Teck Coal Environmental Office
Bag Service 2000, 421 Pine Avenue
Sparwood, B.C. Canada V0B 2G0

+1 250 425 3331 Tel
www.teck.com

Technical Report Overview

Report: Regional Groundwater Monitoring Program 2015 Report

Overview: This report presents the 2015 results of the regional groundwater monitoring program required under Permit 107517. This report summarizes the results of groundwater quality in 2015 and compares groundwater chemistry to nearby surface water chemistry to understand groundwater transport pathways.

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

For More Information
If you have questions regarding this report, please:
- Phone toll-free to 1.855.806.6854
- Email **feedbackteckcoal@teck.com**

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

SNC·LAVALIN

2015 ANNUAL REPORT

Regional Groundwater Monitoring Program

March 31, 2016
Project 635544

Prepared for:

Teck Coal Limited

SNC-LAVALIN INC.

Prepared By:

Genevieve Pomerleau, M.Sc., P.Eng.
Senior Hydrogeologist

PROFESSIONAL GEOSCIENTIST
PROVINCE OF BRITISH COLUMBIA
L. L. HARKER
40673
March 31/16

Leslie Harker, M.Sc., P.Geo.
Project Hydrogeologist

Reviewed By:

PROFESSIONAL GEOSCIENTIST
PROVINCE OF BRITISH COLUMBIA
S. A. HUMPHRIES
#31909
March 31/16

Stefan Humphries, M.Sc., P.Geo
Senior Hydrogeologist/Senior Project Manager

EXECUTIVE SUMMARY

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 Regional Groundwater Program was submitted for approval on July 31, 2015 with no reply to date. This report fulfills requirement 5) in Section 9.2.1 and reporting requirements listed in Section 10.3 of Permit 107517.

Samples were not collected at two locations due to frozen monitoring wells, and wells at CMO were just installed in August 2015 and, as such, only have data for the last two quarters of 2015. The Regional Groundwater Monitoring Program was initiated in the latter part of 2015, generally after site-specific groundwater monitoring programs were already underway. As a result of the differences between site-specific and regional groundwater monitoring programs, some of the wells at GHO and EVO were only sampled bi-annually with limited parameters as part of potability sampling programs that were already underway.

Groundwater quality at all groundwater monitoring locations were compared to applicable primary and secondary benchmarks and trend analyses and interpretation of water levels and selected parameters were completed by Key Area as defined in the Regional Groundwater Synthesis Report for the Elk Valley (‘the Synthesis Report’; SNC-Lavalin, 2015b). A summary of conclusions and recommendations is as follows:

- In general, groundwater conditions were relatively similar to those outlined in the Synthesis Report. Concentrations of constituents of interest and exceedances of screening benchmarks were generally consistent with previous observations and are summarized by Key Area. Concentrations of other constituents were compared to primary screening benchmarks and exceedances were noted at some locations. Most of the exceedances noted are not considered a concern because there was no identified receptor and/or the exceedances were only marginally above benchmarks. For some constituents at certain locations, concentrations were

higher than primary benchmarks and the source was unclear; continued monitoring and further consideration of human health and/or aquatic life may need to be considered at these locations.

- We recommend to reduce the sampling frequency of the Drinking Water Sampling program to bi-annual sampling to capture anticipated high and low groundwater levels in the valley-bottoms in the spring and fall. This would reduce some of the challenge of sampling domestic wells on a quarterly basis as access to obtain samples is subject to landowner permission and availability.
- With the exception of the Drinking Water Sampling Program where limited parameters for analysis are specified, we recommend analyses for all the parameters listed in the Regional Groundwater Monitoring Program begin in Q2 2016. This includes the municipal wells sampled by third parties;
- To increase water level data quality, we recommend concurrent manual water level measurements each time a water level datalogger is deployed or removed from a well and prior to each sampling event;
- The annual report for the Regional Groundwater Monitoring Program is based on data from site-specific programs and a concurrent due date presents difficulties in alignment and consistency between the regional and site- specific programs. As such, we recommend a later due date for submission of subsequent Regional Groundwater Monitoring Program reports; and
- Specific recommendations for monitoring or further evaluation are provided by Key Area within the report.

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1 INTRODUCTION

SNC-Lavalin Inc. (SNC-Lavalin) has generated this report to meet annual reporting requirements for regional groundwater monitoring in the Elk Valley outlined in Permit 107517 for Teck Coal Limited (Teck). SNC-Lavalin developed a Regional Groundwater Monitoring Program for Management Units (MU[s]) 1, 2, 3 and 4 ('the Study Area') as defined in the Elk Valley Water Quality Plan (EVWQP; Teck, 2014) and shown on Figure 1. This report fulfills requirement 5) in Section 9.2.1 and reporting requirements listed in Section 10.3 of Permit 107517. Specifically, requirement 5) in Section 9.2.1 states:

- 5) 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 March 31 of the following year. The first report is due March 31, 2016 and each March 31 thereafter.

1.1 Background Information

To fulfill requirements of Permit 107517, a Regional Groundwater Synthesis Report for the Elk Valley (the 'Synthesis Report', SNC-Lavalin, 2015b) was submitted to the Ministry of Environment (MoE). A regional hydrogeological conceptual model (the 'Regional Conceptual Model') was developed to describe groundwater flow patterns and quality, focussing on mine-related indicator constituents including selenium, cadmium, sulphate, and nitrate, or 'constituents of interest' (hereafter referred to as CIs). Based on the Regional Conceptual Model, twelve areas ('Key Areas') were identified at the local scale as being areas where loading (i.e., transport) of CIs to groundwater in the valley bottom in the main river systems may be occurring, or where transport may occur in the future. As part of the Synthesis Report, data gaps and uncertainties related to Key Areas were identified and categorized into: 1) data gaps to be addressed through continued monitoring; and 2) data gaps to be addressed by additional studies.

Based on the Synthesis Report, a regional groundwater monitoring program ('Regional Groundwater Monitoring Program') was developed to meet Permit 107517 requirements. This was submitted to the MoE for approval which is still pending as of submission of this report. The Regional Groundwater Monitoring Program 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).

1.2 Report Structure and Content

The 2015 Annual Regional Groundwater Monitoring Report has been prepared following the proposed Regional Groundwater Monitoring Program (SNC-Lavalin, 2015a) and requirements of Permit 107517. Specifically, Section 10.3 of Permit 107517 listed the following components to include:

i. A map of monitoring locations with EMS and Permittee descriptors;

ii. A summary of background information on that year's program, including discussion of program modifications relative to previous years;

iii. 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;

iv. Evaluation and discussion of spatial patterns and temporal trends;

v. A summary of all QA/QC issues for the year; and

vi. Recommendations for further study or measures to be taken.

The 2015 Annual Regional Groundwater Monitoring Report is structured as follows:

- Section 1 includes background information on the Regional Groundwater Monitoring Program, including Key Areas for data interpretation and related data gaps and uncertainties;
- Section 2 provides a description of the Regional Groundwater Monitoring Program including monitoring locations and requirements, sampling methodologies and Quality Assurance/Quality Control (QA/QC). This Section is intended to meet the following Permit 107517 requirements for 2015:
    - i. a map of monitoring locations with EMS and Permittee descriptors;
    - ii. a summary of background information on that year's program, including discussion of program modifications relative to previous years; and
    - v. a summary of all QA/QC issues for the year.

- Section 3 provides a description of primary and secondary screening benchmarks for comparison of groundwater quality data. This Section is intended to provide a description and explanation of the criteria and benchmarks outlined in the Regional Groundwater Monitoring Program to address the following Permit 107517 requirement:
    - iii. 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.
- Section 4 includes results from the 2015 Regional Groundwater Monitoring Program, including comparison to criteria outlined in Section 3, broken into Key Area. Trends for water levels and groundwater quality, where sufficient data are available, are presented and used for data interpretation by Key Area. A discussion of how new data affect data gaps and uncertainties has been provided by Key Area, where applicable. This Section is intended to meet the following Permit 107517 requirements:
    - iii. 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; and
    - iv. evaluation and discussion of spatial patterns and temporal trends.
- Section 5 provides the conclusions from the 2015 Regional Groundwater Monitoring Program as well as any recommendations for monitoring. This Section is intended to meet the following Permit 107517 requirements:
    - vi: recommendations for further study or measures to be taken.

1.3 Data Sources and Limitations

SNC-Lavalin received raw field and chemistry data from the groundwater monitoring programs listed above (including groundwater levels, top of casing information and laboratory analytical results), and the regional drinking water sampling program (laboratory analytical results). SNC-Lavalin has relied on data and information provided by Teck and, as such, have assumed that the information provided is both complete and accurate. To ensure 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.

2 REGIONAL GROUNDWATER MONITORING PROGRAM DESCRIPTION

To comply with Permit 107517, the Regional Groundwater Monitoring Program included recommendations related to: monitoring locations; sampling methodology; monitoring requirements including sampling frequency and parameters to submit for laboratory analysis; and a quality assurance/quality control (QA/QC) program. Details of the 2015 monitoring program are provided in the following subsections.

This section includes the following requirements listed in Section 10.3:

i. A map of monitoring locations with EMS and Permittee descriptors;
ii. A summary of background information on that year's program, including discussion of program modifications relative to previous years; and
v. A summary of all QA/QC issues for the year.

2.1 Monitoring Locations

A total of 38 existing monitoring, supply and/or domestic wells in the Study Area were included in the Regional Groundwater Monitoring Program. Table A provides a list of locations in each of the Key Areas, as well as information such as well type (monitoring, supply or domestic), associated operation and location UTMs. Table A also includes a description of each well location and a rationale indicating why these wells were included in the monitoring program. Figures 2 and 3 indicate the location of monitoring locations in each Key Area in relation to MUs and permitted mine boundaries.

Details on rationale for well selection and information associated with well type (i.e., monitoring supply, or domestic well) are provided in the Regional Groundwater Monitoring Program (SNC-Lavalin, 2015a).

Table A: 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 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 off-site groundwater transport 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 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		Background well, immediately upgradient of Key Area 4. Selected to monitor background and upgradient Elk River valley-bottom groundwater conditions in MU 3 upgradient 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.
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.

Table A (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
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.
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_BRS1/EV_BRS2	Supply	4	EVO	*655019*	*5510193*		Michel Creek valley bottom downgradient of Bodie Creek. Selected to monitor spatial variation in groundwater quality within Michel Creek valley bottom in relation to Key Area 9.
	EV_RCS1	Supply	4	EVO	*655902*	*5509299*		
	EV_WHS1/EV_WHS2	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 (Well 1, Well 2, Well 3 and Well 4) which are collectively referred to as FR_GHHW. Easting and Northing are listed for Well 4.

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.

2.2 Sampling Methodology

Sampling for the Regional Groundwater Monitoring Program was 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 Document for water sample collection and handling, using well-specific methods based on well construction, type and recharge. Specific sampling methods for monitoring locations vary by site program and well type; methods were selected to obtain representative and consistent samples to the maximum extent possible.

Since sampling and handling details varied by site program, readers are referred to the 2015 annual reports for individual site-specific programs for details related to sampling methodology, handling and shipment for wells supporting both the Regional Groundwater Monitoring Program and site-specific programs. The exception to this is the 2015 Elk Valley Drinking Water Sampling Program; details on sampling methodology are provided below.

2.2.1 2015 Elk Valley Drinking Water Sampling Program

The detailed sampling methodology for the 2015 Elk Valley Drinking Water Sampling Program is provided in SNC-Lavalin (2016). A summary of sampling methodology from the Drinking Water Program is provided below:

- For residential locations, samplers checked in with the resident or site contact upon arrival and 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. Samples for dissolved selenium analyses were field-filtered using a 0.45 μm syringe filter and appropriately preserved in the plastic laboratory supplied sample container. Nitrile gloves were worn at all times during sampling; and
- Samples were placed in ice-chilled coolers, and delivered within required hold-times to ALS Environmental, in Burnaby, BC, following chain-of-custody procedures.

The Sparwood Municipal Supply Well (RG_DW-03-04) is considered part of the Elk Valley Drinking Water Sampling Program; however, this well is sampled by the District of Sparwood and sampling methodologies for 2015 were not provided.

2.3 Monitoring Requirements

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

2.3.1 Sampling Frequency

The Regional Groundwater Monitoring Program 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 2015 is provided in Section 2.4.

2.3.2 Analyte List

The Regional Groundwater Monitoring Program 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 (2012) *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 guidelines. Analyses for dissolved metals was specified to prevent misrepresentation of the mobile concentrations of constituents due to increased turbidity, which may occur as the result of sampling techniques, well construction, and/or geological formation (i.e., clay or silt bearing formations).

A summary of wells not analyzed for these specified parameters in 2015 is provided in Section 2.4.

2.4 Modifications to Regional Groundwater Monitoring Program

A summary and discussion of program modifications relative to the program outlined in Regional Groundwater Monitoring Program (SNC-Lavalin, 2015a) is provided below. Readers are referred to the 2015 annual reports for individual site-specific programs for details related to operational changes and progress that occurred in 2015, including maintenance, upgrades and reclamation that

has the potential to impact water quality (e.g., new waste rock dumps, dam raises, process changes, etc.) and for planned activities for the upcoming year.

2.4.1 Site-specific Programs

A summary of locations where water level data, where applicable (i.e., water level data cannot be collected from supply or domestic wells), were not collected is provided in Table B below.

Table B: Summary of Water Level Data from 2015

Key Area	Well ID	Q1	Q2	Q3	Q4	Comment
Background	FR_HMW5			x	x	Water levels were missed during sampling for some or all quarters in 2015.
1	FR_09-01-A		x	x		
	FR_09-01-B		x	x		
4	GH_GA-MW-4					
10	EV_ECgw		x	x	x	
11	CM_MW1-OB			x	x	CM_MW1-series wells were not installed until August 2015 and, therefore, water levels could not be measured in Q1 and Q2. Future monitoring will be quarterly.
11	CM_MW1-SH			x	x	
11	CM_MW1-DP			x	x	

Notes: 'x' indicates water level measurement collected

A summary of instances where quarterly sampling was missed is provided in Table C below.

Table C: Summary of Quarterly Data from 2015

Key Area	Well ID	Q1	Q2	Q3	Q4	Description
Back-ground	FR_HMW5		x	x	x	Q1 sample unattainable due to frozen well
3	GH_POTW09		x		x	These wells have historically been sampled bi-annually for potability purposes. In 2015, wells were sampled in Q2 and Q4. These wells were added to the Regional Groundwater Monitoring Program in Q3.
	GH_POTW10		x		x	
	GH_POTW15		x		x	
	GH_POTW17				x	GW_Supply Well 17 was only commissioned in the second half of 2015.
9	EV_BRS1/EV_BRS2		x	x		These wells have historically been sampled bi-annually for potability purposes. In 2015, wells were sampled in Q2 and Q3.
	EV_RCS1		x	x		
	EV_WHS1/EV_WHS2		x	x		

Table C (Cont'd): Summary of Quarterly Data from 2015

Key Area	Well ID	Q1	Q2	Q3	Q4	Description
10	EV_ECgw		x	x	x	Q1 sample unattainable due to frozen well.
11	CM_MW1-OB			x	x	CM_MW1-series wells were not installed until August 2015 and therefore samples could not be collected in Q1 and Q2.
	CM_MW1-SH			x	x	
	CM_MW1-DP			x	x	

Notes: 'x' indicates sample collected.

As indicated in Table C, some of the supply wells at GHO and EVO were only sampled bi-annually in 2015 as part of potability sampling programs. The Regional Groundwater Monitoring Program was only initiated in the latter part of 2015 (i.e., after the potability sampling occurred); as such, quarterly sampling could not be achieved.

The following samples were not submitted for the complete analyte list:

- Field parameters were not measured prior to sampling during Q2 sampling at GH_POTW09, GH_POTW10, GH_POTW15 and GH_POTW17; and
- The EV_BRS1/EV_BRS2, EV_RCS1, EV_WHS1/EV_WHS2 were sampled twice during Q2 (April 27 and June 29) and once during Q3 (September 28) for total selenium and nitrate-N only. These wells were sampled in Q3 (September 14) for potability purposes (total metals analysis and nitrate-N), but field parameters were not measured and samples were not submitted for other anions (other than nitrate-N).

The Regional Groundwater Monitoring Program was initiated in the latter part of 2015, generally after site-specific 2015 groundwater monitoring programs were already underway. As a result of this difference between site-specific and regional groundwater monitoring programs, some parameters may have been missed. Given that these deficiencies were detected at the time of this report (i.e., March), we recommend analyses for all the parameters listed in the Regional Groundwater Monitoring Program start in the second quarter in 2016.

2.4.2 Drinking Water Sampling Program

The Drinking Water Sampling Program is subject to landowner participation in the program and as such obtaining samples from domestic wells at prescribed frequencies at all locations is not always possible. Since Teck may not be able to access any given location and any given time, the absence of sample as part of the Drinking Water Sampling program should not be considered a non-compliance with respect to the Regional Groundwater Monitoring Program and Permit 107517. For completeness, a summary of domestic and supply wells sampling events completed as part of

the Drinking Water Program is provided in Table D below; where samples were not collected a reason is provided.

Table D: Summary of 2015 Sampling Locations

Key Area	Well ID	Q1	Q2	Q3	Q4	Reason
4	RG_DW_01-03	x	x		x	Prioritization of approved monitoring programs over the regional groundwater program that has not yet received approval.
	RG_DW-01-07	x	x		x	
7	RG_DW-02-20	x	x		x	
9	RG_DW-03-01	x	x			Well connected to the District of Sparwood municipal water supply and no longer active after Q3.
11	RG_DW_07-01	x	x		x	Challenges with available resources and prioritization of approved regional monitoring programs over the regional groundwater program that has not yet received approval.

Notes: 'x' indicates sample collected.

Sampling of domestic wells for the 2015 Drinking Water Sampling Program on a quarterly sampling schedule presented challenges with landowner availability and interest. Substantial effort was required to maintain contact with landowners and arrange timing for sampling that meets the sampling schedule. Related to this, in Q3 samples were not obtained as the Regional Groundwater Monitoring Program has not yet received approval and compliance with previously approved programs took priority.

The domestic wells were also sampled for a limited number of parameters, as outlined in the Drinking Water Sampling Program, 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.

Since these wells are domestic wells, Teck have been limiting parameters to those considered to be mine-related indicators and major ions; as such, not all of the parameters listed in the Regional Groundwater Monitoring Program were analyzed. We recommend continued sampling with the limited parameters outlined as part of the Drinking Water Sampling Program.

The Sparwood Municipal Supply Well (RG_DW-03-04) was only sampled for total selenium. The Regional Groundwater Monitoring Program was initiated in the latter part of 2015 and the District of Sparwood was not notified of the additional parameter list. We recommend Teck works with the District of Sparwood to include the additional parameters in 2016.

2.5 QA/QC Program

The Regional Groundwater Monitoring Program included a Quality Assurance/Quality Control (QA/QC) program for the analysis of groundwater samples that will be implemented in accordance with Permit 107517, the *British Columbia Field Sampling Manual*, and Teck's SP&P. The QA/QC program was to include: review of Certificates of Compliance and sampling logs for sampling errors and to evaluate whether laboratory stipulated holding times were met for all samples; and review of laboratory internal QA/QC results.

Readers are referred to the 2015 annual reports for site-specific programs for details related to sample methodology and sampling handling and shipment, and for a summary of QA/QC issues identified during 2015. A QA/QC program specific to the Regional Groundwater Monitoring Program is not yet in place; however, as part of the Site-specific programs, a total of nine field duplicates were submitted for analysis for wells included in the Regional Groundwater Monitoring Program which meets the minimum requirements of 10%. The resulting relative percent difference (RDP) were less than the target of 50 % for all parameters (RPDs included in appended Tables 3, 4 and 5) and therefore were considered to be acceptable.

For the Drinking Water Program (SNC-Lavalin, 2016) a summary of QA/QC results are as follows:

- A total of five field duplicate pairs were submitted for analysis and the RPD were less than the target value of 50%. It is noted that only three of five well locations where duplicate pairs were submitted for analysis were included in the Regional Groundwater Monitoring Program (RG_DW-02-20, RG_DW-03-01 and RG_DW-07-01).

- The hold time for nitrate and nitrite of three days was exceeded for some samples collected in Q2 and Q4. This exceedance was attributed to a delay in sample shipment by sampling personnel. Results from 2015 for these parameters were similar to historical results, and as such the exceedances of hold times were not identified as a issue. Furthermore, concentrations of nitrate and nitrite have historically been low in drinking water samples; however, care will be taken in future to reduce the potential for hold times to be exceeded.

3 GROUNDWATER QUALITY SCREENING (GUIDELINE) SUMMARY

The 2015 groundwater quality data for the Regional Groundwater Monitoring Program was assessed following the technically-based screening process presented in the Regional Groundwater Synthesis Report (SNC-Lavalin, 2015b). The screening process takes into consideration Permit 107515 specifications, other regulatory guidance on protection of groundwater quality, and applicable receptors.

This screening process allows for water to be compared to uniform criteria for groundwater protection across the site (i.e., Contaminated Site Regulation (CSR) standards (BC MoE, 1996) and British Columbia Water Quality Guidelines (BCWQG; BC MoE, 2016), as applicable) as a primary screening step, but also provides a comparison to area-based surface water quality requirements laid out in Permit 107517 as a secondary screening step. The intention of the secondary screening benchmarks is to provide a technically-based framework for regional evaluation of groundwater as it relates 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 well as the updated Health Canada's Guidelines for Canadian Drinking Water Quality (GCDWQ) for selenium. It is noted that the Compliance Point and Site Performance Objective concentrations will change over time as outlined in Permit 107517. The secondary screening step only applies to CIs (i.e., selenium, cadmium, sulphate, and nitrate). Table 1 provides a summary of the applicable primary and secondary groundwater quality screening benchmarks for the monitoring wells included in the 2015 Regional Groundwater Monitoring Program.

For primary screening of groundwater data for aquatic life protection, groundwater concentrations for all the parameters were screened against CSR Aquatic Life (AW) standards except for those wells located within 10 m from a receiving surface water body where the concentrations were screened against the BCWQG. For primary screening of groundwater data for drinking water protection for current and future use and for irrigation and livestock watering, groundwater concentrations were screened against the applicable CSR Drinking Water (DW), Irrigation (IW) and Livestock (LW) standards. This approach is consistent with MoE TG 6 Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MoE, 2012) for EMA Applications and BC MoE Technical Guidance 15 (TG 15), which outlines an approach to application of concentration limits for the protection of aquatic receiving environments (BC MoE, 2013).

As a secondary screening step, groundwater concentrations for CIs were screened against Permit 107517 Site Performance Objectives and Compliance Points to provide context in relation to regional and operational surface water quality requirements. This secondary screening was only performed when a primary benchmark was exceeded, and only for the specific parameter and pathway (i.e., drinking water or aquatic life) that the primary benchmark exceeded. The Site

Performance Objectives are risk-based concentrations based on EVWQP Level 1 benchmarks developed to protect aquatic ecosystem health at a management-unit scale. With the exception of cadmium, Compliance Point and Site Performance Objective criteria for CIs in the main river systems (i.e., Elk and Fording Rivers, Michel Creek) differ along the flow path, and as such different groundwater benchmarks should be applied accordingly. There are no Compliance Point or Site Performance Objective 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 was completed only where sample concentrations exceeded primary screening benchmarks, and secondary screening was only performed on the receptor pathway that was exceeded. For example, if the primary screening for a constituent exceeded primary benchmarks for DW and not AW, the secondary DW benchmark would be applied (i.e., GCDWQ).

The Compliance Point and Site Performance Objective criteria for CIs in the main river systems that apply to the Elk Valley Regional Groundwater Monitoring Program are shown below in Table E.

Table E: Secondary Groundwater Screening Benchmarks for Aquatic Life

CI (Monthly Average Limits)	Compliance Points					Site Performance Objectives			
	Elk River	Fording River		Michel Creek		Elk River			Fording River
	GHO E300090	GHO E200378	FRO E300071	CMO E258937	EVO E300091	ER1 E206661	ER2 0200027	ER3 0200393	FR4 0200378
Selenium[2] (µg/L)	15	80	130	19	28	19	23	19	63
Cadmium[1,2] (µg/L)	0.26 – 1.31					0.24	0.24	0.24	0.39
Nitrate-N (mg/L)	3	24	27	5	6	3	4	3	20
Sulphate (mg/L)	309 - 429[1]	309 - 429[1]	580	500	309 - 429[1]	309	429	429	429

Notes: 1) Benchmark is hardness-based; and 2) Criteria to be applied to dissolved metals only.

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 benchmark as a secondary screening benchmark for the protection of drinking water.

4 RESULTS, TREND ANALYSIS AND INTERPRETATION

Results from the 2015 Regional Groundwater Monitoring Program are provided below. The results are divided into Key Areas as well as a background location, as defined in the Synthesis Report (SNC-Lavalin, 2015b). This section includes the following requirements listed in Section 10.3 of Permit 107517:

iii. 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; and

iv. Evaluation and discussion of spatial patterns and temporal trends.

Figures with monitoring locations and tables summarizing data in relation to primary and secondary benchmarks are referenced throughout the text below. Graphs which show spatial and temporal trends are also referenced and provided in Appendix I. Figures 4 and 5 show the spatial distribution of groundwater elevations and conceptual groundwater flow path through valley-bottom aquifers. Groundwater elevations prior to sampling for the third quarter were selected to include on Figures 4 and 5 to provide regional context. The data set for the third quarter was the most complete and included groundwater elevations for all the monitoring wells.

Figures 6 and 7 show the spatial distribution of groundwater quality results for nitrate, selenium and sulphate in the Study Area; to be conservative, the highest concentrations of each CI in 2015 were presented. These figures are also referenced in the discussion below.

Finally, as outlined in the Regional Groundwater Monitoring Program, the 2015 Annual Report will also assess whether continued monitoring is reducing uncertainties identified for Key Areas 2, 3, 4, 7, 9, 10 and 12 and review any investigations conducted as part of Site-specific Groundwater Monitoring Programs that present drilling and well construction data, hydraulic conductivity testing results, and water quality data for new wells to fill data gaps or improve data resolution in and around Key Areas.

4.1 Background Station FR_HMW5

An understanding of background groundwater quality is required to understand the naturally occurring range of parameters. Monitoring well FR_HMW5 is located upgradient of the mining footprint at FRO, and chemistry data from FR_HMW5 is used to describe background groundwater quality. 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

Continuous groundwater level data available until June 2015 from a water level datalogger installed in FR_HMW5 along with manual water level measurements (Table 2) were reviewed to assess seasonal trends. Groundwater elevations from January to October 2015 were plotted on a time-series graph and included in Appendix I (Graph B-1). There is an approximate 0.8 m discrepancy between manual water level measurements and data logger data; however, fluctuations in the logger can still be used to assess relative changes in groundwater levels. Groundwater elevations at FR_HMW5 exhibited a seasonal trend with generally higher groundwater elevations during the spring from April until the end of June. The maximal fluctuation in groundwater elevation is approximately 0.26 m throughout the monitoring period. Groundwater elevation prior to sampling for the third quarter was selected and shown on Figure 4 to provide regional context.

4.1.2 Groundwater Quality

Exceedances of applied benchmarks were not found for any parameters in any of the samples collected. Nitrate, dissolved cadmium and dissolved selenium were below the laboratory reported MDL in all samples. Of the four CIs, only sulphate was above the MDL and concentrations were generally an order-of-magnitude lower than in downgradient monitoring locations at FRO.

4.1.3 Trend Analysis and Interpretation

No trend analysis for groundwater quality parameters was performed for background monitoring well FR_HMW5 as concentrations of all parameters were well below primary and secondary screening benchmarks. As such, monitoring well FR_HMW5 is considered an appropriate regional background monitoring well.

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

This area was selected 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 (Figure 2). The valley-bottom groundwater in this area receives recharge from the Fording River as well as infiltration from the South Tailings Pond and settling ponds from the Kilmarnock Creek, Swift Creek, Cataract Creek and Porter Creek watersheds. This area also receives loading of 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. The assumed groundwater flow direction in the Fording River valley-bottom is to the southeast, approximately parallel or sub-parallel to the river.

Wells included in the 2015 Regional Groundwater Monitoring Program for Key Area 1 included two monitoring wells: FR_09-01-A/B (nested) and the greenhouse water supply wells which include four wells (Well 1, Well 2, Well 3 and Well 4), collectively referred to as FR_GHHW. FR_09-01A/B were selected to monitor valley-bottom groundwater near the Site boundary of FRO and FR_GHHW was selected to monitoring off-site groundwater within Key Area 1.

4.2.1 Groundwater Levels

No groundwater levels were recorded at FR_GHHW as they are active water supply wells and levels would be influenced by pumping. Manual water level measurements were provided for FR_09-01A/B only for Q2 and Q3 (May and July 2015) which are summarized in Table 2. Groundwater elevations ranged from 1579.13 metres above sea level (masl) to 1583.38 masl at FR_09-01-B (deep nested well); water levels at both FR_09-1A/B varied 3.3 m between May and July, with higher groundwater elevations measured in July. Based on the groundwater elevations recorded at the FR_09-01A/B, the vertical groundwater flow is inferred to be downwards from the shallow sandy gravel unit towards the deeper gravel unit. Groundwater elevations for the third quarter of 2015 are shown on Figure 4 to provide regional context.

4.2.2 Groundwater Quality

The analytical results compared to screening benchmarks are presented in Tables 3 and 4 (primary screening). A summary of primary screening benchmark exceedances for Key Area 1 are presented in Table F below.

Table F: Summary of Primary Screening Benchmark Exceedances for Key Area 1

Parameter[1,2]	FR_09-01A				FR_09_01B				FR_GHHW			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Nitrate Nitrogen (mg/L)	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW
Selenium (µg/L)	AW, IW, DW	AW, IW, LW, DW	AW, IW, LW, DW	AW, IW, LW, DW	AW, IW, DW	AW, IW, DW	AW, IW, LW, DW	AW, IW, 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.) Exceedances presented are in relation to CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW).

Groundwater quality at FR_09-01A/B and FR_GHHW was elevated above primary screening benchmark concentrations in all samples for nitrate (DW) and dissolved selenium (AW, IW, DW and LW in some samples).

Secondary screening was completed where sample concentrations exceeded primary screening benchmarks for CI, and only performed on the receptor pathway that was exceeded. Table G shows the summary of secondary screening benchmark exceedances for Key Area 1. All samples from FR_GHHW exceeded secondary benchmarks for nitrate (SPO and CP) and dissolved selenium (SPO, DW but not CP). Secondary screening benchmarks were also exceeded at nested wells FR_09-01A (all samples, except selenium concentrations in the first quarter) and FR_09-01B (only in the third quarter).

Table G: Summary of Secondary Screening Benchmark Exceedances for Key Area 1

Constituents of Interest (CI)[1]	FR_09-01-A				FR_09-01-B				FR_GHHW			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Nitrate-N (mg/L)	SPO	SPO	SPO, CP	SPO, CP	-	-	SPO, CP	-	SPO, CP	SPO, CP	SPO, CP	SPO, CP
Selenium (µg/L)	-	SPO, DW	SPO, DW	SPO, DW	-	-	SPO, DW	-	SPO, DW	SPO, DW	SPO, DW	SPO, DW

Notes: 1.) '–' denotes secondary screening benchmark for given constituents not exceeded in well; and 2.) Exceedances presented are in relation to Site Performance Objective (SPO), Compliance Point (CP) and GCDWQ for drinking water (DW).

4.2.3 Trend Analysis and Interpretation

Discussion of trends in groundwater quality in Key Area 1 focuses on dissolved selenium and nitrate which are the CIs that exceed the primary and secondary screening benchmarks. Time series plots of dissolved selenium and nitrate from the selected wells located in Key Area 1 are shown in Appendix I (Graphs 1-1 and 1-2). Figure 6 shows the spatial distribution of the maximum concentrations of dissolved selenium, sulphate and nitrate for samples in Key Area 1.

