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Technical Report Overview

Report: Regional Groundwater Monitoring Program 2016 Report

Overview: This report presents the 2016 results of the regional groundwater monitoring program required under Permit 107517. This report summarizes the results of groundwater quality in 2016 and compares groundwater chemistry to nearby surface water chemistry to understand groundwater transport pathways.

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

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

2016 Annual Report

Regional Groundwater Monitoring Program

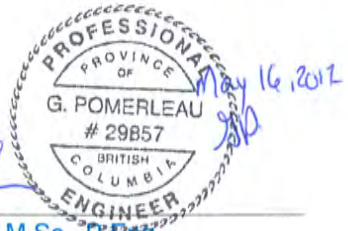
May 16, 2017

Internal Ref: 635544

Prepared For:

Teck Coal Limited

Prepared By:



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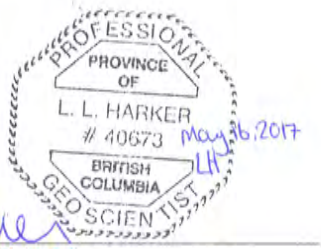

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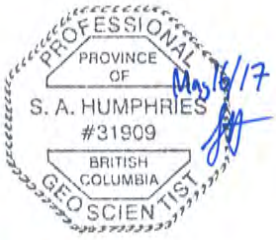

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Executive Summary

This report meets annual reporting requirements for regional groundwater monitoring in the Elk Valley as outlined in Section 10.4 of Permit 107517 (dated March 1, 2017). The Elk Valley Regional Groundwater Monitoring Program started in 2015 and consists of data from selected locations in the following groundwater monitoring programs:

- Fording River Operations (FRO);
- Greenhills Operations (GHO);
- Line Creek Operations (LCO);
- Elkview Operations (EVO);
- Coal Mountain Operations (CMO); and
- The Regional Drinking Water Sampling Program (RDW).

The Elk Valley Regional Groundwater Monitoring Program (RGMP) focuses on twelve areas ("Key Areas") identified in the Regional Groundwater Synthesis Report for the Elk Valley (the "Synthesis Report", SNC-Lavalin, 2015b) as being areas where a potential groundwater transport pathway of Constituents of Interests (CIs) in the valley bottom may exist. The 2016 Annual Regional Groundwater Monitoring Report has been prepared following the approved RGMP (SNC-Lavalin, 2015a) and incorporated feedback received from the Environmental Monitoring Committee (EMC) and Groundwater Working Group (GWG) on the RGMP Groundwater Synthesis Report and the 2015 Annual Report (SNC-Lavalin, 2016b).

Quarterly samples were collected from all wells included in the RGMP with the exception of the Q1 sample from EV_ECgw (located in Key Area 10) due to a frozen well. Samples from site-specific programs were submitted for all parameters on the analyte list except specific conductance which was not reported for samples collected at FRO, GHO and EVO (during Q3 and Q4). In addition, field conductivity was not recorded at samples collected at LCO and EVO (during Q1 and Q2). RG_DW-series wells were sampled on four occasions in 2016; however, the first sample was collected in late May/early June and therefore samples were not collected during the Q1 period (i.e., January to March). These modifications to the RGMP do not impact the overall quality or interpretation of the data.

Groundwater quality at all groundwater monitoring locations were compared to applicable primary and secondary screening criteria and discussion of trends as well as interpretation of water levels and selected parameters were completed by Key Area. To assess groundwater and surface water interaction and increase our understanding of groundwater transport pathways, groundwater chemistry was compared to chemistry at nearby surface water station in some Key Areas where relevant.

In general, groundwater conditions were relatively similar to those outlined in the Groundwater Synthesis Report and the 2015 Annual Report. Concentrations of CIs above primary and secondary screening criteria were generally consistent with previous observations and are summarized by Key Area within the report. Concentrations of other constituents were also compared to primary screening criteria. Most concentrations of other constituents above primary screening criteria noted are not considered a concern because there was no identified receptor for the specific pathway and/or the results were only marginally above criteria. In some Key Areas, concentrations for some constituents (i.e., copper, fluoride, iron and manganese) were significantly higher than primary criteria and the source was unclear. These constituents may be naturally occurring and continued monitoring is recommended. Results of the RGMP will be considered under Big Question 6 in the Adaptive Management Plan (AMP; Teck, 2016). Additional

linkages between the RGMP and the AMP will be considered through the RGMP update submission (Sept 30, 2017) and in future updates to the AMP.

General recommendations for the RGMP are as follows:

- Increase water level data quality by:
  - collecting concurrent (before and after) manual water level measurements each time a water level logger is deployed or removed from a well and prior to each sampling event;
  - re-deploying level logger at exact same depth in monitoring well after it was removed for downloading; and
  - using a barometer and manual water level measurements to compensate and correct the data;
- Review the QA/QC programs, specifically related to field and trip blanks; and
- Analyse for all the parameters listed in the RGMP in 2017, including expansion of the parameters for RDW wells that are part of the RGMP.

Conclusions from the 2016 results and specific recommendations for the RGMP are presented by Key Area within the report. It is noted that these recommendations will be considered and prioritized as part of the September 30, 2017 RGMP submission.

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Acronyms

BCWQG	British Columbia Water Quality Guidelines
CMO	Coal Mountain Operations
CP	Compliance Point
CI	Constituents of interest
EMC	Environmental Monitoring Committee
EVWQP	Elk Valley Water Quality Plan
EVO	Elkview Operations
FRO	Fording River Operations
GHO	Greenhills Operations
GWG	Groundwater Working Group
GCDWQ	Guidelines for Canadian Drinking Water Quality
IHA	Interior Health
KNC	Ktuxana Nation Council
FLNR	Lands and Natural Resource Operations
LCO	Line Creek Operations
MU	Management Unit
MDL	Method Detection Limit
MEM	Ministry of Energy and Mines
MoE	Ministry of Environment
RDW	Regional Drinking Water
RGMP	Regional Groundwater Monitoring Program
RPDs	Relative percent differences
SPO	Site Performance Objective
SP&P	Standard Practice and Procedure
TOR	Terms of Reference
QA/QC	Quality Assurance/Quality Control

1 Introduction

This report was generated to meet annual reporting requirements for Teck Coal Limited (Teck) for regional groundwater monitoring in the Elk Valley outlined in Permit 107517 (dated March 1, 2017). SNC-Lavalin Inc. (SNC-Lavalin) and Teck developed a Regional Groundwater Monitoring Program (RGMP) to monitor groundwater in the valley bottoms of defined areas within Management Units (MU[s]) 1, 2, 3 and 4 as described in the Elk Valley Water Quality Plan (EVWQP; Teck, 2014) and shown on Drawing 635544-101. This report fulfills reporting requirements listed in Section 10.4 of Permit 107517, specifically:

Regional groundwater monitoring results and interpretation must be compiled into a written report and submitted on an annual basis for each calendar year to the Director by May 16 of the following year. The Annual Report must include summaries of the site specific groundwater reports.

The report(s) must include, but is not limited to:

i. *A map of monitoring locations with EMS and Permittee descriptors;*
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.*
iii. *Drawings showing locations and water quality data of groundwater sampling points.*
iv. *A summary of background information on that year's program, including discussion of program modifications relative to previous years;*
v. *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;*
vi. *If applicable, a summary of exceedances of screening benchmarks;*
vii. *Evaluation and discussion of spatial patterns and temporal trends;*
viii. *A summary of all QA/QC issues during the year; and*
ix. *Recommendations for further study or measures to be taken.*

1.1 Background Information

The basis for the RGMP was a regional hydrogeological conceptual model (the "Regional Conceptual Model") developed to describe groundwater flow patterns and quality, focussing on mine-related constituents including selenium, cadmium, sulphate, and nitrate, or "constituents of interest" (hereafter referred to as CIs). The Regional Conceptual Model was described in a Regional Groundwater Synthesis Report for the Elk Valley (the "Synthesis Report", SNC-Lavalin, 2015b) which compiled and interpreted all relevant groundwater information available in the Elk Valley. The Regional Conceptual Model identified potential groundwater migration pathways of CI from mining operations and the RGMP integrates data from ongoing monitoring programs to measure and evaluate the regional effects of these operations on groundwater (SNC-Lavalin, 2015b). The RGMP consists of collecting monitoring data from selected locations in the following groundwater monitoring programs:

- Fording River Operations (FRO);
- Greenhills Operations (GHO);
- Line Creek Operations (LCO);
- Elkview Operations (EVO);
- Coal Mountain Operations (CMO); and
- Regional Drinking Water Sampling Program (RDW).

The Regional Conceptual Model defined twelve areas ("Key Areas") at the local scale (i.e., on the order of tens of metres to a few kilometres) as being areas where groundwater monitoring may be required to confirm the concepts of the Regional Conceptual Model and reduce uncertainties associated with understanding potential groundwater pathways of CI in the valley bottom in the main river systems. These Key Areas were described in detail in the Synthesis Report and summarized below in Table A.

Table A: Key Areas for Groundwater Monitoring as defined in SNC-Lavalin (2015a, 2015b)

Key Area	Description	MU	Program(s)
1	**Fording River Valley Bottom Downgradient of FRO, Cataract and Porter Creeks:** This area is the focal point for the majority of upland and tributary flow to the Fording River valley bottom near the FRO and GHO property boundaries, and the primary off-site migration pathway from FRO.	1	FRO
2	**Fording River Valley Bottom Downgradient of LCO Dry Creek**: This area receives drainage from the planned LCO Phase II development as well as upgradient Fording River valley-bottom groundwater from FRO and GHO.	1	LCO
3	**Fording River Valley Bottom Downgradient of GHO Rail Loop and Greenhills Creek**: This area receives upland groundwater from GHO.	1	GHO
4	**Elk River Valley Bottom Downgradient of Leask, Wolfram and Thompson Creeks:** This area receives groundwater recharge from upgradient mining activities along the western slope of GHO, and is a potential offsite migration pathway.	2	GHO / RDW
5	**Fording River Valley Bottom Downgradient of Line Creek:** The valley bottom in this area receives inputs from Line Creek, the Fording River and the LCO Process Plant.	2 and 4	LCO
6	**Elk River Valley Bottom Downgradient of Confluence with Fording River:** This area receives input from the Fording River valley-bottom, the Elk River valley-bottom and the Line Creek Process Plant site.	4	LCO
7	**Elk River Valley Bottom Downgradient of Grave Creek:** This area receives input from drainages flowing from the northwest slope of EVO, as well as upgradient input from the Elk River and Key Area 6.	4	EVO / RG
8	**Elk River Valley Bottom Downgradient of Balmer, Lindsay, Goddard, Otto and Marsh Creeks:** Upland groundwater flows into the Elk River valley bottom from potential sources along the western slope of EVO.	4	EVO
9	**Michel Creek Valley Bottom Downgradient of Bodie Creek:** Upland groundwater flows into the Michel Creek valley bottom from potential sources along the western slope of EVO.	4	EVO / EVO / RDW

Table A (Cont'd): Key Areas for Groundwater Monitoring as defined in SNC-Lavalin (2015a, 2015b)

Key Area	Description	MU	Program(s)
10	Michel Creek Valley Bottom Downgradient of Erickson Creek: Mining activities on the southwest slope of EVO around Erickson Creek, are a potential source of mining-related constituents to valley-bottom groundwater into the Michel Creek valley bottom.	4	EVO
11	**Michel Creek Valley Bottom Downgradient of CMO:** The Michel Creek valley bottom receives input from CMO immediately downgradient of the confluence of Michel and Corbin Creeks. Valley-bottom deposits in this area are the primary off-site migration pathway.	4	CMO / RDW
12	**Elk River Valley Bottom at Study Area Boundary:** This area is at the boundary of MU4 and the Study Area. Coarse sediments in this area have been identified as a potential migration pathway, and previous studies have inferred that surface water recharge from the Elk River occurs in this area.	4	EVO / RDW

The first Annual Regional Monitoring Report was submitted to the MoE on March 31, 2016 (the "2015 Annual Report", SNC-Lavalin, 2016b), to fulfill groundwater reporting commitments outlined in Permit 107517 (Section 10.4). On October 26 and 27, 2016, SNC-Lavalin and Teck facilitated a workshop that was held with a multi-stakeholder group comprised of Teck, the Ktunaxa Nation Council (KNC) and the MoE. This group has been termed 'the Groundwater Working Group (GWG)', which included members who provided feedback on the 2015 submissions (i.e., Synthesis Report, RGMP, and 2015 Annual Report). In the workshop, content of the 2015 submissions were reviewed. In particular, the following were presented and discussed:

- Important aspects of the Regional Conceptual Model;
- Differentiation between site-specific and regional groundwater monitoring programs;
- Proposed purpose and objective statements; and,
- EMC written comments on the Synthesis Report, and RGMP.

The RGMP was approved on April 18, 2017 with a number of conditions, listed as follows:

1. *The Groundwater Working Group established October 2016 will 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) and Ministry of Environment (ENV), and may expand to include participants from Ministry of Energy and Mines (MEM), Ministry of Forest, Lands and Natural Resource Operations (FLNR), and Interior Health (IHA).*

2. *A meeting of the Groundwater Working Group will be held by the end of June 2017 to discuss the Terms of Reference (TOR) for the RGMP update due in 2017. It is expected that TOR will include a draft framework for identifying and prioritizing additional areas for investigation under the regional monitoring program.*

3. *An update of the RGMP will be submitted to the Director for approval by September 30, 2017, and will contain at a minimum:*

   a. *A list of areas of additional study, and a system for prioritizing the implementation of groundwater studies for the specific areas identified, and a tentative schedule of the additional studies. The list of areas of additional study will be developed from previous assessments (i.e., 12 Key Areas) as well as evaluation of available data and gaps based on criteria identified in the Groundwater Workshop (October 26 and 27, 2016);*

   b. *Integration of information from the Site Specific groundwater programs, which will also be used to identify potential areas of additional study;*

   c. *A Glossary;*

   d. *An updated Conceptual Site Model with well-presented data to support the model;*

   e. *Maps and visual data presentation;*

   f. *Defined purpose and objectives, with measurable outcomes;*

   g. *Definitions and conceptual boundaries of site and regional groundwater programs and the linkages between them;*

   h. *Screening benchmarks with rationale; and,*

   i. *A framework for developing and prioritizing groundwater triggers that integrate with the Water Quality Adaptive Management Plan for Teck Coal Operations in the Elk Valley.*

1.2 Report Structure and Content

The 2016 Annual Regional Groundwater Monitoring Report has been prepared following the approved RGMP (SNC-Lavalin, 2015a) and the annual groundwater reporting requirements listed in Section 10.4 of Permit 107517. The structure and content of this report has incorporated EMC and GWG feedback on the Synthesis Report and the 2015 Annual Report where appropriate. The 2016 Annual Regional Groundwater Monitoring Report is structured as follows:

- Section 1 includes background information on the RGMP;
- Section 2 provides a description of the RGMP including monitoring locations, sampling methodologies and Quality Assurance/Quality Control (QA/QC). This Section meets the Permit 107517 Section 10.4 requirements:
  - *i. a map of monitoring locations with EMS and Permittee descriptors;*
  - *iv. a summary of background information on that year's program, including discussion of program modifications relative to previous years; and*
  - *viii. a summary of all QA/QC issues for the year.*
- Section 3 provides a description and explanation of primary and secondary screening criteria for comparison of groundwater quality data as defined in the approved RGMP;

- Section 4 includes results from the 2016 RGMP, including comparison to screening criteria outlined in Section 3, broken into Key Area. Trends for water levels and groundwater quality and a comparison against available surface water data, where sufficient data are available, are presented and used for data interpretation by Key Area. This Section which meets the Permit 107517 Section 10.4 requirements:
  - *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;*
  - *iii. drawings showing locations and water quality data of groundwater sampling points;*
  - *v. a summary of measured parameters, including appropriate graphs and comparison of result to, Approved and Working Water Quality Guidelines, or other criteria and benchmarks as specified by the Director;*
  - *vi. if applicable, a summary of exceedances of screening benchmarks; and*
  - *vii. evaluation and discussion of spatial patterns and temporal trends.*
- Section 5 provides the conclusions from the 2016 RGMP as well as any recommendations for monitoring, intended to meet Permit 107517 Section 10.4 requirement:
  - *ix: recommendations for further study or measures to be taken.*

As indicated in Section 1.1, an update of the RGMP will be submitted to the Director for approval by September 30, 2017. This includes, but is not limited to, review of screening criteria, definitions of site-specific vs. regional groundwater monitoring and development of a draft framework for identification and prioritization of additional areas for investigation. As such, throughout the 2016 Annual Report we refer to some of these components that may be subject to change in the September 2017 RGMP submission.

1.3 Data Sources and Limitations

SNC-Lavalin received field and chemistry data from both the site-specific and RDW groundwater monitoring programs listed above (including both manual and level logger groundwater levels, top of casing information, field measurements and laboratory analytical results, where applicable). Teck also received some data from the District of Sparwood that has been transferred to SNC-Lavalin through Teck. SNC-Lavalin has relied on data and information provided by Teck and, as such, has assumed that the information provided is both complete and accurate. To confirm that field activities are conducted in a manner that meets the overall data quality objective of the QA/QC program, Teck's sampling activities are conducted in accordance with the 2013 Edition of the British Columbia Field Sampling Manual (Clark, 2002). Environmental personal are trained using on-site Standard Practice and Procedure (SP&P) as detailed in the "Teck Field Sampling Manual". Interpretations and conclusions within this report are made with the assumption that data collection was performed following these standards using the proper duty of care.

1.4 Linkage to Adaptive Management

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. Teck has provided this section of SNC's report in order to provide a consistent approach to describing linkages between Adaptive Management and related programs and reports.

Following an adaptive management framework, the AMP identifies six Big Questions that will be re-evaluated at regular intervals as part of AMP updates throughout the duration of EVWQP implementation. For each Big Question, the AMP describes how the Big Question will be periodically re-evaluated, and how the key uncertainties under the Big Question will be reduced.

The AMP was submitted to the Environmental Monitoring Committee and MOE Director July 31 2016 as required. Study designs for many programs (including the RGMP) were established before the AMP was submitted. Teck is working to embed elements of the AMP within each program through reviews of monitoring programs at the study design and annual report stages. As the AMP is currently under review and in the process of being implemented, this is the first cycle where the monitoring programs are being explicitly reviewed to confirm all required monitoring is included. Gaps identified in review of 2016 annual reports will inform study design updates as required.

As defined in the July 31 2016 AMP, Big Question 6 ("Is water quality being managed to be protective of human health?") will be re-evaluated through periodic review of RGMP monitoring data. This process is outlined in Figure 1. In addition, the analysis of RGMP information will assist in addressing Key Uncertainty 6.1 "Is our understanding of local groundwater conditions for current and future drinking water use sufficient to minimize human exposure to constituents?".

This annual Report supports the re-evaluation of Big Question 6 through evaluating RGMP data. In this report, uncertainty in the RWQM is identified to be considered in the RGMP update submission (September 30, 2017). The evaluation of RGMP performance will be reviewed as part of the update process and adjustments to the program will be discussed with the Groundwater Working Group. In addition, as required by the RGMP approval letter, the update of the RGMP will contain a framework for developing and prioritizing groundwater triggers that integrate with the AMP.

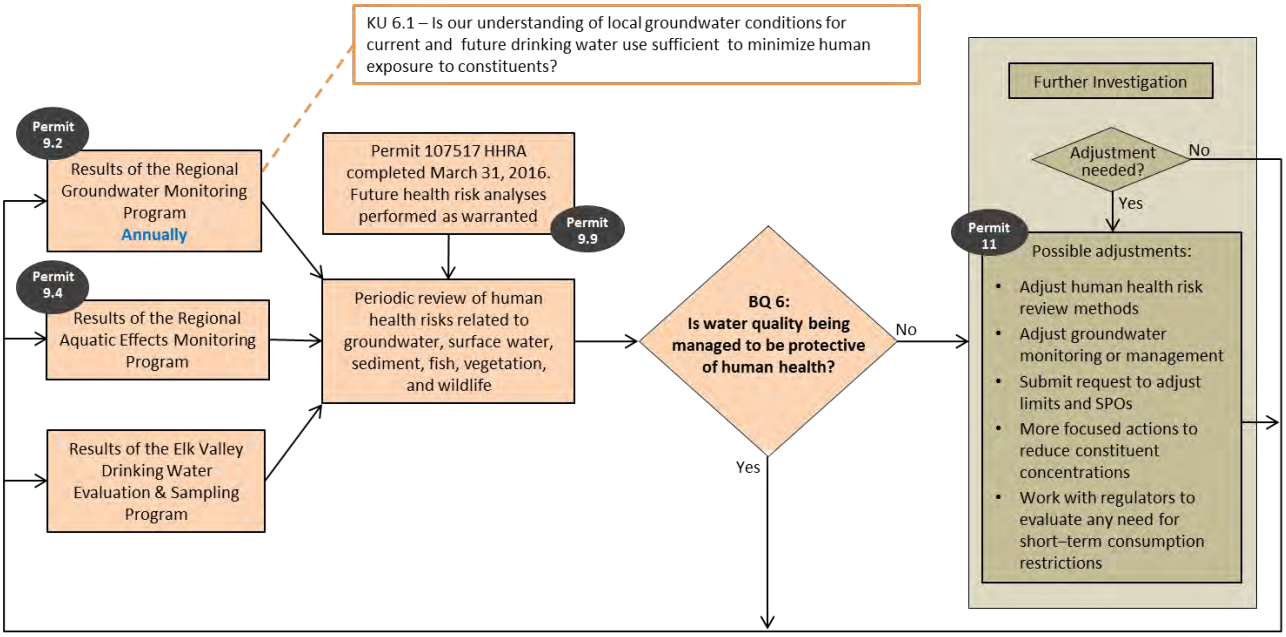

Figure 1: The process for re-evaluating the answer to Big Question 6 (Teck 2016, AMP Figure 6)

2 Regional Groundwater Monitoring Program Description

The approved RGMP outlines monitoring locations; sampling methodology; sampling frequency; analytical parameters; and a quality assurance/quality control (QA/QC) program which combined define a comprehensive groundwater monitoring program for Management Units 1, 2, 3 and 4 as required by Permit 107517 Section 9.2.1. The intent of the RGMP is to dovetail with the Site-specific Groundwater Monitoring Programs to monitor for potential regional effects of mining activities on groundwater. Details of the 2016 monitoring program are provided in the following subsections.

2.1 Monitoring Locations and Rationale

A total of 37 existing monitoring, supply and/or domestic wells were included in the RGMP. These wells provide information on the regional groundwater understanding and have been selected for inclusion into the RGMP as they are existing locations that best characterize groundwater conditions and potential groundwater transport of CI to the valley bottom in Key Areas as defined by the Regional Conceptual Model. Monitoring locations were selected in the RGMP based on the following:

- Wells completed in valley-bottom sediments upgradient of, within, or downgradient of a Key Area;
- Wells in upland or tributary areas upgradient of Key Areas where potential for a groundwater transport pathway was identified by Site-specific Groundwater Monitoring Programs; and,
- A background or reference well to provide a suggestion of naturally occurring conditions in the main river valley-bottoms.

The wells selected for the RGMP are an integration of Site-specific Groundwater Monitoring Programs, the RDW and other ongoing sampling programs such as operational water supply sampling programs. Wells consist of dedicated monitoring wells, supply wells and domestic wells; general rationale for selection and limitations are described below:

- Dedicated groundwater monitoring wells are preferred for inclusion in the monitoring network because they provide a discrete, representative sample of groundwater and water level from the targeted formation. Where available, nested wells screened at two or more different depths were chosen to monitor the variation of water constituents with depth. Multi-level wells may also be used to assess the vertical hydraulic gradient and inform groundwater and surface water interactions;
- Supply wells can provide representative average groundwater quality over a much larger region compared to dedicated monitoring wells and can identify potential influences due to pumping. Water supply wells are not ideal for discrete sampling of groundwater due to longer well screens and mixing effects within the well's capture zone induced by pumping. Also, in most cases static water levels are not available which limits their application for monitoring groundwater levels. However, water supply wells were included in the RGMP in areas where dedicated monitoring wells do not exist;

- Domestic wells selected in the RGMP are distal to operations and provide a representative indication of groundwater quality in areas that would be subject to recharge from surface water such as the Elk and Fording Rivers. Similar to supply wells, the use of domestic wells for monitoring is limited by the effects of long well screens and limited access to wellhead to measure static water level or conduct hydraulic testing. Also, continued monitoring of these wells is at the discretion of the private well owners; therefore, changes may occur to sampling plan based on desired participation of landowners. However, the current RDW Sampling Program allows quarterly access to domestic wells that are useful for monitoring groundwater quality in Key Areas where dedicated monitoring wells or supply wells are not available.

Review of selected locations and the supporting rationale for selection for monitoring will be performed as part of the September 30, 2017 RGMP submission.

Table B provides a list of locations associated with each Key Area, as well as information such as well type (monitoring, supply or domestic), associated operation and location UTMs. Table B also includes a description of each well location and a rationale indicating why these wells were included in the monitoring program. Drawings 635544-102 to -105 indicate the location of monitoring locations included in the RGMP in each Key Area in relation to MUs and permitted mine boundaries. Other monitoring wells not included in RGMP but presented on geological cross sections are also shown.

Additional details on rationale for well selection and information associated with well type (i.e., monitoring supply, or domestic well) are provided in the RGMP (SNC-Lavalin, 2015a). Borehole logs for the wells sampled as part of the RGMP are included in Appendix I.

Table B: Groundwater Monitoring Locations by Key Area, Well Type, Associated Operation and Description

Key Area	Well ID	Well Type	Management Unit (MU)	Operation	Easting (m)	Northing (m)	Setting	Location Description and Rationale
Background	FR_HMW5	Monitoring	1	FRO	655476	5567514	Tributary valley-bottom	Background well upgradient of FRO in Henretta Creek Drainage. Selected to provide background regional groundwater conditions.
1	FR_09-01-A	Monitoring	1	FRO	652601	5558300	Fording River valley-bottom	Downgradient of South Kilmarnock Phase 1 and 2 Settling Ponds, Swift Creek and Kilmarnock Creek, upgradient of Cataract Creek and Key Area 1. Completed in coarse sediments within the Fording River Valley. Selected to monitor groundwater near the Site boundary of FRO.
	FR_09-01-B	Monitoring	1	FRO	652601	5558300		
	FR_GHHW[1]	Supply	1	FRO	653150	5557337		Wells screened within coarse Fording River valley-bottom sediments at the southern border of FRO, downgradient of Swift, Porter and Cataract Creeks. Selected to monitor groundwater transport outside of mine-permitted areas in Key Area 1.
2	LC_PIZDC1308	Monitoring	1	LCO	*658111*	*5541266*	Tributary valley-bottom	Multi-level overburden sentry well upgradient of Key Area 2 in the LCO Dry Creek valley bottom. Selected to monitor potential influence of planned upland and tributary valley-bottom development at LCO Phase II.
	LC_PIZDC1307	Monitoring	1	LCO	*658111*	*5541266*		
3	GH_POTW09	Supply	1	GHO	*654207*	*5545403*	Fording River valley-bottom	Located in the Fording River Valley Aquifer. Selected to monitor groundwater conditions in Key Area 3.
	GH_POTW10	Supply	1	GHO	*653291*	*5545667*		
	GH_POTW15	Supply	1	GHO	*653169*	*5545667*		
	GH_POTW17	Supply	1	GHO	653592	5545620		
4	GH_MW-ERSC-1	Monitoring	3	GHO	649081	5548704	Elk River valley-bottom	Located near the southern boundary of Key Area 4. Selected as a potential sentry well to monitor groundwater quality in Elk River valley-bottom sediments.
	GH_GA-MW-1	Monitoring	3	GHO	648019	5554750		Upgradient area of Key Area 4. Selected to monitor groundwater conditions in Elk River valley-bottom groundwater conditions near GHO in the upgradient area of Key Area 4.
	GH_GA-MW-2	Monitoring	3	GHO	648291	5552115		Located downgradient of Wolfram Creek Settling Ponds. Selected to monitor upland and tributary valley bottom influences from the west side of GHO and evolution of groundwater quality in within the Elk River valley bottom in Key Area 4.
	GH_GA-MW-3	Monitoring	3	GHO	648578	5550296		Located downgradient of Thompson Creek Settling Ponds. Selected to monitor upland and tributary valley bottom influences from the west side of GHO and evolution of groundwater quality in within the Elk River valley bottom in Key Area 4.
	GH_GA-MW-4	Monitoring	3	GHO	648217	5552963		Located downgradient of Leask Creek Settling Ponds. Selected to monitor upland and tributary valley bottom influences from the west side of GHO and evolution of groundwater quality in within the Elk River valley bottom in Key Area 4.
	RG_DW-01-03	Supply	3	RG	649089	5545617		Located 5 km downgradient of Key Area 4. Selected as a potential sentry well to monitor groundwater within coarse Elk River valley bottom sediments downgradient of Key Area 4.
	RG_DW-01-07	Domestic	3	RDW	649737	5534117		Located 15 km downgradient of Key Area 4. A sentry well to monitor groundwater within the Elk River valley bottom downgradient of Key Area 4.
5/6	LC_PIZP1101	Monitoring	4	LCO	653960	5528263	Elk River valley-bottom	Southwest of the effluent ponds at the LCO Process Plant Site, upgradient of Key Area 6. Selected to monitor potential influence from the LCO Process Plant Site on the Elk River valley bottom in Key Area 6.
7	EV_GV3gw	Monitoring	4	EVO	656580	5522255	Tributary valley-bottom	Nearest upgradient well of Key Area 7, within the Grave Creek valley bottom. Selected to monitor upland and tributary valley-bottom input from drainages to the northeast of EVO.
	RG_DW-02-20	Domestic	4	RDW	652327	5522262	Elk River valley-bottom	Located 4 km downgradient of Key Area 6. Selected to monitor groundwater in the Elk River valley bottom in Key Area 7.
8	EV_LSgw	Monitoring	4	EVO	653274	5514731	Elk River valley-bottom	Located near the discharge of Lindsay Creek to the Elk River. Selected to monitor potential inputs to Key Area 8 from upland, tributary valley bottom, and Elk River valley bottom features along the western slope of EVO.
	EV_OCgw	Monitoring	4	EVO	652480	5512671		Located immediately downgradient of Lagoon D and adjacent to Otto Creek. Selected to monitor potential inputs to Key Area 8 from upland, tributary valley bottom, and Elk River valley bottom features along the western slope of EVO.

Table B (Cont'd): Groundwater Monitoring Locations by key Area, Well Type, Associated Operation and Description

Key Area	Well ID	Well Type	Management Unit (MU)	Operation	Easting (m)	Northing (m)	Setting	Location Description and Rationale
9	EV_BCgw	Monitoring	4	EVO	655381	5509659	Michel Creek valley-bottom	Downgradient of the confluence of Bodie Creek and Michel Creek. Selected to monitor spatial distribution of water quality within Michel Creek valley-bottom sediments in relation to potential inputs in Key Area 9.
	EV_MCgwS	Monitoring	4	EVO	653476	5511624	Michel Creek valley-bottom	Located 1.8 km upgradient of the confluence of Michel Creek and the Elk River. Selected to monitor spatial distribution of water quality within Michel Creek valley-bottom sediments in relation to potential inputs in Key Area 9.
	EV_MCgwD	Monitoring	4	EVO	653475	5511616		
	EV_BRgw	Supply	4	EVO	*655019*	*5510193*		Michel Creek valley bottom upgradient and downgradient of Gate Creek and Bodie Creek confluence with Michel Creek. Selected to monitor spatial variation in groundwater quality within Michel Creek valley bottom in relation to Key Area 9.
	EV_RCgw	Supply	4	EVO	*655902*	*5509299*		
	EV_WH50gw	Supply	4	EVO	*654963*	*5510219*		
	RG_DW-03-01	Domestic	4	RDW	653073	5511973		Located 1.2 km upgradient of the confluence of Michel Creek and the Elk River. Selected as a potential sentry well to monitor groundwater within coarse Elk River valley bottom sediments downgradient from Key Area 9.
10	EV_ECgw	Monitoring	4	EVO	660795	5506384	Tributary valley-bottom	Nearest upgradient well of Key Area 10, within Erickson Creek valley bottom. Selected as a sentry well to monitor potential influence of upland and tributary valley-bottom groundwater from the southwest portion of EVO to Key Area 10.
11	CM_MW1-OB	Monitoring	4	CMO	667957	5487526	Michel Creek valley-bottom	Multi-level sentry well immediately downgradient of CMO and the confluence of Michel Creek and Corbin Creek. Selected to monitor groundwater in the Michel Creek valley-bottom in Key Area 11.
	CM_MW1-SH	Monitoring	4	CMO	667957	5487526		
	CM_MW1-DP	Monitoring	4	CMO	667957	5487526		
	RG_DW-07-01	Domestic	4	RDW	668407	5487454		Immediately downgradient of CMO at the confluence of Michel Creek and Corbin Creek. Selected as a sentry well to monitor groundwater conditions in the Michel Creek Valley bottom downgradient of CMO in Key Area 11.
12	EV_ER1gwS	Monitoring	4	EVO	651374	5510955	Elk River valley-bottom	Adjacent to the Elk River, 1 km downgradient of the confluence with Michel Creek. Multi-level sentry well to monitor groundwater in Elk River valley-bottom sediments in Key Area 12.
	EV_ER1gwD	Monitoring	4	EVO	651379	5510952		
	RG_DW-03-04	Supply	4	RG	651836	5510611		Located near the border of MU4 and MU5 in the Elk River valley bottom. Selected as a sentry well to monitor deep overburden groundwater in the Elk River valley bottom at the southern extent of the Study Area in Key Area 12.

[1] Greenhouse water supply includes four wells (FR_GH_WELL1, FR_GH_WELL2, FR_GH_WELL3 and FR_GH_WELL4) which are collectively referred to as FR_GHHW. Easting and Northing are listed for FR_GH_WELL4.
Underlined italics indicate values are approximate. Approximate locations are estimated based on Drawings..

2.2 Sampling Methodology

Sampling for the RGMP was completed by Teck or others and carried out in accordance with the 2013 edition of the British Columbia Field Sampling Manual (Clark, 2002), as required in Permit 107517, and Teck's Field Sampling Guidance documents for water sample collection and handling (TC_GW-01 and TC_GW-02) using well-specific methods based on well construction, type and recharge. Specific sampling methodology varied by program and well type. SNC-Lavalin reviewed site-specific 2016 annual monitoring reports for each operation (Golder, 2017; Hemmera, 2017; SRK, 2017; Teck, 2017a,b) and groundwater samples were collected in accordance with the 2013 edition of the British Columbia Field Sampling Manual (Clark, 2002). A summary of sampling methodology for each monitoring program is provided in Sections 2.2.1 to 2.2.5 below. Teck provided details relating to the sampling methodology for the 2016 RDW program, which is summarized below in Section 2.2.6.

2.2.1 Fording River Operations (FRO)

Manual water elevation measurements (i.e., water level tape) were used to measure groundwater elevation. There is a level logger deployed at FR_HMW5 however Teck was not able to retrieve the barologger (due to frozen conditions in the well); therefore FR_HMW5 level logger data from 2016 could not be provided. Samples collected from FR_09-01-A, FR_09-01-B and FR_HMW5 were collected using a peristaltic pump. Samples collected from supply well FR_GHHW (includes FR_GH_WELL1, FR_GH_WELL2, FR_GH_WELL3 and FR_GH_WELL4); were collected from a distribution point (i.e., faucet) within the water system for Q1, Q2 and Q3 (consistent with previous samples from this location). However, during Q4, the FR_GHHW well pumps were non-operational and it was not possible to collect a sample from the distribution point; instead, the Q4 samples were collected from FR_GH_WELL2 using a peristaltic pump (Teck, 2017a).

2.2.2 Greenhills Operations (GHO)

Water levels were manually measured from the top of the well casing using a water level tape. Level loggers were also deployed at select wells including GH_GA-MW-1, GH_GA-MW-2 and GH_GA-MW-3. Prior to sampling, wells were purged using a Geosub submersible pump with dedicated polyethylene tubing. The pump was run for several minutes at each well prior to sampling to minimize cross contamination between each sample location. The wells were purged at a rate of less than 1 L/min depending on purging duration and stability of parameters. Wells were sampled after the field measured parameters had stabilized. Field parameters (pH, temperature, electrical conductivity) were measured using a calibrated YSI Pro-DSS (Hemmera, 2017).

2.2.3 Line Creek Operation (LCO)

Manual water elevation measurements (i.e., water level tape) and level loggers (deployed at LC_PIZDC1307, LC_PIZDC1308 and LC_PIZP1101) were used to measure groundwater elevation. Wells were purged using a low-flow pump until field parameters (pH, temperature, turbidity, dissolved oxygen and electrical conductivity) stabilized which was monitored with a calibrated YSI Pro-Plus multi-parameter instrument, prior to sample collection (Golder, 2017).

2.2.4 Elkview Operations (EVO)

Both manual water elevation measurements (i.e., water level tape) and level loggers were used to measure groundwater elevation; all monitoring wells from EVO included within the RGMP contained level loggers, with the exception of EV_ER1gwD. Level loggers were set to record hourly pressure and temperature measurements; pressure measurements were corrected using barometric pressure (with a barologger). Wells were purged until field parameters stabilized (conductivity, dissolved oxygen, pH, oxidation-reduction potential, turbidity and temperature). Field parameters were recorded once stable, prior to sampling. The specific sampling method selected for each monitoring well location was determined based on well construction, type and recharge characteristics (Teck, 2017b).

2.2.5 Coal Mountain Operations (CMO)

Water level measurements are collected manually using a Heron – Dipper T graduated water level tape. Sampling of all wells was carried out using a portable bladder pump (i.e., Geotech) and disposable bladders. Water was purged from the well at a rate low enough to avoid (when possible) changes in water level and minimize increases in turbidity. Water was purged from the well until field parameters stabilized which was monitored with a multi-parameter meter (i.e., YSI 556) and a turbidity meter (i.e., Hach 2100Q) (SRK, 2017).

2.2.6 Regional Drinking Water Sampling Program (RDW)

In 2016, sampling of RG_DW-series wells from the RDW was completed by Teck. Teck indicated sampling methodology was as follows:

- Where possible, the sample port used in the initial drinking water evaluation or previous sampling events was used to collect the sample;
- 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 the purging was to obtain samples representative of the water source and not influenced by the distribution system;
- Water quality parameters (pH/electrical conductivity/temperature) were monitored until stable readings were observed. Once the stabilized water quality parameters were recorded, the flow was reduced to minimize splashing and samples were collected into laboratory supplied bottles.

The Sparwood Municipal Supply Well (RG_DW-03-04) is considered part of the RDW; however, this well was sampled monthly by the District of Sparwood during Q1, Q2 and Q3. Teck sampled RG_DW-03-04 during Q4 following the same sampling methodology outlined above for RG_DW-series wells.

2.3 Sample Handling, Shipment and Analysis

Sample bottles and preservatives were provided by the third-party analytical laboratory, ALS Environmental Laboratories (ALS). Sample bottles were certified clean and nitrile gloves were worn by the samplers. Samples collected for dissolved parameters were filtered using an in-line filter, with the exception of the RDW which used a syringe filter. Samples requiring preservation were preserved in the field. Samples were shipped in ice-chilled coolers following chain-of-custody procedures.

Lab analyses for all groundwater samples were completed by ALS in Burnaby, British Columbia and Calgary, Alberta. ALS is certified by the Canadian Association for Laboratory Accreditation and follows the procedures described in British Columbia Laboratory Methods Manual for the Analyses of Water, Wastewater, Sediment, Biological Materials and Discrete Ambient Air Samples (Horvath, 2005).

2.4 Monitoring Specifications in the RGMP

The RGMP (SNC-Lavalin, 2015a) provided details and rationale on sampling frequency and the analyte list as summarized below.

2.4.1 Sampling Frequency

The RGMP specified quarterly sampling, as follows:

- Winter (First Quarter – Q1): January, February, March;
- Spring (Second Quarter – Q2): April, May, June;
- Summer (Third Quarter – Q3): July, August, September; and
- Fall (Fourth Quarter – Q4): October, November, December.

A summary of wells not sampled each quarter of 2016 is provided in Section 2.5.

2.4.2 Analyte List

The RGMP indicated groundwater will be analyzed for select constituents based on the core list of general water quality analytes provided in Table 2 of the BC MoE's (2016b) Water and Air Baseline Monitoring Document for Mine Proponents and Operators and Permit 107517 Table 26. The minimum detection limits for each parameter will be suitable for comparison to the applicable standards and/or guidelines. Analyses for dissolved metals was specified in the RGMP 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).

2.5 Modifications to Regional Groundwater Monitoring Program

A summary and discussion of modifications to the program outlined in the RGMP (SNC-Lavalin, 2015a) is provided below.

2.5.1 Site-specific Programs

Groundwater levels were monitored at all locations during all quarters except where data cannot be collected (from supply or domestic wells). Quarterly samples were collected from all wells included in the RGMP with the exception of the Q1 sample from EV_ECgw (located in Key Area 10) due to a frozen well.

Samples from site-specific programs were submitted for all parameters on the analyte list except field conductivity which was not recorded at samples collected at EVO (during Q1 and Q2). The absence of field conductivity values does not impact the overall quality or interpretation of the data.

2.5.2 Regional Drinking Water Sampling Program (RDW)

RG_DW-series wells were sampled on four occasions in 2016; however, the first sample was collected in late May/early June and therefore samples were not collected during the Q1 period (i.e., January to March). Teck indicated that going forward an effort will be made to collect samples four times per year and within each quarter. The RG_DW-series wells were sampled for a limited number of parameters, as outlined in the RDW and RGMP, including:

- Field parameters including pH, temperature, electrical conductivity;
- Alkalinity, sulphate, nitrate-N, nitrite-N, chloride, hardness; and
- Total and dissolved selenium, total cadmium, calcium, magnesium, potassium and sodium.

Parameters analysed have been limited to those considered to be either mine-related indicators or major ions; as such, not all of the parameters listed in the RGMP were analyzed. In the 2015 RGMP report SNC-Lavalin recommended continued sampling with the limited parameters outlined as part of the RDW.

During Q1, Q2 and Q3, the Sparwood Municipal Supply Well (RG_DW-03-04) which was sampled by the Town of Sparwood, was only sampled for total selenium. Starting in Q4, Teck sampled RG_DW-03-04 for the same limited parameters listed above. SNC-Lavalin recommends continued sampling of these parameters for all RG_DW-series wells, consistent with the RDW. A review of the how the RDW program supports the RGMP will be performed as part of the September 30, 2017 RGMP submission.

2.6 QA/QC Program

The RGMP included a Quality Assurance/Quality Control (QA/QC) program for the analysis of groundwater samples to be implemented in accordance with Permit 107517, the British Columbia Field Sampling Manual, and Teck's internal guidance documents. A QA/QC program specific to the RGMP is not yet in place; however, each site conducted a QA/QC program which is described in site-specific reports and summarized in Section 2.6.1. QA/QC results of RDW Sampling Program are summarized in Section 2.6.2.

2.6.1 Site-specific Programs

Results of each site-specific QA/QC program was summarized in each annual report (Golder, 2017; Hemmera, 2017; SRK, 2017; Teck, 2017a,b). Each operation identified: shipping and handling issues; summarized results of relative percent differences (RPDs) from duplicate samples; and any detections of trip blanks or field blanks. Results of the QA/QC program for each of the site-specific groundwater monitoring programs is summarized in the following sections.

2.6.1.1 Shipping and Handling Issues

A summary of shipping and handling issues from each of the site specific annual groundwater monitoring programs is provided in Table C below.

Table C: Summary of Shipping and Handling Issues

Operation	Key Area	Well ID	Q	Issue
FRO	Background	FR_HMW5	Q2	Total Dissolved Solids (TDS) hold time exceeded due to shipping delay
FRO	1	FR_GHHW	Q2	TDS hold time exceeded due to shipping delay
GHO	4	GH_GA-MW-1 GH_GA-MW-2 GH_GA-MW-3 GH_GA-MW-4	Q3	Laboratory reported temperature of samples collected in August was greater than acceptable limit of 10 °C
EVO	8	EV_OCgw	Q2	TDS hold time exceeded due to laboratory error
EVO	9	EV_MCgwD	Q2	TDS hold time exceeded due to laboratory error
EVO		EV_MCgwS	Q2	TDS hold time exceeded due to laboratory error
EVO			Q4	Sample for dissolved mercury was not submitted in correct container with HCl preservative.
EVO	10	EV_ECgw	Q2	TDS hold time exceeded due to laboratory error
EVO	12	EV_ER1gwD EV_ER1gwS	Q2	TDS hold time exceeded due to laboratory error

Teck (2017a) provided the following related to the shipping delay of FRO samples:

"FRO continues to plan its sampling events, to the extent feasible, to increase the likelihood of same day shipping to Sparwood and subsequent next day delivery through the Cranbrook International Airport to ALS Environmental in Burnaby. As a result, we have seen a significant decrease in hold time exceedances throughout 2016. In addition, Teck has initiated a program to evaluate the efficiencies of using a more local lab (ALS Environmental Calgary) in order to further reduce the potential for hold time exceedances. Teck will evaluate lab performance and review lab preference upon completion of this program. Initial results of this program have indicated improvement as shown by the absence of hold time exceedances since the beginning of the program in December."

The temperature exceedance reported for GHO samples was not expected to influence the interpretation of results (Hemmera, 2017). The hold time exceedances of TDS at EVO are attributable to laboratory error and are not expected to influence the interpretation of results. Teck will endeavour to utilize the correct bottles and preservatives for sampling programs (to avoid the issue identified above for the Q4 sample from EV_MCgwS).

2.6.1.2 Duplicate Samples

Duplicate samples were collected at a frequency of approximately 1 per 10 samples, during site-specific sampling events to assess the precision of the field sampling methodology and consistency of laboratory analysis. Duplicate samples were evaluated by calculation of the relative percent difference (RPD) of the concentration between the sample and duplicate.

RPD = (original value - duplicate value)/[(original value +duplicate value)/2] *100

RPDs were calculated for parameters where at least one of the samples was greater than five times the laboratory detection limit (BC MOE 2015). A RPD of less than 20% for metals and inorganics is considered as an acceptable level of precision per BC MOE Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (2016). Consistent with reporting in site-specific reports, where the result was close to the detection limit, the acceptable RPD was modified as follows:

- RPD of < 20% = Pass
- RPD of > 20% with results < 5 times the detection limit = Pass-1
- RPD of > 20% and <50% with results > 5 times the detection limit = Pass-2
- RPD of >50% with results > 5 times the detection limit = Fail

Table D below summarizes the number of sample duplicates for wells included in the RGMP and any RPDs above acceptable levels (RPD > 50% with results > 5 times the detection limit).

Table D: Summary of Duplicate Sample Results above Acceptable Levels

Operation	Number of Duplicates Included in the RGMP	Summary of RPDs above Acceptable Levels
FRO	2	No RPD values above acceptable level.
GHO	2	RPD values above acceptable level for Total Suspended Solids (TSS) and laboratory turbidity from the sample collected from GW_MW-ERSC-1 on 2016-11-14.
LCO	0	Four duplicate samples were collected as part of the 2016 annual groundwater monitoring program at LCO, however no duplicate samples were collected from wells included in the RGMP. Readers are referred to Golder (2017) for details.
EVO	4	RPD of laboratory conductivity above acceptable levels from Q4 sample collected at EV_OCgw. Teck (2017b) noted the field measured conductivity at this location was consistent with historical data.
CMO	2	RPD of laboratory turbidity above acceptable levels from the Q2 sample collected at CM_MW1-OB.

Review of duplicate sample results from each operation indicated that at select operations (GHO, EVO and CMO) TSS, laboratory conductivity or laboratory turbidity exhibited RPDs above acceptable levels. It is likely that variability in these parameters is attributable to entrainment of sediment accumulated in the bottom caps of monitoring wells during sampling. Sediment disturbance can be minimized by ensuring the pump or tubing intake is > 10 cm from the bottom of the well and the purging/sampling rate is decreased.

2.6.1.3 Field Blanks

In 2016, field blank samples were collected as part of each site-specific groundwater sampling program. Field blank samples are collected at the sampling site during normal sample collection using de-ionized water which was filtered and preserved using the same method as groundwater samples. Field blanks provide information on contamination resulting from the handling technique and atmospheric contamination. A summary of field blank sample results is provided in Table E.

Table E: Summary of Field Blank Sample Results

Operation	Number of Field Blanks and Summary of Results
FRO	Four field blank samples were collected in 2016 with all sample results below detection limit.
GHO	Field blanks were collected in all quarters except Q2. Results for field blanks were non-detectable for wells included in the RGMP. Readers are referred to Hemmera (2017) for details related to detections of field blanks collected at other locations not included in this report.
LCO	Four field blanks were collected throughout 2016. One field blank (location where bottle filled unknown) contained NO3-N (0.0079 mg/L) above the detection limit of <0.005 mg/L and total magnesium (0.028 mg/L) above the detection limit of < 0.10 mg/L.
EVO	Six field blanks were collected during 2016. Field blank samples were not collected in Q1 2016 due to sample planning oversight. On May 18 and August 23, total aluminum and ortho-phosphate were detected in the field blank sample, respectively. Teck (2017b) concluded that sample results on this day are consistent with historical values; therefore, these detections were not considered to be significant to the 2016 groundwater monitoring program.
CMO	Four field blanks were collected. A field blank was collected during the Q3 sampling survey which had parameters above detection limits; however, the sample was collected from a location not included in the RGMP. Readers are referred to SRK (2017) for additional details.

SNC-Lavalin reviewed field blank results from each operation and recommends that Teck reviews the water used (ultra-pure de-ionized water is recommended) for future field blanks to avoid parameter detection in field blanks. For the field blank collected from LCO, it is noted that the detections are three and four orders of magnitude lower than the lowest applicable groundwater standard for nitrate-N and total magnesium and are not considered to be a concern for data reliability.

2.6.1.4 Trip Blanks

Trip blanks were collected as part of some of the 2016 site-specific annual monitoring programs. Trip blanks are ordered from the lab and are unopened throughout the sampling trip and are meant to detect any widespread contamination from the container and preservative during transport and storage. A summary of trip blank sample results are provided in Table F.

Table F: Summary of Trip Blank Sample Results

Operation	Number of Trip Blanks and Summary of Results
FRO	Four trip blank samples were conducted in 2016 with detections occurring in the Q2 and Q4 samples. The Q2 sample produced results above the detection limits for total alkalinity (as CaCO3). The Q4 sample produced a result above the detection limit for nitrogen, ammonia (as N). The detections noted above were at, or less than five times the method detection limit reported by the laboratory, and therefore Teck (2017a) did not consider the detections to be a concern for data reliability.
GHO	Will be incorporated going forward
LCO	Will be incorporated going forward
EVO	Four trip blank samples were collected throughout Q3 and Q4 2016 (started collecting trip blanks at EVO in Q3). On Aug 22, 2016 the trip blank sample detected Total Alkalinity (as CaCO3). This detection was considered by Teck (2017b) during interpretation of the groundwater monitoring data.
CMO	Will be conducted and incorporated going forward.

Detections of trip blanks were considered as part of the data interpretation but were not considered to affect the data reliability. SNC-Lavalin notes that generally detectable concentrations are not expected in trip blanks and Teck should review QAQC procedures related to trip/field blanks to reduce the possibility that going forward these samples do not contain detectable parameters.

2.6.1.5 Turbidity Threshold

SRK (2017) reported that one sample from CMO included in the RGMP (CM_MW1_SH collected on June 22) was measured to contain a turbidity value of 382 NTU, greater than the threshold of 50 NTU. This well was re-sampled on June 16, 2016 with acceptable results for turbidity in Q2.

2.6.2 Regional Drinking Water Sampling Program (RDW)

A summary of QA/QC results for the RG_DW-series wells is provided below:

- All Certificates of Analysis were reviewed by SNC-Lavalin. No QA/QC issues were identified by the laboratory with the exception of hold time exceedances identified for nitrate and nitrite for RG_DW-02-20 and RG_DW-07-01 during the Q2 sampling event. Nitrate and nitrite concentrations from 2016 at these wells were similar to 2015 results, and as such the exceedances of hold times are not considered to be an issue; and,
- One field duplicate was collected in 2016 from RG_DW-series wells included in the RGMP. The duplicate was collected at RG_DW-02-20 and calculated RPD values were below 20%. On trip blank and one field blank were also collected and all results were below the detection limit.

2.6.3 Summary of QA/QC Results

Data from site-specific groundwater monitoring programs were considered acceptable with the exception of one sample (CM_MW1-SH from June 22, 2016) from CMO which was not used for interpretation based on elevated turbidity (i.e., greater than 200 NTU). Detectable concentrations were measured in field and trip blank samples which were considered as part of the data interpretation but were not considered to affect the reliability of results. For future sampling programs, SNC-Lavalin recommends Teck review their methodology used to collect these samples and ensure that ultra-pure de-ionized water is used.

In addition, we note that during data analysis of groundwater levels, some discrepancies between level logger data and manual water level measurements became apparent. In order to increase the quality of the water level data, the following are suggested:

- collecting concurrent (before and after) manual water level measurements each time a water level logger is deployed or removed from a well and prior to each sampling event;
- re-deploying level logger at exact same depth in monitoring well after it was removed for downloading; and
- using a barometer and manual water level measurements to compensate and correct the data.

3 Groundwater Quality Screening Criteria

Groundwater quality data were screened against a number of different criteria based on applicable receptors. A technically-based screening process was developed in the Synthesis Report that took into consideration provincial water quality criteria and guidance, Permit 107517 specifications, and applicable receptors (SNC-Lavalin, 2015a, 2015b). This screening process was prescribed in the approved RGMP and was used for interpretation purposes in the 2016 Annual Report, with some modifications to the secondary screening process as secondary criteria were lower than primary criteria for some CIs. The screening process, receptors considered and modifications to secondary screening are summarized below.

3.1 Primary Screening Criteria (Provincial Guidance)

The primary screening approach developed for the RGMP is consistent with regulatory guidance, including the updated MoE Technical Guidance 6 (TG 6) Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MoE, 2016b) for EMA Applications. The following briefly summarizes the "Protection of Groundwater Quality" Section listed in *Appendix 8, Hydrogeology Rationale*:

- Resource development should be protective of all existing or reasonably expected future uses of groundwater.
- Unless other evidence is provided, drinking water use and freshwater aquatic life are assumed to be default uses of groundwater, whether existing or reasonably expected in the future.
- The mining project must not result in a significant adverse impact to groundwater or surface water quality at any time in areas outside the initial dilution zone (this zone will need to be identified on a site-specific basis). The following will be taken to constitute significant adverse impacts:
  - Substances in groundwater exceeding the standards set out in the *Contaminated Sites Regulation* (CSR) (BC MoE, 1996) for drinking water use and freshwater and marine aquatic life use. The drinking water standard will not apply to substances for which the background groundwater concentration exceeds the applicable standard.
  - Substances in surface water exceeding established water quality concentration guidelines (or site-specific objectives) for protection of aquatic life.
- Reasonable use of groundwater with respect to water quality requires consideration of background water quality and both existing and reasonably expected future contaminant sources.

The primary screening process for the 2016 Annual Report considered the protection of groundwater quality for the following receptors:

- Human Health – groundwater used for drinking water for current and future use as a default use, consistent with TG 6. Primary screening of groundwater data for protection of drinking water was conducted against the applicable CSR Drinking Water (DW);
- Freshwater Aquatic Life - groundwater discharging to aquatic environments as a default use, consistent with TG 6. No dilution zone was applied which is considered to be a conservative approach. Primary screening of groundwater data for protection of aquatic life was conducted against CSR Aquatic Life (AW) standards. The exception to this was for wells located within 10 m from a receiving surface water body where the concentrations were screened against the British Columbia Water Quality Guidelines (BCWQG; BC MoE, 2016a). The application of BCWQG to wells within

10 m of the high water mark is consistent with MoE Technical Guidance 15 (TG 15) which outlines an approach to application of concentration limits for protection of aquatic receiving environments (BC MoE, 2013); and

- Irrigation and Livestock Watering - groundwater for livestock or irrigation watering use. This use was not described in Appendix 8 of TG 6; however, these uses have been applied to be conservative as livestock and irrigation water supplies are sourced from groundwater wells in some locations. Primary screening of groundwater data protection of irrigation and livestock watering was conducted against CSR Irrigation (IW) and Livestock (LW) standards.

As described in the Synthesis Report and approved RGMP, this screening process allows for water to be compared to uniform criteria for groundwater protection across the Elk Valley (i.e., CSR standards and Approved and Working BCWQG), as applicable.

3.2 Secondary Screening

In some MUs, existing concentrations of CI in surface water can be higher than BCWQG and potentially above CSR standards. Due to the high degree of connection between groundwater and surface water as described in the Regional Conceptual Model (SNC-Lavalin 2015b), there is a potential for elevated concentrations of CI in groundwater to be a result of recharge of groundwater from surface water.

A secondary screening step was developed to provide a comparison to area-based surface water quality requirements laid out in Permit 107517 (SNC-Lavalin, 2015a, 2015b). The intention of the secondary screening criteria was to provide context in relation to Teck's operational surface water quality requirements, as well as to provide a technically-based framework for regional evaluation of groundwater as it related to the protection of aquatic life in the Elk Valley (i.e., the area-based Site Performance Objective [SPO] and Compliance Point [CP] concentrations specified in Permit 107517). As such, geographically relevant CPs and SPOs concentration values were utilized for the secondary screening process. Secondary screening for selenium also included comparison to Health Canada's Guidelines for Canadian Drinking Water Quality (GCDWQ).

The secondary screening was intended to be performed for CI when concentrations were above primary screening criteria, and only for the specific parameter and pathway (i.e., drinking water or aquatic life) that exceeded the primary criteria; however, recent review of current BCWQG for aquatic life suggests that secondary screening levels (i.e., CP and SPO) are generally lower than BCWQG for aquatic life for nitrate, sulphate and cadmium. The exception to this is for selenium, for which the CP and SPO are consistently higher than BCWQG or CSR standards. As indicated above, a full review of primary and secondary screening steps will be performed for the September 30, 2017 submission of the RGMP.

As a secondary screening step in the 2016 Annual Report, groundwater concentrations for selenium were screened against Permit 107517 SPO and CP. CP and SPO criteria in the main river systems (i.e., Elk and Fording Rivers) differ along the flow path, and as such different groundwater criteria should be applied accordingly. There are no CP or SPO concentrations for drinking water in Permit 107517. However, as a secondary screening step for drinking water use, groundwater concentrations for selenium was screened against the Health Canada's Guidelines for Canadian Drinking Water Quality (GCDWQ; Health Canada, 2014) to provide context in relation to recent toxicological studies. The GCDWQ for selenium was updated in October 2014 from 10 to 50 µg/L. Secondary screening for selenium was completed only where sample concentrations exceeded primary screening criteria.

The CP and SPO criteria for selenium that apply to the approved RGMP are shown below in Table G.

Table G: Secondary Groundwater Screening Criteria for Aquatic Life

CI (Monthly Average Limits)	Compliance Points					Site Performance Objectives			
	Elk River	Fording River		Michel Creek		Elk River			Fording River
	GH_ERC E300090	GH_FR1 E200378	FR_FRCP1 E300071	CM_MC2 E258937	EV_MC2 E300091	GH_ER1 E206661	EV_ER4 0200027	EV_ER1 0200393	GH_FR1 0200378
Selenium[1] (µg/L)	15	80	130	19	28	19	23	19	63[2]

Notes: 1) Criteria to be applied to dissolved metals only as per the approved RGMP. 2) SPO is effective December 31 2019

Not shown in the table is the updated GCDWQ for selenium of 50 µg/L. This will be applied to all samples exceeding the DW primary screening as a secondary screening criteria for drinking water.

4 Results and Discussion

Results are presented by Key Area, as defined in the Synthesis Report (SNC-Lavalin, 2015b). Drawings with well locations and tables summarizing results above screening criteria are referenced throughout the text below. Graphs which show temporal trends, including select surface water data, are also referenced and provided in Appendix II. Surficial and bedrock geology is presented on Drawings 635544-106 to -109. To fulfill permit requirement *(ii)* listed in Section 1, cross sections showing well installation, stratigraphy and groundwater elevations are presented on Drawings 635544-110 to -114 and focus on Key Areas where the distribution of monitoring well allows for representative cross sections perpendicular and parallel to groundwater flow in the valley bottom. For some cross sections, strict adherence to generations of sections perpendicular and parallel to groundwater flow was not possible given monitoring well distribution and complexities of local scale groundwater flow regime. The cross sections locations are shown on Drawings 635544-102 to -105.

Drawings 635544-115 and -116 show the spatial distribution of groundwater elevations and conceptual groundwater flow path through valley-bottom aquifers. Groundwater elevations prior to sampling for the fourth quarter were selected to include on Drawings 635544-115 and -116 to provide regional context. Drawings 635544-117 to -120 show the spatial distribution of groundwater quality results for nitrate, selenium and sulphate in the Study Area.

4.1 Background (Reference) Station FR_HMW5

A background well installed in the valley-bottom was specified in the RGMP. Information from this well can give a reference for naturally occurring conditions since it is located upgradient of the mining footprint at FRO. Monitoring well FR_HMW5 is completed in an alluvial gravel unit in the Henretta Creek valley-bottom, a tributary of the upper watershed of the Fording River.

4.1.1 Groundwater Levels

In 2016, manual water level measurements from FR_HMW5 (Table 2) were used to assess seasonal water levels. Groundwater elevations from January 2015 to December 2016 were plotted on a time-series graph and included in Appendix II (Graph B-1). Continuous groundwater level data were available from January to June of 2015 (presented in the 2015 annual water level report); as shown on Graph B-1, there is an approximate 0.8 m discrepancy between manual water level measurements and data logger data. The continuous water level data were included on Graph B-1 as the data can still be used to assess relative changes in groundwater levels. The 2016 level logger data were not presented since it was not barometrically corrected (the barologger could not be retrieved from a frozen well).

The maximum fluctuation of groundwater elevation in 2016 was approximately 0.14 m. In 2015, groundwater elevations at FR_HMW5 exhibited a seasonal trend with generally higher groundwater elevations during the spring from April until the end of June (based on continuous groundwater level data); limited 2016 groundwater elevations (from manual measurements) generally supported this trend observation. Groundwater elevation prior to sampling for the fourth quarter was selected and shown on Drawing 635544-115 to provide regional context.

4.1.2 Groundwater Quality

The analytical results compared to screening criteria are presented in Tables 3 and 4 (primary screening). Groundwater quality results were below primary screening criteria for all of the samples collected. Nitrate and dissolved cadmium were below the laboratory reported method detection limit (MDL) in all samples. Sulphate was above the MDL and concentrations were an order-of-magnitude lower than in downgradient monitoring locations at FRO. Dissolved selenium was below the MDL during Q1 and Q3 (< 0.05 µg/L) and slightly above the MDL in Q2 (0.054 µg/L). The Q4 dissolved selenium concentration was considerably higher (3.04 µg/L); this result is considered anomalous as it is more than 50 times the previous sample concentrations at this location and no upgradient sources are known. In contrast, concentrations of other CIs were consistent throughout the monitoring period with no similar increases noted in Q4.

4.1.3 Discussion

All CIs concentrations (except for Selenium concentration in Q4) in background well FR_HMW5 were below or near the MDL and therefore no trend analysis for groundwater quality parameters was performed. Since concentrations of all parameters were below primary screening criteria, monitoring well FR_HMW5 was considered an appropriate reference monitoring well for the RGMP.

4.2 Key Area 1: Fording River Valley-bottom Downgradient of FRO, Cataract and Porter Creeks

This area was identified as it is the focal point for the majority of upland and tributary valley groundwater flow to the Fording River valley-bottom near the FRO and GHO property boundaries (Drawing 635544-102). The valley-bottom groundwater in this area receives recharge from the Fording River as well as infiltration from the South Tailings Pond, and South Kilmarnock Phase 1 and 2 settling ponds. This area may be receiving mine-influenced constituents (i.e., nitrate, and selenium) from waste rock dumps in the Kilmarnock, Swift, Cataract and Porter Creek watersheds, as well as from surface water recharge from the Fording River and other tributaries. The groundwater flow direction in the Fording River valley-bottom is inferred to be to the southeast, parallel or sub-parallel to the river.

Wells included in the 2016 RGMP for Key Area 1 are two monitoring wells: FR_09-01-A/B (nested) and the greenhouse water supply wells which consist of four wells (FR_GH_WELL1, FR_GH_WELL2, FR_GH_WELL3 and FR_GH_WELL4), collectively referred to as FR_GHHW. FR_09-01-A/B and FR_GHHW were selected to monitor valley-bottom groundwater near the southern site boundary of FRO.

4.2.1 Groundwater Levels

Manual water level measurements were provided for FR_09-01-A/B for all four quarters in 2016 (Table 2). Groundwater elevations from May 2015 to November 2016 at those wells were plotted on a time-series graph and included in Appendix II (Graph 1-1). Groundwater elevations at both wells followed a seasonal trend with higher groundwater elevations recorded in June-July. Water levels at both FR_09-1A/B varied by 5 m between January 2016 and June 2016. Based on the groundwater elevations recorded at the FR_09-01-A/B, the vertical groundwater flow is inferred to be downwards from the shallow sandy gravel unit towards the deeper gravel unit. The calculated vertical hydraulic gradient varied from -0.05 to -0.15 in 2016 (Appendix III). Groundwater elevations for the fourth quarter of 2016 are shown on Drawing 635544-115 to provide regional context.

No groundwater levels were recorded at FR_GHHW as this is a supply well, consistent with the RGMP.

4.2.2 Groundwater Quality

The analytical results compared to screening criteria are presented in Tables 3 and 4 (primary screening). A summary of the results above primary screening criteria for Key Area 1 are presented in Table H below.

Table H: Summary of Results above Primary Screening Criteria for Key Area 1

Parameter[1,2]	FR_09-01-A				FR_09-01-B				FR_GHHW[3]			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Nitrate Nitrogen	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
Selenium	AW IW LW DW	AW IW LW DW	AW IW LW DW	AW IW LW DW	AW IW DW	AW IW LW DW	AW IW LW DW	AW IW LW DW	AW IW LW DW	AW IW LW DW	AW IW LW DW	AW IW LW DW

Notes: 1.) Dissolved parameter unless otherwise indicated; and 2.) Primary screening criteria applied are CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) Q4 sample from FR_GHHW was collected from FR_GH_WELL2.

Groundwater quality at FR_09-01-A/B and FR_GHHW was above primary screening criteria concentrations in all samples for nitrate (DW) and dissolved selenium (AW, IW, DW and LW) in all samples except at FR_09-01-B in Q1 where concentrations were below the LW criteria.

Secondary screening was completed where sample concentrations exceeded primary screening criteria for selenium. Table I shows the summary of results above secondary screening criteria for Key Area 1. Most samples were above secondary SPO and DW criteria and a few samples were also above CP criteria.

Table I: Summary of Results above Secondary Screening Criteria for Key Area 1

Parameter [1,2]	FR_09-01-A				FR_09-01-B				FR_GHHW			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Selenium	SPO DW	SPO DW	SPO DW	CP SPO DW	-	SPO DW	SPO DW	SPO DW	CP SPO DW	CP SPO DW	SPO DW	SPO DW

Notes: 1.) '–' denotes result below secondary screening criteria; and 2.) Secondary screening criteria are Site Performance Objective (SPO), Compliance Point (CP) and GCDWQ for drinking water (DW).

4.2.3 Discussion

Discussion of trends in groundwater quality in Key Area 1 focuses on dissolved selenium and nitrate which are the CIs above screening criteria. Drawing 635544-117 shows the spatial distribution of the concentrations of dissolved selenium, sulphate and nitrate for wells in Key Area 1. Time-series plots of dissolved selenium and nitrate from the selected wells located in Key Area 1 are shown in Appendix II (Graphs 1-2 and 1-3). For comparison purposes, surface water concentrations measured in Fording River at surface water station FR_FRCP1 and in Kilmarnock Creek at surface water station FR_KC1 were added to Graphs 1-2 and 1-3.

Groundwater concentrations of dissolved selenium and nitrate were generally the highest at FR_GHHW during the spring (Q2), while no distinct seasonal trend in the concentrations of dissolved selenium and nitrate can be identified for FR_09-01-A/B. Concentrations of dissolved selenium and nitrate at FR_09-01-A/B increased throughout the 2016 monitoring period with the highest concentrations measured in November 2016. Groundwater concentrations at FR_GHHW generally follow a seasonal trend comparable to surface water concentrations measured at surface water station FR_KC1. Concentrations are typically at their lowest in the summer, slowly increase throughout the year with maximum values in March/April and decrease in May. The low concentrations measured in surface water and groundwater are similar but the high concentrations measured are much less in groundwater. Except for some higher dissolved selenium concentrations measured in Fording River in winter 2015 and 2016, concentrations in groundwater at FR_GHHW are generally lower than the concentrations in Kilmarnock Creek but higher than concentrations in Fording River.

As indicated in the Synthesis Report, Fording River interaction with groundwater is dynamic in this area, (i.e., consisting of gaining and losing stretches). The greenhouse supply wells (FR_GHHW) are also intermittently pumped at low volumes and, as such, concentrations from FR_GHHW may be considered average groundwater concentrations in the valley-bottom aquifer. Comparison of pumping rates and groundwater at FR_GHHW and surface water chemistry suggested that the variability in concentration magnitude may be related to seasonal effects from upgradient surface water in Kilmarnock Creek (SNC-Lavalin, 2015c). The location of Kilmarnock Creek and the extent of the sand and gravel aquifer is shown on cross section A-A', a geological section of the Fording River valley-bottom in the direction of the groundwater flow (Drawing 635544-110).

The furthest downgradient monitoring points (FR_GHHW) reported selenium and nitrate above primary screening criteria. Selenium concentrations at FR_GHHW were also above secondary screening criteria for some sampling events. Discharge and mixing with Fording River surface water likely occurs between these points and the nearest downgradient monitoring points at GHO; however, these monitoring points are over 15 km downstream and the localized extents of CI in groundwater are not known. Delineation of localized affected groundwater as well as an understanding of local groundwater flow paths was identified in the Synthesis Report as a data gap.

4.3 Key Area 2: Fording River Valley-bottom Downgradient of LCO Dry Creek

This area was identified as it receives drainage from the LCO Phase II development in the LCO Dry Creek watershed, which is a tributary to the Fording River. The valley-bottom in the LCO Dry Creek watershed consists of a relatively thick till unit with little to no fluvial or glaciofluvial deposits. The till has a relatively low hydraulic conductivity, on the order of 10^{-7} m/s to 10^{-9} m/s. Monitoring wells LC_PIZDC1308 and LC_PIZDC1307 are shallow and deep wells installed in a colluvium/till and basal till, respectively. These wells are downgradient of any potential mine influence and are expected to identify any mine-related impacts to groundwater.

4.3.1 Groundwater Levels

Manual and continuous groundwater elevation data available for nested wells LC_PIZDC1308 (shallow) and LC_PIZDC1307 (deep) were reviewed and assessed for seasonal variability, vertical flow and long-term trends (manual values are presented in Table 2 and both manual and continuous data are presented on Graph 2-1). The data indicate a seasonal trend is apparent, with annual fluctuations in 2016

of 1.6 m and 4.4 in LC_PIZDC1308 and LC_PIZDC1307 respectively (based on continuous level data). In both 2015 and 2016 the highest groundwater levels were measured in June and the lowest elevations were measured in March. The inferred vertical groundwater flow at the nested well LC_PIZDC1308/1307 was consistently downwards in 2016 (based on continuous groundwater level data) and ranged in magnitude from -0.14 m/m to -0.025 m/m. The Q4 groundwater elevation measured at LC_PIZDC1308 and LC_PIZDC1307 is shown on Drawing 635544-115 to provide regional context.

4.3.2 Groundwater Quality

The analytical results compared to screening criteria are presented in Tables 3 and 4 (primary screening). A summary of results above primary screening criteria for Key Area 2 is presented in Table J below.

Table J: Summary of Results above Primary Screening Criteria upgradient of Key Area 2

Parameter[1,2,3]	LC_PIZDC1307				LC_PIZDC1308			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Barium	DW	DW	DW	DW	-	-	-	-
Molybdenum	IW	IW	IW	IW	-	-	-	-

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Primary screening criteria applied are CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) ' –' denotes result below primary screening criteria for given constituents.

Groundwater quality in LC_PIZDC1308 and LC_PIZDC1307 was below the primary screening criteria concentrations for all the CI; therefore, no secondary screening was performed. Groundwater concentrations were above primary screening criteria for dissolved barium (DW) and dissolved molybdenum (IW) for all the sampling events in LC_PIZDC1307. The concentrations of dissolved barium ranged from 1,360 to 1,430 µg/L which was above CSR DW (1,000 µg/L). The concentrations of dissolved molybdenum ranged from 30.8 to 32.0 µg/L, which was marginally above the higher CSR IW (10-30 µg/L). Since no drinking or irrigation wells are located in this area these constituents are not considered a concern.

4.3.3 Discussion

Key Area 2 was identified as an area where transport of CIs to the Fording River valley-bottom may be occurring due to the LCO Phase II development in the LCO Dry Creek watershed. There are no groundwater wells in the Fording River valley-bottom aquifer in this area; however, this data gap is addressed through monitoring of LC_PIZDC1308 and LC_PIZDC1307 located upgradient in the LCO Dry Creek drainage. Drawing 635544-117 shows the results of the screening process for dissolved selenium, sulphate and nitrate for samples collected in Key Area 2. Time series plots of dissolved selenium concentrations are shown in Appendix II (Graph 2-2). Groundwater quality in LC_PIZDC1308 and LC_PIZDC1307 has historically been consistently below all primary screening criteria for the CIs; results from 2015 and 2016 are consistent with historical results. Concentrations in the shallow well (LC_PIZDC1308) appear to follow a seasonal trend with higher concentrations measured in June. To assess groundwater and surface water interactions, selenium concentrations measured in groundwater at LC_PIZDC1308 and LC_PIZDC1307 were compared to concentrations in surface water in LCO Dry Creek (LC_DC1 and LC_DC3) (Appendix II; Graph 2-2). Selenium concentrations in groundwater at LC_PIZP1307 (deep well) and LC_PIZP1308 (shallow) were below detection limit or slightly above detection limit for all samples collected in 2016. Selenium concentrations have been relatively low and stable since December 2014 and are lower than concentrations measured in LCO Dry Creek. Based on

the monitoring results at LC_PIZDC1308 and LC_PIZDC1307 and the presence of till in the LCO Dry Creek drainage, a significant pathway for groundwater transport of CI to Key Area 2 does not appear to exist. The most significant pathway for effects of mine-contact water to the valley-bottom appears to be through surface water from LCO Dry Creek.

4.4 Key Area 3: Fording River Valley-bottom Downgradient of GHO Rail Loop and Greenhills Creek

This Key Area was identified as groundwater in the Fording River valley-bottom may be influenced by upland groundwater from GHO. The thickness of the Fording River valley-bottom sediments is approximately 70 m. Silt and clay units are generally present near surface with at least two evident underlying glaciofluvial gravel units: one at approximately 1,470 metres above sea level (masl) less than 10 m thick; and a deeper unit at approximately 1,455 masl approximately 20 m thick. For reference, cross-sections originally developed by Piteau (2012) and included in the Synthesis Report are included in Appendix IV. An alluvial fan associated with Greenhills Creek is present to the north.

The upper silt and clay units appear to be relatively continuous aquitards reducing the potential for vertical flow. These units also appear to be encountered in a new, deep well drilled in the Rail Loop area at GHO (Hemmera, 2017). The two deeper gravel units appear to be semi-confined or confined, and are relatively continuous along the strike of the valley. Monitoring location GH_POTW09 is completed in the upper gravel unit and GH_POTW17 is completed at the margin of the alluvial fan and the upper gravel unit. Locations GH_POTW10 and GH_POTW15 are completed in the lower gravel unit. Potential sources of groundwater recharge to the valley-bottom in this area include surface water and upland groundwater flow from Greenhills Creek and the Fording River (SNC-Lavalin, 2015b).

4.4.1 Groundwater Levels

No groundwater levels were recorded at any monitoring stations as they are active water supply wells.

4.4.2 Groundwater Quality

The analytical results compared to screening criteria are presented in Tables 3 and 4 (primary screening) and Table 5 (secondary screening). A summary of values above primary screening criteria for Key Area 3 is presented in Table J below.

Table K: Summary of Results above Primary Screening Criteria for Key Area 3

Parameter[1,3]	GH_POTW09				GH_POTW10	GH_POTW15	GH_POTW17[2]			
	Q1	Q2	Q3	Q4	Q1 to Q4	Q1 to Q4	Q1	Q2	Q3	Q4
Manganese	-	IW	IW	IW	-	-	-	-	-	-
Selenium	-	-	-	-	-	-	AW	AW	AW	AW
Sulphate	-	-	-	-	-	-	AW	AW DW	AW	AW

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Primary screening criteria applied are CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW) with the exception of GW_POT17 which was compared to BCWQG AW; 3.) ' –' denotes result below primary screening criteria for given constituents.

Groundwater quality in GH_POTW09 was above primary screening criteria for manganese (IW) for three of four sampling events in 2016. GH_POTW17 was above primary screening levels for selenium (AW) and sulphate (AW) in all four sampling events in 2016; in addition, sulphate concentrations in Q2 were above the CSR DW standard. All other parameters were below primary screening criteria.

Secondary screening was completed for selenium at GW_POTW17 as concentrations were above primary screening criteria; selenium concentrations from all four sampling events in 2016 were below secondary screening criteria.

4.4.3 Discussion

Discussion of trends in groundwater quality in Key Area 3 focuses on total selenium (historical selenium concentrations were reported as total values) and sulphate concentrations which were above primary screening criteria at GH_POTW17. Time series plots of total selenium and sulphate concentrations are shown in Appendix II (Graphs 3-1 and 3-2). To assess potential groundwater and surface water interactions, selenium and sulphate concentrations in surface water in the Fording River (GH_FR1) and Greenhill Creek (GH_GH1) were also plotted in these graphs. Drawing 635544-117 shows the spatial distribution of dissolved selenium, sulphate and nitrate for samples collected in Key Area 3.

Concentrations of total selenium at GH_POTW17 in 2016 were relatively similar for all four sampling events in 2016 (concentration ranged from 5.2 µg/L to 7.7 µg/L) and were within the range of historical concentrations. Surface water concentrations of total selenium in the Fording River at GH_FR1 were consistently higher than groundwater concentrations at GH_POTW17 and all other GH_POTW-series wells; in 2016 total selenium concentrations at GH_FR1 ranged from 24.2 to 50.6 µg/L. Surface water concentrations in Fording River (GH_FR1) follow a seasonal trend with higher concentrations measured during winter months (lower flow rates) and lower concentrations measured during spring freshet as a result of dilution of constituents. In 2016 total selenium concentrations at GH_POTW17 were slightly higher during Q2 and Q3 relative to other sampling events.

Concentrations of sulphate at GH_POTW17 in 2016 were relatively similar between all four sampling events (concentrations ranged from 448 mg/L to 522 mg/L) and similar to historical results. The highest concentration of sulphate at GH_POTW17 was measured in June of 2016 and was slightly above CSR DW standards. Surface water sulphate concentrations at GH_FR1 were lower (ranged from 115 to 262 mg/L in 2016) compared to concentrations measured at GH_POTW17 but were similar in magnitude to groundwater sulphate concentrations at GH_POTW10 and GHPOTW15. Surface water sulphate concentrations at GH_GH1 were significantly higher (up to 803 mg/L in 2016) than surface and groundwater concentrations measured at other locations.

