Barber Rig - DR.24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.	Sandy GRAVEL, some silt, coarse gravel, loose, saturated, medium brown		1564.2 20.5 1563.7 21.0											Slotted Section Sand Slough		
22		GRAVEL, trace sand, medium to coarse gravel, loose, saturated, light grey to brown															
24		End of MONITORING WELL.		1554.7 30.0													
26																	
28																	
30																	
32																	
34																	
36																	
38																	
40																	

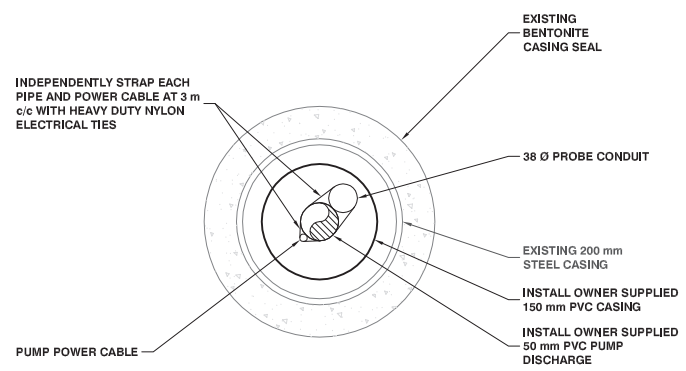
BOREHOLE 09-1324-1039 LOGS.GPJ, CALGARY.GDT 1/11/16



AT FULL SIZE THIS BAR MEASURES 100mm. ALL SCALES REFERENCED TO FULL SIZE.



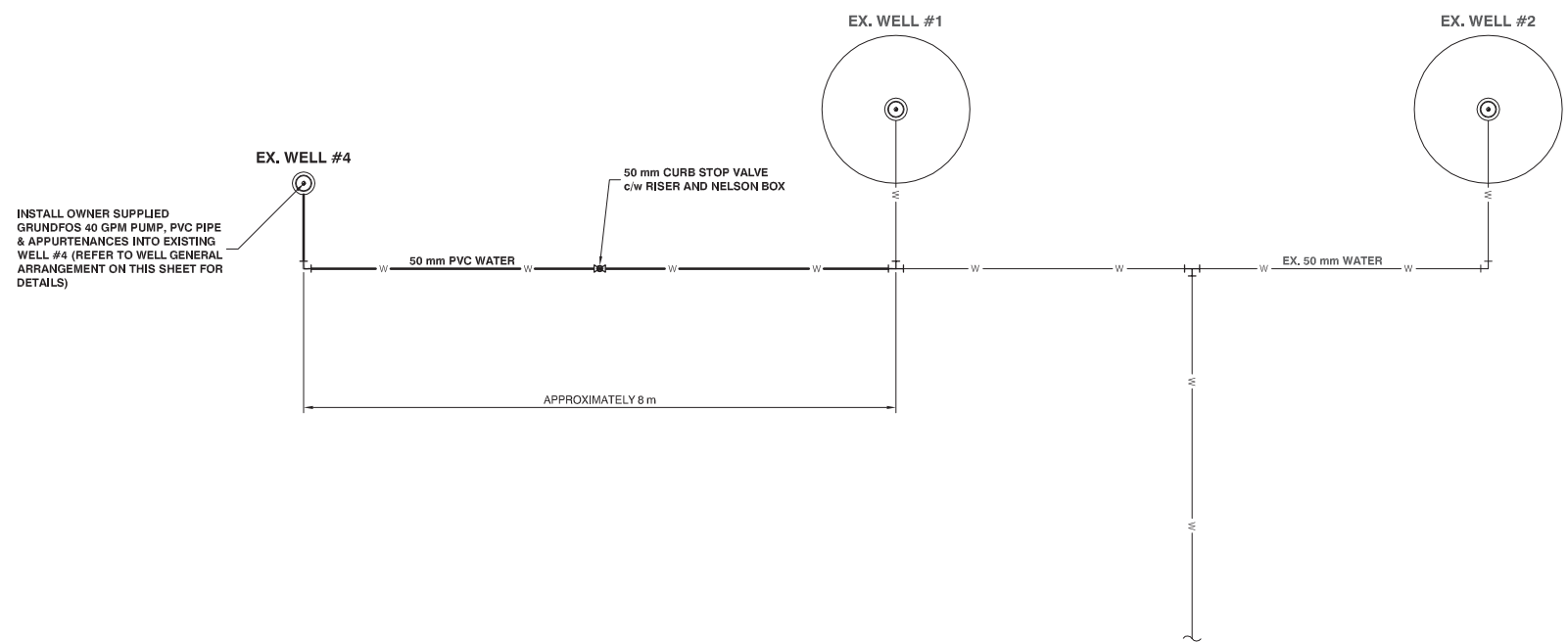
WELL GENERAL ARRANGEMENT
Scale: 1:25



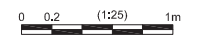
TYPICAL WELL SECTION
Scale: 1:5

SUMMARY OF WELL LOG				
ELEVATION (m GEODETIC)		DEPTH BELOW GROUND (m)		DESCRIPTION OF MATERIAL
FROM	TO	FROM	TO	
1575.8	1572.8	0	3	BROWN ORGANIC SAND, SILT & CLAY (MOIST)
1572.8	1563.6	3	12.2	BROWN SAND w/ PLASTIC CLAY & SILT (MOIST/WET)
1563.6	1560.6	12.2	15.2	BROWN FINE TO MED. GRAIN SAND (WATER BEARING)
1560.6	1557.5	15.2	18.3	BROWN MED. TO COARSE GRAIN SAND (WATER BEARING)
1557.5	1554.5	18.3	21.3	BROWN MED. TO COARSE GRAIN SAND (MOIST, NO FLOW)
1554.5	1551.4	21.3	24.4	BROWN SAND w/ SOME GRAVEL, WATER BEARING (GOOD YIELD)
1551.4	1548.4	24.4	27.4	BROWN SAND, WATER BEARING (GOOD YIELD)
1548.4	1546.85	27.4	28.95	BROWN SAND w/ SOME GRAVEL, WATER BEARING (GOOD YIELD)

- NOTES:**
- WELL DISCHARGE PIPING TO BE FULLY RESTRAINED (EVERY JOINT) BETWEEN PITLESS ADAPTER UNIT AND SUPPLYMAIN.
 - ALL PIPING TO HAVE 1.8m COVER FOR FROST PROTECTION.



PLAN
Scale: 1:50



SAVED: 2013.01.11 12:06:40 PM
C:\0000-0000\008-172500-00\008-172 Well Design.dwg

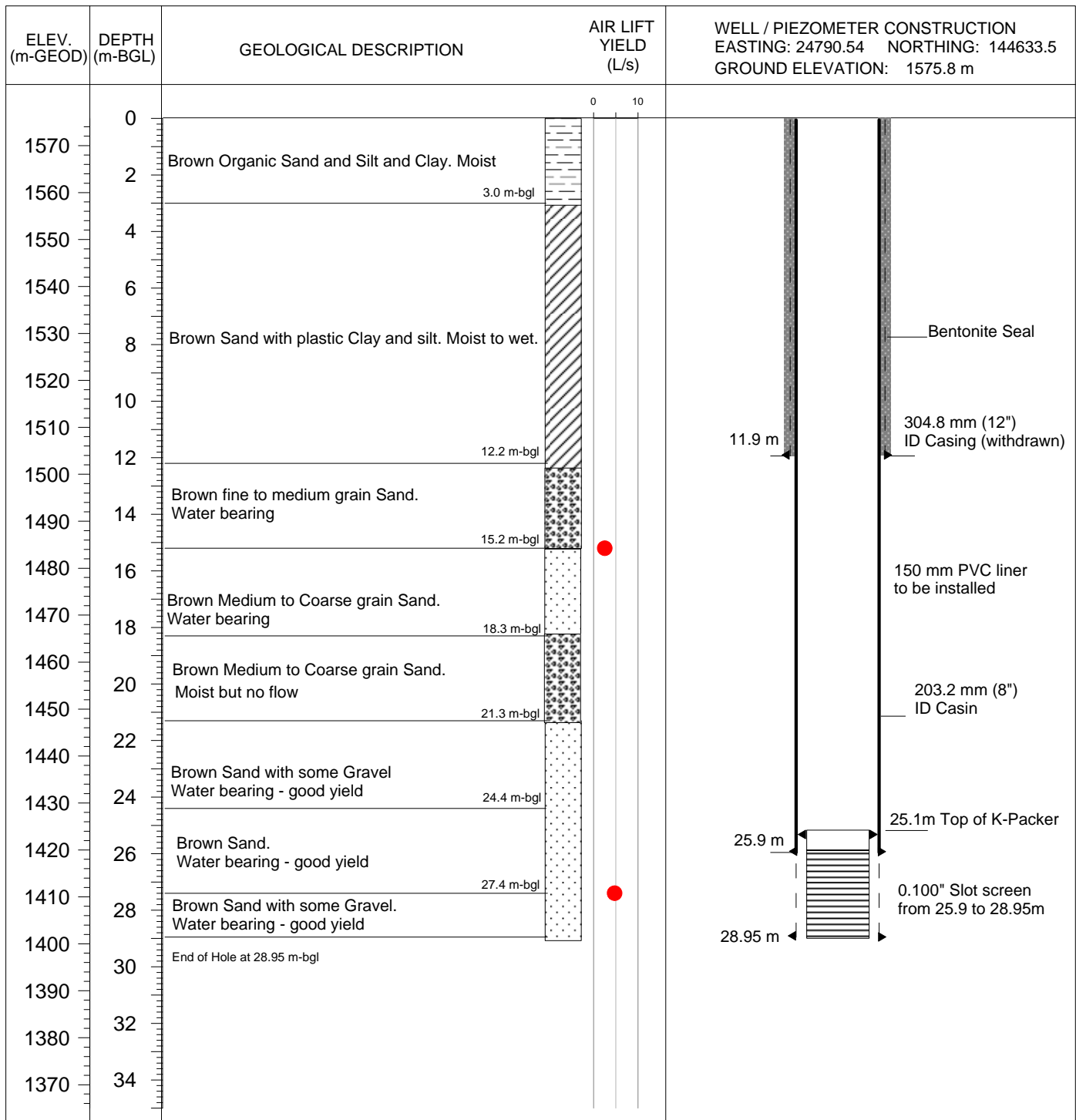
Issued for	Issue	Date	Issued By	Rev. No.	Date	Designed	Drawn	Checked	Description of Revision	Rev. No.	Date	Designed	Drawn	Checked	Description of Revision
Reference				0	JAN.11/13	MHF	MRM		ISSUED FOR TENDER						
Approvals															
Tender	TO	JAN.11/13	MHF												
Permits															
Construction															
Record Drawings															



**FORDING RIVER OPERATIONS
GREEN HOUSE WATER SUPPLY
WELL #4**

KWL Project No.: 008-172 Scale: AS SHOWN
Sheet: 1 of 1 Rev. No.: 0 Drawing Number: SW1
Client: TECH COAL LTD.

H:\Project\3149\Well_Log\Drilled_Well4_Greenhouse.grf



LEGEND

-  Overburden
-  Clay
-  Sand

DRILLING CONTRACTOR: J.R. Drilling Ltd.
 DRILLING METHOD: DUAL ROTARY / AIR HAMMER
 START DATE: 08-Nov-12
 END DATE: 09-Nov-12
 HYDROGEOLOGY: Eric Pastora

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

KERR WOOD LEIDAL ASSOCIATES LTD.
HYDROGEOLOGICAL ASSESSMENT
FORDING RIVER GREENHOUSE, ELKFORD, BC



PITEAU ASSOCIATES

GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS

HYDROGEOLOGICAL LOG FOR WELL No 4

BY	DATE
EP	DEC 12
APPROVED	FIG.
ATH	1



Client
Teck Coal Limited

Borehole No. : FR_BH_FRRD1

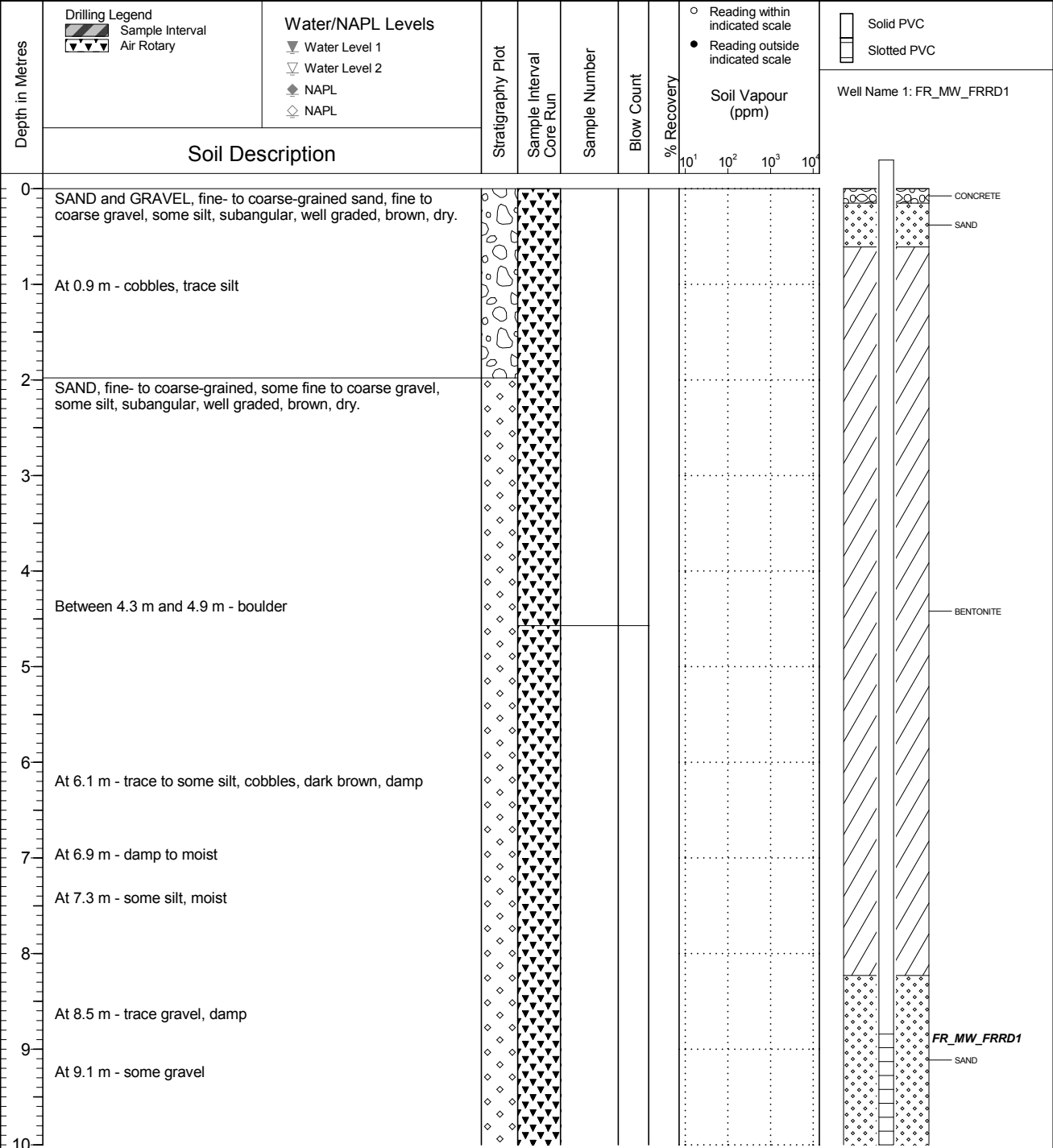
Location
Regional Groundwater Monitoring

PAGE 1 OF 2

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.17
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored n/a
Ground Surface Elev. (m) 1581.026
Top of Casing Elev. (m) 1581.955
Northing: 5556128.232 Easting: 653883.845

Project Number: 657269
Borehole Logged By: IPC
Date Drilled: 2019 01 31
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH_FRRD1

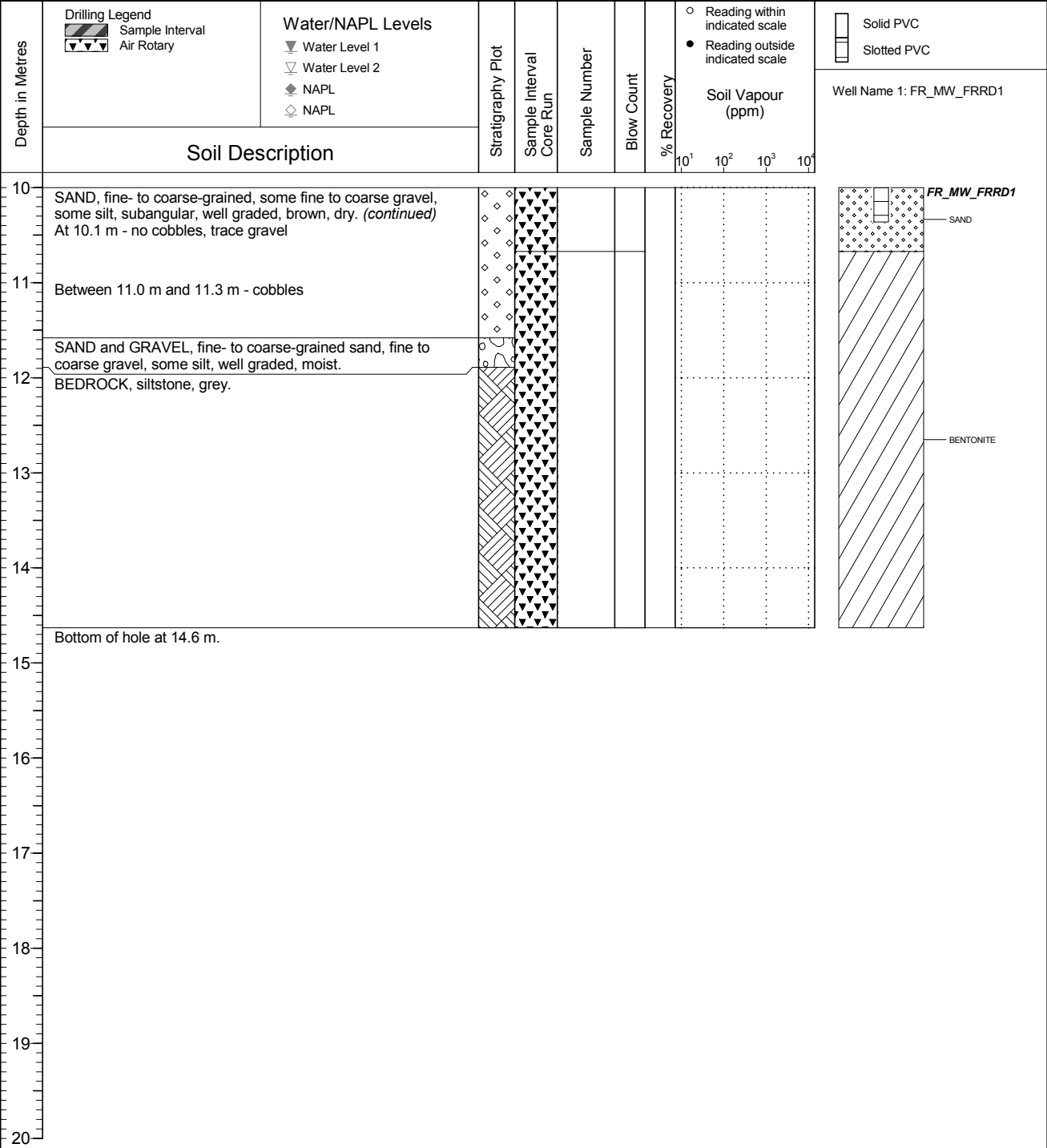
Location
Regional Groundwater Monitoring

PAGE 2 OF 2

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.17
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored n/a
Ground Surface Elev. (m) 1581.026
Top of Casing Elev. (m) 1581.955
Northing: 5556128.232 Easting: 653883.845

Project Number: 657269
Borehole Logged By: IPC
Date Drilled: 2019 01 31
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH_CASW6

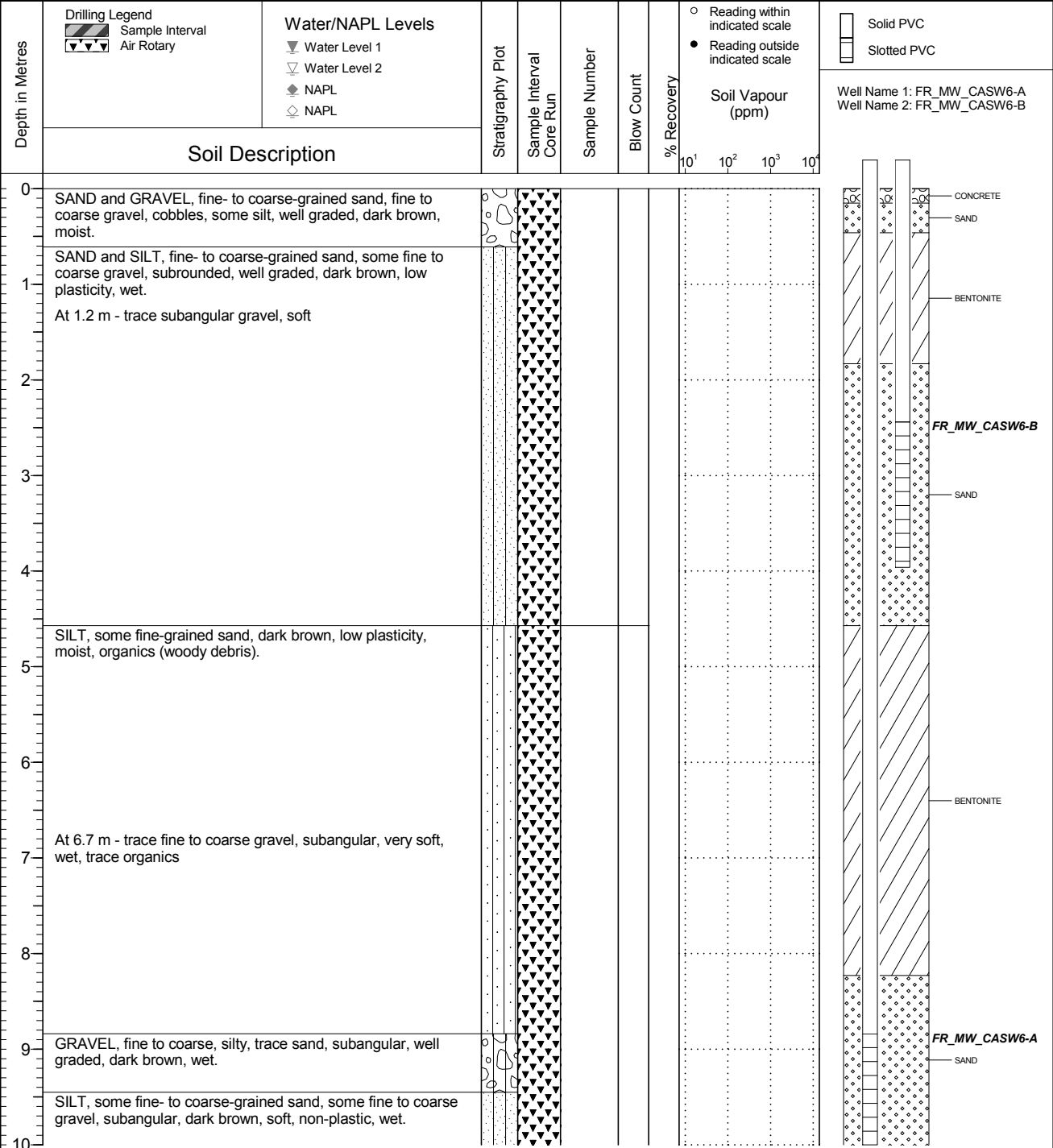
Location
Regional Groundwater Monitoring

PAGE 1 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.17
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored n/a
Ground Surface Elev. (m) 1557.027
Top of Casing Elev. (m) 1557.764 1557.818
Northing: 5554575.787 Easting: 655078.569

Project Number: 657269
Borehole Logged By: IPC
Date Drilled: 2019 02 02
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH_CASW6

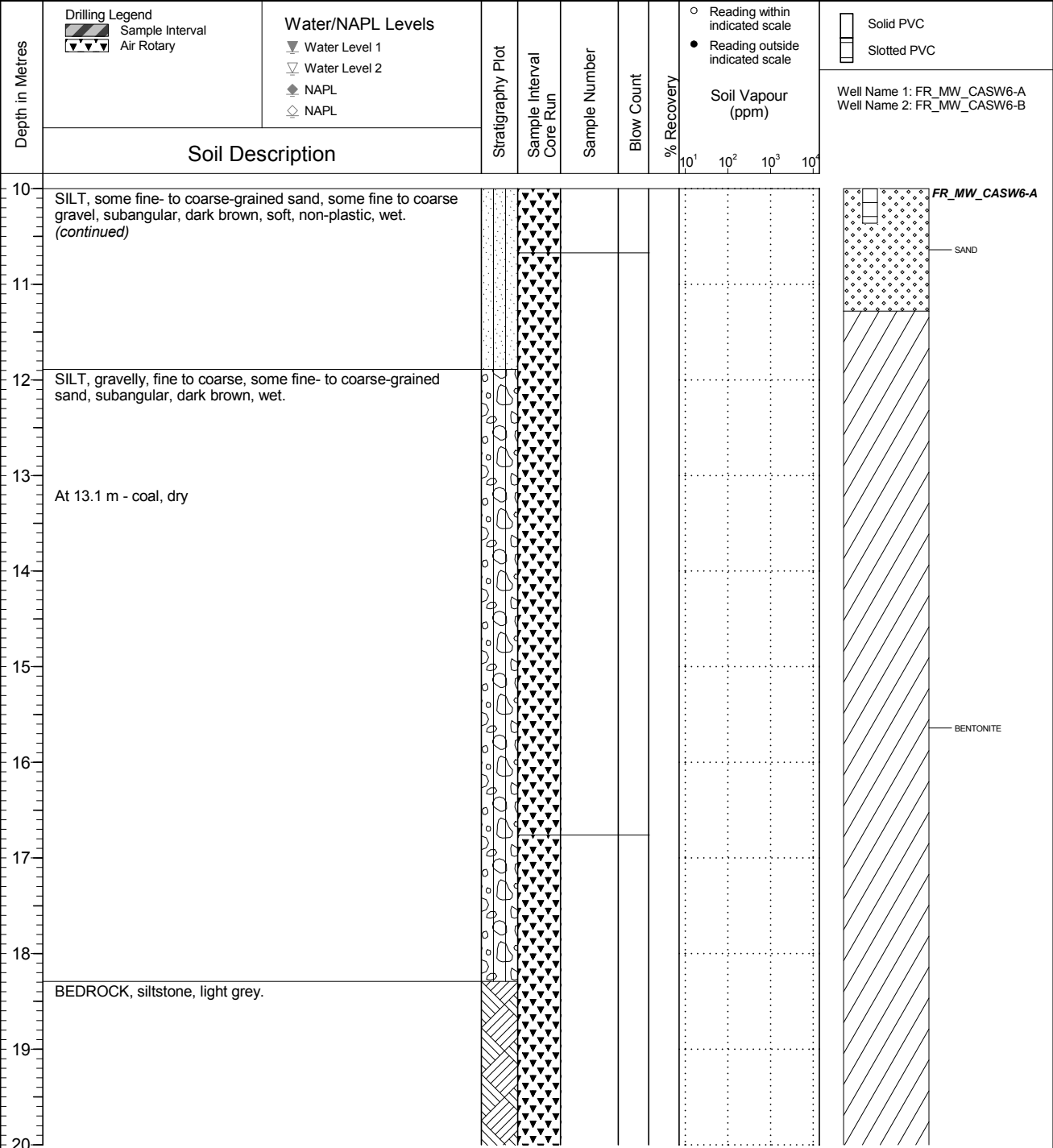
Location
Regional Groundwater Monitoring

PAGE 2 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.17
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored n/a
Ground Surface Elev. (m) 1557.027
Top of Casing Elev. (m) 1557.764 1557.818
Northing: 5554575.787 Easting: 655078.569

Project Number: 657269
Borehole Logged By: IPC
Date Drilled: 2019 02 02
Log Typed By: VL



Well Name 1: FR_MW_CASW6-A
Well Name 2: FR_MW_CASW6-B

FR_MW_CASW6-A

SAND

BENTONITE

NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH_CASW6

Location
Regional Groundwater Monitoring

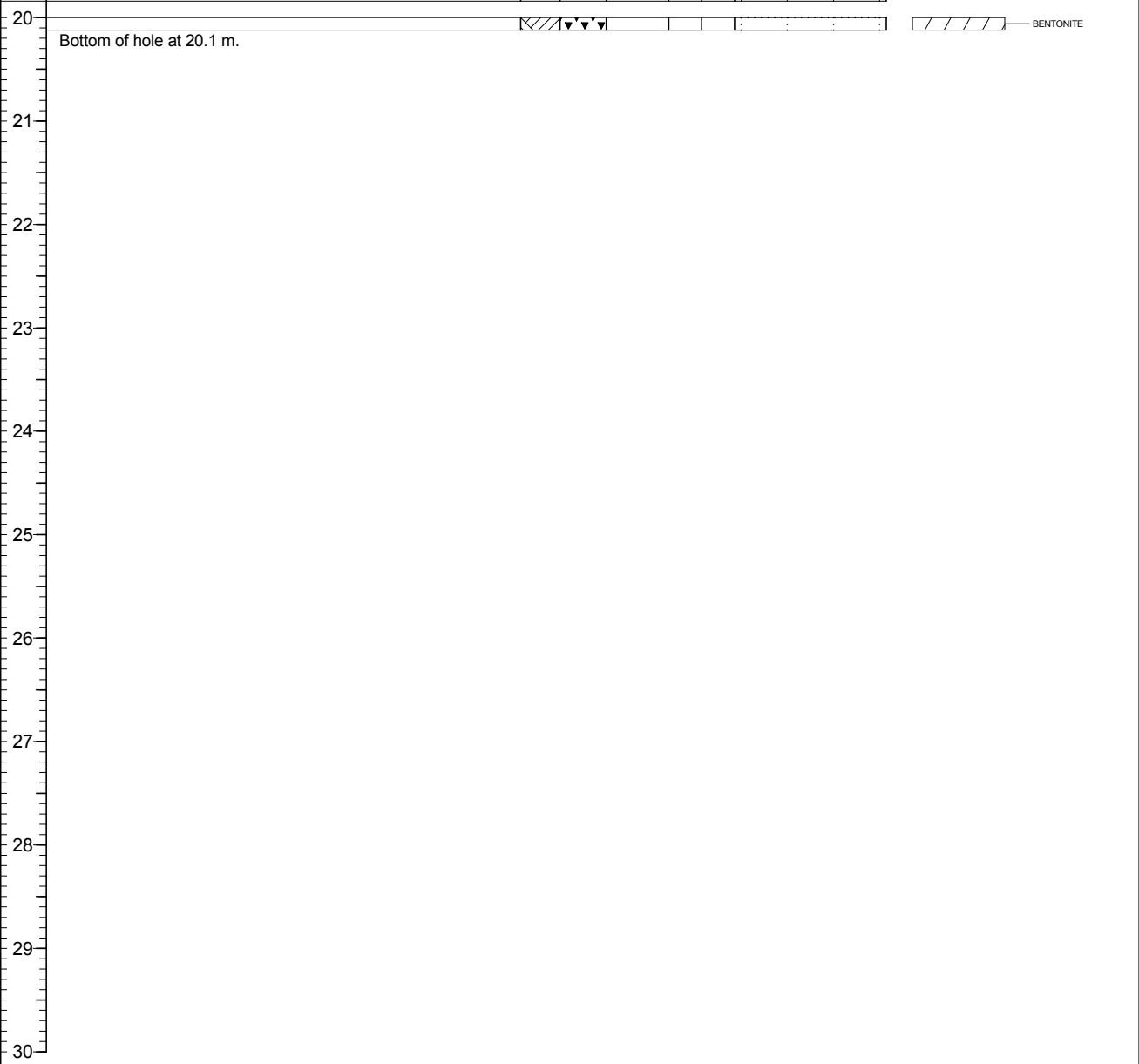
PAGE 3 OF 3

Drilling Contractor Owen's Drilling
 Drilling Method Dual Rotary
 Borehole Dia. (m) 0.17
 Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored n/a
 Ground Surface Elev. (m) 1557.027
 Top of Casing Elev. (m) 1557.764 1557.818
 Northing: 5554575.787 Easting: 655078.569

Project Number: 657269
 Borehole Logged By: IPC
 Date Drilled: 2019 02 02
 Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	Well Name 1: FR_MW_CASW6-A Well Name 2: FR_MW_CASW6-B



NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH_CH1

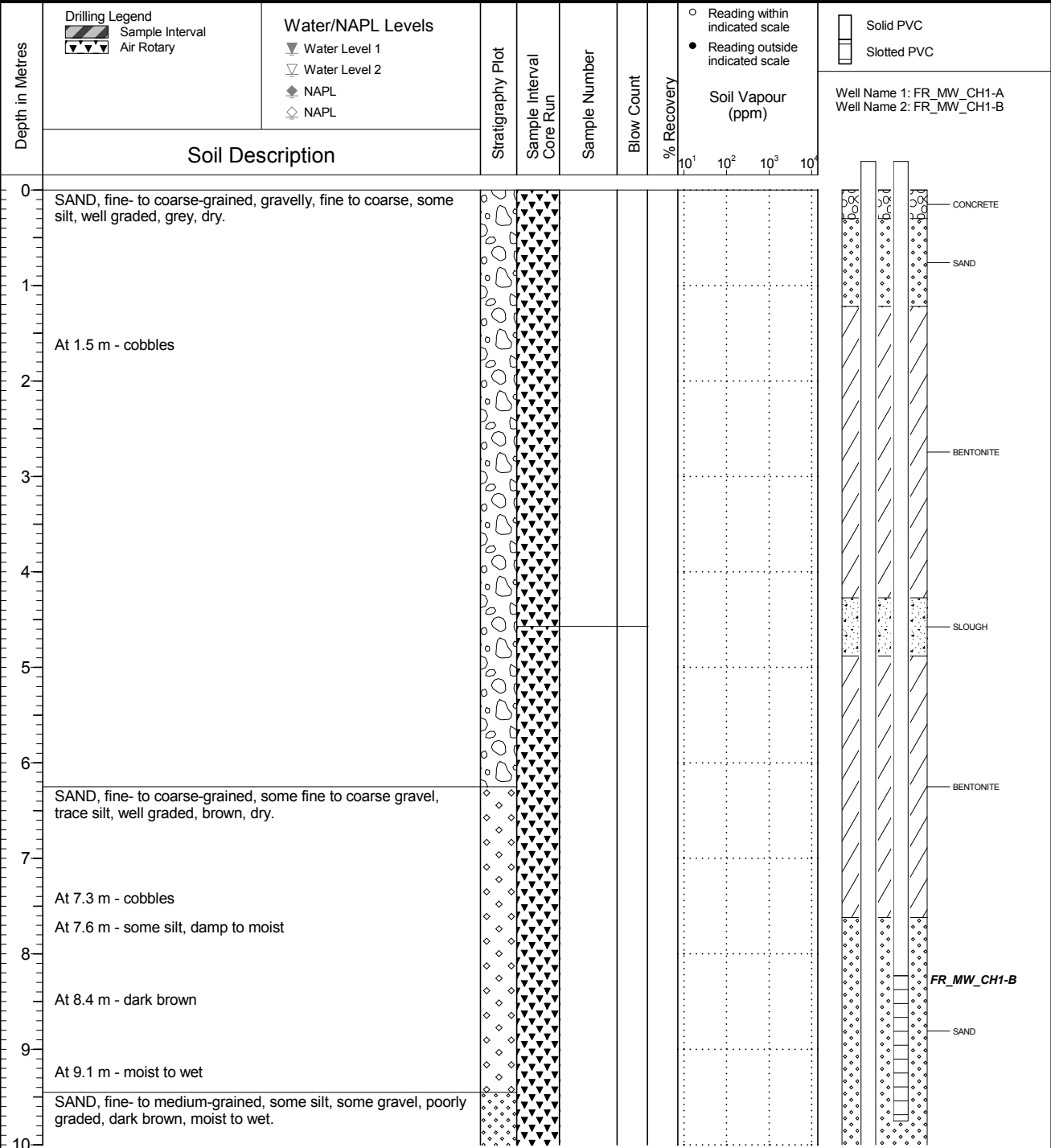
Location
Regional Groundwater Monitoring

PAGE 1 OF 5

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.17
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored n/a
Ground Surface Elev. (m) 1562.013
Top of Casing Elev. (m) 1562.940 1562.983
Northing: 5552549.191 Easting: 655940.085

Project Number: 657269
Borehole Logged By: IPC
Date Drilled: 2019 01 30
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH_CH1

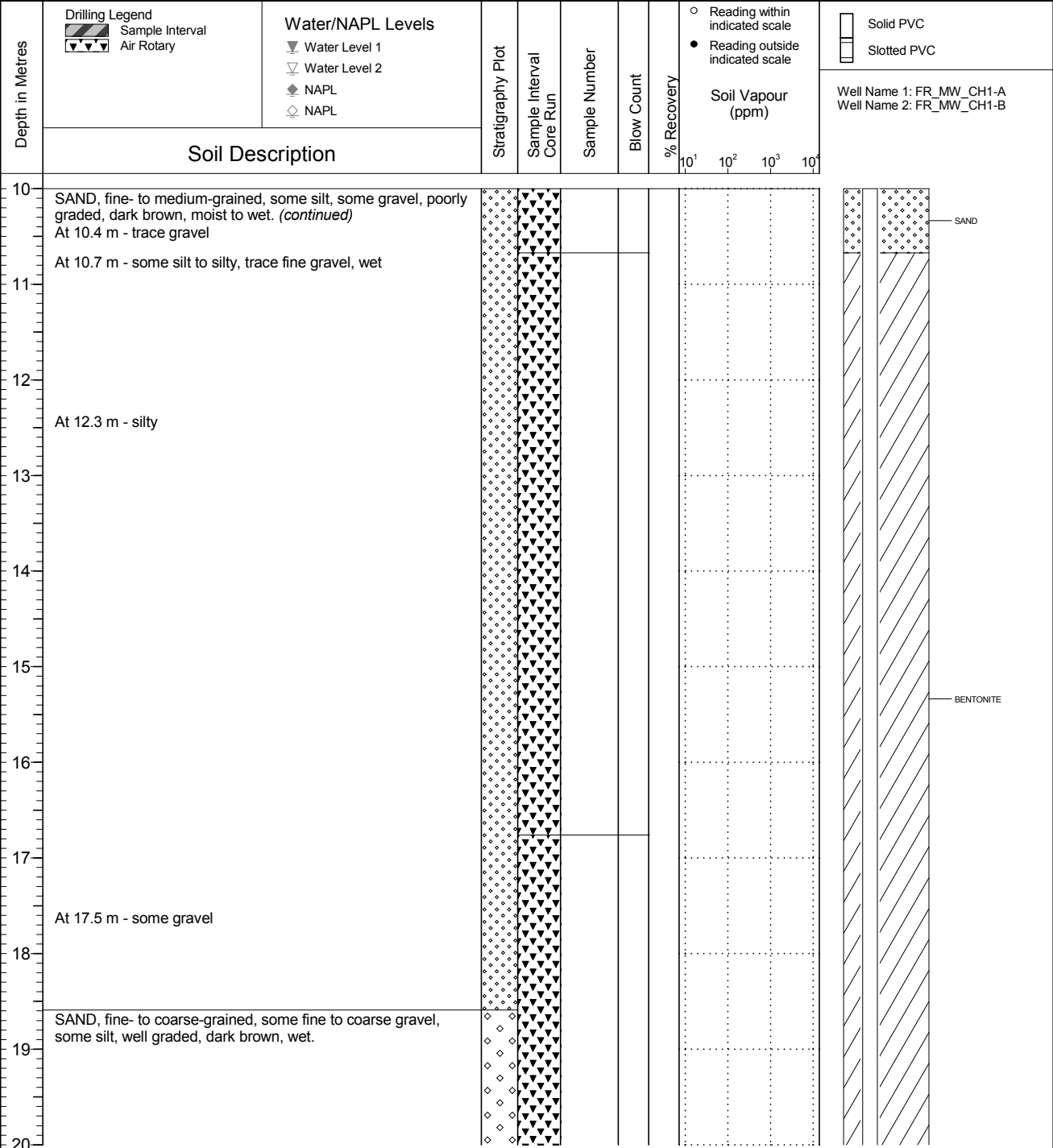
Location
Regional Groundwater Monitoring

PAGE 2 OF 5

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.17
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored n/a
Ground Surface Elev. (m) 1562.013
Top of Casing Elev. (m) 1562.940 1562.983
Northing: 5552549.191 Easting: 655940.085

Project Number: 657269
Borehole Logged By: IPC
Date Drilled: 2019 01 30
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH_CH1

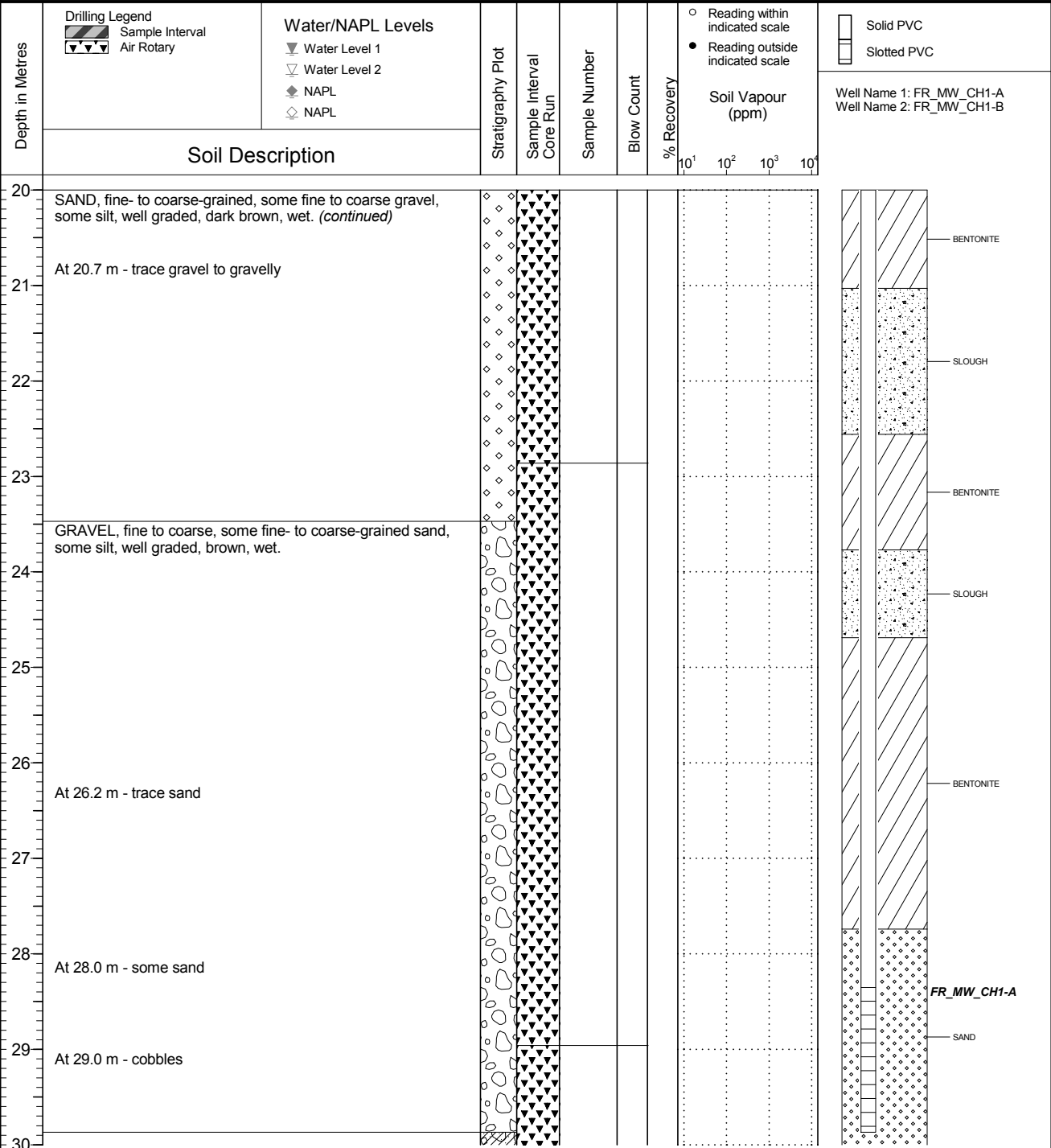
Location
Regional Groundwater Monitoring

PAGE 3 OF 5

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.17
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored n/a
Ground Surface Elev. (m) 1562.013
Top of Casing Elev. (m) 1562.940 1562.983
Northing: 5552549.191 Easting: 655940.085

Project Number: 657269
Borehole Logged By: IPC
Date Drilled: 2019 01 30
Log Typed By: VL



Well Name 1: FR_MW_CH1-A
Well Name 2: FR_MW_CH1-B

NOTES

QA/QC: BH 2019 04 01 Print Date: 2019-09-26



Client
Teck Coal Limited

Borehole No. : FR_BH_CH1

Location
Regional Groundwater Monitoring

PAGE 4 OF 5

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.17
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored n/a
Ground Surface Elev. (m) 1562.013
Top of Casing Elev. (m) 1562.940 1562.983
Northing: 5552549.191 Easting: 655940.085

Project Number: 657269
Borehole Logged By: IPC
Date Drilled: 2019 01 30
Log Typed By: VL

Depth in Metres	Soil Description	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Soil Vapour (ppm)	Water/NAPL Levels		Drilling Legend		Well Name	
								Water Level 1	Water Level 2	Sample Interval	Air Rotary	Well Name 1: FR_MW_CH1-A	Well Name 2: FR_MW_CH1-B
30	SILT and CLAY (TILL), gravelly, sandy, dark brown, wet. <i>(continued)</i>												
31													
32													
33													
34													
35													
36													
37													
38													
39	BEDROCK, siltstone, light grey.												
40													

QA/QC: BH 2019 04 01 Print Date: 2019-09-26

NOTES



Client
Teck Coal Limited

Borehole No. : FR_BH_CH1

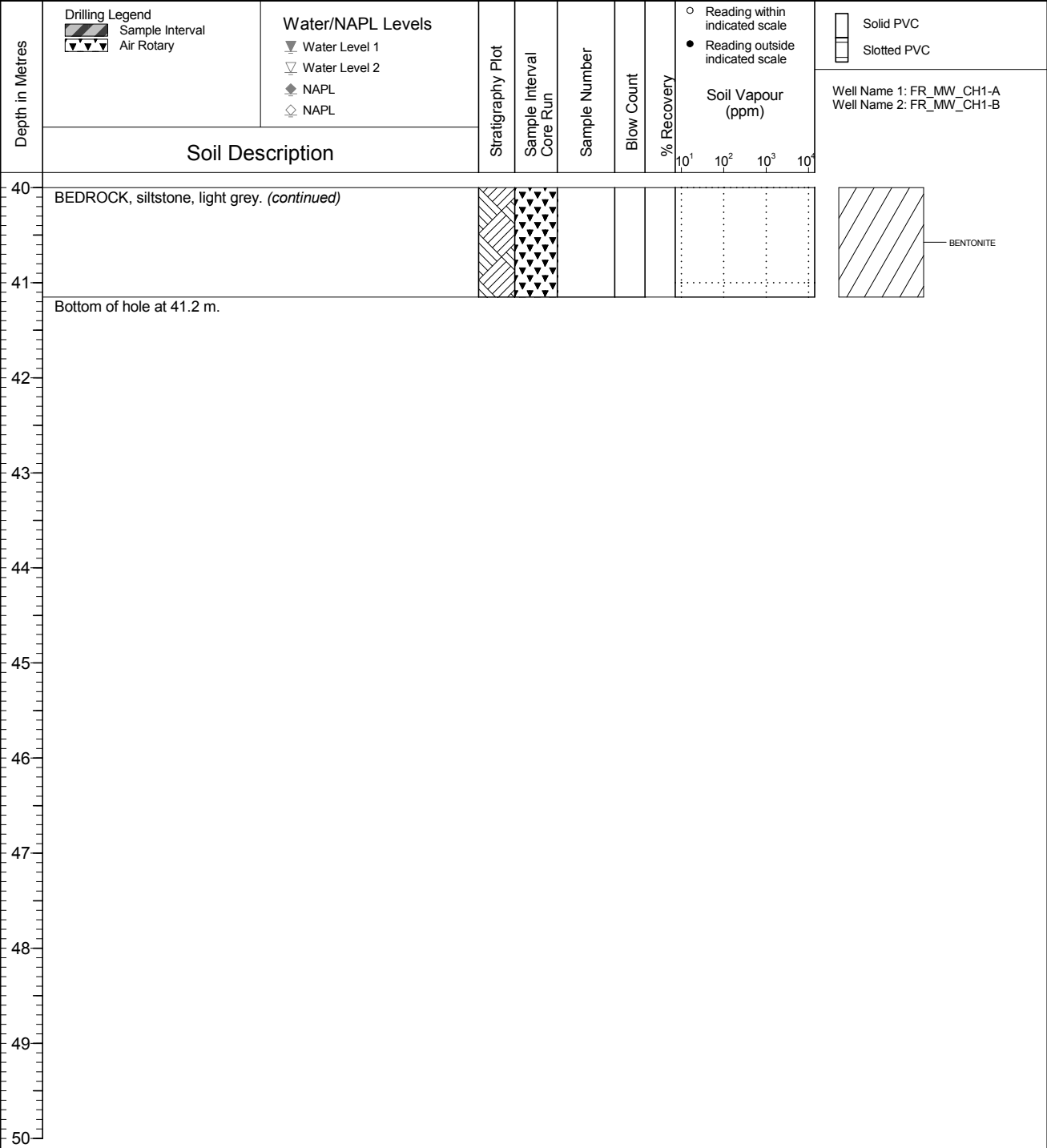
Location
Regional Groundwater Monitoring

PAGE 5 OF 5

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.17
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored n/a
Ground Surface Elev. (m) 1562.013
Top of Casing Elev. (m) 1562.940 1562.983
Northing: 5552549.191 Easting: 655940.085

Project Number: 657269
Borehole Logged By: IPC
Date Drilled: 2019 01 30
Log Typed By: VL



Well Name 1: FR_MW_CH1-A
Well Name 2: FR_MW_CH1-B

BENTONITE

NOTES

Log of Monitoring Well: GH_MW-PC



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 2nd, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 1 of 8

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm		LEL %
							0 250 500	0 50 100	
ft m									
-3									
-2									
-1									
0		Ground Surface	0.00						
1		TOPSOIL TOPSOIL, brown, fine to medium silty sand with fine sub-angular gravel and rootlets	0.00						
2									
3	1	COBBLES and GRAVEL COBBLES and GRAVEL, with silt and sand, pulverized from drilling.	-1.00						
4			1.00						
5									
6	2								
7									
8									
9									
10	3								
11									
12									
13	4	Groundwater encountered at approximately 4.5 mbgs							
14									
15									
16	5								

Well location: Porter Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 7.601
Depth to water level (TOC): 3.852	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24	Well screen interval (bgs): 3.5-6.5	

Log of Monitoring Well: GH_MW-PC



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 2nd, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 2 of 8

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL
							ppm		%
							0 250500	0 50 100	
17									
18			-5.50 5.50						
19		BEDROCK BEDROCK (likely limestone), pulverized silt to fine/medium sub-angular/sub-rounded gravel size particles, crystalline, very hard, dry							
20	6								
21									
22									
23	7								
24									
25									
26	8								
27									
28									
29									
30	9								
31									
32									
33	10								
34									
35									
35	11								

Well location: Porter Creek

Well casing diameter: 50.8mm

Depth of well (TOC): 7.601

Depth to water level (TOC): 3.852

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: September 6th, 2016

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24

Well screen interval (bgs): 3.5-6.5

Log of Monitoring Well: GH_MW-PC



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 2nd, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 3 of 8

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm		LEL %
							0 250 500	0 50 100	
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									

Well location: Porter Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 7.601
Depth to water level (TOC): 3.852	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24	Well screen interval (bgs): 3.5-6.5	

Log of Monitoring Well: GH_MW-PC



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 2nd, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 4 of 8

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250 500		LEL % 0 50 100
57									
58									
59		18							
60									
61									
62		19							
63									
64									
65		20							
66									
67									
68									
69		21							
70									
71									
72		22							
73									
74									
75		23							
76									

Well location: Porter Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 7.601
Depth to water level (TOC): 3.852	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24	Well screen interval (bgs): 3.5-6.5	

Log of Monitoring Well: GH_MW-PC



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 2nd, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 5 of 8

SUBSURFACE PROFILE			SAMPLE					Backfill details		
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250 500		LEL % 0 50 100	
77		<p>Small fracture encountered at 24 mbgs but was not found to have enough water to conduct a flow test</p> <p>From 27.5 mbgs drilling was noted to be smoother/easier; no observable change was identified in rock chips</p>								
78										
79			24							
80										
81										
82			25							
83										
84										
85			26							
86										
87										
88										
89			27							
90										
91										
92			28							
93										
94										
95			29							
96										

Well location: Porter Creek

Well casing diameter: 50.8mm

Depth of well (TOC): 7.601

Depth to water level (TOC): 3.852

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: September 6th, 2016

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24

Well screen interval (bgs): 3.5-6.5

Log of Monitoring Well: GH_MW-PC



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 2nd, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 6 of 8

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm		LEL %
97									
98									
99		30							
00									
01									
02		31							
03									
04									
05		32							
06									
07									
08		33							
09									
10									
11		34							
12									
13									
14									
15	35								
16									

Well location: Porter Creek

Well casing diameter: 50.8mm

Depth of well (TOC): 7.601

Depth to water level (TOC): 3.852

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: September 6th, 2016

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24

Well screen interval (bgs): 3.5-6.5

Log of Monitoring Well: GH_MW-PC



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 2nd, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 7 of 8

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250 500		LEL % 0 50 100
17									
18		36							
19									
20									
21		37							
22									
23									
24									
25		38							
26									
27									
28		39							
29									
30									
31		40							
32									
33									
34	41								
35									
36									

Well location: Porter Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 7.601
Depth to water level (TOC): 3.852	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24	Well screen interval (bgs): 3.5-6.5	

Log of Monitoring Well: GH_MW-PC



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 2nd, 2018

Logged by: TK

Site Location: Elkford, BC

Sheet: 8 of 8

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL
							ppm		%
							0 250 500	0 50 100	
37	42								[Hatched Backfill Pattern]
38									
39									
40									
41									
42									
43									
44									
45									
46									
47	45	End of Log	-45.00 45.00						
48									
49									
50									
51	46								
52									
53									
54	47								
55									
56									

Well location: Porter Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 7.601
Depth to water level (TOC): 3.852	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24	Well screen interval (bgs): 3.5-6.5	

GH_MW-SITE-A



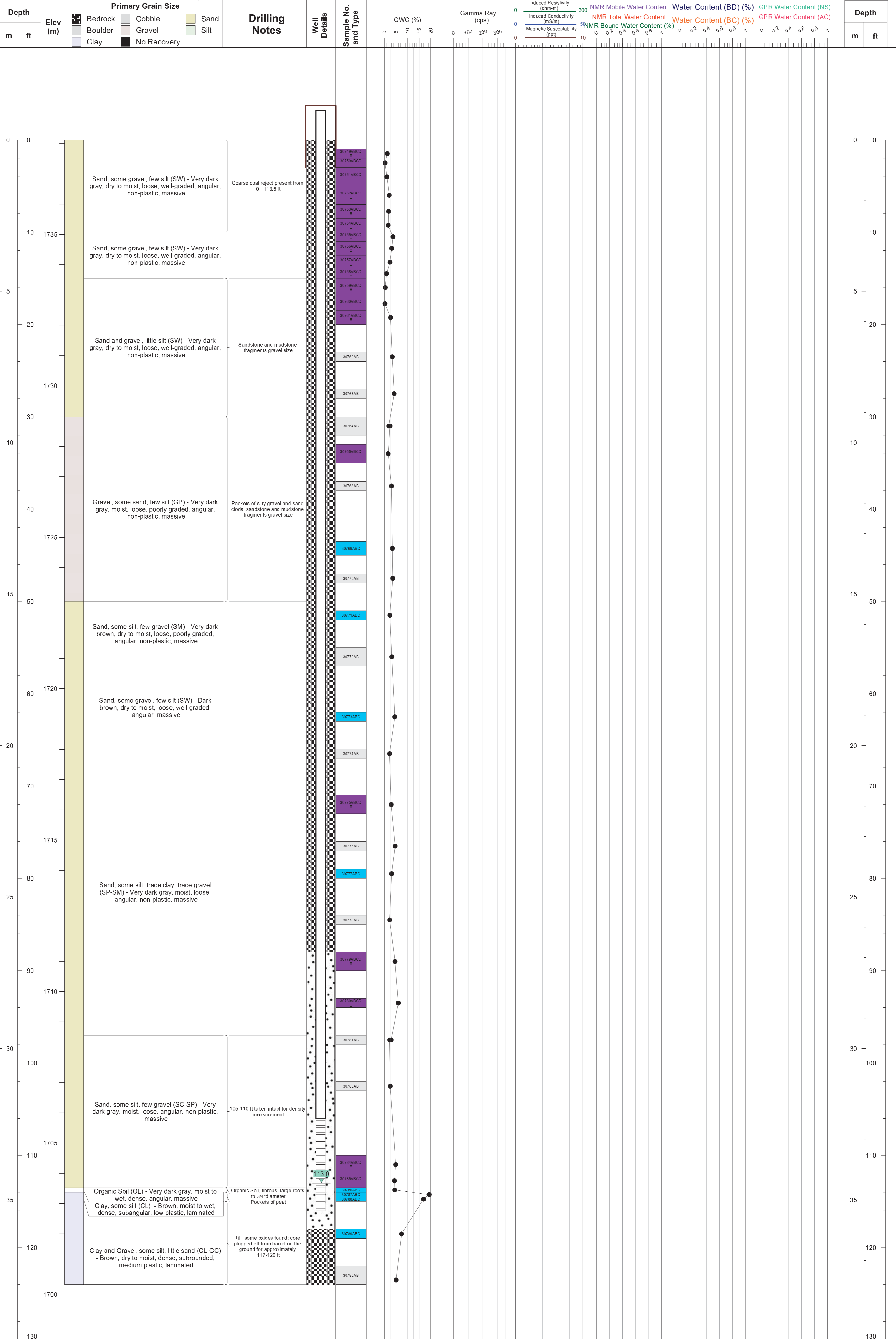
HOLE ID: GHO-CCR-12-01
 LOCATION: Green Hills
 PROJECT NO: TCT017.020
 DRILLING CONTRACTOR: Boart Longyear
 DRILLING TYPE: Sonic
 PROJECT: Teck Coal Watershed R&D
 CLIENT: Teck Coal Ltd.
 LOGGED BY: BS/SB
 BORING DATE: 7-Sep-12 to 9-Sep-12

COORDINATES: E 653747 N 5547430
 DATUM: NAD 83 Zone 11
 GROUND ELEV (m): 1736.122
 AZIMUTH: 0 DIP: 90
 EDH ELEV (m): 1700.3268
 TOTAL DEPTH (m / ft): 37.8 / 124
 INSTALLATION TYPE: 4" Mon. Well
 P. 1 of 1

General Geology: Coarse Coal Reject
 Levellogger Installation: None
 Top of PVC Elev (m): 1739.462
 Top of PVC Elev (m): 1.34 / 4.4
 Water Level Note: Water level based on 2012/09/17 measurements. Approx. at 113ft.
 Water Level (m / ft bgs): 34.44 / 113.0
 Well drilled to 124ft but during installation of well PVC melted/broke.

Recent Water Level Measurement

Date	Water Level (ft bgs)



Well Legend Chips Cuttings Casing Gas Port	Sample Analysis Type A = Geochemical B = Isotopes C = Microbial D = Cultivation E = Anaerobic Cultivation	Sample Legend A AB ABC ABCD ABCDE AC ACD B C CDE CD
---	---	---

Log of Monitoring Well: GH_MW-GHC-1D



Project Name/No: Greenhills Ops Elkford BC/577-016.04

Drilling Company: JR Drilling

Client: Teck Coal Ltd.

Drilling Method: Dual air rotary

Date Drilled: November 20, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 1 of 2

SUBSURFACE PROFILE				SAMPLE				Backfill details	
Depth m	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL
							ppm		%
0		Ground Surface	1610.00						
0		TOPSOIL Black, dry, loose, organic soil	0.00						
1		TILL Sandy (fine, medium and coarse grain) TILL, some gravel (fine and medium grain, sub-angular), brown, dry, loose, well graded	1608.78						
1.22			1.22						
2		Silty TILL, dark brown, wet, dense							
2.13		Water table at 2.13 m	1607.87						
2.13			2.13						
3									
3.66		Gravelly (fine to medium grain, sub-angular) TILL, dark brown, wet, loose to medium dense, well graded. Silty lenses present throughout. Between 4.57 m and 7.62 m, moderate water yield.	1606.34						
3.66			3.66						
5									
8.53		Silty TILL, some gravels (fine to medium grain, sub-angular), dark brown, wet, dense to very dense.	1601.47						
8.53			8.53						

Well location: 5,547,207 N, 654,052 E	Well casing diameter: 2"	Depth of well (TOC): 21.36 m
Depth to water level (TOC): 8.639 m	Well casing material: Sch. 80 PVC	Well Elevation (TOC): 1610.8 m
Date of water level: 25 November, 2014	Well screen slot size: 010	Ground Elevation: 1610 m
Borehole diameter: 0.15 m	Well screen interval (bgs): 18.31 m - 21.36 m	

Log of Monitoring Well: GH_MW-GHC-1D



Project Name/No: Greenhills Ops Elkford BC/577-016.04

Drilling Company: JR Drilling

Client: Teck Coal Ltd.

Drilling Method: Dual air rotary

Date Drilled: November 20, 2014

Logged by: RM

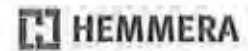
Site Location: Greenhills Operations, BC

Sheet: 2 of 2

SUBSURFACE PROFILE			SAMPLE					Backfill details			
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL		
							ppm			%	
38											
39	12										
40											
41											
42											
43	13										
44											
45											
46	14										
47											
48			1095.37 14.53								
49	15	BEDROCK Quartzitic Sandstone. Light grey, moderately strong, moderately fractured, weathered									
50											
51											
52	16		1503.05 16.15								
53		Sandstone, competent, very strong, small and uniform bedrock cuttings									
54											
55											
56	17										
57											
58											
59	18										
60											
61											
62	19	Between 18.9 m - 20.4 m, major fracture zone, high water yield, oxidation present, nonuniform bedrock cuttings	1591.10 18.00								
63											
64											
65											
66	20										
67											
68											
69	21	Between 21.0 m - 21.7 m, major fracture zone, moderate water yield, nonuniform bedrock cuttings	1588.97 21.05								
70											
71											
72	22										
73											
74											
75	23										
76			1588.84 23.16								
77		End of Log									

Well location: 5,547,207 N, 654,052 E	Well casing diameter: 2"	Depth of well (TOC): 21.36 m
Depth to water level (TOC): 8.639 m	Well casing material: Sch. 80 PVC	Well Elevation (TOC): 1610.8 m
Date of water level: 25 November, 2014	Well screen slot size: 010	Ground Elevation: 1610 m
Borehole diameter: 0.15 m	Well screen interval (bgs): 18.31 m - 21.36 m	

Log of Monitoring Well: GH_MW-GHC-1S



Project Name/No: Greenhills Ops Elkford BC/577-016.04

Drilling Company: JR Drilling

Client: Teck Coal Ltd.

Drilling Method: Dual air rotary

Date Drilled: November 18, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 1 of 2

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL
							ppm		%
-3									
-2									
-1									
0		Ground Surface	1610.00						
0		TOPSOIL Black, dry, loose, organic soil	0.00						
1		TILL Sandy (fine, medium and coarse grain) TILL, some gravel (fine and medium grain, sub-angular), brown, dry, loose, well graded							
2									
3									
4		Silty TILL, dark brown, wet, dense	1608.78						
5			1.22						
6									
7		Water table at 2.13 m	1607.87						
8			2.13						
9									
10									
11									
12		Gravelly (fine to medium grain, sub-angular) TILL, dark brown, wet, loose to medium dense, well graded. Silty lenses present throughout. Between 4.57 m and 7.62 m, moderate water yield.	1606.34						
13			3.66						
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									

Well location: 5,547,205 N, 654,050 E	Well casing diameter: 2"	Depth of well (TOC): 7.63 m
Depth to water level (TOC): 2.976 m	Well casing material: Sch. 80 PVC	Well Elevation (TOC): 1610.8 m
Date of water level: 25 November, 2014	Well screen slot size: 010	Ground Elevation: 1610 m
Borehole diameter: 0.17 m	Well screen interval (bgs): 4.58 m - 7.63 m	

Log of Monitoring Well: GH_MW-GHC-1S



Project Name/No: Greenhills Ops Elkford BC/577-016.04

Drilling Company: JR Drilling

Client: Teck Coal Ltd.

Drilling Method: Dual air rotary

Date Drilled: November 18, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 2 of 2

SUBSURFACE PROFILE			SAMPLE					Backfill details				
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL			
							ppm		%	0	250	500
24		Silty TILL, some gravels (fine to medium grain, sub-angular), dark brown, wet, dense to very dense.	1601.47 8.53									
25												
26				8								
27												
28												
29				9								
30												
31												
32												
33				10								
34												
35												
36				11								
37												
38												
39	12											
40												
41												
42	13											
43												
44												
45	14											
46												
47		Bedrock encountered at 14.6 m	1595.67 14.35									
48		End of Log	1595.37 14.63									
49												

Well location: 5,547,205 N, 654,050 E	Well casing diameter: 2"	Depth of well (TOC): 7.63 m
Depth to water level (TOC): 2.976 m	Well casing material: Sch. 80 PVC	Well Elevation (TOC): 1610.8 m
Date of water level: 25 November, 2014	Well screen slot size: 010	Ground Elevation: 1610 m
Borehole diameter: 0.17 m	Well screen interval (bgs): 4.58 m - 7.63 m	

Log of Monitoring Well: GH_MW-TD



Project Name/No: Greenhills Ops Elkford BC/577-016.04

Drilling Company: JR Drilling

Client: Teck Coal Ltd.

Drilling Method: Dual air rotary

Date Drilled: November 21, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 1 of 3

SUBSURFACE PROFILE				SAMPLE					Backfill details			
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour			LEL		
							0	250		500	0	50
0		Ground Surface	1600.00									
0		TOPSOIL Black, dry, loose, organic soil	0.00									
1		TILL Sand, gravelly (medium to coarse grain, sub-rounded), some lenses of sand and silt, moist, dense, brown										
2		Lots of broken rock fragments										
2.13		Below 2.13 m becomes dry.	1597.87 2.13									
3.66		Below 3.66 m becomes medium dense	1596.34 3.66									
4.6		Below 4.6 m moist and dense	1595.43 4.57									
4.9		Below 4.9 m dry, very dense										
5.5		Below 5.5 m, becomes more silty, more dense	1594.61 5.49									
7.32		Below 7.3 m, siltstone clasts, very dry, very dense	1592.68 7.32									

Well location: 5,546,536 N, 652,694 E	Well casing diameter: 2"	Depth of well (TOC): 34.44 m
Depth to water level (TOC): Flowing artesian well	Well casing material: Sch. 80 PVC	Well Elevation (TOC): 1600.75 m asl
Date of water level: N/A	Well screen slot size: 010	Ground Elevation: 1600 m asl
Borehole diameter: 0.17 m	Well screen interval (bgs): 31.39 - 34.44 m	

Log of Monitoring Well: GH_MW-TD



Project Name/No: Greenhills Ops Elkford BC/577-016.04

Drilling Company: JR Drilling

Client: Teck Coal Ltd.

Drilling Method: Dual air rotary

Date Drilled: November 21, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 2 of 3

SUBSURFACE PROFILE			SAMPLE					Backfill details			
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL		
							0		250	500	0
43	13	Below 14.6 m medium dense, increasing sand content	1585.37								Bentonite
44			14.63								
45											
46	14	Below 16.2 m very dense, dry, siltstone clasts (angular to sub-angular), trace sandstone clasts	1583.65								Bentonite
47			16.15								
48											
49	15	Below 18.3 m Silt and Sand (fine), some siltstone clasts, dark brown	1581.71								Bentonite
50			18.20								
51											
52	16	Below 19.2 m medium dense	1580.80								Bentonite
53			19.20								
54											
55	17	Below 20.1 m very dense	1579.88								Bentonite
56			20.12								
57											
58	18										Bentonite
59											
60											
61	19										Bentonite
62											
63											
64	20										Bentonite
65											
66											
67	21										Bentonite
68											
69											
70	22										Bentonite
71											
72											
73	23										Bentonite
74											
75											
76	24										Bentonite
77											
78											
79	25										Bentonite
80											
81											
82	26										Bentonite
83											
84											
85	27										Bentonite
86											
87											

Well location: 5,546,536 N, 652,694 E	Well casing diameter: 2"	Depth of well (TOC): 34.44 m
Depth to water level (TOC): Flowing artesian well	Well casing material: Sch. 80 PVC	Well Elevation (TOC): 1600.75 m asl
Date of water level: N/A	Well screen slot size: 010	Ground Elevation: 1600 m asl
Borehole diameter: 0.17 m	Well screen interval (bgs): 31.39 - 34.44 m	

Log of Monitoring Well: GH_MW-TD



Project Name/No: Greenhills Ops Elkford BC/577-016.04

Drilling Company: JR Drilling

Client: Teck Coal Ltd.

Drilling Method: Dual air rotary

Date Drilled: November 21, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 3 of 3

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm		LEL %
							0 250 500	0 50 100	
88-92	27	Below 27.4 m increasing sand content, decreasing silt content, trace mudstone clasts, light brown, dense, dry	1572.57 27.43						
93-98	28								
99-101	29								
102-104	30	Below 30.2 m sand and silt till with siltstone clast, wet. First water bearing unit.	1569.92 30.18						
105-107	31								
108-110	32	Moderate water yield between 32.3 m and 34.1 m	1567.09 32.31						
111-113	33								
114-116	34								
117-119	35	BEDROCK Siltstone, fresh, competent, very dense, dry.	1664.96 35.05						
120-122	36								
123-125	37								
126-128	38	End of Log	1661.00 38.10						
129-131	39								
132-134	40								

Well location: 5,546,536 N, 652,694 E

Well casing diameter: 2"

Depth of well (TOC): 34.44 m

Depth to water level (TOC): Flowing artesian well Well casing material: Sch. 80 PVC

Well Elevation (TOC): 1600.75 m asl

Date of water level: N/A

Well screen slot size: 010

Ground Elevation: 1600 m asl

Borehole diameter: 0.17 m

Well screen interval (bgs): 31.39 - 34.44 m

Log of Monitoring Well: GH_MW-RLP-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 4 of 14

SUBSURFACE PROFILE			SAMPLE					Backfill details		
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL	
							ppm		%	
							0 250 500	0 50 100		
57										
58										
59	18									
60										
61										
62	19									
63										
64										
65										
66	20									
67										
68										
69	21									
70										
71										
72	22		-22.00 22.00							
73		SILTY SAND and GRAVEL (TILL) SILTY SAND and GRAVEL, coarse grained, gravel fine to coarse (~1cm), sub-angular, saturated								
74		Increasingly clayey, with finer sub-angular gravel from 24-25mbgs								
75		Decreasing gravel/sand with depth, clay/silt from 30- 31 mbgs is more consolidated								
76	23									

Well location: Rail Loop	Well casing diameter: 50.8mm	Depth of well (TOC): -
Depth to water level (TOC): -	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: -	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 82.5-79.5	

Log of Monitoring Well: GH_MW-RLP-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 5 of 14

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL
							ppm		%
							0 250 500	0 50 100	
77									
78									
79		24							
80									
81									
82		25							
83									
84									
85		26							
86									
87									
88									
89		27							
90									
91									
92		28							
93									
94									
95		29							
96									

Well location: Rail Loop	Well casing diameter: 50.8mm	Depth of well (TOC): -
Depth to water level (TOC): -	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: -	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 82.5-79.5	

Log of Monitoring Well: GH_MW-RLP-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 6 of 14

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL
							ppm		%
							0 250 500	0 50 100	
97									
98									
99									
00									
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									
13									
14									
15									
16									

Well location: Rail Loop	Well casing diameter: 50.8mm	Depth of well (TOC): -
Depth to water level (TOC): -	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: -	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 82.5-79.5	

Log of Monitoring Well: GH_MW-RLP-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 7 of 14

SUBSURFACE PROFILE			SAMPLE						Backfill details				
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour			LEL			
							0	250		500	0	50	100
17													
18	36												
19													
20													
21	37												
22													
23													
24													
25	38												
26													
27													
28	39												
29													
30													
31	40												
32													
33													
34													
35	41												
36													

Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm

Well screen interval (bgs): 82.5-79.5

Log of Monitoring Well: GH_MW-RLP-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 8 of 14

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL
							ppm		%
37							0 250 500	0 50 100	
38									
39									
40									
41			-43.00						
42		SAND and GRAVEL (TILL) SAND and GRAVEL, coarse sand, fine to coarse sub-angular gravel, saturated Fine content increases from 46-48 mbgs	43.00						
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									

Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm

Well screen interval (bgs): 82.5-79.5

Log of Monitoring Well: GH_MW-RLP-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 9 of 14

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL
							ppm		%
							0 250 500	0 50 100	
57			-48.00						
58		SILTY CLAY (TILL) SILTY CLAY with trace sub-angular medium gravel, dark brown, competent, high plasticity, saturated	48.00						
59									
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									
76									

Well location: Rail Loop	Well casing diameter: 50.8mm	Depth of well (TOC): -
Depth to water level (TOC): -	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: -	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 82.5-79.5	

Log of Monitoring Well: GH_MW-RLP-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 10 of 14

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL
							ppm		%
77	54						0 250 500	0 50 100	
78									
79									
80									
81	55								
82									
83									
84	56								
85									
86									
87	57	GRAVEL (TILL) GRAVEL, fine to coarse, sub-angular, with fine to coarse sand Increased fine content with depth	-57.00 57.00						
88									
89									
90	58								
91									
92									
93									
94	59								
95									
96									

Well location: Rail Loop	Well casing diameter: 50.8mm	Depth of well (TOC): -
Depth to water level (TOC): -	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: -	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 82.5-79.5	

Log of Monitoring Well: GH_MW-RLP-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 11 of 14

SUBSURFACE PROFILE			SAMPLE					Backfill details				
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL			
							0		250	500	0	50
97	60											
98												
99												
200	61											
201												
202												
203												
204	62	CLAY (TILL) CLAY, with trace fine to coarse sub-angular gravel (~1-2cm), competent and very firm, high plasticity, moist/wet	-62.00 62.00									
205		High difficulty drilling through this section										
206												
207	63											
208												
209												
210	64											
211												
212												
213	65											
214												
215												
216												
			-66.00 66.00									

Well location: Rail Loop	Well casing diameter: 50.8mm	Depth of well (TOC): -
Depth to water level (TOC): -	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: -	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 82.5-79.5	

Log of Monitoring Well: GH_MW-RLP-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 12 of 14

SUBSURFACE PROFILE			SAMPLE					Backfill details				
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL			
							ppm		%	%		
							0	250	500	0	50	100
217	66	SAND and GRAVEL (TILL) SAND and GRAVEL, fine to coarse grained sand, fine to coarse (~1-2cm) sub-angular gravel, saturated										
218												
219												
220	67											
221												
222												
223	68											
224												
225												
226	69											
227												
228												
229												
230	70											
231												
232												
233	71											
234												
235												
236	72											

Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm

Well screen interval (bgs): 82.5-79.5

Log of Monitoring Well: GH_MW-RLP-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 13 of 14

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL
							ppm		%
							0 250 500	0 50 100	
237	[Patterned]								[Backfill patterns]
238									
239									
240		73							
241									
242									
243		74							
244									
245									
246		75							
247									
248									
249	76								
250									
251									
252	77								
253									
254									
255									
256	78								

Well location: Rail Loop	Well casing diameter: 50.8mm	Depth of well (TOC): -
Depth to water level (TOC): -	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: -	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 82.5-79.5	

Log of Monitoring Well: GH_MW-RLP-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 14 of 14

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL
							ppm		%
							0 250 500	0 50 100	
257	[Symbol: Dotted pattern]	Clayey from 79-81 mbgs							
258									
259			79						
260									
261									
262			80						
263									
264									
265									
266			81						
267									
268									
269	82	Increased sand content from 82-83.5 mbgs							
270									
271									
272	83								
273									
274		End of Log	-83.50 83.50						
275									
276	84								

Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm

Well screen interval (bgs): 82.5-79.5



Greenhills Well 9
Report 1 - Detailed Well Record

GH_POTW09

<p>Well Tag Number: 85223</p> <p>Owner: ELK VALLEY COAL - GREENHILLS OPERATION</p> <p>Address:</p> <p>Area: GREENHILLS</p> <p>WELL LOCATION: Land District District Lot: 4588 Plan: 11279 Lot: 1 Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 83): Well: 5</p> <p>Class of Well: Subclass of Well: Orientation of Well: Status of Well: Well Use: Observation Well Number: Observation Well Status: Construction Method: Diameter: 10.75 inches Casing drive shoe: Well Depth: 117 feet Elevation: feet (ASL) Final Casing Stick Up: inches Well Cap Type: Bedrock Depth: 117 feet Lithology Info Flag: Y File Info Flag: N Sieve Info Flag: N Screen Info Flag: Y</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 1992-06-29 00:00:00</p> <p>Driller: Well Identification Plate Number: 15802 Plate Attached By: KIMBERLY RASMUSSEN Where Plate Attached: WELL CASING</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: (Driller's Estimate) Development Method: Pump Test Info Flag: N Artesian Flow: UNKNOWN YIELD Artesian Pressure (ft): Static Level:</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM): N</p> <p>Water Utility: N Water Supply System Name: GREENHILLS WATER SUPPLY SYSTEM Water Supply System Well Name: WELL 9</p> <p>SURFACE SEAL: Flag: Y Material: Method: Depth (ft): 88 feet Thickness (in):</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>																																
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Screen from</th> <th style="width: 20%;">to feet</th> <th style="width: 20%;">Type</th> <th style="width: 20%;">Slot Size</th> </tr> </thead> <tbody> <tr> <td>88</td> <td>119</td> <td></td> <td>.25</td> </tr> <tr> <td>null</td> <td>null</td> <td></td> <td>.12</td> </tr> </tbody> </table>	Screen from	to feet	Type	Slot Size	88	119		.25	null	null		.12	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Casing from</th> <th style="width: 20%;">to feet</th> <th style="width: 20%;">Diameter</th> <th style="width: 20%;">Material</th> <th style="width: 20%;">Drive Shoe</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>88</td> <td>10.75</td> <td>Other</td> <td>null</td> </tr> </tbody> </table>	Casing from	to feet	Diameter	Material	Drive Shoe	0	88	10.75	Other	null										
Screen from	to feet	Type	Slot Size																														
88	119		.25																														
null	null		.12																														
Casing from	to feet	Diameter	Material	Drive Shoe																													
0	88	10.75	Other	null																													
<p>GENERAL REMARKS:</p> <p>LITHOLOGY INFORMATION:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">From 0 to 19.7 Ft.</td> <td style="width: 20%;">GRAVELY CLAY</td> <td style="width: 20%;">0</td> <td style="width: 40%;">nothing entered</td> </tr> <tr> <td>From 19.7 to 21.4 Ft.</td> <td>GRAVELY CLAY</td> <td>0</td> <td>nothing entered</td> </tr> <tr> <td>From 21.4 to 43 Ft.</td> <td>GRAVELY CLAY COLLUVIUM</td> <td>0</td> <td>nothing entered</td> </tr> <tr> <td>From 43 to 65 Ft.</td> <td>SILTY CLAY - LACUSTRINE</td> <td>0</td> <td>nothing entered</td> </tr> <tr> <td>From 65 to 70 Ft.</td> <td>GRAVEL- DIRTY - WATER</td> <td>0</td> <td>nothing entered</td> </tr> <tr> <td>From 70 to 98.43 Ft.</td> <td>CLEANER GRAVEL</td> <td>0</td> <td>nothing entered</td> </tr> <tr> <td>From 98.43 to 118 Ft.</td> <td>GRAVEL SILTY</td> <td>0</td> <td>nothing entered</td> </tr> <tr> <td>From 118.4 to 121.4 Ft.</td> <td>SANDSTONE AND SHALE</td> <td>0</td> <td>nothing entered</td> </tr> </table>		From 0 to 19.7 Ft.	GRAVELY CLAY	0	nothing entered	From 19.7 to 21.4 Ft.	GRAVELY CLAY	0	nothing entered	From 21.4 to 43 Ft.	GRAVELY CLAY COLLUVIUM	0	nothing entered	From 43 to 65 Ft.	SILTY CLAY - LACUSTRINE	0	nothing entered	From 65 to 70 Ft.	GRAVEL- DIRTY - WATER	0	nothing entered	From 70 to 98.43 Ft.	CLEANER GRAVEL	0	nothing entered	From 98.43 to 118 Ft.	GRAVEL SILTY	0	nothing entered	From 118.4 to 121.4 Ft.	SANDSTONE AND SHALE	0	nothing entered
From 0 to 19.7 Ft.	GRAVELY CLAY	0	nothing entered																														
From 19.7 to 21.4 Ft.	GRAVELY CLAY	0	nothing entered																														
From 21.4 to 43 Ft.	GRAVELY CLAY COLLUVIUM	0	nothing entered																														
From 43 to 65 Ft.	SILTY CLAY - LACUSTRINE	0	nothing entered																														
From 65 to 70 Ft.	GRAVEL- DIRTY - WATER	0	nothing entered																														
From 70 to 98.43 Ft.	CLEANER GRAVEL	0	nothing entered																														
From 98.43 to 118 Ft.	GRAVEL SILTY	0	nothing entered																														
From 118.4 to 121.4 Ft.	SANDSTONE AND SHALE	0	nothing entered																														

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Greenhills Well 10
Report 1 - Detailed Well Record

GH_POTW10

<p>Well Tag Number: 85218</p> <p>Owner: ELK VALLEY COAL - GREENHILLS OPERATION</p> <p>Address:</p> <p>Area: GREENHILLS</p> <p>WELL LOCATION: Land District District Lot: 4588 Plan: 11279 Lot: 1 Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 83): Well: 5</p> <p>Class of Well: Subclass of Well: Orientation of Well: Status of Well: Well Use: Observation Well Number: Observation Well Status: Construction Method: Diameter: 8" inches Casing drive shoe: Well Depth: 176 feet Elevation: feet (ASL) Final Casing Stick Up: inches Well Cap Type: Bedrock Depth: feet Lithology Info Flag: Y File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2001-06-22 00:00:00</p> <p>Driller: Well Identification Plate Number: 15805 Plate Attached By: Where Plate Attached:</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 50 (Driller's Estimate) Development Method: Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level:</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM): N</p> <p>Water Utility: N Water Supply System Name: GREENHILLS WATER SUPPLY SYSTEM Water Supply System Well Name: WELL 10</p> <p>SURFACE SEAL: Flag: N Material: Method: Depth (ft): Thickness (in):</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Screen from</th> <th style="width: 20%;">to feet</th> <th style="width: 20%;">Type</th> <th style="width: 40%;">Slot Size</th> </tr> </thead> <tbody> <tr> <td>Casing from</td> <td>to feet</td> <td>Diameter</td> <td>Material</td> </tr> <tr> <td>0</td> <td>176</td> <td>null</td> <td>Other</td> </tr> </tbody> </table>	Screen from	to feet	Type	Slot Size	Casing from	to feet	Diameter	Material	0	176	null	Other	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Screen from</th> <th style="width: 20%;">to feet</th> <th style="width: 20%;">Type</th> <th style="width: 40%;">Slot Size</th> </tr> </thead> <tbody> <tr> <td>Casing from</td> <td>to feet</td> <td>Diameter</td> <td>Material</td> </tr> <tr> <td>0</td> <td>176</td> <td>null</td> <td>Other</td> </tr> </tbody> </table>	Screen from	to feet	Type	Slot Size	Casing from	to feet	Diameter	Material	0	176	null	Other
Screen from	to feet	Type	Slot Size																						
Casing from	to feet	Diameter	Material																						
0	176	null	Other																						
Screen from	to feet	Type	Slot Size																						
Casing from	to feet	Diameter	Material																						
0	176	null	Other																						
<p>GENERAL REMARKS: WATER QUALITY GUARANTEED BY CONTRACTOR</p> <p>LITHOLOGY INFORMATION: From 0 to 58 Ft. CLAY 0 nothing entered From 58 to 78 Ft. GRAVEL AND BOULDERS 0 nothing entered From 78 to 110 Ft. CLAY AND GRAVEL 0 nothing entered From 110 to 176 Ft. COURSE GRAVEL 0 nothing entered</p>																									

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Information Disclaimer

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Greenhills Well 15 Report 1 - Detailed Well Record

GH_POTW15

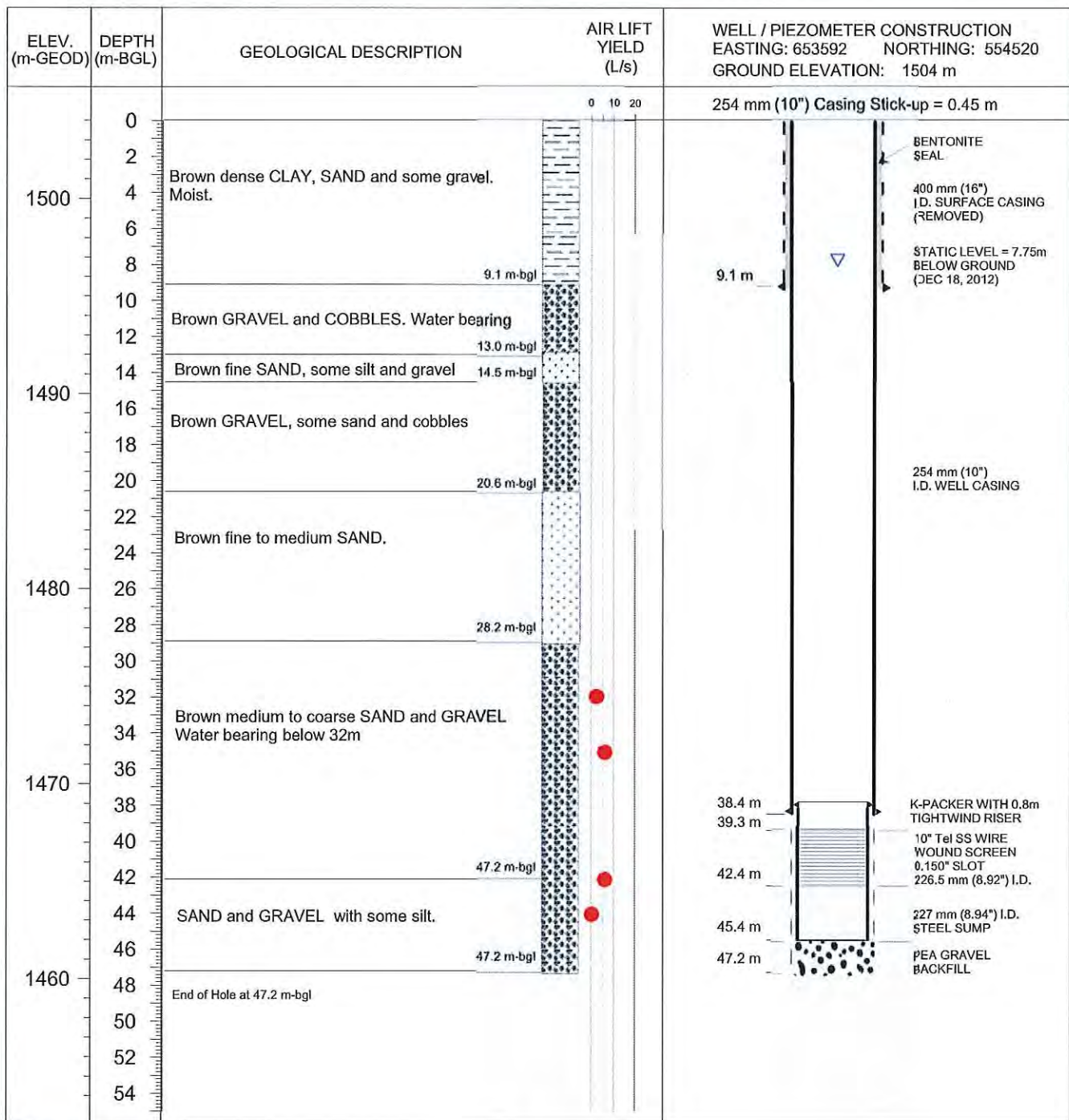
<p>Well Tag Number: 85221</p> <p>Owner: ELK VALLEY COAL - GREENHILLS OPERATION</p> <p>Address:</p> <p>Area:</p> <p>WELL LOCATION: Land District District Lot: 4588 Plan: 11279 Lot: 1 Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 83): Well: 7</p> <p>Class of Well: Subclass of Well: Orientation of Well: Status of Well: Well Use: Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: Well Depth: 144 feet Elevation: feet (ASL) Final Casing Stick Up: inches Well Cap Type: Bedrock Depth: feet Lithology Info Flag: Y File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2001-11-01 00:00:00</p> <p>Driller: Well Identification Plate Number: 15803 Plate Attached By: KIMBERLY RASMUSSEN Where Plate Attached: WELL CASING</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 100 (Driller's Estimate) Development Method: Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 11 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM): N</p> <p>Water Utility: N Water Supply System Name: GREENHILLS WATER SUPPLY SYSTEM Water Supply System Well Name: WELL 15</p> <p>SURFACE SEAL: Flag: N Material: Method: Depth (ft): Thickness (in):</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Screen from</th> <th style="width: 20%;">to feet</th> <th style="width: 20%;">Type</th> <th style="width: 40%;">Slot Size</th> </tr> </thead> <tbody> <tr> <td>Casing from</td> <td>to feet</td> <td>Diameter</td> <td>Material</td> </tr> <tr> <td>0</td> <td>144</td> <td>null</td> <td>Other</td> </tr> </tbody> </table>	Screen from	to feet	Type	Slot Size	Casing from	to feet	Diameter	Material	0	144	null	Other	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Screen from</th> <th style="width: 20%;">to feet</th> <th style="width: 20%;">Type</th> <th style="width: 40%;">Slot Size</th> </tr> </thead> <tbody> <tr> <td>Casing from</td> <td>to feet</td> <td>Diameter</td> <td>Material</td> </tr> <tr> <td>0</td> <td>144</td> <td>null</td> <td>Other</td> </tr> </tbody> </table>	Screen from	to feet	Type	Slot Size	Casing from	to feet	Diameter	Material	0	144	null	Other
Screen from	to feet	Type	Slot Size																						
Casing from	to feet	Diameter	Material																						
0	144	null	Other																						
Screen from	to feet	Type	Slot Size																						
Casing from	to feet	Diameter	Material																						
0	144	null	Other																						
<p>GENERAL REMARKS: WATER QUALITY GUARANTEED BY CONTRACTOR</p> <p>LITHOLOGY INFORMATION: From 0 to 7 Ft. FILL 0 nothing entered From 7 to 15 Ft. CLAY AND GRAVEL 0 nothing entered From 15 to 125 Ft. SILTY CLAY 0 nothing entered From 125 to 144 Ft. COARSE GRAVEL AND COBBLE 0 nothing entered</p>																									

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H:\Project\3148\Well_Log\Well17_Greenhill.corr



LEGEND

- Clay
- Gravel
- Sand

Note:
Coordinates and elevation not surveyed

DRILLING CONTRACTOR: J.R. Drilling Ltd.
 DRILLING METHOD: DUAL ROTARY
 START DATE: 19-Nov-12
 END DATE: 21-Nov-12
 HYDROGEOLOGY: Eric Pastora

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT

**KERR WOOD LEIDAL ASSOCIATES LTD.
 TECK COAL LTD. - GREENHILLS OPERATIONS
 GROUNDWATER SUPPLY ASSESSMENT**



PITEAU ASSOCIATES
 GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS

WELL 17 LOG

BY	DATE
EP	JAN 13
APPROVED	FIG.
ATH	2

DATA ENTRY: JFG

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ_CALGARY.GDT 7/30/15

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-01

SHEET 1 OF 3

LOCATION: See Location Plan

BORING DATE: September 21, 2012

DATUM: UTM Zone 11
(Nad 83)

N: 5554750 E: 648019

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		nat V. + rem V.		Q - U		D			Wp
0		Ground Surface		1357.00												Stick-up = 1.05 m	
1		(SP) SAND, coarse-grained, sub-angular, poorly-graded, dark grey		0.00													
2					1	GRAB											
3																	
4		(GP) CLAYEY GRAVEL, coarse-grained, poorly-graded, sub-rounded clay, brown, firm		1353.00													
5	Barber Rig - Air Rotary Tervis			4.00												Bentonite Pellets	
6																	
7					2	GRAB											
8																	
9		(SP) SAND, coarse-grained, poorly-graded, trace gravel, sub-angular, trace clay, dark grey		1348.00													
10				9.00													
		CONTINUED NEXT PAGE															

DEPTH SCALE
1 : 50



LOGGED: TG
CHECKED: JW

DATA ENTRY: JFG

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-01

SHEET 2 OF 3

LOCATION: See Location Plan

BORING DATE: September 21, 2012

DATUM: UTM Zone 11
(Nad 83)

N: 5554750 E: 648019

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20 40 60 80		nat V. rem V.		+ Q - U -		10 ⁶ 10 ⁵ 10 ⁴ 10 ³			Wp — W — Wl
10		(SP) SAND, coarse-grained, poorly-graded, trace gravel, sub-angular, trace clay, dark grey (continued)	[Pattern]														
11																	
12																	
13																	
14																	
15	Barber Rig - Air Rotary Terzita	(SC) CLAYEY SAND, medium-grained, poorly-graded, dark grey	[Pattern]	1342.00													
16				15.00													
17																	
18																	
19		(SP) SAND, coarse-grained, sub-angular, poorly-graded, dark grey	[Pattern]	1338.00													
20				19.00													

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ, CALGARY.GDT, 7/30/15

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 50



LOGGED: TG
CHECKED: JW

DATA ENTRY: JFG

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-01

SHEET 3 OF 3

LOCATION: See Location Plan

BORING DATE: September 21, 2012

DATUM: UTM Zone 11
(Nad 83)

N: 5554750 E: 648019

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT							
								Cu, kPa		nat V. rem V.		+ Q - U -		Wp				W	
20	Borer Rig - Air Rotary Tervita	(SP) SAND, coarse-grained, sub-angular, poorly-graded, dark grey (continued)																	
21						6	GRAB												Bentonite Pellets
22				— Bedrock at 22.6 m		7	GRAB												
23		End of MONITORING WELL.		1334.46	22.60														
24		<p>NOTES: Hit BEDROCK at 22.6 m. Standpipe installed to 18.6 m. Groundwater level measured at 17.5 mGL on September 23, 2012.</p>																	
25																			
26																			
27																			
28																			
29																			
30																			

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ / CALGARY.GDT 7/30/15

DEPTH SCALE
1 : 50



LOGGED: TG
CHECKED: JW



Client
Teck Coal Limited

Borehole No. : GH_BH-MC-1

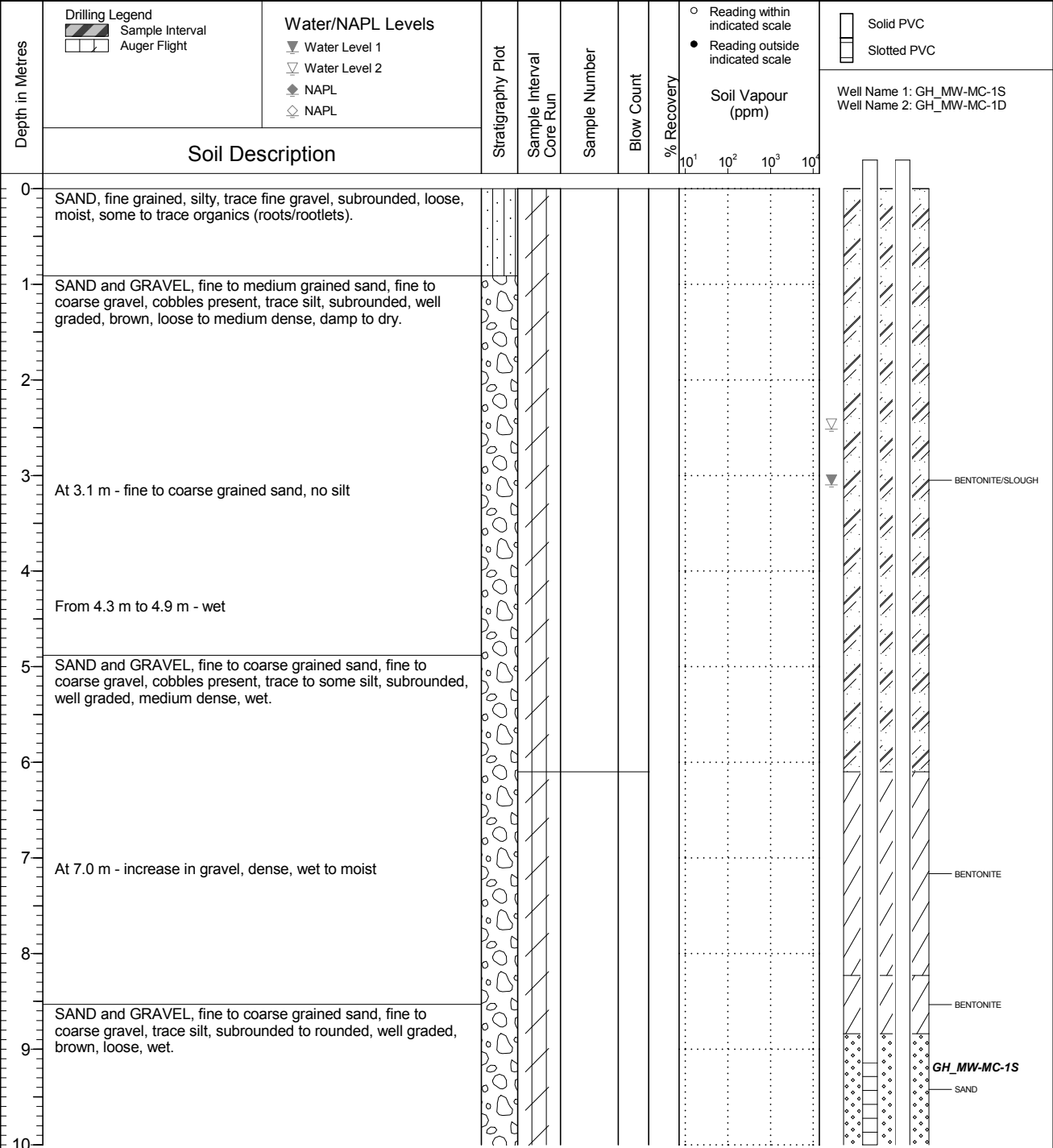
Location
Greenhills Operations Mickelson Pond

PAGE 1 OF 5

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2018 12 06
Ground Surface Elev. (m) 1313.098
Top of Casing Elev. (m) 1314.011 1313.988
Northing: 5553565.222 Easting: 647979.304

Project Number: 658004
Borehole Logged By: MCA
Date Drilled: 2018 11 15
Log Typed By: VL



NOTES
Water level 1 and first top of casing elevation is for GH_MW-MC-1S.
Water level 2 and second top of casing elevation is for GH_MW-MC-1D.



Client
Teck Coal Limited

Borehole No. : GH_BH-MC-1

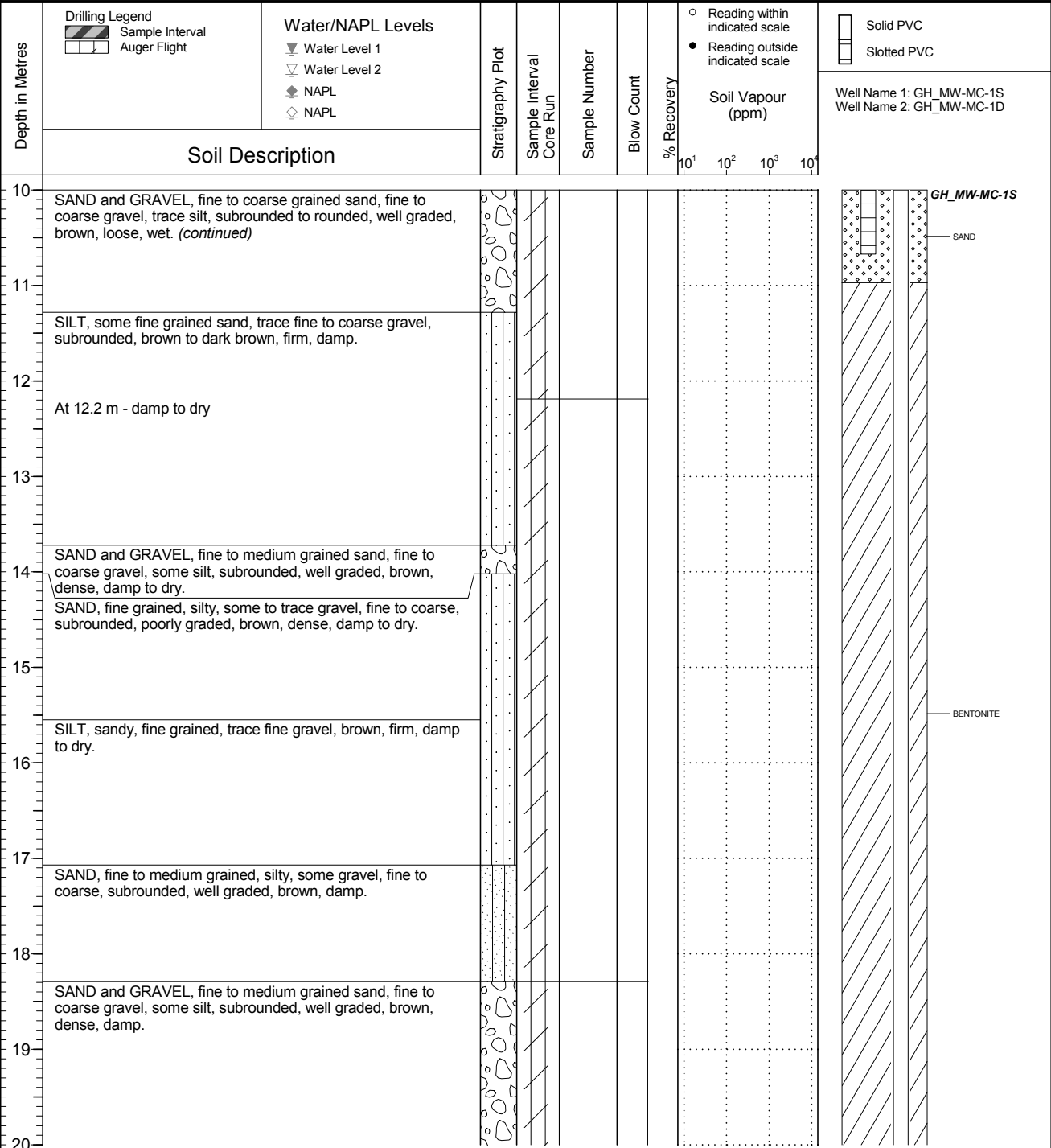
Location
Greenhills Operations Mickelson Pond

PAGE 2 OF 5

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2018 12 06
Ground Surface Elev. (m) 1313.098
Top of Casing Elev. (m) 1314.011 1313.988
Northing: 5553565.222 Easting: 647979.304

Project Number: 658004
Borehole Logged By: MCA
Date Drilled: 2018 11 15
Log Typed By: VL



NOTES
Water level 1 and first top of casing elevation is for GH_MW-MC-1S.
Water level 2 and second top of casing elevation is for GH_MW-MC-1D.