Concentrations of dissolved selenium and nitrate at FR_GHHW were highest during the spring (second quarter) between 2012 and 2015, while no distinct seasonal trend in the concentrations of dissolved selenium and nitrate can be identified for FR_09-01A/B. All three monitoring locations exhibited variation in magnitude of dissolved selenium and nitrate (18.7 to 150 µg/L and 8.5 to 68.3 mg/L, respectively). 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 are also intermittently pumped and, as such, concentrations from FR_GHHW may be considered average groundwater concentrations in the valley-bottom aquifer. Comparison of pumping rates and groundwater and surface water chemistry at FR_GHHW suggested that the variability in concentration magnitude may be related to seasonal effects from upgradient surface water in Kilmarknock Creek (SNC-Lavalin, 2015c).

The furthest downgradient monitoring points (FR_GHHW) reported selenium and nitrate above both primary and secondary screening benchmarks. 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 local impacts are not known. This Key Area was identified in the Synthesis Report as requiring additional studies to delineate groundwater impacts and assess the groundwater flow paths. A phased approach to data gap filling was proposed, with the initial phase of a desktop study to assess groundwater flow paths and refine areas for groundwater delineation (i.e., extent of groundwater impacts) with additional monitoring wells. Continued groundwater monitoring at FR_09-01A/B and FR_GHHW on a quarterly basis is recommended until further groundwater delineation is achieved and groundwater flow paths are better understood.

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

This area was selected as it receives drainage from the planned LCO Phase II development in the Dry Creek watershed, which is a tributary to the Fording River. The valley-bottom in the 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.

4.3.1 Groundwater Levels

Manual groundwater levels measured prior to each sampling events at LC_PIZDC1308 and LC_PIZDC1307 were reviewed and assessed for seasonal variability, vertical flow and long-term trends (Table 2). The data indicate a seasonal trend is apparent, with approximate 1.3 m and 3.9 m increases in groundwater levels at LC_PIZDC1308 and LC_PIZDC1307 respectively. The inferred vertical groundwater flow at the nested well LC_PIZDC1308/1307 is downwards. The groundwater elevation measured at LC_PIZDC1308 and LC_PIZDC1307 prior to sampling for the third quarter is shown on Figure 4 to provide regional context.

4.3.2 Groundwater Quality

The analytical results compared to screening benchmarks are presented in Tables 3 and 4 (primary screening). A summary of primary screening benchmark exceedances for Key Area 2 is presented in Table H below.

Table H: Summary of Primary Screening Benchmark Exceedances for Key Area 2

Parameter[1,2,3]	LC_PIZDC1307				LC_PIZDC1308			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Barium (µg/L)	DW	DW	DW	DW	-	-	-	-
Molybdenum (µg/L)	IW	IW	IW	IW	-	-	-	-

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Exceedances presented are in relation to CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); and 3.) '–' denotes primary screening benchmark for given constituents not exceeded in well.

Groundwater quality in LC_PIZDC1308 and LC_PIZDC1307 was below the primary screening benchmark concentrations for all the CI; therefore, no secondary screening was performed. Groundwater concentrations were above primary screening benchmark for dissolved barium (DW) and dissolved molybdenum (IW) for all the sampling events in LC_PIZDC1307. The concentrations in dissolved barium ranged from 1,330 to 1,400 µg/L and exceeded CSR DW (1,000 µg/L). The concentrations in dissolved molybdenum ranged from 29.8 to 31.1 µg/L and marginally exceeded 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; further evaluation with continued monitoring is recommended.

4.3.3 Trend Analysis and Interpretation

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 Dry Creek watershed. There are no groundwater wells in the Fording River valley-bottom aquifer; however, this data gap is addressed through monitoring of LC_PIZDC1308 and LC_PIZDC1307 located upgradient in the Dry Creek drainage. Groundwater quality in LC_PIZDC1308 and LC_PIZDC1307 was below all primary screening benchmarks for the CIs in 2015. The 2015 results are consistent with historical results.

Figure 6 shows the results of the primary and screening process for dissolved selenium, sulphate and nitrate for samples collected in Key Area 2. Based on the monitoring results at LC_PIZDC1308 and LC_PIZDC1307, the transport of CIs to the Fording River valley-bottom sediments due to mining-related activities in Dry Creek appears to be minimal at this time. Continued monitoring of these wells is recommended.

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

This Key Area was selected 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. Glaciolacustrine/lacustrine silt and clay units are generally present at surface with at least two evident relatively clean glaciofluvial gravel units: one at approximately 1,470 meters above sea level (masl) less than 10 m thick; and a deeper unit at approximately 1,455 masl that is approximately 20 m thick. An alluvial fan associated with Greenhills Creek is present to the north.

The upper silt and clay units are relatively continuous aquitards reducing the potential for vertical flow. The two deeper gravel units are semi-confined or confined, and are relatively continuous along the strike of the valley. Monitoring location GH_POTW9 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 from Greenhills Creek and the Fording River (SNC-Lavalin, 2015b). Groundwater in the deeper gravel unit was inferred to be recharged by the Fording River as maximum groundwater levels appear to coincide with spring freshet and well recharge rates were relatively high (SNC-Lavalin, 2015b).

4.4.1 Groundwater Levels

No groundwater levels were recorded at any monitoring stations as they are active water supply wells and levels would be influenced by pumping.

4.4.2 Groundwater Quality

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

Table I: Summary of Primary Screening Benchmark Exceedances for Key Area 3

Parameter[1,2,3]	GH_POTW09[4]	GH_POTW10[4]		GH_POTW15[4]		GH_POTW17[2,4]
	Q2	Q2	Q4	Q2	Q4	Q4
Selenium (µg/L)	-	-	-	-	-	AW
Sulphate (mg/L)	-	-	-	-	-	AW

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Exceedances presented are in relation to 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 primary screening benchmark for given constituents not exceeded in well; and 4.) Chemistry data were not available from specific quarterly sampling events as summarized in Table C.

Table J: Summary of Secondary Screening Benchmark Exceedances for Key Area 3

Constituents of Interest (CI)[1]	GH_POTW17[2]
	Q4
Selenium (µg/L)	-
Sulphate (mg/L)	SPO, CP

Notes: 1.) '–' denotes secondary screening benchmark for given constituents not exceeded in well; 2.) Chemistry data were not available from specific quarterly sampling events as summarized in Table C; and 3.) Exceedances presented are in relation to Site Performance Objective (SPO) and Compliance Point (CP).

Groundwater quality in GH_POTW17 was elevated above primary screening benchmark concentrations for selenium (AW) and sulphate (AW) for the one sampling event in 2015. All other parameters were below primary screening benchmarks.

Secondary screening was completed where sample concentrations exceeded primary screening benchmarks for CI, and only performed on the receptor pathway that was exceeded. Table J indicates that groundwater concentrations exceeded secondary screening benchmarks for sulphate (CP, SPO) at GH_POTW17 for the one sampling event in 2015.

4.4.3 Trend Analysis and Interpretation

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 approached or exceeded the primary and secondary screening benchmarks at GH_POTW17. Time series plots of total selenium and sulphate concentrations are shown in Appendix I (Graphs 3-1 and 3-2) for GH_POTW17; although sulphate and total selenium at GH_POTW10 and GH_POTW15 did not approach the primary benchmark, they have been included for discussion purposes.

Concentrations of sulphate at GH_POTW17 were relatively similar for all three sample events, indicating little seasonal influence; however, concentrations of total selenium in 2014 and 2015 were lower, similar to GH_POTW10. The cause of this discrepancy is unclear. Concentrations of total selenium and sulphate in GH_POTW10 and GH_POTW15 were relatively consistent

suggesting little seasonal influence; however, there are only three data points. Figure 6 shows the spatial distribution of dissolved selenium, sulphate and nitrate for samples collected in Key Area 3.

The source of elevated CIs in groundwater is still unclear (Fording River or water from the Greenhills Creek drainage) and uncertainty still exists in groundwater quality results due to limited data. Continued monitoring at GH_POTW9, GH_POTW10, GH_POTW15 and GH_POTW17 on a quarterly basis is recommended to allow for assessment of seasonal effects and potential influences on groundwater quality in the Fording River valley-bottom in Key Area 3.

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

Key Area 4 area was selected as surface water and upland groundwater flow into the Elk River valley-bottom setting from potential sources of CIs in the Mickelson, Leask, Wolfram and Thompson Creek drainages (Figure 2). 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 Regional Groundwater Monitoring Program 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_GA-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 existing 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-3S 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 water level dataloggers installed in GH_GA-MW-1, GH_GA-MW-2, GH_GA-MW-3 and GH_GA-MW-ERSC-1 were recorded along with manual water level measurements during the monitoring period (Table 2). Groundwater elevations from January to November 2015 at the four monitoring wells were plotted on a time-series graph and included in Appendix I (Graph 4-1). Groundwater elevations at GH_GA-MW-2, GH_GA-MW-3

and GH_GA-MW-ERSC-1 exhibited a seasonal trend with generally higher groundwater elevations during the spring from mid-March to June. The fluctuation in groundwater levels in those wells was significant ranging from 2.1 m at GH_GA-MW-ERSC-1 to 5.4 m at GH_GA-MW-3. 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 third quarter were selected and shown on Figure 4 to provide regional context.

4.5.2 Groundwater Quality

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

Table K: Summary of Primary Screening Benchmark Exceedances for Key Area 4 (1/2)

Parameter [1,2,3]	GH_GA-MW-1				GH_GA-MW-2				GH_GA-MW-3				RG_DW-01-07[4]		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q4
Sulphate (mg/L)	-	DW	DW	-	-	-	-	-	-	-	-	-	-	-	-
Boron (µg/L)	IW	IW	IW	IW	-	-	-	-	-	-	-	-	na	na	na
Manganese (µg/L)	IW DW	IW DW	IW DW	IW DW	-	-	-	-	-	-	-	-	na	na	na
Molybdenum (µg/L)	IW	IW	-	IW	IW	IW	IW	IW	-	-	-	-	na	na	na
Selenium (µg/L)	-	-	-	-	-	-	-	AW DW	AW IW LW DW	AW IW LW DW	-	AW IW LW DW	-	-	-
Sodium[6] (mg/L)	-	DW	DW	DW	-	-	-	-	-	-	-	-	-	-	-

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Exceedances presented are in relation to CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) '–' denotes primary screening benchmark for given constituents not exceeded in well; 4.) Chemistry data were not available from specific quarterly sampling events as summarized in Table D; 5.) 'na' indicates the well was not sampled for specific parameter; and 6.) Total parameter.

Table L: Summary of Primary Screening Benchmark Exceedances for Key Area 4 (2/2)

Parameter[1,2,3]	GH_GA-MW-4				GH_MW-ERSC-1				RG_DW-01-03		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q4
Selenium (µg/L)	AW DW	-	-	-	-	AW, LW, DW	-	-	-	-	-

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Exceedances presented are in relation to CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) '–' denotes primary screening benchmark for given constituents not exceeded in well; 4.) Chemistry data were not available from specific quarterly sampling events as summarized in Table D; and 5.) 'na' indicates the well was not sampled for specific parameter.

Groundwater quality in GH_GA-MW-2, GH_GA-MW-3 GH_GA-MW-4 and GH_GA-MW-ERSC-1 was elevated above primary screening benchmark concentrations for selenium (DW, AW, IW and/or LW) for at least one sampling event in 2015. Groundwater quality in GH_GA-MW-1 was elevated above primary screening benchmark concentrations for sulphate (DW) for two monitoring samples. Other parameters (dissolved boron, dissolved manganese, dissolved molybdenum and sodium) in GH_GA-MW-1 also exceeded at least one of the primary screening benchmark concentrations (IW and/or DW) as shown in Table K. Dissolved molybdenum concentrations were also above the primary screening benchmark (IW) in GH_GA-MW-2.

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). Molybdenum concentrations from these wells ranged from 10.2 to 26.7 µg/L in 2015 and would likely be below or marginally above the applicable standard if more information on soils or use were available. 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 exceeding CSR DW in GH_GA-MW-1 and is also not considered a concern. Dissolved boron concentrations were above CSR IW standard which varies from 500 to 6,000 µg/L based on crop sensitivity. Boron concentrations in 2015 in GH_GA-MW-1 ranged from 742 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). Also, results from groundwater monitoring will inform the Adaptive Management Plan (Teck, 2016).

In the domestic well RG_DW-01-07 and the water supply well RG_DW-01-03, groundwater concentrations for CIs were below the primary screening benchmarks.

Secondary screening was completed where sample concentrations exceeded primary screening benchmarks for CIs, and only performed on the receptor pathway that was exceeded. Table M shows the summary of secondary screening benchmark exceedances for Key Area 4. GH_MW-ERSC-1 and GH_GA-MW-3 exceeded secondary screening benchmarks for selenium (CP, SPO, and DW (only GH_GA-MW-3)) for at least one sampling event.

Table M: Summary of Secondary Screening Benchmark Exceedances for Key Area 4

Constituents of Interest (CI)	GH_MW-ERSC-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
Selenium (µg/L)	-	SPO, CP	-	-	ns	ns	ns	-	SPO CP DW	SPO CP	ns	SPO CP	-	-	ns	ns

Notes: 1.) '–' denotes secondary screening benchmark for given constituents not exceeded in well; 2.) 'ns' indicates sample did not exceed primary screening benchmarks and therefore was not screened against secondary benchmarks; and 3.) Exceedances are in relation to Site Performance Objective (SPO), Compliance Point (CP) and GCDWQ for drinking water (DW).

4.5.3 Trend Analysis and Interpretation

Discussion of trends in groundwater quality in Key Area 4 focuses on dissolved selenium concentrations which is the CI that exceeds primary and secondary screening benchmarks in several monitoring wells in this Key Area. A time series plot of dissolved selenium from the selected wells located in Key Area 4 and included in the 2015 Regional Groundwater Monitoring Program is shown in Appendix I (Graph 4-2). Figure 6 shows the spatial distribution of dissolved selenium, sulphate and nitrate for samples collected in Key Area 4.

Concentration 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 2014-2015 data. No significant variation in concentrations was noted for GH_GA-MW-1, GH_GA-MW-2, GR_DW-01-03 and RG_DW-01-07.

Elevated dissolved selenium concentrations above both primary and secondary screening benchmarks were measured in a number of wells in Key Area 4, with the highest concentrations at GH_GA-MW-03, which is located downstream from the Thompson Creek catchment. However, groundwater concentrations were extremely variable (i.e., orders-of-magnitude different, with some samples below screening benchmarks) in most wells, indicating some uncertainty exists as to whether these wells are suitable sentry wells. The local-scale interaction with surface water and groundwater discharge is unknown. 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 benchmarks 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.

Additional monitoring data from Key Area 4 is required to confirm representative water quality. Continued monitoring of monitoring wells GH_GA-MW-2, GH_GA-MW-3, GH_GA-MW-4 and GH_GA-MW-ERSC-1 on a quarterly basis is recommended. Continued monitoring at the water supply well RG_DW-01-03 and the domestic well RG_DW-01-07 is also recommended to monitor groundwater quality further downgradient. Based on sampling results from 2014 (SNC-Lavalin, 2016) and 2015 and recognizing challenges with sampling domestic wells on a quarterly basis, we recommend the sampling schedule for the domestic well RG_DW-01-07 be reduced to biannually to capture anticipated high and low groundwater levels in the valley-bottoms in the spring and fall (Q2 and Q4). Based on hydraulic conductivity data, water level and chemistry results, it is inferred that data obtained from GH_GA-MW-01 are not representative of groundwater conditions in the valley-bottom aquifer in Key Area 4. Therefore, it is recommended to remove GH_GA-MW-01 from the Regional Groundwater Monitoring Program for 2016.

4.6 Key Areas 5 & 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 Regional Drinking Water 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. 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. In this area, surficial geology indicates that the depositional environment in the valley-bottom is glaciofluvial and fluvial, which is supported by information from domestic water well logs. Downstream of this confluence, the Elk River hydraulic gradient increases likely due to additional flow from the Fording River. There is no monitoring well within Key Area 5 and the only monitoring well located in Key Area 6 is LC_PIZP1101. Monitoring well LC_PIZP1101 is screened in a deeper sand aquifer approximately 41 mbgs.

4.6.1 Groundwater Levels

Manual groundwater levels measured prior to each sampling events at LC_PIZP1101 were reviewed and assessed for seasonal variability and long-term trend (Table 2). The data show no significant variation in groundwater levels during the monitoring period with an approximate depth to water of 30 m. The groundwater elevation measured at LC_PIZP1101 prior to sampling for the third quarter is shown on Figure 4 to provide regional context.

4.6.2 Groundwater Quality

The analytical results compared to screening benchmarks are presented in Tables 3 and 4 (primary screening). A summary of primary screening benchmark exceedances for Key Area 5 is presented in Table N below.

Table N: Summary of Primary Screening Benchmark Exceedances for Key Area 6

Parameter[1,2,3]	LC_PIZP1101			
	Q1	Q2	Q3	Q4
Fluoride (mg/L)	IW, LW, DW	IW, LW, DW	IW, LW, DW	IW, LW, DW
Molybdenum (µg/L)	IW	IW	IW	IW

Notes: 1.) Dissolved parameter unless otherwise indicated; and 2.) Exceedances presented are in relation to CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW).

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

Groundwater concentrations were above primary screening benchmark for dissolved molybdenum (IW) for all the sampling events. The standard of 10 µg/L 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). Molybdenum concentrations from this well ranged from 11.3 to 23 .1 µg/L in 2015 and would likely be below or marginally above the applicable standard if more information on soils or use were available. Since no irrigation wells are located in this area this constituent is not currently considered a concern.

Groundwater concentrations were also above primary screening benchmark for fluoride (DW, IW and LW) for all the sampling events. 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). Also, results from groundwater monitoring will inform the Adaptive Management Plan (Teck, 2016).

4.6.3 Trend Analysis and Interpretation

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 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 which was a data gap identified in the Synthesis Report.

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. The results showed that groundwater quality at RG_DW-02-20 was tracking surface water quality from the nearest Order Station (ER2 0200027). The results suggest surface water infiltration rather that a valley-bottom groundwater pathway is causing the exceedances measured at this location. Golder (2016) indicated that based on the additional data review, additional groundwater wells were not recommended at this time but triggers are warranted for when additional wells would be needed. Groundwater monitoring at LC_PIZP1101 and surface water monitoring at nearby Order Station should be maintained and additional monitoring wells should be considered 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 (Golder, 2016).

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 Regional Drinking Water Sampling Program (i.e., RG_DW-02-20, RG_DW-02-17, and RG_DW-02-18) exceeded the primary screening benchmarks (AW and DW) for selenium.

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 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 aquifer at EV_GV3gw is relatively deep, approximately 10 mbgs with a saturated thickness of approximately 15 m. Based on the depth to groundwater, Grave Creek appears to be a losing reach in this area, and 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 2015 Regional Groundwater Monitoring Program in Key Area 7 included the monitoring well EV_GV3gw, the nearest well upgradient of 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 water level datalogger 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 to November 2015 were plotted on a time-series graph and included in Appendix I (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 third quarter was selected and shown on Figure 5 to provide regional context.

4.7.2 Groundwater Quality

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

Table O: Summary of Primary Screening Benchmark Exceedances for Key Area 7

Parameter[1,2,3]	EV_GV3gw				RG_DW-02-20[4]		
	Q1	Q2	Q3	Q4	Q1	Q2	Q4
Sulphate (mg/L)	-	-	-	-	-	-	-
Selenium (µg/L)	-	-	-	-	AW, DW	AW, DW	AW, DW

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Exceedances presented are in relation to CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) ' –' denotes primary screening benchmark for given constituents not exceeded in well; and 4.) Chemistry data were not available from specific quarterly sampling events as summarized in Table D.

Groundwater quality in the domestic well RG_DW-02-20 was elevated above primary screening benchmark concentrations for selenium (DW, AW) for all three sampling events in 2015 but below the primary screening benchmark concentrations for all other parameters. Groundwater concentrations in EV_GV3gw were below the primary screening benchmarks for all parameters including the four CIs.

Secondary screening was performed for the drinking water pathway for dissolved selenium concentrations in well RG_DW-02-20 and was found to be below the CDWQG.

4.7.3 Trend Analysis and Interpretation

Discussion of trends in groundwater quality in Key Area 7 focuses on dissolved selenium which exceeded the primary screening benchmarks in domestic well RG_DW-02-20. A time series plot of dissolved selenium for EV_GV3gw and RG_DW-02-20 is shown in Appendix I (Graph 7-2). The dissolved selenium concentrations in EV_GV3gw have been stable since November 2013 while some fluctuations were observed in domestic well RG_DW-02-20 with the highest concentrations measured during the spring months.

Based on 2015 results, potential sources in Harmer Creek do not appear to result in elevated concentrations of CIs at EV_GV3gw. The borehole log indicates that EV_GV3gw is screened in the deeper aquifer (approximately 25 m bgs) and might not be representative of groundwater quality in the shallower part of the aquifer. Potential impact to groundwater quality from Harmer Creek drainage remains unknown. In the absence of other monitoring wells downstream of Harmer Creek, groundwater monitoring at EV_GV3 and RG_DW-02-20 and surface water monitoring of Harmer Creek (as a proxy for shallow groundwater) at EMS E102682 should be maintained on a quarterly basis.

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 (Figure 3). Potential 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 to 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 2015 Regional Groundwater Monitoring Program 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 dataloggers 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 to December 2015 at those wells were plotted on a time-series graph and included in Appendix I (Graph 8-1). Groundwater elevations in both wells show a seasonal trend with slightly higher groundwater elevations in the spring. The maximal fluctuation in groundwater elevation is approximately 0.7 m throughout the monitoring period. Groundwater elevations prior to sampling for the third quarter were selected and shown on Figure 5 to provide regional context.

4.8.2 Groundwater Quality

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

Table P: Summary of Primary Screening Benchmark Exceedances for Key Area 8

Parameter[1,2,3]	EV_LSgw**				EV_OCgw			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Fluoride (mg/L)	-	-	-	-	IW, LW	IW, LW	IW, LW	IW, LW
Iron (µg/L)	AW	AW	AW	AW				
Manganese (µg/L)	IW, DW	IW, DW	IW, DW	IW, DW	-	-	-	-
Molybdenum (µg/L)	-	-	-	-	IW	IW	IW	IW

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Exceedances presented are in relation to BCWQG for Aquatic Life (AW) and CSR standards for Drinking Water (DW), Livestock (LW) and Irrigation (IW); and 3.) ' –' denotes primary screening benchmark for given constituents not exceeded in well.

Groundwater quality in EV_LSgw and EV_OCgw was below the primary screening benchmark concentrations for all the CIs; therefore, no secondary screening was performed. Groundwater quality in EV_LSgw was elevated above primary screening benchmark concentrations for dissolved iron (AW) and dissolved manganese (IW and DW).

Iron and manganese can be naturally elevated in groundwater and are generally not a concern. However, because EV_LSgw is shallow, completed in gravelly sand and within 10 m of surface water, direct interaction with surface water is possible and BCWQG AW may apply. The dissolved

iron concentrations measured ranged from 1,520 to 4,160 µg/L and were above the recommended guideline of 350 µg/L to protect freshwater aquatic life. Dissolved manganese concentrations ranging from 1,410 to 1,790 µg/L were below applicable BCWQG AW but above CSR DW (500 µg/L) and IW (200 µg/L). The source of dissolved iron and manganese at this location is unclear but its occurrence is inferred to be related to reducing conditions in groundwater; it is noted that when discharging to surface water dissolved iron groundwater typically precipitates. Continued monitoring should occur and results considered as part of ongoing programs addressing human health or aquatic receptors.

Groundwater quality in EV_OCgw was elevated above primary screening benchmark concentrations for fluoride (IW and LW) for all four events. 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 and there appears to be no usage of groundwater for livestock or irrigation watering in the area and therefore fluoride is not interpreted to be a concern.

Groundwater quality in EV_OCgw was also elevated above primary screening benchmark concentrations for dissolved molybdenum (IW) for all four events. The standard of 10 µg/L is relatively conservative as it is the default value 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 standards are higher (either 20 or 30 µg/L) and results from this well would be below these values if more information on soils or use were available.

4.8.3 Trend Analysis and Interpretation

Discussion of trends in groundwater quality in Key Area 8 focuses on dissolved selenium and sulphate concentrations which exceeded the primary and secondary screening benchmarks in previous sampling events. Time series plots of dissolved selenium and sulphate concentrations for EV_LSgw and EV_OCgw are shown in Appendix I (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 benchmarks 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 2015 results, potential sources in Key Area 8 do not appear to result in elevated concentrations of CIs. Continued monitoring of these wells is recommended.

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 (Figure 3). 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, recharge 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 2015 Regional Groundwater Monitoring Program in Key Area 9 included three water supply wells: EV_RCS1 (EV_Road Crew Shop Well), EV_WHS1/EV_WHS2 (EV_Rec Office Well) and EV_BRS1/EV_BRS2 (EV_Bus Shop Well) and 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. The domestic well RG_DW-03-01 was also included in the program as a sentry well to monitor valley-bottom groundwater in Michel Creek further downgradient.

4.9.1 Groundwater Levels

Continuous groundwater level data available from water level dataloggers 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 to December 2015 at those wells was plotted on a time-series graph and included in Appendix I (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 mid-March to beginning of June. The lowest elevations during the monitoring period were recorded from August to October 2015. The maximal 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 inferred vertical groundwater flow at the nested well EV_MCgwS/D is downwards based on the groundwater level data recorded. Groundwater elevations prior to sampling for the third quarter were selected and shown on Figure 5 to provide regional context.

4.9.2 Groundwater Quality

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

Table Q: Summary of Primary Screening Benchmark Exceedances 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 (mg/L)	AW, DW	AW, DW	AW, DW	AW,DW	-	-	-	-	-	-	-	-
Sulphate (mg/L)	-	AW DW	AW	-	-	-	-	-	-	-	-	-
Iron (µg/L)	-	-	-	-	AW	AW	AW	AW	AW	AW	AW	AW
Manganese (µg/L)	-	-	-	-	-	-	-	-	IW, DW	IW, DW	IW, DW	IW
Molybdenum (µg/L)	-	-	-	-	-	-	-	-	-	-	-	IW
Selenium (µg/L)	AW, IW, LW, DW	AW, IW, LW, DW	AW, IW, LW, DW	AW, IW, LW, DW	-	-	-	-	-	-	-	-

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Exceedances presented are in relation to BCWQG for Aquatic Life (AW) and CSR standards for Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) '–' denotes primary screening benchmark for given constituents not exceeded in well.

Table R: Summary of Primary Screening Benchmark Exceedances for Key Area 9 (2/2)

Parameter[1,2,3,4]	EV_BRS1/EV_BRS2[5]		EV_WHS1/EV_WHS2[5]		EV_RCS1[5]		RG_DW-03-01[5]	
	Q2	Q3	Q2	Q3	Q2	Q3	Q1	Q2
Nitrate Nitrogen (mg/L)	DW	DW	-	-	DW	DW	-	-
Total Copper (µg/L)	na	-	na	AW, IW, LW	na	AW, IW, LW	na	na
Total Magnesium (mg/L)	na	-	na	-	na	DW	-	-
Total Selenium (µg/L)	AW, IW, LW, DW	AW, IW, LW, DW	AW, IW, DW	AW, IW, DW	AW, IW, LW, DW	AW, IW, LW, DW	-	-
Total Zinc (µg/L)	na	-	na	-	na	LW	na	na

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Exceedances presented are in relation to CSR standards for AW, DW, LW and IW; 3.) '–' denotes primary screening benchmark for given constituents not exceeded in well; and 4.) na indicates the well was not sampled for specific parameter; and 5.) Chemistry data were not available from specific quarterly sampling events as summarized in Tables C and D.

Groundwater quality in EV_BCgw, EV_BRS1/EV_BRS2, EV_RCS1 and EV_WHS1/EV_WHS2 was elevated above primary screening benchmark concentrations for selenium (DW, AW, IW and LW (except EV_WHS1/EV_WHS2)) for all the sampling events in 2015. Groundwater quality in EV_BCgw, EV_BRS1/EV_BRS2 and EV_RCS1 was also elevated above primary screening benchmark concentrations for nitrate (DW and AW (only for EV_BCgw)) for all the monitoring samples. Groundwater quality in EV_BCgw was also elevated above primary screening benchmarks concentrations for sulphate (DW and AW) for at least one sample during the monitoring period. It should be noted that sulphate was not analyzed for the samples collected from EV_BRS1/EV_BRS2, EV_RCS1 and EV_WHS1/EV_WHS2 during the monitoring period.

Other parameters (total copper, total magnesium and total zinc) in the water supply wells EV_RCS1 and EV_WHS1/EV_WHS2 exceeded at least one of the primary screening benchmark concentrations as shown in Table R. The concentrations in total copper are above CSR AW, IW and LW in these two wells in the only sample collected in 2015. The source of copper at these locations is unclear and in the absence of other results no temporal trend can be assessed. Groundwater concentrations marginally exceeded CSR LW standard for total zinc and CSR DW standard for magnesium in the water supply well EV_RCS1 in the only sample collected in 2015. Further assessment should be completed as additional monitoring data become available.

In monitoring wells EV_MCgwS and EV_MCgwD, groundwater concentrations for CIs were below the primary screening benchmarks; however, dissolved iron concentrations were above the primary screening benchmark (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 elevated above primary screening benchmark concentrations for dissolved manganese (IW and DW) and dissolved molybdenum (IW) for at least one sample during the monitoring period. Similar to iron, manganese in groundwater can be naturally elevated due to limited interaction with atmosphere. The concentration in dissolved molybdenum was marginally above the CSR IW standard. The standard of 10 µg/L is relatively conservative as it is the default value 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 standards are higher (either 20 or 30 µg/L) and results from this well would be below these values if more information on soils or use were available.

Secondary screening was completed where sample concentrations exceeded primary screening benchmarks for CIs, and only performed on the receptor pathway that was exceeded. Table S shows the summary of secondary screening benchmark exceedances for Key Area 9. EV_BCgw, EV_BRS1/EV_BRS2, EV_RCS1 and EV_WHS1/EV_WHS2 (only SPO) exceeded secondary screening benchmarks for selenium (CP, SPO, and DW) for all the sampling events. Secondary

screening for nitrates only applied to EV_BCgw and show exceedances for SPO and CP. Groundwater concentrations at EV_BCgw also exceeded the secondary screening benchmarks for sulphate (CP and SPO).

Table S: Summary of Secondary Screening Benchmark Exceedances for Key Area 9

Constituents of Interest (CI)[1,2,3]	EV_BCgw				EV_BRS1/EV_BRS2[4]		EV_WHS1/EV_WHS2[4]		EV_RCS1[4]	
	Q1	Q2	Q3	Q4	Q2	Q3	Q2	Q3	Q2	Q3
Selenium (µg/L)	SPO, CP, DW	SPO, CP, DW	SPO, CP, DW	SPO, CP, DW	SPO, CP, DW	SPO, CP, DW	SPO	SPO	SPO, CP, DW	SPO, CP, DW
Nitrate-N (mg/L)	SPO, CP	SPO, CP	SPO, CP	SPO, CP	ns	ns	ns	ns	ns	ns
Sulphate (mg/L)	-	SPO, CP	SPO, CP	-	na	na	na	na	na	na

Notes: 1) ns indicates secondary screening did not apply for this parameter; 2.) '–' denotes primary screening benchmark for given constituents not exceeded in well; and 3.) 'na' indicates the well was not sampled for specific parameter; 4.) Chemistry data were not available from specific quarterly sampling events as summarized in Table C; and 5.) Exceedances are in relation to Site Performance Objective (SPO), Compliance Point (CP) and GCDWQ for drinking water (DW).