Concentrations of total selenium and sulphate in GH_POTW09, GH_POTW10 and GH_POTW15 were relatively consistent suggesting little seasonal influence and therefore not a direct connection with Fording River surface water. This is consistent with the interpretation that relatively continuous aquitards exist in the valley bottom in Key Area 3. The higher sulphate concentrations at GH_POTW17 suggest influence from Greenhill Creek surface water at this location.

4.5 Key Area 4: Elk River Valley-bottom Downgradient of Leask, Wolfram and Thompson Creeks

Key Area 4 was identified as surface water and upland groundwater flow into the Elk River valley-bottom setting occurs from potential sources of CIs in the Mickelson, Leask, Wolfram and Thompson Creek drainages (Drawing 635544-102). Surface water from each of these creeks is diverted to settling ponds located near the valley-bottom. Groundwater in upland areas is inferred to flow toward the Elk River valley-bottom. The linear distribution of the monitoring wells in the valley-bottom does not allow for triangulation for determining groundwater flow direction; however, groundwater is expected to discharge to the Elk River, with a flow component parallel or sub-parallel to the river. The RGMP for Key Area 4 includes five monitoring wells (GH_GA-MW-1, GH_GA-MW-2, GH_GA-MW-3, GH_GA-MW-4 and GH_MW-ERSC-1), one water supply well (RG_DW-01-03) and one domestic well (RG_DW-01-07).

Valley-bottom deposits consist mainly of fluvial and glaciofluvial deposits in this area and there are a number of former channels of the Elk River; however, the observed stratigraphy at monitoring wells GH_GA-MW-1 and GH_GA-MW-2 indicates lower permeability till and lacustrine/glaciolacustrine (i.e., soft, silty clay) is present at subsurface. To the south at GH_GA-MW-3 and GH_GA-MW-4, coarser-grained materials with sub-angular gravel suggest glaciofluvial deposits overlie bedrock. Monitoring well GH_MW-ERSC-1, situated approximately 1 km south of the Lower Thompson Creek Settling Pond, appears to be installed in a fluvial sand and gravel.

4.5.1 Groundwater Levels

Continuous groundwater level data available from level loggers installed in GH_GA-MW-1, GH_GA-MW-2 and GH_GA-MW-3 were recorded along with manual water level measurements during the monitoring period (Table 2). Groundwater elevations from January 2015 to December 2016 were plotted on a time-series graph and included in Appendix II (Graph 4-1); we note that we have manually corrected 2016 data to be consistent with 2015 data. Groundwater elevations at GH_GA-MW-3 exhibited a seasonal trend with generally higher groundwater elevations during the spring from mid-March to June whereas groundwater elevations at GH_GA-MW-1 and GH_GA-MW-2 were relatively consistent throughout the year and did not appear to vary seasonally.

The fluctuation in groundwater levels in GH_GA-MW-2 and GH_GA-MW-3 was relatively high ranging from 2.3 m to 4.9 m, respectively. The trend observed in each well is unique suggesting a different groundwater/surface water interaction pattern at each location. There is no seasonal trend observed at GH_GA-MW-1 and groundwater elevations showed a time lag of approximately 30 days for groundwater levels to go back to static levels after a sampling event. This is consistent with the low hydraulic conductivity value reported in previous studies.

Groundwater elevations prior to sampling for the fourth quarter were selected and shown on Drawing 635544-115 to provide regional context.

4.5.2 Groundwater Quality

The analytical results compared to screening criteria are presented in Tables 3 and 4 (primary screening) and Table 5 (secondary screening). A summary of results above primary and secondary screening criteria for Key Area 7 is presented in Table L below.

Table L: Summary of Results above Primary Screening Criteria for Key Area 4

Parameter[1,2,3]	GH_GA-MW-1				GH_GA-MW-2				GH_GA-MW-3				GH_GA-MW-4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Sulphate	-	DW	-	DW	-	-	-	-	-	-	-	-	DW	-	-	-
Boron	IW	IW	IW	IW	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	IW DW	IW DW		IW	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	IW	IW	-	IW	IW	IW	IW	IW	-	-	-	-	-	-	-	-
Selenium	-	-	-	-	AW DW	-	AW DW	AW DW	AW DW	-	-	-	-	-	-	-
Sodium[4]	-	DW		DW	-	-	-	-	-	-	-	-	-	-	-	-

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Primary screening criteria applied are CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) '–' denotes result below primary screening criteria for given constituents; 4.) Total parameter.

Of the CI, only selenium and sulphate concentrations were measured above primary screening criteria in Key Area 4. Groundwater quality in GH_GA-MW-2 and GH_GA-MW-3 was above primary screening criteria for selenium (DW and AW) for at least one sampling event in 2016. Groundwater quality in GH_GA-MW-1 and GH_GA-MW-4 was above primary screening criteria for sulphate (DW) for at least one sampling event in 2016.

Groundwater at GH_GA-MW-1 also contained additional parameter concentrations above the IW or DW CSR standards (dissolved boron, dissolved manganese, dissolved molybdenum and sodium). Dissolved molybdenum concentrations were also above the IW primary screening criteria GH_GA-MW-2. Parameter concentrations of these parameters were similar to 2015 concentrations.

The CSR IW standard of 10 µg/L for molybdenum is relatively conservative as it is the default CSR IW standard in the absence of soil data (it relates to poorly drained soils where the Cu:Mo ratio is less than 2:1 used for foraging). All other CSR IW standards are higher (either 20 or 30 µg/L); however, soil and crop information would be required to determine whether a higher standard is applicable. Molybdenum concentrations in 2016 from GH_GA-MW-1 and GH_GA-MW-2 ranged from 5.92 to 32.4 µg/L, similar to 2015 concentrations. A review of molybdenum results from other Key Areas suggests that it may be naturally occurring. Since no irrigation wells are located in this area this constituent is not currently considered a concern.

Manganese in groundwater can be naturally elevated due to limited interaction with atmosphere and is generally not a concern. Sodium concentrations were marginally above CSR DW standards at GH_GA-MW-1 and is also not considered a concern.

Dissolved boron concentrations were above CSR IW standard which varies from 500 µg/L to 6,000 µg/L based on crop sensitivity. Boron concentrations in 2015 and 2016 in GH_GA-MW-1 ranged from 742 µg/L to 909 µg/L and would generally only impact the very sensitive to sensitive crops. Since no irrigation wells are located in this area this constituent is not currently considered a concern. Additional information on risk to human health from groundwater and surface water is provided in the human health risk assessment performed as part of Permit 107517 requirements (Ramboll Environ, 2016). Continued monitoring should occur and the above results and receptors should be further considered in the September 30, 2017 RGMP submission.

At GH_MW-ERSC-1, RG_DW-01-04 and RG_DW-01-07, groundwater concentrations of all parameters were below primary screening criteria.

Secondary screening for selenium was completed where sample concentrations were above primary screening criteria. Table M shows the summary of results above secondary screening criteria for Key Area 4. The only result above secondary screening criteria (Elk River CP) was the Q4 sample from GH_GA-MW-2.

Table M: Summary of Results above Secondary Screening Criteria for Key Area 4

Constituents of Interest (CI)	GH_GA-MW-2				GH_GA-MW-3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Selenium	-	-	-	CP	-	-	-	-

Notes: 1) Secondary screening criteria are Site Performance Objective (SPO), Compliance Point (CP) and GCDWQ for drinking water (DW); and 2.) '–' denotes result below secondary screening criteria.

4.5.3 Discussion

Discussion of trends in groundwater quality in Key Area 4 focuses on dissolved selenium concentrations which is the CI above the primary and secondary screening criteria in select monitoring wells. Drawing 635544-117 shows the spatial distribution of dissolved selenium, sulphate and nitrate for samples collected in Key Area 4. A time series plot of dissolved selenium from the selected wells located in Key Area 4 and included in the 2016 RGMP is shown in Appendix II (Graph 4-2). To compare groundwater concentration trends to surface water in Key Area 4, dissolved selenium concentrations measured in nearby surface water at Elk River (GH_ERC) and Thompson Creek (GH_TC2) were plotted on these graphs.

Historical dissolved selenium concentrations measured at GH_GA-MW-3, GH_GA-MW-4 and GH_MW-ERSC-1 varied considerably with no distinct seasonal or long-term trend based on 2014-2016 data. No significant variation in concentrations was noted in 2015 or 2016 for GH_GA-MW-1, RG_DW-01-03 and RG_DW-01-07. Dissolved selenium concentrations at GH_GA-MW-2 in 2016 were marginally higher compared to 2014 and 2015 concentrations. In contrast, dissolved selenium concentrations at GH_GA-MW-3 in 2016 appear to be lower compared to 2014 and 2015 concentrations. Overall, the highest dissolved selenium concentrations in groundwater in Key Area 4 in 2016 were at GH_GA-MW-2 (ranged from 5.7 µg/L to 17.9 µg/L).

Surface water dissolved selenium concentrations in Thompson Creek (located directly upstream of GH_GA_MW-3) were consistently higher than all groundwater samples collected in 2016 (ranged from 44.6 µg/L to 115 µg/L). Dissolved selenium in the Elk River was at least an order of magnitude lower compared to Thompson Creek in 2016 (ranged from 0.967 µg/L to 2.75 µg/L).

Groundwater selenium concentrations in Key Area 4 have shown considerable variability (i.e., orders-of-magnitude) in select wells. The local-scale interaction with surface water and groundwater discharge is not clear based on available data but it is suspected that variable groundwater concentrations are due to elevated selenium concentrations in surface water.

Downgradient groundwater quality in the Elk River valley-bottom improves, and delineation (i.e., extent of groundwater impacts) is achieved on a regional scale. Selenium concentrations in the valley-bottom groundwater were below all screening criteria at the water supply well RG_DW-01-03, with concentrations decreasing further downgradient of Elkford at domestic well location RG_DW-01-07, suggesting dilution is occurring along the valley-bottom groundwater flow path due to mixing with surface water and additional fresh water inputs.

4.6 Key Areas 5 and 6: Fording River Valley-bottom Downgradient of Line Creek and Elk River Valley-bottom Downgradient of Confluence with Fording River

Key Areas 5 and 6 were selected as the RDW Sampling Program identified elevated selenium in groundwater downgradient of the confluence with Fording River. These Key Areas receive inputs from Line Creek, the Fording River and the LCO Process Plant. Based on field reconnaissance, bedrock is present at the confluence of the Fording and Elk Rivers which may locally affect river grade and restrict groundwater recharge to the valley-bottom (SNC-Lavalin, 2015a). In this area, surficial geology indicates that the depositional environment in the valley-bottom is glaciofluvial and fluvial (Drawing 635544-106), which is supported by information from domestic water well logs. Bedrock elevations and detailed surficial stratigraphy, well installation and groundwater elevations in Key Area 6 are presented on cross section B-B' and C-C' (Drawing 635544-111 and 112). Cross section A-A' is perpendicular to groundwater flow and extends from Fording River to the north to the East Refuse Expansion to the south. Cross section C-C' is parallel to groundwater flow and extends from Line Creek to the northeast to the Elk River to the southwest. There is no monitoring well within Key Area 5 and one monitoring well located in Key Area 6 (LC_PIZP1101) is included in the RGMP. Monitoring well LC_PIZP1101 is screened in a deeper sand aquifer at approximately 41 mbgs.

4.6.1 Groundwater Levels

In 2016, a level logger was installed in LC_PIZP1101 to monitor groundwater levels in Key Areas 5 and 6. Continuous groundwater level data along with manual water level measurements (Table 2) were plotted on Graph 6-1 (Appendix II), reviewed and assessed for seasonal variability and long-term trend. The manual groundwater level readings do not always appear to correlate with level logger data; the level logger data show a muted response to seasonal variation (variation up to 0.4 m) in groundwater levels in 2016 whereas the manual readings indicate a defined seasonal trend with groundwater levels up to 1.6 m higher in June 2016. The reason of these differences has not been investigated but it is inferred to be associated with correction/compensation of the level logger data or manual reading error. The groundwater elevation measured at LC_PIZP1101 prior to sampling for the fourth quarter is shown on Drawing 635544-115 to provide regional context.

4.6.2 Groundwater Quality

The analytical results compared to screening criteria are presented in Tables 3 and 4 (primary screening). A summary of results above primary screening criteria for Key Area 6 is presented in Table N below.

Table N: Summary of Results above Primary Screening Criteria for Key Area 6

Parameter[1,2,3]	LC_PIZP1101			
	Q1	Q2	Q3	Q4
Fluoride	IW, LW, DW	IW, LW, DW	IW, LW, DW	IW, LW, DW
Manganese	-	-	IW	IW
Molybdenum	IW	IW	IW	IW

Notes: 1.) Dissolved parameter unless otherwise indicated; and 2.) Primary screening criteria applied are CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); and 3.) ' –' denotes result below primary screening criteria.

Groundwater quality in LC_PIZP1101 was below the primary screening criteria concentrations for all the CIs; therefore, no secondary screening was performed.

Similar to 2015 results, groundwater concentrations were above primary screening criteria for dissolved molybdenum (IW) and above primary screening criteria for fluoride (DW, IW and LW) for all the sampling events. The CSR IW standard of 10 µg/L for molybdenum is relatively conservative as it is the default CSR IW standard in the absence of soil data (it relates to poorly drained soils where the Cu:Mo ratio is less than 2:1 used for foraging). All other CSR IW standards are higher (either 20 µg/L or 30 µg/L); however, soil and crop information would be required to determine whether a higher standard is applicable. Molybdenum concentrations were relatively low from this well ranging from 11.6 µg/L to 12.9 µg/L in 2016. A review of molybdenum results from other Key Areas suggests that it may be naturally occurring. Since no irrigation wells are located in this area this constituent is not currently considered a concern.

The source of fluoride at this location is unclear. Fluoride can be naturally elevated in groundwater. Concentrations of fluoride are marginally above the respective criteria. Additional information on risk to human health from groundwater and surface water is provided in the human health risk assessment performed as part of Permit 107517 requirements (Ramboll Environ, 2016). Continued monitoring should occur and results and receptors considered in the September 30, 2017 RGMP submission.

In 2016, concentrations of manganese in LC_PIZP1101 were marginally above the CSR IW standard in Q3 and Q4. The source of dissolved manganese at this location is unclear but its occurrence is inferred to be related to reducing conditions in groundwater in the deep aquifer.

4.6.3 Discussion

Groundwater from the LCO Process Plant Site has been shown to flow towards Key Area 6; however, relatively low concentrations of CIs were measured in groundwater collected from LC_PIZP1101 during the 2015 and 2016 groundwater monitoring program. This is consistent with historical sampling results from several wells situated in the Process Plant Site. Previous studies indicated that activities at the Process Plant do not appear to be locally affecting groundwater quality; however, there are no wells situated in the Fording River and/or Elk River valley-bottom in Key Areas 5 and/or 6 to locally assess groundwater quality.

To assess groundwater and surface water interactions, selenium concentrations measured in groundwater at LC_PIZP1101 were compared to concentrations in surface water in Line Creek (LC_LC4) and in the Elk River downstream of Key Area 6 (EV_ER4), respectively (Appendix II; Graph 6-2). Concentrations in groundwater at LC_PIZP1101 have been relatively low and stable since May 2013 and are significantly lower than concentrations measured in Line Creek and also lower than concentrations in the Elk River. Based on this, the most significant pathway for effects of mine-contact water to the valley-bottom appears to be through surface water from Line Creek.

As part of the 2015 site-specific groundwater monitoring program at LCO (Golder, 2016), groundwater and surface water chemistry were compared at downgradient domestic well RG_DW-02-20 to further assess valley-bottom groundwater pathway. This is also further assessed below in Key Area 7. The results showed that groundwater quality at RG_DW-02-20 was tracking surface water quality from the nearest surface water station EV_ER4. The results suggest surface water infiltration rather that a valley-bottom groundwater pathway might be the cause of the results above screening criteria measured at RG_DW-02-20.

4.7 Key Area 7: Elk River Valley-bottom Downgradient of Grave Creek

This area was selected as Harmer Creek flows from EVO into the Grave Creek drainage and Grave Creek is a tributary to the Elk River, and samples from the RDW Sampling Program (i.e., RG_DW-02-20) exceeded the primary screening criteria (AW and DW) for selenium (Drawing 635544-103).

The surficial geology in the Grave Creek is mapped as colluvium; however, borehole logging at monitoring well EV_GV3gw indicates a relatively large thickness (i.e., up to 25 m) of loose sand and sub-angular gravel and silty gravel deposits. This well is situated near the confluence of Grave and Harmer Creeks, and the thicker sediments in this area may be reflective of the Grave Creek alluvial fan. The groundwater level at EV_GV3gw is relatively deep, approximately 10 m bgs, with a saturated thickness of approximately 15 m. Based on a comparison of groundwater elevation with the elevation of Grave Creek, the creek appears to have a losing reach in this area, and accordingly the creek is interpreted to be losing along the approximate 120 m drop in elevation to the Elk River. As such, groundwater from the Grave Creek valley-bottom is interpreted to flow into the Elk River valley-bottom.

The monitoring wells for the 2016 RGMP in Key Area 7 included the monitoring well EV_GV3gw, the nearest well upgradient to Key Area 7 to monitor upland and tributary valley-bottom input from drainage to the northeast of EVO, and the domestic well RG_DW-02-20 to monitor groundwater in the Elk River valley bottom in Key Area 7.

4.7.1 Groundwater Levels

Continuous groundwater level data in Key Area 7, available from a level logger installed in monitoring well EV_GV3gw along with manual water level measurements (Table 2), were reviewed and assessed for seasonal variability and long-term trend. Groundwater elevations from January 2015 to October 2016 were plotted on a time-series graph and included in Appendix II (Graph 7-1). Groundwater elevations in EV_GV3gw ranged from approximately 1296.9 masl to 1297.4 masl throughout the monitoring period and followed a seasonal trend. Higher groundwater elevations were recorded in the spring months. The groundwater elevation prior to sampling for the fourth quarter was selected and shown on Drawing 635544-116 to provide regional context.

4.7.2 Groundwater Quality

The analytical results compared to screening criteria are presented in Tables 3 and 4 (primary screening). A summary of results above primary screening criteria for Key Area 7 is presented in Table O below.

Table O: Summary of Results above Primary Screening Criteria for Key Area 7

Parameter[1,2,3]	EV_GV3gw				RG_DW-02-20[4]			
	Q1	Q2	Q3	Q4	Q2[4]	Q2	Q3	Q4
Selenium	-	-	-	-	AW, DW	AW, DW	-	-

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Primary screening criteria applied are CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) ' –' denotes result below primary screening criteria; 4.) No sample collected in Q1, 2 samples collected in Q2.

Groundwater quality in the domestic well RG_DW-02-20 was above primary screening criteria for selenium (DW, AW) for the two sampling events in June 2016 but below the primary screening criteria for all other parameters. Groundwater concentrations in EV_GV3gw were below the primary screening criteria for all parameters including the four CIs.

Secondary screening was performed for dissolved selenium concentrations in well RG_DW-02-20 and all results were below the secondary screening criteria.

4.7.3 Discussion

Discussion of trends in groundwater quality in Key Area 7 focuses on dissolved selenium which exceeded the primary screening criteria in domestic well RG_DW-02-20. Drawing 635544-118 shows the spatial distribution of dissolved selenium, sulphate and nitrate for samples collected in Key Area 7. A time series plot of dissolved selenium for EV_GV3gw and RG_DW-02-20 is shown in Appendix II (Graph 7-2).

To assess groundwater and surface water interactions, selenium concentrations measured in groundwater at EV_GV3gw and RG_DW-02-20 were compared to concentrations in surface water in Harmer Creek (EV_HC1) and in the Elk River upstream from the confluence with Grave Creek (EV_ER4), respectively. Concentrations in groundwater at EV_GV3gw have been stable since November 2013 and are significantly lower than concentrations measured in Harmer Creek at EV_HC1 and also lower than concentrations in Elk River upstream from the confluence with Grave Creek. Concentrations measured at RG_DW-02-20 appear to follow a seasonal trend with the highest concentrations measured during the spring months and were generally within the range of concentrations measured upstream in the Elk River at EV_ER4 but considerably lower than surface water concentrations in Harmer Creek. Surface water concentrations fluctuate and are typically lower during freshet which is consistent with the effect of dilution on constituents in a freshet dominated regime. We note that although selenium concentrations at RG_DW-02-20 are similar in magnitude to the Elk River, they do not follow the same seasonal trend as observed in surface water suggesting some lag in groundwater-surface water interaction.

Significant groundwater transport of CI from the Harmer Creek drainage to the Elk River valley bottom is inferred to be minimal based on relatively low groundwater concentrations measured in Harmer Creek drainage at EV_GV3gw compared to surface water. We note that EV_GV3gw is screened in the deeper aquifer (approximately 25 m bgs) and as such is representative of groundwater quality in the deeper part of the aquifer. However, considering that 1) the sub-surface geology in EV_GV3gw is described as very loose and varies from sand with some gravel to silty gravel with no confining unit; and 2) the depth to water is relatively deep at this location (approximately 10 m bgs), groundwater quality in the shallower part of the aquifer is not expected to be significantly different

4.8 Key Area 8: Elk River Valley-bottom Downgradient of Balmer, Lindsay and Otto/Cossarini Creeks

This area was selected as surface water and upland groundwater flow into the Elk River valley-bottom from potential sources of CIs in the Lindsay, Otto/Cossarini drainages, as well as Goddard Marsh (Drawing 635544-104). Potential groundwater recharge in this Key Area include infiltration of precipitation, surface water infiltration in the valley-bottom, and recharge from tailings ponds such as Lagoons C and D (refer to site-specific monitoring program at EVO). Groundwater in Key Area 8 will eventually discharge to the Elk River or flow towards the valley-bottom setting in Key Area 12.

The valley-bottom consists mainly of fluvial, glaciofluvial and alluvial fan deposits in this area as the area is near the confluence with Cummings Creek. Underlying the coarse units are finer-grained deposits of lower permeability silt and clay suggesting relatively thick lacustrine/glaciolacustrine deposits exist in the subsurface. Groundwater flow in upland areas is inferred to be toward the Elk River valley-bottom. Groundwater flow direction in the valley-bottom is assumed to be parallel or sub-parallel to the Elk River.

The monitoring wells for the 2016 RGMP in Key Area 8 included the monitoring wells EV_LSgw and EV_OCgw to monitor potential inputs from upland, tributary valley bottom, and Elk River valley bottom features along the western slope of EVO.

4.8.1 Groundwater Levels

Continuous groundwater level data, available from water level level loggers installed in monitoring wells EV_LSgw and EV_OCgw along with manual water level measurements prior to sampling events (Table 2), were reviewed and assessed for seasonal variability and long-term trends. Groundwater elevations from January 2015 to October 2016 at those wells were plotted on a time-series graph and included in Appendix II (Graph 8-1). Groundwater elevations in both wells show a seasonal trend with slightly higher groundwater elevations in the spring. The maximum fluctuation in groundwater elevation is approximately 0.8 m at EV_LSgw and 0.7 m at EV_OCgw throughout the monitoring period. Groundwater elevations prior to sampling for the fourth quarter were selected and shown on Drawing 635544-116 to provide regional context.

4.8.2 Groundwater Quality

The analytical results compared to screening criteria are presented in Tables 3 and 4 (primary screening). A summary of results above primary screening criteria for Key Area 8 is presented in Table P below.

Table P: Summary of Results above Primary Screening Criteria for Key Area 8

Parameter[1,2,3]	EV_LSgw				EV_OCgw**			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Fluoride	-	-	-	-	IW, LW	IW, LW	IW, LW	IW, LW
Manganese	IW, DW	IW, DW	IW, DW	IW, DW	-	-	-	-
Molybdenum	-	-	-	-	IW	IW	IW	IW

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Primary screening criteria applied are BCWQG for Aquatic Life (AW) and CSR standards for Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) ' –' denotes result below primary screening criteria for given constituents; and **) Wells located within 10 m of surface water; comparison to BCWQG.

Groundwater quality in EV_LSgw and EV_OCgw was below the primary screening criteria concentrations for all the CIs. Groundwater quality in EV_LSgw was above primary screening criteria concentrations for dissolved manganese (IW and DW). Manganese can be naturally elevated in groundwater and is generally not a concern. Dissolved manganese concentrations ranging from 892 µg/L to 1,530 µg/L were above CSR DW (550 µg/L) and IW (200 µg/L). The source of dissolved manganese at this location is unclear but its occurrence is inferred to be related to reducing conditions in groundwater. Continued monitoring should occur and results and receptors considered in the September 30, 2017 RGMP submission.

Groundwater quality in EV_OCgw was above primary screening criteria concentrations for fluoride (IW and LW) for all four events. The source of fluoride at this location is unclear but fluoride can be naturally elevated in groundwater. Concentrations of fluoride are marginally above the respective criteria and there appears to be no usage of groundwater for livestock or irrigation watering in the area; therefore fluoride is not interpreted to be a concern. Continued monitoring should occur and results and receptors considered in the September 30, 2017 RGMP submission.

Groundwater quality in EV_OCgw was also above primary screening criteria concentrations for dissolved molybdenum (IW) for all four events. The CSR IW standard of 10 µg/L for molybdenum is relatively conservative as it is the default CSR IW standard in the absence of soil data (it relates to poorly drained soils where the Cu:Mo ratio is less than 2:1 used for foraging). All other CSR IW standards are higher (either 20 µg/L or 30 µg/L); however, soil and crop information would be required to determine whether a higher standard is applicable. A review of molybdenum results from other Key Areas suggests that it may be naturally occurring.

4.8.3 Discussion

Discussion of trends in groundwater quality in Key Area 8 focuses on dissolved selenium and sulphate concentrations which were above the primary and secondary screening criteria in previous sampling events. Time series plots of dissolved selenium and sulphate concentrations for EV_LSgw and EV_OCgw are shown in Appendix II (Graphs 8-2 and 8-3). Both graphs show that the higher concentrations measured in November 2013 and March 2014 appear to be isolated events and concentrations since then have been stable and significantly lower than the primary screening criteria for both parameters. Based on previous information from site monitoring programs and the Synthesis Report, sampling techniques employed might have explained the high concentrations obtained from these single sampling events. Based on the 2016 results, potential sources in Key Area 8 do not appear to result in elevated concentrations of CIs.

4.9 Key Area 9: Michel Creek Valley-bottom Downgradient of Bodie Creek

This area was selected as the upland Bodie Creek area was identified as a potential source of CIs to the Michel Creek valley-bottom (Drawing 635544-104). The valley-bottom setting consists mainly of fluvial and glaciofluvial deposits. Groundwater recharge of this Key Area may occur in the form of infiltration of surface water from Bodie Creek, surface water from Michel Creek, or as a result of upland groundwater discharging to the valley-bottom. Groundwater flow in the Bodie Creek area is inferred to be toward the Michel Creek valley-bottom and flow direction in the valley-bottom is assumed to be parallel or sub-parallel to the creek. The monitoring wells for the 2016 RGMP in Key Area 9 included three water supply wells: EV_RCgw (previously EV_RCS1 or EV_Road Crew Shop Well), EV_WH50gw (previously EV_WHS1/EV_WHS2 or EV_Rec Office Well) and EV_BRgw (previously EV_BRS1/EV_BRS2 or

EV_Bus Shop Well), two monitoring wells: EV_BCgw and EV_MCgwS/D (nested) to monitor spatial variation in groundwater quality within Michel Creek valley bottom in Key Area 9 and one domestic well RG_DW-03-01 to monitor valley-bottom groundwater in Michel Creek further downgradient.

4.9.1 Groundwater Levels

Continuous groundwater level data, available from level loggers installed in monitoring wells EV_BCgw, EV_MCgwS and EV_MCgwD, were recorded along with manual water level measurements during the monitoring period (Table 2). Groundwater elevations from January 2015 to October 2016 at those wells was plotted on a time-series graph and included in Appendix II (Graph 9-1). Groundwater elevations in all three wells followed the same pattern and showed a seasonal trend with generally higher groundwater elevations during the spring from April to beginning of June. The lowest elevations during the monitoring period were recorded from August to September in each year. The maximum fluctuation in groundwater elevation was just under 1 m throughout the monitoring period in EV_MCgwD and EV_BCgw and up to 1.2 m in EV_MCgwS. The vertical groundwater flow at the nested well EV_MCgwS/D is downwards with a vertical hydraulic gradient ranging from -0.05 m/m to -0.06 m/m based on the groundwater level data recorded (Appendix III). Groundwater elevations prior to sampling for the fourth quarter were selected and shown on Drawing 635544-116 to provide regional context.

4.9.2 Groundwater Quality

The analytical results compared to screening criteria are presented in Tables 3 and 4 (primary screening) and Table 5 (secondary screening). A summary of results above primary screening criteria for Key Area 9 is presented in Table Q (monitoring wells) and Table R (supply and domestic wells) below.

Table Q: Summary of Results above Primary Screening Criteria for Key Area 9 (1/2)

Parameter[1,2,3]	EV_BCgw**				EV_MCgwS**				EV_MCgwD**			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Nitrate Nitrogen	AW DW	AW DW	AW	AW	-	-	-	-	-	-	-	-
Iron	-	-	-	-	AW	AW	AW	AW	AW	AW	AW	AW
Manganese	-	-	-	-	-	-	-	-	IW	IW	IW	IW
Molybdenum	-	-	-	-	-	-	-	-	IW	-	-	-
Selenium	AW IW LW DW	AW IW DW	AW IW DW	AW IW DW	-	-	-	-	-	-	-	-

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Primary screening criteria applied are BCWQG for Aquatic Life (AW) and CSR standards for Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) '–' denotes result below primary screening criteria for given constituents, and **) Wells located within 10 m of surface water; comparison to BCWQG.

Table R: Summary of Results above Primary Screening Criteria for Key Area 9 (2/2)

Parameter [1,2,3,4]	EV_BRgw				EV_WH50gw				EV_RCgw				RG_DW-03-01[5]		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q2	Q3	Q4
Nitrate Nitrogen	-	DW	DW	-	-	-	-	-	DW	DW	DW	DW	-	-	-
Sulphate	-	-	-	-	-	-	-	-	AW IW DW	AW IW DW	AW IW DW	AW IW DW	-	-	-
Copper	-	-	-	-	-	-	-	-	-	-	-	AW	na	na	na
Magnesium	-	-	-	-	-	-	-	-	DW	DW	DW	DW	-	-	-
Selenium	AW IW DW	AW IW DW	AW IW DW	AW IW DW	AW DW	-	AW DW	-	AW IW LW DW	AW IW LW DW	AW IW LW DW	AW IW LW DW	-	-	-

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Primary screening criteria applied are CSR standards for AW, DW, LW and IW; 3.) '–' denotes result below primary screening criteria for given constituents; and 4.) na indicates the well was not sampled for specific parameter; and 5.) No sample collected in Q1 and 2 samples collected in Q2.

Groundwater quality in EV_BCgw, EV_BRgw, EV_RCgw and EV_WH50gw was above primary screening criteria concentrations for selenium (DW, AW, IW and/or LW) for most sampling events in 2016. The highest concentrations were measured at EV_RCgw. Groundwater quality in EV_BCgw, EV_BRgw and EV_RCgw was also above primary screening criteria concentrations for nitrate (DW and/or AW) for most monitoring samples. Groundwater quality in EV_RCgw was also above primary screening criteria concentrations for sulphate (DW, AW and IW) and magnesium (DW) for all samples during the monitoring period and for dissolved copper (AW) only for the Q4 sample.

Dissolved copper concentrations at EV_RCgw were above AW primary screening criteria in the Q4 sample in 2016. This result appears to be an isolated event in 2016 compared to 2015 where copper concentrations above primary screening criteria was measured in the three supply wells (EV_BRgw, EV_WH50gw and EV_RCgw). The source of copper in Key Area 9 is unclear and concentrations varied significantly between sampling events. Similar to 2015, groundwater concentrations were above CSR DW standard for magnesium in the water supply well EV_RCgw in 2016. Further review of data from this well will be completed as part of the September 30, 2017 RGMP submission.

In monitoring wells EV_MCgwS and EV_MCgwD, groundwater concentrations for CIs were below the primary screening criteria; however, dissolved iron concentrations were above the primary screening criteria (AW) in both wells. Monitoring wells EV_MCgwS/D are screened within a clayey unit with low hydraulic conductivity values; as such, the results are likely naturally occurring due to limited exchange with the atmosphere resulting in higher dissolved iron concentrations.

Groundwater quality in EV_MCgwD was above primary screening criteria concentrations for dissolved manganese (IW) for all sampling event and above dissolved molybdenum (IW) for Q1. Similar to iron, manganese in groundwater can be naturally elevated due to limited interaction with atmosphere. The concentration in dissolved molybdenum (10.3 µg/L) was marginally above the CSR IW standard. The CSR IW standard of 10 µg/L for molybdenum is relatively conservative as it is the default CSR IW standard in the absence of soil data (it relates to poorly drained soils where the Cu:Mo ratio is less than 2:1 used for foraging). All other CSR IW standards are higher (either 20 µg/L or 30 µg/L); however, soil and crop information would be required to determine whether a higher standard is applicable. A review of molybdenum results from other Key Areas suggests that it may be naturally occurring.

Secondary screening for selenium was completed where sample concentrations were above primary screening criteria. Table S shows the summary of results above secondary screening criteria for Key Area 9. EV_BCgw, EV_BRgw, and EV_RCgw concentrations were above SPO secondary screening criteria for selenium for all the sampling events. Selenium concentrations were also above Michel Creek CP concentrations for most sampling events. The CDWG of 50 mg/L was exceeded for all four sampling events at EV_RCgw and only marginally during Q1 at EV_BCgw.

Table S: Summary of Results above Secondary Screening Criteria for Key Area 9

Parameter [1,2]	EV_BCgw				EV_BRgw				EV_WH50gw				EV_RCgw			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Selenium	SPO CP DW	SPO CP	SPO CP	SPO	SPO CP	SPO CP	SPO CP	SPO CP	-	-	-	-	SPO CP DW	SPO CP DW	SPO CP DW	SPO CP DW

Notes: 1) Secondary screening criteria are Site Performance Objective (SPO), Compliance Point (CP) and GCDWQ for drinking water (DW); and 2.) '–' denotes result below secondary screening criteria.

4.9.3 Discussion

Discussion of trends in groundwater quality in Key Area 9 focuses on dissolved selenium, nitrate and sulphate concentrations which are the CIs that approach or were above the primary and secondary screening criteria in some monitoring wells in this Key Area. Drawing 635544-119 shows the spatial distribution of dissolved selenium, sulphate and nitrate for samples collected in Key Area 9. Time series plots of dissolved selenium, nitrate and sulphate from the selected wells located in Key Area 9 and included in the 2016 RGMP are shown in Appendix II (Graphs 9-2(1), 9-2(2), 9-3, 9-4). To compare groundwater concentration trends to surface water in Key Area 9, dissolved selenium, nitrate and sulphate concentrations measured in nearby surface water at Bodie Creek (EV_BC1), Gate Creek (EV_GT1) and further downstream at Michel Creek (EV_MC2) were plotted on these graphs.

No distinct seasonal trend in the concentrations of selenium, nitrate and sulphate in groundwater can be identified based on 2013-2016 data. No significant variation in concentrations was noted for most wells except for EV_BCgw where concentrations for all three constituents show an increase of more than twofold from October 2014 to June 2015; concentrations have been decreasing since then. The highest concentrations in dissolved selenium, nitrate and sulphate have been measured in water supply well EV_RCgw with levels consistently higher than concentrations measured in surface water stations EV_BC1 and EV_GT1 since 2015. The source and extent of high concentrations measured at EV_RCgw are not well understood.

Based on monitoring results, attenuation of dissolved selenium, nitrate and sulphate appears to be occurring in the Michel Creek valley-bottom suggesting dilution along the flow path and/or groundwater recharge at the local scale. Selenium concentrations above primary and secondary screening criteria and nitrate concentrations above primary screening criteria are still noted in assumed downgradient wells EV_BCgw and EV_BRgw but concentrations are lower than measured at EV_RCgw as shown on Drawing 635544-119. Further downgradient in Key Area 9, concentrations at EV_MCgwS/D and RG_DW_03-01 respectively are below all screening criteria suggesting further attenuation along the flow path. EV_MCgwS/D is installed in a clayey unit and RG_DW-03-01 is a domestic well located more than 2 km downgradient from EV_BRgw. SNC-Lavalin (2016b) noted that wells EV_MCgwS/D might not be ideal downgradient sentry wells due to their installation. Also, monitoring locations do not extend to the deep sand and gravel unit as shown on cross-section E-E' (Drawing 635544-114).

Uncertainty exists in the groundwater quality delineation (i.e., extent of groundwater impacts) in Key Area 9.

4.10 Key Area 10: Michel Creek Valley-bottom Downgradient of Erickson Creek

Key Area 10 consists of Michel Creek valley bottom deposits located downgradient of Erickson Creek (Drawing 635544-104). Mining activities (waste rock dumps and other potential sources) on the southwest slope of EVO around Erickson Creek are a potential source of mining-related constituents to valley-bottom groundwater into the Michel Creek valley bottom with transport through the Erickson Creek valley-bottom. The only monitoring point upgradient of Key Area 10 is EV_ECgw situated in the Erickson Creek valley-bottom; surficial geology mainly consists of colluvium overlying till consistent with surficial geology presented in Drawing 635544-107. Bedrock was not encountered at this location. The bottom half of the monitoring well screened in a clay and sand unit with a hydraulic conductivity value of 1×10^{-8} m/s.

4.10.1 Groundwater Levels

Continuous groundwater level data, available from a level logger installed at monitoring well EV_ECgw, were recorded along with manual water level measurements during the monitoring period (Table 2). Groundwater elevation from January 2015 to October 2016 at EV_ECgw was plotted on a time-series graph and included in Appendix II (Graph 10-1). Groundwater elevation in EV_ECgw ranged from approximately 1,326.1 masl to 1327.5 masl, throughout the monitoring period and followed a seasonal trend fluctuating 1.4 m throughout the monitoring period. In 2016, groundwater levels were at their highest in April and at their lowest in September. Groundwater elevation prior to sampling for the fourth quarter was selected and shown on Drawing 635544-116 to provide regional context.

4.10.2 Groundwater Quality

Groundwater quality results for EV_ECgw (site-specific monitoring program at EVO) were compared to screening criteria and presented in Tables 3 and 4 (primary screening). A summary of results above primary screening criteria for Key Area 10 is presented in Table T below.

Table T: Summary of Results above Primary Screening Criteria for Key Area 10

Parameter[1,2,3]	EV_ECgw[4]		
	Q2	Q3	Q4
Molybdenum	IW	IW	IW

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Primary screening criteria applied are CSR standards for Aquatic Life (AW), Drinking water (DW), Livestock (LW) and Irrigation (IW); 3.) '–' denotes result below primary screening criteria for given constituents and 4.) Chemistry data were not available from specific quarterly sampling events as summarized in Section 2;

Groundwater concentrations for the four CIs in Key Area 10 were below the applicable primary screening criteria (i.e., CSR standards). Dissolved molybdenum concentrations were above the CSR IW as shown in Table T. The concentrations of dissolved molybdenum were marginally above the default CSR IW standard of 10 µg/L and as discussed above for Key Area 8, at these concentrations this constituent is not considered a concern. Continued monitoring should occur and results and receptors considered in the September 30, 2017 RGMP submission.

4.10.3 Discussion

Key Area 10 was identified as an area where transport of CIs to the valley-bottom may be occurring due to spoils in Erickson Creek. There are no groundwater wells in the valley-bottom aquifer; however, groundwater monitoring of EV_ECgw located upgradient in the tributary is considered adequate to assess potential groundwater transport to Key Area 10. Drawing 635544-119 shows the concentrations of dissolved selenium, sulphate and nitrate for samples collected in 2016 in Key Area 10. Groundwater quality in EV_ECgw was below all primary screening criteria for the CI in 2016; therefore, groundwater transport of CI in the Erickson drainage appears to be minimal. The 2016 results are consistent with historical results available at this location since the end of November 2013.

To assess groundwater and surface water interaction in the Erickson drainage and potential impacts to the Michel Creek valley-bottom sediments, selenium concentrations measured in shallow groundwater at EV_ECgw were compared to concentrations in surface water at the mouth of Erickson Creek (EV_EC1) and Michel Creek (EV_MC3) upstream from Erickson Creek discharge. A time series plot of dissolved selenium from the selected well and surface water stations located in Key Area 10 is shown in Appendix II (Graph 10-2). Concentrations in groundwater at EV_ECgw are significantly lower than concentrations measured in Erickson Creek at EV_EC1 and also lower than concentrations in Michel Creek upstream from the confluence with Erickson Creek. Surface water concentrations in Erickson Creek (EV_EC1) follow a seasonal trend with lower concentrations measured during freshet as a result of dilution of constituents. Graph 10-2 also shows an overall increasing trend in dissolved selenium concentrations in Erickson Creek at EV_EC1.

In the absence of monitoring well, groundwater quality in the Michel valley-bottom aquifer immediately downgradient of Erickson Creek is unknown, however, impacts on groundwater, if any, is likely to be the result of infiltration of impacted surface water rather than tributary groundwater transport.

4.11 Key Area 11: Michel Creek Valley-bottom Downgradient of CMO

Key Area 11 consists of Michel Creek valley bottom deposits located downgradient of CMO (Drawing 635544-105). The Michel Creek valley bottom receives input from CMO immediately downgradient of the confluence of Michel and Corbin Creeks. Valley-bottom deposits in this area were identified as the primary migration pathway outside of mine-permitted areas from CMO. The monitoring locations for the 2016 RGMP in Key Area 11 included a domestic well near Corbin Creek (RG_DW-07-01) located just west of the Main Settling Pond and the nested monitoring well (CM_MW1-OB, CM_MW1-SH, CM_MW1-DP) installed immediately downgradient of CMO at the confluence of Michel Creek and Corbin Creek by SRK Consulting (Canada) Inc (SRK) in 2015.

The nested monitoring well CM_MW1-OB/SH/DP was installed in 2015 to provide additional monitoring locations in the Michel Creek valley-bottom deposits. The shallower well CM_MW1-OB was installed in a gravel unit at 4.4 mbgs. CM_MW1-SH and CM_MW1-DP were both installed in bedrock (siltstone) at a total depth of 23.5 mbgs and 37.3 mbgs, respectively.

4.11.1 Groundwater Levels

Manual groundwater levels measured after the installation of the new monitoring wells in August 2015 and quarterly since then were reviewed and assessed for seasonal variability and vertical groundwater flow. Table 2 shows manual water level measurements recorded at CM_MW1 in 2015 and 2016; manual

water level measurements are presented in Appendix II (Graph 11-1). The data show no significant variation in groundwater levels in the two upper wells (CM_MW1-OB and CM_MW1-SH); however, groundwater elevation in the deeper well CM_MW1-DP fluctuated up to 28 m in 2015 and up to 8 m in 2016. Groundwater elevations at other monitoring wells reported in the 2016 Site-Specific Groundwater Monitoring Report at CMO were further reviewed (SRK, 2017). Based on the manual water level readings reported, fluctuations do not correlate with a seasonal trend and appear to be only observed at CM_MW1-DP. The reason of these fluctuations has not been investigated but it is suspected to be an artefact of the timing of groundwater measurement in relation to groundwater sampling at CM_MW1-SH and –DP. Groundwater levels in the three wells should be measured prior any sampling occur in the nested wells. Groundwater elevations for the fourth quarter are shown on Drawing 635544-116 to provide regional context.

Based on the groundwater elevations recorded at the nested well CM_MW1 (Table 2), the vertical groundwater flow is inferred to be downwards from the shallow gravel aquifer to the bedrock aquifer. The calculated vertical hydraulic gradients between CM_MW1-OB and CM_MW1-SH varied from -0.05 m/m to -0.11 m/m in 2016 (Appendix III). The groundwater elevations reported for CM_MW1-DP appear to be transient and affected by groundwater sampling due to a slow recharge of low conductivity bedrock; therefore vertical hydraulic gradients were not calculated using the deep bedrock well.

4.11.2 Groundwater Quality

Groundwater quality results for CM_MW1 and RG_DW-07-01 were compared to screening criteria in Tables 3 and 4 (primary screening). A summary of results above primary screening criteria for Key Area 11 is presented in Table U below.

Table U: Summary of Results above Primary Screening Criteria for Key Area 11

Parameter [1,2,3,5]	CM_MW-1-OB				CM_MW-1-SH				CM_MW-1-DP				RG_DW-07-01[4]			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q2	Q2	Q3	Q4
Sulphate	-	-	-	-	-	-	-	-	-	-	-	-	-	DW	DW	-
Chloride	-	-	-	-	IW	IW	IW	IW	IW	IW	IW	IW	-	-	-	-
Sodium	-	-	-	-	-	DW	-	-	DW	DW	DW	DW	-	-	-	-
Barium	-	-	-	-	-	-	-	-	DW	DW	DW	DW	na	na	na	na
Manganese	-	-	-	-	IW	IW	IW	IW	IW	IW	IW	IW	na	na	na	na
Molybdenum	-	-	-	-	IW	IW LW	IW	IW LW	-	-	-	-	na	na	na	na

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Primary screening criteria applied are CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) '–' denotes result below primary screening criteria for given constituents; 4.) No sample collected in Q1 and 2 samples collected in Q2.; and 5.) na indicates the well was not sampled for specific parameter.

The only result above primary screening criteria noted for the CIs in Key Area 11 is the sulphate concentration that was marginally above the primary screening value for DW (500 mg/L) in domestic well RG_DW-07-01 in two samples. Groundwater concentrations for other CIs in Key Area 11 were below the applicable primary screening criteria (i.e., CSR standards).

Other parameters (chloride, sodium, barium, manganese and molybdenum) were above the primary screening criteria in the bedrock monitoring wells (CM_MW1-SH and CM_MW1-DP) as shown in Table U. All concentrations were below primary screening criteria in the shallow overburden well (CM_MW1-OB).

Concentrations of chloride and sodium above primary screening criteria were measured in other wells at CMO as reported in the Site-Specific Annual report (i.e., CM_MW3, CM_MW4 and CM_MW6; SRK, 2017). Within the period of record, there was no obvious seasonal variation in concentrations. The highest chloride and sodium concentrations were measured in the deep bedrock well at CM_MW3 located upgradient of CMO in the Michel Creek valley suggesting elevated chloride and sodium concentrations in bedrock at CMO are naturally occurring or from another source.

As noted for other Key Areas, groundwater concentrations exceeding CSR IW, LW and/or DW standards in dissolved barium, dissolved manganese and dissolved molybdenum has been observed in deeper monitoring wells. Concentrations of dissolved manganese at CM_MW1-SH and -DP are marginally above the standards and are not considered a concern. Concentrations of dissolved molybdenum and dissolved barium were the highest compared to other wells at CMO at CM_MW1 (i.e., shallow bedrock for dissolved molybdenum and deep bedrock for dissolved barium) based on information from the Site-Specific Annual program (SRK, 2017), and have been increasing during the monitoring period.

4.11.3 Discussion

Discussion of trends in groundwater quality in Key Area 11 focuses on dissolved selenium and sulphate concentrations which are the CIs that approach or are above the primary screening criteria at RG_DW-07-01. Time series plots of dissolved selenium and sulphate from the RGMP monitoring locations in Key Area 11 are shown in Appendix II (Graphs 11-2 and 11-3, respectively). A seasonal trend in concentrations of dissolved selenium and sulphate appears to be present at RG_DW-07-01 based on 2014-2016 data. In general, concentrations of these constituents at this location are lowest in spring and summer, and increase through the fall and winter, which is consistent with the effect of dilution on constituents in shallow groundwater in a freshet dominated regime. Sulphate concentrations were slightly above the CSR DW standard of 500 mg/L in some of the samples during the monitoring period as shown on Graph 11-3. Dissolved selenium concentrations were below applicable CSR standards in 2015-2016 and only above CSR AW and DW in March 2014. Not enough data were available for interpretation of seasonal trends at nested well CM_MW1; however, the data for the nested well show higher concentrations of dissolved selenium and sulphate in the shallow overburden well (CM_MW1-OB) compared to the two bedrock monitoring wells (CM_MW1-SH and CM_MW1-DP). This observation is consistent with the Regional Conceptual Model identifying the surficial deposits as the main groundwater transport pathway for CI in the Study Area.

For comparison purposes, dissolved selenium and sulphate concentrations measured in Corbin Creek at surface water location CM_CC1 and in Michel Creek downstream from the confluence with Corbin Creek at surface water location CM_MC2 were added to Graphs 11-2 and 11-3. Fluctuations of surface water concentration are more prominent compared to groundwater, with lower concentrations measured during freshet as a result of dilution. Selenium concentrations measured at RG_DW-07-01 are within the range of concentrations measured in Michel Creek at CM_MC2 and generally follow the same temporal trend; however, sulphate concentrations measured at RG_DW-07-01 are higher than those measured in Michel Creek but within the range of concentrations measured in Corbin Creek at CM_CC1. These results suggest groundwater sampled from RG_DW-07-01 is hydraulically connected to surface water.

Drawing 635544-120 shows the spatial distribution of dissolved selenium, sulphate and nitrate for samples collected in Key Area 11. The highest concentrations of dissolved selenium and sulphate in groundwater have been measured in domestic well RG_DW-07-01. Attenuation of sulphate and dissolved selenium appears to be occurring in the Michel Creek valley-bottom further downgradient of the confluence of Corbin Creek and Michel Creek as no parameter concentrations above screening criteria were noted in CM_MW1-OB installed in valley-bottom deposits furthest downgradient from CMO.

Based on groundwater geochemistry and water levels, groundwater monitoring in the bedrock monitoring wells CM_MW1-SH and CM_MW1-DP is not recommended as they are not suitable for monitoring groundwater transport of CI from CMO. Continued monitoring of CM_MW1-OB and domestic well RG_DW-07-01 on a quarterly basis is recommended. Based on sampling history at RG_DW-07-01 we recognize there are challenges with sampling this well on a quarterly basis. A detailed review of this and other locations as well as sampling frequencies will be performed as part of the September 30, 2017 submission of the RGMP.

4.12 Key Area 12: Elk River Valley-bottom at Study Area Boundary

Key Area 12 was selected as it is at the boundary of MU4 and therefore the Study Area. The valley-bottom setting consists mainly of fluvial and glaciofluvial deposits. Based on domestic water well logs, the depth to bedrock in this area and therefore thickness of valley-bottom sediments, is over 40 m. This Key Area receives flow from valley-bottom groundwater in Key Areas 8 (Elk River) and 9 (Michel Creek), and groundwater is recharged from Elk River and/or Michel Creek surface water (Franz, 2013) as well as local precipitation. Groundwater flow is assumed to be parallel or sub-parallel to the Elk River; however, variations in local groundwater flow in the capture zone of the municipal well RW_DW-03-04 is expected. The two monitoring points in Key Area 12 are EV_ER1gwS/D and RG_DW-03-04 (also identified as the Sparwood Municipal Well 3).

4.12.1 Groundwater Levels

Groundwater elevation measured during the fourth quarter at EV_ER1gwS/D in Key Area 12 is shown on Drawing 635544-116 to provide regional context with other Key Areas. Continuous groundwater level data available from a water level datalogger installed in monitoring well EV_ER1gwS were recorded along with manual water level measurements during the monitoring period (Table 2). Groundwater elevation from January 2015 to October 2016 at EV_ER1gwS/D was plotted on a time-series graph and included in Appendix II (Graph 12-1). No static pumping water levels were available for RG_DW-03-04 but pumping rate data were provided by the District of Sparwood and added to the time-series plot in Appendix II (Graph 12-1). Daily water level data recorded for Elk River (hydrometric station 08NK016) were also added to the time-series graph to compare with shallow groundwater elevation in Key Area 12. We note that the elevation of water level measurement at the hydrometric station is unknown; therefore, the water level data shown on Graph 12-1 are relative and based on the local datum.

Groundwater elevation in EV_ER1gwS ranged from approximately 1110.4 masl to 1112.1 masl throughout the 2015-2016 monitoring period and followed a typical seasonal trend associated with a freshet regime as shown on Graph 12-1. The fluctuation in the shallow well at EV_ER1gwS generally follows the surface water fluctuation observed at the Elk River hydrometric station suggesting a strong hydraulic connection between groundwater and surface water at this location. We note that the amplitude of the fluctuation in groundwater and surface water are not directly comparable as the hydrometric station

is located approximately 15 m north of Sparwood. The vertical hydraulic gradients calculated at the nested well EV_ER1gwS/D using the 2016 manual water level measurements were consistent throughout the year with a value of 0.02 m/m – 0.03 m/m (Appendix III) and indicated an upward component of groundwater flow.

The reported average pumping rate of Sparwood Municipal Well 3 between May and December 2016 was approximately 2,250 m^3/day. No pumping occurred from mid-December 2015 to mid-May 2016. Based on pumping data reviewed, the pumping rate fluctuates throughout the year with generally higher pumping rates during the spring and summer months and lower pumping rates between September and December. Locally, groundwater levels in Key Area 12 may also be affected by groundwater extraction at the municipal well RG_DW-03-04. As shown on Graph 12-1, groundwater levels at EV_ER1gwS do not appear to be affected by groundwater extraction at RG_DW-03-04. In the absence of continuous water level data for EV_ER1gwD, it is unknown if the deep aquifer is affected by groundwater extraction. The nested monitoring well EV_ER1gwS/D is located more than 600 m away and generally upgradient from the municipal well RG_DW-03-04. Interference at this distance is expected to be minimal. In addition, it is possible that EV_ER1gwS/D is outside the capture zone of RG_DW-03-04 as per previous assessment completed by UMA (2008).

4.12.2 Groundwater Quality

The analytical results compared to screening criteria are presented in Tables 3 and 4 (primary screening) and Table 5 (secondary screening). A summary of results above primary screening criteria for Key Area 12 is presented in Table V.

Table V: Summary of Results Above Primary Screening Criteria for Key Area 12

Parameter[1,2,3,4]	EV_ER1gwS				EV_ER1gwD				RG_DW-03-04			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Dissolved Selenium	AW DW	-	-	-	-	-	-	-	na	na	na	na
Total Selenium	-	-	-	-	-	-	-	-	AW DW	AW DW	-	AW DW

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Primary screening criteria applied are CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) '–' denotes result below primary screening criteria for given constituent; and 4.) na indicates the well was not sampled for specific parameter.

Selenium is the only CI with concentrations above primary screening criteria in Key Area 12. Dissolved selenium concentration was marginally above the primary screening criteria (AW and DW) in February 2016 at EV_ER1gwS and total selenium concentrations were also marginally above AW and DW primary screening criteria of 10 μg/L in RG_DW-03-04 in the monthly samples collected in March, April, May, October and November 2016. Groundwater concentrations for other CIs in Key Area 12 were below applicable primary screening criteria. Secondary screening was performed for total selenium where concentrations were above primary criteria and all concentrations were below secondary screening criteria.

4.12.3 Discussion

Discussion of trends in groundwater quality in Key Area 12 focuses on dissolved/total selenium, which had concentrations marginally above the primary screening criteria for at least part of the year in this Key Area. Since groundwater in this area hydraulically connected to surface water, a time-series plot of weekly and monthly selenium concentrations from samples collected in the Elk River (EV_ER1), Michel Creek (EV_MC2), and RG_DW-03-04 (Sparwood Municipal Well 3) from 2011 is shown in Appendix II (Graph 12-2). Sampling results were provided by the District of Sparwood and sampling locations for the Elk River and Michel Creek are consistent with previous sampling locations reported by Franz (2013). Selenium concentrations available at monitoring wells EV_ER1gwS/D since November 2013 were also added to the time-series plot. We note that the selenium concentrations presented on the graph are dissolved except at RG_DW-03-04 where only total selenium concentrations were provided.

A clear seasonal trend in selenium concentrations is observed in the surface water (Elk River and Michel Creek) and groundwater (RG_DW-03-04 and EV_ER1gwS/D) monitoring points although not as pronounced in monitoring wells EV_ER1gwS/D. In general, concentrations of these constituents are lowest in spring and summer, and increase through the fall and winter, which is consistent with the effect of dilution on constituents in shallow groundwater in a freshet dominated regime. Daily discharge data for the Elk River (hydrometric station 08NK016) were also added to the time-series graph and clearly show the effect of freshet on water concentrations in Key Area 12.

Since 2015, selenium concentrations in Michel Creek have been significantly higher compared to Elk River concentrations and groundwater concentrations in Key Area 12. In 2016, groundwater quality in the deeper aquifer at municipal well RG_DW-03-04 (completed at approximately 35 mbgs) appears to generally reflect the Elk River surface water quality. However, we note that selenium concentrations measured at RG_DW-03-04 were above the concentrations measured in Elk River surface water during the fall of 2015 and 2016 also suggesting influence of Michel Creek surface water quality. It is therefore inferred that surface water recharge have reached the deeper aquifer due to the lack of a laterally continuous confining unit as shown cross-section D-D' (Drawing 635544-113). Induced hydraulic gradients from well extraction might also be a contributing factor.

Drawing 635544-119 shows the spatial distribution of dissolved selenium, sulphate and nitrate for samples collected in 2016 in Key Area 12 and provide regional context with the other Key Areas in the south half of the Study Area. Selenium concentrations above primary screening criteria but below secondary screening criteria were measured at the farthest downgradient monitoring location in Management Unit #4 and the Study Area (i.e., EV_ER1gwS/D). Delineation of groundwater quality in the Elk River valley-bottom aquifer is not achieved. However, since groundwater quality in Key Area 12 appears to reflect the Elk River surface water quality, surface water infiltration (recharge) rather than a valley-bottom groundwater pathway appears to be the cause of concentrations above screening criteria measured at this location.

5 Conclusions and Recommendations

In general, groundwater conditions in 2016 were similar to those outlined in the Regional Conceptual Model in the Synthesis Report (SNC-Lavalin, 2015b) and in the 2015 Annual Report (SNC-Lavalin, 2016b). Concentrations of CIs above primary and secondary screening criteria were generally consistent with previous observations and are summarized by Key Area below. Concentrations of other constituents were also compared to primary screening criteria. Most concentrations of other constituents above primary screening criteria noted are not considered a concern because there was no identified receptor for the specific pathway (e.g., irrigation or livestock watering) and/or the results were only marginally above criteria. In some Key Areas, concentrations for some constituents (i.e., copper, fluoride, iron and manganese) were significantly higher than primary criteria and the source was unclear. These constituents may be naturally occurring and continued monitoring is recommended. Results of the RGMP will be considered under Big Question 6 in the Adaptive Management Plan (Teck, 2016). Additional linkages between the RGMP and the AMP will be considered through the RGMP update submission (Sept 30, 2017) and in future updates to the AMP.

General recommendations for the RGMP are as follows:

- Increase water level data quality by:
  - collecting concurrent (before and after) manual water level measurements each time a water level logger is deployed or removed from a well and prior to each sampling event;
  - re-deploying level logger at exact same depth in monitoring well after it was removed for downloading; and
  - using a barometer and manual water level measurements to compensate and correct the data.
- Review the QA/QC programs, specifically related to field and trip blanks;
- Analyse for all the parameters listed in the RGMP starting in Q2 2017, including expansion of the parameters for RDW wells that are part of the RGMP;

The following summarizes conclusions from the 2016 results and recommendations to be considered in the update of the RGMP by Key Area for the September 30, 2017 RGMP submission.

5.1 Background (Reference) Station FR_HMW5

All CIs concentrations (except for selenium concentration in Q4) in background well FR_HMW5 were below or near the MDL and therefore no trend analysis for groundwater quality parameters was performed. Since concentrations of all parameters were below primary screening criteria, monitoring well FR_HMW5 was considered an appropriate reference monitoring well for the RGMP.

Recommendations for the background location are:

- Continued groundwater monitoring at FR_HMW5 on a quarterly basis; and
- Re-evaluation of this location and other existing monitoring points in the September 30, 2017 RGMP submission.

5.2 Key Area 1

The furthest downgradient monitoring points (FR_GHHW) reported selenium and nitrate above primary screening criteria. Selenium concentrations at FR_GHHW were also above secondary screening criteria for some sampling events. Discharge and mixing with Fording River surface water likely occurs between these points and the nearest downgradient monitoring points at GHO; however, these monitoring points are over 15 km downstream and the localized extents of CI in groundwater are not known. Additional groundwater studies have been initiated at FRO to further assess groundwater influence from Kilmarnock Creek, Swift Creek and Cataract Creek, and the adequacy of existing monitoring wells.

Recommendations for key Area 1 are the following:

- Continued groundwater monitoring at FR_09-01-A/B and FR_GHHW on a quarterly basis; and
- Incorporate results of additional groundwater studies in the September 30, 2017 RGMP submission; any additional studies required for delineation will be assessed and prioritized as part of the submission.

5.3 Key Area 2

Groundwater quality in LC_PIZDC1308 and LC_PIZDC1307 has historically been consistently below all primary screening criteria for the CIs. The most significant pathway for effects of mine-contact water to the valley-bottom appears to be through surface water from LCO Dry Creek. This is supported by low concentrations of CIs in LC_PIZDC1308 and LC_PIZDC1307 compared surface water concentrations and the presence of till in the LCO Dry Creek drainage.

Recommendations for Key Area 2 are the following:

- Continued groundwater monitoring at LC_PIZDC1308 and LC_PIZDC1307 on a quarterly basis until the September, 2017 RGMP submission; and
- Re-assess the inclusion of current wells in the September 30, 2017 RGMP submission.

5.4 Key Area 3

Concentrations of total selenium and sulphate in GH_POTW09, GH_POTW10 and GH_POTW15 were relatively consistent suggesting little seasonal influence and therefore not a direct connection with Fording River surface water. This is consistent with the interpretation that relatively continuous aquitards exist in the valley bottom in Key Area 3. The higher sulphate concentrations at GH_POTW17 suggest influence from Greenhill Creek surface water at this location.

Recommendations for Key Area 3 are the following:

- Continued monitoring at GH_POTW9, GH_POTW10, GH_POTW15 and GH_POTW17 on a quarterly basis; and
- Review of data gaps and prioritization for investigation as part of the September 30, 2017 RGMP submission.

5.5 Key Area 4

Elevated dissolved selenium concentrations above both primary and secondary screening criteria were measured in a number of wells in Key Area 4. Groundwater selenium concentrations in Key Area 4 has shown considerable variability (i.e., orders-of-magnitude) in select wells, which is suspected to be a results of local-scale interaction with surface water. Additional comparison to surface water quality could be performed to understand the connection. Downgradient groundwater quality in the Elk River valley-bottom appears to improve.

Recommendations for Key Area 4 are the following:

- Continued monitoring of monitoring wells GH_GA-MW-2, GH_GA-MW-3, GH_GA-MW-4 and GH_MW-ERSC-1, water supply well RG_DW-01-03 and domestic well RG_DW-01-07;
- Remove GH_GA-MW-01 from the RGMP as data obtained from GH_GA-MW-01 are likely not representative of groundwater conditions in the valley-bottom aquifer in Key Area 4;
- Review of data gaps and prioritization for investigation as part of the September 30, 2017 RGMP submission; and,
- Re-assess inclusion of current wells in the September 30, 2017 RGMP submission.

5.6 Key Areas 5 and 6

Groundwater from the LCO Process Plant Site has been shown to flow towards Key Area 6; however, relatively low concentrations of CIs, below primary screening criteria were measured in groundwater collected from LC_PIZP1101 during the 2015 and 2016 groundwater monitoring program. Based on a comparison of groundwater concentrations at this location and surface water concentrations in Line Creek, the most significant pathway of mine-contact water to the valley-bottom appears to be through surface water from Line Creek.

Recommendations for Key Areas 5 and 6 are the following:

- Maintain groundwater monitoring at LC_PIZP1101 and comparison to data collected at nearby surface water monitoring stations LC_LC4 and EV_ER4; and
- Review of data gaps and prioritization for investigation as part of the September 30, 2017 RGMP submission. Complete further assessment if there is material divergence between domestic groundwater quality in the Key Area 7 and surface water quality that suggest down-valley groundwater mine contact water in addition to surface water infiltration.

5.7 Key Area 7

Significant groundwater transport of CI from the Harmer Creek drainage to the Elk River valley bottom is inferred to be minimal based on relatively low groundwater concentrations measured in Harmer Creek drainage at EV_GV3gw compared to surface water. We note that EV_GV3gw is screened in the deeper aquifer (approximately 25 m bgs) and as such is representative of groundwater quality in the deeper part of the aquifer. However, considering that 1) the sub-surface geology in EV_GV3gw is described as very loose and varies from sand with some gravel to silty gravel with no confining unit; and 2) the depth to water is relatively deep at this location (approximately 10 m bgs), groundwater quality in the shallower part of the aquifer is not expected to be significantly different

Recommendations for Key Area 7 are the following:

- Maintain groundwater monitoring at EV_GV3 and RG_DW-02-20 and surface water monitoring of Harmer Creek (as a proxy for shallow groundwater) at EV_HC1 (EMS E102682) on a quarterly basis; and
- Review of data gaps related to Key Area 7 and prioritization for investigation as part of the September 30, 2017 RGMP submission.

5.8 Key Area 8

Potential sources in Key Area 8 do not appear to result in elevated concentrations of CIs. Higher concentrations in dissolved selenium and sulphate measured at EV_LSgw and EV_OCgw in 2013 and 2014 appear to be isolated events and concentrations since then have been stable and significantly lower than the primary screening criteria for both parameters.

Recommendations for Key Area 8 are the following:

- Continued monitoring of EV_LSgw and EV_OCgw on a quarterly basis; and
- Re-evaluate inclusion of these wells as part of the September 30, 2017 RGMP submission.

5.9 Key Area 9

Groundwater concentrations of dissolved selenium, nitrate and sulphate exceeded the primary and secondary screening criteria in several wells in this Key Area. Monitoring results below primary screening criteria at downgradient monitoring wells EV_MCgwS/D and domestic well RG_DW_03-01 indicate attenuation of dissolved selenium, nitrate and sulphate appears to be occurring in the Michel Creek valley-bottom suggesting dilution along the flow path and/or discharge of contaminated groundwater to Michel Creek at the local scale. However, EV_MCgwS/D is installed in a clayey unit and RG_DW_03-01 is a domestic well, both locations are more than 2 km downgradient from the known groundwater impacted area. As such, these monitoring locations are not ideal downgradient sentry wells. Uncertainty exists in the groundwater quality delineation (i.e., extent of groundwater impacts) in Key Area 9. A Groundwater Supporting Study has been initiated in the Sparwood Area to further assess groundwater conditions and potential impacts from mine-related activities.

Recommendations for Key Area 9 are the following:

- In the absence of other monitoring wells downgradient of Michel Creek before the confluence with the Elk River, maintain groundwater monitoring at EV_MCgwS/D and RG_DW-03-01 on a quarterly basis and evaluated further to assess suitability of wells to support regional groundwater understanding; and
- Incorporate available information from the Sparwood Area Groundwater Supporting Study in the September 30, 2017 RGMP submission; any additional studies will be assessed and prioritized as part of the submission.

5.10 Key Area 10

Groundwater quality in EV_ECgw was below all primary screening criteria for the CI in 2016; therefore, groundwater transport of CI in the Erickson drainage appears to be minimal. The 2016 results are consistent with historical results available at this location since the end of November 2013. In the absence of monitoring well, groundwater quality in the Michel valley-bottom aquifer downgradient of Erickson

Creek is unknown, however, impacts on groundwater, if any, is likely to be the result of infiltration of surface water rather than tributary groundwater transport.

Recommendations for Key Area 10 are the following:

- Maintain groundwater monitoring at EV_ECgw on a quarterly basis; and
- Review of data gaps related to Key Area 10 and prioritization for investigation as part of the September 30, 2017 RGMP submission.

5.11 Key Area 11

The nested monitoring well (CM_MW1) was added to the RGMP in 2015 to provide an additional monitoring point in the Michel Creek valley-bottom deposits. No results above primary screening criteria were noted in CM_MW1-OB which is installed in valley-bottom deposits furthest downgradient from CMO; therefore, attenuation of sulphate and dissolved selenium appears to be occurring in the Michel Creek valley-bottom further downgradient of the confluence of Corbin Creek and Michel Creek.

Recommendations for Key Area 11 are the following:

- Continued monitoring of CM_MW1-OB and domestic well RG_DW-07-01 on a quarterly basis;
- Groundwater monitoring in the bedrock monitoring wells CM_MW1-SH and CM_MW1-DP is not recommended as they are not suitable for monitoring groundwater transport of CI from CMO. This observation supports the CSM which considers deep bedrock CI pathways insignificant compared to surface water or shallow subsurface pathways; and
- Review sampling frequency at RG_DW-07-01 and other locations as part of the September 30, 2017 submission of the RGMP.

5.12 Key Area 12

Selenium concentrations above primary screening criteria but below secondary screening criteria were measured at the farthest downgradient monitoring location in Key Area 12, Management Unit #4 and the Study Area (i.e. EV_ER1gwS/D). Delineation of groundwater quality in the Elk River valley-bottom aquifer is not achieved. However, since groundwater quality in Key Area 12 appears to reflect and be affected by Elk River and Michel Creek surface water quality, surface water infiltration (recharge) rather than a valley-bottom groundwater pathway appears to be the cause of concentrations above screening criteria measured at this location. A Groundwater Supporting Study has been initiated in the Sparwood Area to further assess groundwater conditions and potential impacts from mine-related activities.

Recommendations for Key Area 12 are the following:

- Continued monitoring of EV_ER1gwS/D and RG_DW-03-04 on a quarterly basis;
- Installation of a level logger to monitor continuous groundwater levels in the deep well EV_ER1gwD; and
- Incorporate available information from the Sparwood Area Groundwater Supporting Study in the September 30, 2017 RGMP submission; any additional studies will be assessed and prioritized as part of the submission.

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Tables

TABLE 1: Summary of Applicable Primary and Secondary Screening Criteria

Key Area	Well ID	Operation	MU	Primary Screening				Secondary Screening (Selenium Only)		
				AW Criteria Applied**	DW Criteria Applied	IW Criteria Applied	LW Criteria Applied	Site Performance Objective	Compliance Point	DW Guidelines Applied
Background	FR_HMW5	FRO	1	BC CSR	BC CSR	BC CSR	BC CSR	GH_FR1 (0200378)	FR_FRCP1 (E300071)	CDWQG
1	FR_09-01-A	FRO	1	BC CSR	BC CSR	BC CSR	BC CSR	GH_FR1 (0200378)	FR_FRCP1 (E300071)	CDWQG
	FR_09-01-B	FRO	1	BC CSR	BC CSR	BC CSR	BC CSR	GH_FR1 (0200378)	FR_FRCP1 (E300071)	CDWQG
	FR_GHHW	FRO	1	BC CSR	BC CSR	BC CSR	BC CSR	GH_FR1 (0200378)	FR_FRCP1 (E300071)	CDWQG
2	LC_PIZDC1308	LCO	1	BC CSR	BC CSR	BC CSR	BC CSR	GH_FR1 (0200378)	GH_FR1 (200378)	CDWQG
	LC_PIZDC1307	LCO	1	BC CSR	BC CSR	BC CSR	BC CSR	GH_FR1 (0200378)	GH_FR1 (200378)	CDWQG
3	GH_POTW09	GHO	1	BC CSR	BC CSR	BC CSR	BC CSR	GH_FR1 (0200378)	GH_FR1 (200378)	CDWQG
	GH_POTW10	GHO	1	BC CSR	BC CSR	BC CSR	BC CSR	GH_FR1 (0200378)	GH_FR1 (200378)	CDWQG
	GH_POTW15	GHO	1	BC CSR	BC CSR	BC CSR	BC CSR	GH_FR1 (0200378)	GH_FR1 (200378)	CDWQG
	GH_POTW17	GHO	1	BCWQG	BC CSR	BC CSR	BC CSR	GH_FR1 (0200378)	GH_FR1 (200378)	CDWQG
4	GH_MW-ERSC-1	GHO	3	BC CSR	BC CSR	BC CSR	BC CSR	GH_ER1 (E206661)	GH_ERC (E300090)	CDWQG
	GH_GA-MW-1	GHO	3	BC CSR	BC CSR	BC CSR	BC CSR	GH_ER1 (E206661)	GH_ERC (E300090)	CDWQG
	GH_GA-MW-2	GHO	3	BC CSR	BC CSR	BC CSR	BC CSR	GH_ER1 (E206661)	GH_ERC (E300090)	CDWQG
	GH_GA-MW-3	GHO	3	BC CSR	BC CSR	BC CSR	BC CSR	GH_ER1 (E206661)	GH_ERC (E300090)	CDWQG
	GH_GA-MW-4	GHO	3	BC CSR	BC CSR	BC CSR	BC CSR	GH_ER1 (E206661)	GH_ERC (E300090)	CDWQG
	RG_DW-01-03	RG	3	BC CSR	BC CSR	BC CSR	BC CSR	GH_ER1 (E206661)	-	CDWQG
	RG_DW-01-07	RDW	3	BC CSR	BC CSR	BC CSR	BC CSR	GH_ER1 (E206661)	-	CDWQG
6	LC_PIZP1101	LCO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER4 (0200027)	-	CDWQG
7	EV_GV3gw	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	-	CDWQG
	RG_DW-02-20	RDW	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	-	CDWQG
8	EV_LSgw	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	-	CDWQG
	EV_OCgw	EVO	4	BC WQG	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	-	CDWQG
9	EV_BCgw	EVO	4	BC WQG	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	EV_MC2 (E300091)	CDWQG
	EV_MCgwS	EVO	4	BC WQG	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	EV_MC2 (E300091)	CDWQG
	EV_MCgwD	EVO	4	BC WQG	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	EV_MC2 (E300091)	CDWQG
	EV_BRgw	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	EV_MC2 (E300091)	CDWQG
	EV_RCgw	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	EV_MC2 (E300091)	CDWQG
	EV_WH50gw	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	EV_MC2 (E300091)	CDWQG
	RG_DW-03-01	RDW	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	-	CDWQG
10	EV_ECgw	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	EV_MC2 (E300091)	CDWQG
11	CM_MW1-OB	CMO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	CM_MC2 (E258937)	CDWQG
	CM_MW1-SH	CMO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	CM_MC2 (E258937)	CDWQG
	CM_MW1-DP	CMO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	CM_MC2 (E258937)	CDWQG
	RG_DW-07-01	RDW	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	-	CDWQG
12	EV_ER1gwS	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	-	CDWQG
	EV_ER1gwD	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	-	CDWQG
	RG_DW-03-04	RG	4	BC CSR	BC CSR	BC CSR	BC CSR	EV_ER1 (0200393)	-	CDWQG

** BCWQG applied for wells located within 10 m from a receiving surface water body

TABLE 2: Well Installation Details, Monitoring Values and Hydrogeological Information

Key Area	Well ID	Type	Operation	MU	Ground Elevation (masl)	TOC Elevation (masl)	Drilled Depth (mbgs)	Screened Depth (mbgs)	Screened Formation	Date of Static Water Level Measurement	Depth to Water (mbtoc)	Potentiometric Elevation (masl)	Depth to Bedrock (mbgs)	Hydrostratigraphic Unit	Hydraulic Conductivity[2] (m/s)
Background	FR_HMW5	Monitoring	FRO	1	1785.2	1786.03	12.8	7.3 - 10.4	Gravel	2016/01/21	1.57	1784.46	10.7	-	3.00E-03
										2016/05/18	1.49	1784.54			
										2016/08/10	1.62	1784.41			
										2016/11/03	1.63	1784.40			
1	FR_09-01-A	Monitoring	FRO	1	1584.10	1584.95	7.6	3.83 - 6.88	Sandy Gravel	2016/01/25	6.76	1578.19	-	Fording River valley bottom sediments	-
										2016/06/14	1.68	1583.27			
										2016/08/17	3.93	1581.02			
										2016/11/24	6.05	1578.90			
	FR_09-01-B	Monitoring	FRO	1	1584.10	1584.86	19.3	17.15 - 18.67	Coarse Gravel	2016/01/25	7.26	1577.60	-	Fording River valley bottom sediments	1.50E-04
										2016/06/14	2.27	1582.59			
										2016/08/17	4.54	1580.33			
										2016/11/24	7.80	1577.06			
	FR_GHHW[1]	Supply	FRO	1	1575.8	-	Well 1: 21.6	Well 1: 20.4 - 21.6	Well 1: Gravel	-	-	-	-	Valley-bottom fluvial aquifer	-
							Well 2: 16.8	Well 2: 10.7 - 16.8	Well 2: Gravel						
							Well 3: 11.6	Well 3: 10.4 - 11.6	Well 3: Gravel						
							Well 4: 29.0	Well 4: 25.9 - 29.0	Well 4: Sand and Gravel						
2	LC_PIZDC1308	Monitoring	LCO	1	*1685.7*	1691.37	9.01	-	-	2016/03/16	3.33	1688.04	-	Colluvium and till	-
										2016/06/10	1.82	1689.55			
										2016/09/13	4.48**	1686.89**			
										2016/12/13	2.84	1688.53			
	LC_PIZDC1307	Monitoring	LCO	1	*1685.7*	1691.21	34.6	-	-	2016/03/16	6.48	1684.73	-	Highly consolidated basal till	-
										2016/06/10	2.53	1688.68			
										2016/09/13	2.85**	1688.36**			
										2016/12/13	5.05	1686.16			
3	GH_POTW09	Supply	GHO	1	*1495*	-	37	26.8 - 36.3	Silty Gravel	-	-	-	36.08	Fluvial sediments overlying bedrock	-
	GH_POTW10	Supply	GHO	1	*1489*	-	53.6	-	Gravel	-	-	-	-	Fluvial/glaciofluvial sediments	-
	GH_POTW15	Supply	GHO	1	*1490*	-	43.9	-	Gravel and Cobbles	-	-	-	-	Fluvial/glaciofluvial sediments	-
	GH_POTW17	Supply	GHO	1	1504	-	47.2	39.3 - 42.4	Sand and Gravel	-	-	-	-	Fluvial sediments underlying lacustrine sediments	-
4	GH_MW-ERSC-1	Monitoring	GHO	3	1283.36	1284.11	7.924	4.12 - 7.17	Till/Bedrock	2016/03/22	5.74	1278.37	6.1	Till/ Bedrock interface	3.00E-06
										2016/06/14	5.29	1278.82			
										2016/08/15	6.00	1278.11			
										2016/11/14	5.97	1278.14			
	GH_GA-MW-1	Monitoring	GHO	3	1379.21	1380.26	22.6	15.5 - 18.5	Clayey Sand	2016/03/22	17.05	1363.21	22.6	Interlayered alluvial and lacustrine sediments	1.00E-12
										2016/06/14	17.02	1363.24			
										2016/08/15	17.10	1363.16			
										2016/11/16	19.54	1360.72			
	GH_GA-MW-2	Monitoring	GHO	3	1306.66	1307.68	29	23 - 28	Sand/Silt	2016/03/22	5.16	1302.52	29.6	Fluvial sediments about the bedrock contact	1.00E-03
										2016/06/14	4.04	1303.64			
										2016/08/15	5.15	1302.53			
										2016/11/14	5.78	1301.90			
	GH_GA-MW-3	Monitoring	GHO	3	1299.78	1300.75	29.6	8 - 14	Sand and Gravel	2016/03/22	6.72	1294.03	14.4	Fluvial sediments above the bedrock contact	2.00E-06
										2016/06/14	7.00	1293.75			
										2016/08/15	8.87	1291.88			
										2016/11/14	8.78	1291.97			
	GH_GA-MW-4	Monitoring	GHO	3	1312.15	1313.05	17.2	13.7 - 16.7	Sand and Gravel	2016/03/22	5.54	1307.51	17.2	Alluvial sediments	1.00E-04
										2016/06/14	5.08	1307.97			
										2016/08/15	5.89	1307.16			
										2016/11/14	6.5	1306.55			
	RG_DW-01-03	Supply	RG	3	*1266*	-	17.06	-	Sand and Gravel	-	-	-	-	Interlayered Silt Sand and Gravel Fluvial Sediments	-
	RG_DW-01-07	Domestic	RDW	3	*1231*	-	9.8	-	Sandy Gravel	-	-	-	-	-	-
6	LC_PIZP1101	Monitoring	LCO	4	1266	1267.06	41.2	38.2 - 41.2	Sand and Gravel	2016/03/15	30.96	1236.1	-	Fluvial sediments	7.40E-04
										2016/06/17	29.35	1237.71			
										2016/09/15	30.98	1236.08			
										2016/12/12	31.12	1235.94			
7	EV_GV3gw	Monitoring	EVO	4	*1307*	1307.96	25	22.85 - 24.38	Silty Gravel	2016/02/23	10.95	1297.01	-	Alluvial sediments in the Grave Creek valley-bottom	-
										2016/05/16	2.14*	1305.82*			
										2016/08/22	11.02	1296.94			
										2016/10/20	10.94	1297.02			
	RG_DW-02-20	Domestic	RDW	4	*1169*	-	18.3	-	-	-	-	-	-	-	-

[1] Greenhouse water supply includes four wells (FR_GW_WELL1, FR_GW_WELL2, FR_GW_WELL3 and FR_GW_WELL4) which are collectively referred to as FR_GHHW. Ground elevation of FR_GW_WELL4 is included in Table 2.