Client
Teck Coal Limited

Borehole No. : GH_BH-MC-1

Location
Greenhills Operations Mickelson Pond

PAGE 3 OF 5

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2018 12 06
Ground Surface Elev. (m) 1313.098
Top of Casing Elev. (m) 1314.011 1313.988
Northing: 5553565.222 Easting: 647979.304

Project Number: 658004
Borehole Logged By: MCA
Date Drilled: 2018 11 15
Log Typed By: VL

Depth in Metres	Soil Description	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Soil Vapour (ppm)				○ Reading within indicated scale ● Reading outside indicated scale Solid PVC Slotted PVC		
							10 ¹	10 ²	10 ³	10 ⁴			
20	SAND and GRAVEL, fine to medium grained sand, fine to coarse gravel, some silt, subrounded, well graded, brown, dense, damp. (continued)												
21													
22													
23	SAND and GRAVEL, fine to coarse grained sand, fine to coarse gravel, trace silt, well graded, brown, medium dense, moist. At 22.6 m - some silt to silty, loose, wet												
24													
25													
26													
27	SAND and GRAVEL, fine to coarse grained sand, fine to coarse gravel, some to trace silt, subrounded to subangular, well graded, loose, wet. At 27.7 m - some silt												
28													
29	At 29.0 m - trace silt												
30													

NOTES

Water level 1 and first top of casing elevation is for GH_MW-MC-1S.
Water level 2 and second top of casing elevation is for GH_MW-MC-1D.



Client
Teck Coal Limited

Borehole No. : GH_BH-MC-1

Location
Greenhills Operations Mickelson Pond

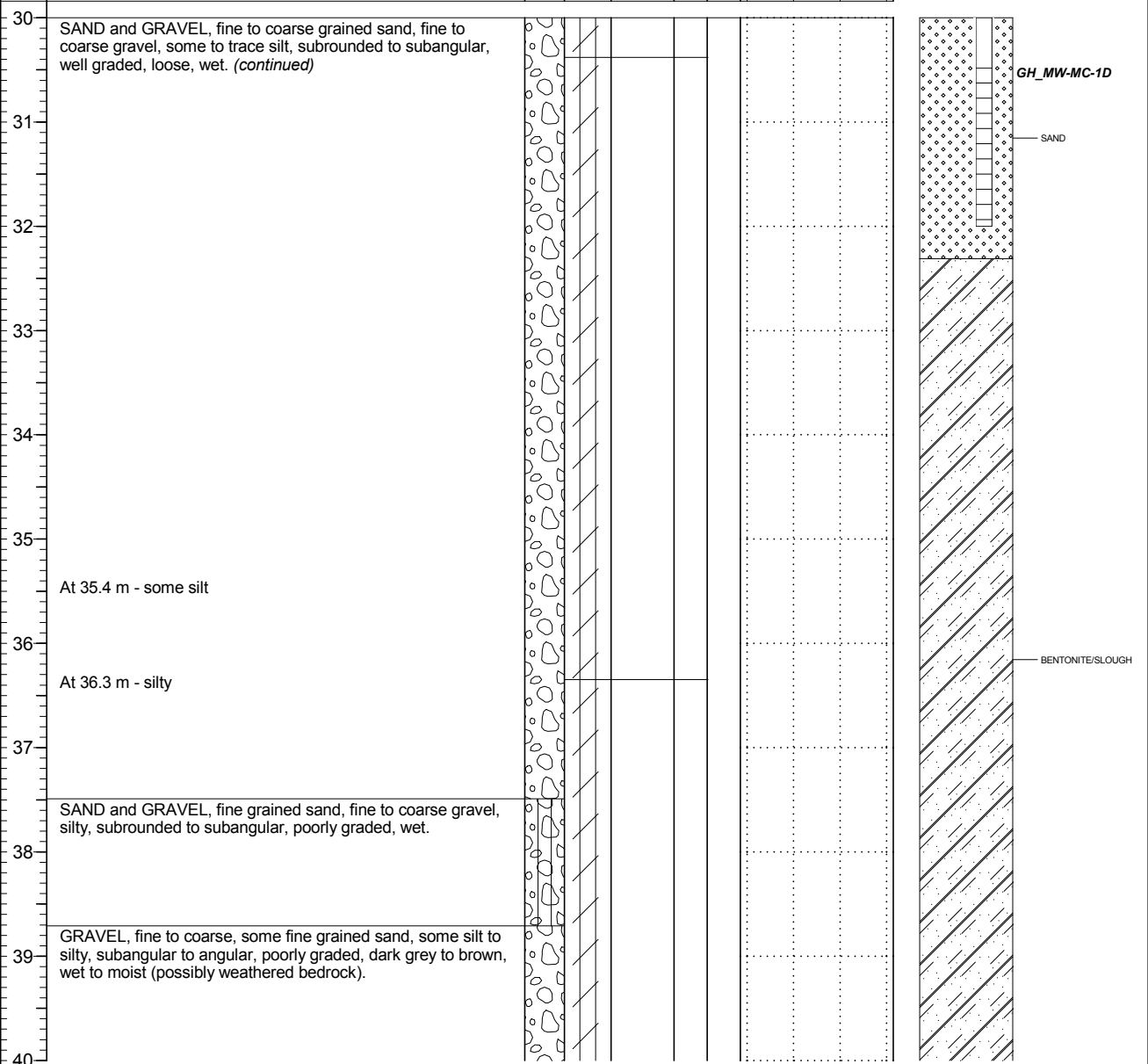
PAGE 4 OF 5

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2018 12 06
Ground Surface Elev. (m) 1313.098
Top of Casing Elev. (m) 1314.011 1313.988
Northing: 5553565.222 Easting: 647979.304

Project Number: 658004
Borehole Logged By: MCA
Date Drilled: 2018 11 15
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Soil Vapour (ppm) 10^1 10^2 10^3 10^4	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description	Well Name 1: GH_MW-MC-1S Well Name 2: GH_MW-MC-1D								



NOTES

Water level 1 and first top of casing elevation is for GH_MW-MC-1S.
Water level 2 and second top of casing elevation is for GH_MW-MC-1D.



Client
Teck Coal Limited

Borehole No. : GH_BH-MC-1

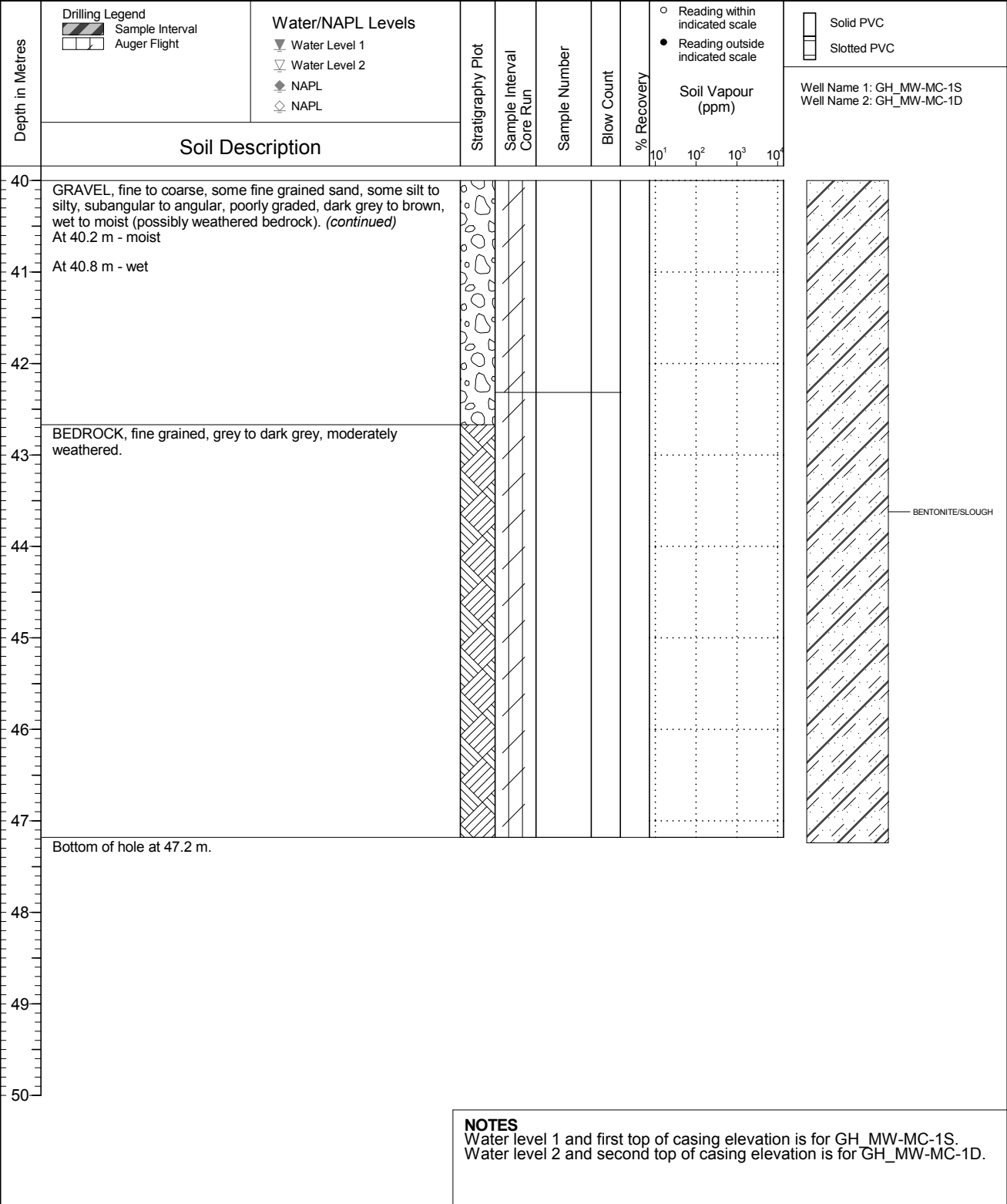
Location
Greenhills Operations Mickelson Pond

PAGE 5 OF 5

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2018 12 06
Ground Surface Elev. (m) 1313.098
Top of Casing Elev. (m) 1314.011 1313.988
Northing: 5553565.222 Easting: 647979.304

Project Number: 658004
Borehole Logged By: MCA
Date Drilled: 2018 11 15
Log Typed By: VL



NOTES
Water level 1 and first top of casing elevation is for GH_MW-MC-1S.
Water level 2 and second top of casing elevation is for GH_MW-MC-1D.



Client
Teck Coal Limited

Borehole No. : GH_BH-MC-2

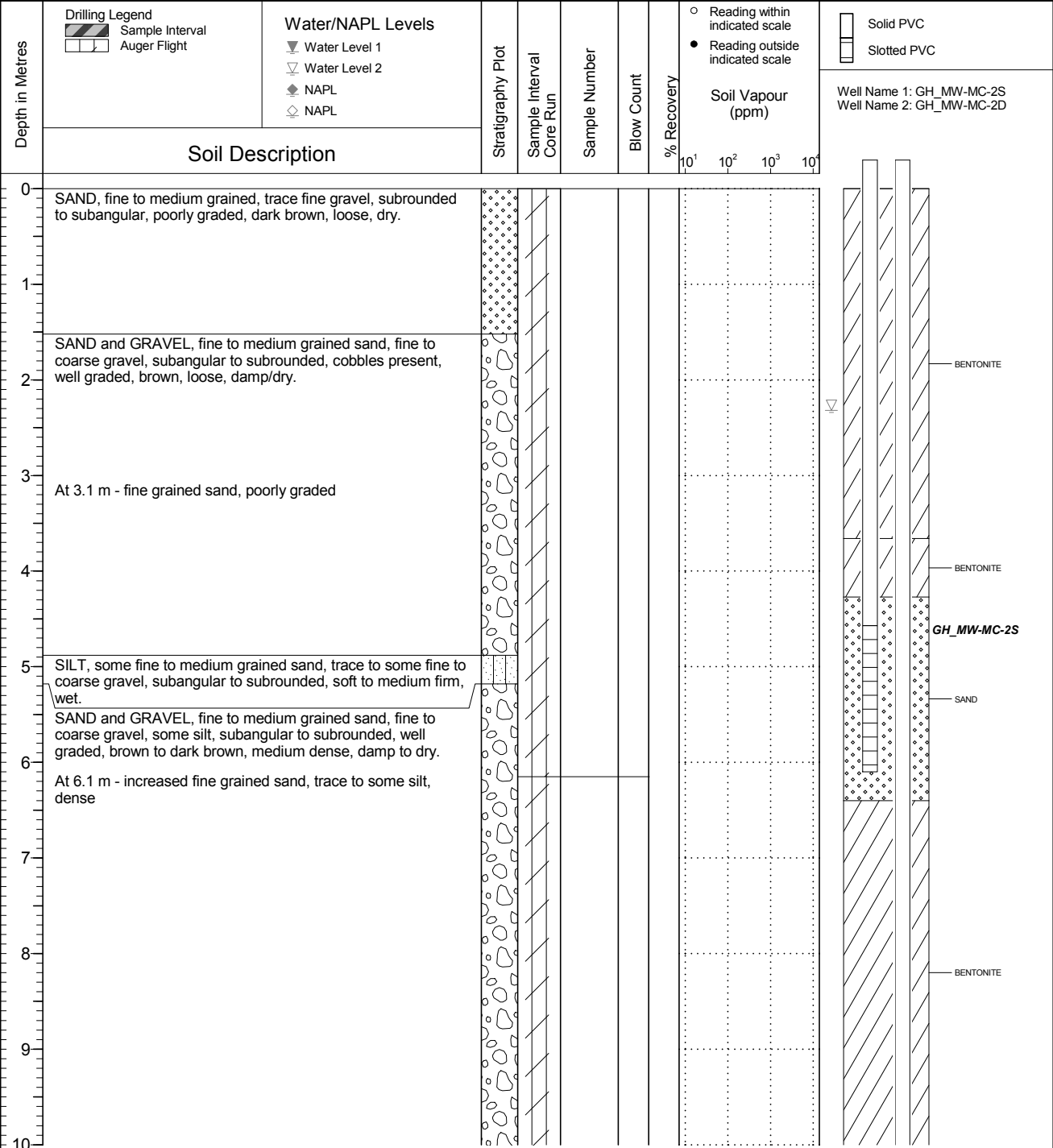
Location
Greenhills Operations Mickelson Pond

PAGE 1 OF 2

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2018 12 06
Ground Surface Elev. (m) 1314.150
Top of Casing Elev. (m) 1315.115 1315.132
Northing: 5553498.261 Easting: 648210.667

Project Number: 658004
Borehole Logged By: MCA
Date Drilled: 2018 11 14
Log Typed By: VL



NOTES
Water level 1 and first top of casing elevation is for GH_MW-MC-2S.
Water level 2 and second top of casing elevation is for GH_MW-MC-2D.
GH_MW-MC-2S monitored 2018 11 18.



Client
Teck Coal Limited

Borehole No. : GH_BH-MC-2

Location
Greenhills Operations Mickelson Pond

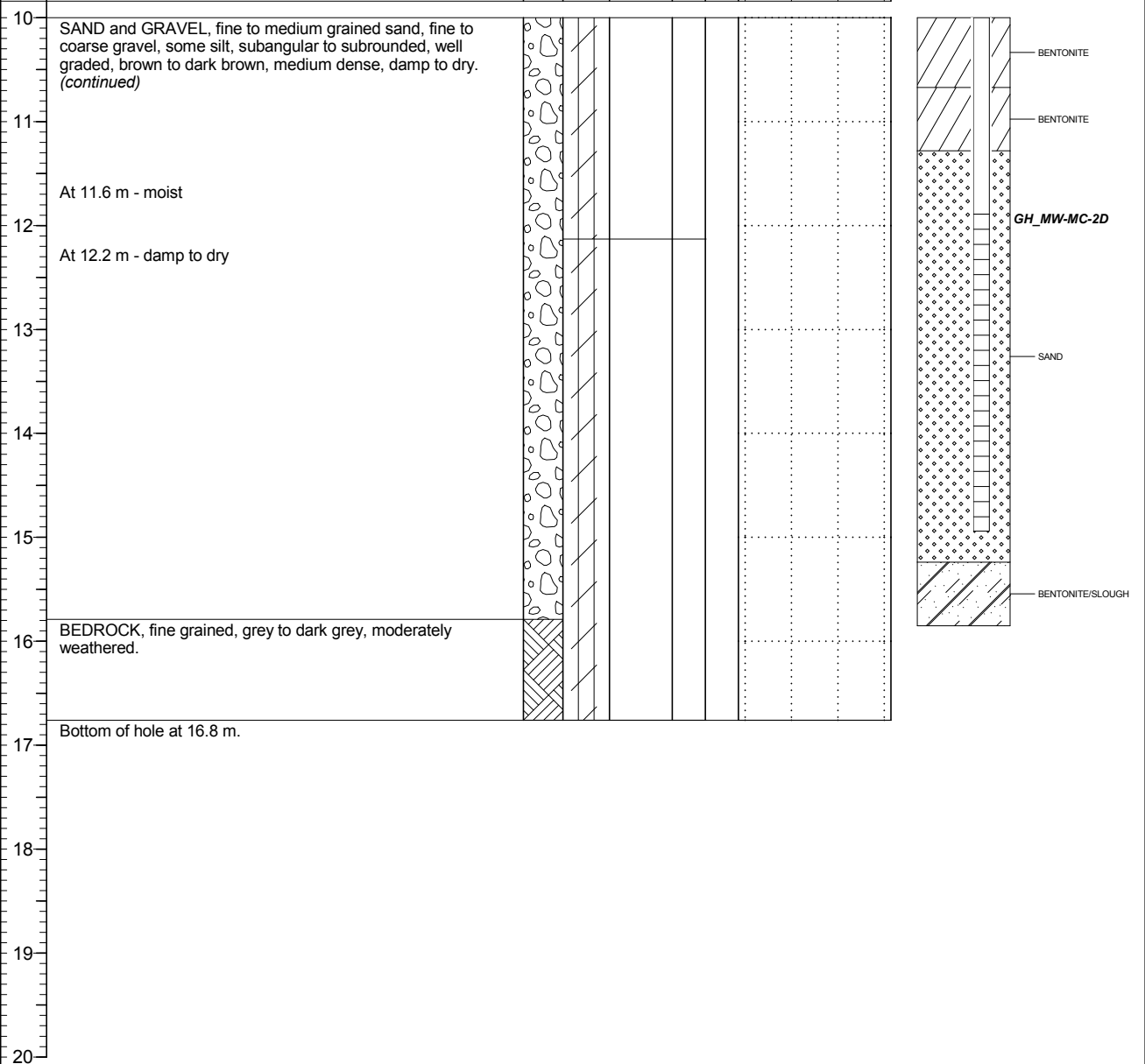
PAGE 2 OF 2

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2018 12 06
Ground Surface Elev. (m) 1314.150
Top of Casing Elev. (m) 1315.115 1315.132
Northing: 5553498.261 Easting: 648210.667

Project Number: 658004
Borehole Logged By: MCA
Date Drilled: 2018 11 14
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	



NOTES
 Water level 1 and first top of casing elevation is for GH_MW-MC-2S.
 Water level 2 and second top of casing elevation is for GH_MW-MC-2D.
 GH_MW-MC-2S monitored 2018 11 18.

DATA ENTRY: JFG

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-02

SHEET 2 OF 3

LOCATION: See Location Plan

BORING DATE: September 19, 2012

DATUM: UTM Zone 11
(Nad 83)

N: 5552115 E: 648291

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH				WATER CONTENT PERCENT					
							20 40 60 80		nat V. rem V.		10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³		We			W
10		(GW) GRAVEL, coarse-grained, sub-angular, well graded, grey		10.00												
11					4	GRAB										
12		(C) SILTY CLAY, with some fine gravel, brown, cohesive, very soft, w-PL		1208.50 11.60												
13																
14																
15	Barber Rig - Air Rotary Tevita															
16																
17		(SP) SAND, coarse-grained, some fine gravel, angular, poorly-graded, dark grey		1292.80 17.20												
18																
19																
20		(GW) GRAVEL, coarse-grained, sub-angular, well graded, grey		1290.50 19.50												
CONTINUED NEXT PAGE																

BOREHOLE - EXPANDED ADD. LAB. TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 7/30/15

DEPTH SCALE

1 : 50



LOGGED: TG

CHECKED: JW

DATA ENTRY: JFG

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-02

SHEET 3 OF 3

LOCATION: See Location Plan

BORING DATE: September 19, 2012

DATUM: UTM Zone 11
(Nad 83)

N: 5552115 E: 648291

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		nat. V. rem V.		+ Q - U -				Wp	
20		(GW) GRAVEL, coarse-grained, sub-angular, well graded, grey <i>(continued)</i>	[Strata Plot: Gravel]												Bentonite Pellets		
21					7	GRAB									10/20 Sand		
22																	
23		(ML) SILT, some fine gravel, trace coarse gravel, dark grey, non-cohesive, dry	[Strata Plot: Silt]	1287.00 23.00		8	GRAB										
24		(SP) SAND, coarse-grained, some fine gravel, angular, poorly-graded, dark grey	[Strata Plot: Sand]	1286.00 24.00											Slotted Section 10/20 Sand		
25	Baiber Rig - Air Rotary Tevita																
26																	
27						9	GRAB										
28																	
29		— Bedrock at 28.5 m NOTES: Encountered BEDROCK at 28.5 m. Standpipe installed to 29.0 m. Groundwater level measured at 11.0 mGL on September 19, 2012.		1280.50 29.00		10	GRAB								Bentonite Pellets		
30		(SP) SAND, coarse-grained, coarse gravel, bits of bedrock, sub-angular, poorly-graded, light grey End of MONITORING WELL.	[Strata Plot: Sand]														

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 7/30/15

DEPTH SCALE
1 : 50



LOGGED: TG
CHECKED: JW

DATA ENTRY: JFG

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-04

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: September 20, 2012

DATUM: UTM Zone 11
(Nad 83)

N: 5552963 E: 648217

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT						
								20 40 60 80		nat V. rem V. + U -		10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³		W _p W _L W _I				
0		Ground Surface		1304.00												Stick-up = 0.9 m		
1		(SP) GRAVELLY SAND, coarse-grained, fine gravel, sub-angular, poorly-graded, dark grey																
2																		
3																		
4																		
5	Barber Rig - Air Rotary Tervis																	
6																		
7																		
8																		
9		(SM) SILTY SAND, medium to fine-grained, sub-rounded, poorly-graded, brown and dark grey		1295.00														
10				9.00														
10				1294.00														

Bentonite Pellets

24 Sep 2012

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 7/30/15

DEPTH SCALE
1 : 50



LOGGED: TG
CHECKED: JW

DATA ENTRY: JPC

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-04

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: September 20, 2012

DATUM: UTM Zone 11
(Nad 83)

N: 5552963 E: 648217

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, K, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20		40		60				80	
10	Barber Rig - Air Rotary Tensita	(SP) GRAVELLY SAND, coarse-grained, fine gravel, sub-angular, poorly-graded, dark grey	10.00												Bentonite Pellets		
12			3	GRAB												10/20 Sand	
14			1290.00														
14	(SM) SILTY SAND, medium to fine-grained, sub-rounded, poorly-graded, brown and dark grey	14.00															
14		1289.50		4	GRAB												
15	(GW) GRAVEL, fine with coarse, sub-angular to sub-rounded, well graded, grey	14.50													Slotted Section 10/20 Sand		
15		1287.00		5	GRAB												
17	(SP) GRAVELLY SAND, coarse-grained, fine gravel, poorly-graded, sub-angular, dark grey End of MONITORING WELL.	17.20													Bentonite Pellets		
18		<p>NOTES: Standpipe installed to 16.7 m. Groundwater present at 6.0 m on September 24, 2012.</p>															
19																	
20																	

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 7/30/15

DEPTH SCALE

1 : 50



LOGGED: TG

CHECKED: JW

DATA ENTRY: JFG

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-3S

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: September 23, 2012

DATUM: UTM Zone 11 (Nad 83)

N: 5550296 E: 648578

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k_v cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT				
							20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³		
							nat V. + O - ● rem V. ⊕ U - ○				Wp ———— W ———— Wl					
							20	40	60	80	10	20	30	40		
0		Ground Surface		1294.00												
0.00		(SP) SAND, coarse-grained, sub-angular, poorly-graded, dark grey, homogenous, moist														
1																
2																
3																
4																
4.50				1288.50												
4.50		(SP) GRAVELY SAND, coarse-grained, fine gravel, poorly-graded, sub-angular, grey														
5	Barber Rig - Air Rotary Tervita															
6																
7																
8																
9																
10																

Bentonite Pellets

10/20 Sand

23 Sep 2012

Slotted Section
10/20 Sand

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052 - BH LOGS.GPJ, CALGARY.GDT 7/30/15

DEPTH SCALE

1 : 50



LOGGED: TG

CHECKED: JW

DATA ENTRY: JPC

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-3S

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: September 23, 2012

DATUM: LITM Zone 11
(Nad 83)

N: 5550296 E: 648578

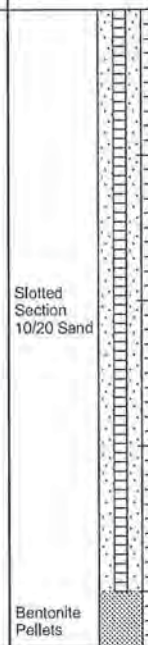
DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER TYPE	BLOWS/0.3m	20	40	60	80	10 ⁻⁹	10 ⁻⁸	10 ⁻⁷		
						SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
						nat V. + O - ● rem V. ⊕ U - ○				Wp ——— W ——— Wl					
						20 40 60 80				10 20 30 40					
10	Barber Rig - Air Rotary Tevita	(SP) GRAVELY SAND, coarse-grained, fine gravel, poorly-graded, sub-angular, grey (continued)		3	GRAS										
11															
12															
13															
14					4	GRAS									
14.4		End of MONITORING WELL.													
14.40		NOTES: Encountered BEDROCK at 14.4 m													
15															
16															
17															
18															
19															
20															

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ, CALGARY.GDT, 7/30/15

DEPTH SCALE
1 : 50



LOGGED: TG
CHECKED: JW



Log of Monitoring Well: GH_MW-UTC-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 2 of 9

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm		LEL %
							0 250 500	0 50 100	
17									
18			-5.50						
19		BEDROCK BEDROCK, gray, dry from 6-7m, sample pulverized from drilling. 5.5-6m is mixed with clay	5.50						
20	6								
21									
22									
23	7	BEDROCK (Shale) BEDROCK (shale), gray/brown, pulverized dust and rock chips from drilling, dry	-7.01						
24		From 30m on, recovered samples are moist-wet from water in cyclone and open hole.	7.01						
25									
26	8								
27									
28									
29									
30	9								
31									
32									
33	10								
34									
35									
36	11								

Well location: Thompson Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 44.846m
Depth to water level (TOC): 32.422m	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 40-43 mbgs	

GH_MW_UTC-A

Log of Monitoring Well: GH_MW-UTC-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 3 of 9

SUBSURFACE PROFILE			SAMPLE						Backfill details		
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour			LEL	
							0	250500		0	50 100
37											
38											
39		12									
40											
41											
42											
43		13									
44											
45											
46		14									
47											
48											
49		15									
50											
51											
52											
53		16									
54											
55											
56	17										

Well location: Thompson Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 44.846m
Depth to water level (TOC): 32.422m	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 40-43 mbgs	

Log of Monitoring Well: GH_MW-UTC-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 4 of 9

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm		LEL %
							0 250 500	0 50 100	
57									
58									
59		18							
60									
61									
62		19							
63									
64									
65									
66		20							
67									
68									
69		21							
70									
71									
72		22							
73									
74									
75		23							
76									

Well location: Thompson Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 44.846m
Depth to water level (TOC): 32.422m	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 40-43 mbgs	

Log of Monitoring Well: GH_MW-UTC-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 5 of 9

SUBSURFACE PROFILE			SAMPLE					Backfill details				
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL			
							0		250500	0	50 100	
77												
78												
79		24										
80												
81												
82		25										
83												
84												
85		26										
86												
87												
88												
89		27										
90												
91												
92		28										
93												
94												
95		29										
96												

Well location: Thompson Creek

Well casing diameter: 50.8mm

Depth of well (TOC): 44.846m

Depth to water level (TOC): 32.422m

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: September 6th, 2016

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm

Well screen interval (bgs): 40-43 mbgs

Log of Monitoring Well: GH_MW-UTC-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 6 of 9

SUBSURFACE PROFILE			SAMPLE					Backfill details			
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL		
							0		250500	0	50 100
97	[Brick pattern symbol]	Fracture Encountered at 30m									
98			30								
99											
00											
01											
02			31								
03											
04											
05			32								
06											
07											
08			33								
09											
10											
11			34								
12											
13											
14											
15	35										
16											

Well location: Thompson Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 44.846m
Depth to water level (TOC): 32.422m	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 40-43 mbgs	

Log of Monitoring Well: GH_MW-UTC-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 7 of 9

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250 500		LEL % 0 50 100
17									
18		35							
19									
20									
21		37							
22									
23									
24									
25		38							
26									
27									
28		39							
29									
30									
31		40							
32									
33									
34									
35	41	Fracture Encountered at 41m							
36									

Well location: Thompson Creek

Well casing diameter: 50.8mm

Depth of well (TOC): 44.846m

Depth to water level (TOC): 32.422m

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: September 6th, 2016

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm

Well screen interval (bgs): 40-43 mbgs

Log of Monitoring Well: GH_MW-UTC-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: August 29th-September 1st 2016

Logged by: TK

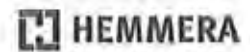
Site Location: Elkford, BC

Sheet: 8 of 9

SUBSURFACE PROFILE			SAMPLE					Backfill details			
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour		LEL		
							0		250500	0	50 100
37											
38		42									
39											
40											
41		43									
42											
43											
44		44									
45											
46											
47											
48		45									
49											
50											
51		46	Fracture Encountered at 46m								
52											
53											
54	47										
55											
56											

Well location: Thompson Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 44.846m
Depth to water level (TOC): 32.422m	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 40-43 mbgs	

Log of Monitoring Well: GH_MW-UTC-1D



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 9 of 9

SUBSURFACE PROFILE			SAMPLE					Backfill details		
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250 500		LEL % 0 50 100	
57	45								[Hatched Box]	
58										
59										
60										
61										
62										
63										
64		50	End of Log	-49.99 49.99						
65										
66										
67	51									
68										
69										
70										
71	52									
72										
73										
74	53									
75										
76										

Well location: Thompson Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 44.846m
Depth to water level (TOC): 32.422m	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 40-43 mbgs	

Log of Monitoring Well: GH_MW-UTC-1S



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 1 of 2

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm		LEL %
ft	m						0 250 500	0 50 100	
		Ground Surface	0.00						
0	0	TOPSOIL Silt and Clay TOPSOIL, dark brown, loose, dry, well sorted	0.00						
1	1								
2	2								
3	3								
4	4								
5	5	SILT and SAND SILT and SAND, fine grained, some small blocky clay, dry, poorly sorted	-1.00						
6	6								
7	7	CLAY CLAY, with silt and sand, some medium sub-rounded/sub-angular gravel, moderate plasticity, dry	-2.00						
8	8								
9	9								
10	10	SILTY SAND SILTY SAND, fine grained, with some small blocky clay and fine to medium sub-rounded/sub-angular gravel, dry, poorly sorted	-3.00						
11	11								
12	12								
13	13	CLAY CLAY with some silty sand, some fine to medium sub-rounded/sub-angular gravel, high plasticity, moist to wet	-4.00						
14	14								
15	15	Groundwater encountered at approximately 4.5m							
16	16								

Well location: Thompson Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 8.690 m
Depth to water level (TOC): 2.336 m	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 4.5-7.5 m	

Log of Monitoring Well: GH_MW-UTC-1S



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 2 of 2

SUBSURFACE PROFILE			SAMPLE					Backfill details	
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm		LEL %
							0 250 500	0 50 100	
17									
18		BEDROCK	-5.50						
19		BEDROCK, gray, dry from 6-7m, sample pulverized from drilling, 5.5-6m is mixed with clay	5.50						
20	6								
21									
22									
23	7	BEDROCK (Shale)	-7.01						
24		BEDROCK (shale), gray/brown, pulverized dust and rock chips from drilling, dry	7.01						
25		End of Log	-7.62						
26	8		7.62						
27									
28									
29									
30	9								
31									
32									
33	10								
34									
35									
36	11								

Well location: Thompson Creek	Well casing diameter: 50.8mm	Depth of well (TOC): 8.690 m
Depth to water level (TOC): 2.336 m	Well casing material: Schedule 40 PVC	Well Elevation (TOC): -
Date of water level: September 6th, 2016	Well screen slot size: 0.25mm	Ground Elevation: -
Borehole diameter: 15.24cm	Well screen interval (bgs): 4.5-7.5 m	

Log of Monitoring Well: GH_MW-ERSC-1



Project Name/No: Greenhills Ops Elkford BC/577-016.04

Drilling Company: JR Drilling

Client: Teck Coal Ltd.

Drilling Method: Dual air rotary

Date Drilled: November 24, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 1 of 1

SUBSURFACE PROFILE				SAMPLE					Backfill details
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm	LEL %	
0		Ground Surface	1293.00						
0.00		TOPSOIL Black, dry, loose, organic soil							
1		TILL Gravelly Till (rounded to subrounded, medium to coarse grain), brown, dry, dense, well graded, lots of rock cuttings.							
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14			1298.73						
15		Sandy Till (medium grain) and Gravel (rounded to subrounded, medium to coarse grain), brown, moist, dense, well graded, lots of rock cuttings.	4.27						
16									
17		Below 5.2 m, a water bearing seam <0.31 m width.	1287.82						
18			5.16						
19		Sandy Till (medium grain) and Gravel (rounded to subrounded, medium to coarse grain), brown, moist, dense, well graded, lots of rock cuttings.	1287.51						
20			5.49						
21		BEDROCK Siltstone, grey, dry, competent, very hard	1289.90						
22			8.10						
23		Between 6.7 m and 7.0 m, fracture zone, moist	1289.29						
24			6.71						
25		Below 7.2 m material is dry, very hard, uniform size cuttings, dusty drilling conditions	1285.99						
26			7.01						
27									
28									
29									
30			1283.86						
		End of Log	9.14						

Well location: 5,548,704 N, 649,081 E	Well casing diameter: 2"	Depth of well (TOC): 7.924 m
Depth to water level (TOC): 5.349 m	Well casing material: Sch. 80 PVC	Well Elevation (TOC): 1293.75 m
Date of water level: 26 November, 2014	Well screen slot size: 010	Ground Elevation: 1293 m
Borehole diameter: 0.17 m	Well screen interval (bgs): 4.12 m - 7.17 m	

DATA ENTRY: JFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_GV3gw

SHEET 1 OF 3

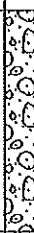

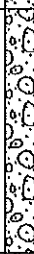

LOCATION: See Location Plan

BORING DATE: October 23, 2013

DATUM: UTM Zone 11 (Nad 03)

N: 5522255 E: 656580

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH				WATER CONTENT PERCENT					
							20 40		60 80		nat V. rem V.		+ ⊕ - ⊙			10 ⁻⁵ 10 ⁻⁴
0		Ground Surface		400.51												
1		SANDY GRAVEL, fine-grained, sub-angular to angular, moderately graded, dry, very loose		0.00												
2		SAND, some gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, dry, very loose		398.98 1.62												
3		SANDY GRAVEL, fine-grained, sub-angular to angular, moderately graded, dry, very loose		397.01 2.90												
4				395.94 4.57												
5	Sonic 127 mm (ID) Casing 152.4 mm (OD) J.R. Drilling	SAND, some gravel, localized thin zones of gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, moist, very loose														
6																
7																
8																
9																
10																

Stick-up = 0.91 m

Bentonite Chips

15 Nov 2013

CONTINUED NEXT PAGE

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED: CD

DATA ENTRY: JPC

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_GV3gw

SHEET 2 OF 3

LOCATION: See Location Plan

BORING DATE: October 23, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5522255 E: 656580

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
							Cu, kPa		nat V. + rem V. ⊕		ϕ - U -		Wp			W
10		SAND, some gravel, localized thin zones of gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, moist, very loose (continued)														
11																
12																
13		SILTY GRAVEL, fine-grained, sub-rounded to sub-angular, poorly graded, wet, very loose		387.55 12.85												
14																
15	Sonic 127 mm (D) Casing 152.4 mm (OD) JR Drilling	GRAVEL, fine-grained, sub-rounded to sub-angular, well graded, moist, very loose		385.88 14.63											Bentonite Chips	
16		SAND, some gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, moist, very loose		384.35 16.15												
17																
18		GRAVEL, some silt, fine-grained, sub-rounded to sub-angular, poorly graded, moist, very loose		382.98 17.63												
19		SILTY GRAVEL, fine-grained, sub-rounded to sub-angular, poorly graded, wet, very loose		381.46 18.05												
20		CONTINUED NEXT PAGE														

BOREHOLE EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED: CD

DATA ENTRY: IPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_GV3gw

SHEET 3 OF 3

LOCATION: See Location Plan

BORING DATE: October 23, 2013

DATUM: UTM Zone 11 (Nad 83)

N: 5522255 E: 656580

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH		WATER CONTENT PERCENT		WATER CONTENT PERCENT			
								Cu, kPa	nat V. rem V. + ⊕ - ⊙	W _p	W	W _p	W		
20	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	SILTY GRAVEL, fine-grained, sub-rounded to sub-angular, poorly graded, wet, very loose <i>(continued)</i>													
21		SILTY GRAVEL, fine and coarse-grained, sub-angular to angular, poorly graded, wet, very loose		379.63 20.88										Bentonite Chips	
22		Silty sand												Silica Sand	
23	Silty sand												Slotted Section		
24	Silty sand												Slotted Section		
25	End of BOREHOLE.												Slotted Section		
26	<p>NOTES: Standpipe installed to 24.4 m upon well completion. Groundwater level measured at 0.9 mbgs on November 15, 2013.</p>														
27	Silty sand														
28	Silty sand														
29	Silty sand														
30	Silty sand														

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/18/14

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD

DATA ENTRY: AM

PROJECT No.: 12.1349.0013
 LOCATION: See Location Plan

RECORD OF BOREHOLE: EV_BALgw

BORING DATE: October 27, 2014

SHEET 1 OF 2
 DATUM: UTM Zone 11
 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				FIELD EC AND ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT				
0		Ground Surface SAND, medium to coarse-grained, some gravel, boulders and cobbles, sub-angular to sub-rounded, well graded, brown / grey, dry	0.00													
4.30	Sonic 127 mm (ID) Casing 152.4 mm (OD) J.R. Drilling	SAND and GRAVEL, sub-rounded to rounded, well graded, brown, dry	4.30												Stick-up =1.0 m	
5															Bentonite Chips	
6																
7																
8																
9																
10																

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 12/30/14

DEPTH SCALE
 1 : 50



LOGGED: RT
 CHECKED:

DATA ENTRY: AM

PROJECT No.: 12.1349.0013
 LOCATION: See Location Plan

RECORD OF BOREHOLE: EV_BALgw

BORING DATE: October 27, 2014

SHEET 2 OF 2
 DATUM: UTM Zone 11
 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				FIELD EC AND ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20 40 60 80		nat V. + Q - rem V. ⊕ U - ⊙		10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³				Wp ----- W ----- WI	
10	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	CLAY, some sand and fine gravel, sub-angular to sub-rounded, poorly graded, dark grey, moist	[Strata Plot]	10.10											Bentonite Chips		
10.40		SILTSTONE, fine-grained, grey / brown --- Fractured with water from 10.7 to 11.3 m	[Strata Plot]													28 Oct 2014 ▽	
11		--- Competent from 11.3 m	[Strata Plot]												Slotted Section		
12			[Strata Plot]														
13		End of BOREHOLE.	[Strata Plot]	12.74													
14		NOTES: Standpipe installed to 12.7 m upon well completion. Groundwater level measured at 11.1 mbgs on October 28, 2014.															
15																	
16																	
17																	
18																	
19																	
20																	

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 12/30/14

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED:

DATA ENTRY: JPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_LSgw

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: October 24, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5514731 E: 653274

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. rem V.	+ U-			Q- U-	Wp
0		Ground Surface		345.03												Stick-up = 0.93 m	
		FILL - Sand sized particles, medium to coarse-grained, sub-rounded to sub-angular, well graded, dark black carbonaceous, moist, very loose		0.00													
2		SANDY GRAVEL, some silt, fine-grained, sub-rounded to sub-angular, poorly graded, moist, very loose		343.51 1.52													
4		GRAVELLY SAND, coarse-grained with fine-grained gravel, sub-rounded to sub-angular, poorly graded, moist, very loose		341.22 3.81													
7		SANDY SILT, fine to medium-grained, wet, mud		338.18 6.86													
10		CONTINUED NEXT PAGE															

BOREHOLE - EXPANDED ADD. LAB. TESTING: 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE
1 : 60



LOGGED: RT
CHECKED: CD

DATA ENTRY: IFG

PROJECT No.: 12.1349.0013
 LOCATION: See Location Plan
 N: 6514731 E: 653274

RECORD OF BOREHOLE: EV_LSgw

BORING DATE: October 24, 2013

SHEET 2 OF 2

DATUM: UTM Zone 11
(Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT						
								20 40 60 80		nat V. + Q - ● rem V. ⊕ U - ○		10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³		Wp — Wl				
10	JR Drilling	SANDY SILT, fine to medium-grained, wet, mud <i>(continued)</i>	[Pattern]	334.36												Silica Sand	[Pattern]	
11		End of BOREHOLE.		10.67														
12		NOTES: Standpipe installed to 6.7 m upon well completion. Groundwater level measured at 3.4 mbgs on November 14, 2013.																
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD

DATA ENTRY: JFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_GCgw

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: October 25, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5513879 E: 653059

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k_v cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.5m	SHEAR STRENGTH c_u , kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat. rem. V. U.	W _p			W _L	W _p
0		Ground Surface		344.42													
		SAND, fine to medium-grained, sub-rounded to sub-angular, well graded, dark black carbonaceous, dry, very loose		0.00													
1																	
2		BANDY GRAVEL, trace silt, fine-grained, sub-rounded to sub-angular, poorly graded, moist, very loose		342.90 1.52												14 Nov 2013 V	
3																	
4		CLAY, some gravel, fine-grained, sub-rounded to sub-angular, poorly graded, moist, firm		340.61 3.91													
5																	
6																	
7																	
8																	
9		SILTY CLAY, well graded, wet, very soft		336.19 8.23													
10																	
CONTINUED NEXT PAGE																	

BOREHOLE - EXPANDED ADD. LAB. TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED: CD

DATA ENTRY: JPS

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_GCgw

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: October 25, 2013

DATUM: UTM Zone 11
(Nad 03)

N: 5513879 E: 653059

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20	40	60	80	10 ⁰	10 ³			10 ¹	10 ³
10 11 12 13 14 15 16 17 18 19 20	Sonic 127 mm (ID) Casing 152.4 mm (OD) UB Drilling	SILTY CLAY, well graded, wet, very soft <i>(continued)</i>													Bentonite Chips Silica Sand Slotted Section		
		End of BOREHOLE.		328.02 15.60													
		NOTES: Standpipe installed to 15.6 m upon well completion. Groundwater level measured at 2.0 mbgs on November 14, 2013.															

BOREHOLE - EXPANDED ADD. LAB TESTING 12_1349_0013_BH LOSS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD

DATA ENTRY: JFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_OCgw

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: November 7, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5512871 E: 652460

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	NUMBER	TYPE	20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³		
0		Ground Surface		342.60											
		SANDY GRAVEL, fine-grained with occasional coarse grains, rounded to sub-rounded, moderately graded, dry, very loose		0.00											
2		SAND and GRAVEL, coarse sand and fine gravel, rounded to sub-rounded, angular, poorly graded, moist, very loose — Hole is being drilled on the edge of a waste rock pile — Moisture at 2.1 m		341.07 1.52											15 Nov 2013 ▽
4		GRAVEL, trace sand, fine to coarse-grained, sub-rounded to rounded, poorly graded, moist, loose		338.84 3.68											Bentonite Chips
7		SAND, fine to medium-grained with occasional coarse grains, some gravel, fine to coarse-grained, sub-angular to sub-rounded, dry to moist, loose		335.60 6.71											
10		CONTINUED NEXT PAGE													

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED: CD

DATA ENTRY: IPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_OCgw

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: November 7, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5512671 E: 652480

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20 40		60 80		10 ⁻⁶ 10 ⁻⁵				10 ⁻⁴ 10 ⁻³	
						nat V. +		Q - ●		Wp		Wl					
						rem V. ⊕		U - ○		10 20		30 40					
10		SAND, fine to medium-grained with occasional coarse grains, some gravel, fine to coarse-grained, sub-angular to sub-rounded, dry to moist, loose, (continued)													Bentonite Chips		
11																Silica Sand	
12	Sonic 127 mm (ID) Casing 152.4 mm (OD) J-R Drilling																
13		SAND, fine to medium-grained with occasional coarse grains, some fine-grained gravel, sub-angular to sub-rounded, moist, loose to compact		329.79											Slotted Section		
14				12.80													
15		BEDROCK		328.12											Silica Sand Tall Pipe		
15				14.46													
16		End of BOREHOLE.		327.06													
16				15.54													
17		<p>NOTES: Standpipe installed to 14.6 m upon well completion. Groundwater level measured at 2.1 mbgs on November 15, 2013.</p>															
18																	
19																	
20																	

DEPTH SCALE
1 : 50

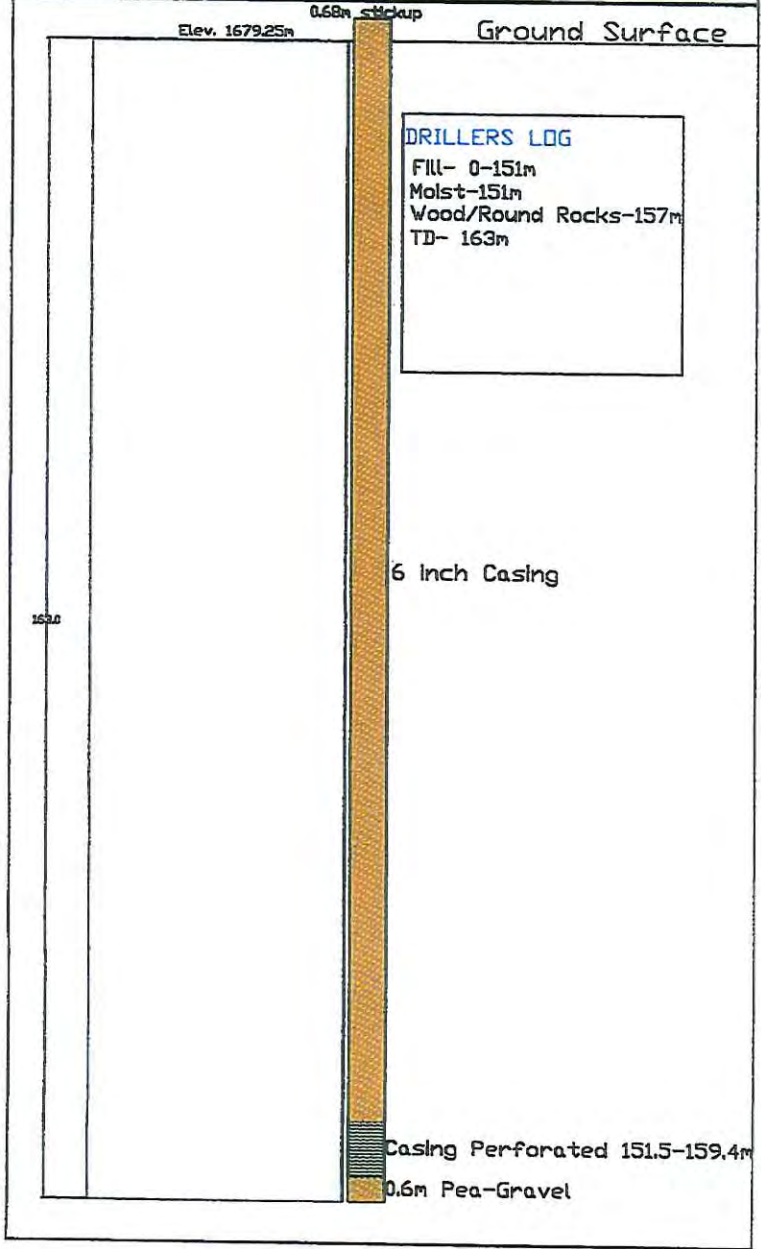


LOGGED: RT
CHECKED: CD

WF Tailings Migration Well (South WF-2)AS-BUILT

Northing: 49859
Easting: 20380
Elev.: 1679.25
Total Depth: Drilling 163.0m or 535ft
Piezo Depths: N/A
Contractor: J.R. Drilling Ltd (Cranbrook)
E.V.C.C. Tech: D. Greener
Start/Finish: April 11-16, 2005 - 6" casing installed

EV_WF_SW



DATA ENTRY: JPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_EGw

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: October 27, 2013

DATUM: UTM Zone 11 (Nad 83)

N: 5506384 E: 660795

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k_v cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20	40	60	80	10 ⁻⁶	10 ⁻⁵		
0		Ground Surface		406.30											
0		GRAVELLY SAND, medium and coarse-grained sand with occasional fine gravel grains, rounded to sub-rounded, moderately graded, dry, very loose		0.00											
1															
2		SAND, trace gravel, medium-grained, rounded to sub-rounded, moderately graded, dry, very loose		404.77 1.52											
3															
4		CLAY and SAND, medium-grained with occasional coarse grains, rounded to sub-rounded, moderately graded, moist, firm		402.49 3.81											
5															
6		SANDY CLAY, medium-grained with occasional coarse grains, rounded to sub-rounded, moderately graded, moist, firm		401.12 5.16											
7		CLAY, some sand, medium-grained, rounded to sub-rounded, moderately graded, moist, semi-firm		399.44 6.86											
8															
9															
10															

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BOREHOLE - EXPANDED ADD. LAB TESTING: 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED: CD

DATA ENTRY: JFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ECgw

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: October 27, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5506304 E: 660795

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE				SAMPLES				DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV.		NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT						
				DEPTH (m)	ELEV. (m)				Cu, kPa	mat V. rem V.	+ ⊕	- ⊖	U - O	⊙	⊙	⊙	⊙		
10	JR Drilling	CLAY, some sand, medium-grained, rounded to sub-rounded, moderately graded, moist, semi-firm <i>(continued)</i>																Bentonite Pellets	
11		End of BOREHOLE.		395.33 10.97															
12		NOTES: Standpipe installed to 4.1 m upon well completion. Groundwater level measured at 1.8 mbgs on November 12, 2013.																	
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			

BOREHOLE - EXPANDED ADD. LAB. TESTING. 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED: CD

DATA ENTRY: JFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_BCgw

SHEET 1 OF 3

LOCATION: See Location Plan

BORING DATE: October 22, 2013

DATUM: UTM Zone 11 (Nad 83)

N: 6509659 E: 655381

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH		nat. V. rem. V.		WATER CONTENT PERCENT			
								Cu, kPa	20 40 60 80	+ ⊕	⊖ ⊙	Wp	Wl		
0		Ground Surface		353.26											
		SANDY GRAVEL, fine-grained with occasional coarse grains, rounded to sub-rounded, moderately graded, dry, very loose		0.00											
1															
2		GRAVEL, trace sand, fine-grained with occasional coarse grains, rounded to sub-rounded, poorly graded, very loose		351.74 1.52											
		— Moist at 2.1 m													
3															
4															
6															
8		Silty SANDY GRAVEL, fine-grained with occasional coarse grains, sub-rounded to sub-angular, poorly graded, wet, very loose		347.17 6.10											
7															
8															
9															
10				343.51 9.75											

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BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED: CD

DATA ENTRY: JPG

PROJECT No.: 12.1349.0013
 LOCATION: See Location Plan
 N: 5509659 E: 655381

RECORD OF BOREHOLE: EV_BCgw

SHEET 2 OF 3
 BORING DATE: October 22, 2013
 DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k_v cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH C_u , kPa	nat V. rem V. \oplus \ominus \bullet \circ	10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³	WATER CONTENT PERCENT W_p W W_L						
10	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	GRAVEL, some sand, trace silt, fine-grained, sub-angular to angular, poorly graded, wet, very loose (continued)															
11																	
12																	
13																	
14																	
15																	
16					Occasional coarse grains from 15.2 m												
17																	
18																	
19																	
20																	

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB. TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD

DATA ENTRY: JFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_BCgw

SHEET 3 OF 3

LOCATION: Soo Location Plan

BORING DATE: October 22, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5509659 E: 655381

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k_f cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		pat V. rem V. $\oplus \ominus$		Q - \bullet U - \circ				Wp	
						20	40	60	80	10 ⁶	10 ⁵	10 ⁴	10 ³				
20	Sonic 127 mm (ID) Casing 152.4 mm (OD) J/R Drilling	GRAVEL, some sand, trace silt, fine-grained, sub-angular to angular, poorly graded, wet, very loose (continued)															
21																	
22		Sandy SILTY GRAVEL, fine-grained, sub-angular to angular, poorly graded, wet, very loose		331.17 22.10													
23		End of BOREHOLE.		330.10 22.10													
24		NOTES: Standpipe installed to 20.7 m upon well completion. Groundwater level measured at 2.4 mbgs on October 23, 2013. Groundwater level measured at 2.2 mbgs on November 12, 2013.															
25																	
26																	
27																	
28																	
29																	
30																	

BOREHOLE - EXPANDED ADD. LAB. TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD



Client
Teck Coal Limited

Borehole No. : EV_BH_AQ1

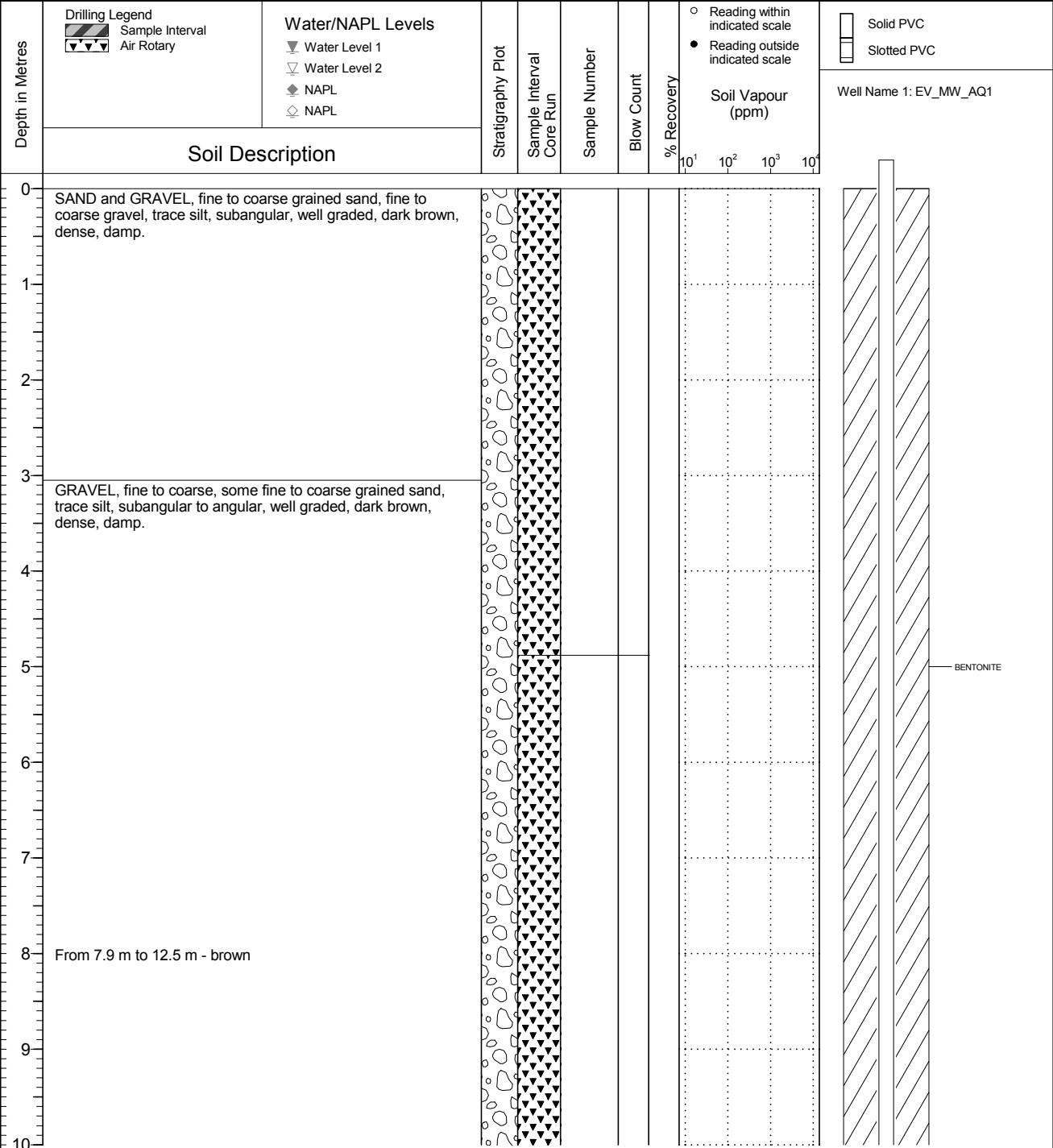
Location
Regional Groundwater Monitoring

PAGE 1 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1173.956
Top of Casing Elev. (m) 1174.862
Northing: 5511292.053 Easting: 654572.618

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 11
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_AQ1

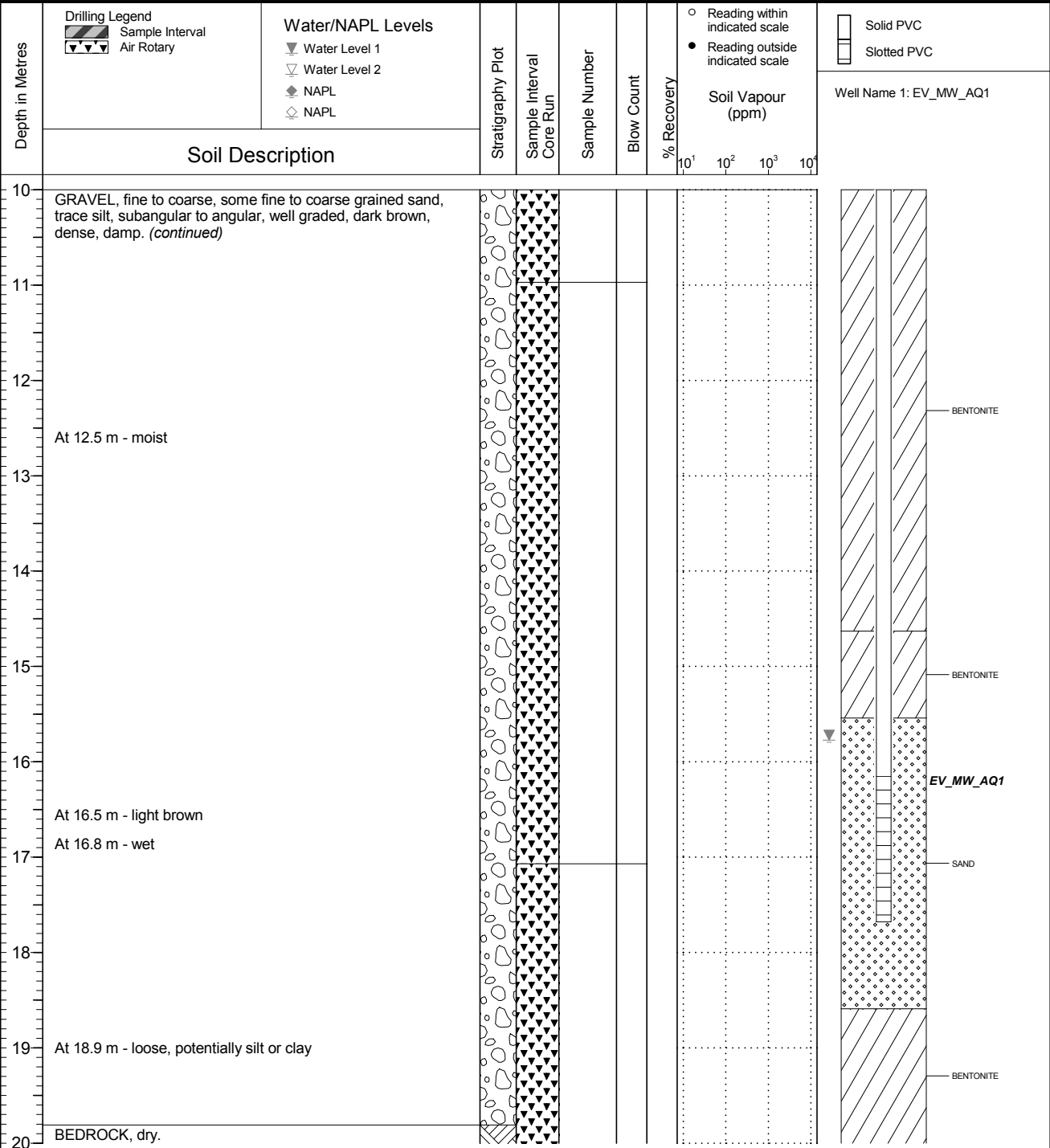
Location
Regional Groundwater Monitoring

PAGE 2 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1173.956
Top of Casing Elev. (m) 1174.862
Northing: 5511292.053 Easting: 654572.618

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 11
Log Typed By: VL



NOTES

QA/QC: BH 2019 04 10 Print Date: 2019-09-26



Client
Teck Coal Limited

Borehole No. : EV_BH_AQ1

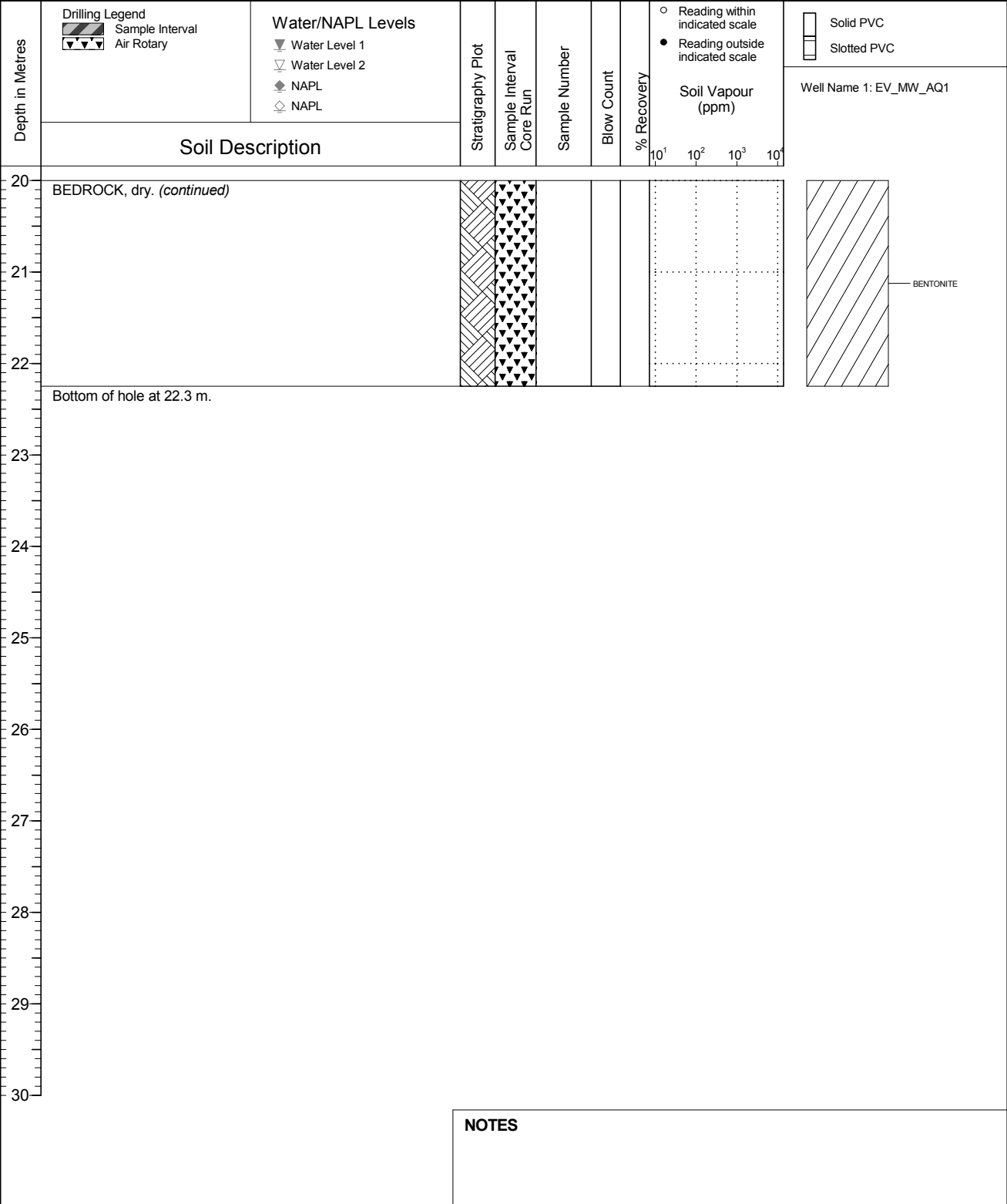
Location
Regional Groundwater Monitoring

PAGE 3 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1173.956
Top of Casing Elev. (m) 1174.862
Northing: 5511292.053 Easting: 654572.618

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 11
Log Typed By: VL





Client
Teck Coal Limited

Borehole No. : EV_BH_AQ2

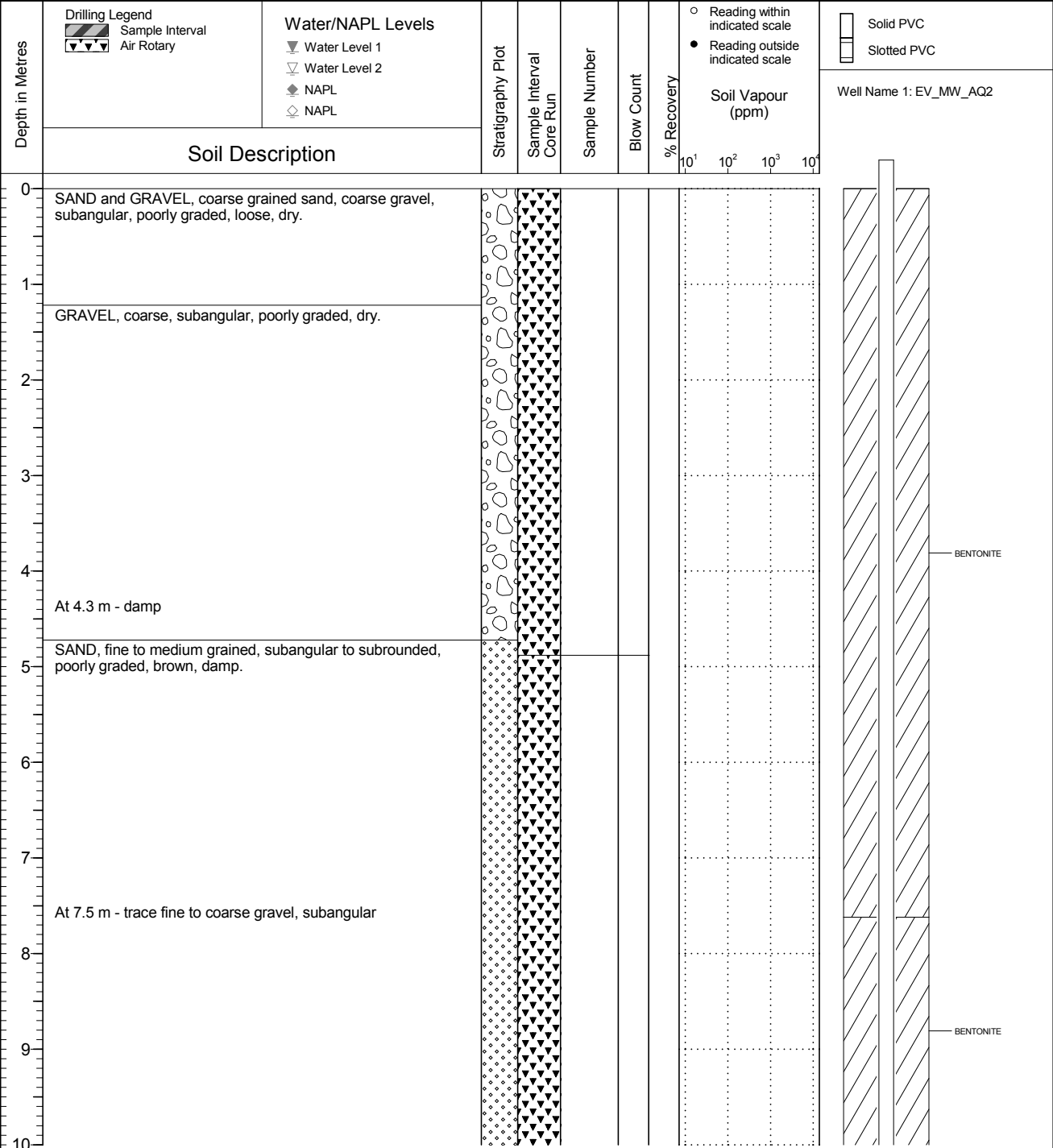
Location
Regional Groundwater Monitoring

PAGE 1 OF 2

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 08
Ground Surface Elev. (m) 1150.689
Top of Casing Elev. (m) 1151.673
Northing: 5511871.860 Easting: 653854.171

Project Number: 660613
Borehole Logged By: RG/AMH
Date Drilled: 2019 01 23
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_AQ2

Location
Regional Groundwater Monitoring

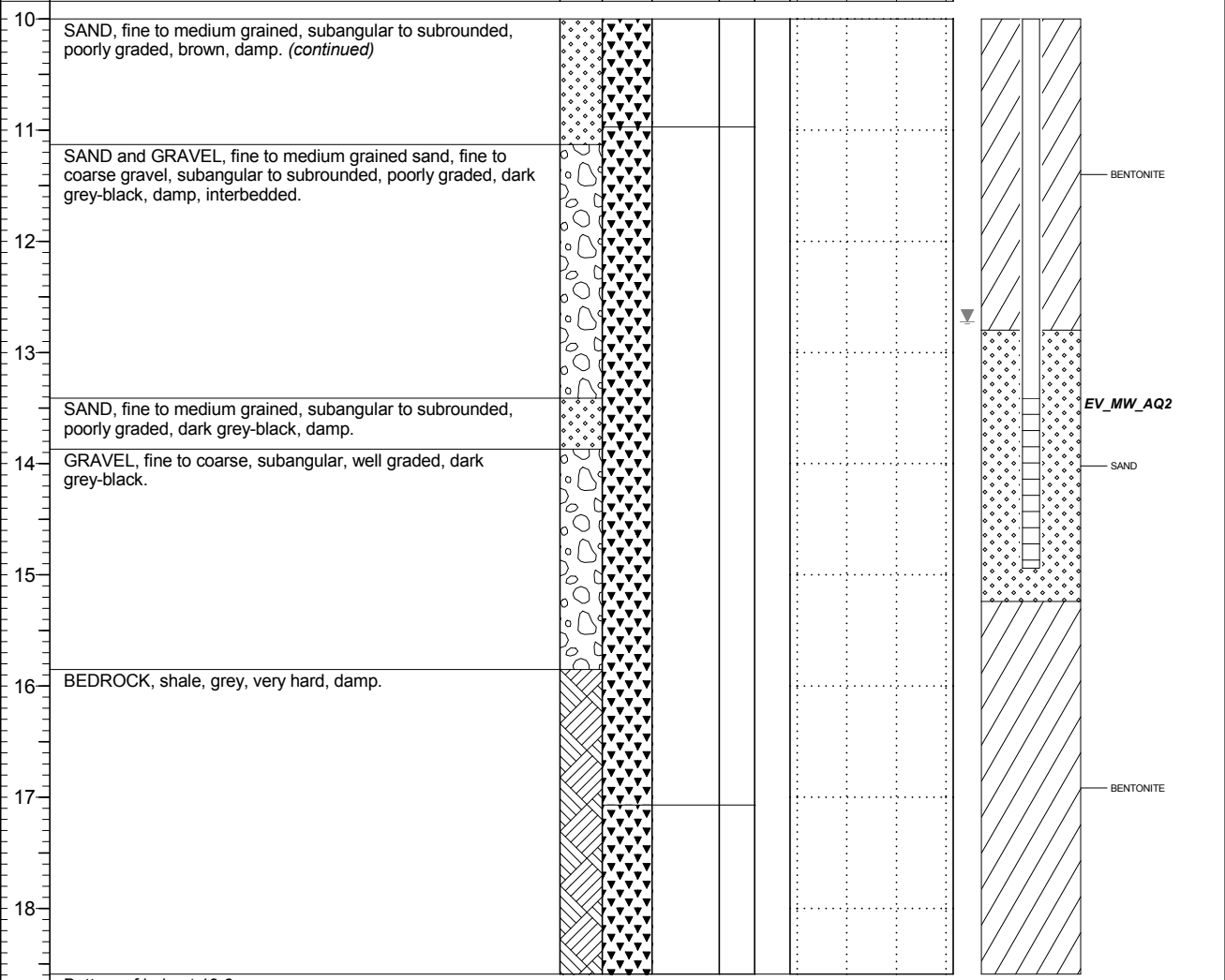
PAGE 2 OF 2

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 08
Ground Surface Elev. (m) 1150.689
Top of Casing Elev. (m) 1151.673
Northing: 5511871.860 Easting: 653854.171

Project Number: 660613
Borehole Logged By: RG/AMH
Date Drilled: 2019 01 23
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="radio"/> Reading within indicated scale <input checked="" type="radio"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	Well Name 1: EV_MW_AQ2



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_BC1

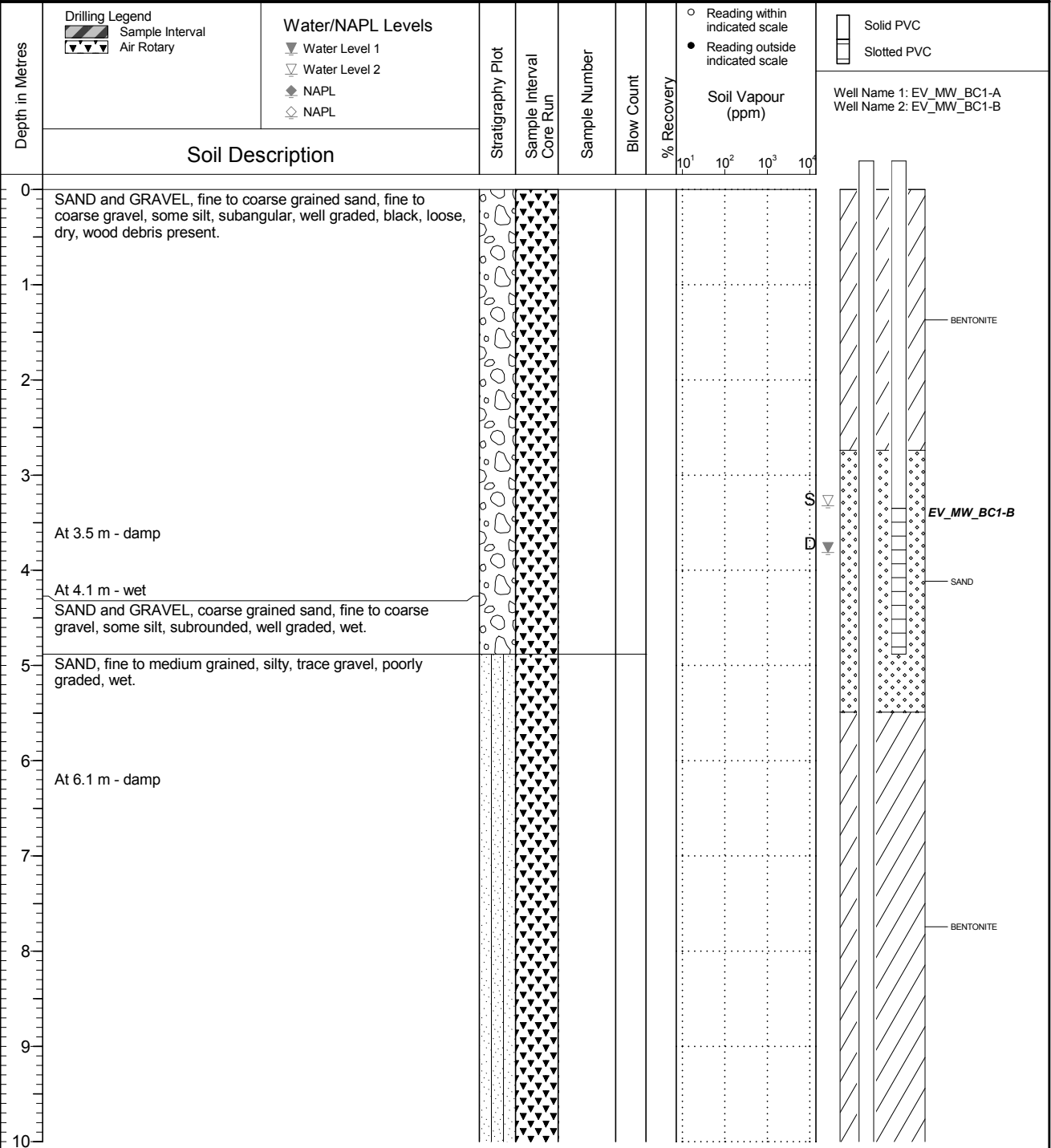
Location
Regional Groundwater Monitoring

PAGE 1 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1156.271
Top of Casing Elev. (m) 1157.085 1157.090
Northing: 5509503.141 Easting: 655664.927

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 15
Log Typed By: VL



NOTES

QA/QC: BH 2019 04 10 Print Date: 2019-09-26



Client
Teck Coal Limited

Borehole No. : EV_BH_BC1

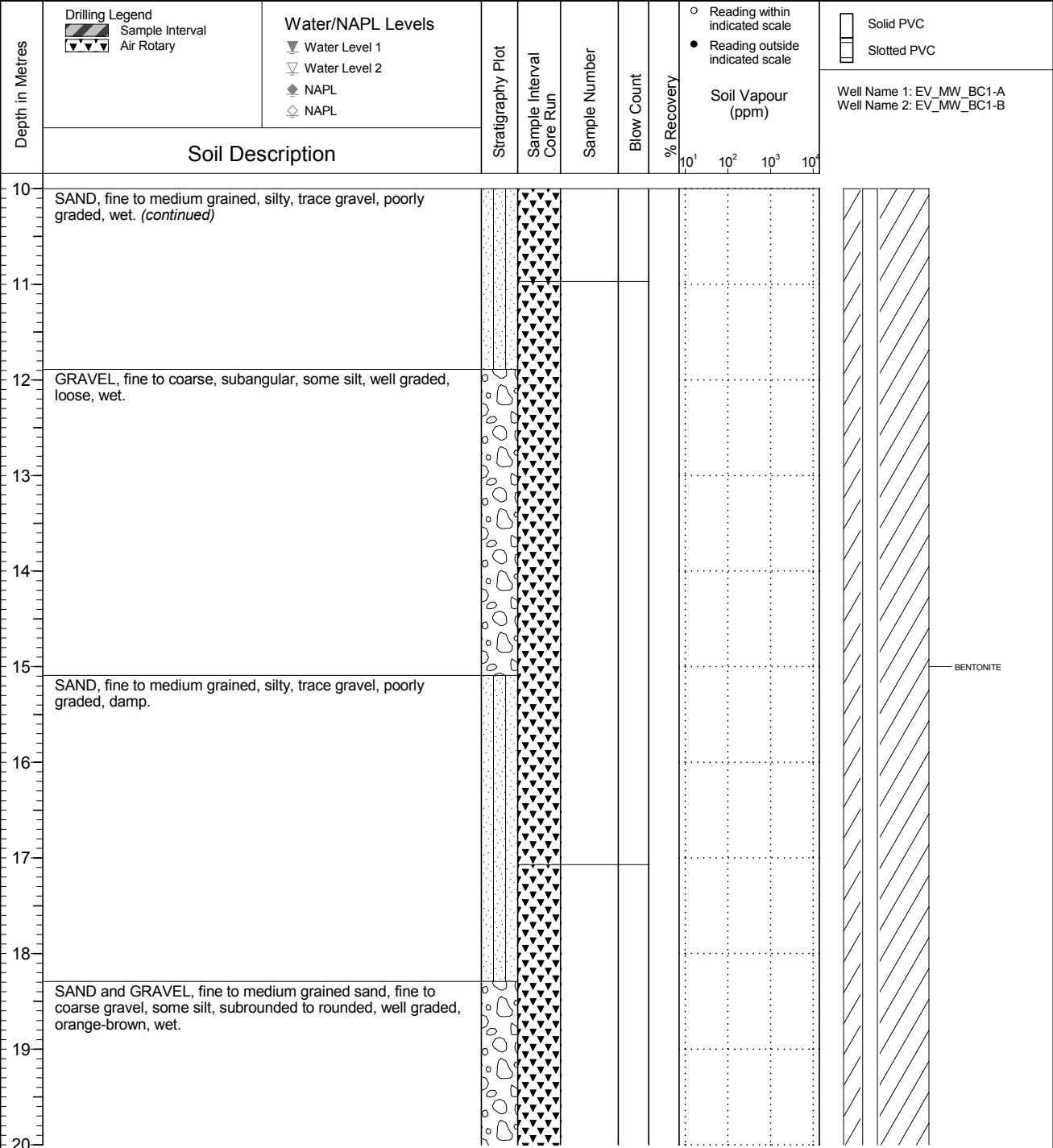
Location
Regional Groundwater Monitoring

PAGE 2 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1156.271
Top of Casing Elev. (m) 1157.085 1157.090
Northing: 5509503.141 Easting: 655664.927

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 15
Log Typed By: VL



NOTES

QA/QC: BH 2019 04 10 Print Date: 2019-09-26



Client
Teck Coal Limited

Borehole No. : EV_BH_BC1

Location
Regional Groundwater Monitoring

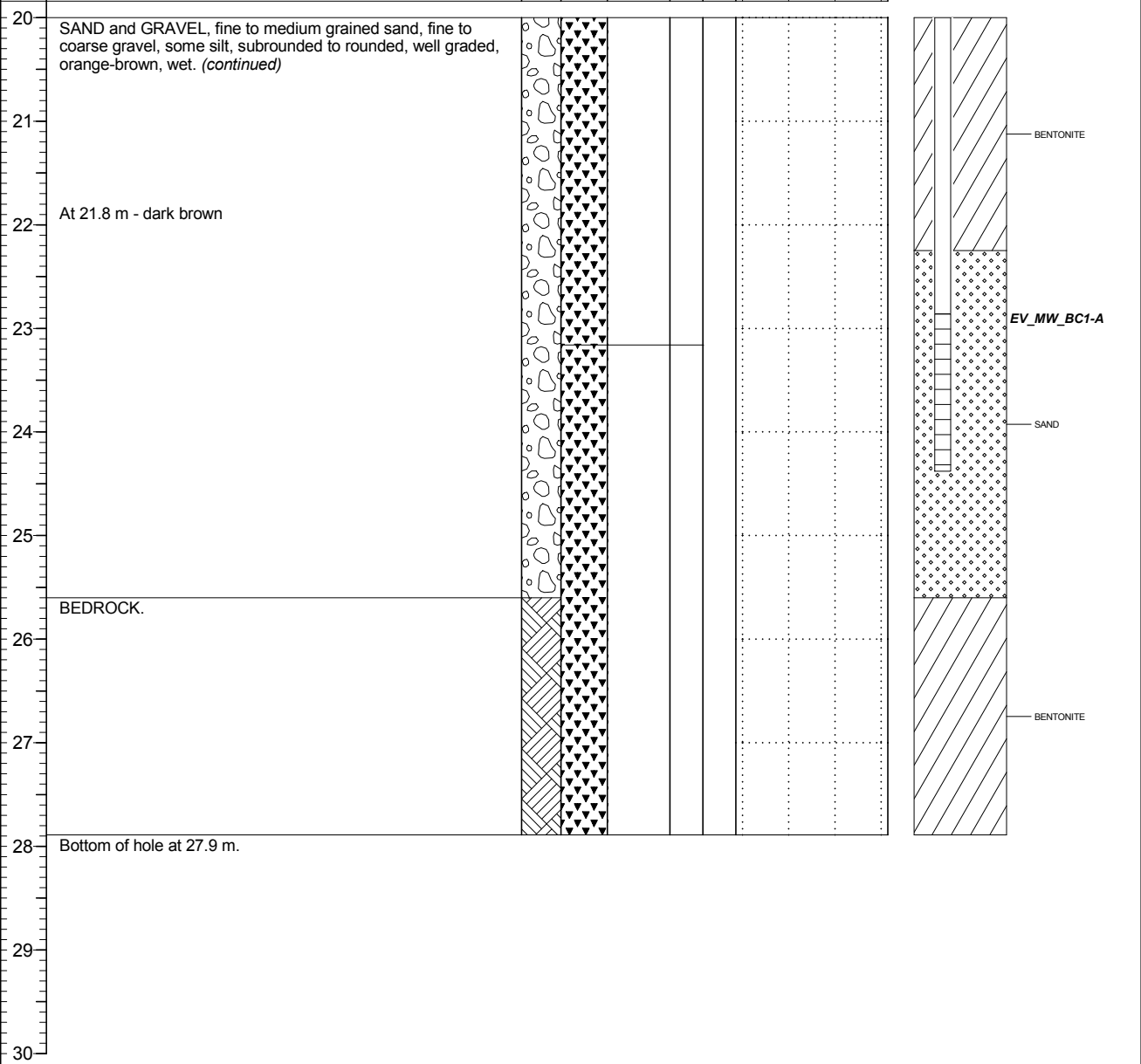
PAGE 3 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1156.271
Top of Casing Elev. (m) 1157.085 1157.090
Northing: 5509503.141 Easting: 655664.927

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 15
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_GT1

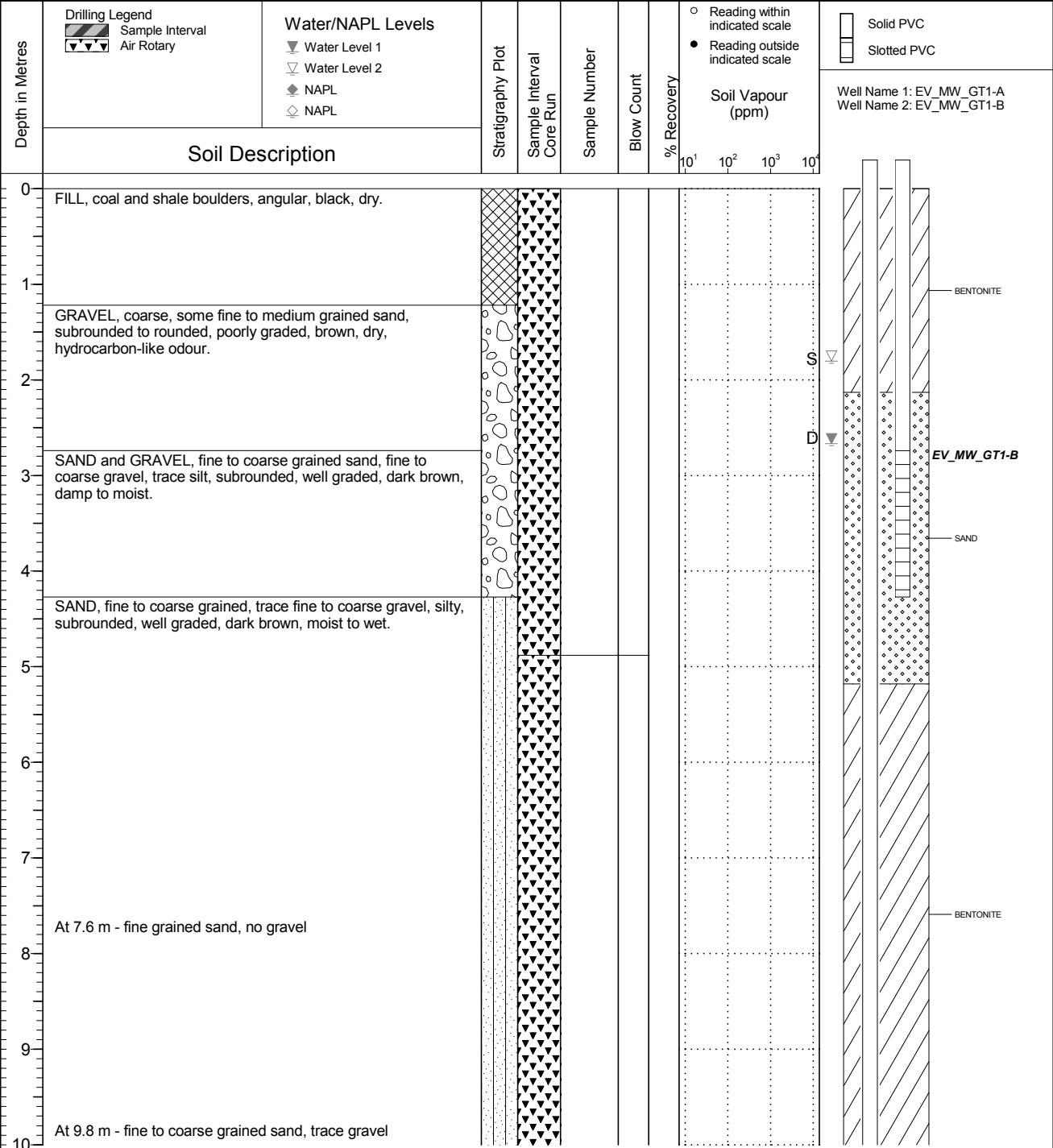
Location
Regional Groundwater Monitoring

PAGE 1 OF 7

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1156.515
Top of Casing Elev. (m) 1157.442 1157.457
Northing: 5509290.376 Easting: 655651.100

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 17
Log Typed By: VL



NOTES

Tar was being stored in area at time of drilling.



Client
Teck Coal Limited

Borehole No. : EV_BH_GT1

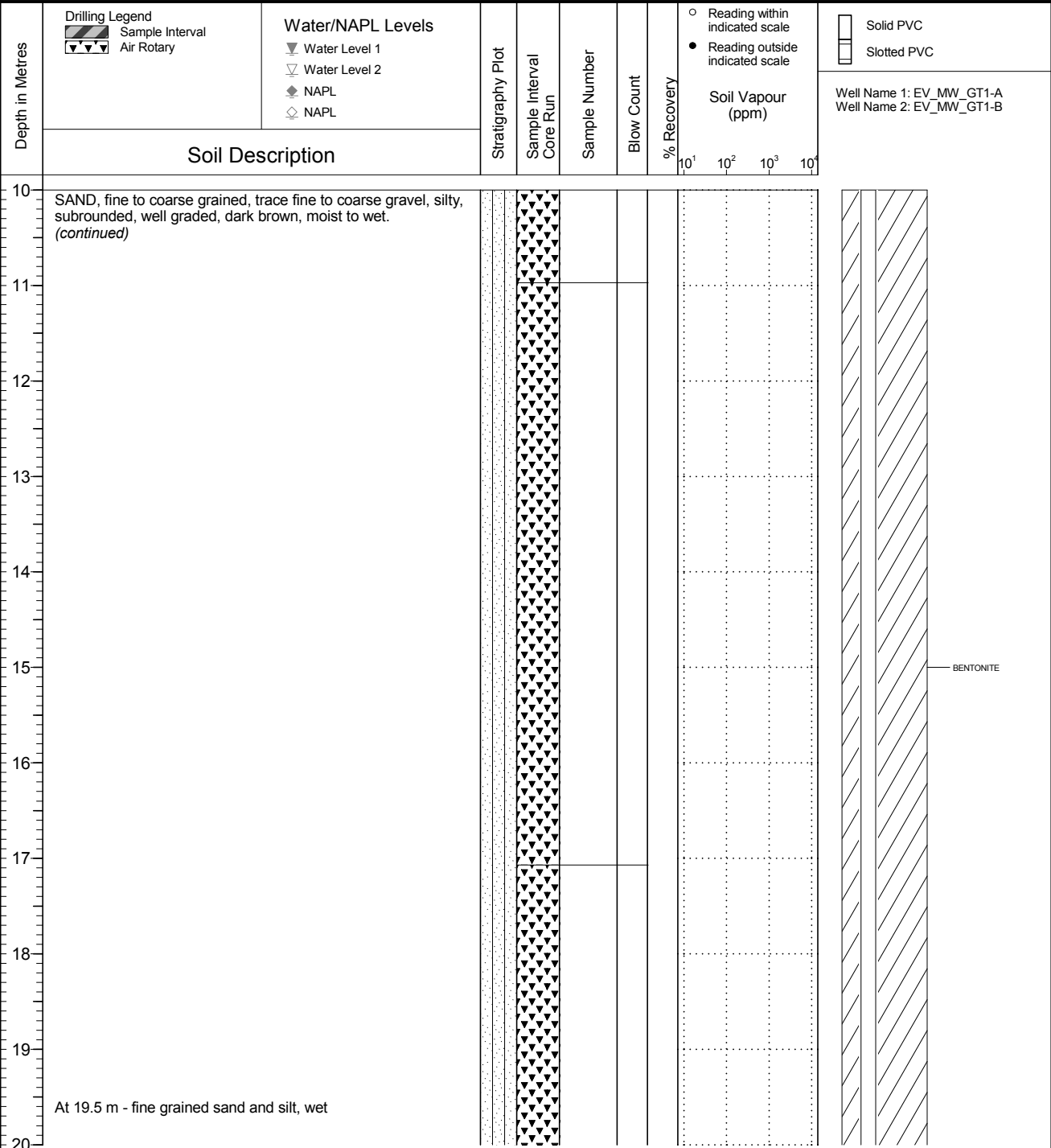
Location
Regional Groundwater Monitoring

PAGE 2 OF 7

Drilling Contractor Owen's Drilling
 Drilling Method Dual Rotary
 Borehole Dia. (m) 0.15
 Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
 Ground Surface Elev. (m) 1156.515
 Top of Casing Elev. (m) 1157.442 1157.457
 Northing: 5509290.376 Easting: 655651.100

Project Number: 660613
 Borehole Logged By: AMH
 Date Drilled: 2019 01 17
 Log Typed By: VL



NOTES
Tar was being stored in area at time of drilling.



Client
Teck Coal Limited

Borehole No. : EV_BH_GT1

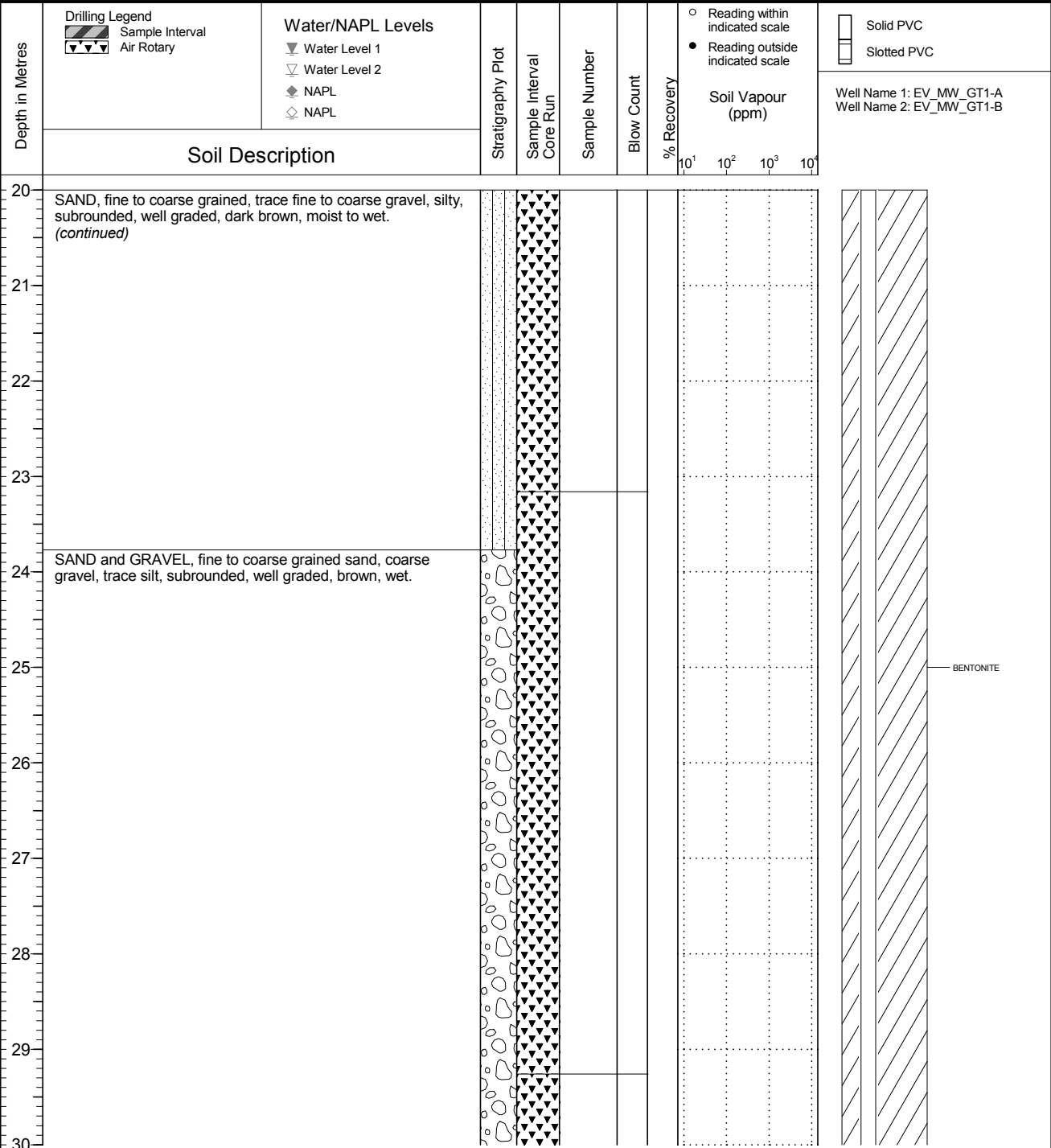
Location
Regional Groundwater Monitoring

PAGE 3 OF 7

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1156.515
Top of Casing Elev. (m) 1157.442 1157.457
Northing: 5509290.376 Easting: 655651.100

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 17
Log Typed By: VL



NOTES

Tar was being stored in area at time of drilling.



Client
Teck Coal Limited

Borehole No. : EV_BH_GT1

Location
Regional Groundwater Monitoring

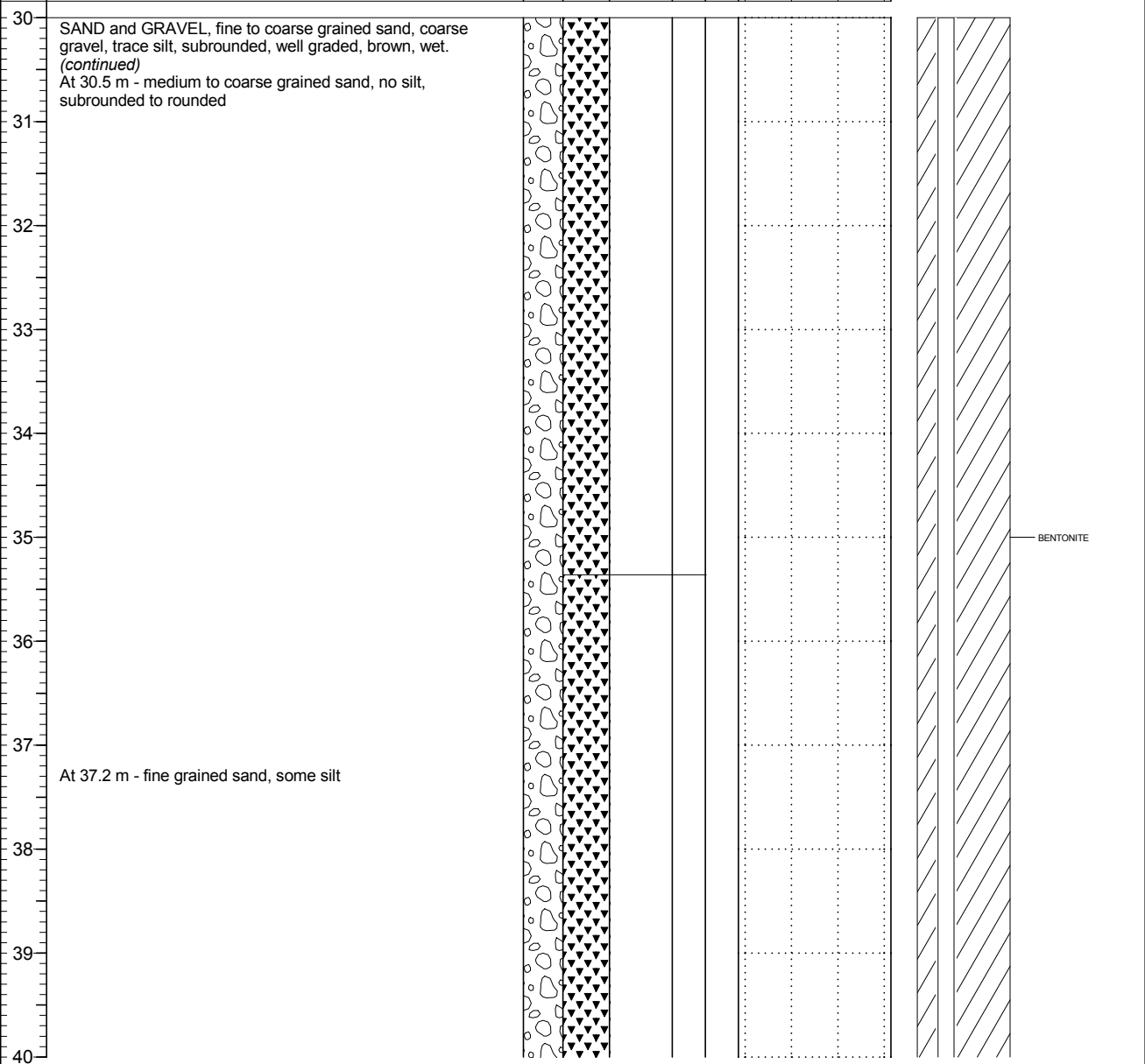
PAGE 4 OF 7

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1156.515
Top of Casing Elev. (m) 1157.442 1157.457
Northing: 5509290.376 Easting: 655651.100

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 17
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="radio"/> Reading within indicated scale <input checked="" type="radio"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	



NOTES
Tar was being stored in area at time of drilling.