4.9.3 Trend Analysis and Interpretation

Discussion of trends in groundwater quality in Key Area 9 focuses on dissolved/total selenium, nitrate and sulphate concentrations which are the CIs that approach or exceed the primary and secondary screening benchmarks in some monitoring wells in this Key Area. Time series plots of total selenium, nitrate and sulphate from the selected wells located in Key Area 9 and included in the 2015 Regional Groundwater Monitoring Program are shown in Appendix I (Graphs 9-2, 9-3 and 9-4).

No distinct seasonal trend in the concentrations of total selenium, nitrate and sulphate can be identified based on 2013-2015 data. No significant variation in concentrations was noted for most wells except for EV_BCgw where concentrations for all three constituents show an increase since the end of 2013 with concentrations that increased more than twofold from October 2014 to June 2015.

Figure 7 shows the spatial distribution of dissolved selenium, sulphate and nitrate for samples collected during the third quarter in Key Area 9. The highest concentrations in dissolved selenium, nitrate and sulphate (no data for EV_RCS1) have been measured in water supply well EV_RCS1 and monitoring well EV_BCgw.

Based on 2015 results at downgradient monitoring wells EV_MCgwS/D and domestic well RG_DW_03-01, attenuation of total 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. However, it is possible that the nested well EV_MCgwS/D might not be representative of the groundwater quality in the shallow valley-bottom aquifer. Both monitoring wells are screened within a clayey unit and low hydraulic conductivity values were reported from previous hydraulic testing (Table 2). In addition, domestic well RG_DW-03-01 is not an ideal monitoring point as the water quality may be influenced by a number of factors including construction type, screen presence/placement, and aquifer characteristics (confining layer). It is unclear as to whether these wells are appropriate downgradient sentry wells for the Michel Creek valley-bottom aquifer. Uncertainty exists in the groundwater quality delineation (i.e., extent of groundwater impacts). In the absence of other monitoring wells downgradient of Michel Creek before the confluence with the Elk River, groundwater monitoring at EV_MCgwS/D and RG_DW-03-01 should be maintained on a quarterly basis and evaluated further in future annual reports to assess suitability of wells to support regional groundwater understanding.

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 (Figure 3). 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. The only monitoring point in Key Area 10 is EV_ECgw. Erickson Creek valley-bottom setting consists mainly of colluvium overlying a till unit. The borehole log for EV_ECgw indicates that the bottom half of the screen was installed in a clay and sand unit. Previous hydraulic testing at this well resulted in a hydraulic conductivity value of 1 x 10^{-8} m/s. Bedrock was not encountered at this location.

4.10.1 Groundwater Levels

Continuous groundwater level data available from a water level datalogger installed at monitoring well EV_ECgw were recorded along with manual water level measurements during the monitoring period (Table 2). Groundwater elevation from January to November 2015 at EV_ECgw was plotted on a time-series graph and included in Appendix I (Graph 10-1). Groundwater elevation in EV_ECgw ranged from approximately 1326.8 masl to 1327.5 masl throughout the monitoring period and followed a subdued seasonal trend. The fluctuation at this well is limited to 0.7 m throughout the monitoring period. Groundwater elevation prior to sampling for the third quarter was selected and shown on Figure 5 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 benchmarks and presented in Tables 3 and 4 (primary screening). A summary of primary screening benchmark exceedances for Key Area 10 is presented in Table T below.

Table T: Summary of Primary Screening Benchmark Exceedances for Key Area 10

Parameter[1,2,3]	EV_ECgw			
	Q1	Q2	Q3	Q4
Manganese (µg/L)	-	-	-	IW
Molybdenum (µg/L)	IW	IW	IW	IW

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Exceedances presented are in relation to CSR standards for Aquatic Life (AW), Drinking water (DW), Livestock (LW) and Irrigation (IW); and 3.) '–' denotes primary screening benchmark for given constituents not exceeded in well.

Groundwater concentrations for the four CIs in Key Area 10 were below the applicable primary screening benchmarks (i.e., CSR standards); therefore, secondary screening was not warranted. Other parameters (dissolved manganese and dissolved molybdenum) exceeded 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, at these concentrations this constituent is not considered a concern. Dissolved manganese only exceeded CSR IW standard in the sample collected in Q4. As mentioned above, manganese in groundwater can be naturally elevated due to limited interaction with atmosphere and is generally not a concern.

4.10.3 Trend Analysis and Interpretation

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, this data gap was addressed through monitoring of EV_ECgw located upgradient in the Erickson drainage. Groundwater quality in EV_ECgw was below all primary screening benchmarks for the CI in 2015. The 2015 results are consistent with historical results available at this location since the end of November 2013.

Figure 7 shows the concentrations of dissolved selenium, sulphate and nitrate for samples collected during the third quarter in Key Area 10. Based on the monitoring results at EV_ECgw, the transport of CIs to the Michel Creek valley-bottom sediments due to mining-related activities in Erickson Creek appears to be minimal. However, due to the low hydraulic conductivity value reported for this well with part of the screen installed in the underlying till unit, it is possible that EV_ECgw might not be representative of the groundwater quality in the shallow colluvial deposits. It

is unclear as to whether this well is appropriate to assess if transport of CIs to the valley-bottom may be occurring due to spoils in Erickson Creek. Groundwater quality in the Michel valley-bottom aquifer downgradient of Erickson Creek is unknown. Continued groundwater monitoring at EV_ECgw should be maintained on a quarterly basis and evaluated further in conjunction with surface water monitoring (as as proxy for shallow groundwater) at Erickson Creek (EMS 0200097) in future annual reports to assess the suitability of the monitoring well to support regional groundwater understanding.

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 (Figure 3). 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 off-site migration pathway from CMO. As indicated in the Synthesis Report (SNC-Lavalin, 2015b), there is relatively little historical information available on groundwater quality at CMO. In the absence of monitoring wells located downgradient from CMO, a domestic well near Corbin Creek (RG_DW-07-01) located just west of the Main Settling Pond was selected for the Elk Valley Regional Groundwater Monitoring Program.

In 2015, additional monitoring wells were installed at CMO by SRK Consulting (Canada) Inc (SRK). The location and monitoring well installation details are provided in SRK (2015). 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 was incorporated in the 2015 Annual Regional Groundwater Monitoring Program. 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 prior to sampling in September and November 2015 were reviewed and assessed for seasonal variability and vertical groundwater flow. The groundwater level data available for Key Area 11 are limited to the third and fourth quarters at CM_MW1 as no water levels were taken from domestic well RG_DW-07-01. Table 2 shows manual water level measurements recorded at CM_MW1 in 2015. The data show no significant variation in groundwater levels in the two upper wells (CM_MW1-OB and CM_MW1-SH) between August and November 2015; however, groundwater elevation in the deeper well CM_MW1-DP increased from 1,466 masl to 1,494 masl during the same period. Groundwater elevations for the third quarter are shown on Figure 5 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.

4.11.2 Groundwater Quality

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

Table U: Summary of Primary Screening Benchmark Exceedances for Key Area 11

Parameter[1,2,3]	CM_MW-1-OB[4]		CM_MW-1-SH[4]		CM_MW-1-DP[4]		RG_DW-07-01[4]		
	Q3	Q4	Q3	Q4	Q3	Q4	Q1	Q2	Q4
Sulphate (mg/L)	-	-	-	-	-	-	-	-	DW
Sodium (mg/L)	-	-	-	-	-	DW	na	na	na
Barium (µg/L)	-	-	-	-	-	DW	na	na	na
Manganese (µg/L)	-	-	-	IW	-	IW	na	na	na
Molybdenum (µg/L)	-	-	IW	IW	IW	-	na	na	na

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Exceedances presented are in relation to CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) '–' denotes primary screening benchmark for given constituents not exceeded in well; 4.) Chemistry data were not available from specific quarterly sampling events as summarized in Tables C and D; and 5.) na indicates the well was not sampled for specific parameter.

The only exceedance noted for the CIs in Key Area 11 is the sulphate concentration that exceeds the primary screening benchmark (DW) in November 2015 in domestic well RG_DW-07-01. Groundwater concentrations for other CIs in Key Area 11 were below the applicable primary screening benchmarks (i.e., CSR standards); therefore, secondary screening was not performed.

Other parameters (sodium, barium, manganese and molybdenum) exceeded the primary screening benchmark in the bedrock monitoring wells (CM_MW1-SH and CM_MW1-DP) as shown in Table U. There was no exceedance noted in the shallow wells (CM_MW1-OB).

As noted in other areas, groundwater concentrations exceeding CSR IW standards for dissolved manganese and dissolved molybdenum has been observed in deeper monitoring wells. Concentrations are marginally above the standards and are not a concern. The sodium concentration was marginally above CSR DW in the Q4 sample and is not a concern. The concentration in dissolved barium was above CSR DW in the Q4 sample.

4.11.3 Trend Analysis and Interpretation

Discussion of trends in groundwater quality in Key Area 11 focuses on dissolved selenium and sulphate concentrations which are the CIs that approach or exceed the primary screening benchmarks at RG_DW-07-01. Time series plots of dissolved selenium and sulphate from the selected wells located in Key Area 11 and included in the 2015 Regional Groundwater Monitoring Program are shown in Appendix I (Graphs 11-1 and 11-2). A seasonal trend in the concentrations of dissolved selenium and sulphate was observed in RG_DW-07-01 based on 2014-2015 data. In general, concentrations in 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. Sulphate concentrations slightly exceeded the CSR DW standard of 500 mg/L at the end of March 2014, in October 2014, and in December 2015. Dissolved selenium concentrations were below applicable CSR standards in 2015 and only exceeded CSR AW and DW in March 2014. Not enough data were available to comment on seasonal trends at CM_MW1. However, the data for the nested well show higher concentrations of dissolved selenium and sulphate in the shallower 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 groundwater conceptual model identifying the surficial deposits as the main groundwater transport pathway in the Study Area.

The highest concentrations in dissolved selenium and sulphate have been measured in domestic well RG_DW-07-01. Figure 7 shows the spatial distribution of dissolved selenium, sulphate and nitrate for samples collected in Key Area 11. Attenuation of sulphate and dissolved selenium appears to be occurring in the Michel Creek valley-bottom further donwgradient of the confluence of Corbin Creek and Michel Creek. No exceedances were noted in CM_MW1-OB which is installed in valley-bottom deposits furthest downgradient from CMO.

The data gap identified in the Synthesis Report was fulfilled by the addition of the nested monitoring well (CM_MW1) to the Regional Groundwater Monitoring Program. Moving forwards, groundwater monitoring in the bedrock monitoring wells CM_MW1-SH and CM_MW1-DP is not required. Continued monitoring of CM_MW1-OB and domestic well RG_DW-07-01 on a quarterly basis is recommended. Based on sampling results from 2014 (SNC-Lavalin, 2016) and 2015 and recognizing challenges with sampling domestic wells on a quarterly basis, we recommend the sampling schedule for the domestic well RG_DW-07-01 to be reduced to biannually to capture anticipated high and low groundwater levels in the valley-bottoms in the spring and fall (Q2 and Q4).

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 50 m. Recharge to this Key Area occurs as downgradient flow from valley-bottom groundwater in Key Areas 8 (Elk River) and 9 (Michel Creek), and potentially from Elk River surface water (Franz, 2013). 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

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 to November 2015 at EV_ER1gwS was plotted on a time-series graph and included in Appendix I (Graph 12-1). No static pumping water levels were available for RG_DW-03-04 but the relatively continuous pumping rate data were provided by the District of Sparwood and added to the time-series plot in Appendix I (Graph 12-1).

Groundwater elevation in EV_ER1gwS ranged from approximately 1110.4 masl to 1112.1 masl throughout the monitoring period. The fluctuation at this well followed a clear seasonal trend with higher groundwater elevations recorded from the end of May to mid-July 2015. The reported average pumping rate of Sparwood Municipal Well 3 is approximately 3,000 m^3/day. Based on pumping data reviewed, the pumping rate fluctuates throughout the year with generally lower pumping rates between September and May and higher pumping rates during the summer months. The groundwater level fluctuation observed in EV_ER1gwS showed a typical seasonal trend associated with a freshet regime. Groundwater levels may also be affected by groundwater extraction at the municipal well RG_DW-03-04 completed approximately 35 mbgs. The vertical groundwater flow at the nested well EV_ER1gwS/D was assessed using the manual water level measurements. The inferred vertical groundwater flow at this location appears to be slightly upwards. Groundwater elevation for the third quarter is shown on Figure 3 and provide regional context.

4.12.2 Groundwater Quality

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

Table V: Summary of Primary Screening Benchmark Exceedances 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
Selenium (µg/L)	AW, DW	-	-	AW, DW	-	-	-	-	na	na	na	na
Total Selenium (µg/L)	AW, DW	-	-	AW, DW	-	-	-	-	-	-	AW, DW	AW, DW

Notes: 1.) Dissolved parameter unless otherwise indicated; 2.) Exceedances presented are in relation to CSR standards for Aquatic Life (AW), Drinking Water (DW), Livestock (LW) and Irrigation (IW); 3.) '–' denotes primary screening benchmark for given constituents not exceeded in well; and 4.) na indicates the well was not sampled for specific parameter.

The only exceedances noted for CIs in Key Area 12 were for dissolved/total selenium that exceeded the primary screening benchmark (AW and DW) in January and November 2015 at EV_ER1gwS and from September to December 2015 in RG_DW-03-04. Groundwater concentrations for other CIs in Key Area 12 were below applicable primary screening benchmarks. Secondary screening was performed for the drinking water and surface water pathways for total selenium and concentrations were below the secondary screening benchmarks.

4.12.3 Trend Analysis and Interpretation

Discussion of trends in groundwater quality in Key Area 12 focuses on dissolved/total selenium, which approach or exceed the primary screening benchmarks for at least part of the year in this Key Area. A time-series plot of weekly and monthly selenium concentrations from samples collected in the Elk River, Michel Creek and RG_DW-03-04 (Sparwood Municipal Well 3) from 2011 is shown in Appendix I (Graph 12-2). Sampling results were provided by the District of Sparwood and sampling locations for Elk River and Michel Creek are consistent with previous sampling locations reported by Franz (2013). Total selenium concentrations available at monitoring wells EV_ER1gwS/D were also added to the time-series plot.

A clear seasonal trend in total 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 the monitoring wells EV_ER1gwS/D. In general, concentrations in 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 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.

In general, total selenium concentrations were slightly higher in the samples collected from Elk River and Michel Creek compared to groundwater in Key Area 12. Groundwater quality in the deeper aquifer at municipal well RG_DW-03-04 (completed at approximately 35 mbgs) appears to reflect the Elk River and/or Michel Creek surface water quality, consistent with previous studies. It is therefore inferred that surface water recharge have reached the deeper aquifer likely as a result of induced hydraulic gradients from well extraction and the lack of a laterally continuous confining unit.

Figure 7 shows the spatial distribution of dissolved selenium, sulphate and nitrate for samples collected during the third quarter in Key Area 12 and provide regional context with the other Key Areas in the south half of the Study Area. Elevated CIs above primary screening benchmarks but below secondary screening benchmarks were measured at the farthest downgradient monitoring location in Management Unit #4 and the Study Area. 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 and/or Michel Creek surface water quality, surface water infiltration (recharge) rather than a valley-bottom groundwater pathway appears to be causing the exceedances measured at this location. Additional groundwater wells to delineate groundwater quality downgradient of the Study Area are not recommended as the impacts on surface water quality are being addressed through the Elk Valley Water Quality Plan (Teck, 2014). Continued monitoring of EV_ER1gwS/D on a quarterly basis and RG_DW-03-04 as per the District of Sparwood schedule and is recommended. Surface water monitoring at nearby Michel Creek and Elk River stations should be maintained. The addition of monitoring wells should be considered if there is material divergence between groundwater quality in the Key Area 12 and surface water quality that suggest down-valley groundwater mine contact water in addition to surface water infiltration.

5 CONCLUSIONS AND RECOMMENDATIONS

In general, groundwater conditions are similar to those outlined in the Regional Conceptual Model in the Synthesis Report (SNC-Lavalin, 2015b). Concentrations of CIs and exceedances of primary and secondary screening benchmarks for these constituents were generally consistent with previous observations and are summarized by Key Area below. Concentrations of other constituents were also compared to primary screening benchmarks and exceedances were noted at some locations. Most of the exceedances noted are not considered a concern because there was no identified receptor for the specific pathway and/or the exceedances were only marginally above benchmarks. For some constituents at certain locations (i.e., copper, fluoride, iron and manganese), concentrations were significantly higher than primary benchmarks and the source was unclear. Continued monitoring is recommended to further assess risk to human health and/or aquatic life and results from groundwater monitoring will inform the Adaptive Management Plan (Teck, 2016). Additional discussion is presented by Key Area below.

General recommendations for the Regional Groundwater Monitoring Program are as follows:

- Reduce the sampling frequency of the Drinking Water Sampling program to bi-annual sampling to capture anticipated high and low groundwater levels in the valley-bottoms in the spring and fall. This would also reduce the challenges of sampling domestic wells on a quarterly basis as access to obtain samples is subject to landowner permission and availability. In addition, this would align with the Adaptive Management Plan (Teck, 2016). The exception to this is at location RG_DW-02-20 and RG_DW-03-01 where additional quarterly data is recommended (See Key Areas 7 and 9 below);
- Continue with the limited parameters outlined as part of the Drinking Water Sampling Program;
- With the exception of the Drinking Water Sampling Program, analyse for all the parameters listed in the Regional Groundwater Monitoring Program in 2016. This includes the municipal wells sampled by third parties;
- To increase water level data quality, collect concurrent manual water level measurements each time a water level datalogger is deployed or removed from a well and prior to each sampling event; and
- The annual report for the Regional Groundwater Monitoring Program is based on data from site-specific programs and a concurrent due date presents difficulties in alignment and consistency between the regional and site-specific programs. As such, we recommend a later due date for submission of subsequent Regional Groundwater Monitoring Program reports.

The following summarizes conclusions from the 2015 results and recommendations for the Regional Groundwater Monitoring Program by Key Area.

5.1 Key Area 1

The furthest downgradient monitoring points (FR_GHHW) in Key Area 1 reported selenium and nitrate above both primary and secondary screening benchmarks. A phased approach to data gap filling was proposed in the Synthesis Report, with the initial phase a desktop study to assess groundwater flow paths and refine areas for groundwater delineation (i.e., extent of groundwater impacts) with additional monitoring wells. Continued groundwater monitoring at FR_09-01A/B and FR_GHHW on a quarterly basis is recommended until further groundwater delineation is achieved and groundwater flow paths are better understood.

5.2 Key Area 2

The transport of CIs to the Fording River valley-bottom sediments due to mining-related activities in Dry Creek appears to be minimal. Continued monitoring of LC_PIZDC1307/1308 is recommended.

5.3 Key Area 3

Elevated total selenium and sulphate concentrations above both primary and secondary (sulphate only) screening benchmarks were measured in GH_POTW17 of wells in Key Area 3. The source of elevated CIs in groundwater is still unclear (Fording River or water from the Greenhills Creek drainage) and uncertainty still exists in groundwater quality results due to limited data. Continued monitoring at GH_POTW9, GH_POTW10, GH_POTW15 and GH_POTW17 on a quarterly basis is recommended to allow for assessment of seasonal effects and potential influences on groundwater quality in the Fording River valley-bottom in Key Area 3.

5.4 Key Area 4

Elevated dissolved selenium concentrations above both primary and secondary screening benchmarks were measured in a number of wells in Key Area 4. Downgradient groundwater quality in the Elk River valley-bottom appears to improve and delineation is achieved on a regional scale. Continued monitoring of monitoring wells GH_GA-MW-2, GH_GA-MW-3, GH_GA-MW-4 and GH_GA-MW-ERSC-1 on a quarterly basis is recommended. Continued monitoring at the water supply well RG_DW-01-03 and the domestic well RG_DW-01-07 is also recommended to monitor groundwater quality further downgradient. As per the recommendation above for the Drinking Water Sampling program, we recommend reducing the sampling frequency at RG_DW-01-07 to bi-annual sampling to capture anticipated high and low groundwater levels in the valley-bottoms in the spring and fall. Data obtained from GH_GA-MW-01 are likely not representative of groundwater conditions

in the valley-bottom aquifer in Key Area 4; therefore, it is recommended to remove GH_GA-MW-01 from the Regional Groundwater Monitoring Program.

5.5 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 were measured in groundwater collected from LC_PIZP1101 during the 2015 groundwater monitoring program. Groundwater concentrations were above primary screening benchmark for fluoride (DW, IW and LW) for all the sampling events. The source of fluoride at this location is unclear and results from groundwater will inform the Adaptive Management Plan (Teck, 2016). Groundwater monitoring at LC_PIZP1101 and surface water monitoring at nearby Order Station (ER2 0200027) should be maintained.

5.6 Key Area 7

Based on 2015 results, potential sources in Harmer Creek do not appear to result in elevated concentrations of CIs at EV_GV3gw. However, groundwater samples collected from EV_GV3gw might not be representative of groundwater quality in the shallower part of the aquifer and therefore, shallow groundwater quality in Harmer Creek drainage remains unknown. In the absence of other monitoring wells downstream of Harmer Creek, groundwater monitoring at EV_GV3 and RG_DW-02-20 and surface water monitoring of Harmer Creek (as a proxy for shallow groundwater) at EMS E102682 should be maintained on a quarterly basis.

5.7 Key Area 8

Based on the 2015 results, potential sources in Key Area 8 do not appear to result in elevated concentrations of CIs. Higher concentrations in dissolved selenium and sulphate measured in 2013 and 2014 appear to be isolated events and concentrations since then have been stable and significantly lower than the primary screening benchmarks for both parameters. Groundwater quality in EV_LSgw was elevated above primary screening benchmark concentrations for dissolved iron (AW) and dissolved manganese (IW and DW). The source of dissolved iron and manganese at this location is unclear but its occurrence is inferred to be related to reducing conditions in groundwater; it is noted that when discharging to surface water dissolved iron groundwater typically precipitates. Continued monitoring at EV_LSgw and EV_OCgw on a quarterly basis is recommended and iron and manganese results at EV_LSgw will inform the Adaptive Management Plan (Teck, 2016).

5.8 Key Area 9

Groundwater concentrations in dissolved/total selenium, nitrate and sulphate exceeded the primary and secondary screening benchmarks in several wells in this Key Area. Based on 2015 results at downgradient monitoring wells EV_MCgwS/D and domestic well RG_DW_03-01, attenuation of total 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 and as such these are not ideal downgradient sentry wells. In the absence of other monitoring wells downgradient of Michel Creek before the confluence with the Elk River, groundwater monitoring at EV_MCgwS/D and RG_DW-03-01 should be maintained on a quarterly basis.

Concentrations in total copper were also above CSR AW, IW and LW in two water supply wells in the only sample collected in 2015. Groundwater concentrations marginally exceeded CSR LW standard for total zinc and CSR DW standard for magnesium in one water supply well in the only sample collected in 2015. The source of these constituents is unclear and further assessment should be completed as additional monitoring data become available.

5.9 Key Area 10

Based on the monitoring results at EV_ECgw, the transport of CIs to the Michel Creek valley-bottom sediments due to mining-related activities in Erickson Creek appears to be minimal. However, it is unclear as to whether this well is appropriate to assess if transport of CIs to the Michel Creek valley-bottom aquifer may be occurring due to spoils in Erickson Creek. Continued groundwater monitoring at EV_ECgw should be maintained on a quarterly basis and evaluated further in conjunction with surface water monitoring (as as proxy for shallow groundwater) at Erickson Creek (EMS 0200097) in future annual reports to assess suitability of well to support regional groundwater understanding.

5.10 Key Area 11

The nested monitoring well (CM_MW1) was added to the Regional Groundwater Monitoring Program to provide an additional monitoring point in the Michel Creek valley-bottom deposits. Moving forwards, groundwater monitoring in the bedrock monitoring wells CM_MW1-SH and CM_MW1-DP is not required for the Regional Groundwater Monitoring Program. Continued monitoring of CM_MW1-OB and domestic well RG_DW-07-01 on a quarterly basis is recommended. As per the recommendation above for the Drinking Water Sampling program, we recommend reducing the sampling frequency at RG_DW-07-01 to bi-annual sampling to capture anticipated high and low groundwater levels in the valley-bottoms in the spring and fall.

5.11 Key Area 12

Elevated CIs above primary screening benchmarks but below secondary screening benchmarks were measured at the farthest downgradient monitoring location in Management Unit #4 and the Study Area. Delineation of groundwater quality in the Elk River valley-bottom aquifer to primary screening benchmarks downgradient of the Study Area is not achieved; however, continued downstream exchange with Elk River surface water with water quality above primary benchmarks for CIs is expected. Since groundwater quality in Key Area 12 appears to reflect the Elk River and/or Michel Creek surface water quality, surface water infiltration (recharge) rather than a valley-bottom groundwater pathway appears to be causing the exceedances measured at this location. Additional groundwater wells to delineate groundwater quality downgradient of the Study Area are not recommended as the impacts on surface water quality are being addressed through the Elk Valley Water Quality Plan (Teck, 2014). Continued monitoring of EV_ER1gwS/D on a quarterly basis and RG_DW-03-04 as per the District of Sparwood schedule and is recommended. Surface water monitoring at nearby Michel Creek and Elk River stations should be maintained. The addition of monitoring wells should be considered if there is material divergence between groundwater quality in the Key Area 12 and surface water quality that suggest down-valley groundwater mine contact water in addition to surface water infiltration.

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TABLES

TABLE 1: Summary of Applicable Primary and Secondary Screening Benchmarks

Key Area	Well ID	Operation	MU	Primary Screening				Secondary Screening	
				AW Criteria Applied**	DW Criteria Applied	IW Criteria Applied	LW Criteria Applied	Permit Criteria Applied	Canadian Drinking Water Guidelines
Background	FR_HMW5	FRO	1	BC CSR	BC CSR	BC CSR	BC CSR	SPO (FR4), CP (FRO; E300071)	Se only
1	FR_09-01-A	FRO	1	BC CSR	BC CSR	BC CSR	BC CSR	SPO (FR4), CP (FRO; E300071)	Se only
	FR_09-01-B	FRO	1	BC CSR	BC CSR	BC CSR	BC CSR	SPO (FR4), CP (FRO; E300071)	Se only
	FR_GHHW	FRO	1	BC CSR	BC CSR	BC CSR	BC CSR	SPO (FR4), CP (FRO; E300071)	Se only
2	LC_PIZDC1308	LCO	1	BC CSR	BC CSR	BC CSR	BC CSR	SPO (FR4), CP (GHO;E200378)	Se only
	LC_PIZDC1307	LCO	1	BC CSR	BC CSR	BC CSR	BC CSR	SPO (FR4), CP (GHO;E200378)	Se only
3	GH_POTW09	GHO	1	BC CSR	BC CSR	BC CSR	BC CSR	SPO (FR4), CP (GHO;E200378)	Se only
	GH_POTW10	GHO	1	BC CSR	BC CSR	BC CSR	BC CSR	SPO (FR4), CP (GHO;E200378)	Se only
	GH_POTW15	GHO	1	BC CSR	BC CSR	BC CSR	BC CSR	SPO (FR4), CP (GHO;E200378)	Se only
	GH_POTW17	GHO	1	BCWQG	BC CSR	BC CSR	BC CSR	SPO (FR4), CP (GHO;E200378)	Se only
4	GH_MW-ERSC-1	GHO	3	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER1), CP (GHO; E300090)	Se only
	GH_GA-MW-1	GHO	3	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER1), CP (GHO; E300090)	Se only
	GH_GA-MW-2	GHO	3	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER1), CP (GHO; E300090)	Se only
	GH_GA-MW-3	GHO	3	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER1), CP (GHO; E300090)	Se only
	GH_GA-MW-4	GHO	3	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER1), CP (GHO; E300090)	Se only
	RG_DW-01-03	RG	3	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER1)	Se only
	RG_DW-01-07	RDW	3	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER1)	Se only
6	LC_PIZP1101	LCO	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER2)	Se only
7	EV_GV3gw	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3)	Se only
	RG_DW-02-20	RDW	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3)	Se only
8	EV_LSgw	EVO	4	BCWQG	BC CSR	BC CSR	BC CSR	SPO (ER3)	Se only
	EV_OCgw	EVO	4	BC WQG	BC CSR	BC CSR	BC CSR	SPO (ER3)	Se only
9	EV_BCgw	EVO	4	BC WQG	BC CSR	BC CSR	BC CSR	SPO (ER3), CP (EVO; E300091)	Se only
	EV_MCgwS	EVO	4	BC WQG	BC CSR	BC CSR	BC CSR	SPO (ER3), CP (EVO; E300091)	Se only
	EV_MCgwD	EVO	4	BC WQG	BC CSR	BC CSR	BC CSR	SPO (ER3), CP (EVO; E300091)	Se only
	EV_BRS1/EV_BRS2	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3), CP (EVO; E300091)	Se only
	EV_RCS1	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3), CP (EVO; E300091)	Se only
	EV_WHS1/EV_WHS2	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3), CP (EVO; E300091)	Se only
	RG_DW-03-01	RDW	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3)	Se only
10	EV_ECgw	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3), CP (EVO; E300091)	Se only
11	CM_MW1-OB	CMO	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3), CP (CMO; E258937)	Se only
	CM_MW1-SH	CMO	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3), CP (CMO; E258937)	Se only
	CM_MW1-DP	CMO	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3), CP (CMO; E258937)	Se only
	RG_DW-07-01	RDW	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3)	Se only
12	EV_ER1gwS	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3)	Se only
	EV_ER1gwD	EVO	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3)	Se only
	RG_DW-03-04	RG	4	BC CSR	BC CSR	BC CSR	BC CSR	SPO (ER3)	Se only

** 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	2015/07/03	1.52	1784.51	10.7	-	3.00E-03
										2015/10/08	1.56	1784.47			
1	FR_09-01-A	Monitoring	FRO	1	1584.10	1584.95	7.6	3.83 - 6.88	Sandy Gravel	2015/05/08	5.13	1579.82	-	Fording River valley bottom sediments	-
										2015/07/02	1.86	1583.09			
	FR_09-01-B	Monitoring	FRO	1	1584.10	1584.86	19.3	17.15 - 18.67	Coarse Gravel	2015/05/08	5.73	1579.13	-	Fording River valley bottom sediments	1.50E-04
										2015/07/02	2.48	1582.38			
	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	-	-	2015/03/10	3.04	1688.33	-	Colluvium and till	-
										2015/06/10	1.75	1689.62			
										2015/09/22	2.54	1688.83			
										2015/12/16	2.89	1688.48			
	LC_PIZDC1307	Monitoring	LCO	1	*1685.7*	1691.21	34.6	-	-	2015/03/10	5.98	1685.23	-	Highly consolidated basal till	-
										2015/06/10	2.14	1689.07			
										2015/09/22	4.76	1686.45			
										2015/12/16	5.75	1685.46			
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	1293	1293.75	7.924	4.12 - 7.17	Till/Bedrock	2015/02/16	5.23	1288.52	6.1	Till/ Bedrock interface	3.00E-06
										2015/04/28	4.87	1288.88			
										2015/09/14	5.95	1287.80			
										2015/11/29	5.98	1287.77			
	GH_GA-MW-1	Monitoring	GHO	3	1357	1358.05	22.6	15.5 - 18.5	Clayey Sand	2015/02/16	17.56	1340.49	22.6	Interlayered alluvial and lacustrine sediments	1.00E-12
										2015/04/28	17.13	1340.92			
										2015/09/14	9.01*	1349.04			
										2015/11/29	16.96	1341.09			
	GH_GA-MW-2	Monitoring	GHO	3	1310	1311.02	29	23 - 28	Sand/Silt	2015/02/16	4.80	1306.22	29.6	Fluvial sediments about the bedrock contact	1.00E-03
										2015/04/28	4.31	1306.71			
										2015/09/14	5.88	1305.14			
										2015/11/29	4.82	1306.20			
	GH_GA-MW-3	Monitoring	GHO	3	1294	1310.97	29.6	8 - 14	Sand and Gravel	2015/02/16	6.16	1304.81	14.4	Fluvial sediments above the bedrock contact	2.00E-06
										2015/04/28	5.85	1305.12			
										2015/09/14	8.82	1302.15			
										2015/11/29	8.86	1302.11			
	GH_GA-MW-4	Monitoring	GHO	3	1304	1304.9	17.2	13.7 - 16.7	Sand and Gravel	-	-	-	17.2	Alluvial sediments	1.00E-04
	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	2015/03/14	30.48	1236.58	-	Fluvial sediments	7.40E-04
										2015/06/12	30.45	1236.61			
										2015/09/24	30.24	1236.82			
										2015/12/18	29.82	1237.24			
7	EV_GV3gw	Monitoring	EVO	4	*1307*	1307.96	25	22.85 - 24.38	Silty Gravel	2015/01/13	10.93	1297.03	-	Till deposit in the Grave Creek valley-bottom	-
										2015/05/15	11.67	1296.29			
										2015/08/11	10.89	1297.07			
										2015/11/18	10.93	1297.03			
	RG_DW-02-20	Domestic	RDW	4	*1169*	-	18.3	-	-	-	-	-	-	-	-

[1] Greenhouse water supply includes four wells (Well 1, Well 2, Well 3 and Well 4) which are collectively referred to as FR_GHHW. Ground elevation of Well 4 is included in Table 3.