[2] Average hydraulic conductivity.

* A field transcription error is suspected for the depth to water value provided for September at GH_GA-MW-1.

** Depth to water values and calculated potentiometric values for LC_PIZDC1307 and LC_PIZDC1308 are suspected to be switched based on levelogger data presented in Graph 2-1.

TOC: Top of casing

Underlined italics indicates values are approximate. Approximate locations are estimated based on figures. Approximate ground elevations are based on LiDAR survey of the Elk Valley.

- indicates that data for the given field is unavailable

TABLE 2 (Cont'd): Well Installation Details, Monitoring Values and Hydrogeological Information

Key Area	Well ID	Type	Operation	MU	Ground Elevation (masl)	TOC Elevation (masl)	Drilled Depth (mbgs)	Screened Depth (mbgs)	Screened Formation	Date of Static Water Level Measurement	Depth to Water (mbtoc)	Potentiometric Elevation (masl)	Depth to Bedrock (mbgs)	Hydrostratigraphic Unit	Hydraulic Conductivity[2] (m/s)
8	EV_LSgw	Monitoring	EVO	4	*1133*	1133.93	10.67	5.18 - 6.71	Sand and Gravel	2016/02/23	4.13	1129.80	-	Fluvial valley-bottom sediments	1.00E-03
										2016/05/17	3.82	1130.11			
										2016/08/24	4.12	1129.81			
										2016/10/19	4.30	1129.63			
	EV_OCgw	Monitoring	EVO	4	*1126*	1126.89	15.54	11.58 - 14.63	Sand	2016/02/22	3.59	1123.30	14.48	Fluvial valley-bottom sediments	7.00E-07
										2016/05/18	3.47	1123.42			
										2016/08/24	4.03	1122.86			
										2016/10/19	3.31	1123.58			
9	EV_BCgw	Monitoring	EVO	4	*1153*	1153.86	23.16	17.77 - 20.82	Gravel	2016/02/22	3.02	1150.84	-	Fluvial valley-bottom sediments	1.00E-04
										2016/05/16	2.69	1151.17			
										2016/08/22	3.12	1156.98			
										2016/10/18	2.83	1151.03			
	EV_MCgwS	Monitoring	EVO	4	*1131*	1131.96	10.67	5.79 - 7.32	Clayey Silt	2016/02/24	2.73	1129.23	-	Shallowest valley-bottom aquifer	7.00E-08
										2016/05/18	2.45	1129.51			
										2016/08/23	3.00	1128.96			
										2016/10/24	2.57	1129.39			
	EV_MCgwD	Monitoring	EVO	4	*1131*	1131.84	47.55	24.50 - 27.55	Sand and Clay	2016/02/24	3.75	1128.09	-	Deepest valley-bottom aquifer	3.00E-06
										2016/05/18	3.23	1128.61			
										2016/08/23	3.78	1128.06			
										2016/10/24	3.55	1128.29			
	EV_BRgw	Supply	EVO	4	*1149*	-	-	-	-	-	-	-	-	Fluvial sediments in the Michel Creek valley bottom	-
	EV_RCgw	Supply	EVO	4	*1161*	-	-	-	Sand and Gravel	-	-	-	-	Fluvial sediments in the Michel Creek valley bottom	-
	EV_WH50gw	Supply	EVO	4	*1159*	-	-	-	-	-	-	-	-	Fluvial sediments in the Michel Creek valley bottom	-
	RG_DW-03-01	Domestic	RDW	4	*1127*	-	15.24	7.6 - 15.2	Gravel	-	-	-	-	-	-
10	EV_ECgw	Monitoring	EVO	4	*1327*	1327.74	10.97	2.59 - 4.12	Sand/Clay and Sand	2016/02/24	0.61	1327.13	-	Colluvium overlying till	1.00E-08
										2016/05/18	0.57	1327.17			
										2016/08/23	1.42	1326.32			
										2016/10/18	0.86	1326.88			
11	CM_MW1-OB	Monitoring	CMO	4	1500.44	1501.29	37.27	2.87 - 4.39	Gravel	2016/03/10	3.16	1497.28	-	Fluvial sediments in the Michel Creek valley bottom	1.20E-04
										2016/06/16	3.40	1497.04			
										2016/09/07	3.52	1496.92			
										2016/12/05	3.41	1497.03			
	CM_MW1-SH	Monitoring	CMO	4	1500.44	1501.29	37.27	20.44 - 23.49	Siltstone	2016/03/10	4.09	1496.35	-	Siltstone	2.00E-07
										2016/06/16	4.99	1495.45			
										2016/09/07	5.54	1494.90			
										2016/12/05	5.44	1495.00			
	CM_MW1-DP	Monitoring	CMO	4	1500.44	1501.29	37.27	34.22 - 37.27	Siltstone	2016/03/10	3.56	1496.88	18	Siltstone	6.00E-06
										2016/06/17	12.56	1487.88			
										2016/09/07	4.48	1495.96			
										2016/12/05	3.30	1497.14			
	RG_DW-07-01	Domestic	RDW	4	*1506*	-	13.7	-	-	-	-	-	-	-	-
12	EV_ER1gwS	Monitoring	EVO	4	*1115*	1115.96	17.61	14.56 - 17.61	Sand and Gravel	2016/02/24	5.30	1110.66	-	Shallowest fluvial aquifer	-
										2016/05/18	4.53	1111.43			
										2016/08/23	5.11	1110.85			
										2016/10/18	5.05	1110.91			
	EV_ER1gwD	Monitoring	EVO	4	*1115*	1115.91	30.78	25.82 - 28.87	Sand/Silty Sand	2016/02/24	4.95	1110.96	27.89	Deepest fluvial aquifer	9.00E-04
										2016/05/18	4.20	1111.71			
										2016/08/23	4.76	1111.15			
										2016/10/18	4.72	1111.19			
	RG_DW-03-04	Supply	RG	4	*1114*	-	32.4	24.2 - 32.4	Sandy Gravel	-	-	-	-	Fluvial sediments in the Elk River valley bottom	-

[1] Greenhouse water supply includes four wells (FR_GW_WELL1, FR_GW_WELL2, FR_GW_WELL3 and FR_GW_WELL4) which are collectively referred to as FR_GHHW. Ground elevation of FR_GW_WELL4 is included in Table 2.
[2] Average hydraulic conductivity.
* A field transcription error is suspected for the depth to water value provided for September at GH_GA-MW-1.
** Depth to water values and calculated potentiometric values for LC_PIZDC1307 and LC_PIZDC1308 are suspected to be switched based on levelogger data presented in Graph 2-1.
TOC: Top of casing
Underlined italics indicates values are approximate. Approximate locations are estimated based on figures. Approximate ground elevations are based on LiDAR survey of the Elk Valley.
- indicates that data for the given field is unavailable

TABLE 3: Summary of Analytical Results compared to Primary Screening Criteria for Dissolved Inorganics in Groundwater

			Field Parameters					Physical Parameters							Dissolved Inorganics											
Sample Location	Sample ID	Sample Date (yyyy mm	Temperature °C	pH pH	Dissolved Oxygen mg/L	Conductivity µS/cm	Field Turbidity NTU	pH pH	Hardness mg/L	Conductivity, Lab µS/cm	Total Suspended Solids mg/L	Total Dissolved Solids mg/L	Turbidity, Lab NTU	Total Alkalinity (as CaCO3) mg/L	Ammonia Nitrogen mg/L	Bromide mg/L	Chloride mg/L	Fluoride mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Kjeldahl Nitrogen-N mg/L	Ortho-Phosphate mg/L	Total Phosphorus mg/L	Sulphate mg/L	Total Organic Carbon mg/L	Dissolved Organic Carbon mg/L
BC Standards																										
BCWQG Aquatic Life Short-term Maximum (AW)[a]			n/a	6.5-9.0	n/a	n/a	n/a	6.5-9.0	n/a	n/a	n/a	n/a	n/a	n/a	12.3 - 24.5[b]	n/a	600	0.4 - 2.6	32.8	0.06 - 0.6[d]	n/a	n/a	0.015[f]	n/a	n/a	n/a
BCWQG Aquatic Life Long-term Average (AW)[a]			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.09 - 1.77[b]	n/a	150	n/a	3	0.02 - 0.2[d]	n/a	n/a	n/a	128 - 429[c]	n/a	n/a
CSR Aquatic Life (AW)[a]			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3.7 - 11.3[b]	n/a	1,500	2 - 3[c]	400	0.2 - 2[d]	n/a	n/a	n/a	1,000	n/a	n/a
CSR Irrigation Watering (IW)			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	100	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CSR Livestock Watering (LW)			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	600	1	100	10	n/a	n/a	n/a	1,000	n/a	n/a
CSR Drinking Water (DW)			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	250	1.5	10	3.2	n/a	n/a	n/a	500	n/a	n/a
Background																										
FR HMW5	FR_HMW5_QSW_04012016_N	2016 01 21	3.2	9.36	1.52	358.7	-	8.43	174	406	< 1.0	240	19.9	181	0.0635	< 0.050	6.4	0.701	< 0.0050	< 0.0010	0.093	0.0306	0.0294	29.8	0.82	0.58
	FR_HMW5_QSW_04042016_N	2016 05 18	4.3	8.20	1.82	358.5	-	8.36	183	402	< 1.0	229	0.11	166	0.0632	< 0.050	1.57	0.579	< 0.0050	< 0.0010	0.079	0.0232	0.0248	41.0	< 0.50	< 0.50
	FR_HMW5_QSW_04072016_N	2016 08 10	3.9	8.08	0.26	359.6	-	8.34	164	430	< 1.0	234	0.11	170	0.0612	< 0.050	1.83	0.597	< 0.0050	< 0.0010	0.062	0.0258	0.0252	40.0	< 0.50	< 0.50
	FR_HMW5_QSW_03102016_N	2016 11 03	3.8	8.12	0.51	331.8	-	8.01	158	381	< 1.0	239	0.16	179	0.0613	< 0.050	2.12	0.661	< 0.0050	< 0.0010	0.083	0.0257	0.058	39.8	0.50	< 0.50
Key Area 1																										
FR_09-01-A	FR_09-01-A_QSW_04012016_N	2016 01 25	6.7	8.69	8.27	1,097	-	7.77	763	1,250	< 1.0	927	<0.10	257	< 0.0050	< 0.25	3.9	0.14	**27.1**	< 0.0050	< 0.050	0.0024	0.0032	366	0.80	0.64
	FD_QSW_04012016_001	Duplicate	-	-	-	-	-	7.79	773	1,240	< 1.0	943	<0.10	252	< 0.0050	< 0.25	3.9	0.14	**27.6**	< 0.0050	0.060	0.0036	0.0027	374	0.55	0.77
	QA/QC RPD%		-	*	*	*	-	< 1	1	1	*	2	*	2	*	*	0	0	2	*	*	*	*	2	*	*
	FR_09-01-A-WG-201606141205	2016 06 14	7.9	7.61	9.36	887	-	8.08	583	1,030	< 1.0	743	<0.10	253	< 0.0050	< 0.25	0.93	0.26	**32.4**	< 0.0050	< 0.050	0.0031	0.0027	226	0.72	0.59
	FR_DC1-WG-201606141205	Duplicate	-	-	-	-	-	8.10	583	1,020	1.1	783	<0.10	251	< 0.0050	< 0.25	0.90	0.27	**32.1**	< 0.0050	< 0.050	0.0036	0.0041	224	0.67	0.64
	QA/QC RPD%		-	*	-	*	-	< 1	0	1	*	5	*	1	*	*	3	4	1	*	*	*	*	1	*	*
	FR_09-01-A_QSW_04072016_N	2016 08 17	11	7.8	7.61	973	-	8.19	696	1,210	< 1.0	848	<0.10	296	< 0.0050	< 0.25	1.13	0.18	**32.2**	< 0.0050	< 0.050	0.0026	0.0033	242	0.52	0.61
	FR_09-01-A_QSW_03102016_N	2016 11 24	4.1	7.41	9.46	1,379	-	7.83	796	1,450	< 1.0	1,160	<0.10	295	< 0.0050	< 0.25	1.16	0.14	**51.7**	< 0.0050	0.051	0.0031	0.0027	347	< 0.50	< 0.50
FR_09-01-B	FR_09-01-B_QSW_04012016_N	2016 01 25	6	7.59	6.99	935	-	7.74	641	1,060	< 1.0	762	0.12	240	< 0.0050	< 0.25	3.2	0.17	**17.6**	< 0.0050	0.059	0.0025	0.0024	291	0.54	< 0.50
	FR_09-01-B-WG-201606141245	2016 06 14	7.5	7.54	11.12	920	-	7.94	595	1,060	< 1.0	772	<0.10	241	< 0.0050	< 0.25	1.12	0.20	**34.8**	< 0.0050	< 0.050	0.0022	0.0043	252	0.58	0.54
	FR_09-01-B_QSW_04072016_N	2016 08 17	9.7	7.66	7.73	990	-	7.73	723	1,220	< 1.0	857	0.11	299	< 0.0050	< 0.25	3.20	0.19	**22.0**	< 0.0050	< 0.050	0.0023	0.0031	297	0.59	0.54
	FR_09-01-B_QSW_03102016_N	2016 11 24	5.3	7.20	6.79	1,342	-	7.71	787	1,410	< 1.0	1,130	<0.10	320	< 0.0050	< 0.25	2.42	0.17	**39.4**	< 0.0050	0.137	0.0030	0.0032	351	< 0.50	< 0.50
FR_GHHW	FR_GHHW_QSW_04012016_N	2016 01 25	12	7.52	8.97	612.2	-	7.84	862	1,450	< 1.0	1,080	1.19	272	< 0.0050	< 0.25	2.2	0.15	**53.9**	< 0.0050	0.063	0.0012	0.0028	360	0.57	< 0.50
	FR_GHHW_QSW_04042016_N	2016 05 18	7.1	7.51	7.79	1,507	-	8.17	940	1,620	< 1.0	1,360	0.36	272	< 0.0050	< 0.50	2.3	< 0.20	**68.4**	< 0.010	< 0.050	0.0018	0.0054	438	0.81	< 0.50
	FR_GHHW_QSW_04072016_N	2016 08 17	16	7.71	8.18	983	-	7.85	655	1,220	1.4	833	0.78	278	< 0.0050	< 0.25	0.93	0.16	**36.3**	< 0.0050	0.120	0.0023	0.0045	252	0.60	0.54
FR GH WELL 2[e]	FR_GH WELL 2-20161020	2016 10 20	6.65	7.58	4.89	775	40.3	7.97	760	1,200	42.6	933	-	282	0.0119	< 0.25	1.10	0.18	**39.0**	< 0.0050	0.056	0.0011	0.0206	270	1.45	< 0.50
	FR_DC1-20161020	Duplicate	-	-	-	-	39.5	7.94	751	1,220	38.5	950	-	290	0.0111	< 0.25	1.13	0.20	**40.1**	< 0.0050	< 0.050	0.0010	0.0213	277	1.31	< 0.50
	QA/QC RPD%		*	*	-	*	2	< 1	1	2	10	2	-	3	*	*	3	11	3	*	*	*	3	3	*	*
	FR_GH WELL 2-20161021	2016 10 21	8.05	7.65	8.7	823	39.1	7.99	689	1,210	53.4	968	-	291	< 0.0050	< 0.25	0.96	0.16	**38.6**	0.0108	< 0.050	0.0013	0.0176	269	1.38	< 0.50
Key Area 2																										
LC PIZDC1307	LC_PIZDC1307_WG_2016-03-14_NP	2016 03 16	0.1	8.14	4.93	362.8	21.57	8.17	186	404	8.7	233	12.6	217	0.0867	< 0.050	1.0	0.548	< 0.0050	< 0.0010	0.334	< 0.0010	0.0222	< 0.30	3.40	3.50
	LC_PIZDC1307_WG_2016-06-13_NP	2016 06 10	5	8.15	0.42	392.9	22.73	8.19	193	397	9.0	217	15.8	216	0.107	< 0.050	0.19	0.552	< 0.0050	< 0.0010	0.211	< 0.0010	0.0224	< 0.30	2.28	2.56
	LC_PIZDC1307_WG_2016-09-12_NP	2016 09 13	6.2	8.10	1.24	293.4	4.27	8.25	181	381	3.9	235	9.13	228	0.0946	< 0.050	0.18	0.580	< 0.0050	< 0.0010	0.186	< 0.0010	0.0133	< 0.30	2.26	3.28
	LC_PIZDC1307_WG_2016-12-12_NP	2016 12 13	5.5	8.13	1.25	327.9	5.6	8.13	183	362	4.5	190	13.3	208	0.0724	< 0.050	< 0.50	0.549	< 0.0050	< 0.0010	0.253	0.0014	0.0126	< 0.30	2.25	2.17
LC PIZDC1308	LC_PIZDC1308_WG_2016-03-14_NP	2016 03 16	2.3	7.55	1.9	459.7	1.63	7.86	252	509	2.6	293	6.96	268	0.0382	< 0.050	1.0	0.291	0.0082	< 0.0010	0.117	< 0.0010	0.0060	3.23	2.22	2.45
	LC_PIZDC1308_WG_2016-06-13_NP	2016 06 10	5.3	7.18	0.29	565	0.37	7.67	338	567	< 1.0	308	0.25	311	< 0.0050	< 0.050	1.35	0.171	0.258	< 0.0010	0.117	< 0.0010	< 0.0020	5.11	2.40	3.39
	LC_PIZDC1308_WG_2016-09-12_NP	2016 09 13	5.5	7.26	0.21	423	2.27	7.87	314	555	< 1.0	343	0.45	332	0.0054	< 0.050	1.15	0.199	0.0326	< 0.0010	0.101	< 0.0010	< 0.0020	4.60	2.78	3.23
	LC_PIZDC1308_WG_2016-12-12_NP	2016 12 13	3.1	7.27	0.65	498.8	3.87	7.74	331	576	< 1.0	333	0.43	328	< 0.0050	< 0.050	1.32	0.161	0.0432	< 0.0010	0.126	0.0015	0.0035	5.09	4.03	3.46
Key Area 3																										
GH POTW09	GH_POTW09_WG_2016-03-07_N	2016 03 07	6.6	7.91	8.02	661.4	1.54	8.09	413	751	1.2	480	1.89	246	0.0260	< 0.25	6.9	0.81	< 0.025	< 0.0050	< 0.050	< 0.0010	< 0.0020	161	1.09	1.02
	GH_POTW09_WG_2016-06-14_NP	2016 06 14	6.7	7.48	2.08	654	0.35	7.79	424	745	4.3	533	4.55	245	0.0274	< 0.25	7.36	0.83	< 0.025	< 0.0050	0.071	< 0.0010	< 0.0020	178	0.66	0.55
	GH_POTW09_WG_2016-08-15_NP	2016 08 16	9.2	7.71	2.20	107.5	3.49	7.92	395	791	< 1.0	526	2.63	256	0.0271	< 0.25	6.78	0.81	< 0.025	< 0.0050	0.061	< 0.0010	0.0021	166	0.55	< 0.50
	GH_POTW09_WG_2016-11-17_NP	2016 11 17	6.7	7.6	3.55	628.8	0.58	7.83	389	726	1.9	455	6.27	242	0.0237	< 0.050	6.58	0.781	0.0119	< 0.0010	< 0.050	0.0011	0.0029	163	< 0.50	< 0.50
GH POTW10	GH_POTW10_WS_2016-03-07_N	2016 03 07	-	8.07	5.75	650.9	-	7.78	405	740	1.4	453	9.68	203	0.0616	< 0.25	4.5	0.76	0.705	0.0140	0.093	< 0.0010	< 0.0020	191	< 0.50	< 0.50
	GH_POTW10_WG_2016-06-14_NP	2016 06 14	7.4	7.84	2.75	717.6	1.26	7.86	407	703	2.0	500	9.98	201	0.0626	< 0.25	4.93	0.89	0.445	0.0122	0.108	< 0.0010	< 0.0020	200	< 0.50	< 0.50
	GH_POTW10_WG_2016-08-15_NP	2016 08 16	7.2	8.05	2.42	113.9	1.39	7.91	376	760	< 1.0	489	10	212	0.0650	< 0.25	4.69	0.83	0.391	0.0114	0.110	< 0.0010	< 0.0020	186	< 0.50	< 0.50
	GH_POTW10_WG_2016-11-17_NP	2016 11 17	7.5	7.72	3.63	595.3	2.02	7.92	367	694	1.1	465	10.8	199	0.0582	< 0.050	4.44	0.845	0.478	0.0183	0.237	< 0.0010	0.0028	185	< 0.50	< 0.50
GH POTW15	GH_POTW15_WG_2016-03-07_N	2016 03 07	6.5	7.81	7.76	819	1.65	7.76	505	938	1.2	603	4.83	218	0.0330	< 0.25	31.7	0.20	0.041	0.0132	0.078	< 0.0010	< 0.0020	261	1.08	0.98
	GH_POTW15_WG_2016-06-14_NP	2016 06 14	7	7.9	8.13	914	1.5	7.84	522	911	1.9	649	5.88	219	0.0349	< 0.25	32.4	0.20	< 0.025	< 0.0050	0.111	< 0.0010	< 0.0020	273	1.02	1.02
	GH_POTW15_WG_2016-08-15_NP	2016 08 16	7.7	8.29	2.25	114.7	1.53	7.87	480	971	< 1.0	645	10.9	230	0.0366	< 0.25	28.8	0.20	< 0.025	< 0.0050	0.083	< 0.0010	< 0.0020	254	1.01	0.94
	GH_POTW15_WG_2016-11-17_NP	2016 11 17	6.9	7.61	3.88	756	1.29	7.76	465	885	1.1	595	10.9	217	0.0421	0.084	27.4	0.176	< 0.0050	0.0022	0.092	< 0.0010	0.0039	244	< 0.50	< 0.50
GH_POTW17**	GH_POTW17_WG_2016-03-07_N	2016 03 07	6.3	7.76	7.45	1,182	0.38	7.64	786	1,330	1.2	1,020	2.18	268	0.0159	< 0.25	22.4	0.17	0.198	< 0.0050	< 0.050	< 0.0010	< 0.0020	***498****	0.84	0.73
	GH_POTW17_WG_2016-06-14_NP	2016 06 14	8.2	7.86	7.2	1,315	0.9	8.01	803	1,300	< 1.0	1,030	1.48	272	0.0146	< 0.25	22.1	0.17	0.345	< 0.0050	0.093	< 0.0010	< 0.0020	***522****	1.03	0.83
	GH_POTW17_WG_2016-08-15_NP	2016 08 16	7.6	7.72	8.25	121.1	1.71	8.05	734	1,370	1.7	1,010	1.95	284	0.0112	< 0.25	20.1	0.18	0.330	< 0.0050	0.063	< 0.0010	0.0028	***480****	0.92	0.83
	GH_POTW17_WG_2016-11-17_NP	2016 11 17	8.1	7.74	6.81	1,060	0.97	8.03	712	1,230	< 1.0	965	1.62	265	0.0098	< 0.050	19.6	0.146	0.255	< 0.0010	0.051	0.0010	0.0023	***448****	< 0.50	< 0.50
	GH_POTW17_WG_2016-11-17_FD	Duplicate	-	-	-	-	-	8.05	713	1,230	< 1.0	945	1.48	276	0.0261	< 0.050	18.9	0.138	0.245	0.0020	< 0.050	< 0.0010	0.0025	422	< 5.0	< 0.50
	QA/QC RPD%		-	*	*	*	*	0	0	0	*	2	9	4	*	*	4	6	4	*	*	*	*	6	*	*
Key Area 4																										
GH MW-ERSC-1	GH_MW-ERSC-1_WG_2016-03-22_NP	2016 03 22	4.9	7.84	4.99	484.4	196.1	7.87	308	549	144	331	107	304	0.0410	< 0.050	3.8	0.340	0.190	0.0051	0.216	< 0.0010	0.211	17.6	3.57	2.18
	GH_MW-ERSC-1_WG_2016-06-14_NP	2016 06 14	7.6	7.69	8.14	351.2	73.1	7.83	228	396	16.1	260	15.2	179	0.0108	< 0.050	1.00	0.189	0.412	< 0.0010	0.157	0.0040	0.234	40.9	2.03	1.42
	GH_MW-ERSC-1_WG_2016-08-15_NP	2016 08 15	9.8	7.07	6.3	114.1	6.02	7.92	365	709	4.5	390	5.53	378	0.0286	< 0.25	2.29	0.23	0.037	< 0.0050	0.100	0.0015	0.0210	16.3	1.95	2.10
	GH_MW-ERSC-1_WG_2016-11-14_NP	2016 11 14	6.8	7.22	5.28	486.2	2.65	8.07	322	566	15.5	339	18.5	312	0.0242	< 0.050	2.37	0.258	0.0449	< 0.0010	0.091	< 0.0010	0.0160	17.2	1.75	2.70
	GH_MW_ERSC-1_WG_2016-11-14_FD	Duplicate	-	-	-	-	-	8.01	321	585	5.4	334	8.53	319	0.0264	< 0.050	2.21	0.249	0.0453	< 0.0010	0.082	< 0.0010	0.0142	17.4	1.97	2.05
	QA/QC RPD%		-	*	-	*	*	1	< 1	3	97	1	74	2	*	*	7	4	1	*	*	*	12	1	*	*
GH GA-MW-1	GH_GA_MW-1_WG_2016-03-22_NP	2016 03 22	7	7.67	2.87	1,223	82.83	7.78	426	1,570	123	1,060	77.1	369	0.564	< 0.50	36.5	0.44	1.33	0.037	0.996	0.0047	0.109	453	11.5	9.58
	GH_GA-MW-1_WG_2016-06-14_NP	2016 06 14	8	7.63	3.39	1,851	601.6	7.51	514	1,970	262	1,410	155	376	1.36	0.92	60.4	0.40	0.600	0.016	2.36	0.0044	0.517	**715**	26.3	13.3
	GH_GA-MW-1_WG_2016-08-15_NP	2016 08 16	8.7	7.99	2.33	119.9	25.49	7.88	260	1,150	47.8	686	20.3	357	0.116	< 0.25	12.8	0.56	1.77	0.0173	0.401	0.0186	0.0647	229	4.69	3.76
	GH_GA-MW-1_WG_2016-11-16_NP	2016 11 16	5.3	7.41	3.4	998	56.64	7.94	459	1,770	119	1,280	59.8	392	0.328	0.83	44.2	0.41	0.165	0.016	0.780	< 0.0010	0.136	**564**	10.3	9.81
GH GA-MW-2	GH_GA_MW-2_WG_2016-03-22_NP	2016 03 22	5.2	7.71	1.6	629.9	9.53	7.99	400	713	7.0	449	5.46	214	< 0.0050	< 0.25	8.0	0.12	3.49	< 0.0050	0.125	0.0023	0.0110	158	1.36	1.07
	GH_GA-MW-2_WG_2016-06-14_NP	2016 06 14	6.6	7.62	1.73	592	8.27	7.85	379	667	14.1	488	5.34	208	< 0.0050	< 0.25	7.98	0.15	0.751	0.0266	0.228	0.0018	0.147	160	3.18	0.87
	GH_GA-MW-2_WG_2016-08-15_NP	2016 08 15	8	7.61	0.56	704.1	16.07	8.10	366	734	14.8	476	9.95	222	< 0.0050	< 0.25	7.40	0.13	1.63	0.0431	0.112	0.0029	0.0190	157	1.09	1.13
	GH_GA-MW-2_WG_2016-11-14_NP	2016 11 14	5.3	7.5	0.36	614.1	4.23	8.09	394	745	6.2	514	4.46	216	< 0.0050	< 0.25	7.88	0.12	4.22	0.0164	0.119	0.0033	0.0059	181	0.83	1.06
GH GA-MW-3	GH_GA_MW-3_WG_2016-03-22_NP	2016 03 22	5.5	8.02	1.95	670.2	60.25	7.66	321	723	65.7	387	71.8	245	0.370	< 0.050	8.1	0.633	0.789	0.174	0.663	< 0.0010	0.342	117	2.61	0.51
	GH_GA-MW-3_WG_2016-06-14_NP	2016 06 14	6.9	7.75	2.53	534	152	7.71	265	600	210	354	79.8	270	0.366	< 0.050	6.93	0.701	< 0.0050	0.0011	0.753	0.0037	0.508	37.7	5.35	< 0.50
	GH_GA-MW-3_WG_2016-08-15_NP	2016 08 15	9.2	7.68	0.11	123.5	2.58	8.09	230	628	5.6	345	28.4	254	0.349	< 0.050	6.16	0.727	< 0.0050	< 0.0010	0.382	0.0026	0.0106	35.3	< 0.50	1.69
	GH_GA-MW-3_WG_2016-11-14_NP	2016 11 14	5	7.67	0.29	481.4	2.38	8.40	234	571	9.5	337	28.9	270	0.360	< 0.050	6.38	0.683	< 0.0050	< 0.0010	0.398	0.0045	0.0160	26.9	< 0.50	< 0.50
GH_GA-MW-4	GH_GA_MW-4_WG_2016-03-22_NP	2016 03 22	3.3	7.65	6.44	1,325	0.58	7.83	930	1,520	3.3	1,200	1.09	236	< 0.0050	< 0.25	8.2	0.12	8.02	0.0559	0.137	< 0.0010	< 0.0020	**646**	0.99	0.96
	GH_GA-MW-4_WG_2016-06-14_NP	2016 06 14	6.3	7.96	6.24	1,330	3.97	7.74	813	1,100	21.4	850	1.53	219	< 0.0050	< 0.25	4.00	0.18	5.97	0.0064	0.129	< 0.0010	0.0050	425	0.87	0.77
	GH_GA-MW-4_WG_2016-08-15_NP	2016 08 16	9.7	7.48	4.61	900	0.25	8.15	476	925	< 1.0	635	0.18	225	< 0.0050	< 0.25	2.98	0.14	3.16	< 0.0050	0.107	0.0018	< 0.0020	266	0.92	0.95
	GH_GA-MW-4_WG_2016-11-14_NP	2016 11 14	6.3	7.45	4.3	756	0.02	8.18	505	890	< 1.0	653	0.26	221	< 0.0050	< 0.25	4.60	0.14	2.41	< 0.0050	0.091	0.0013	< 0.0020	294	0.84	1.90
RG DW-01-03	RG_01-03_WP_2016-06-01_NP	2016 06 01	6.6	7.4	10.3	-	-	-	202	253	-	-	-	-	-	-	1.17	-	0.806	< 0.0010	-	-	-	49.2	-	-
	RG_01-03_WP_2016-06-29_NP	2016 06 29	7.1	7.56	9.7	-	-	8.19	227	261	-	-	-	152	-	< 0.050	1.02	0.123	0.833	< 0.0010	-	-	-	50.7	-	-
	RG_01-03_WP_2016-09-14_NP	2016 09 14	6.7	7.1	10.5	-	-	-	216	369	-	-	-	-	-	-	1.42	-	0.840	< 0.0010	-	-	-	53.7	-	-
	RG_01-03_WP_2016-12-12_NP	2016 12 12	6.2	7.79	12.7	-	-	-	225	374	-	-	-	-	-	< 0.050	1.23	0.154	0.610	< 0.0010	-	-	-	46.5	-	-
RG DW-01-07	RG_01-07_WP_2016-6-01_NP	2016 06 01	6.4	6.9	7.8	-	-	-	455	559	-	-	-	-	-	-	61.9	-	0.652	< 0.0050	-	-	-	65.1	-	-
	RG_01-07_WP_2016-06-29_NP	2016 06 29	6.5	7.07	7.4	-	-	7.45	474	549	-	-	-	317	-	< 0.050	50.4	0.077	0.612	0.0013	-	-	-	61.3	-	-
	RG_01-07_WP_2016-09-14_NP	2016 09 14	6.9	7.1	8.1	-	-	-	446	762	-	-	-	-	-	-	39.2	-	0.623	< 0.0050	-	-	-	64.2	-	-
	RG_01-07_WP_2016-12-12_NP	2016 12 12	6.4	6.99	11.4	-	-	-	486	798	-	-	-	-	-	< 0.25	41.8	0.10	0.661	< 0.0050	-	-	-	68.5	-	-
Key Area 6																										
LC_PIZP1101	LC_PIZP1101_WG_2016-03-14_N	2016 03 15	5.5	8.06	0.83	278.6	80.05	8.07	136	308	20.2	189	67.5	165	0.0171	< 0.050	0.67	**1.74**	< 0.0050	< 0.0010	0.154	0.0088	0.0967	3.83	1.98	0.66
	LC_PIZP1101_WG_2016-06-13_N	2016 06 17	13	7.99	0.77	248.8	11.31	8.20	138	303	3.3	173	7.45	161	0.0158	< 0.050	0.63	**1.75**	< 0.0050	< 0.0010	0.063	0.0117	0.0344	4.14	0.52	0.78
	LC_PIZP1101_WG_2016-09-12_N	2016 09 15	21	7.93	1.74	245.6	430.27	7.83	129	284	1,430	173	<0.10	195	0.0147	< 0.050	< 0.50	**1.96**	< 0.0050	< 0.0010	0.373	0.0119	0.314	3.50	1.77	1.04
	LC_PIZP1101_WG_2016-12-12_N	2016 12 12	5.9	7.43	0.59	254.8	193.4	8.12	121	292	62.3	213	177	159	0.0156	< 0.050	0.56	**1.84**	< 0.0050	< 0.0010	0.322	0.0120	0.228	3.62	< 2.5	0.78
Key Area 7																										
EV GV3gw	EV_GV3GW_WG_2016-02-23_NP	2016 02 23	3.5	7.11	2.44	608	0.34	7.76	366	619	< 1.0	412	<0.10	198	< 0.0050	< 0.050	1.8	0.513	0.137	< 0.0010	< 0.050	0.0016	< 0.0020	140	< 0.50	< 0.50
	EV_GV3GW_WG_2016-05-16_NP	2016 05 16	8.2	7.46	2.4	603	0.82	8.09	358	615	< 1.0	408	0.14	201	< 0.0050	< 0.25	1.74	0.52	0.150	< 0.0050	< 0.050	0.0014	< 0.0020	149	< 0.50	< 0.50
	EV_GV3GW_WG_2016-08-22_NP	2016 08 22	8.7	7.52	2.84	617	-7.7	8.12	332	609	< 1.0	460	<0.10	214	< 0.0050	< 0.050	1.49	0.482	0.134	< 0.0010	< 0.050	0.0010	< 0.0020	131	0.53	0.97
	EV_GV3GW_WG_2016-10-20_NP	2016 10 20	5.4	7.42	2.75	622	-9.1	8.19	352	593	< 1.0	388	<0.10	192	< 0.0050	< 0.050	1.45	0.485	0.136	< 0.0010	< 0.050	0.0015	0.0051	129	< 0.50	< 0.50
RG DW-02-20	RG_02-20_WP_2016-06-01_NP	2016 06 01	7.2	7.38	9.68	333	-	-	264	-	-	-	-	-	-	-	3.05	-	3.62	< 0.0010	-	-	-	87.6	-	-
	RG_02-20_WP_2016-06-28_NP	2016 06 28	7.5	7.44	9.1	329	-	-	259	-	-	-	-	-	-	-	2.45	-	3.26	< 0.0010	-	-	-	83.6	-	-
	RG_02-20_WP_2016-09-14_NP	2016 09 14	8.6	7.2	9	409.4	-	-	232	-	-	-	-	-	-	-	1.66	-	2.12	< 0.0010	-	-	-	59.9	-	-
	RG_02-20_WP_2016-12-12_NP	2016 12 12	7.9	7.63	8.8	433	-	-	245	-	-	-	-	-	-	< 0.050	2.03	0.200	2.19	0.0015	-	-	-	63.3	-	-
	RG_DUP_WP_2016-12-12_NP	Duplicate	-	-	-	-	-	-	241	-	-	-	-	-	-	< 0.050	2.05	0.200	2.19	0.0013	-	-	-	63.3	-	-
	QA/QC RPD%		-	-	-	-	-	-	2	-	-	-	-	-	-	*	1	0	0	*	-	-	-	0	-	-
Key Area 8																										
EV LSgw	EV_LSGW_WG_2016-02-23_NP	2016 02 23	7.7	7.23	0.37	934	2.33	7.58	556	953	17.8	568	18.7	426	0.204	< 0.25	15.2	0.29	< 0.025	< 0.0050	0.322	< 0.0010	< 0.0020	110	1.95	5.30
	EV_LSGW_WG_2016-05-17_NP	2016 05 17	11	7.22	0.63	979	1.49	8.29	592	988	5.3	575	14.4	490	0.116	< 0.25	13.9	0.35	0.048	< 0.0050	0.205	< 0.0010	0.0194	101	1.73	3.31
	EV_LSGW_WG_2016-08-24_NP	2016 08 24	15	7.12	0.58	1,114	-7.6	8.23	650	1,030	6.1	690	29.3	551	0.143	< 0.25	14.4	0.32	< 0.025	< 0.0050	0.248	0.0029	0.0510	95.0	2.35	2.61
	EV_LSGW_WG_2016-10-19_NP	2016 10 19	13	7.08	0.45	1,084	-9.6	8.32	625	982	5.1	624	7.21	543	0.145	< 0.25	14.5	0.31	< 0.025	< 0.0050	0.230	< 0.0010	0.0213	97.9	2.38	3.01
EV_OCgw**	EV_OCGW_WG_2016-02-22_NP	2016 02 22	6.7	7.84	0.48	433	1.1	8.03	149	453	8.1	282	6.41	178	0.0686	< 0.050	2.2	**1.30**	< 0.0050	< 0.0010	0.132	0.0067	0.0288	56.0	0.72	0.69
	EV_OCGW_WG_2016-05-18_NP	2016 05 18	9.9	7.84	0.42	430	4.7	8.41	159	445	12.6	262	9.41	183	0.0600	< 0.050	1.88	**1.23**	< 0.0050	< 0.0010	0.110	0.0077	0.0327	51.7	0.65	1.09
	EV_OCGW_WG_2016-08-24_NP	2016 08 24	12	7.95	0.42	455	10.3	8.32	149	449	18.6	281	18.9	194	0.0734	< 0.050	1.96	**1.32**	< 0.0050	< 0.0010	0.129	0.0090	0.0358	57.9	0.64	1.73
	EV_OCGW_WG_2016-10-19_NP	2016 10 19	6.4	7.61	0.63	464	3.7	8.37	145	430	4.6	262	4.72	193	0.0742	< 0.050	2.18	**1.23**	< 0.0050	< 0.0010	0.123	0.0073	0.0249	58.7	0.99	0.91
	EV_MC5GW_WG_2016-10-19_NP	Duplicate	-	-	-	-	-	8.11	150	178	6.0	253	6.71	191	0.0739	< 0.050	2.15	**1.25**	< 0.0050	< 0.0010	0.130	0.0086	0.0264	60.6	0.70	1.11
	QA/QC RPD%		-	-	-	-	-	3	3	83	*	3	35	1	< 1	*	1	2	*	*	*	16	6	3	*	*

Data provided by Teck Coal, associated lab reports available upon request.
All terms defined within the body of SNC-Lavalin's report.
< Denotes concentration less than indicated detection limit or RPD less than indicated value.
- Denotes analysis not conducted.
n/a Denotes no applicable standard/guideline.
* RPDs are not calculated where one or more concentrations are less than five times RDL.
** Comparison to BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.

[a] Standard to protect freshwater aquatic life.
[b] Standard/guideline varies with pH.
[c] Standard/guideline varies with Hardness.
[d] Standard/guideline varies with Chloride.
[e] During Q4, the FR_GHHW well pumps were non-operational and it was not possible to collect a sample from the distribution point. Instead, the Q4 sample was collected from FR_GW_Well 2
[f] Guideline only for lakes where the predominant species is salmonids.

BOLD*	Concentration greater than BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.
BOLD	Concentration greater than CSR Aquatic Life (AW) standard.
SHADOW	Concentration greater than CSR Irrigation Watering (IW) standard.
INVERSE	Concentration greater than CSR Livestock Watering (LW) standard.
SHADED	Concentration greater than CSR Drinking Water (DW) standard.

TABLE 3: Summary of Analytical Results compared to Primary Screening Criteria for Dissolved Inorganics in Groundwater

Sample Location	Sample ID	Sample Date (yyyy mm	Field Parameters: Temperature °C	pH pH	Dissolved Oxygen mg/L	Conductivity µS/cm	Field Turbidity NTU	Physical Parameters: pH pH	Hardness mg/L	Conductivity µS/cm	Total Suspended Solids mg/L	Total Dissolved Solids mg/L	Turbidity, Lab NTU	Total Alkalinity (as CaCO3) mg/L	Dissolved Inorganics: Ammonia Nitrogen mg/L	Bromide mg/L	Chloride mg/L	Fluoride mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Kjeldahl Nitrogen-N mg/L	Ortho-Phosphate mg/L	Total Phosphorus mg/L	Sulphate mg/L	Total Organic Carbon mg/L	Dissolved Organic Carbon mg/L
BC Standards																										
BCWQG Aquatic Life Short-term Maximum (AW)[a]			n/a	6.5-9.0	n/a	n/a	n/a	6.5-9.0	n/a	n/a	n/a	n/a	n/a	n/a	12.3 - 24.5[b]	n/a	600	0.4 - 2.6	32.8	0.06 - 0.6[d]	n/a	n/a	0.015[f]	n/a	n/a	n/a
BCWQG Aquatic Life Long-term Average (AW)[a]			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.09 - 1.77[b]	n/a	150	n/a	3	0.02 - 0.2[d]	n/a	n/a	n/a	128 - 429[d]	n/a	n/a
CSR Aquatic Life (AW)[a]			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3.7 - 11.3[b]	n/a	1,500	2 - 3[c]	400	0.2 - 2[d]	n/a	n/a	n/a	1,000	n/a	n/a
CSR Irrigation Watering (IW)			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	100	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CSR Livestock Watering (LW)			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	600	1	100	10	n/a	n/a	n/a	1,000	n/a	n/a
CSR Drinking Water (DW)			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	250	1.5	10	3.2	n/a	n/a	n/a	500	n/a	n/a
Key Area 9																										
EV_BCgw**	EV_BCGW_WG_2016-02-22_NP	2016 02 22	6.5	7.17	3.03	-	0	7.48	667	1,160	1.3	871	0.85	209	< 0.0050	< 0.25	13.9	0.14	***13.3***	< 0.0050	< 0.050	0.0036	0.0069	395	0.64	0.76
	EV_BCGW_WG_2016-05-16_NP	2016 05 16	8.3	7.25	3.42	-	3.87	7.95	619	1,050	3.0	776	0.65	199	< 0.0050	< 0.25	12.6	0.14	***11.2***	< 0.0050	< 0.050	0.0038	0.0056	350	0.64	0.68
	EV_BCGW_WG_2016-08-22_NP	2016 08 22	7.4	7.26	2.49	897	-7.3	8.01	504	904	< 1.0	632	0.34	207	< 0.0050	< 0.25	8.66	0.13	***7.19***	< 0.0050	0.087	0.0029	0.0054	254	0.68	1.03
	EV_BCGW_WG_2016-10-18_NP	2016 10 18	6.7	7.29	2.67	809	-9	8.23	449	777	< 1.0	576	0.28	203	< 0.0050	< 0.25	7.51	0.15	***5.96***	< 0.0050	0.080	0.0039	0.0040	235	0.61	0.87
EV MCgwS**	EV_MCGWS_WG_2016-02-24_NP	2016 02 24	3.9	7.26	0.74	-	21.2	7.66	432	869	34.9	510	47.8	294	0.125	< 0.25	46.8	0.36	< 0.025	< 0.0050	0.189	< 0.0010	0.0323	107	1.59	1.59
	EV_MCGWS_WG_2016-05-18_NP	2016 05 18	7.5	7.2	0.38	-	0.6	7.99	438	863	17.3	541	35.5	282	0.0948	< 0.25	43.7	0.33	< 0.025	< 0.0050	0.183	< 0.0010	0.0289	123	2.02	2.04
	EV_MCGWS_WG_2016-08-23_NP	2016 08 23	11	7.41	2.19	859	2.4	7.90	404	826	18.3	510	44.2	310	0.114	< 0.25	47.0	0.33	< 0.025	< 0.0050	0.168	< 0.0010	0.0141	92.2	1.59	1.91
	EV_MCGWS_WG_2016-10-24_NP	2016 10 24	7.7	6.97	1.51	841	11	7.74	395	813	16.9	512	42.4	304	0.116	< 0.25	45.1	0.29	< 0.025	< 0.0050	0.185	< 0.0010	0.0112	94.1	1.56	1.54
EV MCgwD**	EV_MCGWD_WG_2016-02-24_NP	2016 02 24	4.8	7.45	0.45	-	115.5	7.79	250	528	80.2	318	122	245	0.273	< 0.050	2.0	0.946	< 0.0050	< 0.0010	0.48	0.0030	0.250	52.5	3.32	1.48
	EV_MCGWD_WG_2016-05-18_NP	2016 05 18	11	7.38	0.52	-	26.8	8.31	284	659	46.8	406	35.9	239	0.223	0.054	3.45	0.829	< 0.0050	< 0.0010	0.446	< 0.0010	0.0889	116	3.22	5.17
	EV_MCGWD_WG_2016-08-23_NP	2016 08 23	14	7.37	1.24	653	7.3	8.00	270	630	54.2	408	37.8	244	0.189	< 0.25	4.21	0.88	< 0.025	< 0.0050	0.443	< 0.0010	0.0441	108	2.53	3.40
	EV_MCGWD_WG_2016-10-24_NP	2016 10 24	6	7.2	1.02	695	79	7.79	245	610	65.9	380	32	244	0.238	< 0.050	3.53	0.902	< 0.0050	0.0015	0.453	< 0.0010	0.0914	95.8	2.50	2.75
EV BRgw	EV_BRGW_WG_2016-02-25_NP	2016 02 25	5.95	7.06	0.82	-	0	7.40	663	1,160	6.4	820	6.23	274	0.0053	0.27	35.4	0.15	6.64	0.0054	0.085	0.0014	0.0082	320	0.93	1.69
	EV_BRGW_WG_2016-05-17_NP	2016 05 17	9.52	7.3	5.29	-	4.15	8.10	706	1,180	3.3	929	2.64	243	< 0.0050	< 0.25	26.5	0.13	**10.7**	< 0.0050	< 0.050	0.0020	0.0055	367	< 0.50	0.59
	EV_BRGW_WG_2016-08-25_NP	2016 08 25	7.9	6.47	7.55	1,234	-6.3	8.04	722	1,200	3.2	894	4.94	262	< 0.0050	< 0.25	24.0	0.13	**10.6**	< 0.0050	0.062	0.0022	0.0113	358	0.69	0.74
	EV_BRGW_WG_2016-10-19_NP	2016 10 19	9.5	7.3	3.53	1,191	-	7.92	690	1,090	41.2	922	6.82	247	< 0.0050	< 0.25	22.5	0.13	8.60	< 0.0050	0.094	0.0020	0.0318	379	0.74	0.78
EV_RCgw	EV_RCSGW_WG_2016-02-25_NP	2016 02 25	5.58	6.83	5.06	-	0.97	7.35	1,610	2,510	1.1	2,250	1.54	253	< 0.0050	< 1.0	12.7	< 0.40	**48.4**	< 0.020	0.103	0.0047	0.0069	***1,160***	1.23	1.40
	EV_RCSGW_WG_2016-05-17_NP	2016 05 17	8.41	7.84	9.07	-	1.7	8.09	1,620	2,470	1.4	2,150	0.39	267	< 0.0050	< 1.0	23.0	< 0.40	**50.6**	0.029	< 0.050	0.0049	0.0047	***1,220***	1.22	1.09
	EV_RCSGW_WG_2016-08-22_NP	2016 08 22	7.9	7.71	9.03	2,433	-7.5	7.86	1,530	2,340	2.3	2,330	0.31	277	< 0.0050	< 1.0	13.3	< 0.40	**44.2**	< 0.020	0.195	0.0043	0.0060	***1,120***	1.17	1.16
	EV_RCSGW_WG_2016-10-24_NP	2016 10 24	15	7.12	7.56	2,429	-0.9	7.54	1,520	2,370	< 1.0	2,210	0.21	281	< 0.0050	< 1.0	20.5	< 0.40	**43.1**	0.051	0.079	0.0022	0.0023	***1,120***	1.42	1.41
EV WH50gw	EV_WH50GW_WG_2016-02-24_NP	2016 02 24	4.64	7.36	9.41	-	1	7.93	294	548	8.6	339	15.1	168	< 0.0050	< 0.050	3.6	0.149	2.36	< 0.0010	0.081	0.0044	0.0284	113	0.67	0.74
	EV_WH50GW_WG_2016-05-17_NP	2016 05 17	4.57	7.32	9.41	-	0.2	8.32	186	335	7.0	200	13.0	126	< 0.0050	< 0.050	1.54	0.177	0.861	< 0.0010	0.070	0.0031	0.0245	49.9	1.10	1.34
	EV_WH50GW_WG_2016-08-25_NP	2016 08 25	9.8	7.45	3.98	544	3.7	8.25	305	538	1.4	389	3.28	172	< 0.0050	< 0.050	2.83	0.153	2.60	< 0.0010	0.085	0.0035	0.0092	115	0.77	0.85
	EV_WH50GW_WG_2016-10-19_NP	2016 10 19	11	7.72	6.2	298	-6.2	8.33	234	410	3.8	279	7.74	169	< 0.0050	< 0.050	1.79	0.165	1.18	< 0.0010	0.074	0.0055	0.0136	72.8	0.68	0.99
RG_DW-03-01	RG_03-01_WP_2016-05-19_NP	2016 05 19	-	-	-	-	-	7.42	420	813	-	-	-	-	-	-	30.1	-	< 0.025	< 0.0050	-	-	-	76.9	-	-
	RG_03-01_WP_2016-09-21_NP	2016 09 21	7.89	7.18	2.41	-	-	-	440	-	-	-	-	-	-	< 0.25	34.1	0.16	0.069	< 0.0050	-	-	-	57.8	-	-
	RG_03-01_WP_2016-12-12_NP	2016 12 12	8	7.21	2.57	-	-	-	481	-	-	-	-	-	-	< 0.25	35.5	0.18	0.089	< 0.0050	-	-	-	48.5	-	-
Key Area 10																										
EV ECgw	EV_ECGW_WG_2016-05-18_NP	2016 05 18	2	171.1	7.66	-	409	8.33	191	425	131	277	137	212	0.155	< 0.050	0.53	0.778	0.0720	0.0093	0.697	0.0162	0.683	26.9	7.23	1.68
	EV_ECGW_WG_2016-08-24_NP	2016 08 24	10	6.36	2.82	430	15.2	8.12	177	405	47.9	253	58.8	211	0.126	< 0.050	0.51	0.879	0.103	0.0224	0.213	0.0208	0.0630	27.5	1.00	1.27
	EV_ECGW_WG_2016-10-19_NP	2016 10 19	8.1	7.76	2.44	424	11.5	8.36	176	398	13.1	234	18.7	217	0.160	< 0.050	0.54	0.853	0.0473	0.0098	0.233	0.0202	0.0459	28.7	1.07	0.96
Key Area 11																										
CM_MW1-DP	CM_MW1-DP_WG_Q1_N	2016 03 10	2.4	7.9	0.31	1,159	10.22	8.37	149	1,330	7.0	695	7.05	352	0.547	0.83	**211**	0.21	< 0.025	< 0.0050	0.613	< 0.0010	0.0159	8.4	1.98	1.74
	CM_MW1-DP_WG_Q2_N	2016 06 17	5.8	8.02	3.74	811	77.4	8.40	160	1,250	1.0	690	3.80	345	0.513	0.823	**212**	0.234	0.0113	0.0028	0.480	< 0.0010	0.0122	6.77	1.67	1.65
	CM_MW1-DP_WG_Q3_N	2016 09 07	8.7	7.88	1.72	899	8.59	8.06	136	1,200	13.1	650	8.29	348	0.640	0.851	**221**	0.182	< 0.0050	< 0.0010	0.668	< 0.0010	0.0153	3.54	1.78	1.78
	CM_MW1-DP_WG_Q4_N	2016 12 05	2.85	7.18	5.27	965	44	7.88	152	1,240	35.0	655	24.8	337	0.525	0.82	**212**	0.17	< 0.025	0.008	0.702	< 0.0010	0.0188	4.4	3.22	2.28
CM MW1-OB	CM_MW1-OB_WG_Q1_N	2016 03 10	2.7	7.22	3.69	1,079	1.18	7.88	575	1,220	< 1.0	789	0.29	272	< 0.0050	< 0.25	65.6	< 0.10	1.95	< 0.0050	0.082	0.0021	0.0028	291	< 0.50	0.57
	CM_MW1-OB_WG_Q2_N	2016 06 16	6.3	7.4	8.5	682	3.45	7.75	504	1,030	3.2	675	2.26	274	< 0.0050	0.066	61.0	0.090	1.21	< 0.0010	0.110	0.0044	0.0065	216	0.81	0.94
	CM_NNP_WG_Q2_N	Duplicate	-	-	-	-	-	7.73	519	1,030	2.2	660	1.34	292	< 0.0050	0.062	60.4	0.097	1.20	< 0.0010	-	0.0029	0.0034	216	-	-
	QA/QC RPD%		-	-	-	-	-	< 1	3	0	*	2	51	6	*	*	1	*	1	*	-	*	*	0	*	-
	CM_MW1-OB_WG_Q3_N	2016 09 07	9.5	7.41	7.09	674	8.11	7.50	447	869	3.6	575	2.61	334	< 0.0050	0.077	53.3	0.106	0.820	< 0.0010	< 0.050	0.0033	0.0044	174	1.06	1.19
	CM_MW1-OB_WG_Q4_N	2016 12 05	4.3	7.18	5.48	620	1.15	7.24	496	975	< 1.0	593	0.53	282	0.0150	< 0.25	55.6	< 0.10	0.824	0.0059	0.230	0.0018	0.006	197	1.15	1.17
	CM_NNP_WG_Q4_N	Duplicate	-	-	-	-	-	7.22	484	978	< 1.0	558	0.49	292	< 0.0050	< 0.25	55.4	< 0.10	0.821	0.0064	-	-	0.0061	197	-	-
	QA/QC RPD%		-	-	-	-	-	< 1	2	< 1	*	6	8	3	*	*	< 1	*	< 1	8	-	*	*	0	*	-
CM_MW1-SH	CM_MW1-SH_WG_Q1_N	2016 03 10	2	7.79	0.46	702.9	15.55	8.27	160	965	6.0	509	6.33	218	0.0403	0.66	**158**	0.49	< 0.025	< 0.0050	0.149	< 0.0010	0.017	19.5	1.28	0.93
	CM_MW1-SH_WG_Q2_N	2016 06 16	5.8	7.9	3.1	723	5.26	8.24	142	1,110	2.4	590	4.71	203	0.0582	0.924	**229**	0.687	< 0.0050	< 0.0010	< 0.050	< 0.0010	0.0133	25.2	1.01	0.78
	CM_MW1-SH_WG_Q2_NP	2016 06 22	-	-	-	-	-	8.32	208	1,150	468	625	382	216	0.0211	0.93	**222**	0.83	0.030	0.0055	0.393	0.0010	0.306	27.2	2.02	1.17
	CM_MW1-SH_WG_Q3_N	2016 09 07	7.5	7.7	1.59	627	9.05	7.94	147	889	7.7	460	4.34	215	0.0724	0.699	**172**	0.632	< 0.0050	< 0.0010	0.058	< 0.0010	0.0115	23.0	1.19	1.12
	CM_MW1-SH_WG_Q4_N	2016 12 05	3.1	7.6	3.33	548	6.25	7.81	151	927	3.8	543	5.77	209	0.0609	0.71	**168**	0.57	< 0.025	0.0053	0.155	< 0.0010	0.0077	21.1	1.35	1.29
RG DW-07-01	RG_07-01_WP_2016-05-20_NP	2016 05 20	4.78	7.21	9.35	-	-	-	700	-	-	-	-	-	-	-	6.27	-	3.38	< 0.0050	-	-	-	433	-	-
	RG_07-01_WP_2016-06-28_NP	2016 06 28	-	-	-	-	-	-	754	-	-	-	-	-	-	-	16.7	-	4.20	< 0.0050	-	-	-	**503**	-	-
	RG_07-01_WP_2016-09-12_NP	2016 09 12	8.4	7.1	7.3	-	-	-	867	-	-	-	-	-	-	< 0.25	8.5	0.17	4.63	< 0.0050	-	-	-	**569**	-	-
	RG_07-01_WP_2016-12-14_NP	2016 12 14	4.9	6.93	9.2	-	-	-	762	-	-	-	-	-	-	-	11.4	-	2.63	< 0.0050	-	-	-	470	-	-
Key Area 12																										
EV ER1gwS	EV_ER1GWS_WG_2016-02-24_NP	2016 02 24	2.5	7.81	9.07	-	1.28	7.94	288	531	< 1.0	317	0.21	177	< 0.0050	< 0.050	5.8	0.194	2.51	< 0.0010	0.052	0.0037	0.0056	85.2	< 0.50	0.73
	EV_ER1GWS_WG_2016-05-18_NP	2016 05 18	6.2	7.3	8.41	-	1.4	8.29	209	394	< 1.0	241	0.17	149	< 0.0050	< 0.050	3.15	0.204	1.46	< 0.0010	0.059	0.0023	0.0024	48.7	0.99	0.96
	EV_MC5GW_WG_2016-05-18_NP	Duplicate	-	-	-	-	-	8.32	218	394	< 1.0	241	0.13	153	< 0.0050	< 0.050	3.15	0.204	1.46	< 0.0010	< 0.050	0.0022	< 0.0020	48.8	0.92	1.05
	QA/QC RPD%		-	-	*	-	*	< 1	4	0	*	0	27	3	*	*	0	0	0	*	*	*	*	< 1	*	*
	EV_ER1GWS_WG_2016-08-23_NP	2016 08 23	12	7.6	6.57	431	-7.5	8.18	225	420	< 1.0	263	0.21	159	< 0.0050	< 0.050	1.81	0.239	2.04	< 0.0010	< 0.050	0.0039	0.0044	63.9	< 0.50	0.78
	EV_ER1GWS_WG_2016-10-18_NP	2016 10 18	9.1	7.64	8.77	435	-9.3	8.34	235	413	< 1.0	287	0.18	164	< 0.0050	< 0.050	2.18	0.223	1.99	< 0.0010	0.068	0.0042	0.0033	70.6	0.65	0.78
EV ER1gwD	EV_ER1GWD_WG_2016-02-24_NP	2016 02 24	2.7	7.73	10.22	-	10.6	7.96	275	503	10.3	309	5.55	177	< 0.0050	< 0.050	4.1	0.216	2.41	< 0.0010	0.071	0.0052	0.0194	82.2	0.62	< 0.50
	EV_ER1GWD_WG_2016-05-18_NP	2016 05 18	5.7	7.5	8	-	2.5	8.33	225	401	3.1	241	1.3	160	< 0.0050	< 0.050	2.79	0.233	1.25	< 0.0010	0.052	0.0046	0.0070	44.7	0.68	1.02
	EV_ER1GWD_WG_2016-08-23_NP	2016 08 23	13	7.72	6.32	429	24.9	8.08	228	423	103	276	42.4	176	< 0.0050	< 0.050	2.82	0.252	1.64	0.0011	0.100	0.0050	0.0651	55.3	1.27	0.93
	EV_ER1GWD_WG_2016-10-18_NP	2016 10 18	7.8	7.59	6.72	445	3	8.36	237	415	13.5	280	7.84	185	< 0.0050	< 0.050	3.68	0.242	1.51	< 0.0010	0.091	0.0041	0.0185	57.5	0.54	1.55
RG DW-03-04	RG_03-04_WP_2016-12-13_NP	2016 12 13	7.5	7.59	8.8	-	-	-	251	-	-	-	-	-	-	< 0.050	8.61	0.170	1.31	< 0.0010	-	-	-	73.2	-	-

Data provided by Teck Coal, associated lab reports available upon request.
All terms defined within the body of SNC-Lavalin's report.
< Denotes concentration less than indicated detection limit or RPD less than indicated value.
- Denotes analysis not conducted.
n/a Denotes no applicable standard/guideline.
* RPDs are not calculated where one or more concentrations are less than five times RDL.
** Comparison to BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.

[a] Standard to protect freshwater aquatic life.
[b] Standard/guideline varies with pH.
[c] Standard/guideline varies with Hardness.
[d] Standard/guideline varies with Chloride.
[e] During Q4, the FR_GHHW well pumps were non-operational and it was not possible to collect a sample from the distribution point. Instead, the Q4 sample was collected from FR_GW_Well 2
[f] Guideline only for lakes where the predominant species is salmonids.

BOLD*	Concentration greater than BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.
BOLD	Concentration greater than CSR Aquatic Life (AW) standard.
SHADOW	Concentration greater than CSR Irrigation Watering (IW) standard.
INVERSE	Concentration greater than CSR Livestock Watering (LW) standard.
SHADED	Concentration greater than CSR Drinking Water (DW) standard.

TABLE 4: Summary of Analytical Results compared to Primary Screening Criteria for Dissolved Metals in Groundwater

Sample Location	Sample ID	Sample Date (yyyy mm dd)	Hardness	Dissolved Metals																																
			mg/L	Aluminum µg/L	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Bismuth µg/L	Boron µg/L	Cadmium (D) µg/L	Cadmium (T) µg/L	Calcium mg/L	Chromium µg/L	Cobalt µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Lithium µg/L	Magnesium mg/L	Manganese µg/L	Mercury µg/L	Molybdenum µg/L	Nickel µg/L	Potassium mg/L	Selenium (D) µg/L	Selenium (T) µg/L	Silver µg/L	Sodium mg/L	Strontium µg/L	Thallium µg/L	Tin µg/L	Titanium µg/L	Uranium µg/L	Vanadium µg/L	Zinc[f] µg/L
BC Standard/Guideline																																				
BCWQG Aquatic Life Short-term Maximum (AW)[a]			n/a	100	n/a	5	n/a	n/a	n/a	1,200	0.862 - 2.8[c]	0.862 - 2.8[c]	n/a	1 (Cr(+6))	110	15.6 - 77.5[c]	350 (max)	131 - 1,157[c]	n/a	n/a	2,137 - 9,389[c]	n/a	2,000	n/a	n/a	2	2	0.1 - 3[c]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	74 - 568[c]
BCWQG Aquatic Life Long-term Average (AW)[a]			n/a	50	9	n/a	1,000	0.13	n/a	n/a	0.278 - 0.457[c]	0.278 - 0.457[c]	n/a	n/a	4	5.8 - 32.1[c]	n/a	8.4 - 48.5[c]	n/a	n/a	1,243 - 4,138[c]	n/a	1,000	110 - 150[c]	n/a	n/a	n/a	0.05 - 1.5[c]	n/a	n/a	0.8	n/a	n/a	8.5	n/a	49 - 542[c]
CSR Aquatic Life (AW)[a]			n/a	n/a	200	50	10,000	53	n/a	50,000	0.5 - 0.6[c]	0.5 - 0.6[c]	n/a	10[d]	40	50 - 90[c]	n/a	60 - 160[c]	n/a	n/a	n/a	1	10,000	1,100 -	n/a	10	10	0.5 - 15[c]	n/a	n/a	3	n/a	1,000	3,000	n/a	900 - 1,400[c]
CSR Irrigation Watering (IW)			n/a	5,000	n/a	100	n/a	100	n/a	500 - 6,000[b]	5	5	n/a	5[d]	50	200	5,000	200	2,500	n/a	200	1	10-30[e]	200	n/a	20[f]	20[f]	n/a	n/a	n/a	n/a	n/a	n/a	10	100	1,000 (pH<6.0)[g]
CSR Livestock Watering (LW)			n/a	5,000	n/a	25	n/a	100	n/a	5,000	80	80	1,000	50[d]	1,000	300	n/a	100	5,000	n/a	n/a	2	50	1,000	n/a	50	50	n/a	n/a	n/a	n/a	n/a	n/a	200	100	2,000
CSR Drinking Water (DW)			n/a	9,500	6	10	1,000	n/a	n/a	5,000	5	5	n/a	50	n/a	1,000	6,500	10	730	100	550	1	250	n/a	n/a	10	10	n/a	200	22,000	n/a	22,000	n/a	20	n/a	5,000
Background																																				
FR_HMW5	FR_HMW5_QSW_04012016_N	2016 01 21	174	7.1	< 0.10	0.10	197	< 0.10	< 0.050	69	< 0.0050	< 0.0050	38.0	< 0.10	< 0.10	< 0.50	< 10	< 0.050	280	19.2	75.1	< 0.0050	0.146	< 0.50	0.790	< 0.050	< 0.050	< 0.010	21.6	359	< 0.010	< 0.10	< 10	0.060	< 0.50	< 3.0
	FR_HMW5_QSW_04042016_N	2016 05 18	183	6.1	< 0.10	< 0.10	195	< 0.020	< 0.050	48	< 0.0050	< 0.0050	40.8	< 0.10	< 0.10	< 0.50	< 10	< 0.050	206	19.6	56.0	< 0.0050	< 0.050	< 0.50	0.709	0.054	< 0.050	< 0.010	15.6	330	< 0.010	0.13	< 10	0.019	< 0.50	< 3.0
	FR_HMW5_QSW_03102016_N	2016 11 03	158	6.4	< 0.10	< 0.10	187	< 0.020	< 0.050	62	< 0.0050	< 0.0050	34.7	< 0.10	< 0.10	< 0.50	< 10	< 0.050	241	17.2	29.9	< 0.00050	< 0.050	< 0.50	0.644	< 0.050	< 0.050	< 0.010	23.9	313	< 0.010	< 0.10	< 10	0.017	< 0.50	< 3.0
	FR_HMW5_QSW_04072016_N	2016 08 10	164	7.6	< 0.10	< 0.10	175	< 0.020	< 0.050	57	< 0.0050	< 0.0050	34.3	< 0.10	< 0.10	< 0.50	< 10	< 0.050	208	19.0	53.2	< 0.00050	< 0.050	< 0.50	0.807	3.04	< 0.050	< 0.010	20.6	306	< 0.010	< 0.10	< 10	0.021	< 0.50	< 3.0
Key Area 1																																				
FR_09-01-A	FR_09-01-A_QSW_04012016_N	2016 01 25	763	< 3.0	0.23	< 0.10	119	< 0.10	< 0.050	21	0.0418	0.0488	176	< 0.10	0.33	< 0.50	< 10	< 0.050	76.1	79.0	< 0.10	< 0.0050	0.624	1.32	3.38	***66.1***	***59.5***	< 0.010	4.11	167	< 0.010	< 0.10	14	4.36	< 0.50	< 3.0
	FD_QSW_04012016_001	Duplicate	773	< 3.0	0.24	< 0.10	118	< 0.10	< 0.050	20	0.0468	0.0532	180	< 0.10	0.33	< 0.50	< 10	< 0.050	71.7	78.9	< 0.10	< 0.0050	0.610	1.29	3.33	***66.3***	***58.3***	< 0.010	4.08	165	< 0.010	< 0.10	14	4.33	< 0.50	< 3.0
	QA/QC RPD%		1	*	*	*	1	*	*	*	11	9	2	*	*	*	*	*	6	< 1	*	*	2	*	1	< 1	2	*	1	1	*	*	0	1	*	*
	FR_09-01-A-WG-201606141205	2016 06 14	583	< 3.0	0.28	< 0.10	82.7	< 0.020	< 0.050	15	0.0203	0.0234	134	< 0.10	< 0.10	< 0.50	< 10	< 0.050	37.4	60.2	< 0.10	< 0.0050	1.73	< 0.50	2.77	***76.1***	***77.1***	< 0.010	1.97	117	< 0.010	< 0.10	< 10	5.19	< 0.50	< 3.0
	FR_DC1-WG-201606141205	Duplicate	583	< 3.0	0.27	< 0.10	85.4	< 0.020	< 0.050	15	0.0250	0.0257	134	< 0.10	< 0.10	< 0.50	< 10	< 0.050	37.3	60.0	< 0.10	< 0.0050	1.75	< 0.50	2.68	***77.5***	***77.5***	< 0.010	1.77	118	< 0.010	< 0.10	< 10	5.14	< 0.50	< 3.0
	QA/QC RPD%		0	*	*	*	3	*	*	*	*	*	0	*	*	*	*	*	< 1	< 1	*	*	1	*	3	2	1	*	11	1	*	*	*	1	*	*
	FR_09-01-A_QSW_04072016_N	2016 08 17	696	< 3.0	0.32	< 0.10	105	< 0.020	< 0.050	22	0.0348	0.0326	155	< 0.10	< 0.10	< 0.50	< 10	< 0.050	53.3	74.9	< 0.10	< 0.0050	1.35	< 0.50	3.52	***85.7***	***83.7***	< 0.010	2.74	143	< 0.010	< 0.10	< 10	4.84	< 0.50	< 3.0
	FR_09-01-A_QSW_03102016_N	2016 11 24	796	< 3.0	0.22	< 0.10	112	< 0.020	< 0.050	17	0.0257	0.0283	177	< 0.10	< 0.10	< 0.50	< 10	< 0.050	56.3	86.3	< 0.10	< 0.0050	0.803	< 0.50	3.05	***159***	***137***	< 0.010	2.87	174	< 0.010	< 0.10	< 10	5.71	< 0.50	< 3.0
FR_09-01-B	FR_09-01-B_QSW_04012016_N	2016 01 25	641	< 3.0	0.14	< 0.10	169	< 0.10	< 0.050	20	0.0325	0.113	151	0.11	0.32	< 0.50	< 10	< 0.050	72.8	64.0	< 0.10	< 0.0050	0.689	1.13	3.66	***42.6***	***37.8***	< 0.010	4.52	157	< 0.010	< 0.10	14	3.09	< 0.50	< 3.0
	FR_09-01-B-WG-201606141245	2016 06 14	595	< 3.0	0.11	< 0.10	134	< 0.020	< 0.050	15	0.0194	0.0216	136	< 0.10	< 0.10	< 0.50	< 10	< 0.050	43.8	61.9	< 0.10	< 0.0050	0.717	< 0.50	2.67	***79.9***	***80.5***	< 0.010	2.14	149	< 0.010	< 0.10	< 10	3.59	< 0.50	< 3.0
	FR_09-01-B_QSW_04072016_N	2016 08 17	723	< 3.0	0.13	< 0.10	155	< 0.020	< 0.050	16	0.0316	0.0339	161	< 0.10	0.25	< 0.50	< 10	< 0.050	58.7	78.2	< 0.10	< 0.0050	0.938	0.99	3.48	***58.9***	***60.2***	< 0.010	3.82	177	< 0.010	< 0.10	< 10	5.09	< 0.50	< 3.0
	FR_09-01-B_QSW_03102016_N	2016 11 24	787	< 3.0	0.13	< 0.10	175	< 0.020	< 0.050	19	0.0328	0.0279	177	< 0.10	0.17	< 0.50	< 10	< 0.050	62.1	84.0	< 0.10	< 0.0050	0.748	0.62	3.48	***117***	***106***	< 0.010	3.83	199	< 0.010	< 0.10	< 10	4.72	< 0.50	< 3.0
FR_GHHW	FR_GHHW_QSW_04012016_N	2016 01 25	862	4.3	< 0.10	< 0.10	96.5	< 0.10	< 0.050	16	0.0336	0.0445	201	< 0.10	< 0.10	2.85	20	0.067	55.5	87.7	1.30	< 0.0050	0.691	< 0.50	3.18	***137***	***123***	< 0.010	2.42	177	< 0.010	< 0.10	15	5.18	< 0.50	76.4
	FR_GHHW_QSW_04042016_N	2016 05 18	940	< 3.0	< 0.10	< 0.10	102	< 0.020	< 0.050	14	0.0353	0.0329	216	< 0.10	< 0.10	2.89	< 10	< 0.050	42.3	97.4	0.40	< 0.0050	0.615	0.53	3.03	***160***	***152***	< 0.010	2.55	186	< 0.010	< 0.10	< 10	5.16	< 0.50	32.1
	FR_GHHW_QSW_04072016_N	2016 08 17	655	< 3.0	< 0.10	< 0.10	80.5	< 0.020	< 0.050	17	0.0305	0.0388	149	< 0.10	< 0.10	5.46	< 10	< 0.050	45.1	68.4	0.65	< 0.0050	0.701	< 0.50	2.88	***91***	***95.4***	< 0.010	2.30	135	< 0.010	< 0.10	< 10	4.16	< 0.50	55.8
FR_GH WELL 2[i]	FR_GH WELL 2-20161020	2016 10 20	760	< 3.0	< 0.10	< 0.10	86.2	< 0.020	< 0.050	18	< 0.0050	0.153	182	0.11	< 0.10	< 0.50	< 10	< 0.050	44.5	74.2	8.53	< 0.0050	0.702	< 0.50	3.14	***108***	***109***	< 0.010	2.44	139	< 0.010	< 0.10	< 10	4.54	< 0.50	7.6
	FR_DC1-20161020	Duplicate	751	< 3.0	< 0.10	< 0.10	83.6	< 0.020	< 0.050	18	< 0.0050	0.130	181	0.14	< 0.10	< 0.50	< 10	< 0.050	44.7	72.3	8.71	< 0.0050	0.712	< 0.50	3.02	***110***	***103***	< 0.010	2.36	139	< 0.010	< 0.10	< 10	4.59	< 0.50	7.1
	QA/QC RPD%		1	*	*	*	3	*	*	*	*	16	1	*	*	*	*	*	< 1	3	2	*	1	*	4	2	6	*	3	0	*	*	*	1	*	7
	FR_GH WELL 2-20161021	2016 10 21	689	< 3.0	< 0.10	< 0.10	82.4	< 0.020	< 0.050	18	< 0.0050	0.163	159	< 0.10	< 0.10	< 0.50	< 10	< 0.050	46.4	71.0	1.41	< 0.0050	0.702	< 0.50	3.17	***108***	***103***	< 0.010	2.33	145	< 0.010	< 0.10	< 10	4.77	< 0.50	< 3.0
Key Area 2																																				
LC_PIZDC1307	LC_PIZDC1307_WG_2016-03-14_NP	2016 03 16	186	< 3.0	< 0.10	0.77	**1,380**	< 0.10	< 0.050	24	< 0.0050	0.0323	40.8	< 0.10	< 0.10	< 0.50	18	< 0.050	78.3	20.3	9.66	< 0.0050	**31.3**	1.21	5.16	< 0.050	< 0.050	< 0.010	14.5	132	< 0.010	< 0.10	< 10	0.047	< 0.50	8.4
	LC_PIZDC1307_WG_2016-06-13_NP	2016 06 10	193	< 3.0	< 0.10	0.94	**1,360**	< 0.020	< 0.050	24	< 0.0050	0.0259	44.1	< 0.10	< 0.10	< 0.50	< 10	< 0.050	87.4	20.1	9.09	< 0.0050	**30.8**	0.68	5.00	< 0.050	< 0.050	< 0.010	14.2	134	< 0.010	< 0.10	< 10	0.029	< 0.50	< 3.0
	LC_PIZDC1307_WG_2016-09-12_NP	2016 09 13	181	< 3.0	< 0.10	1.15	**1,430**	< 0.020	< 0.050	22	< 0.0050	0.0168	37.8	< 0.10	< 0.10	< 0.50	401	< 0.050	71.5	20.9	9.83	< 0.0050	**31.5**	0.98	5.04	< 0.050	< 0.050	< 0.010	14.2	133	< 0.010	< 0.10	< 10	0.029	< 0.50	3.2
	LC_PIZDC1307_WG_2016-12-12_NP	2016 12 13	183	< 5.0	< 0.50	1.28	**1,400**	< 0.10	< 0.25	< 50	< 0.025	< 0.025	40.0	< 0.50	< 0.50	< 1.0	1,040	< 0.25	72.3	20.2	9.39	< 0.0050	**32.0**	< 2.5	5.20	< 0.25	< 0.25	< 0.050	13.7	130	< 0.050	< 0.50	< 10	< 0.050	< 2.5	< 5.0
LC PIZDC1308	LC_PIZDC1308_WG_2016-03-14_NP	2016 03 16	252	< 3.0	< 0.10	0.26	373	< 0.10	< 0.050	15	< 0.0050	0.0470	66.2	< 0.10	1.42	< 0.50	< 10	0.066	24.9	21.0	126	< 0.0050	8.46	2.67	2.55	< 0.050	0.058	< 0.010	9.56	97.9	0.036	< 0.10	< 10	0.715	< 0.50	6.6
	LC_PIZDC1308_WG_2016-06-13_NP	2016 06 10	338	< 3.0	0.11	< 0.10	235	< 0.020	< 0.050	11	0.161	0.149	95.4	< 0.10	0.21	< 0.50	< 10	< 0.050	7.5	24.1	2.18	< 0.0050	1.21	1.09	1.79	0.317	0.3	< 0.010	1.29	86.3	0.018	< 0.10	< 10	1.08	< 0.50	3.0
	LC_PIZDC1308_WG_2016-09-12_NP	2016 09 13	314	< 3.0	< 0.10	< 0.10	271	< 0.020	< 0.050	11	0.0950	0.164	83.5	< 0.10	0.47	< 0.50	38	< 0.050	9.3	25.6	24.3	< 0.0050	2.25	1.22	2.16	0.141	0.169	< 0.010	2.15	91.0	0.017	< 0.10	< 10	1.03	< 0.50	< 3.0
	LC_PIZDC1308_WG_2016-12-12_NP	2016 12 13	331	< 5.0	< 0.50	< 0.50	262	< 0.10	< 0.25	< 50	0.170	0.187	90.4	< 0.50	< 0.50	< 1.0	< 50	< 0.25	7.8	25.7	16.0	< 0.0050	1.53	< 2.5	1.83	< 0.25	< 0.25	< 0.050	1.46	90.8	< 0.050	< 0.50	< 10	1.23	< 2.5	< 5.0
Key Area 3																																				
GH_POTW09	GH_POTW09_WG_2016-03-07_N	2016 03 07	413	4.9	< 0.10	0.28	32.8	< 0.10	< 0.050	19	< 0.0050	0.0081	98.1	< 0.10	0.17	< 0.50	< 10	< 0.050	11.8	40.8	196	< 0.0050	2.73	1.39	1.52	0.647	0.689	< 0.010	6.65	328	0.017	< 0.10	< 10	1.98	< 0.50	3.4
	GH_POTW09_WG_2016-06-14_NP	2016 06 14	424	< 3.0	< 0.10	0.17	31.8	< 0.020	< 0.050	20	0.0064	0.0101	101	< 0.10	0.19	0.64	< 10	< 0.050	12.1	41.6	**206**	< 0.0050	2.68	3.19	1.52	0.705	0.696	< 0.010	6.76	331	0.018	< 0.10	< 10	1.94	< 0.50	7.3
	GH_POTW09_WG_2016-08-15_NP	2016 08 16	395	< 3.0	< 0.10	0.22	33.0	< 0.020	< 0.050	20	0.0088	0.0175	95.6	< 0.10	0.18	5.24	< 10	0.093	12.1	37.9	**202**	< 0.0050	2.72	9.57	1.54	0.645	0.636	< 0.010	6.58	342	0.017	< 0.10	< 10	1.99	< 0.50	18.6
	GH_POTW09_WG_2016-11-17_NP	2016 11 17	389	< 1.0	< 0.10	0.43	34.5	< 0.020	< 0.050	19	0.0133	0.0124	91.2	< 0.10	0.19	2.73	152	0.063	12.2	39.1	**209**	< 0.0050	2.66	5.89	1.62	0.788	0.749	< 0.010	6.41	335	0.018	< 0.10	< 10	1.78	< 0.50	17.6
GH POTW10	GH_POTW10_WS_2016-03-07_N	2016 03 07	405	< 3.0	< 0.10	0.63	19.2	< 0.10	< 0.050	34	0.0065	0.0061	93.6	< 0.10	0.12	< 0.50	< 10	< 0.050	15.5	41.6	46.9	< 0.0050	2.83	0.88	1.65	4.8	4.62	< 0.010	4.87	504	< 0.010	< 0.10	< 10	0.648	< 0.50	< 3.0
	GH_POTW10_WG_2016-06-14_NP	2016 06 14	407	< 3.0	< 0.10	0.68	18.7	< 0.020	< 0.050	36	< 0.0050	0.0052	94.2	< 0.10	0.14	< 0.50	< 10	< 0.050	15.6	41.7	52.7	< 0.0050	2.80	0.92	1.68	3.42	3.35	< 0.010	5.22	491	< 0.010	< 0.10	< 10	0.615	< 0.50	< 3.0
	GH_POTW10_WG_2016-08-15_NP	2016 08 16	376	< 3.0	< 0.10	0.53	18.5	< 0.020	< 0.050	35	< 0.0050	0.0067	87.6	< 0.10	0.13	< 0.50	< 10	< 0.050	15.1	38.1	49.9	< 0.0050	2.84	0.82	1.66	3.02	2.93	< 0.010	5.05	503	< 0.010	< 0.10	< 10	0.634	< 0.50	< 3.0
	GH_POTW10_WG_2016-11-17_NP	2016 11 17	367	< 1.0	< 0.10	1.19	19.9	< 0.020	< 0.050	33	0.0089	0.0094	83.7	< 0.10	0.14	< 0.20	680	< 0.050	15.8	38.3	52.9	< 0.0050	2.86	1.42	1.71	3.8	3.73	< 0.010	4.83	492	< 0.010	< 0.10	< 10	0.581	< 0.50	3.7
GH POTW15	GH_POTW15_WG_2016-03-07_N	2016 03 07	505	< 3.0	< 0.10	0.97	22.4	< 0.10	< 0.050	18	0.0161	0.0175	129	< 0.10	0.23	< 0.50	33	< 0.050	14.1	44.4	181	< 0.0050	2.51	1.20	1.50	0.206	0.233	< 0.010	9.96	358	0.015	< 0.10	< 10	1.36	< 0.50	< 3.0
	GH_POTW15_WG_2016-06-14_NP	2016 06 14	522	< 3.0	< 0.10	0.78	21.9	< 0.020	< 0.050	19	0.0175	0.0231	134	< 0.10	0.23	0.61	< 10	< 0.050	14.6	45.2	188	< 0.0050	2.54	2.44	1.51	0.207	0.233	< 0.010	10.3	359	0.015	< 0.10	< 10	1.33	< 0.50	< 3.0
	GH_POTW15_WG_2016-08-15_NP	2016 08 16	480	< 3.0	< 0.10	0.72	21.8	< 0.020	< 0.050	19	0.0082	0.0263	125	< 0.10	0.21	< 0.50	< 10	< 0.050	13.7	40.9	188	< 0.0050	2.50	1.07	1.51	0.125	0.177	< 0.010	10.2	363	0.015	< 0.10	< 10	1.35	< 0.50	< 3.0
	GH_POTW15_WG_2016-11-17_NP	2016 11 17	465	< 5.0	< 0.50	1.37	23.6	< 0.10	< 0.25	< 50	< 0.025	< 0.025	116	< 0.50	< 0.50	< 1.0	713	< 0.25	13.3	42.4	195	< 0.0050	2.59	< 2.5	1.62	< 0.25	< 0.25	< 0.050	10.3	354	< 0.050	< 0.50	< 10	1.21	< 2.5	8.3
GH_POTW17**	GH_POTW17_WG_2016-03-07_N	2016 03 07	786	< 3.0	< 0.10	0.11	28.1	< 0.10	< 0.050	20	0.0500	0.0467	191	< 0.10	0.19	< 0.50	14	< 0.050	11.7	75.1	92.4	< 0.0050	1.10	1.35	1.59	***5.76*****	***5.39*****	< 0.010	7.20	486	0.012	< 0.10	12	2.12	< 0.50	< 3.0
	GH_POTW17_WG_2016-06-14_NP	2016 06 14	803	< 3.0	< 0.10	0.12	30.7	< 0.020	< 0.050	21	0.0506	0.0515	194	< 0.10	0.16	< 0.50	< 10	< 0.050	12.9	77.5	64.9	< 0.0050	1.05	6.59	1.60	***7.71*****	***7.66*****	< 0.010	7.56	464	0.012	< 0.10	< 10	2.23	< 0.50	< 3.0
	GH_POTW17_WG_2016-08-15_NP	2016 08 16	734	< 3.0	< 0.10	< 0.10	30.2	< 0.020	< 0.050	20	0.0061	0.0559	178	< 0.10	< 0.10	< 0.50	< 10	< 0.050	12.1	70.2	31.3	< 0.0050	1.04	2.70	1.61	***7.98*****	***7.66*****	< 0.010	7.41	456	0.013	< 0.10	< 10	2.29	< 0.50	< 3.0
	GH_POTW17_WG_2016-11-17_NP	2016 11 17	712	< 5.0	< 0.50	< 0.50	30.8	< 0.10	< 0.25	< 50	0.066	0.070	170	< 0.50	< 0.50	1.6	247	0.27	12.1	70.0	74.9	< 0.0050	1.14	4.1	1.69	***5.41*****	***5.2*****	< 0.050	7.59	470	< 0.050	< 0.50	< 10	2.01	< 2.5	6.3
	GH_POTW17_WG_2016-11-17_FD	Duplicate	713	< 5.0	< 0.50	< 0.50	30.1	< 0.10	< 0.25	< 50	0.048	0.057	169	< 0.50	< 0.50	< 1.0	238	< 0.25	12.1	70.5	72.5	< 0.0050	1.09	4.2	1.70	***5.1*****	***5.23*****	< 0.050	7.64	464	< 0.050	< 0.50	< 10	1.97	< 2.5	5.6
	QA/QC RPD%		< 1	*	*	*	2	*	*	*	32	20	1	*	*	*	4	*	0	1	3	*	4	2	1	6	1	*	1	1	*	*	*	2	*	12

Data provided by Teck Coal, associated lab reports available upon request.
All terms defined within the body of SNC-Lavalin's report.
< Denotes concentration less than indicated detection limit or RPD less than indicated value.
- Denotes analysis not conducted.
n/a Denotes no applicable standard/guideline.
* RPDs are not calculated where one or more concentrations are less than five times RDL.
** Comparison to BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.