Client
Teck Coal Limited

Borehole No. : EV_BH_GT1

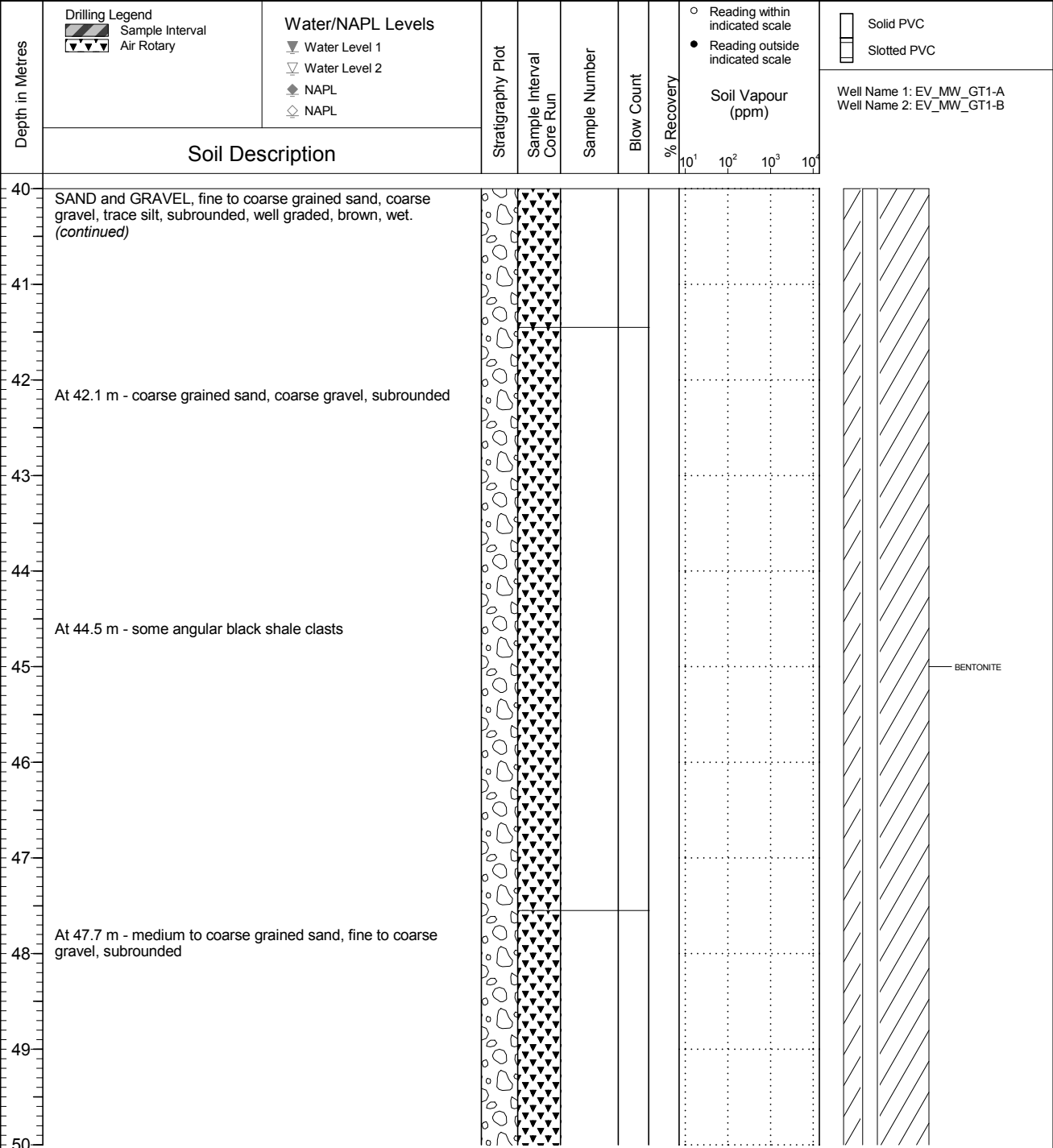
Location
Regional Groundwater Monitoring

PAGE 5 OF 7

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1156.515
Top of Casing Elev. (m) 1157.442 1157.457
Northing: 5509290.376 Easting: 655651.100

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 17
Log Typed By: VL



NOTES
Tar was being stored in area at time of drilling.



Client
Teck Coal Limited

Borehole No. : EV_BH_GT1

Location
Regional Groundwater Monitoring

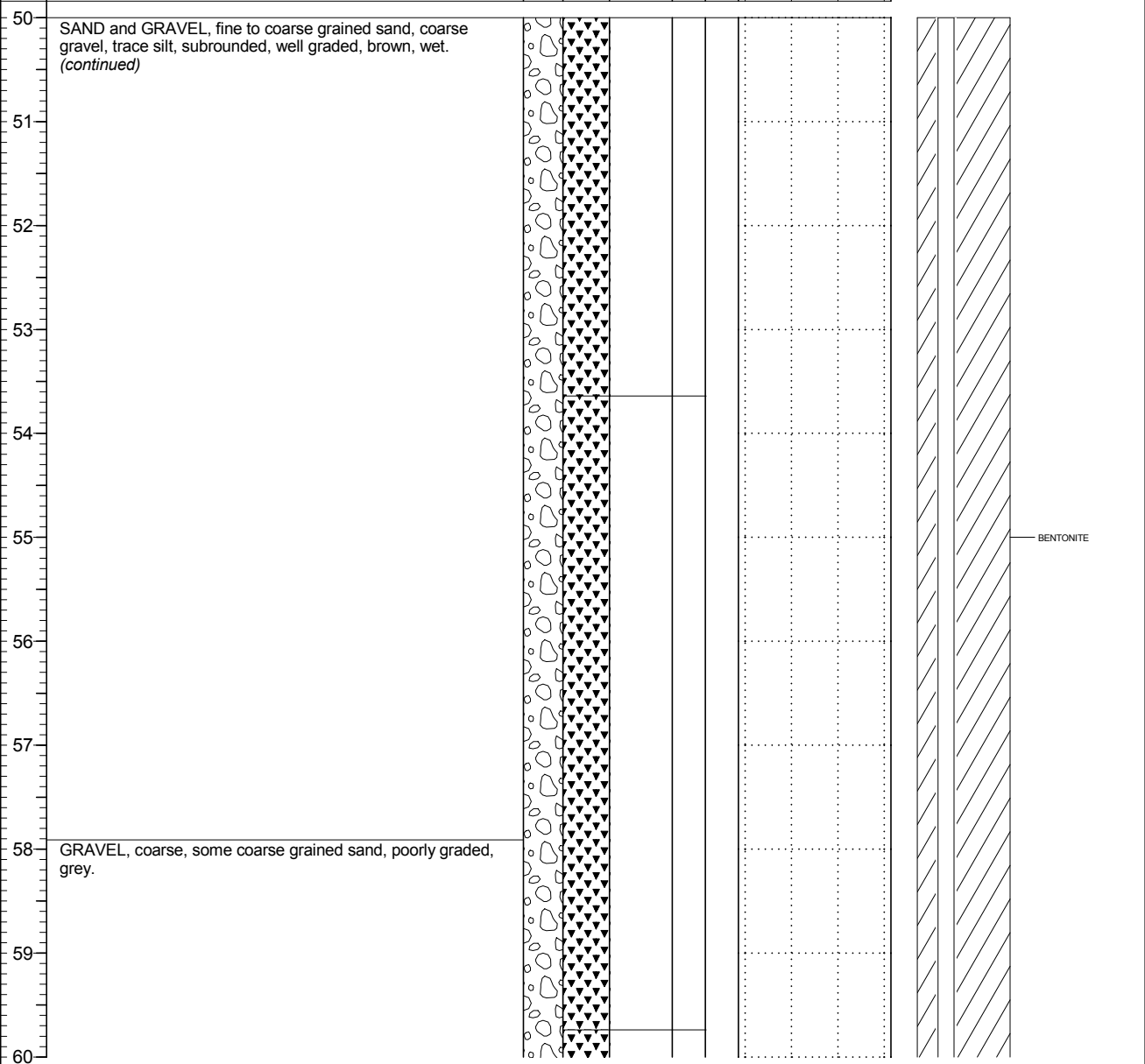
PAGE 6 OF 7

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1156.515
Top of Casing Elev. (m) 1157.442 1157.457
Northing: 5509290.376 Easting: 655651.100

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 17
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	



NOTES
Tar was being stored in area at time of drilling.



Client
Teck Coal Limited

Borehole No. : EV_BH_GT1

Location
Regional Groundwater Monitoring

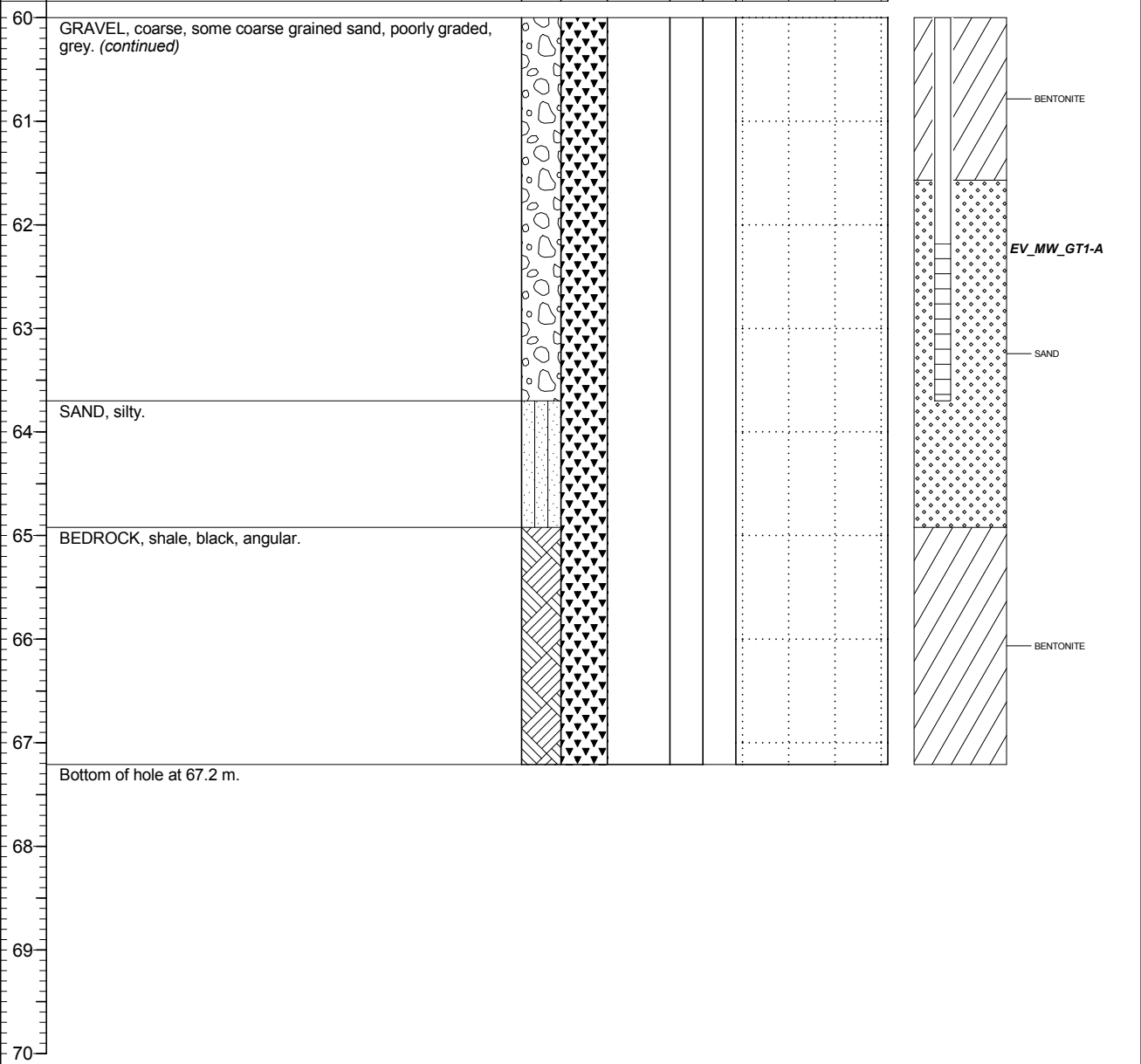
PAGE 7 OF 7

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1156.515
Top of Casing Elev. (m) 1157.442 1157.457
Northing: 5509290.376 Easting: 655651.100

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 17
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	



NOTES
Tar was being stored in area at time of drilling.



Client
Teck Coal Limited

Borehole No. : EV_BH_MC1

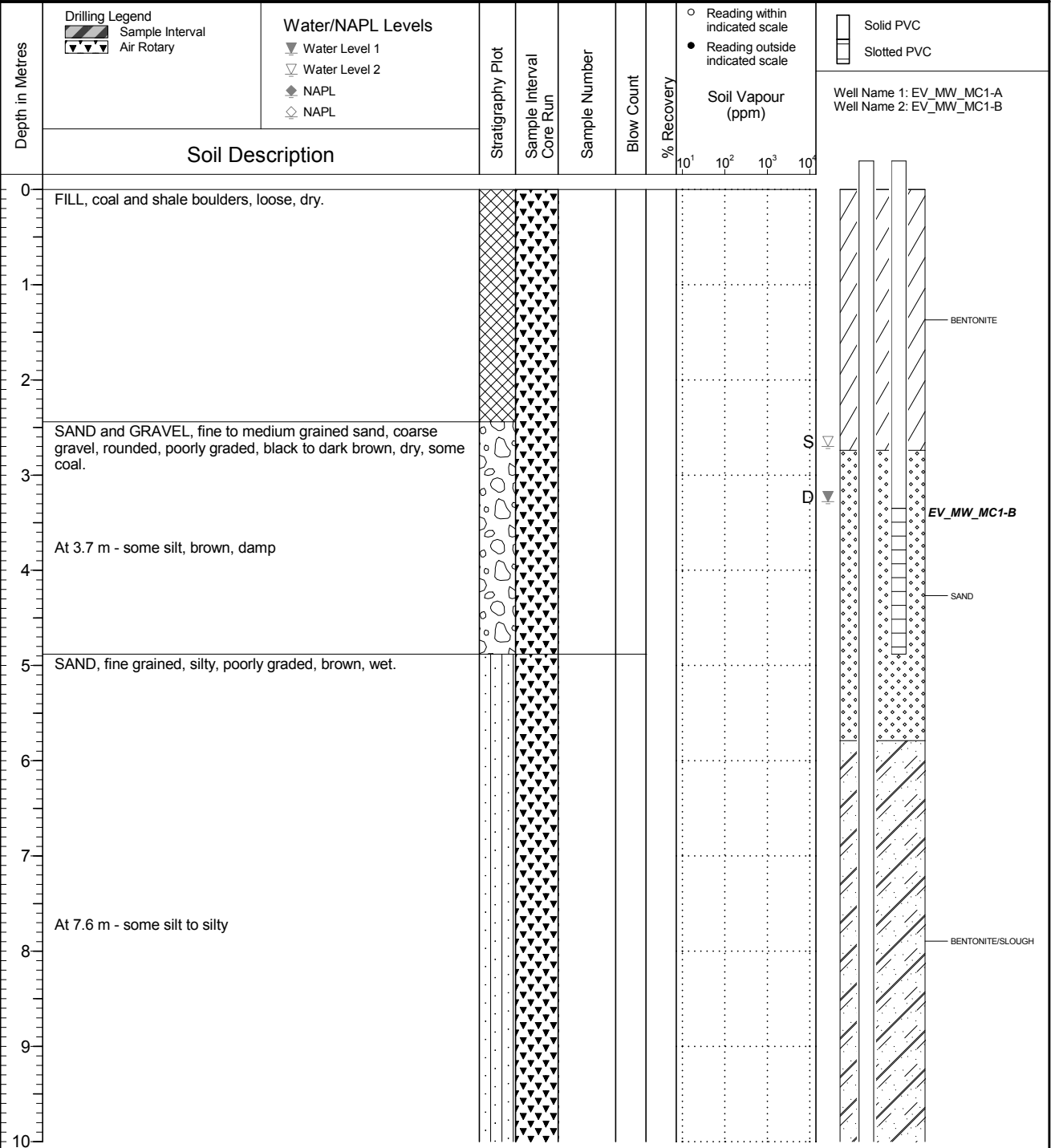
Location
Regional Groundwater Monitoring

PAGE 1 OF 4

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1147.631
Top of Casing Elev. (m) 1148.587 1148.585
Northing: 5510593.103 Easting: 654902.674

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 20
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_MC1

Location
Regional Groundwater Monitoring

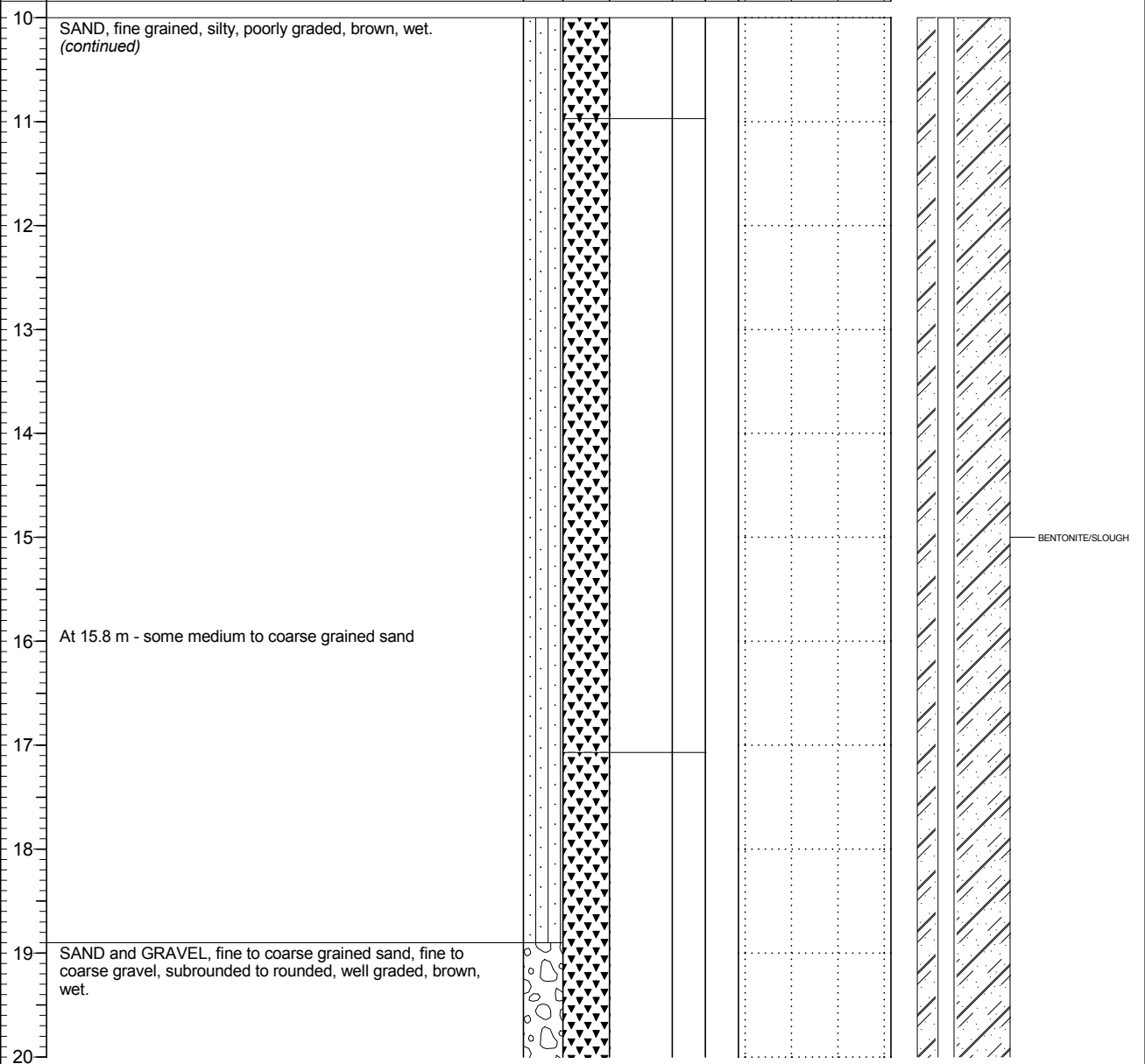
PAGE 2 OF 4

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1147.631
Top of Casing Elev. (m) 1148.587 1148.585
Northing: 5510593.103 Easting: 654902.674

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 20
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	Well Name 1: EV_MW_MC1-A Well Name 2: EV_MW_MC1-B



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_MC1

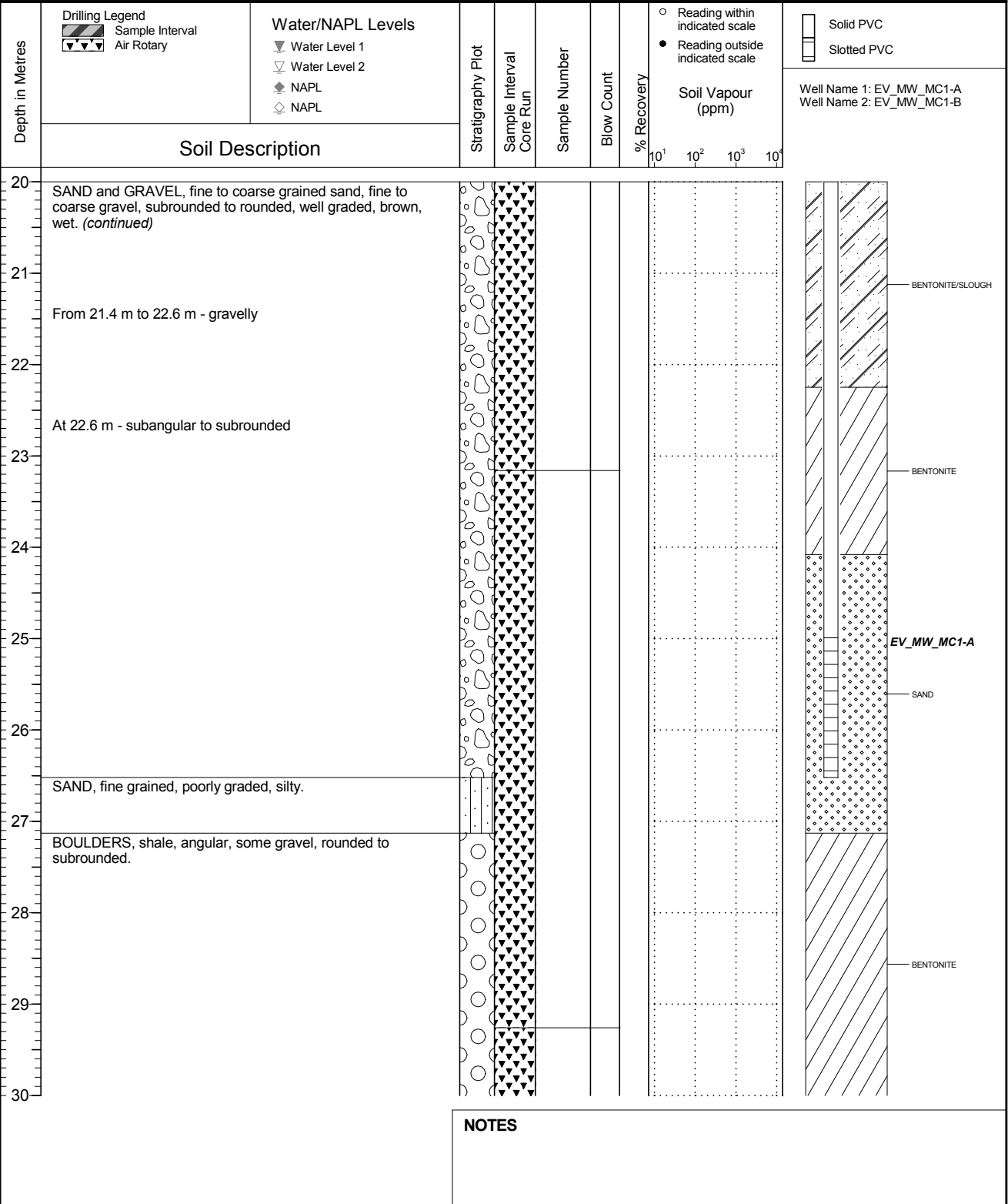
Location
Regional Groundwater Monitoring

PAGE 3 OF 4

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1147.631
Top of Casing Elev. (m) 1148.587 1148.585
Northing: 5510593.103 Easting: 654902.674

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 20
Log Typed By: VL



NOTES

QA/QC: BH 2019 04 10 Print Date: 2019-09-26



Client
Teck Coal Limited

Borehole No. : EV_BH_MC1

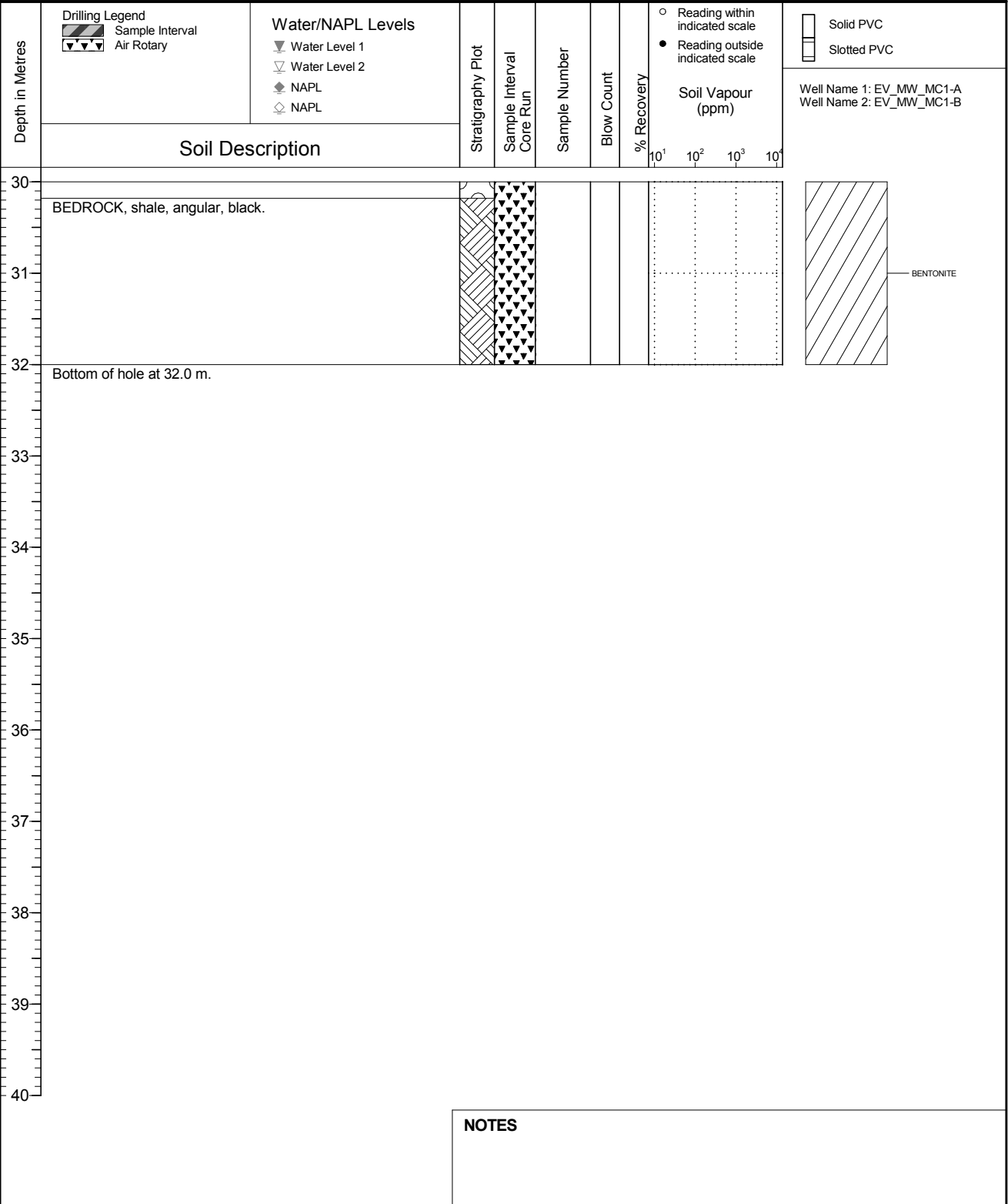
Location
Regional Groundwater Monitoring

PAGE 4 OF 4

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1147.631
Top of Casing Elev. (m) 1148.587 1148.585
Northing: 5510593.103 Easting: 654902.674

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 20
Log Typed By: VL





Client
Teck Coal Limited

Borehole No. : EV_BH_MC2

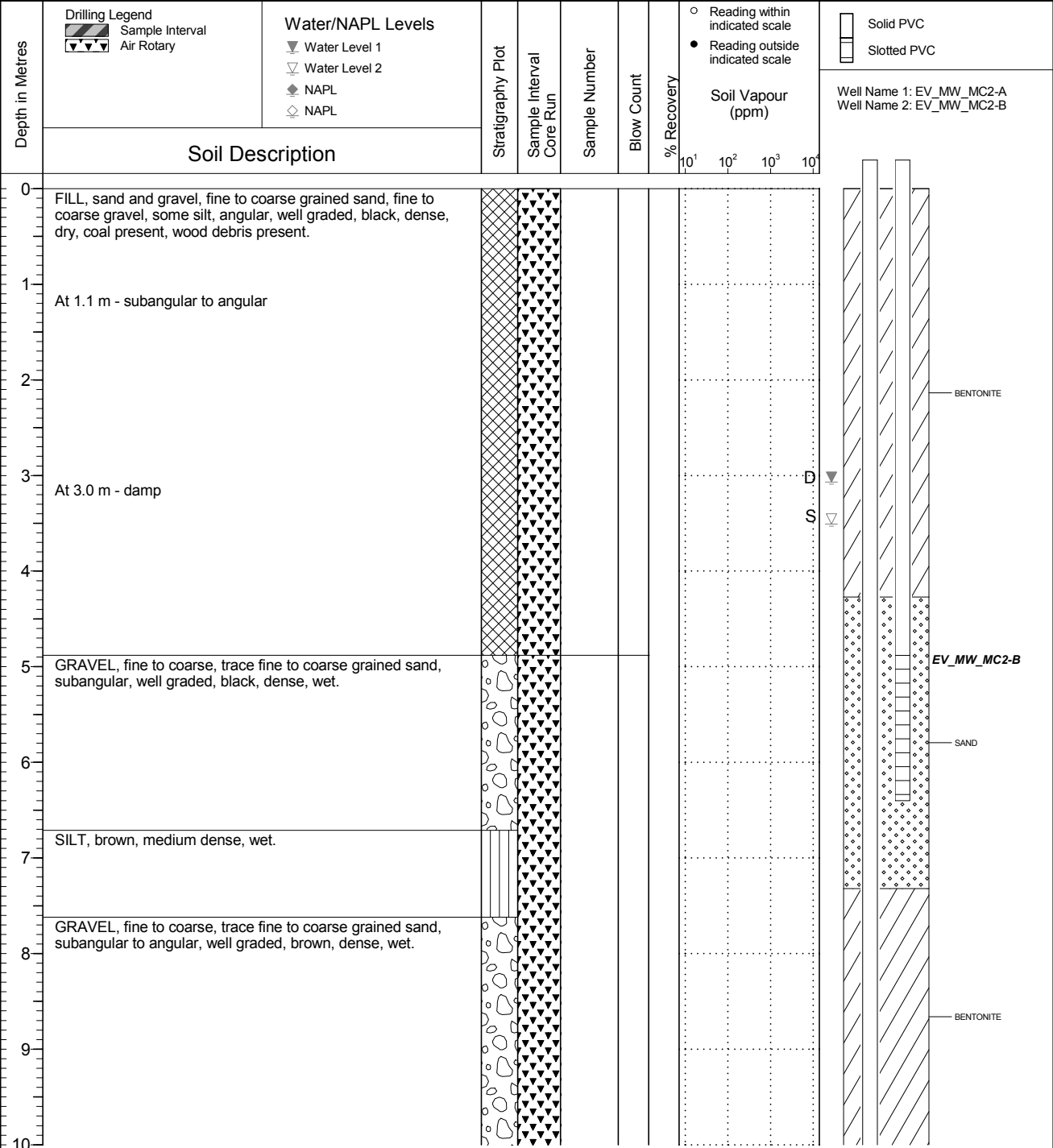
Location
Regional Groundwater Monitoring

PAGE 1 OF 6

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1146.989
Top of Casing Elev. (m) 1147.950 1147.969
Northing: 5510529.408 Easting: 654758.366

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 14
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_MC2

Location
Regional Groundwater Monitoring

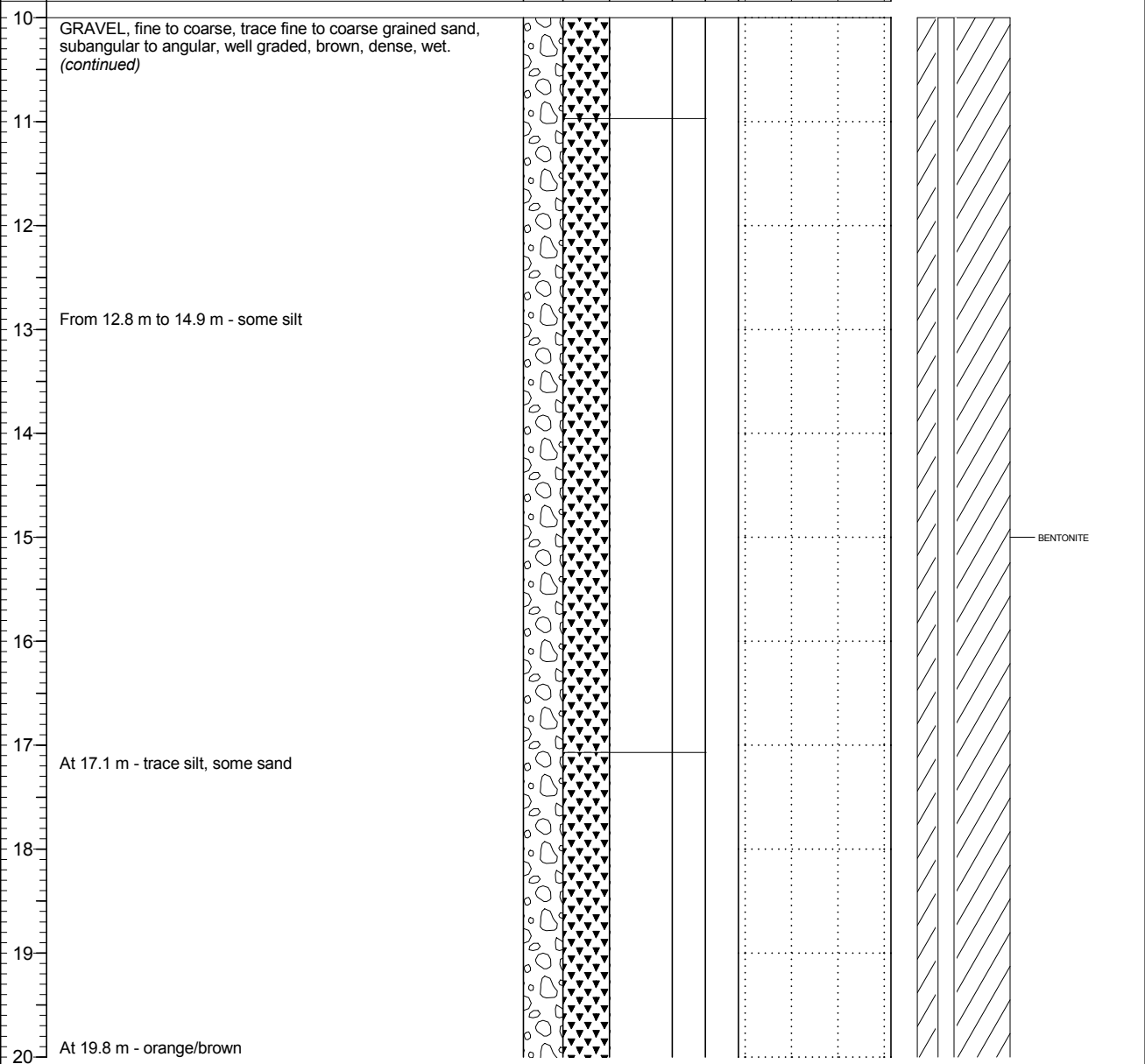
PAGE 2 OF 6

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1146.989
Top of Casing Elev. (m) 1147.950 1147.969
Northing: 5510529.408 Easting: 654758.366

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 14
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="radio"/> Reading within indicated scale <input checked="" type="radio"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	Well Name 1: EV_MW_MC2-A Well Name 2: EV_MW_MC2-B



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_MC2

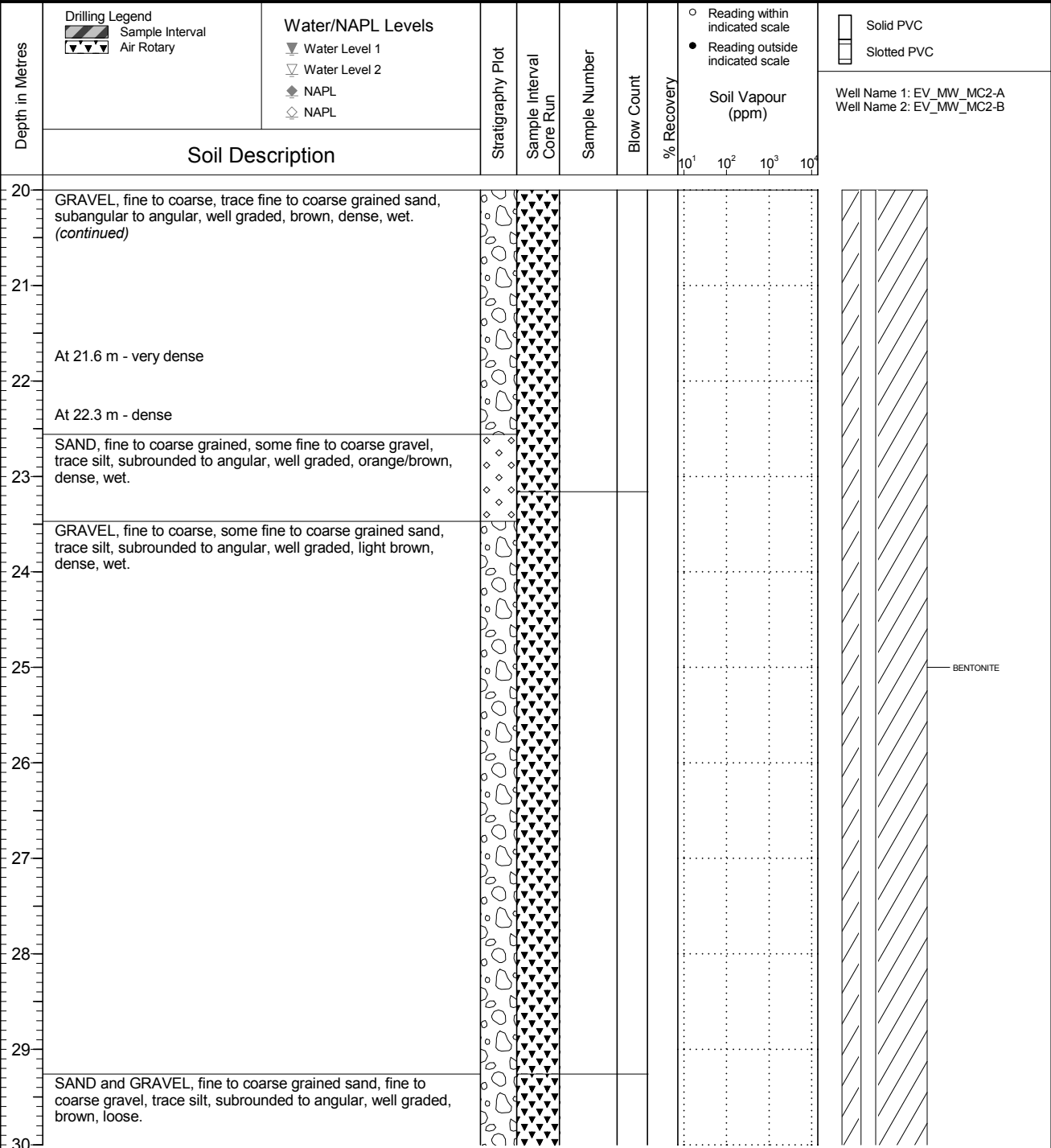
Location
Regional Groundwater Monitoring

PAGE 3 OF 6

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1146.989
Top of Casing Elev. (m) 1147.950 1147.969
Northing: 5510529.408 Easting: 654758.366

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 14
Log Typed By: VL



NOTES

QA/QC: BH 2019 04 10 Print Date: 2019-09-26



Client
Teck Coal Limited

Borehole No. : EV_BH_MC2

Location
Regional Groundwater Monitoring

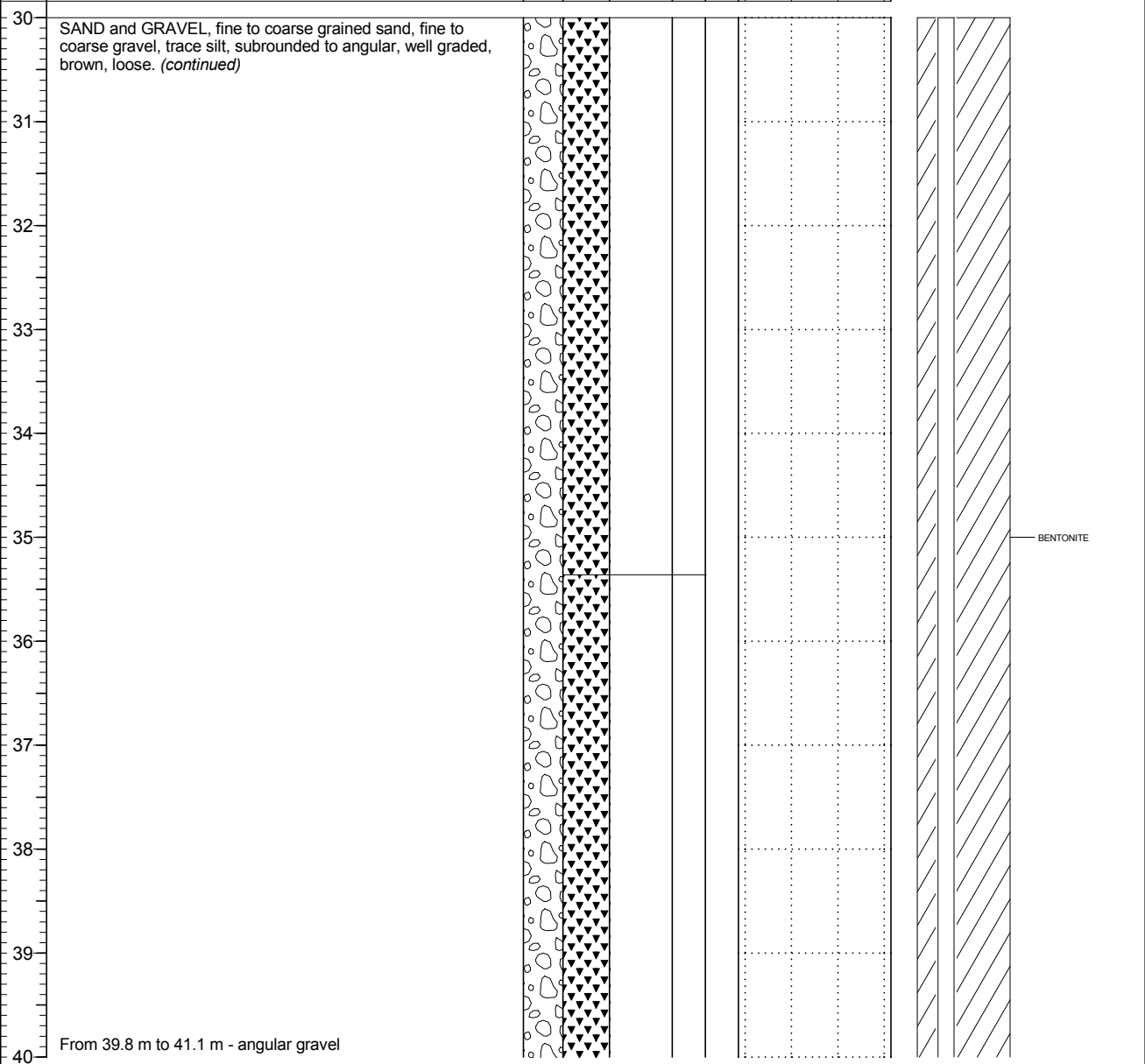
PAGE 4 OF 6

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1146.989
Top of Casing Elev. (m) 1147.950 1147.969
Northing: 5510529.408 Easting: 654758.366

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 14
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_MC2

Location
Regional Groundwater Monitoring

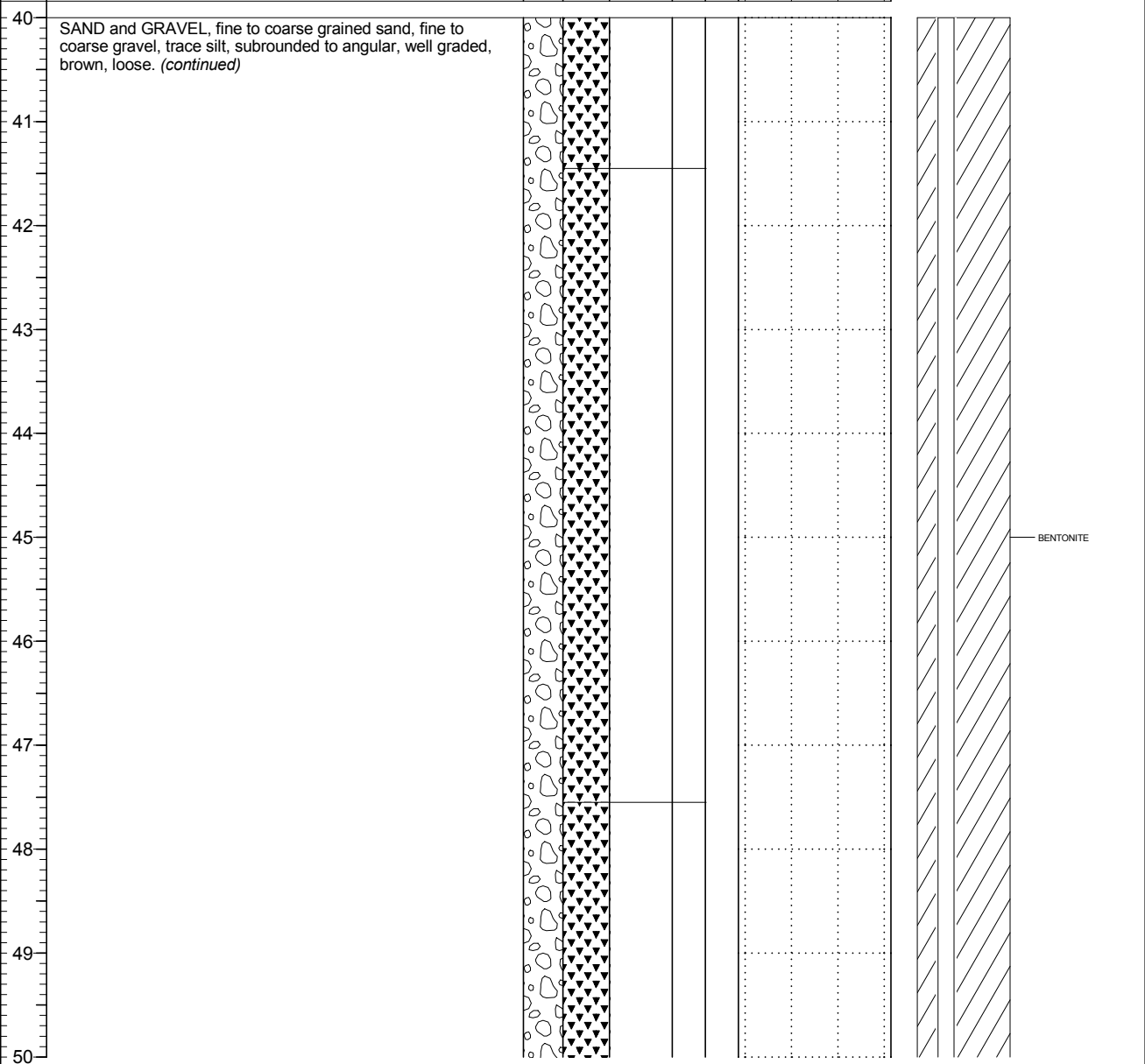
PAGE 5 OF 6

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1146.989
Top of Casing Elev. (m) 1147.950 1147.969
Northing: 5510529.408 Easting: 654758.366

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 14
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	Well Name 1: EV_MW_MC2-A Well Name 2: EV_MW_MC2-B



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_MC2

Location
Regional Groundwater Monitoring

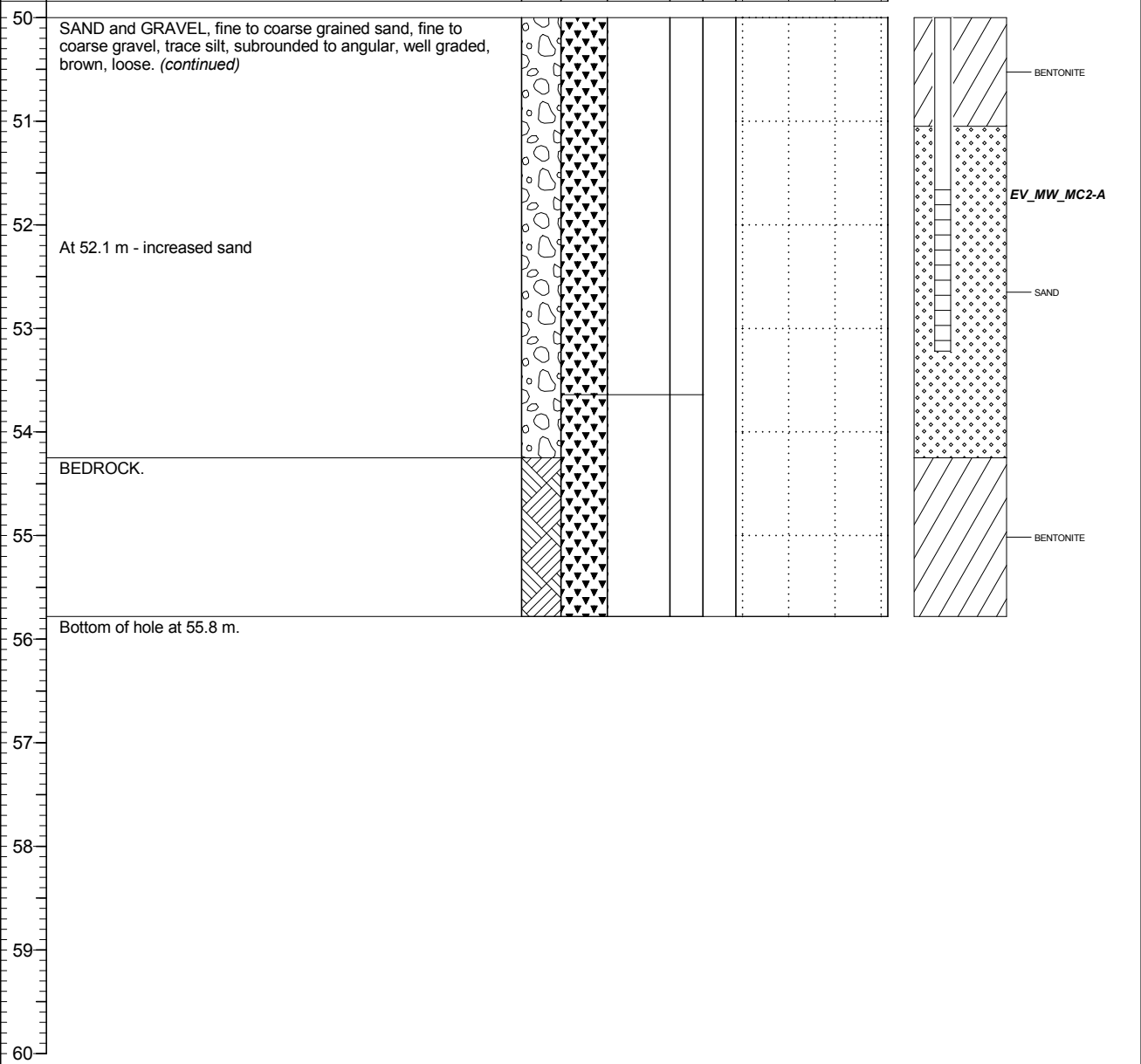
PAGE 6 OF 6

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1146.989
Top of Casing Elev. (m) 1147.950 1147.969
Northing: 5510529.408 Easting: 654758.366

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 14
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="radio"/> Reading within indicated scale <input type="radio"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_MC3

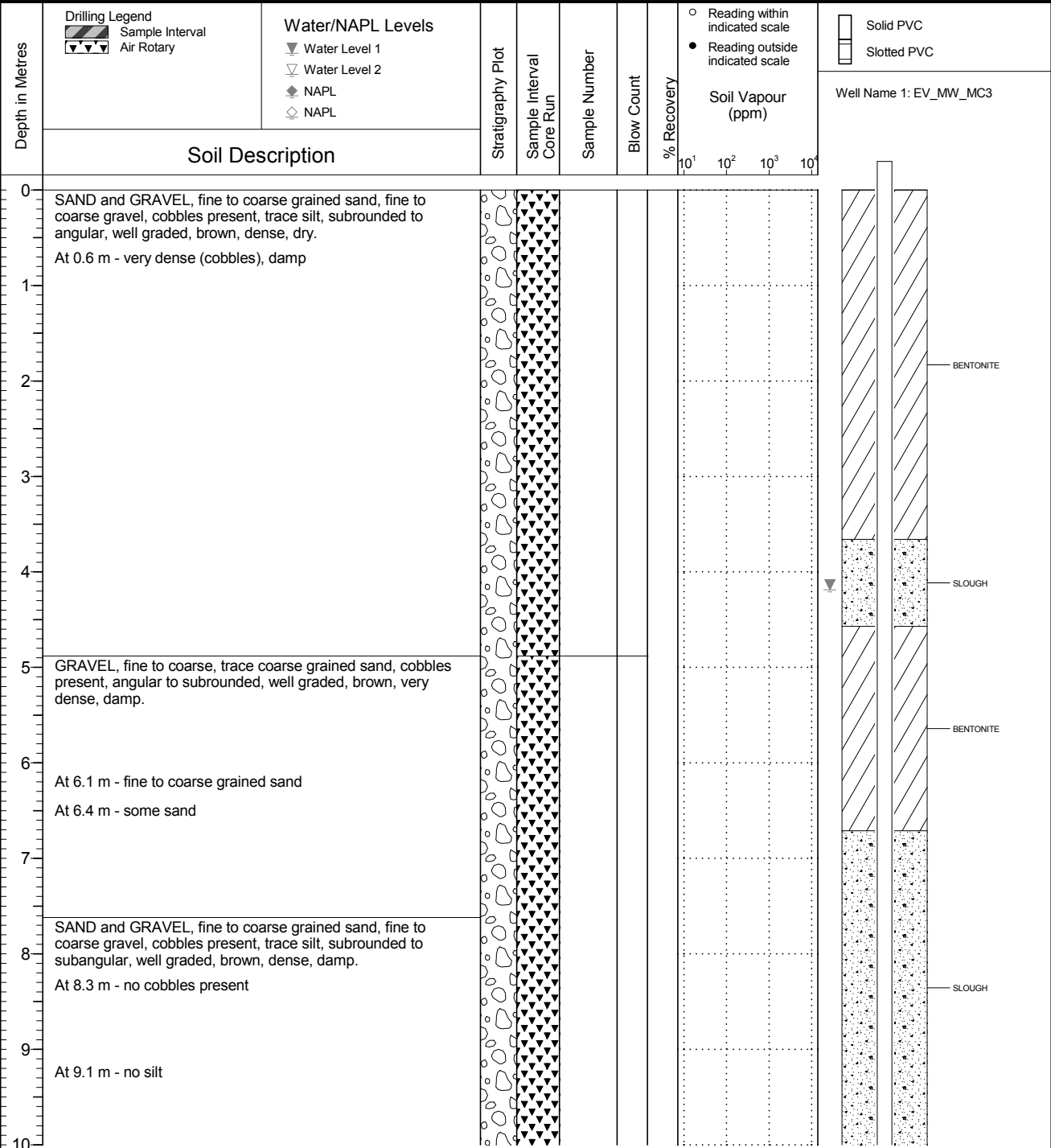
Location
Regional Groundwater Monitoring

PAGE 1 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 08
Ground Surface Elev. (m) 1137.925
Top of Casing Elev. (m) 1138.815
Northing: 5510983.197 Easting: 653666.891

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 23
Log Typed By: VL



NOTES

QA/QC: BH 2019 04 10 Print Date: 2019-09-26



Client
Teck Coal Limited

Borehole No. : EV_BH_MC3

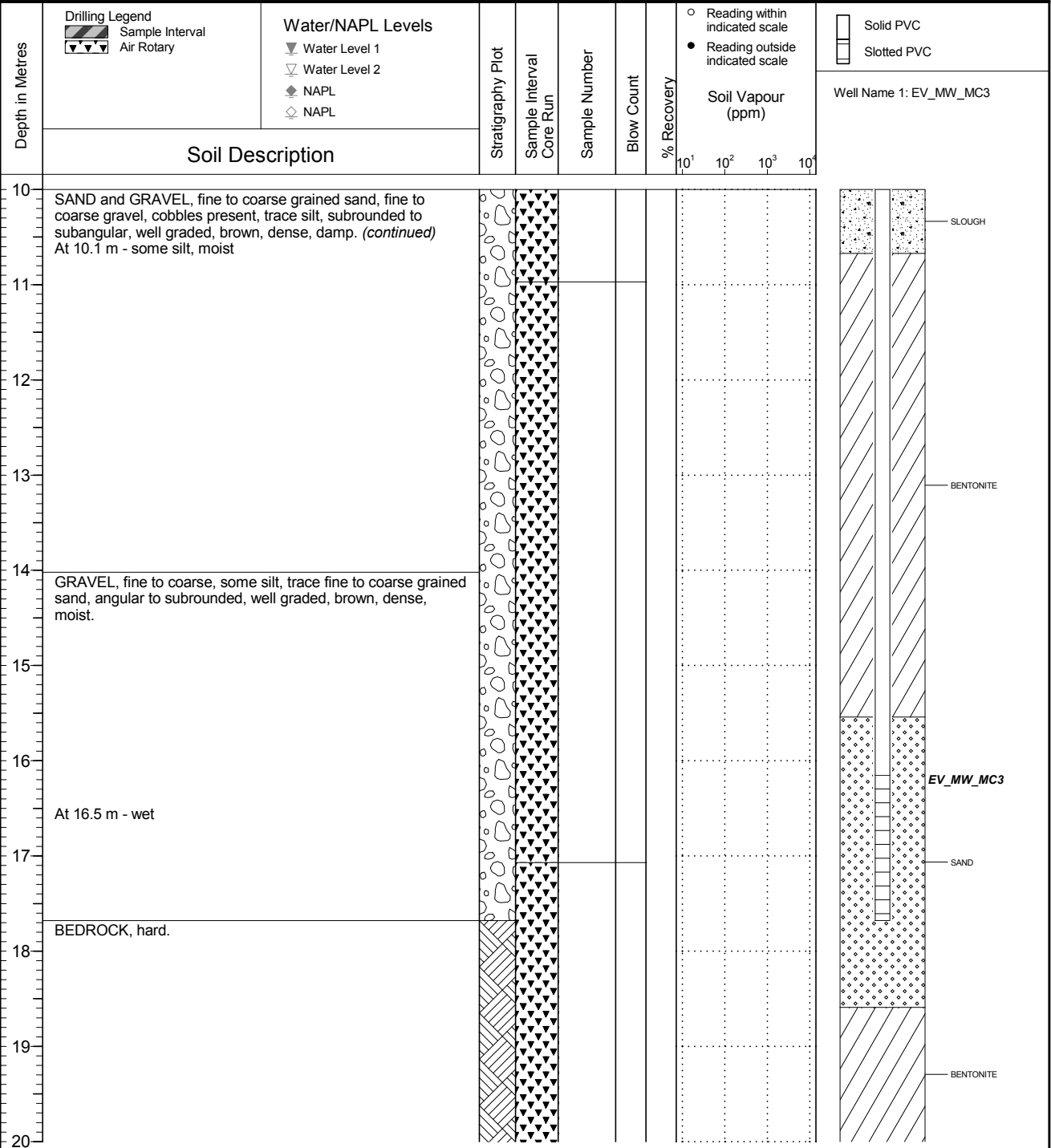
Location
Regional Groundwater Monitoring

PAGE 2 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 08
Ground Surface Elev. (m) 1137.925
Top of Casing Elev. (m) 1138.815
Northing: 5510983.197 Easting: 653666.891

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 23
Log Typed By: VL



NOTES

QA/QC: BH 2019 04 10 Print Date: 2019-09-26



Client
Teck Coal Limited

Borehole No. : EV_BH_MC3

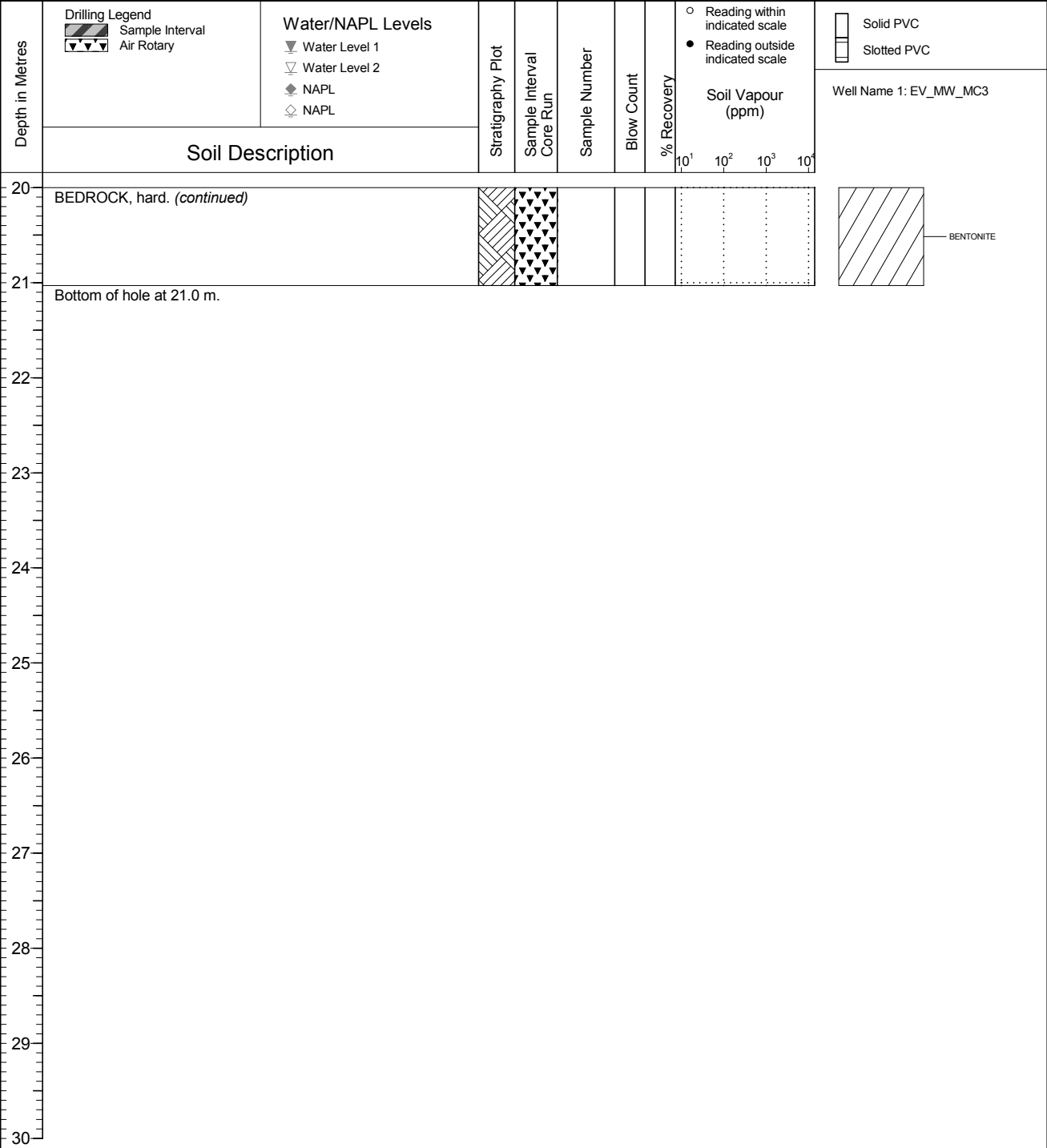
Location
Regional Groundwater Monitoring

PAGE 3 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 08
Ground Surface Elev. (m) 1137.925
Top of Casing Elev. (m) 1138.815
Northing: 5510983.197 Easting: 653666.891

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 23
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_MC4

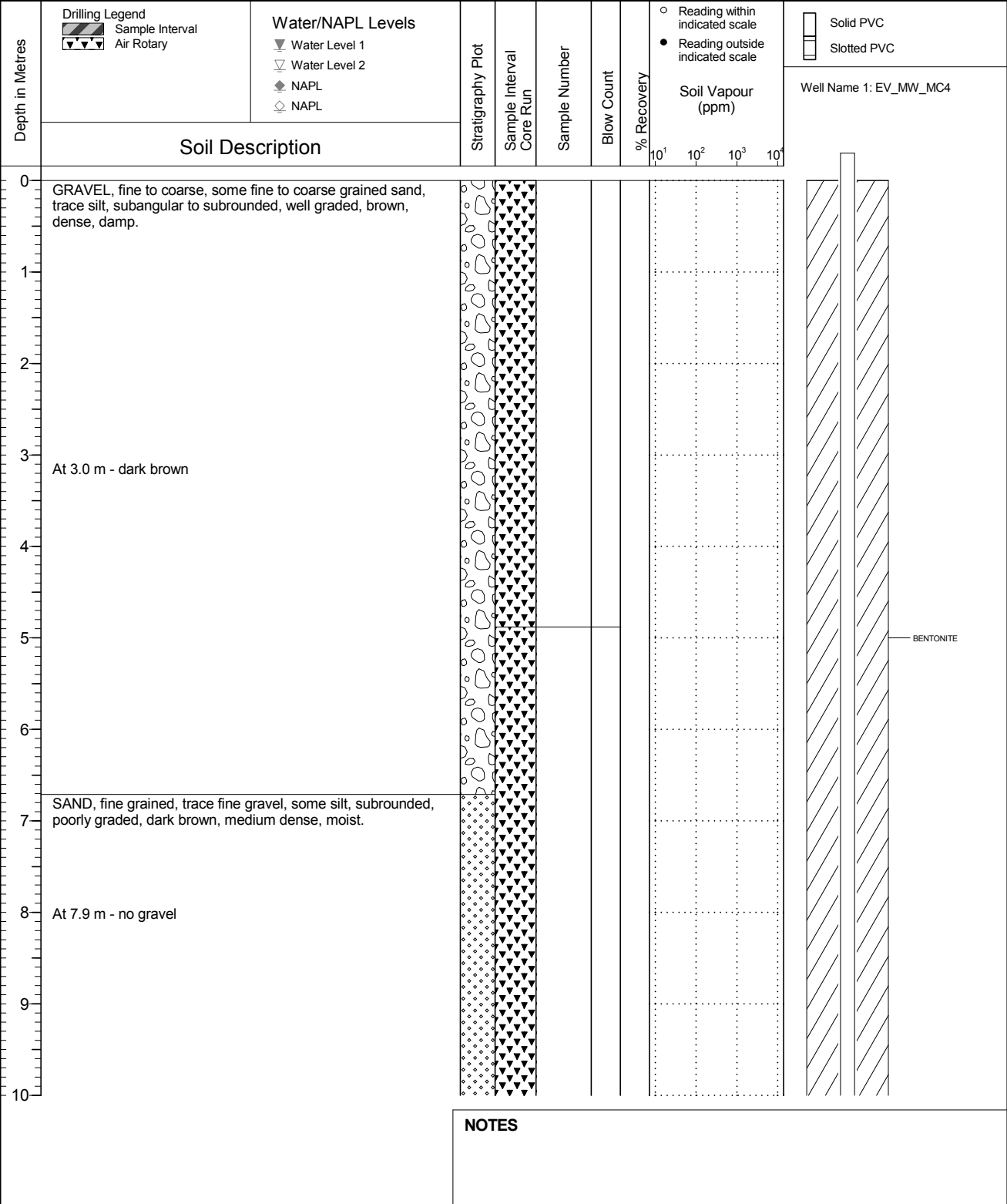
Location
Regional Groundwater Monitoring

PAGE 1 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1144.345
Top of Casing Elev. (m) 1145.308
Northing: 5512279.753 Easting: 653309.224

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 09
Log Typed By: VL



QA/QC: BH 2019 04 10 Print Date: 2019-09-26



Client
Teck Coal Limited

Borehole No. : EV_BH_MC4

Location
Regional Groundwater Monitoring

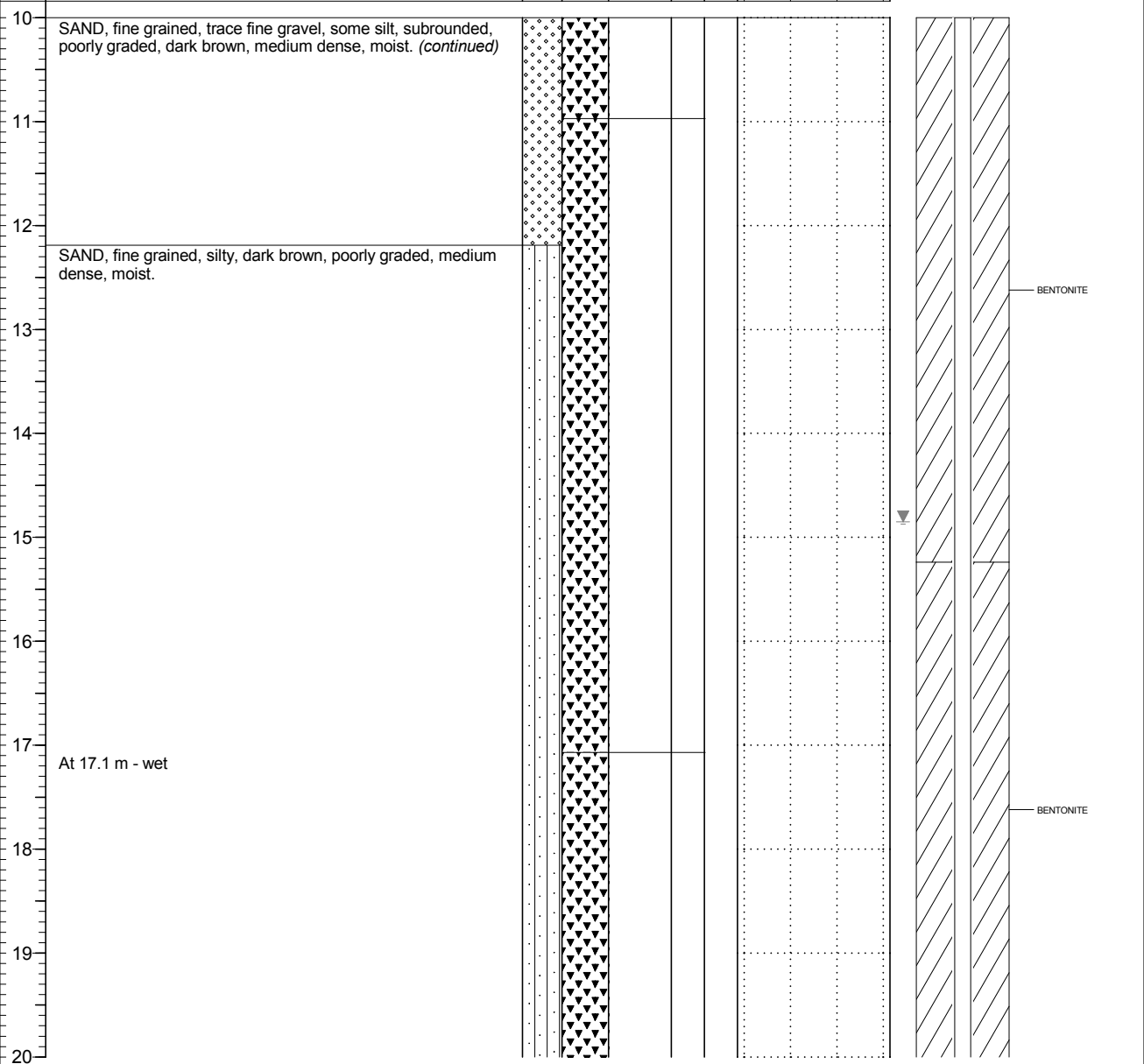
PAGE 2 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1144.345
Top of Casing Elev. (m) 1145.308
Northing: 5512279.753 Easting: 653309.224

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 09
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="radio"/> Reading within indicated scale <input checked="" type="radio"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	Well Name 1: EV_MW_MC4



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_MC4

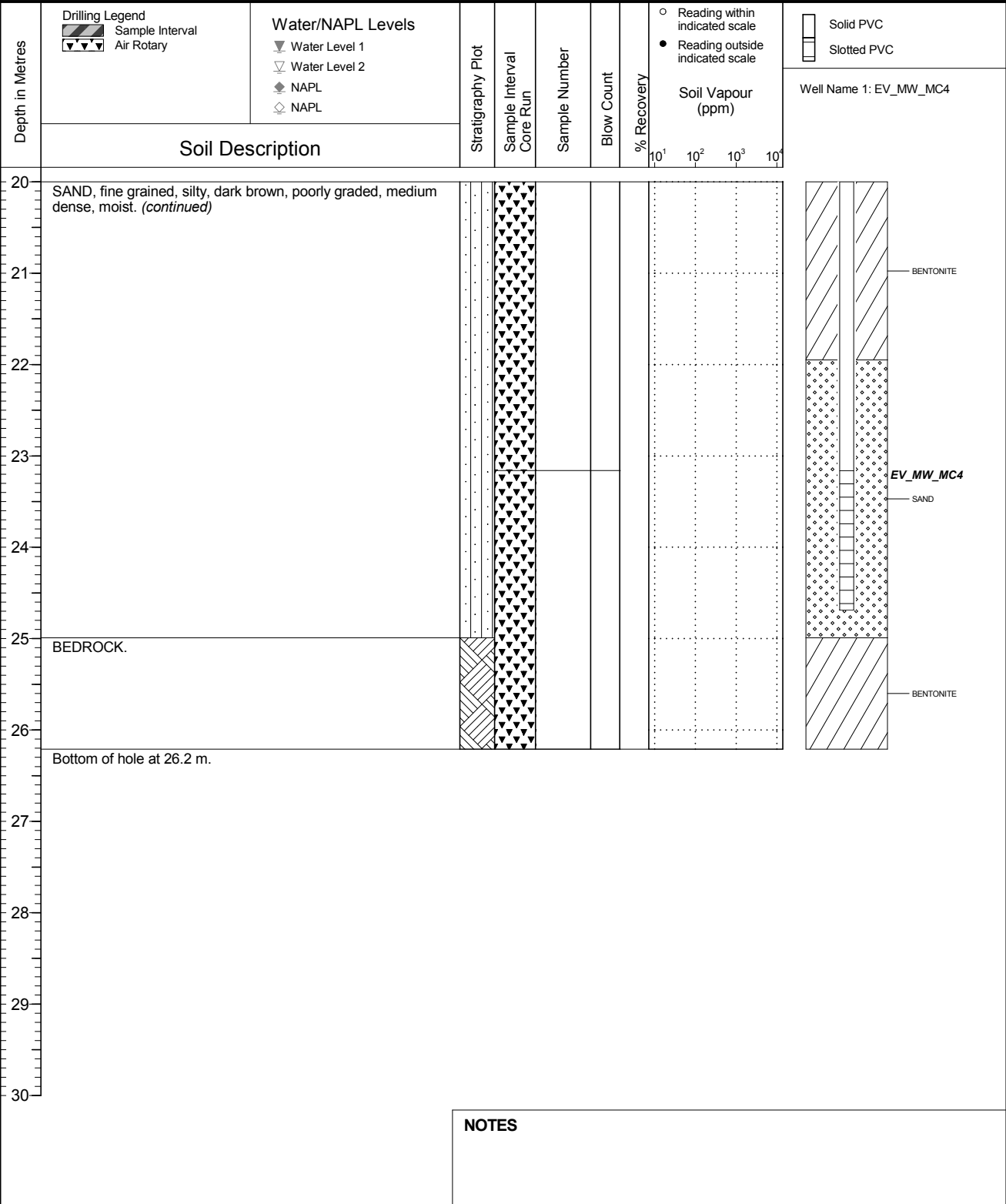
Location
Regional Groundwater Monitoring

PAGE 3 OF 3

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 07
Ground Surface Elev. (m) 1144.345
Top of Casing Elev. (m) 1145.308
Northing: 5512279.753 Easting: 653309.224

Project Number: 660613
Borehole Logged By: RAS
Date Drilled: 2019 01 09
Log Typed By: VL





Client
Teck Coal Limited

Borehole No. : EV_BH_SPR1

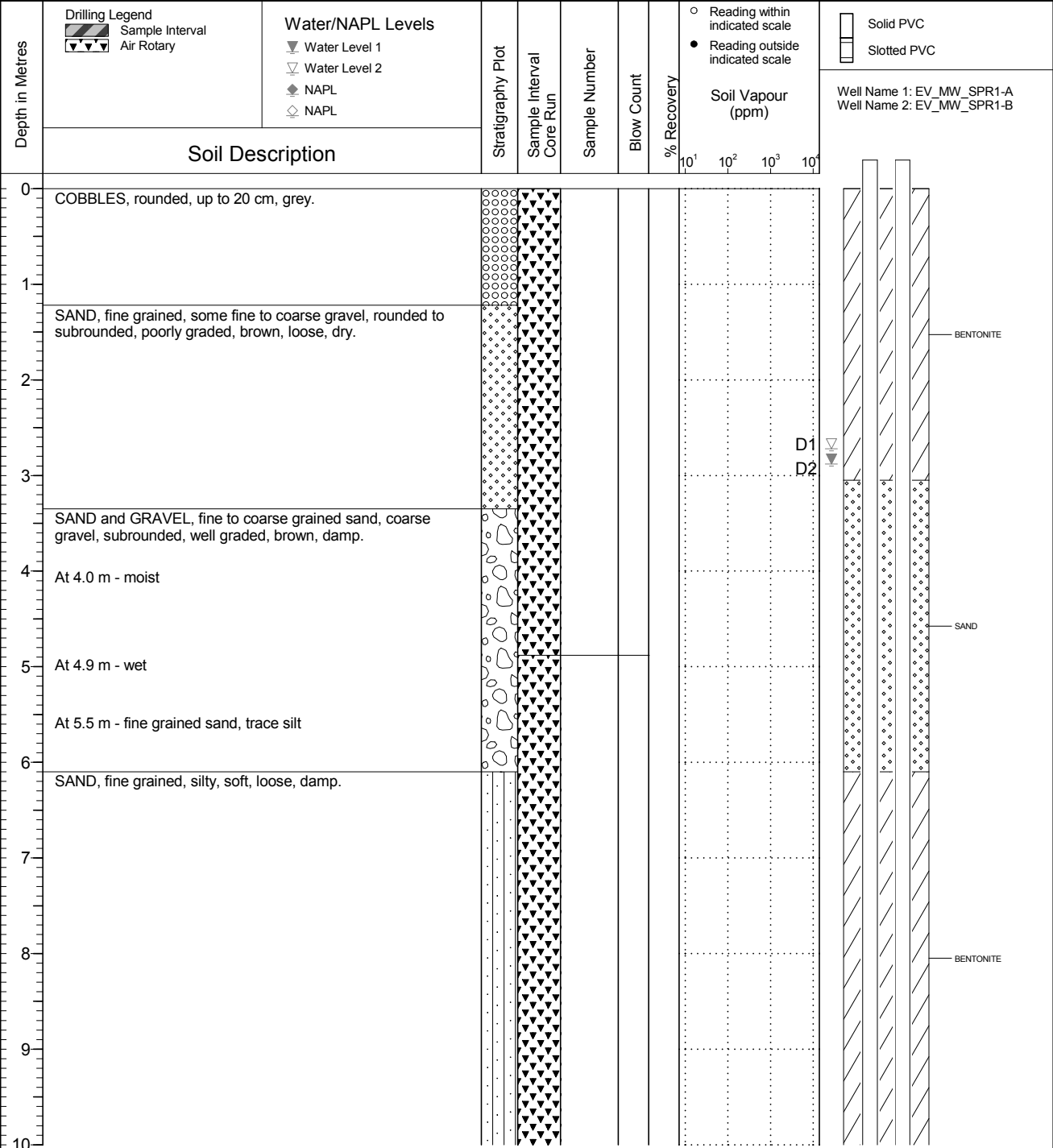
Location
Regional Groundwater Monitoring

PAGE 1 OF 6

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 08
Ground Surface Elev. (m) 1137.376
Top of Casing Elev. (m) 1138.248 1138.247
Northing: 5511277.374 Easting: 653946.968

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 21
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_SPR1

Location
Regional Groundwater Monitoring

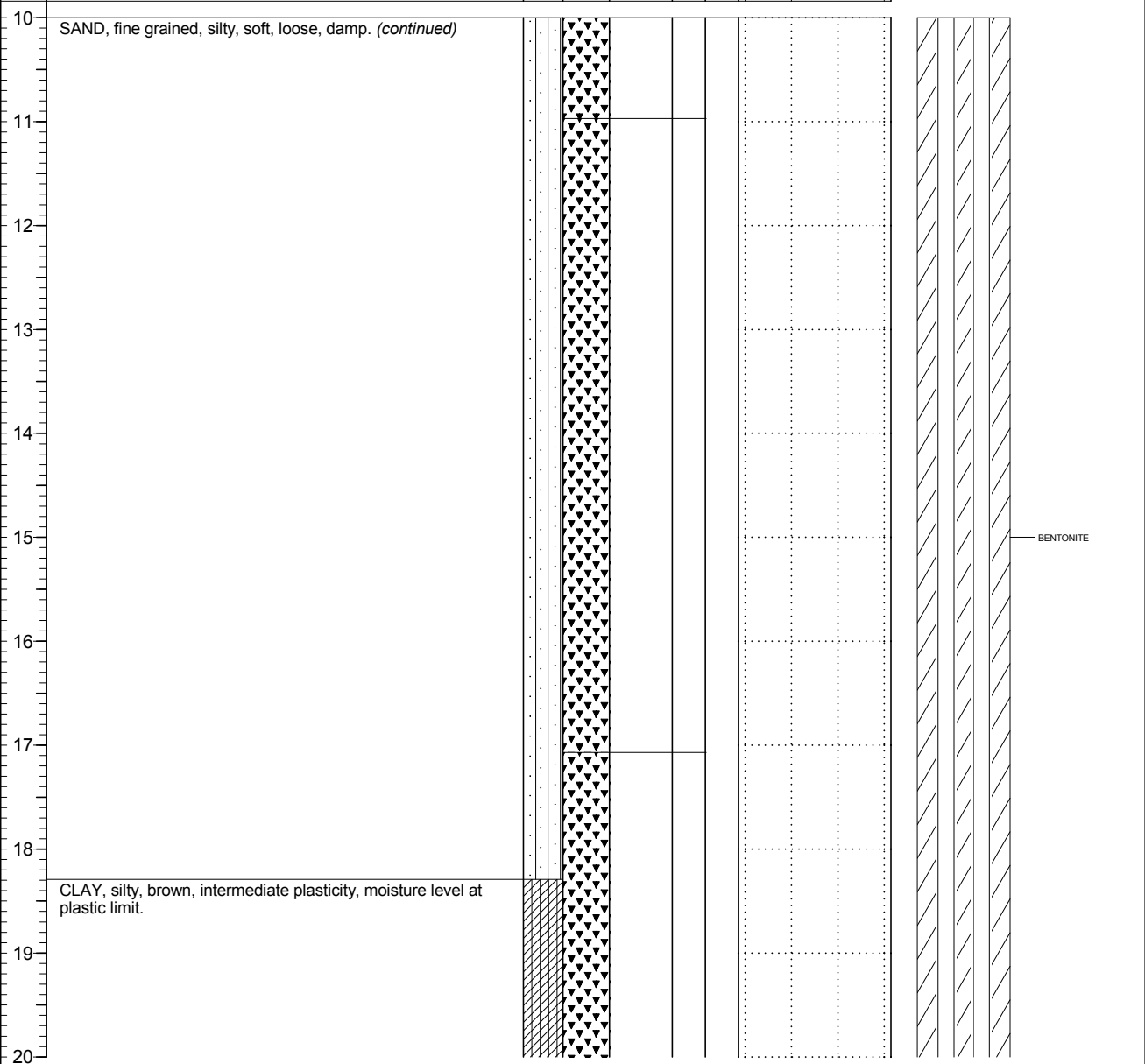
PAGE 2 OF 6

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 08
Ground Surface Elev. (m) 1137.376
Top of Casing Elev. (m) 1138.248 1138.247
Northing: 5511277.374 Easting: 653946.968

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 21
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	Well Name 1: EV_MW_SPR1-A Well Name 2: EV_MW_SPR1-B



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_SPR1

Location
Regional Groundwater Monitoring

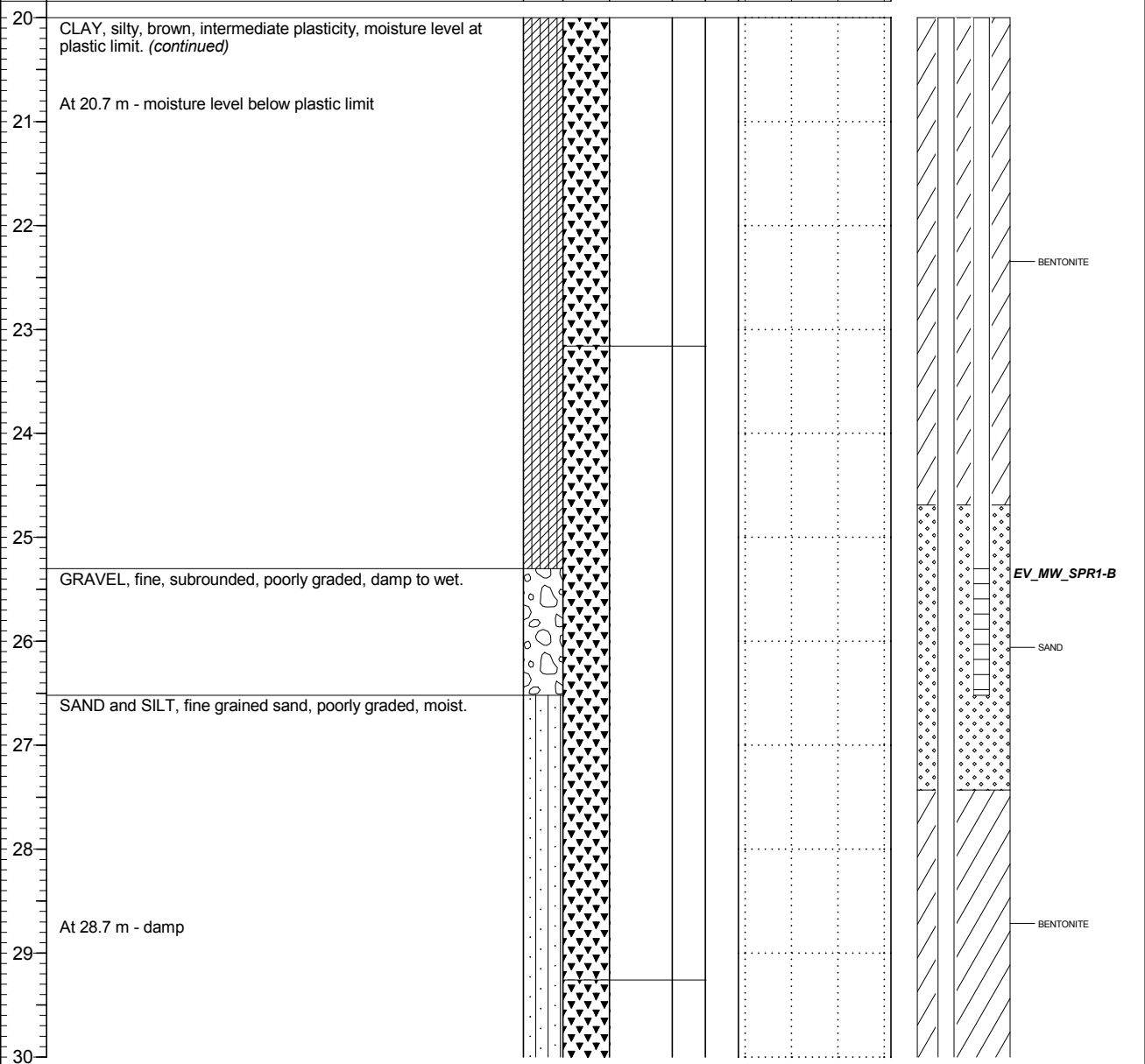
PAGE 3 OF 6

Drilling Contractor Owen's Drilling
 Drilling Method Dual Rotary
 Borehole Dia. (m) 0.15
 Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 08
 Ground Surface Elev. (m) 1137.376
 Top of Casing Elev. (m) 1138.248 1138.247
 Northing: 5511277.374 Easting: 653946.968

Project Number: 660613
 Borehole Logged By: AMH
 Date Drilled: 2019 01 21
 Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="checkbox"/> Reading within indicated scale <input checked="" type="checkbox"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_SPR1

Location
Regional Groundwater Monitoring

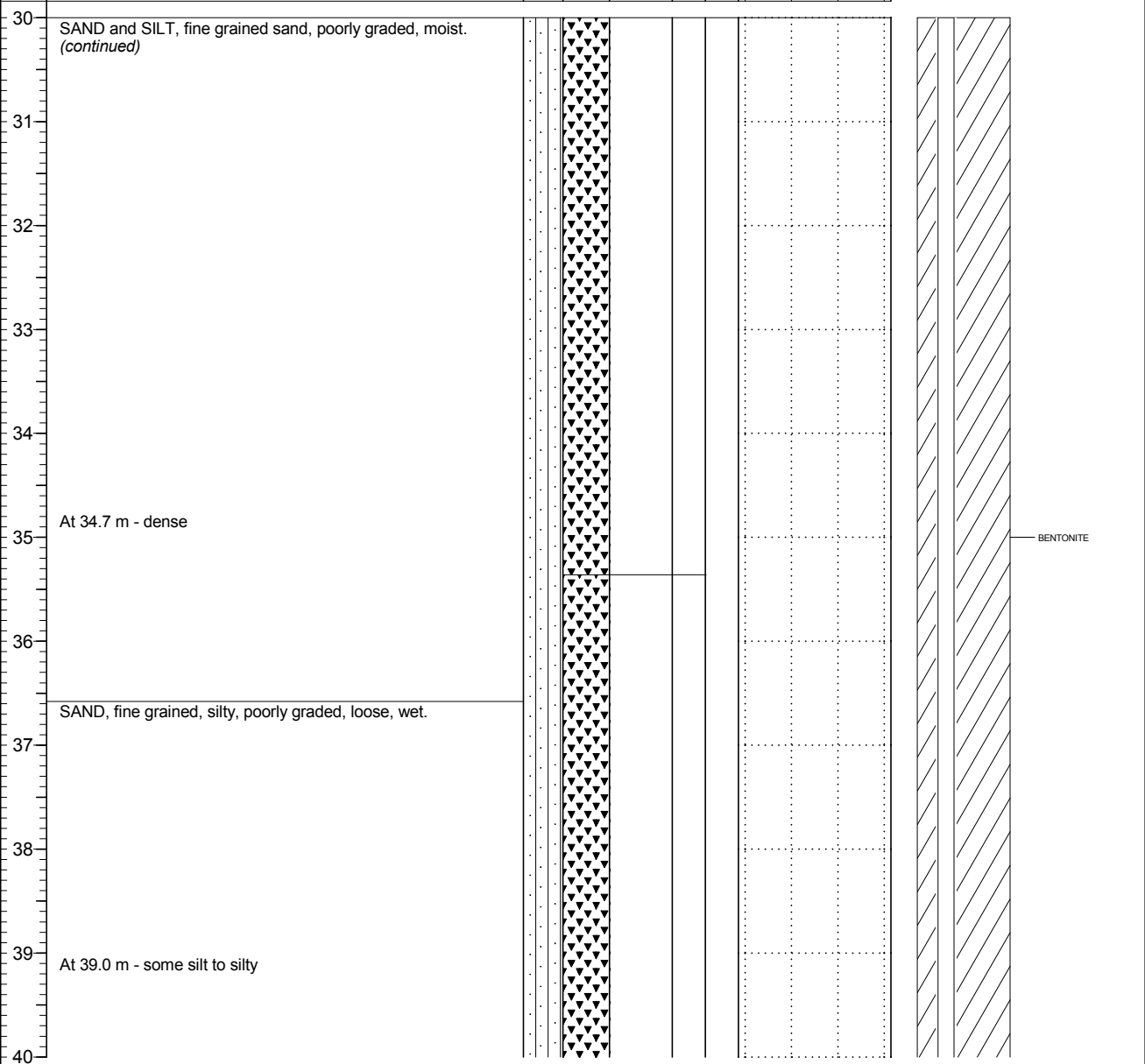
PAGE 4 OF 6

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 08
Ground Surface Elev. (m) 1137.376
Top of Casing Elev. (m) 1138.248 1138.247
Northing: 5511277.374 Easting: 653946.968

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 21
Log Typed By: VL

Depth in Metres	Drilling Legend Sample Interval Air Rotary	Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<input type="radio"/> Reading within indicated scale <input type="radio"/> Reading outside indicated scale	Solid PVC Slotted PVC
	Soil Description							Soil Vapour (ppm)	



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_SPR1

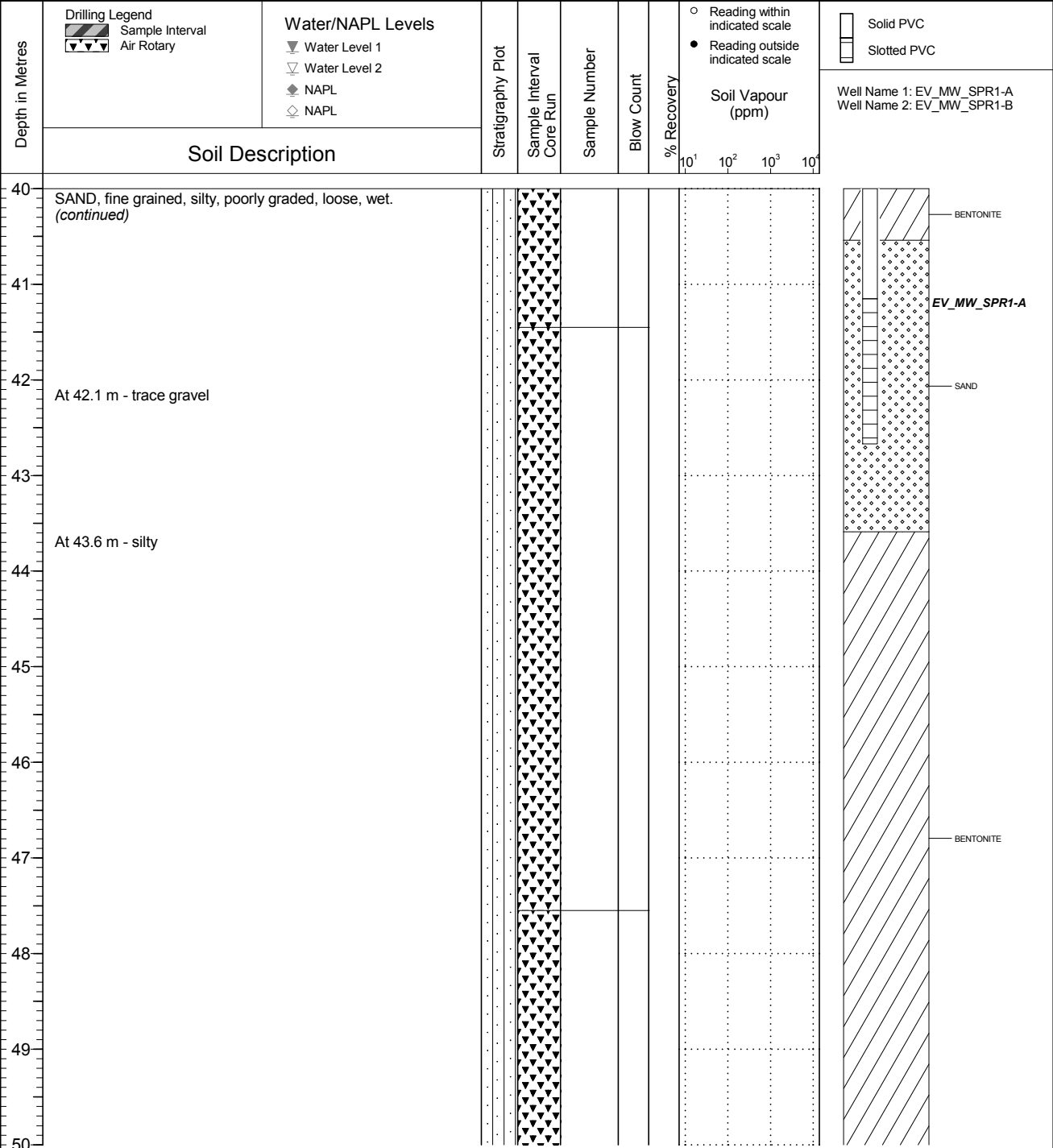
Location
Regional Groundwater Monitoring

PAGE 5 OF 6

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 08
Ground Surface Elev. (m) 1137.376
Top of Casing Elev. (m) 1138.248 1138.247
Northing: 5511277.374 Easting: 653946.968

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 21
Log Typed By: VL



NOTES



Client
Teck Coal Limited

Borehole No. : EV_BH_SPR1

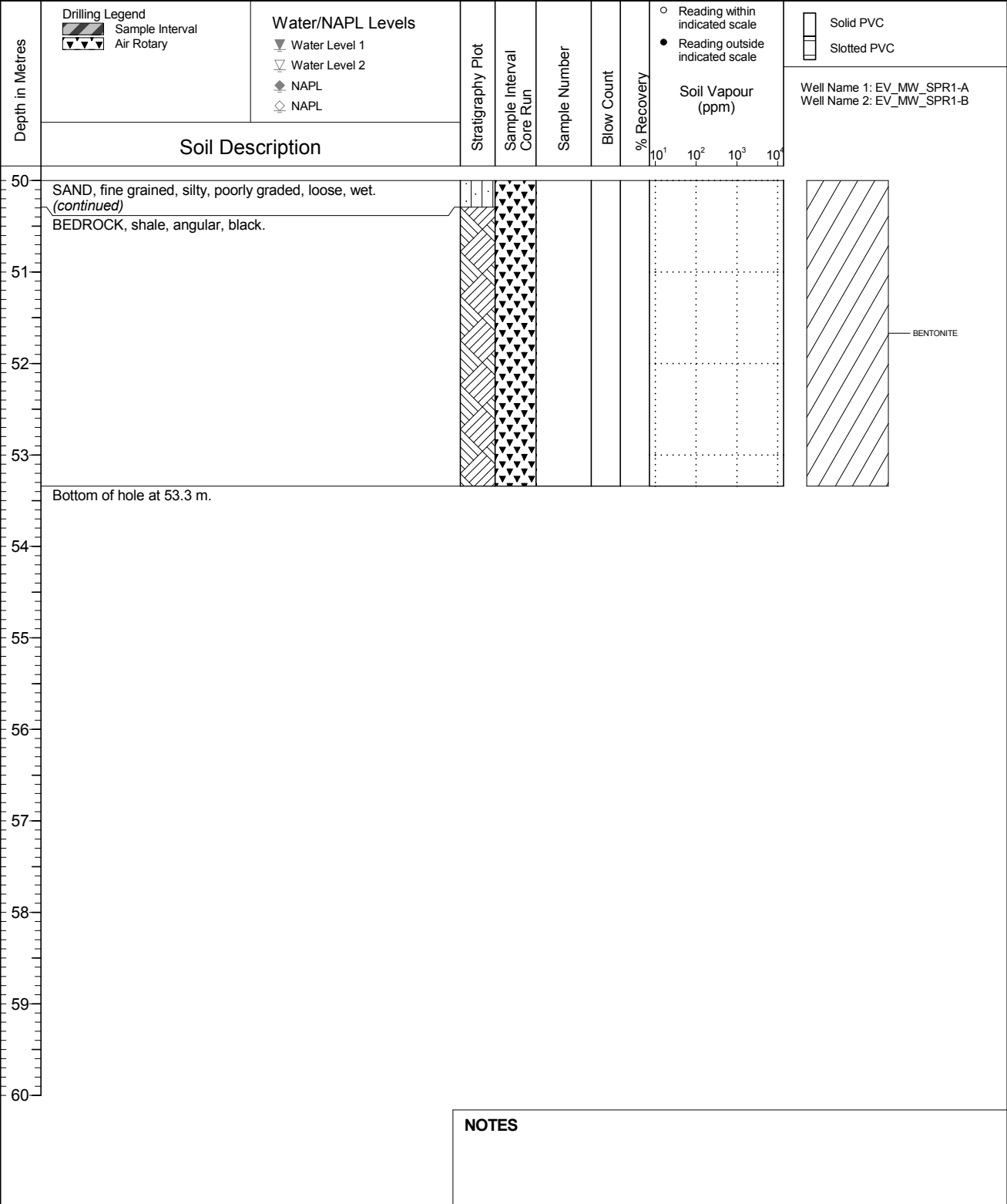
Location
Regional Groundwater Monitoring

PAGE 6 OF 6

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 08
Ground Surface Elev. (m) 1137.376
Top of Casing Elev. (m) 1138.248 1138.247
Northing: 5511277.374 Easting: 653946.968