[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 for EV_MCgwS/D for May were switched as it appeared a transcription error was made in the field.

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	2015/01/14	4.32	1129.61	-	Fluvial valley-bottom sediments	1.00E-03
										2015/05/14	3.85	1130.08			
										2015/08/12	4.10	1129.83			
										2015/11/19	4.02	1129.91			
	EV_OCgw	Monitoring	EVO	4	*1126*	1126.89	15.54	11.58 - 14.63	Sand	2015/01/14	3.85	1123.04	14.48	Fluvial valley-bottom sediments	7.00E-07
										2015/05/14	3.25	1123.64			
										2015/08/10	3.74	1123.15			
										2015/11/19	3.23	1123.66			
9	EV_BCgw	Monitoring	EVO	4	*1153*	1153.86	23.16	17.77 - 20.82	Gravel	2015/01/13	2.77	1151.09	-	Fluvial valley-bottom sediments	1.00E-04
										2015/05/11	2.39	1151.47			
										2015/08/10	2.88	1150.98			
										2015/11/16	2.71	1151.15			
	EV_MCgwS	Monitoring	EVO	4	*1131*	1131.96	10.67	5.79 - 7.32	Clayey Silt	2015/01/12	2.25	1129.71	-	Shallowest valley-bottom aquifer	7.00E-08
										2015/05/12	2.19**	1129.77			
										2015/08/11	2.87	1129.09			
										2015/11/17	2.36	1129.60			
	EV_MCgwD	Monitoring	EVO	4	*1131*	1131.84	47.55	24.50 - 27.55	Sand and Clay	2015/01/12	3.22	1128.62	-	Deepest valley-bottom aquifer	3.00E-06
										2015/05/15	3.14**	1128.70			
										2015/08/11	3.72	1128.12			
										2015/11/17	3.71	1128.13			
	EV_BRS1/EV_BRS2	Supply	EVO	4	*1149*	-	-	-	-	-	-	-	-	Fluvial sediments in the Michel Creek valley bottom	-
	EV_RCS1	Supply	EVO	4	*1161*	-	-	-	Sand and Gravel	-	-	-	-	Fluvial sediments in the Michel Creek valley bottom	-
	EV_WHS1/EV_WHS2	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	Clay and Sand	2015/05/14	0.89	1326.85	-	Fluvial sediments overlying lacustrine sediments	1.00E-08
										2015/08/13	0.79	1326.95			
										2015/11/16	0.46	1327.28			
11	CM_MW1-OB	Monitoring	CMO	4	1500.44	1501.29	37.27	2.87 - 4.39	Gravel	2015/08/18	3.45	1497.84	18	Fluvial sediments in the Michel Creek valley bottom	1.20E-04
										2015/09/08	3.42	1497.87			
										2015/11/24	3.46	1497.83			
	CM_MW1-SH	Monitoring	CMO	4	1500.44	1501.29	37.27	20.44 - 23.49	Siltstone	2015/08/18	3.57	1496.87	18	Siltstone	2.00E-07
										2015/09/09	4.34	1496.95			
										2015/11/24	5.21	1496.08			
	CM_MW1-DP	Monitoring	CMO	4	1500.44	1501.29	37.27	34.22 - 37.27	Siltstone	2015/08/18	34.78	1465.66	18	Siltstone	6.00E-06
										2015/09/08	17.45	1483.84			
										2015/11/24	6.90	1494.39			
	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	2015/01/13	5.58	1110.38	-	Shallowest fluvial aquifer	-
										2015/05/12	5.11	1110.85			
										2015/08/11	5.03	1110.93			
										2015/11/17	5.20	1110.76			
	EV_ER1gwD	Monitoring	EVO	4	*1115*	1115.91	30.78	25.82 - 28.87	Sand/Silty Sand	2015/01/13	5.28	1110.63	27.89	Deepest fluvial aquifer	9.00E-04
										2015/05/12	4.76	1111.15			
										2015/08/11	4.69	1111.22			
										2015/11/17	4.87	1111.04			
	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 (Well 1, Well 2, Well 3 and Well 4) which are collectively referred to as FR_GHHW. Ground elevation of Well 4 is included in Table 3.

[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 for EV_MCgwS/D for May were switched as it appeared a transcription error was made in the field.

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 for Dissolved Inorganics in Groundwater

Sample Location	Sample Date (yyyy mm dd)	Physical Parameters							Nitrogen Parameters				Anions					Geochemical Indicators			
		Hardness mg/L	Total Dissolved Solids mg/L	Total Suspended Solids mg/L	Total Alkalinity (as CaCO3) mg/L	Alkalinity Bicarbonate (as CaCO3) mg/L	pH (lab) pH	Conductivity µS/cm	Ammonia Nitrogen mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Kjeldahl Nitrogen- mg/L	Chloride mg/L	Fluoride mg/L	Sulphate mg/L	Bromide mg/L	Phosphate mg/L	Phosphorous mg/L	Ortho-Phosphate mg/L	Total Organic Carbon mg/L	Dissolved Organic Carbon mg/L
Background																					
FR_HMW5	2015 05 25	178	-	-	-	-	-	-	0.0693	< 0.0050	< 0.0010	-	5.3	0.6	34.8	-	-	0.0351	0.0281	-	-
	2015 07 03	181	239	2.7	173	-	8.34	382	0.0619	< 0.0050	< 0.0010	0.100	3.7	0.662	34.5	< 0.050	0.0281	0.0350	0.0266	< 0.50	< 0.50
	2015 10 08	182	236	4.1	178	-	8.30	404	0.0647	< 0.0050	< 0.0010	0.104	4.5	0.639	41.2	< 0.050	0.0266	-	-	< 0.50	< 0.50
Key Area 1																					
FR_09-01-A	2015 01 22	644	876	< 1.0	260	-	7.98	1,130	< 0.0050	**20.1**	< 0.0050	< 0.050	3.6	0.13	336	< 0.25	0.0025	0.0030	0.0025	0.69	0.86
	Duplicate	658	900	< 1.0	258	-	7.99	1,130	< 0.0050	**20.2**	< 0.0050	< 0.050	3.6	0.14	337	< 0.25	0.0025	0.0038	0.0025	0.75	0.76
	QA/QC RPD%	2	7	*	17	-	3	10	*	< 1	*	*	0	7	< 1	*	*	*	*	*	*
	2015 04 14	735	962	< 1.0	273	-	8.34	1,260	< 0.0050	**25.1**	< 0.0050	< 0.050	4.5	0.14	374	< 0.25	0.0023	0.0029	0.0023	0.56	0.71
	2015 07 02	601	903	3.0	247	-	7.99	1,020	< 0.0050	**33.1**	< 0.0050	< 0.050	1.3	0.22	219	< 0.25	0.0029	0.0036	0.0029	< 0.50	0.52
	2015 10 08	724	967	1.2	306	-	8.27	1,250	< 0.0050	**27.8**	< 0.0050	< 0.050	3.7	0.12	351	< 0.25	0.0027	0.0022	0.0027	< 0.50	0.52
FR_09-01-B	2015 01 22	523	691	< 1.0	225	-	8.01	902	< 0.0050	**11.4**	< 0.0050	< 0.050	3	0.19	261	< 0.25	0.0022	0.0026	0.0022	0.78	0.74
	2015 04 14	596	756	1.1	246	-	8.39	1,020	< 0.0050	**11.3**	< 0.0050	< 0.050	4	0.18	300	< 0.25	0.0022	< 0.0020	0.0022	0.53	0.65
	2015 07 02	588	838	< 1.0	229	-	7.86	991	< 0.0050	**30.5**	< 0.0020	< 0.050	1.6	0.166	224	< 0.10	0.0018	0.0023	0.0018	< 0.50	< 0.50
	Duplicate	588	849	< 1.0	231	-	7.85	985	< 0.0050	**30.8**	< 0.0020	< 0.050	1.6	0.167	227	< 0.10	0.0017	0.0028	0.0017	< 0.50	< 0.50
	QA/QC RPD%	0	12	*	17	-	5	4	*	1	*	*	0	1	1	*	*	*	*	*	*
	2015 10 08	588	754	< 1.0	274	-	8.28	1,030	< 0.0050	**11.1**	< 0.0050	0.067	4.2	0.19	288	< 0.25	0.0023	0.0021	0.0023	< 0.50	< 0.50
FR_GHHW	2015 01 21	672	920	< 1.0	238	-	7.98	1,210	< 0.0050	**46.7**	< 0.0050	< 0.050	2.4	0.11	276	< 0.25	0.0013	< 0.0020	0.0013	0.78	0.68
	2015 04 14	748	1,020	< 1.0	239	-	8.44	1,330	< 0.0050	**56.2**	< 0.010	< 0.050	3	< 0.20	336	< 0.50	0.0056	0.0062	0.0056	0.80	0.72
	Duplicate	746	1,040	< 1.0	220	-	8.32	1,350	< 0.0050	**55.3**	< 0.010	< 0.050	3.3	< 0.20	333	< 0.50	0.0050	0.0046	0.0050	0.58	0.74
	QA/QC RPD%	< 1	2	*	8	-	1	1	*	2	*	*	10	*	1	*	11	*	11	*	*
	2015 07 02	705	1,070	1.1	229	-	7.88	1,180	< 0.0050	**45.5**	< 0.0050	< 0.050	3.5	< 0.10	286	< 0.25	0.0080	0.0048	0.0080	< 0.50	0.63
	2015 11 05	682	-	-	-	-	-	-	0.279	**37.8**	0.0692	-	1.6	0.15	280	-	-	-	-	-	-
Key Area 2																					
LC_PIZDC1308	2015 03 10	295	302	7.5	292	-	8.07	510	0.0294	0.112	0.001	0.159	1.6	0.236	4.78	< 0.050	< 0.0010	0.0174	< 0.0010	3.14	1.99
	2015 06 10	333	307	1.1	316	-	7.98	580	< 0.0050	0.667	< 0.0010	0.102	1.9	0.167	5.38	< 0.050	0.0018	0.0026	0.0018	2.16	2.20
	2015 09 22	313	322	2.7	301	-	7.72	560	< 0.0050	0.383	0.0044	0.109	2	0.179	4.24	< 0.050	0.0012	0.0031	0.0012	2.90	3.37
	Duplicate	316	322	2.2	305	-	7.63	551	< 0.0050	0.384	0.0033	0.134	2	0.179	4.23	< 0.050	< 0.0010	0.0038	< 0.0010	3.11	3.01
	QA/QC RPD%	1	0	*	1	-	1	2	*	< 1	*	*	0	0	< 1	*	*	*	*	7	11
	2015 12 16	326	312	< 1.0	300	-	7.65	549	0.0061	0.107	0.0032	0.114	1.8	0.188	4.41	< 0.050	0.0019	0.0050	0.0019	2.37	2.41
LC_PIZDC1307	2015 03 10	189	228	118	215	-	8.33	343	0.0983	0.0073	< 0.0010	0.607	1.5	0.527	0.44	0.056	< 0.0010	0.167	< 0.0010	16.2	3.30
	2015 06 10	193	231	151	221	-	8.28	407	0.0712	< 0.0050	< 0.0010	0.602	1.1	0.566	0.45	0.052	< 0.0010	0.185	< 0.0010	15.3	2.88
	2015 09 22	187	263	141	223	-	8.18	400	0.0757	< 0.0050	< 0.0010	0.555	1.3	0.557	< 0.30	< 0.050	< 0.0010	0.166	< 0.0010	13.3	3.64
	2015 12 16	193	237	90.1	219	-	8.18	394	0.0969	< 0.0050	< 0.0010	0.484	< 1.0	0.585	< 0.30	< 0.050	0.0014	0.116	0.0014	8.75	2.83
BC Standards																					
BCWQG Aquatic Life (AW)[a]		n/a	n/a	n/a	n/a	n/a	6.5 - 9	n/a	1.9 (pH 8.5-<9.0) 5.68 (pH 8.0-<8.5) 12.3 (pH 7.5-<8.0) 19.7 (pH 7.0-<7.5)	3	0.06 (Cl<2) 0.12 (Cl 2-<4) 0.24 (Cl 6-<8) 0.3 (Cl 8-<10) 0.6 (Cl >=10)	n/a	600	1.494 - 2.182 (H>10)	309 (H >75-180) 429 (H >180-250) 429[d]	n/a	n/a	n/a	n/a	n/a[e]	n/a[e]
CSR Aquatic Life (AW)[b]		n/a	n/a	n/a	n/a	n/a	n/a	n/a	11.3 (pH 7.5-<8.0) 18.5 (pH 7.0-<7.5) 3.7 (pH 8.0-<8.5) 1.31 (pH Is Null)	400	0.2 (Cl<2.0) 0.4 (Cl 2.0-<4.0) 0.6 (Cl 4.0-<6.0) 0.8 (Cl 6.0-<8.0) 1 (Cl 8.0-<10.0) 2 (Cl>=10.0)	n/a	1,500	2 (H<50) 3 (H>=50) 2 (H Is Null)	1,000	n/a	n/a	n/a	n/a	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	100	1	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	100	10	n/a	600	1[c]	1,000	n/a	n/a	n/a	n/a	n/a	n/a
CSR Drinking Water (DW)		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10	3.2	n/a	250	1.5	500	n/a	n/a	n/a	n/a	n/a	n/a

Associated ALS file(s): L1567016, L1567695, L1568098, L1570709, L1579365, L1585216, L1586412, L1586803, L1586807, L1587055, L1587338, L1587345, L1587796, L1600339, L1606058, L1611222, L1611919, L1612908, L1617029, L1623601, L1625608, L1626479, L1630418, L1630431, L1630435, L1630436, L1630437, L1630438, L1636950, L1656853, L1657608, L1658136, L1658158, L1671431, L1671435, L1674725, L1678287, L1679229, L1699666, L1704802, L1704810, L1705351, L1707507, L1707777, L1707813, L1708279, L1708643, L1710411, L1713684, L1713686, L1716543, L1716634, L1717638.

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BOLD Concentration greater than CSR Aquatic Life (AW) standard.

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[a] British Columbia Approved Water Quality Guidelines, includes Working Water Quality Guidelines for British Columbia (BCWQG), 2015.

[b] Standard to protect freshwater aquatic life.

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Sample Location	Sample Date (yyyy mm dd)	Physical Parameters							Nitrogen Parameters				Anions					Geochemical Indicators			
		Hardness mg/L	Total Dissolved Solids mg/L	Total Suspended Solids mg/L	Total Alkalinity (as CaCO3) mg/L	Alkalinity Bicarbonate (as CaCO3) mg/L	pH (lab) pH	Conductivity µS/cm	Ammonia Nitrogen mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Kjeldahl Nitrogen- mg/L	Chloride mg/L	Fluoride mg/L	Sulphate mg/L	Bromide mg/L	Phosphate mg/L	Phosphorous mg/L	Ortho-Phosphate mg/L	Total Organic Carbon mg/L	Dissolved Organic Carbon mg/L
Key Area 3																					
GH_POTW09	2015 06 08	418	485	< 1.0	250	238	8.11	792	0.0271	0.025	< 0.0020	0.072	7.1	0.774	161	< 0.10	< 0.0010	< 0.0020	0.0012	0.73	0.65
	2015 12 21	424	499	< 1.0	249	249	7.88	742	0.0267	< 0.025	< 0.0050	0.061	7.0	0.85	161	< 0.25	0.0012	< 0.0020	< 0.0010	0.76	0.90
GH_POTW10	2015 06 08	410	468	1.2	193	184	8.15	772	0.0619	0.405	0.0119	0.112	4.5	0.83	196	< 0.10	< 0.0010	< 0.0020	< 0.0010	0.69	0.59
	2015 11 04	403	489	1.0	210	210	8.14	748	0.0593	0.493	0.0113	0.102	4.5	0.84	190	< 0.25	< 0.0010	< 0.0020	< 0.0010	< 0.50	< 0.50
GH_POTW15	2015 06 08	523	633	1.3	225	225	8.04	985	0.0312	0.077	0.025	0.079	29.6	0.19	272	< 0.25	< 0.0010	< 0.0020	< 0.0010	1.13	0.99
	2015 11 04	499	613	< 1.0	222	222	8.03	926	0.0326	0.025	0.0071	0.509	25.2	0.19	254	< 0.25	< 0.0010	< 0.0020	< 0.0010	0.91	0.74
GH_POTW17**	2015 11 04	784	989	3.7	275	275	8.18	1,320	0.022	0.118	< 0.0050	0.055	23.4	0.15	***482****	< 0.25	< 0.0010	0.0039	< 0.0010	1.09	0.63
Key Area 4																					
GH_GA-MW-1	2015 02 17	463	960	139	370	-	8.18	1,400	0.692	0.796	0.0105	1.00	31	0.52	363	0.26	0.0032	0.156	0.0032	6.82	5.76
	2015 04 29	467	1,180	56.9	378	-	8.09	1,720	0.748	0.726	0.03	1.33	48.7	0.34	**525**	< 0.50	0.0015	0.0776	0.0015	9.47	12.7
	2015 09 15	476	1,260	325	374	-	7.55	1,790	0.743	0.592	0.023	1.11	51.7	0.36	**573**	< 0.50	< 0.0010	0.205	< 0.0010	12.0	12.9
	2015 11 30	506	930	31.9	367	-	7.87	1,480	0.536	2.14	0.0597	0.800	27.8	0.38	403	< 0.25	0.0060	0.0656	0.0060	5.97	6.73
GH_GA-MW-2	2015 02 17	326	386	11.6	214	-	8.24	599	< 0.0050	1.65	0.0118	0.076	7.6	0.154	99.9	< 0.050	< 0.0010	0.0184	< 0.0010	1.50	0.92
	2015 04 29	330	420	165	207	-	8.23	632	< 0.0050	1.7	0.0403	0.141	7.6	0.129	115	< 0.10	0.0026	0.0898	0.0026	0.79	0.60
	Duplicate	348	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	QA/QC RPD%	5	*	*	*	-	*	*	*	*	*	*	*	*	*	*	*	-	-	*	*
	2015 09 15	370	455	8.4	214	-	7.86	671	< 0.0050	3.01	0.0349	0.114	7.6	0.14	134	< 0.050	0.0032	0.0141	0.0032	0.60	0.59
	2015 11 30	387	445	2.5	187	-	7.97	679	< 0.0050	4	0.0427	0.076	7.42	0.117	141	< 0.050	0.0021	0.0097	0.0021	0.80	0.84
GH_GA-MW-3	2015 02 17	757	988	6.1	217	-	8.06	1,290	0.178	8.71	0.765	< 0.050	14.6	0.29	481	< 0.25	< 0.0010	0.0171	< 0.0010	1.26	1.42
	2015 04 29	418	489	20.8	186	-	8.18	770	0.289	1.19	0.0869	0.313	8.4	0.434	165	< 0.10	< 0.0010	0.0387	< 0.0010	0.99	1.19
	2015 09 15	259	354	107	252	-	7.90	613	0.37	0.0374	0.0102	0.544	10.3	0.682	50	< 0.050	0.0029	0.211	0.0029	2.19	< 0.50
	2015 11 30	579	715	1.3	230	-	7.97	1,050	0.379	3.77	0.165	0.454	10.8	0.362	330	< 0.050	< 0.0010	0.0171	< 0.0010	1.07	1.15
GH_GA-MW-4	2015 02 17	364	435	< 1.0	235	-	8.21	677	< 0.0050	4.63	< 0.0020	< 0.050	4.2	0.172	125	< 0.10	< 0.0010	< 0.0020	< 0.0010	1.13	1.14
	2015 04 29	373	473	1.0	257	-	8.19	742	< 0.0050	6.68	< 0.0020	< 0.050	3.4	0.133	141	< 0.10	0.0011	< 0.0020	0.0011	1.77	1.83
	2015 09 15	678	866	1.6	210	-	7.76	1,130	< 0.0050	7.35	< 0.0050	0.106	5.6	0.11	425	< 0.25	0.0012	< 0.0020	0.0012	0.81	0.80
	2015 11 30	883	1,070	< 1.0	217	-	7.90	1,410	< 0.0050	8.95	< 0.0050	< 0.050	6.2	0.1	**598**	< 0.25	0.0070	0.0071	0.0070	0.93	1.01
	Duplicate	884	1,040	4.5	217	-	7.88	1,380	< 0.0050	8.98	< 0.0050	-	6.2	< 0.10	**599**	< 0.25	< 0.0010	0.0177	< 0.0010	-	-
	QA/QC RPD%	< 1	3	*	0	-	< 1	2	*	< 1	*	-	0	*	< 1	*	*	*	*	-	-
GH_MW-ERSC-1	2015 02 17	299	342	1,530	264	-	8.21	547	0.0244	0.318	0.0068	0.566	3.1	0.28	31	< 0.050	0.0021	1.41	0.0021	5.44	2.02
	2015 04 29	409	493	10.9	234	-	8.16	722	< 0.0050	2.79	< 0.0020	< 0.050	6.1	0.1	168	< 0.10	0.0035	0.0490	0.0035	1.65	1.81
	2015 09 15	320	369	24.4	328	-	7.58	615	0.0251	0.0368	< 0.0010	0.100	2.3	0.271	20.7	< 0.050	0.0029	0.113	0.0029	2.06	1.66
	2015 11 30	329	280	114	327	-	7.99	530	0.0067	0.0543	0.0018	0.110	1.17	0.226	21.1	< 0.050	0.0041	0.167	0.0041	1.99	1.59
RG_DW-01-03	2015 03 09	181	-	-	-	162	-	-	-	0.413	< 0.001	-	0.83	-	29.4	-	-	-	-	-	-
	2015 06 18	174	209	-	-	153	-	-	-	0.614	< 0.001	-	1	-	34.6	-	-	-	-	-	-
	2015 11 24	184	-	-	-	161	-	-	-	0.473	< 0.001	-	0.99	-	32.4	-	-	-	-	-	-
RG_DW-01-07	2015 03 11	414	-	-	-	344	-	-	-	0.714	< 0.001	-	12.2	-	66.9	-	-	-	-	-	-
	2015 06 18	366	427	-	-	330	-	-	-	0.228	< 0.002	-	3.5	-	26.9	-	-	-	-	-	-
	2015 11 24	391	-	-	340	340	7.87	-	-	0.526	< 0.005	-	8	-	69.2	-	-	-	-	-	-
BC Standards																					
BCWQG Aquatic Life (AW)[a]		n/a	n/a	n/a	n/a	n/a	6.5 - 9	n/a	1.9 (pH 8.5-<9.0) 5.68 (pH 8.0-<8.5) 12.3 (pH 7.5-<8.0) 19.7 (pH 7.0-<7.5)	3	0.06 (Cl<2) 0.12 (Cl 2-<4) 0.24 (Cl 6-<8) 0.3 (Cl 8-<10) 0.6 (Cl >=10)	n/a	600	1.494 - 2.182 (H>10)	309 (H >75-180) 429 (H >180-250) 429[d]	n/a	n/a	n/a	n/a	n/a[e]	n/a[e]
CSR Aquatic Life (AW)[b]		n/a	n/a	n/a	n/a	n/a	n/a	n/a	11.3 (pH 7.5-<8.0) 18.5 (pH 7.0-<7.5) 3.7 (pH 8.0-<8.5) 1.31 (pH Is Null)	400	0.2 (Cl<2.0) 0.4 (Cl 2.0-<4.0) 0.6 (Cl 4.0-<6.0) 0.8 (Cl 6.0-<8.0) 1 (Cl 8.0-<10.0) 2 (Cl>=10.0)	n/a	1,500	2 (H<50) 3 (H>=50) 2 (H Is Null)	1,000	n/a	n/a	n/a	n/a	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	100	1	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	100	10	n/a	600	1[c]	1,000	n/a	n/a	n/a	n/a	n/a	n/a
CSR Drinking Water (DW)		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10	3.2	n/a	250	1.5	500	n/a	n/a	n/a	n/a	n/a	n/a

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Key Area 6																					
LC_PIZP1101	2015 03 14	138	224	120	162	-	8.23	313	0.021	0.0072	< 0.0010	0.394	3.9	1.7	3.5	< 0.050	0.0106	0.327	0.0106	2.59	0.76
	2015 06 12	138	196	28.2	170	-	8.23	328	0.0158	0.0066	0.0011	0.229	1.3	1.77	3.49	< 0.050	0.0090	0.122	0.0090	1.67	1.03
	2015 09 24	142	395	434	202	-	8.06	310	0.0235	< 0.0050	< 0.0010	0.496	1.4	1.73	3.49	< 0.050	0.0113	0.540	0.0113	5.07	0.85
	2015 12 18	133	173	-	160	-	8.00	312	0.0217	< 0.0050	< 0.0010	0.077	0.66	1.8	4.35	-	0.0260	0.065	0.0260	1.07	5.66
Key Area 7																					
EV_GV3gw	2015 01 13	360	418	< 1.0	207	-	8.08	620	< 0.0050	0.143	< 0.0010	< 0.050	1.8	0.553	142	< 0.050	0.0012	0.0021	0.0012	< 0.50	< 0.50
	2015 05 15	350	428	< 1.0	199	-	7.72	596	< 0.0050	0.128	< 0.0020	0.069	1.8	0.49	143	< 0.10	0.0016	< 0.0020	0.0016	< 0.50	0.80
	2015 08 11	357	461	< 1.0	206	-	8.12	629	< 0.0050	0.129	< 0.0050	0.054	1.8	0.5	147	< 0.25	0.0013	< 0.0020	0.0013	< 0.50	< 0.50
	2015 11 18	351	405	< 1.0	206	-	8.10	622	< 0.0050	0.143	< 0.0010	< 0.050	2.3	0.504	137	< 0.050	0.0014	0.0027	0.0014	< 0.50	0.63
RG_DW-02-20	2015 03 10	237	-	-	-	176	-	-	-	2.97	< 0.001	-	2.49	-	69.1	-	-	-	-	-	-
	Duplicate	233	-	-	-	170	-	-	-	2.98	< 0.001	-	2.5	-	69.4	-	-	-	-	-	-
	QA/QC RPD%	2	-	-	-	3	-	-	-	< 1	*	-	< 1	-	< 1	-	-	-	-	-	-
	2015 06 18	229	330	-	-	169	-	-	-	3.21	< 0.001	-	2.32	-	78.2	-	-	-	-	-	-
	2015 11 26	241	-	-	-	168	-	-	-	2.44	< 0.001	-	1.72	-	60.2	-	-	-	-	-	-
Key Area 8																					
EV_LSgw**	2015 01 14	583	588	7.1	455	-	8.11	932	0.314	< 0.025	< 0.0050	0.454	15.9	0.27	117	< 0.25	< 0.0010	0.0031	< 0.0010	2.52	2.55
	Duplicate	582	581	7.3	455	-	8.09	987	0.313	< 0.025	< 0.0050	0.422	16	0.28	116	< 0.25	< 0.0010	< 0.0020	< 0.0010	2.74	2.22
	QA/QC RPD%	< 1	1	3	0	-	< 1	6	< 1	*	*	7	1	4	1	*	*	*	*	8	*
	2015 05 14	582	627	5.8	507	-	8.16	1,020	0.248	< 0.025	< 0.0050	0.365	14.5	0.28	99.6	< 0.25	< 0.0010	< 0.020	< 0.0010	2.31	2.42
	2015 08 12	640	669	11.5	536	-	7.40	1,090	0.407	< 0.025	< 0.0050	0.540	16.5	0.27	98.3	< 0.25	< 0.0010	< 0.0020	< 0.0010	3.32	3.41
	2015 11 19	594	615	6.1	482	-	7.97	1,010	0.279	< 0.0050	< 0.0010	0.407	16.8	0.354	109	0.109	< 0.0010	0.0041	< 0.0010	2.51	2.68
EV_OCgw**	2015 01 14	154	301	105	193	-	8.31	404	0.0674	0.0135	0.0027	0.309	3.8	1.27	47.5	0.138	0.0036	0.174	0.0036	1.15	1.21
	2015 05 14	149	283	29.4	155	-	8.36	462	0.0652	< 0.0050	< 0.0010	0.170	2.1	1.27	59.3	0.060	0.0076	0.0409	0.0076	1.40	8.82
	2015 08 10	155	289	35.1	192	-	8.26	461	0.0654	< 0.0050	< 0.0010	0.149	2.4	1.27	60.1	< 0.050	0.0075	0.0436	0.0075	1.31	1.05
	2015 11 19	154	285	13.1	189	-	8.31	457	0.0665	< 0.0050	< 0.0010	0.171	2.5	1.24	59.3	< 0.050	0.0063	0.0308	0.0063	0.87	0.82
Key Area 9																					
EV_BCgw**	2015 01 13	609	776	< 1.0	202	-	8.03	1,040	< 0.0050	***11.5****	< 0.0050	< 0.050	12.7	0.15	338	< 0.25	0.0035	0.0032	0.0035	< 0.50	0.61
	2015 05 11	824	1,080	2.7	239	-	8.15	1,420	< 0.0050	***19.4****	< 0.010	< 0.050	20.6	< 0.20	***531****	< 0.50	0.0037	0.0067	0.0037	0.74	0.84
	2015 08 10	771	1,040	2.1	227	-	8.04	1,310	< 0.0050	***16.5****	< 0.0050	0.053	17.7	0.1	***449****	< 0.25	0.0034	0.0041	0.0034	0.73	0.75
	2015 11 16	702	858	2.4	224	-	8.07	1,190	< 0.0050	***14****	< 0.0050	0.073	14.3	0.13	411	< 0.25	0.0037	0.0043	0.0037	< 0.50	0.74
EV_MCgwS**	2015 01 12	429	576	4,790	313	-	8.06	894	0.101	0.028	0.0057	0.654	50.3	0.366	111	0.27	< 0.0010	0.629	< 0.0010	7.3	2.87
	2015 05 12	427	538	93.0	321	-	7.68	863	0.105	< 0.010	< 0.0020	0.28	48.9	0.367	107	0.27	< 0.0010	0.0766	< 0.0010	2.52	1.89
	2015 08 11	433	563	21.9	315	-	7.91	846	0.113	< 0.025	< 0.0050	0.25	48.9	0.34	93.6	0.25	< 0.0010	0.0185	< 0.0010	1.71	3.91
	2015 11 17	429	548	67.7	309	-	7.97	871	0.115	< 0.025	< 0.0050	0.207	46.2	0.34	128	< 0.25	< 0.0010	0.0264	< 0.0010	1.81	1.54
EV_MCgwD**	2015 01 12	247	397	623	246	-	8.20	546	0.232	0.0056	< 0.0010	0.381	1.6	0.904	59.5	0.060	0.0043	0.952	0.0043	12.9	1.46
	2015 05 12	311	455	141	204	-	7.86	729	0.243	< 0.010	< 0.0020	0.622	7	0.78	153	< 0.10	< 0.0010	0.0973	< 0.0010	3.68	2.85
	2015 08 11	275	578	981	269	-	8.11	596	0.252	< 0.0050	< 0.0010	1.01	2.9	0.857	87.2	< 0.050	0.0035	1.23	0.0035	12.5	1.93
	2015 11 17	267	325	270	259	-	8.30	554	0.27	< 0.0050	< 0.0010	0.491	3.4	0.918	62.2	< 0.050	0.0018	0.253	0.0018	5.39	1.24
BC Standards																					
BCWQG Aquatic Life (AW)[a]		n/a	n/a	n/a	n/a	n/a	6.5 - 9	n/a	1.9 (pH 8.5-<9.0) 5.68 (pH 8.0-<8.5) 12.3 (pH 7.5-<8.0) 19.7 (pH 7.0-<7.5)	3	0.06 (Cl<2) 0.12 (Cl 2-<4) 0.24 (Cl 6-<8) 0.3 (Cl 8-<10) 0.6 (Cl >=10)	n/a	600	1.494 - 2.182 (H>10)	309 (H >75-180) 429 (H >180-250) 429[d]	n/a	n/a	n/a	n/a	n/a[e]	n/a[e]
CSR Aquatic Life (AW)[b]		n/a	n/a	n/a	n/a	n/a	n/a	n/a	11.3 (pH 7.5-<8.0) 18.5 (pH 7.0-<7.5) 3.7 (pH 8.0-<8.5) 1.31 (pH Is Null)	400	0.2 (Cl<2.0) 0.4 (Cl 2.0-<4.0) 0.6 (Cl 4.0-<6.0) 0.8 (Cl 6.0-<8.0) 1 (Cl 8.0-<10.0) 2 (Cl>=10.0)	n/a	1,500	2 (H<50) 3 (H>=50) 2 (H Is Null)	1,000	n/a	n/a	n/a	n/a	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	100	1	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	100	10	n/a	600	1[c]	1,000	n/a	n/a	n/a	n/a	n/a	n/a
CSR Drinking Water (DW)		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10	3.2	n/a	250	1.5	500	n/a	n/a	n/a	n/a	n/a	n/a

Associated ALS file(s): L1567016, L1567695, L1568098, L1570709, L1579365, L1585216, L1586412, L1586803, L1586807, L1587055, L1587338, L1587345, L1587796, L1600339, L1606058, L1611222, L1611919, L1612908, L1617029, L1623601, L1625608, L1626479, L1630418, L1630431, L1630435, L1630436, L1630437, L1630438, L1636950, L1656853, L1657608, L1658136, L1658158, L1671431, L1671435, L1674725, L1678287, L1679229, L1699666, L1704802, L1704810, L1705351, L1707507, L1707777, L1707813, L1708279, L1708643, L1710411, L1713684, L1713686, L1716543, L1716634, L1717638.