BOLD*	Concentration greater than BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.
BOLD	Concentration greater than CSR Aquatic Life (AW) standard.
SHADOW	Concentration greater than CSR Irrigation Watering (IW) standard.
INVERSE	Concentration greater than CSR Livestock Watering (LW) standard.
SHADED	Concentration greater than CSR Drinking Water (DW) standard.

[a] Standard to protect freshwater aquatic life.
[b] Standard varies with crop.
[c] Standard/guideline varies with Hardness.
[d] Individual standards exist for Cr +3 and Cr +6. Reported value represents more stringent standard.
[e] Standard varies with crop, soil drainage and Mo:Cu ratio.
[f] Individual standards exist for continuous and intermittent applications on crops. Reported value denotes more stringent standard.
[g] Standard varies with soil pH. Zinc IW guideline of 1,000 mg/L (soil pH < 6) was used due to no soil pH values.
[h] Reported metals values are Total values.
[i] During Q4, the FR_GHHW well pumps were non-operational and it was not possible to collect a sample from the distribution point. Instead, the Q4 sample was collected from FR_GW_Well 2.

TABLE 4: Summary of Analytical Results compared to Primary Screening Criteria for Dissolved Metals in Groundwater

Sample Location	Sample ID	Sample Date (yyyy mm dd)	Hardness	Dissolved Metals																																		
			mg/L	Aluminum µg/L	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Bismuth µg/L	Boron µg/L	Cadmium (D) µg/L	Cadmium (T) µg/L	Calcium mg/L	Chromium µg/L	Cobalt µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Lithium µg/L	Magnesium mg/L	Manganese µg/L	Mercury µg/L	Molybdenum µg/L	Nickel µg/L	Potassium mg/L	Selenium (D) µg/L	Selenium (T) µg/L	Silver µg/L	Sodium mg/L	Strontium µg/L	Thallium µg/L	Tin µg/L	Titanium µg/L	Uranium µg/L	Vanadium µg/L	Zinc[f] µg/L
BC Standard/Guideline																																						
BCWQG Aquatic Life Short-term Maximum (AW)[a]			n/a	100	n/a	5	n/a	n/a	n/a	1,200	0.862 - 2.8[c]	0.862 - 2.8[c]	n/a	1 (Cr(+6))	110	15.6 - 77.5[c]	350 (max)	131 - 1,157[c]	n/a	n/a	2,137 - 9,389[c]	n/a	2,000	n/a	n/a	2	2	0.1 - 3[c]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	74 - 568[c]
BCWQG Aquatic Life Long-term Average (AW)[a]			n/a	50	9	n/a	1,000	0.13	n/a	n/a	0.278 - 0.457[c]	0.278 - 0.457[c]	n/a	n/a	4	5.8 - 32.1[c]	n/a	8.4 - 48.5[c]	n/a	n/a	1,243 - 4,138[c]	n/a	1,000	110 - 150[c]	n/a	n/a	n/a	0.05 - 1.5[c]	n/a	n/a	0.8	n/a	n/a	8.5	n/a	49 - 542[c]
CSR Aquatic Life (AW)[a]			n/a	n/a	200	50	10,000	53	n/a	50,000	0.5 - 0.6[c]	0.5 - 0.6[c]	n/a	10[d]	40	50 - 90[c]	n/a	60 - 160[c]	n/a	n/a	n/a	1	10,000	1,100 -	n/a	10	10	0.5 - 15[c]	n/a	n/a	3	n/a	1,000	3,000	n/a	900 - 1,400[c]
CSR Irrigation Watering (IW)			n/a	5,000	n/a	100	n/a	100	n/a	500 - 6,000[b]	5	5	n/a	5[d]	50	200	5,000	200	2,500	n/a	200	1	10-30[e]	200	n/a	20[f]	20[f]	n/a	n/a	n/a	n/a	n/a	n/a	10	100	1,000 (pH<6.0)[g]
CSR Livestock Watering (LW)			n/a	5,000	n/a	25	n/a	100	n/a	5,000	80	80	1,000	50[d]	1,000	300	n/a	100	5,000	n/a	n/a	2	50	1,000	n/a	50	50	n/a	n/a	n/a	n/a	n/a	n/a	200	100	2,000
CSR Drinking Water (DW)			n/a	9,500	6	10	1,000	n/a	n/a	5,000	5	5	n/a	50	n/a	1,000	6,500	10	730	100	550	1	250	n/a	n/a	10	10	n/a	200	22,000	n/a	22,000	n/a	20	n/a	5,000
Key Area 4																																						
GH_MW-ERSC-1	GH_MW-ERSC-1_WG_2016-03-22_NP	2016 03 22	308	< 3.0	0.17	0.29	111	< 0.10	< 0.050	24	0.0062	0.152	83.5	0.24	0.17	< 0.50	66	< 0.050	15.0	24.2	87.7	< 0.0050	5.22	1.31	1.28	0.847	1.23	< 0.010	5.57	295	< 0.010	< 0.10	< 10	0.585	< 0.50	3.4
	GH_MW-ERSC-1_WG_2016-06-14_NP	2016 06 14	228	< 3.0	< 0.10	0.20	82.3	< 0.020	< 0.050	11	0.0088	0.117	60.8	0.19	< 0.10	< 0.50	< 10	< 0.050	7.7	18.6	17.2	< 0.0050	2.72	0.65	0.842	3.01	3.19	< 0.010	2.35	188	0.012	< 0.10	< 10	0.737	< 0.50	< 3.0
	GH_MW-ERSC-1_WG_2016-08-15_NP	2016 08 15	365	< 3.0	0.13	0.34	149	< 0.020	< 0.050	16	< 0.0050	0.0395	104	0.11	< 0.10	< 0.50	164	< 0.050	13.0	25.3	22.4	-	3.31	1.66	1.02	0.815	0.682	< 0.010	4.95	298	< 0.010	< 0.10	< 10	0.780	< 0.50	< 3.0
	GH_MW-ERSC-1_WG_2016-11-14_NP	2016 11 14	322	< 3.0	0.13	0.58	153	< 0.020	< 0.050	15	< 0.0050	0.0347	89.7	< 0.10	0.13	< 0.50	331	< 0.050	11.7	23.7	49.4	< 0.0050	5.25	1.91	0.881	0.932	0.889	< 0.010	4.53	281	< 0.010	< 0.10	< 10	0.706	< 0.50	< 3.0
	GH_MW_ERSC-1_WG_2016-11-14_FD	Duplicate	321	< 3.0	0.13	0.56	153	< 0.020	< 0.050	15	< 0.0050	0.0254	88.7	< 0.10	0.13	< 0.50	336	< 0.050	11.0	24.2	50.4	< 0.0050	5.19	1.98	0.885	0.908	0.864	< 0.010	4.49	275	< 0.010	< 0.10	< 10	0.707	< 0.50	< 3.0
	QA/QC RPD%		< 1	*	*	4	0	*	*	*	*	31	1	*	*	*	1	*	6	2	2	*	1	*	< 1	3	3	*	1	2	*	*	*	< 1	*	*
GH_GA-MW-1	GH_GA_MW-1_WG_2016-03-22_NP	2016 03 22	426	< 3.0	1.61	0.78	59.4	< 0.10	< 0.050	**769**	0.0377	0.188	89.7	0.49	1.67	0.86	167	< 0.050	130	49.2	**761**	< 0.0050	**32.4**	5.06	3.92	0.306	0.38	< 0.010	183	5,490	0.026	< 0.10	10	3.28	0.57	5.3
	GH_GA-MW-1_WG_2016-06-14_NP	2016 06 14	514	3.8	0.87	1.08	52.6	< 0.020	< 0.050	**834**	0.0580	***0.671***	101	< 0.10	2.76	0.80	471	< 0.050	123	63.4	**1,750**	< 0.0050	**14.7**	4.40	4.72	0.56	1.61	< 0.010	**240**	6,960	0.062	< 0.10	< 10	3.49	1.25	4.2
	GH_GA-MW-1_WG_2016-08-15_NP	2016 08 16	260	< 3.0	2.31	0.47	41.3	< 0.020	< 0.050	**800**	0.0352	0.0672	55.0	< 0.10	0.42	2.04	< 10	< 0.050	158	29.9	166	< 0.0050	5.93	2.51	3.23	0.296	0.335	< 0.010	145	3,540	0.028	< 0.10	< 10	1.74	< 0.50	4.5
	GH_GA-MW-1_WG_2016-11-16_NP	2016 11 16	459	5.7	2.18	0.55	53.9	< 0.020	< 0.050	**775**	0.0059	-	89.4	< 0.10	1.55	1.17	< 10	< 0.050	139	57.4	**525**	< 0.0050	**12.8**	4.07	4.33	0.218	-	< 0.010	**228**	6,500	0.044	< 0.10	< 10	3.37	< 0.50	< 3.0
GH_GA-MW-2	GH_GA_MW-2_WG_2016-03-22_NP	2016 03 22	400	< 3.0	0.91	0.30	105	< 0.10	< 0.050	20	0.0312	0.0882	110	< 0.10	< 0.10	< 0.50	< 10	< 0.050	14.7	30.5	8.77	< 0.0050	**13.3**	1.74	1.03	***13.5***	***12.5***	< 0.010	7.31	417	< 0.010	< 0.10	11	2.85	< 0.50	3.3
	GH_GA-MW-2_WG_2016-06-14_NP	2016 06 14	379	< 3.0	1.28	0.31	83.2	< 0.020	< 0.050	23	0.0204	0.113	103	< 0.10	0.13	< 0.50	< 10	< 0.050	16.2	29.8	42.9	< 0.0050	**31.1**	3.24	1.06	5.7	5.34	< 0.010	8.15	436	< 0.010	< 0.10	< 10	3.16	< 0.50	5.0
	GH_GA-MW-2_WG_2016-08-15_NP	2016 08 15	366	< 3.0	1.17	0.26	88.8	< 0.020	< 0.050	19	0.0338	0.0493	101	< 0.10	0.13	< 0.50	< 10	< 0.050	16.0	27.6	42.3	< 0.0050	**23.8**	2.74	1.01	***10.4***	9.39	< 0.010	7.85	451	< 0.010	< 0.10	< 10	3.26	< 0.50	3.3
	GH_GA-MW-2_WG_2016-11-14_NP	2016 11 14	394	< 3.0	0.95	0.22	95.3	< 0.020	< 0.050	17	0.0428	0.0675	108	< 0.10	< 0.10	< 0.50	< 10	< 0.050	16.8	30.1	23.4	< 0.0050	**12.7**	2.31	1.08	***17.9***	***17.9***	< 0.010	7.90	452	0.013	< 0.10	< 10	2.91	< 0.50	3.2
GH_GA-MW-3	GH_GA_MW-3_WG_2016-03-22_NP	2016 03 22	321	3.3	< 0.10	0.12	114	< 0.10	< 0.050	220	< 0.0050	0.256	64.4	< 0.10	< 0.10	< 0.50	< 10	0.067	84.6	38.9	18.4	< 0.25	< 0.050	< 0.50	2.33	***11.3***	7.69	< 0.010	32.4	1,940	< 0.010	< 0.10	< 10	0.189	< 0.50	< 3.0
	GH_GA-MW-3_WG_2016-06-14_NP	2016 06 14	265	3.9	< 0.10	< 0.10	101	< 0.020	< 0.050	279	< 0.0050	0.403	46.4	0.17	< 0.10	< 0.50	< 10	< 0.050	97.7	36.1	12.5	< 0.0050	< 0.050	< 0.50	2.50	0.783	2.05	< 0.010	38.5	2,090	< 0.010	< 0.10	< 10	0.036	< 0.50	< 3.0
	GH_GA-MW-3_WG_2016-08-15_NP	2016 08 15	230	< 3.0	< 0.10	< 0.10	106	< 0.020	< 0.050	258	< 0.0050	0.0058	42.7	0.11	< 0.10	< 0.50	< 10	< 0.050	102	30.0	6.91	< 0.010	< 0.050	< 0.50	2.43	0.972	< 0.050	< 0.010	36.2	2,160	< 0.010	< 0.10	< 10	0.030	< 0.50	< 3.0
	GH_GA-MW-3_WG_2016-11-14_NP	2016 11 14	234	< 3.0	< 0.10	< 0.10	111	< 0.020	< 0.050	240	< 0.0050	0.0055	42.1	0.16	< 0.10	< 0.50	< 10	< 0.050	105	31.2	9.97	< 0.0050	< 0.050	< 0.50	2.52	1.03	< 0.050	< 0.010	37.4	2,170	< 0.010	< 0.10	< 10	0.029	< 0.50	< 3.0
GH_GA-MW-4	GH_GA_MW-4_WG_2016-03-22_NP	2016 03 22	930	< 3.0	0.13	< 0.10	95.6	< 0.10	< 0.050	15	0.0266	0.0257	216	0.40	< 0.10	< 0.50	< 10	< 0.050	62.6	95.1	< 0.10	< 0.0050	1.98	0.61	1.31	4.19	3.79	< 0.010	6.96	591	< 0.010	< 0.10	15	4.17	< 0.50	< 3.0
	GH_GA-MW-4_WG_2016-06-14_NP	2016 06 14	813	< 3.0	0.14	< 0.10	80.3	< 0.020	< 0.050	16	0.0150	0.0258	183	0.13	< 0.10	< 0.50	< 10	< 0.050	65.9	86.6	0.17	< 0.0050	2.07	< 0.50	1.43	3.66	3	< 0.010	5.67	527	< 0.010	< 0.10	< 10	4.38	< 0.50	< 3.0
	GH_GA-MW-4_WG_2016-08-15_NP	2016 08 16	476	< 3.0	0.18	< 0.10	53.6	< 0.020	< 0.050	15	0.0152	0.0153	114	0.15	< 0.10	< 0.50	< 10	< 0.050	48.0	46.5	< 0.10	< 0.0050	1.86	< 0.50	1.19	3.62	3.24	< 0.010	4.59	341	< 0.010	< 0.10	< 10	3.01	< 0.50	< 3.0
	GH_GA-MW-4_WG_2016-11-14_NP	2016 11 14	505	< 3.0	0.13	< 0.10	69.5	< 0.020	< 0.050	15	0.0162	0.0145	115	0.16	< 0.10	< 0.50	< 10	< 0.050	44.8	52.9	< 0.10	< 0.0050	1.68	< 0.50	1.38	3	3.02	< 0.010	6.34	352	< 0.010	< 0.10	< 10	3.60	< 0.50	< 3.0
RG DW-01-03[h]	RG_01-03_WP_2016-06-01_NP	2016 06 01	202	-	-	-	-	-	-	-	-	0.0083	57.5	-	-	-	-	-	-	14.2	-	-	-	-	0.446	3.43	3.21	-	1.27	-	-	-	-	-	-
	RG_01-03_WP_2016-06-29_NP	2016 06 29	227	-	-	-	-	-	-	-	-	< 0.025	64.5	-	-	-	-	-	-	15.9	-	-	-	-	0.43	2.92	3.27	-	1.35	-	-	-	-	-	-
	RG_01-03_WP_2016-09-14_NP	2016 09 14	216	-	-	-	-	-	-	-	-	0.0097	61,700	-	-	-	-	-	-	15,000	-	-	-	-	446	3.42	3.28	-	1,350	-	-	-	-	-	-
	RG_01-03_WP_2016-12-12_NP	2016 12 12	225	-	-	-	-	-	-	-	-	< 0.0050	65.7	-	-	-	-	-	-	14.8	-	-	-	-	0.442	2.77	2.77	-	1.39	-	-	-	-	-	-
RG DW-01-07[h]	RG_01-07_WP_2016-6-01_NP	2016 06 01	455	-	-	-	-	-	-	-	-	0.0451	115	-	-	-	-	-	-	40.7	-	-	-	-	0.95	1.69	1.67	-	5.95	-	-	-	-	-	-
	RG_01-07_WP_2016-06-29_NP	2016 06 29	474	-	-	-	-	-	-	-	-	0.039	122	-	-	-	-	-	-	41.4	-	-	-	-	0.88	1.54	1.4	-	6.88	-	-	-	-	-	-
	RG_01-07_WP_2016-09-14_NP	2016 09 14	446	-	-	-	-	-	-	-	-	0.0415	115	-	-	-	-	-	-	38.8	-	-	-	-	0.921	1.72	1.45	-	6.84	-	-	-	-	-	-
	RG_01-07_WP_2016-12-12_NP	2016 12 12	486	-	-	-	-	-	-	-	-	0.0397	128	-	-	-	-	-	-	40.6	-	-	-	-	0.929	1.79	1.72	-	6.59	-	-	-	-	-	-
Key Area 6																																						
LC_PIZP1101	LC_PIZP1101_WG_2016-03-14_N	2016 03 15	136	3.6	< 0.10	1.21	471	< 0.10	< 0.050	18	< 0.0050	0.160	30.4	< 0.10	0.23	< 0.50	190	< 0.050	9.5	14.5	199	< 0.0050	**12.3**	< 0.50	0.759	< 0.050	0.479	< 0.010	17.8	209	< 0.010	< 0.10	< 10	1.67	< 0.50	< 3.0
	LC_PIZP1101_WG_2016-06-13_N	2016 06 17	138	< 3.0	< 0.10	1.05	446	< 0.020	< 0.050	21	< 0.0050	0.0226	30.8	< 0.10	0.23	< 0.50	126	< 0.050	10.8	14.7	192	< 0.0050	**12.9**	< 0.50	0.760	< 0.050	0.063	< 0.010	17.5	209	< 0.010	< 0.10	< 10	1.66	< 0.50	< 3.0
	LC_PIZP1101_WG_2016-09-12_N	2016 09 15	129	5.5	< 0.50	0.99	466	< 0.10	< 0.25	< 50	< 0.025	0.476	28.1	< 0.50	< 0.50	< 1.0	< 50	< 0.25	9.3	14.2	**238**	< 0.0050	**12.2**	< 2.5	0.80	< 0.25	1.45	< 0.050	18.9	211	< 0.050	< 0.50	< 10	1.69	< 2.5	< 5.0
	LC_PIZP1101_WG_2016-12-12_N	2016 12 12	121	< 5.0	< 0.50	1.17	439	< 0.10	< 0.25	< 50	< 0.025	0.449	26.5	< 0.50	< 0.50	< 1.0	205	< 0.25	8.7	13.4	**231**	< 0.0050	**11.6**	< 2.5	0.71	< 0.25	1.21	< 0.050	17.1	195	< 0.050	< 0.50	< 10	1.36	< 2.5	< 5.0
Key Area 7																																						
EV GV3gw	EV_GV3GW_WG_2016-02-23_NP	2016 02 23	366	< 3.0	< 0.10	< 0.10	17.4	< 0.10	< 0.050	12	0.0059	0.0088	91.7	0.23	< 0.10	< 0.50	< 10	< 0.050	15.2	33.2	< 0.10	0.0054	0.908	< 0.50	1.05	3.66	3.61	< 0.010	3.25	531	< 0.010	< 0.10	< 10	1.74	< 0.50	< 3.0
	EV_GV3GW_WG_2016-05-16_NP	2016 05 16	358	< 3.0	< 0.10	< 0.10	18.0	< 0.020	< 0.050	12	0.0086	< 0.0050	88.4	0.23	< 0.10	< 0.50	< 10	< 0.050	15.6	33.3	< 0.10	< 0.0050	0.890	< 0.50	0.939	3.88	3.76	< 0.010	3.04	546	< 0.010	< 0.10	< 10	1.65	< 0.50	< 3.0
	EV_GV3GW_WG_2016-08-22_NP	2016 08 22	332	< 3.0	< 0.10	< 0.10	18.8	< 0.020	< 0.050	12	0.0099	< 0.0050	81.3	0.23	< 0.10	< 0.50	< 10	< 0.050	14.2	31.2	< 0.10	< 0.0050	0.897	< 0.50	1.04	3.85	3.72	< 0.010	3.22	534	< 0.010	< 0.10	< 10	1.61	< 0.50	< 3.0
	EV_GV3GW_WG_2016-10-20_NP	2016 10 20	352	2.0	< 0.10	< 0.10	18.2	< 0.020	< 0.050	12	0.0088	0.0099	86.3	0.24	< 0.10	< 0.20	< 10	< 0.050	16.7	33.1	< 0.10	< 0.0050	0.942	< 0.50	1.02	4.24	3.6	< 0.010	3.25	560	< 0.010	< 0.10	< 10	1.60	< 0.50	< 1.0
RG DW-02-20[h]	RG_02-20_WP_2016-06-01_NP	2016 06 01	264	-	-	-	-	-	-	-	-	0.0080	71.2	-	-	-	-	-	-	20.8	-	-	-	-	0.641	***12.9***	***12.6***	-	2.53	-	-	-	-	-	-
	RG_02-20_WP_2016-06-28_NP	2016 06 28	259	-	-	-	-	-	-	-	-	< 0.0050	70.2	-	-	-	-	-	-	20.2	-	-	-	-	0.637	***11.5***	***11.2***	-	2.6	-	-	-	-	-	-
	RG_02-20_WP_2016-09-14_NP	2016 09 14	232	-	-	-	-	-	-	-	-	0.0076	63.2	-	-	-	-	-	-	18	-	-	-	-	0.608	8.58	7.43	-	2.37	-	-	-	-	-	-
	RG_02-20_WP_2016-12-12_NP	2016 12 12	245	-	-	-	-	-	-	-	-	0.0100	69.2	-	-	-	-	-	-	17.5	-	-	-	-	0.579	8.57	8.54	-	2.13	-	-	-	-	-	-
	RG_DUP_WP_2016-12-12_NP	2016 12 12	241	-	-	-	-	-	-	-	-	0.006	65	-	-	-	-	-	-	19.1	-	-	-	-	0.603	8.63	8.52	-	2.28	-	-	-	-	-	-
	QA/QC RPD%		2	-	-	-	-	-	-	-	-	*	6	-	-	-	-	-	-	9	-	-	-	-	4	1	0	-	7	-	-	-	-	-	-

Data provided by Teck Coal, associated lab reports available upon request.
All terms defined within the body of SNC-Lavalin's report.
< Denotes concentration less than indicated detection limit or RPD less than indicated value.
- Denotes analysis not conducted.
n/a Denotes no applicable standard/guideline.
* RPDs are not calculated where one or more concentrations are less than five times RDL.
** Comparison to BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.

BOLD*	Concentration greater than BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.
BOLD	Concentration greater than CSR Aquatic Life (AW) standard.
SHADOW	Concentration greater than CSR Irrigation Watering (IW) standard.
INVERSE	Concentration greater than CSR Livestock Watering (LW) standard.
SHADED	Concentration greater than CSR Drinking Water (DW) standard.

[a] Standard to protect freshwater aquatic life.
[b] Standard varies with crop.
[c] Standard/guideline varies with Hardness.
[d] Individual standards exist for Cr +3 and Cr +6. Reported value represents more stringent standard.
[e] Standard varies with crop, soil drainage and Mo:Cu ratio.
[f] Individual standards exist for continuous and intermittent applications on crops. Reported value denotes more stringent standard.
[g] Standard varies with soil pH. Zinc IW guideline of 1,000 mg/L (soil pH < 6) was used due to no soil pH values.
[h] Reported metals values are Total values.
[i] During Q4, the FR_GHHW well pumps were non-operational and it was not possible to collect a sample from the distribution point. Instead, the Q4 sample was collected from FR_GW_Well 2.

TABLE 4: Summary of Analytical Results compared to Primary Screening Criteria for Dissolved Metals in Groundwater

Sample Location	Sample ID	Sample Date (yyyy mm dd)	Hardness	Dissolved Metals																																
			mg/L	Aluminum µg/L	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Bismuth µg/L	Boron µg/L	Cadmium (D) µg/L	Cadmium (T) µg/L	Calcium mg/L	Chromium µg/L	Cobalt µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Lithium µg/L	Magnesium mg/L	Manganese µg/L	Mercury µg/L	Molybdenum µg/L	Nickel µg/L	Potassium mg/L	Selenium (D) µg/L	Selenium (T) µg/L	Silver µg/L	Sodium mg/L	Strontium µg/L	Thallium µg/L	Tin µg/L	Titanium µg/L	Uranium µg/L	Vanadium µg/L	Zinc[f] µg/L
BC Standard/Guideline																																				
BCWQG Aquatic Life Short-term Maximum (AW)[a]			n/a	100	n/a	5	n/a	n/a	n/a	1,200	0.862 - 2.8[c]	0.862 - 2.8[c]	n/a	1 (Cr(+6))	110	15.6 - 77.5[c]	350 (max)	131 - 1,157[c]	n/a	n/a	2,137 - 9,389[c]	n/a	2,000	n/a	n/a	2	2	0.1 - 3[c]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	74 - 568[c]
BCWQG Aquatic Life Long-term Average (AW)[a]			n/a	50	9	n/a	1,000	0.13	n/a	n/a	0.278 - 0.457[c]	0.278 - 0.457[c]	n/a	n/a	4	5.8 - 32.1[c]	n/a	8.4 - 48.5[c]	n/a	n/a	1,243 - 4,138[c]	n/a	1,000	110 - 150[c]	n/a	n/a	n/a	0.05 - 1.5[c]	n/a	n/a	0.8	n/a	n/a	8.5	n/a	49 - 542[c]
CSR Aquatic Life (AW)[a]			n/a	n/a	200	50	10,000	53	n/a	50,000	0.5 - 0.6[c]	0.5 - 0.6[c]	n/a	10[d]	40	50 - 90[c]	n/a	60 - 160[c]	n/a	n/a	n/a	1	10,000	1,100 -	n/a	10	10	0.5 - 15[c]	n/a	n/a	3	n/a	1,000	3,000	n/a	900 - 1,400[c]
CSR Irrigation Watering (IW)			n/a	5,000	n/a	100	n/a	100	n/a	500 - 6,000[b]	5	5	n/a	5[d]	50	200	5,000	200	2,500	n/a	200	1	10-30[e]	200	n/a	20[f]	20[f]	n/a	n/a	n/a	n/a	n/a	n/a	10	100	1,000 (pH<6.0)[g]
CSR Livestock Watering (LW)			n/a	5,000	n/a	25	n/a	100	n/a	5,000	80	80	1,000	50[d]	1,000	300	n/a	100	5,000	n/a	n/a	2	50	1,000	n/a	50	50	n/a	n/a	n/a	n/a	n/a	n/a	200	100	2,000
CSR Drinking Water (DW)			n/a	9,500	6	10	1,000	n/a	n/a	5,000	5	5	n/a	50	n/a	1,000	6,500	10	730	100	550	1	250	n/a	n/a	10	10	n/a	200	22,000	n/a	22,000	n/a	20	n/a	5,000
Key Area 8																																				
EV_LSgw	EV_LSGW_WG_2016-02-23_NP	2016 02 23	556	< 3.0	< 0.10	0.42	190	< 0.10	< 0.050	25	0.0128	0.0341	105	< 0.10	1.45	< 0.50	1,450	< 0.050	43.7	71.1	**1,530**	< 0.0050	3.58	5.27	2.82	0.413	0.383	< 0.010	9.99	420	0.054	< 0.10	10	1.67	< 0.50	< 3.0
	EV_LSGW_WG_2016-05-17_NP	2016 05 17	592	< 3.0	< 0.10	1.17	168	< 0.020	< 0.050	47	0.0118	0.0237	112	< 0.10	0.89	< 0.50	1,400	< 0.050	58.1	75.9	**911**	< 0.0050	3.10	4.12	3.51	0.12	0.107	< 0.010	10.5	451	0.055	< 0.10	< 10	2.34	< 0.50	< 3.0
	EV_LSGW_WG_2016-08-24_NP	2016 08 24	650	< 3.0	< 0.10	2.57	205	< 0.020	< 0.050	60	< 0.0050	0.0122	124	< 0.10	0.82	< 0.50	2,580	< 0.050	68.6	82.5	**892**	< 0.0050	3.57	4.13	4.47	0.069	0.09	< 0.050	11.8	523	0.045	< 0.10	< 10	2.09	< 0.50	< 3.0
	EV_LSGW_WG_2016-10-19_NP	2016 10 19	625	< 3.0	< 0.10	1.84	209	< 0.020	< 0.050	52	< 0.0050	0.0102	116	< 0.10	1.04	< 0.50	1,910	< 0.050	58.7	81.5	**1,030**	< 0.0050	3.08	4.34	4.44	0.083	0.08	< 0.010	12.6	480	0.047	< 0.10	< 10	1.80	< 0.50	< 3.0
EV_OCgw**	EV_OCGW_WG_2016-02-22_NP	2016 02 22	149	4.7	< 0.10	1.13	47.6	< 0.10	< 0.050	108	< 0.0050	0.0093	28.8	< 0.10	0.11	< 0.50	180	< 0.050	24.2	18.7	86.6	< 0.0050	**14.9**	< 0.50	1.63	< 0.050	< 0.050	< 0.010	44.8	382	< 0.010	< 0.10	< 10	1.18	< 0.50	< 3.0
	EV_OCGW_WG_2016-05-18_NP	2016 05 18	159	48.4	< 0.10	1.39	52.7	< 0.020	< 0.050	115	< 0.0050	0.0091	31.2	0.10	0.21	< 0.50	254	< 0.050	24.9	19.7	92.9	< 0.00050	**14.1**	< 0.50	1.64	0.685	< 0.050	< 0.010	42.2	375	< 0.010	< 0.10	< 10	1.14	< 0.50	< 3.0
	EV_OCGW_WG_2016-08-24_NP	2016 08 24	149	3.1	< 0.10	1.24	53.1	< 0.020	< 0.050	123	< 0.0050	0.0159	28.6	< 0.10	< 0.10	< 0.50	143	< 0.050	26.0	18.9	85.4	< 0.00050	**14.4**	< 0.50	1.54	< 0.050	< 0.050	< 0.010	42.9	388	< 0.010	< 0.10	< 10	1.12	< 0.50	< 3.0
	EV_OCGW_WG_2016-10-19_NP	2016 10 19	145	< 3.0	< 0.10	1.23	54.0	< 0.020	< 0.050	120	< 0.0050	0.0058	27.5	< 0.10	< 0.10	< 0.50	196	< 0.050	24.9	18.6	89.4	< 0.00050	**12.3**	< 0.50	1.62	0.07	< 0.050	< 0.010	42.5	385	< 0.010	< 0.10	< 10	1.05	< 0.50	< 3.0
	EV_MC5GW_WG_2016-10-19_NP	Duplicate	150	< 3.0	< 0.10	1.23	54.4	< 0.020	< 0.050	125	< 0.0050	< 0.0050	28.0	< 0.10	< 0.10	< 0.50	198	< 0.050	24.0	19.5	90.5	< 0.00050	**12.6**	< 0.50	1.63	0.104	< 0.050	< 0.010	45.4	379	< 0.010	< 0.10	< 10	1.04	< 0.50	< 3.0
	QA/QC RPD%		3	*	*	0	1	*	*	4	*	*	2	*	*	*	1	*	4	5	1	*	2	*	1	*	*	*	7	2	*	*	*	1	*	*
Key Area 9																																				
EV_BCgw**	EV_BCGW_WG_2016-02-22_NP	2016 02 22	667	< 3.0	0.12	0.11	46.7	< 0.10	< 0.050	17	0.0544	0.0567	160	0.14	< 0.10	< 0.50	< 10	< 0.050	33.1	64.7	< 0.10	< 0.0050	0.772	0.71	1.50	***53.2***	***59.3***	< 0.010	6.95	266	0.018	< 0.10	14	1.68	< 0.50	< 3.0
	EV_BCGW_WG_2016-05-16_NP	2016 05 16	619	< 3.0	< 0.10	0.12	44.8	< 0.020	< 0.050	16	0.0529	0.0541	149	0.13	< 0.10	< 0.50	< 10	< 0.050	29.6	60.2	< 0.10	< 0.0050	0.690	0.71	1.32	***45.3***	***42.4***	< 0.010	5.63	240	0.015	< 0.10	11	1.49	< 0.50	< 3.0
	EV_BCGW_WG_2016-08-22_NP	2016 08 22	504	< 3.0	< 0.10	0.10	42.7	< 0.020	< 0.050	16	0.0440	0.0465	122	0.12	< 0.10	< 0.50	< 10	< 0.050	26.0	48.1	0.12	< 0.0050	0.825	< 0.50	1.26	***31.9***	***31.6***	< 0.010	5.31	210	0.013	< 0.10	< 10	1.37	< 0.50	< 3.0
	EV_BCGW_WG_2016-10-18_NP	2016 10 18	449	< 3.0	0.11	0.14	38.3	< 0.020	< 0.050	15	0.0361	0.0342	107	0.10	< 0.10	< 0.50	< 10	< 0.050	24.7	44.1	< 0.10	< 0.0050	0.763	0.53	1.20	***27.4***	***25.2***	< 0.010	4.83	177	0.013	< 0.10	< 10	1.23	< 0.50	< 3.0
EV_MCgwS**	EV_MCGWS_WG_2016-02-24_NP	2016 02 24	432	< 3.0	< 0.10	1.59	21.4	< 0.10	< 0.050	28	< 0.0050	0.0251	110	< 0.10	< 0.10	< 0.50	***2,990***	< 0.050	27.4	37.9	95.0	< 0.0050	3.18	< 0.50	2.18	0.155	0.479	< 0.010	22.6	316	< 0.010	< 0.10	< 10	1.60	< 0.50	< 3.0
	EV_MCGWS_WG_2016-05-18_NP	2016 05 18	438	< 3.0	< 0.10	1.35	22.4	< 0.020	< 0.050	28	< 0.0050	0.0121	113	< 0.10	< 0.10	< 0.50	***2,610***	< 0.050	29.5	38.2	100	< 0.00050	3.73	< 0.50	2.21	< 0.050	< 0.050	< 0.010	33.1	318	< 0.010	< 0.10	< 10	1.71	< 0.50	< 3.0
	EV_MCGWS_WG_2016-08-23_NP	2016 08 23	404	< 3.0	< 0.10	1.66	19.2	< 0.020	< 0.050	28	< 0.0050	0.0179	102	< 0.10	< 0.10	< 0.50	***2,960***	< 0.050	29.2	36.5	107	< 0.00050	3.33	< 0.50	2.11	< 0.050	< 0.050	< 0.010	20.7	299	< 0.010	< 0.10	< 10	1.47	< 0.50	< 3.0
	EV_MCGWS_WG_2016-10-24_NP	2016 10 24	395	< 3.0	< 0.10	1.57	27.8	< 0.020	< 0.050	28	< 0.0050	0.0133	101	< 0.10	< 0.10	< 0.50	***2,970***	< 0.050	29.6	34.7	111	< 0.0050	4.02	0.80	2.20	< 0.050	< 0.050	< 0.050	22.7	310	< 0.010	< 0.10	< 10	1.61	< 0.50	< 3.0
EV_MCgwD**	EV_MCGWD_WG_2016-02-24_NP	2016 02 24	250	< 3.0	< 0.10	1.47	79.8	< 0.10	< 0.050	74	< 0.0050	0.295	55.7	< 0.10	0.51	< 0.50	***522***	< 0.050	7.9	26.9	**471**	< 0.0050	**10.3**	1.17	1.33	< 0.050	0.237	< 0.010	22.6	494	< 0.010	< 0.10	< 10	2.28	< 0.50	< 3.0
	EV_MCGWD_WG_2016-05-18_NP	2016 05 18	284	< 3.0	< 0.10	0.99	94.7	< 0.020	< 0.050	70	< 0.0050	0.0764	65.2	< 0.10	0.40	< 0.50	***708***	< 0.050	10.1	29.4	**527**	< 0.00050	8.19	1.25	1.64	0.071	0.083	< 0.010	33.1	500	< 0.010	< 0.10	< 10	2.24	< 0.50	< 3.0
	EV_MCGWD_WG_2016-08-23_NP	2016 08 23	270	< 3.0	< 0.10	0.69	97.2	< 0.020	< 0.050	70	< 0.0050	0.146	60.5	< 0.10	0.35	< 0.50	***608***	< 0.050	10.3	28.8	**494**	< 0.00050	8.07	1.18	1.55	0.169	0.145	< 0.010	27.6	502	< 0.010	< 0.10	< 10	2.19	< 0.50	< 3.0
	EV_MCGWD_WG_2016-10-24_NP	2016 10 24	245	< 3.0	< 0.10	0.78	89.1	0.031	< 0.050	68	< 0.0050	0.0871	54.9	< 0.10	0.43	< 0.50	***645***	< 0.050	9.3	26.2	**537**	< 0.00050	9.67	1.58	1.54	0.119	0.106	< 0.010	30.9	502	< 0.010	< 0.10	< 10	2.28	< 0.50	< 3.0
EV_BRgw	EV_BRGW_WG_2016-02-25_NP	2016 02 25	663	< 3.0	0.11	< 0.10	74.9	< 0.10	< 0.050	35	0.0788	0.107	175	0.38	< 0.10	< 0.50	45	< 0.050	57.0	55.0	5.13	< 0.0050	0.599	1.86	2.11	***30***	***27.8***	< 0.010	11.0	348	< 0.010	< 0.10	11	1.61	< 0.50	26.5
	EV_BRGW_WG_2016-05-17_NP	2016 05 17	706	< 3.0	< 0.10	< 0.10	90.2	< 0.020	< 0.050	33	0.0579	0.0610	186	< 0.10	< 0.10	< 0.50	15	< 0.050	51.8	58.6	0.63	< 0.0050	0.588	1.85	2.18	***41.9***	***37.6***	< 0.010	9.87	355	< 0.010	< 0.10	< 10	1.49	< 0.50	< 3.0
	EV_BRGW_WG_2016-08-25_NP	2016 08 25	722	< 3.0	< 0.10	< 0.10	89.0	< 0.020	< 0.050	34	0.0581	0.101	185	0.16	< 0.10	< 0.50	18	< 0.050	67.0	62.9	0.92	< 0.0050	0.583	2.06	2.47	***44.7***	***45.5***	< 0.010	10.3	370	< 0.010	< 0.10	< 10	1.59	< 0.50	< 3.0
	EV_BRGW_WG_2016-10-19_NP	2016 10 19	690	< 3.0	< 0.10	< 0.10	80.5	< 0.020	< 0.050	34	0.0539	0.197	177	0.13	< 0.10	< 0.50	22	< 0.050	54.8	60.0	2.21	< 0.0050	0.597	2.35	2.23	***32.5***	***31.3***	< 0.010	10.1	353	< 0.010	< 0.10	< 10	1.61	< 0.50	< 3.0
EV_RCgw	EV_RCSGW_WG_2016-02-25_NP	2016 02 25	1,610	< 3.0	< 0.20	< 0.20	37.4	< 0.20	< 0.10	< 20	0.205	0.213	364	< 0.20	< 0.20	< 0.50	< 20	< 0.10	61.1	**170**	1.26	< 0.0050	1.32	1.3	3.21	*238*	*228*	< 0.020	4.95	377	< 0.020	< 0.20	13	7.21	< 1.0	9.9
	EV_RCSGW_WG_2016-05-17_NP	2016 05 17	1,620	< 3.0	< 0.20	< 0.20	40.5	< 0.040	< 0.10	< 20	0.238	0.243	364	< 0.20	< 0.20	0.95	< 20	< 0.10	62.9	**173**	0.99	< 0.0050	1.28	1.3	3.45	*257*	*224*	< 0.020	8.28	394	< 0.020	< 0.20	< 10	7.49	< 1.0	9.1
	EV_RCSGW_WG_2016-08-22_NP	2016 08 22	1,530	< 3.0	< 0.20	< 0.20	39.2	< 0.040	< 0.10	< 20	0.226	0.227	338	< 0.20	< 0.20	7.06	< 20	5.03	64.0	**166**	2.57	< 0.0050	1.34	34.3	3.37	*216*	*219*	< 0.020	4.76	389	< 0.020	< 0.20	< 10	7.03	< 1.0	30.5
	EV_RCSGW_WG_2016-10-24_NP	2016 10 24	1,520	< 3.0	0.29	< 0.20	41.9	< 0.040	< 0.10	20	0.284	0.295	336	< 0.20	0.21	***123***	< 20	0.75	73.8	**166**	21.6	< 0.0050	1.21	10.7	3.83	*208*	*200*	< 0.020	7.62	405	< 0.020	< 0.20	< 10	6.59	< 1.0	187
EV_WH50gw	EV_WH50GW_WG_2016-02-25_NP	2016 02 24	294	< 3.0	0.14	0.10	96.0	< 0.10	< 0.050	< 10	0.0201	0.108	76.2	< 0.10	< 0.10	< 0.50	24	< 0.050	9.9	25.3	2.97	< 0.0050	1.21	< 0.50	0.758	***12.2***	***11.5***	< 0.010	3.53	153	< 0.010	< 0.10	< 10	1.45	< 0.50	< 3.0
	EV_WH50GW_WG_2016-05-17_NP	2016 05 17	186	< 3.0	0.19	< 0.10	60.9	< 0.020	< 0.050	< 10	0.0122	0.0715	47.8	< 0.10	< 0.10	0.53	55	< 0.050	6.9	16.1	8.60	0.0061	1.34	< 0.50	0.648	4.56	4.65	< 0.010	2.49	93.5	< 0.010	< 0.10	< 10	0.742	< 0.50	< 3.0
	EV_WH50GW_WG_2016-08-25_NP	2016 08 25	305	< 3.0	0.20	< 0.10	127	< 0.020	< 0.050	13	0.0208	0.0359	74.5	< 0.10	< 0.10	< 0.50	18	< 0.050	12.6	28.9	6.60	< 0.0050	1.35	< 0.50	1.25	***13.1***	***13.3***	< 0.010	3.33	166	< 0.010	< 0.10	< 10	1.16	< 0.50	< 3.0
	EV_WH50GW_WG_2016-10-19_NP	2016 10 19	234	< 3.0	0.19	0.12	101	< 0.020	< 0.050	11	0.0196	0.0801	59.3	0.10	< 0.10	< 0.50	< 10	< 0.050	9.6	20.8	2.94	< 0.0050	1.12	< 0.50	0.985	7.17	6.99	< 0.010	2.60	136	< 0.010	< 0.10	< 10	0.892	< 0.50	< 3.0
RG DW-03-01[h]	RG_03-01_WP_2016-05-19_NP	2016 05 19	420	-	-	-	-	-	-	-	-	0.0640	112	-	-	-	-	-	-	34.1	-	-	-	-	1.97	0.106	0.095	-	14.5	-	-	-	-	-	-
	RG_03-01_WP_2016-09-21_NP	2016 09 21	440	-	-	-	-	-	-	-	-	0.0602	113	-	-	-	-	-	-	38.3	-	-	-	-	2.25	0.124	0.138	-	14.4	-	-	-	-	-	-
	RG_03-01_WP_2016-12-12_NP	2016 12 12	481	-	-	-	-	-	-	-	-	0.0674	137	-	-	-	-	-	-	33.9	-	-	-	-	1.95	0.182	0.178	-	14	-	-	-	-	-	-
Key Area 10																																				
EV_ECgw	EV_ECGW_WG_2016-05-18_NP	2016 05 18	191	23.4	0.23	0.39	48.4	< 0.020	< 0.050	107	< 0.0050	0.164	44.1	< 0.10	0.42	< 0.50	14	< 0.050	10.9	19.6	182	< 0.0050	**13.0**	1.27	0.988	0.18	0.274	< 0.010	23.6	433	0.055	< 0.10	< 10	1.49	< 0.50	< 3.0
	EV_ECGW_WG_2016-08-24_NP	2016 08 24	177	< 3.0	0.11	0.42	48.1	< 0.020	< 0.050	117	0.0529	0.105	39.7	< 0.10	0.36	< 0.50	< 10	< 0.050	11.2	18.9	197	< 0.0050	**13.5**	1.50	1.34	0.137	0.164	< 0.010	25.0	443	0.082	0.23	< 10	1.44	< 0.50	7.7
	EV_ECGW_WG_2016-10-19_NP	2016 10 19	176	< 3.0	< 0.10	0.43	55.0	< 0.020	< 0.050	117	0.0148	0.0595	38.5	< 0.10	0.32	< 0.50	< 10	< 0.050	10.5	19.3	194	< 0.0050	**13.4**	1.23	1.10	< 0.050	0.119	< 0.010	27.4	425	0.043	< 0.10	< 10	1.37	< 0.50	< 3.0

Data provided by Teck Coal, associated lab reports available upon request.
All terms defined within the body of SNC-Lavalin's report.
< Denotes concentration less than indicated detection limit or RPD less than indicated value.
\- Denotes analysis not conducted.
n/a Denotes no applicable standard/guideline.
* RPDs are not calculated where one or more concentrations are less than five times RDL.
** Comparison to BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.

BOLD*	Concentration greater than BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.
BOLD	Concentration greater than CSR Aquatic Life (AW) standard.
SHADOW	Concentration greater than CSR Irrigation Watering (IW) standard.
INVERSE	Concentration greater than CSR Livestock Watering (LW) standard.
SHADED	Concentration greater than CSR Drinking Water (DW) standard.

[a] Standard to protect freshwater aquatic life.
[b] Standard varies with crop.
[c] Standard/guideline varies with Hardness.
[d] Individual standards exist for Cr +3 and Cr +6. Reported value represents more stringent standard.
[e] Standard varies with crop, soil drainage and Mo:Cu ratio.
[f] Individual standards exist for continuous and intermittent applications on crops. Reported value denotes more stringent standard.
[g] Standard varies with soil pH. Zinc IW guideline of 1,000 mg/L (soil pH < 6) was used due to no soil pH values.
[h] Reported metals values are Total values.
[i] During Q4, the FR_GHHW well pumps were non-operational and it was not possible to collect a sample from the distribution point. Instead, the Q4 sample was collected from FR_GW_Well 2.

TABLE 4: Summary of Analytical Results compared to Primary Screening Criteria for Dissolved Metals in Groundwater

Sample Location	Sample ID	Sample Date (yyyy mm dd)	Hardness	Dissolved Metals																																		
			mg/L	Aluminum µg/L	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Bismuth µg/L	Boron µg/L	Cadmium (D) µg/L	Cadmium (T) µg/L	Calcium mg/L	Chromium µg/L	Cobalt µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Lithium µg/L	Magnesium mg/L	Manganese µg/L	Mercury µg/L	Molybdenum µg/L	Nickel µg/L	Potassium mg/L	Selenium (D) µg/L	Selenium (T) µg/L	Silver µg/L	Sodium mg/L	Strontium µg/L	Thallium µg/L	Tin µg/L	Titanium µg/L	Uranium µg/L	Vanadium µg/L	Zinc[f] µg/L
BC Standard/Guideline																																						
BCWQG Aquatic Life Short-term Maximum (AW)[a]			n/a	100	n/a	5	n/a	n/a	n/a	1,200	0.862 - 2.8[c]	0.862 - 2.8[c]	n/a	1 (Cr(+6))	110	15.6 - 77.5[c]	350 (max)	131 - 1,157[c]	n/a	n/a	2,137 - 9,389[c]	n/a	2,000	n/a	n/a	2	2	0.1 - 3[c]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	74 - 568[c]
BCWQG Aquatic Life Long-term Average (AW)[a]			n/a	50	9	n/a	1,000	0.13	n/a	n/a	0.278 - 0.457[c]	0.278 - 0.457[c]	n/a	n/a	4	5.8 - 32.1[c]	n/a	8.4 - 48.5[c]	n/a	n/a	1,243 - 4,138[c]	n/a	1,000	110 - 150[c]	n/a	n/a	n/a	0.05 - 1.5[c]	n/a	n/a	0.8	n/a	n/a	8.5	n/a	49 - 542[c]
CSR Aquatic Life (AW)[a]			n/a	n/a	200	50	10,000	53	n/a	50,000	0.5 - 0.6[c]	0.5 - 0.6[c]	n/a	10[d]	40	50 - 90[c]	n/a	60 - 160[c]	n/a	n/a	n/a	1	10,000	1,100 -	n/a	10	10	0.5 - 15[c]	n/a	n/a	3	n/a	1,000	3,000	n/a	900 - 1,400[c]
CSR Irrigation Watering (IW)			n/a	5,000	n/a	100	n/a	100	n/a	500 - 6,000[b]	5	5	n/a	5[d]	50	200	5,000	200	2,500	n/a	200	1	10-30[e]	200	n/a	20[f]	20[f]	n/a	n/a	n/a	n/a	n/a	n/a	10	100	1,000 (pH<6.0)[g]
CSR Livestock Watering (LW)			n/a	5,000	n/a	25	n/a	100	n/a	5,000	80	80	1,000	50[d]	1,000	300	n/a	100	5,000	n/a	n/a	2	50	1,000	n/a	50	50	n/a	n/a	n/a	n/a	n/a	n/a	200	100	2,000
CSR Drinking Water (DW)			n/a	9,500	6	10	1,000	n/a	n/a	5,000	5	5	n/a	50	n/a	1,000	6,500	10	730	100	550	1	250	n/a	n/a	10	10	n/a	200	22,000	n/a	22,000	n/a	20	n/a	5,000
Key Area 11																																						
CM_MW1-DP	CM_MW1-DP_WG_Q1_N	2016 03 10	149	3.1	0.21	2.54	**5,320**	< 0.020	< 0.050	236	< 0.0050	0.0275	32.6	< 0.10	0.91	< 0.20	417	< 0.050	653	16.4	**281**	< 0.0050	6.38	< 0.50	5.70	0.223	0.062	< 0.010	**213**	1,890	< 0.010	0.26	< 0.30	1.14	< 0.50	2.4
	CM_MW1-DP_WG_Q2_N	2016 06 17	160	3.4	0.21	2.56	**5,760**	< 0.020	< 0.050	255	< 0.0050	0.0056	33.8	< 0.10	1.07	< 0.20	126	< 0.050	625	18.3	**313**	< 0.0050	7.51	0.60	5.97	0.374	0.065	< 0.010	**244**	1,960	< 0.010	< 0.10	< 10	1.11	< 0.50	4.3
	CM_MW1-DP_WG_Q3_N	2016 09 07	136	6.7	< 0.50	2.45	**6,120**	< 0.10	< 0.25	233	< 0.025	< 0.025	28.6	< 0.50	0.93	3.2	529	< 0.25	716	15.6	**250**	< 0.0050	6.08	< 2.5	4.95	< 0.25	< 0.25	< 0.050	**214**	2,020	< 0.050	< 0.50	< 1.5	0.988	< 2.5	< 5.0
	CM_MW1-DP_WG_Q4_N	2016 12 05	152	4	0.15	2.01	**6,480**	< 0.020	< 0.050	223	< 0.0050	-	32.5	< 0.10	1.11	< 0.20	18	< 0.050	717	17.2	**262**	< 0.0050	6.2	0.88	4.74	0.054	-	< 0.010	**236**	2,170	< 0.010	< 0.10	< 0.30	1.22	< 0.50	3.6
CM MW1-OB	CM_MW1-OB_WG_Q1_N	2016 03 10	575	2.0	< 0.10	0.10	86.4	< 0.020	< 0.050	29	0.0685	0.0654	155	0.21	< 0.10	< 0.20	< 10	< 0.050	23.0	45.8	0.92	< 0.0050	0.412	0.82	1.53	4.1	3.92	< 0.010	41.2	346	0.017	< 0.10	< 0.30	1.18	< 0.50	1.4
	CM_MW1-OB_WG_Q2_N	2016 06 16	504	1.5	< 0.10	0.19	89.1	< 0.020	< 0.050	37	0.0570	0.0602	135	0.35	< 0.10	0.33	< 10	< 0.050	17.5	40.7	1.04	< 0.0050	0.371	0.59	1.77	4.73	3.38	< 0.010	43.8	336	0.019	< 0.10	< 10	1.18	< 0.50	1.7
	CM_NNP_WG_Q2_N	Duplicate	519	-	-	-	-	-	-	-	-	0.0566	138	-	-	-	-	-	-	42.1	-	-	-	-	1.89	-	3.26	-	45.7	-	-	-	-	-	-	-	-
	QA/QC RPD%		3	*	*	*	*	*	*	*	*	6	2	*	*	*	*	*	*	3	*	*	*	*	7	*	4	*	4	*	*	*	*	*	*	*	*
	CM_MW1-OB_WG_Q3_N	2016 09 07	447	< 5.0	< 0.50	< 0.50	93.4	< 0.10	< 0.25	< 50	0.057	0.050	118	< 0.50	< 0.50	1.2	< 50	< 0.25	16.7	36.9	0.76	< 0.0050	0.43	< 2.5	1.80	2.36	2.22	< 0.050	33.0	308	< 0.050	< 0.50	< 1.5	1.05	< 2.5	< 5.0
	CM_MW1-OB_WG_Q4_N	2016 12 05	496	1.8	0.10	0.12	81.7	< 0.020	< 0.050	34	0.0588	-	134	0.39	< 0.10	< 0.20	< 10	< 0.050	25.5	38.8	0.58	< 0.0050	0.274	< 0.50	1.50	2.49	-	< 0.010	39.4	326	0.020	< 0.10	< 0.30	1.23	< 0.50	1.6
	CM_NNP_WG_Q4_N	Duplicate	484	1.4	< 0.10	0.13	81.9	< 0.020	< 0.050	35	0.0613	-	131	0.38	< 0.10	< 0.20	< 10	< 0.050	26.3	38.2	0.55	< 0.0050	0.284	< 0.50	1.50	2.49	-	< 0.010	38.6	316	0.020	< 0.10	< 0.30	1.21	< 0.50	1.8
	QA/QC RPD%		2	*	*	*	0	*	*	*	4	-	2	*	*	*	*	*	3	2	5	*	4	*	0	0	-	*	2	3	*	*	*	2	*	*
CM_MW1-SH	CM_MW1-SH_WG_Q1_N	2016 03 10	160	2.5	< 0.10	1.43	446	< 0.020	< 0.050	68	0.0102	0.0150	41.3	< 0.10	0.59	< 0.20	360	< 0.050	25.1	13.9	**278**	< 0.0050	**36.5**	0.65	2.12	0.08	< 0.050	< 0.010	**201**	396	< 0.010	< 0.10	< 0.30	1.05	< 0.50	4.5
	CM_MW1-SH_WG_Q2_N	2016 06 16	142	2.4	< 0.10	1.71	388	< 0.020	< 0.050	63	0.0150	0.0218	33.6	< 0.10	0.54	< 0.20	486	< 0.050	25.5	14.2	**305**	< 0.0050	**59.7**	< 0.50	2.26	0.102	< 0.050	< 0.010	**201**	396	< 0.010	< 0.10	< 10	1.13	< 0.50	1.8
	CM_MW1-SH_WG_Q2_NP	2016 06 22	208	6.9	< 0.10	1.27	327	< 0.020	< 0.050	57	0.0141	0.315	26.3	< 0.10	0.46	< 0.50	< 10	< 0.050	24.8	10.7	197	< 0.0050	**72.7**	0.76	1.72	0.054	0.257	< 0.010	191	297	0.025	< 0.10	< 10	1.14	< 0.50	3.1
	CM_MW1-SH_WG_Q3_N	2016 09 07	147	5.5	< 0.50	1.61	288	< 0.10	< 0.25	66	< 0.025	0.034	37.6	< 0.50	< 0.50	1.9	385	< 0.25	16.5	12.8	**210**	< 0.0050	**48.7**	< 2.5	1.51	0.26	< 0.25	< 0.050	141	329	< 0.050	< 0.50	< 1.5	1.21	< 2.5	< 5.0
	CM_MW1-SH_WG_Q4_N	2016 12 05	151	2.8	< 0.10	1.62	302	< 0.020	< 0.050	62	< 0.0050	-	36.8	< 0.10	0.53	< 0.20	285	< 0.050	16.7	14.5	**260**	< 0.0050	**52.6**	2.11	1.72	< 0.050	-	< 0.010	154	361	0.010	< 0.10	< 0.30	1.35	< 0.50	1.3
RG DW-07-01[h]	RG_07-01_WP_2016-05-20_NP	2016 05 20	700	-	-	-	-	-	-	-	-	0.071	169	-	-	-	-	-	-	67.6	-	-	-	-	2.12	8.61	8.55	-	24.5	-	-	-	-	-	-
	RG_07-01_WP_2016-06-28_NP	2016 06 28	754	-	-	-	-	-	-	-	-	0.0512	183	-	-	-	-	-	-	72.1	-	-	-	-	2.25	6.88	6.81	-	27.5	-	-	-	-	-	-
	RG_07-01_WP_2016-09-12_NP	2016 09 12	867	-	-	-	-	-	-	-	-	0.0528	206	-	-	-	-	-	-	85.8	-	-	-	-	2.69	9.82	9.16	-	27	-	-	-	-	-	-
	RG_07-01_WP_2016-12-14_NP	2016 12 14	762	-	-	-	-	-	-	-	-	0.0271	187	-	-	-	-	-	-	71.9	-	-	-	-	2.23	5.96	6.49	-	29.8	-	-	-	-	-	-
Key Area 12																																						
EV_ER1gwS	EV_ER1GWS_WG_2016-02-24_NP	2016 02 24	288	< 3.0	< 0.10	0.11	98.1	< 0.10	< 0.050	< 10	0.0096	0.0094	77.3	0.25	< 0.10	< 0.50	< 10	< 0.050	7.0	23.1	< 0.10	< 0.0050	1.18	< 0.50	0.618	***10.1***	10	< 0.010	4.03	210	< 0.010	< 0.10	< 10	1.25	< 0.50	< 3.0
	EV_ER1GWS_WG_2016-05-18_NP	2016 05 18	209	< 3.0	< 0.10	0.11	85.4	< 0.020	< 0.050	< 10	0.0081	0.0072	56.4	0.18	< 0.10	< 0.50	< 10	< 0.050	7.3	16.5	< 0.10	< 0.0050	1.17	< 0.50	0.664	6.49	6.18	< 0.010	3.08	156	< 0.010	< 0.10	< 10	0.827	< 0.50	< 3.0
	EV_MC5GW_WG_2016-05-18_NP	Duplicate	218	< 3.0	< 0.10	0.11	85.6	< 0.020	< 0.050	< 10	0.0079	0.0062	59.0	0.19	< 0.10	< 0.50	< 10	< 0.050	7.3	17.1	< 0.10	< 0.0050	1.15	< 0.50	0.645	6.46	6.27	< 0.010	3.03	156	< 0.010	< 0.10	< 10	0.821	< 0.50	< 3.0
	QA/QC RPD%		4	*	*	*	< 1	*	*	*	*	*	5	*	*	*	*	*	0	4	*	*	2	*	3	< 1	1	*	2	0	*	*	*	1	*	*
	EV_ER1GWS_WG_2016-08-23_NP	2016 08 23	225	< 3.0	< 0.10	0.15	100	< 0.020	< 0.050	< 10	0.0091	0.0106	59.5	0.21	< 0.10	< 0.50	< 10	< 0.050	8.8	18.5	< 0.10	< 0.0050	1.51	< 0.50	0.763	8.39	7.9	< 0.010	2.10	186	< 0.010	< 0.10	< 10	1.08	< 0.50	< 3.0
	EV_ER1GWS_WG_2016-10-18_NP	2016 10 18	235	< 3.0	0.11	0.15	97.2	< 0.020	< 0.050	< 10	0.0083	0.0105	61.8	0.22	< 0.10	< 0.50	< 10	< 0.050	7.3	19.5	< 0.10	< 0.0050	1.42	< 0.50	0.713	9.04	8.34	< 0.010	2.35	188	< 0.010	< 0.10	< 10	1.12	< 0.50	< 3.0
EV_ER1gwD	EV_ER1GWD_WG_2016-02-24_NP	2016 02 24	275	9.6	< 0.10	0.11	75.3	< 0.10	< 0.050	< 10	< 0.0050	0.0138	73.2	0.25	< 0.10	< 0.50	< 10	< 0.050	6.2	22.4	0.53	< 0.0050	1.26	< 0.50	0.563	9.88	9.29	< 0.010	3.10	211	< 0.010	< 0.10	< 10	1.45	< 0.50	< 3.0
	EV_ER1GWD_WG_2016-05-18_NP	2016 05 18	225	11.8	< 0.10	0.11	70.3	< 0.020	< 0.050	< 10	< 0.0050	< 0.0050	60.1	0.27	< 0.10	< 0.50	< 10	< 0.050	7.1	18.2	3.08	< 0.0050	1.45	< 0.50	0.595	5.71	5.16	< 0.010	2.42	169	< 0.010	< 0.10	< 10	1.03	< 0.50	< 3.0
	EV_ER1GWD_WG_2016-08-23_NP	2016 08 23	228	15.0	< 0.10	0.14	87.2	< 0.020	< 0.050	< 10	< 0.0050	0.0640	60.2	0.27	< 0.10	< 0.50	< 10	< 0.050	8.5	18.9	25.0	< 0.0050	1.56	< 0.50	0.731	6.86	6.41	< 0.010	2.31	191	< 0.010	< 0.10	< 10	1.17	< 0.50	< 3.0
	EV_ER1GWD_WG_2016-10-18_NP	2016 10 18	237	13.9	< 0.10	0.13	85.4	< 0.020	< 0.050	< 10	< 0.0050	0.0128	63.4	0.26	< 0.10	< 0.50	< 10	< 0.050	7.3	19.2	5.10	< 0.0050	1.49	< 0.50	0.723	6.77	6.24	< 0.010	2.47	198	< 0.010	< 0.10	< 10	1.25	< 0.50	< 3.0
RG DW-03-04 WP[h]	WELL PUMP #3 (RAW WATER), WELL START UP	2016 03 09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**11.8**	-	-	-	-	-	-	-	-	-
	WELL PUMP #3 (RAW WATER)	2016 04 05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**11.6**	-	-	-	-	-	-	-	-	-
	WELL PUMP #3 (RAW WATER)	2016 05 03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**10.4**	-	-	-	-	-	-	-	-	-
	WELL PUMP #3	2016 06 01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.75	-	-	-	-	-	-	-	-	-
	WELL PUMP #3 (RAW WATER)	2016 07 05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.66	-	-	-	-	-	-	-	-	-
	WELL PUMP #3	2016 08 03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.93	-	-	-	-	-	-	-	-	-
	WELL PUMP #3 (RAW WATER)	2016 09 07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.04	-	-	-	-	-	-	-	-	-
	WELL PUMP #3 (RAW WATER)	2016 10 04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**10.7**	-	-	-	-	-	-	-	-	-
	WELL PUMP #3	2016 11 02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**10.1**	-	-	-	-	-	-	-	-	-
	RG_03-04_WP_2016-12-13_NP	2016 12 13	251	-	-	-	-	-	-	-	-	0.0101	66.7	-	-	-	-	-	-	20.4	-	-	-	-	0.916	6.65	6.21	-	6.29	-	-	-	-	-	-

Data provided by Teck Coal, associated lab reports available upon request.
All terms defined within the body of SNC-Lavalin's report.
< Denotes concentration less than indicated detection limit or RPD less than indicated value.
- Denotes analysis not conducted.
n/a Denotes no applicable standard/guideline.
* RPDs are not calculated where one or more concentrations are less than five times RDL.
** Comparison to BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.

BOLD*	Concentration greater than BCWQG Aquatic Life (AW) Short-term Maximum and/or Long-term Average guideline.
BOLD	Concentration greater than CSR Aquatic Life (AW) standard.
SHADOW	Concentration greater than CSR Irrigation Watering (IW) standard.
INVERSE	Concentration greater than CSR Livestock Watering (LW) standard.
SHADED	Concentration greater than CSR Drinking Water (DW) standard.

[a] Standard to protect freshwater aquatic life.
[b] Standard varies with crop.
[c] Standard/guideline varies with Hardness.
[d] Individual standards exist for Cr +3 and Cr +6. Reported value represents more stringent standard.
[e] Standard varies with crop, soil drainage and Mo:Cu ratio.
[f] Individual standards exist for continuous and intermittent applications on crops. Reported value denotes more stringent standard.
[g] Standard varies with soil pH. Zinc IW guideline of 1,000 mg/L (soil pH < 6) was used due to no soil pH values.
[h] Reported metals values are Total values.
[i] During Q4, the FR_GHHW well pumps were non-operational and it was not possible to collect a sample from the distribution point. Instead, the Q4 sample was collected from FR_GW_Well 2.

TABLE 5: Summary of Analytical Results compared to Secondary Screening Criteria for Constituents of Interest

Sample Location	Sample ID	Sample Date (yyyy mm dd)	SPO	Compliance Point	Dissolved Selenium µg/L	Total Selenium µg/L
Groundwater Quality Benchmarks						
Guidelines for Canadian Drinking Water Quality (DW)					50	50
SPO		Elk River [GH_ER1 (E206661)/EV_ER1 (0200393)]			19	19
		Fording River [GH_FR1 (0200378)]			63	63
Compliance Point		Fording River [FR_FRCP1 (E300071)]			130	130
		Fording River [FH_FR1 (0200378)]			80	80
		Elk River [GH_ERC (E300090)]			15	15
		Michel Creek [EV_MC2 (E300091)]			28	28
Key Area 1						
FR_09-01-A	FR_09-01-A_QSW_04012016_N	2016 01 25	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***66.1***	***59.5***
	FD_QSW_04012016_001	Duplicate	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***66.3***	***58.3***
	QA/QC RPD%				< 1	2
	FR_09-01-A-WG-201606141205	2016 06 14	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***76.1***	***77.1***
	FR_DC1-WG-201606141205	Duplicate	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***77.5***	***77.5***
	QA/QC RPD%				2	1
	FR_09-01-A_QSW_04072016_N	2016 08 17	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***85.7***	***83.7***
	FR_09-01-A_QSW_03102016_N	2016 11 24	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***159***	***137***
FR_09-01-B	FR_09-01-B_QSW_04012016_N	2016 01 25	GH_FR1 (0200378)	FR_FRCP1 (E300071)	42.6	37.8
	FR_09-01-B-WG-201606141245	2016 06 14	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***79.9***	***80.5***
	FR_09-01-B_QSW_04072016_N	2016 08 17	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***58.9***	***60.2***
	FR_09-01-B_QSW_03102016_N	2016 11 24	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***117***	***106***
FR_GHHW	FR_GHHW_QSW_04012016_N	2016 01 25	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***137***	***123***
	FR_GHHW_QSW_04042016_N	2016 05 18	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***160***	***152***
	FR_GHHW_QSW_04072016_N	2016 08 17	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***91***	***95.4***
FR_GH WELL 2	FR_GH WELL 2-20161020	2016 10 20	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***108***	***109***
	FR_DC1-20161020	Duplicate	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***110***	***103***
	QA/QC RPD%				2	6
	FR_GH WELL 2-20161021	2016 10 21	GH_FR1 (0200378)	FR_FRCP1 (E300071)	***108***	***103***
Key Area 3						
GH_POTW17**	GH_POTW17_WG_2016-03-07_N	2016 03 07	GH_FR1 (0200378)	GH_FR1 (0200378)	5.76	5.39
	GH_POTW17_WG_2016-06-14_NP	2016 06 14	GH_FR1 (0200378)	GH_FR1 (0200378)	7.71	7.66
	GH_POTW17_WG_2016-08-15_NP	2016 08 16	GH_FR1 (0200378)	GH_FR1 (0200378)	7.98	7.66
	GH_POTW17_WG_2016-11-17_NP	2016 11 17	GH_FR1 (0200378)	GH_FR1 (0200378)	5.41	5.2
	GH_POTW17_WG_2016-11-17_FD	Duplicate	GH_FR1 (0200378)	GH_FR1 (0200378)	5.1	5.23
	QA/QC RPD%				6	1
Key Area 4						
GH_GA-MW-2	GH_GA_MW-2_WG_2016-03-22_NP	2016 03 22	GH_ER1 (E206661)	GH_ERC (E3000090)	13.5	12.5
	GH_GA-MW-2_WG_2016-06-14_NP	2016 06 14	GH_ER1 (E206661)	GH_ERC (E3000090)	5.7	5.34
	GH_GA-MW-2_WG_2016-08-15_NP	2016 08 15	GH_ER1 (E206661)	GH_ERC (E3000090)	10.4	9.39
	GH_GA-MW-2_WG_2016-11-14_NP	2016 11 14	GH_ER1 (E206661)	GH_ERC (E3000090)	**17.9**	**17.9**
GH_GA-MW-3	GH_GA_MW-3_WG_2016-03-22_NP	2016 03 22	GH_ER1 (E206661)	GH_ERC (E3000090)	11.3	7.69
	GH_GA-MW-3_WG_2016-06-14_NP	2016 06 14	GH_ER1 (E206661)	GH_ERC (E3000090)	0.783	2.05
	GH_GA-MW-3_WG_2016-08-15_NP	2016 08 15	GH_ER1 (E206661)	GH_ERC (E3000090)	0.972	< 0.050
	GH_GA-MW-3_WG_2016-11-14_NP	2016 11 14	GH_ER1 (E206661)	GH_ERC (E3000090)	1.03	< 0.050
Key Area 7						
RG_DW-02-20[h]	RG_02-20_WP_2016-06-01_NP	2016 06 01	EV_ER1 (0200393)	n/a	12.9	12.6
	RG_02-20_WP_2016-06-28_NP	2016 06 28	EV_ER1 (0200393)	n/a	11.5	11.2
	RG_02-20_WP_2016-09-14_NP	2016 09 14	EV_ER1 (0200393)	n/a	8.58	7.43
	RG_02-20_WP_2016-12-12_NP	2016 12 12	EV_ER1 (0200393)	n/a	8.57	8.54
Key Area 9						
EV_BCgw**	EV_BCGW_WG_2016-02-22_NP	2016 02 22	EV_ER1 (0200393)	EV_MC2 (E3000091)	***53.2***	***59.3***
	EV_BCGW_WG_2016-05-16_NP	2016 05 16	EV_ER1 (0200393)	EV_MC2 (E3000091)	**45.3**	**42.4**
	EV_BCGW_WG_2016-08-22_NP	2016 08 22	EV_ER1 (0200393)	EV_MC2 (E3000091)	**31.9**	**31.6**
	EV_BCGW_WG_2016-10-18_NP	2016 10 18	EV_ER1 (0200393)	EV_MC2 (E3000091)	**27.4**	**25.2**
EV_BRgw	EV_BRGW_WG_2016-02-25_NP	2016 02 25	EV_ER1 (0200393)	EV_MC2 (E3000091)	**30**	**27.8**
	EV_BRGW_WG_2016-05-17_NP	2016 05 17	EV_ER1 (0200393)	EV_MC2 (E3000091)	**41.9**	**37.6**
	EV_BRGW_WG_2016-08-25_NP	2016 08 25	EV_ER1 (0200393)	EV_MC2 (E3000091)	**44.7**	**45.5**
	EV_BRGW_WG_2016-10-19_NP	2016 10 19	EV_ER1 (0200393)	EV_MC2 (E3000091)	**32.5**	**31.3**
EV_RCgw	EV_RCSGW_WG_2016-02-25_NP	2016 02 25	EV_ER1 (0200393)	EV_MC2 (E3000091)	***238***	***228***
	EV_RCSGW_WG_2016-05-17_NP	2016 05 17	EV_ER1 (0200393)	EV_MC2 (E3000091)	***237***	***224***
	EV_RCSGW_WG_2016-08-22_NP	2016 08 22	EV_ER1 (0200393)	EV_MC2 (E3000091)	***216***	***219***
	EV_RCSGW_WG_2016-10-24_NP	2016 10 24	EV_ER1 (0200393)	EV_MC2 (E3000091)	***208***	***200***
EV_WH50gw	EV_WH50GW_WG_2016-02-25_NP	2016 02 24	EV_ER1 (0200393)	EV_MC2 (E3000091)	12.2	11.5
	EV_WH50GW_WG_2016-05-17_NP	2016 05 17	EV_ER1 (0200393)	EV_MC2 (E3000091)	4.56	4.65
	EV_WH50GW_WG_2016-08-25_NP	2016 08 25	EV_ER1 (0200393)	EV_MC2 (E3000091)	13.1	13.3
	EV_WH50GW_WG_2016-10-19_NP	2016 10 19	EV_ER1 (0200393)	EV_MC2 (E3000091)	7.17	6.99
Key Area 12						
EV_ER1gwS	EV_ER1GWS_WG_2016-02-24_NP	2016 02 24	EV_ER1 (0200393)	n/a	10.1	10
	EV_ER1GWS_WG_2016-05-18_NP	2016 05 18	EV_ER1 (0200393)	n/a	6.49	6.18
	EV_MC5GW_WG_2016-05-18_NP	Duplicate	EV_ER1 (0200393)	n/a	6.46	6.27
	QA/QC RPD%				< 1	1
	EV_ER1GWS_WG_2016-08-23_NP	2016 08 23	EV_ER1 (0200393)	n/a	8.39	7.9
	EV_ER1GWS_WG_2016-08-23_NP_2	Duplicate	EV_ER1 (0200393)	n/a	3.44	3.07
	QA/QC RPD%				84	88
	EV_ER1GWS_WG_2016-10-18_NP	2016 10 18	EV_ER1 (0200393)	n/a	9.04	8.34
	EV_ER1GWS_WG_2016-10-18_NP_2	Duplicate	EV_ER1 (0200393)	n/a	2.7	2.55
	QA/QC RPD%				108	106
RG_DW-03-04_WP	VELL PUMP #3 (RAW WATER), WELL START U	2016 03 09	EV_ER1 (0200393)	n/a	-	11.8
	WELL PUMP #3 (RAW WATER)	2016 04 05	EV_ER1 (0200393)	n/a	-	11.6
	WELL PUMP #3 (RAW WATER)	2016 05 03	EV_ER1 (0200393)	n/a	-	10.4
	WELL PUMP #3 (RAW WATER)	2016 10 04	EV_ER1 (0200393)	n/a	-	10.7
	WELL PUMP #3	2016 11 02	EV_ER1 (0200393)	n/a	-	10.1

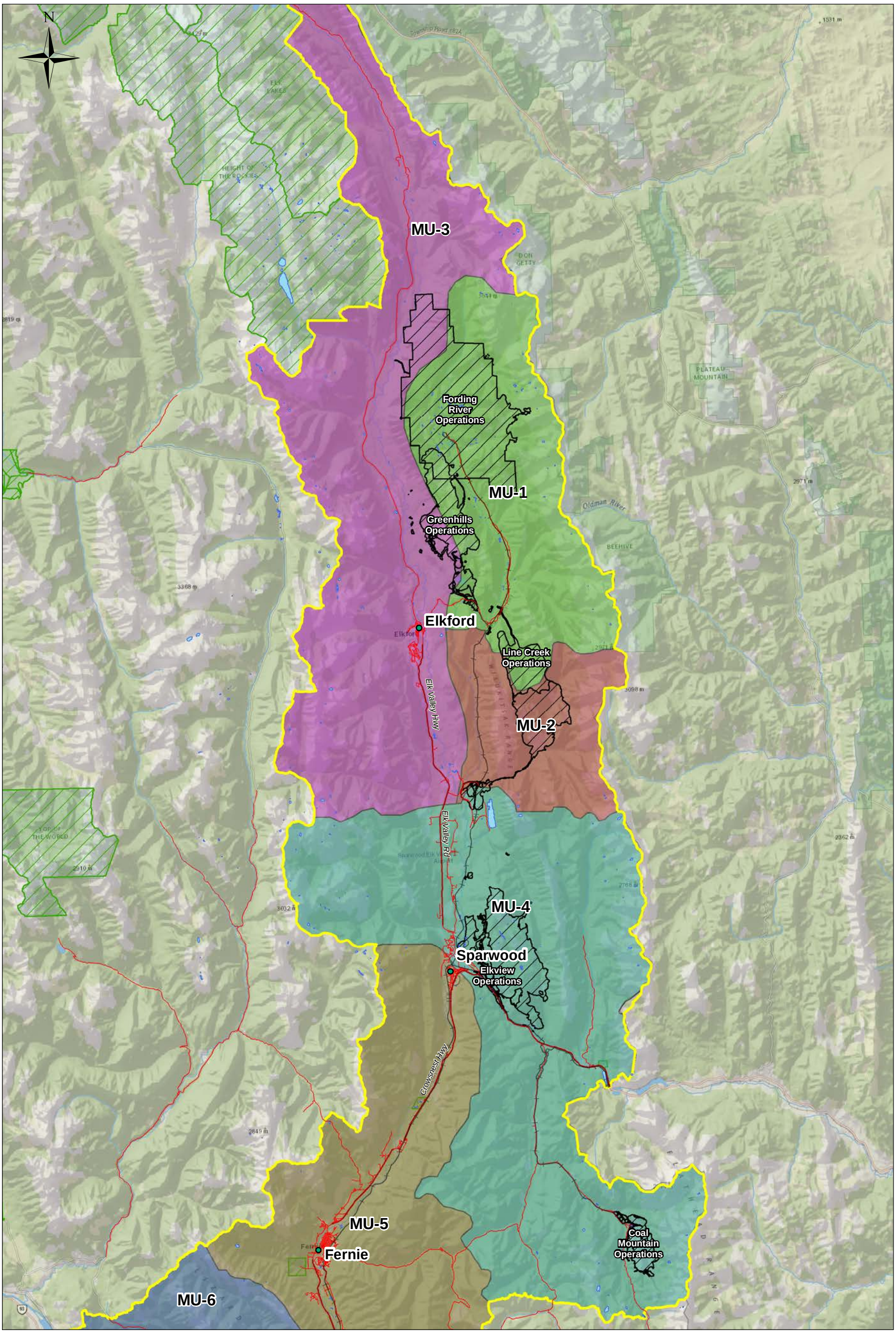
Data provided by Teck Coal, associated lab reports available upon request.
All terms defined within the body of SNC-Lavalin's report.
< Denotes concentration less than indicated detection limit or RPD less than indicated value.
- Denotes analysis not conducted.
* RPDs are not calculated where one or more concentrations are less than five times RDL.