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 21
Log Typed By: VL





Client
Teck Coal Limited

Borehole No. : EV_BH_SPR-C

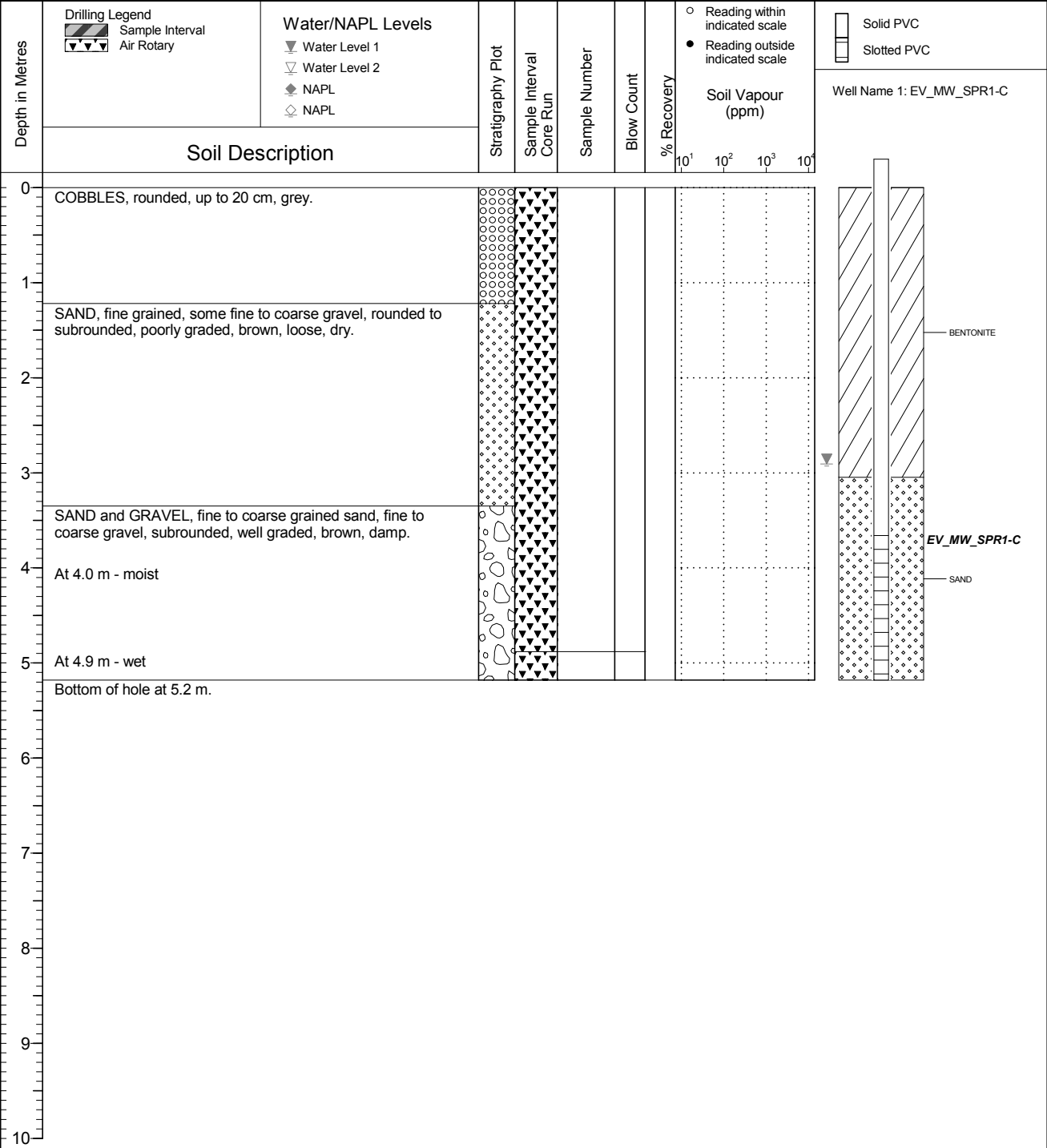
Location
Regional Groundwater Monitoring

PAGE 1 OF 1

Drilling Contractor Owen's Drilling
Drilling Method Dual Rotary
Borehole Dia. (m) 0.15
Pipe/Slotted Pipe Dia. (m) 0.05/0.05

Date Monitored 2019 03 06
Ground Surface Elev. (m) 1137.270
Top of Casing Elev. (m) 1138.188
Northing: 5511278.052 Easting: 653945.619

Project Number: 660613
Borehole Logged By: AMH
Date Drilled: 2019 01 21
Log Typed By: VL



NOTES

DATA ENTRY: JPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgWD

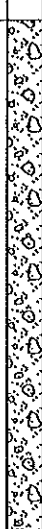



SHEET 1 OF 5

LOCATION: See Location Plan

BORING DATE: November 3, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5511616 E: 653475

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH C _v , kPa		nat V. rem V.		WATER CONTENT PERCENT			
								20	40	60	80	10 ⁻⁶	10 ⁻⁵		
0		Ground Surface		344.73											Stick-up = 0.84 m
0		SAND, coarse and medium-grained, and fine-grained GRAVEL, rounded to sub-rounded, moderately graded, wet, very loose		0.00											
4		SAND, fine and medium-grained, sub-rounded to sub-angular, well graded, dry, very loose		341.07 3.66											
6	Sonic 127 mm (ID) Casing 152.4 mm (OD) UR Drilling	SILT, some fine-grained sand, well graded, very loose --- Wet at 5.8 m		339.09 5.84											
8		CLAY, some fine-grained sand, well-sorted, moist, compact		336.65 8.08											
10		CONTINUED NEXT PAGE													

BOREHOLE - EXPANDED ADD. LAB TESTING. 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED: CD

DATA ENTRY: IFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgWD

SHEET 2 OF 5

LOCATION: See Location Plan

BORING DATE: November 3, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5511616 E: 653475

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, K, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20		40		60				80	
10	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	CLAY, some fine-grained sand, well-sorted, moist, compact <i>(continued)</i>															
11		SILT, some fine-grained sand, well graded, wet, very loose		333.30													
12		CLAY, some fine-grained sand, well-sorted, wet, soft		330.40													
13		CLAY, some fine-grained sand, well-sorted, moist, compact		328.88													
14		CLAY, some fine-grained sand, well-sorted, moist, loose		327.36													
15		CLAY, some fine-grained sand, well-sorted, moist, compact		17.37													
16		CLAY, some fine-grained sand, well-sorted, moist, compact															
17		CLAY, some fine-grained sand, well-sorted, moist, compact															
18		CLAY, some fine-grained sand, well-sorted, moist, compact															
19		CLAY, some fine-grained sand, well-sorted, moist, compact															
20		CLAY, some fine-grained sand, well-sorted, moist, compact															

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD

DATA ENTRY: JRG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgWD

SHEET 3 OF 5

LOCATION: See Location Plan

BORING DATE: November 3, 2013

DATUM: UTM Zone 11 (Nad 83)

N: 5511616 E: 653475

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH				WATER CONTENT PERCENT					
							Cu, kPa		nat V. rem V.		Wp		Wl			
20		CLAY, some fine-grained sand, well-sorted, moist, loose (continued)														
21																
22															Bentonite Pellets	
23																
24															Silica Sand	
25	Sonic 127 mm (ID) Casings 452.4 mm (OD) JRT Drilling															
26															Slotted Section	
27																
28																
29															Silica Sand	
30															Bentonite Pellets	
															Slough	

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB. TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED: CD

DATA ENTRY: IFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgwD

SHEET 4 OF 5

LOCATION: See Location Plan

BORING DATE: November 3, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5511616 E: 653475

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		STRATA PLOT	SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	ELEV. DEPTH (m)		NUMBER	TYPE	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
							20	40	60	80	nat V. + rem V. ⊕	U - O	Wp	W		
30		CLAY, some fine-grained sand, well-sorted, moist, loose (continued)														
		CLAY, some fine-grained sand, well-sorted, wet, soft	314.28 30.45													
31																
32																
33																
34																
35																
36																
37		SAND, coarse-grained, sub-angular to angular, well graded, wet, very loose	307.54 37.19													
38																
39		SILT and SAND, coarse-grained, sub-angular, moderately-sorted, wet, very loose	305.87 38.66													
40																

CONTINUED NEXT PAGE

BOREHOLE - EXPANDED ADD. LAB TESTING. 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD

DATA ENTRY: JFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgWD

SHEET 5 OF 5

LOCATION: See Location Plan

BORING DATE: November 3, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 6511616 E: 653475

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH				WATER CONTENT PERCENT					
							20 40		60 80		Wp		Wi			
40	Sonic 127 mm (ID) Casing 132.4 mm (OD) JF Drilling	SILT and SAND, coarse-grained, sub-angular, moderately-sorted, wet, very loose <i>(continued)</i>		304.34												
41		SANDY SILT, fine-grained, moderately-sorted, wet, very loose		40.39												
42																
43		CLAYEY SAND, fine-grained, some coarse-grained gravel, angular, moderately-sorted, brown, wet, very loose		302.06												
44				42.67												
45		GRAVEL, fine-grained, sub-rounded, moderately-sorted, grey to brown, very loose, wet		300.69												
46			44.04													
47	SAND, medium-grained with some fine grains, sub-rounded, poorly graded, mainly black to grey and brown, wet		299.02													
48			44.81													
49	End of BOREHOLE.		297.10													
50			47.55													
		<p>NOTES: Sloughing present to 29.9 m. Standpipe installed to 27.6 m upon well completion. Groundwater level measured at 2.5 mbgs on November 7, 2013. Groundwater level measured at 3.4 mbgs on November 15, 2013.</p>														

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED: CD

DATA ENTRY: IPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgwS

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: November 6, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5511624 E: 653476

BOREHOLE - EXPANDED ADD. LAB TESTING. 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20 40 60 80		SHEAR STRENGTH Cu, kPa		DYNAMIC PENETRATION RESISTANCE				10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³	
0		Ground Surface		344.73											Stick-up = 0.96 m		
0.91		SAND, coarse and medium-grained, and fine-grained GRAVEL, rounded to sub-rounded, moderately graded, dark brown, damp, very loose		0.00													
0.91		SAND, fine and medium-grained, sub-rounded to sub-angular, poorly graded, brown, dry, very loose		343.61											15 Nov 2013		
4.57		CLAYEY SILT, some fine-grained sand, dark brown to grey, moist, soft to very loose		340.16											Bentonite Pellets		
5.49		CLAYEY SILT, some fine-grained sand, dark brown to grey, wet, very soft, very loose (runny)		339.24											Silica Sand		
9.14		CLAY, some fine-grained sand, well-sorted, moist, compact		335.58											Slotted Section		
9.14				9.14											Slough		

CONTINUED NEXT PAGE

DEPTH SCALE

1 : 50



LOGGED: RT

CHECKED: CD

DATA ENTRY: JFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgws

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: November 6, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5511624 E: 653476

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE				SAMPLES				DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT							
								20	40	60	80	nat V. rem V. ϕ	+ ϕ U- ϕ	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³		
10	JR Drilling	CLAY, some fine-grained sand, well-sorted, moist, compact (continued)		334.06													Slough		
11		End of BOREHOLE.		10.67															
12		<p>NOTES: Standpipe installed to 7.32 m upon well completion. Groundwater level measured at 3.8 mbgs on November 7, 2013. Groundwater level measured at 1.1 mbgs on November 15, 2013.</p>																	
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			

BOREHOLE - EXPANDED ADD. LAB. TESTING - 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD

DATA ENTRY: JPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ER1gwD

SHEET 2 OF 4

LOCATION: See Location Plan

BORING DATE: 29 and 31 October, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5510952 E: 651379

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER TYPE	BLOWS/0.3m	20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴		
						SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
						nat V. + Q - ● rem V. ⊕ U - ○				Wp — Wl					
						20 40 60 80				10 20 30 40					
10		SANDY GRAVEL, fine-grained with some coarse grains, sub-rounded to sub-angular, poorly sorted, wet, very loose (continued)													
11															
12															
13															
14															
15	SR Drilling Sonic 127 mm (ID) Casing 152.4 mm (OD)														
16															
17		SAND, medium to coarse-grained, some fine-grained gravel, angular to sub-angular, moderately sorted, wet, very loose		322.94 16.92											
18															
19															
20															

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD

DATA ENTRY: JFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ER1gwd

SHEET 3 OF 4

LOCATION: See Location Plan

BORING DATE: 29 and 31 October, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5510952 E: 651379

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k_v cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								20		40		60				80	
20	Sonic 127 mm (ID) Casing, 152.4 mm (OD) JR Drilling	SAND, medium to coarse-grained, some fine-grained gravel, angular to sub-angular, moderately sorted, wet, very loose (continued)															
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28		SILTY SAND, fine to medium-grained, occasional angular gravel, rounded to sub-rounded, moderately graded, dry, very loose (BEDROCK)		311.96 27.89													
29																	
30																	

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BOREHOLE - EXPANDED ADD. LAB TESTING: 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD

DATA ENTRY: JFG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ER1gwD

SHEET 4 OF 4

LOCATION: See Location Plan

BORING DATE: 29 and 31 October, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5510952 E: 651379

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE				SAMPLES				DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT							
								20	40	60	80	nat V. rem V.	+	⊕	⊖	⊙	Wp		
30	A.R. Drilling	SILTY SAND, fine to medium-grained, occasional angular gravel, rounded to sub-rounded, moderately graded, dry, very loose (BEDROCK) (continued)		309.07 30.76													Slough		
31		End of BOREHOLE.																	
32		NOTES: Standpipe installed to 28.9 m upon well completion. Groundwater level measured at 4.6 mbgs on November 16, 2013.																	
33																			
34																			
35																			
36																			
37																			
38																			
39																			
40																			

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD

DATA ENTRY: jpg

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ER1gws

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: October 30, 2013

DATUM: UTM Zone 11
(Nad 83)

N: 5510955 E: 651374

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k_v cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PILOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH C_u , kPa				WATER CONTENT PERCENT					
								20		40		60				80	
0		Ground Surface		339.85													
1		SAND, medium and coarse-grained with some fine grains, rounded to sub-rounded, moderately graded, dry, very loose		0.00													
2																	
3																	
4																	
5	Sonic 127 mm (ID) Casing 152.4 mm (OD) - R Drilling																
6																	
7		SAND, medium to coarse-grained, some fine-grained gravel, sub-rounded, sub-angular, moderately sorted, dry, very loose		333.15 6.71													
8																	
9		SAND, medium to coarse-grained, some fine-grained gravel, sub-rounded, sub-angular and angular, moderately sorted, wet, very loose		331.32 8.53													
10																	

BOREHOLE - EXPANDED ADD. LAB TESTING: 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

CONTINUED NEXT PAGE

16 Nov 2013
▽
Bentonite Chips

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD

DATA ENTRY: JFG

PROJECT No.: 12.1349.0013
 LOCATION: See Location Plan
 N: 5510955 E: 651374

RECORD OF BOREHOLE: EV_ER1gwS

BORING DATE: October 30, 2013

SHEET 2 OF 2
 DATUM: UTM Zone 11
 (Nad 83)

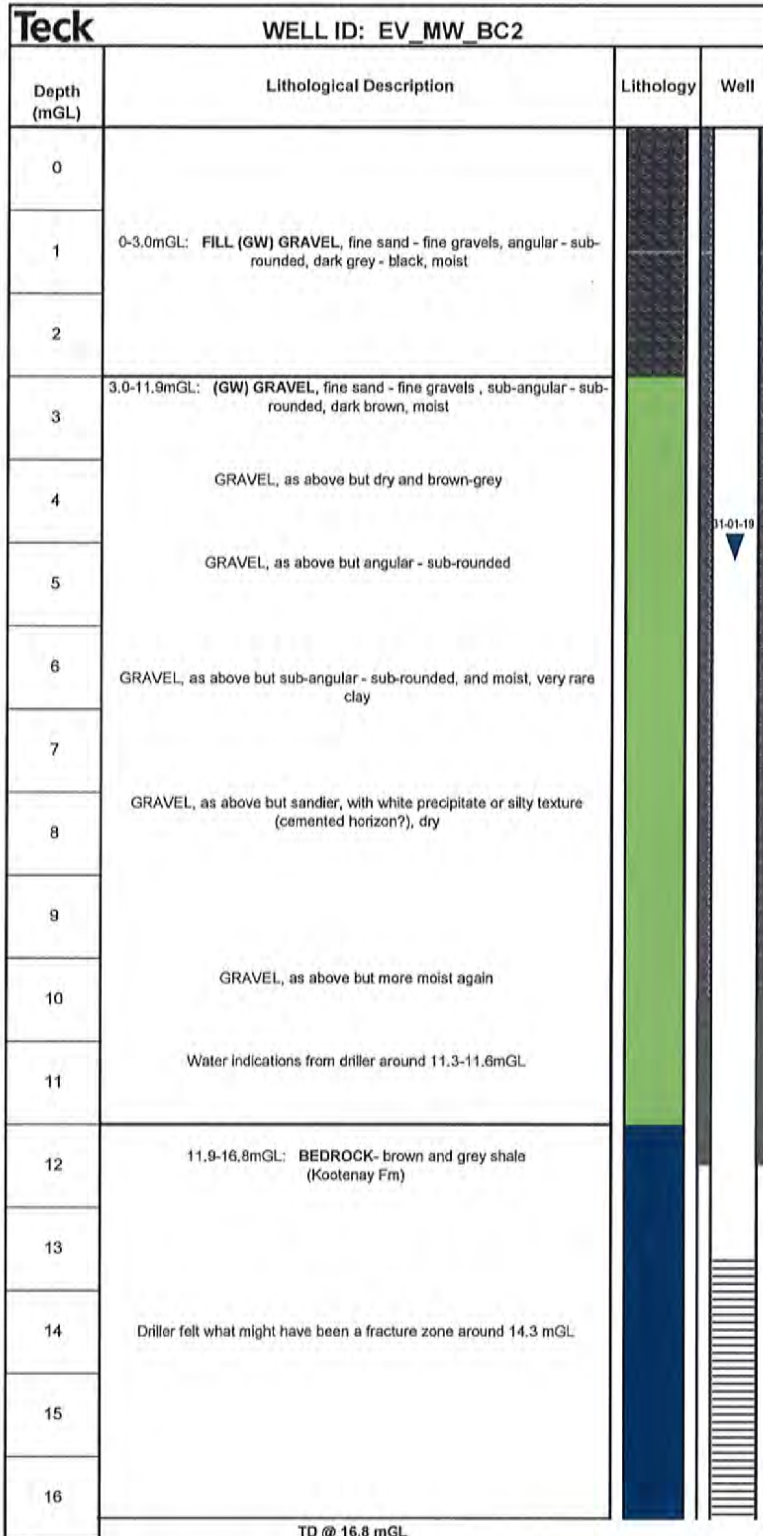
DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION			
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT							
							20	40	60	80	10 ⁵	10 ⁵	10 ⁴	10 ³					
							nat V. + Q - ● rem V. ⊕ U - ○				Wp ----- Wl								
							20	40	60	80	10	20	30	40					
10	Sonic 127 mm (ID), Casing 152.4 mm (OD) JR Drilling	SAND, medium to coarse-grained, some fine-grained gravel, sub-rounded, sub-angular and angular, moderately sorted, wet, very loose (continued)	[Strata Plot]																
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			
17.8		End of BOREHOLE.		322.24 17.61															
18		NOTES: Standpipe installed to 17.8 m upon well completion. Groundwater level measured at 8.2 mbgs on October 30, 2013. Groundwater level measured at 4.7 mbgs on November 16, 2013.																	

BOREHOLE - EXPANDED ADD. LAB. TESTING 12.1349.0013.BH.LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE
1 : 50



LOGGED: RT
CHECKED: CD



TD @ 16.8 mGL

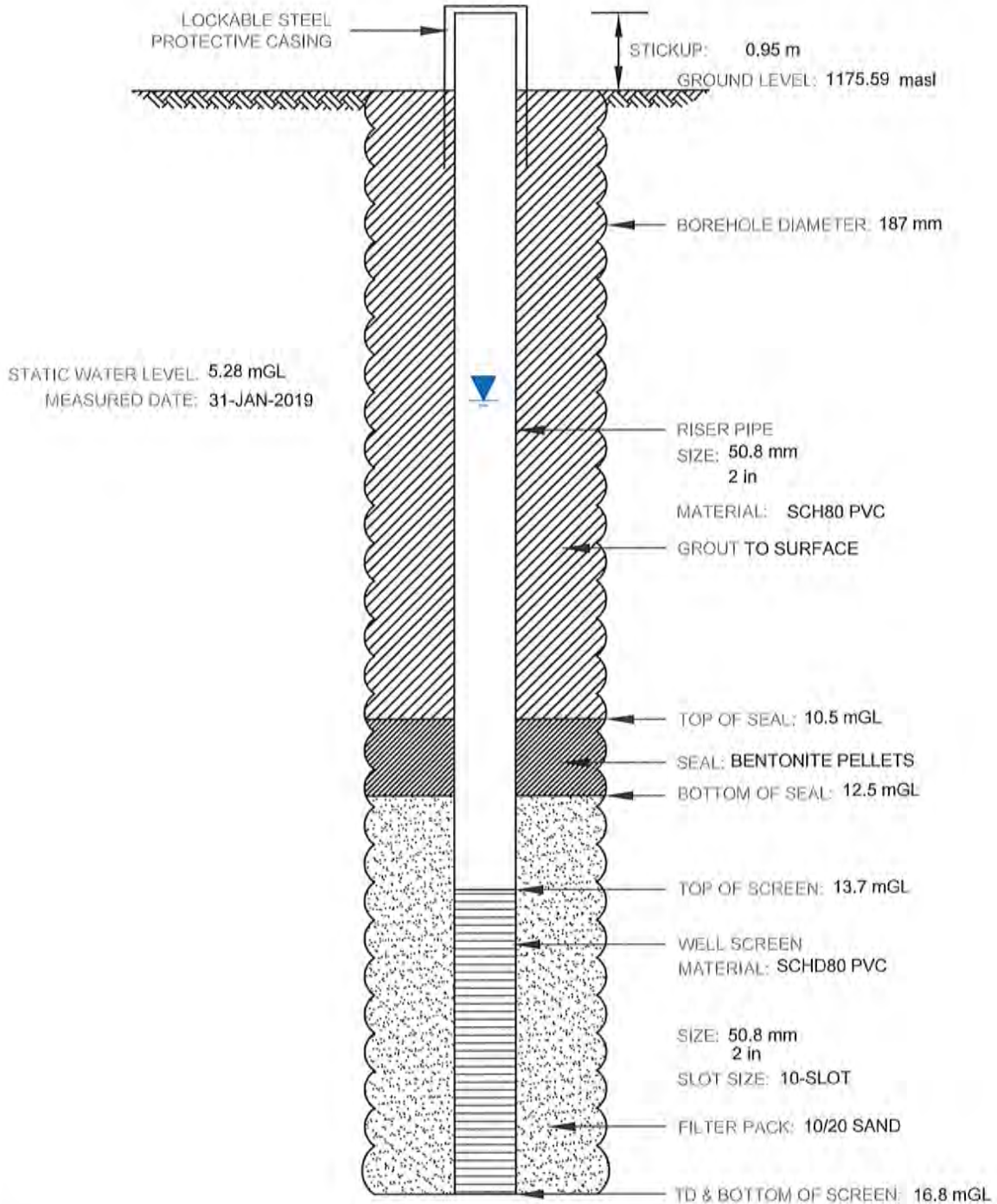
Legend	
Fill/Spoil	
Clay	
Silty-Clay	
Clayey Silt	
Clayey Sand	
Sand	
Clayey Gravel	
Sand & Gravel	
Gravel	
Bedrock	

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>TECK COAL - EVO-AWTF</u>	Spud Date: <u>27-JAN-2019</u>
EV_MW_BC2	Well Name: <u>EV_MW_BC2</u> (N5509496, E655878)	Project Short Title: <u>EVO-AWTF</u>
		Project Number: <u>18102898</u>
		Site Geologist: <u>G. Harding</u>

Drilling Method: Dual Air Rotary	Development: Method: Airlifting
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SCHEMATIC ONLY--NOT TO SCALE



- NOTES:
1. masl - metres above sea level
 2. mGL - metres below ground level
 3. TD - Total Depth

Teck		WELL ID: EV_MW_BC3	
Depth (mGL)	Lithological Description	Lithology	Well
0			
1	0-3.0mGL: FILL (GW) GRAVEL, fine sand - fine gravels, angular - sub-rounded, dark grey - black, moist		
2			
3	3.0-11.9mGL: (GW) GRAVEL, fine sand - fine gravels, sub-angular - sub-rounded, dark brown, moist		
4	GRAVEL, as above but dry and brown-grey		
5			
6	GRAVEL, as above but angular - sub-rounded		
7			
8	GRAVEL, as above but sub-angular - sub-rounded, and moist, very rare clay		
9			
10	GRAVEL, as above but sandier, with white precipitate or silty texture (cemented horizon?), dry		31-01-19
11	GRAVEL, as above but more moist again		
12	11.9-12.2mGL: Bedrock - brown and grey shale (Kootenay Fm) TD @ 12.2 mGL		

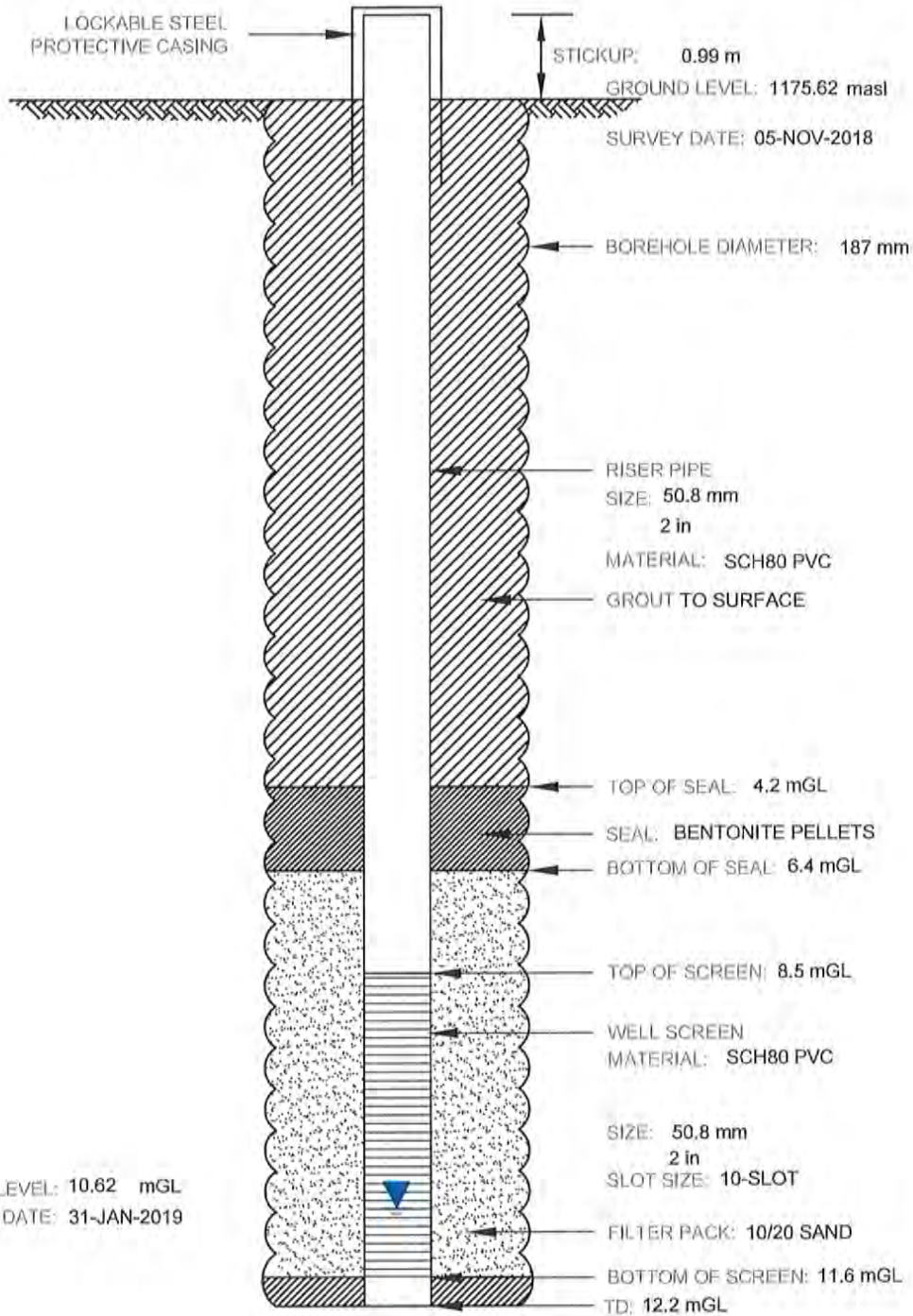
Legend	
Fill/Spoil	
Clay	
Silty-Clay	
Clayey Silt	
Clayey Sand	
Sand	
Clayey Gravel	
Sand & Gravel	
Gravel	
Bedrock	

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>TECK COAL - EVO-AWTF</u>	Spud Date: <u>29-JAN-2019</u>
EV_MW_BC3	Well Name: <u>EV_MW_BC3</u> (N5509498, E655878)	Project Short Title: <u>EVO-AWTF</u>
		Project Number: <u>18102898</u>
		Site Geologist: <u>G. Harding</u>

Drilling Method: Dual Air Rotary	Development: Method: Airlifting
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SCHEMATIC ONLY—NOT TO SCALE



STATIC WATER LEVEL: 10.62 mGL
MEASURED DATE: 31-JAN-2019

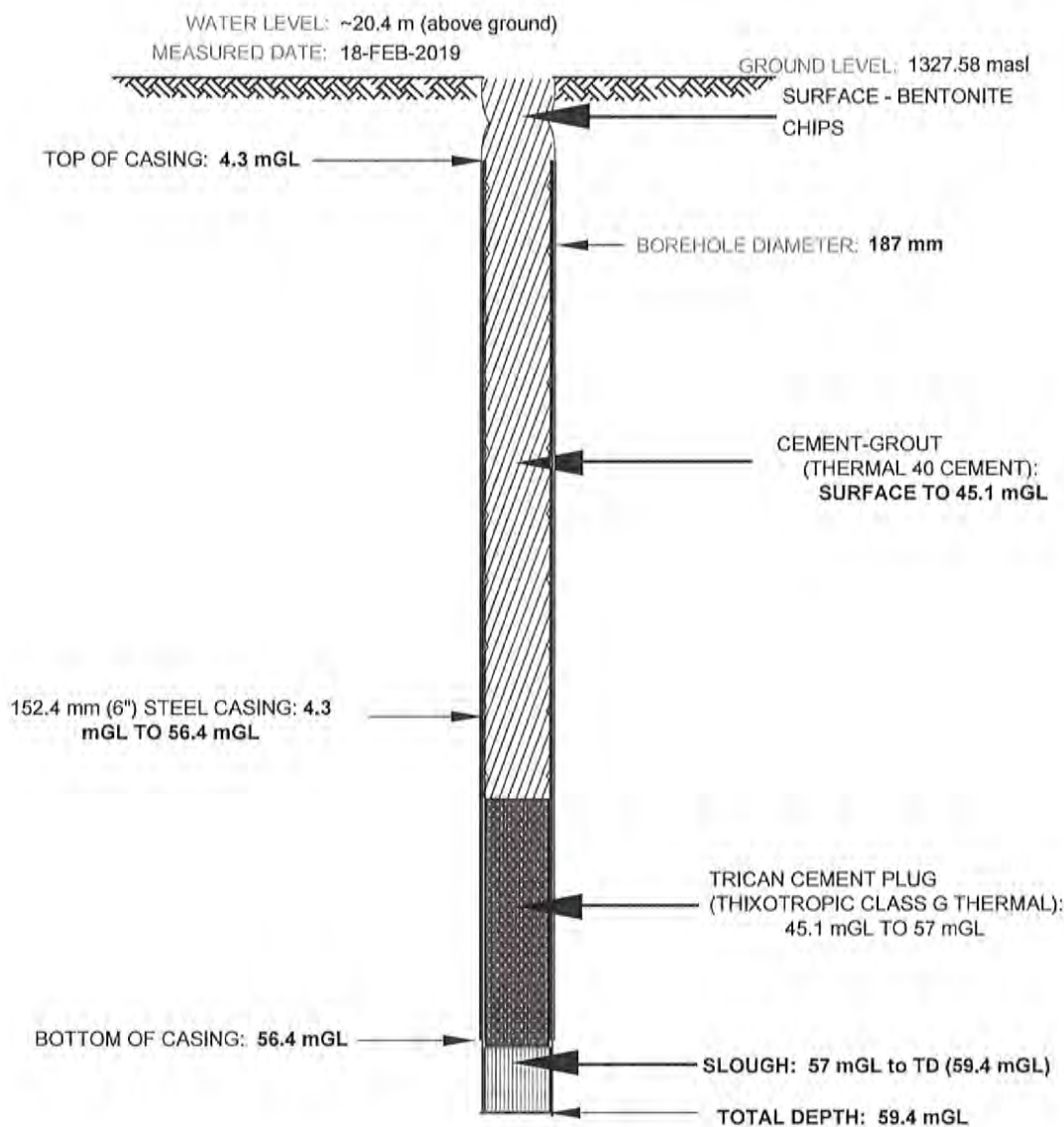
- NOTES:
1. masl - metres above sea level
 2. mGL - metres below ground level
 3. TD - Total Depth

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>TECK COAL - EVO-AWTF</u>	Spud Date: <u>30-JAN-2019</u>
EV_MW_EC1 ABANDONED	Well Name: <u>EV_MW_EC1 (ABANDONED) (N5506381 E660795)</u>	Project Short Title: <u>EVO-AWTF</u>
		Project Number: <u>18102898</u>
		Site Geologist: <u>G. Harding</u>

Drilling Method: Dual Air Rotary

SCHEMATIC ONLY--NOT TO SCALE



- NOTES:
1. masl - metres above sea level
 2. mGL - metres below ground level
 3. TD - Total Depth

Depth (mGL)	Lithological Description	Lithology	Borehole Completion
0			
1	0-3.0mGL: (ML) CLAYEY SILT, clay - silt with rare coarse sand grains to fine gravels, mod plasticity, brown, moist		Borehole Diameter 313 mm
2			
3	3.0-22.9mGL: (MH) CLAYEY SILT, clay - silt with rare coarse sand grains to fine gravels, mod to high plasticity, brown, moist		Cemented 203.2 mm surface casing to 16.8 mGL
4	(MH) CLAYEY SILT, as above but darker brown and more moist		Between casings, granular grout from surface to 16.8 mGL
5			
6	(MH) CLAYEY SILT, as above but more moist to wet		
7			
8			Top cement grout plug from surface to 10.7 mGL
9			
10			
11			
12	Drilling fast through clays, 5 min/rod, but clearing out bottom at end of rod takes at least 10 min		152.4 mm steel casing from surface to total depth of 40.8 mGL
13			
14			
15	CLAYEY SILT, as above but cleaner clay seems to have less coarse sands and fine gravels		
16			
17			Borehole Diameter 187 mm
18	Last two rods driller felt like there were almost voids or that we were drilling through fine sands with water, but returns are only showing clays and not much for returns through discharge		
19			Bentonite plug from 10.7 mGL to 21.3 mGL
20			
21			
22			
23	22.9-30.5 mGL: (SC) CLAYEY SAND, clay-fine-medium grained sand, brown, moist-wet		Slough from 21.3 mGL to total depth of 40.8 mGL
24			
25			
26	CLAYEY SAND, as above slightly sandier		
27			
28			
29	CLAYEY SAND, as above sandier		
30			
31			
32			
33			
34			
35	30.5-39.8mGL: (SP) SAND, fine to medium grained, sub-rounded to sub-angular, brown, wet		
36			
37			
38			
39			
40			

TD @40.8mGL

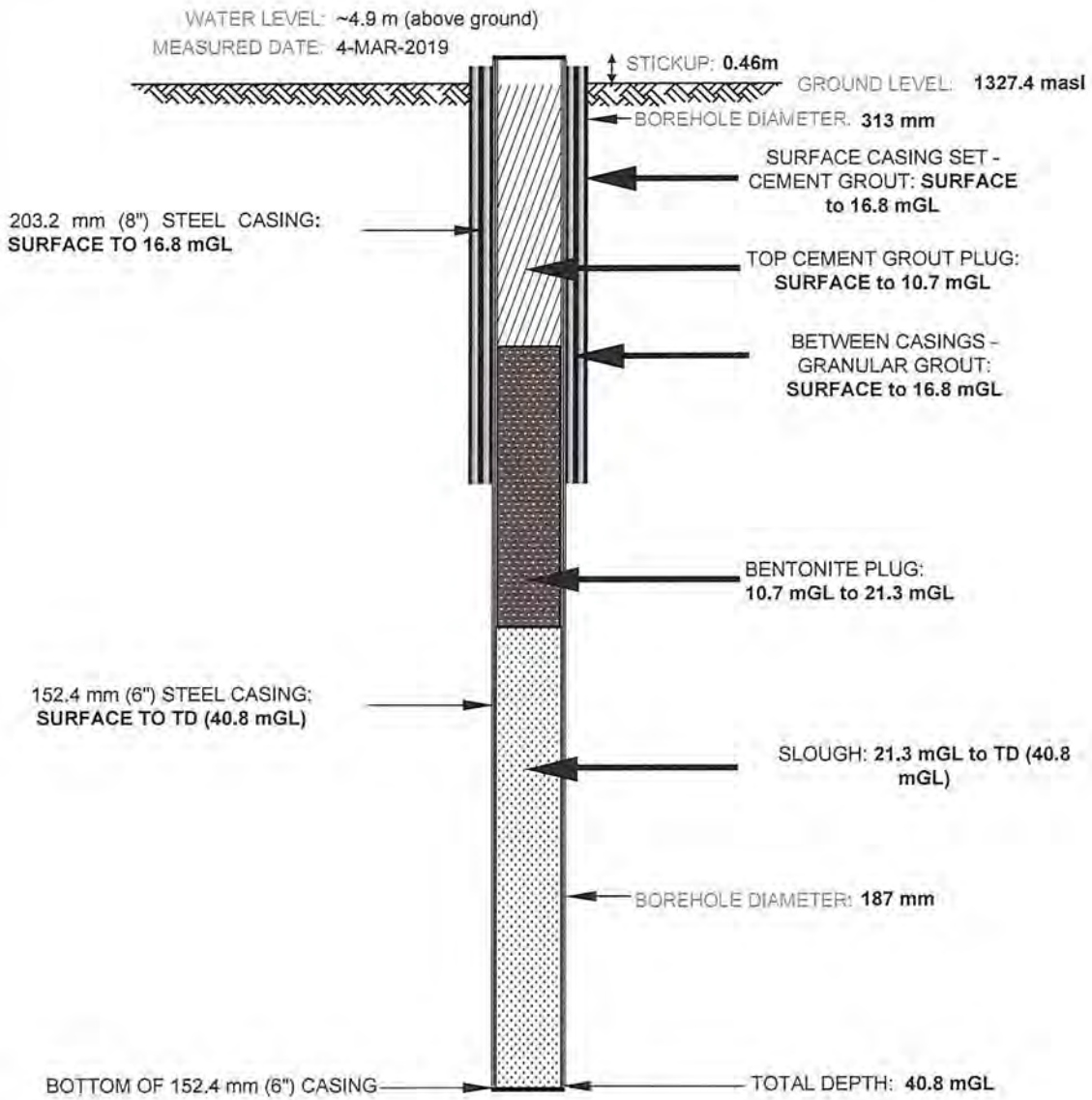
Legend	
Fill/Spill	
Clay	
Clay-Clay	
Clayey Silt	
Clayey Sand	
Sand	
Clayey Gravel	
Sand & Gravel	
Gravel	
Bedrock	

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>TECK COAL - EVO-AWTF</u>	Spud Date: <u>27-FEB-2019</u>
EV_MW_EC2 ABANDONED	Well Name: <u>EV_MW_EC2 -ABANDONED (N5506383 E550798)</u>	Project Short Title: <u>EVO-AWTF</u>
		Project Number: <u>18102898</u>
		Site Geologist: <u>G. Harding</u>

Drilling Method:
Dual Air Rotary

SCHEMATIC ONLY—NOT TO SCALE



- NOTES:
 1. masl — metres above sea level
 2. mGL — metres below ground level
 3. TD — Total Depth

Golder Associates

Teck		WELL ID: EV_MW_GT2	
Depth (mGL)	Lithological Description	Lithology	Well
0			
1			
2	0-4.5mGL: (SW) SAND, fine sand - fine gravels, sub-angular - sub-rounded, dark brown, dry		
3			
4			
5	4.5-6.1mGL: (GW) GRAVEL, fine sand - fine gravels, sub-angular - sub-rounded, dark brown, dry		
6			
7	6.1-6.1mGL: (SW) SAND, fine sand - fine gravels, sub-angular - sub-rounded, dark brown, moist		
8			
9	8.1-15.2mGL: (GW) GRAVEL, fine sand - fine gravels, sub-angular - sub-rounded, brown, dry		
10			
11	GRAVEL, as above, but more moist and darker brown		
12			
13			
14	GRAVEL, as above, but drier and lighter brown		
15	15.2-15.6mGL: (SP) SAND, fine grained, moist, brown, with rare fine gravel clasts		
16			
17			
18			
19			
20			
21	18.6-26.5mGL: (GW) GRAVEL, fine sand - fine gravels, sub-angular - sub-rounded, brown, dry		
22			
23			
24			
25			
26			
27	26.5-27.4mGL: boulder, angular - sub-angular, light brown, dry		
28			
29			
30	27.4-35.6mGL: (GW) GRAVEL, medium sand - fine gravels, sub-angular - sub-rounded, dark brown, moist		
31			
32			
33	GRAVEL is more clayey darker grey brown, and more moist		
34			
35	GRAVEL is slightly more moist		
36	Some water between connections		
37			
38	38.8-42.7mGL: (SC) CLAYEY GRAVEL, clay - fine gravels, sub-angular - sub-rounded, dark brown grey, moist		
39			
40			
41			
42			
43	42.7-44.3mGL: (GW) GRAVEL, coarse sand - fine gravels, angular - sub-rounded, dark brown grey, wet (possibly bedrock angular fragments)		
44	44.2-45.7mGL: (SC) CLAYEY SAND, clay - fine gravels, sub-angular - sub-rounded, brown-grey, moist		
45			

TD @ 45.7 mGL

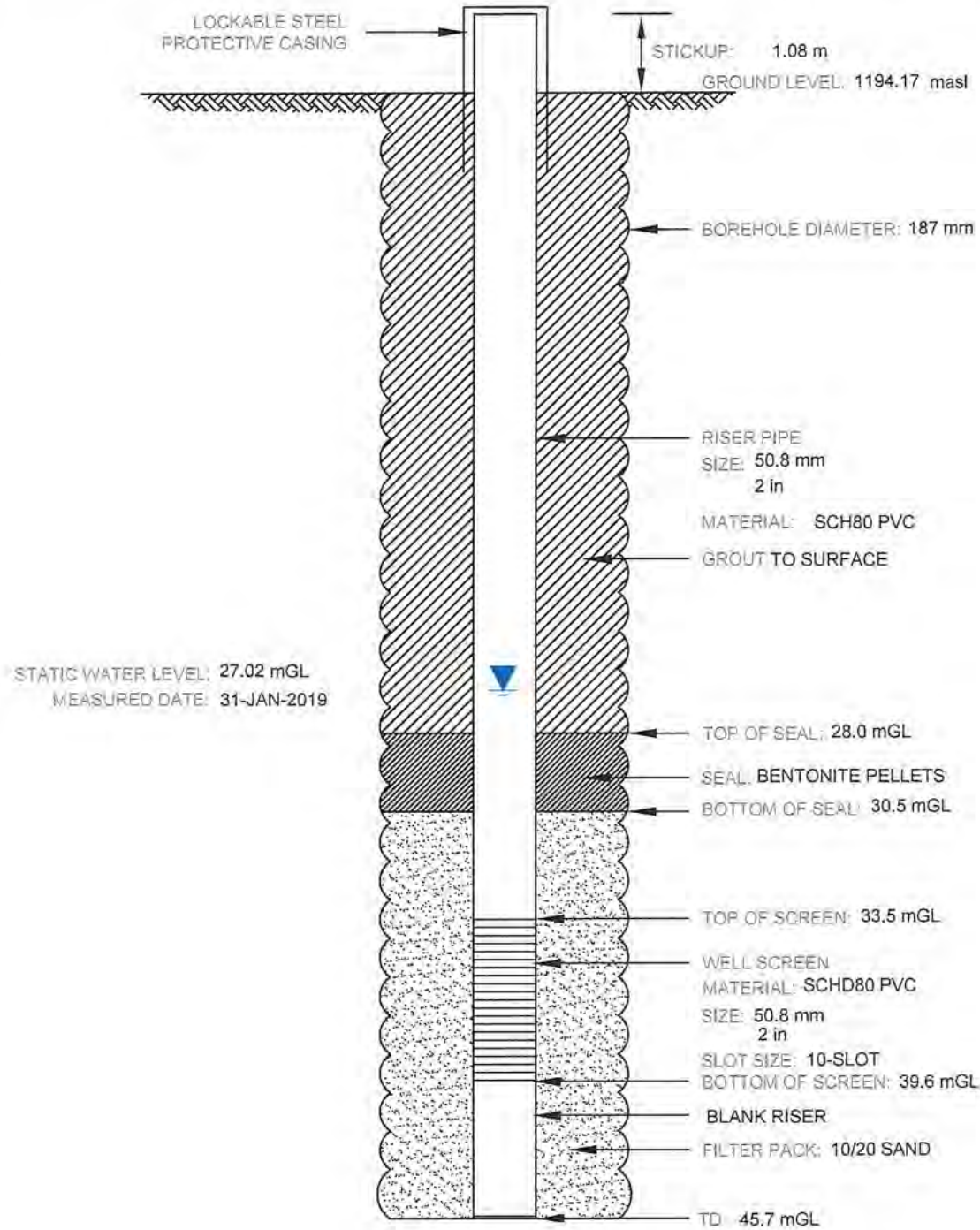
Legend	
Fill/Spoil	
Clay	
Silty-Clay	
Clayey Silt	
Clayey Sand	
Sand	
Clayey Gravel	
Sand & Gravel	
Gravel	
Bedrock	

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>TECK COAL - EVO-AWTF</u>	Spud Date: <u>21-JAN-2019</u>
EV_MW_GT2	Well Name: <u>EV_MW_GT2</u> (N5509282, E656118)	Project Short Title: <u>EVO-AWTF</u>
		Project Number: <u>18102898</u>
		Site Geologist: <u>G. Harding</u>

Drilling Method: <u>Dual Air Rotary</u>	Development Method: <u>Airlifting</u>
---	---------------------------------------

SCHEMATIC ONLY--NOT TO SCALE



- NOTES:
1. masl - metres above sea level
 2. mGL - metres below ground level
 3. TD - Total Depth

Golder Associates

Teck		WELL ID: EV_MW_SGC1	
Depth (mGL)	Lithological Description	Lithology	Well
0			
1	0-3.0mGL: (OL) ORGANIC SOIL, silty, stark brown, dry-moist		
2			
3	3.0-9.1mGL: (GW) GRAVEL, fine sand - fine gravels, sub-angular - sub-rounded, grey brown, dry		
4			
5	GRAVEL, as above but moist and brown		
6			
7			
8			
9	9.1-12.2mGL: (GC) CLAYEY GRAVEL, clay-fine gravels, sub-angular - sub-rounded, brown, moist		
10			
11	CLAYEY GRAVEL, as above, but sandier, less clay		
12	12.2-13.7mGL: (SP) SAND, fine to medium sand with rare fine gravels and clay clast, sub-angular - sub-rounded, brown, moist		
13			
14	13.7-22.9mGL: (SW) SAND, fine sand to fine gravels, sub-angular - sub-rounded, brown, moist, and slightly clayey		
15			
16	SAND, as above slightly more clayey		
17			
18	DURING INSTALL DRILLER INDICATED THAT THERE WAS WATER ACCUMULATING 3m deep at about 18.3mGL		
19			
20			
21			
22			
23	22.9-24.4mGL: (GC) CLAYEY GRAVEL, clay to fine gravels, sub-angular - sub-rounded, brown, and moist		
24			
25	24.4-25.9mGL: (SC) CLAYEY SAND, clay to fine gravels, sub-angular - sub-rounded, brown with grey white matrix - possible cement residue (hard drilling and HCL rxn), and dry		
26	25.9-27.4mGL: (GC) CLAYEY GRAVEL, clay to fine gravels, sub-angular - sub-rounded, brown, and dry		
27			
28	27.4-29.0mGL: (GM) SILTY GRAVEL, silt to fine gravels, sub-angular - sub-rounded, brown, and dry		
29	29.0-30.2mGL: (GC) CLAYEY GRAVEL, clay to fine gravels, sub-angular - sub-rounded, brown, and moist		
30	DRILLER INDICATED WATER AFTER CONNECTION WAS MADE @ 29.0mGL		
31			
32	30.2-35.1mGL: BEDROCK - light grey-brown shale (Kootenay Fm)		
33			
34			
35	TD @ 35.1m		

B1-01-13

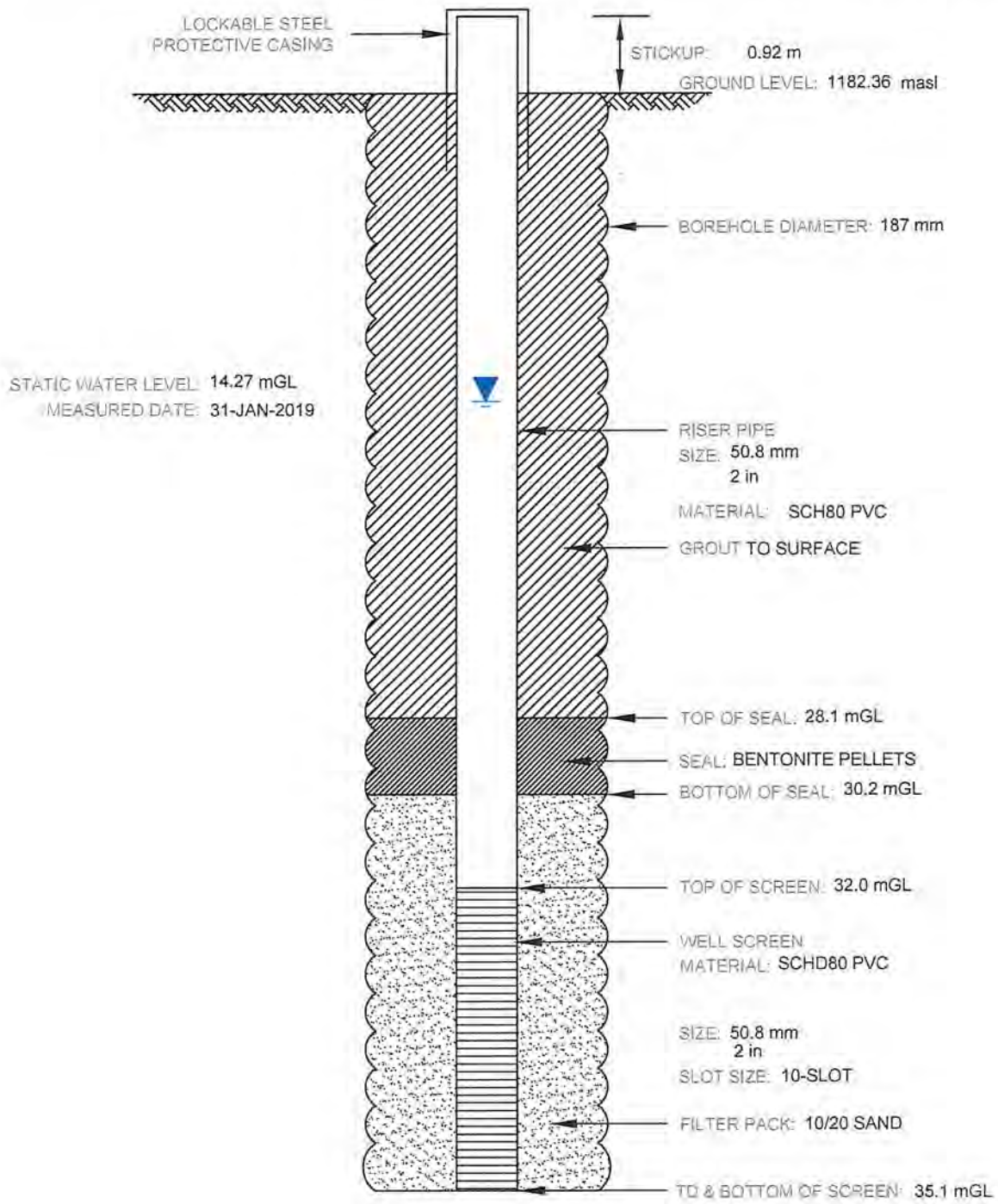
Legend	
Fill/Spoil	
Clay	
Silty-Clay	
Clayey Silt	
Clayey Sand	
Sand	
Clayey Gravel	
Sand & Gravel	
Gravel	
Bedrock	

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>Teck Coal - EVO-AWTF</u>	Spud Date: <u>25-JAN-2019</u>
EV_MW_SGC1	Well Number: <u>EV_MW_SGC1</u> (N5508861, E656306)	Project Short Title: <u>EVO-AWTF</u>
		Project Number: <u>18102898</u>
		Site Geologist: <u>G. Harding</u>

Drilling Method: <u>Dual Air Rotary</u>	Development: <u>Airlifting</u>
	Method: <u>Airlifting</u>

SCHEMATIC ONLY--NOT TO SCALE



- NOTES:
1. masl - metres above sea level
 2. mGL - metres below ground level
 3. TD - Total Depth

Golder Associates

Teck		WELL ID: EV_MW_SGC2	
Depth (mGL)	Lithological Description	Lithology	Well
0			
1	0-3.0mGL: (OL) ORGANIC SOIL, silty, dark brown, dry-moist		
2			
3			
4	3.0-9.1mGL: (GW) GRAVEL, fine sand - fine gravels, sub-angular - sub-rounded, grey brown, dry		
5	GRAVEL, as above but moist and brown		
6			
7			
8			
9	9.1-12.2mGL: (GC) CLAYEY GRAVEL, clay- fine gravels, sub-angular - sub-rounded, brown, moist		
10			
11	CLAYEY GRAVEL, as above, but sandier, less clay		
12	12.2-13.7mGL: (SP) SAND, fine to medium sand with rare fine gravels and clay clast, sub-angular - sub-rounded, brown, moist		
13			
14			
15			
16	13.7-23.2mGL: (SW) SAND, fine sand to fine gravels, sub-angular - sub-rounded, brown, moist, and slightly clayey		31-01-19
17			
18			
19			
20	SAND, as above slightly more clayey		
21			
22			
23	TD @ 23.2mGL		

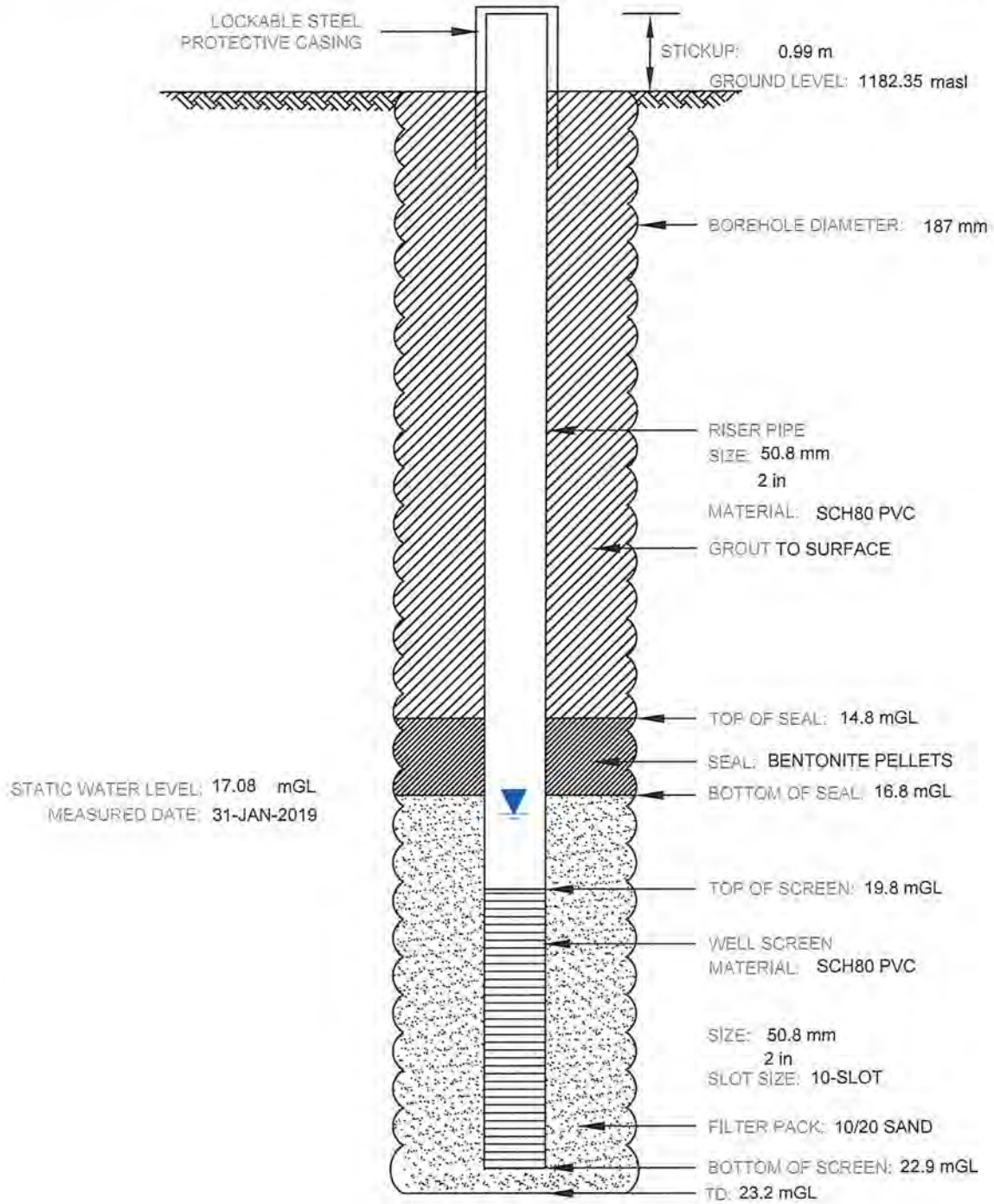
Legend	
Organic Material	
Clay	
Silty-Clay	
Clayey Silt	
Clayey Sand	
Sand	
Clayey Gravel	
Sand & Gravel	
Gravel	
Bedrock	

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: <u>TECK COAL - EVO-AWTF</u>	Spud Date: <u>26-JAN-2019</u>
EV_MW_SGC2	Well Name: <u>EV_MW_SGC2</u> (N5508860, E656308)	Project Short Title: <u>EVO-AWTF</u>
		Project Number: <u>18102898</u>
		Site Geologist: <u>G. Harding</u>

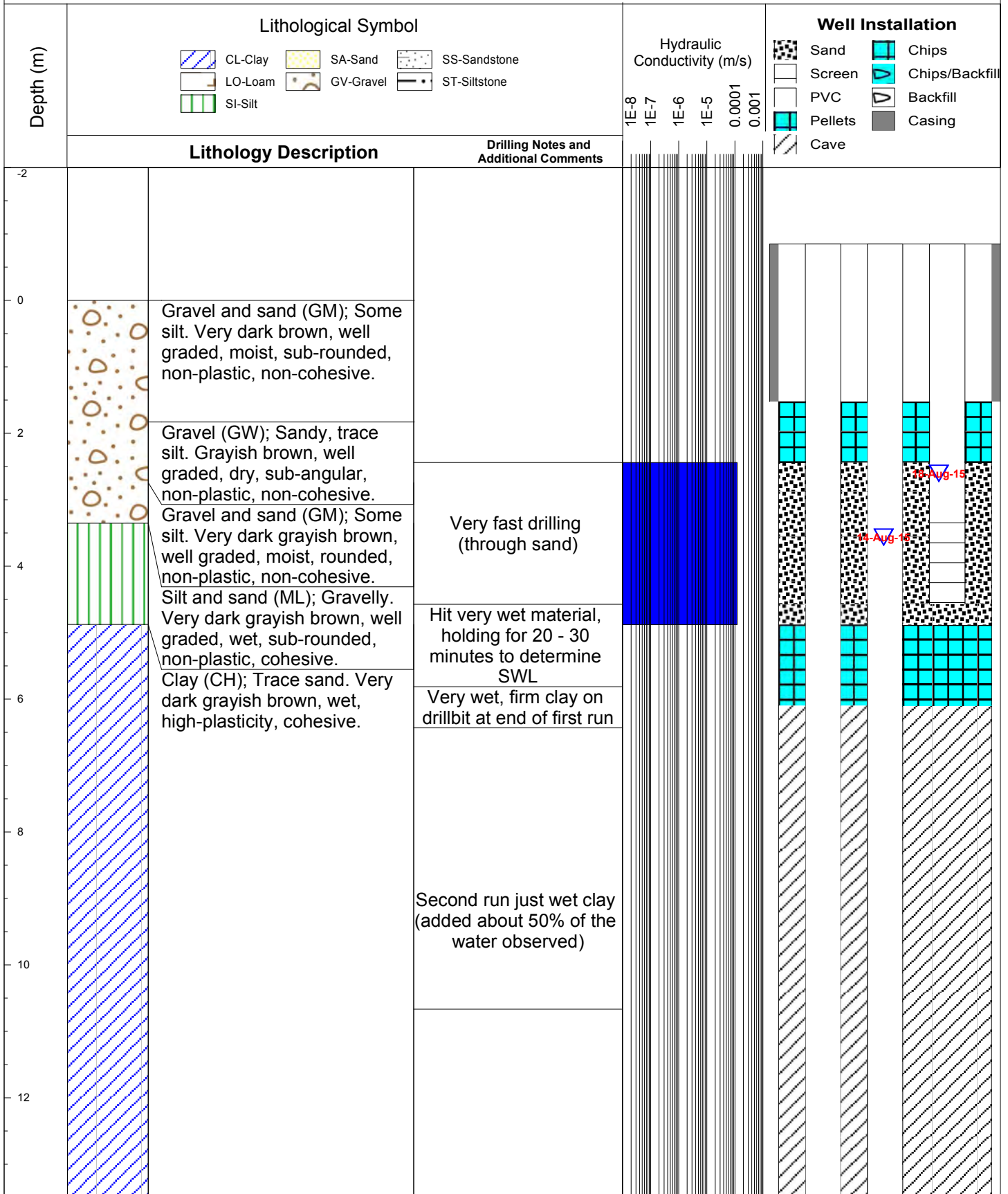
Drilling Method: <u>Dual Air Rotary</u>	Development: <u>Airlifting</u>
	Method: <u>Airlifting</u>

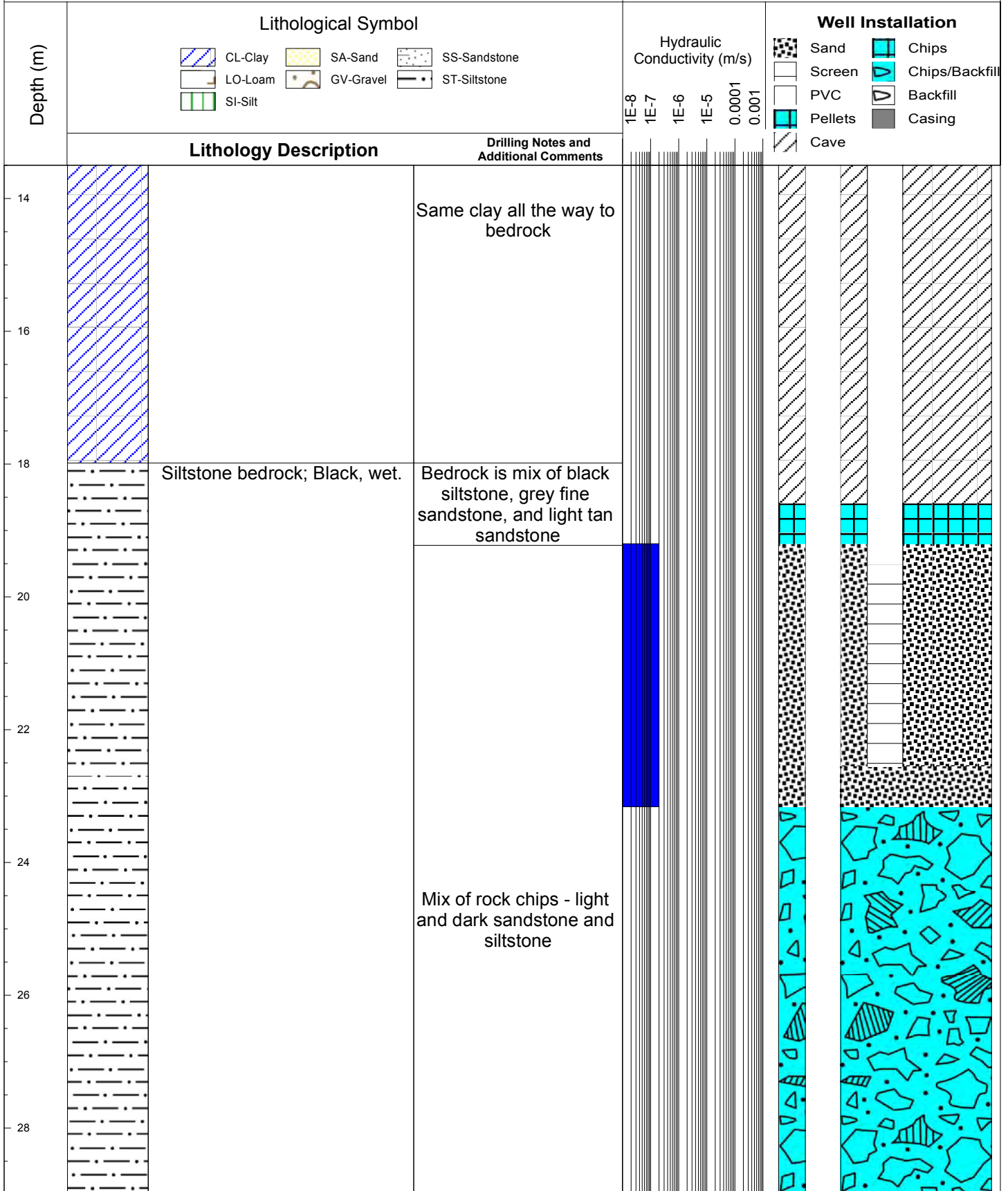
SCHEMATIC ONLY—NOT TO SCALE

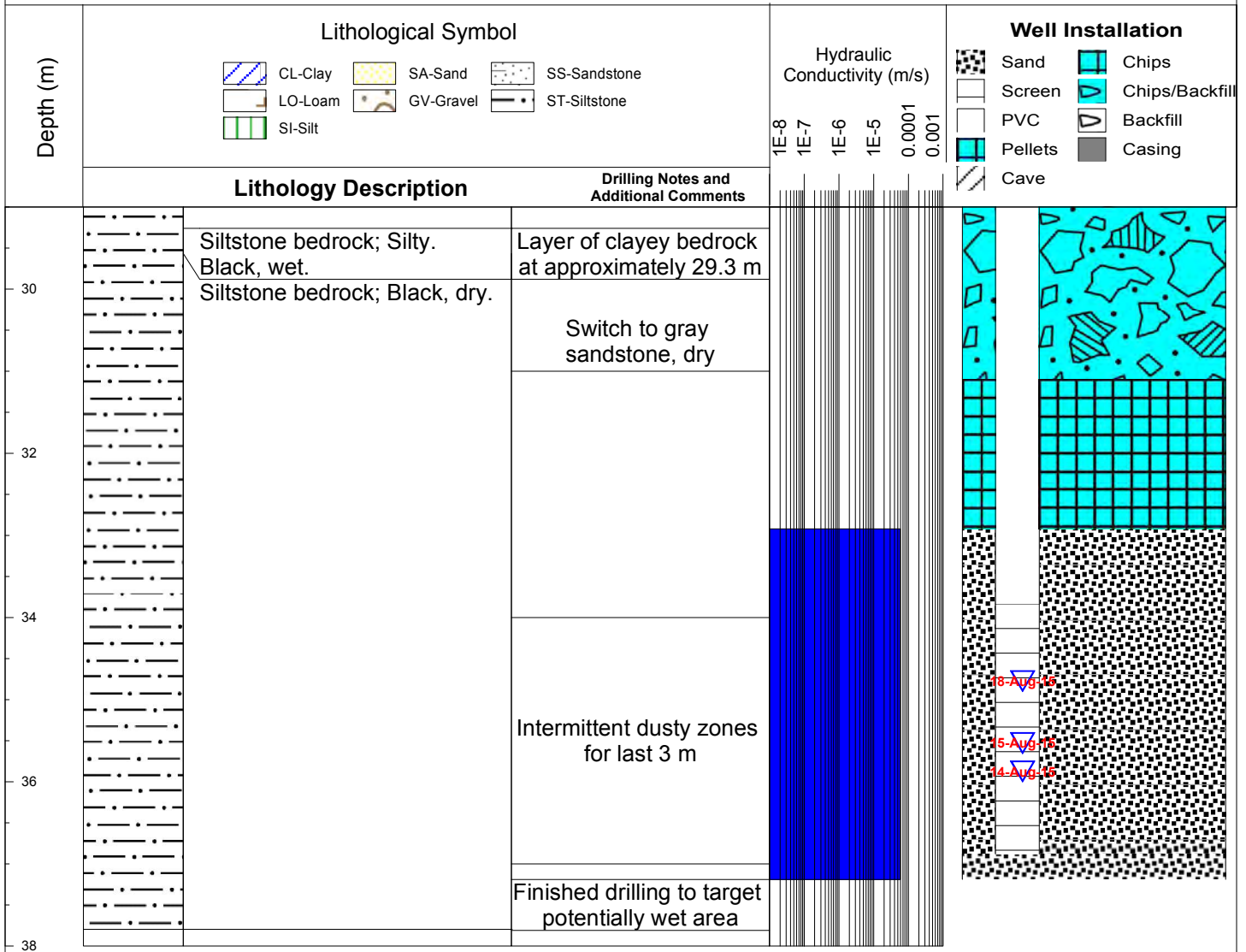


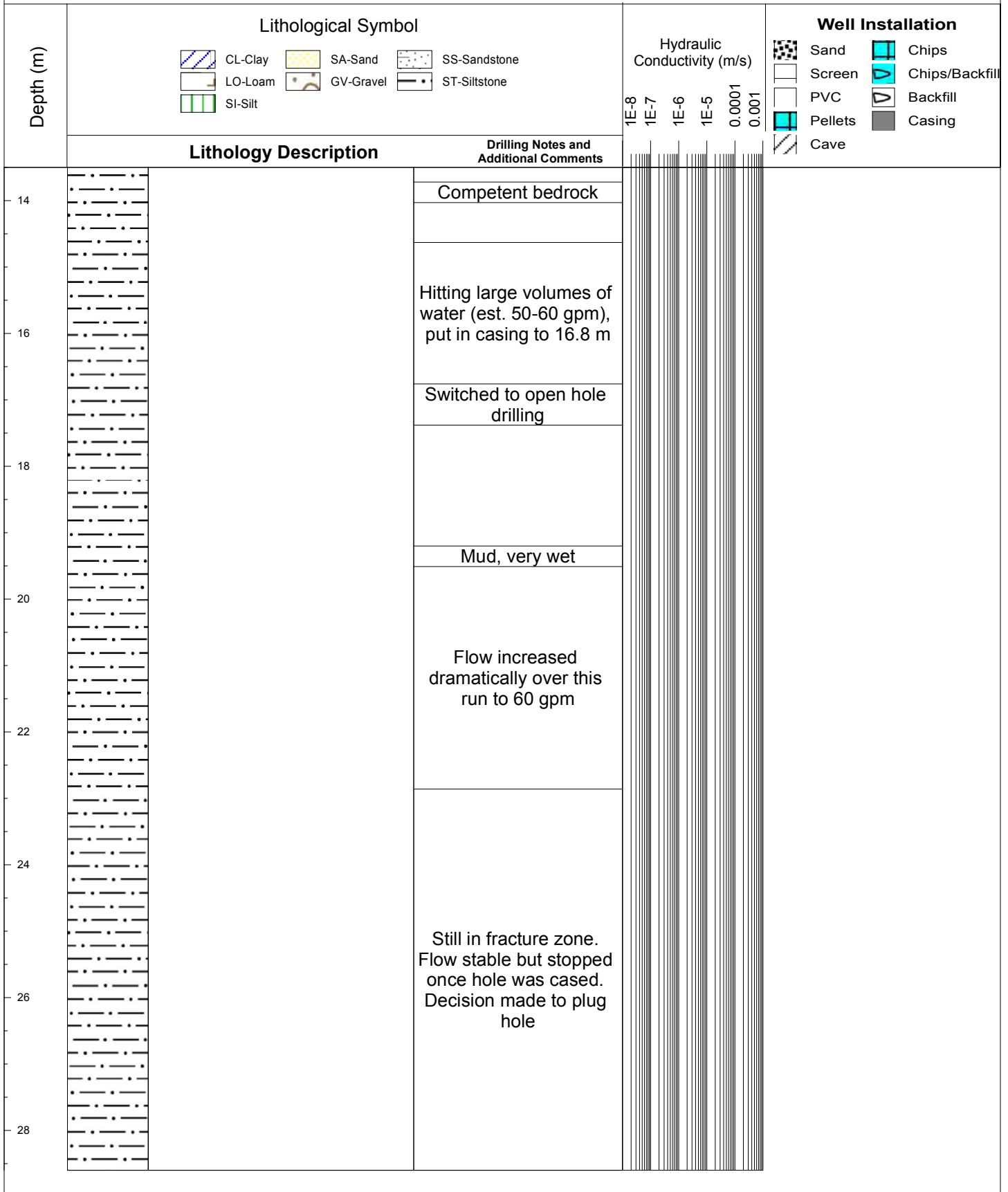
- NOTES:
1. masl — metres above sea level
 2. mGL — metres below ground level
 3. TD — Total Depth

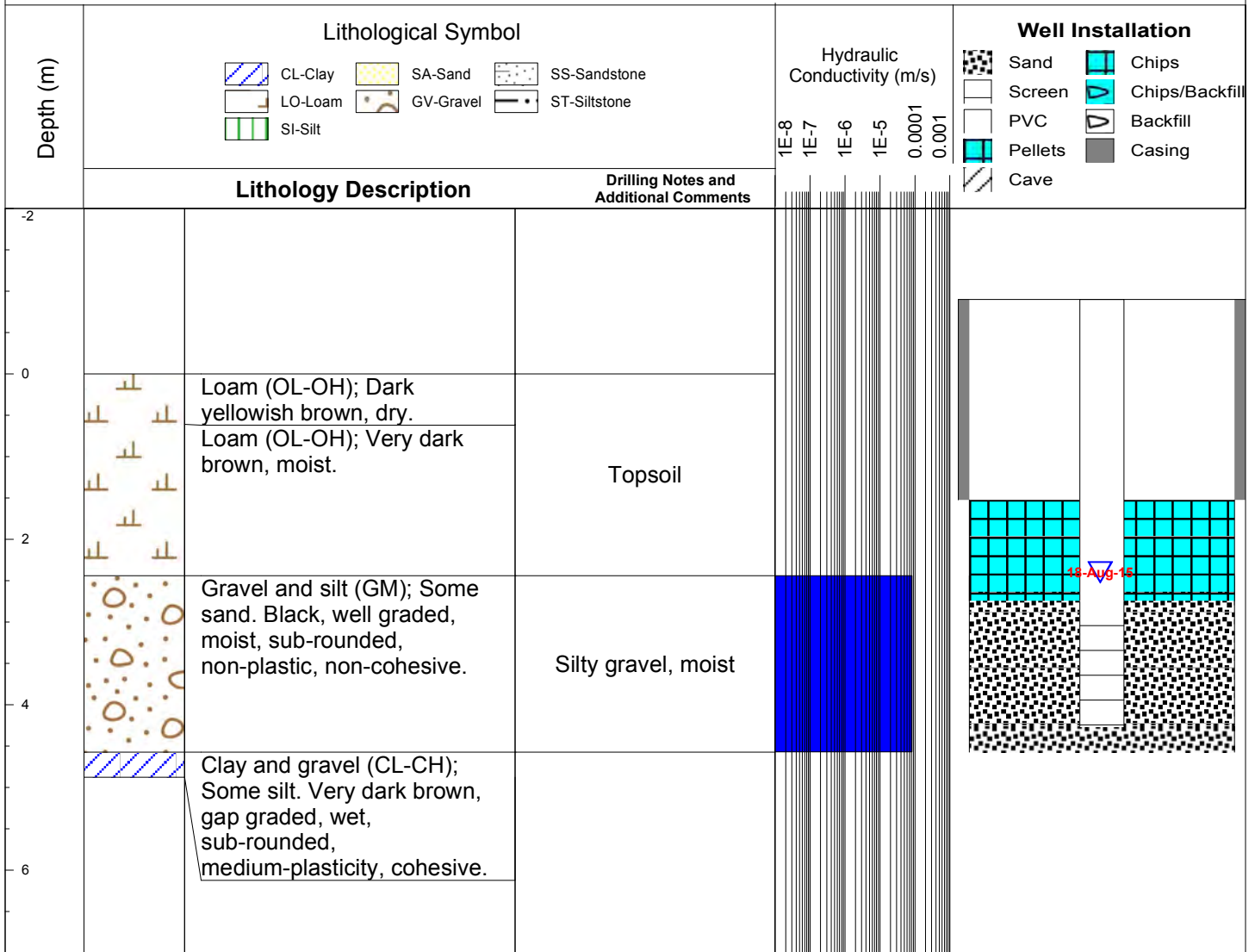
Golder Associates

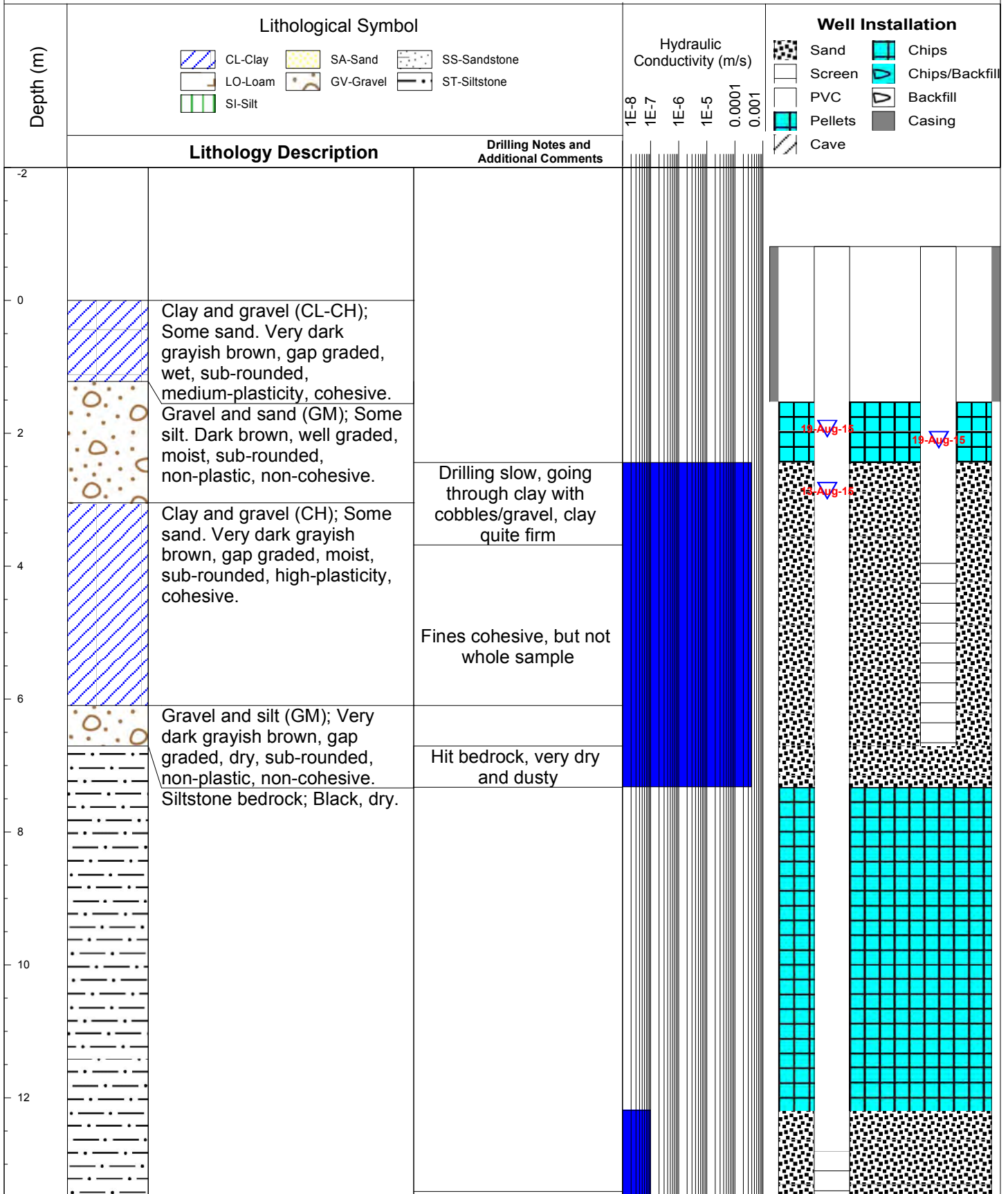


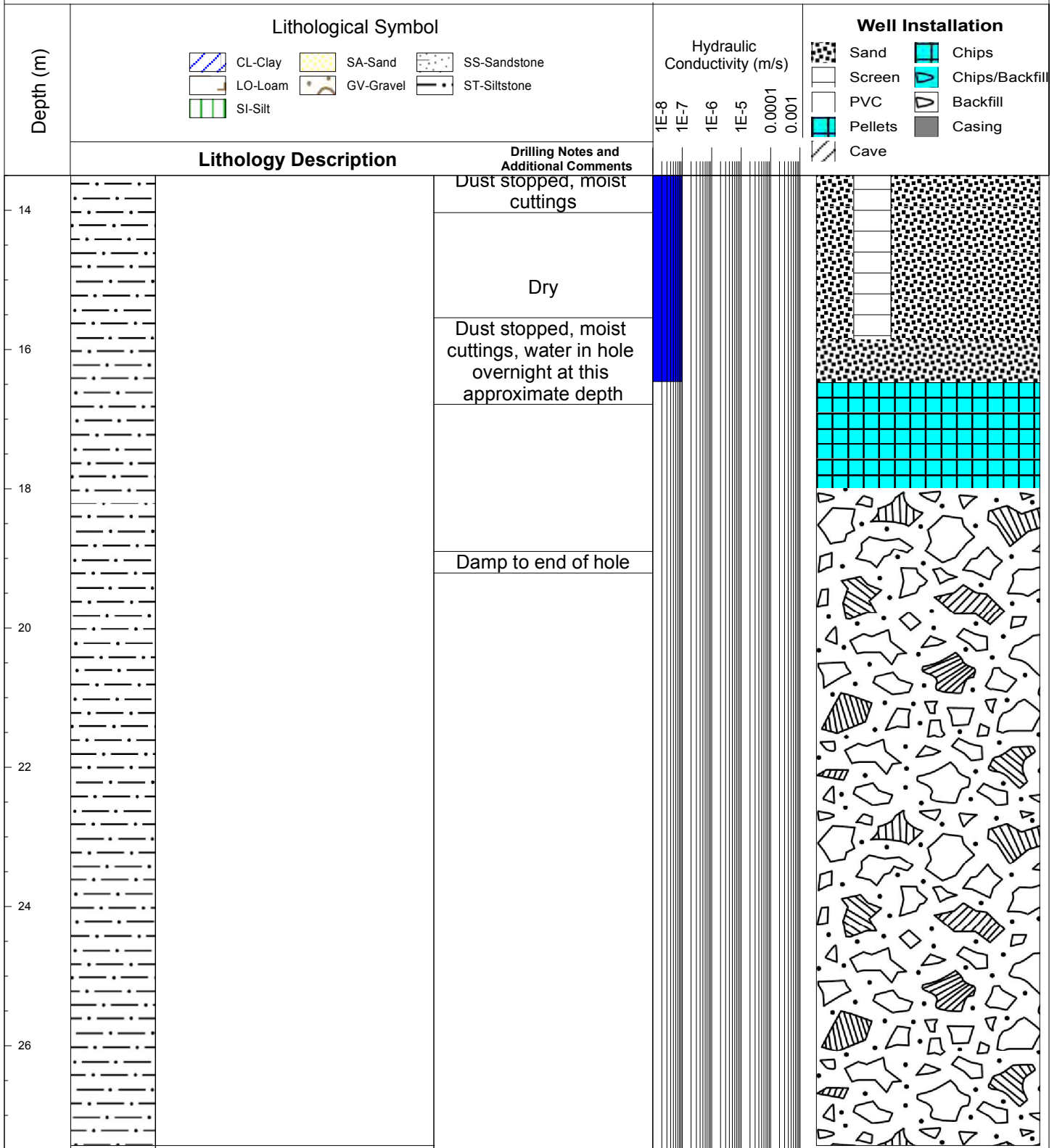


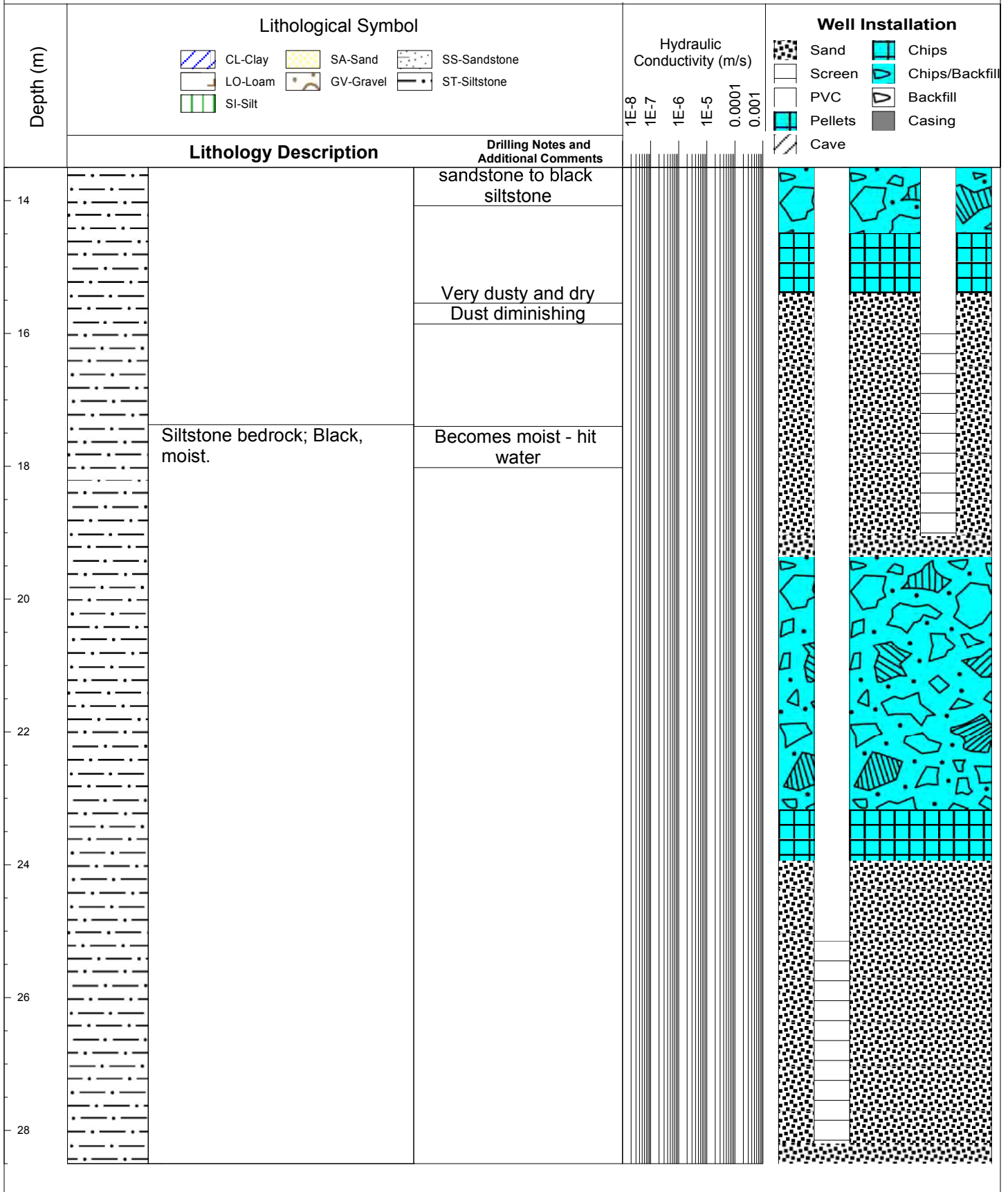


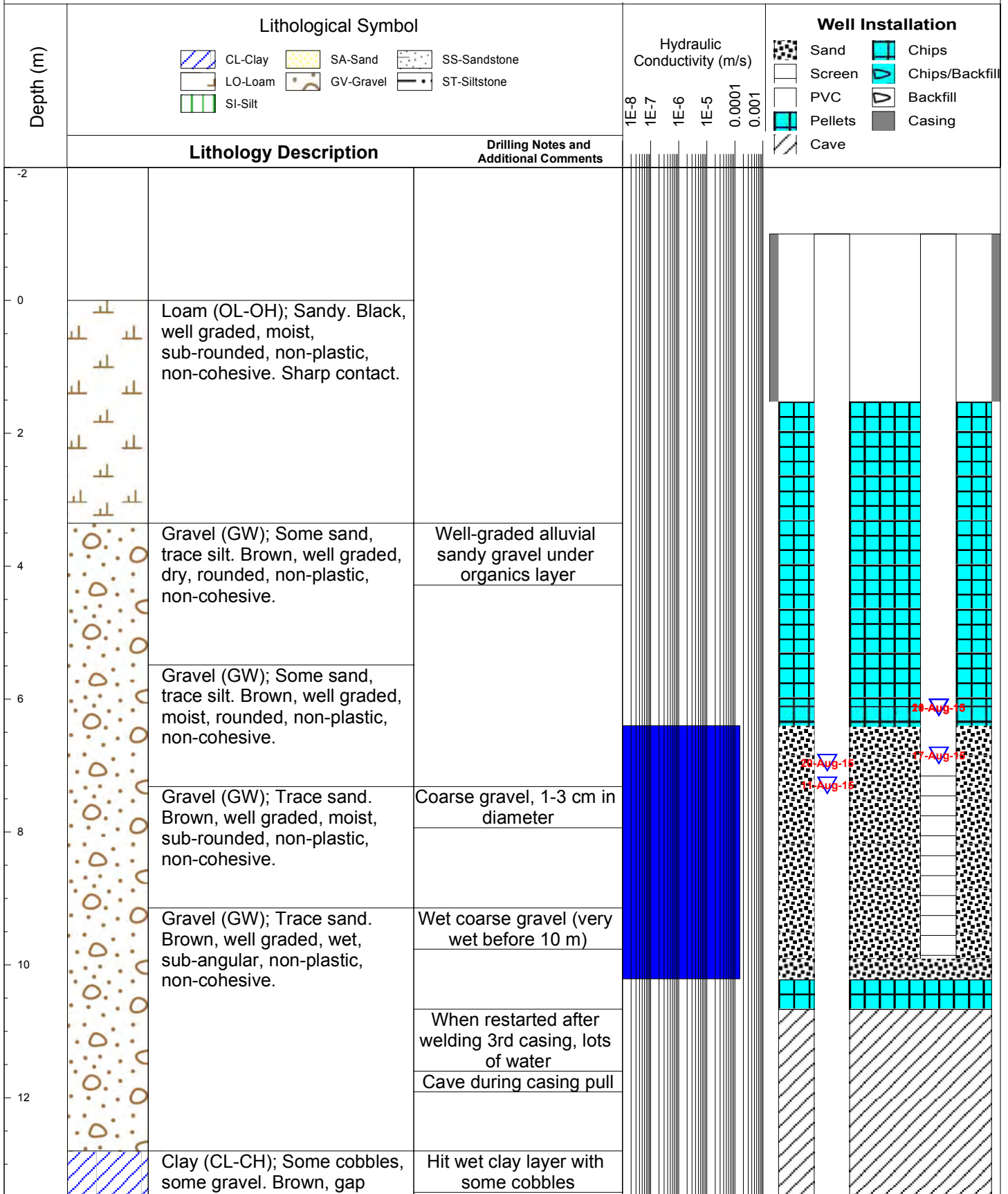


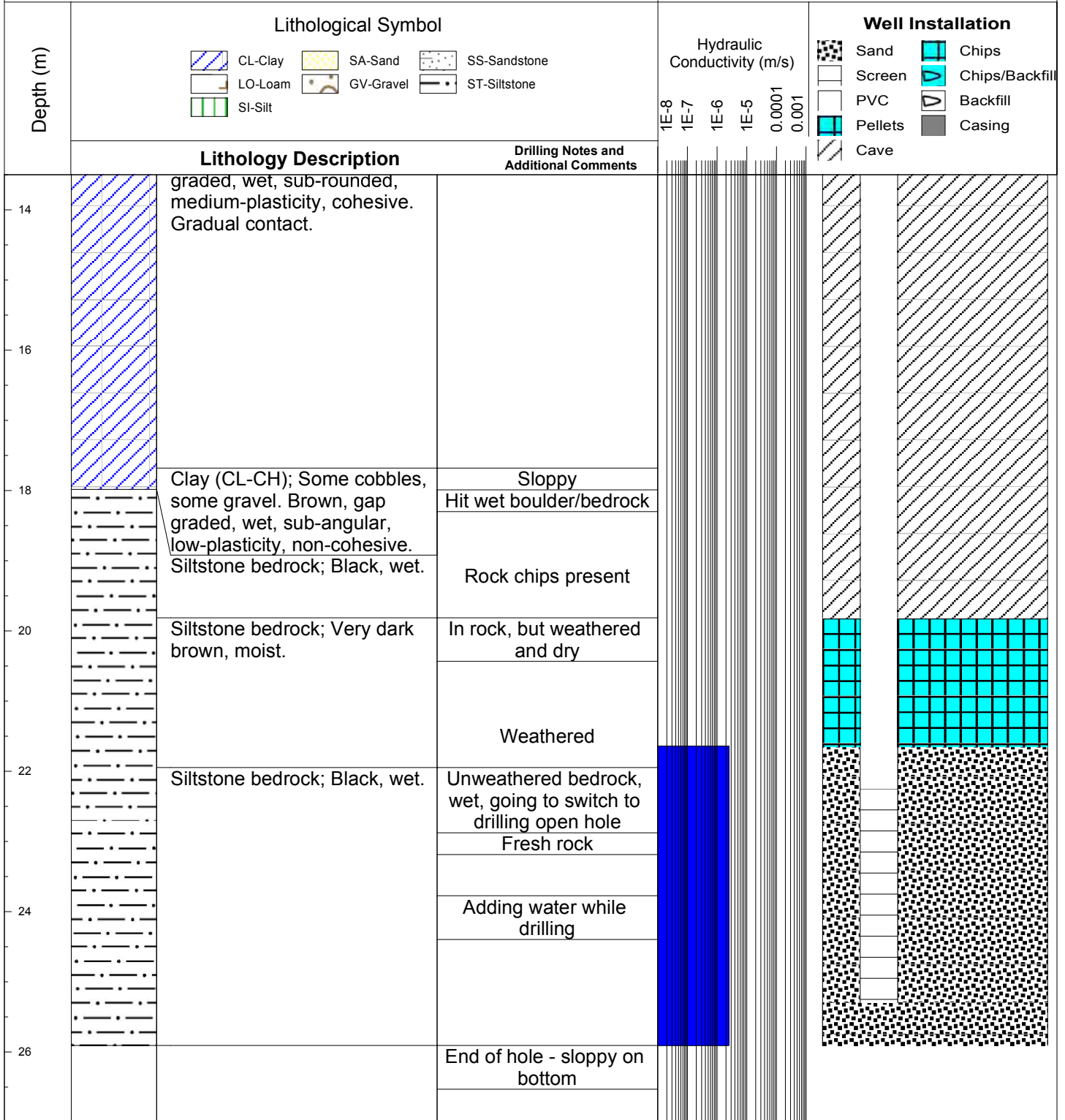


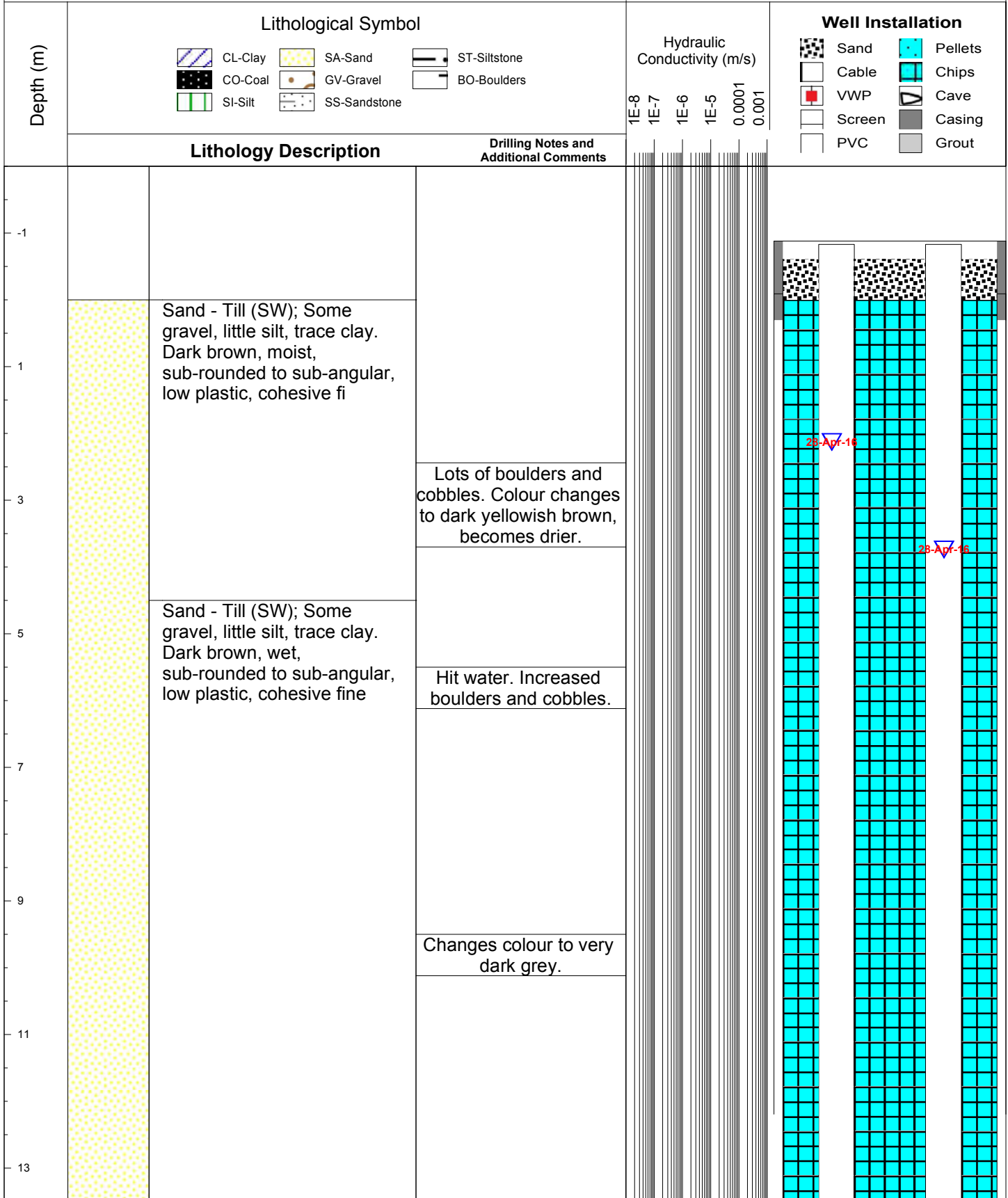


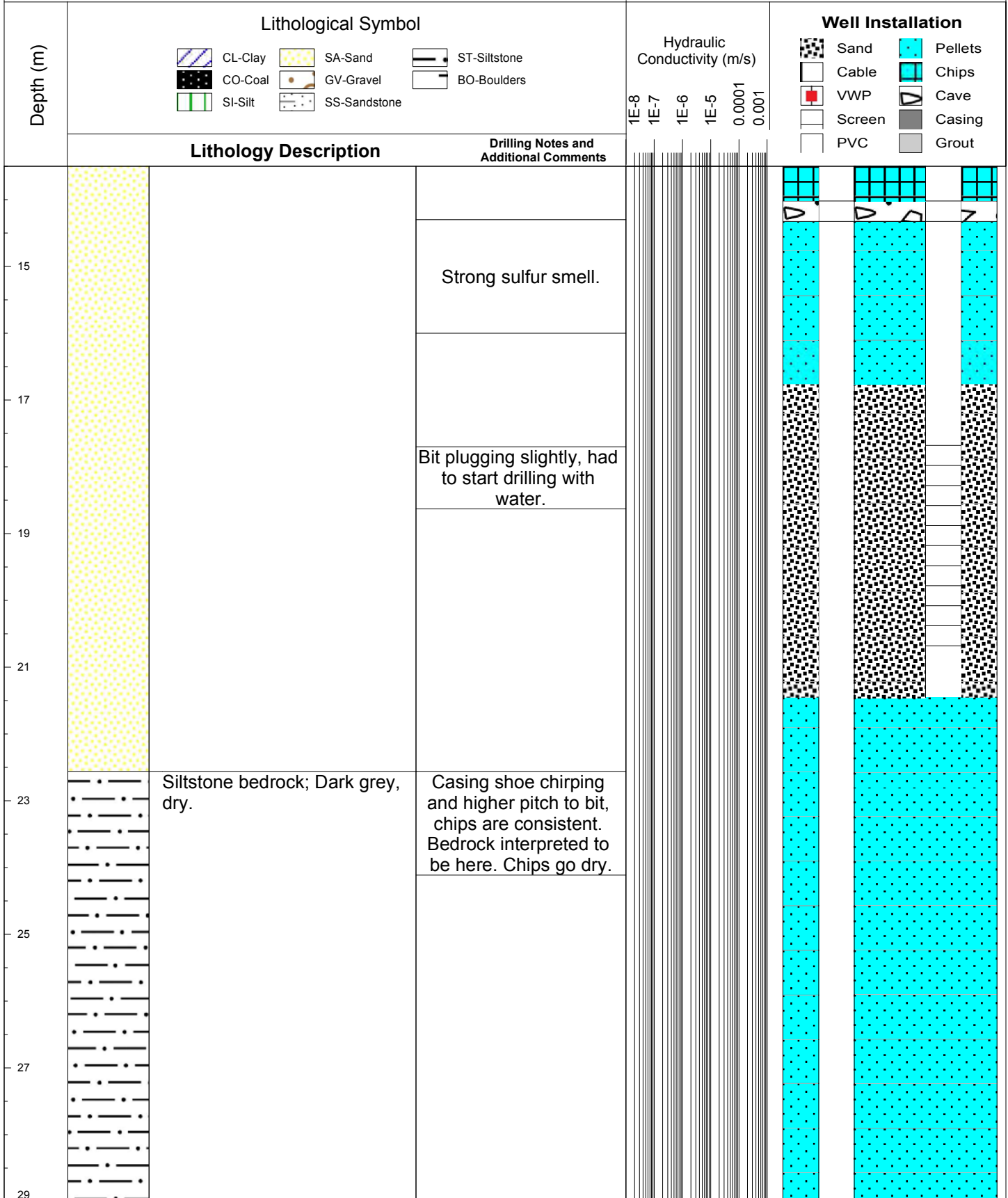


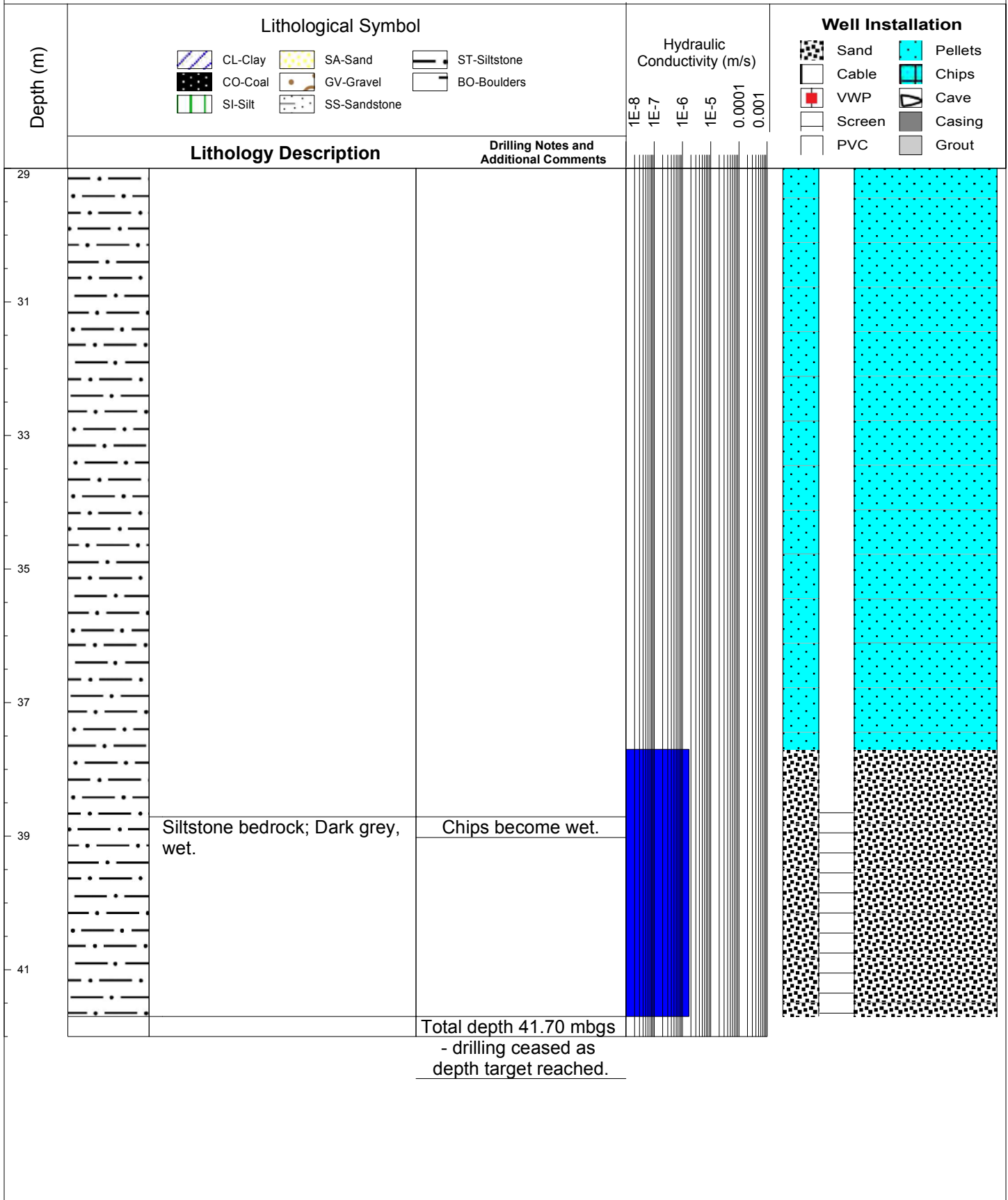


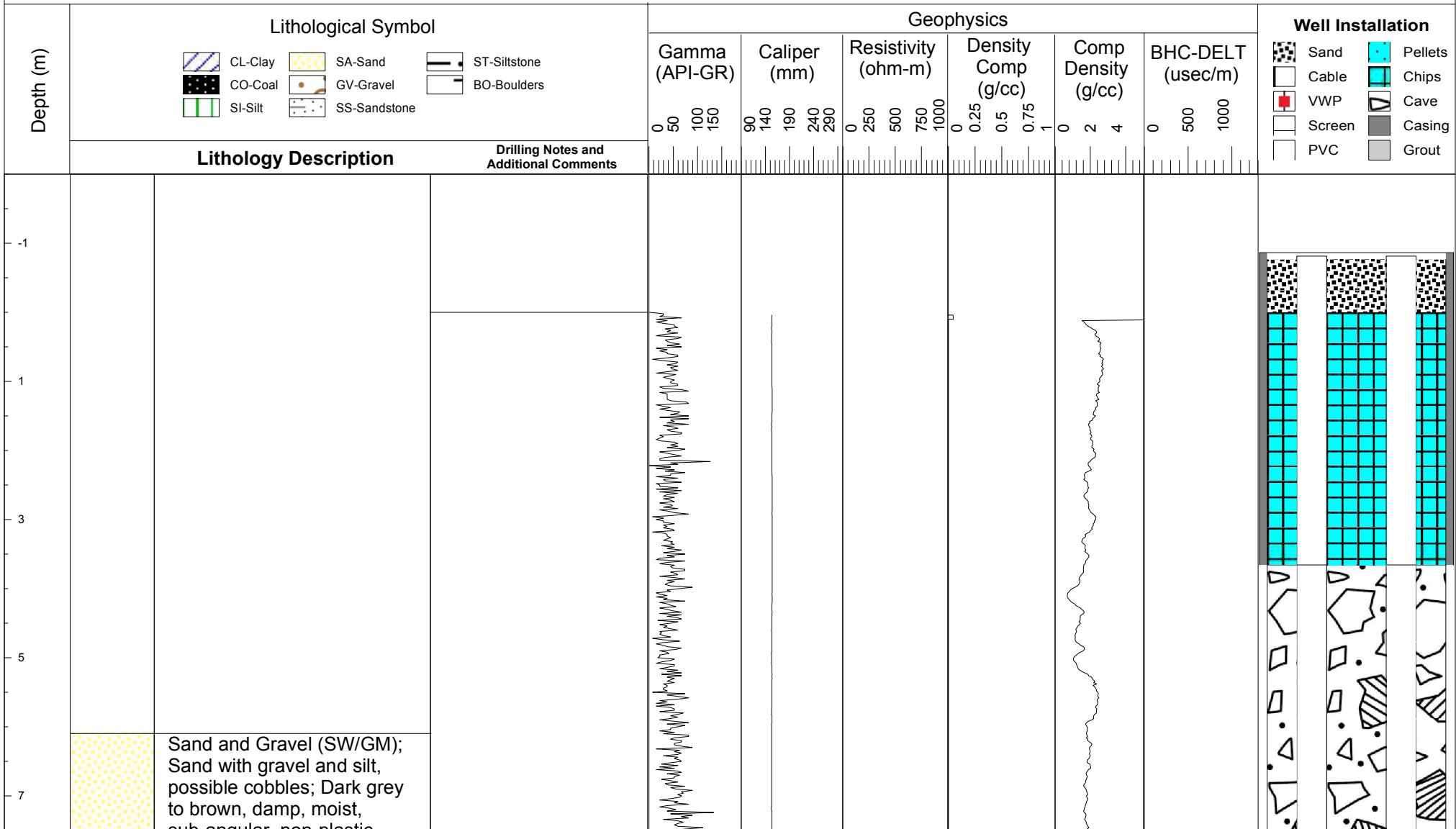








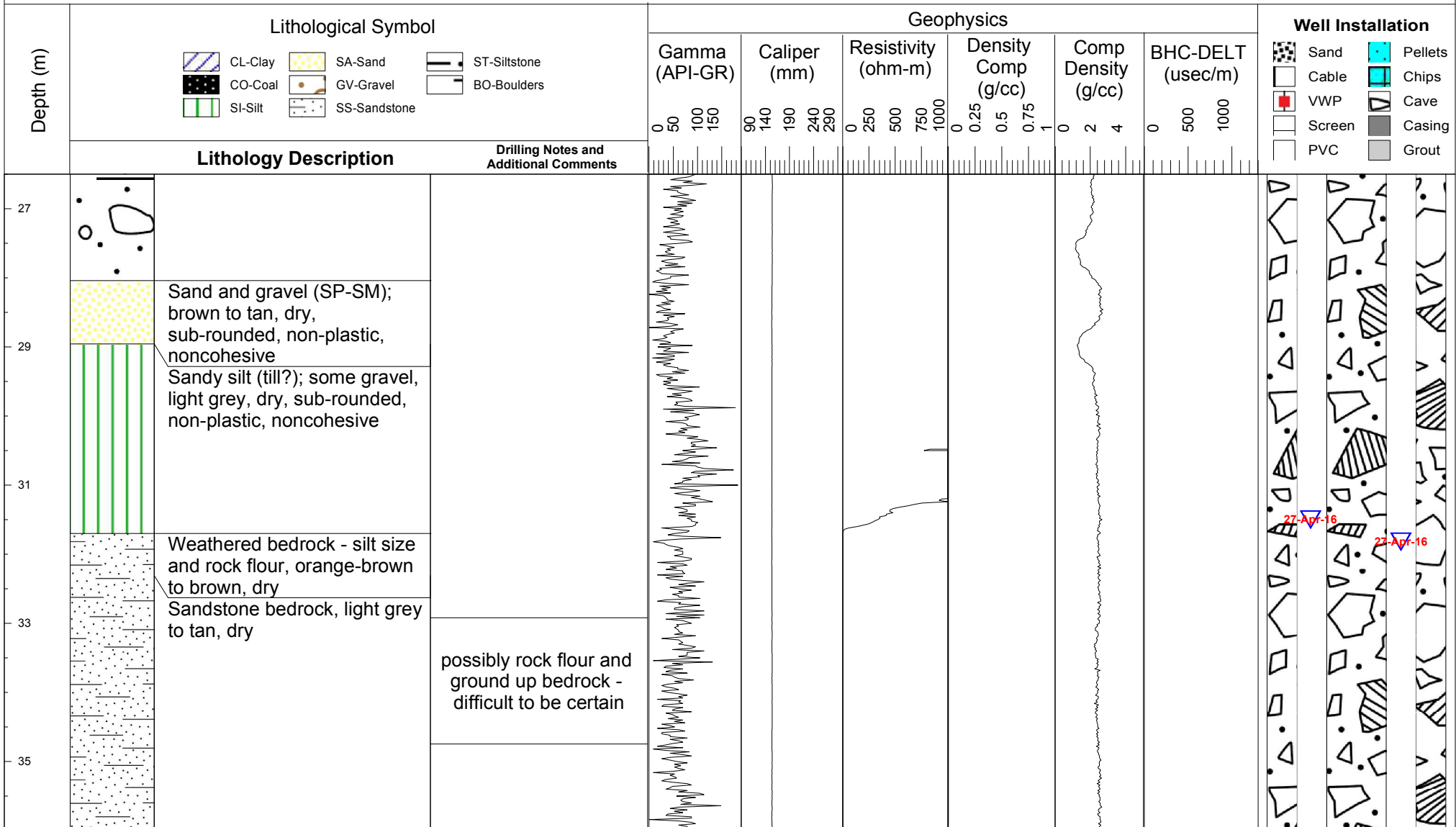




Depth (m)	Lithological Symbol			Geophysics						Well Installation						
	CL-Clay	SA-Sand	ST-Siltstone	Gamma (API-GR)	Caliper (mm)	Resistivity (ohm-m)	Density Comp (g/cc)	Comp Density (g/cc)	BHC-DELT (usec/m)	Sand	Pellets	Cable				
	CO-Coal	GV-Gravel	BO-Boulders	0 50 100 150	90 140 190 240 290	0 250 500 750 1000	0 0.25 0.5 0.75 1	0 2 4	0 500 1000	VWP	Chips	Cave				
	SI-Silt	SS-Sandstone		Lithology Description									Screen	Casing	Grout	
				Drilling Notes and Additional Comments									PVC			
17																
19																
21																
23																
25																

similar to above;
 variable moisture;
 suspect cobbles getting
 pushed to sides

Boulders or cobbles



Sand and gravel (SP-SM); brown to tan, dry, sub-rounded, non-plastic, noncohesive