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BOLD Concentration greater than CSR Aquatic Life (AW) standard.

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[b] Standard to protect freshwater aquatic life.

[c] Standard varies with type of livestock.

[d] There is no sulphate standard specified for Hardness > 250 mg/L CaCO3, therefore, the standard for Hardness>180-250 mg/L CaCO3 is applied as a conservative comparison.

[e] Background data not available to calculate the long-term median

TABLE 3 (Cont'd): Summary of Analytical Results for Dissolved Inorganics in Groundwater

Sample Location	Sample Date (yyyy mm dd)	Physical Parameters							Nitrogen Parameters				Anions					Geochemical Indicators			
		Hardness mg/L	Total Dissolved Solids mg/L	Total Suspended Solids mg/L	Total Alkalinity (as CaCO3) mg/L	Alkalinity Bicarbonate (as CaCO3) mg/L	pH (lab) pH	Conductivity µS/cm	Ammonia Nitrogen mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Kjeldahl Nitrogen- mg/L	Chloride mg/L	Fluoride mg/L	Sulphate mg/L	Bromide mg/L	Phosphate mg/L	Phosphorous mg/L	Ortho-Phosphate mg/L	Total Organic Carbon mg/L	Dissolved Organic Carbon mg/L
Key Area 9																					
EV_BRS1/EV_BRS2	2015 04 27	-	-	-	-	-	-	-	-	9.86	-	-	-	-	-	-	-	-	-	-	-
	2015 06 29	-	-	-	-	-	-	-	-	**19.6**	-	-	-	-	-	-	-	-	-	-	-
	2015 09 14	628	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2015 09 28	-	-	-	-	-	-	-	-	**13.3**	-	-	-	-	-	-	-	-	-	-	-
EV_WHS1/EV_WHS2	2015 04 27	-	-	-	-	-	-	-	-	7.13	-	-	-	-	-	-	-	-	-	-	-
	2015 06 29	-	-	-	-	-	-	-	-	1.90	-	-	-	-	-	-	-	-	-	-	-
	2015 09 14	410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2015 09 28	-	-	-	-	-	-	-	-	4.17	-	-	-	-	-	-	-	-	-	-	-
EV_RCS1	2015 04 27	-	-	-	-	-	-	-	-	**45.6**	-	-	-	-	-	-	-	-	-	-	-
	2015 06 29	-	-	-	-	-	-	-	-	**49.1**	-	-	-	-	-	-	-	-	-	-	-
	2015 09 14	1,550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2015 09 28	-	-	-	-	-	-	-	-	**49.3**	-	-	-	-	-	-	-	-	-	-	-
RG_DW-03-01	2015 03 11	397	-	-	-	366	-	-	-	0.745	< 0.001	-	29.7	-	37.6	-	-	-	-	-	-
	2015 06 18	375	473	-	-	354	-	-	-	0.551	< 0.002	-	12.4	-	21.1	-	-	-	-	-	-
	Duplicate	386	466	-	-	347	-	-	-	0.563	< 0.002	-	12.3	-	20.9	-	-	-	-	-	-
	QA/QC RPD%	3	1	-	-	2	-	-	-	2	*	-	1	-	1	-	-	-	-	-	-
Key Area 10																					
EV_ECgw	2015 05 14	184	256	11.6	199	-	8.34	431	0.181	0.016	0.0052	0.305	1.2	0.818	29.6	< 0.050	0.0164	0.0436	0.0164	1.22	0.90
	Duplicate	186	260	48.4	179	-	8.31	401	0.173	0.0158	0.0048	0.305	1.1	0.812	29.4	< 0.050	0.0179	0.0423	0.0179	1.32	1.06
	QA/QC RPD%	1	2	123	11	-	< 1	7	5	*	*	0	9	1	1	*	9	3	9	*	*
	2015 08 13	191	244	72.1	208	-	7.92	422	0.146	0.0058	0.0029	0.313	1.5	0.821	28.2	< 0.050	0.0155	0.150	0.0155	2.58	1.17
	2015 11 18	226	278	77.5	222	-	8.21	415	0.119	0.103	0.0309	0.265	1.8	0.805	27.5	< 0.050	0.0203	0.143	0.0203	2.07	1.86
Key Area 11																					
CM_MW1-OB	2015 09 08	507	-	-	-	-	-	-	< 0.0050	1.14	0.0051	-	86.3	0.11	180	-	-	-	-	-	-
	2015 11 24	532	-	-	-	-	-	-	< 0.0050	1.44	< 0.0050	-	70.6	0.11	226	-	-	-	-	-	-
CM_MW1-SH	2015 09 09	175	-	-	-	-	-	-	0.067	< 0.025	< 0.0050	-	72	0.45	7.8	-	-	-	-	-	-
	2015 11 24	158	-	-	-	-	-	-	0.0425	< 0.025	< 0.0050	-	88.4	0.54	9.7	-	-	-	-	-	-
CM_MW1-DP	2015 09 09	244	-	-	-	-	-	-	0.33	0.096	0.0397	-	**126**	0.33	90.6	-	-	-	-	-	-
	2015 11 25	-	-	-	-	-	-	-	0.495	< 0.025	0.0051	-	**208**	0.24	14.7	-	-	-	-	-	-
RG_DW-07-01	2015 03 05	651	881	-	-	280	-	-	-	1.56	< 0.005	-	8.3	-	422	-	-	-	-	-	-
	2015 06 19	524	850	-	-	266	-	-	-	1.21	< 0.005	-	6.8	-	371	-	-	-	-	-	-
	2015 12 09	792	-	-	298	298	7.62	-	-	3.26	0.0072	-	14.3	-	**564**	-	-	-	-	-	-
	Duplicate	825	-	-	-	299	-	-	-	3.19	0.0105	-	14.4	-	**567**	-	-			-	-
	QA/QC RPD%	2	-	-	-	< 1	*	-	-	2	*	-	< 1	-	< 1	-	-			-	-
BC Standards																					
BCWQG Aquatic Life (AW)[a]		n/a	n/a	n/a	n/a	n/a	6.5 - 9	n/a	1.9 (pH 8.5-<9.0) 5.68 (pH 8.0-<8.5) 12.3 (pH 7.5-<8.0) 19.7 (pH 7.0-<7.5)	3	0.06 (Cl<2) 0.12 (Cl 2-<4) 0.24 (Cl 6-<8) 0.3 (Cl 8-<10) 0.6 (Cl >=10)	n/a	600	1.494 - 2.182 (H>10)	309 (H >75-180) 429 (H >180-250) 429[d]	n/a	n/a	n/a	n/a	n/a[e]	n/a[e]
CSR Aquatic Life (AW)[b]		n/a	n/a	n/a	n/a	n/a	n/a	n/a	11.3 (pH 7.5-<8.0) 18.5 (pH 7.0-<7.5) 3.7 (pH 8.0-<8.5) 1.31 (pH Is Null)	400	0.2 (Cl<2.0) 0.4 (Cl 2.0-<4.0) 0.6 (Cl 4.0-<6.0) 0.8 (Cl 6.0-<8.0) 1 (Cl 8.0-<10.0) 2 (Cl>=10.0)	n/a	1,500	2 (H<50) 3 (H>=50) 2 (H Is Null)	1,000	n/a	n/a	n/a	n/a	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	100	1	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	100	10	n/a	600	1[c]	1,000	n/a	n/a	n/a	n/a	n/a	n/a
CSR Drinking Water (DW)		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10	3.2	n/a	250	1.5	500	n/a	n/a	n/a	n/a	n/a	n/a

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Key Area 12																					
EV_ER1gwS	2015 01 13	255	299	< 1.0	173	-	8.20	462	< 0.0050	2.03	< 0.0010	< 0.050	3.6	0.217	71.3	< 0.050	0.0033	0.0033	0.0033	< 0.50	0.55
	2015 05 12	218	279	< 1.0	169	-	8.06	434	< 0.0050	1.79	< 0.0010	< 0.050	3.7	0.199	59	< 0.050	0.0026	0.0034	0.0026	0.72	0.74
	Duplicate	222	288	< 1.0	162	-	8.08	429	< 0.0050	1.79	< 0.0010	0.080	3.6	0.199	59.2	< 0.050	0.0022	0.0034	0.0022	0.77	0.76
	QA/QC RPD%	2	3	*	4	-	< 1	1	*	0	*	*	3	0	< 1	*	*	*	*	*	*
	2015 08 11	235	295	< 1.0	160	-	8.22	430	< 0.0050	2.06	< 0.0010	0.103	2.4	0.226	63.3	< 0.050	0.0047	0.0033	0.0047	< 0.50	0.58
	2015 11 17	261	278	< 1.0	168	-	8.30	477	< 0.0050	2.36	< 0.0010	0.055	3.2	0.21	76.8	< 0.050	0.0035	0.0024	0.0035	< 0.50	0.76
EV_ER1gwD	2015 01 13	245	282	98.3	149	-	8.24	446	< 0.0050	1.71	< 0.0010	< 0.050	3.6	0.239	63.7	< 0.050	0.0092	0.0994	0.0092	0.90	< 0.50
	2015 05 12	224	277	30.2	132	-	8.11	434	< 0.0050	1.59	< 0.0010	0.095	3.6	0.228	55.5	< 0.050	0.0075	0.0132	0.0084	0.83	0.73
	2015 08 11	242	297	6.3	165	-	8.22	427	< 0.0050	1.8	< 0.0010	0.096	2.6	0.24	57.6	< 0.050	0.0084	0.0205	0.0062	< 0.50	0.91
	2015 11 17	256	299	20.5	173	-	8.32	465	< 0.0050	2.01	< 0.0010	0.087	3.6	0.231	67.7	< 0.050	0.0062	0.0353	0.0075	< 0.50	0.66
BC Standards																					
BCWQG Aquatic Life (AW)[a]		n/a	n/a	n/a	n/a	n/a	6.5 - 9	n/a	1.9 (pH 8.5-<9.0) 5.68 (pH 8.0-<8.5) 12.3 (pH 7.5-<8.0) 19.7 (pH 7.0-<7.5)	3	0.06 (Cl<2) 0.12 (Cl 2-<4) 0.24 (Cl 6-<8) 0.3 (Cl 8-<10) 0.6 (Cl >=10)	n/a	600	1.494 - 2.182 (H>10)	309 (H >75-180) 429 (H >180-250) 429[d]	n/a	n/a	n/a	n/a	n/a[e]	n/a[e]
CSR Aquatic Life (AW)[b]		n/a	n/a	n/a	n/a	n/a	n/a	n/a	11.3 (pH 7.5-<8.0) 18.5 (pH 7.0-<7.5) 3.7 (pH 8.0-<8.5) 1.31 (pH Is Null)	400	0.2 (Cl<2.0) 0.4 (Cl 2.0-<4.0) 0.6 (Cl 4.0-<6.0) 0.8 (Cl 6.0-<8.0) 1 (Cl 8.0-<10.0) 2 (Cl>=10.0)	n/a	1,500	2 (H<50) 3 (H>=50) 2 (H Is Null)	1,000	n/a	n/a	n/a	n/a	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	100	1	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	100	10	n/a	600	1[c]	1,000	n/a	n/a	n/a	n/a	n/a	n/a
CSR Drinking Water (DW)		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10	3.2	n/a	250	1.5	500	n/a	n/a	n/a	n/a	n/a	n/a

Associated ALS file(s): L1567016, L1567695, L1568098, L1570709, L1579365, L1585216, L1586412, L1586803, L1586807, L1587055, L1587338, L1587345, L1587796, L1600339, L1606058, L1611222, L1611919, L1612908, L1617029, L1623601, L1625608, L1626479, L1630418, L1630431, L1630435, L1630436, L1630437, L1630438, L1636950, L1656853, L1657608, L1658136, L1658158, L1671431, L1671435, L1674725, L1678287, L1679229, L1699666, L1704802, L1704810, L1705351, L1707507, L1707777, L1707813, L1708279, L1708643, L1710411, L1713684, L1713686, L1716543, L1716634, L1717638.

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.

RPD Denotes relative percent difference.

* RPDs are not calculated where one or more concentrations are less than five times RDL.

** Comparison to BCWQG Aquatic Life (AW) guideline.

BOLD Concentration greater than CSR Aquatic Life (AW) standard.

BOLD* Concentration greater than BCWQG Aquatic Life (AW) guideline.

SHADOW Concentration greater than CSR Irrigation (IW) standard.

INVERSE Concentration greater than CSR Livestock (LW) standard.

SHADED Concentration greater than CSR Drinking Water (DW) standard.

[a] British Columbia Approved Water Quality Guidelines, includes Working Water Quality Guidelines for British Columbia (BCWQG), 2015.

[b] Standard to protect freshwater aquatic life.

[c] Standard varies with type of livestock.

[d] There is no sulphate standard specified for Hardness > 250 mg/L CaCO3, therefore, the standard for Hardness>180-250 mg/L CaCO3 is applied as a conservative comparison.

[e] Background data not available to calculate the long-term median

TABLE 4: Summary of Analytical Results for Metals in Groundwater

Sample Location	Sample Date (yyyy mm dd)	Physical Parameter	Dissolved / Total Metals																																
		Hardness 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 µg/L
Background																																			
FR_HMW5	2015 05 25	178	7.8	0.15	0.34	185	< 0.10	-	51	< 0.0050	0.0847	38.1	-	0.14	< 0.50	< 10	< 0.050	211	20.1	99.2	< 0.0050	0.508	< 0.50	-	< 0.050	0.051	< 0.010	18.3	327	0.014	< 0.10	< 10	0.137	< 0.50	< 3.0
	2015 07 03	181	7	< 0.10	0.18	185	< 0.10	< 0.050	64	< 0.0050	0.0118	39.5	< 0.10	< 0.10	< 0.50	< 10	< 0.050	255	19.9	101	< 0.025	0.31	< 0.50	0.775	< 0.050	< 0.050	< 0.010	18.7	331	< 0.010	< 0.10	< 10	0.089	< 0.50	< 3.0
	2015 10 08	182	15.8	< 0.10	< 0.10	202	< 0.10	< 0.050	52	< 0.0050	0.029	39.7	< 0.10	< 0.10	< 0.50	< 10	< 0.050	249	20.1	79.1	< 0.0050	0.149	< 0.50	0.786	< 0.050	< 0.050	< 0.010	18.1	372	< 0.010	< 0.10	< 10	0.051	< 0.50	< 3.0
Key Area 1																																			
FR_09-01-A	2015 01 22	644	< 3.0	0.23	< 0.10	109	< 0.10	< 0.50	21	0.056	0.057	146	0.14	0.31	< 0.50	< 10	< 0.050	59.3	67.7	< 0.050	< 0.010	0.619	1.17	3.07	***49.3***	***49.6***	< 0.010	4.12	152	< 0.010	< 0.10	17	3.51	< 1.0	< 3.0
	Duplicate	658	< 3.0	0.23	< 0.10	108	< 0.10	< 0.50	21	0.054	0.061	150	0.13	0.31	< 0.50	< 10	< 0.050	61.7	68.5	< 0.050	< 0.010	0.624	1.18	3.08	***49***	***49.6***	< 0.010	4.19	155	< 0.010	< 0.10	16	3.61	< 1.0	< 3.0
	QA/QC RPD%	2	*	*	*	1	*	*	*	4	7	3	*	0	*	*	*	4	1	*	*	1	*	0	1	0	*	2	2	*	*	6	3	*	*
	2015 04 14	735	< 3.0	0.19	< 0.10	120	< 0.10	< 0.050	17	0.0517	0.0522	165	< 0.10	0.37	< 0.50	< 10	< 0.050	63.9	78.2	< 0.10	< 0.0050	0.537	1.31	3.09	*64.5*	*63*	< 0.010	4.66	178	< 0.010	< 0.10	14	4.6	< 0.50	< 3.0
	2015 07 02	601	< 3.0	0.3	< 0.10	89.3	< 0.10	< 0.050	20	0.0217	0.0258	143	< 0.10	< 0.10	< 0.50	< 10	< 0.050	38.9	59.3	< 0.10	< 0.0050	1.96	< 0.50	3.03	*92.2*	*93.3*	< 0.010	1.71	127	< 0.010	< 0.10	< 10	5.37	< 0.50	< 3.0
	2015 10 08	724	< 3.0	0.26	< 0.10	121	< 0.10	< 0.050	28	0.0447	0.0455	171	0.17	0.32	< 0.50	< 10	< 0.050	68.8	72.5	< 0.10	< 0.0050	0.589	1.18	3.36	*66.6*	*69.4*	< 0.010	3.92	167	< 0.010	< 0.10	< 10	3.56	< 0.50	< 3.0
FR_09-01-B	2015 01 22	523	< 3.0	0.14	< 0.10	123	< 0.10	< 0.50	20	0.034	0.04	121	0.15	0.25	< 0.50	< 10	< 0.050	50.7	53.4	0.057	< 0.010	0.798	0.78	2.71	***31.1***	***30.6***	< 0.010	3.49	138	< 0.010	< 0.10	14	2.68	< 1.0	< 3.0
	2015 04 14	596	< 3.0	0.11	< 0.10	134	< 0.10	< 0.050	16	0.039	0.0427	135	0.11	0.33	< 0.50	< 10	< 0.050	52.1	63	< 0.10	< 0.0050	0.65	0.94	2.62	***34.2***	***33***	< 0.010	4.1	157	< 0.010	< 0.10	12	3.23	< 0.50	< 3.0
	2015 07 02	588	< 3.0	0.13	< 0.10	128	< 0.10	< 0.050	18	0.0173	0.022	138	< 0.10	< 0.10	< 0.50	< 10	< 0.050	45.1	59.1	< 0.10	< 0.0050	0.788	< 0.50	2.80	*76.8*	*78.3*	< 0.010	2.19	150	< 0.010	< 0.10	< 10	3.45	< 0.50	< 3.0
	Duplicate	588	< 3.0	0.14	< 0.10	127	< 0.10	< 0.050	18	0.0199	0.0217	139	< 0.10	< 0.10	< 0.50	< 10	< 0.050	44.9	58.5	< 0.10	< 0.0050	0.789	< 0.50	2.79	*71.8*	*78.5*	< 0.010	2.2	150	< 0.010	< 0.10	< 10	3.48	< 0.50	< 3.0
	QA/QC RPD%	0	*	*	*	1	*	*	*	*	*	1	*	*	*	*	*	< 1	1	*	*	< 1	*	0	7	< 1	*	< 1	0	*	*	*	1	*	*
	2015 10 08	588	< 3.0	0.14	< 0.10	144	< 0.10	< 0.050	23	0.0314	0.034	139	0.15	0.37	< 0.50	< 10	< 0.050	62.3	58.7	< 0.10	< 0.0050	0.916	1.22	2.96	***30.2***	***31***	< 0.010	3.86	162	< 0.010	< 0.10	< 10	3.7	< 0.50	< 3.0
FR_GHHW	2015 01 21	672	< 3.0	< 0.10	< 0.10	108	< 0.10	< 0.50	13	0.047	0.045	168	0.12	< 0.10	6.81	< 10	< 0.050	19.3	61.2	0.486	< 0.010	0.352	< 0.50	1.15	*102*	*98.6*	< 0.010	2.22	226	< 0.010	< 0.10	18	2.52	< 1.0	50.2
	2015 04 14	748	< 3.0	< 0.10	< 0.10	110	< 0.10	< 0.050	13	0.0439	0.0511	187	< 0.10	< 0.10	4.66	< 10	< 0.050	20.3	68.1	1.37	< 0.0050	0.306	< 0.50	1.28	*128*	*122*	< 0.010	2.42	265	< 0.010	< 0.10	14	2.99	< 0.50	116
	Duplicate	746	< 3.0	< 0.10	< 0.10	108	< 0.10	< 0.050	13	0.0441	0.051	187	< 0.10	< 0.10	5.53	< 10	< 0.050	21.4	67.6	1.13	< 0.0050	0.355	< 0.50	1.30	*127*	*125*	< 0.010	2.45	270	< 0.010	< 0.10	14	3.08	< 0.50	131
	QA/QC RPD%	< 1	*	*	*	2	*	*	*	< 1	< 1	0	*	*	17	*	*	5	1	19	*	15	*	2	3	2	*	1	2	*	*	0	3	*	12
	2015 07 02	705	< 3.0	< 0.10	< 0.10	127	< 0.10	< 0.050	13	0.0486	0.0469	178	< 0.10	< 0.10	12.1	< 10	0.111	21.6	63.3	0.53	< 0.0050	0.322	< 0.50	1.49	*108*	*108*	< 0.010	2.65	225	< 0.010	< 0.10	< 10	2.63	< 0.50	86.3
	2015 11 05	682	< 3.0	< 0.10	< 0.10	81.8	< 0.10	-	22	0.0421	0.0597	158	-	< 0.10	5.02	< 10	< 0.050	39.8	69.9	2.2	< 0.0050	0.728	0.71	-	*97.5*	*97.1*	< 0.010	2.3	144	< 0.010	< 0.10	13	4.23	< 0.50	105
Key Area 2																																			
LC_PIZDC1308	2015 03 10	295	< 3.0	0.18	0.2	355	< 0.10	< 0.50	12	< 0.010	0.101	78.2	< 0.10	1.64	< 0.50	135	< 0.050	16.4	24.2	151	< 0.010	6.01	3.3	2.37	0.27	0.35	< 0.010	5.93	106	0.059	< 0.10	11	0.915	< 1.0	< 3.0
	2015 06 10	333	< 3.0	0.1	< 0.10	224	< 0.10	< 0.050	11	0.132	0.147	93.3	< 0.10	0.2	0.66	< 10	0.325	7.2	24.4	1.6	< 0.0050	1.22	1.04	1.73	0.686	0.578	< 0.010	1.29	84.8	0.014	< 0.10	< 10	0.967	< 0.50	5.6
	2015 09 22	313	< 3.0	0.12	< 0.10	230	< 0.10	< 0.050	11	0.139	0.153	85.8	< 0.10	0.35	< 0.50	< 10	< 0.050	8.2	24	3.38	< 0.0050	1.3	0.89	1.91	0.375	0.326	< 0.010	1.3	80.9	0.014	< 0.10	< 10	0.898	< 0.50	< 3.0
	Duplicate	316	< 3.0	0.13	< 0.10	230	< 0.10	< 0.050	11	0.146	0.169	86.4	< 0.10	0.35	< 0.50	< 10	< 0.050	8	24.2	3.62	< 0.0050	1.3	0.92	1.95	0.383	0.346	< 0.010	1.33	80.8	0.018	< 0.10	< 10	0.892	< 0.50	3.2
	QA/QC RPD%	1	*	*	*	0	*	*	*	5	10	1	*	0	*	*	*	2	1	7	*	0	*	2	2	6	*	2	< 1	*	*	*	1	*	*
	2015 12 16	326	< 3.0	0.1	< 0.10	242	< 0.10	< 0.050	11	0.125	0.152	90.3	< 0.10	0.37	< 0.50	18	< 0.050	8.7	24.5	18.7	< 0.0050	1.74	1.07	1.86	0.177	0.142	< 0.010	1.76	85.2	0.015	< 0.10	< 10	0.995	< 0.50	< 3.0
LC_PIZDC1307	2015 03 10	189	< 3.0	< 0.10	0.91	**1,400**	< 0.10	< 0.50	22	< 0.010	0.313	40.8	< 0.10	< 0.10	< 0.50	10	< 0.050	80.4	21.1	11.9	< 0.010	**30.4**	< 0.50	4.95	< 0.10	0.24	< 0.010	13.3	134	< 0.010	< 0.10	< 10	0.078	< 1.0	< 3.0
	2015 06 10	193	< 3.0	< 0.10	0.78	**1,340**	< 0.10	< 0.050	24	< 0.0050	0.42	42.6	< 0.10	< 0.10	< 0.50	94	< 0.050	78.4	21	10.9	< 0.0050	**31.1**	< 0.50	5.17	< 0.050	0.3	< 0.010	14.3	137	< 0.010	0.12	< 10	0.054	< 0.50	< 3.0
	2015 09 22	187	< 3.0	< 0.10	1.49	**1,330**	< 0.10	< 0.050	22	< 0.0050	0.361	39.7	< 0.10	< 0.10	< 0.50	1,010	< 0.050	90.4	21.3	11	< 0.0050	**31**	0.58	5.06	0.053	0.238	< 0.010	13.5	131	< 0.010	0.13	< 10	0.057	< 0.50	< 3.0
	2015 12 16	193	< 3.0	< 0.10	1.11	**1,390**	< 0.10	< 0.050	23	< 0.0050	0.247	42.5	< 0.10	< 0.10	< 0.50	235	< 0.050	83.5	21.1	10	< 0.0050	**29.8**	1.14	4.89	< 0.050	0.16	< 0.010	13.6	133	< 0.010	< 0.10	< 10	0.038	< 0.50	3.8
Key Area 3																																			
GH_POTW09	2015 06 08	418	< 3.0	< 0.10	0.21	31.7	< 0.10	< 0.050	22	0.0075	0.0055	98.7	< 0.10	0.17	0.82	< 10	< 0.050	11.7	41.6	187	< 0.0050	2.63	1.05	1.58	1	1.02	< 0.010	7.02	320	0.016	< 0.10	< 10	2.05	< 0.50	< 3.0
	2015 12 21	424	< 3.0	< 0.10	0.29	32.2	< 0.10	< 0.050	20	< 0.0050	0.0074	101	< 0.10	0.18	1.29	< 10	< 0.050	12.1	41.4	192	< 0.0050	2.68	4.40	1.49	1.01	0.999	< 0.010	6.75	338	0.018	< 0.10	10	2.07	< 0.50	9.6
GH_POTW10	2015 06 08	410	< 3.0	< 0.10	0.66	18.1	< 0.10	< 0.050	37	< 0.0050	0.0054	94.3	< 0.10	0.1	< 0.50	< 10	< 0.050	14.9	42.4	46.4	< 0.0050	2.79	0.76	1.67	3.62	3.72	< 0.010	5.02	493	< 0.010	< 0.10	< 10	0.613	< 0.50	< 3.0
	2015 11 04	403	< 3.0	< 0.10	0.71	20.5	< 0.10	< 0.050	37	0.0052	< 0.0050	93.1	< 0.10	0.14	< 0.50	< 10	< 0.050	14.1	41.5	55.5	< 0.0050	2.83	1.05	1.71	3.49	3.7	< 0.010	5.21	498	< 0.010	< 0.10	< 10	0.617	< 0.50	< 3.0
GH_POTW15	2015 06 08	523	< 3.0	< 0.10	0.76	21.7	< 0.10	< 0.050	21	0.0114	0.0279	133	< 0.10	0.23	< 0.50	< 10	< 0.050	13.8	46.5	183	< 0.0050	2.66	3.35	1.51	0.486	0.577	< 0.010	9.96	362	0.018	< 0.10	< 10	1.36	< 0.50	< 3.0
	2015 11 04	499	< 3.0	< 0.10	1.06	21.2	< 0.10	< 0.050	20	0.0201	0.0196	127	< 0.10	0.23	< 0.50	< 10	< 0.050	12.7	43.9	178	< 0.0050	2.57	1.56	1.38	0.216	0.264	< 0.010	9.29	352	0.016	< 0.10	12	1.31	< 0.50	< 3.0
GH_POTW17**	2015 11 04	784	< 3.0	< 0.10	0.2	23.7	< 0.10	< 0.050	25	0.0437	0.0488	196	< 0.10	0.26	< 0.50	< 10	< 0.050	11.4	71.7	121	< 0.0050	1.17	1.51	1.55	***3.4****	***3.68****	< 0.010	6.93	506	0.015	< 0.10	14	1.88	< 0.50	< 3.0
Key Area 4																																			
GH_GA-MW-1	2015 02 17	463	4	0.79	0.59	73.6	< 0.10	< 0.50	**742**	0.103	0.226	98.1	< 0.10	3.12	0.63	111	< 0.050	104	52.9	**877**	< 0.010	**10.2**	6.43	4.77	1.57	0.61	< 0.010	163	5,320	< 0.010	0.23	< 10	3.66	< 1.0	6.7
	2015 04 29	467	3	0.58	1.16	67.4	< 0.10	< 0.050	**853**	0.048	0.1	97	0.27	2.55	0.57	1,110	< 0.050	114	54.5	**1,370**	< 0.0050	**10.5**	5.97	4.29	0.303	0.309	< 0.010	**205**	6,150	0.032	< 0.10	< 10	4.03	< 0.50	3
	2015 09 15	476	< 3.0	0.51	0.97	58.4	< 0.10	< 0.050	**760**	0.0308	0.488	96.5	< 0.10	2.37	< 0.50	559	< 0.050	113	57.1	**1,170**	< 0.0050	9.28	5.45	4.37	0.276	0.694	< 0.010	**209**	6,280	0.019	< 0.10	< 10	3.8	< 0.50	< 3.0
	2015 11 30	506	< 5.0	< 0.50	0.94	51.8	< 0.50	< 0.25	**909**	0.034	0.072	106	< 0.50	2.96	4.8	477	< 0.25	123	58.8	**835**	< 0.0050	**10.2**	5.7	3.97	< 0.25	< 0.25	< 0.050	**225**	6,700	< 0.050	< 0.50	< 10	3.45	< 2.5	< 5.0
GH_GA-MW-2	2015 02 17	326	< 3.0	0.98	0.41	123	< 0.10	< 0.50	20	0.024	0.071	87.5	< 0.10	< 0.10	< 0.50	< 10	< 0.050	14.8	26.1	26.4	< 0.010	**11.7**	1.32	0.952	6.78	5.03	< 0.010	6.72	401	< 0.010	< 0.10	< 10	2.04	< 1.0	3.2
	2015 04 29	330	< 3.0	1.33	0.32	134	< 0.10	< 0.050	21	0.0251	0.152	91.2	< 0.10	< 0.10	< 0.50	< 10	< 0.050	14.6	24.8	36	< 0.0050	**25.3**	2.08	0.961	8.56	7.41	< 0.010	8.07	429	< 0.010	< 0.10	< 10	2.69	< 0.50	< 3.0
	Duplicate	348	-	-	-	-	-	-	-	-	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	8.93	-	-	-	-	-	-	-	-	-	-
	QA/QC RPD%	5	*	*	*	*	*	*	*	*	24	*	*	*	*	*	*	*	*	*	*	*	*	*	*	19	*	*	*	*	*	*	*	*	*	*
	2015 09 15	370	< 3.0	1.33	0.34	119	< 0.10	< 0.050	21	0.02	0.0322	99.2	< 0.10	0.12	< 0.50	< 10	< 0.050	15.1	29.6	35.3	< 0.0050	**26.7**	2.49	1.02	9.13	9.27	< 0.010	7.75	436	< 0.010	< 0.10	< 10	3.12	< 0.50	< 3.0
	2015 11 30	387	< 5.0	0.95	< 0.50	120	< 0.50	< 0.25	< 50	0.027	0.048	103	< 0.50	< 0.50	< 1.0	< 50	< 0.25	17.4	31.2	25.1	< 0.0050	**18.7**	2.5	0.99	***12***	***11.8***	< 0.050	8.71	473	< 0.050	< 0.50	< 10	2.52	< 2.5	< 5.0
GH_GA-MW-3	2015 02 17	757	< 3.0	< 0.10	0.16	151	< 0.10	< 0.50	37	0.018	0.072	186	< 0.10	0.12	< 0.50	684	< 0.050	25.6	71.1	14.6	< 0.010	1.18	1.04	1.46	*85.3*	*81.6*	< 0.010	9.45	964	< 0.010	< 0.10	14	1.1	< 1.0	< 3.0
	2015 04 29	418	< 3.0	< 0.10	1.05	86.1	< 0.10	< 0.050	143	0.0119	0.0647	91.6	< 0.10	< 0.10	< 0.50	111	< 0.050	58.3	45.9	13.5	< 0.0050	0.193	< 0.50	1.75	***29.4***	***19.4***	< 0.010	21.9	1,480	< 0.010	< 0.10	< 10	0.775	< 0.50	< 3.0
	2015 09 15	259	3.4	< 0.10	< 0.10	103	< 0.10	< 0.050	249	< 0.0050	0.3	47.1	0.65	< 0.10	< 0.50	24	< 0.050	95.7	34.4	12.5	< 0.050	1.28	< 0.50	2.51	1.53	1.98	< 0.010	37.8	2,180	< 0.010	< 0.10	< 10	0.055	< 0.50	< 3.0
	2015 11 30	579	5.2	< 0.50	< 0.50	141	< 0.50	< 0.25	126	< 0.025	0.031	133	< 0.50	< 0.50	< 1.0	214	< 0.25	53.7	59.8	13.3	< 0.0050	0.46	< 2.5	1.72	***45.4***	***38.1***	< 0.050	20.2	1,630	< 0.050	< 0.50	< 10	0.834	< 2.5	< 5.0
GH_GA-MW-4	2015 02 17	364	< 3.0	< 0.10	< 0.10	119	< 0.10	< 0.50	19	0.01	0.015	93.8	< 0.10	< 0.10	< 0.50	< 10	< 0.050	42.2	31.4	< 0.050	< 0.010	0.901	< 0.50	0.880	***10.5***	9.27	< 0.010	12.9	322	< 0.010	< 0.10	< 10	1.17	< 1.0	< 3.0
	2015 04 29	373	< 3.0	0.17	0.12	124	< 0.10	< 0.050	21	0.0081	0.0102	91.8	0.17	< 0.10	< 0.50	< 10	< 0.050	48.4	34.9	< 0.10	< 0.0050	1.79	0.51	1.07	***13.2***	***12.5***	< 0.010	15.6	319	< 0.010	< 0.10	< 10	1.81	< 0.50	< 3.0
	2015 09 15	678	< 3.0	0.19	0.1	206	< 0.10	< 0.050	21	0.0164	0.0263	172	0.14	< 0.10	< 0.50	< 10	< 0.050	42.5	60.3	< 0.10	< 0.0050	1.53	0.64	1.32	8.74	8.45	< 0.010	9.86	590	< 0.010	< 0.10	< 10	2.5	< 0.50	< 3.0
	2015 11 30	883	< 5.0	< 0.50	< 0.50	130	< 0.50	< 0.25	< 50	< 0.025	< 0.025	220	< 0.50	< 0.50	< 1.0	< 50	< 0.25	65.3	81	< 0.50	< 0.0050	1.19	< 2.5	1.21	5.31	5.18	< 0.050	9.15	740	< 0.050	< 0.50	< 10	2.76	< 2.5	< 5.0
	Duplicate	884	-	-	-	-	-	-	-	-	< 0.025	220	-	-	-	-	-	-	81.1	-	-	-	-	1.21	-	5.05	-	9.06	-	-	-	-	-	-	-	-
	QA/QC RPD%	< 1	*	*	*	*	*	*	*	*	*	0	*	*	*	*	*	*	< 1	-	*	*	*	*	0	*	3	*	1	*	*	*	*	*	*	*
BC Standards																																			
BCWQG Aquatic Life (AW)[a]		n/a	100	9 (long-term	5	1,000 (long-term	0.13 (long-term)	n/a	1,200	0.887 - 2.8[d]	0.887 - 2.8[d]	n/a	1 (Cr(+6))	110	16 - 79.5[d]	350 (max)	135.6 - 1,197[d]	n/a	n/a	1,260 - 9,620[d]	n/a	2,000	110 (H >120-180) 150 (H>180)	n/a	2	2	3 (H>100)	n/a	n/a	0.8 (long-term)	n/a	n/a	8.5 (long-term)	n/a	77.3 - 583[d]
CSR Aquatic Life (AW)[b]		n/a	n/a	200	50	10,000	53	n/a	50,000	0.1 (H 0-30) 0.5 (H >90-150) 0.6 (H >150-210) 0.6 (H >210) 0.1 (H Is Null)	0.1 (H 0-30) 0.5 (H >90-150) 0.6 (H >150-210) 0.6 (H >210) 0.1 (H Is Null)	n/a	10[f]	40	20 (H 0-50) 60 (H >125-150) 70 (H >150-175) 80 (H >175-200) 90 (H >200) 20 (H Is Null)	n/a	40 (H<50) 60 (H 100-<200) 110 (H 200-<300) 160 (H>=300) 40 (H Is Null)	n/a	n/a	n/a	1	10,000	250 (H 0-60) 1,100 (H 120-180) 1,500 (H >180) 250 (H Is Null)	n/a	10	10	0.5 (H <100) 15 (H >100) 0.5 (H Is Null)	n/a	n/a	3	n/a	1,000	3,000	n/a	75 (H 0-90) 900 (H 100-200) 1,650 (H 200-300) 2,400 (H 300-400) 2,400 (H >400) 75 (H Is Null)
CSR Irrigation Watering (IW)		n/a	5,000	n/a	100	n/a	100	n/a	500 - 6,000[e]	5	5	n/a	5	50	200	5,000	200	2,500	n/a	200	1	10 - 30[g]	200	n/a	20[h]	20[h]	n/a	n/a	n/a	n/a	n/a	n/a	10	100	1,000 (pH <6.0)[i]
CSR Livestock Watering (LW)		n/a	5,000	n/a	25	n/a	100	n/a	5,000	80	80	1,000	50[f]	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