BOLD	Concentration greater than or equal to Canadian Drinking Water Quality Drinking Water (DW) guideline.
SHADOW	Concentration greater than SPO by Area.
SHADED	Concentration greater than Compliance Point by Area.

[a] During Q4, the FR_GHHW well pumps were non-operational and it was not possible to collect a sample from the distribution point. Instead, the Q4 sample was collected from FR_GW_Well 2.

Drawings

- 635544-101: Site Location and Management Units
- 635544-102: Key Areas 1 to 4 and Sample Location Plan
- 635544-103: Key Areas 5 – 7 and Sample Location Plan
- 635544-104: Key Areas 8 – 10 and 12 and Sample Location Plan
- 635544-105: Key Area 11 and Sample Location Plan
- 635544-106: Surficial Geology - North Half of Study Area
- Key Area and Sample Location Plan:
- 635544-107: Surficial Geology - South Half of Study Area
- 635544-108: Bedrock Geology - North Half of Study Area
- 635544-109: Bedrock Geology - South Half of Study Area
- 635544-110: Inferred Geological Cross Section A-A’
- 635544-111: Inferred Geological Cross Section B-B’
- 635544-112: Inferred Geological Cross Section C-C’
- 635544-113: Inferred Geological Cross Section D-D’
- 635544-114: Inferred Geological Cross Section E-E’
- 635544-115: Groundwater Elevations from Q4 and Conceptual Regional Groundwater Flow - North Half of Study Area
- 635544-116: Groundwater Elevations from Q4 and Conceptual Regional Groundwater Flow - South Half of Study Area
- 635544-117: Spatial Distribution of Selected Groundwater Analytical Data - Key Areas 1 to 4
- 635544-118: Spatial Distribution of Selected Groundwater Analytical Data - Key Areas 5 – 7
- 635544-119: Spatial Distribution of Selected Groundwater Analytical Data - Key Areas 8 – 10 and 12
- 635544-120: Spatial Distribution of Selected Groundwater Analytical Data - Key Area 11



Legend

- Rails
- Highway
- Secondary Road
- Surface Water
- Mine Permitted Areas
- Provincial Park
- Elk Valley Area-Based Management Plan Boundary

Management Units

- MU-1
- MU-2
- MU-3
- MU-4
- MU-5
- MU-6

Notes:
1. Original in colour.
2. Site location is approximate.

References:
1. Service Layer Credits: Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Revisons:
0 - AO -2017-04-25 - CHECK PRINT -LH
0 - AO -2017-05-16 - FINAL -LH

0 2 4 8 12 16 20 km

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

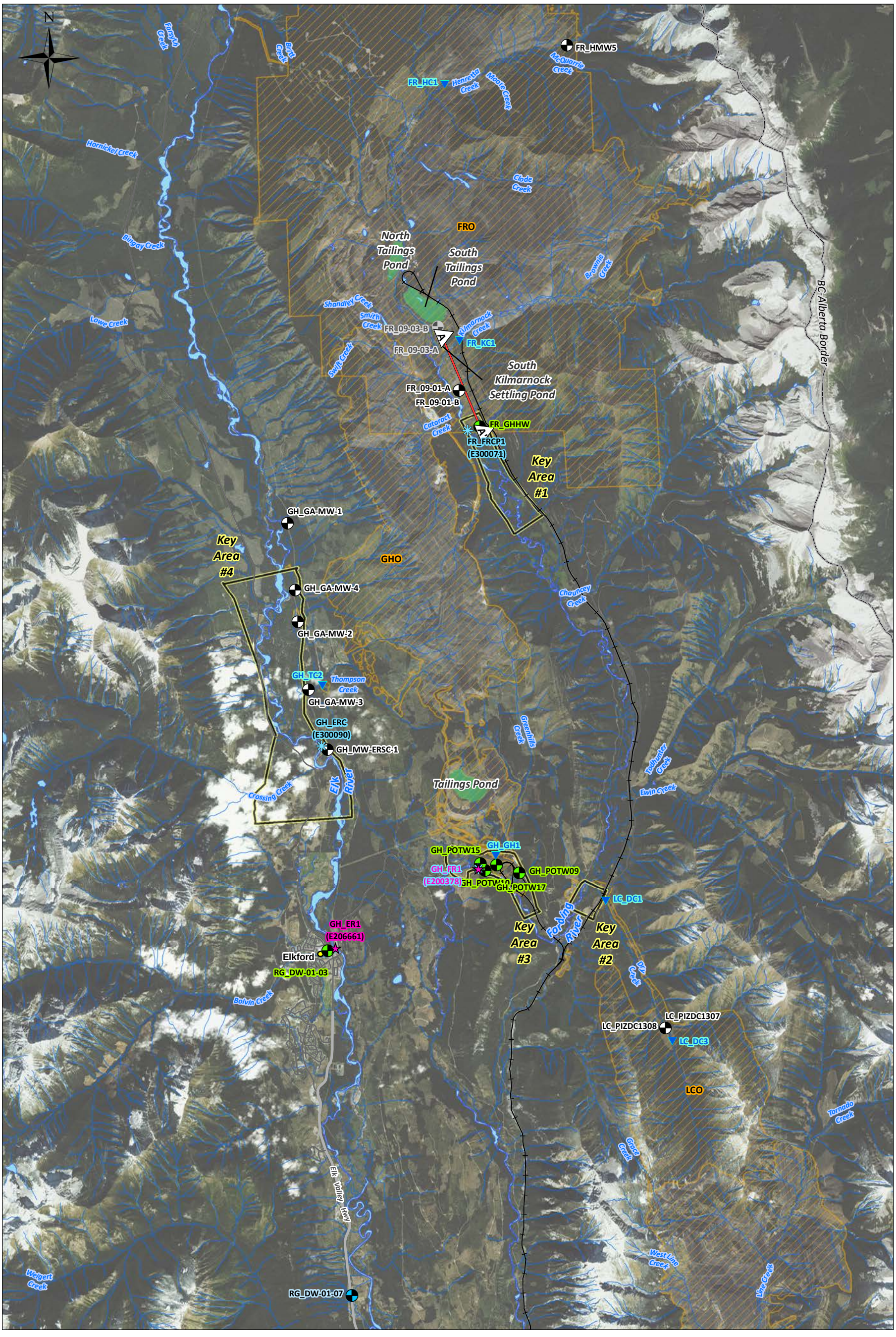
SNC·LAVALIN

Site Location and Managment Units

CHK'D: LH | DATE: 2017/05/16 | SCALE: 1:350,000 | Ref Num: | REV: 0
BY: AO | COORD SYS: NAD 1983 UTM Zone 11N | 635544-101

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GISMapSeries\2016 Annual Report\635544-101 Site Location and Management Units.mxd



Legend

Surface Water Sampling Stations
- Site Performance Points (SPO)
- Compliance Points (CP)
- Permitted Surface Water Points

Groundwater Sampling Stations
- Domestic Well
- Monitoring Well
- Water Supply Well
- Well not included in the RGMP but included on the cross-sections

- Geological Cross-Section
- Rails
- Highway
- Secondary Road
- Streams
- BC-Alberta Border
- Settling Pond
- Tailing Pond
- Key Areas
- Surface Water
- Mine Permitted Areas

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
1. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Revisons:
0 - AO - 2017-04-26 - CHECK PRINT - LH
1 - AO - 2017-05-16 - FINAL - LH

0 0.4 0.8 1.6 2.4 3.2 4 Kilometers

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

SNC·LAVALIN

Key Areas 1 to 4 and Sample Location Plan

CHK'D: LH	DATE: 2017/05/16	SCALE: 1:100000	Ref Num:	REV: 0
BY: AO	COORD SYS: NAD 1983 UTM Zone 11N		635544-102	

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GIS\MapSeries\2016 Annual Report\635544-102-105 Key Areas.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report

Legend

Surface Water Sampling Stations

- Site Performance Points (SPO)
- Compliance Points (CP)
- Permitted Surface Water Points

Groundwater Sampling Stations

- Domestic Well
- Monitoring Well
- Well not included in the RGMP but included on the cross-sections

- Geological Cross-Section
- Rails
- Highway
- Secondary Road
- Streams
- Key Areas
- Surface Water
- Mine Permitted Areas

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
1. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Revisons:
0 - AO - 2017-04-26 - CHECK PRINT - LH
1 - AO - 2017-05-16 - FINAL - LH

0 0.2 0.4 0.8 1.2 1.6 2 Kilometers

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

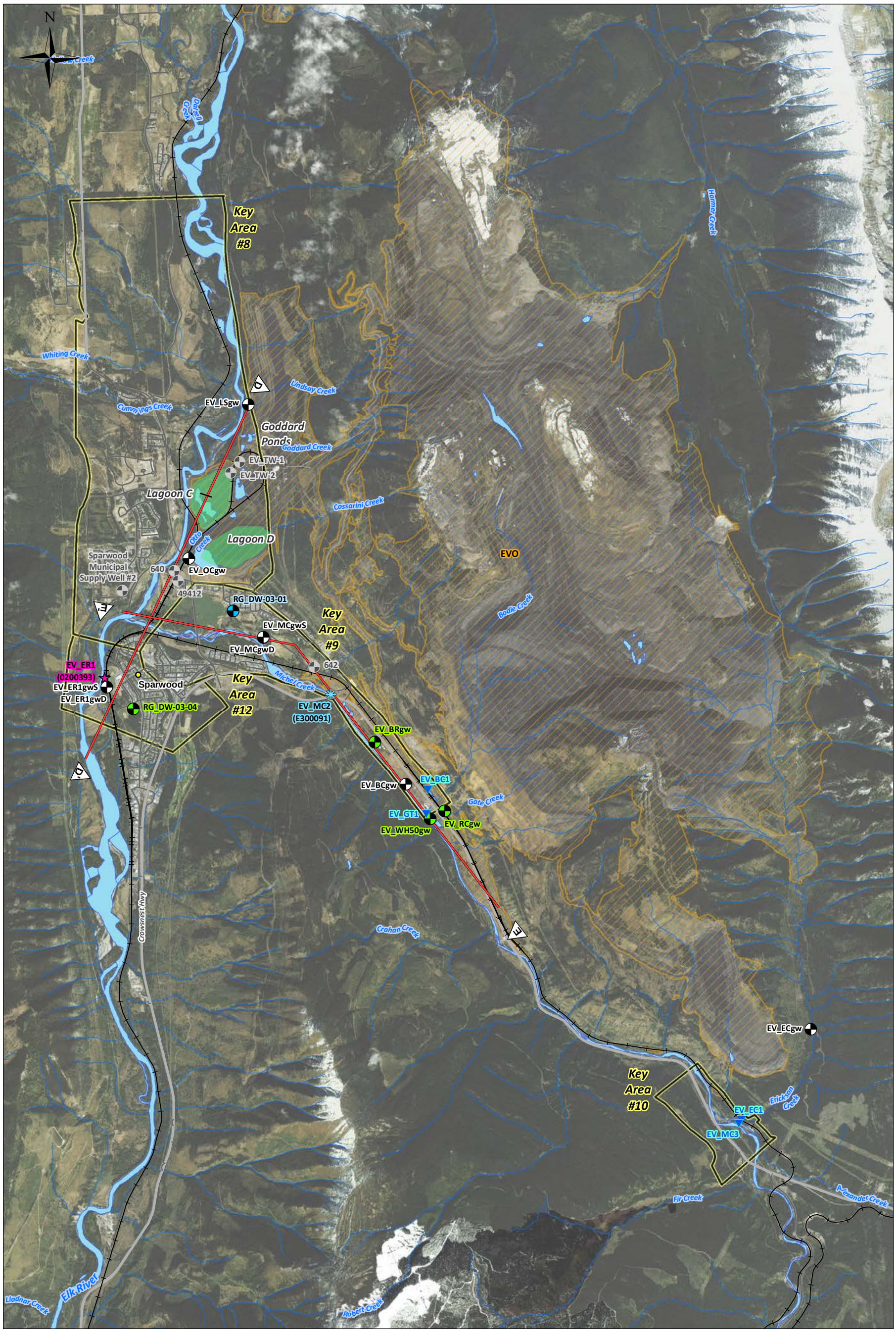
SNC·LAVALIN

Key Areas 5 to 7 and Sample Location Plan

CHK'D: LH	DATE: 2017/05/16 SCALE: 1:50000	Ref Num:	REV: 0
BY: AO	COORD SYS: NAD 1983 UTM Zone 11N	635544-103	

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GIS\MapSeries\2016 Annual Report\635544-102-105 Key Areas.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report



Legend

Surface Water Sampling Stations
- Site Performance Points (SPO)
- Compliance Points (CP)
- Permitted Surface Water Points

Groundwater Sampling Stations
- Domestic Well
- Monitoring Well
- Water Supply Well
- Well not included in the RGMP but included on the cross-sections

- Geological Cross-Section
- Rails
- Highway
- Secondary Road
- Streams
- Settling Pond
- Tailing Pond
- Key Areas
- Surface Water
- Mine Permitted Areas

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
1. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Revisons:
0 - AO - 2017-04-26 - CHECK PRINT - LH
1 - AO - 2017-05-16 - FINAL - LH

0 0.2 0.4 0.8 1.2 1.6 2 Kilometers

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

SNC·LAVALIN

Key Areas 8-10 and 12 and Sample Location Plan

CHK'D: LH | BY: AO | DATE: 2017/05/16 | SCALE: 1: 50000 | COORD SYS: NAD 1983 UTM Zone 11N | Ref Num: 635544-104 | REV: 0

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GISMapSeries\2016 Annual Report\635544-102-105 Key Areas.mxd

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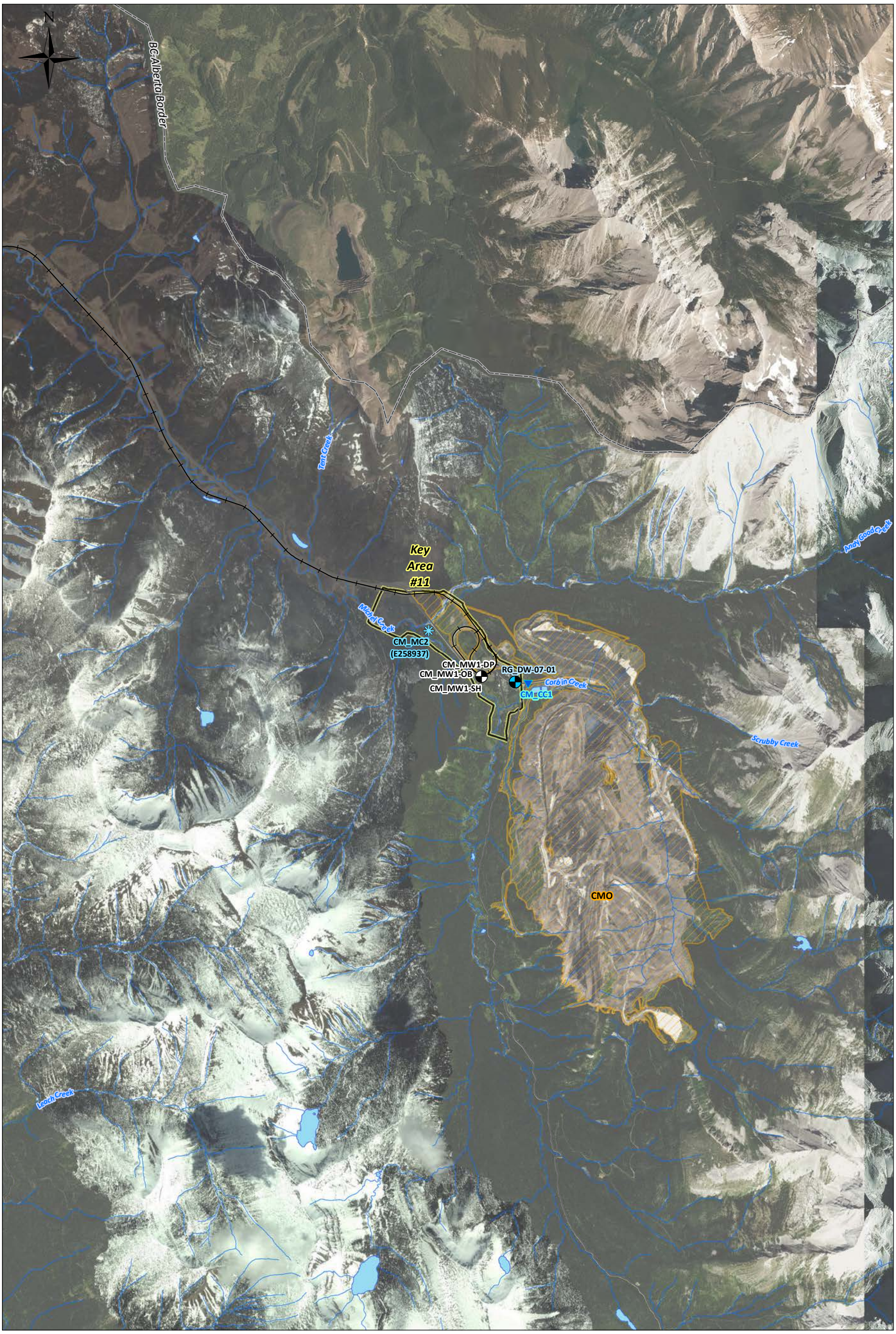


Legend

Surface Water Sampling Stations
- Compliance Points (CP)
- Permitted Surface Water Points

Groundwater Sampling Stations
- Domestic Well
- Monitoring Well
- Rails
- Secondary Road
- Streams
- BC-Alberta Border
- Key Areas
- Surface Water
- Mine Permitted Areas

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
1. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Revisons:
0 - AO - 2017-04-26 - CHECK PRINT - LH
1 - AO - 2017-05-16 - FINAL - LH

0 0.2 0.4 0.8 1.2 1.6 2 Kilometers

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

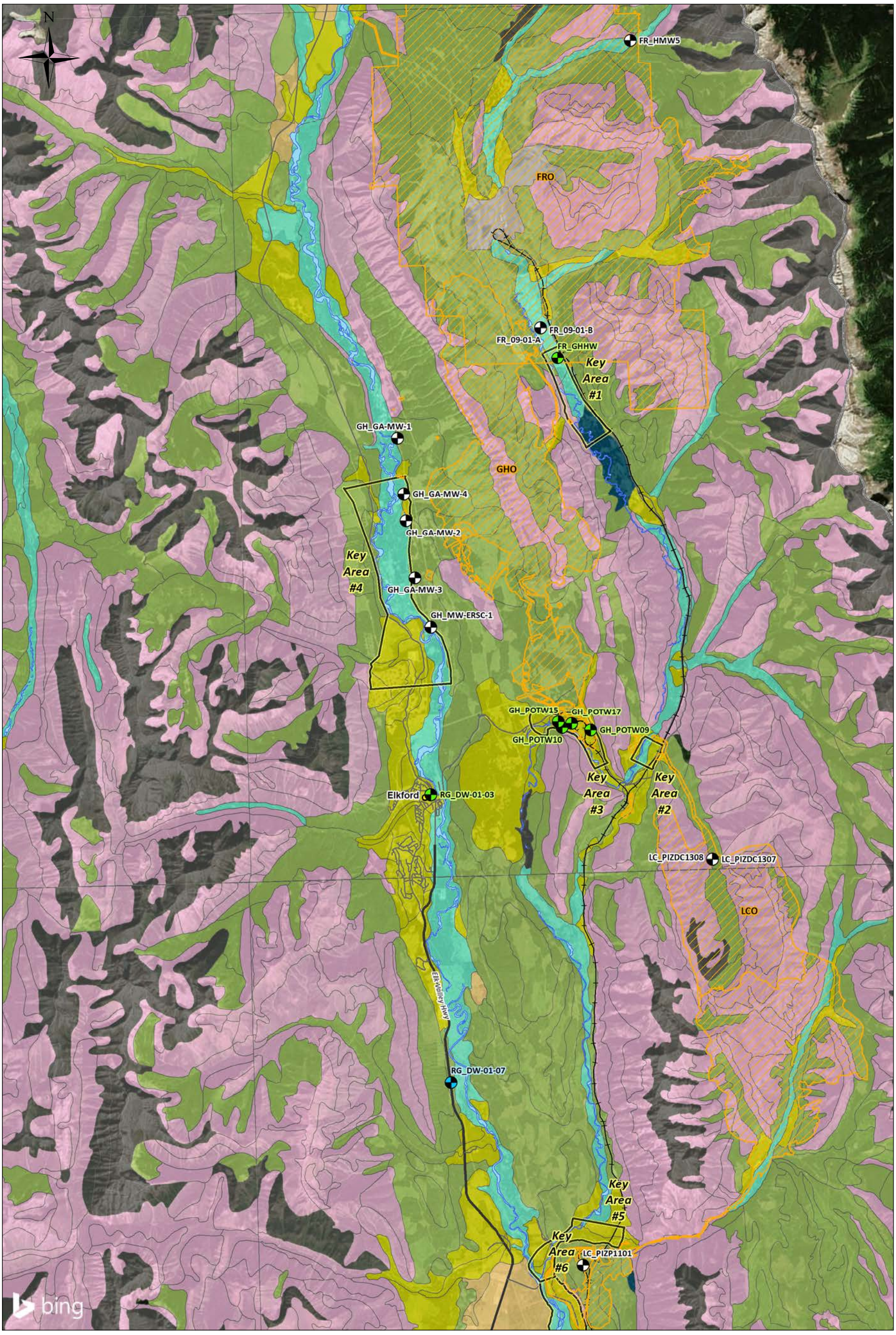
SNC·LAVALIN

Key Area 11 and Sample Location Plan

CHK'D: LH | DATE: 2017/05/16 | SCALE: 1:50000 | Ref Num: | REV: 0
BY: AO | COORD SYS: NAD 1983 UTM Zone 11N | 635544-105

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GIS\MapSeries\2016 Annual Report\635544-102-105 Key Areas.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report



Legend

- Domestic Well
- Monitoring Well
- Water Supply Well
- BC-Alberta Border
- Rails
- Highway
- Secondary Road
- Surface Water
- Mine Permitted Areas
- Key Areas

Surficial Unit

- Anthropogenic
- Colluvium
- Fluvial
- Glaciofluvial
- Glaciolacustrine
- Rock Outcrop
- Till/Moranial
- Organic Soil

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
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Revisons:
0 - AO - 2017-04-25 -CHECK PRINT - AO
1 - AO -2017-05-16 - FINAL -LH

0 0.75 1.5 3 4.5 6 7.5 km

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

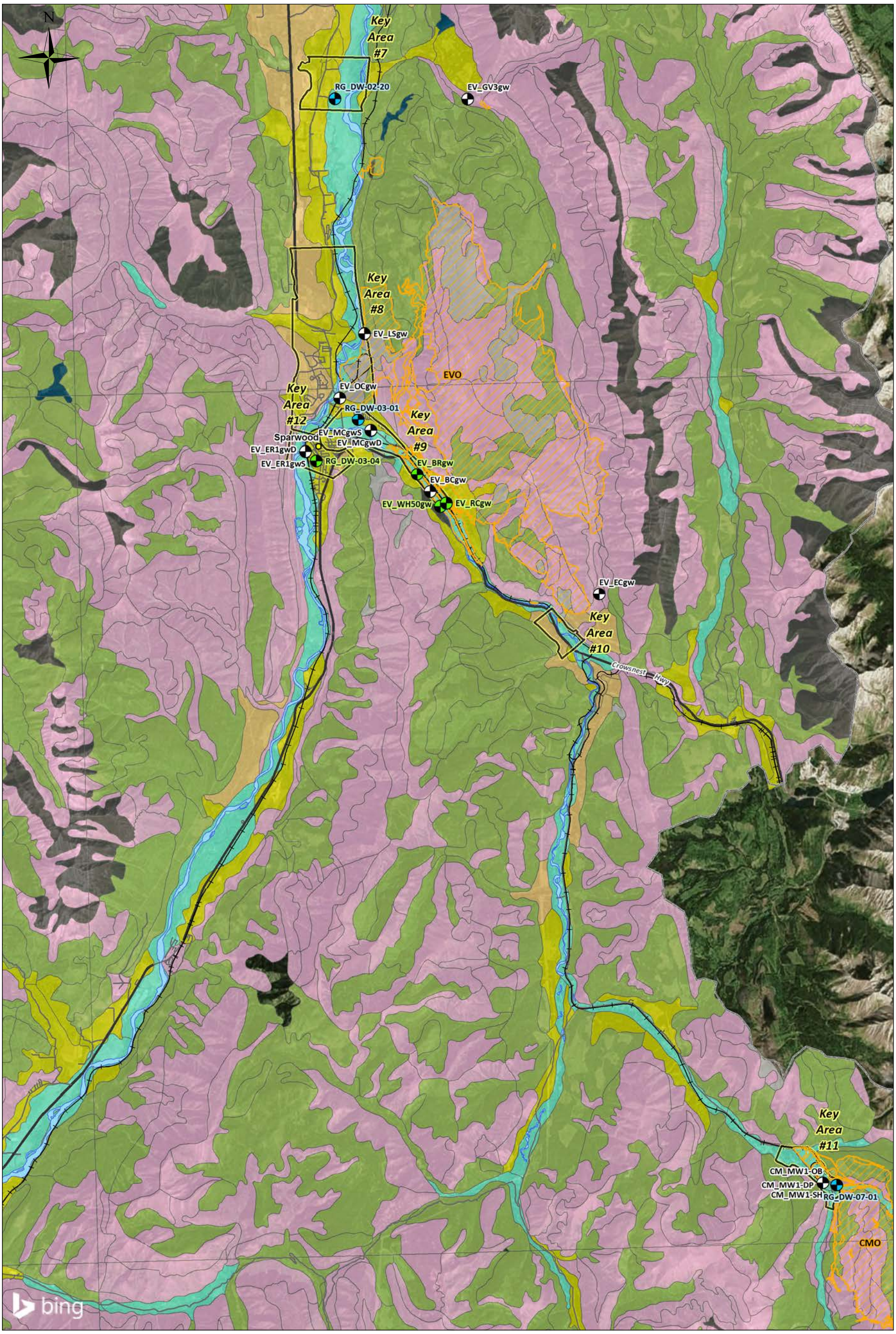
SNC·LAVALIN

Surficial Geology - North Half of Study Area

CHK'D: LH | BY: AO | DATE: 2017/05/16 | SCALE: 1:120,000 | COORD SYS: NAD 1983 UTM Zone 11N | Ref Num: 635544-106 | REV: 0

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GISMapSeries\2016 Annual Report\635544-106-107 Surficial Geology.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report



Legend

- Domestic Well
- Monitoring Well
- Water Supply Well
- BC-Alberta Border
- Rails
- Highway
- Secondary Road
- Surface Water
- Mine Permitted Areas
- Key Areas

Surficial Unit

- Anthropogenic
- Colluvium
- Fluvial
- Glaciofluvial
- Glaciolacustrine
- Rock Outcrop
- Till/Moranial
- Organic Soil

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
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Revisons:
0 - AO - 2017-04-25 -CHECK PRINT - AO
1 - AO -2017-05-16 - FINAL -LH

0 0.75 1.5 3 4.5 6 7.5 km

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

SNC·LAVALIN

Surficial Geology- South Half of Study Area

CHK'D: LH | DATE: 2017/05/16 | SCALE: 1:120,000 | Ref Num: | REV: 0

BY: AO | COORD SYS: NAD 1983 UTM Zone 11N | 635544-107

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report

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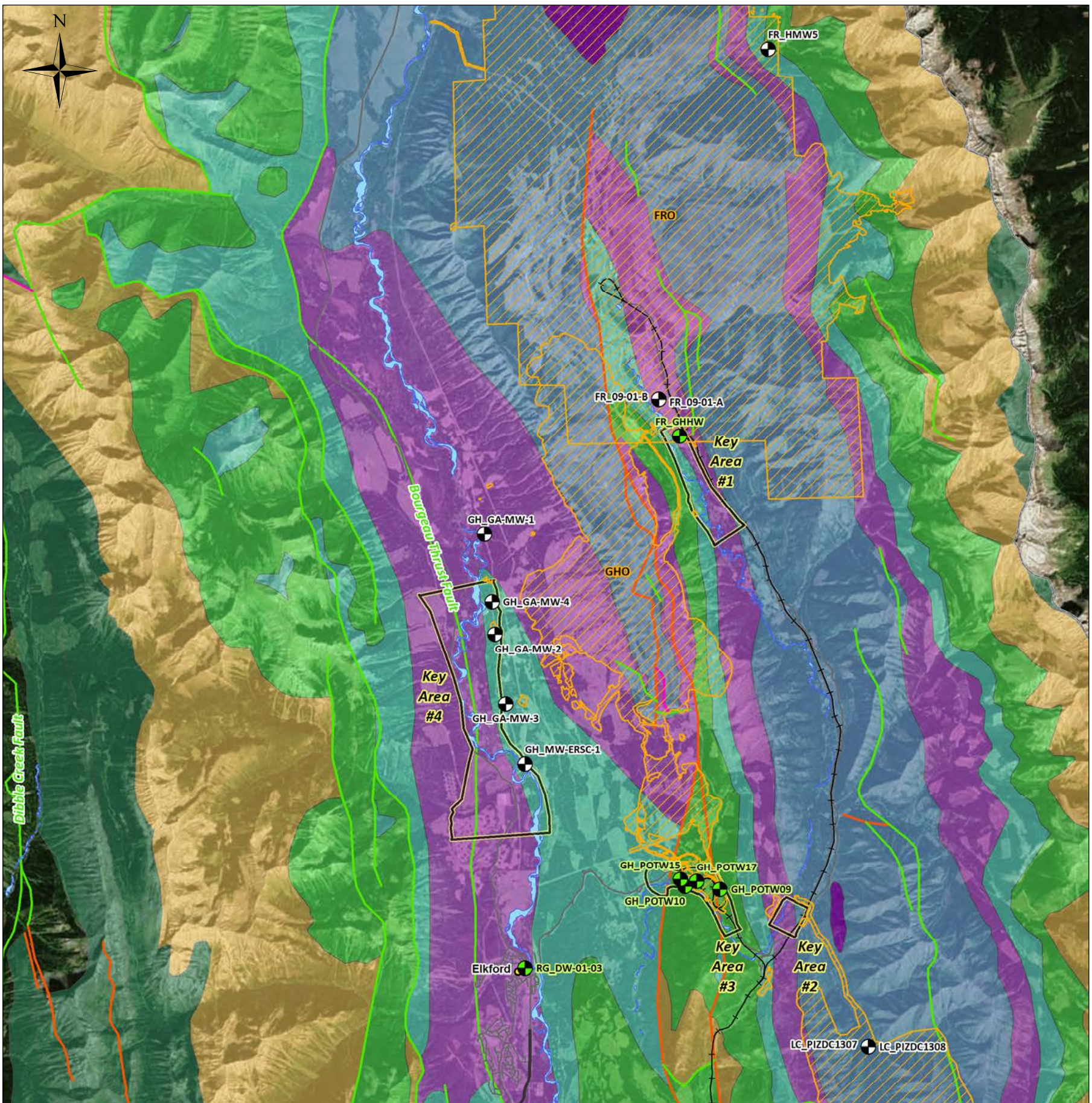

Legend

- Domestic Well
- Monitoring Well
- Water Supply Well
- BC-Alberta Border
- Rails
- Highway
- Secondary Road
- Surface Water
- Mine Permitted Areas
- Key Areas

Fault Type

- Fault
- Normal fault
- Thrust fault

Bedrock Geology

- Blairmore Group
- Fernie Formation
- Kootenay Group
- Rocky Mountain Group
- Rundle Group
- Spray River Group
- Other

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
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Revisons:
0 - AO - 2017-04-25 -CHECK PRINT - AO
1 - AO -2017-05-16 - FINAL -LH

0 0.75 1.5 3 4.5 6 7.5 km

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

SNC·LAVALIN

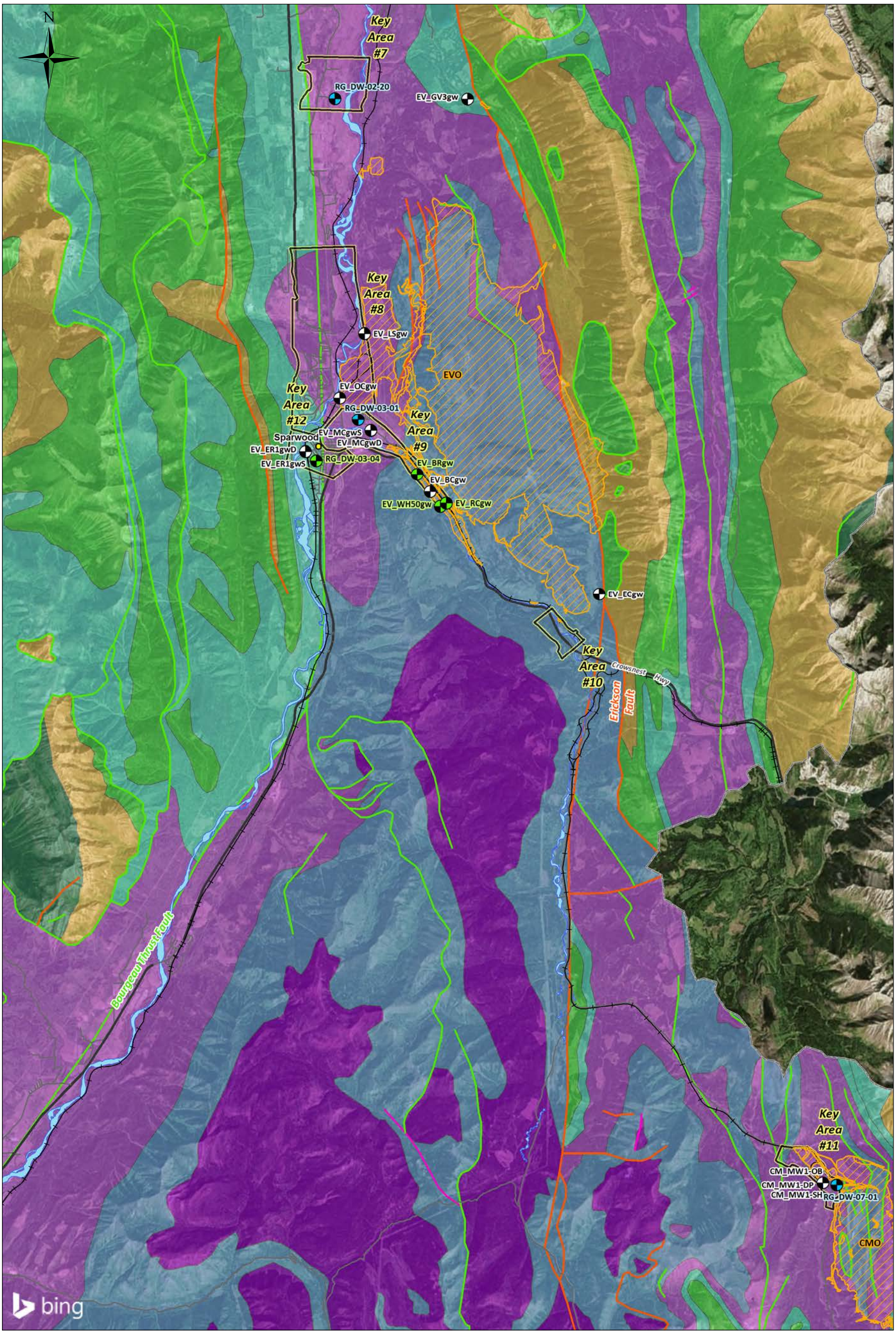
Bedrock Geology- North Half of Study Area

CHK'D: LH | DATE: 2017/05/16 | SCALE: 1:120,000 | Ref Num: | REV: 0

BY: AO | COORD SYS: NAD 1983 UTM Zone 11N | 635544-108

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GISMapSeries\2016 Annual Report\635544-108-109 Bedrock Geology.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report



Legend

- Domestic Well
- Monitoring Well
- Water Supply Well
- BC-Alberta Border
- Rails
- Highway
- Secondary Road
- Surface Water
- Mine Permitted Areas
- Key Areas

Fault Type

- Fault
- Normal fault
- Thrust fault

Bedrock Geology

- Blairmore Group
- Fernie Formation
- Kootenay Group
- Rocky Mountain Group
- Rundle Group
- Spray River Group
- Other

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
1. Service Layer Credits: © Harris Corp, Earthstar Geographics LLC Earthstar Geographics SIO © 2017 Microsoft Corporation © Harris Corp, Earthstar Geographics LLC Earthstar Geographics SIO © 2017 Microsoft Corporation

Revisons:
0 - AO - 2017-04-25 -CHECK PRINT - AO
1 - AO -2017-05-16 - FINAL -LH

0 0.75 1.5 3 4.5 6 7.5 km

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

SNC·LAVALIN

Bedrock Geology- South Half of Study Area

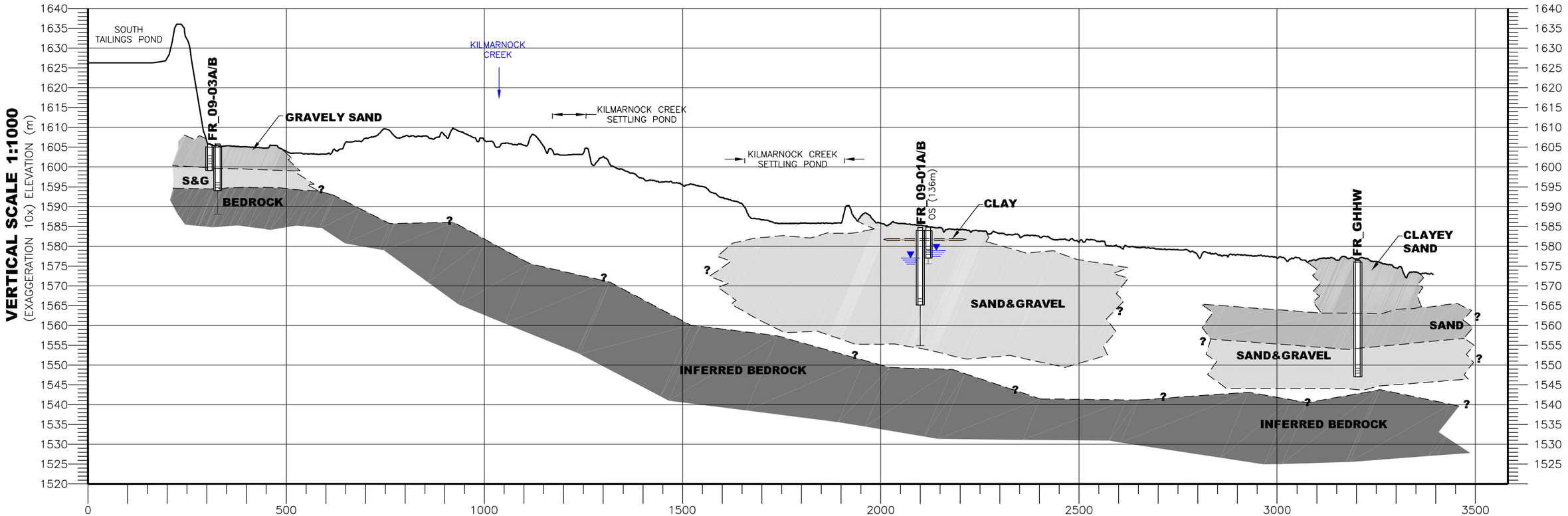
CHK'D: LH	DATE: 2017/05/16	SCALE: 1:120,000	Ref Num: 635544-109	REV: 0
BY: AO	COORD SYS: NAD 1983 UTM Zone 11N			

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GIS\MapSeries\2016 Annual Report\635544-108-109 Bedrock Geology.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report

A NORTHWEST

A' SOUTHEAST



A-A' SECTION

102

HORIZONTAL SCALE
1:10000 (m)

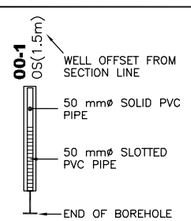
LEGEND

- FILL
- SAND & GRAVEL
- SAND
- SILT
- CLAY
- BEDROCK

INFERRED STRATIGRAPHIC BOUNDARY

GROUNDWATER ELEVATION (2016 Q4 MANUAL WATER LEVEL MEASUREMENT)

BOREHOLE LEGEND



NOTES

1. THE CROSS SECTION DEPICTED IS BASED ON INTERPRETATION OF LIMITED GEOLOGICAL DATA. ACTUAL GEOLOGICAL CONDITIONS MAY BE DIFFERENT FROM THOSE INTERPRETED. REFER TO PLAN MAP 626147-102 FOR LOCATION OF CROSS SECTION LINE.
2. INFORMATION PRESENTED IS WITHIN 10m OF SECTION LINE UNLESS INDICATED OTHERWISE ON DRAWING.
3. ORIGINAL DRAWING IN COLOUR.
4. Q4 GROUNDWATER ELEVATIONS WERE NOT AVAILABLE FOR FR_09-03A/B AND FR_GREENHOUSE WELL 4

REFERENCE DRAWINGS

DWG. NO.	DATE	DESCRIPTION
–	–	–

REVISIONS

REV.	DATE	DESCRIPTION	BY	CHK
0	2017-05-15	ISSUED TO CLIENT	AJK	LH

SNC·LAVALIN

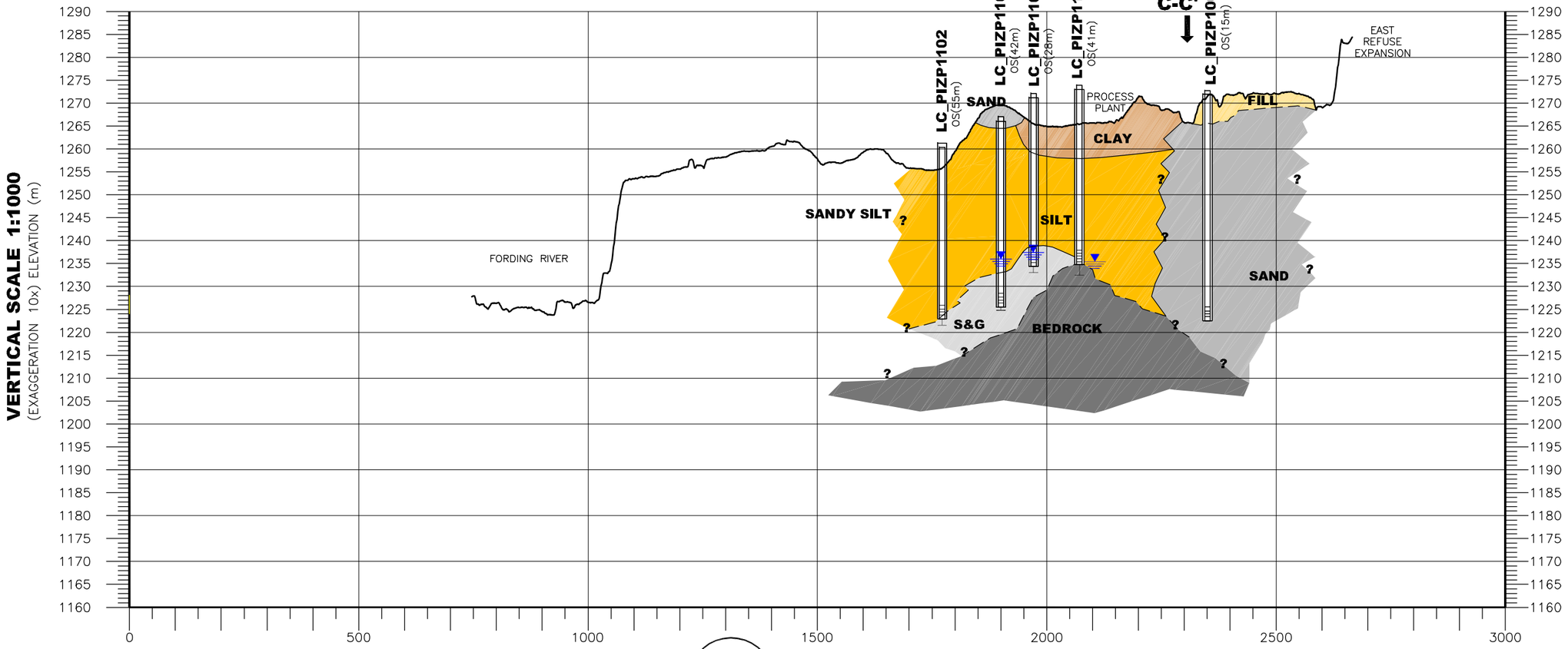
CLIENT NAME: TECK COAL LTD.

PROJECT LOCATION: ELK VALLEY BC

TITLE: **INFERRED GEOLOGICAL CROSS SECTION A-A'**

DWN BY: AJK	SCALE: AS SHOWN	DATE: 2015-07-17	DWG No:	REV.: 0
CHK'D: CB	PLOT: 20170516.0656	CADFILE: 635544-XR1	**635544-110**	

PATH: \\SLI2606\PROJECTS\CURRENT PROJECTS\TECK COAL LTD\SP0\635544\4.0 EXECUTION\4.5 GIS AND DRAWINGS\CAD\635544-XR1.DWG



B-B' SECTION

102

HORIZONTAL SCALE
1:10000 (m)

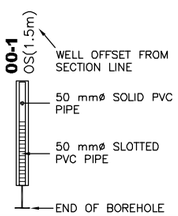
LEGEND

- FILL
- SAND & GRAVEL
- SAND
- SILT
- CLAY
- BEDROCK

INFERRED STRATIGRAPHIC BOUNDARY

GROUNDWATER ELEVATION (2016 Q4 MANUAL WATER LEVEL MEASUREMENT)

BOREHOLE LEGEND



NOTES

1. THE CROSS SECTION DEPICTED IS BASED ON INTERPRETATION OF LIMITED GEOLOGICAL DATA. ACTUAL GEOLOGICAL CONDITIONS MAY BE DIFFERENT FROM THOSE INTERPRETED. REFER TO PLAN MAP 626147-102 FOR LOCATION OF CROSS SECTION LINE.
2. INFORMATION PRESENTED IS WITHIN 10m OF SECTION LINE UNLESS INDICATED OTHERWISE ON DRAWING.
3. ORIGINAL DRAWING IN COLOUR.
4. Q4 GROUNDWATER ELEVATIONS WERE NOT AVAILABLE FOR LC_PIZP1102 AND LC_PIZP1004

REFERENCE DRAWINGS

–	–	–
DWG. NO.	DATE	DESCRIPTION

REVISIONS

REV.	DATE	DESCRIPTION	BY	CHK
0	2017-05-15	ISSUED TO CLIENT	AJK	LH

SNC·LAVALIN

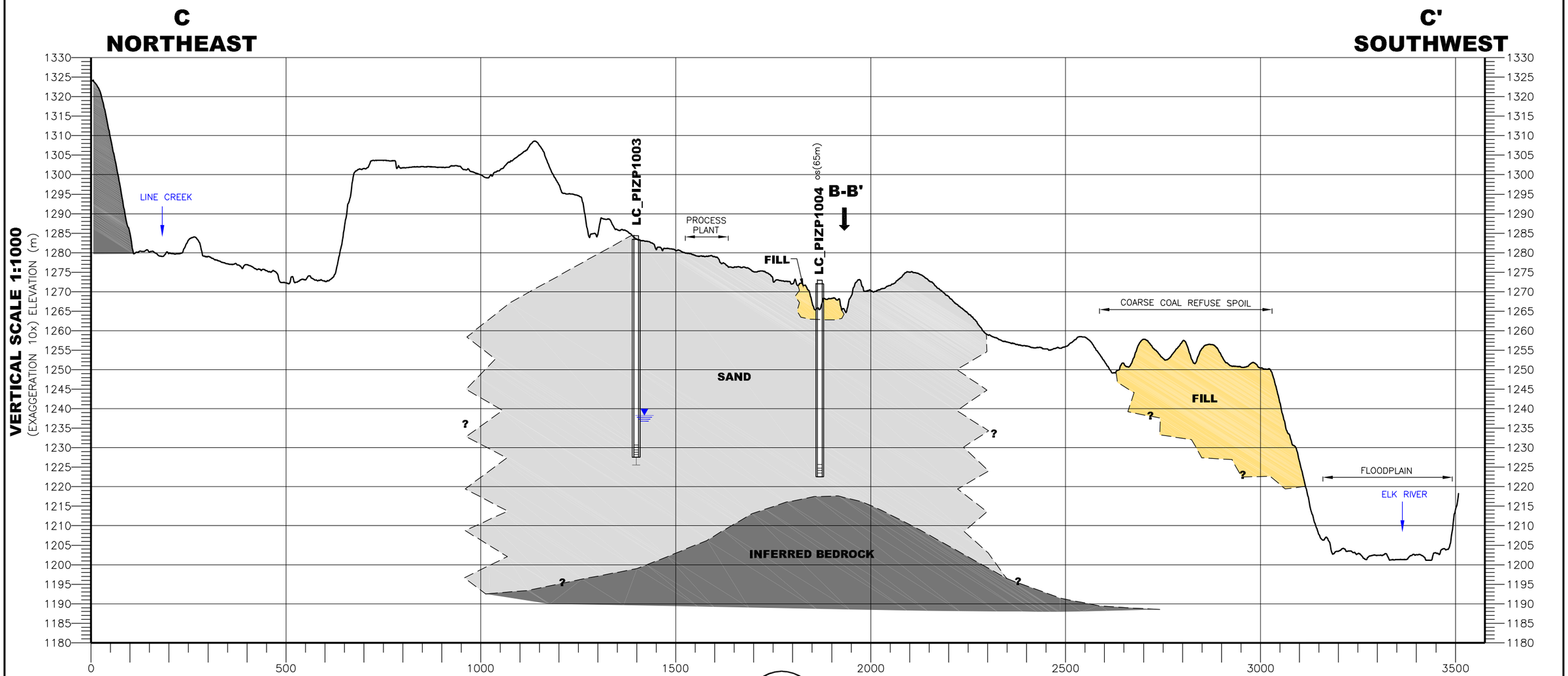
CLIENT NAME: TECK COAL LTD.

PROJECT LOCATION: ELK VALLEY BC

TITLE: **INFERRED GEOLOGICAL CROSS SECTION B-B'**

DWN BY: AJK	SCALE: AS SHOWN	DATE: 2015-07-17	DWG No:	REV.: 0
CHK'D: CB	PLOT: 20170516.0656	CADFILE: 635544-XR1	635544-111	

PATH: \\SLI2606\PROJECTS\CURRENT PROJECTS\TECK COAL LTD\SPO\635544\4.0 EXECUTION\4.5 GIS AND DRAWINGS\CAD\635544-XR1.DWG



C-C' SECTION

102

HORIZONTAL SCALE
1:10000 (m)

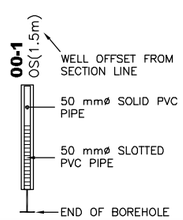
LEGEND

- FILL
- SAND & GRAVEL
- SAND
- SILT
- CLAY
- BEDROCK

INFERRED STRATIGRAPHIC BOUNDARY

GROUNDWATER ELEVATION (2016 Q4 MANUAL WATER LEVEL MEASUREMENT)

BOREHOLE LEGEND



NOTES

1. THE CROSS SECTION DEPICTED IS BASED ON INTERPRETATION OF LIMITED GEOLOGICAL DATA. ACTUAL GEOLOGICAL CONDITIONS MAY BE DIFFERENT FROM THOSE INTERPRETED. REFER TO PLAN MAP 626147-102 FOR LOCATION OF CROSS SECTION LINE.
2. INFORMATION PRESENTED IS WITHIN 10m OF SECTION LINE UNLESS INDICATED OTHERWISE ON DRAWING.
3. ORIGINAL DRAWING IN COLOUR.
4. Q4 GROUNDWATER ELEVATIONS WERE NOT AVAILABLE FOR LC_PIZP1004.

REFERENCE DRAWINGS

DWG. NO.	DATE	DESCRIPTION
–	–	–

REVISIONS

REV.	DATE	DESCRIPTION	BY	CHK
0	2017-05-15	ISSUED TO CLIENT	AJK	LH

SNC·LAVALIN

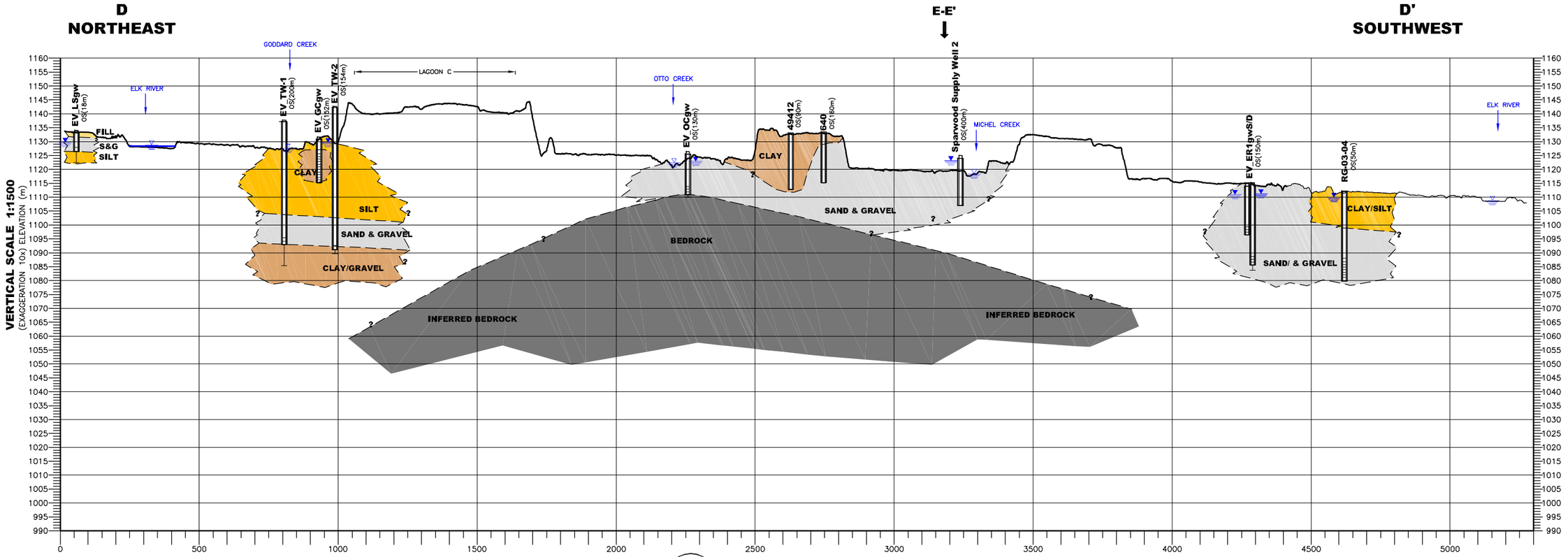
CLIENT NAME: TECK COAL LTD.

PROJECT LOCATION: ELK VALLEY BC

TITLE: **INFERRED GEOLOGICAL CROSS SECTION C-C'**

DWN BY: AJK	SCALE: AS SHOWN	DATE: 2015-07-17	DWG No: 635544-112 REV.: 0
CHK'D: CB	PLOT: 20170516.0657	CADFILE: 635544-XR1	

PATH: \\SLI2606\PROJECTS\CURRENT PROJECTS\TECK COAL LTD\SP0\635544\4.0 EXECUTION\4.5 GIS AND DRAWINGS\CAD\635544-XR1.DWG



D-D' SECTION
104
HORIZONTAL SCALE
1:15000 (m)

LEGEND

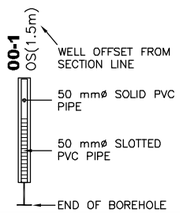
- FILL
- SAND & GRAVEL
- SILT
- CLAY
- BEDROCK

INFERRED STRATIGRAPHIC BOUNDARY

GROUNDWATER ELEVATION (2016 Q4 MANUAL WATER LEVEL MEASUREMENT)

INFERRED SURFACE WATER ELEVATION

BOREHOLE LEGEND



NOTES

1. THE CROSS SECTION DEPICTED IS BASED ON INTERPRETATION OF LIMITED GEOLOGICAL DATA. ACTUAL GEOLOGICAL CONDITIONS MAY BE DIFFERENT FROM THOSE INTERPRETED. REFER TO PLAN MAP 626147-104 FOR LOCATION OF CROSS SECTION LINE.
2. INFORMATION PRESENTED IS WITHIN 10m OF SECTION LINE UNLESS INDICATED OTHERWISE ON DRAWING.
3. ORIGINAL DRAWING IN COLOUR.

REFERENCE DRAWINGS

DWG. NO.	DATE	DESCRIPTION
–	–	–

REVISIONS

REV.	DATE	DESCRIPTION	BY	CHK
0	2017-05-15	ISSUED TO CLIENT	AJK	LH

SNC·LAVALIN

CLIENT NAME: TECK COAL LTD.

PROJECT LOCATION: ELK VALLEY BC

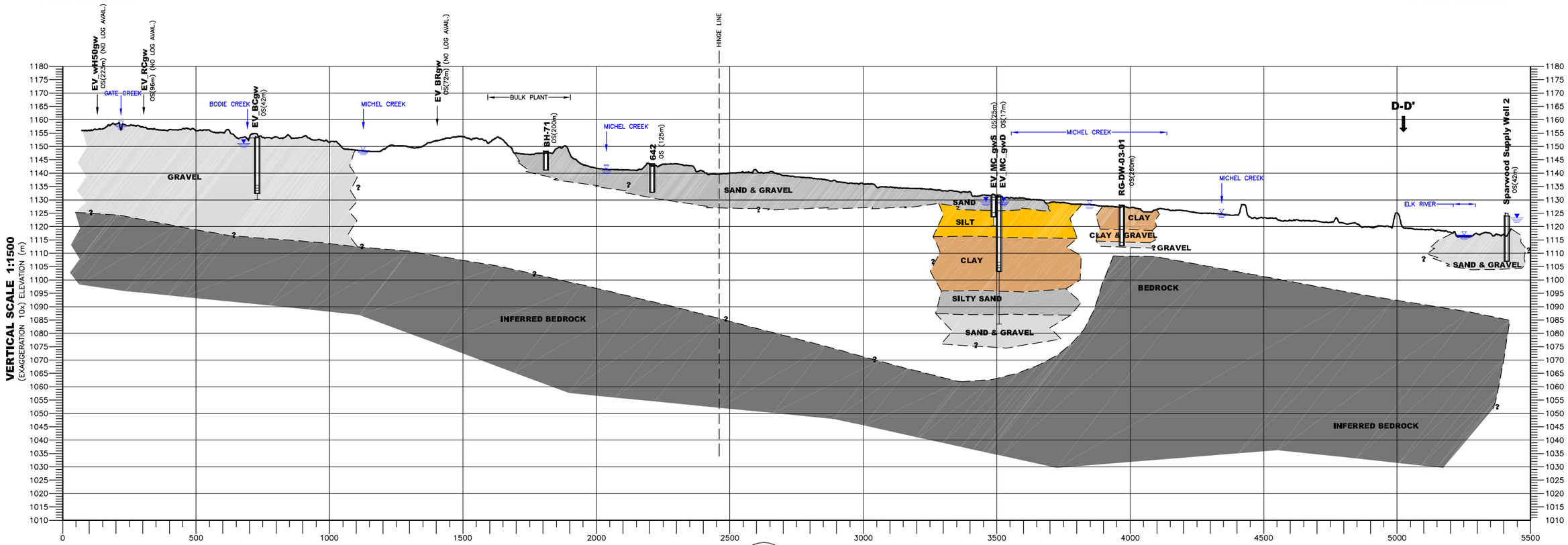
TITLE: **INFERRED GEOLOGICAL CROSS SECTION D-D'**

DWN BY: AJK	SCALE: AS SHOWN	DATE: 2015-07-17	DWG No: 635544-113 REV.: 0
CHK'D: CB	PLOT: 20170516.0702	CADFILE: 635544-XR1	

PATH: \\SLI2606\PROJECTS\CURRENT PROJECTS\TECK COAL LTD\SPO\635544\4.0 EXECUTION\4.5 GIS AND DRAWINGS\CAD\635544-XR1.DWG

E
SOUTHEAST

E'
NORTHWEST



E-E' SECTION
104
HORIZONTAL SCALE
1:15000 (m)

LEGEND

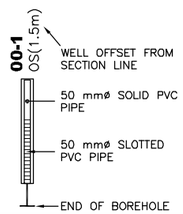
- FILL
- SAND & GRAVEL
- SILT
- CLAY
- BEDROCK

INFERRED STRATIGRAPHIC BOUNDARY

GROUNDWATER ELEVATION (2016 Q4 MANUAL WATER LEVEL MEASUREMENT)

INFERRED SURFACE WATER ELEVATION

BOREHOLE LEGEND



NOTES

1. THE CROSS SECTION DEPICTED IS BASED ON INTERPRETATION OF LIMITED GEOLOGICAL DATA. ACTUAL GEOLOGICAL CONDITIONS MAY BE DIFFERENT FROM THOSE INTERPRETED. REFER TO PLAN MAP 626147-104 FOR LOCATION OF CROSS SECTION LINE.
2. INFORMATION PRESENTED IS WITHIN 10m OF SECTION LINE UNLESS INDICATED OTHERWISE ON DRAWING.
3. ORIGINAL DRAWING IN COLOUR.

REFERENCE DRAWINGS

DWG. NO.	DATE	DESCRIPTION
–	–	–

REVISIONS

REV.	DATE	DESCRIPTION	BY	CHK
0	2017-05-15	ISSUED TO CLIENT	AJK	LH

SNC·LAVALIN

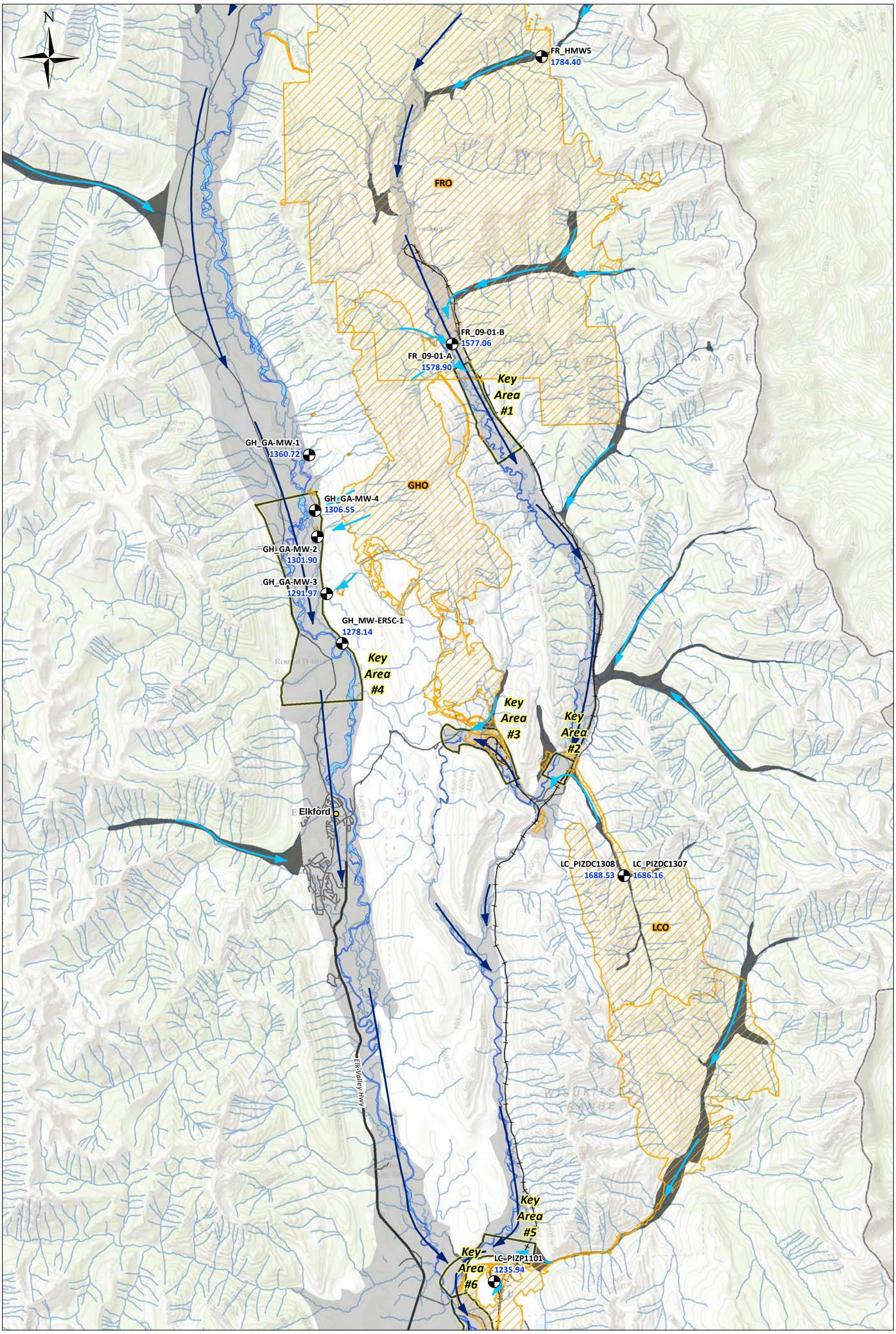
CLIENT NAME: TECK COAL LTD.

PROJECT LOCATION: ELK VALLEY BC

TITLE: **INFERRED GEOLOGICAL CROSS SECTION E-E'**

DWN BY: AJK	SCALE: AS SHOWN	DATE: 2015-07-17	DWG No: 635544-114 REV.: 0
CHK'D: CB	PLOT: 20170516.0657	CADFILE: 635544-XR1	

PATH: \\SLI2606\PROJECTS\CURRENT PROJECTS\TECK COAL LTD\SPO\635544\4.0 EXECUTION\4.5 GIS AND DRAWINGS\CAD\635544-XR1.DWG



Legend

- Monitoring Well — 1287.77 Groundwater Elevation (masl) measured in 2016 Q4
- BC-Alberta Border
- Mine Permitted Areas
- Key Areas
- Rails
- Highway
- Secondary Road
- Surface Water
- Interpreted Tributary Valley-bottom Extent
- Interpreted Main Valley-bottom Extent
- Inferred Valley-Bottom Flow Direction
- Inferred Upland or Tributary Valley-bottom Groundwater Flow

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
1. Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

0 0.75 1.5 3 4.5 6 7.5 km

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

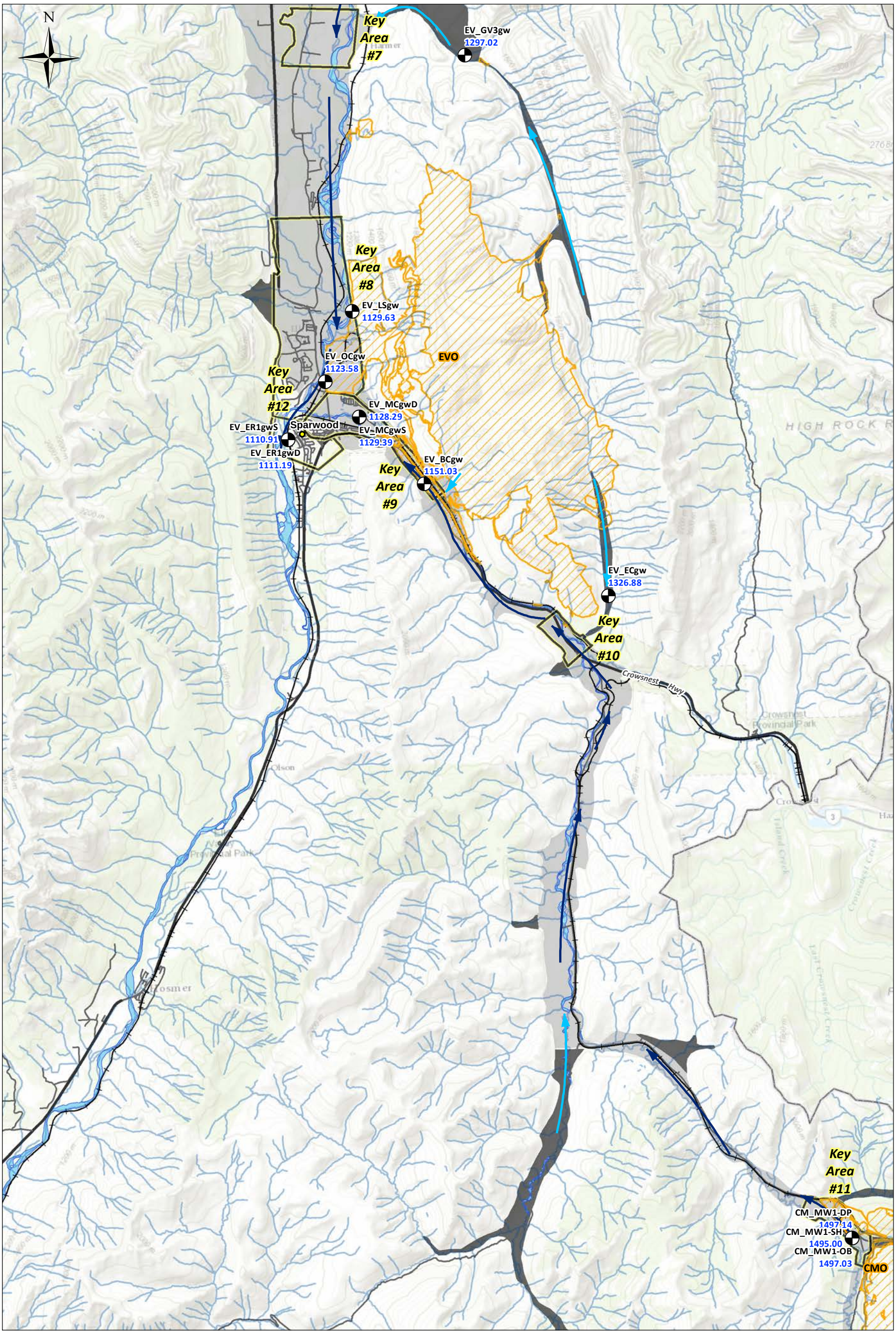
SNC·LAVALIN

Groundwater Elevations from Q4 and Conceptual Regional Groundwater Flow - North Half of Study Area

CHK'D: LH	DATE: 2017/05/16	SCALE: 1:120,000	Ref Num:	REV: 0
BY: AO	COORD SYS: NAD 1983 UTM Zone 11N		635544-115	

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GISMapSeries\2016 Annual Report\635544-115-116 Groundwater Elevations.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report



Legend

- Monitoring Well — 1287.77 Groundwater Elevation (masl) measured in 2016 Q4
- BC-Alberta Border
- Mine Permitted Areas
- Key Areas
- Rails
- Highway
- Secondary Road
- Surface Water
- Interpreted Tributary Valley-bottom Extent
- Interpreted Main Valley-bottom Extent
- Inferred Valley-Bottom Flow Direction
- Inferred Upland or Tributary Valley-bottom Groundwater Flow

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
1. Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

0 0.5 1 2 3 4 5 km

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

SNC·LAVALIN

Groundwater Elevations from Q4 and Conceptual Regional Groundwater Flow - South Half of Study Area

CHK'D: LH | DATE: 2017/05/16 | SCALE: 1:120,000 | Ref Num: 635544-116 | REV: 0
BY: AO | COORD SYS: NAD 1983 UTM Zone 11N

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GISMapSeries\2016 Annual Report\635544-115-116 Groundwater Elevations.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
FR_HMW5	2016 01 21	29.8	< 0.0050	< 0.050	< 0.050
	2016 05 18	41.0	< 0.0050	0.054	< 0.050
	2016 08 10	40.0	< 0.0050	< 0.050	< 0.050
	2016 11 03	39.8	< 0.0050	3.04	< 0.050

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
FR_09-01-A	2016 01 25	366	27.1	66.1	59.5
	Duplicate	374	27.6	66.3	58.3
	2016 06 14	226	32.4	76.1	77.1
	Duplicate	224	32.1	77.5	77.5
	2016 08 17	242	32.2	85.7	83.7
	2016 11 24	347	51.7	159	137

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
FR_09-01-B	2016 01 25	291	17.6	42.6	37.8
	2016 06 14	252	34.8	79.9	80.5
	2016 08 17	297	22.0	58.9	60.2
	2016 11 24	351	39.4	117	106

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
FR_GHHW	2016 01 25	360	53.9	137	123
	2016 05 18	438	68.4	160	152
	2016 08 17	252	36.3	91.0	95.4
	2016 10 20	270	39.0	108	109
	Duplicate	277	40.1	110	103
	2016 10 21	269	38.6	108	103

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
GH_GA-MW-1	2016 03 22	453	1.33	0.306	0.380
	2016 06 14	715	0.600	0.560	1.61
	2016 08 16	229	1.77	0.296	0.335
	2016 11 16	564	0.165	0.218	-

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
GH_POTW15	2016 03 07	261	0.041	0.206	0.233
	2016 06 14	273	< 0.025	0.207	0.233
	2016 08 16	254	< 0.025	0.125	0.177
	2016 11 17	244	< 0.0050	< 0.25	< 0.25

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
GH_POTW10	2016 03 07	191	0.705	4.80	4.62
	2016 06 14	200	0.445	3.42	3.35
	2016 08 16	186	0.391	3.02	2.93
	2016 11 17	185	0.478	3.80	3.73

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
RG_DW-01-03	2016 06 01	49.2	0.806	3.43	3.21
	2016 06 29	50.7	0.833	2.92	3.27
	2016 09 14	53.7	0.840	3.42	3.28
	2016 12 12	46.5	0.610	2.77	2.77

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
LC_PIZDC1307	2016 03 16	< 0.30	< 0.0050	< 0.050	< 0.050
	2016 06 10	< 0.30	< 0.0050	< 0.050	< 0.050
	2016 09 13	< 0.30	< 0.0050	< 0.050	< 0.050
	2016 12 13	< 0.30	< 0.0050	< 0.25	< 0.25

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
RG_DW-01-07	2016 06 01	65.1	0.652	1.69	1.67
	2016 06 29	61.3	0.612	1.54	1.40
	2016 09 14	64.2	0.623	1.72	1.45
	2016 12 12	68.5	0.661	1.79	1.72

Primary Screening Criteria	Nitrate as N (mg/L)	Sulphate (mg/L)	Selenium (µg/L)
BCWQG Aquatic Life Short-term Maximum (AW)[a]	32.8	n/a	2
BCWQG Aquatic Life Long-term Average (AW)[a]	3	128 - 429[b]	n/a
CSR Aquatic Life (AW)[a]	400	1,000	10
CSR Irrigation Watering (IW)	n/a	n/a	20[c]
CSR Livestock Watering (LW)	100	1,000	50
CSR Drinking Water (DW)	10	500	10
Secondary Screening Criteria			**Selenium (µg/L)**
Guidelines for Canadian Drinking Water Quality (DW)			50
SPO - Elk River [GH_ER1 (E206661)/EV_ER1 (0200393)]			19
SPO - Fording River [GH_FR1 (0200378)]			63
CP - Fording River [FR_FRCP1 (E300071)]			130
CP - Fording River [FH_FR1 (0200378)]			80
CP - Elk River [GH_ERC (E300090)]			15
CP - Michel Creek [EV_MC2 (E300091)]			28

[a] Standard to protect freshw ater aquatic life.
[b] Standard/guideline varies w ith Hardness.
[c] Individual standards exist for continuous and intermittent applications on crops. Reported value denotes

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
GH_GA-MW-4	2016 03 22	646	8.02	4.19	3.79
	2016 06 14	425	5.97	3.66	3.00
	2016 08 16	266	3.16	3.62	3.24
	2016 11 14	294	2.41	3.00	3.02

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
GH_GA-MW-2	2016 03 22	158	3.49	13.5	12.5
	2016 06 14	160	0.751	5.70	5.34
	2016 08 15	157	1.63	10.4	9.39
	2016 11 14	181	4.22	17.9	17.9

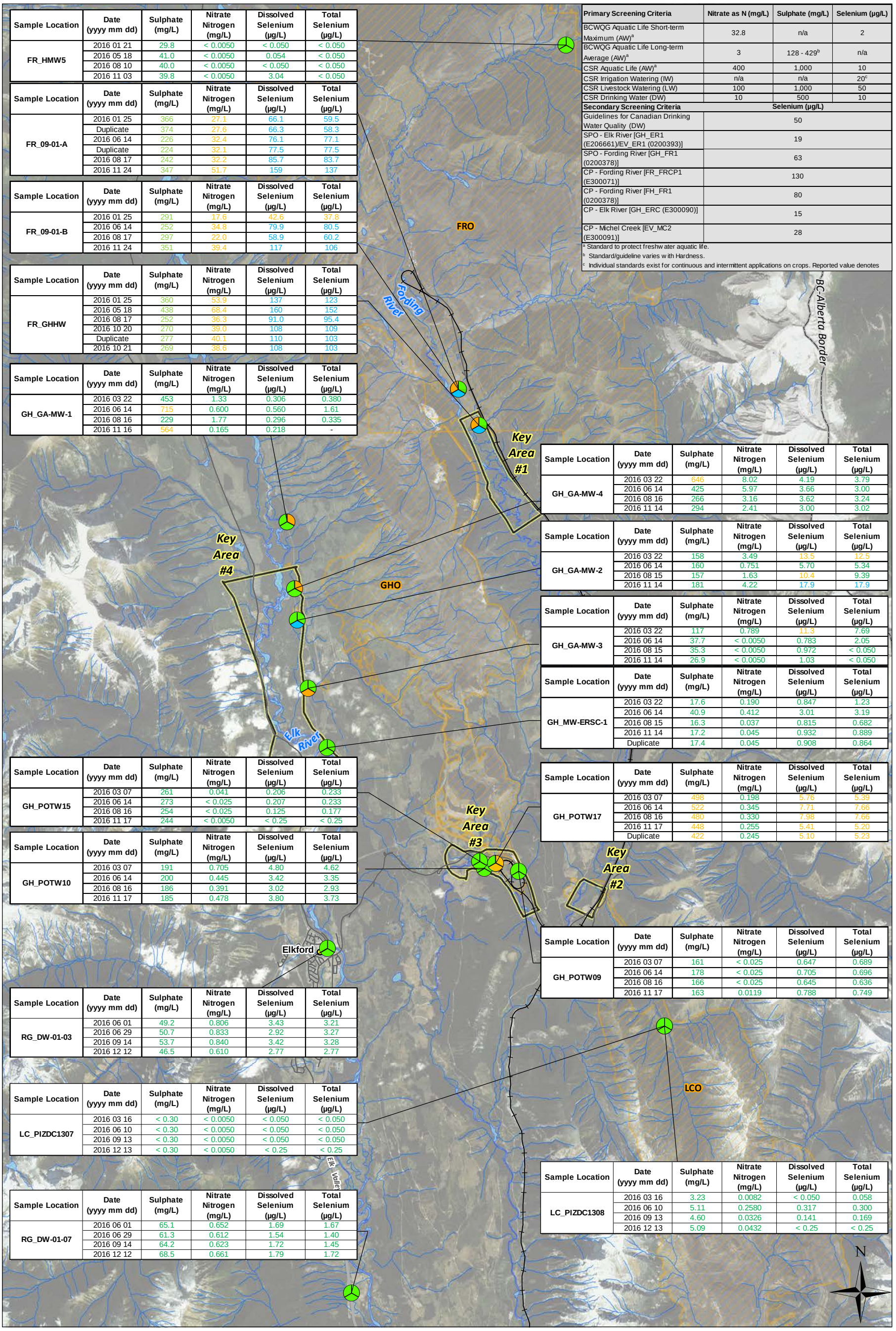
Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
GH_GA-MW-3	2016 03 22	117	0.789	11.3	7.69
	2016 06 14	37.7	< 0.0050	0.783	2.05
	2016 08 15	35.3	< 0.0050	0.972	< 0.050
	2016 11 14	26.9	< 0.0050	1.03	< 0.050

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
GH_MW-ERSC-1	2016 03 22	17.6	0.190	0.847	1.23
	2016 06 14	40.9	0.412	3.01	3.19
	2016 08 15	16.3	0.037	0.815	0.682
	2016 11 14	17.2	0.045	0.932	0.889
	Duplicate	17.4	0.045	0.908	0.864

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
GH_POTW17	2016 03 07	498	0.198	5.76	5.39
	2016 06 14	522	0.345	7.71	7.66
	2016 08 16	480	0.330	7.98	7.66
	2016 11 17	448	0.255	5.41	5.20
	Duplicate	422	0.245	5.10	5.23

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
GH_POTW09	2016 03 07	161	< 0.025	0.647	0.689
	2016 06 14	178	< 0.025	0.705	0.696
	2016 08 16	166	< 0.025	0.645	0.636
	2016 11 17	163	0.0119	0.788	0.749

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
LC_PIZDC1308	2016 03 16	3.23	0.0082	< 0.050	0.058
	2016 06 10	5.11	0.2580	0.317	0.300
	2016 09 13	4.60	0.0326	0.141	0.169
	2016 12 13	5.09	0.0432	< 0.25	< 0.25



Legend

- Below primary screening criteria
- Above at least one of the primary screening criteria
- Selenium concentrations above at least one of the secondary screening criteria
- Rails
- Highway
- Secondary Road
- BC-Alberta Border
- Key Areas
- Streams
- Mine Permitted Areas

Nitrate / Sulphate / Selenium

Notes:
1. Original in colour.
2. Numerical scale reflects full-size print. Print scaling will distort this scale, however scale bar will remain accurate.
3. Intended for illustration purposes, accuracy has not been verified for construction or navigation purposes.
4. For primary water quality screening, analytical results for wells within 10 m of a receiving surface water body were compared to BCWQG for AW; see Table 1 for a list of wells.