Sandy silt (till?); some gravel, light grey, dry, sub-rounded, non-plastic, noncohesive

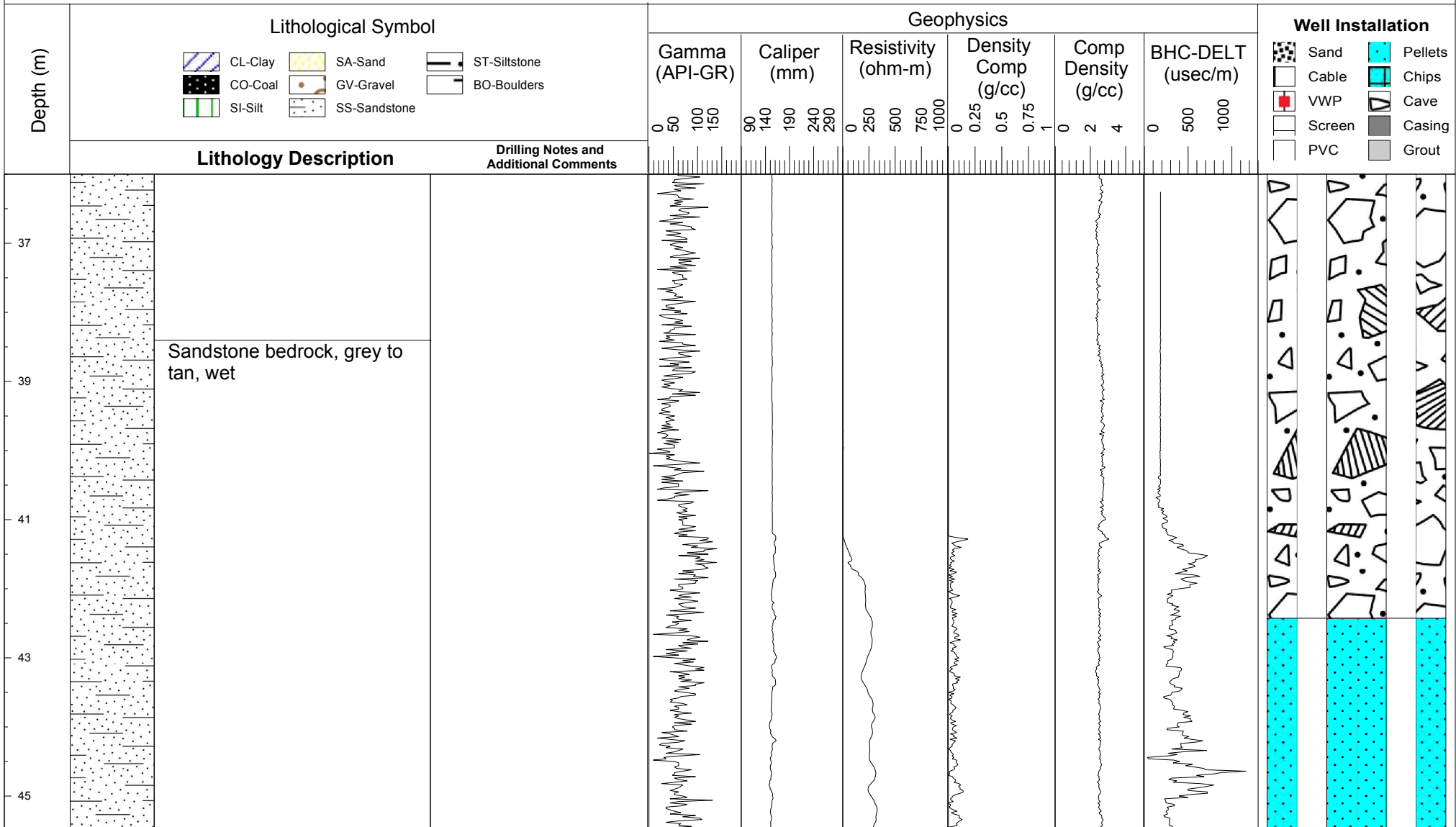
Weathered bedrock - silt size and rock flour, orange-brown to brown, dry

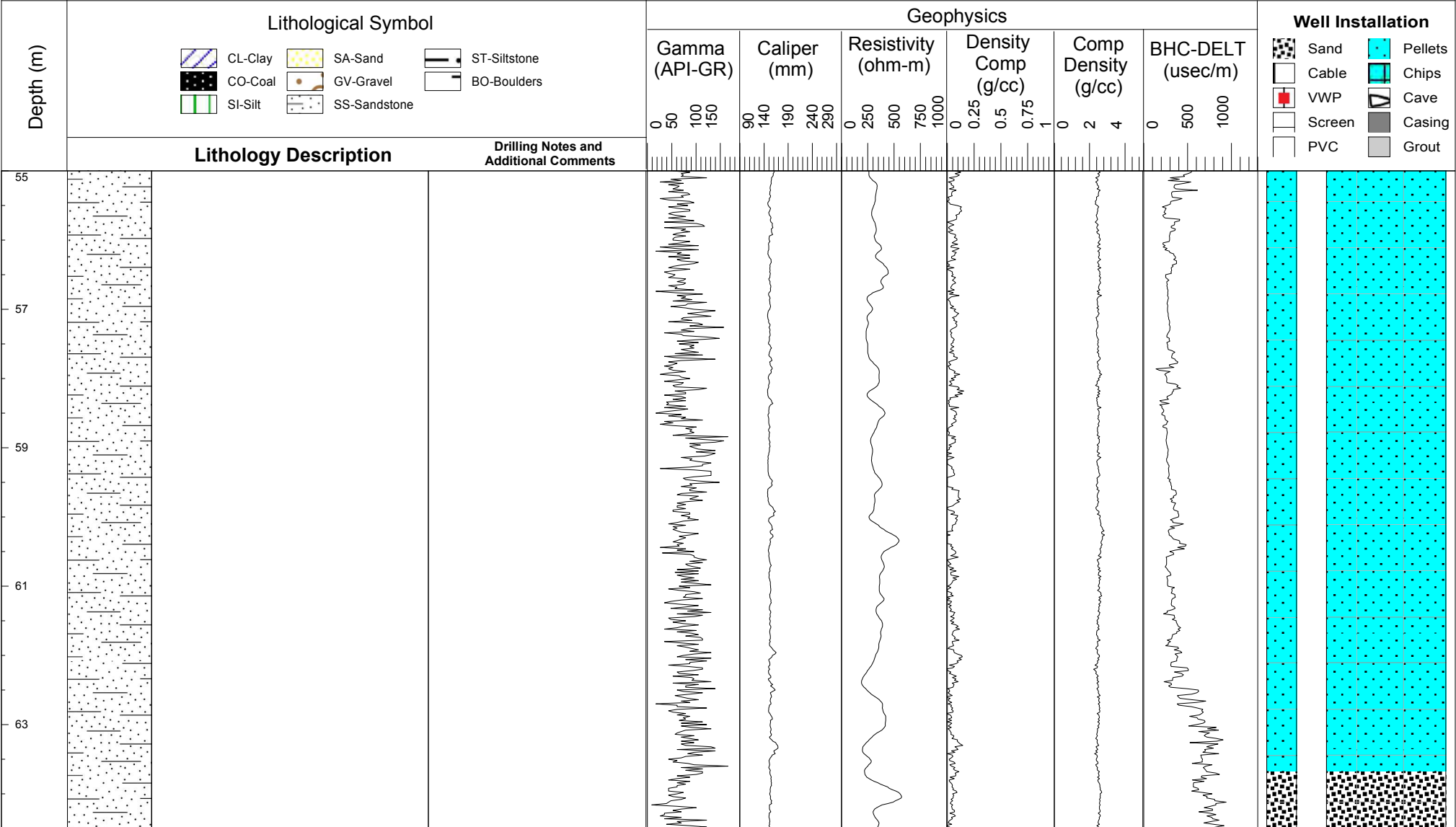
Sandstone bedrock, light grey to tan, dry

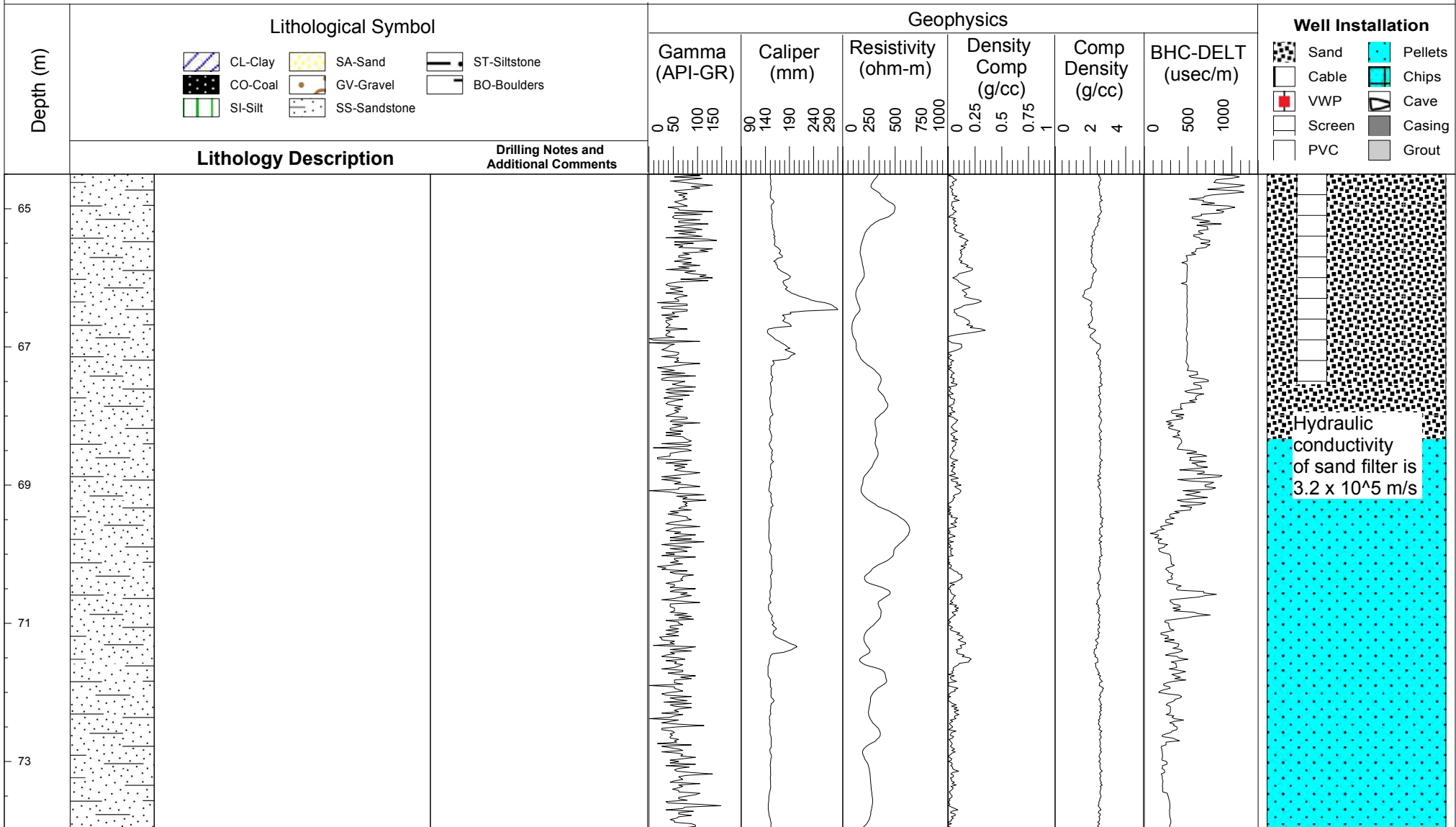
possibly rock flour and ground up bedrock - difficult to be certain

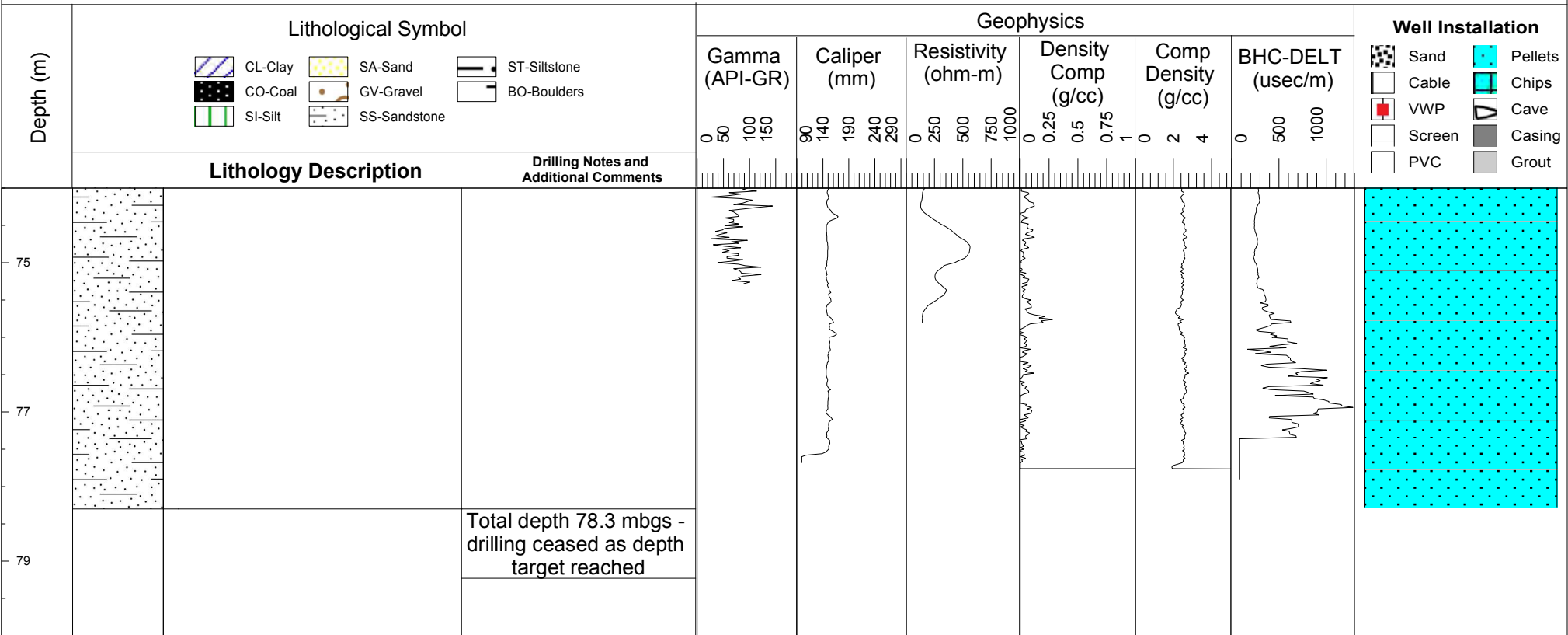
27-Apr-16

22-Apr-16

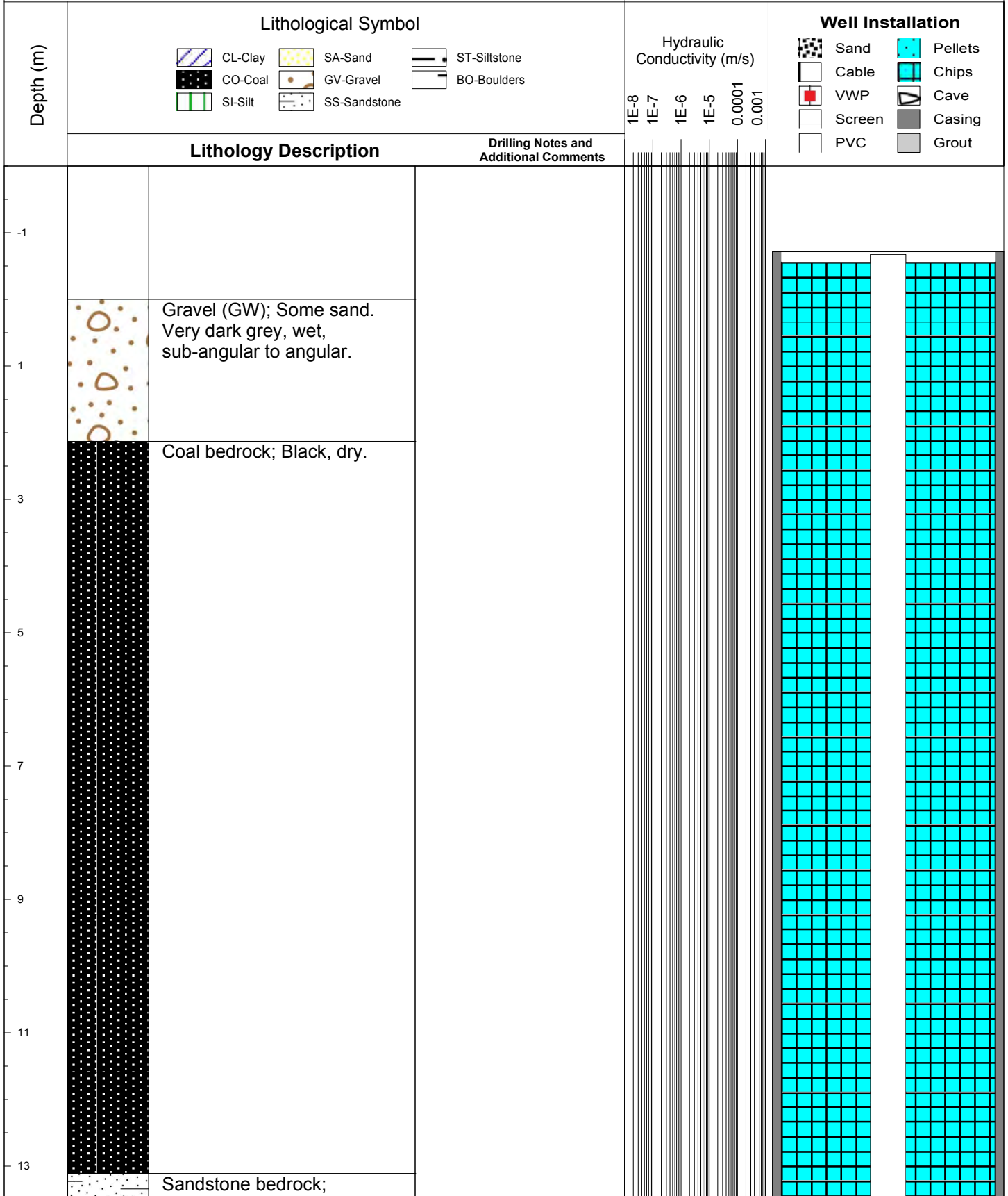




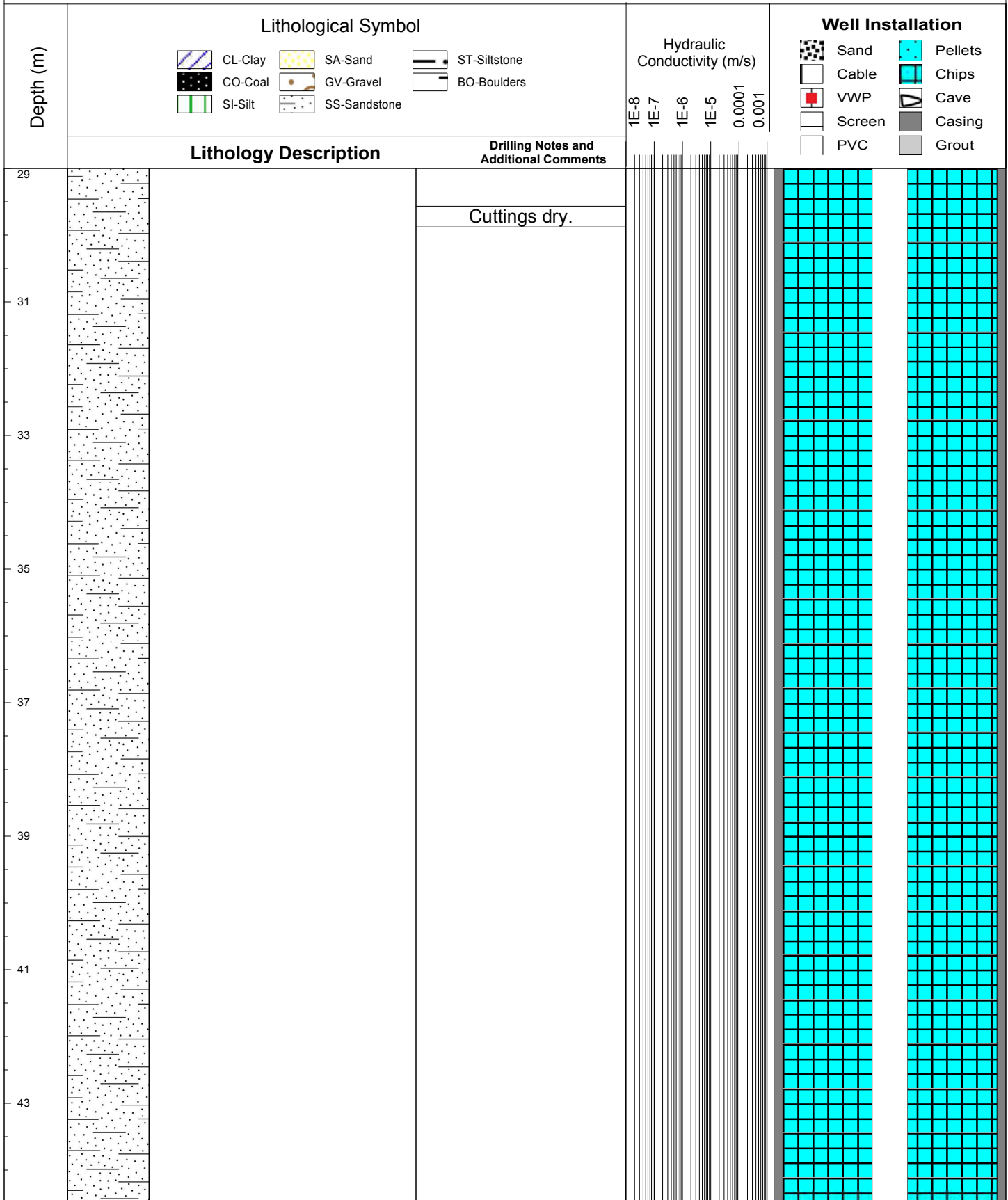


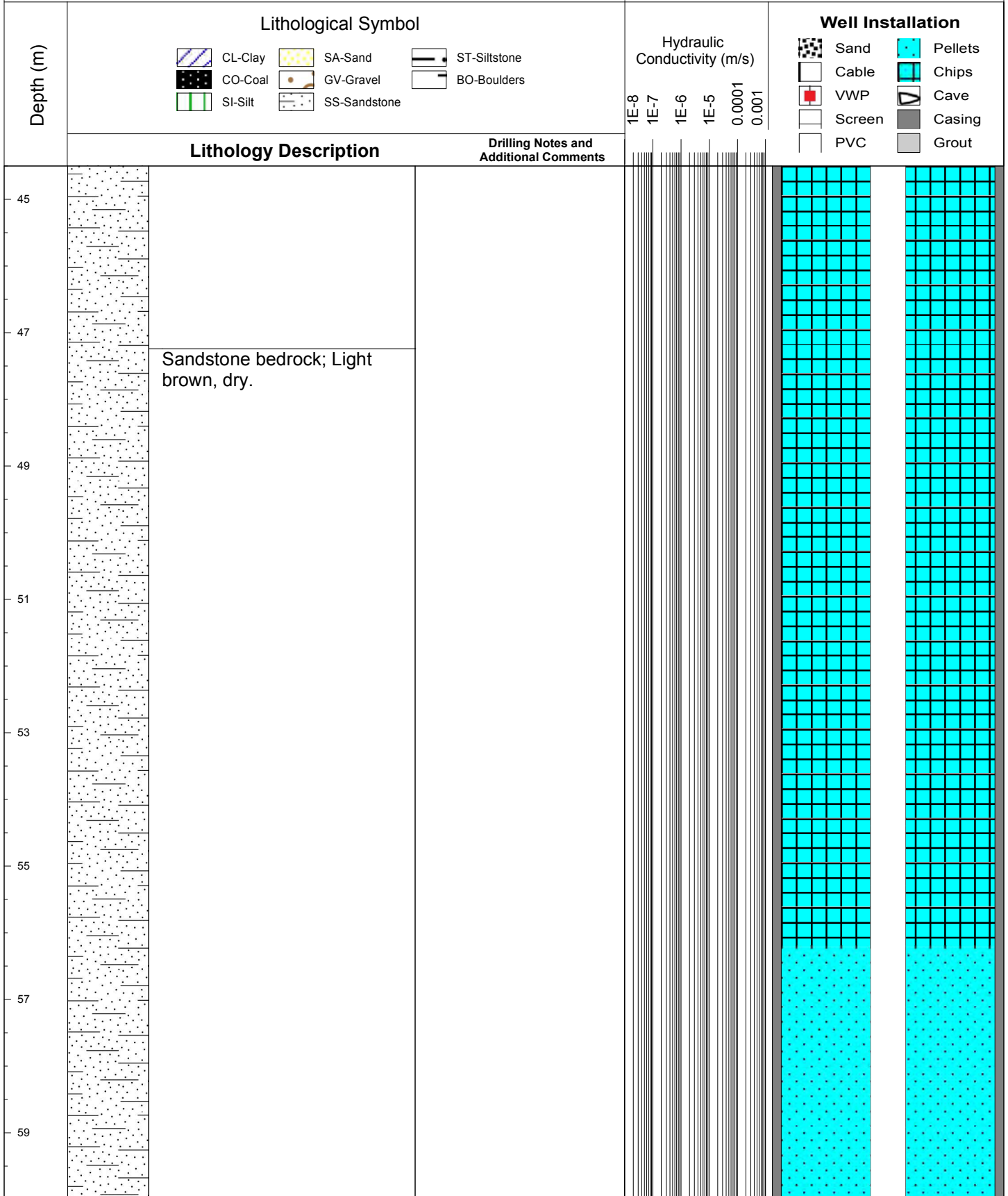


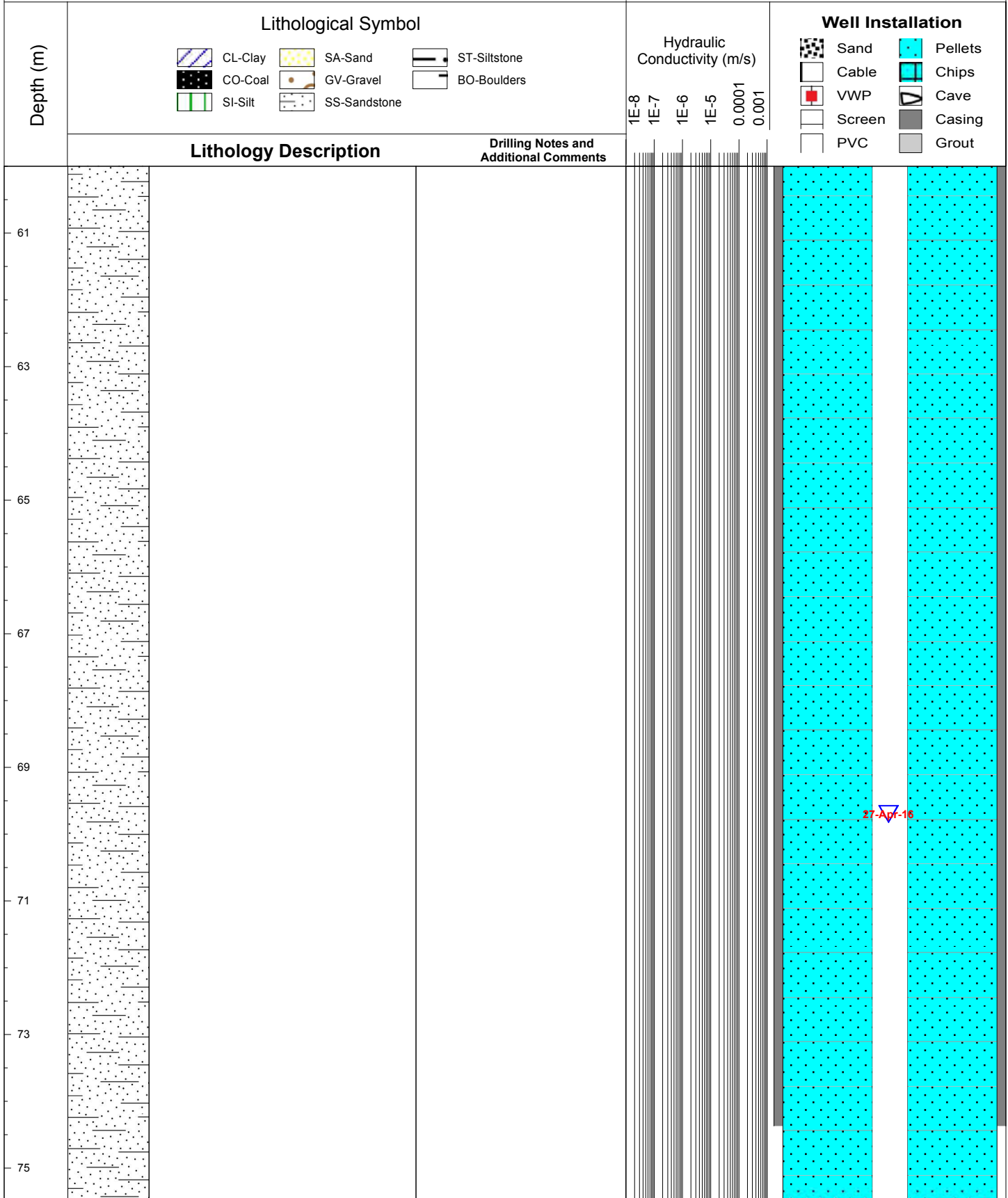
Total depth 78.3 mbgs -
 drilling ceased as depth
 target reached



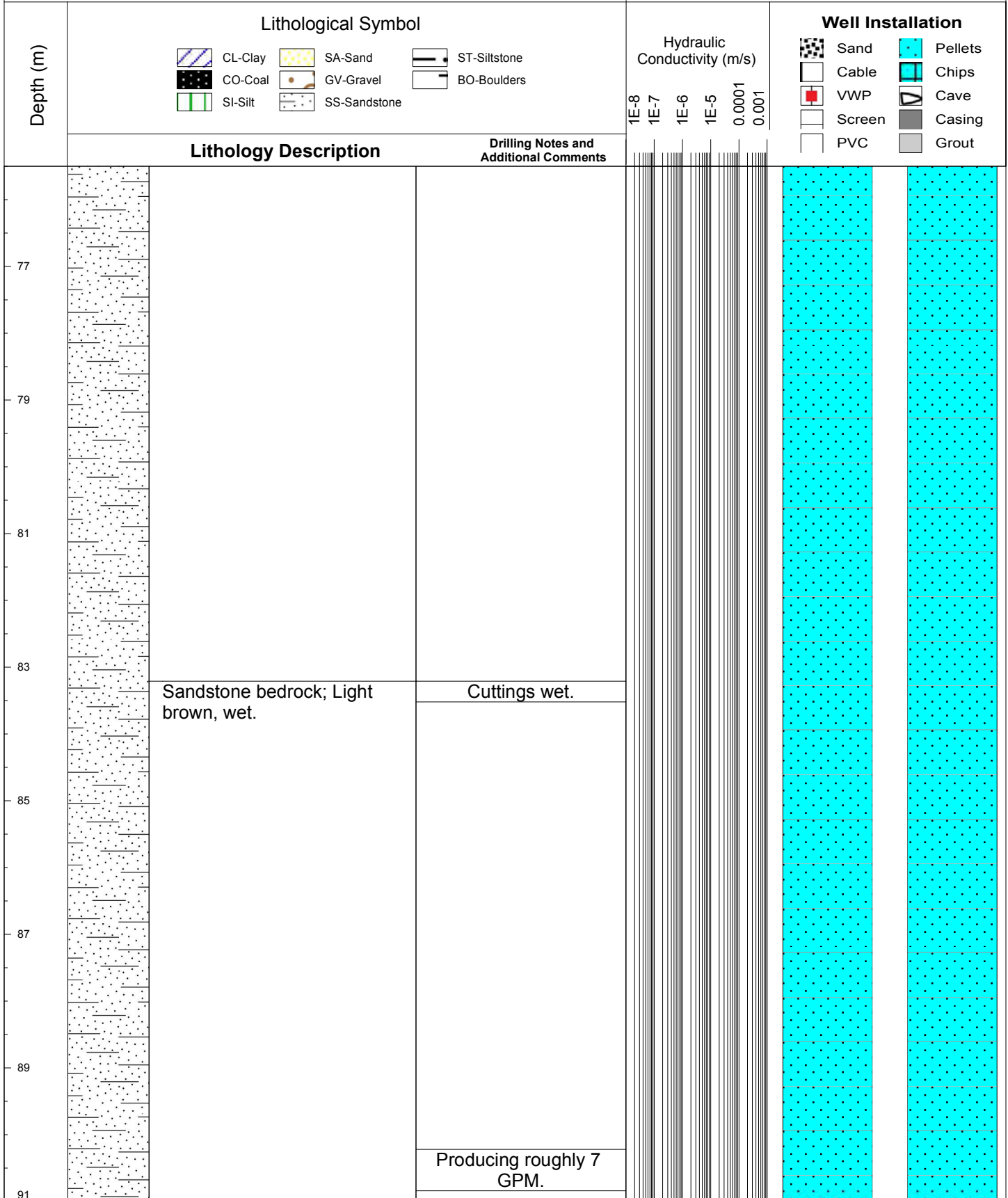
Depth (m)	Lithological Symbol			Hydraulic Conductivity (m/s)	Well Installation	
	CL-Clay	SA-Sand	ST-Siltstone		Sand	Pellets
	<ul style="list-style-type: none"> CL-Clay CO-Coal SI-Silt 	<ul style="list-style-type: none"> SA-Sand GV-Gravel SS-Sandstone 	<ul style="list-style-type: none"> ST-Siltstone BO-Boulders 	<ul style="list-style-type: none"> 1E-8 1E-7 1E-6 1E-5 0.0001 0.001 	<ul style="list-style-type: none"> Cable VWP Screen PVC 	<ul style="list-style-type: none"> Chips Cave Casing Grout
	Lithology Description		Drilling Notes and Additional Comments			
15	Orangish-brown, dry, soft.					
17						
19						
21						
23	Sandstone bedrock; Orangish-brown, wet, soft.		Cuttings moist.			
25			Cuttings wet.			
27			Bit plugging slightly, had to start drilling with water.			
29	Sandstone bedrock; Orangish-brown, dry, soft.		Drilling with water ceases.			

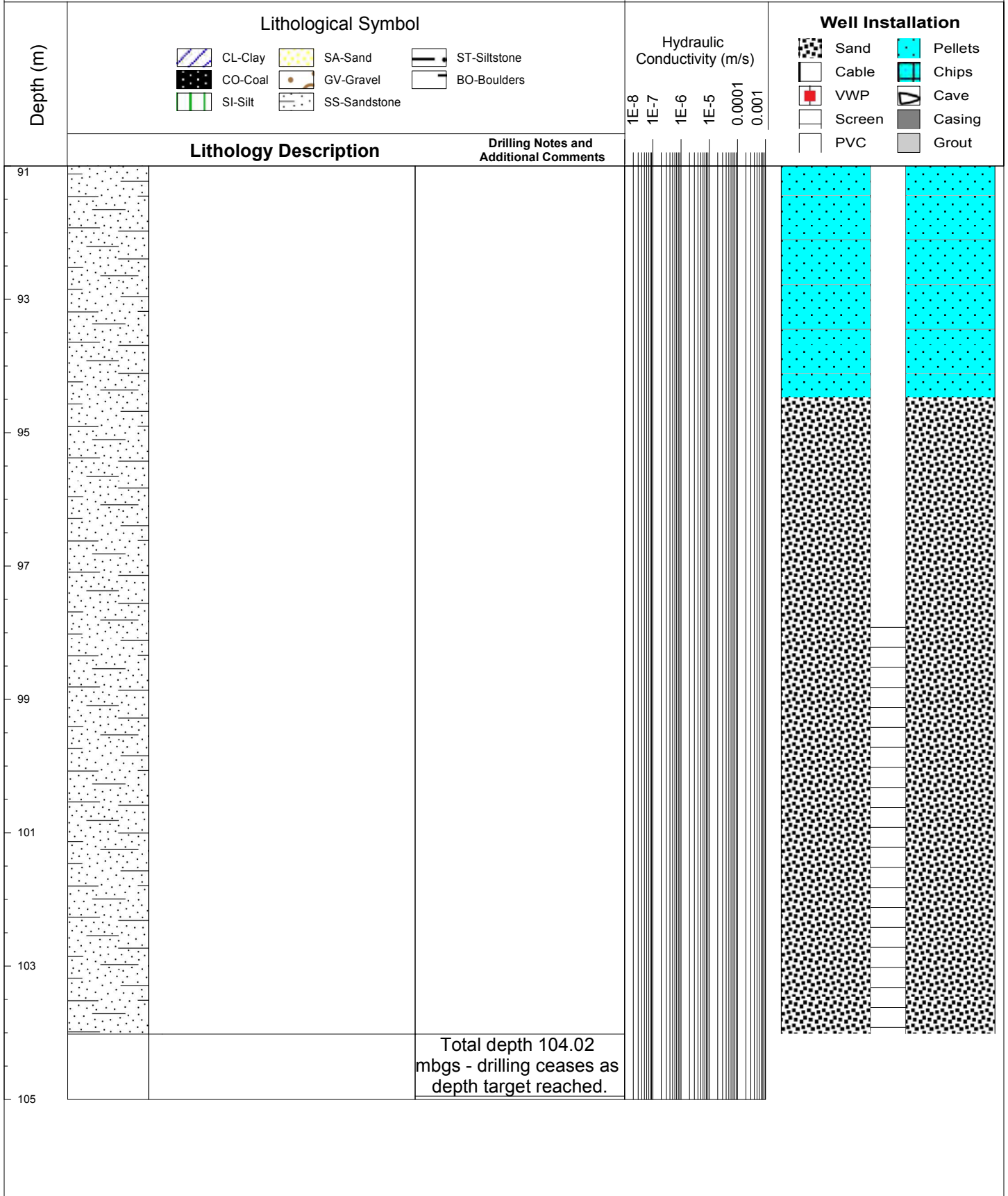


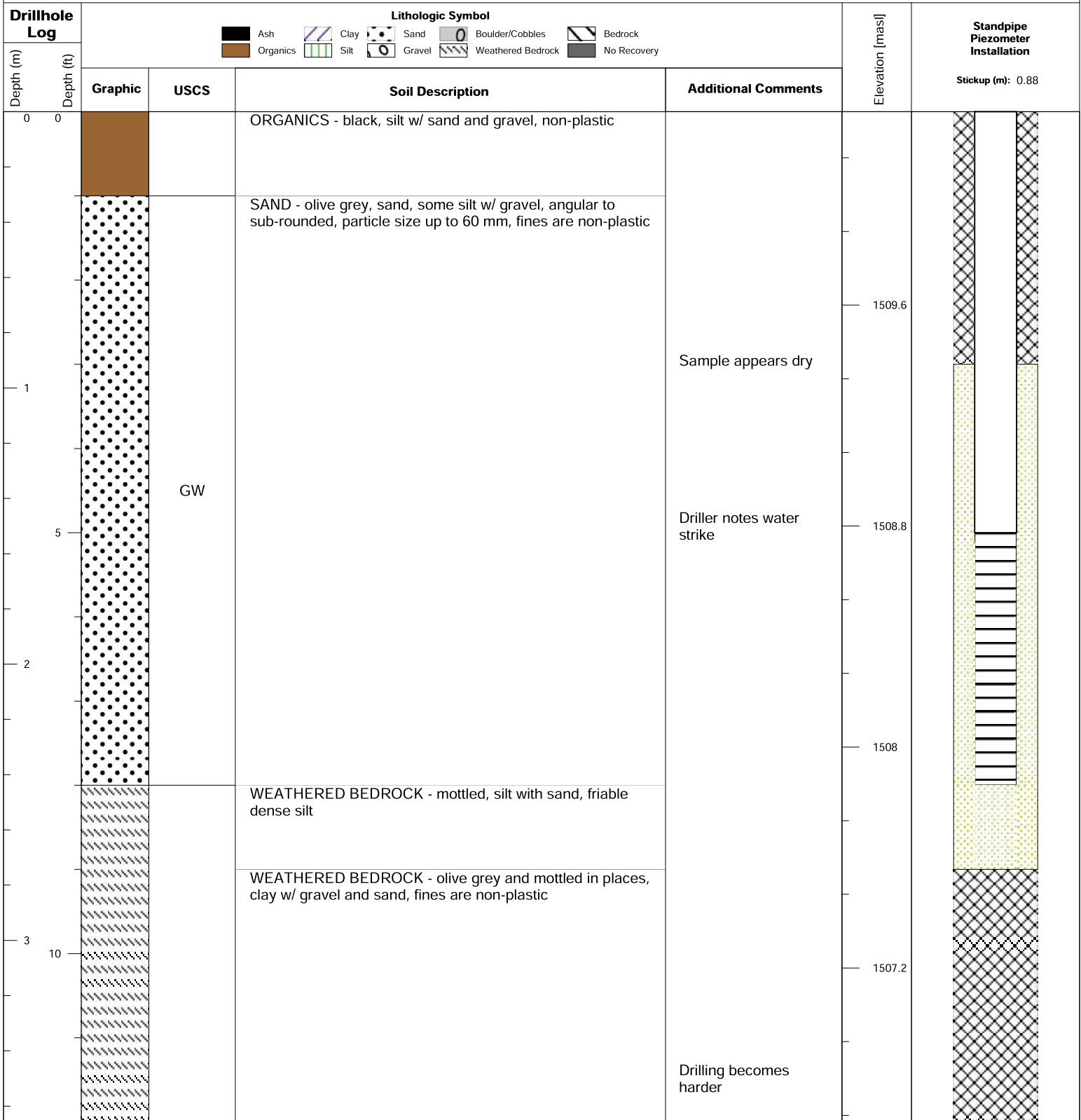




27-Apr-16





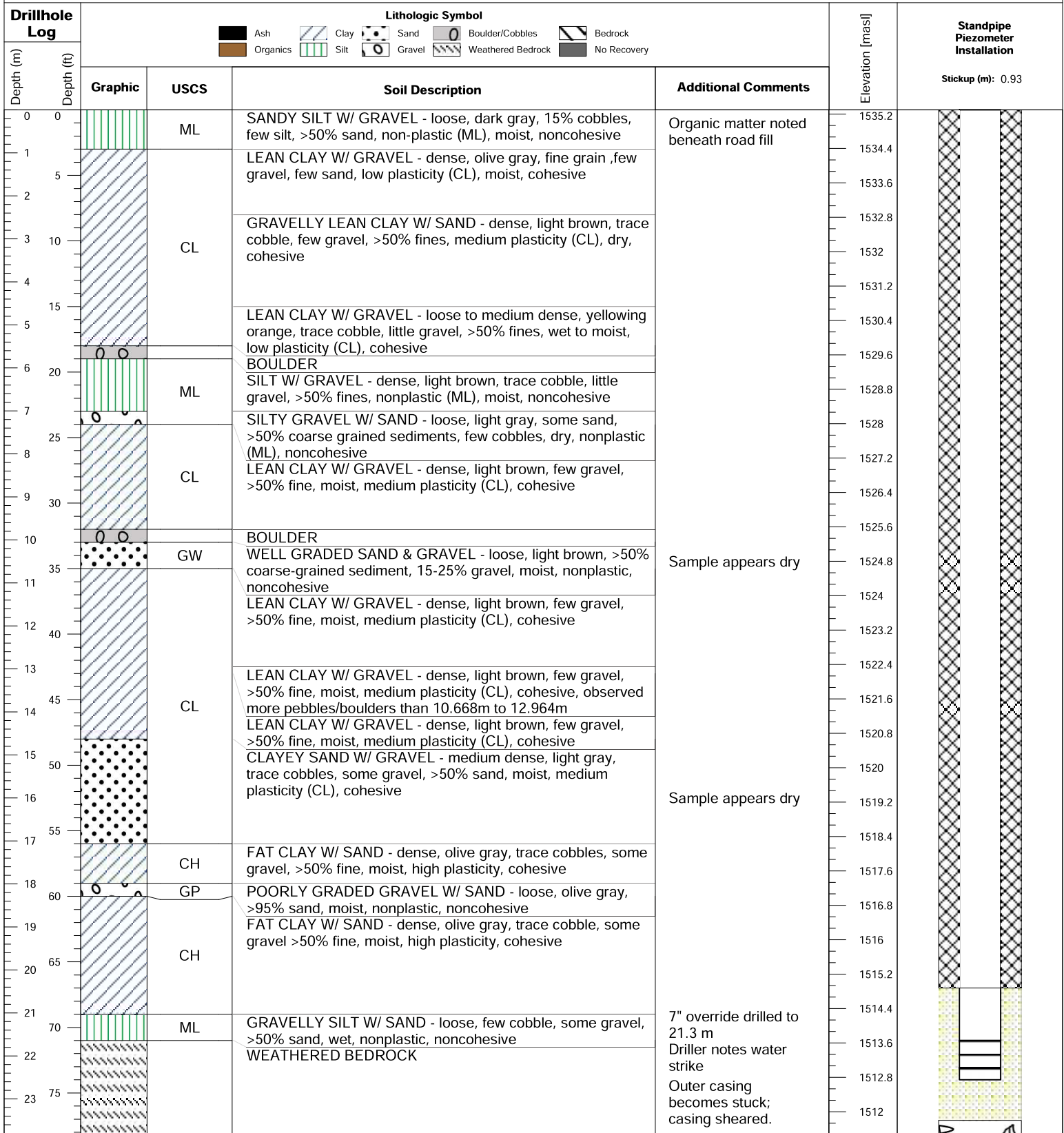


Notes:

Coordinates and elevation were measured via differential GPS

Installation Legend

- Bentonite Chips
- Sand
- PVC
- Screen
- Sump
- Casing
- Cement
- Bentonite Pellets
- Slough



Notes:
 Coordinates and elevation were measured via differential GPS

Installation Legend

- Bentonite Chips
- Sand
- PVC
- Screen
- Sump
- Casing
- Cement
- Bentonite Pellets
- Slough



Report 1 - Detailed Well Record

RG_01-03 (Elkford Supply Well)

<p>Well Tag Number: 42698</p> <p>Owner: VILLAGE OF ELKFORD</p> <p>Address: BOIVIN CK & ELK RIVER</p> <p>Area:</p> <p>WELL LOCATION: Land District District Lot: 12378 Plan: Lot: Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 83): Well: 5</p> <p>Class of Well: Subclass of Well: Orientation of Well: Status of Well: New Well Use: Observation Well Number: Observation Well Status: Construction Method: Diameter: 0.0 inches Casing drive shoe: Well Depth: 0 feet Elevation: 0 feet (ASL) Final Casing Stick Up: inches Well Cap Type: Bedrock Depth: feet Lithology Info Flag: File Info Flag: Sieve Info Flag: Screen Info Flag:</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 1979-07-01 00:00:00</p> <p>Driller: Well Identification Plate Number: Plate Attached By: Where Plate Attached:</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 0 (Driller's Estimate) Development Method: Pump Test Info Flag: Y Artesian Flow: Artesian Pressure (ft): Static Level:</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: Y Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: Material: Method: Depth (ft): Thickness (in):</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe
<p>GENERAL REMARKS: YIELD:NO DATA EXPLORATORY & WATER WELL</p> <p>LITHOLOGY INFORMATION: From 0 to 0 Ft. MEASURED IN METERS From 0 to 12.2 Ft. DRY MED. FINE SAND SOME SILT TRACE OF From 0 to 0 Ft. GRAVEL.</p>				



Report 1 - Detailed Well Record

RG_DW-01-07

Well Tag Number: 55014 Owner: JOE SMITHIES Address: 5 M BEFORE Area: ELKFORD WELL LOCATION: KOOTENAY Land District District Lot: 7995 Plan: 13618 Lot: 3 Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 83): 082G096144 Well: 1 Class of Well: Subclass of Well: Orientation of Well: Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Drilled Diameter: 6.0 inches Casing drive shoe: Well Depth: 32 feet Elevation: 0 feet (ASL) Final Casing Stick Up: inches Well Cap Type: Bedrock Depth: feet Lithology Info Flag: File Info Flag: Sieve Info Flag: Screen Info Flag: Site Info Details: Other Info Flag: Other Info Details:	Construction Date: 1985-07-22 00:00:00.0 Driller: Owen's Drilling Ltd. Well Identification Plate Number: Plate Attached By: Where Plate Attached: PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 2.5 (Driller's Estimate) Gallons per Minute (U.S./Imperial) Development Method: Pump Test Info Flag: Artesian Flow: Artesian Pressure (ft): Static Level: 22 feet WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: Field Chemistry Info Flag: Site Info (SEAM): Water Utility: Water Supply System Name: Water Supply System Well Name: SURFACE SEAL: Flag: Material: Method: Depth (ft): 0 feet Thickness (in): Liner from To: feet WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:																														
<table border="1"> <thead> <tr> <th>Screen from</th> <th>to feet</th> <th>Type</th> <th>Slot Size</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td></td><td>0</td></tr> <tr><td>0</td><td>0</td><td></td><td>0</td></tr> <tr><td>0</td><td>0</td><td></td><td>0</td></tr> <tr><td>0</td><td>0</td><td></td><td>0</td></tr> </tbody> </table>	Screen from	to feet	Type	Slot Size	0	0		0	0	0		0	0	0		0	0	0		0	<table border="1"> <thead> <tr> <th>Casing from</th> <th>to feet</th> <th>Diameter</th> <th>Material</th> <th>Drive Shoe</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>null</td> <td>null</td> </tr> </tbody> </table>	Casing from	to feet	Diameter	Material	Drive Shoe	0	0	0	null	null
Screen from	to feet	Type	Slot Size																												
0	0		0																												
0	0		0																												
0	0		0																												
0	0		0																												
Casing from	to feet	Diameter	Material	Drive Shoe																											
0	0	0	null	null																											
GENERAL REMARKS: LITHOLOGY INFORMATION: From 0 to 31 Ft. sandy gravel and clay wet From 31 to 32 Ft. sandy gravel																															

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<p>Well Tag Number: 101942</p> <p>Owner: ELK VALLEY FLYING CLUB</p> <p>Address:</p> <p>Area:</p> <p>WELL LOCATION: KOOTENAY Land District District Lot: 4144 Plan: Lot: Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 27): 082G086231 Well: 4</p> <p>Class of Well: Water supply Subclass of Well: Domestic Orientation of Well: Vertical Status of Well: New Well Use: Private Domestic Observation Well Number: Observation Well Status: Construction Method: Diameter: inches Casing drive shoe: Y Well Depth: 60 feet Elevation: feet (ASL) Final Casing Stick Up: inches Well Cap Type: Bedrock Depth: feet Lithology Info Flag: N File Info Flag: N Sieve Info Flag: N Screen Info Flag: N</p> <p>Site Info Details: Other Info Flag: Other Info Details:</p>	<p>Construction Date: 2002-04-02 00:00:00</p> <p>Driller: J. R. Drilling Well Identification Plate Number: Plate Attached By: Where Plate Attached:</p> <p>PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 60 (Driller's Estimate) U.S. Gallons per Minute Development Method: Air lifting Pump Test Info Flag: N Artesian Flow: Artesian Pressure (ft): Static Level: 7 feet</p> <p>WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM):</p> <p>Water Utility: Water Supply System Name: Water Supply System Well Name:</p> <p>SURFACE SEAL: Flag: N Material: Method: Depth (ft): Thickness (in): Liner from To: feet</p> <p>WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:</p>			
Screen from	to feet	Type	Slot Size	
Casing from	to feet	Diameter	Material	Drive Shoe
0	60	6	Steel	Y
GENERAL REMARKS:				
MEASUREMENTS: TOP OF CASING. PITLESS UNIT: WELDED. SHOE: BARBER. WATER QUALITY AND QUANTITY NOT GUARANTEED BY CONTRACTOR.				
LITHOLOGY INFORMATION:				
From	0 to	47 Ft.	gravel	
From	47 to	52 Ft.	clay	
From	52 to	60 Ft.	gravel	

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Report 1 - Detailed Well Record

RG_DW-03-01

<p>Well Tag Number: 94779</p> <p>Owner: SPARDELL MOBILE HOME PARK LTD</p> <p>Address: 100 INDUSTRIAL ROAD #1</p> <p>Area: SPARWOOD</p> <p>WELL LOCATION:</p> <p>KOOTENAY Land District</p> <p>District Lot: 4588 Plan: 1358 & NEP 64776 Lot: 13 & 1</p> <p>Township: Section: Range:</p> <p>Indian Reserve: Meridian: Block:</p> <p>Quarter:</p> <p>Island:</p> <p>BCGS Number (NAD 83): 082G076233 Well: 9</p> <p>Class of Well: Water supply</p> <p>Subclass of Well: Domestic</p> <p>Orientation of Well: Vertical</p> <p>Status of Well: New</p> <p>Licence General Status: UNLICENSED</p> <p>Well Use: Water Supply System</p> <p>Observation Well Number:</p> <p>Observation Well Status:</p> <p>Construction Method:</p> <p>Diameter: inches</p> <p>Casing drive shoe: Y</p> <p>Well Depth: 50 feet</p> <p>Elevation: 3697 feet (ASL)</p> <p>Final Casing Stick Up: 12 inches</p> <p>Well Cap Type: BOLT ON</p> <p>Bedrock Depth: feet</p> <p>Lithology Info Flag: Y</p> <p>File Info Flag: N</p> <p>Sieve Info Flag: N</p> <p>Screen Info Flag: Y</p> <p>Site Info Details:</p> <p>Other Info Flag:</p> <p>Other Info Details:</p>	<p>Construction Date: 2008-02-28 00:00:00</p> <p>Driller: Owen's Drilling Ltd.</p> <p>Well Identification Plate Number: 26287</p> <p>Plate Attached By: MIKE CALDWELL</p> <p>Where Plate Attached: TOP OF CASING</p> <p>PRODUCTION DATA AT TIME OF DRILLING:</p> <p>Well Yield: 30 (Driller's Estimate) U.S. Gallons per Minute</p> <p>Development Method: Air lifting</p> <p>Pump Test Info Flag: N</p> <p>Artesian Flow:</p> <p>Artesian Pressure (ft):</p> <p>Static Level:</p> <p>WATER QUALITY:</p> <p>Character:</p> <p>Colour:</p> <p>Odour:</p> <p>Well Disinfected: N</p> <p>EMS ID:</p> <p>Water Chemistry Info Flag: N</p> <p>Field Chemistry Info Flag:</p> <p>Site Info (SEAM):</p> <p>Water Utility:</p> <p>Water Supply System Name:</p> <p>Water Supply System Well Name:</p> <p>SURFACE SEAL:</p> <p>Flag: Y</p> <p>Material: Bentonite clay</p> <p>Method: Poured</p> <p>Depth (ft): 15 feet</p> <p>Thickness (in): 2 inches</p> <p>Liner from To: feet</p> <p>WELL CLOSURE INFORMATION:</p> <p>Reason For Closure:</p> <p>Method of Closure:</p> <p>Closure Sealant Material:</p> <p>Closure Backfill Material:</p> <p>Details of Closure:</p>										
<table border="1"> <thead> <tr> <th>Screen from</th> <th>to feet</th> <th>Type</th> <th>Slot Size</th> </tr> </thead> <tbody> <tr> <td>46</td> <td>50</td> <td></td> <td>30</td> </tr> </tbody> </table>	Screen from	to feet	Type	Slot Size	46	50		30			
Screen from	to feet	Type	Slot Size								
46	50		30								
<table border="1"> <thead> <tr> <th>Casing from</th> <th>to feet</th> <th>Diameter</th> <th>Material</th> <th>Drive Shoe</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>46</td> <td>6</td> <td>Steel</td> <td>Y</td> </tr> </tbody> </table>	Casing from	to feet	Diameter	Material	Drive Shoe	0	46	6	Steel	Y	
Casing from	to feet	Diameter	Material	Drive Shoe							
0	46	6	Steel	Y							

GENERAL REMARKS:

LITHOLOGY INFORMATION:

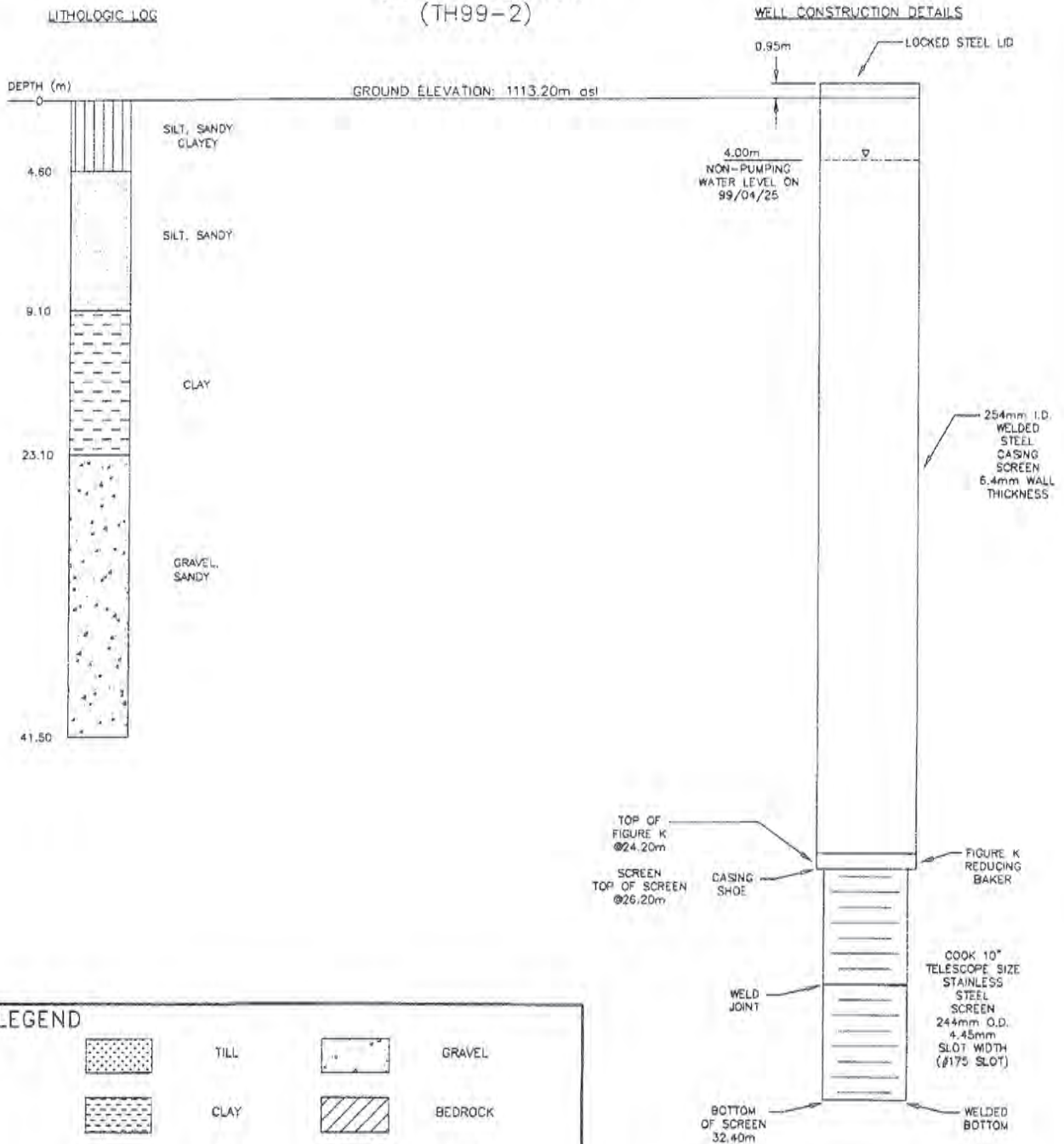
From	0	to	15 Ft.	Medium CLAY & TOP SOIL	brown
From	15	to	30 Ft.	Medium	brown
From	30	to	45 Ft.	Medium CLAY & GRAVEL	brown
From	45	to	50 Ft.	Medium 30 U.S. Gallons per Minute	brown

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TEST PRODUCTION
(TH99-2)



LEGEND

	TILL		GRAVEL
	CLAY		BEDROCK
	SAND		SILT

RIG TYPE: BARBER AIR ROTARY
 DRILLING CONTRACTOR: JR DRILLING, CRANBROOK, BC
 PUMPING TEST CONTRACTOR: MOORE'S WELL & PUMP SERVICE, VERNON, BC
 DATE OF COMPLETION: 22 APRIL 1999

NOT TO SCALE



HYDROGEOLOGICAL EVALUATION OF A NEW TEST WELL
DISTRICT OF SPARWOOD, BC

FIG. 3

Appendix V

Field Methodology



Field Methodology

Water sample collection and handling was completed by Teck or others in accordance with the 2013 edition of the British Columbia Field Sampling Manual (BCFSM; Clark, 2013) as required in Permit 107517 and Teck's Standard Practices and Procedures (SP&Ps) for well monitoring, purging, and sampling (TC_GW-01 and TC_GW-02), using appropriate well-specific methods to account for well construction, type, and recharge. A consistent method was followed for each location. During monitoring and sampling events, field observations were recorded, such as weather conditions and any unusual occurrences (i.e. changes in site use or site physical conditions, the condition of the monitoring well and whether repairs are needed, and ponded water in the vicinity of the monitoring well).

Sampling Frequency

Permit 107517 prescribes a minimum quarterly sampling frequency. Therefore, the monitoring schedule and rationale was as follows:

- › Winter (First Quarter): Winter sampling to capture when groundwater levels are nearing their lowest and recharge to groundwater is minimized due to frozen ground.
- › Spring (Second Quarter): Sampling during the freshet months to capture when groundwater levels and the extent of groundwater recharge and discharge are maximized.
- › Summer (Third Quarter): Sampling during the post freshet months to capture when the groundwater levels are decreasing.
- › Fall (Fourth Quarter): Sampling to capture groundwater conditions between the summer and winter sampling events.

Quarterly sampling was recommended for a minimum of one year after well installation to assess seasonal variability of groundwater conditions as per the BC Ministry of Environment & Climate Change Strategy (ENV) Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (ENV, 2016). Monitoring frequency is reviewed on an annual basis to assess adequacy to address the seasonal variability and to address whether the frequency should be reduced if little to no variability is observed.

Analyte List

Groundwater was analyzed for select constituents from the core list of general water quality analytes provided in Table 2 of the BC ENV's Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (ENV, 2016) and Permit 107517 Table 25. Minimum detection limits for each parameter are suitable for comparison to the screening criteria. The list of recommended constituents, detection limits, and rationale is presented in the Site-specific Groundwater Monitoring Program (SSGMP) Update report.

Analyses for dissolved metals is specified to prevent misrepresentation of the mobile concentrations of constituents due to increased turbidity, which may occur as the result of sampling techniques, well construction, and/or geological formation (i.e., clay or silt bearing formations). For metals, the dissolved (i.e., filtered samples) component provides the best representation of groundwater transport. Approval for removal of total metals from all of Teck's groundwater sampling programs was received via email to Teck from ENV on November 3, 2016.

The 2018 SSGMP Update recommends analyzing for bicarbonate, carbonate, and hydroxide in place of bicarbonate-, carbonate-, and hydroxide-alkalinity to assist with water-type data interpretation. These parameters are used to characterize water type and direct analysis of these parameters would eliminate the need to convert alkalinity results.

Sample Handling and Shipment

Samples were handled and shipped in a manner that is consistent with the practices and procedures prescribed in the British Columbia Field Sampling Manual. Samples were submitted to a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory for analysis in accordance with the British Columbia Environmental Laboratory Manual (Austin, 2016).

Samples were shipped to an accredited laboratory to reduce hold time exceedances. Teck used a more local laboratory to avoid the potential for hold time exceedances.

The following was completed as per Teck's SP&P:

- › Preservatives and certified clean sample bottles were provided by an accredited laboratory;
- › Samples collected for dissolved metals were field-filtered using an in-line filter;
- › Samples that required preservation were preserved in the field, with the exception of dissolved ultra-trace mercury that was lab filtered as required by the laboratory; and
- › Samples were shipped in ice-chilled coolers under chain-of-custody documentation and procedures.

Fording River Operations

As per Teck's SP&P and the BCFSM, groundwater monitoring, purging, and sampling at Fording River Operations (FRO) was completed as follows:

- › The equipment was prepared and calibrated. If a field measurement was identified out of the expected historical ranges from previous sampling events at the monitoring well, calibration of field probes was re-confirmed.
- › Prior to sample collection, manual water level measurements (i.e. with a water level tape) were measured from each location.
- › In addition to manual monitoring, wells FR_HMW1S/D, FR_HMW2, FR_HMW3, FR_HMW5, FR_TBSSMW-1, FR_TBSSMW-2, FR_GCMW-1B, FR_GCMW-2, FR_KB-1, FR_KB-2, FR_KB-3A/B, FR_MW-SK1A/B were continuously monitored with data loggers.
- › Data from the loggers were downloaded each quarter when possible. Prior to sampling or deployment of pressure transducers (also referred to as dataloggers) depth-to-water measurements were collected. Manual and data logger measurements were collected at approximately the same time of day to avoid possible discrepancies in data due to daily fluctuation of water table. Data loggers were removed and uploaded following the depth to water measurement. After samples were collected the data logger was re-deployed at the same depth. Any changes in length of cable used were noted.
- › Pressure transducer data was corrected for atmospheric influences using a barometric logger which measures atmospheric pressure. Pressure transducers were deployed below water level and both pressure transducers and barometric loggers were deployed below the anticipated frost penetration depth to prevent the instrument from freezing.

- › Dedicated tubing was installed in each well and a pump was used to draw water to the surface for sample collection. The specific pump type selected for each monitoring well location was determined based on well construction, type, and recharge characteristics (Table 2b). Wells with depth to water less than 7 mbgs were purged and sampled following low-flow (0.5 L/min) sampling techniques to minimize sediment entrainment. In cases where depth to water was approximately 7 mbgs or greater, wells were sampled using tubing fitted with a Waterra foot valve or a bladder pump. Wells were purged three well volumes or until field parameters [electrical conductivity (EC), dissolved oxygen (DO), pH, oxidation-reduction potential (ORP), and temperature] stabilized after three consecutive readings using a YSI flow through cell. Field parameters were recorded once stable, prior to sampling.
- › Following purging, a sample was collected at a flow rate of approximately 0.1 L/min using the lowest possible setting for the particular pump. The low-flow rate is intended to minimize the disturbance of entrained sediments mixing within the well and is intended to draw water directly from the formation around the well.

Select wells at FRO require different methods for sampling. Supply wells, FR_GH_WELL4 and FR_POTWELLS, have limited access to the wellhead; therefore, samples were collected from a distribution point (i.e. faucet) within the water system or at the sample port at the well head. Samples from FR_POTWELLS are representative of one or more of a number of wells in the water supply system, while FR_GH_WELL4 is representative of a single well. Both supply wells FR_POTWELLS (continuously running) and FR_GH_WELL4 (not continuously running), were purged and parameters were monitored to ensure stabilization prior to sampling.

Greenhills Operations

As per Teck's SP&P and the BCFSM, groundwater monitoring, purging, and sampling at Greenhills Operations (GHO) was completed as follows:

- › The equipment was prepared and calibrated. If a field measurement was identified out of the expected historical ranges from previous sampling events at the monitoring well, calibration of field probes was re-confirmed.
- › Prior to sample collection, manual water level measurements (i.e. with a water level tape) were measured from each location.
- › In addition to manual monitoring, all wells except for GH_MW-TD were continuously monitored with data loggers. Continuous water level data from the supply wells GH_POTW09, GH_POTW10, GH_POTW15, and GH_POTW17 could not be reduced as the data loggers require calibration.
- › Data from the loggers were downloaded each quarter when possible. Prior to sampling or deployment of pressure transducers (also referred to as dataloggers) depth-to-water measurements were collected. Manual and data logger measurements were collected at approximately the same time of day to avoid possible discrepancies in data due to daily fluctuation of water table. Data loggers were removed and uploaded following the depth to water measurement. After samples were collected the data logger was re-deployed at the same depth. Any changes in length of cable used were noted.
- › Pressure transducer data was corrected for atmospheric influences using a barometric logger which measures atmospheric pressure. Pressure transducers were deployed below water level and both pressure transducers and barometric loggers were deployed below the anticipated frost penetration depth to prevent the instrument from freezing.

- › Dedicated tubing was installed in each well and a pump was used to draw water to the surface for sample collection. The specific pump type selected for each monitoring well location was determined based on well construction, type, and recharge characteristics (Table 3b). The specific pump type selected for each monitoring well location was determined based on well construction, type, and recharge characteristics. Wells with depth to water less than 7 mbgs were purged and sampled following low-flow (0.5 L/min) sampling techniques to minimize sediment entrainment. In cases where depth to water was approximately 7 mbgs or greater, wells were sampled using tubing fitted with a Waterra foot valve. Wells were purged three well volumes or until field parameters (EC, DO, pH, ORP, and temperature) stabilized after three consecutive readings using a YSI flow through cell. Field parameters were recorded once stable, prior to sampling.
- › Following purging, a sample was collected at a flow rate of approximately 0.1 L/min using the lowest possible setting for the particular pump. The low-flow rate is intended to minimize the disturbance of entrained sediments mixing within the well and is intended to draw water directly from the formation around the well.

Select wells at GHO require different methods for sampling (GH_MW-TD and supply wells). Flowing artesian conditions were encountered at GH_MW-TD during installation. Groundwater at this well is collected directly from the discharge spigot using filters and a syringe. Supply wells were GH_POTW09, GH_POTW10, GH_POTW15, and GH_POTW17 were sampled from the sample port at the wellhead. Prior to collection of samples, the supply wells were purged and parameters were monitored to ensure stabilization prior to sampling.

Elkview Operations

As per Teck's SP&P and the BCFSM, groundwater monitoring, purging, and sampling at Elkview Operations (EVO) was completed as follows:

- › Prior to sample collection, manual water level measurements (i.e. with a water level tape) were measured from each location. Water levels were measured relative to the top of the well casing using an electronic water level probe.
- › In addition to manual monitoring, the following wells were continuously monitored with data loggers: EV_BCgw, EV_BRgw, EV_EVgw, EV_ER1gwS, EV_GCgw, EV_GV3gw, EV_LSgw, EV_MCgwS/D, EV_MW_AQ1, EV_MW_BC1-A/B, EV_MW_GT1B, EV_MW_MC2B, EV_MW_MC3, EV_MW_SPRB/C and EV_OCgw.
- › Data loggers were removed and uploaded following the depth to water measurement. After samples were collected the data logger was re-deployed at the same depth. Any changes in length of cable used were noted.
- › Pressure transducer data was corrected for atmospheric influences using a barometric logger which measures atmospheric pressure. Pressure transducers were deployed below water level and both pressure transducers and barometric loggers were deployed below the anticipated frost penetration depth to prevent the instrument from freezing.
- › Dedicated tubing was installed in each well and a pump was used to draw water to the surface for sample collection. The specific pump type selected for each monitoring well location was determined based on well construction, type, and recharge characteristics (Table 4b). The specific pump type

selected for each monitoring well location was determined based on well construction, type, and recharge characteristics.

- › Prior to sampling, wells were purged with the exception of EV_WF_SW and supply wells EV_RCgw and EV_HW1. EV_WF_SW was sampled using a Hydrasleeve™ (no purge method) due to the deep water level at this well (>130 mbgs). Supply wells were sampled from a distribution point. Prior to collection of samples, the tap or valve at the supply wells was opened for a minimum of five minutes to purge water through the distribution system. The objective of purging was to obtain samples representative of the water source and not a sample influenced by the distribution system.
- › Purging was completed using a bladder pump or a submersible pump following low-flow sampling techniques (<0.5 L/min) until field parameters (pH, temperature, EC, ORP, DO) stabilized for three consecutive readings. Field parameters were measured using a calibrated multi-parameter YSI Pro-DSS or YSI 6820 V2-2 Sonde probe which include in-built turbidity measurements. Groundwater parameter values were recorded periodically during purging and prior to sampling.

Coal Mountain Operations

As per Teck's SP&P and the BCFSM, groundwater monitoring, purging, and sampling at Coal Mountain Operations (CMO) was completed as follows:

- › Prior to sampling, manual water level measurements were measured. Water levels were measured relative to the top of the well casing using an electronic water level probe. Water levels were measured relative to the top of the steel casing up to Q2 2019. In Q3 2019 water levels were measured relative to top of PVC to be consistent with methodology at other sites.
- › Pressure transducer data loggers were deployed to collect continuous groundwater levels at two wells: CM_MW5-SH and CM_MW5-DP. Dataloggers were set to record pressure and temperature measurements every hour; pressure measurements were corrected using barometric pressure data collected with a barometric logger.

Monitoring wells were sampled using three methods: low-flow purging/sampling, artesian flow grab sampling, and no-purge sampling. The specific pump type selected for each monitoring well location was determined based on well construction, type, and recharge characteristics (Table 5b).

- › Low-flow sampling was conducted using dedicated bladder pumps for nine wells: CM_MW1-OB, CM_MW1-SH, CM_MW2-SH, CM_MW3-SH, CM_MW3-DP, CM_MW5-SH, CM_MW5-DP, CM_MW6-SH and CM_MW6-DP. Flow rates were sustained below 0.5 L/min while purging, and samples were collected following stabilization of field parameters. Field parameter stabilization was confirmed by three consecutive readings of all parameters (pH, temperature, conductivity, ORP, DO) within stabilization criteria.
- › Grab samples were collected from artesian flow at monitoring wells CM_MW4-SH and CM_MW4-DP. Water discharging from the top of the standpipe was directed into sample bottles.
- › No-purge sampling was conducted at four monitoring wells (CM_MW1-DP, CM_MW7-SH, CM_MW7-DP, and CM_MW8) using the hydrasleeve system. The hydrasleeve was lowered to the bottom of the standpipe a few days prior to sample collection. Recovering the sleeve captured a core of water from the standpipe along the well screen interval.

- › Field parameter measurements were recorded immediately before filling sample bottles. Field parameters were measured using multi-parameter probes (pH, temperature, EC, ORP, DO) and a separate turbidity sensor. Sensors were calibrated on a routine basis and the calibration process was documented.
- › One new monitoring well was developed in 2019: CM_MW10. Development was conducted using inertial pumping with a surge block. A total of 680 L of water was pumped out of the well over three and a half hours. Field parameters (pH, EC, temperature) were measured frequently as development progressed and demonstrated stabilization. Development was assessed to be complete and quarterly sampling initiated for Q4 2019.

Regional Drinking Water Program

As per Teck's SP&P and the BCFSM, groundwater monitoring, purging, and sampling was completed as follows:

- › The equipment was prepared and calibrated. If a field measurement was identified out of the expected historical ranges from previous sampling events at the monitoring well, calibration of field probes was re-confirmed.
- › There is limited access to the wellhead at supply and domestic wells sampled as part of the RGMP (RG_DW-01-03, RG_DW-01-07, RG_DW-02-20, RG_DW-03-01, RG_DW-03-04); therefore, samples were collected from a distribution point (i.e. faucet) within the water system or at the sample port at the well head as shown on Table 6b. Domestic wells were sampled, where possible, via the sample port used in the initial drinking water evaluation or previous sampling event.
- › Prior to collection of samples, the tap or valve at the sample location was opened for a minimum of five minutes to purge water through the distribution system. The objective of purging was to obtain samples representative of the water source and not a sample influenced by the distribution system.
- › Water quality parameters (pH/EC/temperature) were monitored until stable readings were obtained. Once the stabilized water quality parameters were recorded, the flow was reduced to minimize splashing and samples were collected in laboratory supplied bottles.

References

- Austin, J. (editor). 2016. British Columbia Environmental Laboratory Manual. Environmental Monitoring, Reporting and Economics Section, Knowledge Management Branch, B.C., Ministry of Environment, Victoria, BC.
- British Columbia Ministry of Environment, 2016. Technical Guidance 6: Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators. Technical Guidance for Environmental Management Act Applications, Version 2.0, June 2016.
- Clark, M.J.R., 2013. British Columbia Field Sampling Manual: 2013 – For Continuous Monitoring plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples. Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection, Victoria, BC, Canada. 344 pp.

MEASUREMENT OF WATER TABLE ELEVATION IN WELLS



Teck Coal Ltd. utilizes a system in which Standard Practices and Procedures are developed, implemented and maintained. This helps ensure that safety and environmental risks associated with various work tasks are identified, mitigated and managed.

1.0 PURPOSE AND SCOPE

This document outlines the procedure which will be used by personnel for measuring water depth in wells, observation wells, and piezometers.

2.0 RESPONSIBILITIES

Depending on the operation, field monitoring activities and documentation may be carried out by an Environmental Officer, Environmental Technician (not all operations have this position), or a designate, such as an Environmental Co-op Student.

The Environmental Officer, Technician, or designate is responsible for:

- Measuring the depth to groundwater in a structure (well, observation well, piezometer)

3.0 BACKGROUND

Depth to groundwater surface is measured using an electric water level meter (such as Solinst Model No. 101 or equivalent). A light on the water level meter illuminates and/or an audible alarm sounds when the weighted probe tip contacts the water surface in the well and completes an electronic circuit. The measured depth to water is determined to within 0.01 meter by noting the point on the probe cable that corresponds to the measuring point (MP) at the top of the well/piezometer casing at the initial point of contact.

4.0 PROCEDURES

The following steps are necessary to collect water level measurements:

1. Check the operation of the meter by turning on the indicator switch and pressing the test button.

MEASUREMENT OF WATER TABLE ELEVATION IN WELLS



2. Holding the water level indicator above the well casing, lower the cable gradually into the well or piezometer until the indicator contacts the water surface. The contact with water surface is indicated by the buzzer sounding and/or illumination of the indicator light. At this point, stop lowering the cable.
3. Note the point on the graduated cable that corresponds to the MP at the top of the casing when the electronic circuit is first completed. The MP should be the inner casing and not the outer casing that is protecting the well. If the inner casing cannot be reached and the outer casing is used as the MP, then this must be recorded in the datasheet. If necessary, grasp tape with thumb and index finger exactly at the measuring point marked at the top of the well casing. Pull tape out of well slowly and read measurement.
4. Record the depth to the water surface to the nearest 0.01 m.
5. Draw the cable about 0.25 above the surface of the water, then lower it and repeat Steps 2 through 4. If these two readings differ by more than 0.02 m, repeat until the measured readings stabilize. Measurements should always be taken as the indicator is lowered into the well, not as it is raised.

5.0 DEVIATION FROM PROCEDURE

Adherence to this procedure will help to ensure that depth to water is measured properly, can be consistently repeated, and provides accurate data for measurement of water table elevation. Deviation from this procedure may result in improper measurement of water depth and inaccurate data being recorded.

6.0 KEY DOCUMENTS/TOOLS/REFERENCES

- Teck. 2012. Environment, Health, Safety and Community Management Standards. July.
 - Standard 4 – Water, Ecosystems and Biodiversity
 - Standard 13 – Monitoring – Measurement, Inspection and Audit
 - Standard 20 – Documents and Records

MONITORING WELL PURGING AND GROUNDWATER SAMPLING

Teck Coal Ltd. utilizes a system in which Standard Practices and Procedures are developed, implemented and maintained. This helps ensure that safety and environmental risks associated with various work tasks are identified, mitigated and managed.

1.0 PURPOSE AND SCOPE

This document outlines the procedure which will be used by Teck Coal for purging, monitoring and sampling groundwater from monitoring wells. This is applicable to more routine monitoring programs such as compliance monitoring, and not necessarily to research and development programs, which may require far more detailed water chemistry.

2.0 RESPONSIBILITIES

Depending on the operation, field monitoring activities and documentation may be carried out by an Environmental Officer, Environmental Technician (not all operations have this position), or a designate, such as an Environmental Co-op Student.

The Environmental Officer, Technician, or designate is responsible for:

- Purging the well as possible prior to performing any monitoring or sampling activities.
- Collecting the water sample(s)

3.0 BACKGROUND

It is recommended that a low-flow pump is used to sample groundwater where possible. This is not always a feasible or practical methodology. Having to use a pump, power source, and associated equipment can be a major hindrance, especially for sampling locations which may be remote and/or off of roadways or good pathways.

Manual methods to purge and collect groundwater include use of bailers or plastic tubing with foot valves to allow water to be pumped one-way by hand. Dedicated plastic tubing with foot valves is inexpensive, effective, easy to use and can be set up so that each monitoring well has its own dedicated tubing. This would eliminate potential for cross-contamination between wells. Bailers can also be used for purging and sampling, and are inexpensive and very portable. If bailers are used, care must be taken to prevent contamination from one well to the next. Either

MONITORING WELL PURGING AND GROUNDWATER SAMPLING

bailers need to be disposable (single use), or carefully cleaned and decontaminated between sampling locations.

4.0 PROCEDURES**Actively producing well**

If a dewatering well has been installed and is actively being used to lower or control the water table, then samples can likely be collected at the surface. Either sample at the discharge point of the pump (hard or soft line) or from a tap installed at the well head.

Monitoring Well or Piezometer

A monitoring well or piezometer is a passive structure (no permanent pump installed) and so water must be brought to the surface manually or by use of a low flow pump.

Water can be brought to the surface for measurement and sample collection using a low flow pump, plastic tubing and one-way foot valve, or bailer.

Preparation

Preparation includes inspecting the condition of the well, monitoring health and safety conditions, and calibrating and decontaminating equipment. General procedures are presented below:

1. Make sure area around well head is clean and free of debris. If necessary, place a plastic drop cloth around the well head to prevent sampling equipment from coming into contact with the ground surface.
2. Inspect condition of well (e.g., well locked, loose-fitting cap, measuring point well marked, surface casing disturbed, well casing straight, condition of concrete pad). Indicate condition of well on the datasheet.
3. All equipment should be decontaminated before and after introduction to each well. Protective latex or nitrile gloves should be worn during possible water-contact or

MONITORING WELL PURGING AND GROUNDWATER SAMPLING

equipment-contact activities. At a minimum, gloves should be changed between each well or when introduction of potential contaminants to the well is possible.

4. Measure water level using an electronic water level meter as described in SP&P TC-GW-01. Sounding the bottom of the well using a weighted tape (i.e., for well casing volume calculations) before sampling is not recommended to avoid resuspension of settled solids. If possible, determine the elevation of the well bottom from drilling records.
5. Calculate the well casing volume as follows:

$$\text{well casing volume (L)} = \pi (r^2)(h)(1000 \text{ L/m}^3)$$

where h = height of water in the well casing (i.e., depth to bottom of the well minus depth to water (in m), and r = radius of well casing (in m).

6. Calibrate water quality meters for measuring field parameters as appropriate. At a minimum, temperature, pH, specific conductance, and turbidity measurements should be collected during purging and before sampling. Record equipment calibration and maintenance in the equipment log sheets. Decontaminate meters between wells by rinsing with distilled water.

Well Purging

Where reasonably practicable, it is recommended that 3-4 purge volumes of water is removed from the well. Monitoring wells are purged before groundwater samples are collected for analyses. The purpose of well purging is to remove stagnant groundwater from the well (which has interacted with air in the well casing).

The well must then be allowed to recharge prior to sampling. In some cases, such as encountering a very low production and/or essentially dry well, it is not feasible to purge 3-4 volumes of water. If this situation is encountered, be sure to keep good records of the field conditions experienced, the volume of water purged, and notes detailing why 3-4 purge volumes are not possible. Also record any visual observations of the water purged, such as color, turbidity, odor, presence of invertebrates (eg. mayfly larva) etc., which may provide useful information about the state of the well.

Field parameters (i.e., at a minimum pH, temperature and specific conductance) are measured during the purging process (See SOP TC-GW-03).

Purging is assumed to be complete when the readings of these parameters have stabilized.

MONITORING WELL PURGING AND GROUNDWATER SAMPLING

It is recommended that purging takes place the day before sampling. The well needs to have the stagnant water removed and then recharge. However, recharge water should not sit for too long prior to sampling, as it can react again with air in the casing and become unrepresentative of the groundwater in the area.

1. Lower the pump intake or intake tubing (as applicable) into the water column. The pump intake should be placed at the middle or slightly above the middle of the screened interval in confined aquifers. Placement of the pump intake near the top of the water column is recommended for unconfined aquifers screened across the water table.
2. Conduct purging at a rate that is lower than used to develop the well and that will minimize drawdown in the well. Recommended purge rates for low-flow sampling are generally less than 0.5 L/min, or a rate that results in minimal (i.e., less than 0.3 m) drawdown in the well. Actual purge rates will vary on the basis of aquifer material, well construction, and purging equipment.
3. Continue purging the well until field parameters have stabilized. Field parameters are stable when three successive readings are within ± 0.1 for pH, ± 3 percent for conductivity, ± 0.2 °C for temperature, ± 10 mV for redox potential and ± 10 percent for turbidity and dissolved oxygen.
4. After the field parameters have stabilized, reduce the pump rate to approximately 0.1 L/min or the lowest possible flow setting for the particular pump. Pump should be operated at a rate less than 0.1 L/min when collecting samples for VOC analysis.
5. In the event that even very low purge rates result in emptying of the well, groundwater samples for laboratory analyses should be collected as soon as sufficient groundwater accumulates in the well, regardless of field parameters or total volume purged.

Groundwater Sampling

- Groundwater sampling is conducted after proper purging of the well.
- Where possible, groundwater samples for analyses should be collected directly from the pump discharge at the lowest rate possible to minimize cross contamination, suspension of solids, and aeration of the sample.
- Both bladder pumps and submersible pumps are suitable for purging and sampling of all groundwater parameters. A bailer may be used to collect groundwater samples for laboratory

MONITORING WELL PURGING AND GROUNDWATER SAMPLING



analyses of volatile organic compounds; however, the peristaltic pump is suitable for collection of semivolatile organic compounds (SVOCs), metals, and general chemistry parameters.

- Bailers are not recommended for purging or sampling of groundwater monitoring wells because they may agitate solids in and next to the well.
1. Groundwater samples should be introduced directly from the pump discharge into the proper sample container and filled to capacity.
 2. In general, groundwater samples collected for multiple compounds should be collected in the following order:
 - Volatile organic compounds (VOCs)
 - Dissolved gasses and total organic carbon (TOC)
 - SVOCs (such as polycyclic aromatic hydrocarbons)
 - Metals and cyanide
 - Major water quality cations and anions
 - Radionuclides.
 3. In some cases, field filtration may be required (e.g., metals). Filtered water should be introduced directly into the appropriate sample container. If samples cannot be filtered in the field, do not preserve them. The receiving lab can filter then preserve.
 4. If applicable, remove the pump or tubing from the well. Close and lock the well. Decontaminate the sampling equipment.

5.0 DEVIATION FROM PROCEDURE

Adherence to this procedure will ensure that wells are purged and sampled correctly. Deviation from this procedure may result in improper collection of samples which yield poor or incorrect data, or to unnecessary health and safety risk to the person(s) collecting the sample(s).

6.0 KEY DOCUMENTS/TOOLS/REFERENCES

MONITORING WELL PURGING AND GROUNDWATER SAMPLING

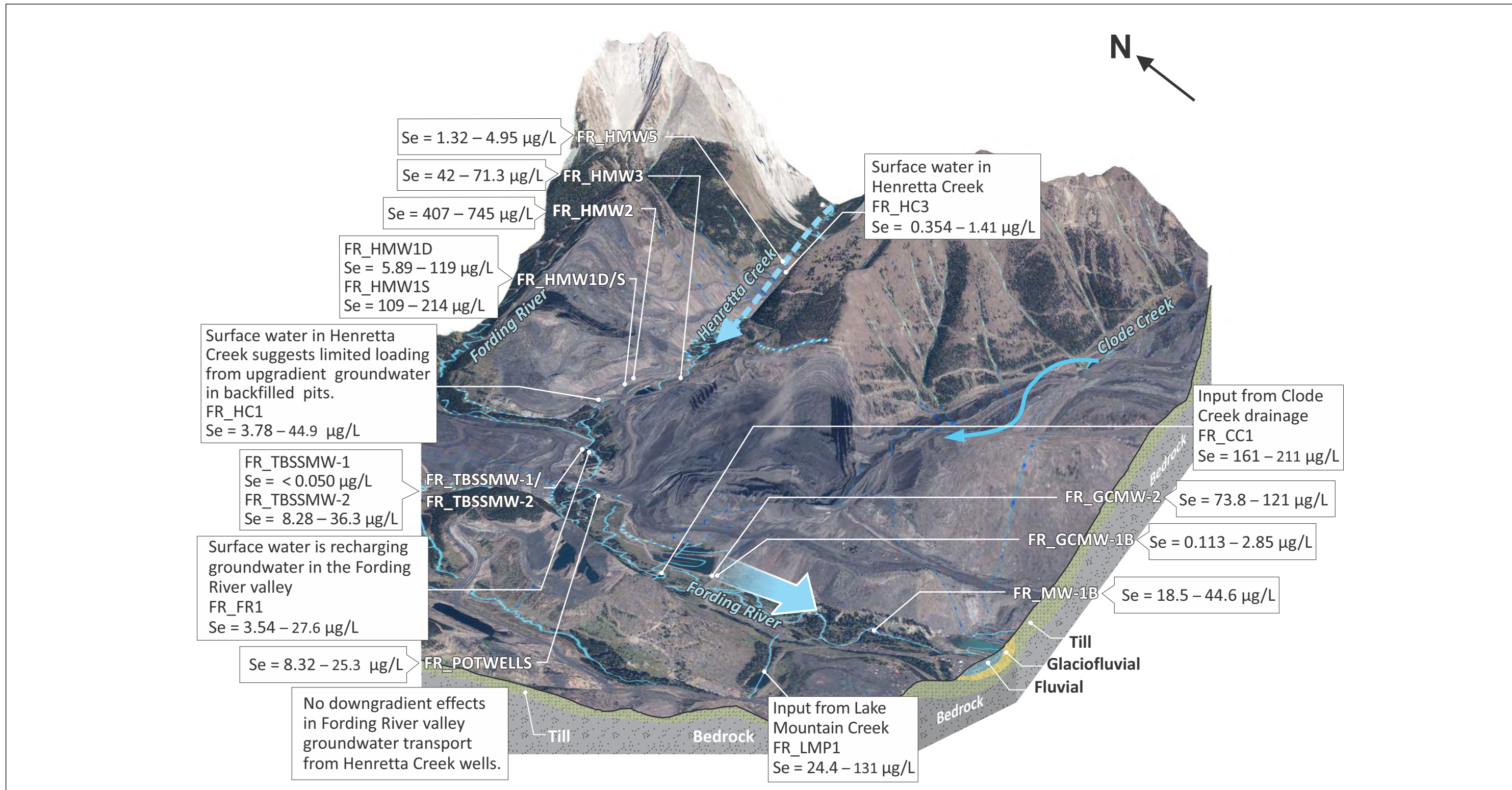


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 - Standard 4 – Water, Ecosystems and Biodiversity
 - Standard 13 – Monitoring – Measurement, Inspection and Audit
 - Standard 20 – Documents and Records
- U.S. EPA. 1993. Ground water sampling—a workshop summary. EPA/600/R-94/205. U.S. Environmental Protection Agency, Robert S. Kerr Environmental Research Laboratory, Ada, OK.

Appendix VI

Block Diagrams





Flow Legend

- Main Stem Down-Valley Groundwater
- Upland or Tributary Groundwater
- Surface Water

REFERENCES:
1. Graphics by Brick Tudor Studios, LLC.

NOTES:
1. Original in colour.
2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
3. Subsurface geology is not to scale.
4. Vertical exaggeration 2x for topographic profile.