Associated ALS file(s): District of Sparwood, L1567016, L1567695, L1568098, L1570709, L1579365, L1585216, L1586412, L1586803, L1586807, L1587055, L1587338, L1587345, L1587796, L1600339, L1606058, L1611222, L1611919, L1612908, L1617029, L1623601, L1625608, L1626479, L1630418, L1630431, L1630435, L1630436, L1630437, L1630438, L1636950, L1656853, L1657608, L1658136, L1658158, L1671431, L1671435, L1674725, L1678287, L1679229, L1699666, L1704802, L1704810, L1705351, L1707507, L1707777, L1707813, L1708279, L1708643, L1710411, L1713684, L1713686, L1716543, L1716634, L1717638.

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.

RPD Denotes relative percent difference.

* RPDs are not calculated where one or more concentrations are less than five times RDL.

** Comparison to BCWQG Aquatic Life (AW) guideline.

BOLD Concentration greater than CSR Aquatic Life (AW) standard.

BOLD* Concentration greater than BCWQG Aquatic Life (AW) guideline.

SHADOW Concentration greater than CSR Irrigation (IW) standard.

INVERSE Concentration greater than CSR Livestock (LW) standard.

SHADED Concentration greater than CSR Drinking Water (DW) standard.

[a] British Columbia Approved Water Quality Guidelines, includes Working Water Quality Guidelines for British Columbia (BCWQG), 2015.

[b] Standard to protect freshwater aquatic life.

[c] Reported metals values are Total values.

[d] Guideline varies with hardness.

[e] Standard varies with crop.

[f] Individual standards exist for Cr +3 and Cr +6. Reported value represents more stringent standard.

[g] Standard varies with crop, soil drainage and Mo:Cu ratio.

[h] Individual standards exist for continuous and intermittent applications on crops. Reported value denotes more stringent standard.

[i] Standard varies with soil pH. Zinc IW guideline of 1,000 mg/L (soil pH < 6) was used due to no soil pH values.

TABLE 4 (Cont'd): Summary of Analytical Results for Metals in Groundwater

Sample Location	Sample Date (yyyy mm dd)	Physical Parameter	Dissolved / Total Metals																																
		Hardness 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 µg/L
Key Area 4 (Cont'd)																																			
GH_MW-ERSC-1	2015 02 17	299	< 3.0	0.12	0.18	126	< 0.10	< 0.50	< 10	0.039	1.01	81	< 0.10	0.12	< 0.50	< 10	< 0.050	3.73	23.4	24.6	< 0.010	5.53	1.13	1.21	1.58	3.75	< 0.010	3.24	165	0.011	< 0.10	< 10	0.662	< 1.0	3.5
	2015 04 29	409	< 3.0	< 0.10	0.11	134	< 0.10	< 0.050	10	0.0252	0.0385	101	0.14	< 0.10	< 0.50	< 10	< 0.050	9.5	37.8	0.63	< 0.0050	1.34	0.53	0.867	***28.2***	***25.4***	< 0.010	5	302	< 0.010	< 0.10	< 10	1.27	< 0.50	< 3.0
	2015 09 15	320	< 3.0	0.16	0.42	153	< 0.10	< 0.050	45	0.0164	0.0602	87	< 0.10	0.4	< 0.50	164	< 0.050	28.3	24.9	120	< 0.0050	5.32	2.02	2.14	0.646	0.921	< 0.010	10.4	396	0.017	< 0.10	< 10	0.659	< 0.50	5.2
	2015 11 30	329	< 5.0	< 0.50	< 0.50	111	< 0.50	< 0.25	< 50	0.029	0.194	91.3	< 0.50	< 0.50	< 1.0	< 50	< 0.25	7.1	24.6	32	< 0.0050	5.02	< 2.5	0.92	1.08	1.23	< 0.050	3.15	237	< 0.050	< 0.50	< 10	0.783	< 2.5	< 5.0
RG_DW-01-03[c]	2015 03 09	181	-	-	-	-	-	-	-	-	< 0.2	51.4	-	-	-	-	-	-	12.7	-	-	-	-	0.428	2.98	2.7	-	1.2	-	-	-	-	-	-	-
	2015 06 18	174	-	-	-	-	-	-	-	-	< 0.005	49.3	-	-	-	-	-	-	12.4	-	-	-	-	0.399	3.03	2.95	-	1.13	-	-	-	-	-	-	-
	2015 11 24	184	-	-	-	-	-	-	-	-	0.0053	53.1	-	-	-	-	-	-	12.5	-	-	-	-	0.412	2.91	2.53	-	1.15	-	-	-	-	-	-	-
RG_DW-01-07[c]	2015 03 11	414	-	-	-	-	-	-	-	-	< 0.2	108	-	-	-	-	-	-	35.2	-	-	-	-	0.847	1.85	1.7	-	3.68	-	-	-	-	-	-	-
	2015 06 18	366	-	-	-	-	-	-	-	-	0.0286	92.8	-	-	-	-	-	-	32.7	-	-	-	-	0.814	1.8	1.79	-	3.62	-	-	-	-	-	-	-
	2015 11 24	391	-	-	-	-	-	-	-	-	0.0367	101	-	-	-	-	-	-	34	-	-	-	-	0.833	2.09	1.89	-	3.98	-	-	-	-	-	-	-
Key Area 6																																			
LC_PIZP1101	2015 03 14	138	< 3.0	< 0.10	1.03	458	< 0.10	< 0.50	19	< 0.010	0.6	29.9	< 0.10	0.22	< 0.50	37	< 0.050	9.01	15.4	176	< 0.010	**12.1**	< 0.50	0.761	< 0.10	1.78	< 0.010	17.1	211	< 0.010	< 0.10	< 10	1.6	< 1.0	< 3.0
	2015 06 12	138	3.4	< 0.10	1.03	494	< 0.10	< 0.050	19	< 0.0050	0.234	31.3	< 0.10	0.23	< 0.50	61	< 0.050	9.5	14.6	181	< 0.0050	**12.5**	0.58	0.758	< 0.050	0.618	< 0.010	17.5	216	< 0.010	0.11	< 10	1.57	< 0.50	< 3.0
	2015 09 24	142	9.7	< 0.10	1.07	469	< 0.10	< 0.050	19	< 0.0050	1.04	31.2	< 0.10	0.22	< 0.50	< 10	< 0.050	10.1	15.5	194	< 0.0050	**11.3**	< 0.50	0.967	< 0.050	2.53	< 0.010	17.3	203	0.012	< 0.10	< 10	1.52	< 0.50	< 3.0
	2015 12 18	133	2.6	< 0.050	1.13	456	< 0.050	-	21.3	< 0.0050	0.0379	29.3	< 0.10	0.265	< 0.20	243	< 0.030	10.7	14.5	196	< 0.0050	**23.1**	1.1	0.810	< 0.050	0.129	< 0.010	18.6	204	< 0.010	< 0.050	< 1.0	1.68	< 0.50	< 1.0
Key Area 7																																			
EV_GV3gw	2015 01 13	360	< 3.0	< 0.10	< 0.10	17.3	< 0.10	< 0.50	12	< 0.010	0.014	88.2	0.22	< 0.10	< 0.50	< 10	< 0.050	14.9	34	0.064	< 0.010	0.844	< 0.50	0.980	3.76	3.43	< 0.010	3.16	541	< 0.010	< 0.10	12	1.66	< 1.0	< 3.0
	2015 05 15	350	< 3.0	< 0.10	< 0.10	14.8	< 0.10	< 0.050	12	0.0062	0.008	86	0.19	< 0.10	< 0.50	< 10	< 0.050	15.9	32.9	0.24	0.0086	0.882	< 0.50	0.849	3.35	3.15	< 0.010	2.84	552	< 0.010	< 0.10	< 10	1.68	< 0.50	< 3.0
	2015 08 11	357	< 3.0	< 0.10	< 0.10	16.3	< 0.10	< 0.050	12	0.0091	0.0066	88.4	0.22	< 0.10	< 0.50	< 10	< 0.050	15.7	33	0.21	< 0.0050	0.86	< 0.50	0.987	3.56	3.19	< 0.010	3.09	545	< 0.010	< 0.10	< 10	1.69	< 0.50	< 3.0
	2015 11 18	351	< 3.0	< 0.10	< 0.10	18	< 0.10	< 0.050	11	0.0106	0.0087	87.4	0.21	< 0.10	< 0.50	< 10	< 0.050	15.8	32.2	0.17	< 0.0050	1.27	0.52	1.00	3.59	3.52	< 0.010	3.23	534	< 0.010	< 0.10	11	1.74	< 0.50	< 3.0
RG_DW-02-20[c]	2015 03 10	237	-	-	-	-	-	-	-	-	< 0.2	65.4	-	-	-	-	-	-	18	-	-	-	-	0.594	***13.6***	***12***	-	2.35	-	-	-	-	-	-	-
	Duplicate	233	-	-	-	-	-	-	-	-	< 0.2	63.8	-	-	-	-	-	-	17.9	-	-	-	-	0.567	***13.3***	***12.1***	-	2.3	-	-	-	-	-	-	-
	QA/QC RPD%	2	-	-	-	-	-	-	-	-	*	*	-	-	*	-	-	-	*	-	-	-	-	*	2	1	-	*	-	-	-	-	-	-	-
	2015 06 18	229	-	-	-	-	-	-	-	-	0.0057	60.9	-	-	-	-	-	-	18.7	-	-	-	-	0.585	***13.1***	***12***	-	2.38	-	-	-	-	-	-	-
	2015 11 26	241	-	-	-	-	-	-	-	-	0.0096	66.5	-	-	-	-	-	-	18.2	-	-	-	-	0.584	***10.3***	9.79	-	2.26	-	-	-	-	-	-	-
Key Area 8																																			
EV_LSgw**	2015 01 14	583	< 3.0	< 0.10	0.61	209	< 0.10	< 0.50	33	0.016	0.026	110	< 0.10	2.27	< 0.50	***2,740****	< 0.050	48	75.1	**1,410**	< 0.010	3.37	7.05	2.76	0.14	0.12	< 0.010	9.25	460	0.069	< 0.10	11	1.23	< 1.0	< 3.0
	Duplicate	582	< 3.0	< 0.10	0.62	216	< 0.10	< 0.50	31	0.019	0.024	110	< 0.10	2.36	< 0.50	***2,880****	< 0.050	43.6	74.9	**1,470**	< 0.010	3.32	7.26	2.78	0.14	0.14	< 0.010	9.34	444	0.072	< 0.10	11	1.16	< 1.0	< 3.0
	QA/QC RPD%	< 1	*	*	2	3	*	*	6	*	*	0	*	4	*	5	*	10	< 1	4	*	1	3	1	*	*	*	1	4	4	*	0	6	*	*
	2015 05 14	582	< 3.0	< 0.10	0.4	212	< 0.10	< 0.050	39	0.0236	0.0334	113	< 0.10	1.86	< 0.50	***1,520****	< 0.050	55.6	73	**1,790**	< 0.0050	3.31	7.12	2.81	0.104	0.08	< 0.010	9.18	494	0.067	< 0.10	< 10	1.38	< 0.50	< 3.0
	2015 08 12	640	< 3.0	< 0.10	1.43	294	< 0.10	< 0.050	61	0.0176	0.0271	126	< 0.10	2.79	< 0.50	***4,160****	< 0.050	65.9	78.8	**1,720**	0.0056	3.77	8.13	3.70	0.136	0.114	< 0.010	10.3	555	0.09	< 0.10	< 10	0.961	< 0.50	< 3.0
	2015 11 19	594	< 3.0	0.12	0.77	266	< 0.10	< 0.050	35	0.0102	0.109	114	< 0.10	1.82	< 0.50	***1,940****	< 0.050	49	75.3	**1,750**	< 0.0050	4.59	6.71	3.49	0.101	0.121	< 0.010	10.3	486	0.072	< 0.10	12	1.56	< 0.50	< 3.0
EV_OCgw**	2015 01 14	154	3.5	< 0.10	1.69	57.4	< 0.10	< 0.50	114	< 0.010	0.121	30.2	< 0.10	< 0.10	< 0.50	29	< 0.050	20.8	19.1	84.1	< 0.010	**13**	< 0.50	1.70	< 0.10	0.15	< 0.010	36.9	352	< 0.010	< 0.10	< 10	0.964	< 1.0	< 3.0
	2015 05 14	149	3.1	< 0.10	1.19	54	< 0.10	< 0.050	123	< 0.0050	0.0143	29.8	< 0.10	< 0.10	< 0.50	111	< 0.050	24	18.2	110	< 0.0050	**14.8**	< 0.50	1.61	< 0.050	< 0.050	< 0.010	38.9	380	< 0.010	0.16	< 10	1.29	< 0.50	< 3.0
	2015 08 10	155	3.6	< 0.10	1.25	54.4	< 0.10	< 0.050	126	< 0.0050	0.0267	29.9	< 0.10	0.17	< 0.50	40	< 0.050	29	19.5	108	0.0063	**15.3**	0.79	1.88	0.207	< 0.050	< 0.010	45.7	381	< 0.010	0.16	< 10	1.32	< 0.50	< 3.0
	2015 11 19	154	6.8	< 0.10	1.17	53.9	< 0.10	< 0.050	113	< 0.0050	0.0132	30	< 0.10	0.11	< 0.50	170	< 0.050	25.4	19.3	98.9	< 0.0050	**15**	< 0.50	1.77	0.069	< 0.050	< 0.010	47.5	376	< 0.010	0.11	< 10	1.16	< 0.50	< 3.0
Key Area 9																																			
EV_BCgw**	2015 01 13	609	< 3.0	0.11	0.11	128	< 0.10	< 0.50	15	0.049	0.052	151	0.12	< 0.10	< 0.50	< 10	< 0.050	21.5	56.5	< 0.050	< 0.010	0.692	< 0.50	1.29	*67.3***	*63.2***	< 0.010	6.24	277	0.015	< 0.10	14	1.49	< 1.0	< 3.0
	2015 05 11	824	< 3.0	0.12	0.11	64.7	< 0.10	< 0.050	21	0.0463	0.066	191	0.15	< 0.10	< 0.50	< 10	< 0.050	31.2	84.3	0.74	< 0.0050	0.747	1.78	1.53	*97.6***	*97.6***	< 0.010	8.16	330	0.019	< 0.10	< 10	1.94	< 0.50	< 3.0
	2015 08 10	771	< 3.0	0.12	0.13	54.1	< 0.10	< 0.050	20	0.0599	0.0753	189	< 0.10	0.11	< 0.50	< 10	< 0.050	36.8	72.3	0.18	< 0.0050	0.711	0.71	1.51	*73.6***	*71.7***	< 0.010	7.79	302	0.017	< 0.10	< 10	1.81	< 0.50	< 3.0
	2015 11 16	702	14.7	0.12	0.13	50.7	< 0.10	< 0.050	19	0.0548	0.0566	170	0.13	0.12	< 0.50	16	< 0.050	31.6	67.2	0.98	< 0.0050	2.52	1.09	1.37	*59.7***	*61***	< 0.010	6.32	259	0.017	< 0.10	16	1.8	< 0.50	< 3.0
EV_MCgwS**	2015 01 12	429	< 3.0	0.17	2.88	31	< 0.10	< 0.50	33	< 0.010	0.957	104	< 0.10	< 0.10	< 0.50	***3,030****	< 0.050	30.7	41	95.3	< 0.010	6.19	0.67	2.64	< 0.10	1.11	< 0.010	31.3	399	< 0.010	< 0.10	15	1.5	< 1.0	< 3.0
	2015 05 12	427	< 3.0	< 0.10	1.9	16.1	< 0.10	< 0.050	28	< 0.0050	0.0604	100	< 0.10	< 0.10	< 0.50	***3,600****	< 0.050	28.6	42.9	93.9	< 0.0050	3.95	< 0.50	2.39	< 0.050	0.076	< 0.010	26.9	358	< 0.010	< 0.10	< 10	1.4	< 0.50	< 3.0
	2015 08 11	433	< 3.0	< 0.10	1.91	17.4	< 0.10	< 0.050	29	< 0.0050	0.0187	110	< 0.10	< 0.10	< 0.50	***3,630****	< 0.050	30.7	38.7	96.6	< 0.0050	3.39	< 0.50	2.54	< 0.050	0.053	< 0.010	21.6	335	< 0.010	< 0.10	< 10	1.45	< 0.50	< 3.0
	2015 11 17	429	< 3.0	0.14	1.64	19.6	< 0.10	< 0.050	28	< 0.0050	0.0236	109	< 0.10	< 0.10	< 0.50	***3,060****	< 0.050	29.1	38	100	< 0.0050	4.32	< 0.50	2.36	< 0.050	0.066	< 0.010	33.8	330	< 0.010	< 0.10	13	1.93	< 0.50	< 3.0
EV_MCgwD**	2015 01 12	247	14.9	< 0.10	1.47	83.1	< 0.10	< 0.50	80	< 0.010	1.04	55.1	< 0.10	0.77	< 0.50	***431****	< 0.050	7.8	26.6	**652**	< 0.010	9.56	1.89	1.43	< 0.10	0.93	< 0.010	23.9	491	< 0.010	< 0.10	< 10	2.1	< 1.0	< 3.0
	2015 05 12	311	4.1	< 0.10	1.31	97.1	< 0.10	< 0.050	66	< 0.0050	0.134	65.7	0.14	0.52	< 0.50	***1,140****	< 0.050	8.8	35.7	**795**	< 0.0050	5.31	12.5	1.66	0.072	0.168	< 0.010	39.4	560	< 0.010	0.1	< 10	2.78	< 0.50	< 3.0
	2015 08 11	275	< 3.0	< 0.10	1.27	92	< 0.10	< 0.050	75	< 0.0050	1.15	62.3	< 0.10	0.59	< 0.50	***618****	< 0.050	8.5	29.1	**682**	< 0.0050	8.46	1.36	1.55	0.059	1.16	< 0.010	32.3	509	< 0.010	< 0.10	< 10	2.09	< 0.50	< 3.0
	2015 11 17	267	35.5	0.11	1.48	84.6	< 0.10	< 0.050	69	< 0.0050	0.242	60.2	< 0.10	0.53	< 0.50	***535****	< 0.050	8.9	28.3	**437**	< 0.0050	**10.3**	1.43	1.36	0.123	0.223	< 0.010	25.5	484	< 0.010	< 0.10	< 10	2.73	< 0.50	< 3.0
EV_BRS1/EV_BRS2	2015 04 27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***51.4***	-	-	-	-	-	-	-	-
	2015 06 29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***51.6***	-	-	-	-	-	-	-	-
	2015 09 14	628	< 1.0	< 0.10	< 0.10	71.1	< 0.020	-	42	-	0.052	161	< 50[a]	0.94	197	< 10	1.77	63.2	54.8	6.41	< 0.0050	0.67	4.5	2.07	-	***62.6***	< 0.010	44.5	342	< 0.010	0.60	< 0.30	1.67	< 0.50	50
	2015 09 28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***60.1***	-	-	-	-	-	-	-	-
V_WHS1/EV_WHS2	2015 04 27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***25.9***	-	-	-	-	-	-	-	-
	2015 06 29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.88	-	-	-	-	-	-	-	-
	2015 09 14	410	< 1.0	< 0.10	< 0.10	180	< 0.020	-	< 10	-	0.145	101	< 50[a]	0.27	***598***	198	7.68	26.0	38.2	24.3	< 0.0050	1.36	3.1	1.51	-	***27.3***	< 0.010	4.05	242	< 0.010	< 0.10	< 0.30	1.54	< 0.50	253
	2015 09 28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***20.1***	-	-	-	-	-	-	-	-
BC Standards																																			
BCWQG Aquatic Life (AW)[a]		n/a	100	9 (long-term	5	1,000 (long-term	0.13 (long-term)	n/a	1,200	0.887 - 2.8[d]	0.887 - 2.8[d]	n/a	1 (Cr(+6))	110	16 - 79.5[d]	350 (max)	135.6 - 1,197[d]	n/a	n/a	1,260 - 9,620[d]	n/a	2,000	110 (H >120-180) 150 (H>180)	n/a	2	2	3 (H>100)	n/a	n/a	0.8 (long-term)	n/a	n/a	8.5 (long-term)	n/a	77.3 - 583[d]
CSR Aquatic Life (AW)[b]		n/a	n/a	200	50	10,000	53	n/a	50,000	0.1 (H 0-30) 0.5 (H >90-150) 0.6 (H >150-210) 0.6 (H >210) 0.1 (H Is Null)	0.1 (H 0-30) 0.5 (H >90-150) 0.6 (H >150-210) 0.6 (H >210) 0.1 (H Is Null)	n/a	10[f]	40	20 (H 0-50) 60 (H >125-150) 70 (H >150-175) 80 (H >175-200) 90 (H >200) 20 (H Is Null)	n/a	40 (H<50) 60 (H 100-<200) 110 (H 200-<300) 160 (H>=300) 40 (H Is Null)	n/a	n/a	n/a	1	10,000	250 (H 0-60) 1,100 (H 120-180) 1,500 (H >180) 250 (H Is Null)	n/a	10	10	0.5 (H <100) 15 (H >100) 0.5 (H Is Null)	n/a	n/a	3	n/a	1,000	3,000	n/a	75 (H 0-90) 900 (H 100-200) 1,650 (H 200-300) 2,400 (H 300-400) 2,400 (H >400) 75 (H Is Null)
CSR Irrigation Watering (IW)		n/a	5,000	n/a	100	n/a	100	n/a	500 - 6,000[e]	5	5	n/a	5	50	200	5,000	200	2,500	n/a	200	1	10 - 30[g]	200	n/a	20[h]	20[h]	n/a	n/a	n/a	n/a	n/a	n/a	10	100	1,000 (pH <6.0)[i]
CSR Livestock Watering (LW)		n/a	5,000	n/a	25	n/a	100	n/a	5,000	80	80	1,000	50[f]	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

Associated ALS file(s): District of Sparwood, L1567016, L1567695, L1568098, L1570709, L1579365, L1585216, L1586412, L1586803, L1586807, L1587055, L1587338, L1587345, L1587796, L1600339, L1606058, L1611222, L1611919, L1612908, L1617029, L1623601, L1625608, L1626479, L1630418, L1630431, L1630435, L1630436, L1630437, L1630438, L1636950, L1656853, L1657608, L1658136, L1658158, L1671431, L1671435, L1674725, L1678287, L1679229, L1699666, L1704802, L1704810, L1705351, L1707507, L1707777, L1707813, L1708279, L1708643, L1710411, L1713684, L1713686, L1716543, L1716634, L1717638.

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.

RPD Denotes relative percent difference.

* RPDs are not calculated where one or more concentrations are less than five times RDL.

** Comparison to BCWQG Aquatic Life (AW) guideline.

BOLD Concentration greater than CSR Aquatic Life (AW) standard.

BOLD* Concentration greater than BCWQG Aquatic Life (AW) guideline.

SHADOW Concentration greater than CSR Irrigation (IW) standard.

INVERSE Concentration greater than CSR Livestock (LW) standard.

SHADED Concentration greater than CSR Drinking Water (DW) standard.

[a] British Columbia Approved Water Quality Guidelines, includes Working Water Quality Guidelines for British Columbia (BCWQG), 2015.