References:
1. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Revisons:
0 - AO - 2017-04-26 - CHECK PRINT - LH
1- AO - 2017-05-16 -FINAL - LH

0 0.4 0.8 1.6 2.4 3.2 4 Kilometers

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

SNC·LAVALIN

Spatial Distribution of Selected Groundwater Analytical Data - Key Areas 1 to 4

CHK'D: LH | DATE: 2017/05/16 | SCALE: 1:100000 | Ref Num: | REV: 0
BY: AO | COORD SYS: NAD 1983 UTM Zone 11N | 635544-117

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GISMapSeries\2016 Annual Report\635544-117 Selected Groundwater Analytical Data - Key Areas 1 to 4.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report

Primary Screening Criteria	Nitrate as N (mg/L)	Sulphate (mg/L)	Selenium (µg/L)
BCWQG Aquatic Life Short-term Maximum (AW)[a]	32.8	n/a	2
BCWQG Aquatic Life Long-term Average (AW)[a]	3	128 - 429[b]	n/a
CSR Aquatic Life (AW)[a]	400	1,000	10
CSR Irrigation Watering (IW)	n/a	n/a	20[c]
CSR Livestock Watering (LW)	100	1,000	50
CSR Drinking Water (DW)	10	500	10
Secondary Screening Criteria			**Selenium (µg/L)**
Guidelines for Canadian Drinking Water Quality (DW)			50
SPO - Elk River [GH_ER1 (E206661)/EV_ER1 (0200393)]			19
SPO - Fording River [GH_FR1 (0200378)]			63
CP - Fording River [FR_FRCP1 (E300071)]			130
CP - Fording River [FH_FR1 (0200378)]			80
CP - Elk River [GH_ERC (E300090)]			15
CP - Michel Creek [EV_MC2 (E300091)]			28

[a] Standard to protect freshw ater aquatic life.
[b] Standard/guideline varies w ith Hardness.
[c] Individual standards exist for continuous and intermittent applications on crops. Reported value denotes

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
LC_PIZP1101	2016 03 15	3.83	< 0.0050	< 0.050	0.479
	2016 06 17	4.14	< 0.0050	< 0.050	0.063
	2016 09 15	3.50	< 0.0050	< 0.25	1.45
	2016 12 12	3.62	< 0.0050	< 0.25	1.21

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
RG_DW-02-20	2016 06 01	87.6	3.62	12.9	12.6
	2016 06 28	83.6	3.26	11.5	11.2
	2016 09 14	59.9	2.12	8.58	7.43
	2016 12 12	63.3	2.19	8.57	8.54

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_GV3gw	2016 02 23	140	0.137	3.66	3.61
	2016 05 16	149	0.150	3.88	3.76
	2016 08 22	131	0.134	3.85	3.72
	2016 10 20	129	0.136	4.24	3.60

Elk River
Elk Valley Hwy
Fording River
Key Area #5
Key Area #6
Key Area #7
Key Area #8
EVO

Legend
- Below primary screening criteria
- Above at least one of the primary screening criteria
- Selenium concentrations above at least one of the secondary screening criteria
- Rails
- Highway
- Secondary Road
- Key Areas
- Streams
- Mine Permitted Areas

Nitrate / Sulphate / Selenium

Notes:
1. Original in colour.
2. Numerical scale reflects full-size print. Print scaling will distort this scale, however scale bar will remain accurate.
3. Intended for illustration purposes, accuracy has not been verified for construction or navigation purposes.
4. For primary water quality screening, analytical results for wells within 10 m of a receiving surface water body were compared to BCWQG for AW; see Table 1 for a list of wells.

References:
1. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Revisons:
0 - AO - 2017-04-26 - CHECK PRINT - LH
1- AO - 2017-05-16 -FINAL - LH

0 0.2 0.4 0.8 1.2 1.6 2 Kilometers

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

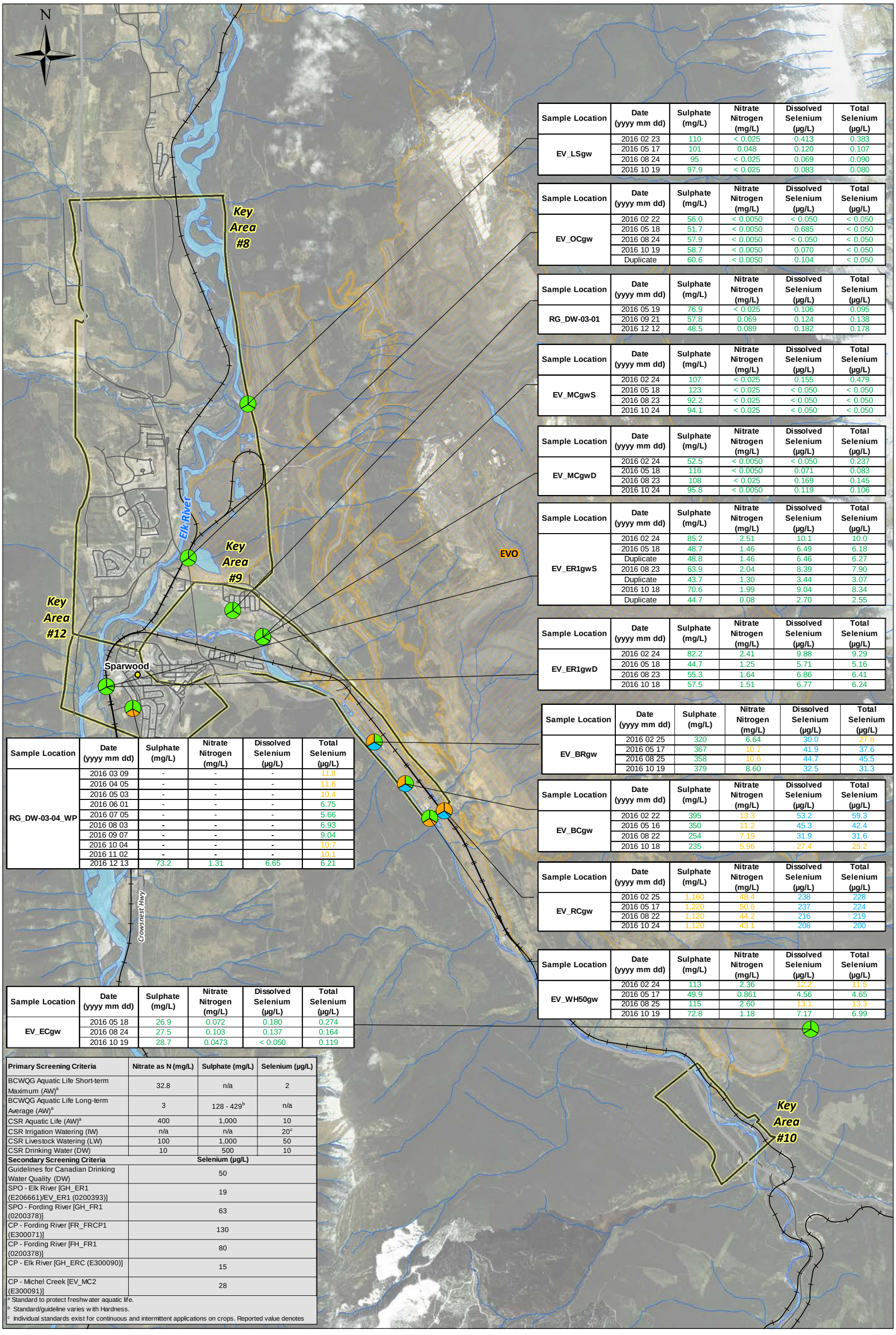
SNC·LAVALIN

Spatial Distribution of Selected Groundwater Analytical Data - Key Areas 5 - 7

CHK'D: LH | DATE: 2017/05/16 | SCALE: 1:50000 | Ref Num: | REV: 0
BY: AO | COORD SYS: NAD 1983 UTM Zone 11N | 635544-118

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GISMapSeries\2016 Annual Report\635544-118 Selected Groundwater Analytical Data - Key Areas 5 - 7.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report



Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_LSgw	2016 02 23	110	< 0.025	0.413	0.383
	2016 05 17	101	0.048	0.120	0.107
	2016 08 24	95	< 0.025	0.069	0.090
	2016 10 19	97.9	< 0.025	0.083	0.080

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_OCgw	2016 02 22	56.0	< 0.0050	< 0.050	< 0.050
	2016 05 18	51.7	< 0.0050	0.685	< 0.050
	2016 08 24	57.9	< 0.0050	< 0.050	< 0.050
	2016 10 19	58.7	< 0.0050	0.070	< 0.050
	Duplicate	60.6	< 0.0050	0.104	< 0.050

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
RG_DW-03-01	2016 05 19	76.9	< 0.025	0.106	0.095
	2016 09 21	57.8	0.069	0.124	0.138
	2016 12 12	48.5	0.089	0.182	0.178

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_MCgwS	2016 02 24	107	< 0.025	0.155	0.479
	2016 05 18	123	< 0.025	< 0.050	< 0.050
	2016 08 23	92.2	< 0.025	< 0.050	< 0.050
	2016 10 24	94.1	< 0.025	< 0.050	< 0.050

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_MCgwD	2016 02 24	52.5	< 0.0050	< 0.050	0.237
	2016 05 18	116	< 0.0050	0.071	0.083
	2016 08 23	108	< 0.025	0.169	0.145
	2016 10 24	95.8	< 0.0050	0.119	0.106

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_ER1gwS	2016 02 24	85.2	2.51	10.1	10.0
	2016 05 18	48.7	1.46	6.49	6.18
	Duplicate	48.8	1.46	6.46	6.27
	2016 08 23	63.9	2.04	8.39	7.90
	Duplicate	43.7	1.30	3.44	3.07
	2016 10 18	70.6	1.99	9.04	8.34
	Duplicate	44.7	0.08	2.70	2.55

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_ER1gwD	2016 02 24	82.2	2.41	9.88	9.29
	2016 05 18	44.7	1.25	5.71	5.16
	2016 08 23	55.3	1.64	6.86	6.41
	2016 10 18	57.5	1.51	6.77	6.24

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
RG_DW-03-04_WP	2016 03 09	-	-	-	11.8
	2016 04 05	-	-	-	11.6
	2016 05 03	-	-	-	10.4
	2016 06 01	-	-	-	6.75
	2016 07 05	-	-	-	5.66
	2016 08 03	-	-	-	6.93
	2016 09 07	-	-	-	9.04
	2016 10 04	-	-	-	10.7
	2016 11 02	-	-	-	10.1
	2016 12 13	73.2	1.31	6.65	6.21

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_BRgw	2016 02 25	320	6.64	30.0	27.8
	2016 05 17	367	10.7	41.9	37.6
	2016 08 25	358	10.6	44.7	45.5
	2016 10 19	379	8.60	32.5	31.3

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_BCgw	2016 02 22	395	13.3	53.2	59.3
	2016 05 16	350	11.2	45.3	42.4
	2016 08 22	254	7.19	31.9	31.6
	2016 10 18	235	5.96	27.4	25.2

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_RCgw	2016 02 25	1,160	48.4	238	228
	2016 05 17	1,220	50.6	237	224
	2016 08 22	1,120	44.2	216	219
	2016 10 24	1,120	43.1	208	200

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_WH50gw	2016 02 24	113	2.36	12.2	11.5
	2016 05 17	49.9	0.861	4.56	4.65
	2016 08 25	115	2.60	13.1	13.3
	2016 10 19	72.8	1.18	7.17	6.99

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
EV_ECgw	2016 05 18	26.9	0.072	0.180	0.274
	2016 08 24	27.5	0.103	0.137	0.164
	2016 10 19	28.7	0.0473	< 0.050	0.119

Primary Screening Criteria	Nitrate as N (mg/L)	Sulphate (mg/L)	Selenium (µg/L)
BCWQG Aquatic Life Short-term Maximum (AW)[a]	32.8	n/a	2
BCWQG Aquatic Life Long-term Average (AW)[a]	3	128 - 429[b]	n/a
CSR Aquatic Life (AW)[a]	400	1,000	10
CSR Irrigation Watering (IW)	n/a	n/a	20[c]
CSR Livestock Watering (LW)	100	1,000	50
CSR Drinking Water (DW)	10	500	10
Secondary Screening Criteria			**Selenium (µg/L)**
Guidelines for Canadian Drinking Water Quality (DW)			50
SPO - Elk River [GH_ER1 (E206661)/EV_ER1 (0200393)]			19
SPO - Fording River [GH_FR1 (0200378)]			63
CP - Fording River [FR_FRCP1 (E300071)]			130
CP - Fording River [FH_FR1 (0200378)]			80
CP - Elk River [GH_ERC (E300090)]			15
CP - Michel Creek [EV_MC2 (E300091)]			28

[a] Standard to protect freshwater aquatic life.
[b] Standard/guideline varies with Hardness.
[c] Individual standards exist for continuous and intermittent applications on crops. Reported value denotes

Legend

- Below primary screening criteria
- Above at least one of the primary screening criteria
- Selenium concentrations above at least one of the secondary screening criteria
- Rails
- Highway
- Secondary Road
- Key Areas
- Streams
- Mine Permitted Areas

Nitrate / Sulphate / Selenium

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1. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Revisons:
0 - AO - 2017-04-26 - CHECK PRINT - LH
1- AO - 2017-05-16 -FINAL - LH

0 0.2 0.4 0.8 1.2 1.6 2 Kilometers

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

SNC·LAVALIN

Spatial Distribution of Selected Groundwater Analytical Data - Key Areas 8-10 and 12

CHK'D: LH | DATE: 2017/05/16 | SCALE: 1:50000 | Ref Num: | REV: 0
BY: AO | COORD SYS: NAD 1983 UTM Zone 11N | 635544-119

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GISMapSeries\2016 Annual Report\635544-119 Selected Groundwater Analytical Data - Key Areas 8-10 and 12.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report

Primary Screening Criteria	Nitrate as N (mg/L)	Sulphate (mg/L)	Selenium (µg/L)
BCWQG Aquatic Life Short-term Maximum (AW)[a]	32.8	n/a	2
BCWQG Aquatic Life Long-term Average (AW)[a]	3	128 - 429[b]	n/a
CSR Aquatic Life (AW)[a]	400	1,000	10
CSR Irrigation Watering (IW)	n/a	n/a	20[c]
CSR Livestock Watering (LW)	100	1,000	50
CSR Drinking Water (DW)	10	500	10
Secondary Screening Criteria	**Selenium (µg/L)**		
Guidelines for Canadian Drinking Water Quality (DW)	50		
SPO - Elk River [GH_ER1 (E206661)/EV_ER1 (0200393)]	19		
SPO - Fording River [GH_FR1 (0200378)]	63		
CP - Fording River [FR_FRCP1 (E300071)]	130		
CP - Fording River [FH_FR1 (0200378)]	80		
CP - Elk River [GH_ERC (E300090)]	15		
CP - Michel Creek [EV_MC2 (E300091)]	28		

[a] Standard to protect freshwater aquatic life.
[b] Standard/guideline varies with Hardness.
[c] Individual standards exist for continuous and intermittent applications on crops. Reported value denotes

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
CM_MW1-SH	2016 03 10	19.5	< 0.025	0.080	< 0.050
	2016 06 16	25.2	< 0.0050	0.102	< 0.050
	2016 06 22	27.2	0.030	0.054	0.257
	2016 09 07	23.0	< 0.0050	0.260	< 0.25
	2016 12 05	21.1	< 0.025	< 0.050	-

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
CM_MW1-SH	2016 03 10	19.5	< 0.025	0.080	< 0.050
	2016 06 16	25.2	< 0.0050	0.102	< 0.050
	2016 06 22	27.2	0.030	0.054	0.257
	2016 09 07	23.0	< 0.0050	0.260	< 0.25
	2016 12 05	21.1	< 0.025	< 0.050	-

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
CM_MW1-OB	2016 03 10	291	1.95	4.10	3.92
	2016 06 16	216	1.21	4.73	3.38
	Duplicate	216	1.20	-	3.26
	2016 09 07	174	0.820	2.36	2.22
	2016 12 05	197	0.824	2.49	-
	Duplicate	197	0.821	2.49	-

Sample Location	Date (yyyy mm dd)	Sulphate (mg/L)	Nitrate Nitrogen (mg/L)	Dissolved Selenium (µg/L)	Total Selenium (µg/L)
RG_DW-07-01	2016 05 20	433	3.38	8.61	8.55
	2016 06 28	503	4.20	6.88	6.81
	2016 09 12	569	4.63	9.82	9.16
	2016 12 14	470	2.63	5.96	6.49

Key Area #11

CMO

Legend

- Below primary screening criteria
- Above at least one of the primary screening criteria
- Selenium concentrations above at least one of the secondary screening criteria
- Rails
- Secondary Road
- BC-Alberta Border
- Key Areas
- Streams
- Mine Permitted Areas

Nitrate / Sulphate / Selenium

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1. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Revisons:
0 - AO - 2017-04-26 - CHECK PRINT - LH
1- AO - 2017-05-16 -FINAL - LH

0 0.2 0.4 0.8 1.2 1.6 2 Kilometers

PROJECT LOCATION: Elk Valley, BC

CLIENT NAME: Teck Coal Ltd

SNC·LAVALIN

Spatial Distribution of Selected Groundwater Analytical Data - Key Area 11

CHK'D: LH | DATE: 2017/05/16 | SCALE: 1:50000 | Ref Num: | REV: 0
BY: AO | COORD SYS: NAD 1983 UTM Zone 11N | 635544-120

MXD Path: \\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GIS\MapSeries\2016 Annual Report\635544-120 Selected Groundwater Analytical Data - Key Area 11.mxd

Project Path: \\sli2606\PROJECTS\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports\2016 Annual Report

Appendix I

Borehole Logs

DATA ENTRY: KJM

PROJECT No.: 09-1324-1039

RECORD OF MONITORING WELL: 09-01A

SHEET 1 OF 1

LOCATION: East of Old Stream Bed Kilmamock Alluvium

BORING DATE: October 14, 2009

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (10 20 30 40)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		1584.1							Stickup =0.85 m
0	Barber Rig - DR-24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.	Silty SAND, trace gravel, loose, dry, light brown		0.0 / 1583.6							
		Sandy GRAVEL, trace silt, loose, moist, medium brown		0.5 / 1582.1							Bentonite
2		Clayey SILT, some sand and gravel, soft, low to medium plasticity, moist, medium brown		2.0 / 1581.6							
		Sandy GRAVEL, loose, moist, medium brown		2.5							Granular Filter
4											Slotted Section
6											Oct. 16, 2009 ▽
8				1575.7							Slough
		End of MONITORING WELL.		8.4							
10											
12											
14											
16											
18											
20											

DEPTH SCALE
1 : 100

Golder Associates

LOGGED: EA
CHECKED: MB

BOREHOLE 09-1324-1039_LOGS.GPJ CALGARY.GDT 1/11/16

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	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER / TYPE / BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (10 20 30 40) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp — W — Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
	Ground Surface		1584.1					Stickup =0.76 m
0	Silty SAND, trace gravel, loose, dry, light brown		0.0 / 1583.6					
	Sandy GRAVEL, trace silt, loose, moist, medium brown		0.5 / 1582.1					
2	Clayey SILT, some sand and gravel, soft, low to medium plasticity, moist, medium brown		2.0 / 1581.6					
	Sandy GRAVEL, loose, moist, medium brown		2.5					Bentonite
4								
6								
								Oct 16, 2009 ▽
8								
			1574.1					
10	Coarse GRAVEL, trace sand, loose, saturated, grey to medium brown		10.0					Slough
12	— Some silty sand from 12.5 to 13.0 m							
14								
16								Bentonite
								Slotted Section
18	— Medium to coarse gravel, light grey to brown from 18.0 to 23.0 m							
								Slough
20	*CONTINUED NEXT PAGE*							

BORING METHOD: Barber Rig - DR-24 - 9" Hole Diameter, Beck Drilling and Environmental Services Ltd.

DEPTH SCALE 1 : 100

LOGGED: EA

CHECKED: MB

Golder Associates

DATA ENTRY: KJM

BOREHOLE 09-1324-1039_LOGS.GPJ CALGARY.GDT 1/11/16

DATA ENTRY: KJM

PROJECT No.: 09-1324-1039

RECORD OF MONITORING WELL: 09-01B

SHEET 2 OF 2

LOCATION: East of Old Stream Bed Kilmamock Alluvium

BORING DATE: October 14, 2009

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (10 20 30 40) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
20	Barber Rig - DR-24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.	Coarse GRAVEL, trace sand, loose, saturated, grey to medium brown *(continued)*									Slough
22											
24											
26											
28		— Silty sand, saturated, medium brown from 28.5 to 29.0 m		1555.1							
		End of MONITORING WELL.		29.0							
30											
32											
34											
36											
38											
40											

DEPTH SCALE
1 : 100

Golder Associates

LOGGED: EA
CHECKED: MB

BOREHOLE 09-1324-1039_LOGS.GPJ CALGARY.GDT 1/11/16

BRITISH COLUMBIA

TABLE A-1 - Detailed Well Record For Well #3

Well Tag Number: 819
Driller: R. J. Drilling
Owner: FORDING COAL LTD PUR
WELL LOCATION:
KOOTENAY Land District
District Lot: 6687 Plan: Lot:
BCGS Number (NAD 27): 082J006421 Well: 2 WATER QUALITY:
Diameter: 6.0 inches
Well Depth: 40 feet

GENERAL REMARKS:
YIELD: 80 GPM COMMERCIAL & INDUSTRIAL

LITHOLOGY INFORMATION:

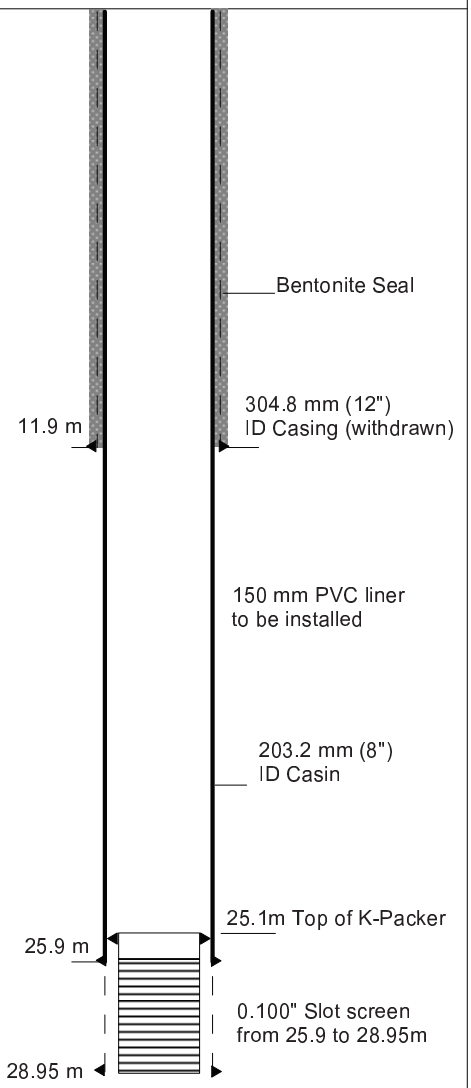
From 0 to 15 Ft. TILL
From 15 to 40 Ft. GRAVEL

H:\Project\3149\Well_Log\[Web_log.xls]819(well#3)

H:\Project\3149\Well_Log\Drilled_Well4_Greenhouse.grf

ELEV. (m-GEOD)	DEPTH (m-BGL)	GEOLOGICAL DESCRIPTION	AIR LIFT YIELD (L/s)
1570	0		0 10
1560	2	Brown Organic Sand and Silt and Clay. Moist	
1550	4	3.0 m-bgl	
1540	6	Brown Sand with plastic Clay and silt. Moist to wet.	
1530	8		
1520	10		
1510	12	12.2 m-bgl	
1500	14	Brown fine to medium grain Sand. Water bearing	
1490		15.2 m-bgl	
1480	16	Brown Medium to Coarse grain Sand. Water bearing	
1470	18	18.3 m-bgl	
1460	20	Brown Medium to Coarse grain Sand. Moist but no flow	
1450		21.3 m-bgl	
1440	22	Brown Sand with some Gravel Water bearing - good yield	
1430	24	24.4 m-bgl	
1420	26	Brown Sand. Water bearing - good yield	
1410		27.4 m-bgl	
1400	28	Brown Sand with some Gravel. Water bearing - good yield	
1390	30	End of Hole at 28.95 m-bgl	
1380	32		
1370	34		

WELL / PIEZOMETER CONSTRUCTION
EASTING: 24790.54 NORTHING: 144633.5
GROUND ELEVATION: 1575.8 m



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

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

DATA ENTRY: VI

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

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		1785.20							
0		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					1	GRAB					13 Aug 2011 ▽
2											
3											
4		--- Soft, low plasticity, damp, non-cohesive, with more grey CLAY									
5					2	GRAB					
6	Barber Rig H24 Air Rotary BECK Drilling & Environmental Services Ltd.										
				1778.50							
7		Hard layer, angular fragments, low returns GRAVEL		6.90							
		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)			3	GRAB					
8											
9		--- Clay becomes dark brown, damp, cohesive and very dense									
10					4	GRAB					
				1774.50							
11		Very loose fragments (drill cut-up), wet, massive, light to dark grey, angular BEDROCK		10.70							
12					5	GRAB					
				1772.40							
13		End of BOREHOLE.		12.80							
14											
15											

DEPTH SCALE

1 : 75

Golder Associates

LOGGED: TC

CHECKED: JW

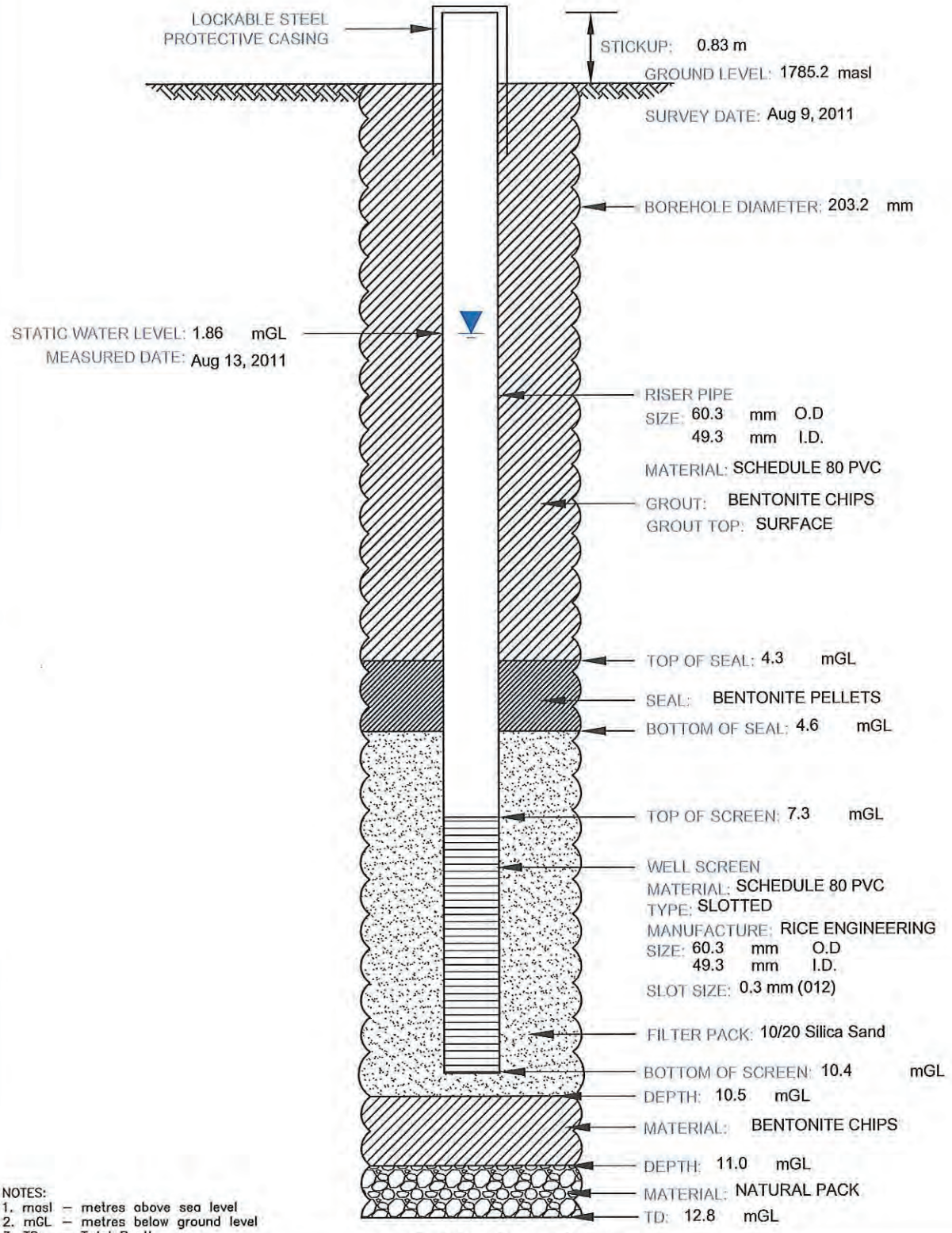
BOREHOLE - EXPANDED ADD. LAB TESTING 11.1348.0020 2000 BH LOGS.GPJ CALGARY.GDT 12/15/11

MONITORING WELL CONSTRUCTION DETAILS

Short Well ID	Well Owner: Teck Coal Fording River Operations	Spud Date: Aug 9, 2011
H5		Project Short Title: Teck Coal FRO - Henretta
	Well Name: GA-HMW5	Project Number: 11.1348.0020-1000-2000
		Site Geologist: T.Crowell

Drilling Method:	Development:	
Air Rotary	Method: Air Lift	Duration: 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

File Path: R:\Active_2011\1348\11-1348-0020 Teck Coal Henretta Ridge Assessment\Phase 2000 Drilling Report\Final

DATA ENTRY: IPG

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-01

SHEET 1 OF 3

LOCATION: See Location Plan
N: 5554750 E: 648019

BORING DATE: September 21, 2012

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		1357.00							Stick-up = 1.05 m
0	Barber Rig – Air Rotary Tervita	(SP) SAND, coarse-grained, sub-angular, poorly-graded, dark grey		0.00							
1											
2					1	GRAB					
3											
4				1353.00							
		(GP) CLAYEY GRAVEL, coarse-grained, poorly-graded, sub-rounded clay, brown, firm		4.00							
5											Bentonite Pellets
6					2	GRAB					
7											
8											
9				1348.00							
		(SP) SAND, coarse-grained, poorly-graded, trace gravel, sub-angular, trace clay, dark grey		9.00							
					3	GRAB					
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TG
CHECKED: JW

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 11/16/12

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-01

SHEET 2 OF 3

LOCATION: See Location Plan
N: 5554750 E: 648019

BORING DATE: September 21, 2012

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Barber Rig – Air Rotary Terra Tek	(SP) SAND, coarse-grained, poorly-graded, trace gravel, sub-angular, trace clay, dark grey *(continued)*									
11											
12					4	GRAB					Bentonite Pellets
13											
14											
15		(SC) CLAYEY SAND, medium-grained, poorly-graded, dark grey		1342.00 15.00							10/20 Sand
16											Slotted Section 10/20 Sand
17					5	GRAB					23 Sep 2012 ▽
18											
19		(SP) SAND, coarse-grained, sub-angular, poorly-graded, dark grey		1338.00 19.00	6	GRAB					Bentonite Pellets
20		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TG
CHECKED: JW

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 11/16/12

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: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
20	Barber 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		1334.40	7	GRAB					
		End of MONITORING WELL.		22.60							
23		NOTES: Hit BEDROCK at 22.6 m. Standpipe installed to 18.6 m. Groundwater level measured at at 17.5 mGL on September 23, 2012.									
24											
25											
26											
27											
28											
29											
30											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TG

CHECKED: JW

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 11/16/12

DATA ENTRY: IPG

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-02

SHEET 1 OF 3

LOCATION: See Location Plan
N: 5552115 E: 648291

BORING DATE: September 19, 2012

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		1310.00							Stick-up = 1.02 m
0	Barber Rig – Air Rotary Tervita	(SP) SAND, coarse-grained, trace fine gravel, angular, poorly-graded, grey		0.00							
1											
2					1	GRAB					
3											
4											19 Sep 2012 ▽
5		(GP) GRAVEL, coarse-grained, sub-rounded, brown		1305.00 5.00							Bentonite Pellets
6					2	GRAB					
7		(CI) SILTY CLAY, some fine gravel, brown, cohesive, water content is close to plastic limit, very soft		1303.00 7.00							
8											
9					3	GRAB					
10				1300.00							
		CONTINUED NEXT PAGE									

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 11/16/12

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TG
CHECKED: JW

DATA ENTRY: IPG

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: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Barber Rig – Air Rotary Tervita	(GW) GRAVEL, coarse-grained, sub-angular, well graded, grey		10.00	4	GRAB					
				1298.50							
11		(Cl) SILTY CLAY, with some fine gravel, brown, cohesive, very soft, w~PL		11.50							
12											
13											
14											
15					5	GRAB					Bentonite Pellets
16											
17				1292.80							
		(SP) SAND, coarse-grained, some fine gravel, angular, poorly-graded, dark grey		17.20							
18					6	GRAB					
19											
				1290.50							
		(GW) GRAVEL, coarse-grained, sub-angular, well graded, grey		19.50	7	GRAB					
20		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TG
CHECKED: JW

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 11/16/12

DATA ENTRY: IPG

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: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
20	Barber Rig – Air Rotary Tervita	(GW) GRAVEL, coarse-grained, sub-angular, well graded, grey *(continued)*											Bentonite Pellets
21					7	GRAB							10/20 Sand
22													
23				1287.00									
		(ML) SILT, some fine gravel, trace coarse gravel, dark grey, non-cohesive, dry		23.00	8	GRAB							
24				1286.00									
		(SP) SAND, coarse-grained, some fine gravel, angular, poorly-graded, dark grey		24.00									
25													
26													Slotted Section 10/20 Sand
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									Bentonite Pellets
		(SP) SAND, coarse-grained, coarse gravel, bits of bedrock, sub-angular, poorly-graded, light grey			10	GRAB							
				29.60									
30		End of MONITORING WELL.											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TG

CHECKED: JW

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 11/16/12

DATA ENTRY: IPG

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-3S

SHEET 1 OF 2

LOCATION: See Location Plan
N: 5550296 E: 648578

BORING DATE: September 23, 2012

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		1294.00							
0	Barber Rig – Air Rotary Tervita	(SP) SAND, coarse-grained, sub-angular, poorly-graded, dark grey, homogenous, moist		0.00							
1											
2					1	GRAB					
3											Bentonite Pellets
4											
				1289.50							
5		(SP) GRAVELY SAND, coarse-grained, fine gravel, poorly-graded, sub-angular, grey		4.50							
6											
7					2	GRAB					10/20 Sand 23 Sep 2012 ▽
8											
9											Slotted Section 10/20 Sand
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TG
CHECKED: JW

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 11/16/12

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-3S

SHEET 2 OF 2

LOCATION: See Location Plan
N: 5550296 E: 648578

BORING DATE: September 23, 2012

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; 20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Barber Rig – Air Rotary Tervita	(SP) GRAVELY SAND, coarse-grained, fine gravel, poorly-graded, sub-angular, grey *(continued)*											
11					3	GRAB							
12													Slotted Section 10/20 Sand
13													
14					4	GRAB							Bentonite Pellets
				1279.60									
		End of MONITORING WELL.		14.40									
15		NOTES: Encountered BEDROCK at 14.4 m											
16													
17													
18													
19													
20													

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TG
CHECKED: JW

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 11/16/12

DATA ENTRY: IPG

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-04

SHEET 1 OF 2

LOCATION: See Location Plan

N: 5552963 E: 648217

BORING DATE: September 20, 2012

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		1304.00							Stick-up = 0.9 m
0	Barber Rig – Air Rotary Tervita	(SP) GRAVELLY SAND, coarse-grained, fine gravel, sub-angular, poorly-graded, dark grey		0.00							
1											
2											
3											
4					1	GRAB					
5											Bentonite Pellets
6											24 Sep 2012 ▽
7											
8											
9				1295.00							
		(SM) SILTY SAND, medium to fine-grained, sub-rounded, poorly-graded, brown and dark grey		9.00							
					2	GRAB					
10				1294.00							
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TG

CHECKED: JW

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 11/16/12

PROJECT No.: 11.1422.0052

RECORD OF MONITORING WELL: GA-MW-04

SHEET 2 OF 2

LOCATION: See Location Plan

N: 5552963 E: 648217

BORING DATE: September 20, 2012

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Barber Rig – Air Rotary Tarvita	(SP) GRAVELLY SAND, coarse-grained, fine gravel, sub-angular, poorly-graded, dark grey		10.00									Bentonite Pellets
11													
12					3	GRAB							
13													10/20 Sand
14		(SM) SILTY SAND, medium to fine-grained, sub-rounded, poorly-graded, brown and dark grey		1290.00 14.00	4	GRAB							
				1289.50									
15		(GW) GRAVEL, fine with coarse, sub-angular to sub-rounded, well graded, grey		14.50									Slotted Section 10/20 Sand
16					5	GRAB							
17				1287.00									Bentonite Pellets
		(SP) GRAVELLY SAND, coarse-grained, fine gravel, poorly-graded, sub-angular, dark grey			6	GRAB							
		End of MONITORING WELL.		17.20									
18		NOTES: Standpipe installed to 16.7 m. Groundwater present at 6.0 m on September 24, 2012.											
19													
20													

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TG

CHECKED: JW

DATA ENTRY: JPG

BOREHOLE - EXPANDED ADD. LAB TESTING 11.1422.0052_BH LOGS.GPJ CALGARY.GDT 11/16/12

Log of Monitoring Well: GH_MW-ERSC-1

HEMMERA

Project Name/No: Greenhills Ops Elkford BC/577-016.04

Client: Teck Coal Ltd.

Date Drilled: November 24, 2014

Site Location: Greenhills Operations, BC

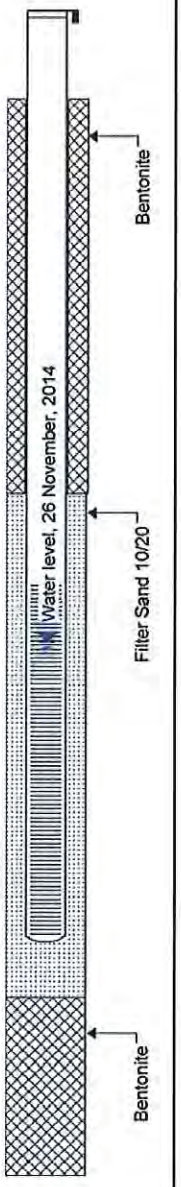
Drilling Company: JR Drilling

Drilling Method: Dual air rotary

Logged by: RM

Sheet: 1 of 1

SUBSURFACE PROFILE			SAMPLE						
Depth (ft / m)	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm (0 250 500)	LEL % (0 50 100)	Backfill details
0		Ground Surface	1293.00						
0		**TOPSOIL** Black, dry, loose, organic soil	0.00						
1		**TILL** Gravelly Till (rounded to subrounded, medium to coarse grain), brown, dry, dense, well graded, lots of rock cuttings.							
13			1288.73						
14		Sandy Till (medium grain) and Gravel (rounded to subrounded, medium to coarse grain), brown, moist, dense, well graded, lots of rock cuttings.	4.27						
17		Below 5.2 m, a water bearing seam <0.31 m width.	1287.82 5.18						
18		Sandy Till (medium grain) and Gravel (rounded to subrounded, medium to coarse grain), brown, moist, dense, well graded, lots of rock cuttings.	1287.51 5.49						
20		**BEDROCK** Siltstone, grey, dry, competent, very hard	1286.90 6.10						
22		Between 6.7 m and 7.0 m, fracture zone, moist	1286.29 6.71						
23		Below 7.2 m material is dry, very hard, uniform size cuttings, dusty drilling conditions	1285.99 7.01						
30		End of Log	1283.86 9.14						



Well location: 5,548,704 N, 649,081 E

Depth to water level (TOC): 5.349 m

Date of water level: 26 November, 2014

Borehole diameter: 0.17 m

Well casing diameter: 2"

Well casing material: Sch. 80 PVC

Well screen slot size: 010

Well screen interval (bgs): 4.12 m - 7.17 m

Depth of well (TOC): 7.924 m

Well Elevation (TOC): 1293.75 m

Ground Elevation: 1293 m

BRITISH COLUMBIA

Greenhills Well 9

Report 1 - Detailed Well Record

GH_POTW09

Well Tag Number: 85223

Owner: ELK VALLEY COAL - GREENHILLS OPERATION

Address:

Area: GREENHILLS

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

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

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1992-06-29 00:00:00

Driller:
Well Identification Plate Number: 15802
Plate Attached By: KIMBERLY RASMUSSEN
Where Plate Attached: WELL CASING

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:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag: N
Field Chemistry Info Flag:
Site Info (SEAM): N

Water Utility: N
Water Supply System Name: GREENHILLS WATER SUPPLY SYSTEM
Water Supply System Well Name: WELL 9

SURFACE SEAL:
Flag: Y
Material:
Method:
Depth (ft): 88 feet
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

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

GENERAL REMARKS:

LITHOLOGY INFORMATION:

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

- Return to Main
- Return to Search Options
- Return to Search Criteria

BRITISH COLUMBIA

Greenhills Well 10

Report 1 - Detailed Well Record

GH_POTW10

Well Tag Number: 85218 Owner: ELK VALLEY COAL - GREENHILLS OPERATION Address: Area: GREENHILLS 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 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 Site Info Details: Other Info Flag: Other Info Details:	Construction Date: 2001-06-22 00:00:00 Driller: Well Identification Plate Number: 15805 Plate Attached By: Where Plate Attached: 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: WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM): N Water Utility: N Water Supply System Name: GREENHILLS WATER SUPPLY SYSTEM Water Supply System Well Name: WELL 10 SURFACE SEAL: Flag: N Material: Method: Depth (ft): Thickness (in): WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:

Screen from	to feet

Casing from	to feet	Diameter	Material	Drive Shoe
0	176	null	Other	null

GENERAL REMARKS:
WATER QUALITY GUARANTEED BY CONTRACTOR

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

- Return to Main
- Return to Search Options
- Return to Search Criteria

BRITISH COLUMBIA

Greenhills Well 15

Report 1 - Detailed Well Record

GH_POTW15

Well Tag Number: 85221 Owner: ELK VALLEY COAL - GREENHILLS OPERATION Address: Area: 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 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 Site Info Details: Other Info Flag: Other Info Details:	Construction Date: 2001-11-01 00:00:00 Driller: Well Identification Plate Number: 15803 Plate Attached By: KIMBERLY RASMUSSEN Where Plate Attached: WELL CASING 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 WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: N Field Chemistry Info Flag: Site Info (SEAM): N Water Utility: N Water Supply System Name: GREENHILLS WATER SUPPLY SYSTEM Water Supply System Well Name: WELL 15 SURFACE SEAL: Flag: N Material: Method: Depth (ft): Thickness (in): WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:

Screen from	to feet

Casing from	to feet	Diameter	Material	Drive Shoe
0	144	null	Other	null

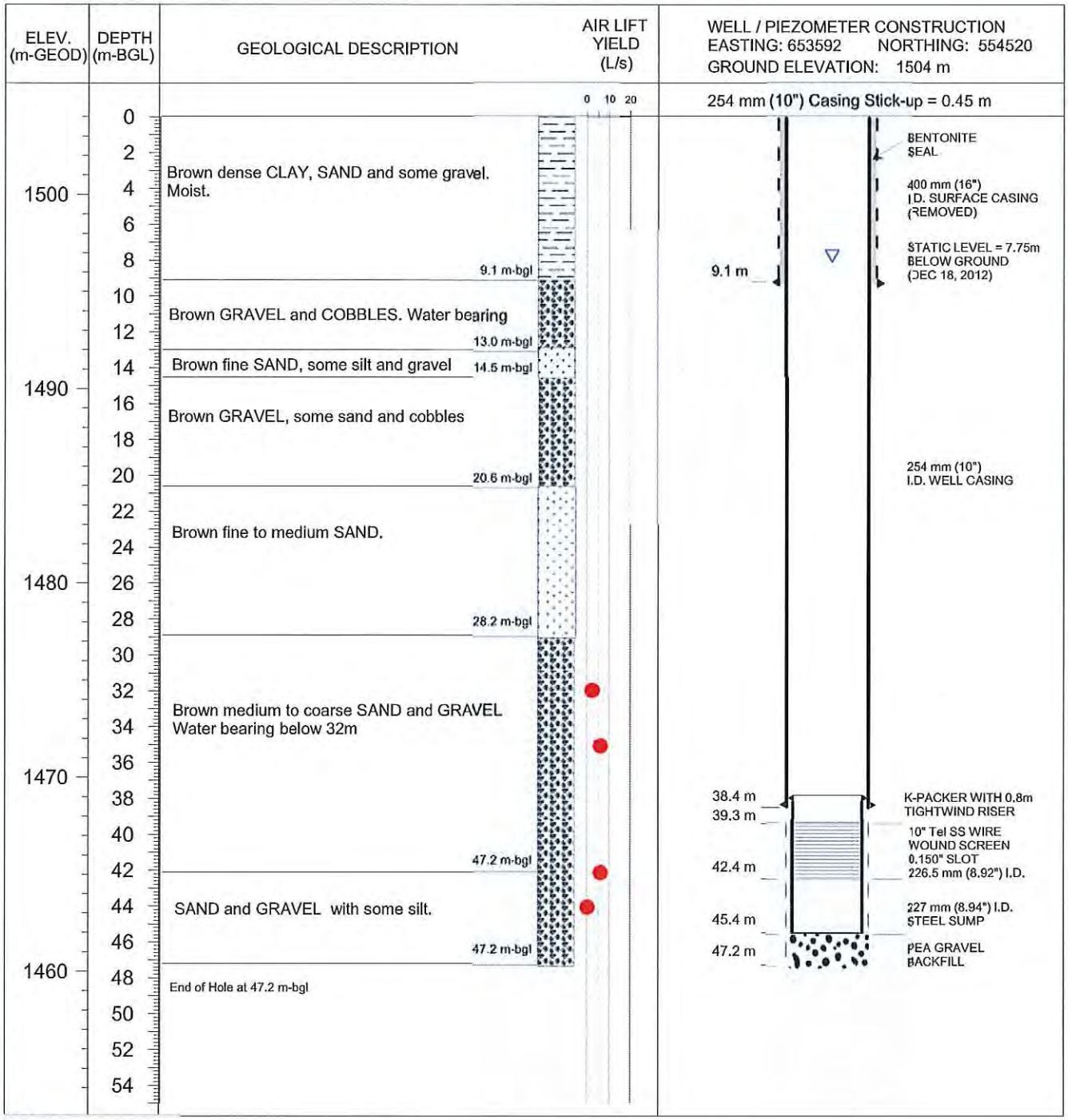
GENERAL REMARKS:
WATER QUALITY GUARANTEED BY CONTRACTOR

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	

- Return to Main
- Return to Search Options
- Return to Search Criteria

H:\Project\3148\Well Log\Well17 Greenhill.grf



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

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

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: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (20 40 60 80); nat V. +, rem V. ⊕; Q - ●, U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		353.26									Stick-up =0.86 m
		SANDY GRAVEL, fine-grained with occasional coarse grains, rounded to sub-rounded, moderately graded, dry, very loose		0.00									
				351.74									
		GRAVEL, trace sand, fine-grained with occasional coarse grains, rounded to sub-rounded, poorly graded, very loose		1.52									
2		— Moist at 2.1 m											12 Nov 2013 ▽
5													Bentonite Chips
				347.17									
		Silty SANDY GRAVEL, fine-grained with occasional coarse grains, sub-rounded to sub-angular, poorly graded, wet, very loose		6.10									
				343.51									
				9.75									
10		*CONTINUED NEXT PAGE*											

Sonic 127 mm (ID) Casing 152.4 mm (OD)
JR Drilling

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: GD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DATA ENTRY: IPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_BCgw

SHEET 2 OF 3

LOCATION: See Location Plan

N: 5509659 E: 655381

BORING DATE: October 22, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
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													Bentonite Chips
14													
15		— Occasional coarse grains from 15.2 m											
16													
17													Silica Sand
18													
19													Slotted Section
20		*CONTINUED NEXT PAGE*											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DATA ENTRY: IPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_BCgw

SHEET 3 OF 3

LOCATION: Soo Location Plan

N: 5509659 E: 655381

BORING DATE: October 22, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
20	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)*									Stotted Section
21											
22				331.17							Silica Sand
		Sandy SILTY GRAVEL, fine-grained, sub-angular to angular, poorly graded, wet, very loose		22.10							
23				330.10							
		End of BOREHOLE.		23.18							
		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.									
24											
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

Golder Associates

LOGGED: RT

CHECKED: CD

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ECgw

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: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		406.30							Stick-up +0.74 m
0		GRAVELLY SAND, medium and coarse-grained sand with occasional fine gravel grains, rounded to sub-rounded, moderately graded, dry, very loose		0.00							16 Nov 2014 ▽ Bentonite Chips
				404.77							
1		SAND, trace gravel, medium-grained, rounded to sub-rounded, moderately graded, dry, very loose		1.52							
2											Silica Sand
3											Slotted Section
				402.49							
4		CLAY and SAND, medium-grained with occasional coarse grains, rounded to sub-rounded, moderately graded, moist, firm		3.81							Silica Sand
5	JR Drilling / Casing 127 mm (ID) Casing 152.4 mm (OD)			401.12							
		SANDY CLAY, medium-grained with occasional coarse grains, rounded to sub-rounded, moderately graded, moist, firm		5.18							
6				399.44							
		CLAY, some sand, medium-grained, rounded to sub-rounded, moderately graded, moist, semi-firm		6.86							Bentonite Pellets
7											
8											
9											
10											
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RT

CHECKED: CO

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ECgw

SHEET 2 OF 2

LOCATION: See Location Plan
N: 5506384 E: 660795

BORING DATE: October 27, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q- ● rem V. ⊕ U- ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	JR Drilling	CLAY, some sand, medium-grained, rounded to sub-rounded, moderately graded, moist, semi-firm *(continued)*		395.33							Bentonite Pellets
11		End of BOREHOLE.		10.97							
12		NOTES: Standpipe installed to 4.1 m upon well completion. Groundwater level measured at 1.6 mbgs on November 12, 2013.									
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ER1gwD

SHEET 1 OF 4

LOCATION: See Location Plan
N: 5510952 E: 651379

BORING DATE: 29 and 31 October, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q- ●, rem V. ⊕ U- ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		339.85									Stick-up =0.71 m
0	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	SILTY SAND, fine-grained with occasional medium grains, rounded to sub-rounded, moderately graded, minor organics (roots), dry, very loose		0.00									
1				338.33									
2		SAND, medium and coarse-grained, and fine-grained with some coarse-grained GRAVEL, poorly sorted, sub-rounded, sub-angular and angular clasts, dry, very loose		1.52									
3													
4													16 Nov 2013 ▽
5													Bentonite Chips
6													
7													
8													
9													
10				329.95 9.91									

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ER1gwD

SHEET 2 OF 4

LOCATION: See Location Plan

N: 5510952 E: 651379

BORING DATE: 29 and 31 October, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	SANDY GRAVEL, fine-grained with some coarse grains, sub-rounded to sub-angular, poorly sorted, wet, very loose *(continued)*									
11											
12											
13											
14											
15											Bentonite Chips
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		*CONTINUED NEXT PAGE*									

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: RT

CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ER1gwD

SHEET 3 OF 4

LOCATION: See Location Plan
N: 5510952 E: 651379

BORING DATE: 29 and 31 October, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q- ● rem V. ⊕ U- ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
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)*									Bentonite Chips
21											
22											
23											
24											Silica Sand
25											
26											
27											Slotted Section
28		SILTY SAND, fine to medium-grained, occasional angular gravel, rounded to sub-rounded, moderately graded, dry, very loose (BEDROCK)		311.96 / 27.69							
29											Silica Sand / Bentonite Pellets / Slough
30		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DATA ENTRY: IPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ER1gwD

SHEET 4 OF 4

LOCATION: See Location Plan

N: 5510952 E: 651379

BORING DATE: 29 and 31 October, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
30	JR Drilling	SILTY SAND, fine to medium-grained, occasional angular gravel, rounded to sub-rounded, moderately graded, dry, very loose (BEDROCK) *(continued)*		309.07							Slough
31		End of BOREHOLE.		30.78							
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

Golder Associates

LOGGED: RT

CHECKED: CD

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ER1gwS

SHEET 1 OF 2

LOCATION: See Location Plan
N: 5510955 E: 651374

BORING DATE: October 30, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	Ground Surface		339.85							Stick-up +0.96 m
		SAND, medium and coarse-grained with some fine grains, rounded to sub-rounded, moderately graded, dry, very loose		0.00							
1											
2											
3											
4											
5											16 Nov 2013 ▽ Bentonite Chips
6											
				333.15							
7		SAND, medium to coarse-grained, some fine-grained gravel, sub-rounded, sub-angular, moderately sorted, dry, very loose		6.71							
8											
				331.32							
9		SAND, medium to coarse-grained, some fine-grained gravel, sub-rounded, sub-angular and angular, moderately sorted, wet, very loose		8.53							
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DATA ENTRY: IPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_ER1gwS

SHEET 2 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: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
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)*									Bentonite Chips
11											
12											
13											
14											Silica Sand
15											
16											Slotted Section
17				322.24							
		End of BOREHOLE.		17.61							
18		NOTES: Standpipe installed to 17.6 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.									
19											
20											

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RT

CHECKED: CD

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 83)

N: 5522255 E: 656580

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		400.51							Stick-up +0.91 m
0	Sonic 127 mm (ID) Casing 152.4 mm (OD) / JR Drilling	SANDY GRAVEL, fine-grained, sub-angular to angular, moderately graded, dry, very loose		0.00							
1				398.98							
2		SAND, some gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, dry, very loose		1.52							
3				397.61							
4		SANDY GRAVEL, fine-grained, sub-angular to angular, moderately graded, dry, very loose		2.90							
5				395.94							Bentonite Chips
6		SAND, some gravel, localized thin zones of gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, moist, very loose		4.57							
7											
8											
9											
10		*CONTINUED NEXT PAGE*									15 Nov 2013 ▽

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

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: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	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											
				367.55							
13		SILTY GRAVEL, fine-grained, sub-rounded to sub-angular, poorly graded, wet, very loose		12.95							
14											
				365.88							
15		GRAVEL, fine-grained, sub-rounded to sub-angular, well graded, moist, very loose		14.63							Bentonite Chips
				384.35							
16		SAND, some gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, moist, very loose		16.15							
17											
				382.98							
18		GRAVEL, some silt, fine-grained, sub-rounded to sub-angular, poorly graded, moist, very loose		17.63							
19											
				381.46							
		SILTY GRAVEL, fine-grained, sub-rounded to sub-angular, poorly graded, wet, very loose		19.05							
20											
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RT

CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

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: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q- ● rem V. ⊕ U- ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp — W — Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
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 *(continued)*		379.63							
21		SILTY GRAVEL, fine and coarse-grained, sub-angular to angular, poorly graded, wet, very loose		20.88							Bentonite Chips
22											
23											Silica Sand
24											Slotted Section
25		End of BOREHOLE.		375.51 25.00							Silica Sand
26		NOTES: Standpipe installed to 24.4 m upon well completion. Groundwater level measured at 9.9 mbgs on November 15, 2013.									
27											
28											
29											
30											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RT

CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

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	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp — W — Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		345.03							Stick-up =0.93 m
0	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	FILL - Sand sized particles, medium to coarse-grained, sub-rounded to sub-angular, well graded, dark black carbonaceous, moist, very loose		0.00							
1											
				343.51							
		SANDY GRAVEL, some silt, fine-grained, sub-rounded to sub-angular, poorly graded, moist, very loose		1.52							
2											Bentonite Chips
3											14 Nov 2013 ▽
				341.22							
		GRAVELY SAND, coarse-grained with fine-grained gravel, sub-rounded to sub-angular, poorly graded, moist, very loose		3.81							
4											
5											Silica Sand
6											Slotted Section
				338.16							
7		SANDY SILT, fine to medium-grained, wet, mud		6.86							
8											Silica Sand
9											
10											
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 60

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_LSgw

SHEET 2 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: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	JR Drilling	SANDY SILT, fine to medium-grained, wet, mud *(continued)*		334.36							Silica Sand
		End of BOREHOLE.		10.67							
11		NOTES: Standpipe installed to 6.7 m upon well completion. Groundwater level measured at 3.4 mbgs on November 14, 2013.									
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgwD

SHEET 1 OF 5

LOCATION: See Location Plan
N: 5511616 E: 653475

BORING DATE: November 3, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q- ● rem V. ⊕ U- ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		344.73									Stick-up =0.84 m
		SAND, coarse and medium-grained, and fine-grained GRAVEL, rounded to sub-rounded, moderately graded, wet, very loose		0.00									
1													
2													
3													15 Nov 2013 ▽
				341.07									
4		SAND, fine and medium-grained, sub-rounded to sub-angular, well graded, dry, very loose		3.66									
5	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling												Bentonite Pellets
				339.09									
6		SILT, some fine-grained sand, well graded, very loose --- Wet at 5.8 m		5.64									
7													
8				336.65									
		CLAY, some fine-grained sand, well-sorted, moist, compact		8.08									
9													
10		*CONTINUED NEXT PAGE*											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DATA ENTRY: IPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgwD

SHEET 2 OF 5

LOCATION: See Location Plan
N: 5511616 E: 653475

BORING DATE: November 3, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q- ● rem V. ⊕ U- ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	CLAY, some fine-grained sand, well-sorted, moist, compact *(continued)*									
11				333.30							
		SILT, some fine-grained sand, well graded, wet, very loose		11.43							
12											
13											
14				330.40							
		CLAY, some fine-grained sand, well-sorted, wet, soft		14.33							
15											Bentonite Pellets
				328.68							
16		CLAY, some fine-grained sand, well-sorted, moist, compact		15.85							
17											
				327.36							
18		CLAY, some fine-grained sand, well-sorted, moist, loose		17.37							
19											
20											
		CONTINUED NEXT PAGE									

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

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: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
20	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	CLAY, some fine-grained sand, well-sorted, moist, loose *(continued)*									Bentonite Pellets
21											
22											
23											Silica Sand
24											
25											
26											Slotted Section
27											
28											Silica Sand
29											
30		*CONTINUED NEXT PAGE*									Bentonite Pellets / Slough

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgwD

SHEET 4 OF 5

LOCATION: See Location Plan
N: 5511616 E: 653475

BORING DATE: November 3, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
30	Sonic 127 mm (ID) Casing 152.4 mm (OD)	CLAY, some fine-grained sand, well-sorted, moist, loose *(continued)*											
				314.26									
		CLAY, some fine-grained sand, well-sorted, wet, soft		30.45									
31													
32													
33													
34													
35													Slough
36													
37				307.64									
		SAND, coarse-grained, sub-angular to angular, well graded, wet, very loose		37.19									
38													
				305.87									
39		SILT and SAND, coarse-grained, sub-angular, moderately-sorted, wet, very loose		38.66									
40		*CONTINUED NEXT PAGE*											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgwD

SHEET 5 OF 5

LOCATION: See Location Plan
N: 6511616 E: 653475

BORING DATE: November 3, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q- ●, U- ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
40	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	SILT and SAND, coarse-grained, sub-angular, moderately-sorted, wet, very loose *(continued)*		304.34									
		SANDY SILT, fine-grained, moderately-sorted, wet, very loose		40.39									
41													
42													
				302.06									
43		CLAYEY SAND, fine-grained, some coarse-grained gravel, angular, moderately-sorted, brown, wet, very loose		42.67									
44				300.69									Slough
		GRAVEL, fine-grained, sub-rounded, moderately-sorted, grey to brown, very loose, wet		44.04									
				299.02									
45		SAND, medium-grained with some fine grains, sub-rounded, poorly graded, mainly black to grey and brown, wet		44.81									
46													
47				297.18									
		End of BOREHOLE.		47.65									
48		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.											
49													
50													

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

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

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		344.73							Stick-up =0.98 m
0	Sonic 127 mm (ID) Casing 152.4 mm (OD) / JR Drilling	SAND, coarse and medium-grained, and fine-grained GRAVEL, rounded to sub-rounded, moderately graded, dark brown, damp, very loose		0.00 / 343.61							
1		SAND, fine and medium-grained, sub-rounded to sub-angular, poorly graded, brown, dry, very loose		0.91							15 Nov 2013 ▽
2											
3											Bentonite Pellets
4				340.16							
5		CLAYEY SILT, some fine-grained sand, dark brown to grey, moist, soft to very loose		4.57 / 339.24							
6		CLAYEY SILT, some fine-grained sand, dark brown to grey, wet, very soft, very loose (runny)		5.49							Silica Sand
7											Slotted Section
8											Slough
9				335.58							
		CLAY, some fine-grained sand, well-sorted, moist, compact		9.14							
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: RT

CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12-1349-0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_MCgwS

SHEET 2 OF 2

LOCATION: See Location Plan

N: 5511624 E: 653476

BORING DATE: November 6, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp — W — Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	JR Drilling	CLAY, some fine-grained sand, well-sorted, moist, compact *(continued)*		334.06							Slough
		End of BOREHOLE.		10.67							
11		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.									
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_OCgw

SHEET 1 OF 2

LOCATION: See Location Plan
N: 5512671 E: 652460

BORING DATE: November 7, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q- ●, rem V. ⊕ U- ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	Ground Surface		342.60							Stick-up =0.89 m
0		SANDY GRAVEL, fine-grained with occasional coarse grains, rounded to sub-rounded, moderately graded, dry, very loose		0.00							
1				341.07							
1		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		1.52							15 Nov 2013 ▽
2											
3				338.94							
3		GRAVEL, trace sand, fine to coarse-grained, sub-rounded to rounded, poorly graded, moist, loose		3.66							
4											
5											Bentonite Chips
6											
6				335.89							
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,		6.71							
8											
9											
10											

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 50

Golder Associates

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
N: 5512071 E: 652480

BORING DATE: November 7, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q- ● rem V. ⊕ U- ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	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													
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 12.80									Slotted Section
14				328.12									
15		BEDROCK		14.48 327.06									Silica Sand Tail Pipe
16		End of BOREHOLE. NOTES: Standpipe installed to 14.6 m upon well completion. Groundwater level measured at 2.1 mbgs on November 15, 2013.		15.64									
17													
18													
19													
20													

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

DEPTH SCALE
1 : 50

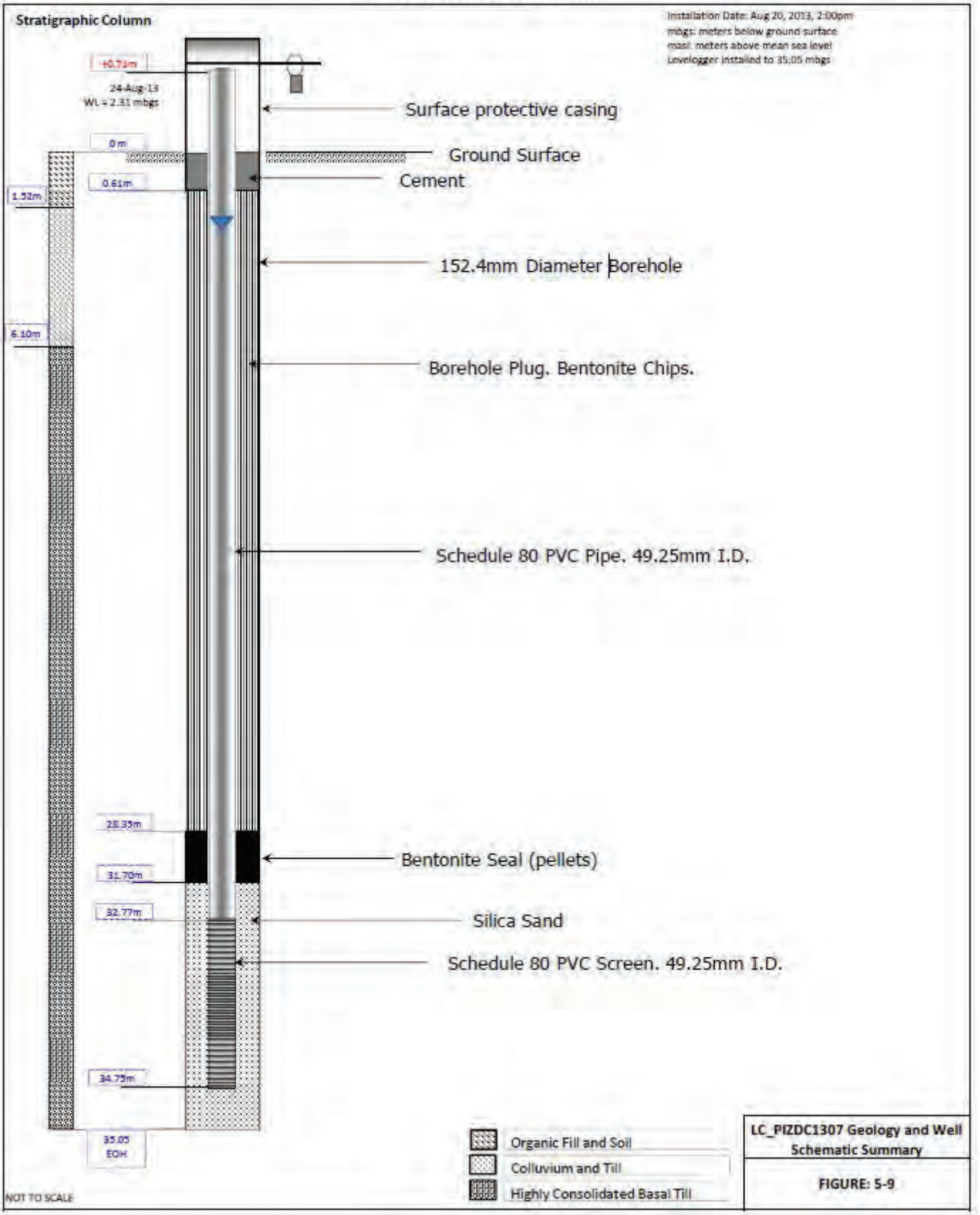
Golder Associates

LOGGED: RT
CHECKED: CD

MONITORING WELL LC_MW13-1D

Borehole: LC_PIZDC1307 **Location:** 5541229.683N, 658168.846E ; 1690.506 masl

DRY CREEK PROJECT - 13-1345-0010



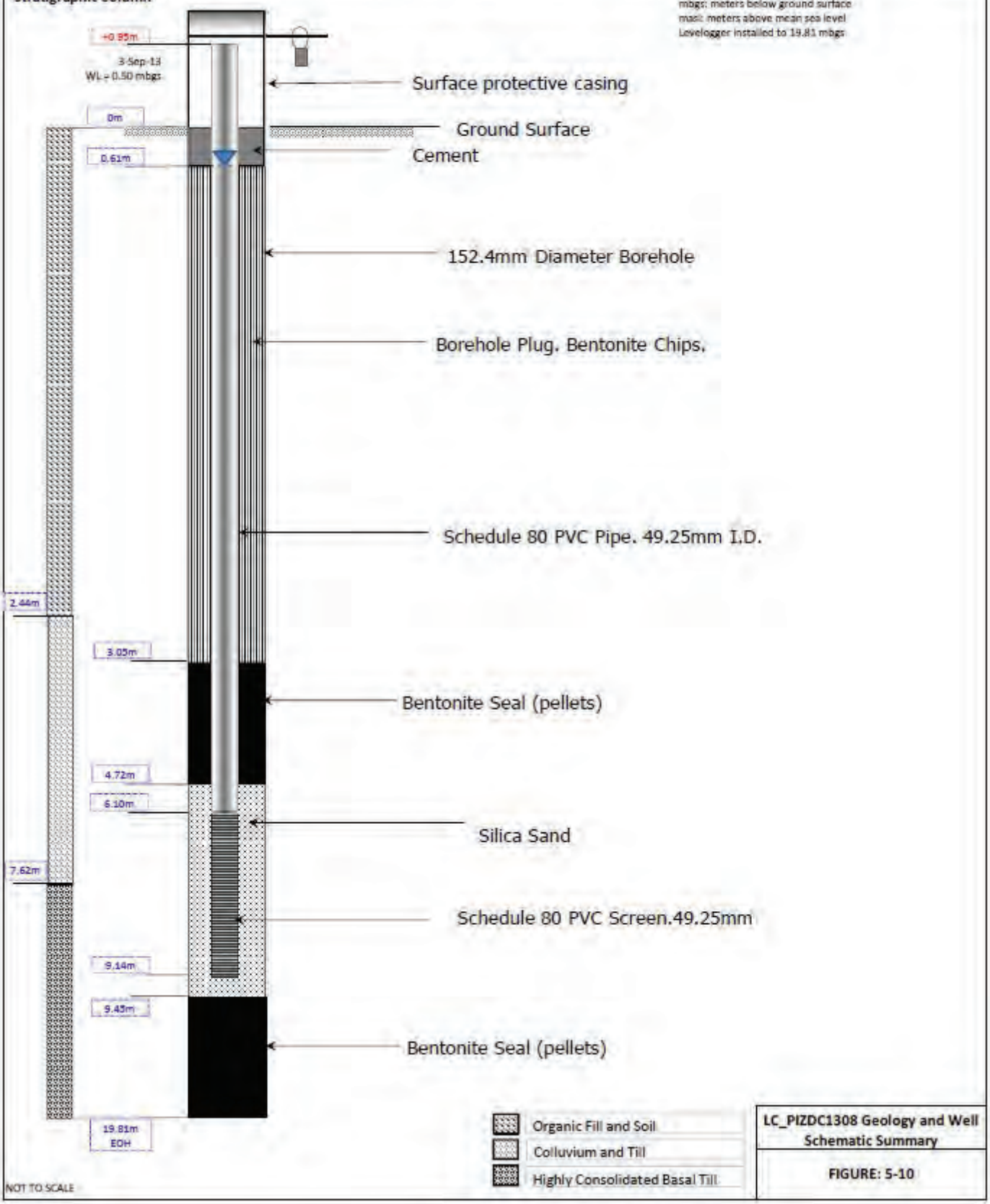
LC_PIZDC1307 Geology and Well Schematic Summary

FIGURE: 5-9

MONITORING WELL
Borehole: LC_PIZDC1308 **Location:** 5541252.170N, 658167.863E ~1690.424 masl
LC_MW13-1S
DRY CREEK PROJECT - 13-1345-0010

Stratigraphic Column

Installation Date: Aug 24, 2013
mbgs: meters below ground surface
masl: meters above mean sea level
Levelogger installed to 19.81 mbgs



NOT TO SCALE

LC_PIZDC1308 Geology and Well Schematic Summary

FIGURE: 5-10

LC_PIZP1101
LC_MW11(P)-01

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: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; Split-Pen; Core

BACKFILL TYPE: Bentonite; Pea Gravel; Slough; Grout; Drill Cuttings; Sand

GASTECH VAPOUR 200 400 600 800

STANDARD PEN (N) 20 40 60 80

PLASTIC M.C. LIQUID 20 40 60 80

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
0	**SAND**, silty, some gravel, trace clay, loose, compact, medium brown, dry		1			Top of casing (TOC) elevation is 1267.06 mASL. Stick-up = 1.0 m.	1265
1			2				1264
2	-gravelly		3				1263
3	**SILT**, sandy, some cobbles, some gravel, compact, grey brown, damp		4				1262
4			5				1261
5			6				1260
6	**SILTY SAND**, some gravel, compact, medium brown, dry						1259
7			7				1258
8	**SILT** , some cobbles, trace FG sand, firm, medium brown, damp		8				1257
9			9				1256
10			10				1255
11							1254
12			11				1253
13							1252
14							1251
15			12				1250
16							1249
17							1248
18							1247
19	-damp						1246
20	-dry		13				1245
21							1244
22							1243
23							1242
24			14				1241
25							1240
26							1239
27	-damp		15			Depth to groundwater was 30.81 m from TOC 23 November 2011 (1236.25 mASL).	1238
28							1237
29							1236
30							1235
31							1234
32							1233
33						150 mm steel casing installed from surface to 33.5 m.	1232
34	**SAND AND GRAVEL**, dense, brown grey, moist (sub-rounded gravel)						1231
35			16				1230
36	**CG SAND**, some gravel, dense, brown grey, wet (sub rounded to sub angular)		17				1229
37							1228
38							1227
39	-wet					A 50 mm Schedule 40 slotted PVC screen was installed from 37.5 m to 40.5 m.	1226
40							1225
41						K = 7.4 x 10^{-4} m/s	1224
42	**END OF HOLE AT 41.2 m** Borehole wet at completion. Monitoring well installed.						1223
43							1222
44							
45							