CLIENT:
Teck Coal Limited

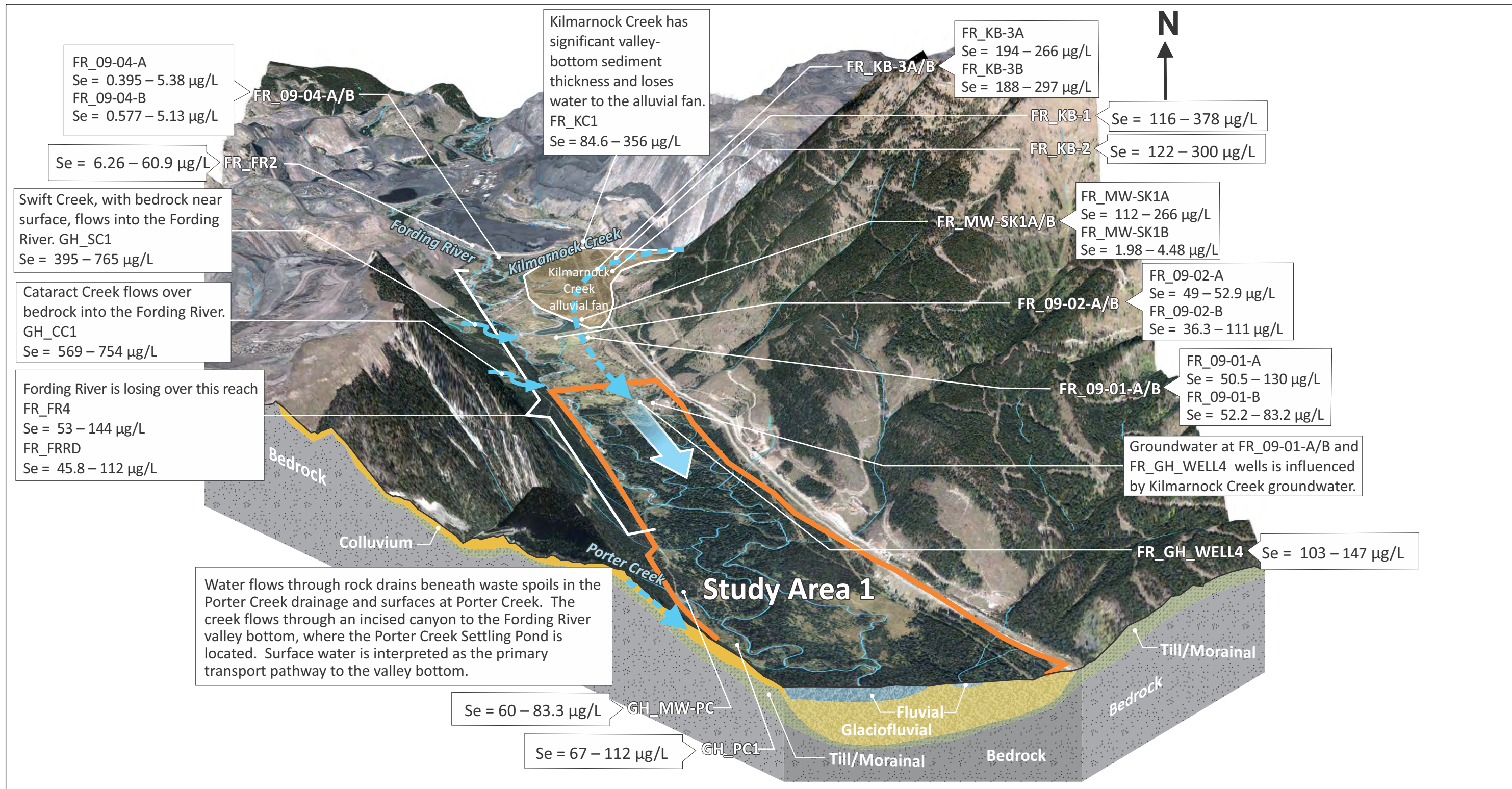
PROJECT LOCATION:
Elk Valley, BC



SNC • LAVALIN

Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at FRO - Upper Fording River and Henretta Creek

BY:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
CHK'D: KM	Proj Coord Sys:		FIGURE 1	



Flow Legend

- Main Stem Down-Valley Groundwater
- Upland or Tributary Groundwater
- Surface Water

REFERENCES:
1. Graphics by Brick Tudor Studios, LLC.

NOTES:
1. Original in colour.
2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
3. Subsurface geology is not to scale.
4. Vertical exaggeration 2x for topographic profile.

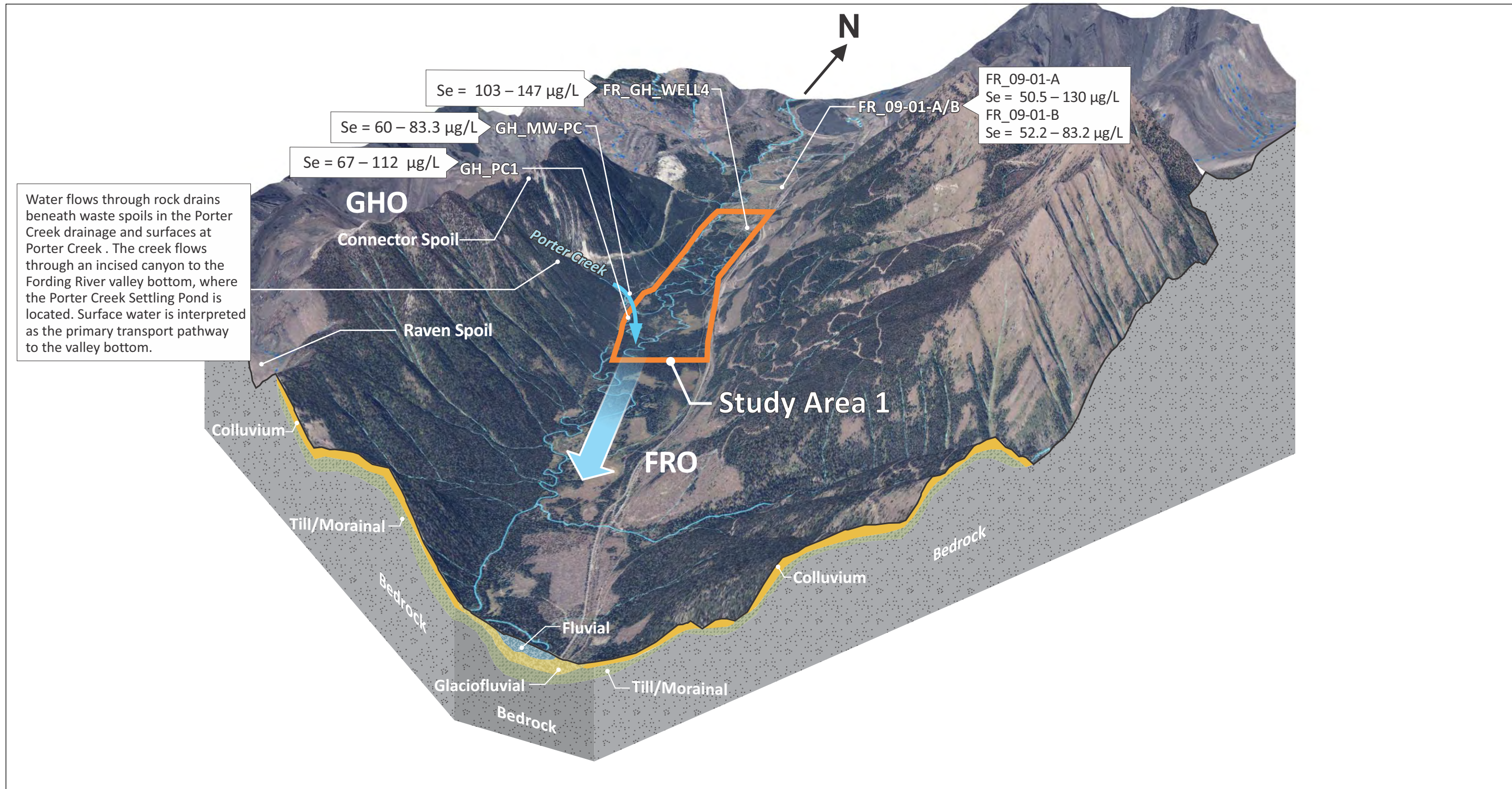
CLIENT:
Teck Coal Limited

PROJECT LOCATION:
Elk Valley, BC






Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at FRO - Lower Fording River and Study Area 1

BY:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
CHKD: KM	Proj Coord Sys:		FIGURE 2	



Water flows through rock drains beneath waste spoils in the Porter Creek drainage and surfaces at Porter Creek. The creek flows through an incised canyon to the Fording River valley bottom, where the Porter Creek Settling Pond is located. Surface water is interpreted as the primary transport pathway to the valley bottom.

Flow Legend

-  Main Stem Down-Valley Groundwater
-  Upland or Tributary Groundwater
-  Surface Water

REFERENCES:
1. Graphics by Brick Tudor Studios, LLC.

NOTES:
1. Original in colour.
2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
3. Subsurface geology is not to scale.
4. Vertical exaggeration 2x for topographic profile.

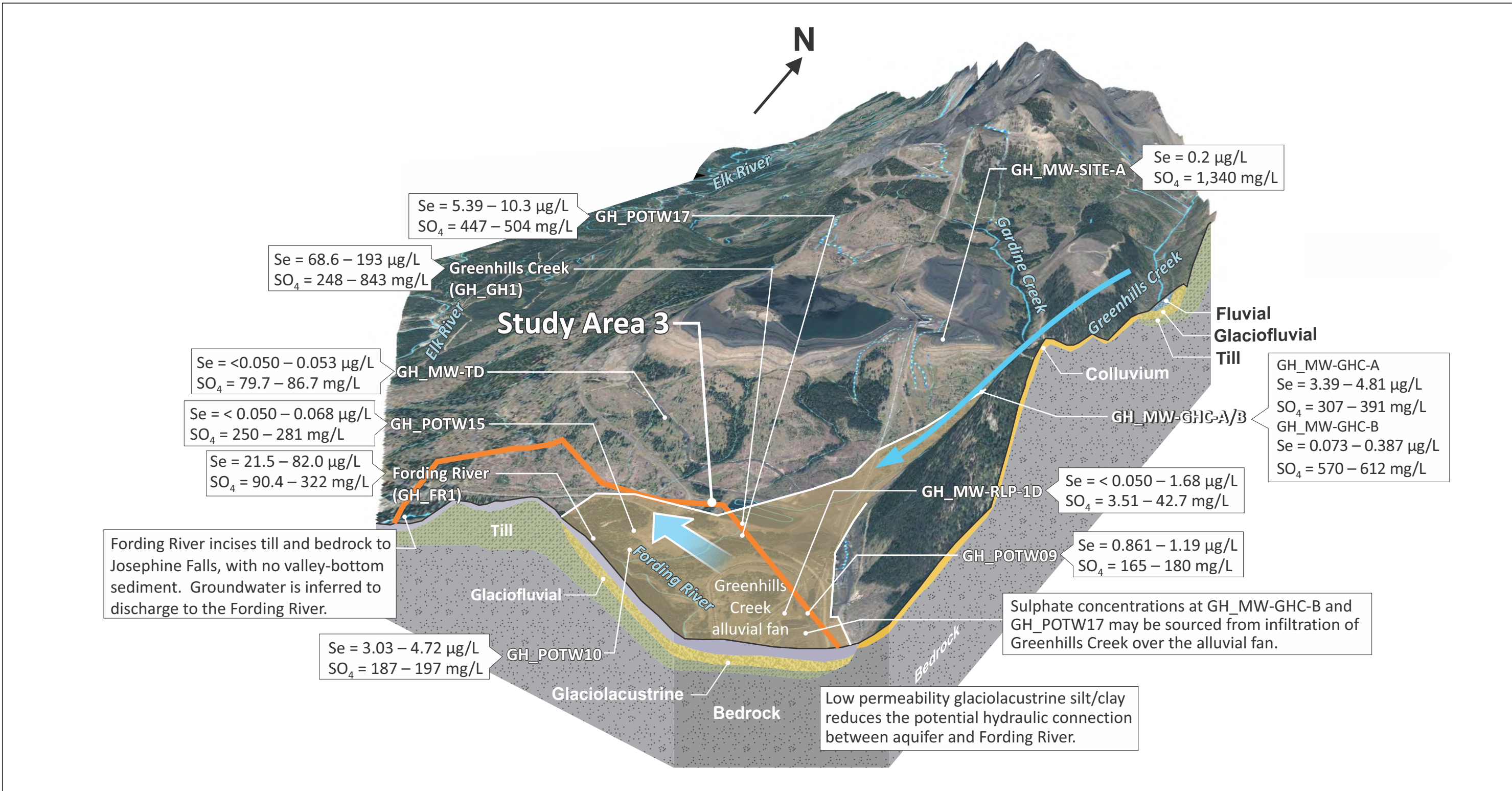
CLIENT:
Teck Coal Limited

PROJECT LOCATION:
Elk Valley, BC



Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at GHO - Fording River, Porter Creek, and Study Area 1

BY:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
CHK'D: KM	Proj Coord Sys:		FIGURE 3	



Flow Legend

- Main Stem Down-Valley Groundwater
- Upland or Tributary Groundwater
- Surface Water

REFERENCES:
1. Graphics by Brick Tudor Studios, LLC.

NOTES:
1. Original in colour.
2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
3. Subsurface geology is not to scale.
4. Vertical exaggeration 2x for topographic profile.

CLIENT:
Teck Coal Limited

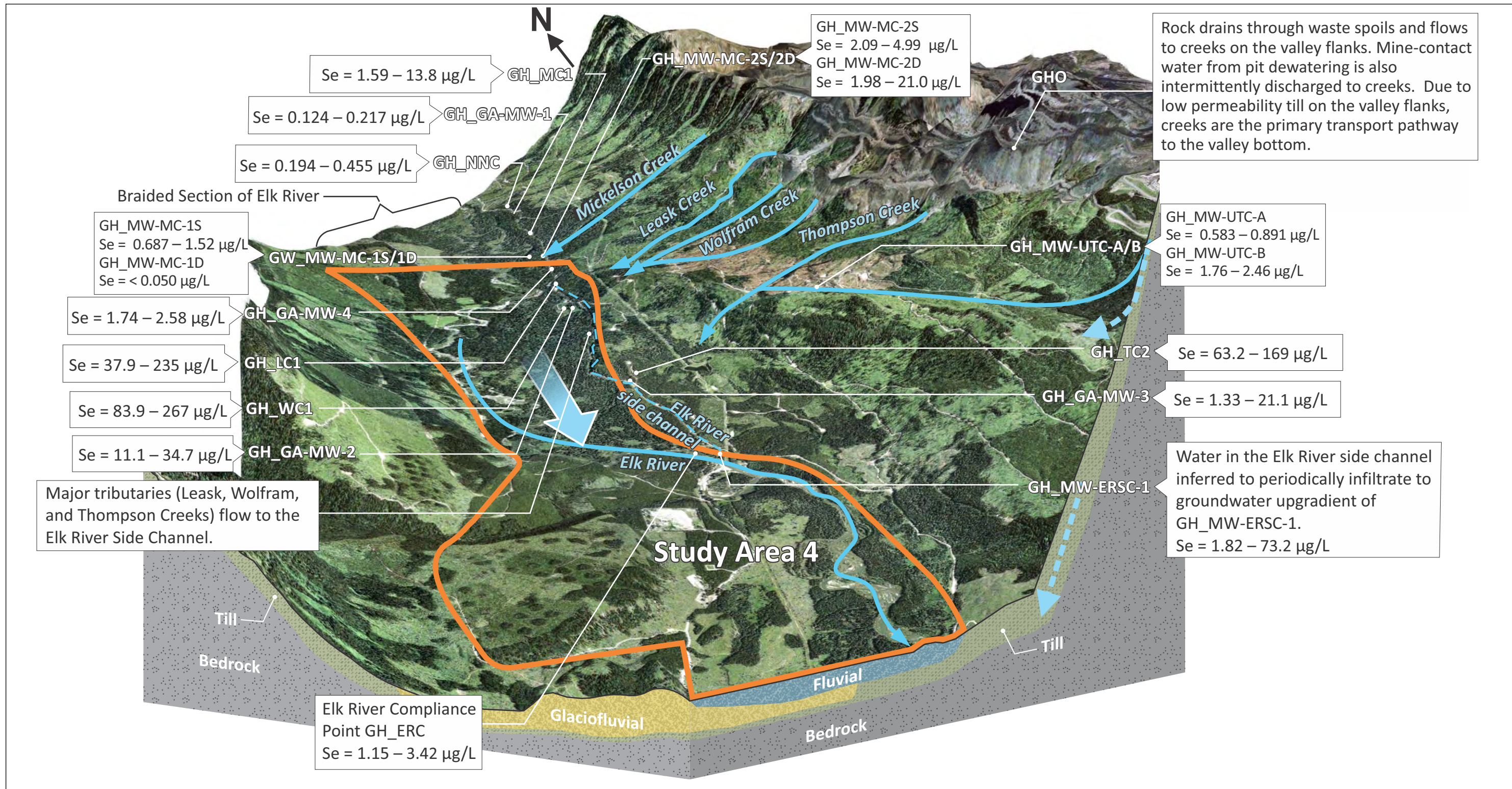
PROJECT LOCATION:
Elk Valley, BC






SNC • LAVALIN

Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at GHO - Fording River and Greenhills Creek and Study Area 3

BY:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
CHK'D: KM	Proj Coord Sys:		FIGURE 4	



Flow Legend

-  Main Stem Down-Valley Groundwater
-  Upland or Tributary Groundwater
-  Surface Water

REFERENCES:
1. Graphics by Brick Tudor Studios, LLC.

NOTES:
1. Original in colour.
2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
3. Subsurface geology is not to scale.
4. Vertical exaggeration 2x for topographic profile.

CLIENT:
Teck Coal Limited

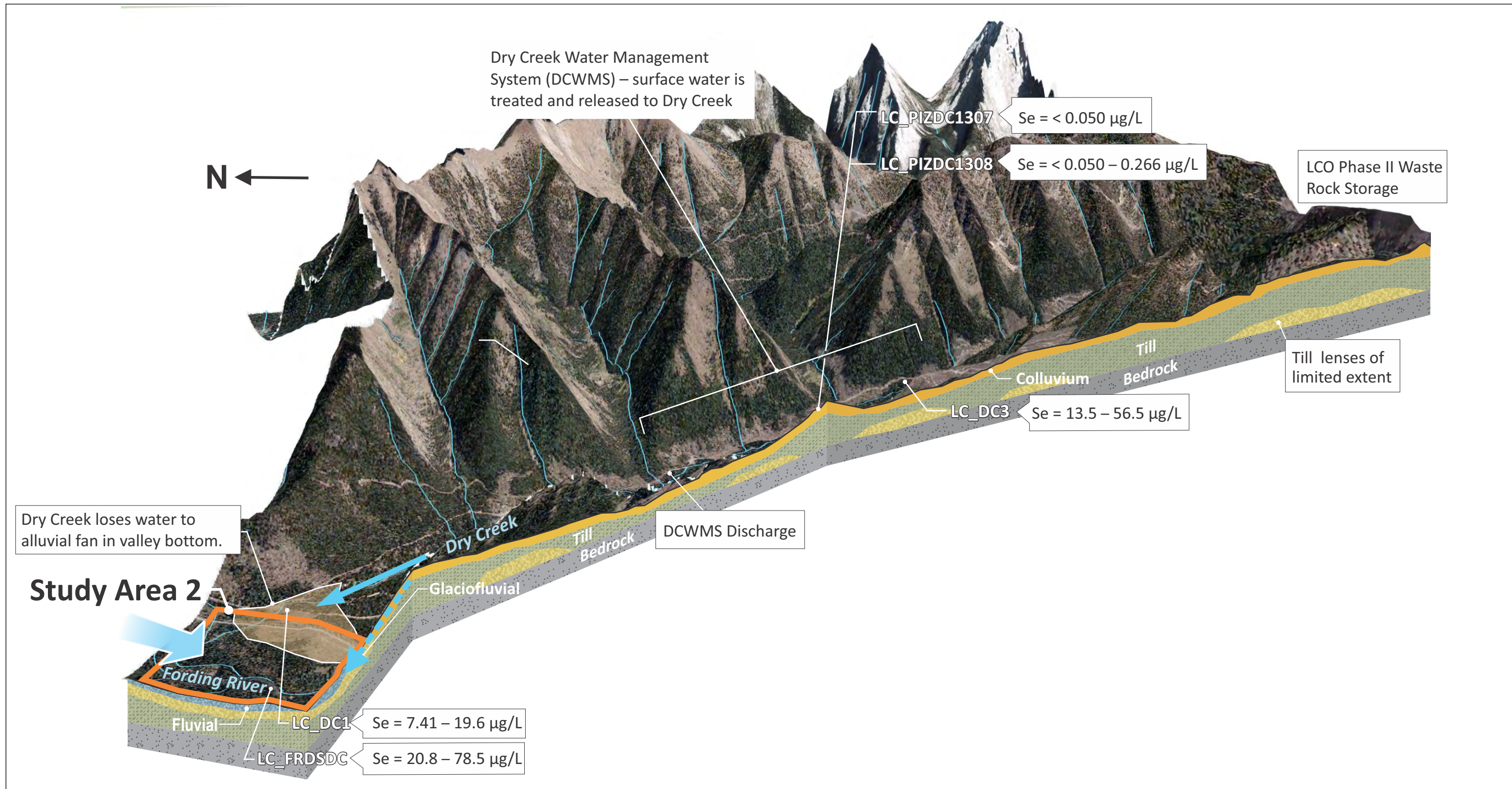
PROJECT LOCATION:
Elk Valley, BC






SNC • LAVALIN

Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at GHO - Elk River and Study Area 4

BY:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
CHKD: KM	Proj Coord Sys:		FIGURE 5	



Flow Legend

-  Main Stem Down-Valley Groundwater
-  Upland or Tributary Groundwater
-  Surface Water

REFERENCES:
1. Graphics by Brick Tudor Studios, LLC.

NOTES:
1. Original in colour.
2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
3. Subsurface geology is not to scale.
4. Vertical exaggeration 2x for topographic profile.

CLIENT:
Teck Coal Limited

PROJECT LOCATION:
Elk Valley, BC



SNC • LAVALIN

Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at LCO - Dry Creek and Study Area 2

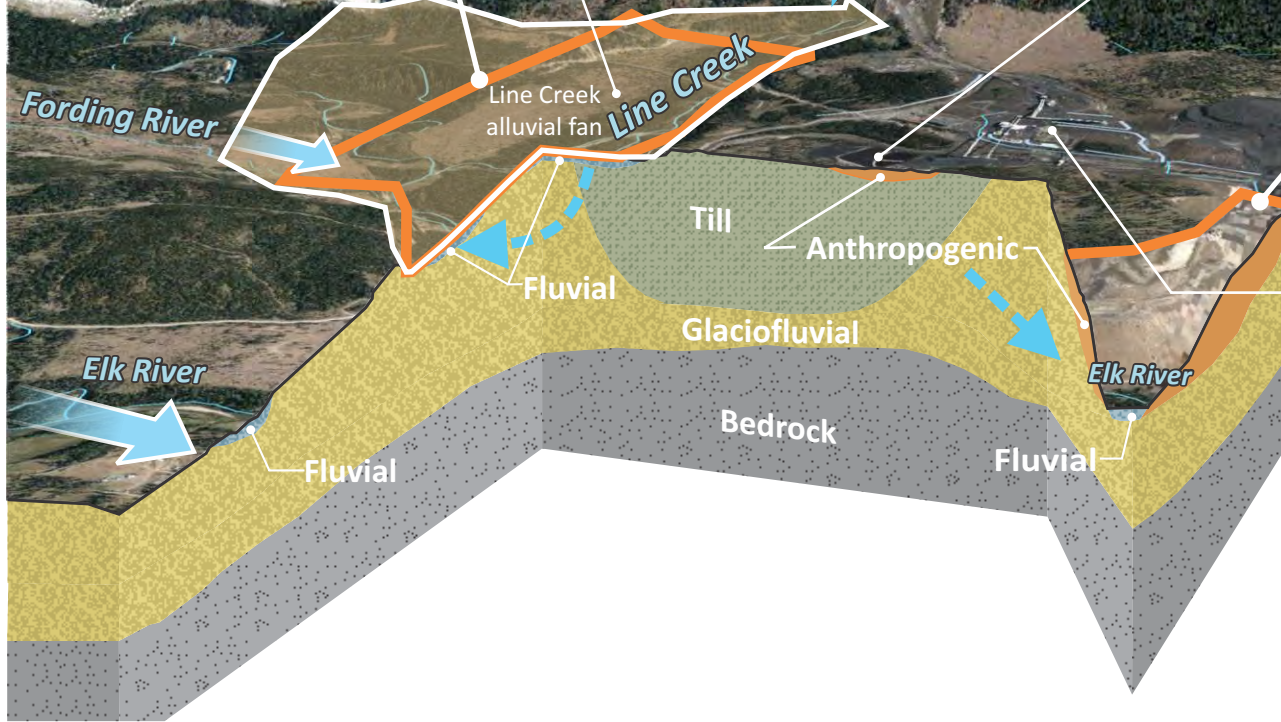
BY:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
CHK'D: KM	Proj Coord Sys:		FIGURE 6	



Line Creek flows over the alluvial fan and probably loses water to ground. Line Creek is the main pathway for CI to the valley bottom.

Line Creek flows through a bedrock canyon with no near surface flows into Fording River.
LC_LC4
Se = 10.5 – 47.7 µg/L

Study Area 5






LC_PIZP1101 Se = <0.050 – 0.1µg/L

Study Area 6

Monitoring wells at Process Plant LC_PIZP1104 and LC_PIZP1105 indicate deep groundwater at ~35 mbgs with Se = < 0.050 – 0.704 µg/L. Cross-gradient Monitoring Well LC_PIZP1103 Se = < 0.05 – 0.211 µg/L.

Flow Legend

-  Main Stem Down-Valley Groundwater
-  Upland or Tributary Groundwater
-  Surface Water

REFERENCES:
1. Graphics by Brick Tudor Studios, LLC.

NOTES:
1. Original in colour.
2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
3. Subsurface geology is not to scale.
4. Vertical exaggeration 2x for topographic profile.

CLIENT:
Teck Coal Limited

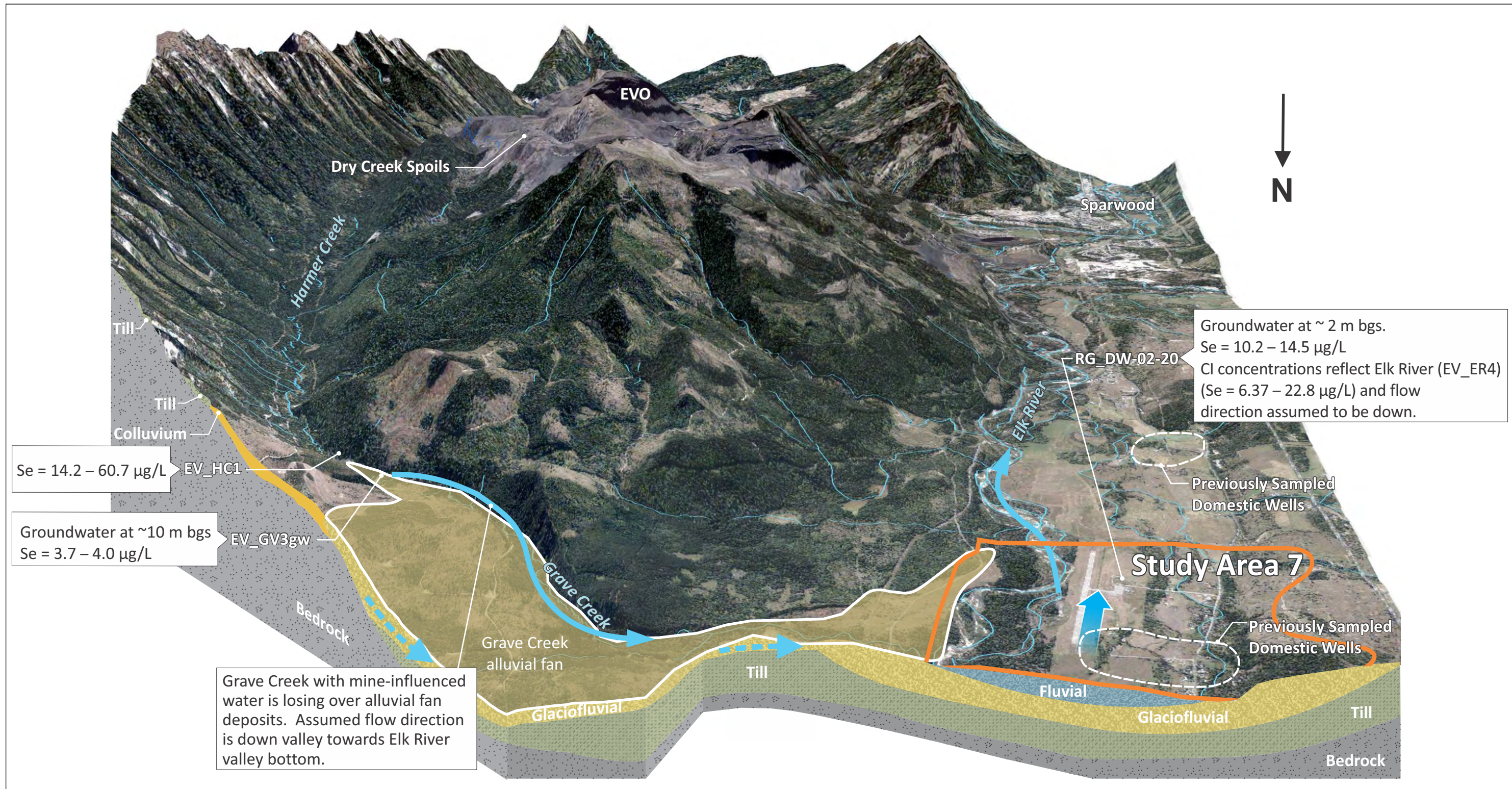
PROJECT LOCATION:
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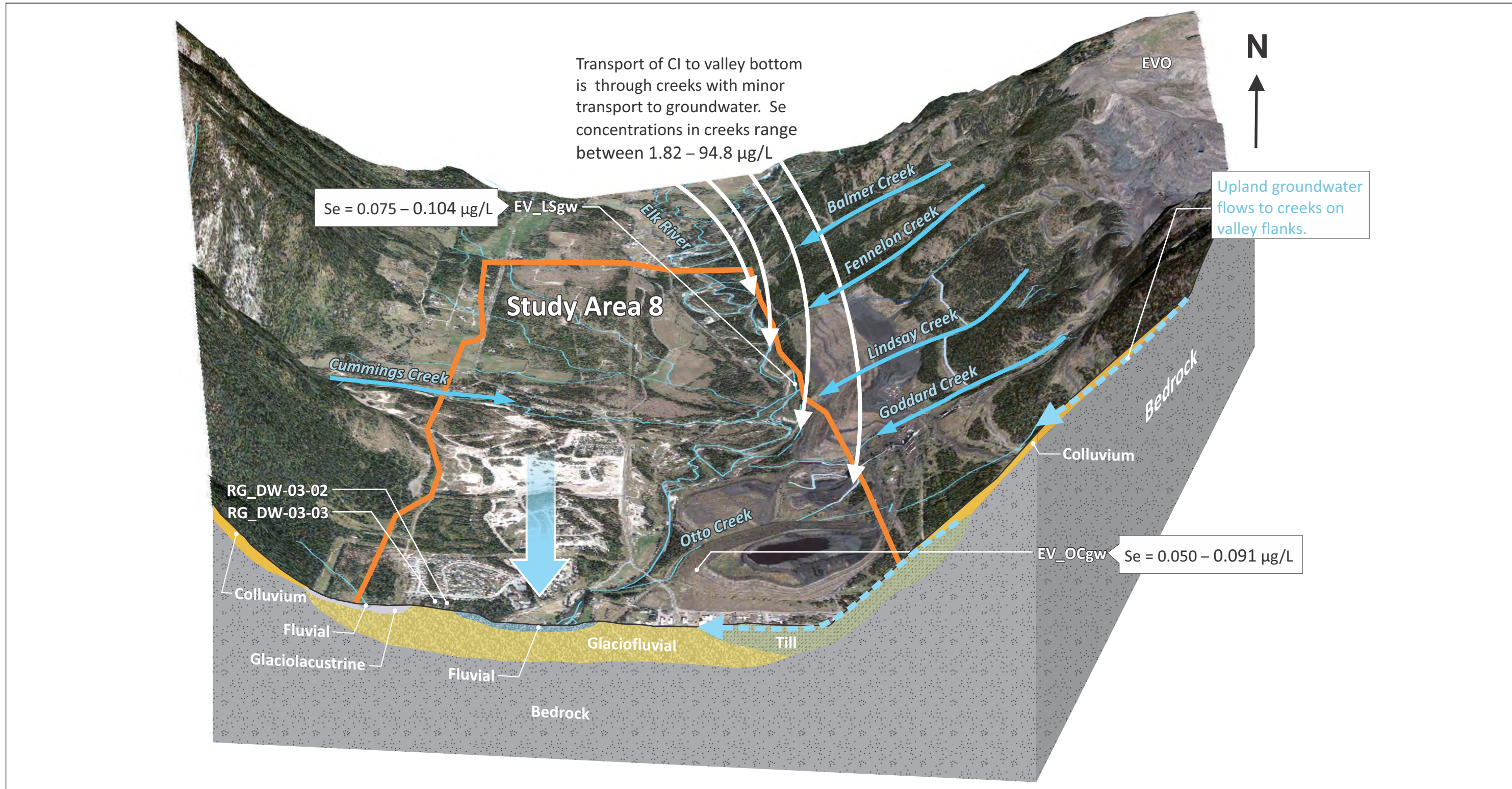


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Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at LCO - Line Creek, Elk River, and Study Areas 5 and 6

BY:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
CHK'D: KM	Proj Coord Sys:		FIGURE 7	





Flow Legend

-  Main Stem Down-Valley Groundwater
-  Upland or Tributary Groundwater
-  Surface Water

REFERENCES:
1. Graphics by Brick Tudor Studios, LLC.

NOTES:
1. Original in colour.
2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
3. Subsurface geology is not to scale.
4. Vertical exaggeration 2x for topographic profile.

CLIENT:
Teck Coal Limited

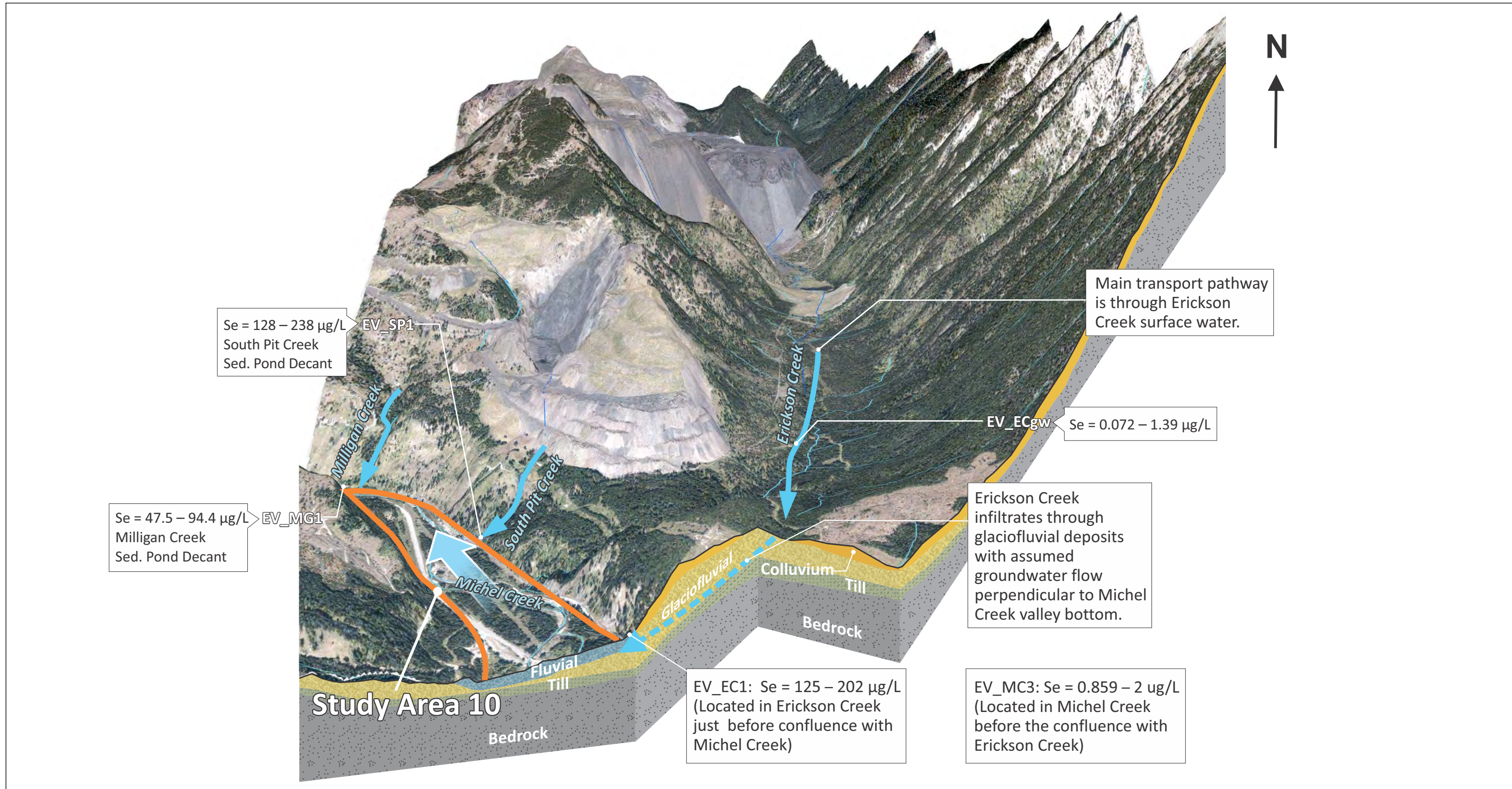
PROJECT LOCATION:
Elk Valley, BC






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Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at EVO - Elk River Proximal to EVO and Study Area 8

BY:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
CHK'D: KM	Proj Coord Sys:		FIGURE 9	



Flow Legend

-  Main Stem Down-Valley Groundwater
-  Upland or Tributary Groundwater
-  Surface Water

REFERENCES:

1. Graphics by Brick Tudor Studios, LLC.

NOTES:

1. Original in colour.
2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
3. Subsurface geology is not to scale.
4. Vertical exaggeration 2x for topographic profile.

CLIENT:
Teck Coal Limited

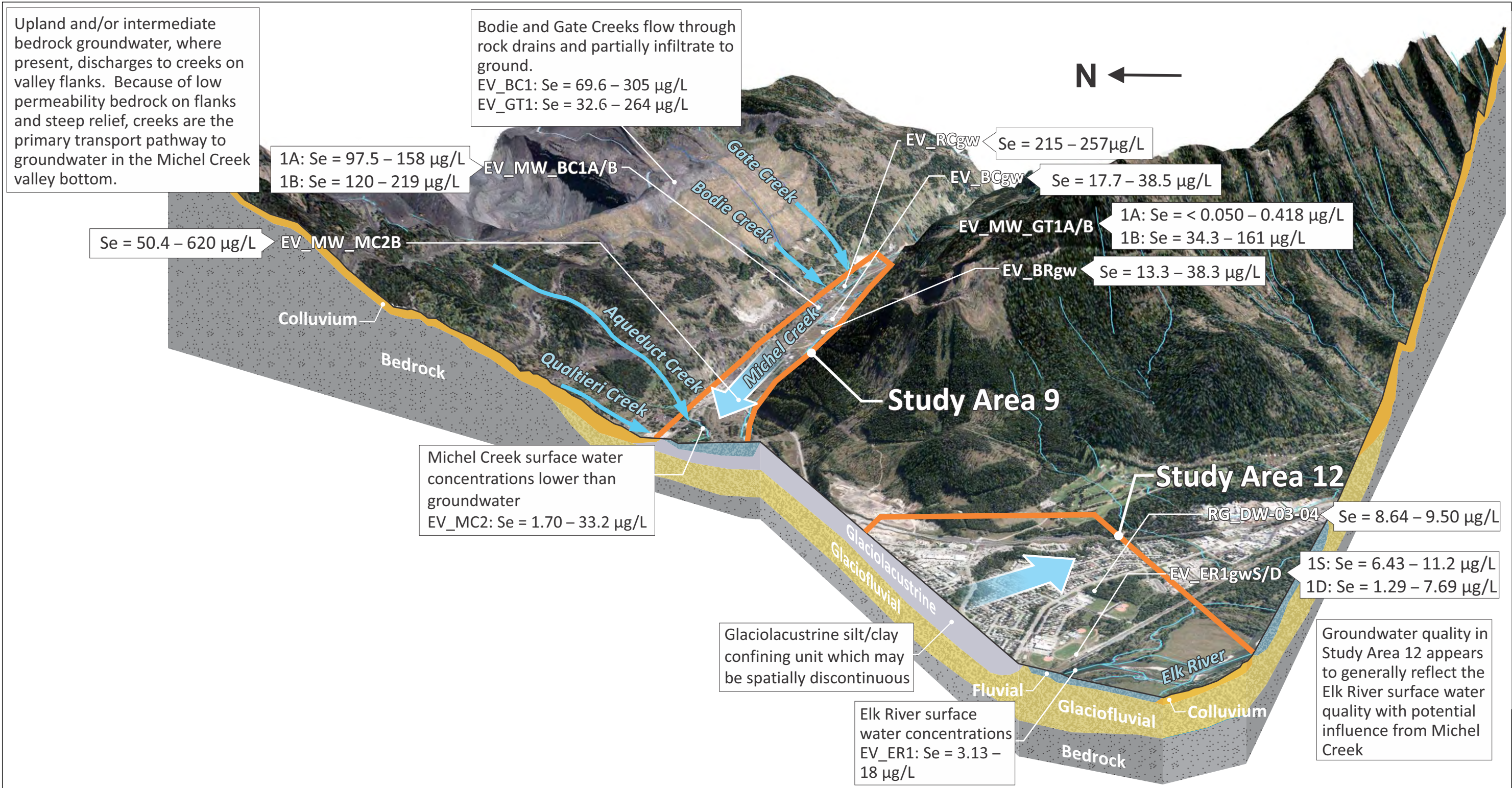
PROJECT LOCATION:
Elk Valley, BC



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Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at EVO - Erickson Creek and Study Area 10

BY:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
CHK'D: KM	Proj Coord Sys:		FIGURE 10	



Flow Legend

- Main Stem Down-Valley Groundwater
- Upland or Tributary Groundwater
- Surface Water

REFERENCES:
 1. Graphics by Brick Tudor Studios, LLC.

NOTES:
 1. Original in colour.
 2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
 3. Subsurface geology is not to scale.
 4. Vertical exaggeration 2x for topographic profile.

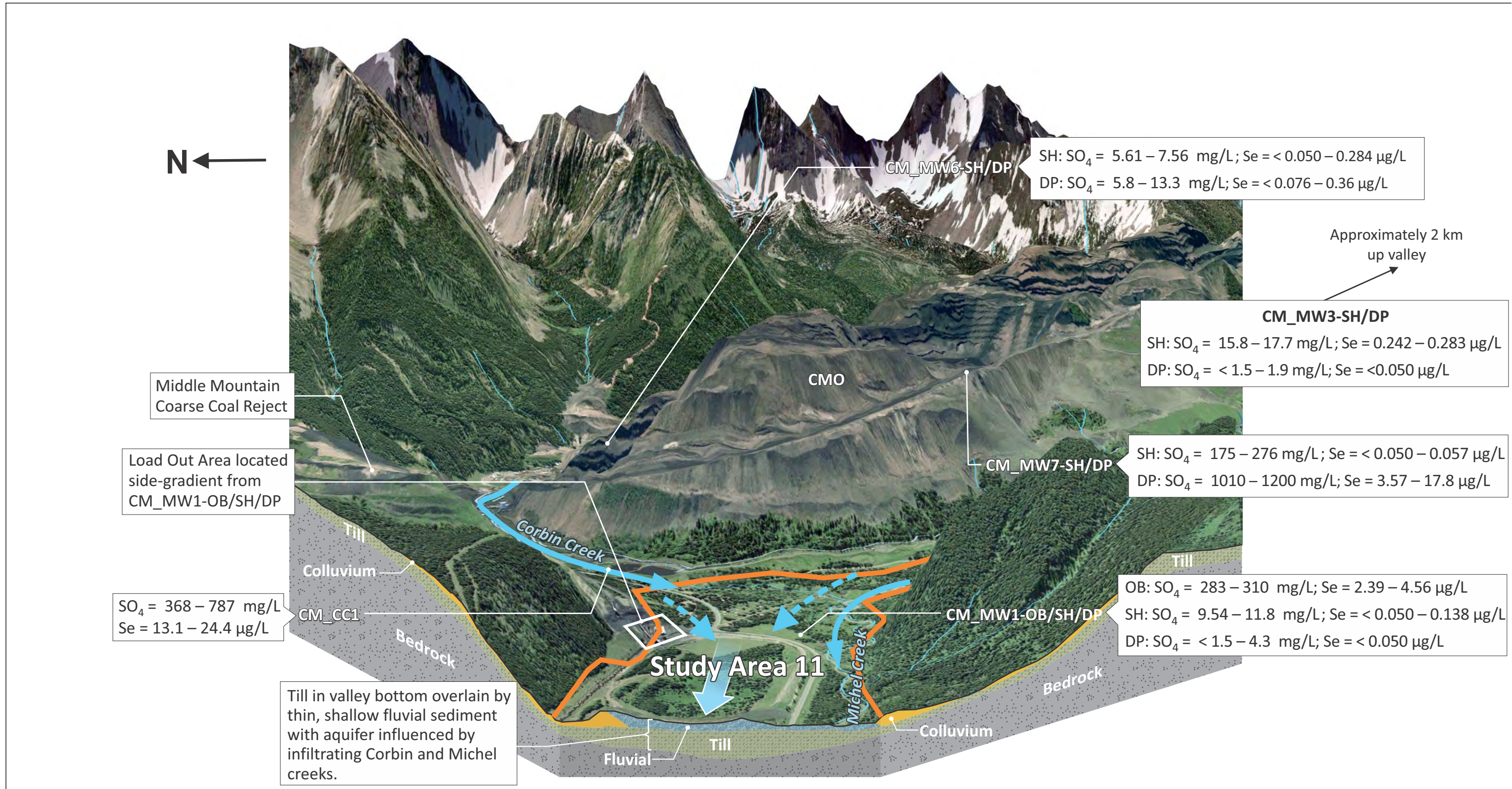
CLIENT:
Teck Coal Limited

PROJECT LOCATION:
Elk Valley, BC



Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at EVO - Michel Creek and Elk River Distal to EVO, Study Areas 9 and 12

BY:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
CHK'D: KM	Proj Coord Sys:		FIGURE 11	



Flow Legend

- Main Stem Down-Valley Groundwater
- Upland or Tributary Groundwater
- Surface Water

REFERENCES:
 1. Graphics by Brick Tudor Studios, LLC.

NOTES:
 1. Original in colour.
 2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
 3. Subsurface geology is not to scale.
 4. Vertical exaggeration 2x for topographic profile.

CLIENT:
 Teck Coal Limited

PROJECT LOCATION:
 Elk Valley, BC



SNC • LAVALIN

Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at CMO - Michel and Corbin Creeks and Study Area 11

BY:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
CHK'D: KM	Proj Coord Sys:		FIGURE 12	

Appendix VII

Mann-Kendall Trend Analysis

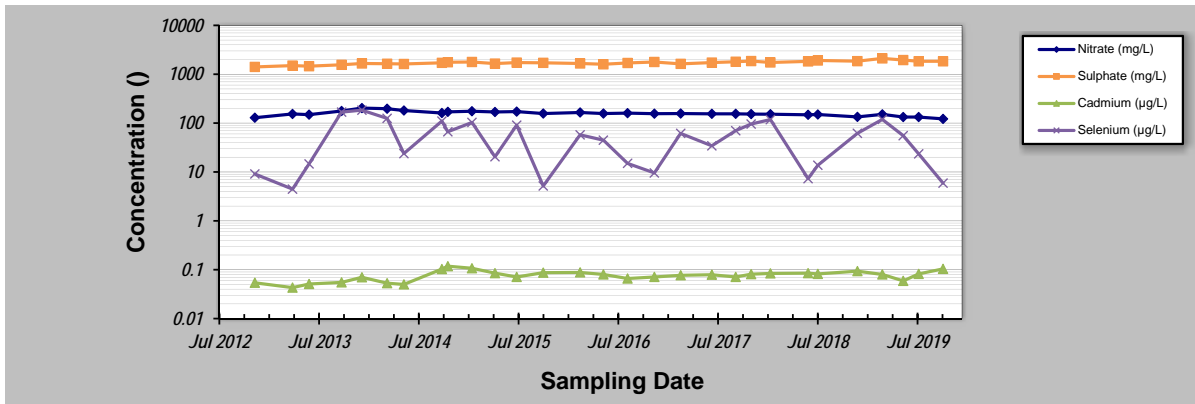


GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - FRO	Location: FR_HMW1D
Conducted By: NDS	

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	FR_HMW1D CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	9-Nov-12	129	1410	0.054	9.1
2	28-Mar-13	154	1500	0.043	4.46
3	28-May-13	149	1460	0.051	14.6
4	25-Sep-13	177	1560	0.055	168
5	9-Dec-13	203	1660	0.07	184
6	12-Mar-14	197	1640	0.053	125
7	13-May-14	181	1620	0.05	23.8
8	30-Sep-14	161	1710	0.103	110
9	22-Oct-14	170	1760	0.118	66.5
10	19-Jan-15	175	1780	0.107	103
11	14-Apr-15	169	1650	0.085	20.5
12	3-Jul-15	172	1730	0.071	90.7
13	9-Oct-15	157	1710	0.087	5.17
14	22-Feb-16	165	1660	0.088	57.5
15	18-May-16	157	1600	0.08	44.8
16	15-Aug-16	160	1700	0.066	15
17	22-Nov-16	156	1780	0.071	9.55
18	27-Feb-17	157	1630	0.0769	61.5
19	22-Jun-17	155	1730	0.079	34.3
20	18-Sep-17	155	1800	0.071	70.1
21	14-Nov-17	153	1860	0.081	95.6
22	24-Jan-18	152	1740	0.084	118
23	12-Jun-18	148	1830	0.085	7.31
24	18-Jul-18	150	1910	0.082	13.7
25	11-Dec-18	134	1850	0.0934	61.7
26	13-Mar-19	151	2110	0.08	119
27	29-May-19	133	1950	0.059	55.4
28	25-Jul-19	133	1840	0.082	23.5
29	23-Oct-19	122	1840	0.104	5.91
30					
Coefficient of Variation:		0.12	0.09	0.24	0.86
Mann-Kendall Statistic (S):		-233	269	122	-32
Confidence Factor:		>99.9%	>99.9%	98.9%	71.8%
Concentration Trend:		Decreasing	Increasing	Increasing	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

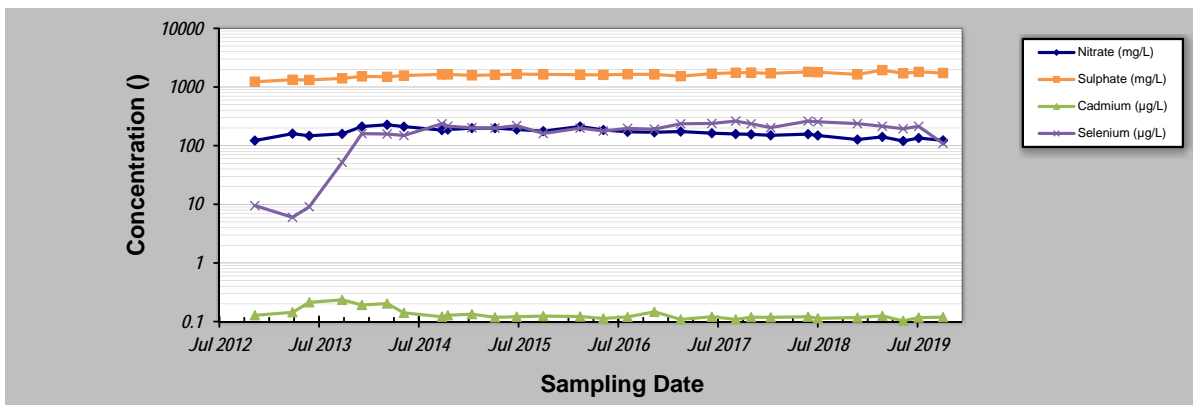
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - FRO	Location: FR_HMW1S
Conducted By: NDS	

Parameter (units) **Nitrate (mg/L)** **Sulphate (mg/L)** **Cadmium (µg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	FR_HMW1S CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	9-Nov-12	122	1230	0.128	9.51
2	28-Mar-13	160	1330	0.144	6
3	29-May-13	147	1320	0.213	9.07
4	27-Sep-13	159	1400	0.235	51.9
5	9-Dec-13	212	1520	0.192	160
6	12-Mar-14	227	1490	0.203	158
7	13-May-14	211	1570	0.141	149
8	30-Sep-14	184	1640	0.121	236
9	22-Oct-14	188	1640	0.128	215
10	19-Jan-15	199	1580	0.134	202
11	14-Apr-15	199	1610	0.118	199
12	3-Jul-15	189	1660	0.121	220
13	9-Oct-15	177	1640	0.124	161
14	22-Feb-16	212	1620	0.122	199
15	18-May-16	185	1610	0.113	178
16	15-Aug-16	172	1650	0.12	197
17	22-Nov-16	169	1640	0.147	191
18	27-Feb-17	174	1530	0.109	236
19	22-Jun-17	163	1690	0.121	239
20	18-Sep-17	158	1750	0.109	262
21	14-Nov-17	156	1760	0.119	236
22	25-Jan-18	150	1710	0.118	203
23	12-Jun-18	157	1810	0.121	262
24	18-Jul-18	149	1790	0.114	255
25	11-Dec-18	127	1640	0.117	238
26	13-Mar-19	141	1940	0.125	214
27	29-May-19	120	1710	0.103	194
28	25-Jul-19	135	1810	0.117	213
29	23-Oct-19	123	1730	0.119	109
30					
Coefficient of Variation:		0.18	0.10	0.25	0.41
Mann-Kendall Statistic (S):		-198	287	-213	169
Confidence Factor:		>99.9%	>99.9%	>99.9%	99.9%
Concentration Trend:		Decreasing	Increasing	Decreasing	Increasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S=0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

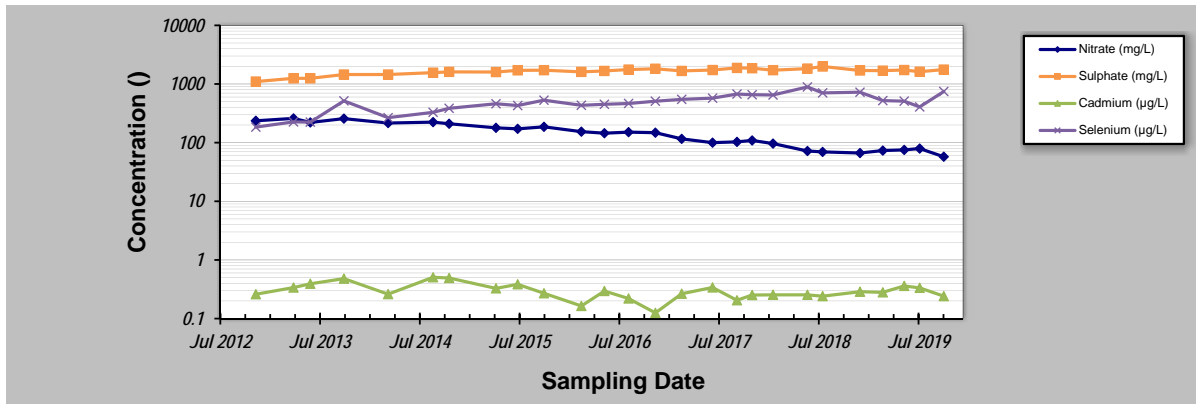
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - FRO	Location: FR_HMW2
Conducted By: NDS	

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	FR_HMW2 CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	9-Nov-12	236	1100	0.26	184
2	28-Mar-13	259	1250	0.338	226
3	29-May-13	221	1250	0.392	224
4	30-Sep-13	257	1450	0.48	516
5	12-Mar-14	216	1450	0.261	267
6	25-Aug-14	224	1560	0.506	329
7	23-Oct-14	210	1610	0.492	385
8	14-Apr-15	179	1600	0.327	461
9	3-Jul-15	172	1710	0.384	430
10	8-Oct-15	186	1720	0.27	530
11	23-Feb-16	154	1610	0.164	434
12	18-May-16	145	1670	0.295	451
13	15-Aug-16	151	1760	0.22	465
14	22-Nov-16	148	1820	0.125	509
15	27-Feb-17	116	1670	0.265	547
16	21-Jun-17	100	1730	0.339	574
17	19-Sep-17	103	1880	0.205	674
18	14-Nov-17	109	1860	0.252	657
19	30-Jan-18	96.5	1720	0.254	650
20	6-Jun-18	72	1830	0.254	891
21	1-Aug-18	69.5	1990	0.241	705
22	17-Dec-18	66.5	1700	0.287	725
23	11-Mar-19	73.3	1690	0.28	522
24	29-May-19	75.2	1730	0.36	510
25	25-Jul-19	79.3	1620	0.334	407
26	22-Oct-19	57.5	1760	0.241	745
27					
28					
29					
30					
Coefficient of Variation:		0.45	0.12	0.31	0.35
Mann-Kendall Statistic (S):		-277	186	-69	203
Confidence Factor:		>99.9%	>99.9%	93.3%	>99.9%
Concentration Trend:		Decreasing	Increasing	Prob. Decreasing	Increasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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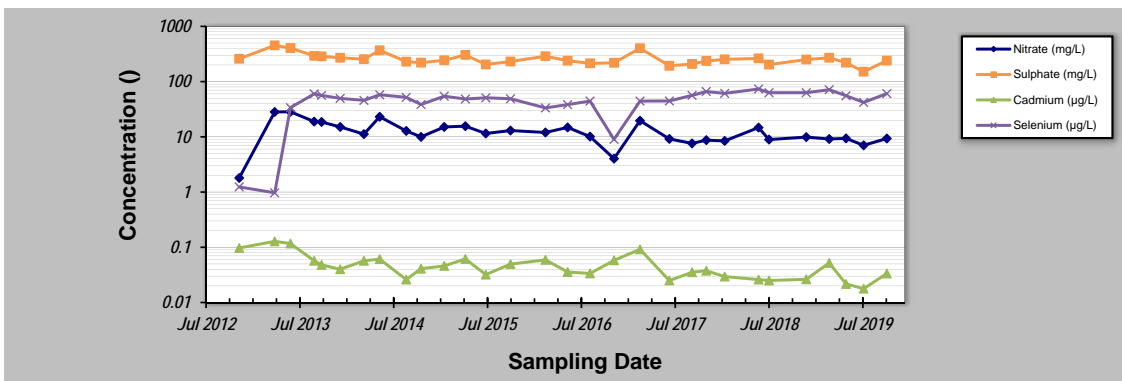
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - FRO** Location: **FR_HMW3**
 Conducted By: **NDS**

Parameter (units): **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	FR_HMW3 CONCENTRATION			
1	8-Nov-12	1.8	259	0.097	1.24
2	27-Mar-13	28.2	452	0.128	0.97
3	28-May-13	28.4	405	0.117	33.7
4	29-Aug-13	18.9	292	0.057	60
5	27-Sep-13	18.6	286	0.048	56.2
6	9-Dec-13	15.1	270	0.04	49.7
7	12-Mar-14	11.2	255	0.057	45.7
8	13-May-14	23.1	368	0.061	57.8
9	25-Aug-14	12.8	229	0.026	51.8
10	22-Oct-14	9.98	220	0.041	38.5
11	21-Jan-15	15.1	243	0.046	54.4
12	14-Apr-15	15.6	304	0.0615	48.3
13	3-Jul-15	11.5	204	0.032	50.9
14	8-Oct-15	13	231	0.0496	48.9
15	22-Feb-16	12	288	0.0592	33.4
16	19-May-16	14.8	239	0.0357	38.3
17	15-Aug-16	10.1	214	0.0336	44.4
18	17-Nov-16	4.03	219	0.058	9.01
19	27-Feb-17	19.6	402	0.0918	44.4
20	22-Jun-17	9.17	193	0.025	44.6
21	19-Sep-17	7.6	208	0.0353	56.3
22	14-Nov-17	8.7	236	0.0377	66.1
23	25-Jan-18	8.43	253	0.0295	61.2
24	7-Jun-18	14.7	263	0.026	73.5
25	18-Jul-18	8.92	203	0.025	62.9
26	11-Dec-18	9.9	251	0.0263	62.9
27	11-Mar-19	9.13	270	0.052	71.3
28	16-May-19	9.38	220	0.0217	55.5
29	24-Jul-19	7.02	151	0.0178	42
30	23-Oct-19	9.33	240	0.0335	60.6
31					
32					
33					
34					
35					

Coefficient of Variation:	0.48	0.26	0.56	0.38
Mann-Kendall Statistic (S):	-190	-155	-214	131
Confidence Factor:	>99.9%	99.7%	>99.9%	99.0%
Concentration Trend:	Decreasing	Decreasing	Decreasing	Increasing



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

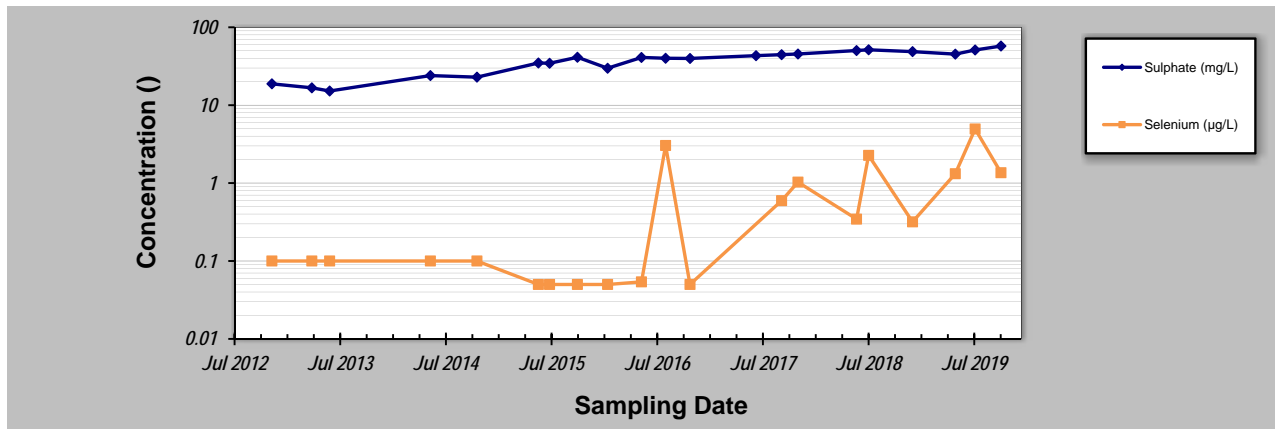
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - FRO** Location: **FR_HMW5**
 Conducted By: **NDS**

Parameter (units) **Sulphate (mg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	FR_HMW5 CONCENTRATION					
		Sulphate (mg/L)	Selenium (µg/L)				
1	8-Nov-12	18.8	0.1				
2	27-Mar-13	16.7	0.1				
3	28-May-13	15.2	0.1				
4	14-May-14	24	0.1				
5	23-Oct-14	22.9	0.1				
6	25-May-15	34.8	0.05				
7	3-Jul-15	34.5	0.05				
8	8-Oct-15	41.2	0.05				
9	21-Jan-16	29.8	0.05				
10	18-May-16	41	0.054				
11	10-Aug-16	40	3.04				
12	3-Nov-16	39.8	0.05				
13	21-Jun-17	43.2					
14	18-Sep-17	44.5	0.595				
15	14-Nov-17	45.4	1.03				
16	6-Jun-18	50.3	0.345				
17	18-Jul-18	51.4	2.27				
18	18-Dec-18	48.7	0.318				
19	16-May-19	45.2	1.32				
20	24-Jul-19	51.1	4.95				
21	22-Oct-19	57.4	1.36				
22							
23							
24							
25							
Coefficient of Variation:		0.33	1.60				
Mann-Kendall Statistic (S):		168	74				
Confidence Factor:		>99.9%	99.2%				
Concentration Trend:		Increasing	Increasing				



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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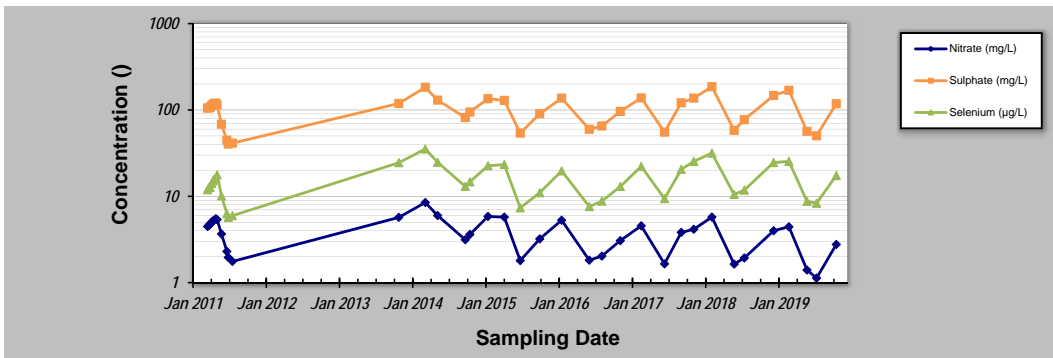
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - FRO	Location: FR_POTWELLS
Conducted By: NDS	

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Selenium (µg/L)
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Sampling Event	Sampling Date	FR_POTWELLS CONCENTRATION		
		Nitrate (mg/L)	Sulphate (mg/L)	Selenium (µg/L)
1	15-Mar-11	4.48	105	11.9
2	21-Mar-11	4.58	106	12.6
3	28-Mar-11	4.75	107	12.7
4	5-Apr-11	5.05	113	14.1
5	11-Apr-11	5.18	116	15.1
6	18-Apr-11	5.32	119	15.9
7	26-Apr-11	5.51	120	16.2
8	2-May-11	5.37	114	17.7
9	24-May-11	3.66	68.4	10.1
10	20-Jun-11	2.3	44.6	6.29
11	27-Jun-11	1.96	40.2	5.69
12	18-Jul-11	1.76	41.3	5.97
13	31-Oct-13	5.7	119	24.5
14	13-Mar-14	8.48	183	35.3
15	14-May-14	5.99	130	24.8
16	30-Sep-14	3.14	81.6	13
17	23-Oct-14	3.62	94.6	14.7
18	22-Jan-15	5.84	135	22.6
19	14-Apr-15	5.74	129	23.3
20	3-Jul-15	1.8	53.9	7.34
21	9-Oct-15	3.21	90.4	11
22	27-Jan-16	5.29	137	19.7
23	14-Jun-16	1.82	59.7	7.6
24	16-Aug-16	2.03	65.2	8.78
25	17-Nov-16	3.07	96.1	13
26	2-Mar-17	4.55	138	22.2
27	27-Jun-17	1.65	55.3	9.4
28	19-Sep-17	3.82	121	20.5
29	21-Nov-17	4.15	137	25.4
30	20-Feb-18	5.75	186	31.6
31	12-Jun-18	1.64	58.1	10.5
32	2-Aug-18	1.93	77.2	11.8
33	27-Dec-18	3.99	147	24.6
34	14-Mar-19	4.44	169	25.4
35	13-Jun-19	1.4	56.5	8.73
36	31-Jul-19	1.13	50.2	8.32
37	7-Nov-19	2.77	118	17.4
38				
39				
40				

Coefficient of Variation:	0.45	0.39	0.47
Mann-Kendall Statistic (S):	-178	52	70
Confidence Factor:	99.0%	74.6%	81.5%
Concentration Trend:	Decreasing	No Trend	No Trend



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

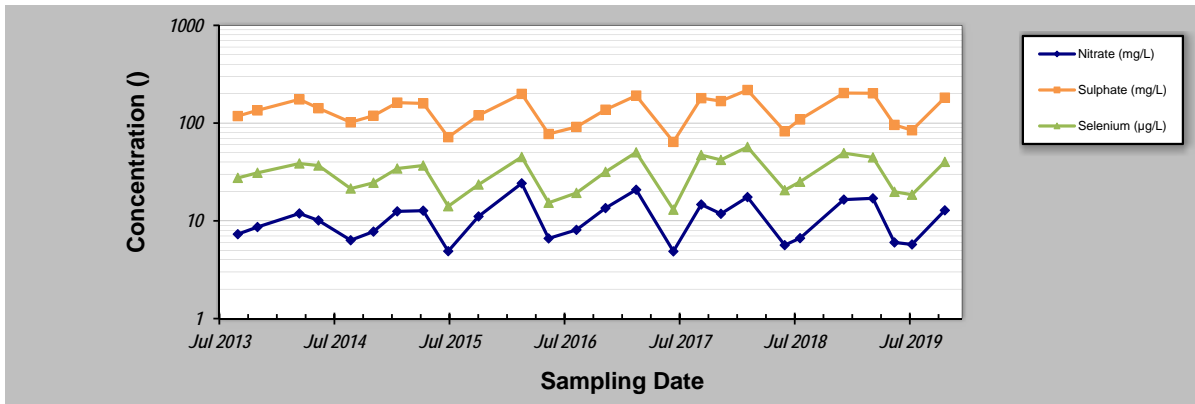
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - FRO	Location: FR_MW-1B
Conducted By: NDS	

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	FR_MW-1B CONCENTRATION					
		Nitrate (mg/L)	Sulphate (mg/L)	Selenium (µg/L)			
1	29-Aug-13	7.3	118	27.5			
2	31-Oct-13	8.64	135	31			
3	14-Mar-14	11.9	175	38.6			
4	14-May-14	10.1	142	36.8			
5	25-Aug-14	6.33	102	21.4			
6	6-Nov-14	7.76	119	24.5			
7	21-Jan-15	12.5	162	34.3			
8	14-Apr-15	12.7	159	36.8			
9	3-Jul-15	4.89	71.8	14.1			
10	8-Oct-15	11.1	120	23.5			
11	23-Feb-16	24.2	199	45			
12	19-May-16	6.61	77.4	15.3			
13	16-Aug-16	8.08	91.4	19.3			
14	17-Nov-16	13.5	137	31.7			
15	23-Feb-17	20.8	191	50.2			
16	22-Jun-17	4.87	64.2	13			
17	19-Sep-17	14.7	180	47.1			
18	21-Nov-17	11.8	168	42			
19	14-Feb-18	17.5	218	57			
20	13-Jun-18	5.64	82.5	20.6			
21	1-Aug-18	6.65	109	25.1			
22	19-Dec-18	16.5	203	49.3			
23	22-Mar-19	17	202	44.6			
24	30-May-19	6.01	95.9	19.8			
25	25-Jul-19	5.73	84.5	18.5			
26	7-Nov-19	12.8	182	40.1			
27							
28							
29							
30							
Coefficient of Variation:		0.47	0.34	0.40			
Mann-Kendall Statistic (S):		27	31	20			
Confidence Factor:		71.5%	74.4%	66.1%			
Concentration Trend:		No Trend	No Trend	No Trend			



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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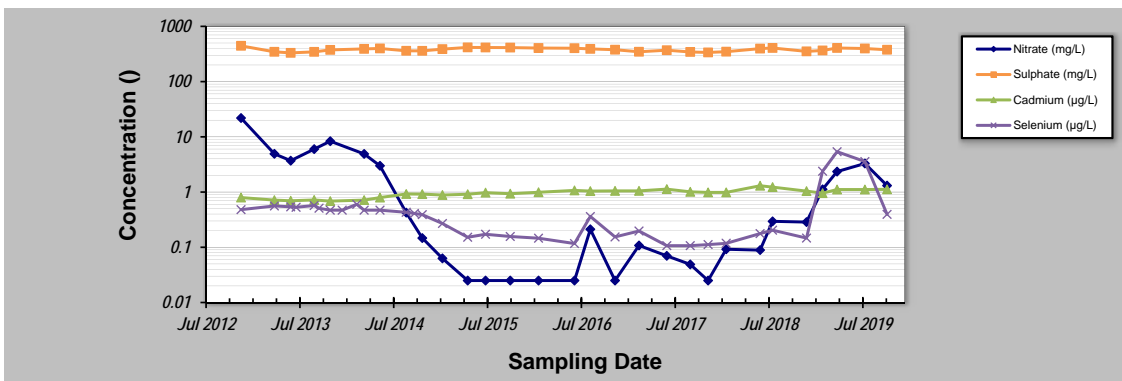
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - FRO** Location: **FR_09-04-A**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L)** **Sulphate (mg/L)** **Cadmium (µg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	FR_09-04-A CONCENTRATION			
1	15-Nov-12	21.9	444	0.795	0.48
2	26-Mar-13	4.92	346	0.714	0.56
3	29-May-13	3.7	331	0.695	0.54
4	19-Jun-13				0.53
5	29-Aug-13	5.99	345	0.719	0.57
6	17-Sep-13				0.51
7	31-Oct-13	8.34	375	0.686	0.47
8	17-Dec-13				0.47
9	12-Feb-14				0.6
10	13-Mar-14	4.9	391	0.715	0.47
11	14-May-14	2.99	398	0.794	0.47
12	25-Aug-14	0.424	361	0.923	0.43
13	26-Sep-14				0.41
14	27-Oct-14	0.147	360	0.917	0.39
15	14-Jan-15	0.063	387	0.884	0.27
16	23-Apr-15	0.025	416	0.913	0.152
17	2-Jul-15	0.025	414	0.975	0.172
18	7-Oct-15	0.025	413	0.933	0.157
19	26-Jan-16	0.025	405	0.991	0.146
20	15-Jun-16	0.025	402	1.07	0.117
21	16-Aug-16	0.212	391	1.04	0.361
22	21-Nov-16	0.025	378	1.05	0.154
23	23-Feb-17	0.108	347	1.05	0.197
24	12-Jun-17	0.07	370	1.13	0.107
25	12-Sep-17	0.049	344	1.01	0.107
26	21-Nov-17	0.025	337	0.985	0.112
27	31-Jan-18	0.0921	348	0.986	0.118
28	13-Jun-18	0.089	396	1.3	0.177
29	1-Aug-18	0.295	406	1.23	0.204
30	12-Dec-18	0.286	352	1.04	0.147
31	13-Feb-19	1.12	366	0.955	2.38
32	11-Apr-19	2.35	406	1.11	5.38
33	29-Jul-19	3.29	397	1.11	3.57
34	24-Oct-19	1.31	377	1.12	0.395
35					

Coefficient of Variation:	2.03	0.08	0.17	1.71
Mann-Kendall Statistic (S):	-65	2	267	-202
Confidence Factor:	88.4%	50.7%	>99.9%	99.9%
Concentration Trend:	No Trend	No Trend	Increasing	Decreasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

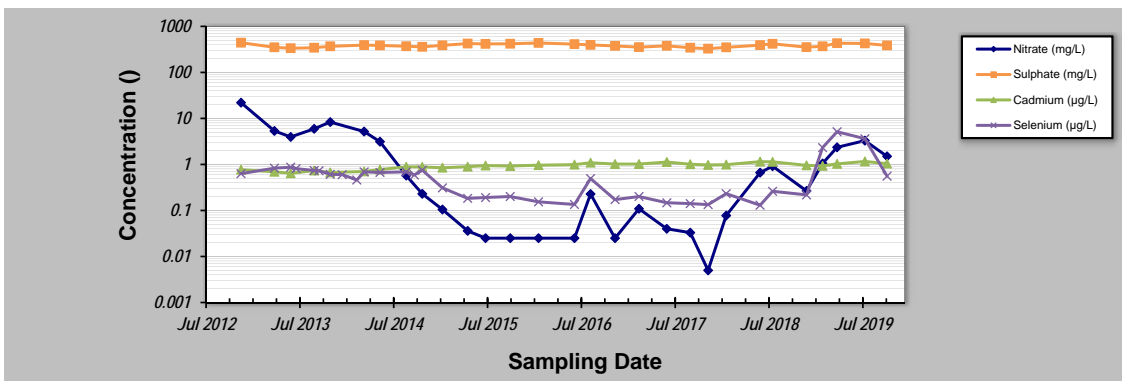
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - FRO** Location: **FR_09-04-B**
 Conducted By: **NDS**

Parameter (units): **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	FR_09-04-B CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	15-Nov-12	22	442	0.769	0.63
2	26-Mar-13	5.35	351	0.693	0.83
3	29-May-13	3.96	335	0.641	0.87
4	19-Jun-13				0.81
5	29-Aug-13	5.95	343	0.736	0.74
6	17-Sep-13				0.73
7	31-Oct-13	8.34	369	0.67	0.61
8	17-Dec-13				0.6
9	12-Feb-14				0.46
10	13-Mar-14	5.18	392	0.704	0.69
11	14-May-14	3.12	385	0.772	0.67
12	25-Aug-14	0.573	370	0.888	0.69
13	26-Sep-14				0.59
14	27-Oct-14	0.23	359	0.884	0.75
15	14-Jan-15	0.105	387	0.849	0.31
16	23-Apr-15	0.036	423	0.894	0.183
17	2-Jul-15	0.025	416	0.946	0.191
18	7-Oct-15	0.025	419	0.922	0.201
19	26-Jan-16	0.025	436	0.966	0.154
20	15-Jun-16	0.025	411	0.992	0.135
21	17-Aug-16	0.228	395	1.09	0.494
22	21-Nov-16	0.025	376	1.02	0.172
23	23-Feb-17	0.109	353	1.02	0.201
24	12-Jun-17	0.04	378	1.13	0.147
25	12-Sep-17	0.033	343	1.01	0.141
26	21-Nov-17	0.005	328	0.977	0.134
27	31-Jan-18	0.0776	350	0.99	0.232
28	13-Jun-18	0.664	392	1.15	0.13
29	1-Aug-18	0.915	418	1.14	0.261
30	12-Dec-18	0.266	353	0.957	0.218
31	13-Feb-19	1.05	369	0.931	2.32
32	11-Apr-19	2.36	431	1.03	5.13
33	29-Jul-19	3.29	426	1.16	3.62
34	24-Oct-19	1.5	385	1.04	0.557
35					
Coefficient of Variation:		1.95	0.09	0.16	1.42
Mann-Kendall Statistic (S):		-74	31	275	-177
Confidence Factor:		91.4%	71.2%	>99.9%	99.6%
Concentration Trend:		Prob. Decreasing	No Trend	Increasing	Decreasing



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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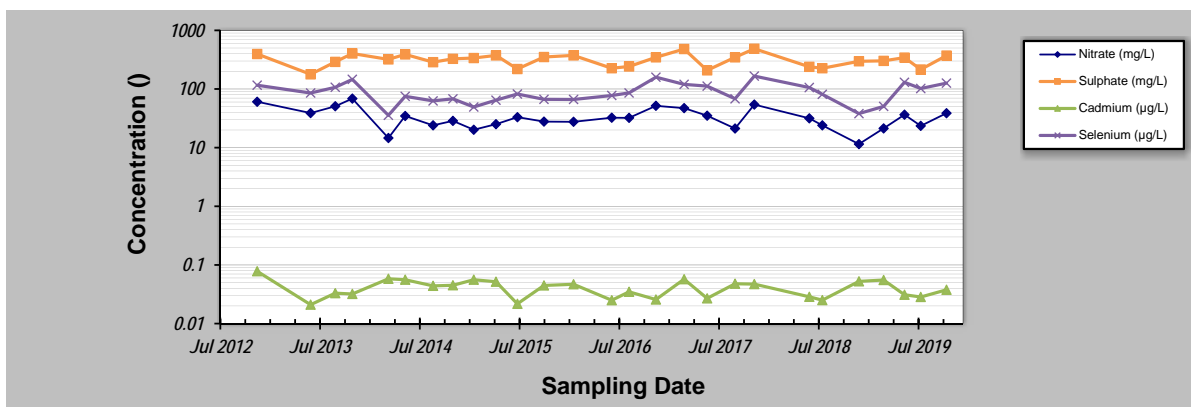
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - FRO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **FR_09-01-A**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	FR_09-01-A CONCENTRATION			
1	14-Nov-12	60.6	395	0.078	116
2	30-May-13	38.9	178	0.021	85.5
3	29-Aug-13	50.8	290	0.033	107
4	31-Oct-13	68.6	403	0.032	146
5	13-Mar-14	14.6	320	0.058	35.6
6	14-May-14	34.7	389	0.056	75
7	25-Aug-14	24	287	0.044	62.7
8	6-Nov-14	28.6	327	0.045	68
9	22-Jan-15	20.2	337	0.056	49.3
10	14-Apr-15	25.1	374	0.0517	64.5
11	2-Jul-15	33.1	219	0.0217	82.2
12	8-Oct-15	27.8	351	0.0447	66.6
13	25-Jan-16	27.6	374	0.0468	66.3
14	14-Jun-16	32.4	226	0.025	77.5
15	17-Aug-16	32.2	242	0.0348	85.7
16	24-Nov-16	51.7	347	0.0257	159
17	8-Mar-17	47.2	481	0.0571	120
18	1-Jun-17	35.1	208	0.0269	112
19	12-Sep-17	21.2	347	0.0478	68.1
20	22-Nov-17	54.3	486	0.0471	166
21	13-Jun-18	31.6	239	0.0286	106
22	31-Jul-18	24	226	0.0251	81.2
23	13-Dec-18	11.5	297	0.0525	38.1
24	14-Mar-19	21.3	302	0.0553	50.5
25	30-May-19	36.5	343	0.031	130
26	29-Jul-19	23.5	215	0.0284	102
27	1-Nov-19	38.7	371	0.0377	126
28					
29					
30					
Coefficient of Variation:		0.41	0.25	0.35	0.39
Mann-Kendall Statistic (S):		-50	-24	-34	47
Confidence Factor:		84.5%	68.3%	75.3%	83.0%
Concentration Trend:		Stable	Stable	Stable	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

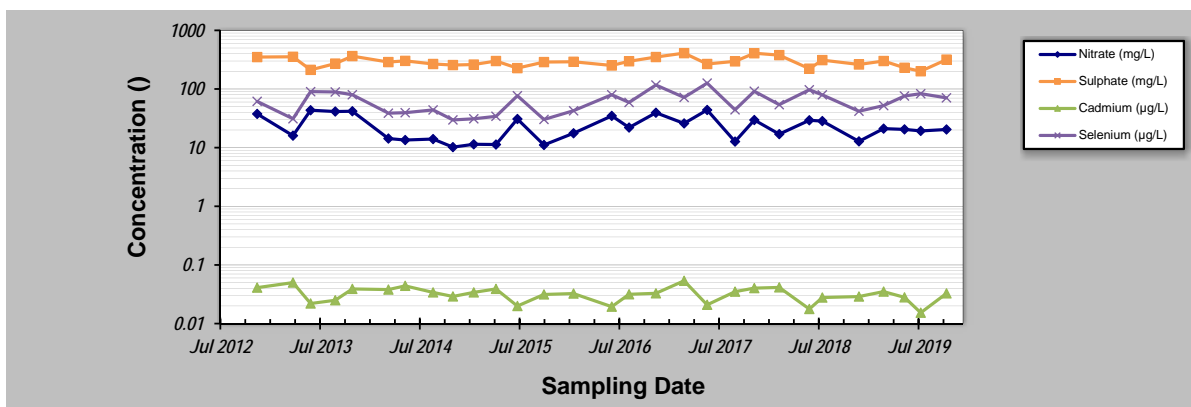
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - FRO	Location: FR_09-01-B
Conducted By: NDS	

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	FR_09-01-B CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	14-Nov-12	37.6	350	0.041	61.5
2	26-Mar-13	16	354	0.05	31.1
3	30-May-13	43.5	212	0.022	90.2
4	29-Aug-13	41.3	271	0.025	89
5	31-Oct-13	41.8	364	0.039	79.9
6	13-Mar-14	14.3	288	0.038	38.7
7	14-May-14	13.5	302	0.044	39.5
8	25-Aug-14	14	267	0.034	44
9	6-Nov-14	10.2	256	0.029	29.7
10	22-Jan-15	11.4	261	0.034	31.1
11	14-Apr-15	11.3	300	0.039	34.2
12	2-Jul-15	30.8	227	0.0199	76.8
13	8-Oct-15	11.1	288	0.0314	30.2
14	25-Jan-16	17.6	291	0.0325	42.6
15	14-Jun-16	34.8	252	0.0194	79.9
16	17-Aug-16	22	297	0.0316	58.9
17	24-Nov-16	39.4	351	0.0328	117
18	8-Mar-17	25.9	409	0.0536	71.8
19	1-Jun-17	43.9	267	0.0209	126
20	12-Sep-17	12.7	296	0.035	44.2
21	22-Nov-17	29.6	407	0.0402	91.5
22	22-Feb-18	17	378	0.0414	54.1
23	13-Jun-18	29.3	222	0.0177	97.1
24	31-Jul-18	28.4	311	0.0278	79.4
25	13-Dec-18	12.8	262	0.0289	41.8
26	14-Mar-19	21.1	300	0.0351	52.2
27	30-May-19	20.5	230	0.028	76
28	29-Jul-19	19.3	201	0.0153	83.2
29	1-Nov-19	20.4	317	0.0327	70.7
30					
Coefficient of Variation:		0.47	0.19	0.29	0.42
Mann-Kendall Statistic (S):		-24	-13	-80	74
Confidence Factor:		66.6%	58.8%	93.0%	91.4%
Concentration Trend:		Stable	Stable	Prob. Decreasing	Prob. Increasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

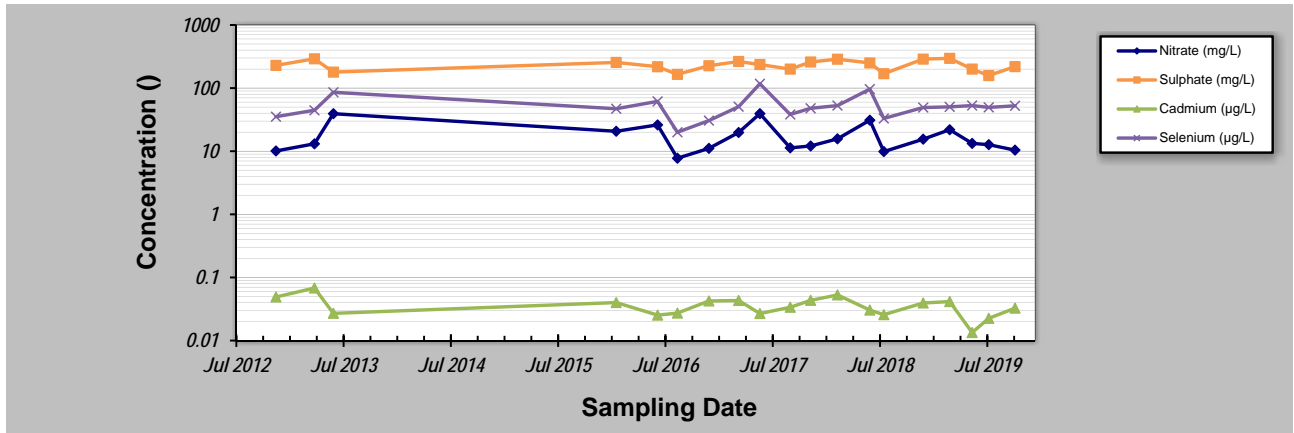
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - FRO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **FR_09-02-A**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	FR_09-02-A CONCENTRATION			
1	14-Nov-12	10.1	229	0.049	35.2
2	26-Mar-13	13.1	291	0.068	44.5
3	30-May-13	39.3	179	0.027	85.9
4	25-Jan-16	20.7	255	0.04	47.1
5	15-Jun-16	26.1	218	0.0253	61.5
6	22-Aug-16	7.74	165	0.0272	20
7	8-Dec-16	11.1	226	0.0424	30.5
8	20-Mar-17	19.8	264	0.0431	50.8
9	1-Jun-17	39.4	236	0.0268	117
10	13-Sep-17	11.3	200	0.0337	38.2
11	22-Nov-17	12.1	259	0.0434	47.9
12	22-Feb-18	15.7	287	0.0528	52.8
13	13-Jun-18	31	250	0.0304	96.3
14	31-Jul-18	9.87	169	0.0257	33
15	13-Dec-18	15.5	288	0.0394	49.2
16	14-Mar-19	21.9	296	0.0414	50.4
17	30-May-19	13.3	200	0.0134	52.9
18	26-Jul-19	12.7	158	0.0225	49.5
19	24-Oct-19	10.4	219	0.0326	52.4
20					

Coefficient of Variation:	0.54	0.19	0.35	0.44
Mann-Kendall Statistic (S):	-11	-2	-39	33
Confidence Factor:	63.5%	51.4%	90.7%	86.7%
Concentration Trend:	Stable	Stable	Prob. Decreasing	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

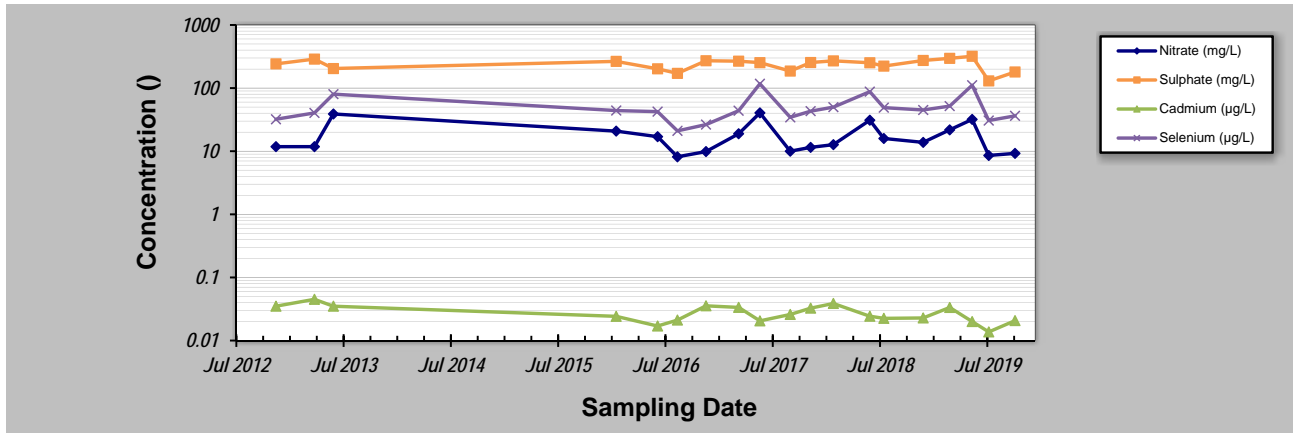
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - FRO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **FR_09-02-B**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	FR_09-02-B CONCENTRATION			
1	14-Nov-12	11.8	242	0.035	32.1
2	26-Mar-13	11.8	288	0.045	40.4
3	30-May-13	38.9	204	0.035	80.2
4	25-Jan-16	20.8	265	0.0242	44.1
5	15-Jun-16	17	202	0.017	42.4
6	22-Aug-16	8.15	171	0.0211	21
7	28-Nov-16	9.87	271	0.0355	26.4
8	20-Mar-17	18.9	267	0.0335	43.8
9	1-Jun-17	40.5	253	0.0205	117
10	13-Sep-17	10	186	0.0259	34.4
11	22-Nov-17	11.5	254	0.0326	43.1
12	8-Feb-18	12.7	270	0.0387	49.9
13	13-Jun-18	31	252	0.0243	87.8
14	31-Jul-18	15.9	223	0.0225	49
15	13-Dec-18	13.8	274	0.0228	45
16	14-Mar-19	21.8	296	0.0334	51.8
17	30-May-19	31.9	319	0.02	111
18	26-Jul-19	8.56	130	0.0137	30.6
19	24-Oct-19	9.24	180	0.0207	36.3
20					

Coefficient of Variation:	0.57	0.20	0.31	0.52
Mann-Kendall Statistic (S):	-2	5	-60	33
Confidence Factor:	51.4%	55.5%	98.1%	86.7%
Concentration Trend:	Stable	No Trend	Decreasing	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

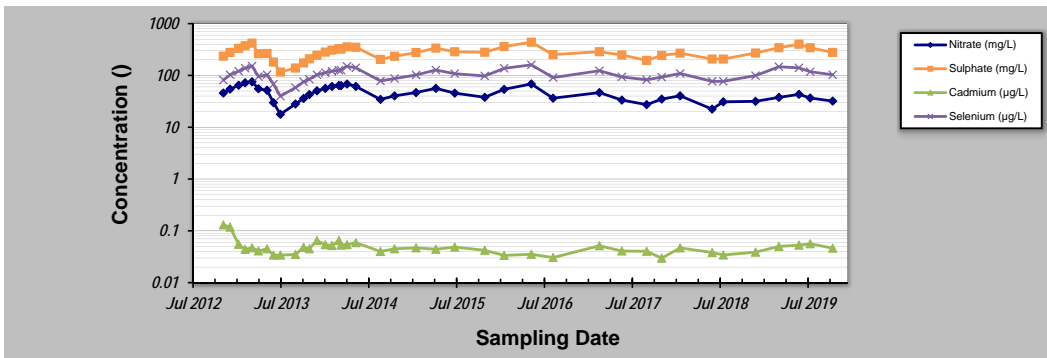
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - FRO	Location: FR_GH_WELL4
Conducted By: NDS	

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
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Sampling Event	Sampling Date	FR_GH_WELL4 CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	5-Nov-12	45.7	235	0.13	81.3
2	3-Dec-12	54.4	278	0.118	103
3	8-Jan-13	64.5	333	0.055	121
4	4-Feb-13	72.2	373	0.044	138
5	5-Mar-13	75.6	419	0.047	152
6	1-Apr-13	55.2	262	0.041	94.9
7	7-May-13	51.7	265	0.045	103
8	3-Jun-13	29.8	181	0.034	67.9
9	2-Jul-13	17.8	116	0.034	39.8
10	3-Sep-13	28.1	139	0.035	58.1
11	7-Oct-13	35.9	174	0.048	75.5
12	31-Oct-13	42.8	209	0.045	84.5
13	2-Dec-13	50.4	245	0.065	103
14	6-Jan-14	56.2	282	0.054	113
15	3-Feb-14	61.2	308	0.052	121
16	4-Mar-14	64	328	0.065	126
17	13-Mar-14	63.6	322	0.053	127
18	7-Apr-14	68.3	356	0.054	150
19	14-May-14	61.4	349	0.059	140
20	25-Aug-14	34.4	204	0.04	78.3
21	23-Oct-14	40.3	234	0.045	87
22	21-Jan-15	46.7	276	0.047	102
23	14-Apr-15	56.2	336	0.0441	127
24	2-Jul-15	45.5	286	0.0486	108
25	5-Nov-15	37.8	280	0.0421	97.5
26	25-Jan-16	53.9	360	0.0336	137
27	18-May-16	68.4	438	0.0353	160
28	17-Aug-16	36.3	252	0.0305	91
29	27-Feb-17	46.6	287	0.0515	123
30	1-Jun-17	33.4	248	0.0408	93.5
31	13-Sep-17	27.3	195	0.0403	82.2
32	15-Nov-17	34.9	243	0.0297	92.8
33	31-Jan-18	40.4	269	0.0468	109
34	14-Jun-18	22.4	207	0.0382	77
35	31-Jul-18	30.9	207	0.0342	76.9
36	13-Dec-18	31.6	271	0.0388	99.2
37	21-Mar-19	37.7	342	0.05	147
38	13-Jun-19	43.1	400	0.0529	140
39	30-Jul-19	36.7	342	0.0562	118
40	1-Nov-19	31.9	278	0.0463	103
Coefficient of Variation:	0.32	0.26	0.40	0.26	
Mann-Kendall Statistic (S):	-231	71	-145	63	
Confidence Factor:	99.7%	79.2%	95.3%	76.4%	
Concentration Trend:	Decreasing	No Trend	Decreasing	No Trend	



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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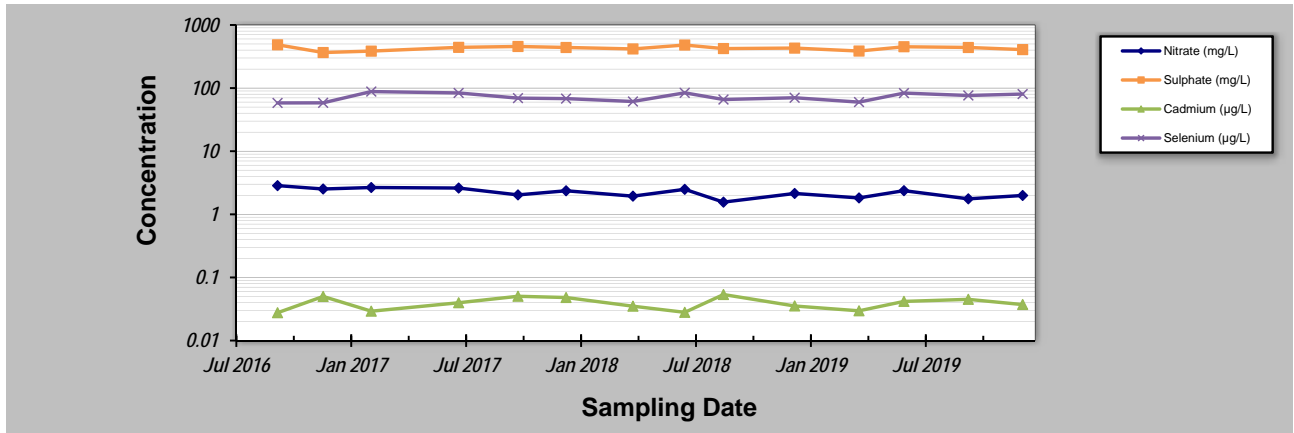
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - GHO** Location: **GH_MW-PC**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L)** **Sulphate (mg/L)** **Cadmium (µg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	GH_MW-PC CONCENTRATION			
1	5-Sep-16	2.85	485	0.0276	58.2
2	17-Nov-16	2.52	366	0.05	58.4
3	2-Feb-17	2.66	385	0.0292	88.1
4	22-Jun-17	2.61	442	0.0397	83.7
5	25-Sep-17	2.03	456	0.0503	69.3
6	11-Dec-17	2.36	440	0.0481	68.1
7	28-Mar-18	1.94	417	0.035	61.3
8	19-Jun-18	2.49	481	0.028	84
9	20-Aug-18	1.56	423	0.0536	65.9
10	12-Dec-18	2.14	430	0.0353	70.3
11	25-Mar-19	1.82	386	0.0296	60
12	5-Jun-19	2.37	452	0.0417	83.3
13	16-Sep-19	1.76	440	0.045	76.4
14	12-Dec-19	1.99	407	0.0372	80.5
15					
16					
17					
18					
19					
20					

Coefficient of Variation:	0.17	0.08	0.23	0.15
Mann-Kendall Statistic (S):	-49	-6	9	15
Confidence Factor:	99.7%	60.6%	66.6%	77.5%
Concentration Trend:	Decreasing	Stable	No Trend	No Trend



Notes:

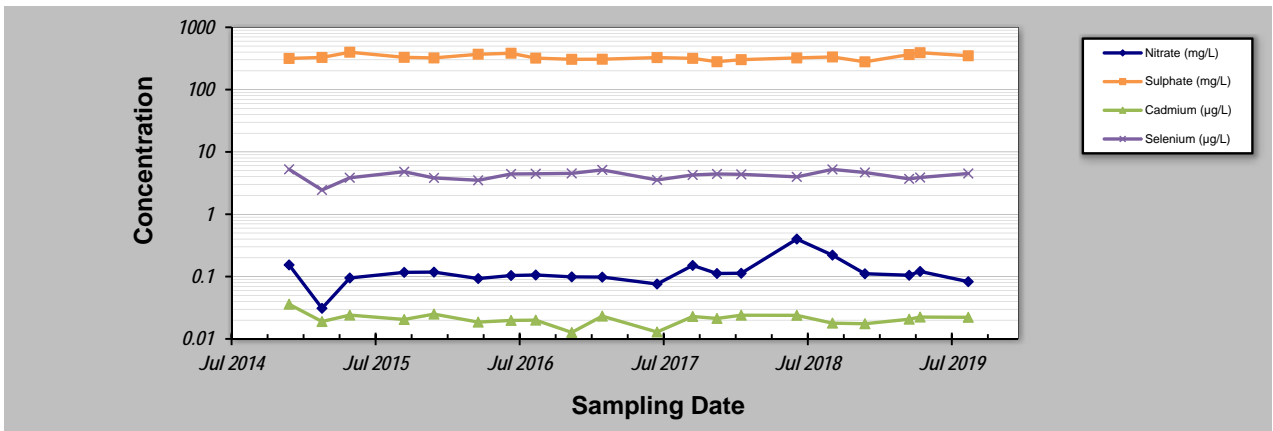
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - GHO	Location: GH_MW-GHC-A
Conducted By: NDS	

Parameter (units)		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)			
GH_MW-GHC-A CONCENTRATION								
Sampling Event	Sampling Date							
1	25-Nov-14	0.154	316	0.036	5.26			
2	17-Feb-15	0.031	328	0.019	2.45			
3	29-Apr-15	0.095	398	0.0241	3.85			
4	15-Sep-15	0.117	329	0.0205	4.81			
5	30-Nov-15	0.118	322	0.025	3.83			
6	22-Mar-16	0.093	369	0.0186	3.51			
7	14-Jun-16	0.104	383	0.0198	4.43			
8	16-Aug-16	0.106	320	0.02	4.46			
9	16-Nov-16	0.099	306	0.0127	4.53			
10	2-Feb-17	0.098	307	0.0232	5.15			
11	22-Jun-17	0.076	326	0.0129	3.55			
12	21-Sep-17	0.151	317	0.0229	4.27			
13	22-Nov-17	0.112	280	0.0213	4.43			
14	23-Jan-18	0.113	302	0.024	4.37			
15	14-Jun-18	0.4	322	0.0239	3.98			
16	13-Sep-18	0.221	334	0.0179	5.24			
17	5-Dec-18	0.111	279	0.0175	4.68			
18	28-Mar-19	0.105	365	0.0207	3.7			
19	25-Apr-19	0.121	391	0.0224	3.89			
20	26-Aug-19	0.0829	349	0.0222	4.51			
21								
22								
23								
24								
25								
Coefficient of Variation:		0.59	0.10	0.23	0.16			
Mann-Kendall Statistic (S):		24	-9	-18	11			
Confidence Factor:		77.0%	60.1%	70.7%	62.6%			
Concentration Trend:		No Trend	Stable	Stable	No Trend			



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

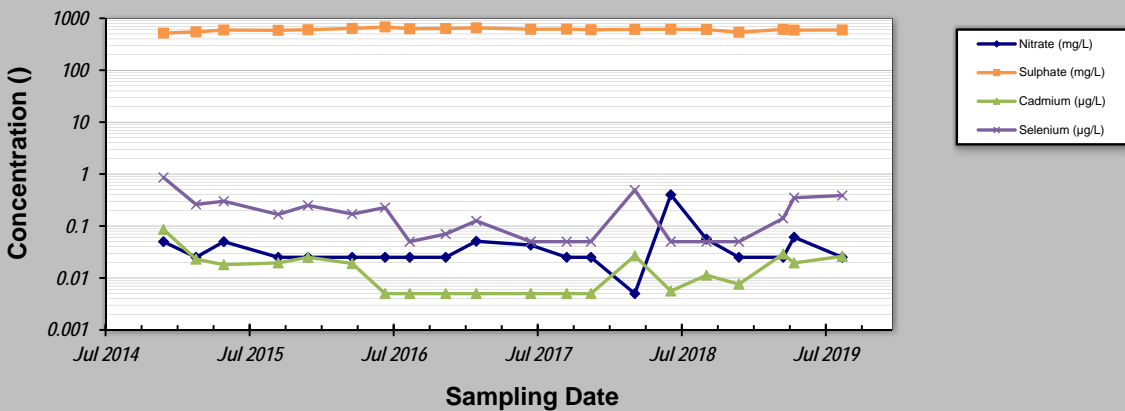
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - GHO** Location: **GH_MW-GHC-B**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (µg/L) | Selenium (µg/L)**