[b] Standard to protect freshwater aquatic life.

[c] Reported metals values are Total values.

[d] Guideline varies with hardness.

[e] Standard varies with crop.

[f] Individual standards exist for Cr +3 and Cr +6. Reported value represents more stringent standard.

[g] Standard varies with crop, soil drainage and Mo:Cu ratio.

[h] Individual standards exist for continuous and intermittent applications on crops. Reported value denotes more stringent standard.

[i] Standard varies with soil pH. Zinc IW guideline of 1,000 mg/L (soil pH < 6) was used due to no soil pH values.

TABLE 4 (Cont'd): Summary of Analytical Results for Metals in Groundwater

Sample Location	Sample Date (yyyy mm dd)	Physical Parameter	Dissolved / Total Metals																																
		Hardness 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 µg/L
Key Area 9																																			
EV_RCS1[c]	2015 04 27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***224***	-	-	-	-	-	-	-	-	-
	2015 06 29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***255***	-	-	-	-	-	-	-	-	-
	2015 09 14	1,550	< 1.0	0.62	< 0.10	49.7	< 0.020	-	54	-	0.452	322	< 50[a]	5.67	***393***	< 10	4.17	97.4	**181**	86.3	< 0.0050	1.47	76.0	3.81	-	***216***	< 0.010	5.89	360	< 0.010	2.00	< 0.30	7.05	< 0.50	**2,020**
	2015 09 28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***222***	-	-	-	-	-	-	-	-	-
RG_DW-03-01[c]	2015 03 11	397	-	-	-	-	-	-	-	-	< 0.2	110	-	-	-	-	-	-	29.5	-	-	-	-	1.9	0.17	< 1	-	11.7	-	-	-	-	-	-	-
	2015 06 18	375	-	-	-	-	-	-	-	-	0.476	100	-	-	-	-	-	-	30.2	-	-	-	-	2.07	0.211	0.222	-	12.9	-	-	-	-	-	-	-
	Duplicate	386	-	-	-	-	-	-	-	-	-	104	-	-	-	-	-	-	31	-	-	-	-	2.14	-	-	-	13.3	-	-	-	-	-	-	-
	QA/QC RPD%	3	-	-	-	-	-	-	-	-	*	*	-	-	-	-	-	-	3	-	-	-	-	*	-	-	-	*	-	-	-	-	-	-	-
Key Area 10																																			
EV_ECgw	2015 05 14	184	< 3.0	0.14	0.38	42.3	< 0.10	< 0.050	108	0.012	0.0388	43.1	< 0.10	0.3	< 0.50	< 10	< 0.050	10.7	18.5	173	< 0.0050	**12.3**	1.34	0.960	0.13	0.138	< 0.010	21.1	455	0.105	< 0.10	< 10	1.51	< 0.50	< 3.0
	Duplicate	186	< 3.0	0.15	0.38	41	< 0.10	< 0.050	103	0.0167	0.0496	43.7	< 0.10	0.28	< 0.50	< 10	< 0.050	10.6	18.6	163	0.0063	**12**	1.33	0.932	0.115	0.12	< 0.010	20.4	449	0.104	< 0.10	< 10	1.5	< 0.50	< 3.0
	QA/QC RPD%	1	*	*	*	3	*	*	5	*	24	1	*	7	*	*	*	1	1	6	*	2	*	3	*	*	*	3	1	1	*	*	1	*	*
	2015 08 13	191	3.8	< 0.10	0.38	46.1	< 0.10	< 0.050	112	< 0.0050	0.105	44.2	< 0.10	0.19	< 0.50	17	< 0.050	10	19.5	190	< 0.0050	**11.6**	0.73	1.04	0.178	0.151	< 0.010	22.1	431	< 0.010	< 0.10	< 10	1.48	< 0.50	< 3.0
	2015 11 18	226	809	0.1	0.6	71.1	< 0.10	< 0.050	105	0.131	0.158	55.8	1.27	0.78	1.53	589	0.617	11.4	21	**270**	0.0145	**10.9**	2.32	1.37	0.156	0.309	< 0.010	22.6	471	0.07	< 0.10	142	1.53	2.31	6.3
Key Area 11																																			
CM_MW1-OB	2015 09 08	507	1.4	0.13	0.13	103	< 0.020	< 0.050	39	0.0474	0.0503	138	0.31	0.17	0.22	< 10	< 0.050	19.4	39.2	19.4	< 0.0050	0.876	0.73	1.99	3.3	2.94	< 0.010	46.1	336	0.02	< 0.10	< 0.30	1.4	< 0.50	1.3
	2015 11 24	532	1.1	< 0.10	0.14	94.7	< 0.020	< 0.050	32	0.0751	0.0855	146	0.32	< 0.10	< 0.20	< 10	< 0.050	19.3	40.8	5.64	< 0.0050	0.5	0.77	1.71	2.95	2.79	< 0.010	37.9	329	0.017	< 0.10	< 0.30	1.27	< 0.50	2.8
CM_MW1-SH	2015 09 09	175	3.2	0.38	0.88	701	< 0.020	< 0.050	61	0.0241	0.0263	43.5	-	0.28	0.24	< 10	< 0.050	15.2	16	117	< 0.0050	**15.9**	0.92	2.03	0.252	0.185	< 0.010	75.9	408	0.038	< 0.10	< 0.30	0.954	< 0.50	2.8
	2015 11 24	158	2.2	< 0.10	1.56	449	< 0.020	< 0.050	70	< 0.0050	< 0.0050	38.5	-	0.65	< 0.20	385	< 0.050	17.3	15	**289**	< 0.0050	**23.1**	< 0.50	2.06	< 0.050	< 0.050	< 0.010	93.8	383	< 0.010	< 0.10	< 0.30	0.546	< 0.50	3.5
CM_MW1-DP	2015 09 09	244	7.1	5.85	1.36	782	< 0.020	< 0.050	131	0.0106	0.0335	62.7	-	0.17	1.29	< 10	< 0.050	312	21.4	36.3	< 0.0050	**11.4**	1.52	7.82	1.92	1.66	< 0.010	160	963	0.015	0.83	< 0.30	2.23	< 0.50	9.7
	2015 11 25	-	6.7	2.35	1.8	**3,200**	< 0.10	< 0.050	227	0.012	0.0257	36.4	0.12	0.76	< 0.50	< 10	< 0.050	544	17.2	**279**	< 0.0050	7.76	0.89	6.66	0.115	0.164	< 0.010	**206**	1,620	0.012	0.16	< 10	1.48	< 0.50	4.9
RG_DW-07-01	2015 03 05	651	-	-	-	-	-	-	-	-	< 0.2	167	-	-	-	-	-	-	57	-	-	-	-	1.85	4.44	4.1	-	24.8	-	-	-	-	-	-	-
	2015 06 19	524	-	-	-	-	-	-	-	-	0.0205	132	-	-	-	-	-	-	47.5	-	-	-	-	1.74	4.56	4.29	-	18.9	-	-	-	-	-	-	-
	2015 12 09	792	-	-	-	-	-	-	-	-	0.0386	193	-	-	-	-	-	-	75.4	-	-	-	-	2.2	7.36	6.79	-	28.5	-	-	-	-	-	-	-
	Duplicate	825	-	-	-	-	-	-	-	-	0.0364	200	-	-	-	-	-	-	79.1	-	-	-	-	2.3	7.27	7.09	-	29.9	-	-	-	-	-	-	-
	QA/QC RPD%	4	-	-	-	-	-	-	-	-	6	4	-	-	-	-	-	-	5	-	-	-	-	4	1	4	-	5	-	-	-	-	-	-	-
Key Area 12																																			
EV_ER1gwS	2015 01 13	255	< 3.0	< 0.10	< 0.10	96.9	< 0.10	< 0.50	< 10	< 0.010	< 0.010	68	0.26	< 0.10	< 0.50	< 10	< 0.050	5.23	20.6	< 0.050	< 0.010	1.19	< 0.50	0.577	***10.4***	***10.1***	< 0.010	2.87	176	< 0.010	< 0.10	< 10	1.12	< 1.0	< 3.0
	2015 05 12	218	7.6	< 0.10	0.11	105	< 0.10	< 0.050	< 10	0.008	0.0084	58.4	0.23	< 0.10	< 0.50	< 10	< 0.050	6.4	17.5	< 0.10	< 0.0050	1.11	< 0.50	0.651	9.16	9.17	< 0.010	3.44	176	< 0.010	< 0.10	< 10	0.952	< 0.50	< 3.0
	Duplicate	222	< 3.0	< 0.10	0.14	93.9	< 0.10	< 0.050	< 10	0.0111	0.0084	59.4	0.24	< 0.10	< 0.50	< 10	< 0.050	6.6	17.9	< 0.10	< 0.0050	1.1	< 0.50	0.609	8.99	8.48	< 0.010	3.27	178	< 0.010	< 0.10	< 10	0.961	< 0.50	< 3.0
	QA/QC RPD%	2	*	*	*	11	*	*	*	*	*	2	*	*	*	*	*	3	2	*	*	1	*	7	2	8	*	5	1	*	*	*	1	*	*
	2015 08 11	235	3.4	< 0.10	0.16	102	< 0.10	< 0.050	< 10	0.0119	0.0089	64.3	0.20	< 0.10	< 0.50	< 10	< 0.050	7.4	18.1	< 0.10	0.0166	1.49	< 0.50	0.771	9.22	9.03	< 0.010	2.03	180	< 0.010	< 0.10	< 10	1.05	< 0.50	< 3.0
	2015 11 17	261	< 3.0	0.11	0.13	95.9	< 0.10	< 0.050	< 10	0.0088	0.0089	70.2	0.20	< 0.10	< 0.50	< 10	< 0.050	6.8	20.8	0.23	< 0.0050	1.41	< 0.50	0.584	***10.4***	***10.5***	< 0.010	2.39	187	< 0.010	< 0.10	< 10	1.33	< 0.50	< 3.0
EV_ER1gwD	2015 01 13	245	9.3	< 0.10	0.19	75.8	< 0.10	< 0.50	< 10	< 0.010	0.065	63.7	0.31	< 0.10	< 0.50	< 10	< 0.050	5.45	20.8	1.16	< 0.010	1.33	< 0.50	0.632	8.98	8.12	< 0.010	2.56	195	< 0.010	< 0.10	< 10	1.2	< 1.0	25.9
	2015 05 12	224	10.3	< 0.10	0.19	73.8	< 0.10	< 0.050	< 10	0.0097	0.0091	58.5	0.29	< 0.10	< 0.50	< 10	< 0.050	6.3	18.9	0.88	< 0.0050	1.45	0.75	0.602	8.12	7.36	< 0.010	2.61	193	< 0.010	< 0.10	< 10	1.18	< 0.50	21.5
	2015 08 11	242	14.3	< 0.10	0.12	79	< 0.10	< 0.050	< 10	< 0.0050	0.0063	65.1	0.25	< 0.10	< 0.50	< 10	< 0.050	7.8	19.2	0.29	< 0.0050	1.48	< 0.50	0.712	8.66	8.22	< 0.010	2.25	187	< 0.010	< 0.10	< 10	1.19	< 0.50	< 3.0
	2015 11 17	256	15.1	0.22	0.12	83.7	< 0.10	< 0.050	< 10	< 0.0050	0.0151	68.6	0.18	0.13	< 0.50	23	< 0.050	6.7	20.6	0.81	< 0.0050	6.38	0.91	0.656	8.84	9.03	< 0.010	2.46	198	< 0.010	< 0.10	< 10	1.45	< 0.50	< 3.0
RG_DW-03-04	2015 01 08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.41	-	-	-	-	-	-	-	-	-
	2015 02 06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.95	-	-	-	-	-	-	-	-	-
	2015 03 03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.23	-	-	-	-	-	-	-	-	-
	2015 04 14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.01	-	-	-	-	-	-	-	-	-
	2015 05 12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.03	-	-	-	-	-	-	-	-	-
	2015 06 03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.7	-	-	-	-	-	-	-	-	-
	2015 07 07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.89	-	-	-	-	-	-	-	-	-
	2015 08 05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.05	-	-	-	-	-	-	-	-	-
	2015 09 02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***12.9***	-	-	-	-	-	-	-	-	-
	2015 10 06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***13.6***	-	-	-	-	-	-	-	-	-
	2015 11 04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***13.2***	-	-	-	-	-	-	-	-	-
	2015 12 01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***13.0***	-	-	-	-	-	-	-	-	-
BC Standards																																			
BCWQG Aquatic Life (AW)[a]		n/a	100	9 (long-term	5	1,000 (long-term	0.13 (long-term)	n/a	1,200	0.887 - 2.8[d]	0.887 - 2.8[d]	n/a	1 (Cr(+6))	110	16 - 79.5[d]	350 (max)	135.6 - 1,197[d]	n/a	n/a	1,260 - 9,620[d]	n/a	2,000	110 (H >120-180) 150 (H>180)	n/a	2	2	3 (H>100)	n/a	n/a	0.8 (long-term)	n/a	n/a	8.5 (long-term)	n/a	77.3 - 583[d]
CSR Aquatic Life (AW)[b]		n/a	n/a	200	50	10,000	53	n/a	50,000	0.1 (H 0-30) 0.5 (H >90-150) 0.6 (H >150-210) 0.6 (H >210) 0.1 (H Is Null)	0.1 (H 0-30) 0.5 (H >90-150) 0.6 (H >150-210) 0.6 (H >210) 0.1 (H Is Null)	n/a	10[f]	40	20 (H 0-50) 60 (H >125-150) 70 (H >150-175) 80 (H >175-200) 90 (H >200) 20 (H Is Null)	n/a	40 (H<50) 60 (H 100-<200) 110 (H 200-<300) 160 (H>=300) 40 (H Is Null)	n/a	n/a	n/a	1	10,000	250 (H 0-60) 1,100 (H 120-180) 1,500 (H >180) 250 (H Is Null)	n/a	10	10	0.5 (H <100) 15 (H >100) 0.5 (H Is Null)	n/a	n/a	3	n/a	1,000	3,000	n/a	75 (H 0-90) 900 (H 100-200) 1,650 (H 200-300) 2,400 (H 300-400) 2,400 (H >400) 75 (H Is Null)
CSR Irrigation Watering (IW)		n/a	5,000	n/a	100	n/a	100	n/a	500 - 6,000[e]	5	5	n/a	5	50	200	5,000	200	2,500	n/a	200	1	10 - 30[g]	200	n/a	20[h]	20[h]	n/a	n/a	n/a	n/a	n/a	n/a	10	100	1,000 (pH <6.0)[i]
CSR Livestock Watering (LW)		n/a	5,000	n/a	25	n/a	100	n/a	5,000	80	80	1,000	50[f]	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

Associated ALS file(s): District of Sparwood, L1567016, L1567695, L1568098, L1570709, L1579365, L1585216, L1586412, L1586803, L1586807, L1587055, L1587338, L1587345, L1587796, L1600339, L1606058, L1611222, L1611919, L1612908, L1617029, L1623601, L1625608, L1626479, L1630418, L1630431, L1630435, L1630436, L1630437, L1630438, L1636950, L1656853, L1657608, L1658136, L1658158, L1671431, L1671435, L1674725, L1678287, L1679229, L1699666, L1704802, L1704810, L1705351, L1707507, L1707777, L1707813, L1708279, L1708643, L1710411, L1713684, L1713686, L1716543, L1716634, L1717638.

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.

RPD Denotes relative percent difference.

* RPDs are not calculated where one or more concentrations are less than five times RDL.

** Comparison to BCWQG Aquatic Life (AW) guideline.

BOLD Concentration greater than CSR Aquatic Life (AW) standard.

BOLD** Concentration greater than BCWQG Aquatic Life (AW) guideline.

SHADOW Concentration greater than CSR Irrigation (IW) standard.

INVERSE Concentration greater than CSR Livestock (LW) standard.

SHADED Concentration greater than CSR Drinking Water (DW) standard.

[a] British Columbia Approved Water Quality Guidelines, includes Working Water Quality Guidelines for British Columbia (BCWQG), 2015.

[b] Standard to protect freshwater aquatic life.

[c] Reported metals values are Total values.

[d] Guideline varies with hardness.

[e] Standard varies with crop.

[f] Individual standards exist for Cr +3 and Cr +6. Reported value represents more stringent standard.

[g] Standard varies with crop, soil drainage and Mo:Cu ratio.

[h] Individual standards exist for continuous and intermittent applications on crops. Reported value denotes more stringent standard.

[i] Standard varies with soil pH. Zinc IW guideline of 1,000 mg/L (soil pH < 6) was used due to no soil pH values.

TABLE 5: Summary of Secondary Screening Benchmarks for Constituents of Interest

Sample Location	Sample Date (yyyy mm dd)	SPO	Compliance Point	Hardness mg/L	Nitrate Nitrogen mg/L	Sulphate mg/L	Total Cadmium µg/L	Dissolved Cadmium µg/L	Total Selenium µg/L	Dissolved Selenium µg/L
Key Area 1										
FR_09-01-A	2015 01 22	FR4	FRO (E300071)	644	**20.1**	336	0.057	0.056	49.6	49.3
	Duplicate	FR4	FRO (E300071)	658	**20.2**	337	0.061	0.054	49.6	49
	QA/QC RPD%			2	< 1	< 1	7	4	0	1
	2015 04 14	FR4	FRO (E300071)	735	**25.1**	374	0.0522	0.0517	***63***	***64.5***
	2015 07 02	FR4	FRO (E300071)	601	**33.1**	219	0.0258	0.0217	***93.3***	***82.2***
	2015 10 08	FR4	FRO (E300071)	724	**27.8**	351	0.0455	0.0447	***69.4***	***66.6***
FR_09-01-B	2015 01 22	FR4	FRO (E300071)	523	11.4	261	0.04	0.034	30.6	31.1
	2015 04 14	FR4	FRO (E300071)	596	11.3	300	0.0427	0.039	33	34.2
	2015 07 02	FR4	FRO (E300071)	588	**30.5**	224	0.022	0.0173	***78.3***	***76.8***
	Duplicate	FR4	FRO (E300071)	588	**30.8**	227	0.0217	0.0199	***78.5***	***71.8***
	QA/QC RPD%			0	1	1	*	*	< 1	7
	2015 10 08	FR4	FRO (E300071)	588	11.1	288	0.034	0.0314	31	30.2
FR_GHHW	2015 01 21	FR4	FRO (E300071)	672	**46.7**	276	0.045	0.047	***98.6***	***102***
	2015 04 14	FR4	FRO (E300071)	748	**56.2**	336	0.0511	0.0439	***122***	***123***
	Duplicate	FR4	FRO (E300071)	746	**55.3**	333	0.051	0.0441	***125***	***127***
	QA/QC RPD%			< 1	2	1	< 1	< 1	2	3
	2015 07 02	FR4	FRO (E300071)	705	**45.5**	286	0.0469	0.0486	***108***	***108***
	2015 11 05	FR4	FRO (E300071)	682	**37.8**	280	0.0597	0.0421	***87.1***	***97.5***
Key Area 3										
GH_POTW17	2015 11 04	FR4	GHO (E200378)	784	0.118	**482**	0.0488	0.0437	3.68	3.4
Key Area 4										
GH_GA-MW-2	2015 02 17	ER1	GHO (E300090)	326	1.65	99.9	0.071	0.024	5.03	6.78
	2015 04 29	ER1	GHO (E300090)	330	1.7	115	0.152	0.0251	7.41	8.56
	Duplicate	ER1	GHO (E300090)	348	-	-	0.12	-	8.93	-
	QA/QC RPD%			5	*	*	24	*	19	*
	2015 09 15	ER1	GHO (E300090)	370	**3.01**	134	0.0322	0.02	9.27	9.13
	2015 11 30	ER1	GHO (E300090)	387	**4**	141	0.048	0.027	11.8	12
GH_GA-MW-3	2015 02 17	ER1	GHO (E300090)	757	**8.71**	**481**	0.072	0.018	***81.6***	***85.3***
	2015 04 29	ER1	GHO (E300090)	418	1.19	165	0.0647	0.0119	**19.4**	**29.4**
	2015 09 15	ER1	GHO (E300090)	259	0.0374	50	**0.3**	< 0.0050	1.98	1.53
	2015 11 30	ER1	GHO (E300090)	579	**3.77**	**330**	0.031	< 0.025	**38.1**	**45.4**
GH_GA-MW-4	2015 02 17	ER1	GHO (E300090)	364	**4.63**	125	0.015	0.01	9.27	10.5
	2015 04 29	ER1	GHO (E300090)	373	**6.68**	141	0.0102	0.0081	12.5	13.2
	2015 09 15	ER1	GHO (E300090)	678	**7.35**	**425**	0.0263	0.0164	8.45	8.74
	2015 11 30	ER1	GHO (E300090)	883	**8.95**	**598**	< 0.025	< 0.025	5.18	5.31
	Duplicate	ER1	GHO (E300090)	884	**8.98**	**599**	< 0.025	-	5.05	-
	QA/QC RPD%			0	< 1	< 1	*	*	3	*
GH_MW-ERSC-1	2015 02 17	ER1	GHO (E300090)	299	0.318	31	**1.01**	0.039	3.75	1.58
	2015 04 29	ER1	GHO (E300090)	409	2.79	168	0.0385	0.0252	**25.4**	**28.2**
	2015 09 15	ER1	GHO (E300090)	320	0.0368	20.7	0.0602	0.0164	0.921	0.646
	2015 11 30	ER1	GHO (E300090)	329	0.0543	21.1	0.194	0.029	1.23	1.08
Key Area 7										
RG_DW-02-20	2015 03 10	ER3	n/a	237	2.97	69.1	< 0.2	-	12	13.6
	Duplicate	ER3	n/a	233	2.98	69.4	< 0.2	-	12.1	13.3
	QA/QC RPD%			2	< 1	< 1	*	-	1	2
	2015 06 18	ER3	n/a	229	**3.21**	78.2	0.0057	-	12	13.1
	2015 11 26	ER3	n/a	241	2.44	60.2	0.0096	-	9.79	10.3
Key Area 9										
EV_BCgw	2015 01 13	ER3	EVO (E300091)	609	**11.5**	338	0.052	0.049	***63.2***	***67.3***
	2015 05 11	ER3	EVO (E300091)	824	**19.4**	**531**	0.066	0.0463	***97.6***	***97.6***
	2015 08 10	ER3	EVO (E300091)	771	**16.5**	**449**	0.0753	0.0599	***71.2***	***73.8***
	2015 11 16	ER3	EVO (E300091)	702	**14**	411	0.0566	0.0548	***61***	***59.7***
EV_BRS1/EV_BRS2	2015 04 27	ER3	EVO (E300091)	-	**9.86**	-	-	-	***51.4***	-
	2015 06 29	ER3	EVO (E300091)	-	**19.6**	-	-	-	***91.6***	-
	2015 09 14	ER3	EVO (E300091)	628	-	-	0.052	-	***62.8***	-
	2015 09 28	ER3	EVO (E300091)	-	**13.3**	-	-	-	***60.1***	-
EV_WHS1/EV_WHS2	2015 04 27	ER3	EVO (E300091)	-	**7.13**	-	-	-	**25.9**	-
	2015 06 29	ER3	EVO (E300091)	-	1.90	-	-	-	5.88	-
	2015 09 14	ER3	EVO (E300091)	410	-	-	0.145	-	**27.3**	-
	2015 09 28	ER3	EVO (E300091)	-	**4.17**	-	-	-	**20.1**	-
EV_RCS1	2015 04 27	ER3	EVO (E300091)	-	**45.6**	-	-	-	***224***	-
	2015 06 29	ER3	EVO (E300091)	-	**49.1**	-	-	-	***255***	-
	2015 09 14	ER3	EVO (E300091)	1,550	-	-	**0.452**	-	***216***	-
	2015 09 28	ER3	EVO (E300091)	-	**49.3**	-	-	-	***222***	-
Key Area 12										
EV_ER1gwS	2015 01 13	ER3	n/a	255	2.03	71.3	< 0.010	< 0.010	10.1	10.4
	2015 05 12	ER3	n/a	218	1.79	59	0.0084	0.008	9.17	9.16
	Duplicate	ER3	n/a	222	1.79	59.2	0.0084	0.0111	8.48	8.99
	QA/QC RPD%			2	0	< 1	*	*	8	2
	2015 08 11	ER3	n/a	235	2.06	63.3	0.0089	0.0119	9.03	9.22
	2015 11 17	ER3	n/a	261	2.36	76.8	0.0089	0.0088	10.5	10.4
RG_DW-03-04	2015 01 08	ER3	n/a	-	-	-	-	-	6.41	-
	2015 02 06	ER3	n/a	-	-	-	-	-	6.95	-
	2015 03 03	ER3	n/a	-	-	-	-	-	7.23	-
	2015 04 14	ER3	n/a	-	-	-	-	-	7.01	-
	2015 05 12	ER3	n/a	-	-	-	-	-	7.03	-
	2015 06 03	ER3	n/a	-	-	-	-	-	5.7	-
	2015 07 07	ER3	n/a	-	-	-	-	-	4.89	-
	2015 08 05	ER3	n/a	-	-	-	-	-	8.05	-
	2015 09 02	ER3	n/a	-	-	-	-	-	12.9	-
	2015 10 06	ER3	n/a	-	-	-	-	-	13.6	-
	2015 11 04	ER3	n/a	-	-	-	-	-	13.2	-
	2015 12 01	ER3	n/a	-	-	-	-	-	13.0	-
Groundwater Quality Benchmarks										
Guidelines for Canadian Drinking Water Quality (DW) (selenium only)				n/a	n/a	n/a	n/a	n/a	50	50
SPO	Elk River (ER1 / ER3)			n/a	3	309 / 429	0.24	0.24	19	19
	Fording River (FR4)			n/a	20	429	0.39	0.39	63	63
Compliance Point	FRO - Fording River - E300071			n/a	27	580	0.26 - 1.31[a]	0.26 - 1.31[a]	130	130
	GHO - Fording River - E200378			n/a	24	309 (H 76-180) / 429 (H >181)	0.26 - 1.31[a]	0.26 - 1.31[a]	80	80
	GHO - Elk River - E300090			n/a	3	309 (H 76-180) / 429 (H >181)	0.26 - 1.31[a]	0.26 - 1.31[a]	15	15
	EVO - Michel Creek - E300091			n/a	6	309 (H 76-180) / 429 (H >181)	0.26 - 1.31[a]	0.26 - 1.31[a]	28	28

Associated ALS file(s): District of Sparwood, L1567695, L1570709, L1579365, L1586803, L1600339, L1606058, L1611222, L1611919, L1636950, L1656853, L1657608, L1674725, L1699666, L1704802, L1704810, L1708279, L1710411.

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.

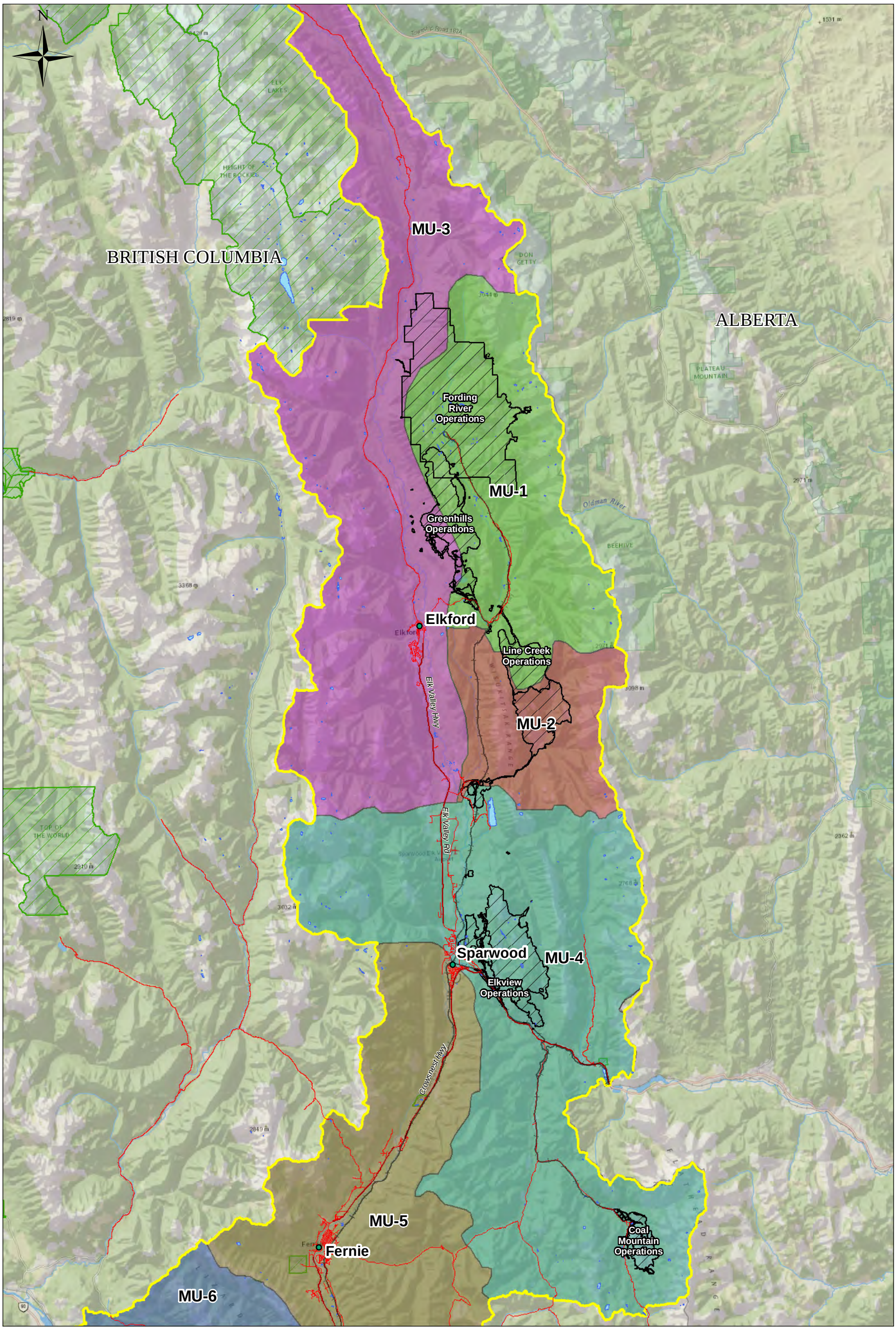
RPD Denotes relative percent difference.

* RPDs are not normally calculated where one or more concentrations are less than five times MDL.

[a] Criterion for cadmium is determined using the following formula: 10 exp(0.83[log(hardness)] - 2.53.

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.

FIGURES



LEGEND

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

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.

REFERENCES

1. BCGOV ILMB Crown Registry and Geographic Base Branch (CRGB) (data accessed through www.GeoBC.gov.bc.ca)
2. 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.
3. Location of Management Units, Mine Permitted Areas provided by Teck Coal Limited.