BX06169 - BOREHOLE LOGS - SEPTEMBER 30,2011.GPJ 12/01/04 03:30 PM (BOREHOLE LOG)

amec

AMEC Environment & Infrastructure
Medicine Hat, Alberta

LOGGED BY: RH
REVIEWED BY: LH

COMPLETION DEPTH: 40.50 m
COMPLETION DATE: 11/15/11

srk consulting

Teck

HOLE ID:	MW-1	COORDINATES:	667969 E 5487521 N
LOCATION:	CMO	DATUM:	UTM Zone 11
PROJECT NO:	1CT017.098	GROUND ELEV (masl):	1500.44
DRILLING CONTRACTOR:	AquaPro Drilling Ltd.	COLLAR DIP:	-90
		EOH ELEV. (masl):	1463.25
DRILLING TYPE:	Air Rotary	TOTAL DEPTH (mbgs):	37.19
LOGGED BY:	LC	STICKUP HEIGHT (magl):	0.85
BORING DATE:	8/12/2015 to 8/13/2015	CASING STICKUP (magl):	0.85

PROJECT: Phase 1 Groundwater Monitoring

CLIENT: Teck Coal Ltd. - CMO

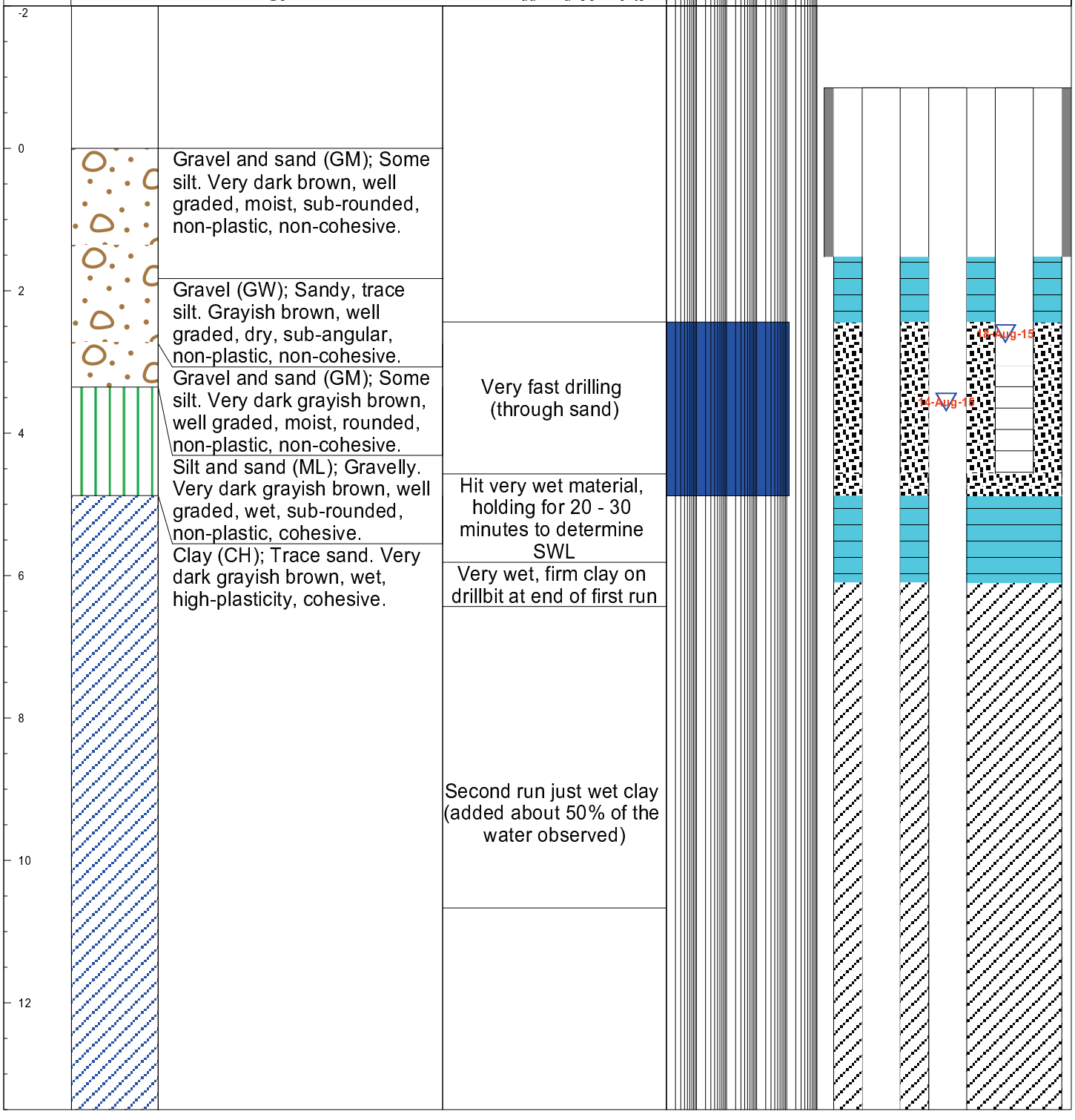
AREA: **Michel Creek**

Lithological Symbol: CL-Clay, LO-Loam, SI-Silt, SA-Sand, GV-Gravel, SS-Sandstone, ST-Siltstone

Hydraulic Conductivity (m/s): 1E-8, 1E-7, 1E-6, 1E-5, 0.0001, 0.001

Well Installation: Sand, Screen, PVC, Pellets, Cave, Chips, Chips/Backfill, Backfill, Casing

Depth (m)	Lithology Description	Drilling Notes and Additional Comments
0	Gravel and sand (GM); Some silt. Very dark brown, well graded, moist, sub-rounded, non-plastic, non-cohesive.	
2	Gravel (GW); Sandy, trace silt. Grayish brown, well graded, dry, sub-angular, non-plastic, non-cohesive.	Very fast drilling (through sand)
4	Gravel and sand (GM); Some silt. Very dark grayish brown, well graded, moist, rounded, non-plastic, non-cohesive.	
6	Silt and sand (ML); Gravelly. Very dark grayish brown, well graded, wet, sub-rounded, non-plastic, cohesive.	Hit very wet material, holding for 20 - 30 minutes to determine SWL
8	Clay (CH); Trace sand. Very dark grayish brown, wet, high-plasticity, cohesive.	Very wet, firm clay on drillbit at end of first run
10		Second run just wet clay (added about 50% of the water observed)
12		



srk consulting

Teck

HOLE ID:	**MW-1**	COORDINATES:	667969 E 5487521 N
LOCATION:	CMO	DATUM:	UTM Zone 11
PROJECT NO:	1CT017.098	GROUND ELEV (masl):	1500.44
DRILLING CONTRACTOR:	AquaPro Drilling Ltd.	COLLAR DIP:	-90
		EOH ELEV. (masl):	1463.25
DRILLING TYPE:	Air Rotary	TOTAL DEPTH (mbgs):	37.19
LOGGED BY:	LC	STICKUP HEIGHT (magl):	0.85
BORING DATE:	8/12/2015 to 8/13/2015	CASING STICKUP (magl):	0.85

PROJECT: Phase 1 Groundwater Monitoring

CLIENT: Teck Coal Ltd. - CMO

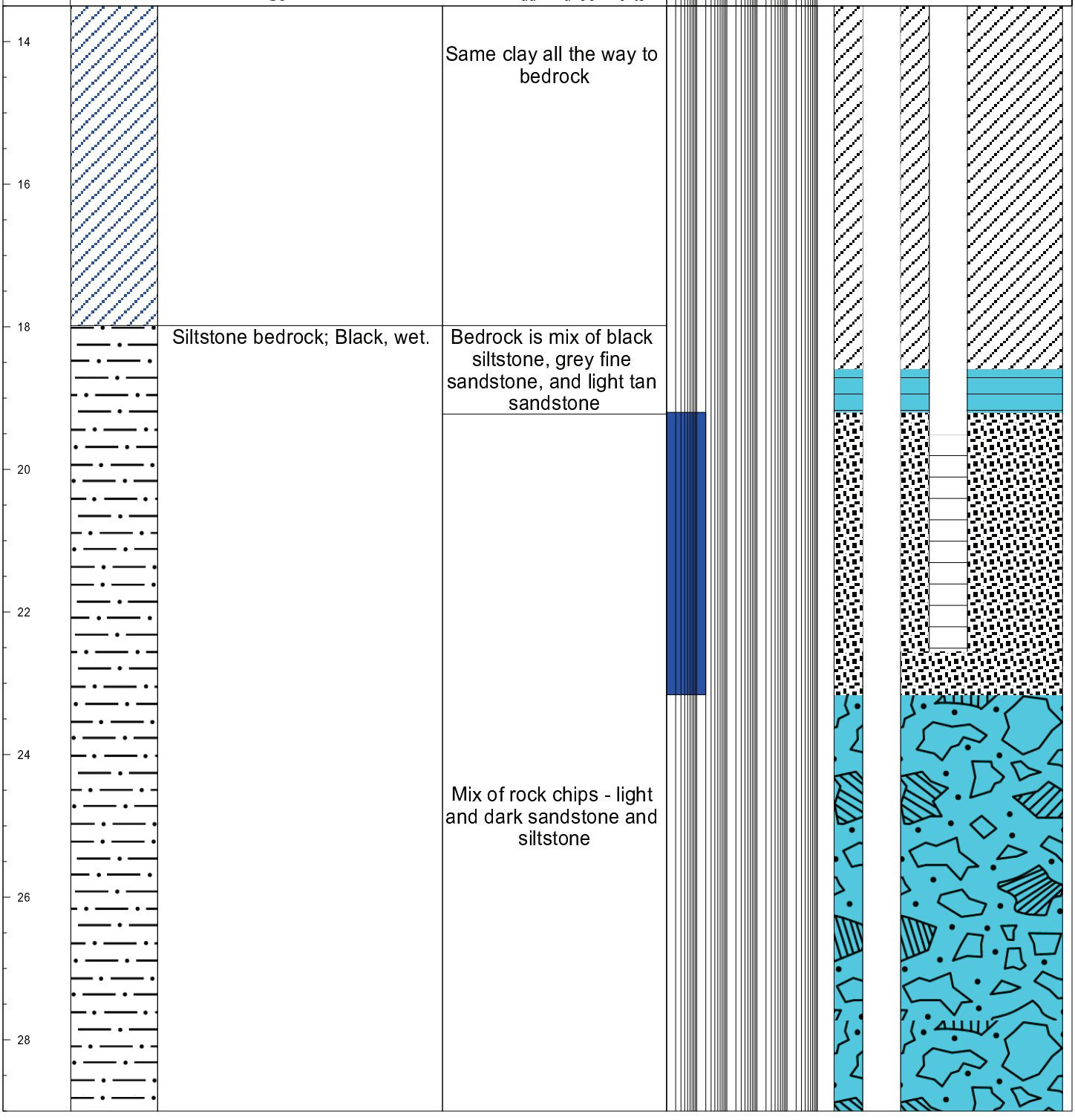
AREA: **Michel Creek**

Lithological Symbol: CL-Clay, LO-Loam, SI-Silt, SA-Sand, GV-Gravel, SS-Sandstone, ST-Siltstone

Hydraulic Conductivity (m/s): 1E-8, 1E-7, 1E-6, 1E-5, 0.0001, 0.001

Well Installation: Sand, Screen, PVC, Pellets, Cave, Chips, Chips/Backfill, Backfill, Casing

Depth (m)	Lithology Description	Drilling Notes and Additional Comments
14		Same clay all the way to bedrock
16		
18	Siltstone bedrock; Black, wet.	Bedrock is mix of black siltstone, grey fine sandstone, and light tan sandstone
20		
22		
24		Mix of rock chips - light and dark sandstone and siltstone
26		
28		



srk consulting

Teck

HOLE ID:	**MW-1**	COORDINATES:	667969 E 5487521 N
LOCATION:	CMO	DATUM:	UTM Zone 11
PROJECT NO:	1CT017.098	GROUND ELEV (masl):	1500.44
DRILLING CONTRACTOR:	AquaPro Drilling Ltd.	COLLAR DIP:	-90
		EOH ELEV. (masl):	1463.25
DRILLING TYPE:	Air Rotary	TOTAL DEPTH (mbgs):	37.19
LOGGED BY:	LC	STICKUP HEIGHT (magl):	0.85
BORING DATE:	8/12/2015 to 8/13/2015	CASING STICKUP (magl):	0.85

PROJECT: Phase 1 Groundwater Monitoring

CLIENT: Teck Coal Ltd. - CMO

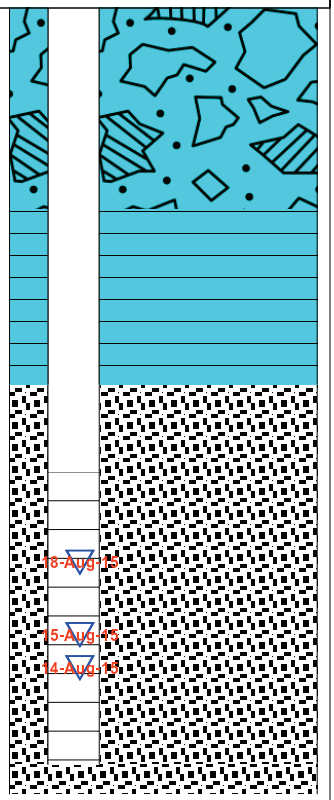
AREA: **Michel Creek**

Lithological Symbol: CL-Clay, LO-Loam, SI-Silt, SA-Sand, GV-Gravel, SS-Sandstone, ST-Siltstone

Hydraulic Conductivity (m/s): 1E-8, 1E-7, 1E-6, 1E-5, 0.0001, 0.001

Well Installation: Sand, Screen, PVC, Pellets, Cave, Chips, Chips/Backfill, Backfill, Casing

Depth (m)	Lithology Description	Drilling Notes and Additional Comments
30	Siltstone bedrock; Silty. Black, wet.	Layer of clayey bedrock at approximately 29.3 m
	Siltstone bedrock; Black, dry.	Switch to gray sandstone, dry
32		
34		Intermittent dusty zones for last 3 m
36		
		Finished drilling to target potentially wet area
38		



BRITISH COLUMBIA

Report 1 - Detailed Well Record

RG_01-03 (Elkford Supply Well)

Well Tag Number: 42698	Construction Date: 1979-07-01 00:00:00
Owner: VILLAGE OF ELKFORD	Driller: Well Identification Plate Number: Plate Attached By:
Address: BOIVIN CK & ELK RIVER	Where Plate Attached:
Area:	PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 0 (Driller's Estimate)
WELL LOCATION: Land District District Lot: 12378 Plan: Lot: Township: Section: Range: Indian Reserve: Meridian: Block: Quarter: Island: BCGS Number (NAD 83): Well: 5	Development Method: Pump Test Info Flag: Y Artesian Flow: Artesian Pressure (ft): Static Level:
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:	WATER QUALITY: Character: Colour: Odour: Well Disinfected: N EMS ID: Water Chemistry Info Flag: Y 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): Thickness (in):
Site Info Details: Other Info Flag: Other Info Details:	WELL CLOSURE INFORMATION: Reason For Closure: Method of Closure: Closure Sealant Material: Closure Backfill Material: Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
YIELD:NO DATA EXPLORATORY & WATER WELL

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.

From	12.2	to	18.3	Ft. DRY GRAVEL SOME SILT & TRACE OF SAND.
From	0	to	0	Ft. GRAVEL WELL ROUNDED TO @ 1.5cm
From	18.3	to	21.3	Ft. DRY GRAVEL SOME BOULDERS & SILT,TRACE
From	0	to	0	Ft. OF SAND.
From	21.3	to	22.9	Ft. SANDY GRAVEL SOME SILT & CLAY
From	22.9	to	33.5	Ft. DRY GRAVEL,SOME SAND,TRACE OF SILT &
From	0	to	0	Ft. BROWN CLAY.
From	33.5	to	47.2	Ft. MOIST STICKY GRAVEL,SOME SAND,TRACE OF
From	0	to	0	Ft. SILT & CLAY.
From	47.2	to	48.8	Ft. BOULDER,PREDOMINANTLY SHALE
From	48.8	to	57.3	Ft. GRAVEL SOME SAND,TRACE OF SILT,SUB-
From	0	to	0	Ft. -ROUNDED PEBBLES TO @ 2cm.
From	57.3	to	67.1	Ft. SANDY GRAVEL WITH SOME COBBLES & TRACE
From	0	to	0	Ft. OF SILT.SAND IS MOSTLY COARSE.GRAVEL
From	0	to	0	Ft. FROM FINE TO COARSE.
From	67.1	to	70.7	Ft. SANDY GRAVEL & TRACE OF SILT.ABUNDENT
From	0	to	0	Ft. MUD & FINE SAND.
From	70.7	to	77.4	Ft. SANDY GRAVEL WITH SOME COBBLES & TRACE
From	0	to	0	Ft. OF SILT.
From	77.4	to	79.3	Ft. SANDY GRAVEL WITH SOME FINE SAND & SILT
From	79.3	to	81.4	Ft. SANDY GRAVEL WITH SOME COBBLES & TRACE
From	0	to	0	Ft. OF SILT.
From	81.4	to	84.4	Ft. SANDY GRAVEL WITH TRACE COBBLES & SILT.
From	0	to	0	Ft. SUBROUNDED GRAVEL 1-3 cm.
From	84.4	to	89.3	Ft. FINE SANDY GRAVEL TRACE COBBLES & SILT
From	90.5	to	91.7	Ft. SILTY SAND WITH SOME GRAVEL & COBBLES

- Return to Main
- Return to Search Options
- Return to Search Criteria

BRITISH COLUMBIA

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:

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

- Return to Main
- Return to Search Options
- Return to Search Criteria

BRITISH COLUMBIA

Report 1 - Detailed Well Record

RG_DW-02-20

Well Tag Number: 101942

Owner: ELK VALLEY FLYING CLUB

Address:

Area:

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

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

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 2002-04-02 00:00:00

Driller: J. R. Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

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

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag: N
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag: N
Material:
Method:
Depth (ft):
Thickness (in):
Liner from To: feet

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

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

- Return to Main
- Return to Search Options
- Return to Search Criteria

BRITISH COLUMBIA

Report 1 - Detailed Well Record

RG_DW-03-01

Well Tag Number: 94779

Owner: SPARDELL MOBILE HOME PARK LTD

Address: 100 INDUSTRIAL ROAD #1

Area: SPARWOOD

WELL LOCATION:
KOOTENAY Land District
District Lot: 4588 Plan: 1358 & NEP 64776 Lot: 13 & 1
Township: Section: Range:
Indian Reserve: Meridian: Block:
Quarter:
Island:
BCGS Number (NAD 83): 082G076233 Well: 9

Class of Well: Water supply
Subclass of Well: Domestic
Orientation of Well: Vertical
Status of Well: New
Licence General Status: UNLICENSED
Well Use: Water Supply System
Observation Well Number:
Observation Well Status:
Construction Method:
Diameter: inches
Casing drive shoe: Y
Well Depth: 50 feet
Elevation: 3697 feet (ASL)
Final Casing Stick Up: 12 inches
Well Cap Type: BOLT ON
Bedrock Depth: feet
Lithology Info Flag: Y
File Info Flag: N
Sieve Info Flag: N
Screen Info Flag: Y

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 2008-02-28 00:00:00

Driller: Owen's Drilling Ltd.
Well Identification Plate Number: 26287
Plate Attached By: MIKE CALDWELL
Where Plate Attached: TOP OF CASING

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 30 (Driller's Estimate) U.S. Gallons per Minute
Development Method: Air lifting
Pump Test Info Flag: N
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag: N
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag: Y
Material: Bentonite clay
Method: Poured
Depth (ft): 15 feet
Thickness (in): 2 inches
Liner from To: feet

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size
46	50		30

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

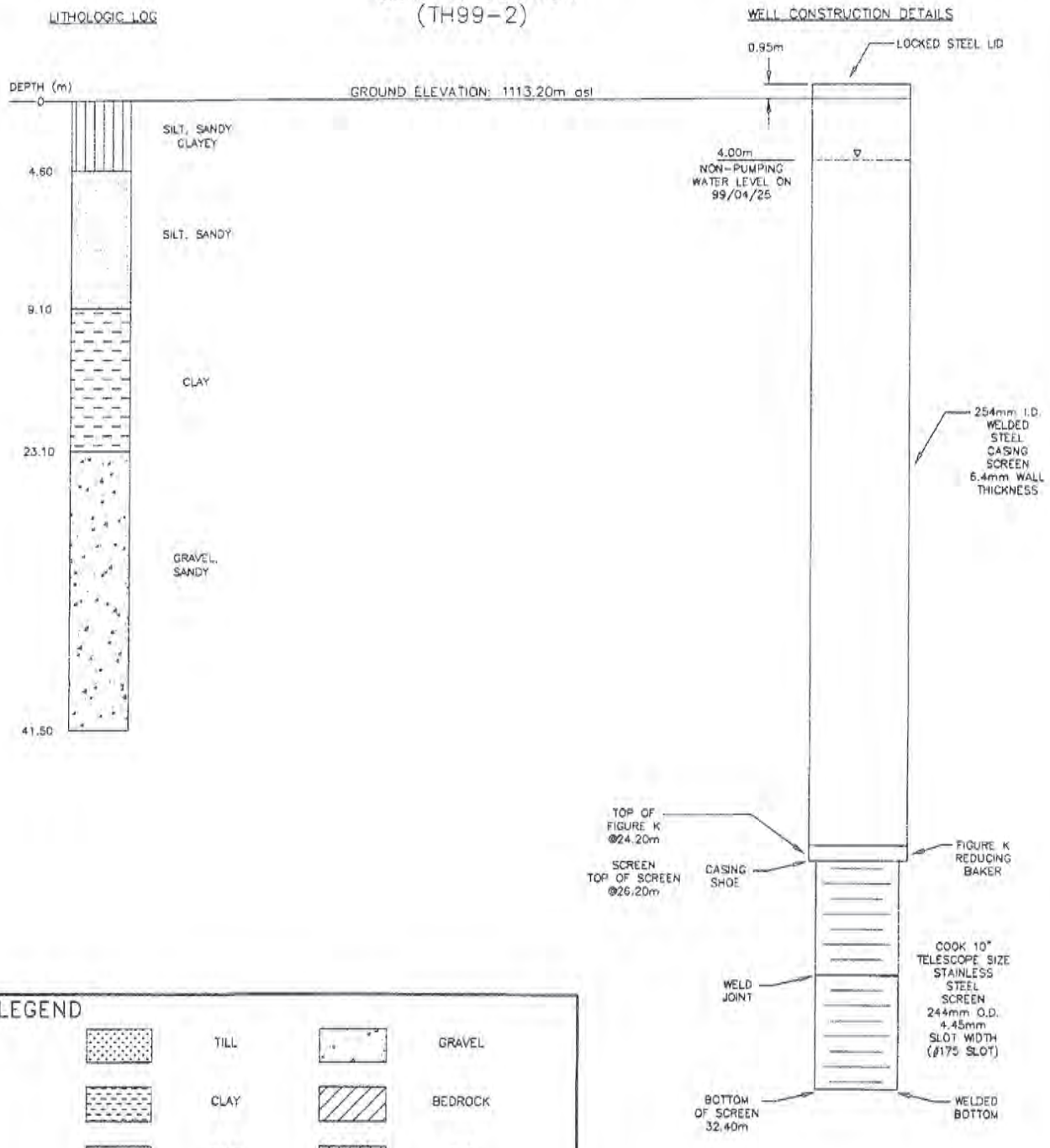
From 15 to 30 Ft. Medium brown

From 30 to 45 Ft. Medium CLAY & GRAVEL brown

From 45 to 50 Ft. Medium 30 U.S. Gallons per Minute brown

- Return to Main
- Return to Search Options
- Return to Search Criteria

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

uma

HYDROGEOLOGICAL EVALUATION OF A NEW TEST WELL
DISTRICT OF SPARWOOD, BC

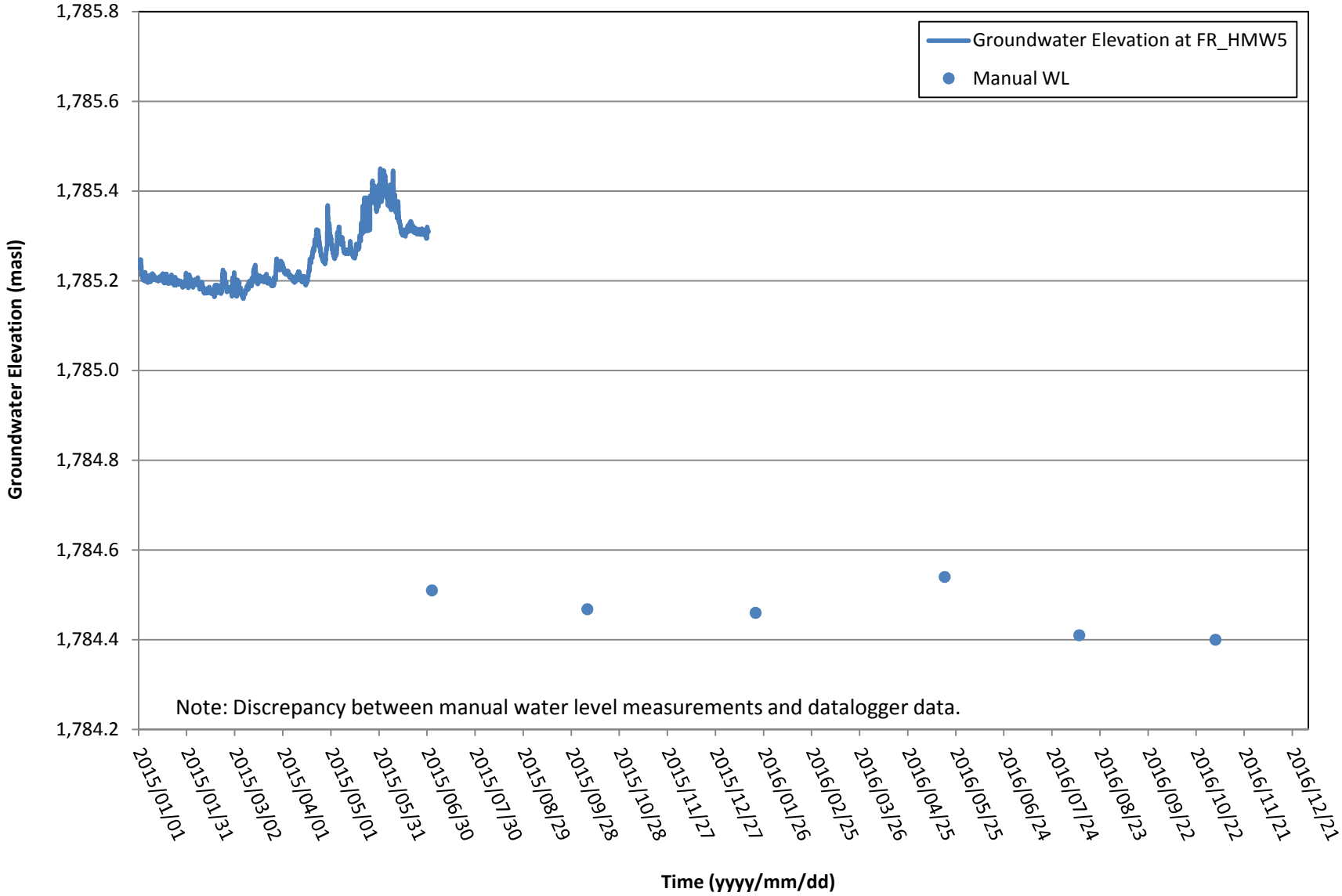
FIG. 3

JOB# 0764-206-00-02

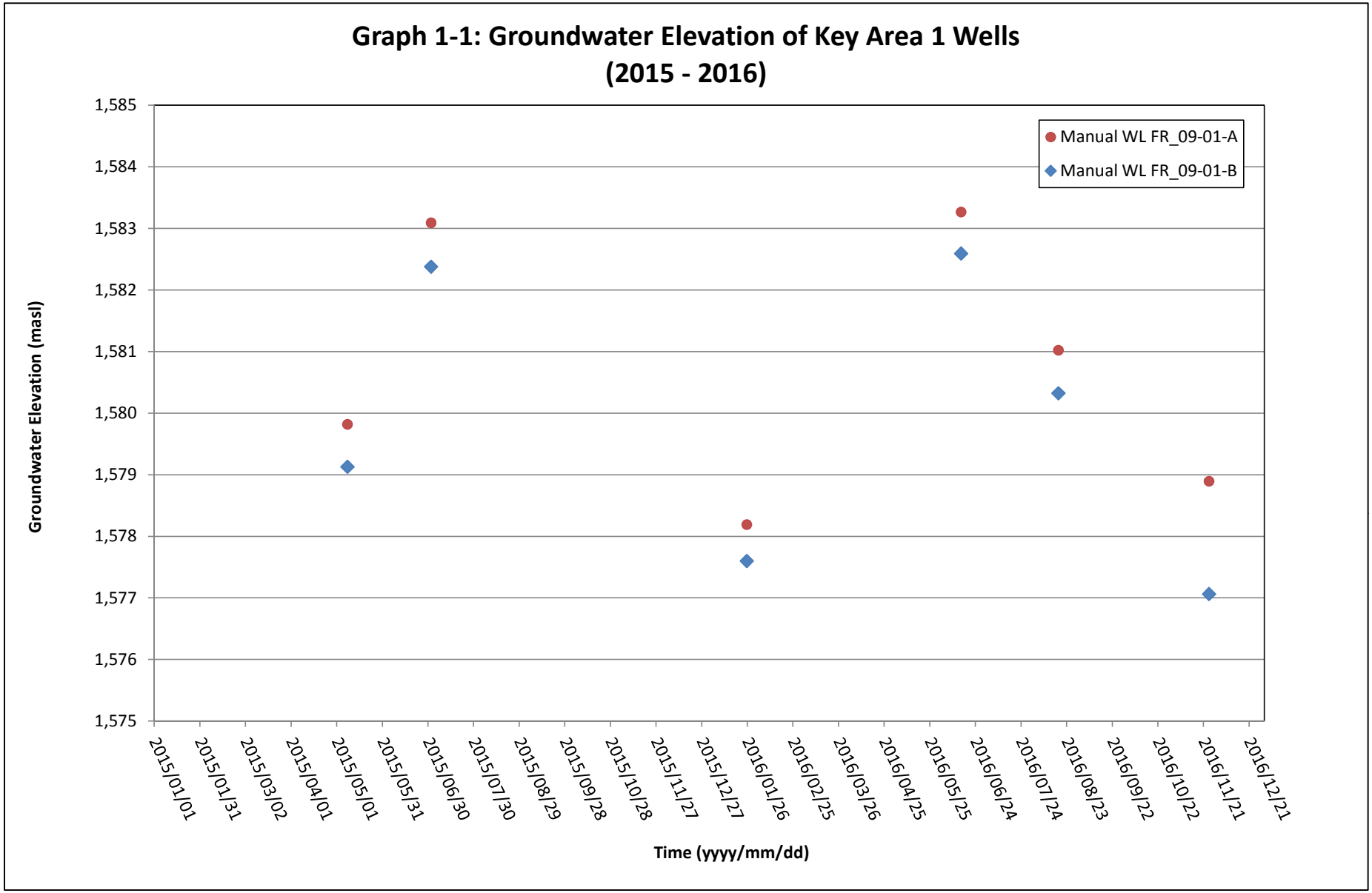
Appendix II

Time-Series Graphs

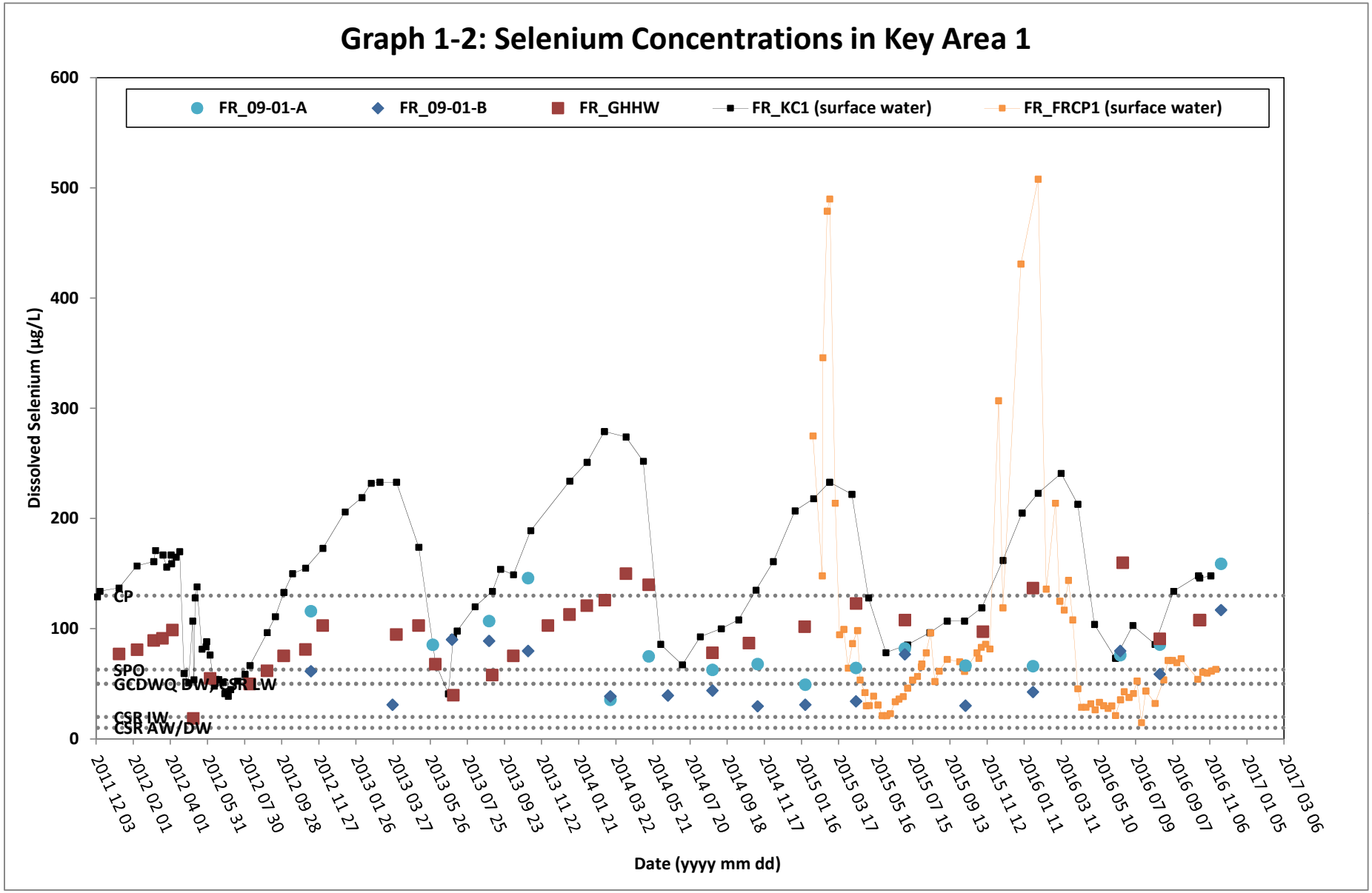
Graph B-1: Groundwater Elevation of FR_HMW5 (Background Well) (2015 - 2016)



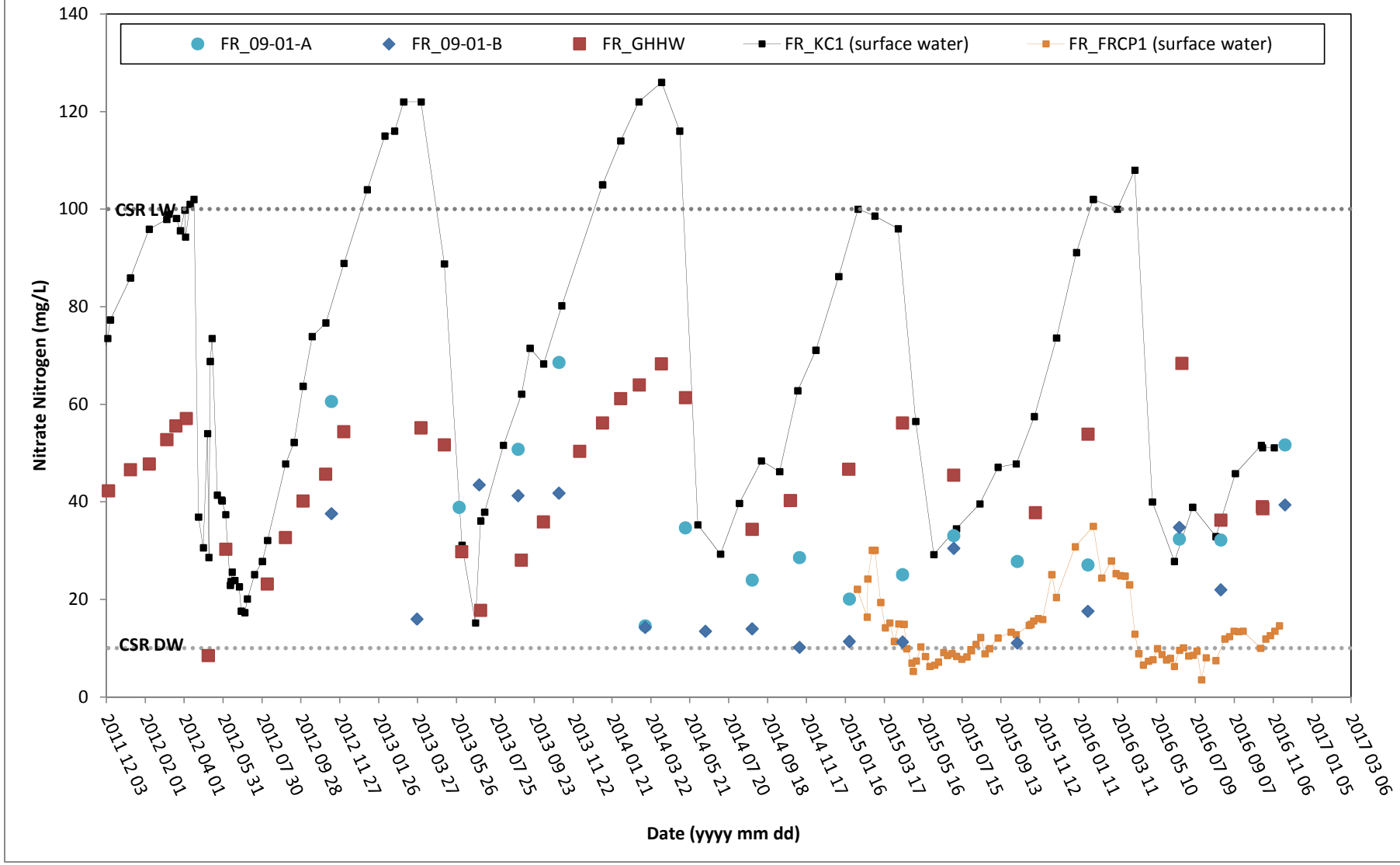
Graph 1-1: Groundwater Elevation of Key Area 1 Wells (2015 - 2016)



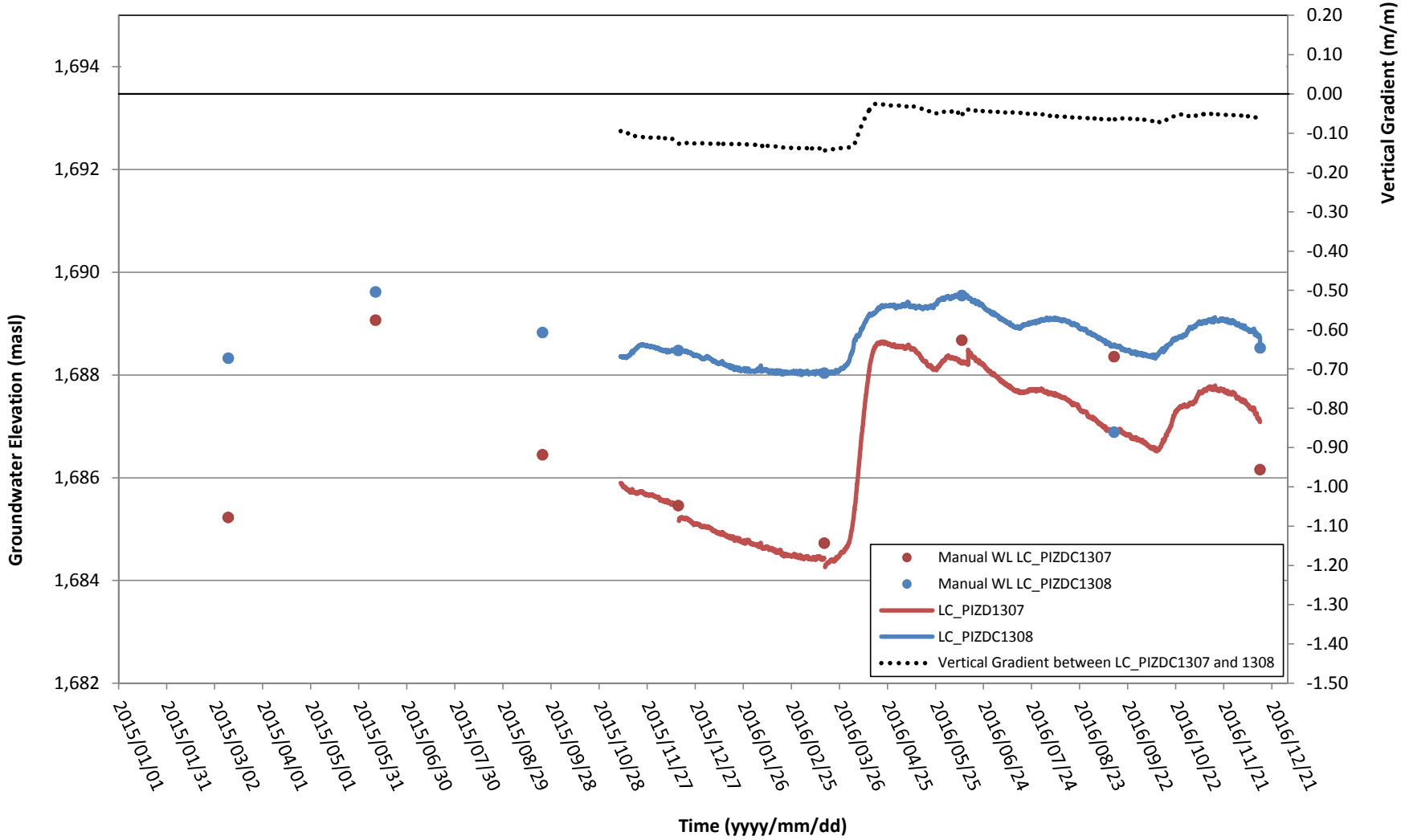
Graph 1-2: Selenium Concentrations in Key Area 1



Graph 1-3: Nitrate Concentrations in Key Area 1

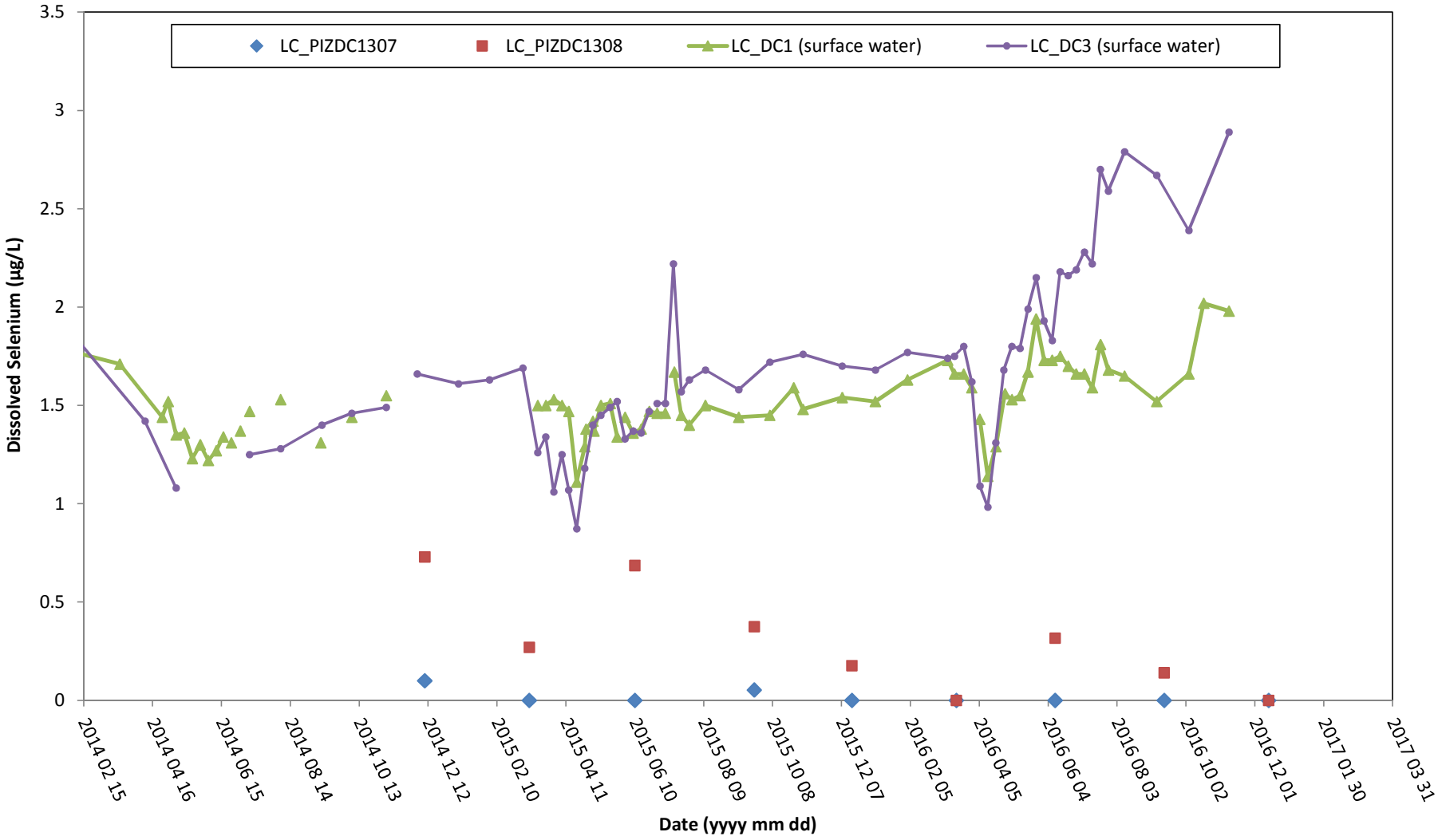


Graph 2-1: Groundwater Elevation of Key Area 2 Wells (2015 - 2016)



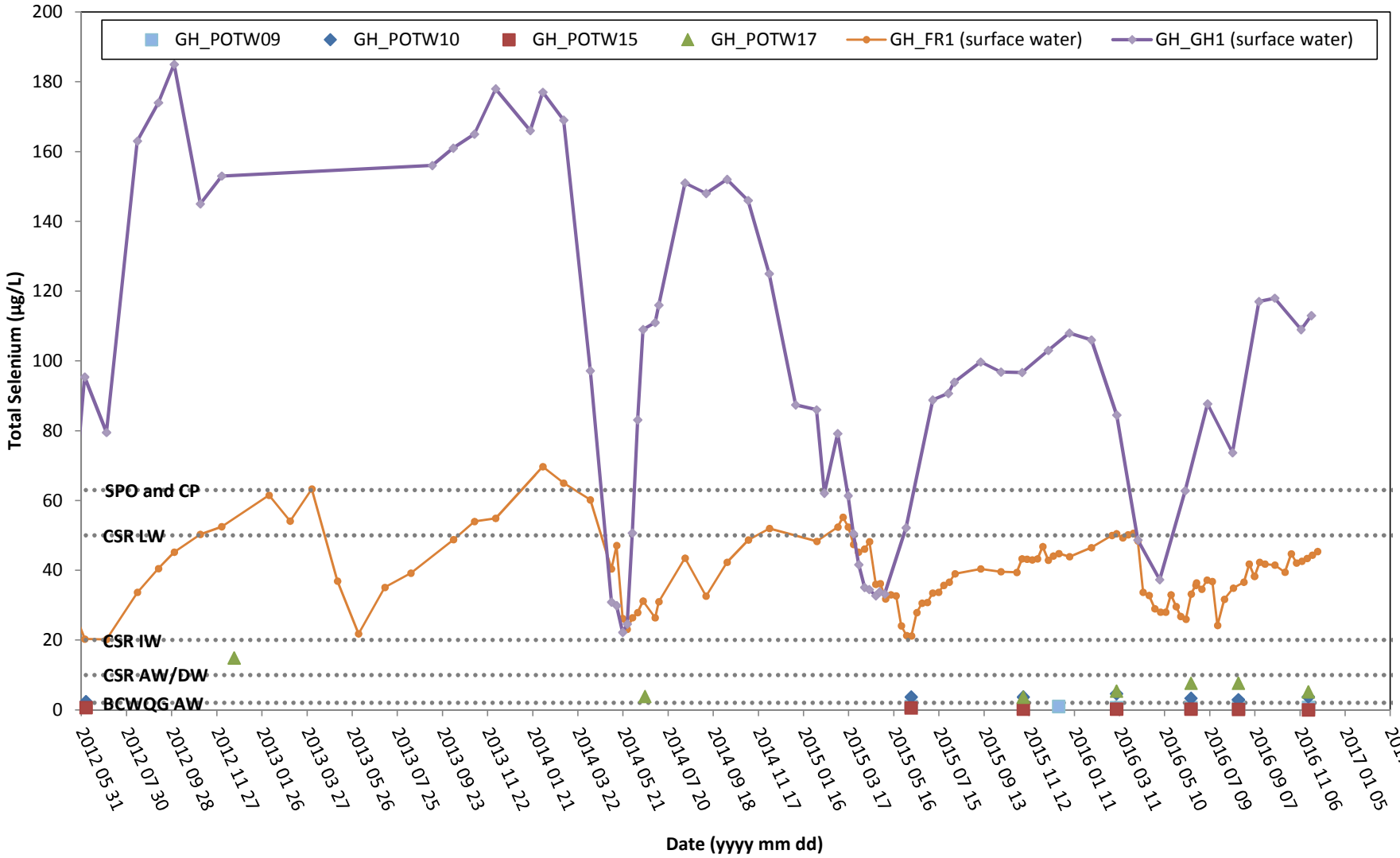
Note: data was removed where suspected datalogger removal occured. September 2016 depth to water values and calculated potentiometric values for LC_PIZDC1307 and LC_PIZDC1308 are suspected to be switched

Graph 2-2: Selenium Concentrations for Monitoring Wells in Key Area 2

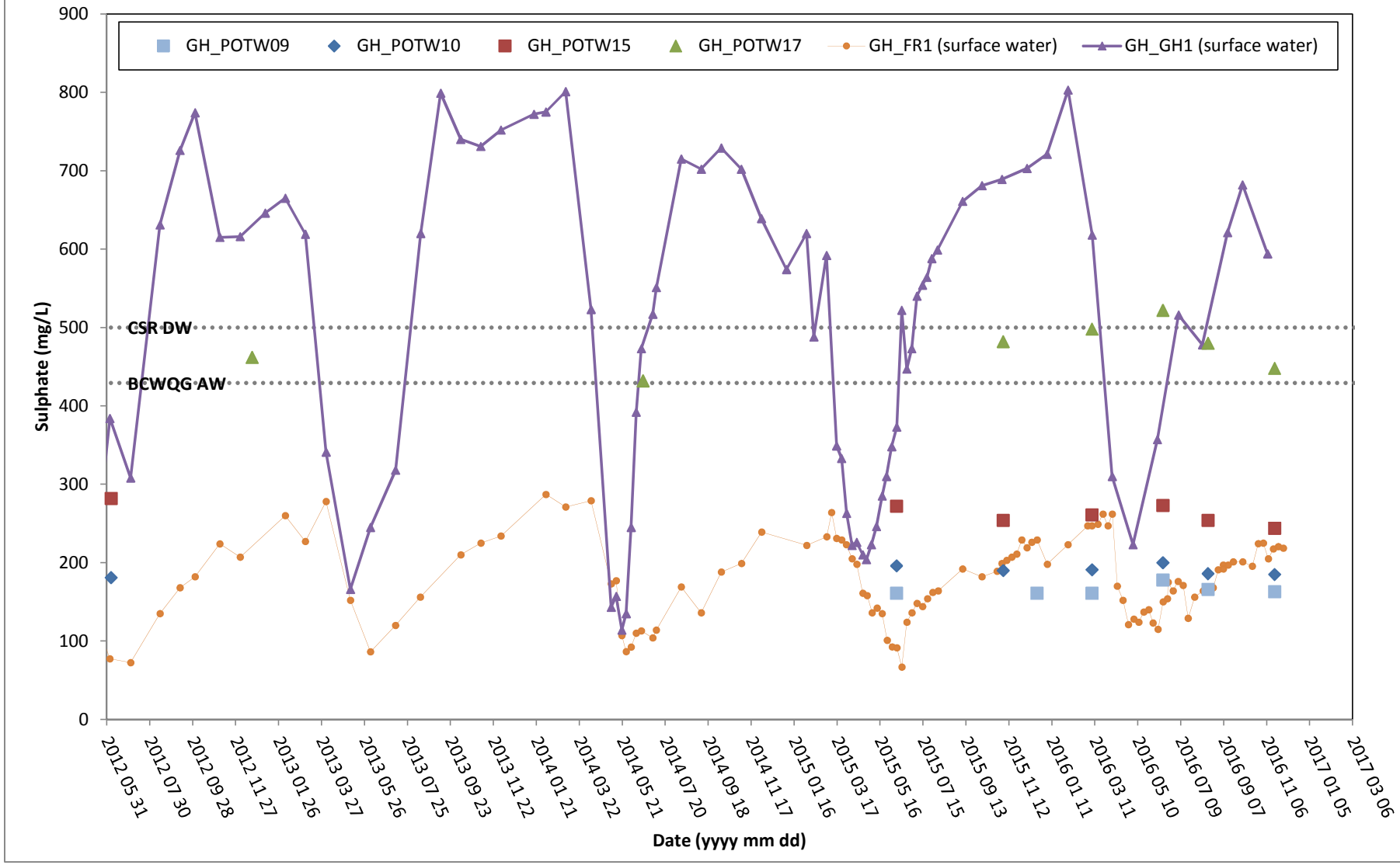


Note: Primary and Secondary Screening Crtieria are not show on this graph as they are greater than the concentrations shown on this graph.

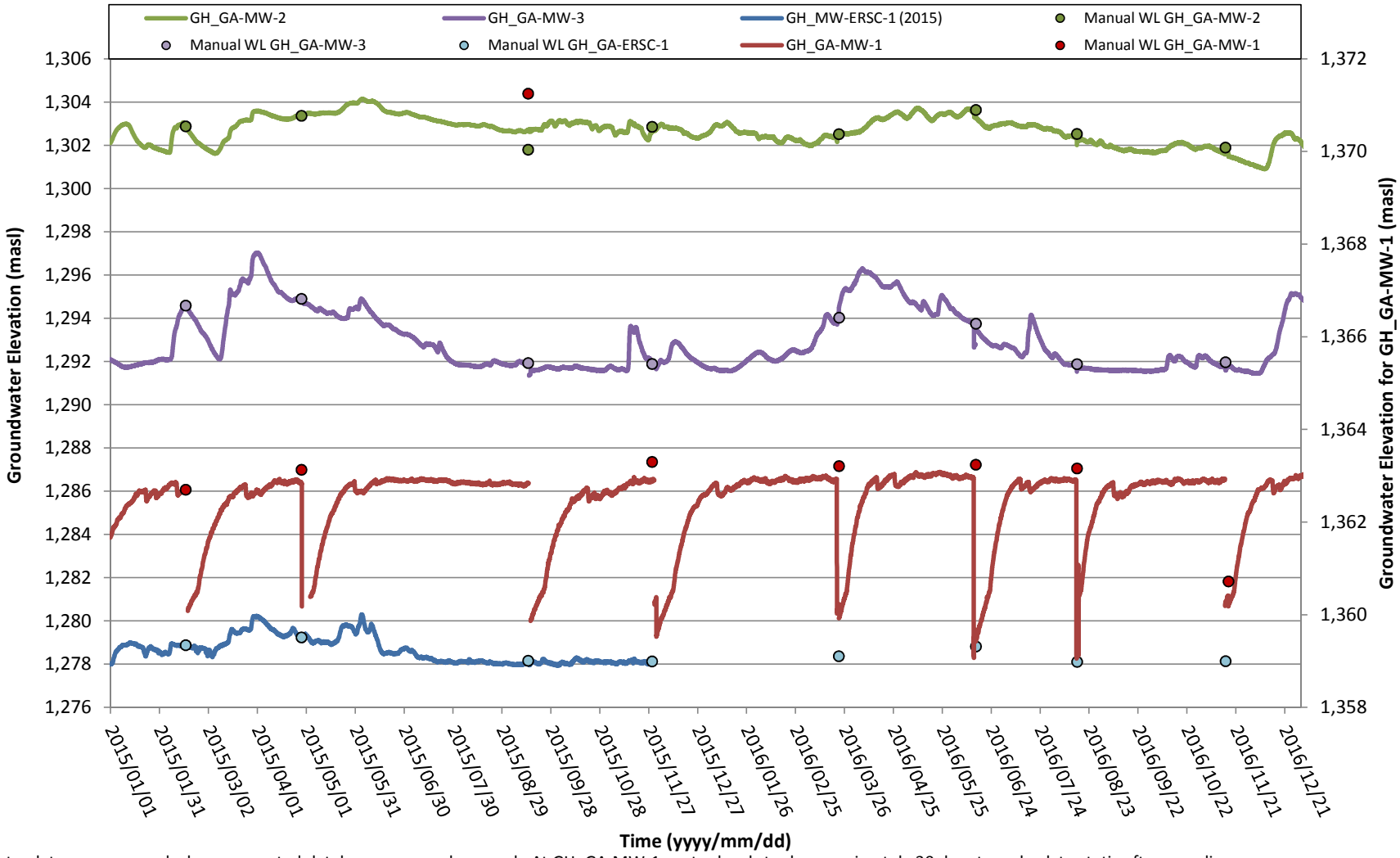
Graph 3-1: Selenium Concentrations in Key Area 3



Graph 3-2: Sulphate Concentrations in Key Area 3

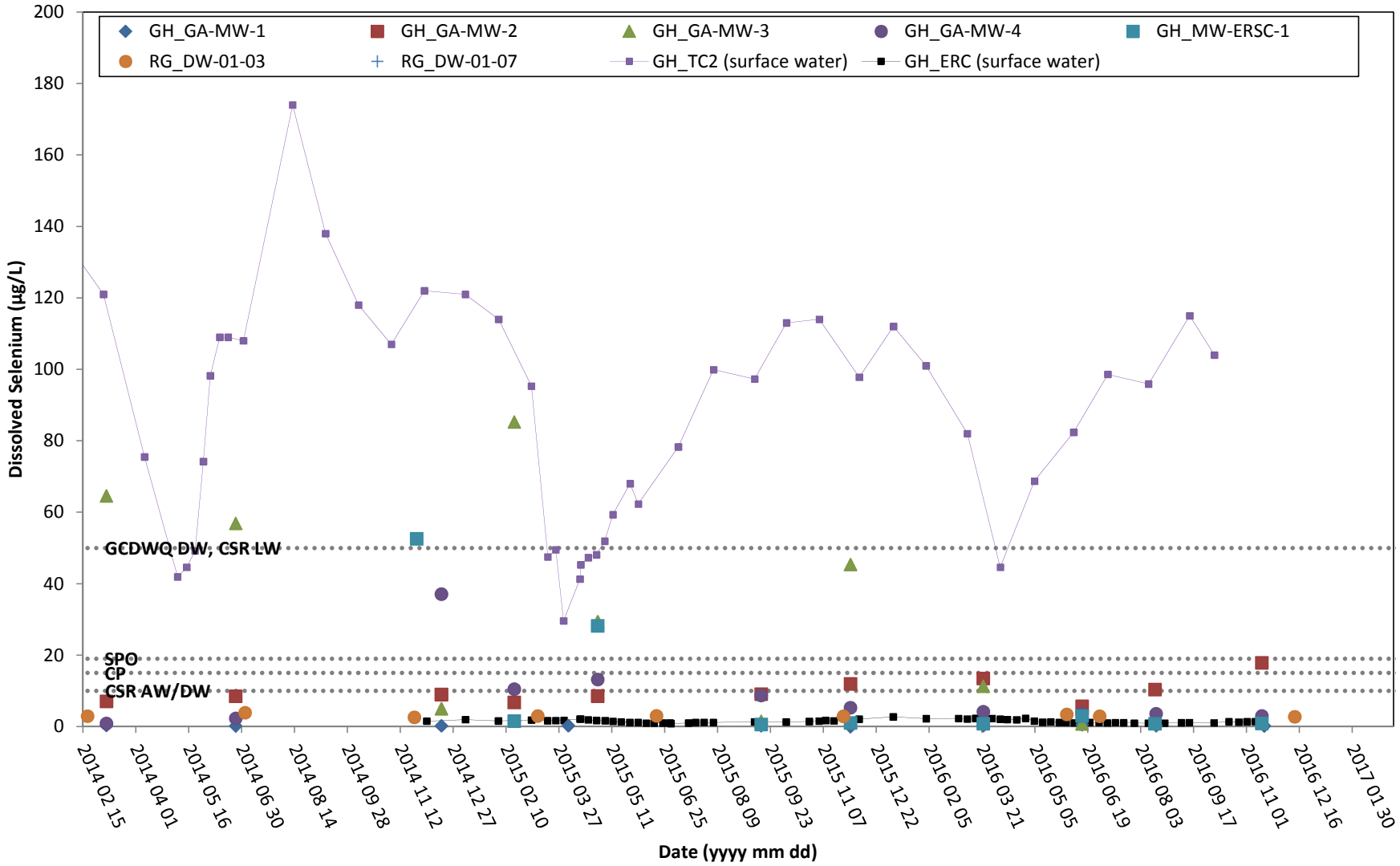


Graph 4-1: Groundwater Elevation of Key Area 4 Wells (2015 - 2016)

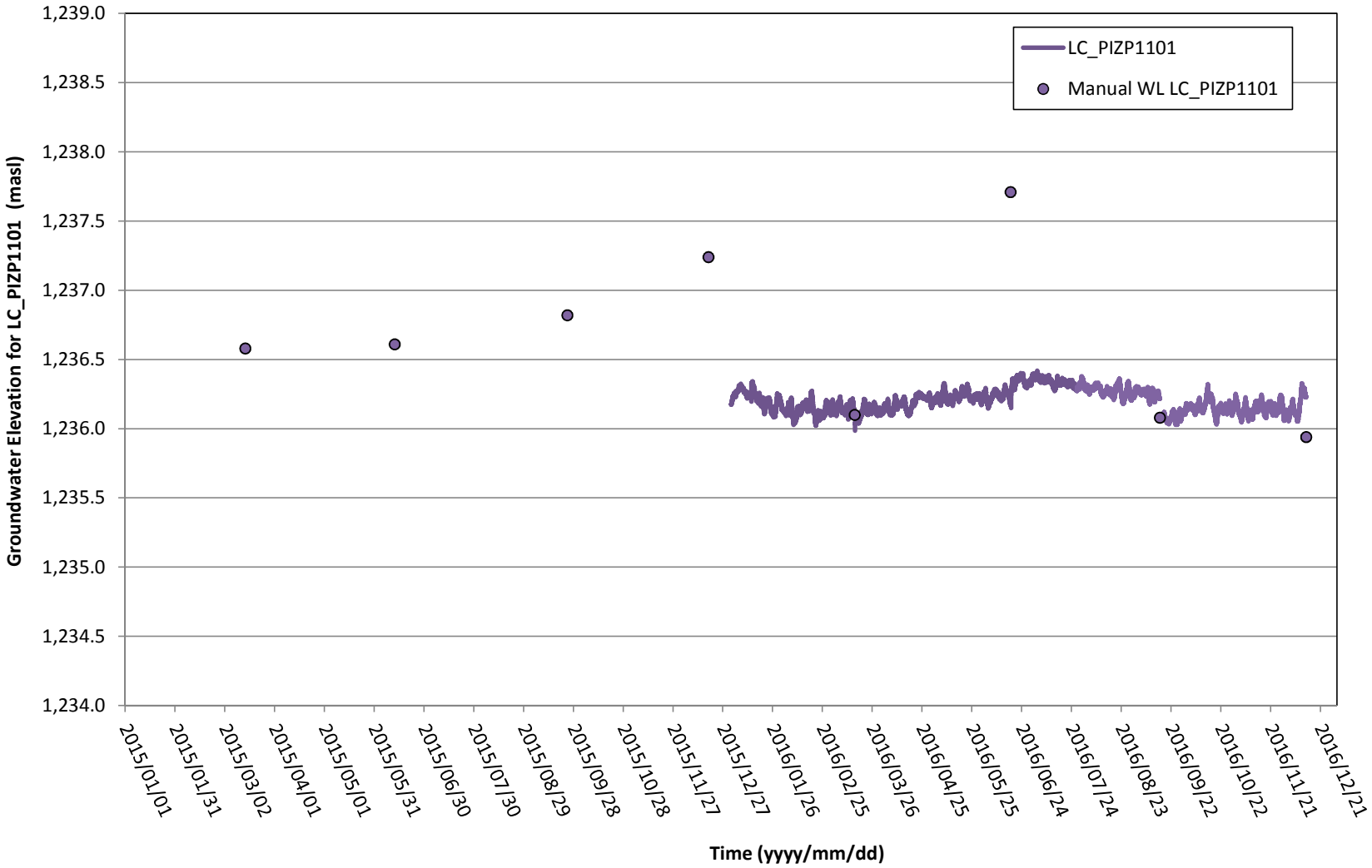


Note: data was removed where suspected datalogger removal occured. At GH_GA-MW-1, water levels took approximately 30 days to go back to static after sampling.

Graph 4-2: Selenium Concentrations in Key Area 4

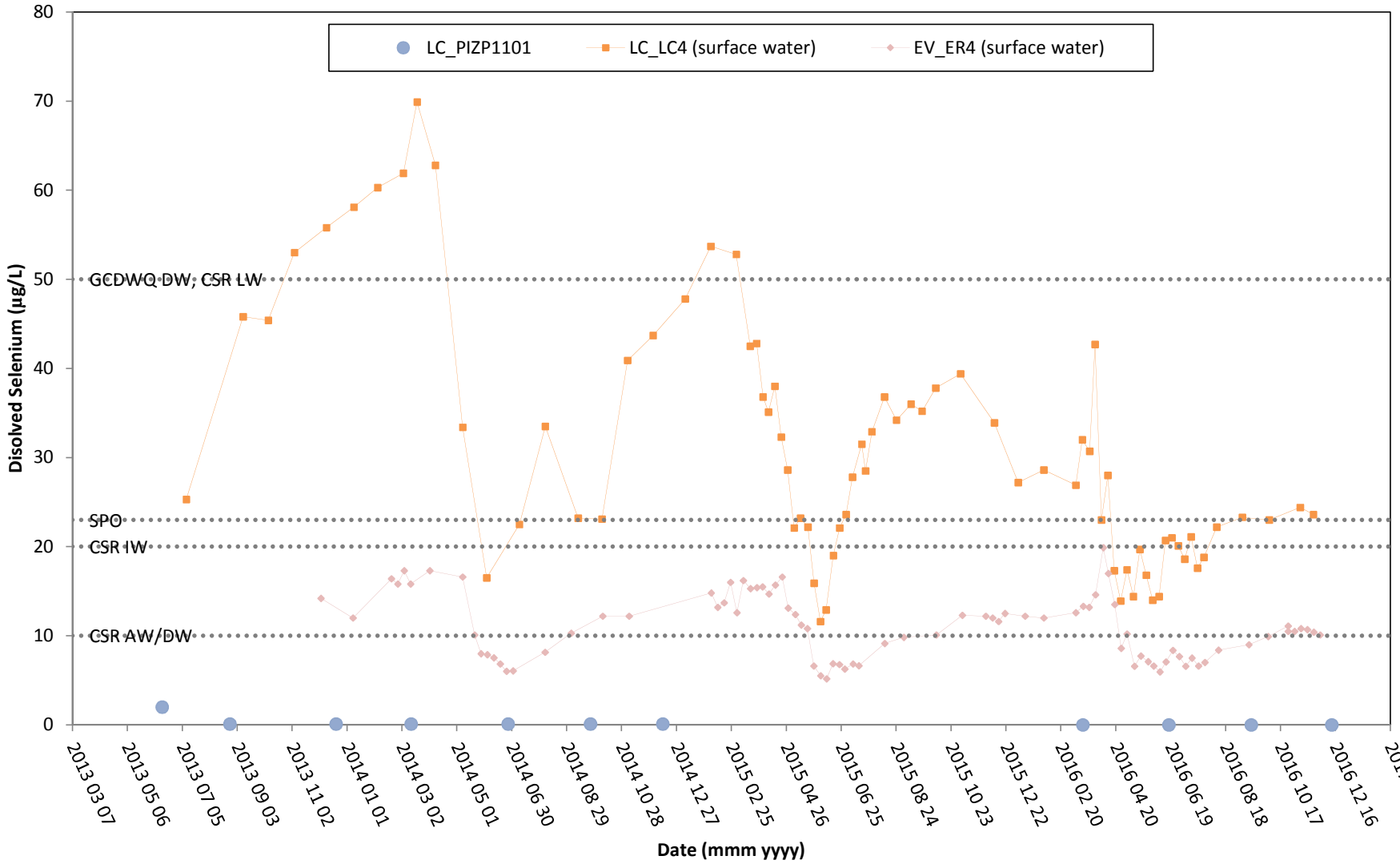


Graph 6-1: Groundwater Elevation of Key Area 6 Well (March 2015 to December 2016)

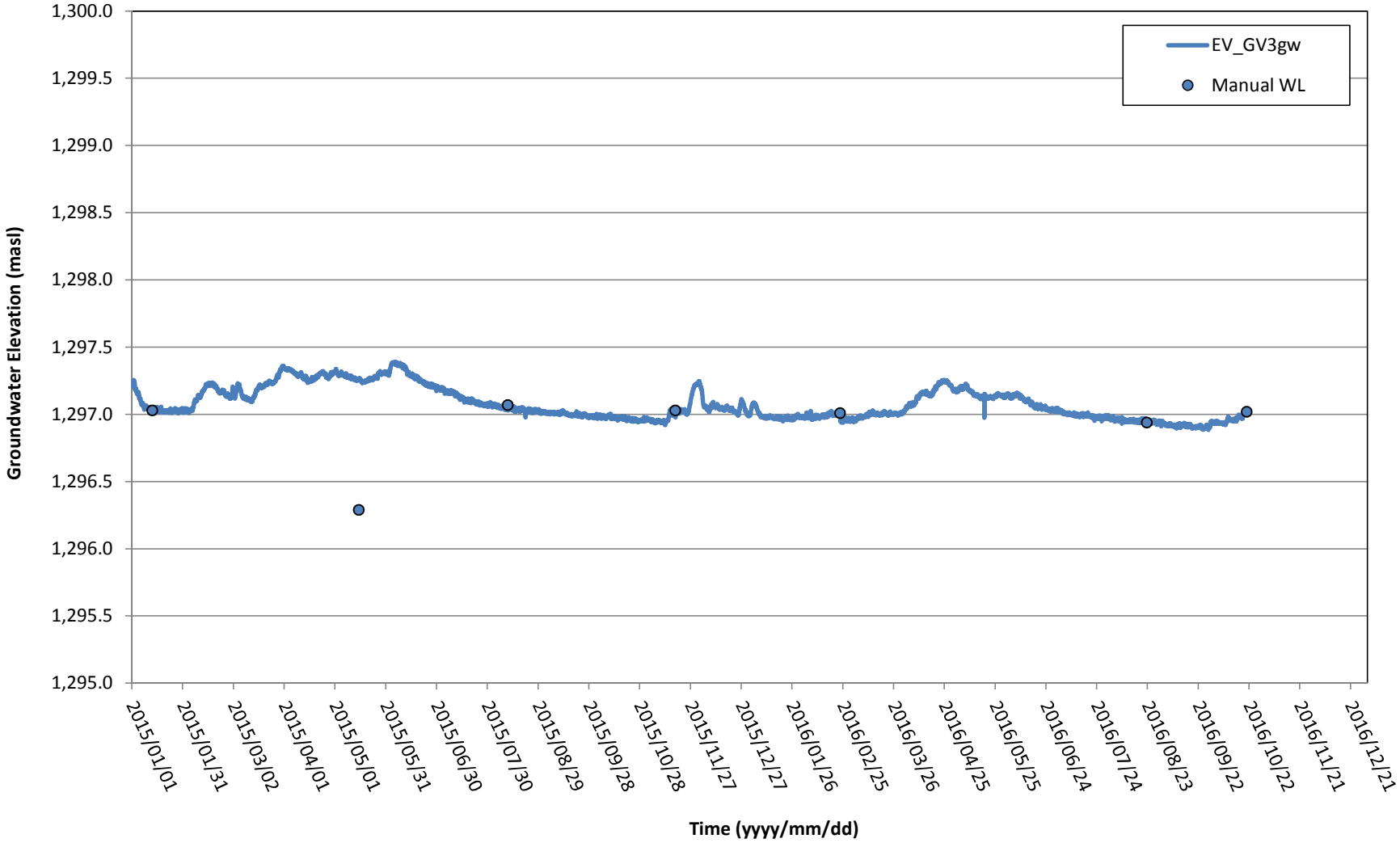


Note: data was removed where suspected datalogger removal occured

Graph 6-2: Selenium Concentrations in Key Area 5 and 6

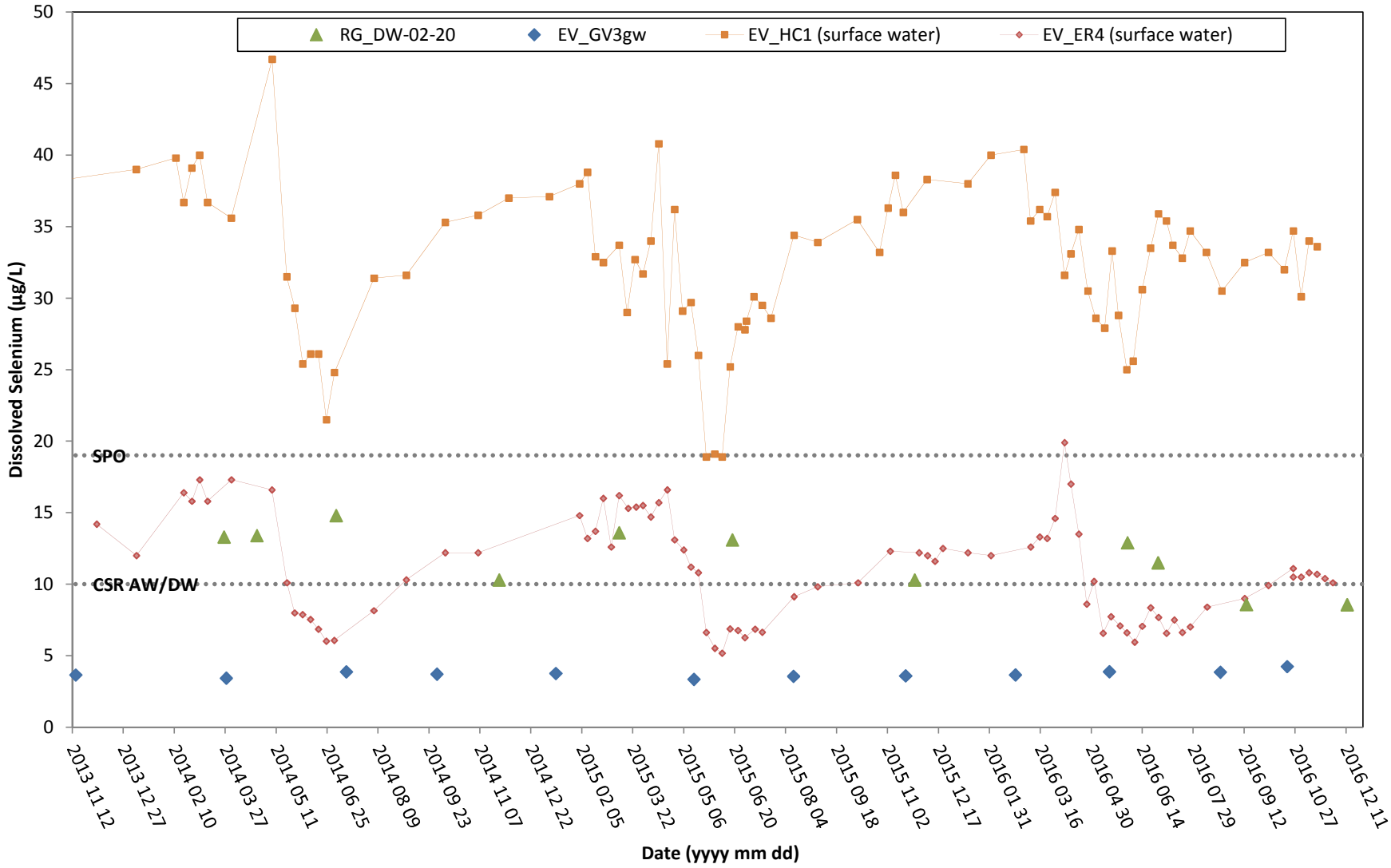


Graph 7-1: Groundwater Elevation of Key Area 7 Well (2015 - 2016)

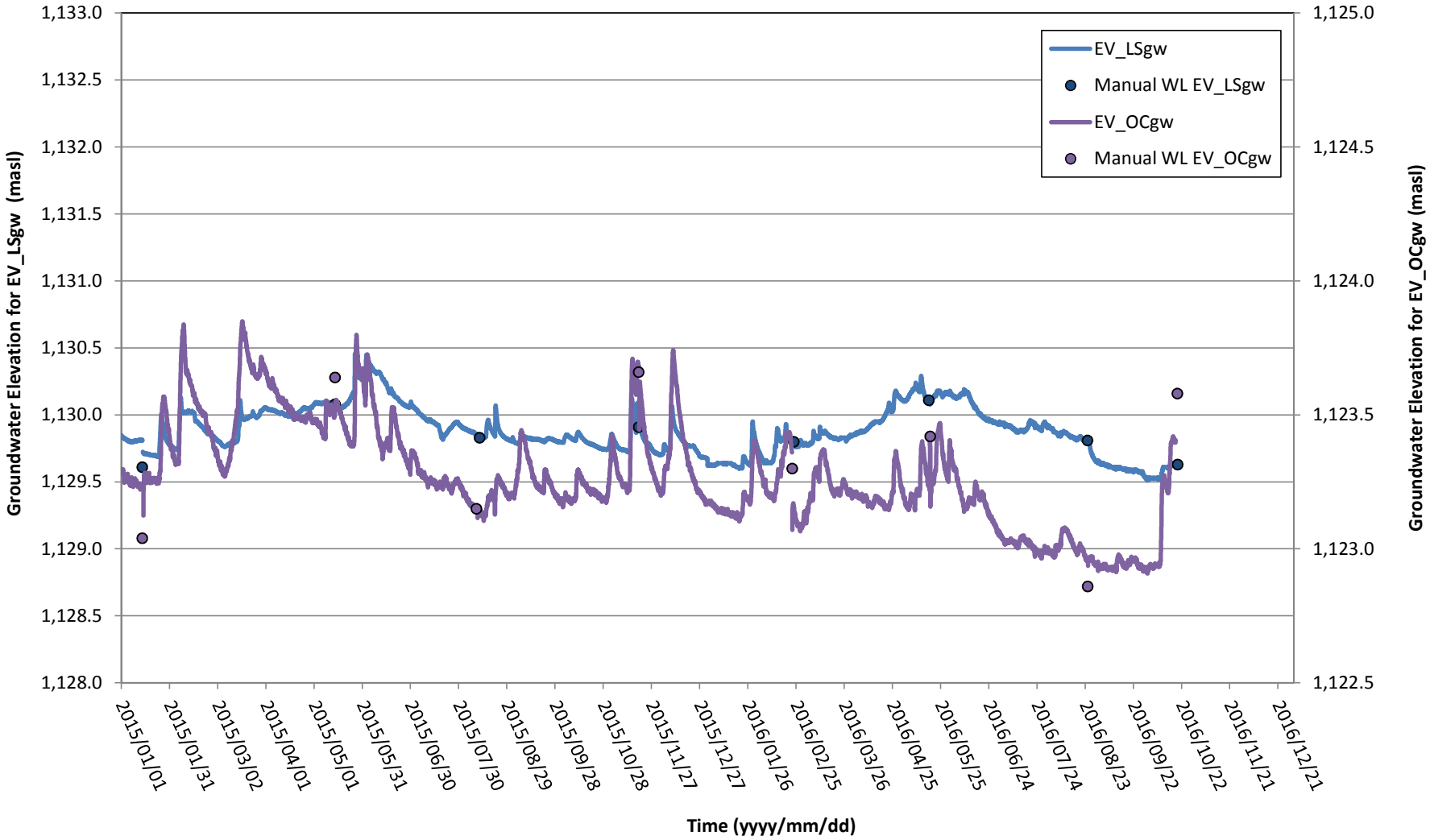


Note: data was removed where suspected datalogger removal occured.