Sampling Event	Sampling Date	GH_MW-GHC-B CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	26-Nov-14	0.05	518	0.086	0.86
2	17-Feb-15	0.025	548	0.023	0.26
3	29-Apr-15	0.05	595	0.018	0.3
4	15-Sep-15	0.025	587	0.0195	0.167
5	30-Nov-15	0.025	602	0.025	0.25
6	22-Mar-16	0.025	638	0.019	0.17
7	14-Jun-16	0.025	682	0.005	0.227
8	16-Aug-16	0.025	629	0.005	0.05
9	16-Nov-16	0.025	636	0.005	0.07
10	2-Feb-17	0.051	655	0.005	0.126
11	21-Jun-17	0.043	615	0.005	0.05
12	21-Sep-17	0.025	619	0.005	0.05
13	22-Nov-17	0.025	601	0.005	0.05
14	14-Mar-18	0.005	610	0.0267	0.494
15	14-Jun-18	0.4	615	0.0056	0.05
16	13-Sep-18	0.056	608	0.0113	0.05
17	5-Dec-18	0.025	537	0.0076	0.05
18	28-Mar-19	0.025	612	0.0289	0.141
19	25-Apr-19	0.061	593	0.0195	0.351
20	26-Aug-19	0.025	595	0.0261	0.387
21					
22					
23					
24					
25					
Coefficient of Variation:		1.64	0.06	1.05	0.98
Mann-Kendall Statistic (S):		7	-4	0	-45
Confidence Factor:		57.7%	53.8%	48.7%	92.3%
Concentration Trend:		No Trend	Stable	No Trend	Prob. Decreasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

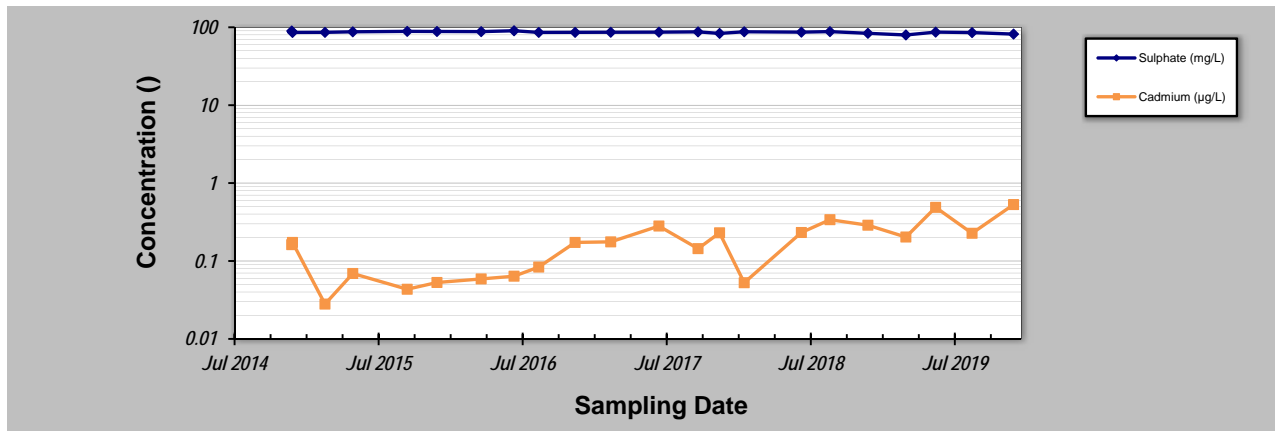
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - GHO** Location: **GH_MW-TD**
 Conducted By: **NDS**

Parameter (units) **Sulphate (mg/L)** **Cadmium (µg/L)**

Sampling Event	Sampling Date	GH_MW-TD CONCENTRATION					
		Sulphate (mg/L)	Cadmium (µg/L)				
1	24-Nov-14	89.6	0.162				
2	26-Nov-14	85.8	0.173				
3	17-Feb-15	86.1	0.028				
4	29-Apr-15	87.4	0.0691				
5	15-Sep-15	88.5	0.0434				
6	30-Nov-15	88.3	0.053				
7	22-Mar-16	87.9	0.0589				
8	14-Jun-16	90.2	0.0638				
9	16-Aug-16	85.9	0.0836				
10	17-Nov-16	86.1	0.173				
11	16-Feb-17	86.3	0.176				
12	19-Jun-17	86.6	0.281				
13	27-Sep-17	87.3	0.144				
14	21-Nov-17	83.4	0.23				
15	23-Jan-18	87.6	0.0526				
16	18-Jun-18	86.6	0.232				
17	30-Aug-18	87.9	0.339				
18	5-Dec-18	83.6	0.288				
19	12-Mar-19	79.7	0.203				
20	27-May-19	86.7	0.488				
21	28-Aug-19	85.5	0.227				
22	12-Dec-19	81.8	0.53				
23							
24							
25							
Coefficient of Variation:		0.03	0.74				
Mann-Kendall Statistic (S):		-72	132				
Confidence Factor:		97.8%	>99.9%				
Concentration Trend:		Decreasing	Increasing				



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

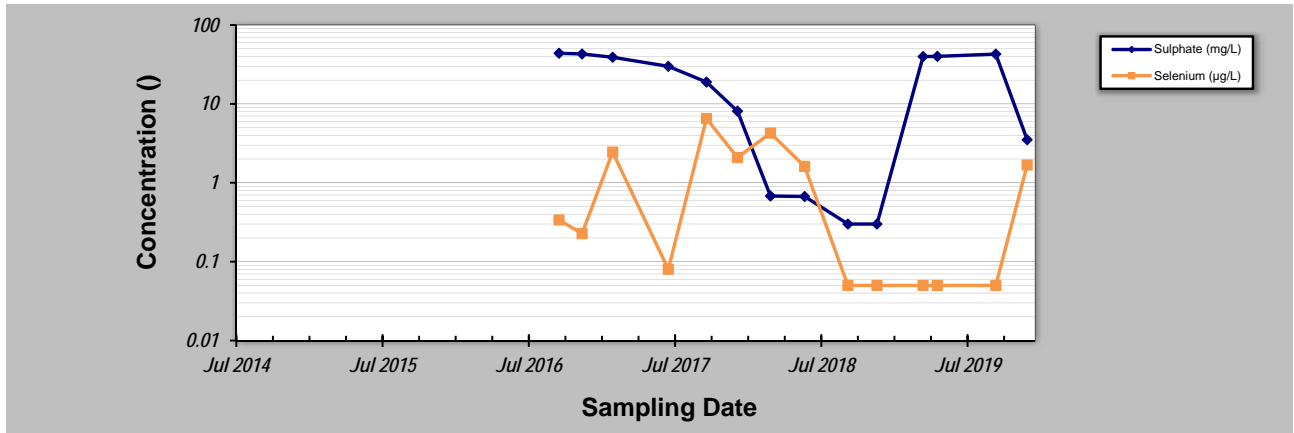
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - GHO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **GH_MW-RLP-1D**

Parameter (units): **Sulphate (mg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	GH_MW-RLP-1D CONCENTRATION					
1	20-Sep-16	43.8	0.338				
2	17-Nov-16	42.9	0.227				
3	2-Feb-17	39	2.45				
4	22-Jun-17	29.9	0.08				
5	26-Sep-17	18.9	6.53				
6	13-Dec-17	8.09	2.09				
7	6-Mar-18	0.68	4.26				
8	31-May-18	0.67	1.61				
9	17-Sep-18	0.3	0.05				
10	29-Nov-18	0.3	0.05				
11	25-Mar-19	39.8	0.05				
12	30-Apr-19	40	0.05				
13	24-Sep-19	42.7	0.05				
14	12-Dec-19	3.51	1.68				
15							
16							
17							
18							
19							
20							

Coefficient of Variation:	0.86	1.40				
Mann-Kendall Statistic (S):	-28	-29				
Confidence Factor:	92.9%	93.7%				
Concentration Trend:	Prob. Decreasing	Prob. Decreasing				



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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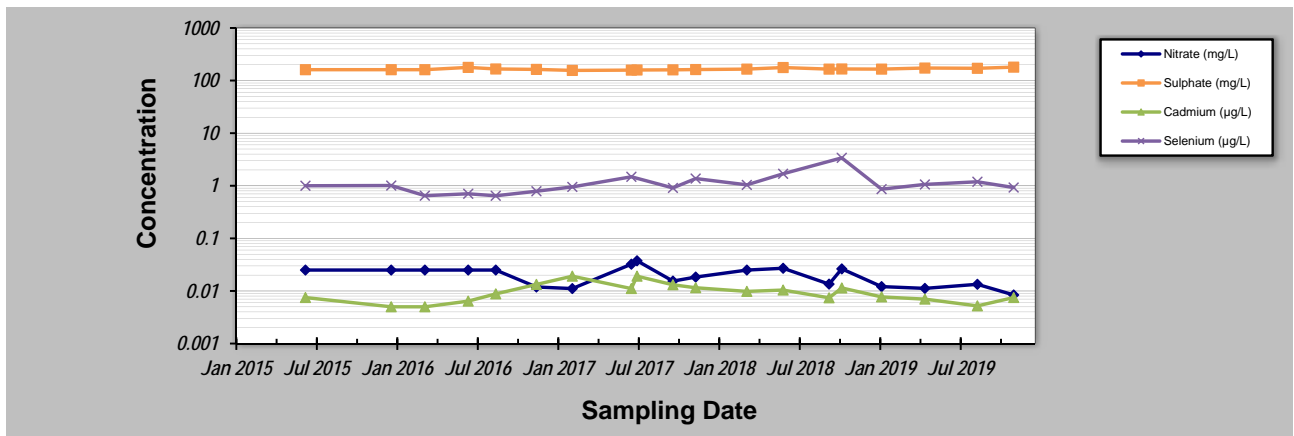
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - GHO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **GH_POTW09**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	GH_POTW09 CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	8-Jun-15	0.025	161	0.0075	1
2	21-Dec-15	0.025	161	0.005	1.01
3	7-Mar-16	0.025	161	0.005	0.647
4	14-Jun-16	0.025	178	0.0064	0.705
5	16-Aug-16	0.025	166	0.0088	0.645
6	17-Nov-16	0.0119	163	0.0133	0.788
7	7-Feb-17	0.0111	156	0.0191	0.951
8	22-Jun-17	0.0323	158	0.0111	1.48
9	5-Jul-17	0.0375	159	0.0191	
10	25-Sep-17	0.0154	160	0.0131	0.91
11	16-Nov-17	0.0184	162	0.0115	1.37
12	13-Mar-18	0.025	165	0.0098	1.04
13	4-Jun-18	0.027	177	0.0104	1.69
14	17-Sep-18	0.0135	165	0.0074	
15	16-Oct-18	0.0263	166	0.0114	3.39
16	15-Jan-19	0.0121	165	0.0077	0.861
17	24-Apr-19	0.0112	173	0.007	1.06
18	22-Aug-19	0.0134	171	0.0052	1.19
19	13-Nov-19	0.0084	180	0.0075	0.926
20					
Coefficient of Variation:		0.40	0.04	0.42	0.56
Mann-Kendall Statistic (S):		-48	70	-8	44
Confidence Factor:		95.0%	99.3%	59.6%	96.2%
Concentration Trend:		Prob. Decreasing	Increasing	Stable	Increasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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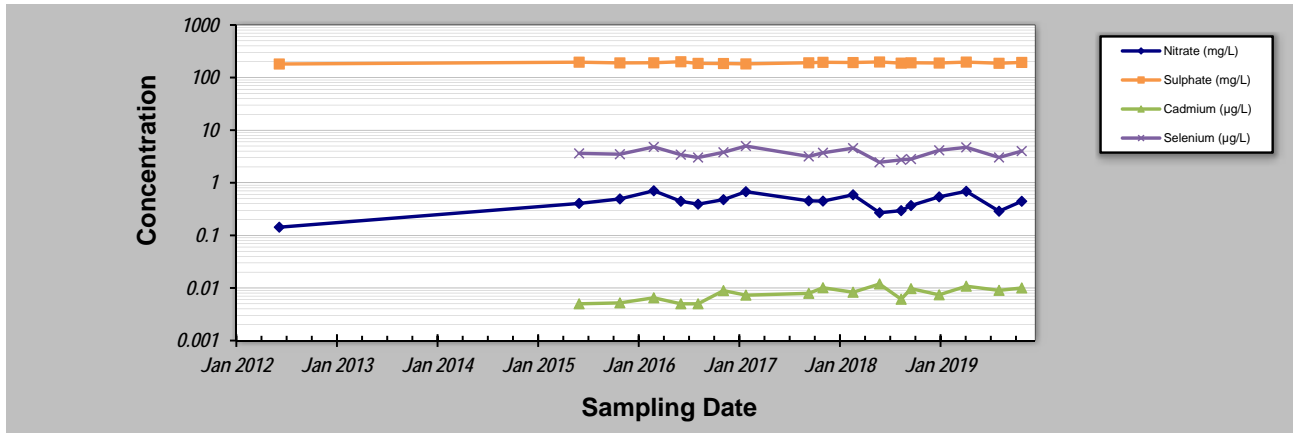
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - GHO** Location: **GH_POTW10**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L)** **Sulphate (mg/L)** **Cadmium (µg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	GH_POTW10 CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	6-Jun-12	0.143	181		
2	8-Jun-15	0.405	196	0.005	3.62
3	4-Nov-15	0.493	190	0.0052	3.49
4	7-Mar-16	0.705	191	0.0065	4.8
5	14-Jun-16	0.445	200	0.005	3.42
6	16-Aug-16	0.391	186	0.005	3.02
7	17-Nov-16	0.478	185	0.0089	3.8
8	7-Feb-17	0.677	182	0.0073	4.99
9	19-Jun-17				
10	25-Sep-17	0.453	191	0.0079	3.17
11	16-Nov-17	0.448	195	0.0101	3.71
12	6-Mar-18	0.591	193	0.0083	4.55
13	11-Jun-18	0.269	198	0.0119	2.45
14	29-Aug-18	0.295	188	0.0061	2.73
15	4-Oct-18	0.369	191	0.0097	2.82
16	15-Jan-19	0.539	189	0.0074	4.14
17	24-Apr-19	0.688	197	0.0108	4.72
18	22-Aug-19	0.288	187	0.009	3.03
19	13-Nov-19	0.445	194	0.01	4
20					

Coefficient of Variation:	0.34	0.03	0.28	0.21
Mann-Kendall Statistic (S):	-2	18	71	-6
Confidence Factor:	51.5%	73.8%	99.9%	58.0%
Concentration Trend:	Stable	No Trend	Increasing	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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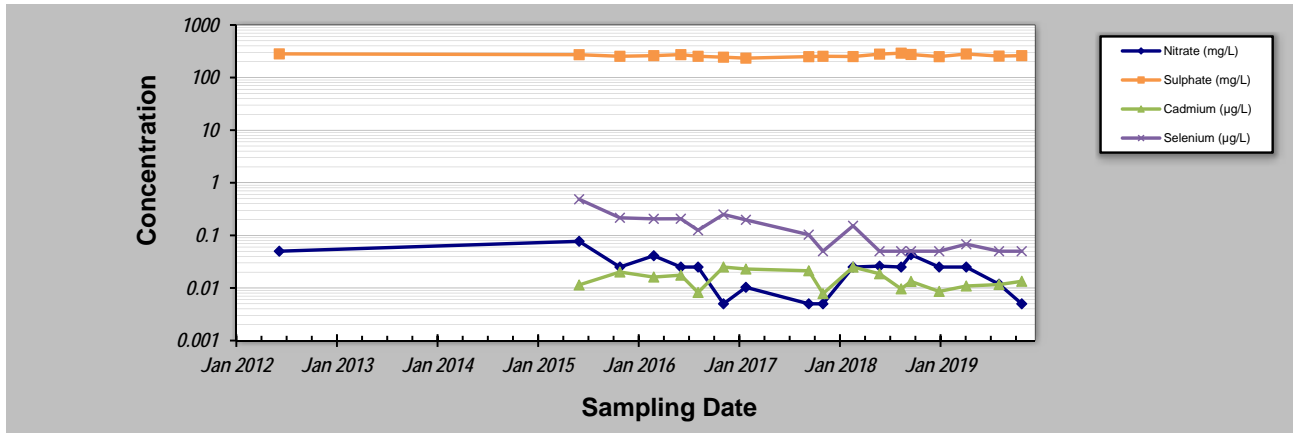
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - GHO** Location: **GH_POTW15**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L)** **Sulphate (mg/L)** **Cadmium (µg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	GH_POTW15 CONCENTRATION			
1	6-Jun-12	0.05	282		
2	8-Jun-15	0.077	272	0.0114	0.486
3	4-Nov-15	0.025	254	0.0201	0.216
4	7-Mar-16	0.041	261	0.0161	0.206
5	14-Jun-16	0.025	273	0.0175	0.207
6	16-Aug-16	0.025	254	0.0082	0.125
7	17-Nov-16	0.005	244	0.025	0.25
8	7-Feb-17	0.0103	234	0.0229	0.197
9	19-Jun-17				
10	25-Sep-17	0.005	250	0.0212	0.103
11	16-Nov-17	0.005	254	0.0078	0.05
12	6-Mar-18	0.025	251	0.0249	0.152
13	11-Jun-18	0.026	279	0.0186	0.05
14	29-Aug-18	0.025	291	0.0096	0.05
15	4-Oct-18	0.043	275	0.0133	0.05
16	15-Jan-19	0.025	250	0.0086	0.05
17	24-Apr-19	0.025	281	0.0109	0.068
18	22-Aug-19	0.0118	256	0.0116	0.05
19	13-Nov-19	0.005	261	0.0134	0.05
20					
Coefficient of Variation:		0.74	0.06	0.38	0.83
Mann-Kendall Statistic (S):		-42	4	-20	-87
Confidence Factor:		93.9%	54.5%	78.0%	>99.9%
Concentration Trend:		Prob. Decreasing	No Trend	Stable	Decreasing



Notes:

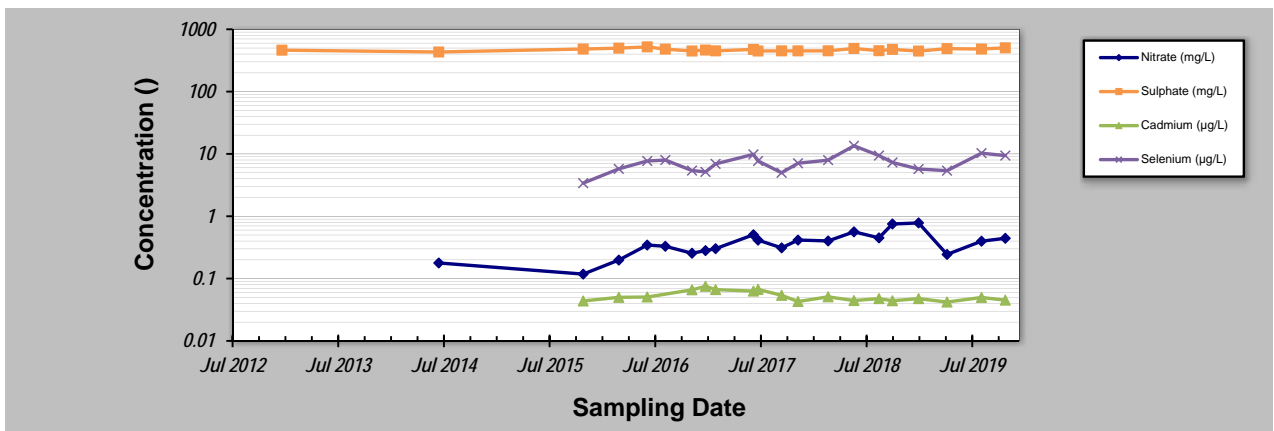
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - GHO** Location: **GH_POTW17**
 Conducted By: **NDS**

Parameter (units)		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
Sampling Event	Sampling Date	GH_POTW17 CONCENTRATION			
1	20-Dec-12		462		
2	19-Jun-14	0.178	432		
3	4-Nov-15	0.118	482	0.0437	3.4
4	7-Mar-16	0.198	498	0.05	5.76
5	14-Jun-16	0.345	522	0.0506	7.71
6	16-Aug-16	0.33	480		7.98
7	17-Nov-16	0.255	448	0.066	5.41
8	3-Jan-17	0.281	464	0.075	5.15
9	7-Feb-17	0.302	450	0.0665	6.93
10	19-Jun-17	0.505	475	0.063	9.83
11	5-Jul-17	0.414	448	0.0671	7.71
12	25-Sep-17	0.311	450	0.0539	4.98
13	21-Nov-17	0.415	450	0.0429	7.09
14	6-Mar-18	0.402	451	0.0509	7.96
15	4-Jun-18	0.563	492	0.0444	13.5
16	30-Aug-18	0.45	453	0.0477	9.42
17	16-Oct-18	0.752	475	0.044	7.3
18	15-Jan-19	0.782	447	0.0477	5.73
19	24-Apr-19	0.244	489	0.042	5.39
20	22-Aug-19	0.398	482	0.0498	10.3
21	13-Nov-19	0.443	504	0.045	9.42
22					
23					
24					
25					
Coefficient of Variation:		0.45	0.05	0.19	0.32
Mann-Kendall Statistic (S):		98	22	-46	45
Confidence Factor:		99.9%	73.5%	95.6%	93.8%
Concentration Trend:		Increasing	No Trend	Decreasing	Prob. Increasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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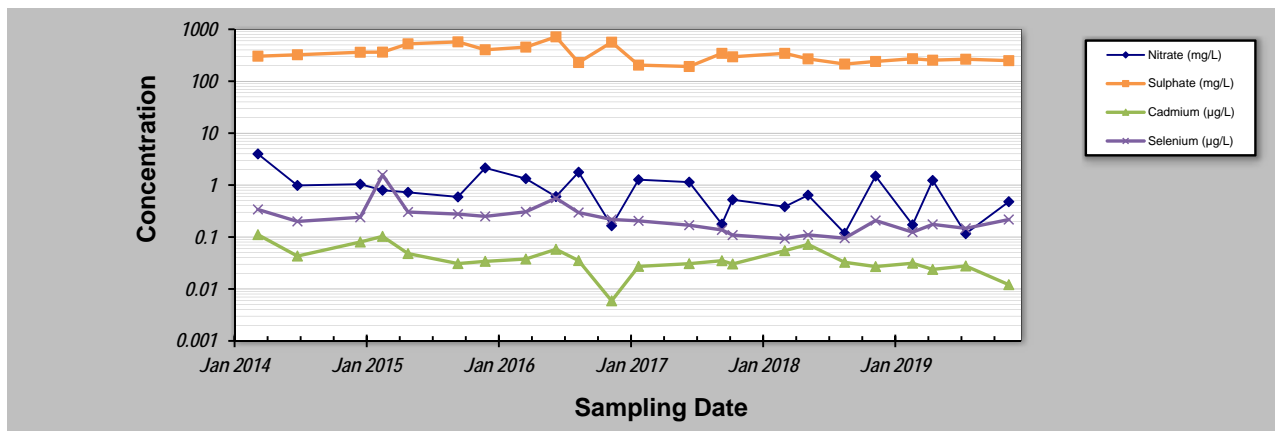
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - GHO** Location: **GH_GA-MW-1**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (µg/L) | Selenium (µg/L)**

Sampling Event	Sampling Date	GH_GA-MW-1 CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	7-Mar-14	3.98	303	0.111	0.34
2	25-Jun-14	0.984	323	0.043	0.2
3	17-Dec-14	1.04	361	0.08	0.24
4	17-Feb-15	0.796	363	0.103	1.57
5	29-Apr-15	0.726	525	0.048	0.303
6	15-Sep-15	0.592	573	0.0308	0.276
7	30-Nov-15	2.14	403	0.034	0.25
8	22-Mar-16	1.33	453	0.0377	0.306
9	14-Jun-16	0.6	715	0.058	0.56
10	16-Aug-16	1.77	229	0.0352	0.296
11	16-Nov-16	0.165	564	0.0059	0.218
12	30-Jan-17	1.27	204	0.0272	0.205
13	20-Jun-17	1.14	192	0.0307	0.169
14	19-Sep-17	0.177	344	0.035	0.137
15	19-Oct-17	0.523	295	0.0303	0.109
16	13-Mar-18	0.384	344	0.0546	0.093
17	17-May-18	0.64	269	0.0722	0.11
18	27-Aug-18	0.118	214	0.0326	0.095
19	21-Nov-18	1.49	240	0.027	0.208
20	4-Mar-19	0.172	271	0.0313	0.124
21	29-Apr-19	1.23	254	0.0238	0.175
22	30-Jul-19	0.116	265	0.0277	0.147
23	27-Nov-19	0.479	249	0.0121	0.217
24					
25					
Coefficient of Variation:		0.91	0.39	0.61	1.09
Mann-Kendall Statistic (S):		-91	-82	-121	-117
Confidence Factor:		99.2%	98.4%	100.0%	99.9%
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing



Notes:

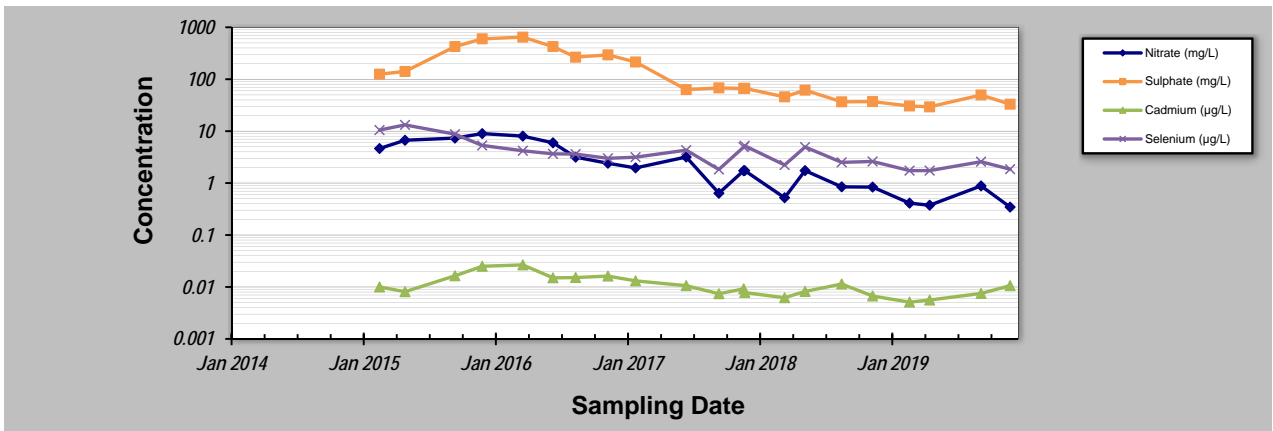
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - GHO	Location: GH_GA-MW-4
Conducted By: NDS	

Parameter (units)		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
GH_GA-MW-4 CONCENTRATION					
Sampling Event	Sampling Date				
1	7-Mar-14				
2	25-Jun-14				
3	17-Dec-14				
4	17-Feb-15	4.63	125	0.01	10.5
5	29-Apr-15	6.68	141	0.0081	13.2
6	15-Sep-15	7.35	425	0.0164	8.74
7	30-Nov-15	8.98	599	0.025	5.31
8	22-Mar-16	8.02	646	0.0266	4.19
9	14-Jun-16	5.97	425	0.015	3.66
10	16-Aug-16	3.16	266	0.0152	3.62
11	14-Nov-16	2.41	294	0.0162	3
12	30-Jan-17	1.96	215	0.0131	3.16
13	20-Jun-17	3.18	63	0.0106	4.31
14	19-Sep-17	0.638	68	0.0074	1.83
15	27-Nov-17	1.73	66.4	0.0092	4.93
16	30-Nov-17	1.74	66.7	0.0078	5.23
17	21-Mar-18	0.523	45.7	0.0062	2.23
18	17-May-18	1.74	61.6	0.0082	4.95
19	27-Aug-18	0.848	36.7	0.0114	2.51
20	21-Nov-18	0.838	37.1	0.0067	2.61
21	4-Mar-19	0.411	30.5	0.0051	1.74
22	29-Apr-19	0.375	29.4	0.0056	1.74
23	19-Sep-19	0.883	49.7	0.0075	2.58
24	9-Dec-19	0.345	33	0.0106	1.85
25					
Coefficient of Variation:		0.94	1.09	0.51	0.69
Mann-Kendall Statistic (S):		-151	-145	-99	-119
Confidence Factor:		>99.9%	>99.9%	99.9%	>99.9%
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

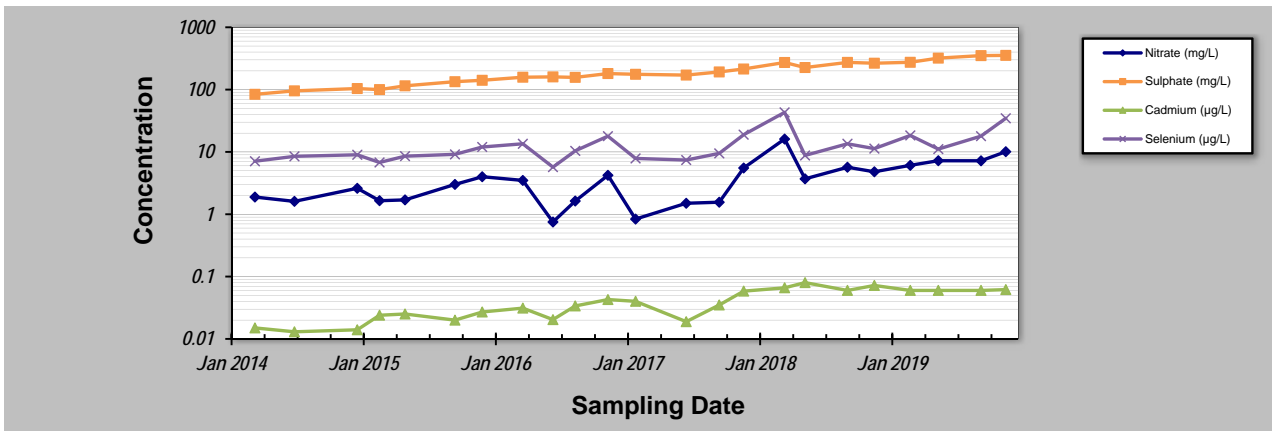
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - GHO	Location: GH_GA-MW-2
Conducted By: NDS	

Parameter (units)		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)			
GH_GA-MW-2 CONCENTRATION								
Sampling Event	Sampling Date							
1	7-Mar-14	1.89	84	0.015	7.09			
2	25-Jun-14	1.61	95.4	0.013	8.5			
3	17-Dec-14	2.61	104	0.014	8.99			
4	17-Feb-15	1.65	99.9	0.024	6.78			
5	29-Apr-15	1.7	115	0.0251	8.56			
6	15-Sep-15	3.01	134	0.02	9.13			
7	30-Nov-15	4	141	0.027	12			
8	22-Mar-16	3.49	158	0.0312	13.5			
9	14-Jun-16	0.751	160	0.0204	5.7			
10	15-Aug-16	1.63	157	0.0338	10.4			
11	14-Nov-16	4.22	181	0.0428	17.9			
12	30-Jan-17	0.837	176	0.0401	7.87			
13	20-Jun-17	1.5	171	0.0189	7.41			
14	20-Sep-17	1.56	192	0.035	9.49			
15	27-Nov-17	5.52	214	0.0584	18.9			
16	21-Mar-18	16.1	272	0.066	43.1			
17	17-May-18	3.7	226	0.08	8.78			
18	12-Sep-18	5.68	273	0.06	13.5			
19	26-Nov-18	4.8	265	0.072	11.3			
20	6-Mar-19	6.09	274	0.06	18.4			
21	23-May-19	7.23	320	0.06	11.1			
22	19-Sep-19	7.21	351	0.06	17.9			
23	27-Nov-19	10.1	354	0.0618	34.7			
24								
25								
Coefficient of Variation:		0.84	0.42	0.52	0.67			
Mann-Kendall Statistic (S):		125	235	177	117			
Confidence Factor:		>99.9%	>99.9%	>99.9%	99.9%			
Concentration Trend:		Increasing	Increasing	Increasing	Increasing			



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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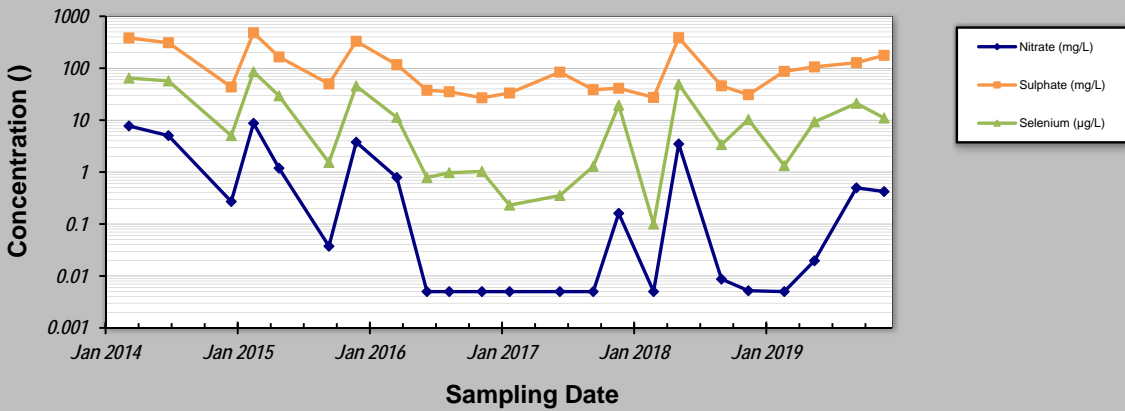
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - GHO** Location: **GH_GA-MW-3**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) | Sulphate (mg/L) | Selenium (µg/L)**

Sampling Event	Sampling Date	GH_GA-MW-3 CONCENTRATION		
1	7-Mar-14	7.73	382	64.6
2	25-Jun-14	5.04	310	56.9
3	17-Dec-14	0.271	43.5	5.03
4	17-Feb-15	8.71	481	85.3
5	29-Apr-15	1.19	165	29.4
6	15-Sep-15	0.0374	50	1.53
7	30-Nov-15	3.77	330	45.4
8	22-Mar-16	0.789	117	11.3
9	14-Jun-16	0.005	37.7	0.783
10	15-Aug-16	0.005	35.3	0.972
11	14-Nov-16	0.005	26.9	1.03
12	30-Jan-17	0.005	33.3	0.231
13	19-Jun-17	0.005	84	0.354
14	20-Sep-17	0.005	38.7	1.29
15	30-Nov-17	0.161	41.1	19.4
16	7-Mar-18	0.005	27.4	0.1
17	16-May-18	3.48	387	49.2
18	12-Sep-18	0.0087	45.8	3.38
19	26-Nov-18	0.0052	30.9	10.3
20	6-Mar-19	0.005	87	1.33
21	29-May-19	0.0196	106	9.26
22	23-Sep-19	0.498	128	21.1
23	9-Dec-19	0.422	177	11
24				
25				
Coefficient of Variation:		1.83	1.01	1.32
Mann-Kendall Statistic (S):		-65	-33	-45
Confidence Factor:		95.4%	79.9%	87.6%
Concentration Trend:		Decreasing	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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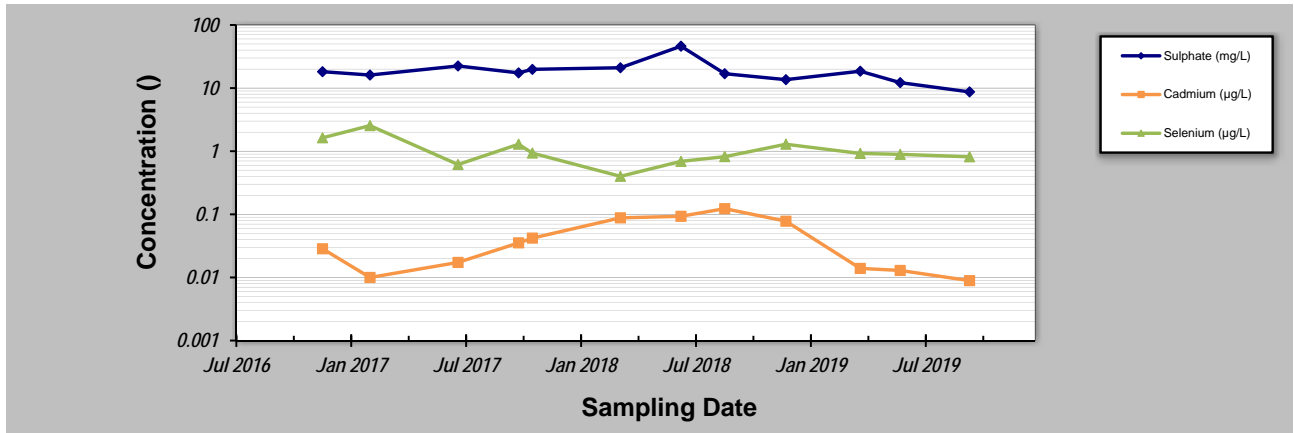
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - GHO** Location: **GH_MW-UTC-A**
 Conducted By: **NDS**

Parameter (units): **Sulphate (mg/L)** **Cadmium (µg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	GH_MW-UTC-A CONCENTRATION					
		Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)			
1	20-Sep-16						
2	16-Nov-16	18.2	0.0285	1.63			
3	31-Jan-17	16.1	0.01	2.54			
4	21-Jun-17	22.4	0.0173	0.615			
5	26-Sep-17	17.4	0.0353	1.29			
6	18-Oct-17	19.8	0.042	0.933			
7	8-Mar-18	21	0.088	0.4			
8	13-Jun-18	46.1	0.093	0.69			
9	22-Aug-18	16.9	0.123	0.82			
10	28-Nov-18	13.6	0.0778	1.29			
11	27-Mar-19	18.5	0.0139	0.921			
12	30-May-19	12.2	0.0129	0.891			
13	18-Sep-19	8.7	0.0089	0.814			
14							
15							
16							
17							
18							
19							
20							

Coefficient of Variation:	0.48	0.86	0.53			
Mann-Kendall Statistic (S):	-22	0	-17			
Confidence Factor:	92.4%	47.3%	86.0%			
Concentration Trend:	Prob. Decreasing	Stable	Stable			



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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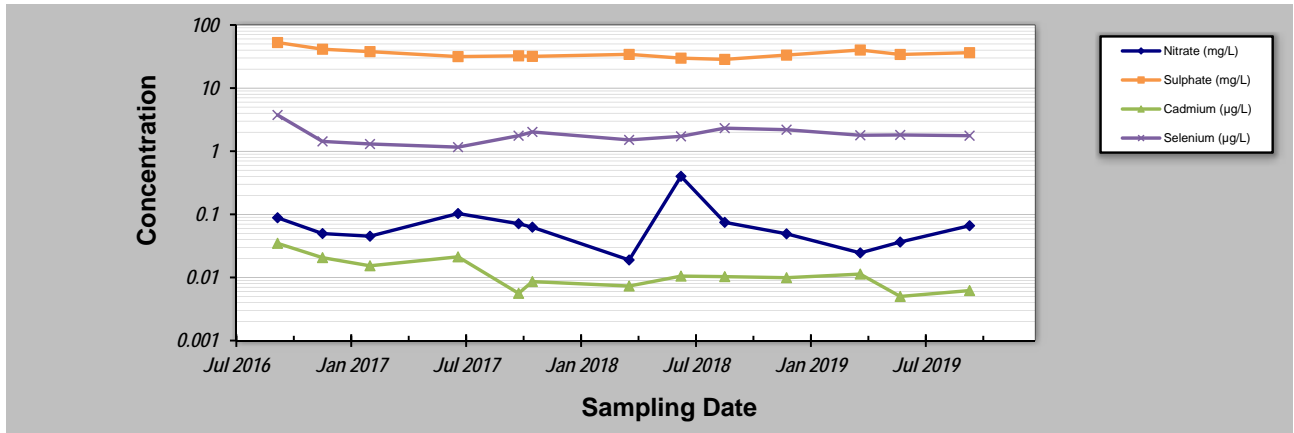
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - GHO** Location: **GH_MW-UTC-B**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L)** **Sulphate (mg/L)** **Cadmium (µg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	GH_MW-UTC-B CONCENTRATION			
1	5-Sep-16	0.0883	52.7	0.0347	3.75
2	16-Nov-16	0.0496	41.3	0.0206	1.43
3	31-Jan-17	0.045	37.8	0.0153	1.3
4	21-Jun-17	0.103	31.5	0.0212	1.16
5	26-Sep-17	0.071	32.4	0.0056	1.76
6	18-Oct-17	0.0626	31.8	0.0086	2.02
7	22-Mar-18	0.0189	34.2	0.0073	1.51
8	13-Jun-18	0.4	29.8	0.0105	1.72
9	22-Aug-18	0.0746	28.5	0.0103	2.32
10	29-Nov-18	0.0491	33.3	0.0099	2.19
11	27-Mar-19	0.0245	40.1	0.0113	1.79
12	30-May-19	0.0364	34.1	0.005	1.81
13	18-Sep-19	0.066	36.4	0.0062	1.76
14					
15					
16					
17					
18					
19					
20					

Coefficient of Variation:	1.17	0.18	0.65	0.34
Mann-Kendall Statistic (S):	-16	-14	-36	15
Confidence Factor:	81.6%	78.2%	98.5%	79.9%
Concentration Trend:	No Trend	Stable	Decreasing	No Trend



Notes:

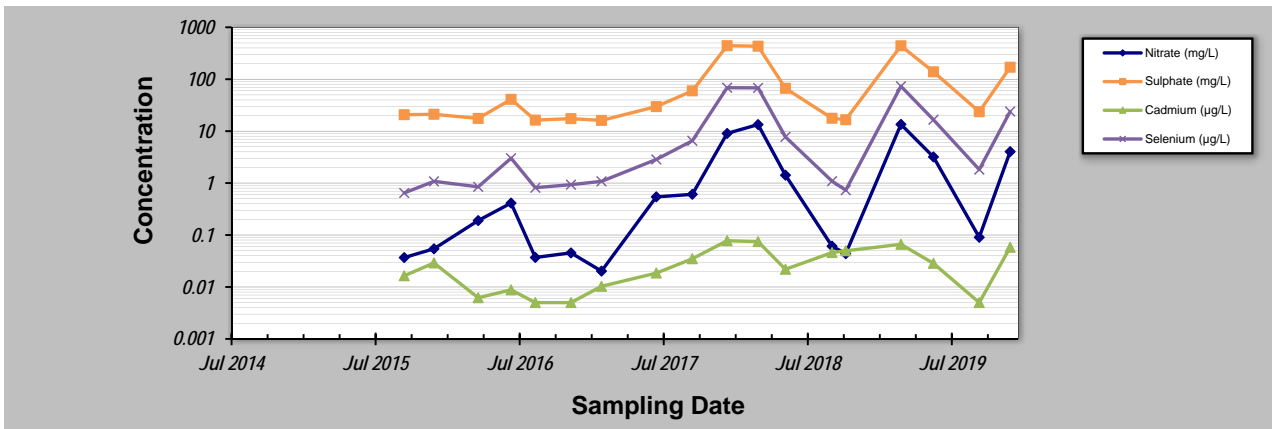
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- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - GHO	Location: GH_MW-ERSC-1
Conducted By: NDS	

Parameter (units)		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
GH_MW-ERSC-1 CONCENTRATION					
Sampling Event	Sampling Date				
1	26-Nov-14				
2	17-Feb-15				
3	29-Apr-15				
4	15-Sep-15	0.0368	20.7	0.0164	0.646
5	30-Nov-15	0.0543	21.1	0.029	1.08
6	22-Mar-16	0.19	17.6	0.0062	0.847
7	14-Jun-16	0.412	40.9	0.0088	3.01
8	15-Aug-16	0.037	16.3	0.005	0.815
9	14-Nov-16	0.0453	17.4	0.005	0.932
10	31-Jan-17	0.0202	16.1	0.0103	1.08
11	20-Jun-17	0.543	29.7	0.0185	2.85
12	20-Sep-17	0.608	59.6	0.0349	6.53
13	18-Dec-17	9.04	442	0.0777	68.7
14	7-Mar-18	13.4	432	0.0747	68.1
15	16-May-18	1.42	66.8	0.0219	7.75
16	12-Sep-18	0.0609	17.7	0.0459	1.09
17	17-Oct-18	0.0437	16.6	0.0497	0.73
18	7-Mar-19	13.5	440	0.0662	73.2
19	29-May-19	3.19	139	0.0285	16.6
20	23-Sep-19	0.0903	23.7	0.005	1.82
21	11-Dec-19	4.03	170	0.058	23.9
22					
23					
24					
25					
Coefficient of Variation:		1.75	1.42	0.80	1.66
Mann-Kendall Statistic (S):		61	45	50	66
Confidence Factor:		98.9%	95.2%	96.9%	99.4%
Concentration Trend:		Increasing	Increasing	Increasing	Increasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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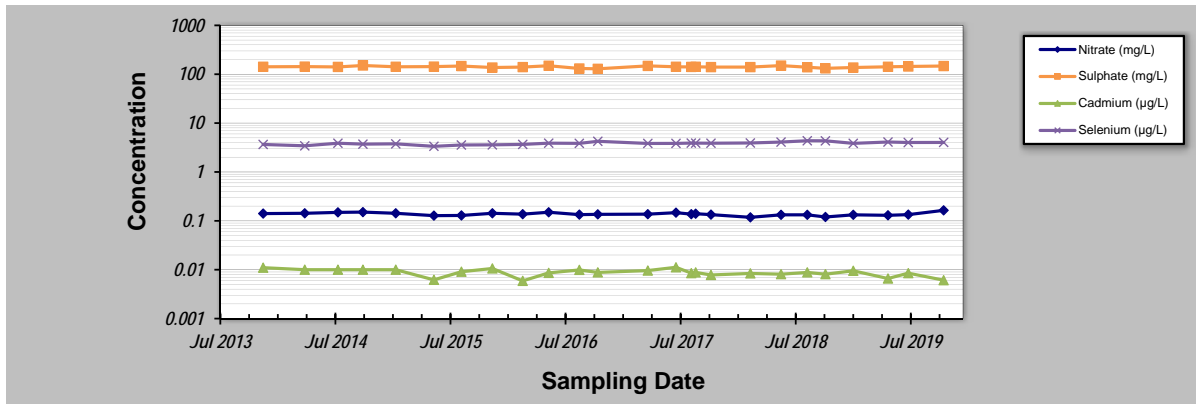
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - EVO	Location: EV_GV3gw
Conducted By: NDS	

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	EV_GV3GW CONCENTRATION							
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)				
1	15-Nov-13	0.141	142	0.011	3.65				
2	28-Mar-14	0.143	143	0.01	3.43				
3	12-Jul-14	0.149	141	0.01	3.87				
4	30-Sep-14	0.151	151	0.01	3.71				
5	13-Jan-15	0.143	142	0.01	3.76				
6	15-May-15	0.128	143	0.0062	3.35				
7	11-Aug-15	0.129	147	0.0091	3.56				
8	18-Nov-15	0.143	137	0.0106	3.59				
9	23-Feb-16	0.137	140	0.0059	3.66				
10	16-May-16	0.15	149	0.0086	3.88				
11	22-Aug-16	0.134	131	0.0099	3.85				
12	20-Oct-16	0.136	129	0.0088	4.24				
13	29-Mar-17	0.137	148	0.0096	3.83				
14	27-Jun-17	0.147	142	0.0112	3.84				
15	15-Aug-17	0.137	141	0.0085	3.9				
16	29-Aug-17	0.14	142	0.0088	3.89				
17	17-Oct-17	0.134	140	0.0078	3.87				
18	20-Feb-18	0.118	140	0.0084	3.92				
19	29-May-18	0.133	150	0.0081	4.09				
20	21-Aug-18	0.133	139	0.0088	4.36				
21	18-Oct-18	0.12	132	0.0081	4.34				
22	15-Jan-19	0.133	137	0.0095	3.85				
23	6-May-19	0.13	142	0.0066	4.1				
24	10-Jul-19	0.134	144	0.0085	4.01				
25	31-Oct-19	0.164	147	0.0061	4.02				
26									
27									
28									
29									
30									
Coefficient of Variation:		0.07	0.04	0.17	0.07				
Mann-Kendall Statistic (S):		-88	-31	-129	174				
Confidence Factor:		97.9%	75.6%	99.9%	>99.9%				
Concentration Trend:		Decreasing	Stable	Decreasing	Increasing				



Notes:

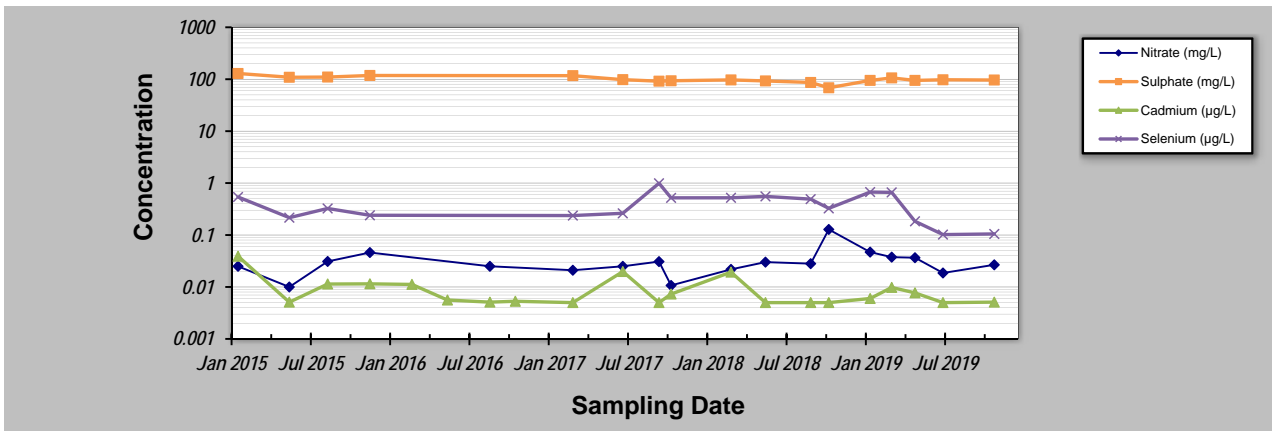
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - EVO	Location: EV_BALgw
Conducted By: NDS	

Parameter (units)		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)			
Sampling Event	Sampling Date	EV_BALGW CONCENTRATION						
1	16-Jan-15	0.025	129	0.039	0.54			
2	15-May-15	0.01	109	0.0051	0.216			
3	12-Aug-15	0.031	110	0.0114	0.325			
4	18-Nov-15	0.046	118	0.0115	0.24			
5	23-Feb-16	0.073	150	0.0112	0.457			
6	16-May-16	0.035	118	0.0056	0.194			
7	22-Aug-16	0.025	115	0.0051	0.135			
8	20-Oct-16	0.0065	109	0.0053	0.241			
9	3-Mar-17	0.021	117	0.005	0.237			
10	27-Jun-17	0.025	98.1	0.0198	0.262			
11	19-Sep-17	0.0308	91.6	0.005	0.992			
12	17-Oct-17	0.0107	93.3	0.0073	0.52			
13	5-Mar-18	0.0218	96.9	0.0193	0.521			
14	24-May-18	0.0301	92.6	0.005	0.555			
15	6-Sep-18	0.0281	86.6	0.005	0.491			
16	18-Oct-18	0.128	68.4	0.005	0.326			
17	22-Jan-19	0.0469	94.8	0.006	0.672			
18	13-Mar-19	0.0375	106	0.0098	0.663			
19	6-May-19	0.0366	94.8	0.0077	0.184			
20	10-Jul-19	0.0186	97.6	0.005	0.102			
21	6-Nov-19	0.0267	96.4	0.0051	0.105			
22								
23								
24								
25								
Coefficient of Variation:		0.77	0.14	0.86	0.58			
Mann-Kendall Statistic (S):		-5	-93	-56	-46			
Confidence Factor:		55.9%	>99.9%	95.1%	96.8%			
Concentration Trend:		Stable	Decreasing	Decreasing	Decreasing			



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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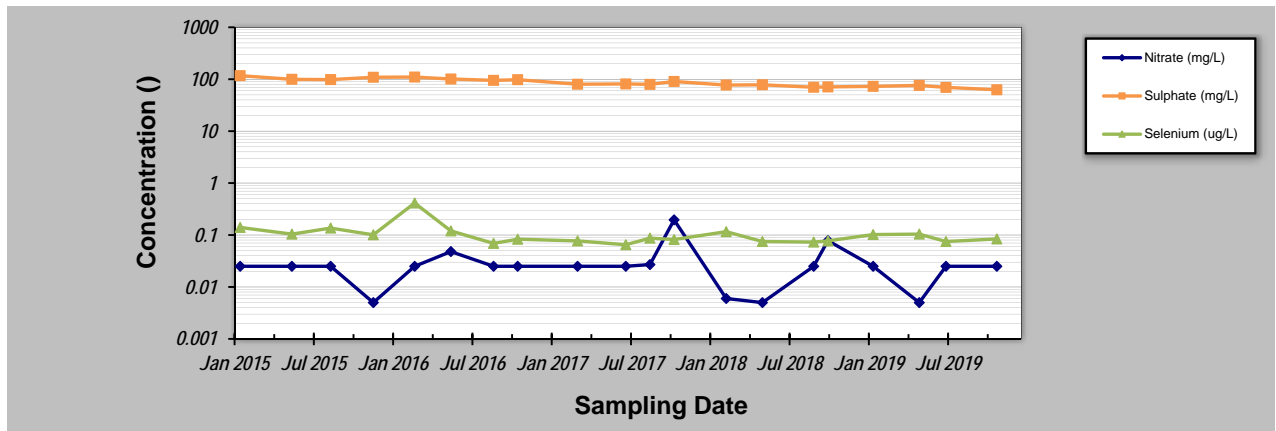
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - EVO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **EV_LSgw**

Parameter (units) **Nitrate (mg/L) | Sulphate (mg/L) | Selenium (ug/L)**

Sampling Event	Sampling Date	EV_LSGW CONCENTRATION					
		Nitrate (mg/L)	Sulphate (mg/L)	Selenium (ug/L)			
1	14-Jan-15	0.025	117	0.14			
2	14-May-15	0.025	99.6	0.104			
3	12-Aug-15	0.025	98.3	0.136			
4	19-Nov-15	0.005	109	0.101			
5	23-Feb-16	0.025	110	0.413			
6	17-May-16	0.048	101	0.12			
7	24-Aug-16	0.025	95	0.069			
8	19-Oct-16	0.025	97.9	0.083			
9	7-Mar-17	0.025	80.1	0.077			
10	27-Jun-17	0.025	81.1	0.065			
11	22-Aug-17	0.027	79.5	0.087			
12	17-Oct-17	0.196	90.5	0.082			
13	15-Feb-18	0.006	77.1	0.116			
14	10-May-18	0.005	78.1	0.075			
15	6-Sep-18	0.025	70	0.073			
16	9-Oct-18	0.078	71	0.077			
17	22-Jan-19	0.025	72.8	0.102			
18	9-May-19	0.005	75.9	0.104			
19	10-Jul-19	0.025	69.5	0.075			
20	5-Nov-19	0.025	62.7	0.084			
21							
22							
23							
24							
25							
Coefficient of Variation:		1.24	0.18	0.68			
Mann-Kendall Statistic (S):		-3	-152	-57			
Confidence Factor:		52.6%	>99.9%	96.6%			
Concentration Trend:		No Trend	Decreasing	Decreasing			



Notes:

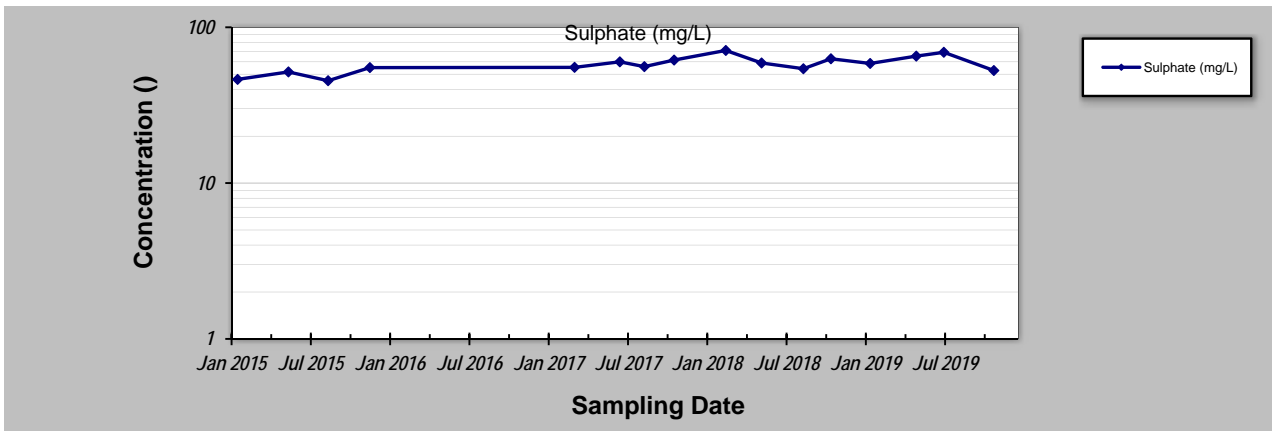
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - EVO	Location: EV_GCgw
Conducted By: NDS	

Parameter (units)	EV_GCgw CONCENTRATION						
Sulphate (mg/L)							
Sampling Event	Sampling Date						
1	15-Jan-15	46.3					
2	13-May-15	51.7					
3	13-Aug-15	45.4					
4	18-Nov-15	55.1					
5	24-Feb-16	52.0					
6	18-May-16	56.3					
7	24-Aug-16	55.1					
8	18-Oct-16	58.1					
9	7-Mar-17	55.3					
10	20-Jun-17	60					
11	16-Aug-17	55.9					
12	24-Oct-17	61.6					
13	21-Feb-18	71					
14	15-May-18	59					
15	20-Aug-18	54.2					
16	23-Oct-18	62.8					
17	22-Jan-19	58.6					
18	9-May-19	65.3					
19	12-Jul-19	69.1					
20	5-Nov-19	52.8					
21							
22							
23							
24							
25							
Coefficient of Variation:	0.13						
Mann-Kendall Statistic (S):	26						
Confidence Factor:	86.7%						
Concentration Trend:	No Trend						



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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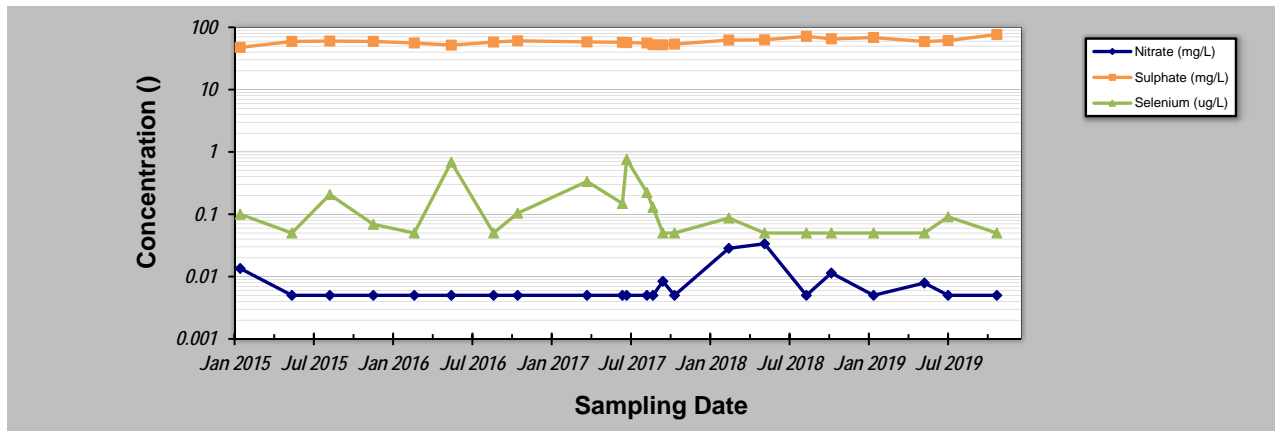
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - EVO** Location: **EV_Ocgw**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) | Sulphate (mg/L) | Selenium (ug/L)**

Sampling Event	Sampling Date	EV_OCGW CONCENTRATION		
		Nitrate (mg/L)	Sulphate (mg/L)	Selenium (ug/L)
1	14-Jan-15	0.0135	47.5	0.1
2	14-May-15	0.005	59.3	0.05
3	10-Aug-15	0.005	60.1	0.207
4	19-Nov-15	0.005	59.3	0.069
5	22-Feb-16	0.005	56	0.05
6	18-May-16	0.005	51.7	0.685
7	24-Aug-16	0.005	57.9	0.05
8	19-Oct-16	0.005	60.6	0.104
9	29-Mar-17	0.005	58.2	0.336
10	19-Jun-17	0.005	57.4	0.149
11	29-Jun-17	0.005	56.7	0.76
12	15-Aug-17	0.005	55.9	0.223
13	29-Aug-17	0.005	52.5	0.129
14	21-Sep-17	0.0084	52.3	0.05
15	18-Oct-17	0.005	53.7	0.05
16	21-Feb-18	0.0284	62.3	0.087
17	15-May-18	0.0336	62.9	0.05
18	20-Aug-18	0.005	71.5	0.05
19	17-Oct-18	0.0114	65.1	0.05
20	23-Jan-19	0.005	68.4	0.05
21	21-May-19	0.0079	59	0.05
22	15-Jul-19	0.005	61.3	0.091
23	5-Nov-19	0.005	76.5	0.05
24				
25				
Coefficient of Variation:		0.93	0.11	1.28
Mann-Kendall Statistic (S):		29	84	-62
Confidence Factor:		76.8%	98.6%	94.6%
Concentration Trend:		No Trend	Increasing	Prob. Decreasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

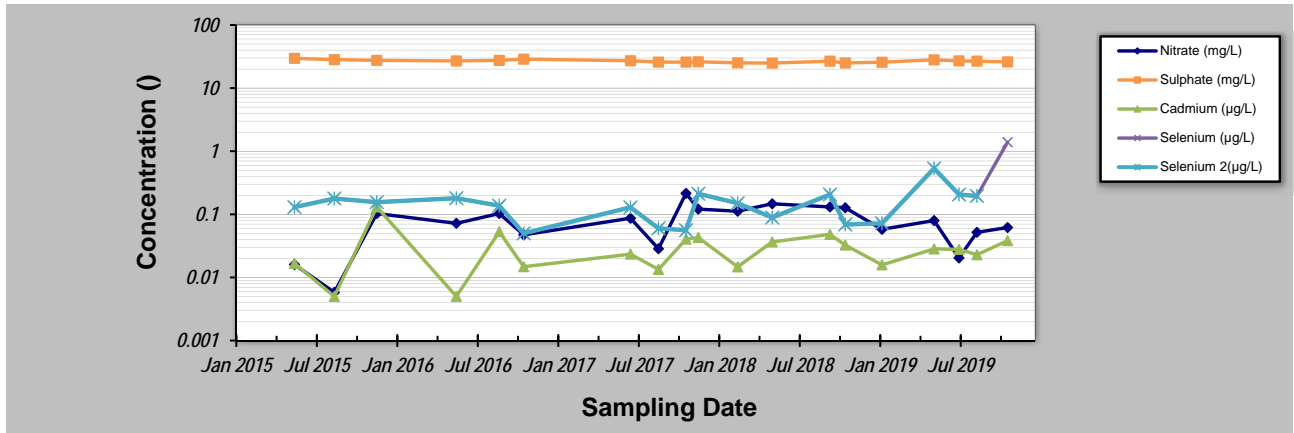
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - EVO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **EV_ECgw**

Parameter (units): **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L) Selenium 2(µg/L)**

Sampling Event	Sampling Date	EV_ECgw CONCENTRATION				
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)	Selenium 2(µg/L)
1	14-May-15	0.016	29.6	0.0167	0.13	0.13
2	13-Aug-15	0.0058	28.2	0.005	0.178	0.178
3	18-Nov-15	0.103	27.5	0.131	0.156	0.156
4	18-May-16	0.072	26.9	0.005	0.18	0.18
5	24-Aug-16	0.103	27.5	0.0529	0.137	0.137
6	19-Oct-16	0.0473	28.7	0.0148	0.05	0.05
7	20-Jun-17	0.0868	27.1	0.0234	0.129	0.129
8	23-Aug-17	0.0285	25.8	0.0134	0.06	0.06
9	25-Oct-17	0.215	25.8	0.0404	0.056	0.056
10	22-Nov-17	0.121	26.1	0.0429	0.212	0.212
11	20-Feb-18	0.112	25.1	0.0147	0.15	0.15
12	10-May-18	0.147	24.9	0.0365	0.089	0.089
13	19-Sep-18	0.131	26.7	0.0481	0.206	0.206
14	24-Oct-18	0.127	25	0.0326	0.069	0.069
15	16-Jan-19	0.0579	25.7	0.0158	0.072	0.072
16	15-May-19	0.0796	28	0.0283	0.534	0.534
17	11-Jul-19	0.0204	27	0.0278	0.206	0.206
18	21-Aug-19	0.0519	26.7	0.0229	0.195	0.195
19	30-Oct-19	0.0618	26	0.0383	1.39	
20						

Coefficient of Variation:	0.63	0.05	0.86	1.37	0.70
Mann-Kendall Statistic (S):	16	-66	18	38	20
Confidence Factor:	69.8%	98.9%	72.2%	90.1%	76.2%
Concentration Trend:	No Trend	Decreasing	No Trend	Prob. Increasing	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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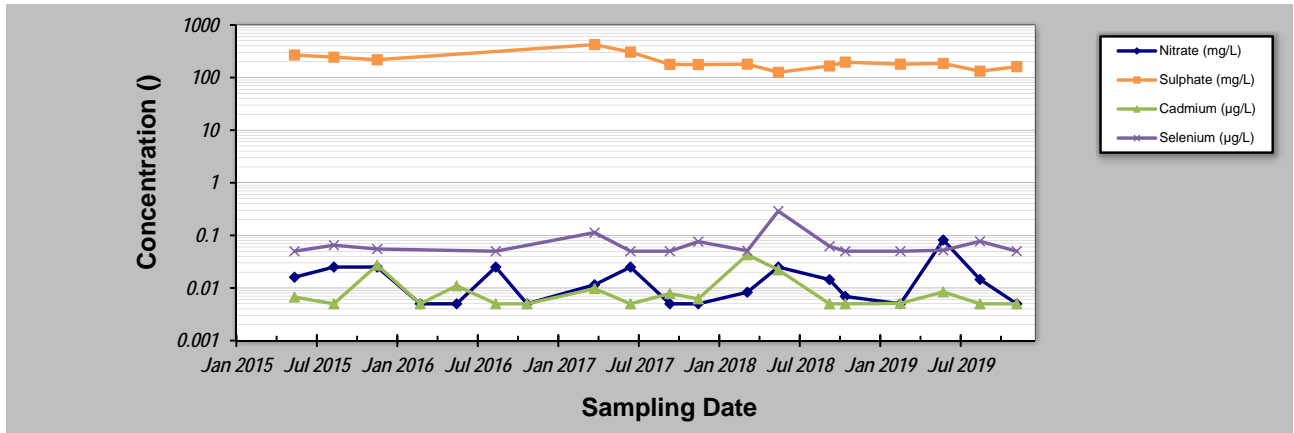
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - EVO** Location: **EV_WF_SW**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	EV_WF_SW CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	14-May-15	0.016	269	0.0067	0.05
2	12-Aug-15	0.025	244	0.005	0.065
3	19-Nov-15	0.025	218	0.0272	0.055
4	25-Feb-16	0.005	157	0.005	0.425
5	18-May-16	0.005	128	0.011	0.066
6	16-Aug-16	0.025	298	0.005	0.05
7	26-Oct-16	0.005	170	0.005	0.072
8	30-Mar-17	0.0115	424	0.0097	0.113
9	20-Jun-17	0.025	305	0.005	0.05
10	18-Sep-17	0.005	178	0.0078	0.05
11	22-Nov-17	0.005	177	0.0062	0.076
12	14-Mar-18	0.0083	180	0.0428	0.051
13	24-May-18	0.025	126	0.0221	0.289
14	18-Sep-18	0.0144	166	0.005	0.062
15	24-Oct-18	0.0069	196	0.005	0.05
16	27-Feb-19	0.005	180	0.0051	0.05
17	5-Jun-19	0.0817	186	0.0084	0.052
18	28-Aug-19	0.0145	132	0.005	0.077
19	20-Nov-19	0.005	161	0.005	0.05
20					

Coefficient of Variation:	1.08	0.36	0.99	0.80
Mann-Kendall Statistic (S):	-12	-84	-15	-28
Confidence Factor:	64.8%	>99.9%	68.6%	88.6%
Concentration Trend:	No Trend	Decreasing	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

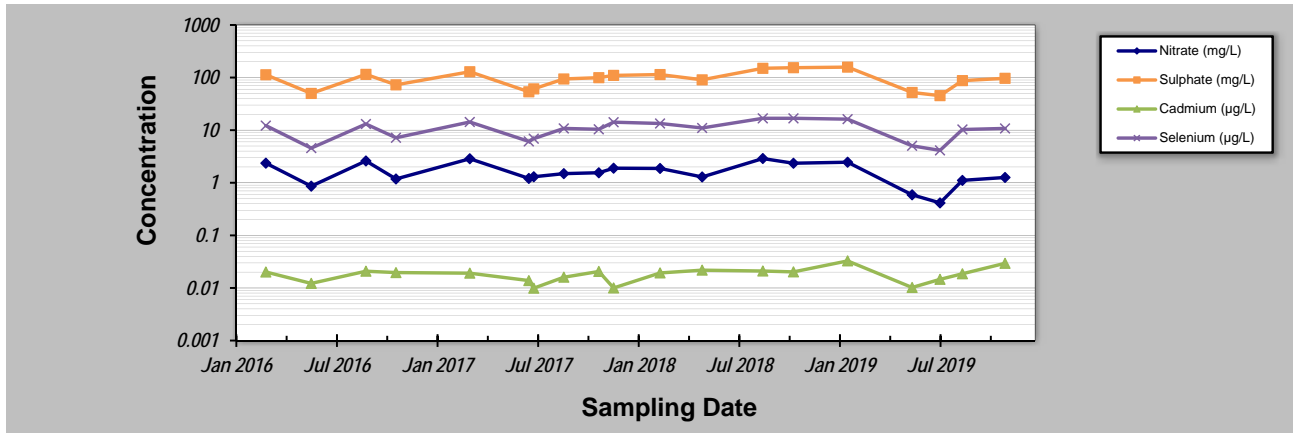
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - EVO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **EV_WH50gw**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	EV_WH50GW CONCENTRATION			
1	24-Feb-16	2.36	113	0.0201	12.2
2	17-May-16	0.861	49.9	0.0122	4.56
3	25-Aug-16	2.6	115	0.0208	13.1
4	19-Oct-16	1.18	72.8	0.0196	7.17
5	3-Mar-17	2.86	129	0.0191	14.3
6	19-Jun-17	1.21	53.6	0.0138	6.12
7	28-Jun-17	1.3	61	0.0099	6.89
8	22-Aug-17	1.49	94.1	0.016	10.8
9	25-Oct-17	1.55	99.4	0.0206	10.4
10	21-Nov-17	1.89	110	0.01	14.2
11	14-Feb-18	1.87	114	0.0193	13.4
12	2-May-18	1.29	90.6	0.0218	11
13	21-Aug-18	2.89	150	0.021	16.8
14	16-Oct-18	2.35	154	0.0202	16.8
15	23-Jan-19	2.46	158	0.0327	16.2
16	21-May-19	0.59	52.1	0.0102	5.04
17	11-Jul-19	0.414	45.3	0.0146	4.13
18	21-Aug-19	1.11	87.5	0.0186	10.3
19	7-Nov-19	1.26	96.8	0.0294	10.8
20					

Coefficient of Variation:	0.45	0.37	0.33	0.38
Mann-Kendall Statistic (S):	-17	13	25	13
Confidence Factor:	71.0%	66.1%	79.7%	66.1%
Concentration Trend:	Stable	No Trend	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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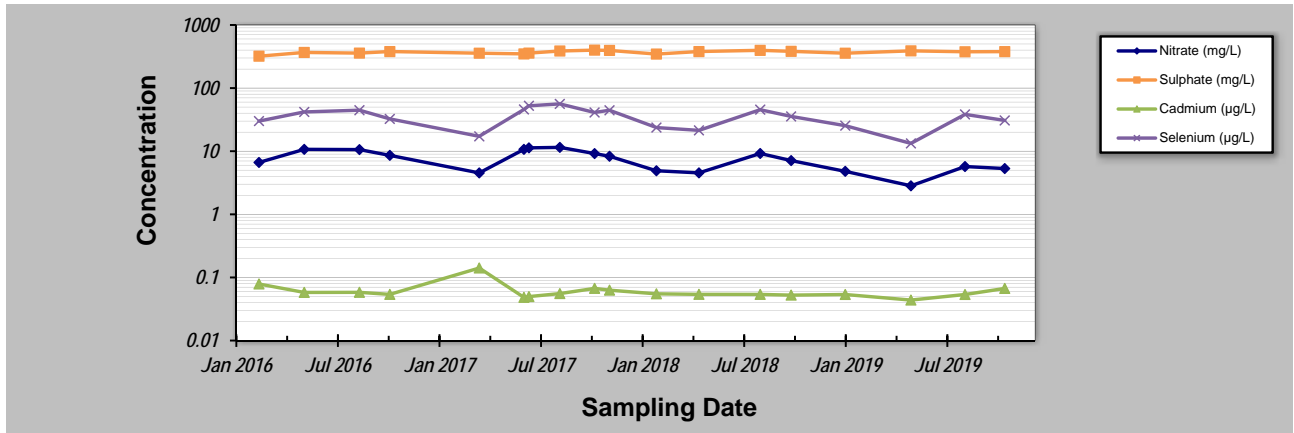
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - EVO** Location: **EV_BRGw**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L)** **Sulphate (mg/L)** **Cadmium (µg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	EV_BRGW CONCENTRATION			
1	25-Feb-16	6.64	320	0.0788	30
2	17-May-16	10.7	367	0.0579	41.9
3	25-Aug-16	10.6	358	0.0581	44.7
4	19-Oct-16	8.6	379	0.0539	32.5
5	30-Mar-17	4.53	357	0.141	17.2
6	19-Jun-17	10.7	348	0.0483	45.9
7	28-Jun-17	11.3	358	0.0497	52.4
8	23-Aug-17	11.5	387	0.0555	56.2
9	25-Oct-17	9.18	399	0.0671	41.1
10	21-Nov-17	8.31	395	0.0628	44.5
11	14-Feb-18	4.9	346	0.055	23.7
12	2-May-18	4.54	379	0.054	21.4
13	21-Aug-18	9.2	396	0.0539	45.5
14	16-Oct-18	7.1	382	0.0525	35.6
15	22-Jan-19	4.8	357	0.0537	25.4
16	21-May-19	2.83	389	0.0438	13.3
17	27-Aug-19	5.72	376	0.0537	38.3
18	7-Nov-19	5.31	378	0.0669	30.7
19					
20					

Coefficient of Variation:	0.37	0.06	0.35	0.34
Mann-Kendall Statistic (S):	-52	36	-47	-27
Confidence Factor:	97.4%	90.6%	95.9%	83.5%
Concentration Trend:	Decreasing	Prob. Increasing	Decreasing	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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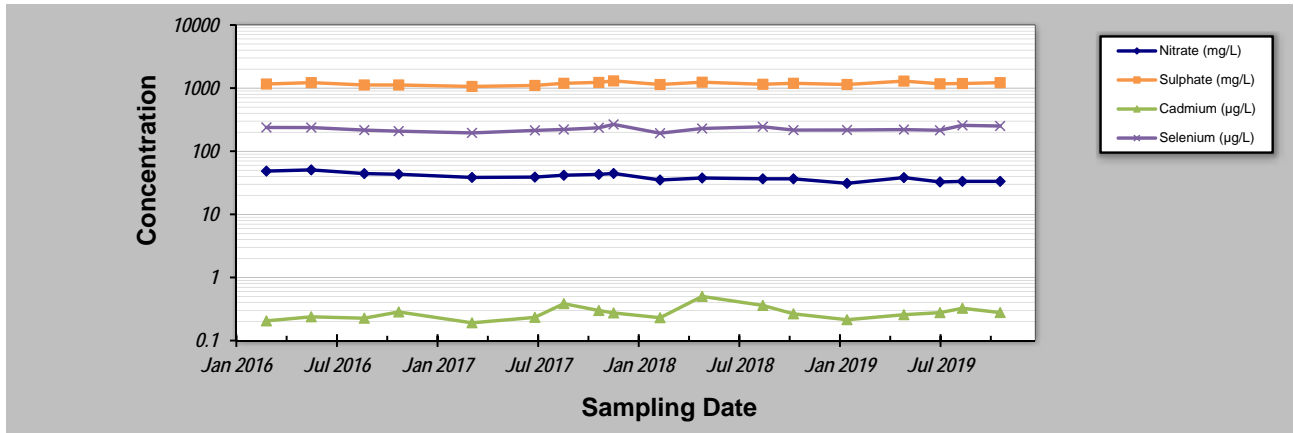
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - EVO** Location: **EV_RCgw**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	EV_RCgw CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	25-Feb-16	48.4	1160	0.205	238
2	17-May-16	50.6	1220	0.238	237
3	22-Aug-16	44.2	1120	0.226	216
4	24-Oct-16	43.1	1120	0.284	208
5	7-Mar-17	38.4	1060	0.191	195
6	30-Jun-17	38.9	1100	0.233	214
7	22-Aug-17	41.6	1190	0.384	221
8	25-Oct-17	42.9	1230	0.299	235
9	21-Nov-17	44.4	1300	0.274	266
10	14-Feb-18	35	1140	0.23	193
11	2-May-18	37.6	1240	0.501	229
12	21-Aug-18	36.5	1150	0.36	244
13	16-Oct-18	36.5	1190	0.265	216
14	22-Jan-19	31	1140	0.214	217
15	6-May-19	38.2	1290	0.257	220
16	11-Jul-19	32.6	1170	0.277	215
17	21-Aug-19	33.3	1180	0.325	257
18	29-Oct-19	33.3	1220	0.278	251
19					
20					

Coefficient of Variation:	0.14	0.05	0.27	0.09
Mann-Kendall Statistic (S):	-99	37	39	20
Confidence Factor:	>99.9%	91.2%	92.4%	76.2%
Concentration Trend:	Decreasing	Prob. Increasing	Prob. Increasing	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

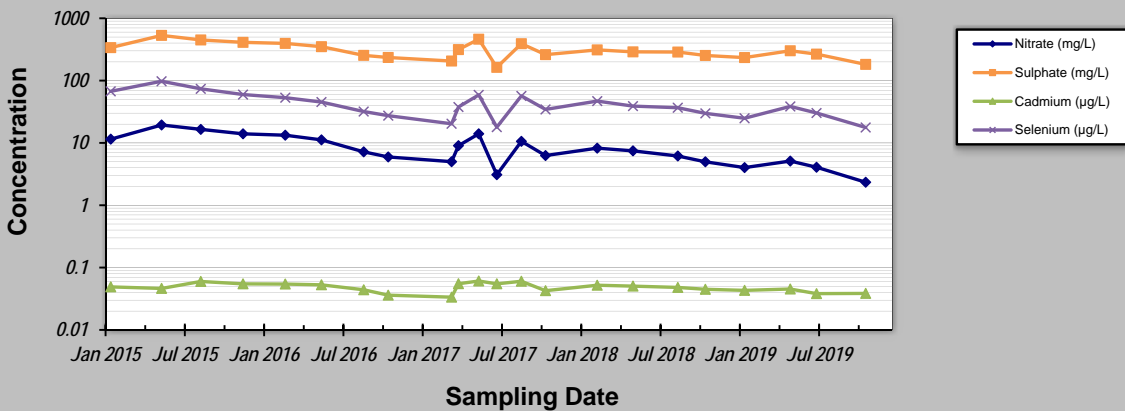
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - EVO** Location: **EV_BCgw**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (µg/L) | Selenium (µg/L)**

Sampling Event	Sampling Date	EV_BCgw CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	13-Jan-15	11.5	338	0.049	67.3
2	11-May-15	19.4	531	0.0463	97.6
3	10-Aug-15	16.5	449	0.0599	73.8
4	16-Nov-15	14	411	0.0548	59.7
5	22-Feb-16	13.3	395	0.0544	53.2
6	16-May-16	11.2	350	0.0529	45.3
7	22-Aug-16	7.19	254	0.044	31.9
8	18-Oct-16	5.96	235	0.0361	27.4
9	14-Mar-17	5	206	0.0335	20.3
10	30-Mar-17	9.04	314	0.0551	37.7
11	16-May-17	14	462	0.0609	59
12	27-Jun-17	3.09	163	0.0549	17.9
13	23-Aug-17	10.6	391	0.0603	56.8
14	18-Oct-17	6.27	261	0.0426	34.5
15	15-Feb-18	8.25	311	0.0521	46.9
16	9-May-18	7.46	289	0.0504	39
17	21-Aug-18	6.17	287	0.048	36.7
18	24-Oct-18	4.98	253	0.0448	29.8
19	23-Jan-19	4.02	234	0.0431	24.9
20	9-May-19	5.12	301	0.0453	38.5
21	9-Jul-19	4.07	266	0.0382	30.2
22	31-Oct-19	2.34	182	0.0385	17.7
23					
24					
25					
Coefficient of Variation:		0.54	0.30	0.16	0.46
Mann-Kendall Statistic (S):		-144	-101	-67	-113
Confidence Factor:		>99.9%	99.8%	96.9%	99.9%
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

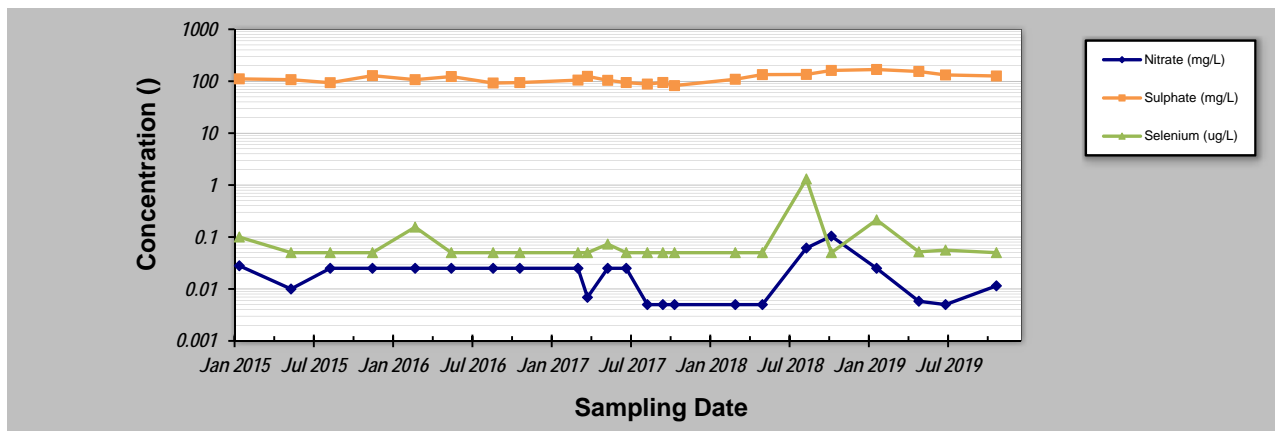
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - EVO** Location: **EV_MCgws**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) | Sulphate (mg/L) | Selenium (ug/L)**

Sampling Event	Sampling Date	EV_MCgws CONCENTRATION					
		Nitrate (mg/L)	Sulphate (mg/L)	Selenium (ug/L)			
1	12-Jan-15	0.028	111	0.1			
2	12-May-15	0.01	107	0.05			
3	11-Aug-15	0.025	93.6	0.05			
4	17-Nov-15	0.025	128	0.05			
5	24-Feb-16	0.025	107	0.155			
6	18-May-16	0.025	123	0.05			
7	23-Aug-16	0.025	92.2	0.05			
8	24-Oct-16	0.025	94.1	0.05			
9	8-Mar-17	0.025	105	0.05			
10	30-Mar-17	0.0069	124	0.05			
11	16-May-17	0.025	104	0.073			
12	28-Jun-17	0.025	94.2	0.05			
13	16-Aug-17	0.005	88.1	0.05			
14	21-Sep-17	0.005	94.4	0.05			
15	18-Oct-17	0.005	82.3	0.05			
16	8-Mar-18	0.005	109	0.05			
17	10-May-18	0.005	134	0.05			
18	20-Aug-18	0.0613	135	1.31			
19	17-Oct-18	0.104	161	0.05			
20	30-Jan-19	0.025	168	0.214			
21	8-May-19	0.0058	154	0.052			
22	9-Jul-19	0.005	132	0.056			
23	4-Nov-19	0.0115	126	0.05			
24							
25							
Coefficient of Variation:		1.01	0.20	2.19			
Mann-Kendall Statistic (S):		-59	72	23			
Confidence Factor:		93.7%	97.0%	71.7%			
Concentration Trend:		Prob. Decreasing	Increasing	No Trend			



Notes:

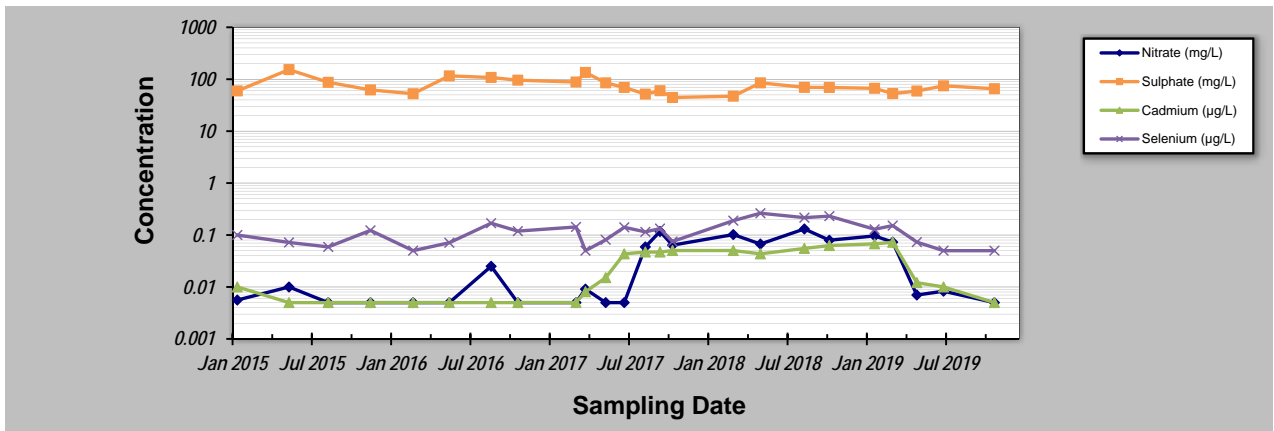
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - EVO** Location: **EV_MCgwd**
 Conducted By: **NDS**

Parameter (units)		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)			
Sampling Event	Sampling Date	EV_MCgWD CONCENTRATION						
1	12-Jan-15	0.0056	59.5	0.01	0.1			
2	12-May-15	0.01	153	0.005	0.072			
3	11-Aug-15	0.005	87.2	0.005	0.059			
4	17-Nov-15	0.005	62.2	0.005	0.123			
5	24-Feb-16	0.005	52.5	0.005	0.05			
6	18-May-16	0.005	116	0.005	0.071			
7	23-Aug-16	0.025	108	0.005	0.169			
8	24-Oct-16	0.005	95.8	0.005	0.119			
9	8-Mar-17	0.005	88.3	0.005	0.143			
10	30-Mar-17	0.0091	135	0.0081	0.05			
11	16-May-17	0.005	85.1	0.0151	0.081			
12	28-Jun-17	0.005	69.4	0.0434	0.141			
13	16-Aug-17	0.059	51.7	0.047	0.115			
14	19-Sep-17	0.117	60.1	0.047	0.133			
15	18-Oct-17	0.0639	44.5	0.0503	0.075			
16	8-Mar-18	0.102	47.1	0.0503	0.189			
17	10-May-18	0.0671	85.1	0.0434	0.263			
18	20-Aug-18	0.131	69.6	0.0552	0.216			
19	17-Oct-18	0.0794	69.3	0.0627	0.231			
20	30-Jan-19	0.0959	66.8	0.0677	0.129			
21	13-Mar-19	0.073	52.9	0.0724	0.152			
22	8-May-19	0.007	59.2	0.0121	0.073			
23	9-Jul-19	0.0083	74.6	0.01	0.05			
24	4-Nov-19	0.005	65.6	0.005	0.05			
25								
Coefficient of Variation:		1.14	0.36	0.92	0.51			
Mann-Kendall Statistic (S):		84	-79	134	38			
Confidence Factor:		98.1%	97.4%	>99.9%	81.9%			
Concentration Trend:		Increasing	Decreasing	Increasing	No Trend			



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

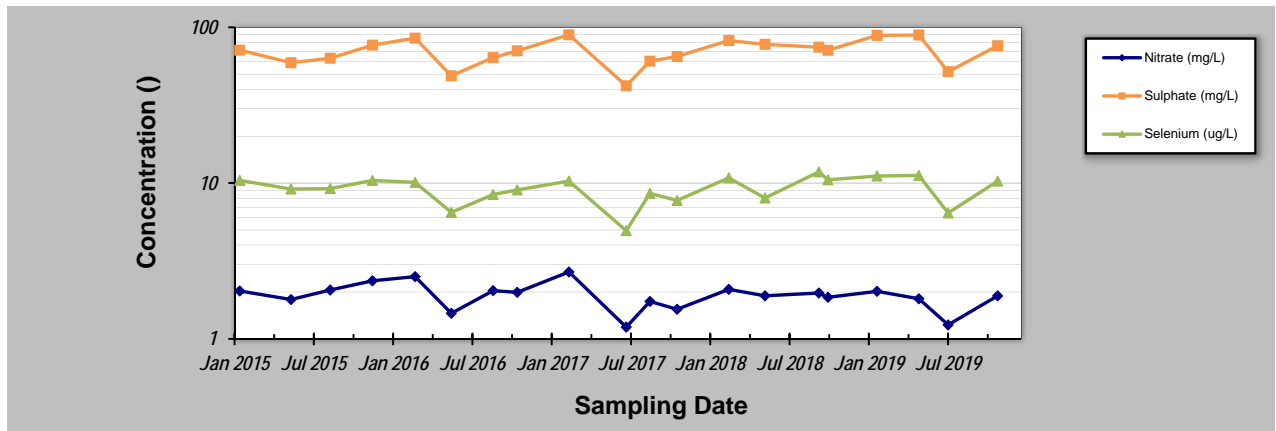
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - EVO** Location: **EV_ER1gwS**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) | Sulphate (mg/L) | Selenium (ug/L)**

Sampling Event	Sampling Date	EV_ER1GWS CONCENTRATION					
		Nitrate (mg/L)	Sulphate (mg/L)	Selenium (ug/L)			
1	13-Jan-15	2.03	71.3	10.4			
2	12-May-15	1.79	59.2	9.16			
3	11-Aug-15	2.06	63.3	9.22			
4	17-Nov-15	2.36	76.8	10.4			
5	24-Feb-16	2.51	85.2	10.1			
6	18-May-16	1.46	48.8	6.49			
7	23-Aug-16	2.04	63.9	8.44			
8	18-Oct-16	1.99	70.6	9.04			
9	15-Feb-17	2.69	89.5	10.3			
10	28-Jun-17	1.19	42.1	4.95			
11	22-Aug-17	1.74	60.6	8.59			
12	24-Oct-17	1.55	65	7.74			
13	21-Feb-18	2.08	82.2	10.8			
14	16-May-18	1.89	77.7	8.02			
15	18-Sep-18	1.97	74.5	11.8			
16	9-Oct-18	1.85	71.2	10.5			
17	31-Jan-19	2.02	88.7	11.1			
18	8-May-19	1.81	89.2	11.2			
19	15-Jul-19	1.23	51.9	6.43			
20	7-Nov-19	1.89	76.1	10.3			
21							
22							
23							
24							
25							
Coefficient of Variation:		0.20	0.19	0.20			
Mann-Kendall Statistic (S):		-41	38	20			
Confidence Factor:		90.2%	88.3%	72.9%			
Concentration Trend:		Prob. Decreasing	No Trend	No Trend			



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

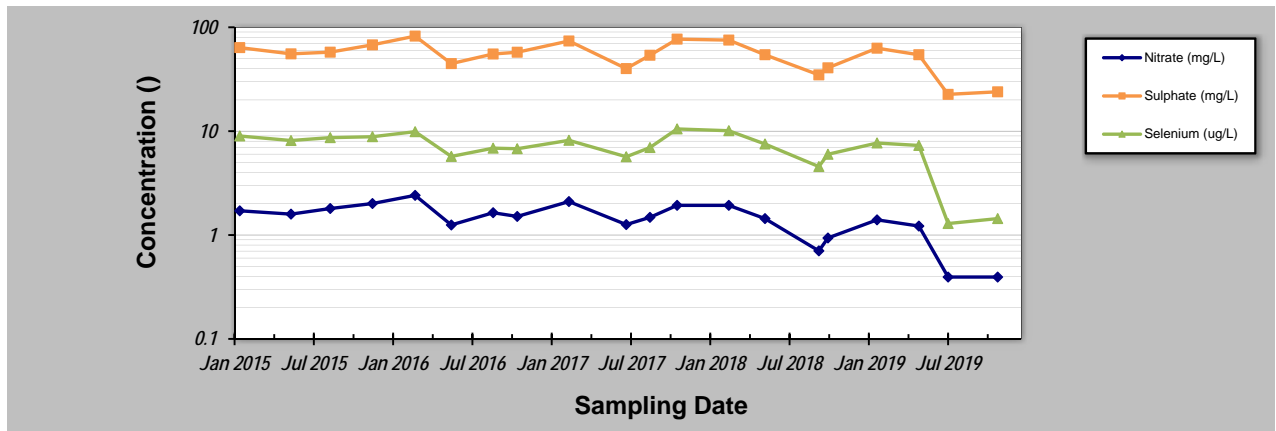
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - EVO** Location: **EV_ER1gwD**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) | Sulphate (mg/L) | Selenium (ug/L)**

Sampling Event	Sampling Date	EV_ER1GWD CONCENTRATION					
		Nitrate (mg/L)	Sulphate (mg/L)	Selenium (ug/L)			
1	13-Jan-15	1.71	63.7	8.98			
2	12-May-15	1.59	55.5	8.12			
3	11-Aug-15	1.8	57.6	8.66			
4	17-Nov-15	2.01	67.7	8.84			
5	24-Feb-16	2.41	82.2	9.88			
6	18-May-16	1.25	44.7	5.71			
7	23-Aug-16	1.64	55.3	6.86			
8	18-Oct-16	1.51	57.5	6.77			
9	15-Feb-17	2.1	73.8	8.16			
10	28-Jun-17	1.26	40	5.67			
11	22-Aug-17	1.48	53.8	6.95			
12	24-Oct-17	1.93	76.9	10.5			
13	21-Feb-18	1.93	75.3	10.1			
14	16-May-18	1.44	54.4	7.52			
15	18-Sep-18	0.704	34.8	4.56			
16	9-Oct-18	0.937	40.7	5.99			
17	31-Jan-19	1.4	62.9	7.69			
18	8-May-19	1.22	54.4	7.28			
19	15-Jul-19	0.394	22.6	1.29			
20	7-Nov-19	0.394	23.9	1.44			
21							
22							
23							
24							
25							
Coefficient of Variation:		0.37	0.30	0.35			
Mann-Kendall Statistic (S):		-94	-65	-64			
Confidence Factor:		99.9%	98.2%	98.0%			
Concentration Trend:		Decreasing	Decreasing	Decreasing			



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

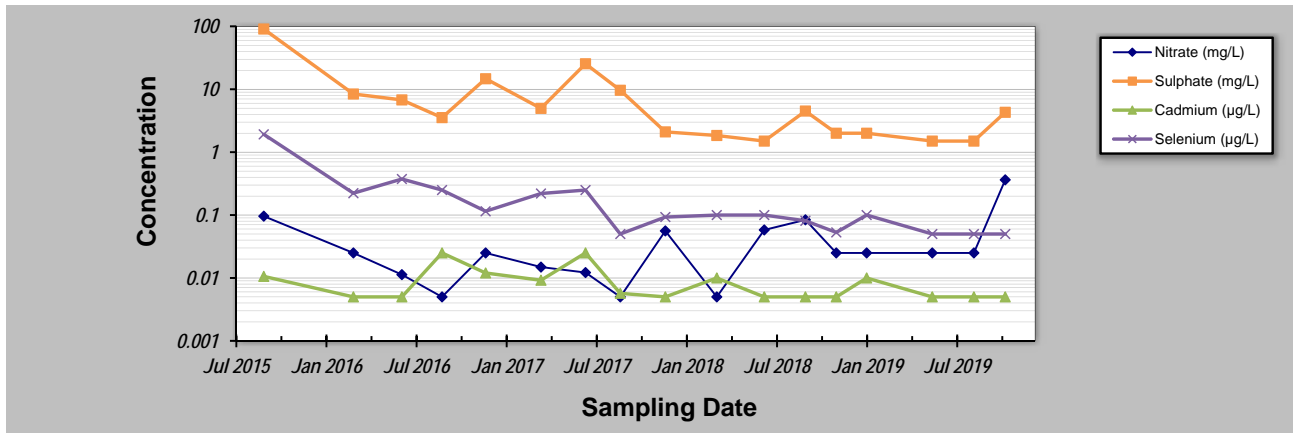
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - CMO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **CM_MW1-DP**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	CM_MW1-DP CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	9-Sep-15	0.096	90.6	0.0106	1.92
2	10-Mar-16	0.025	8.4	0.005	0.223
3	17-Jun-16	0.0113	6.77	0.005	0.374
4	7-Sep-16	0.005	3.54	0.025	0.25
5	5-Dec-16	0.025	14.7	0.012	0.115
6	28-Mar-17	0.0149	4.97	0.0092	0.22
7	27-Jun-17	0.0122	25.4	0.025	0.25
8	6-Sep-17	0.005	9.64	0.0057	0.05
9	7-Dec-17	0.056	2.1	0.005	0.093
10	22-Mar-18	0.005	1.84	0.01	0.1
11	27-Jun-18	0.058	1.5	0.005	0.1
12	19-Sep-18	0.084	4.5	0.005	0.081
13	21-Nov-18	0.025	2	0.005	0.053
14	22-Jan-19	0.025	2	0.01	0.1
15	5-Jun-19	0.025	1.5	0.005	0.05
16	29-Aug-19	0.025	1.5	0.005	0.05
17	1-Nov-19	0.363	4.3	0.005	0.05
18					
19					
20					

Coefficient of Variation:	1.68	1.97	0.73	1.85
Mann-Kendall Statistic (S):	26	-74	-42	-92
Confidence Factor:	84.6%	99.9%	95.4%	>99.9%
Concentration Trend:	No Trend	Decreasing	Decreasing	Decreasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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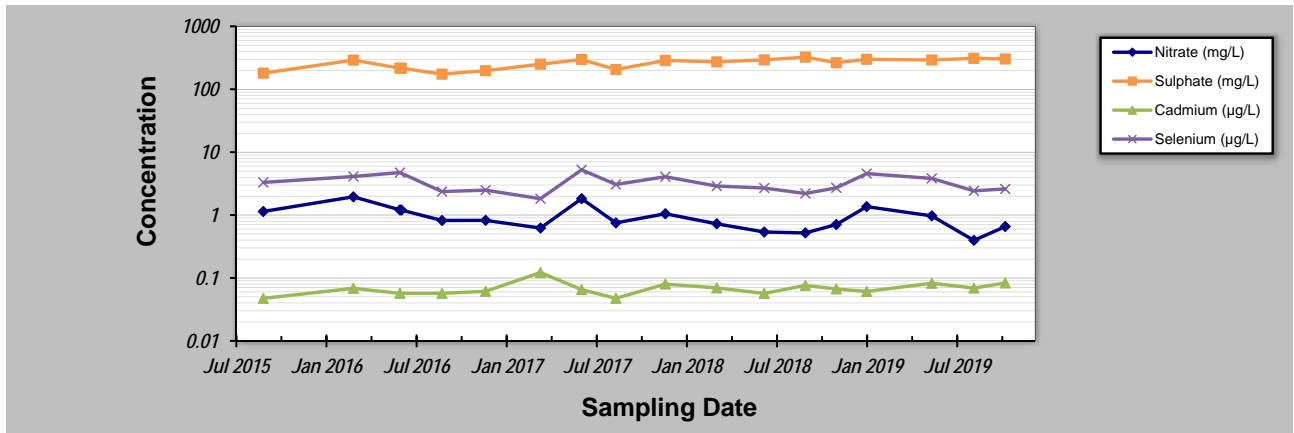
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - CMO** Location: **CM_MW1-OB**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L)** **Sulphate (mg/L)** **Cadmium (µg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	CM_MW1-OB CONCENTRATION			
1	8-Sep-15	1.14	180	0.0474	3.3
2	10-Mar-16	1.95	291	0.0685	4.1
3	13-Jun-16	1.21	216	0.057	4.73
4	16-Jun-16	1.2	216		
5	7-Sep-16	0.82	174	0.057	2.36
6	5-Dec-16	0.824	197	0.0613	2.49
7	27-Mar-17	0.622	250	0.122	1.82
8	19-Jun-17	1.82	297	0.0653	5.24
9	28-Aug-17	0.751	206	0.0474	3.07
10	7-Dec-17	1.05	287	0.0799	4.07
11	22-Mar-18	0.726	272	0.0695	2.89
12	27-Jun-18	0.538	293	0.0569	2.69
13	19-Sep-18	0.52	324	0.0761	2.2
14	21-Nov-18	0.707	264	0.0668	2.71
15	22-Jan-19	1.36	300	0.0611	4.56
16	4-Jun-19	0.97	292	0.0824	3.82
17	29-Aug-19	0.396	310	0.0691	2.43
18	1-Nov-19	0.657	303	0.0833	2.6
19					
20					

Coefficient of Variation:	0.45	0.19	0.25	0.31
Mann-Kendall Statistic (S):	-67	82	46	-20
Confidence Factor:	99.5%	99.9%	96.8%	78.0%
Concentration Trend:	Decreasing	Increasing	Increasing	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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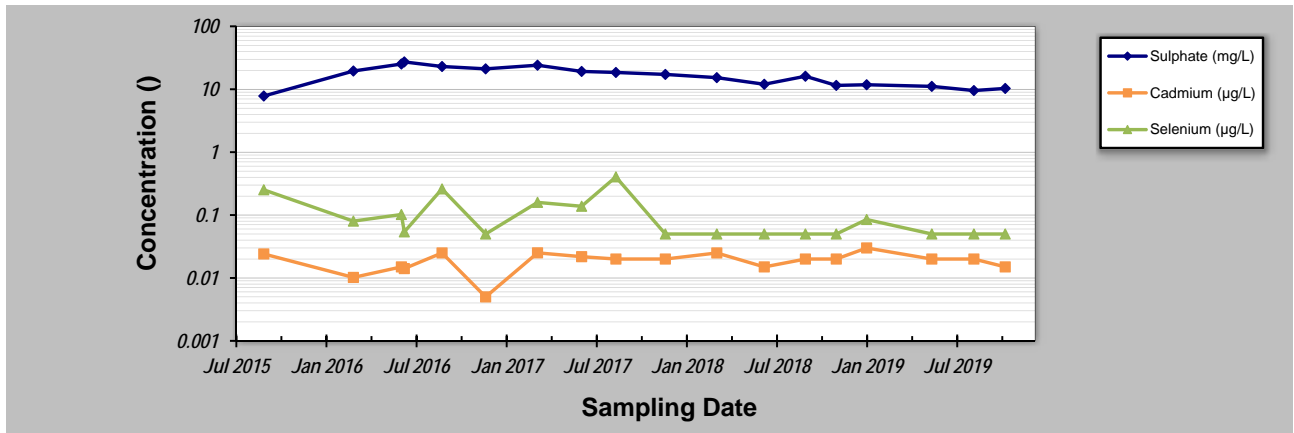
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - CMO	Location: CM_MW1-SH
Conducted By: NDS	