Graph 7-2: Selenium Concentrations in Key Area 7

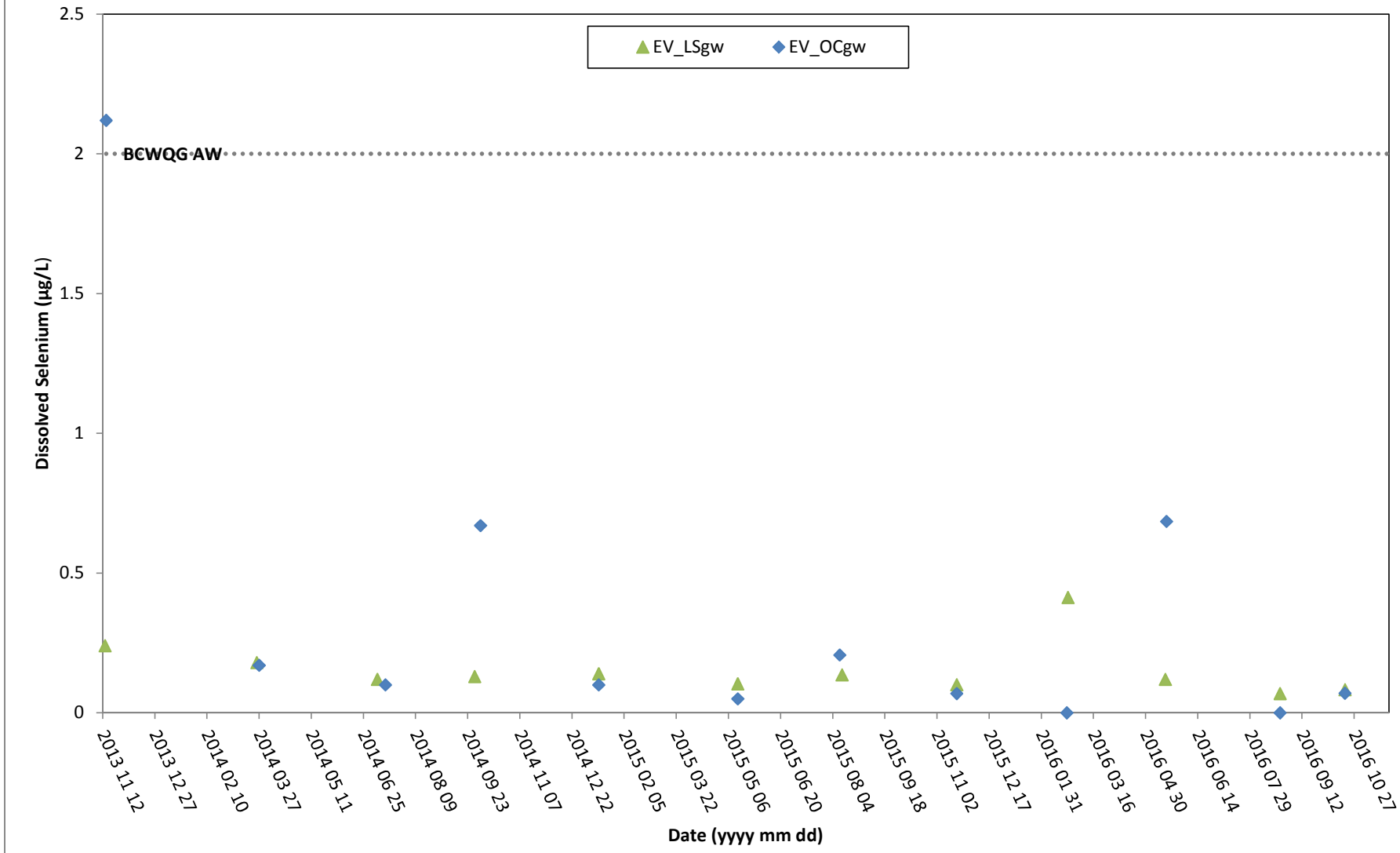


Graph 8-1: Groundwater Elevation of Key Area 8 Wells (2015 - 2016)

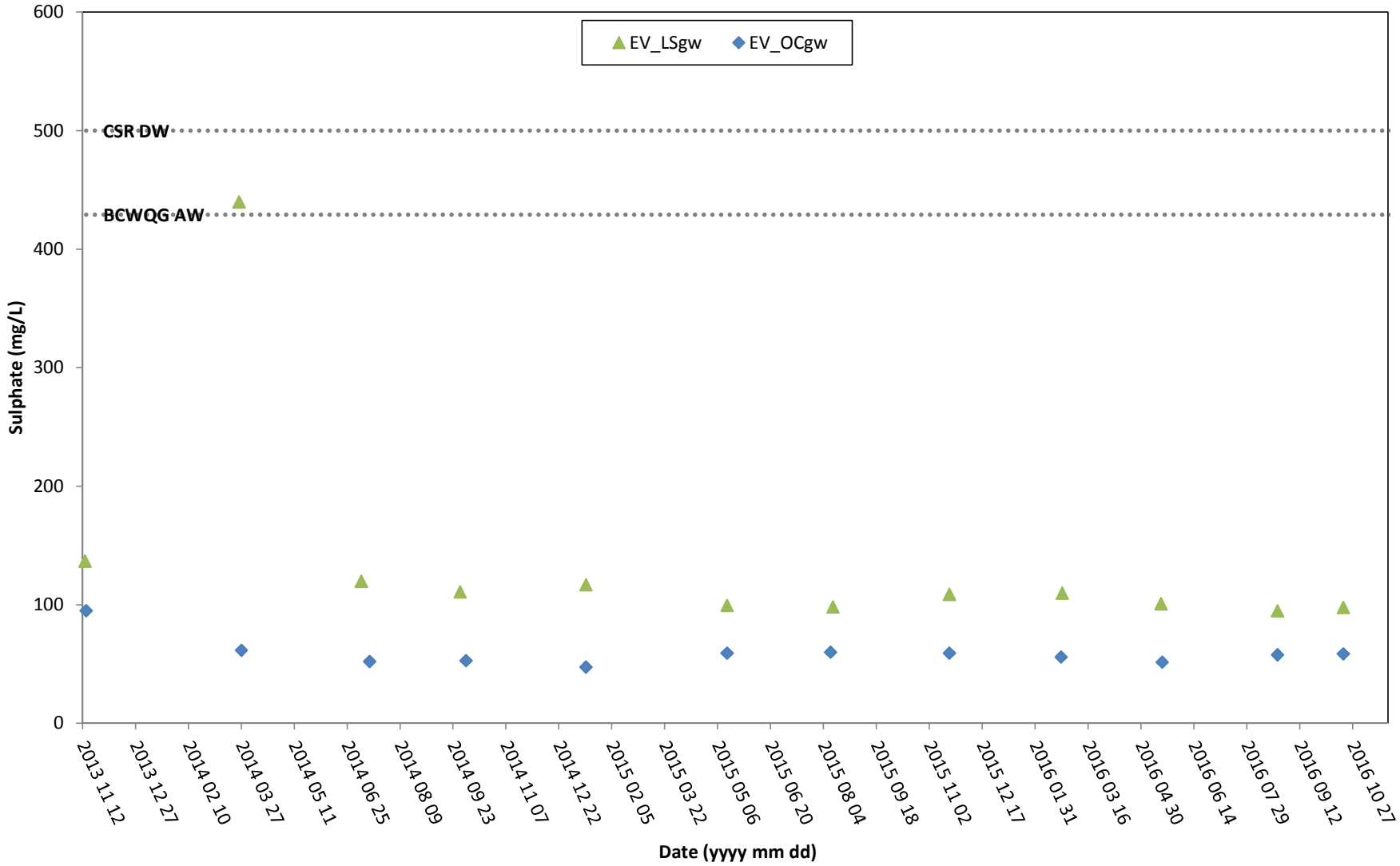


Note: data was removed where suspected datalogger removal occured

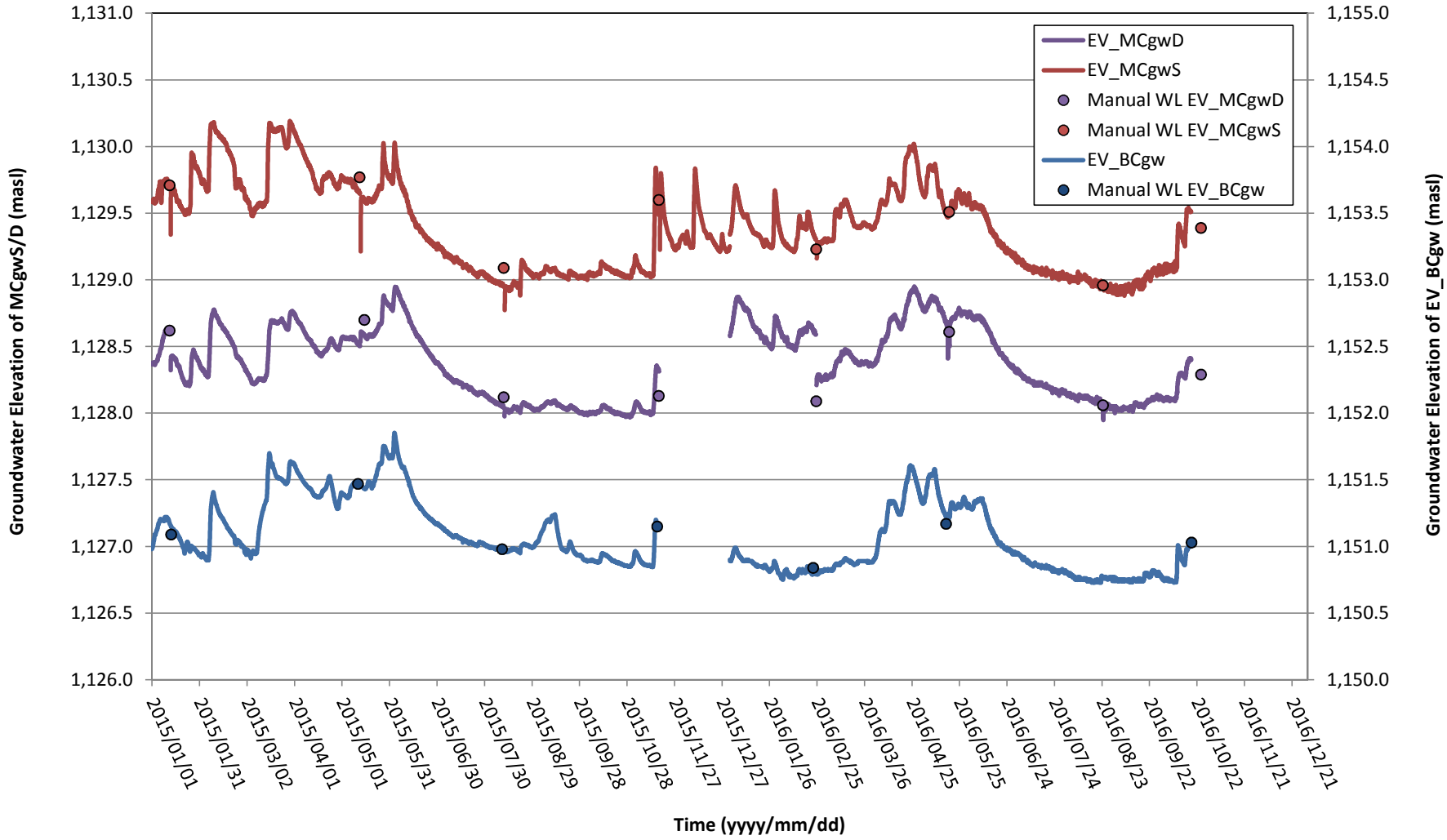
Graph 8-2: Selenium Concentrations in Key Area 8



Graph 8-3: Sulphate Concentrations in Key Area 8

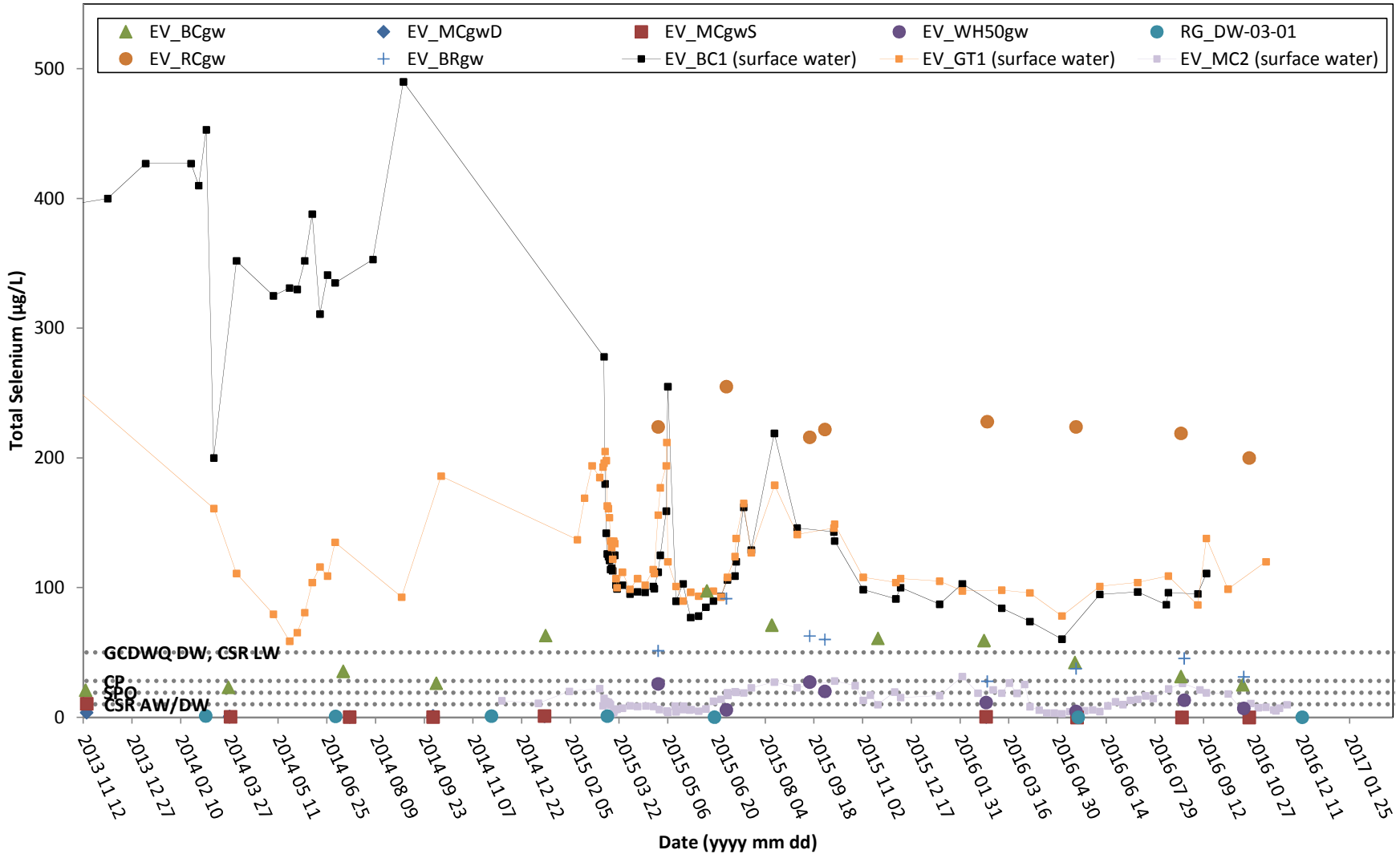


Graph 9-1: Groundwater Elevation of Key Area 9 Wells (2015 - 2016)

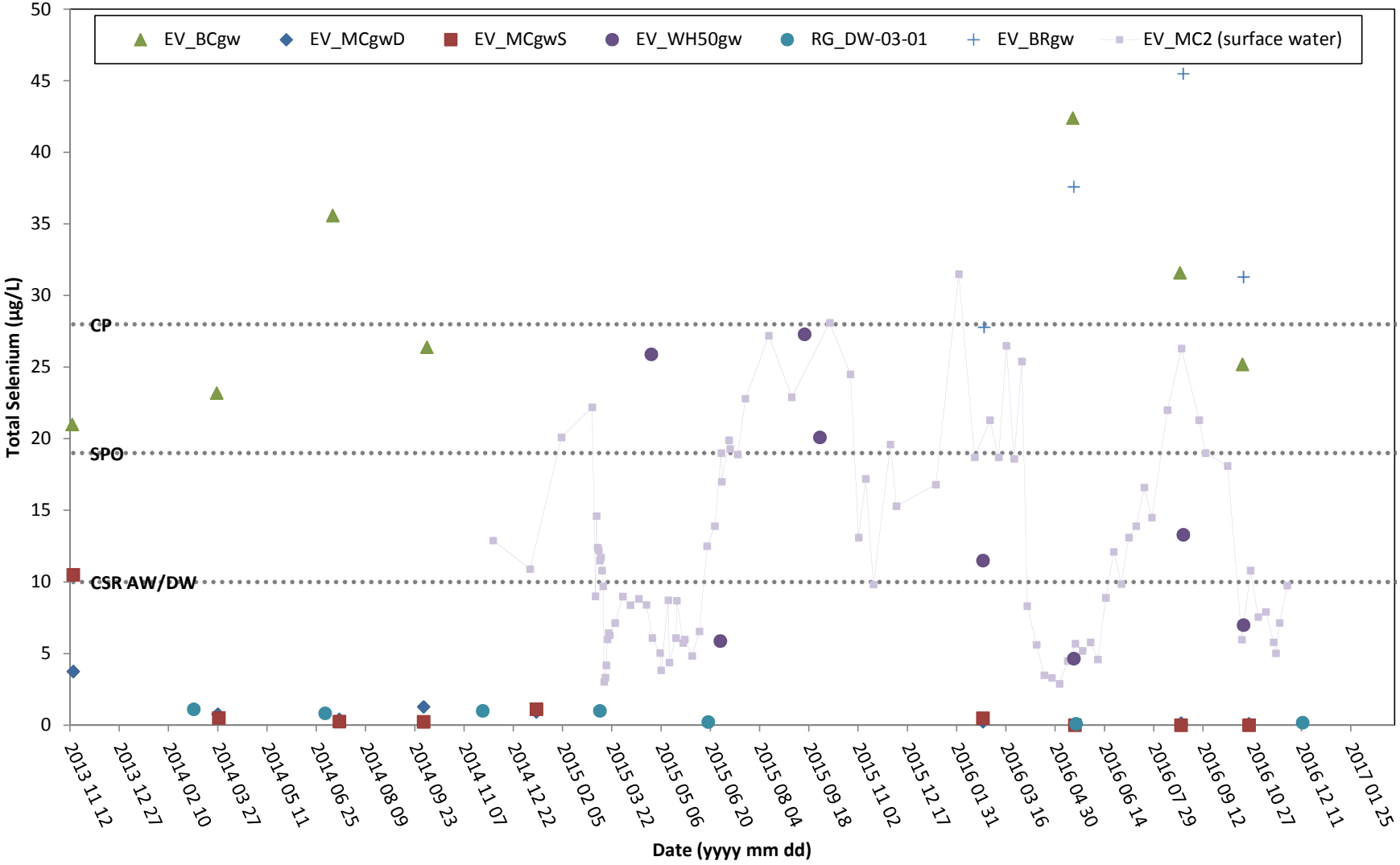


Note: data was removed where suspected datalogger removal occured, dataloggers MCgwD and MCgwS were switched on November 17, 2015

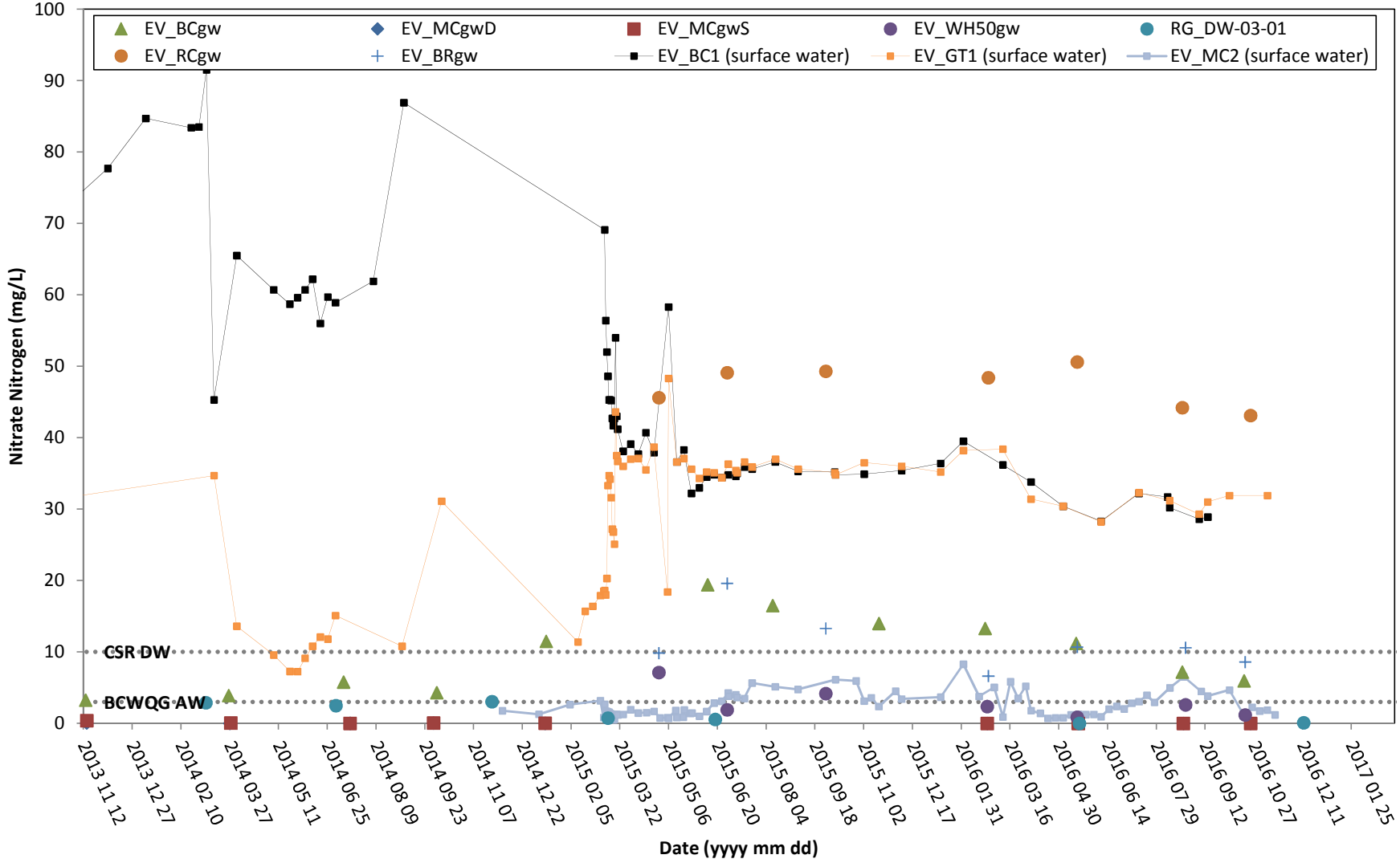
Graph 9-2(1): Selenium Concentrations in Key Area 9



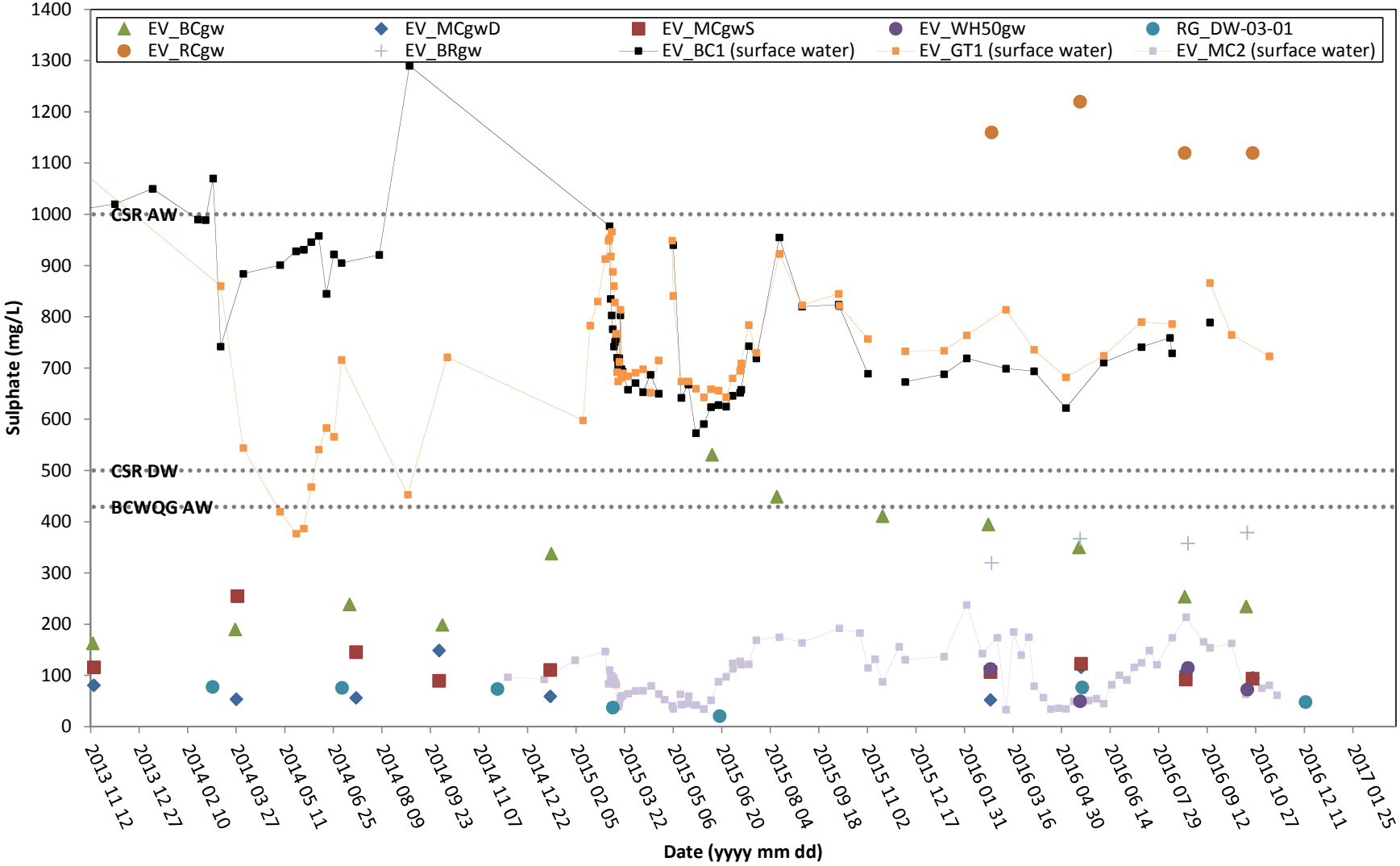
Graph 9-2(2): Selenium Concentrations in Key Area 9 (Low concentration)



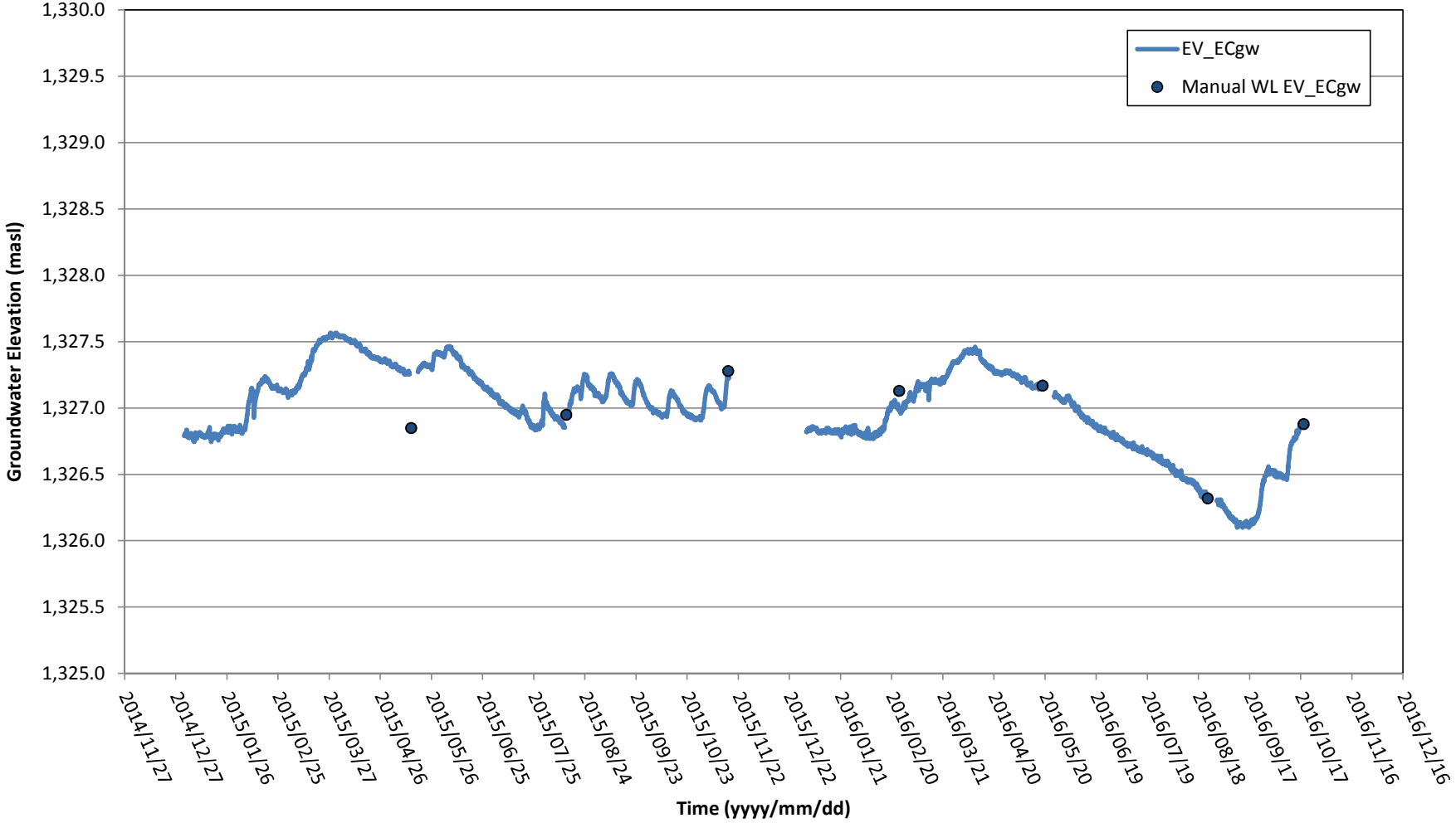
Graph 9-3: Nitrate Concentrations in Key Area 9



Graph 9-4: Sulphate Concentrations in Key Area 9

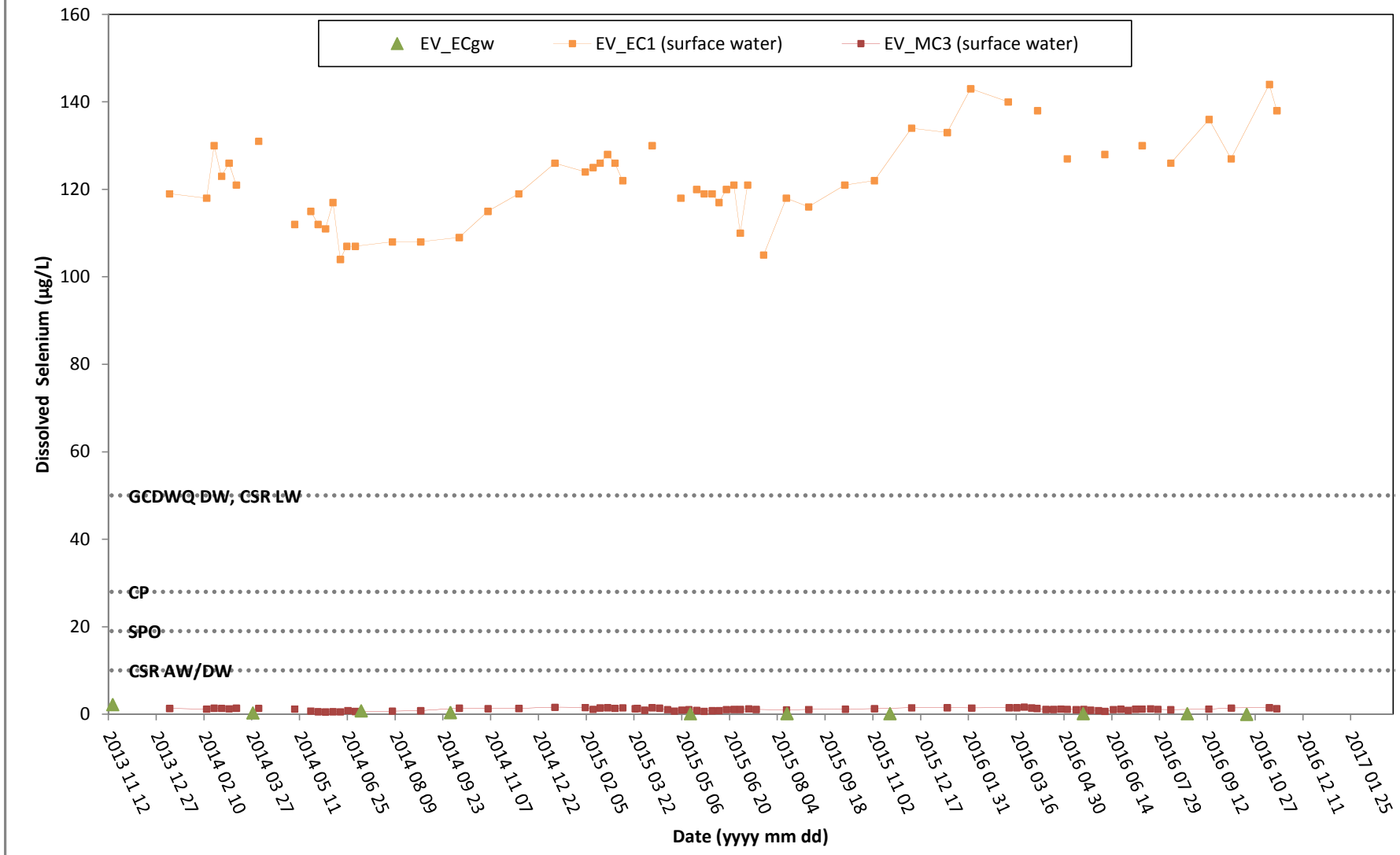


Graph 10-1: Groundwater Elevation of Key Area 10 (2015 - 2016)

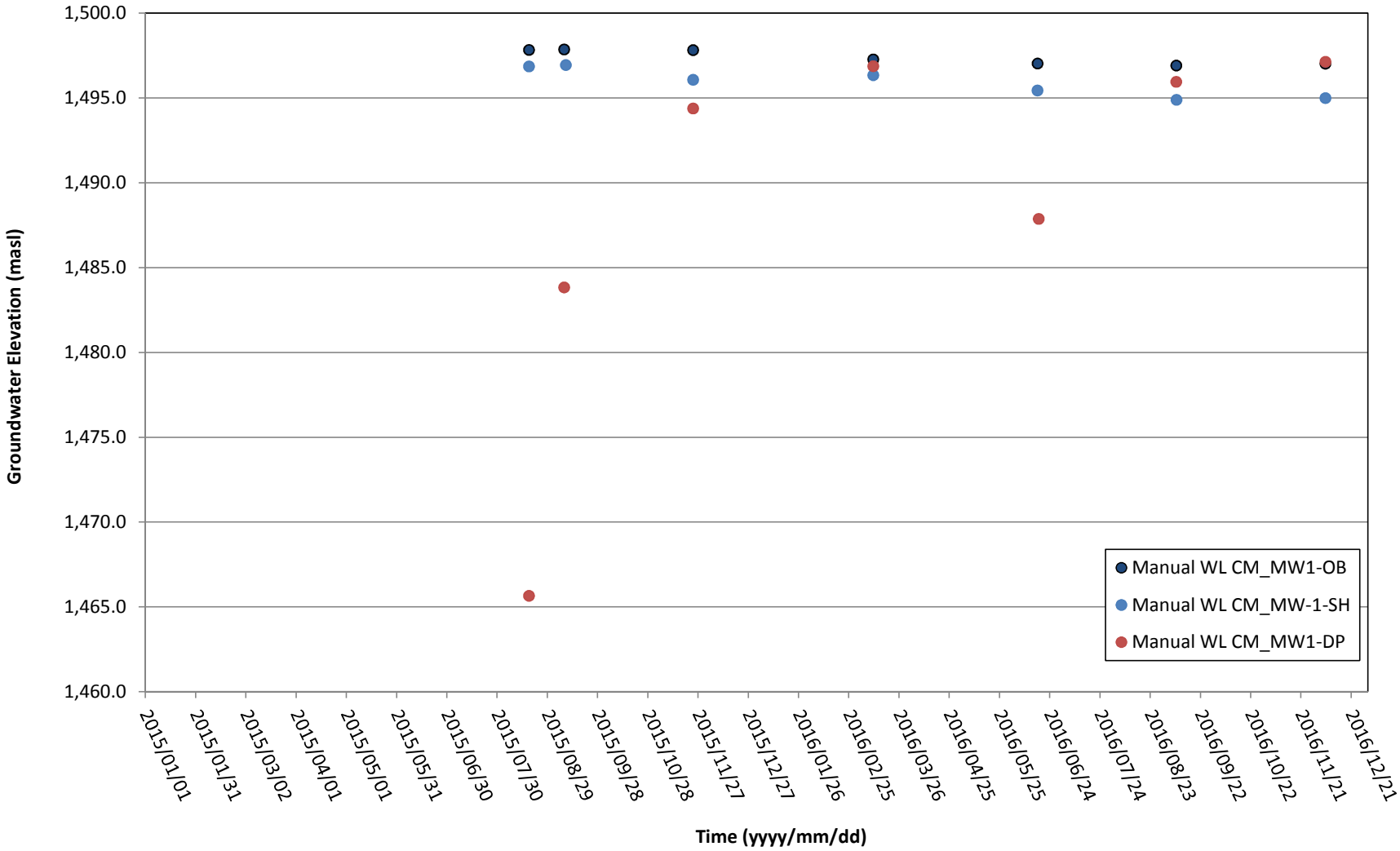


Note: data was removed where suspected datalogger removal occured, dataloggers MCgwD and MCgwS were switched on November 17, 2015

Graph 10-2: Selenium Concentrations in Key Area 10

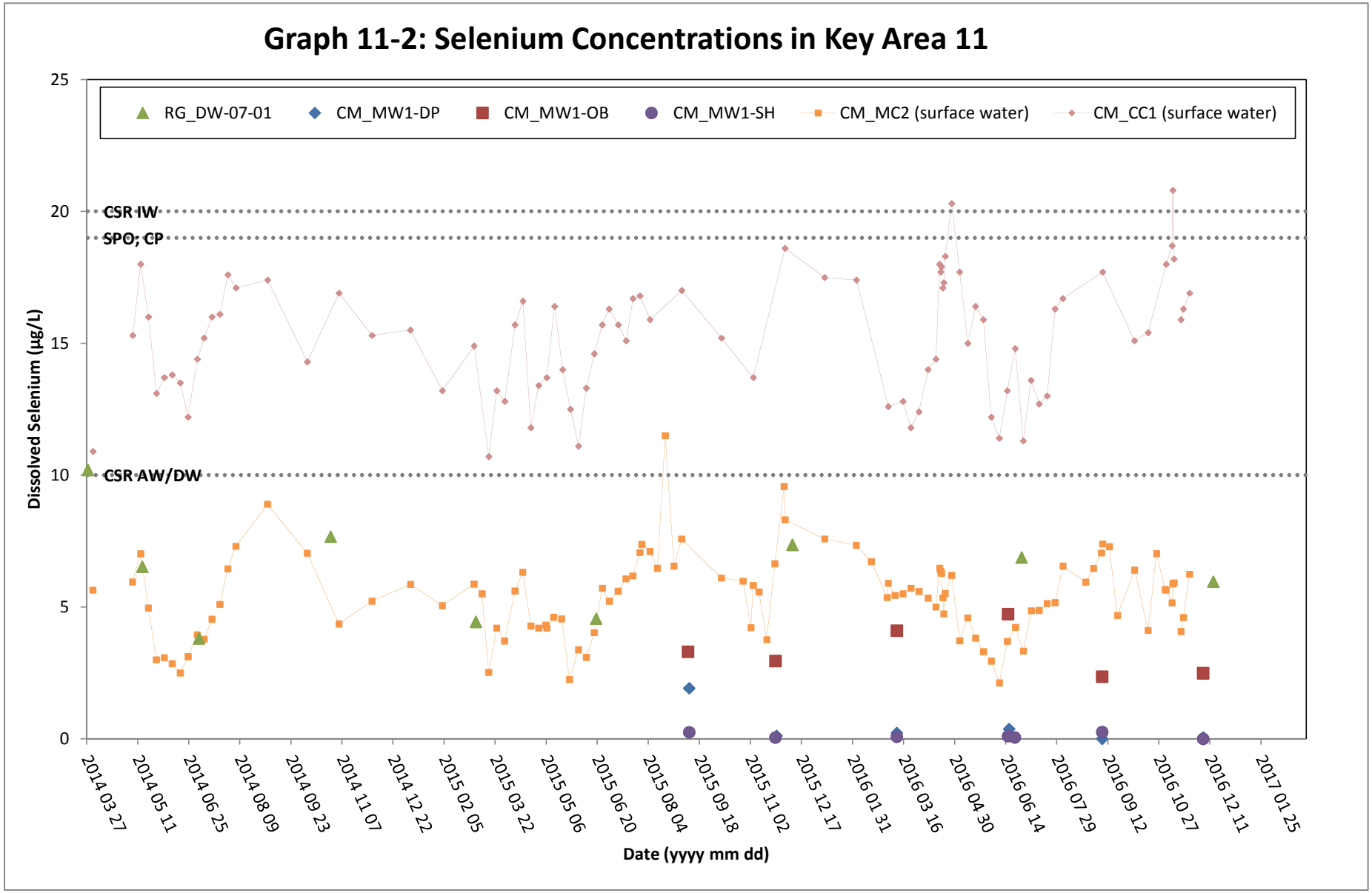


Graph 11-1: Groundwater Elevation of Key Area 11 Wells (2015 - 2016)

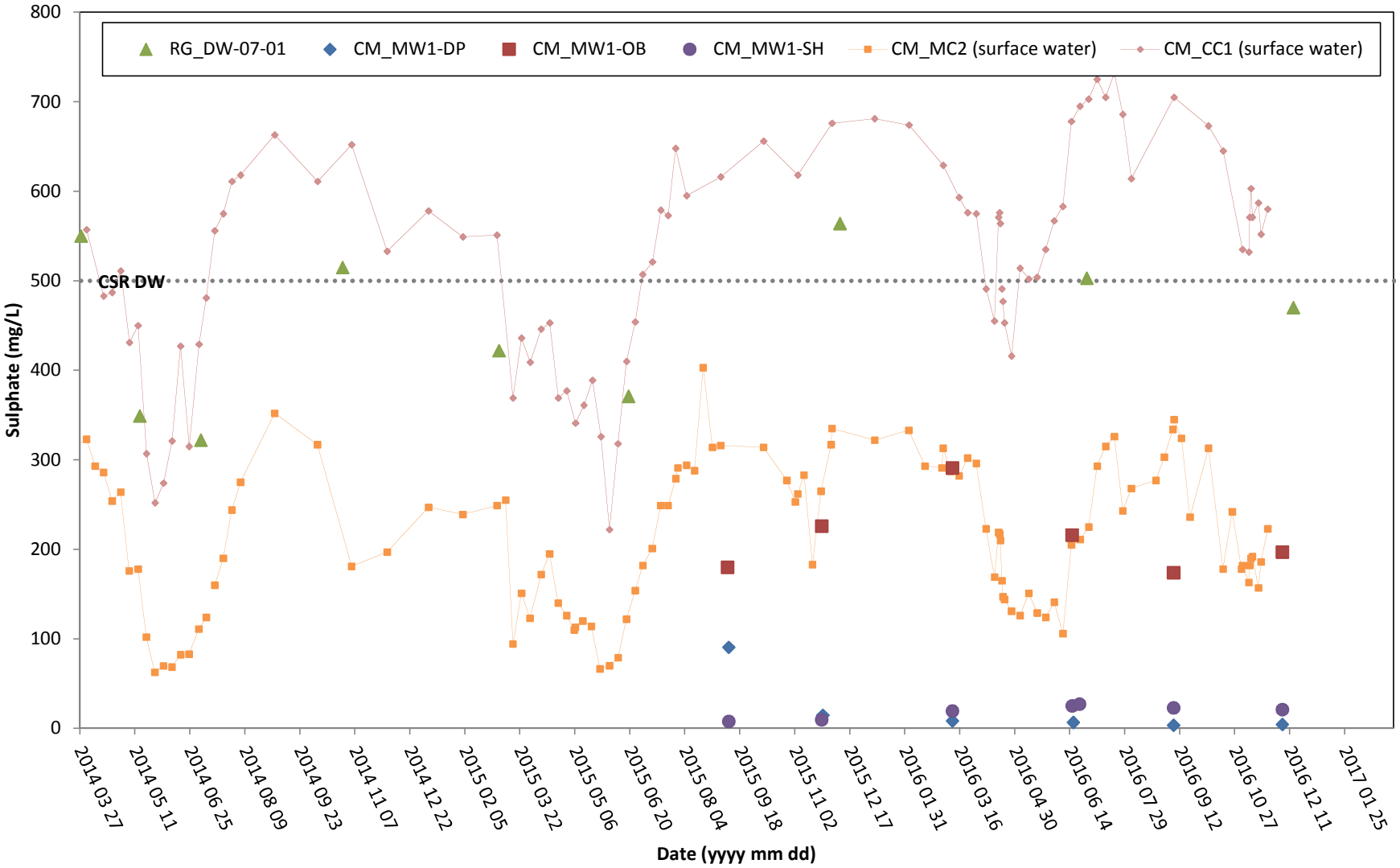


Note: data was removed where suspected datalogger removal occured

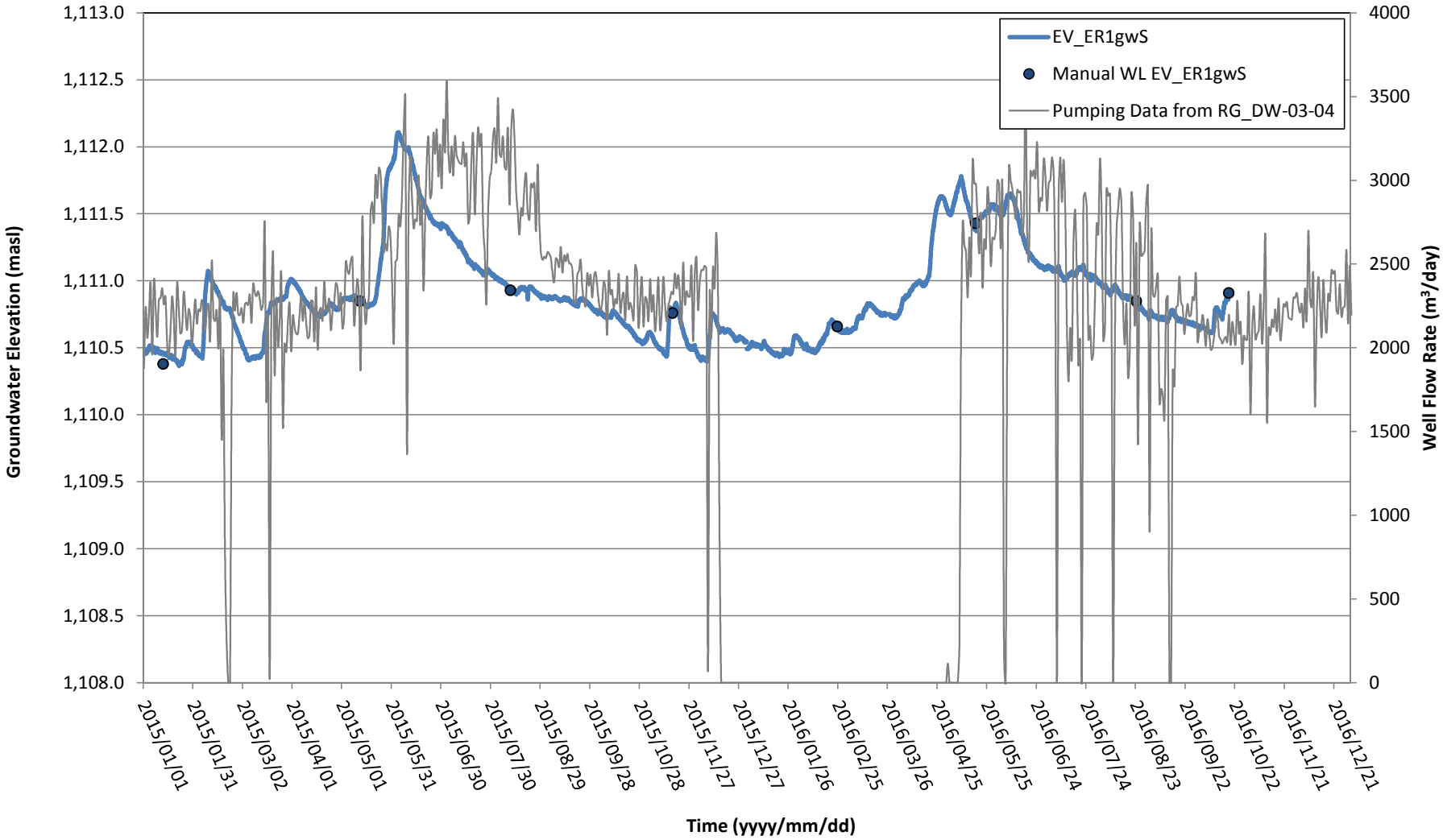
Graph 11-2: Selenium Concentrations in Key Area 11



Graph 11-3: Sulphate Concentrations in Key Area 11

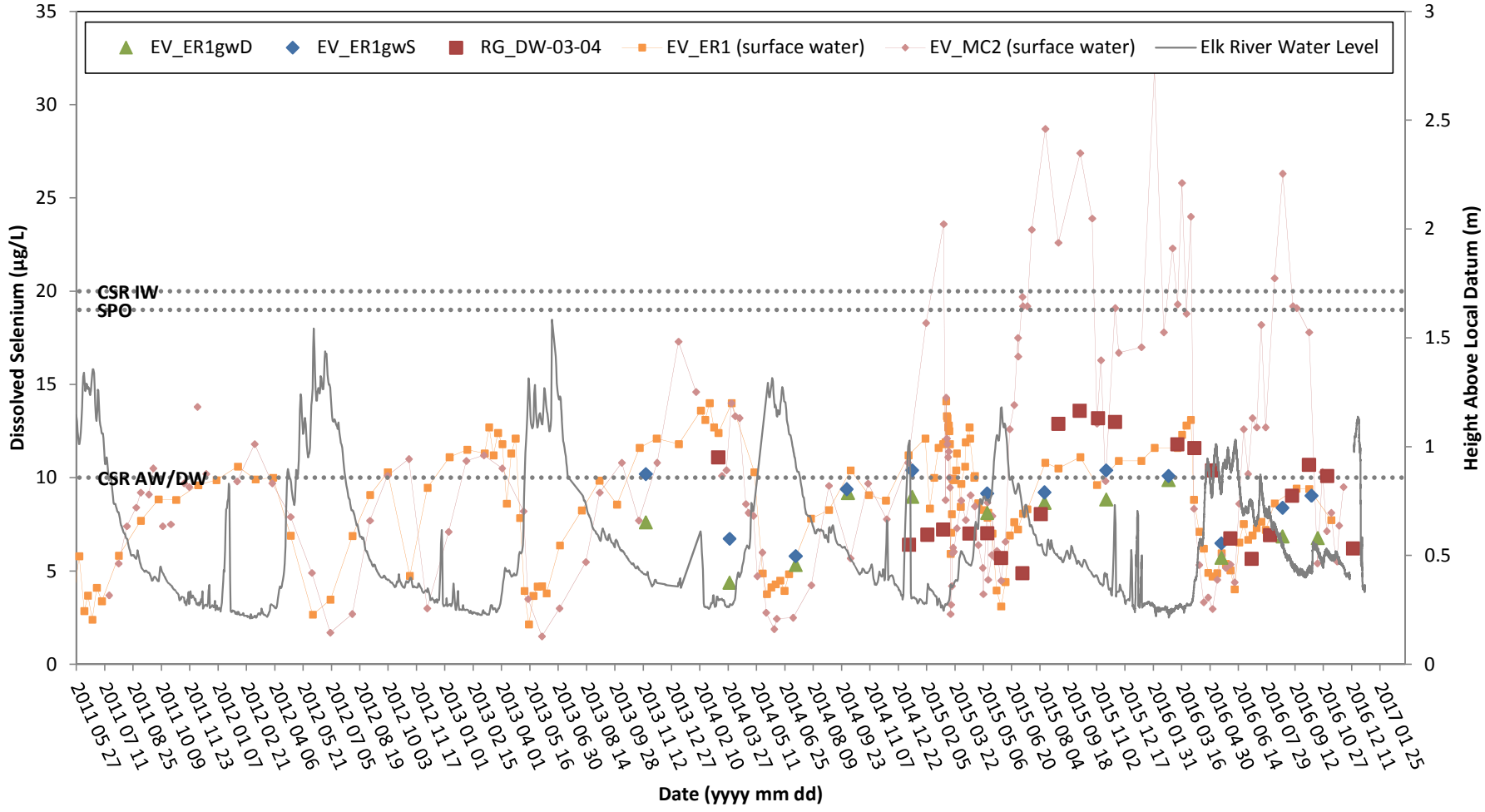


Graph12-1: Groundwater Elevation and Pumping Rate in Key Area 12 (2015 - 2016)



Note: data was removed where suspected datalogger removal occured

Graph 12-2:
Selenium Concentrations in Key Area 12 and Elk River Water Level



Note: Total selenium concentrations shown at RG_DW-03-04 and EV_ER1gwD prior to 2014 12 03

Appendix III

Vertical Hydraulic Gradient Calculation

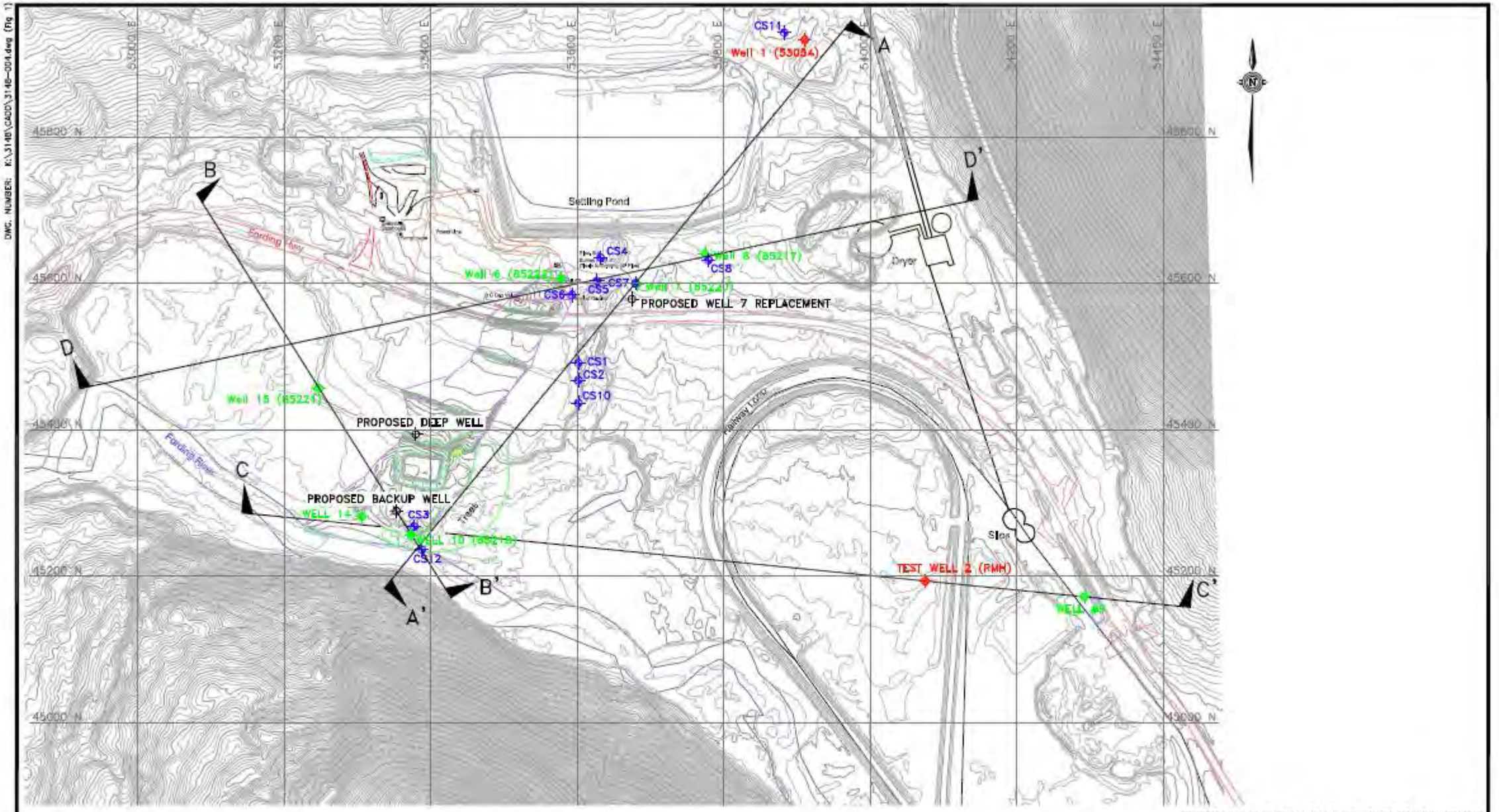
Appendix III: Summary of Vertical Gradient Calculations

Key Area	Well IDs	Date of Static Water Level Measurement (yyyy/mm/dd)	Elevation Difference (m)	Head Difference (m)	Vertical Hydraulic Gradient
1	FR_09-01-A/B	2016/01/25	12.56	-0.59	-0.05
		2016/06/14		-0.67	-0.05
		2016/08/17		-0.70	-0.06
		2016/11/24		-1.83	-0.15
2	LC_PIZDC1308/1307	2016/03/16	26.14	-3.31	-0.13
		2016/06/10		-0.87	-0.03
		2016/09/13		-	-
		2016/12/13		-2.37	-0.09
9	EV_MCgwS/D	2016/02/24	19.47	-1.14	-0.06
		2016/05/18		-0.90	-0.05
		2016/08/23		-0.90	-0.05
		2016/10/24		-1.10	-0.06
11	CM_MW1-OB/SH	2016/03/10	18.34	-0.93	-0.05
		2016/06/16		-1.59	-0.09
		2016/09/07		-2.02	-0.11
		2016/12/05		-2.03	-0.11
	CM_MW1-SH/DP	2016/03/10	13.78	0.53	0.04
		2016/06/16		-7.57	-0.55
		2016/09/07		1.06	0.08
		2016/12/05		2.14	0.16
12	EV_ER1gwS/D	2016/02/24	11.26	0.30	0.03
		2016/05/18		0.28	0.02
		2016/08/23		0.30	0.03
		2016/10/18		0.28	0.02

* Vertical gradient values were not calculated between LC_PIZDC1308/1307 in September 2016 as depth to water values and calculated potentiometric elevations are considered suspect based on level logger data (Graph 2-1)

Appendix IV

Cross-Sections for the GHO Rail Loop



DWG. NUMBER: K:\3148\CADD\3148-004.dwg (Fig. 1)

LEGEND

- PRODUCTION WELL
- ABANDONED WELL
- TEST HOLE
- PROPOSED WELL

HYDROGEOLOGICAL SECTIONS (FIGS. 2 TO 5)

NOTES: SEE WELL LOGS IN APPENDIX A.

0 50 100 150 200 250m

SCALE 1:5000

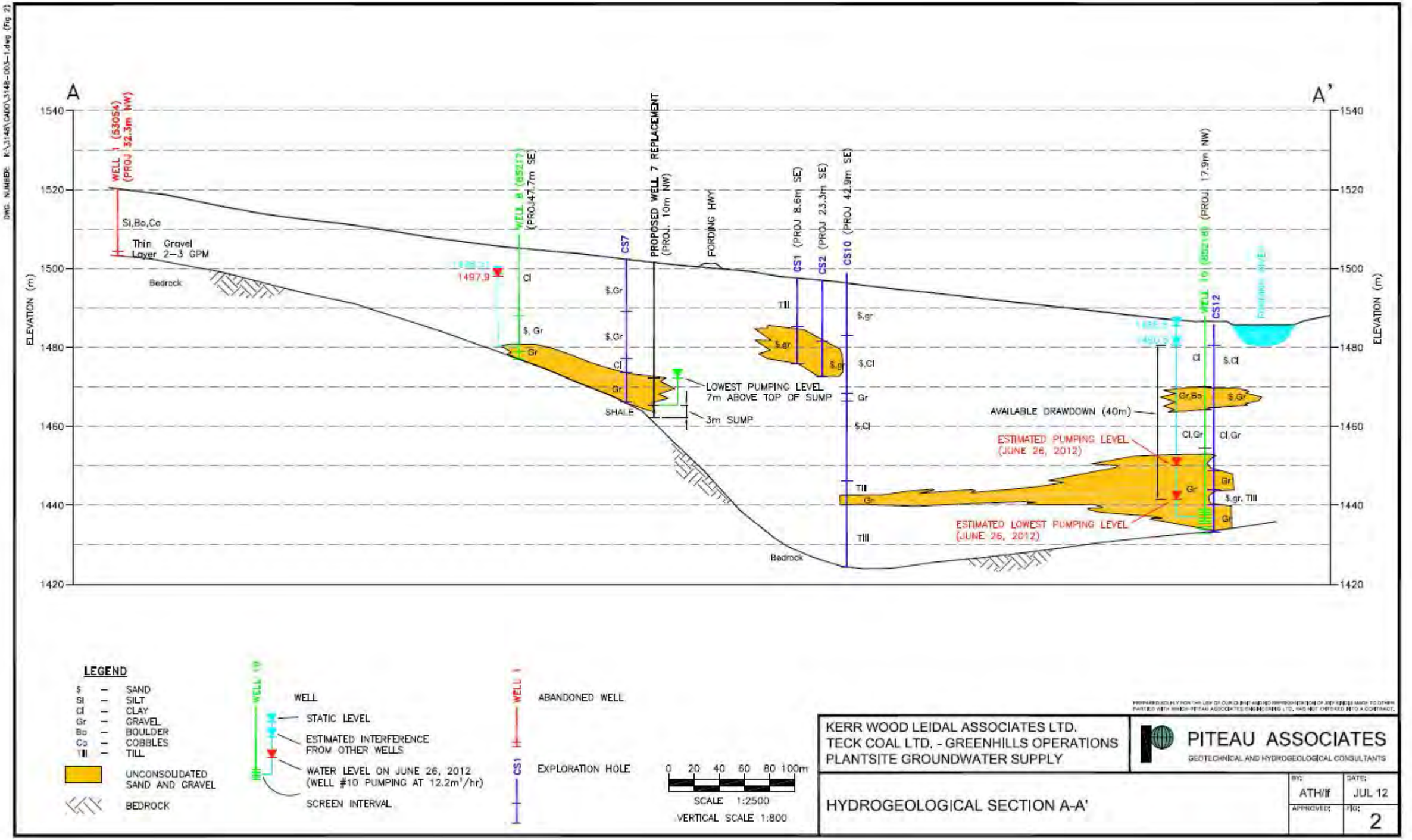
KERR WOOD LEIDAL ASSOCIATES LTD.
TECK COAL LTD. - GREENHILLS OPERATIONS
PLANTSITE GROUNDWATER SUPPLY

PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS

SITE PLAN

BY:	DATE:
ATH/lf	JUL 12
APPROVED:	FIG: 1

DWG. NUMBER: K:\3148\CADD\3148-003-1.dwg (Fig 2)



LEGEND

$	–	SAND
Si	–	SILT
Cl	–	CLAY
Gr	–	GRAVEL
Bo	–	BOULDER
Co	–	COBBLES
TIII	–	TILL

UNCONSOLIDATED SAND AND GRAVEL

BEDROCK

WELL 10

WELL

STATIC LEVEL

ESTIMATED INTERFERENCE FROM OTHER WELLS

WATER LEVEL ON JUNE 26, 2012 (WELL #10 PUMPING AT 12.2m³/hr)

SCREEN INTERVAL

WELL 1

ABANDONED WELL

CS1

EXPLORATION HOLE

0 20 40 60 80 100m

SCALE 1:2500

VERTICAL SCALE 1:800

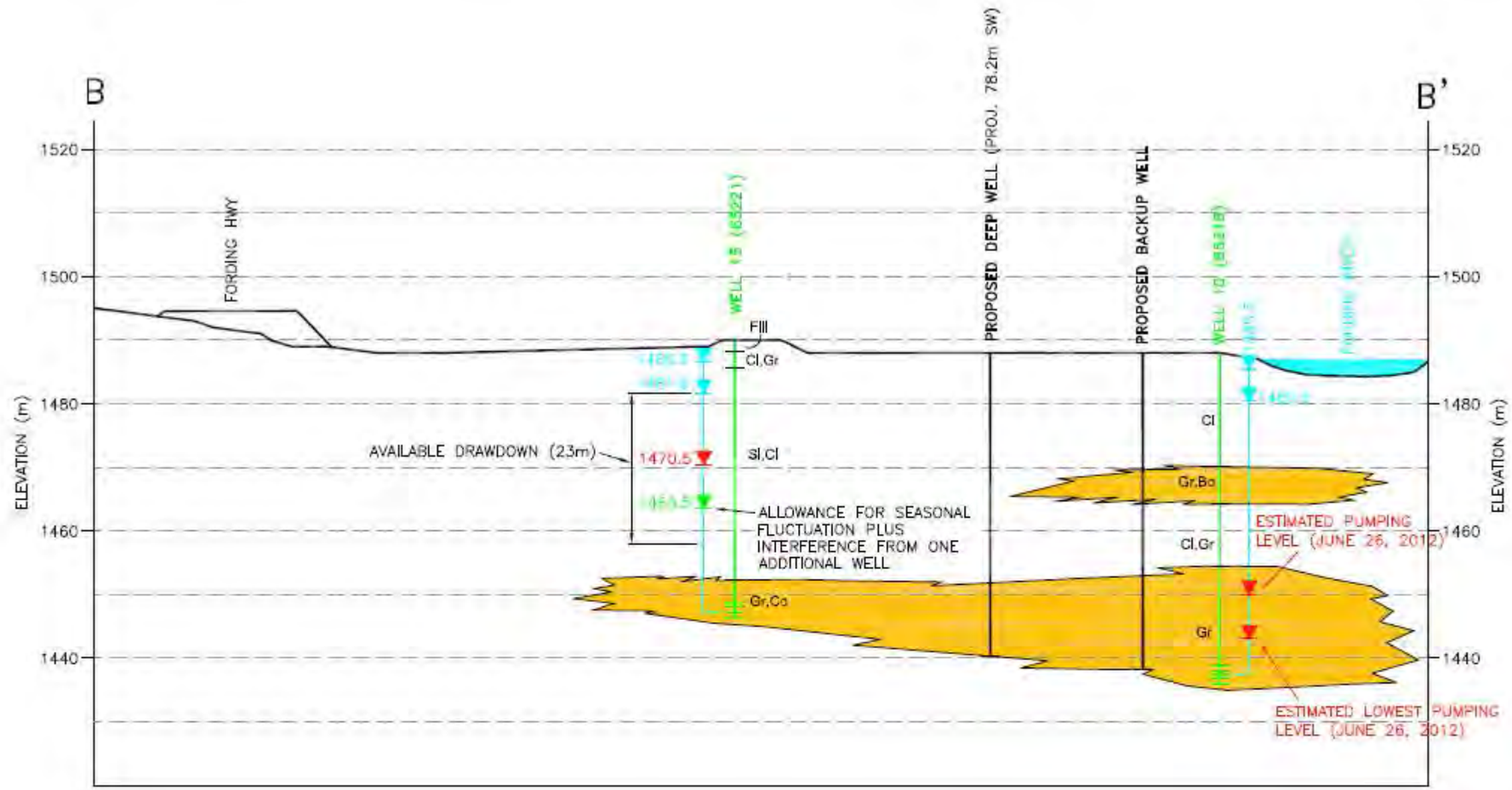
KERR WOOD LEIDAL ASSOCIATES LTD.
TECK COAL LTD. - GREENHILLS OPERATIONS
PLANTSITE GROUNDWATER SUPPLY

PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS

HYDROGEOLOGICAL SECTION A-A'

BY:	DATE:
ATH/lf	JUL 12
APPROVED:	FIG:
	2

DWG. NUMBER: K:\3148\CADD\3148-003-1.dwg (Fig. 3)



LEGEND

S	–	SAND
Sl	–	SILT
Cl	–	CLAY
Gr	–	GRAVEL
Bo	–	BOULDER
Co	–	COBBLES
Till	–	TILL

UNCONSOLIDATED SAND AND GRAVEL

BEDROCK

WELL

STATIC LEVEL

ESTIMATED INTERFERENCE FROM OTHER WELLS

WATER LEVEL ON JUNE 26, 2012

SCREEN INTERVAL

0 20 40 60 80 100m

SCALE 1:2500

VERTICAL SCALE 1:800

NOTES: 1) COULD NOT MEASURE PUMPING LEVEL IN WELL #10
2) PUMPING LEVELS INCORPORATE INTERFERENCE BETWEEN WELLS FOR FOLLOWING PUMPING RATES: WELL #15 66.3 m³/hr
#10 12.2 m³/hr
9 59.0 m³/hr

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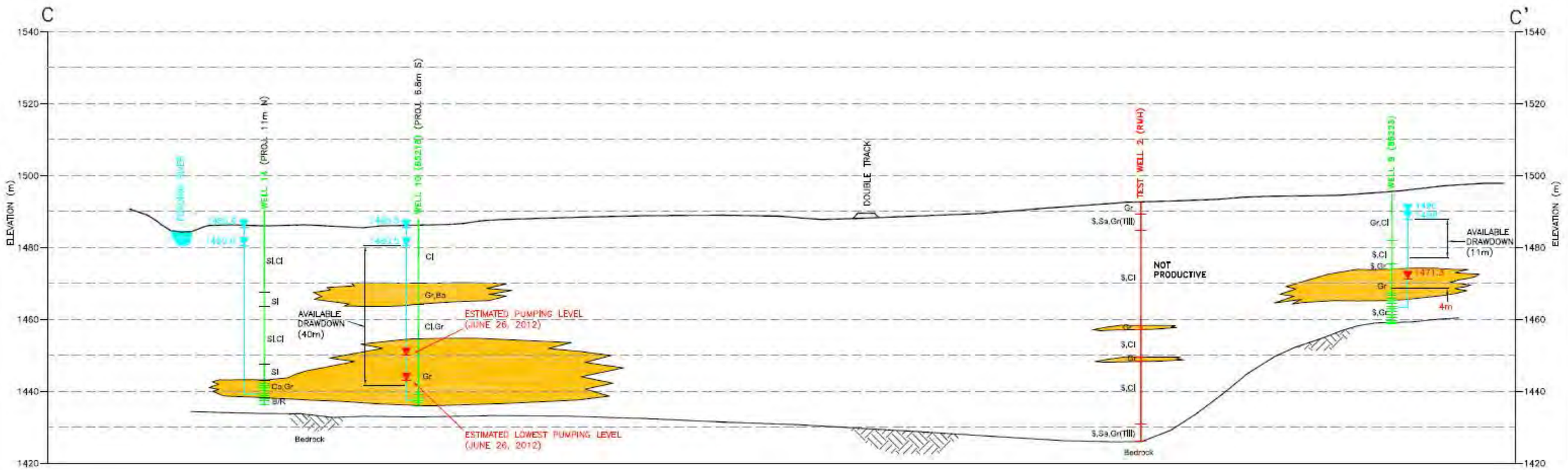
HYDROGEOLOGICAL SECTION B-B'

BY:	DATE:
ATH/lf	JUL 12
APPROVED:	FIG: 3

DWG NUMBER: K:\3148\(2012)\3148-003-1.dwg (Fig 4)



LEGEND

$	–	SAND
SI	–	SILT
Cl	–	CLAY
Gr	–	GRAVEL
Ba	–	BOULDER
Co	–	COBBLES
Till	–	TILL

UNCONSOLIDATED SAND AND GRAVEL

BEDROCK

WELL 10

WELL

STATIC LEVEL

ESTIMATED INTERFERENCE FROM OTHER WELLS

WATER LEVEL ON JUNE 26, 2012 (WELL 9 PUMPING AT 59m³/hr)

SCREEN INTERVAL

TEST WELL 2

TEST WELL

NOTES: ON JUNE 26, 2012, WELL INTERFERENCES IN EFFECT FROM WELL #9 (59 m³/hr), WELL #15 (66.3 m³/hr) AND WELL #10 (12.2 m³/hr).

0 20 40 60 80 100m

SCALE 1:2500

VERTICAL SCALE 1:800

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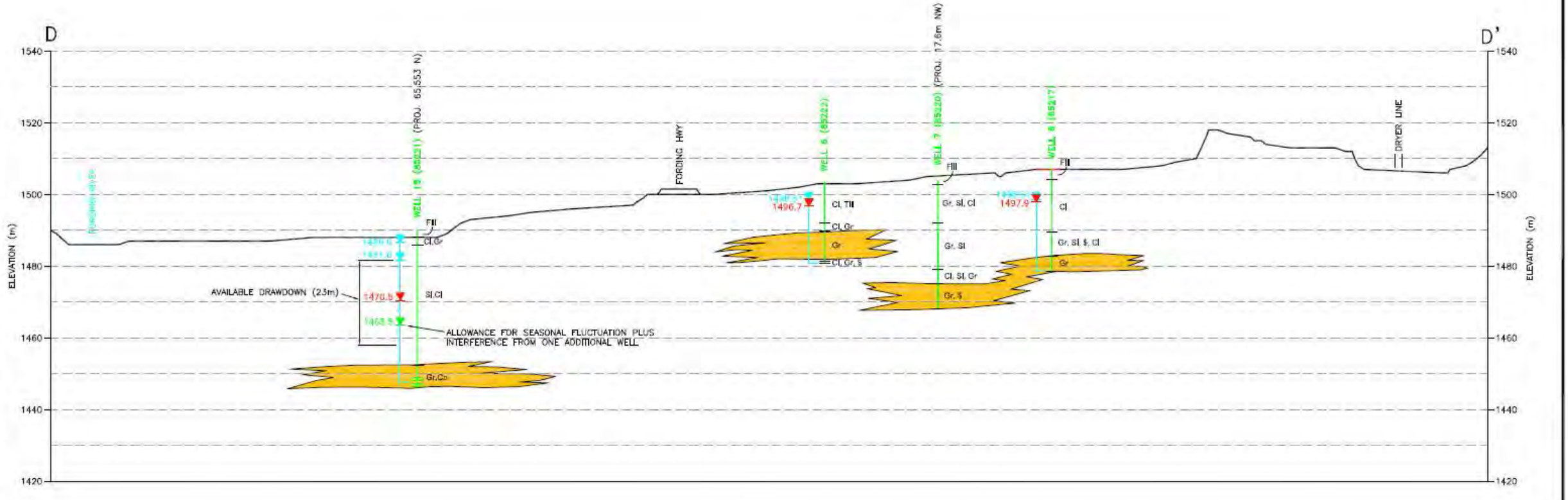
HYDROGEOLOGICAL SECTION C-C'

BY	DATE
ATH/lf	JUL 12
APPROVED	FIG 4

DWG. NUMBER: K:\3148\CADD\3148-003-1.dwg (Fig 5)



LEGEND

S	–	SAND
Sl	–	SILT
Cl	–	CLAY
Gr	–	GRAVEL
Bo	–	BOULDER
Co	–	COBBLES
Till	–	TILL

UNCONSOLIDATED SAND AND GRAVEL

BEDROCK

WELL

STATIC LEVEL

ESTIMATED INTERFERENCE FROM OTHER WELLS

WATER LEVEL ON JUNE 26, 2012

SCREEN INTERVAL

NOTES: ON JUNE 26, 2012, WELL INTERFERENCES IN EFFECT FROM WELL #9 (59 m^3/hr), WELL #15 (65.3 m^3/hr) AND WELL #10 (12.2 m^3/hr).

0 20 40 60 80 100m

SCALE 1:2500

VERTICAL SCALE 1:800

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HYDROGEOLOGICAL SECTION D-D'

BY:	DATE:
ATH/lf	JUL 12
APPROVED:	FIG:
	5

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