Parameter (units): **Sulphate (mg/L)** **Cadmium (µg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	CM_MW1-SH CONCENTRATION					
		Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)			
1	9-Sep-15	7.8	0.0241	0.252			
2	10-Mar-16	19.5	0.0102	0.08			
3	16-Jun-16	25.2	0.015	0.102			
4	22-Jun-16	27.2	0.0141	0.054			
5	7-Sep-16	23	0.025	0.26			
6	5-Dec-16	21.1	0.005	0.05			
7	21-Mar-17	24.1	0.0251	0.159			
8	19-Jun-17	19.2	0.0218	0.138			
9	28-Aug-17	18.5	0.02	0.404			
10	7-Dec-17	17.2	0.02	0.05			
11	22-Mar-18	15.3	0.025	0.05			
12	27-Jun-18	12	0.015	0.05			
13	19-Sep-18	16.1	0.02	0.05			
14	21-Nov-18	11.5	0.02	0.05			
15	22-Jan-19	11.8	0.03	0.085			
16	4-Jun-19	11.1	0.02	0.05			
17	29-Aug-19	9.54	0.02	0.05			
18	1-Nov-19	10.3	0.015	0.05			
19							
20							

Coefficient of Variation:	0.35	0.31	0.91			
Mann-Kendall Statistic (S):	-95	10	-59			
Confidence Factor:	>99.9%	63.2%	98.7%			
Concentration Trend:	Decreasing	No Trend	Decreasing			



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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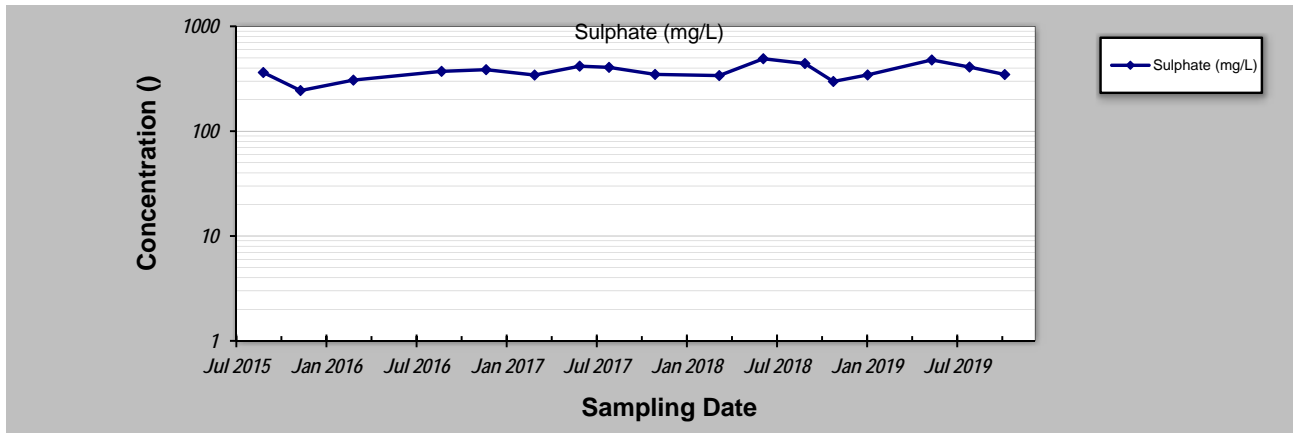
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - CMO** Location: **CM_MW2-SH**
 Conducted By: **NDS**

Parameter (units): **Sulphate (mg/L)**

Sampling Event	Sampling Date	CM_MW2-SH CONCENTRATION					
1	8-Sep-15	363					
2	23-Nov-15	244					
3	10-Mar-16	307					
4	6-Sep-16	372					
5	6-Dec-16	386					
6	15-Mar-17	343					
7	15-Jun-17	417					
8	14-Aug-17	406					
9	16-Nov-17	348					
10	27-Mar-18	339					
11	25-Jun-18	491					
12	18-Sep-18	442					
13	15-Nov-18	298					
14	24-Jan-19	344					
15	4-Jun-19	478					
16	20-Aug-19	409					
17	31-Oct-19	347					
18							
19							
20							

Coefficient of Variation: **0.17**
 Mann-Kendall Statistic (S): **30**
 Confidence Factor: **88.2%**
 Concentration Trend: **No Trend**



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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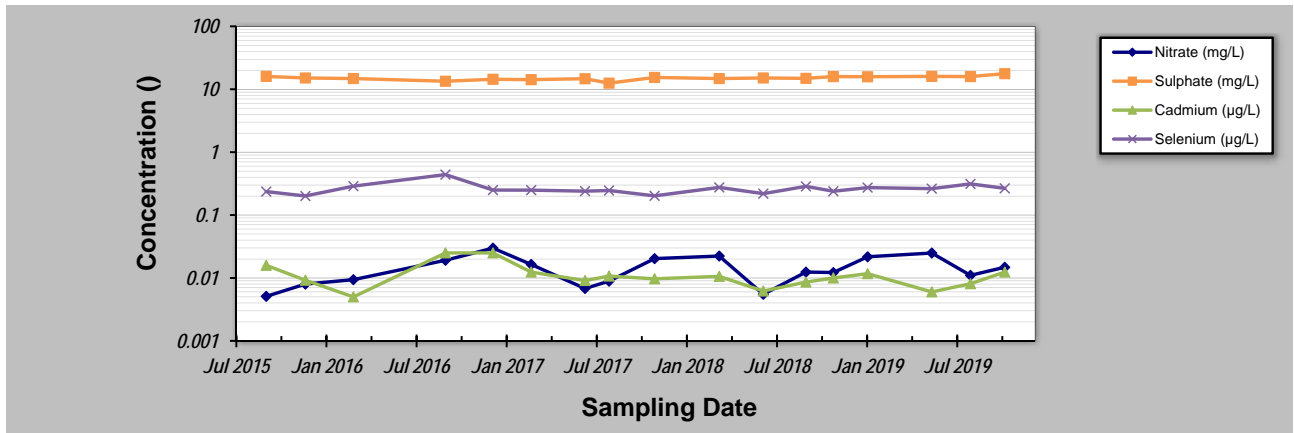
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - CMO** Location: **CM_MW3-SH**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	CM_MW3-SH CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	14-Sep-15	0.0051	16	0.0159	0.236
2	3-Dec-15	0.008	15.1	0.0092	0.201
3	10-Mar-16	0.0094	14.8	0.005	0.288
4	14-Sep-16	0.0191	13.4	0.025	0.44
5	20-Dec-16	0.0298	14.4	0.025	0.25
6	8-Mar-17	0.0164	14.2	0.0124	0.249
7	26-Jun-17	0.0068	14.7	0.0091	0.24
8	14-Aug-17	0.0089	12.5	0.0107	0.246
9	15-Nov-17	0.0203	15.4	0.0097	0.202
10	27-Mar-18	0.0223	14.8	0.0106	0.275
11	25-Jun-18	0.0055	15.1	0.0062	0.219
12	20-Sep-18	0.0124	14.9	0.0086	0.286
13	15-Nov-18	0.0122	15.9	0.01	0.239
14	24-Jan-19	0.0217	15.8	0.0117	0.273
15	4-Jun-19	0.0249	16	0.006	0.263
16	22-Aug-19	0.011	15.9	0.0081	0.313
17	31-Oct-19	0.0148	17.7	0.0124	0.266
18					
19					
20					

Coefficient of Variation:	0.50	0.08	0.50	0.21
Mann-Kendall Statistic (S):	32	56	-28	22
Confidence Factor:	89.8%	98.9%	86.5%	80.4%
Concentration Trend:	No Trend	Increasing	Stable	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

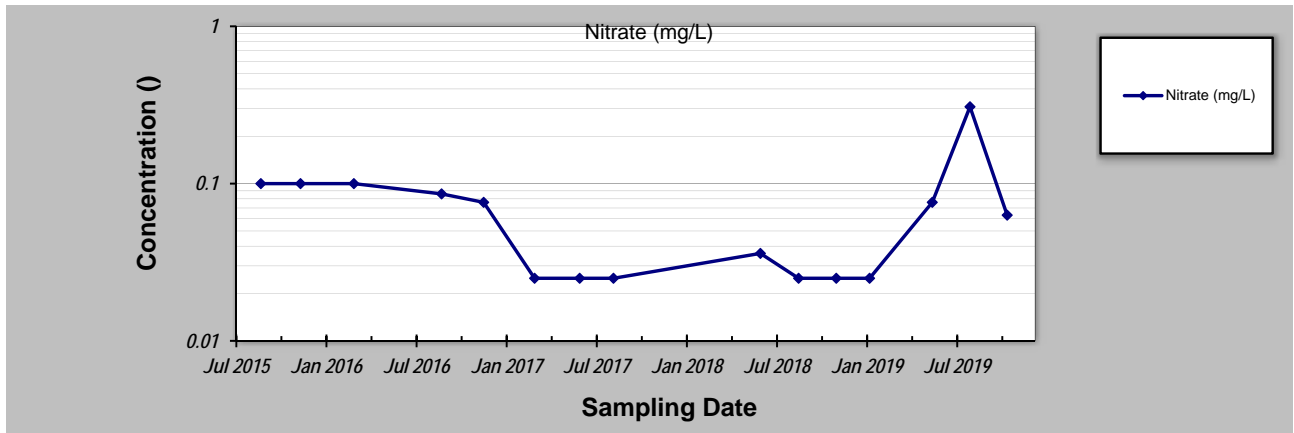
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - CMO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **CM_MW4-DP**

Parameter (units): **Nitrate (mg/L)**

Sampling Event	Sampling Date	CM_MW4-DP CONCENTRATION					
1	3-Sep-15	0.1					
2	23-Nov-15	0.1					
3	11-Mar-16	0.1					
4	6-Sep-16	0.086					
5	1-Dec-16	0.076					
6	15-Mar-17	0.025					
7	15-Jun-17	0.025					
8	23-Aug-17	0.025					
9	19-Jun-18	0.036					
10	5-Sep-18	0.025					
11	21-Nov-18	0.025					
12	28-Jan-19	0.025					
13	5-Jun-19	0.076					
14	21-Aug-19	0.308					
15	5-Nov-19	0.063					
16							
17							
18							
19							
20							

Coefficient of Variation: **0.99**
 Mann-Kendall Statistic (S): **-26**
 Confidence Factor: **89.0%**
 Concentration Trend: **Stable**



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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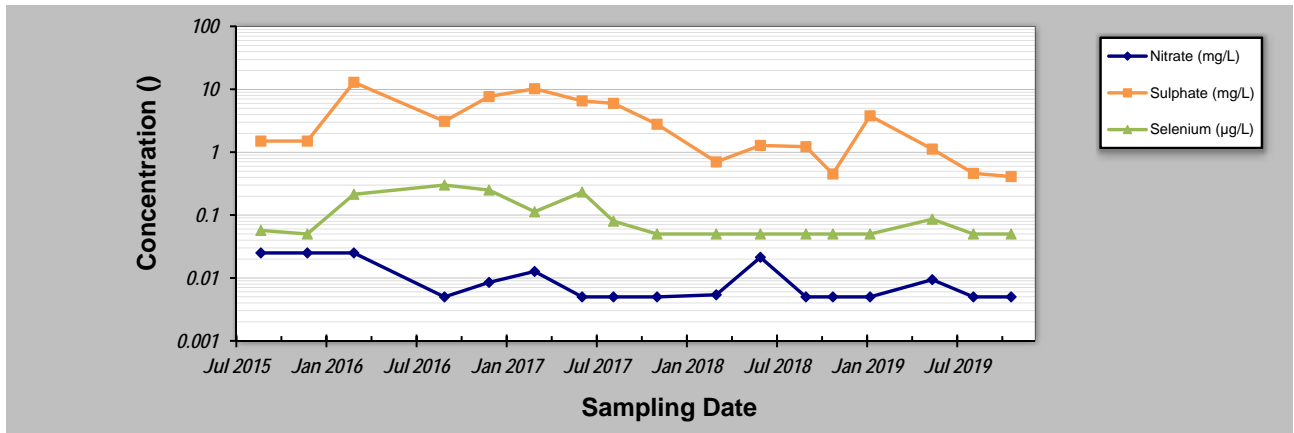
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - CMO** Location: **CM_MW5-DP**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	CM_MW5-DP CONCENTRATION		
1	3-Sep-15	0.025	1.5	0.057
2	7-Dec-15	0.025	1.5	0.05
3	11-Mar-16	0.025	12.9	0.214
4	12-Sep-16	0.005	3.1	0.3
5	12-Dec-16	0.0085	7.66	0.25
6	15-Mar-17	0.0127	10.2	0.113
7	20-Jun-17	0.005	6.53	0.232
8	23-Aug-17	0.005	5.97	0.08
9	20-Nov-17	0.005	2.78	0.05
10	21-Mar-18	0.0054	0.7	0.05
11	19-Jun-18	0.0213	1.28	0.05
12	20-Sep-18	0.005	1.22	0.05
13	14-Nov-18	0.005	0.45	0.05
14	29-Jan-19	0.005	3.78	0.05
15	5-Jun-19	0.0094	1.12	0.086
16	28-Aug-19	0.005	0.46	0.05
17	13-Nov-19	0.005	0.41	0.05
18				
19				
20				

Coefficient of Variation:	0.78	1.04	0.82
Mann-Kendall Statistic (S):	-51	-71	-50
Confidence Factor:	98.1%	99.9%	97.9%
Concentration Trend:	Decreasing	Decreasing	Decreasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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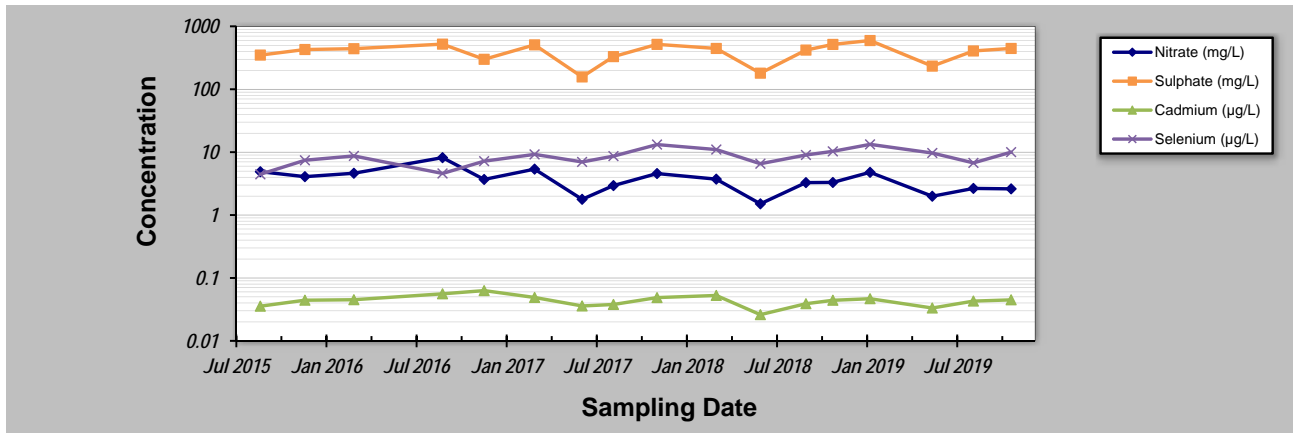
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - CMO** Location: **CM_MW5-SH**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L)** **Sulphate (mg/L)** **Cadmium (µg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	CM_MW5-SH CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	2-Sep-15	4.89	349	0.0356	4.45
2	2-Dec-15	4.08	428	0.0443	7.43
3	11-Mar-16	4.62	441	0.0451	8.71
4	8-Sep-16	8.18	521	0.056	4.59
5	2-Dec-16	3.68	299	0.063	7.19
6	15-Mar-17	5.37	508	0.049	9.22
7	20-Jun-17	1.78	157	0.0359	6.99
8	23-Aug-17	2.94	330	0.0379	8.65
9	20-Nov-17	4.57	517	0.0487	13.2
10	21-Mar-18	3.72	445	0.0527	11
11	19-Jun-18	1.51	180	0.0261	6.55
12	20-Sep-18	3.28	419	0.039	9.02
13	14-Nov-18	3.3	516	0.0442	10.3
14	29-Jan-19	4.78	595	0.0468	13.3
15	5-Jun-19	1.99	233	0.0333	9.69
16	28-Aug-19	2.65	406	0.0429	6.75
17	13-Nov-19	2.61	445	0.0449	10
18					
19					
20					

Coefficient of Variation:	0.43	0.31	0.20	0.29
Mann-Kendall Statistic (S):	-54	9	-14	48
Confidence Factor:	98.6%	62.7%	70.1%	97.4%
Concentration Trend:	Decreasing	No Trend	Stable	Increasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

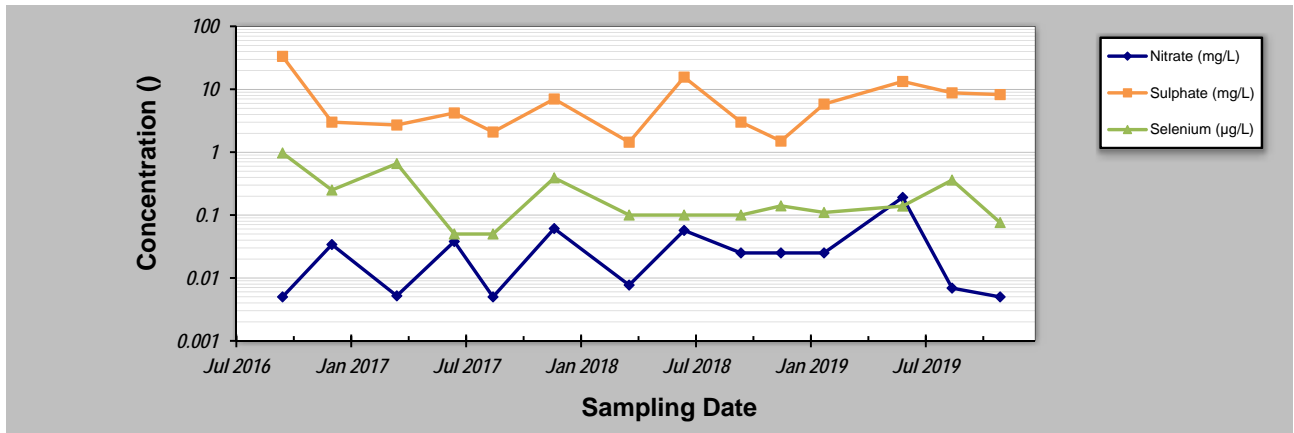
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - CMO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **CM_MW6-DP**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	CM_MW6-DP CONCENTRATION		
1	13-Sep-16	0.005	33.3	0.97
2	1-Dec-16	0.034	3	0.25
3	15-Mar-17	0.0052	2.7	0.659
4	15-Jun-17	0.038	4.2	0.05
5	16-Aug-17	0.005	2.09	0.05
6	22-Nov-17	0.061	7	0.39
7	22-Mar-18	0.0077	1.44	0.1
8	18-Jun-18	0.057	15.6	0.1
9	17-Sep-18	0.025	3	0.1
10	20-Nov-18	0.025	1.5	0.14
11	28-Jan-19	0.025	5.8	0.11
12	3-Jun-19	0.191	13.3	0.139
13	21-Aug-19	0.0069	8.77	0.36
14	6-Nov-19	0.005	8.22	0.076
15				
16				
17				
18				
19				
20				

Coefficient of Variation:	1.39	1.09	1.08
Mann-Kendall Statistic (S):	5	10	-13
Confidence Factor:	58.5%	68.6%	74.1%
Concentration Trend:	No Trend	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

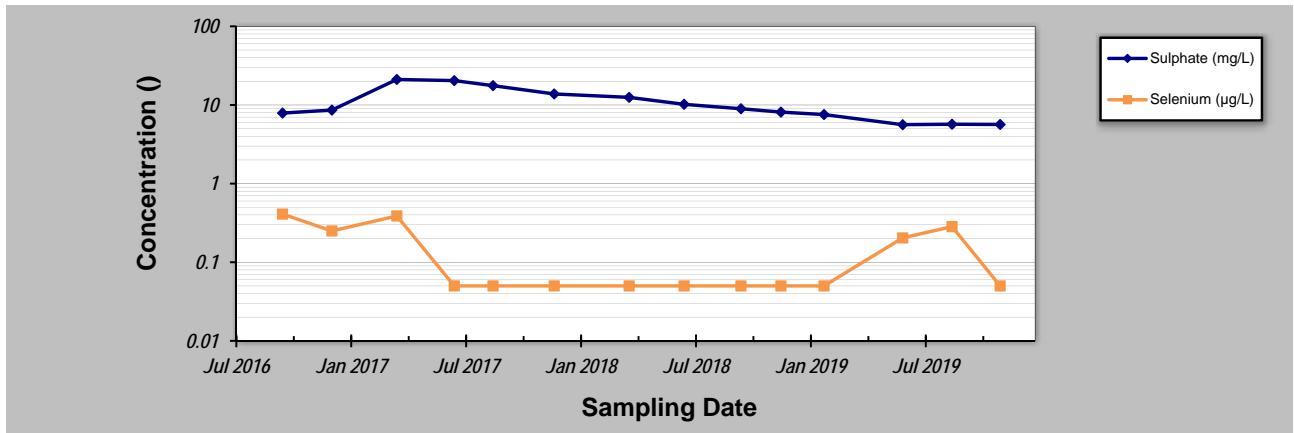
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - CMO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **CM_MW6-SH**

Parameter (units): **Sulphate (mg/L)** **Selenium (µg/L)**

Sampling Event	Sampling Date	CM_MW6-SH CONCENTRATION			
1	13-Sep-16	7.89	0.41		
2	1-Dec-16	8.61	0.25		
3	15-Mar-17	21.1	0.388		
4	15-Jun-17	20.4	0.05		
5	16-Aug-17	17.6	0.05		
6	22-Nov-17	13.8	0.05		
7	22-Mar-18	12.5	0.05		
8	18-Jun-18	10.2	0.05		
9	17-Sep-18	8.96	0.05		
10	20-Nov-18	8.12	0.05		
11	28-Jan-19	7.56	0.05		
12	3-Jun-19	5.61	0.204		
13	21-Aug-19	5.69	0.284		
14	6-Nov-19	5.65	0.05		
15					
16					
17					
18					
19					
20					

Coefficient of Variation:	0.49	0.97				
Mann-Kendall Statistic (S):	-55	-17				
Confidence Factor:	99.9%	80.6%				
Concentration Trend:	Decreasing	Stable				



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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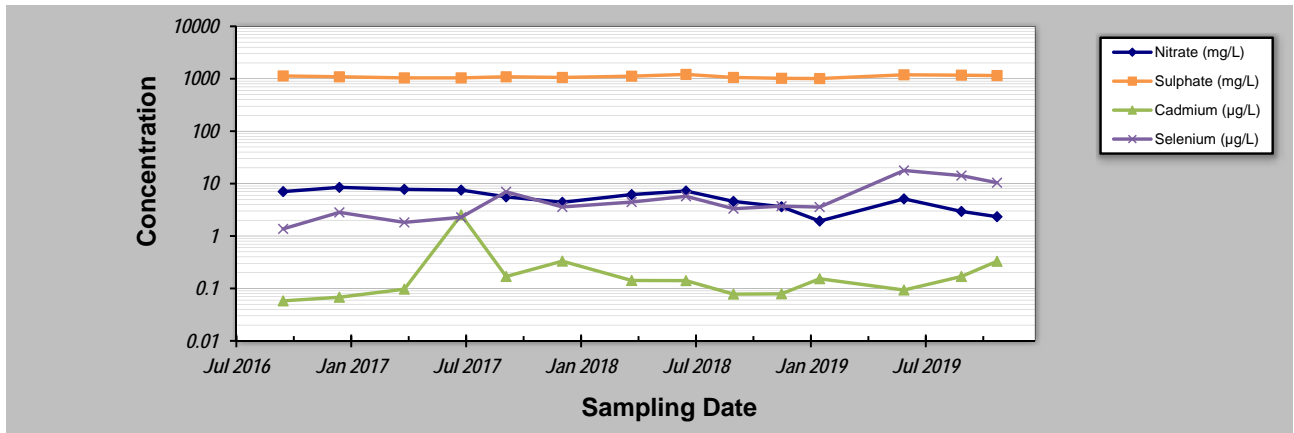
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - CMO** Location: **CM_MW7-DP**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	CM_MW7-DP CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	14-Sep-16	7.05	1130	0.058	1.37
2	13-Dec-16	8.48	1090	0.068	2.83
3	27-Mar-17	7.77	1040	0.097	1.82
4	26-Jun-17	7.53	1040	2.53	2.28
5	6-Sep-17	5.59	1090	0.169	6.98
6	5-Dec-17	4.4	1060	0.332	3.59
7	26-Mar-18	6.18	1120	0.142	4.45
8	21-Jun-18	7.22	1210	0.141	5.73
9	5-Sep-18	4.58	1060	0.078	3.33
10	21-Nov-18	3.62	1020	0.079	3.71
11	21-Jan-19	1.93	1010	0.153	3.57
12	5-Jun-19	5.11	1190	0.0933	17.8
13	5-Sep-19	2.95	1170	0.169	14.2
14	1-Nov-19	2.34	1150	0.33	10.4
15					
16					
17					
18					
19					
20					

Coefficient of Variation:	0.40	0.06	2.03	0.84
Mann-Kendall Statistic (S):	-59	8	20	51
Confidence Factor:	100.0%	64.6%	84.8%	99.8%
Concentration Trend:	Decreasing	No Trend	No Trend	Increasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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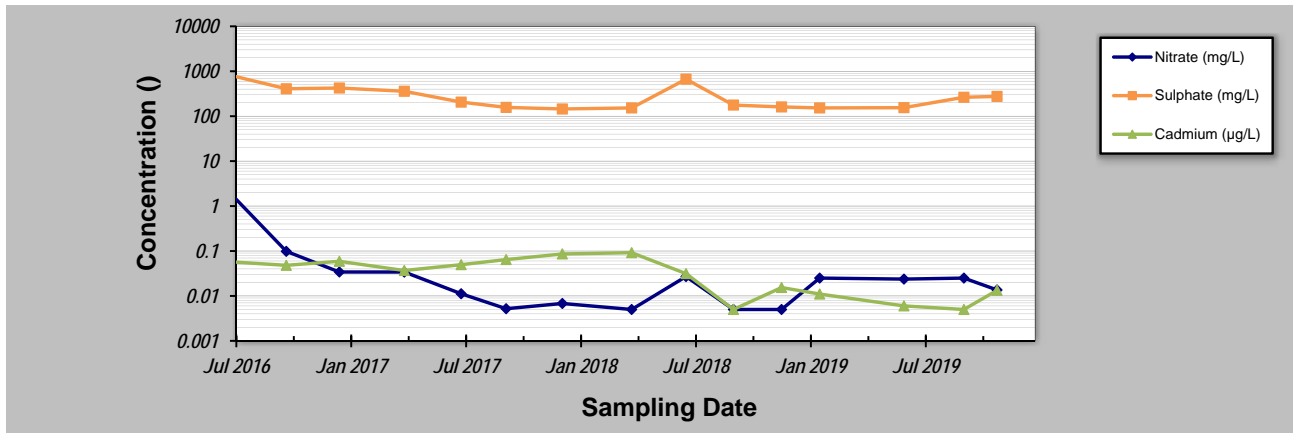
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - CMO** Location: **CM_MW7-SH**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L)**

Sampling Event	Sampling Date	CM_MW7-SH CONCENTRATION		
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)
1	21-Apr-16	14.8	1310	0.065
2	19-Sep-16	0.0984	408	0.048
3	13-Dec-16	0.0341	424	0.059
4	27-Mar-17	0.034	359	0.0368
5	26-Jun-17	0.0112	206	0.0496
6	6-Sep-17	0.0052	157	0.0645
7	5-Dec-17	0.0068	145	0.086
8	26-Mar-18	0.005	153	0.0917
9	21-Jun-18	0.027	667	0.0314
10	5-Sep-18	0.005	177	0.005
11	21-Nov-18	0.005	161	0.0154
12	21-Jan-19	0.025	153	0.011
13	5-Jun-19	0.0237	155	0.006
14	9-Sep-19	0.025	264	0.005
15	1-Nov-19	0.0136	276	0.0133
16				
17				
18				
19				
20				

Coefficient of Variation:	3.79	0.92	0.76
Mann-Kendall Statistic (S):	-41	-32	-50
Confidence Factor:	97.7%	93.7%	99.3%
Concentration Trend:	Decreasing	Prob. Decreasing	Decreasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

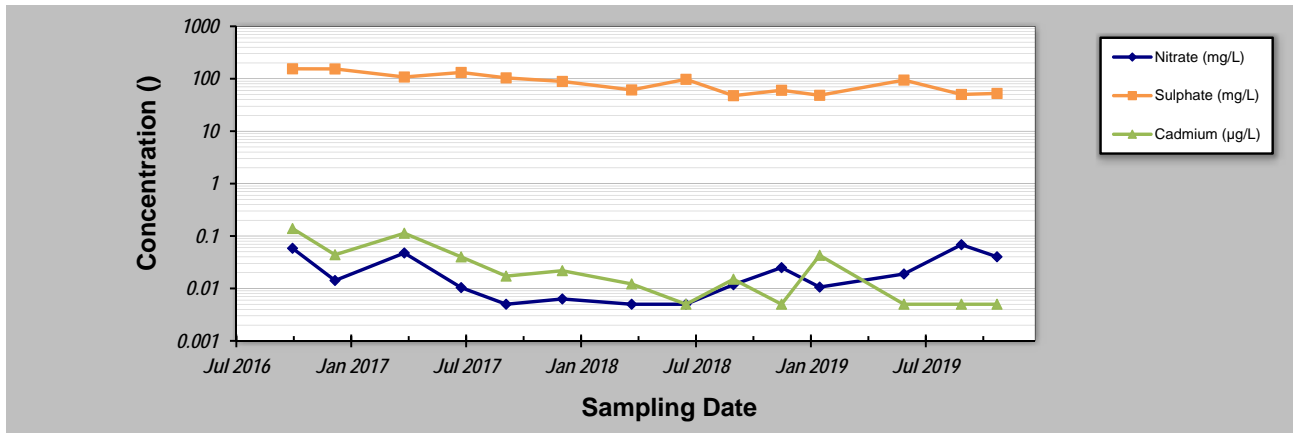
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - CMO**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **CM_MW8**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L)**

Sampling Event	Sampling Date	CM_MW8 CONCENTRATION		
1	29-Sep-16	0.0584	155	0.139
2	6-Dec-16	0.0142	154	0.0439
3	27-Mar-17	0.0475	108	0.113
4	26-Jun-17	0.0104	132	0.04
5	6-Sep-17	0.005	104	0.0172
6	5-Dec-17	0.0063	89	0.0218
7	26-Mar-18	0.005	61.2	0.0122
8	21-Jun-18	0.005	97.6	0.005
9	5-Sep-18	0.0118	47.6	0.015
10	21-Nov-18	0.025	60.4	0.005
11	21-Jan-19	0.0106	48.4	0.0428
12	5-Jun-19	0.0189	94.3	0.005
13	5-Sep-19	0.0684	50.2	0.005
14	1-Nov-19	0.0402	52.5	0.005
15				
16				
17				
18				
19				
20				

Coefficient of Variation:	0.92	0.43	1.25
Mann-Kendall Statistic (S):	10	-61	-59
Confidence Factor:	68.6%	>99.9%	100.0%
Concentration Trend:	No Trend	Decreasing	Decreasing



Notes:

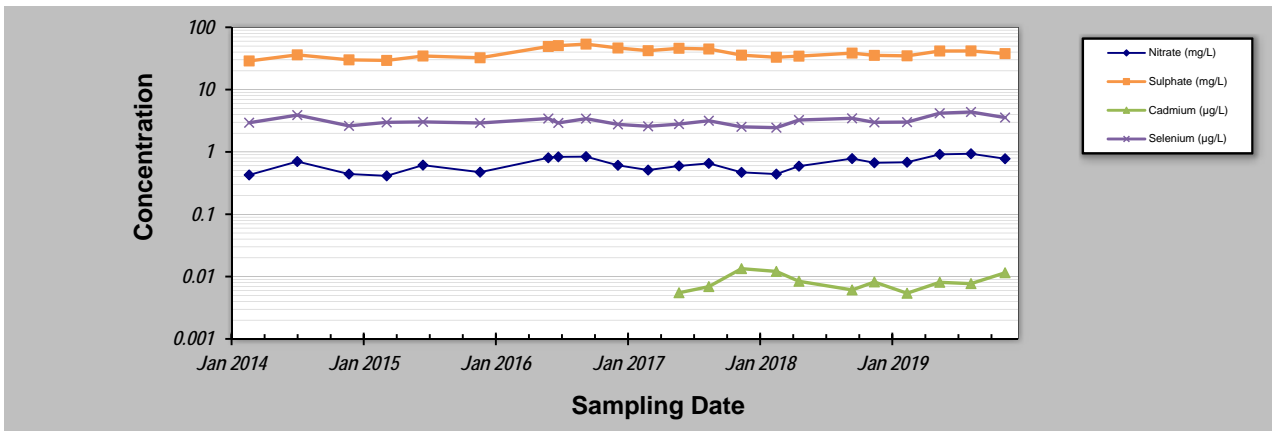
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- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - RG	Location: RG_DW-01-03
Conducted By: NDS	

Parameter (units)		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)			
RG_DW-01-03 CONCENTRATION								
Sampling Event	Sampling Date							
1	19-Feb-14	0.427	28.8		2.94			
2	3-Jul-14	0.701	36.1		3.9			
3	24-Nov-14	0.442	30		2.62			
4	9-Mar-15	0.413	29.4		2.98			
5	18-Jun-15	0.614	34.6		3.03			
6	24-Nov-15	0.473	32.4		2.91			
7	1-Jun-16	0.806	49.2		3.43			
8	29-Jun-16	0.833	50.7		2.92			
9	14-Sep-16	0.84	53.7		3.42			
10	12-Dec-16	0.61	46.5		2.77			
11	6-Mar-17	0.512	42.1		2.58			
12	31-May-17	0.596	46	0.0055	2.8			
13	22-Aug-17	0.655	44.8	0.0069	3.16			
14	21-Nov-17	0.47	35.7	0.0134	2.53			
15	26-Feb-18	0.441	33	0.0121	2.45			
16	30-Apr-18	0.591	34.4	0.0084	3.25			
17	25-Sep-18	0.782	38.5	0.0061	3.46			
18	26-Nov-18	0.67	35.4	0.0082	2.98			
19	25-Feb-19	0.683	34.8	0.0054	3.01			
20	27-May-19	0.913	41.6	0.0081	4.18			
21	22-Aug-19	0.935	41.7	0.0077	4.37			
22	25-Nov-19	0.777	37.8	0.0115	3.56			
23								
24								
25								
Coefficient of Variation:		0.25	0.18	0.32	0.16			
Mann-Kendall Statistic (S):		77	27	-1	44			
Confidence Factor:		98.5%	76.6%	50.0%	88.6%			
Concentration Trend:		Increasing	No Trend	Stable	No Trend			



- Notes:**
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 - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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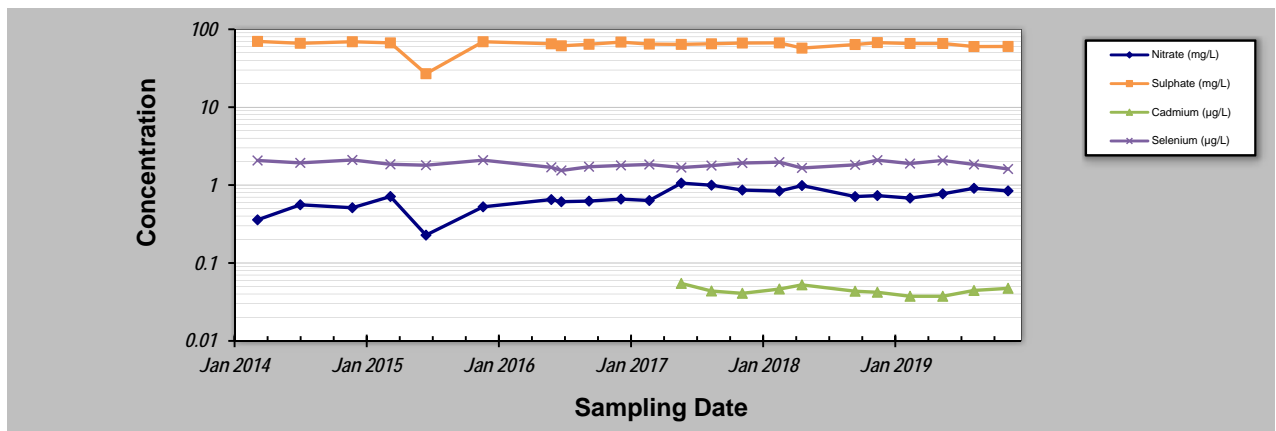
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **05-Feb-20** Job ID: **671557**
 Facility Name: **Teck Coal Regional Groundwater - RG** Location: **RG_DW-01-07**
 Conducted By: **NDS**

Parameter (units) **Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (µg/L) | Selenium (µg/L)**

Sampling Event	Sampling Date	RG_DW-01-07 CONCENTRATION			
		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
1	6-Mar-14	0.358	69.9		2.07
2	3-Jul-14	0.559	66.1		1.93
3	25-Nov-14	0.512	69.2		2.1
4	11-Mar-15	0.714	66.9		1.85
5	18-Jun-15	0.228	26.9		1.8
6	24-Nov-15	0.526	69.2		2.09
7	1-Jun-16	0.652	65.1		1.69
8	29-Jun-16	0.612	61.3		1.54
9	14-Sep-16	0.623	64.2		1.72
10	12-Dec-16	0.661	68.5		1.79
11	1-Mar-17	0.634	64.5		1.84
12	29-May-17	1.06	64	0.0547	1.68
13	21-Aug-17	0.997	65.1	0.0437	1.78
14	15-Nov-17	0.863	66.6	0.0408	1.92
15	26-Feb-18	0.838	66.9	0.0463	1.97
16	30-Apr-18	0.987	57.3	0.0524	1.66
17	25-Sep-18	0.712	63.7	0.0434	1.82
18	26-Nov-18	0.733	67.4	0.0421	2.09
19	25-Feb-19	0.681	65.7	0.0374	1.89
20	27-May-19	0.773	65.7	0.0374	2.07
21	22-Aug-19	0.91	60	0.0444	1.84
22	25-Nov-19	0.843	60.2	0.0473	1.61
23					
24					
25					
Coefficient of Variation:		0.29	0.14	0.12	0.09
Mann-Kendall Statistic (S):		119	-63	-12	-26
Confidence Factor:		>99.9%	96.0%	79.9%	75.7%
Concentration Trend:		Increasing	Decreasing	Stable	Stable



Notes:

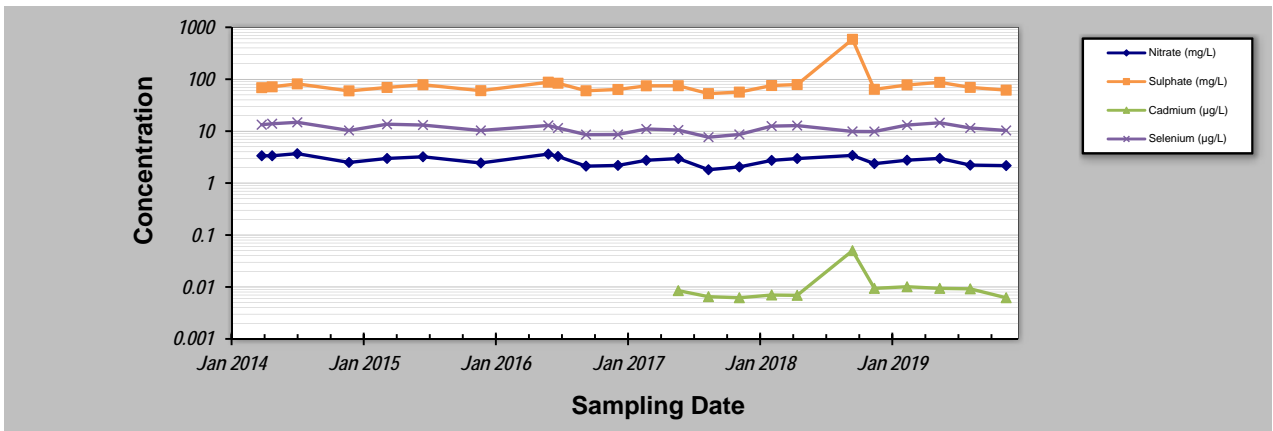
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20	Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - RG	Location: RG_DW-02-20
Conducted By: NDS	

Parameter (units)		Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)			
RG_DW-02-20 CONCENTRATION								
Sampling Event	Sampling Date							
1	26-Mar-14	3.36	68.6		13.3			
2	24-Apr-14	3.36	71.3		13.9			
3	3-Jul-14	3.69	81.2		14.8			
4	24-Nov-14	2.5	59.6		10.3			
5	10-Mar-15	2.98	69.4		13.6			
6	18-Jun-15	3.21	78.2		13.1			
7	26-Nov-15	2.44	60.2		10.3			
8	1-Jun-16	3.62	87.6		12.9			
9	28-Jun-16	3.26	83.6		11.5			
10	14-Sep-16	2.12	59.9		8.58			
11	12-Dec-16	2.19	63.5		8.63			
12	1-Mar-17	2.75	74.6		11			
13	29-May-17	2.97	74.9	0.0085	10.5			
14	21-Aug-17	1.81	52.8	0.0065	7.65			
15	15-Nov-17	2.05	56.5	0.0062	8.64			
16	13-Feb-18	2.74	75.6	0.007	12.5			
17	25-Apr-18	2.97	78.9	0.0069	12.8			
18	26-Sep-18	3.41	586	0.05	9.87			
19	26-Nov-18	2.37	63.9	0.0094	9.83			
20	25-Feb-19	2.76	77.6	0.0101	13.1			
21	27-May-19	2.99	87	0.0094	14.5			
22	20-Aug-19	2.22	69.5	0.0092	11.5			
23	28-Nov-19	2.17	61.6	0.0062	10.3			
24								
25								
Coefficient of Variation:		0.20	1.16	1.09	0.18			
Mann-Kendall Statistic (S):		-75	19	7	-52			
Confidence Factor:		97.5%	68.1%	67.6%	91.0%			
Concentration Trend:		Decreasing	No Trend	No Trend	Prob. Decreasing			



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

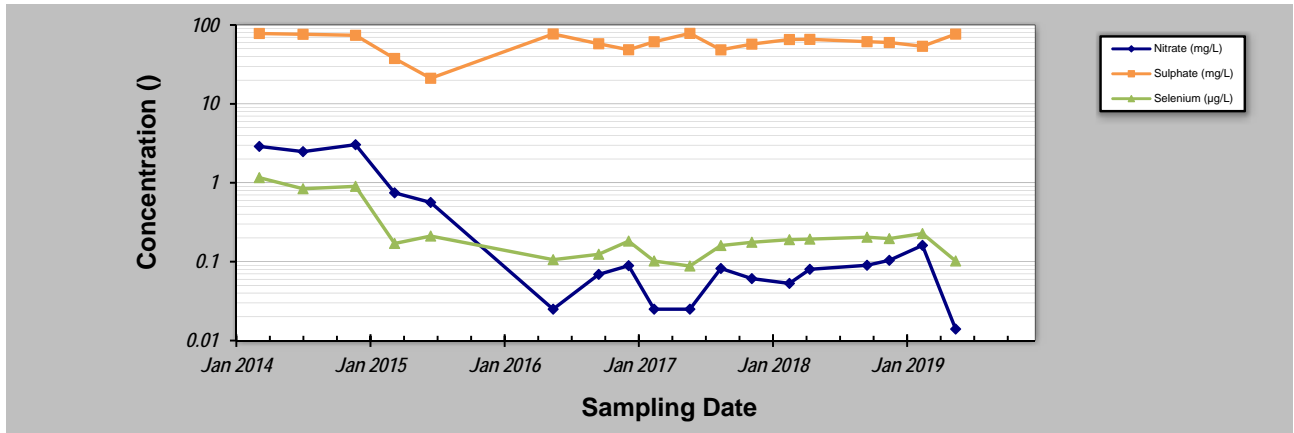
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - RG**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **RG_DW-03-01**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	RG_DW-03-01 CONCENTRATION		
1	5-Mar-14	2.89	78	1.16
2	3-Jul-14	2.48	76.2	0.84
3	24-Nov-14	3.04	74	0.9
4	11-Mar-15	0.745	37.6	0.17
5	18-Jun-15	0.563	21.1	0.211
6	19-May-16	0.025	76.9	0.106
7	21-Sep-16	0.069	57.8	0.124
8	12-Dec-16	0.089	48.5	0.182
9	20-Feb-17	0.025	61.2	0.102
10	29-May-17	0.025	78.2	0.088
11	22-Aug-17	0.082	48.4	0.16
12	15-Nov-17	0.061	57.2	0.176
13	26-Feb-18	0.053	65.4	0.19
14	23-Apr-18	0.08	65.7	0.193
15	27-Sep-18	0.09	61.4	0.204
16	27-Nov-18	0.104	59.9	0.196
17	26-Feb-19	0.161	53.7	0.227
18	28-May-19	0.014	76.6	0.102
19	20-Aug-19	0.0550	64.4	0.155
20				

Coefficient of Variation:	1.77	0.25	1.07
Mann-Kendall Statistic (S):	-30	11	0
Confidence Factor:	86.2%	64.6%	48.5%
Concentration Trend:	No Trend	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

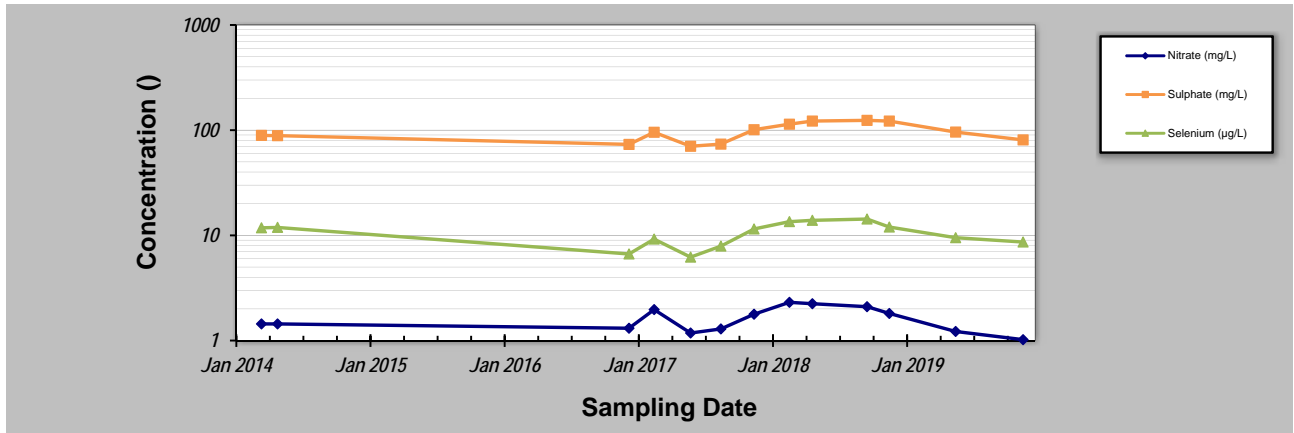
Evaluation Date: **05-Feb-20**
 Facility Name: **Teck Coal Regional Groundwater - RG**
 Conducted By: **NDS**

Job ID: **671557**
 Location: **RG_DW-03-04**

Parameter (units) **Nitrate (mg/L) Sulphate (mg/L) Selenium (µg/L)**

Sampling Event	Sampling Date	RG_DW-03-04 CONCENTRATION					
		Nitrate (mg/L)	Sulphate (mg/L)	Selenium (µg/L)			
1	11-Mar-14	1.44	89.2	11.8			
2	24-Apr-14	1.44	88.7	11.9			
3	13-Dec-16	1.31	73.2	6.65			
4	20-Feb-17	1.97	95.5	9.21			
5	31-May-17	1.18	70.3	6.21			
6	22-Aug-17	1.29	73.7	7.9			
7	21-Nov-17	1.78	101	11.5			
8	26-Feb-18	2.31	114	13.5			
9	30-Apr-18	2.24	122	13.9			
10	27-Sep-18	2.1	124	14.3			
11	27-Nov-18	1.81	122	12			
12	26-Feb-19	1.95	129	15.8			
13	28-May-19	1.22	95.9	9.5			
14	20-Aug-19	0.662	57.5	5.88			
15	29-Nov-19	1.02	80.8	8.64			
16							
17							
18							
19							
20							

Coefficient of Variation:	0.27	0.20	0.26			
Mann-Kendall Statistic (S):	16	48	35			
Confidence Factor:	81.6%	99.9%	98.2%			
Concentration Trend:	No Trend	Increasing	Increasing			



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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Appendix VIII

Quality Assurance/Quality Control (QA/QC)



Data Quality Assurance / Quality Control

Teck provided field and laboratory data relevant to the Site-Specific Groundwater Monitoring Programs (SSGMPs) and Regional Groundwater Monitoring Program (RGMP) to SNC-Lavalin Inc. (SNC-Lavalin) and Golder Associates (Golder). Analysis of the Quality Assurance/Quality Control (QA/QC) data was completed by SNC-Lavalin and Golder. SNC-Lavalin has relied on data and information provided by Teck and has therefore assumed that the information provided is both complete and accurate. Interpretations and conclusions within this report are made with the assumption that data collection was completed in accordance with Permit 107517, the British Columbia Field Sampling Manual (Clark, 2013), and Teck's Standard Practice and Procedures (SP&P).

A QA/QC program specific to the RGMP is not yet in place; however, each Operation conducted a QA/QC program, which is described below, with the exception of LCO, which is described in the site-specific report (Appendix II). The QA/QC assessment completed for the RGMP included shipping and handling issues, summarized results of relative percent differences (RPDs) from duplicate samples, and any detection of analytes in field blanks for QA/QC samples not already identified in the SSGMPs. A summary of QA/QC methods and results of the QA/QC programs are summarized in the following sections.

Summary of QA/QC Methods

Shipping and Handling

Shipping and handling QA/QC includes assessment of sample integrity upon arrival at the laboratory and analysis hold time exceedances. Sample integrity observations are documented by the laboratory upon receipt of the sample and may include elevated sample temperature, bottle damage, or labelling errors. The British Columbia Laboratory Analysis Manual (BCLAM) specifies a maximum sample temperature of 10oC during transport (Austin, 2016). Bottle damage and labelling errors may result in analysis with preservation that deviates from the specifications of the BCLAM, or analyses not conducted.

Maximum hold times between sample collection and analysis are specified in Austin (2016). Hold time exceedances may be from samples arriving past their specified hold time, or from analysis after the maximum hold time. Hold time exceedances are identified on the Certificates of Analyses (COAs).

Duplicate Samples

Duplicate samples were collected at a frequency of at least one per ten samples during sampling events to assess the precision of the field sampling methodology and consistency of laboratory analysis. Duplicate samples were evaluated by calculation of the RPD of the concentration between the sample and duplicate, as follows:

$$RPD = \frac{|sample\ 1 - sample\ 2|}{\frac{1}{2}(sample\ 1 + sample\ 2)} \times 100\%$$

RPDs are calculated for parameters where at least one of the samples was greater than five times the laboratory detection limit; an RPD of less than 20% for metals and inorganics is considered as an acceptable level of precision per the BC Field Sampling Manual (Clark, 2013). Teck have a QA/QC program based on this manual; where the result is less than five times the detection limit, the acceptable RPD will be modified as follows:

- › RPD < 20%: Acceptable;
- › RPD > 20% with value > 5 times the DL: Possible problem; and
- › RPD > 50% with results > 5 times the DL: Definite problem, most likely sample contamination or lack of sample representativeness.

Blanks

Field and trip blanks were processed and submitted for analysis as part of each sampling event under each SSGMP and the RGMP. Teck's standard practice for collecting field blank samples is to open a designated field blank sample bottle pre-filled with ultra-pure de-ionized (DI) water and preservative (where applicable) at the sampling site during regular sample collection. Field blanks provide information on contamination resulting from the handling technique and exposure to ambient air.

Filter blanks were collected as part of the Greenhills Operations (GHO) Cougar Pit Extension Phase 2 Program (CPX2). Select wells from GHO CPX2 have been included in the SSGMP; therefore, these results are summarized. The filter blank is collected by passing laboratory-supplied DI water through a filter and collecting the sample. The sample is subsequently preserved in the same manner as the original samples, replicating the sampling protocol. Filter blanks provide information on contamination resulting from potential residue remaining on the filter, which may result in sample bias.

Standard practice for trip blanks includes delivery of a sample set from the laboratory pre-filled with ultra-pure DI water and preservative (where applicable), which are kept in a cooler (with the other samples) and are unopened throughout the sampling trip. Trip blanks are meant to detect widespread contamination from the container and preservative during transport and storage. Field and trip blanks were shipped to the laboratory with routine samples and screened for analyte detections.

Laboratory QA/QC

ALS Laboratory (ALS) conducted routine internal QA/QC in accordance with Austin (2016) and reported these results as analyte qualifiers alongside the sample analysis results. SNC-Lavalin reviewed the qualifiers and considered them in the context of the other QA/QC analyses in evaluating their potential effects on the groundwater quality data.

Fording River Operations

Shipping and Handling

A summary of shipping and handling issues from the 2019 sampling program is provided in Table VIII-A.

Table VIII-A: Summary of Shipping and Handling Issues

Qualifier	Quarter	Well ID	Possibly Affected Analytes	Comment
Hold Time Exceedance	1-4	All wells blanks and duplicates	pH, Oxidation Reduction Potential (ORP)	Exceeded ALS recommended hold time of 15 minutes prior to sample receipt. Field measurement recommended.
Hold Time Exceedance	1	FR_TBSSMW-1 FR_TBSSMW-2	Total Suspended Solids (TSS)	Exceeded ALS recommended hold time of 7 days prior to analysis. Samples were received on time but analysed one day after hold time.

Except for pH and ORP for each sample and two TSS samples, initial hold times were not exceeded for parameters analysed in 2019. Parameters pH and ORP have a hold time of 15 minutes and measurements are taken in the field. These hold time exceedances are not considered to be an issue as field measurement for pH and ORP are used for data analysis. Both samples that were past hold times for TSS arrived at the laboratory within the 7 day hold time; however, the laboratory did not complete the analyses until after the hold time had expired. Results from Q1 for TSS were similar to subsequent quarters and not identified as an issue.

Duplicate Samples

A summary of duplicate samples from the 2019 sampling program is provided in Table VIII-B.

Table VIII-B: Summary of Relative Percent Difference Values for Duplicate Samples

Quarter	Number of Duplicate Samples Collected	Summary of RPDs above Acceptable Percentage
1	5	› Cadmium with an RPD of 57% FR_HMW3
2	3	› None
3	5	› None
4	6	› Alkalinity (Carbonate as CaCO ₃) with an RPD value of 58% FR_TBSSMW-1 › Turbidity with an RPD value of 149% FR_09-02-A

Review of duplicate sample results indicated that dissolved cadmium at FR_HMW3 had an RPD above acceptable levels. The results were an order of magnitude less than the lower limit of the Contaminated Sites Regulation Aquatic Life (CSR AW) standard and is not a concern. Alkalinity (carbonate as CaCO₃) in FR_TBSSMW-1 and turbidity in FR_09-02 had RPDs above the acceptable level. There are no standards

for alkalinity (carbonate as CaCO₃) or turbidity. Of the numerous organic, inorganic, and physical parameters analysed, RPDs were otherwise less than 50%. These results indicate a good sampling program with low variability in constituent concentrations from sampling and handling.

Field and Trip Blanks

A summary of field and trip blanks from the 2019 sampling program is provided in Table VIII-C.

Table VIII-C: Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter Above Detection Limit	Value
Field Blanks			
1	FR_HMW1D	Ammonia-N	0.747 µg/L
		Total Kjeldahl Nitrogen-N (TKN)	0.203 µg/L
		Orthophosphate	0.0014 µg/L
		Dissolved boron	46 µg/L
2	FR_KB-3A	Ammonia-N	0.0187 µg/L
	FR_09-04-A	Ammonia-N	0.0124 µg/L
4	FR_TBSSMW-1	Ammonia-N	0.0070 µg/L
		Dissolved zinc	2.8 µg/L
	FR_HMW1D	Ammonia-N	0.0069 µg/L
Trip Blanks			
1	February 13	Ammonia-N	0.140 µg/L
		TKN	0.071 µg/L
2	February 25	Orthophosphate	0.0016 µg/L
		Ammonia-N	0.0448 µg/L
	April 10	Ammonia-N	0.0305 µg/L
	April 11	Ammonia-N	0.0374 µg/L
4	June 10	Dissolved chromium	0.12 µg/L
	July 24	Ammonia-N	0.0385 µg/L
4	October 21	Ammonia-N	0.0162 µg/L
	October 22	Ammonia-N	0.0276 µg/L

Notes: Detection Limits – Ammonia-N <0.0050 µg/L; Total Kjeldahl Nitrogen-N <0.050 µg/L; Orthophosphate <0.0010 µg/L; dissolved boron <10 µg/L; dissolved chromium <0.20 µg/L; dissolved zinc <1.0 µg/L

Total Kjeldahl Nitrogen-N concentrations were slightly above to four times greater than the detection limit in field and trip blank samples; however, there is no standard for TKN. Dissolved boron concentrations were greater than four times the detection limit, but one order of magnitude below the most stringent standard. Dissolved chromium was marginally above the detection limit for one sample, but more than an order of magnitude less than the most stringent standard. Dissolved zinc was nearly three times the detection limit, but less than an order of magnitude less than the most stringent standard. Because of their low concentrations, these constituents are not considered a concern.

Orthophosphate concentrations above the detection limit in trip and field blanks were marginally above the detection limit (0.0010 mg/L) and are not a concern. Ammonia-N concentrations were approximately three orders of magnitude above the detection limit, but several orders of magnitude below primary screening criteria. The parameters above the detection limits are not considered to affect the reliability of the data.

In 2019 SNC-Lavalin contacted the laboratory to determine the source(s) of parameters above the DLs for the 2018 SSGMP (SNC-Lavalin, 2019a). The laboratory provided results of ultra-pure DI water for select months in 2018; however, these results did not provide any clear resolution to detections in blanks. There is a possibility that the elevated concentrations of select parameters in field blanks is from contamination in the field or that the bottles and lids or preservative may be contributing to the detectable parameters. The parameters above the DLs did not affect the reliability of the data due to their low concentrations. In addition, similar detectable parameters in field and trip blanks from groundwater monitoring at other mines (Elkview Operations [EVO and GHO]) were also reported in 2017 and 2018 and are also being investigated by the laboratory.

Laboratory QA/QC

The detailed results of laboratory QA/QC are included in COAs in Appendix X. The Quality Control Reports noted the following for some samples:

- › Matrix Spike recovery could not be accurately calculated for some constituents due to high analyte background in sample;
- › detection limits were raised or adjusted due to dilution required due to high concentration of test analyte(s), high dissolved solids/electrical conductivity, sample matrix effects (e.g., chemical interference, colour, turbidity), or because analyte was detected at comparable level in method blank;
- › TKN results may be biased low due to nitrate interference. Nitrate-N is > 10x TKN;
- › reported result was verified by repeat analysis;
- › duplicate results outside ALS data quality objectives (DQO), due to sample heterogeneity;
- › dissolved concentration exceeds total. Results were confirmed by re-analysis;
- › water sample(s) for dissolved mercury analysis was not submitted in glass or polytetrafluoroethylene (PTFE) container with hydrochloric (HCL) preservative. Results may be biased low;
- › water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCL preservative. Results may be biased low;
- › data quality objective was marginally exceeded (by <10% absolute) for <10% of analytes in a Multi-Element Scan/Multi-Parameter Scan (considered acceptable);
- › hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time; and
- › method blank exceeded ALS DQO. Limits of reporting were adjusted for samples with positive hits below 5x blank level.

These notes are not unusual for these analyses considering the chemistry of the samples that reflects a mine-influenced groundwater (i.e., select samples have high total dissolved solids or nitrate concentrations). The results of the laboratory QA/QC were acceptable for the purpose of this assessment. A review of the quality assurance portion of the laboratory analytical reports did not identify any additional QA/QC issues.

QA/QC Summary

The field QA/QC program and laboratory QA/QC results for groundwater samples indicated the data collected are acceptable for use in this report. Except for three RPD values greater than 50% for three parameters, the remaining RPD values for the remaining parameters sampled were less than 50%. The possibility of higher dissolved cadmium, alkalinity (carbonate as CaCO₃) and turbidity concentrations reflected in the RPD result will be considered in the interpretation of the result. Hold time exceedances were considered in analysis of the results. The results reflect low variability for handling and sampling for the program.

The laboratory quality control reports were reviewed, and the data are considered reliable. Detectable concentrations of select parameters in trip and field blanks were marginally above the detection limit for orthophosphate, ammonia-N, TKN, and dissolved zinc, boron, and chromium were well below applicable primary screening criteria where applicable and did not affect the reliability of the data.

Greenhills Operations

Shipping and Handling

A summary of shipping and handling issues from the 2019 sampling program is provided in Table VIII-D.

Table VIII-D: GHO – Summary of Shipping and Handling

Qualifier	Quarter	Well ID	Possibly Affected Analytes	Comment
Hold Time Exceedance	1-4	All wells, duplicates and blanks	pH, ORP	Exceeded ALS recommended hold time of 15 minutes prior to sample receipt. Field measurement recommended.
Hold Time Exceedance	1	GH_MW-MC-1S GH_MW-MC-1D	Nitrate-N and Nitrite-N	Laboratory received sample on time. However, hold times were exceeded by the addition of analyzing for select parameters after the laboratory received the samples.
		GH_MW-MC-2S GH_MW-MC-2D MW 19-A (Duplicate)	Nitrate-N, Nitrite-N, and Total Dissolved Solids (TDS)	Laboratory received samples on time. However, hold times were exceeded by the addition of analyzing select parameters after laboratory received the samples.
		GH_GA-MW-2 GH_GA-MW-3 GH_MW-ERSC-1	Nitrate-N and Nitrite-N	Laboratory received sample on time. Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
Hold Time Exceedance	2	GH_GWB3 (Field Blank)	Nitrate-N	Laboratory received sample on time. Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
		GH_MW-MC-1C (Trip Blank)	Nitrate-N and Nitrite-N	Laboratory received samples less than 24 hours prior to expiry. Although the same was originally analysed within 24 hours, the hold time exceeded for re-analysis or dilution.

Table VIII-D (Cont'd): GHO – Summary of Shipping and Handling

Qualifier	Quarter	Well ID	Possibly Affected Analytes	Comment
Hold Time Exceedance	3	GH_GWB3 (Field Blank)	Orthophosphate	Laboratory received sample on time. Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
Hold Time Exceedance	4	GH_MW-RLP-1D	Orthophosphate	Laboratory received sample on time. Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
		GH_GWB2 (Field Blank)	TDS	

Except for pH and ORP and the above listed, hold-times were not exceeded for parameters analysed in 2019. Parameters pH and ORP have a hold time of 15 minutes and measurements are taken in the field. These hold time exceedances are not considered to be an issue as field measurement for pH and ORP are used for data analysis. The other hold time exceedances listed above are not considered to be an issue as concentrations of these parameters remained consistent with other sampling events.

Results from 2018 for these parameters were similar to historical results; therefore, exceedances of hold times were not identified as an issue. Furthermore, with the exception of nitrate, concentrations of these parameters have historically been low in groundwater samples.

Duplicate Samples

A summary of duplicate samples from the 2019 sampling program is provided in Table VIII-E.

Table VIII-E: GHO – Summary of Relative Percent Difference Values for Duplicate Samples

Quarter	Number of Duplicate Samples Collected	Summary of RPDs above Acceptable Percentage
1	3	› None
2	4	› None
3	5	› Alkalinity (carbonate as CaCO ₃) with an RPD value of 63% GH_GA-MW-1
4	4	› None

Review of duplicate sample results indicated that an RPD value of 63% was calculated for alkalinity (carbonate as CaCO₃) in GH_GA-MW-1 in Q3, while RPDs for total alkalinity, alkalinity (bicarbonate as CaCO₃) and alkalinity (hydroxide as CaCO₃) were below 3%. There is no standard for alkalinity (carbonate as CaCO₃) and the RPD value greater than 50% is not a concern for the integrity of the sampling program. Of the numerous organic, inorganic, and physical parameters analysed, RPDs were otherwise less than 50%. These results indicate a good sampling program with low variability in constituent concentrations from sampling and handling.

Field, Filter, and Trip Blanks

A summary of field and trip blanks from the 2019 sampling program is provided in Table VIII-F.

Table VIII-F: Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter	Value	Detection Limit
Field Blanks				
1	GH_MW-POTW06	Ammonia-N	0.0233 mg/L	0.0050 mg/L
		TKN	0.089 mg/L	0.050 mg/L
		Dissolved boron	23 µg/L	10 µg/L
		Dissolved mercury	0.0053 µg/L	0.0050 µg/L
	GH_MW-UTC-A	TDS	23 mg/L	10 mg/L
		Turbidity	0.21 NTU	0.10 NTU
		Ammonia-N	0.0131 µg/L	0.005 µg/L
		Dissolved barium	0.17 µg/L	0.10 µg/L
	GH_MW-GHC-A	Dissolved boron	25 µg/L	10 µg/L
		Dissolved barium	5.55 µg/L	0.10 µg/L
		Dissolved boron	22 µg/L	10 µg/L
		Dissolved calcium	0.129 mg/L	0.050 mg/L
		Dissolved manganese	0.16 mg/L	0.10 mg/L
		Dissolved sodium	0.502 mg/L	0.050 mg/L
		Dissolved strontium	0.23 µg/L	0.20 µg/L
	2	GH_MW-MC-1D	Turbidity	0.30 NTU
GH_MW-GHC-A		Ammonia-N	0.0067 mg/L	0.0050 mg/L
		Dissolved barium	0.22 µg/L	0.10 µg/L
GH_MW-ERSC-1		Ammonia-N	0.0072 mg/L	0.0050 mg/L
		Dissolved aluminum	3.0 µg/L	3.0 µg/L
		Dissolved barium	2.73 µg/L	0.10 µg/L
		Dissolved calcium	0.164 mg/L	0.050 mg/L
		Dissolved chromium	0.17 µg/L	0.10 µg/L
		Dissolved sodium	0.515 mg/L	0.05 mg/L
		Dissolved strontium	0.27 µg/L	0.20 µg/L
Dissolved tin	0.36 µg/L	0.10 µg/L		

Table VIII-F (Cont'd): Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter	Value	Detection Limit
Field Blanks				
3	GH_MW-RLP-1D	Turbidity	0.26 NTU	0.10 NTU
		Ammonia-N	0.0160 mg/L	0.0050 mg/L
		Orthophosphate	0.0016 mg/L	0.0010 mg/L
	GH_GA-MW-1	Dissolved magnesium	0.005 mg/L	0.10 mg/L
4	GH_MW-UTC-B	Dissolved copper	0.38 µg/L	0.20 µg/L
	GH_GA-MW-4	Orthophosphate	0.0010 mg/L	0.0010 mg/L
Filter Blanks				
3	GH_MW-MC-2S	Dissolved Organic Carbon (DOC)	2.04 mg/L	0.50 mg/L
4	GH_MW-MC-2S	Dissolved copper	0.25 µg/L	0.20 µg/L
		Dissolved manganese	0.005 mg/L	0.10 mg/L
Trip Blanks				
1	March 25	Ammonia-N	0.0372 mg/L	0.0050 mg/L
		TKN	0.207 mg/L	0.050 mg/L
2	April 25	Ammonia-N	0.0280 mg/L	0.0050 mg/L
		TOC	0.659mg/L	0.50 mg/L
		DOC	0.54 mg/L	0.50 mg/L
		Dissolved calcium	0.057 mg/L	0.050 mg/L
3	November 20	Ammonia-N	0.0223 mg/L	0.0050 mg/L
		Dissolved copper	0.53 µg/L	0.20 µg/L
4	December 9	Dissolved copper	1.26 µg/L	0.20 µg/L

Overall detectable concentrations in the field, filter and trip blanks were within 5 times the DL, with the exception of the following:

- › Dissolved barium and sodium at field blanks associated with GH_MW-GHC-A in Q1 and GH_MW-ERSC-1 in Q2;
- › Ammonia-N in trip blanks collected on March 25 and April 25, 2019; and
- › Dissolved copper in the trip blank collected on December 9, 2019.

The laboratory indicated that physical damage was observed for the filter used to collect the field blank associated with GH_MW-GHC-A in Q1 2019. Although the filter was damaged, the majority of the detected parameters in this sample were within five times the detection limits, with the exception of dissolved barium and sodium. Concentrations of these parameters in groundwater from GH_MW-GHC-A in Q1 were consistent with historical results. Groundwater samples associated with GH_MW-GHC-A, GH_MW-ERSC-1, and the March 25 and April 25, 2019 trip blanks, contained concentrations of dissolved barium, sodium, copper, and ammonia-N at least one to two orders of magnitudes below the most stringent CSR standards.

In 2019 SNC-Lavalin contacted the laboratory to determine the source(s) of parameters above the DLs for the 2018 SSGMP. The laboratory provided results of ultra-pure DI water for select months in 2018; however, these results did not provide any clear resolution to detections in blanks. There is a possibility that the elevated concentrations of select parameters in field blanks is from contamination in the field or that the bottles and lids or preservative may be contributing to the detectable parameters. The parameters above the DLs did not affect the reliability of the data due to their low concentrations. In addition, similar detectable parameters in field and trip blanks from groundwater monitoring at other mines [Fording River Operations (FRO) and Elkview Operations (EVO)] were also reported in 2017 and 2018 and are also being investigated by the laboratory.

Laboratory QA/QC

The detailed results of laboratory QA/QC are included in COAs in Appendix X. The Quality Control Reports noted the following for some samples:

- › Matrix Spike recovery could not be accurately calculated for some constituents due to high analyte background in sample;
- › detection limits were raised or adjusted due to dilution required due to high concentration of test analyte(s), high dissolved solids/electrical conductivity, sample matrix effects (e.g., chemical interference, colour, turbidity), or because analyte was detected at comparable level in method blank;
- › TKN results may be biased low due to nitrate interference. Nitrate-N is > 10x TKN;
- › reported result was verified by repeat analysis;
- › report results was verified by alternate process;
- › duplicate results outside ALS DQO, due to sample heterogeneity;
- › dissolved metals concentrations exceeds total for field-filtered metals sample. Metallic contaminants may be introduced to dissolved sample during field filtration;
- › dissolved concentration exceeds total. Results were confirmed by re-analysis;
- › filter shows some physical damage. Use result with caution;
- › refer to report remarks for issues regarding analysis;
- › sample was preserved at the laboratory;
- › sample was filtered and preserved at the laboratory;
- › hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time;
- › dissolved selenium concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed;
- › Brown Ring: IRB dominant;
- › Brown Cloudy: IRB dominant;
- › detection limit adjusted for required dilution;
- › balance reviewed: Interference or non-measured component;
- › data quality objective was marginally exceeded (by <10% absolute) for <10% of analytes in a Multi-Element Scan/Multi-Parameter Scan (considered acceptable); and
- › refer to report remarks for information regarding this QC result.

These notes are not unusual for these analyses considering the chemistry of the samples that reflects a mine-influenced groundwater (i.e., select samples have high total dissolved solids or nitrate concentrations). The results of the laboratory QA/QC were considered to be acceptable for the purpose of this assessment. A review of the quality assurance portion of the laboratory analytical reports did not identify any additional QA/QC issues.

Dissolved metals sample was missing for field blanks from GH_POTW06 in Q1 and GH_MW-RLP-1D in Q3 and samples were filtered and preserved in the laboratory from the routine water bottles. The field blank from GH_POTW06 contained detectable concentrations of select dissolved metals; however, these concentrations remained less than five times the DL. No detectable concentrations of dissolved parameters were measured at GH_MW-RLP-1D. The dissolved metals results for these field blanks are considered to be acceptable.

Between Q2 and Q4 several groundwater samples were flagged indicating that the dissolved selenium concentration exceeded the total and a positive bias may exist. Groundwater samples containing this qualifier included GH_MW-RLP-1D (Q4), GH_MW-UTC-A (Q2 and Q3), GH_GA-MW-2 (Q4), GH_GAMW3 (Q3 and Q4), and GH_MW-ERSC-1 (Q3). A review of dissolved selenium concentrations vs total selenium concentrations was completed and RPDs were calculated and are presented in Table VIII-G.

Table VIII-G: GHO – Dissolved vs. Total Selenium for Select Samples

Well ID	Quarter	Dissolved Selenium (µg/L)	Total Selenium (µg/L)	RPD (%)
GH_MW-RLP-1D	Q4	1.86	< 0.50	108
GH_MW-UTC-A	Q2	0.891	0.584	42
	Q3	0.814	0.435	61
GH_GA-MW-2	Q4	34.7	22.1	44
GH_GA-MW-3	Q3	21.1	12	55
	Q4	11	7.26	41
GH_MW-ERSC-1	Q3	1.82	0.928	65

Relative Percent Differences ranged from 41% (GH_GA-MW-3 in Q4) to 108% (GH_MW-RLP-1D). Although a high RPD was calculated at GH_MW-RLP-1D, the concentration measured in Q4 remained well below the most stringent CSR standard and considered acceptable for this assessment. The remainder of the groundwater results have also been included in the groundwater assessment. These results are not expected to affect overall evaluation of trends; however, are considered suspect. A more in depth investigation into the significance and representativeness of higher dissolved selenium relative to total selenium concentrations is recommended.

QA/QC Summary

The field QA/QC program and laboratory QA/QC results for groundwater samples indicated the data collected are acceptable for use in this report, except for dissolved selenium results from GH_MW-RLP-1D (Q4), GH_MW-UTC-A (Q2 and Q3), GH_GA-MW-2 (Q4), GH_GA-MW-3 (Q3 and Q4), and GH_MW-ERSC-1 where concentrations are inferred to be biased high. These dissolved selenium results are considered suspect; however, do not appear to affect the overall evaluation. With the exception of one RPD value greater than 50% for one parameter, the remaining RPD values for the remaining parameters

sampled were less than 50%. Hold time exceedances were only for re-analysed samples. Detectable concentrations of select parameters in trip and field blanks were well below applicable primary screening criteria for dissolved boron, sodium, copper, and ammonia-N and did not affect the reliability of the data. The laboratory quality control reports were reviewed and the data are considered reliable.

Elkview Operations

Shipping and Handling Issues

A summary of shipping and handling issues from the 2019 sampling program is provided in Table VIII-H below.

Table VIII-H: Summary of Shipping and Handling Issues

Qualifier	Quarter	Well ID	Possibly Affected Analytes	Comment
Hold Time Exceedance	1	EV_MW_AQ1, EV_MW_AQ2, EV_MW_BC1A, EV_MW_BC1B, EV_MW_GT1A, EV_MW_GT1B, EV_MW_MC1A, EV_MW_MC1B, EV_MW_MC3, EV_MW_MC4, EV_MW_SPR1_A	Nitrate-N, Nitrite-N	Laboratory received sample on time. Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
		EV_MW_MC2B and duplicate	TSS	
	2	Field Blank (BC10-C from EV_MW_BC1A)	Orthophosphate	
	3	EV_MW_MC2A	Nitrate-N, Nitrite-N	
	4	EV_MW_MC1A	Orthophosphate	
	1-4	All wells, duplicates and blanks	pH, ORP	

With the exception of pH and ORP for each sample and two total phosphorus samples, initial hold times were not exceeded for parameters analysed in 2019. Parameters pH and ORP have a hold time of 15 minutes and measurements are taken in the field. These hold time exceedances are not considered to be an issue as field measurements for pH and ORP are used for data analysis. The three day hold time for nitrate, nitrite, colour and orthophosphate were met for initial analyses; however, re-analyses or dilution were completed past the holding time.

Results from 2018 for these parameters were similar to historical results; therefore, exceedances of hold times were not identified as an issue. Furthermore, with the exception of nitrate, concentrations of these parameters have historically been low in groundwater samples.

Duplicate Samples

Table VIII-I below summarizes RPDs above acceptable levels (RPD > 50% with results > 5 times the detection limit).

Table VIII-I: Summary of Relative Percent Difference Values for Duplicate Samples

Quarter	Number of Duplicate Samples Collected	Summary of RPDs above Acceptable Percentage
1	4	› Turbidity with an RPD value of 85% at EV_MW_MC2B
2	4	› None
3	4	› Alkalinity (Carbonate as CaCO ₃) with an RPD value of 121% at EV_MW_MC3.
4	3	› None

At EV_MW_MC3, an RPD value of 121% was calculated for alkalinity (carbonate as CaCO₃), while RPDs for total alkalinity, alkalinity (bicarbonate as CaCO₃) and alkalinity (hydroxide as CaCO₃) were below 5%. The RPD values > 50 % for turbidity and alkalinity (carbonate as CaCO₃) are not a concern for the integrity of the sampling program. Of the numerous organic, inorganic, and physical parameters analysed, RPDs were otherwise less than 50%. These results indicate a good sampling program with low variability in constituent concentrations from sampling and handling.

Field and Trip Blanks

Table VIII-J below summarizes field and trip blank samples with parameters above the detection limit. Trip blanks were only collected in Q1 and Q3. For future sampling programs, it is recommended trip blanks be collected every quarter.

Table VIII-J: Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter	Value	Detection Limit
Field Blank				
1	EV_GCgw	Hardness	13.8 mg/L	0.50 mg/L
		Dissolved barium	2.71 µg/L	0.10 µg/L
		Dissolved calcium	4.02 mg/L	0.050 mg/L
		Dissolved iron	14 µg/L	10 µg/L
		Dissolved magnesium	0.91 mg/L	0.10 µg/L
		Dissolved manganese	6.59 µg/L	0.10 µg/L
		Dissolved molybdenum	0.053 µg/L	0.050 µg/L
		Dissolved potassium	0.081 mg/L	0.050 µg/L

Table VIII-J (Cont'd): Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter	Value	Detection Limit
Field Blank (Cont'd)				
1 (Cont'd)	EV_GCgw (Cont'd)	Dissolved sodium	0.322 mg/L	0.050 mg/L
		Dissolved strontium	15.6 µg/L	0.20 µg/L
		Dissolved uranium	0.033 µg/L	0.010 µg/L
		Dissolved zinc	33.8 µg/L	1.0 µg/L
	EV_OCgw	Ammonia-N	0.0058 mg/L	0.0050 mg/L
		Dissolved calcium	0.105 mg/L	0.050 mg/L
		Dissolved zinc	3.7 µg/L	1.0 µg/L
3	EV_MW_BC1B	Ammonia-N	0.0331 mg/L	0.0050 mg/L
		DOC	2.59 mg/L	0.50 mg/L
4	EV_ER1gwS	Dissolved barium	0.29 µg/L	0.10 µg/L
	EV_MW_SPR1-C	Dissolved barium	0.16 µg/L	0.10 µg/L
Trip Blank				
1	January 22	Ammonia-N	0.0257 mg/L	0.0050 mg/L
	January 23	Ammonia-N	0.0936 mg/L	0.0050 mg/L
		Nitrogen	117 µg/L	50 µg/L
		Phosphorus-T	2.2 µg/L	2 µg/L

Detections were reported for 13 parameters in the field blank taken at EV_GCgw in Q1 of 2019. The blank analysis results indicate that the blank may have been contaminated with water from EV_GCgw. None of the non-detect parameters in EV_GCgw were observed above detection limits in the field blank, suggesting the Q1 results from EV_GCgw are considered acceptable. All parameters for the associated trip blank were below detection limits.

Field blank detections in samples other than EV_GCgw in Q1 and trip blank detections were identified for various parameters; these detections were compared to the most stringent CSR standards and there were no parameter detections close to standards.

In 2019 SNC-Lavalin contacted the laboratory to determine the source(s) of parameters above the DLs for the 2018 SSGMP. The laboratory provided results of ultra-pure DI water for select months in 2018; however, there results did not provide any clear resolution to detections in blanks. There is a possibility that the elevated concentrations of select parameters in field blanks is from contamination in the field or that the bottles and lids or preservative may be contributing to the detectable parameters. The parameters above the DLs did not affect the reliability of the data due to their low concentrations. In addition, similar detectable parameters in field and trip blanks from groundwater monitoring at other mines (FRO and GHO) were also reported in 2017 and 2018 and are also being investigated by the laboratory.

Laboratory QA/QC

The detailed results of laboratory QA/QC are included in COAs in Appendix X. The Quality Control Reports noted the following for some samples:

Detection limits were occasionally increased in response to a series of commonly encountered analytical circumstances, including the following:

- › the analyte was detected at a comparable level in the batch method blank;
- › dilution was required due to high dissolved solids in the sample;
- › dilution was required due to high test analyte concentration; and
- › sample matrix effects (e.g., chemical interference, colour, turbidity).

The higher detection limits were consistently below the screening standards and as such these detection limit qualifiers did not affect data quality.

Results for laboratory QA/QC samples occasionally yielded a series of qualifiers used to flag limitations in the reportability of the QA/QC result. These qualifiers are not expected to reflect on data quality, and include the following:

- › duplicate results and limits were expressed in terms of absolute difference;
- › matrix spike recovery could not be accurately calculated due to high analyte background in sample; and
- › relative percent difference between duplicates not available due to result being less than detection limit.

These notes are not unusual for these analyses considering the chemistry of the samples that reflects a mine-influenced groundwater (i.e., select samples have high total dissolved solids or nitrate concentrations). The results of the laboratory QA/QC were considered to be acceptable for the purpose of this assessment. A review of the quality assurance portion of the laboratory analytical reports did not identify any additional QA/QC issues.

QA/QC Summary

The field QA/QC program and laboratory QA/QC results for groundwater samples indicated the data collected are acceptable for use in this report. RPD values greater than 50% were identified for turbidity and alkalinity (carbonate as CaCO₃) in one sample in Q1 and Q3, respectively; however, the remaining RPD values for all other parameters were less than 50%. Hold time exceedances were only for re-analysed samples. Detectable concentrations of select parameters in trip and field blanks were well below applicable primary screening criteria for ammonia-N and did not affect the reliability of the data. For future sampling programs, it is recommended trip blanks be collected every quarter. The laboratory quality control reports were reviewed and the data are considered reliable.

Coal Mountain Operations

Shipping and Handling

The COAs indicate that shipping and handling of samples was conducted in a manner that led to consistently meeting the specifications of Austin (2016). One batch of samples collected during the second quarter arrived at the laboratory with a measured temperature of 12°C (Table VIII-K), exceeding the specification of 10°C. Austin (2016) specifies that refrigeration is required for storage prior to analysis for all physical properties, nitrogen, and phosphorous parameters analyzed. Refrigeration is not required for metals.

Table VIII-K: Summary of Shipping and Handling Issues

Qualifier	Quarter	Well ID	Possibly Affected Analytes	Comments
Hold Time Exceedances	1	CM_MW5-SH	Nitrate-N, Nitrite-N	Hold time exceeded for re-analysis or dilution but initial testing was conducted within hold time
Transport Temperature	2	CM_MW1-OB CM_MW1-SH CM_MW2-SH CM_MC3-DP CM_MW3-SH duplicate 1 duplicate 2 trip blank	Physical properties, Nitrogen analytes, Phosphorous analytes	Laboratory recorded temperature of 12°C on receipt
Sample Integrity Observations	None	None	None	
Incorrect Preservation	2	CM_MW6-DP	Dissolved metals	Analysis conducted on sample filtered and preserved at lab

With the exception of pH and ORP, initial hold times were not exceeded for parameters analysed in 2019. Parameters pH and ORP have a hold time of 15 minutes and measurements are taken in the field. These hold time exceedances are not considered to be an issue as field measurements for pH and ORP are used for data analysis. The three day hold time for nitrate, nitrite, colour and orthophosphate were met for initial analyses; however, re-analyses or dilution of nitrate and nitrite at CM_MW-SH were completed past the hold time.

One sample (CM_MW6-DP in Q2) for dissolved metals was incorrectly preserved with sulfuric acid rather than nitric acid, as a result the lab filtered and preserved from a raw unfiltered sample. Dissolved metals results for the Q2 sample were reviewed and found to be consistent with the ranges identified in the other 2019 samples. One exception was dissolved iron which was low at 11 ug/L in Q2 vs 69 to 157 ug/L during the remainder of 2019.

Duplicate Samples

The duplicate samples indicate adequate precision associated with the field and laboratory methods. 199 RPDs were calculated for the eight duplicate samples collected over the four quarterly sampling events. Among these RPDs, one was greater than 50% (Table VIII-L). The elevated RPD for turbidity in Q2 occurred for values near the detection limit: measurements of 1.08 NTU and 0.51 NTU, detection limit of 0.1 NTU. Both are considered very low turbidity readings and there are no screening criteria turbidity.

Table VIII-L: Summary of Relative Percent Difference Values for Duplicate Samples

Quarter	Number of Duplicate Samples Collected	Summary of RPDs above Acceptable Percentage
1	2	› None
2	2	› Turbidity, CM_MW1-OB, RPD of 72%
3	2	› None
4	2	› None

Field and Trip Blanks

Detections were reported in three of the eight blanks (four field and four trip) submitted for laboratory analysis in 2019 (Table VIII-M). Among the six detections, one is for a metal, one is for a phosphorus analyte, and four are for nitrogen analytes.

Table VIII-M: Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter Above Detection Limit	Value
Field Blanks			
1	CM_MW1-SH	Ammonia-N Orthophosphate Dissolved manganese	8.8 µg/L 1.3 µg/L 0.12 µg/L ^a
2	CM_MW1-DP	Ammonia-N	26.1 µg/L ^a
Trip Blanks			
2	June 4	Ammonia-N TKN	142 µg/L ^a 0.202 mg/L

^a Result verified by repeat analysis

Detection limits: ammonia-N 5 µg/L, orthophosphate 1 µg/L, manganese 0.1 µg/L, TKN 0.05 mg/L

Results for ammonia-N in groundwater samples collected at CMO ranged from the DL (5 µg/L) to 659 µg/L. The ammonia results should be regarded as provisional because the concentrations in blanks range over the same orders of magnitude as the sample results. However, both the results and blank detections are an order of magnitude lower than the primary screening criteria.

Given that these ammonia analyte detections occurred in both field and trip blanks, the potential sources of the detections have been identified as the laboratory and bottles. A similar elevated frequency of nitrogen analyte detections in blank samples was identified for the 2018 monitoring year for GHO (SNC-Lavalin 2019b).

The laboratory conducted an investigation into elevated nitrogen analyte concentrations in blanks following completion of the 2018 SSGMP and RGMP monitoring programs. The investigation included examination of the laboratory QC method blank data and reverse-osmosis water monitoring data (source of deionized water used for lab, field and trip blanks). The laboratory investigation did not identify a potential sources of sample cross-contamination. Additional possible sources of ammonia cross-contamination include the bottles (pre-use decontamination and leaching from the materials) and sulfuric acid preservative. The blank analysis results indicate no sample contamination in the lab or field that materially affects data quality, notwithstanding ammonia.

Laboratory QA/QC

Complete laboratory QA/QC results are included in the COAs issued by the laboratory (Appendix X).

Detection limits were occasionally increased in response to a series of commonly encountered analytical circumstances, including the following:

- › the analyte was detected at a comparable level in the batch method blank;
- › dilution was required due to high dissolved solids in the sample;
- › dilution was required due to high test analyte concentration; and
- › sample matrix effects (e.g., chemical interference, colour, turbidity).

The higher detection limits were consistently below the primary and secondary screening criteria and therefore these detection limit qualifiers have not affected data quality.

Results for laboratory QA/QC samples occasionally yielded a series of qualifiers used to flag limitations in the reportability of the QA/QC result. These qualifiers are not expected to reflect on data quality, and include the following:

- › duplicate results and limits were expressed in terms of absolute difference;
- › matrix spike recovery could not be accurately calculated due to high analyte background in sample; and
- › relative percent difference between duplicates not available due to result being less than detection limit.

Additional non-routine data qualifiers were reported for isolated analytes in isolated samples or batches. These data qualifiers include the following:

- › method blanks exceeded laboratory DQO (one sample batch during each of Q1 and Q4);
- › DOC concentration was greater than TOC concentration in three samples (Q1 CM_MW6-DP, Q2 CM_MW6-DP and Q3 CM_MW1-SH);
- › TKN results may be biased low due to nitrate interference where nitrate-N concentration is more than ten times TKN concentration (Q2 CM_MW7-DP and Q4 CM_MW7-DP); and
- › Data Quality Objective was exceeded by less than 10% in a multi-element scan (affects bismuth analysis for Q3 trip blank).

The laboratory QA/QC results indicate data quality acceptable for the groundwater quality analyses conducted for CMO.

QA/QC Summary

The field QA/QC program and laboratory QA/QC results for groundwater samples indicate the data collected are acceptable for the analyses conducted in this report. With one exception, all RPD values were less than 50%. Sample temperatures in transport exceeded the Austin (2016) target by 2°C in one batch of samples. Ammonia-N results should be regarded as provisional because concentrations in blanks ranged the same orders of magnitude as the sample results; however, both the results and blank detections are an order of magnitude lower than the primary screening criteria. The laboratory quality control reports were reviewed and the data are considered reliable.

Regional Drinking Water Sampling Program

Shipping and Handling

There were no shipping and handling issues identified for RG-DW-series wells included in the RGMP with the exception of laboratory measured pH and ORP. All laboratory measured pH and ORP exceeded a hold time of 15 minutes. These measurements are collected in the field provide a reliable measurement.

Duplicate Samples

Table VIII-N summarizes the number of sample duplicates for wells included only in the RGMP (i.e., not in the SSGMP above) and any RPDs above acceptable levels (RPD > 50% with results > 5 times the DL).

Table VIII-N: Summary of Relative Percent Difference Values for Duplicate Samples

Quarter	Number of Duplicate Samples Collected	Summary of RPDs above Acceptable Percentage
1	1	› none
2	0	› n/a
3	1	› Turbidity with an RPD value of 53% at RG_DW-02-20
4	1	› none

The RPD values > 50 % for turbidity at RG_DW-02-20 are not a concern for the integrity of the sampling program. Of the numerous organic, inorganic, and physical parameters analysed, RPDs were otherwise less than 50%. These results indicate a good sampling program with low variability in constituent concentrations from sampling and handling.

Blanks

In 2019, there were no trip or field blanks collected at any of the RG_DW-series locations included in the RGMP.

Laboratory QA/QC

The detailed results of laboratory QA/QC are included in COAs in Appendix X. The Quality Control Reports noted the following for some samples.

- › Matrix Spike recovery could not be accurately calculated for some constituents due to high analyte background in sample.
- › DLs were raised due to dilution required due to high concentration of test analyte(s), analyte was detected at a comparable level in the method blank, high dissolved solids/electrical conductivity, or sample matrix effects (e.g., chemical interference, colour, turbidity).
- › TKN results were likely biased low due to nitrate interference. Nitrate-N is > 10x TKN.
- › Method blank exceeded ALS DQO. Limits of reporting were adjusted for samples with positive hits below 5x blank level.
- › Lab control sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, it reported, have been qualified.

- › Dissolved concentrations exceeded total on one occasion. Results were confirmed by re-analysis.

These notes are not unusual for these analyses and the results of the laboratory QA/QC were considered to be acceptable for the purpose of this assessment. A review of the QA portion of the laboratory analytical reports did not identify any additional QA/QC issues.

QA/QC Summary

QA/QC data relating to the RGMP were considered acceptable. A summary of the QA/QC results is as follows. There were no hold time exceedances. The RPD for turbidity above acceptable levels is not considered to influence interpretation of results. SNC-Lavalin recommends collecting field and trip blanks at the RG_DW-series locations included in the RGMP.

References

- Austin, J. (editor). 2016. British Columbia Environmental Laboratory Manual. Environmental Monitoring, Reporting and Economics Section, Knowledge Management Branch, B.C., Ministry of Environment, Victoria, BC.
- British Columbia Ministry of Environment, 2016. Technical Guidance 6: Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators. Technical Guidance for Environmental Management Act Applications, Version 2.0, June 2016.
- Clark, M.J.R., 2013. British Columbia Field Sampling Manual: 2013 – For Continuous Monitoring plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples. Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection, Victoria, BC, Canada. 344 pp.
- SNC-Lavalin, 2019. 2018 Site-Specific Groundwater Monitoring Report – Fording River Operations. Prepared for Teck Coal Limited. Dated March 28, 2019.

Appendix IX

K Testing



EVO Hydraulic Conductivity Testing

Single well response testing was conducted at EV_MCgwD and EV_MCgwS on November 5, 2019 using falling- and rising-head single well response tests (i.e., “slug”). The single well response testing involved inserting a section of solid PVC into the water column resulting in the displacement of a known volume of water which causes a short-term increase in the groundwater level; the slug was held below the initial static level and recovery was monitored until it was within approximately 95% of the static measurement (i.e., falling-head test). When the water level returned to the static level the slug was ‘instantaneously’ removed resulting in a drop in the groundwater level; groundwater entered the well from the surrounding formation to stabilize, eventually returning to static conditions (i.e., rising-head test).

Well response (i.e., water level change and recovery) was recorded using a Solinst® Levelogger suspended in the water column on a stainless steel cable. Water level measurements were downloaded from the Levelogger and hydraulic conductivity was estimated using AQTESOLV software; the well response was matched using the appropriate solution based on the aquifer type and response.

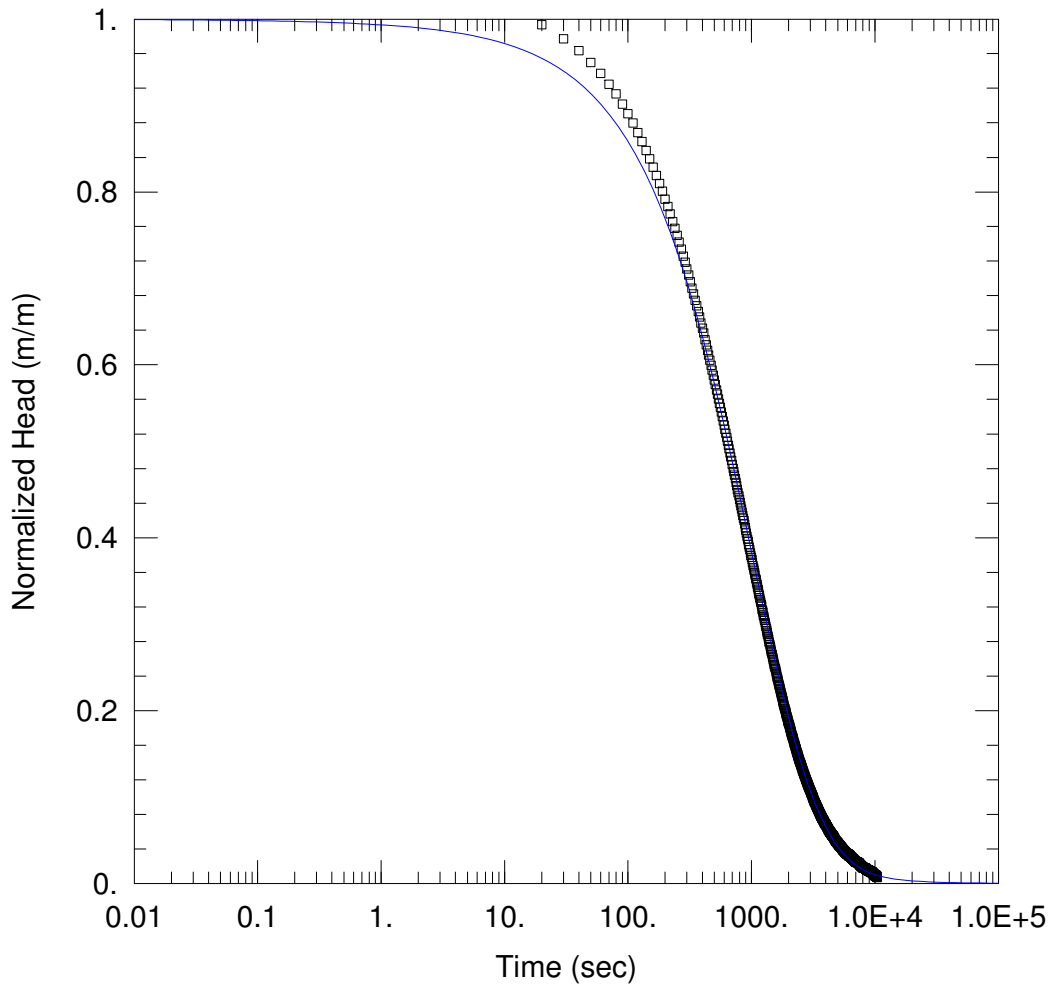
The results of the single well response tests completed are presented in Table IX-A below.

Table IX-A: Hydraulic Conductivity Results

Well ID	Lithology of Screen Interval	Hydraulic Conductivity Estimate (m/s)	Solution	Range of typical Hydraulic Conductivity for Screened Lithology (m/s) ¹
EV_MCgwS	Silt	1.9×10^{-6}	KGS Model w/skin	1×10^{-9} to 2×10^{-5}
EV_MCgwD	Clay	2.8×10^{-7}	KGS Model	1×10^{-11} to 4.7×10^{-9}

¹ Range of typical hydraulic conductivity from Domenico and Schwartz (1990).

The hydraulic conductivity estimate for EV_MCgwS is consistent with expectations for the silt unit observed in the screened interval during drilling. Skin effects were identified and corrected when the data was initially analyzed using the KGS-model type curve. The hydraulic conductivity estimate for EV_MCgwD is higher than would be expected for a well screened within a homogeneous clay unit. It is possible that this unit contains a larger amount of silt and fine sand than was observed at the time of drilling, which would result in a higher hydraulic conductivity estimate.



WELL TEST ANALYSIS

Data Set: ...\EV_MCgwd.aqt
 Date: 02/11/20

Time: 11:47:02

PROJECT INFORMATION

Company: SNC-Lavalin Inc.
 Client: Teck Coal
 Project: 635544
 Location: Elkview Operations
 Test Well: EV_MCgwd
 Test Date: November 5, 2019

AQUIFER DATA

Saturated Thickness: 22.28 m

WELL DATA (EV_MCgwd)

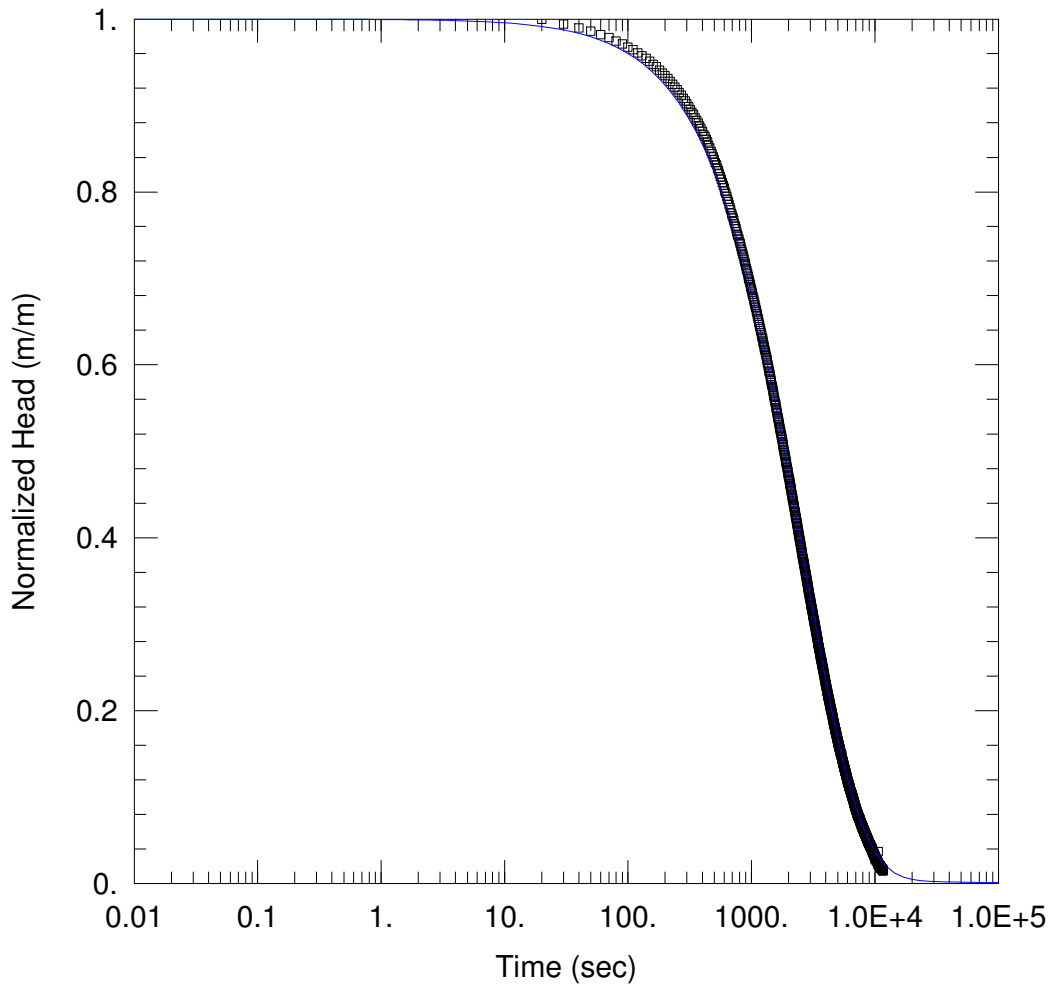
Initial Displacement: 0.67 m
 Total Well Penetration Depth: 21.9 m
 Casing Radius: 0.025 m

Static Water Column Height: 24.21 m
 Screen Length: 3. m
 Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
 $K_r = 2.838E-7$ m/sec
 $K_z/K_r = 1.$

Solution Method: KGS Model
 $S_s = 0.0001515$ m⁻¹



WELL TEST ANALYSIS

Data Set: ...\EV_MCgws.aqt
 Date: 02/11/20

Time: 11:06:56

PROJECT INFORMATION

Company: SNC-Lavalin Inc.
 Client: Teck Coal
 Project: 635544
 Location: Elkview Operations
 Test Well: EV_MCgws
 Test Date: November 5, 2019

AQUIFER DATA

Saturated Thickness: 1.2 m

WELL DATA (EV_MCgws)

Initial Displacement: 0.649 m
 Total Well Penetration Depth: 2.7 m
 Casing Radius: 0.025 m
 Well Skin Radius: 1. m

Static Water Column Height: 5.137 m
 Screen Length: 1.5 m
 Well Radius: 0.075 m
 Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Confined
 $K_r = 1.874E-6 \text{ m/sec}$
 $K_z/K_r = 1.$
 $Ss' = 1.0E-10 \text{ m}^{-1}$

Solution Method: KGS Model w/skin
 $Ss = 3.112E-11 \text{ m}^{-1}$
 $K_r' = 4.132E-7 \text{ m/sec}$
 $K_z/K_r' = 0.001$