0 2.5 5 10 15 20 Kilometers

SNC·LAVALIN

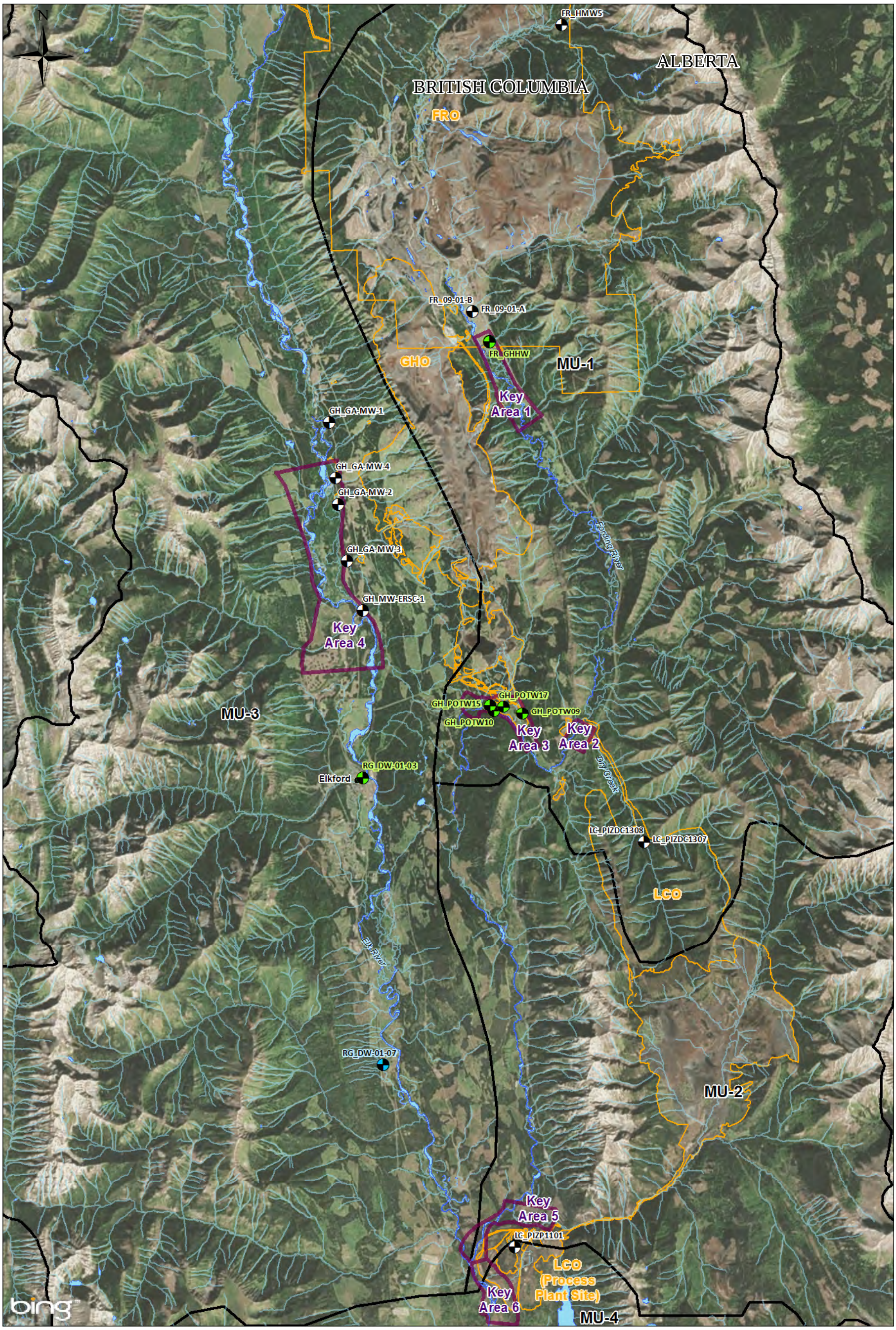
CLIENT NAME:	PROJECT LOCATION:
Teck Coal Ltd	Elk Valley, BC

Site Location and Management Units

BY:	AO	DATE:	2016/03/30	REF No:	REV: 0
CHK'D:	LH	SCALE:	1:350,000	Figure 1	

\\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports

MXD Path: P:\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GIS\MapSeries\635544-Figure 1-Site Location and Management Units.mxd



LEGEND

- Domestic Well
- Monitoring Well
- Water Supply Well
- Management Units
- Key Areas
- Mine Permitted Areas
- Surface Water

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.

REFERENCES

1. BCGOV ILMB Crown Registry and Geographic Base Branch (CRGB) (data accessed through www.GeoBC.gov.bc.ca)
2. Service Layer Credits: © Harris Corp, Earthstar Geographics LLC Earthstar Geographics SIO © 2016 Microsoft Corporation
3. Location of Management Units, Mine Permitted Areas provided by Teck Coal Limited.

0 0.5 1 2 3 4 5 Kilometers

SNC·LAVALIN

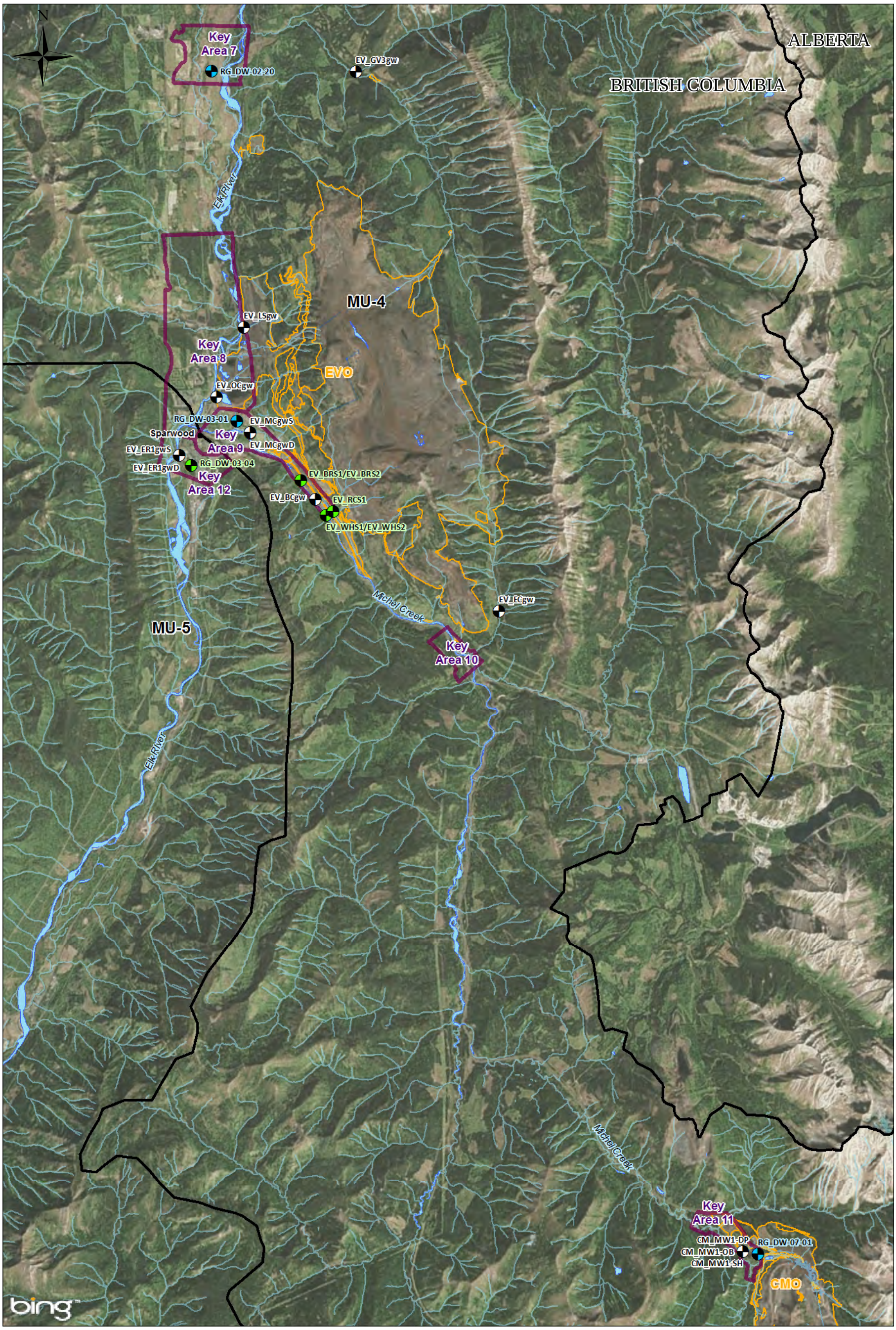
CLIENT NAME: Teck Coal Ltd	PROJECT LOCATION: Elk Valley, BC

Key Area and Sample Location Plan- North Half of Study Area

BY:	AO	DATE:	2016/03/30	REF No:	REV: 0
CHK'D:	LH	SCALE:	1:120,000	**Figure 2**	

\\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports

MXD Path: P:\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GISMapSeries\635544-Figure 2-Key Area and Sample Location Plan-North Half of Study Area.mxd



LEGEND

- Domestic Well
- Monitoring Well
- Water Supply Well
- Mine Permitted Areas
- Key Areas
- Management Units
- Surface Water

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.

REFERENCES

1. BCGOV ILMB Crown Registry and Geographic Base Branch (CRGB) (data accessed through www.GeoBC.gov.bc.ca)
2.Service Layer Credits: © Harris Corp, Earthstar Geographics LLC Earthstar Geographics SIO © 2016 Microsoft Corporation
3. Location of Management Units, Mine Permitted Areas provided by Teck Coal Limited.

0 0.5 1 2 3 4 5 Kilometers

SNC·LAVALIN

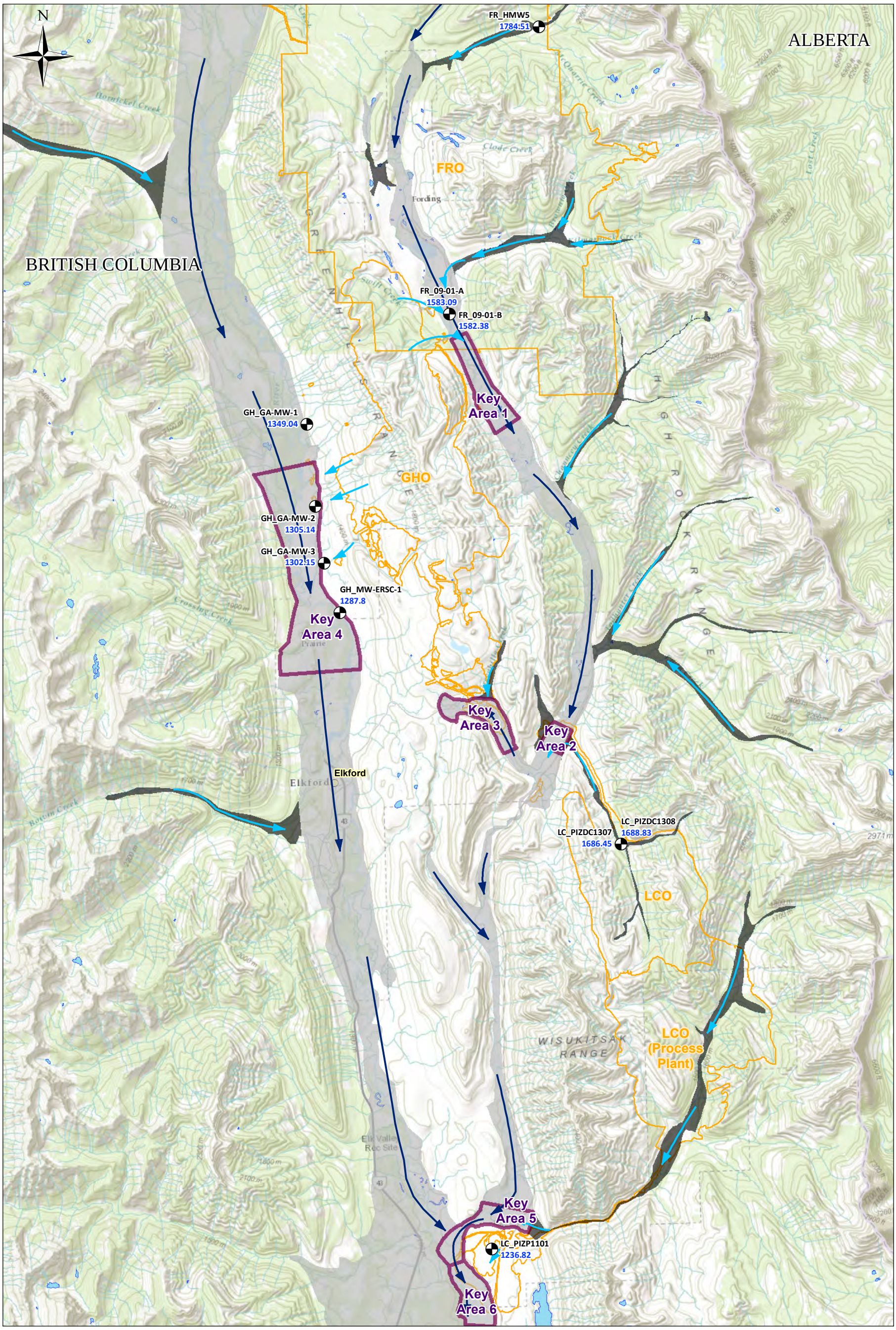
CLIENT NAME:	PROJECT LOCATION:
Teck Coal Ltd	Elk Valley, BC

Key Area and Sample Location Plan – South Half of Study Area

BY:	AO	DATE:	2016/03/30	REF No:	REV: 0
CHK'D:	LH	SCALE:	1:110,000	Figure 3	

\\Proj_srv\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports

MXD Path: P:\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GIS\MapSeries\635544-Figure 3-Key Area and Sample Location Plan-South Half of Study Area.mxd



LEGEND

- Monitoring Well
- Interpreted Tributary Valley-bottom Extent
- Interpreted Main Valley-bottom Extent
- Mine Permitted Areas
- Key Areas
- Surface Water
- Inferred Valley-Bottom Flow Direction
- Inferred Upland or Tributary Valley-bottom Groundwater Flow
- 1287.77 Groundwater Elevation (masl) measured in Q3

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. Wells only shown where groundwater level measured (i.e. monitoring wells)
5. See SNC-Lavalin (2015b) for interpretation of Conceptual Groundwater Flow

REFERENCES

1. BCGOV ILMB Crown Registry and Geographic Branch (CRGB) (data accessed through www.GeoBC.gov.bc.ca)
2. 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
3. Lidar data, location of Mine Permitted Areas and location of monitoring wells provided by Teck Coal Limited.

0 0.75 1.5 3 4.5 6 Kilometers

SNC·LAVALIN

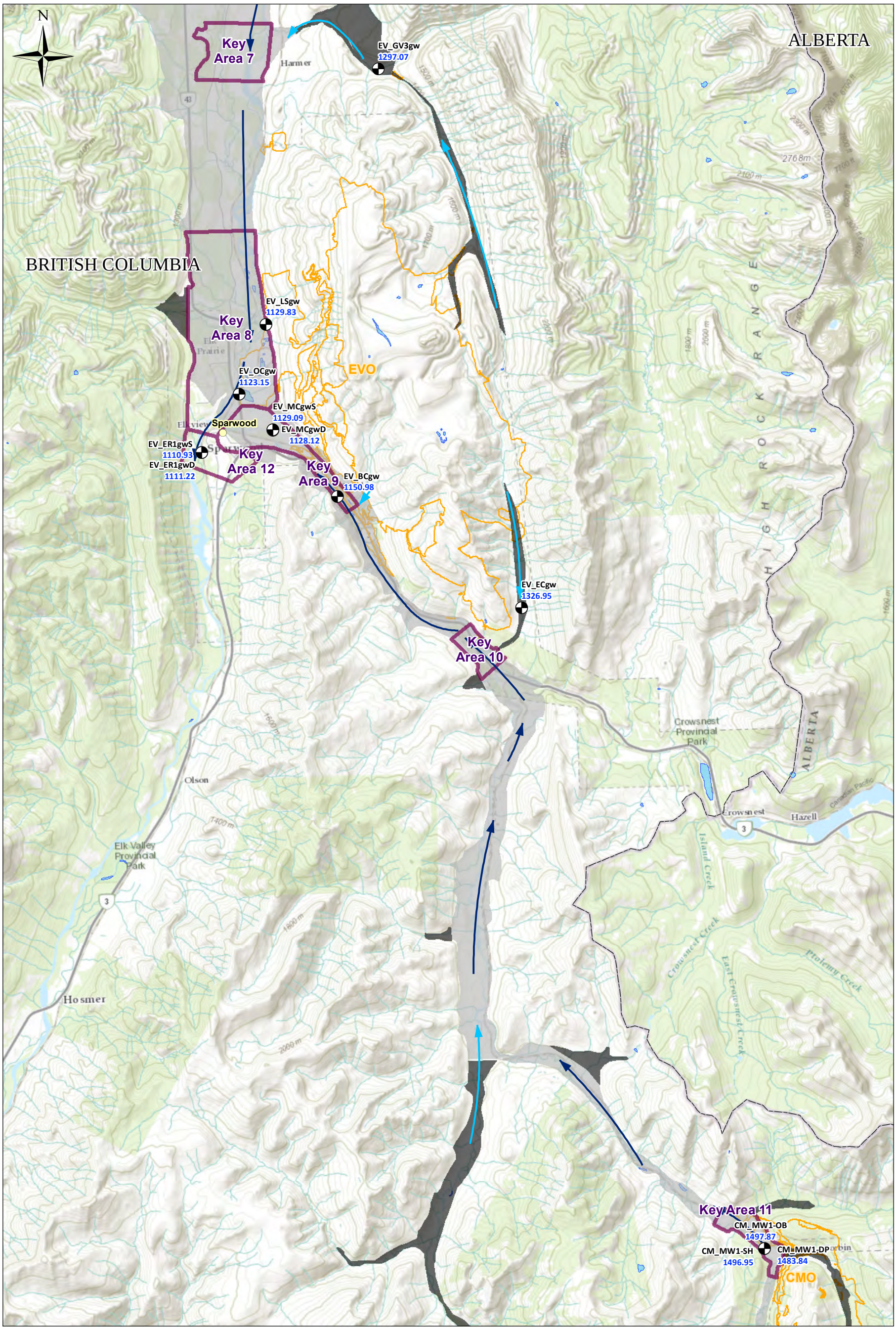
CLIENT NAME:	PROJECT LOCATION:
Teck Coal Ltd	Elk Valley, BC

Groundwater Elevations from Q3 and Conceptual Regional Groundwater Flow – North Half of Study Area

BY:	DATE:	REF No:	REV:
AO	2016/03/30	Figure 4	0
CHK'D: LH	SCALE: 1:120,000		

MXD Path: P:\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GIS\MapSeries\635544-Figure 4-Groundwater Elevations and Conceptual Regional Groundwater Flow – North.mxd

Project Path:\\Sli2606\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports



LEGEND

- Monitoring Well
- Mine Permitted Areas
- Surface Water
- Key Areas
- Interpreted Tributary Valley-bottom Extent
- Interpreted Main Valley-bottom Extent
- Inferred Valley-Bottom Flow Direction
- Inferred Upland or Tributary Valley-bottom Groundwater Flow
- 1287.77 Groundwater Elevation (masl) measured in Q3

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.Wells only shown where groundwater level measured (i.e. monitoring wells)
5. See SNC-Lavalin (2015b) for interpretation of Conceptual Groundwater Flow

REFERENCES

1. BCGOV ILMB Crown Registry and Geographic Base Branch (CRGB) (data accessed through www.GeoBC.gov.bc.ca)
2. 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
3. Lidar data, location of Mine Permitted Areas and location of monitoring wells provided by Teck Coal Limited.

0 0.75 1.5 3 4.5 6 Kilometers

SNC·LAVALIN

CLIENT NAME:	PROJECT LOCATION:
Teck Coal Ltd	Elk Valley, BC

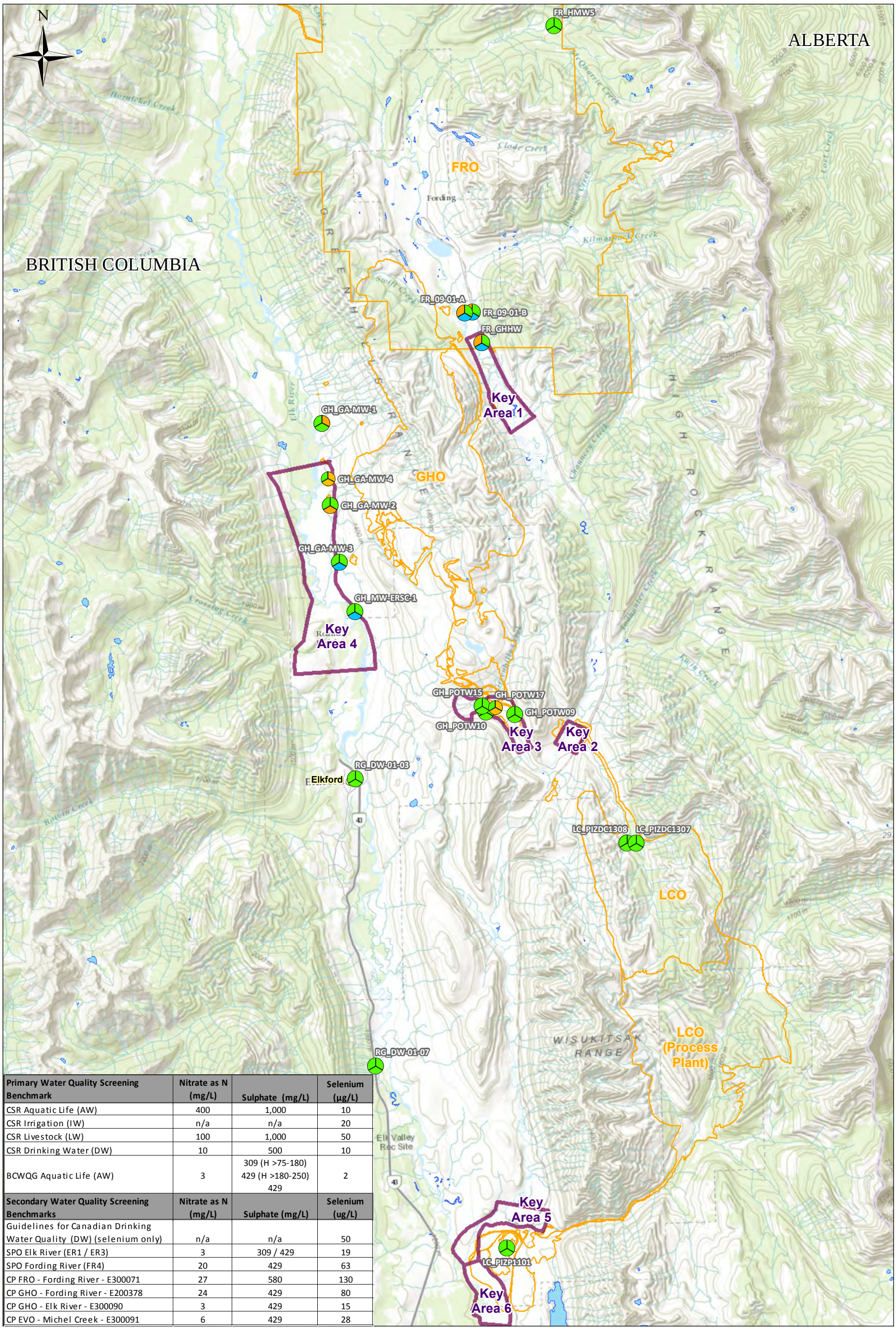
Groundwater Elevations from Q3 and Conceptual Regional Groundwater Flow – South Half of Study Area

BY:	AO	DATE:	2016/03/30	REF No:	REV: 0
CHK'D:	LH	SCALE:	1:110,000	Figure 5	

\\Sli2606\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports

MXD Path: P:\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GIS\MapSeries\635544-Figure 5- Groundwater Elevations and Conceptual Regional Groundwater Flow – South.mxd

2. 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



Primary Water Quality Screening Benchmark	Nitrate as N (mg/L)	Sulphate (mg/L)	Selenium (µg/L)
CSR Aquatic Life (AW)	400	1,000	10
CSR Irrigation (IW)	n/a	n/a	20
CSR Livestock (LW)	100	1,000	50
CSR Drinking Water (DW)	10	500	10
BCWQG Aquatic Life (AW)	3	309 (H >75-180) 429 (H >180-250) 429	2
Secondary Water Quality Screening Benchmarks	**Nitrate as N (mg/L)**	**Sulphate (mg/L)**	**Selenium (ug/L)**
Guidelines for Canadian Drinking Water Quality (DW) (selenium only)	n/a	n/a	50
SPO Elk River (ER1 / ER3)	3	309 / 429	19
SPO Fording River (FR4)	20	429	63
CP FRO - Fording River - E300071	27	580	130
CP GHO - Fording River - E200378	24	429	80
CP GHO - Elk River - E300090	3	429	15
CP EVO - Michel Creek - E300091	6	429	28

LEGEND

Nitrate / Sulphate / Selenium

- Below Primary Screening Benchmark
- Exceeds Primary Screening Benchmark
- Exceeds Primary and Secondary Screening Benchmarks
- No Data
- Mine Permitted Areas
- Surface Water
- Key Areas

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. Selenium concentrations are dissolved except for EV_BRS1/EV_BRS2, EV_WHS1/EV_WHS2, EV_RCS1 and RG_DW-03-04.
5. Analytical data shown on drawing is representative of the highest concentrations of nitrate, sulphate and selenium at each well measured in 2015. Concentrations are provided in appended Tables 3 to 5.
6. 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. BCGOV ILMB Crown Registry and Geographic Base Branch (CRGB) (data accessed through www.GeoBC.gov.bc.ca)
2. 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
3. Lidar data, location of Mine Permitted Areas and location of monitoring wells provided by Teck Coal Limited.

0 0.75 1.5 3 4.5 6 Kilometers

SNC·LAVALIN

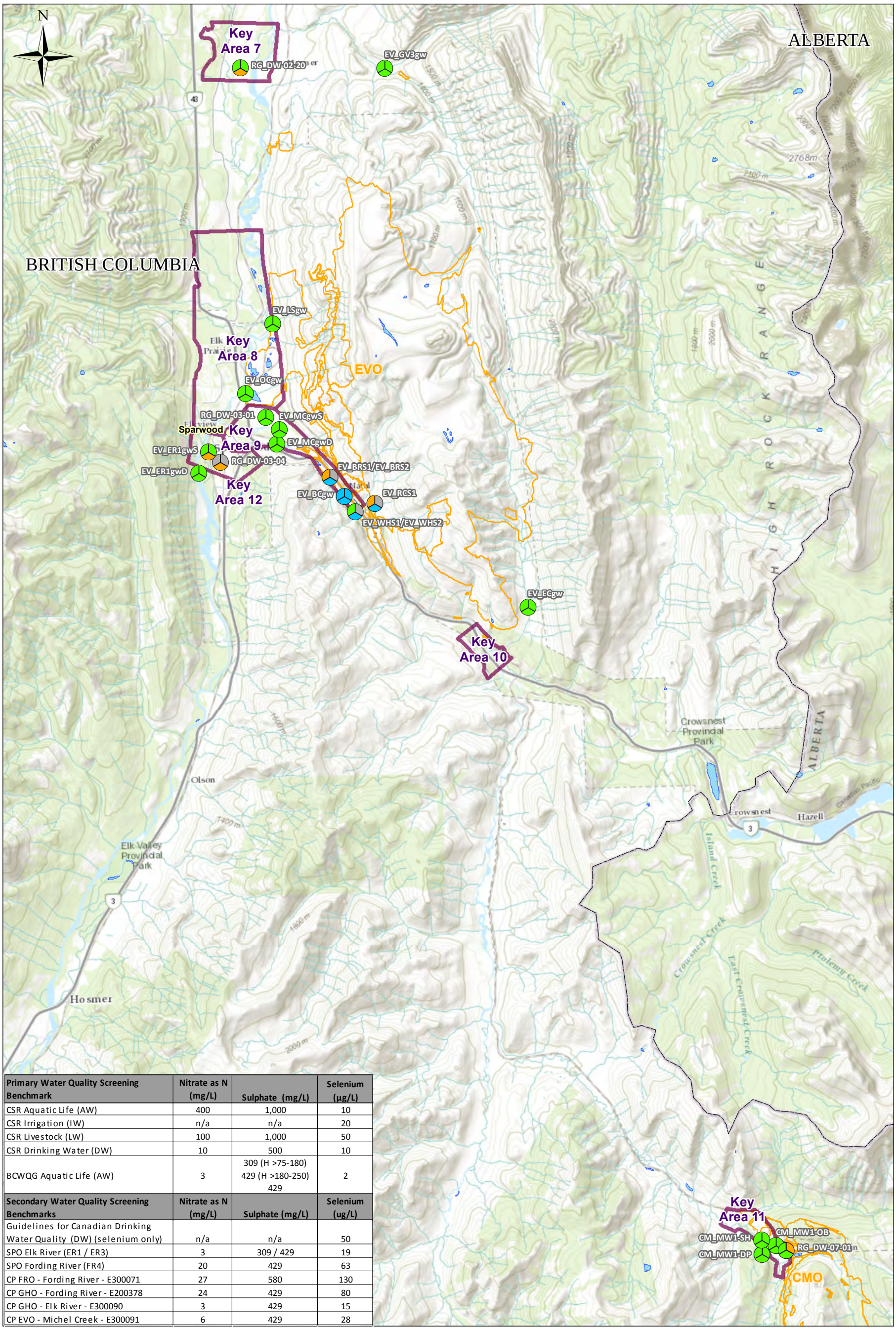
CLIENT NAME:	PROJECT LOCATION:
Teck Coal Ltd	Elk Valley, BC

Spatial Distribution of Selected Groundwater Analytical Data – North Half of Study Area

BY:	AO	DATE:	2016/03/30	REF No:	REV: 0
CHK'D:	LH	SCALE:	1:120,000	Figure 6	

Project Path:\\Sli2606\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports

MXD Path: P:\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GIS\MapSeries\635544-Figure 6-Spatial Distribution of Selected Groundwater Analytical Data – North Half of Study Area.mxd



Primary Water Quality Screening Benchmark	Nitrate as N (mg/L)	Sulphate (mg/L)	Selenium (µg/L)
CSR Aquatic Life (AW)	400	1,000	10
CSR Irrigation (IW)	n/a	n/a	20
CSR Livestock (LW)	100	1,000	50
CSR Drinking Water (DW)	10	500	10
BCWQG Aquatic Life (AW)	3	309 (H >75-180) 429 (H >180-250) 429	2
Secondary Water Quality Screening Benchmarks	**Nitrate as N (mg/L)**	**Sulphate (mg/L)**	**Selenium (ug/L)**
Guidelines for Canadian Drinking Water Quality (DW) (selenium only)	n/a	n/a	50
SPO Elk River (ER1 / ER3)	3	309 / 429	19
SPO Fording River (FR4)	20	429	63
CP FRO - Fording River - E300071	27	580	130
CP GHO - Fording River - E200378	24	429	80
CP GHO - Elk River - E300090	3	429	15
CP EVO - Michel Creek - E300091	6	429	28

LEGEND

- Below Primary Screening Benchmark
- Exceeds Primary Screening Benchmark
- Exceeds Primary and Secondary Screening Benchmarks
- No Data
- Mine Permitted Areas
- Surface Water
- Key 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. Selenium concentrations are dissolved except for EV_BRS1/EV_BRS2, EV_WHS1/EV_WHS2, EV_RCS1 and RG_DW-03-04.
5. Analytical data shown on drawing is representative of the highest concentrations of nitrate, sulphate and selenium at each well measured in 2015. Concentrations are provided in appended Tables 3 to 5..
6. 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. BCGOV ILMB Crown Registry and Geographic Base Branch (CRGB) (data accessed through www.GeoBC.gov.bc.ca)
2. 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
3. Lidar data, location of Mine Permitted Areas and location of monitoring wells provided by Teck Coal Limited.

0 0.75 1.5 3 4.5 6 Kilometers

SNC·LAVALIN

CLIENT NAME:	PROJECT LOCATION:
Teck Coal Ltd	Elk Valley, BC

Spatial Distribution of Selected Groundwater Analytical Data – South Half of Study Area

BY:	AO	DATE:	2016/03/30	REF No:	REV: 0
CHK'D:	LH	SCALE:	1:110,000	Figure 7	

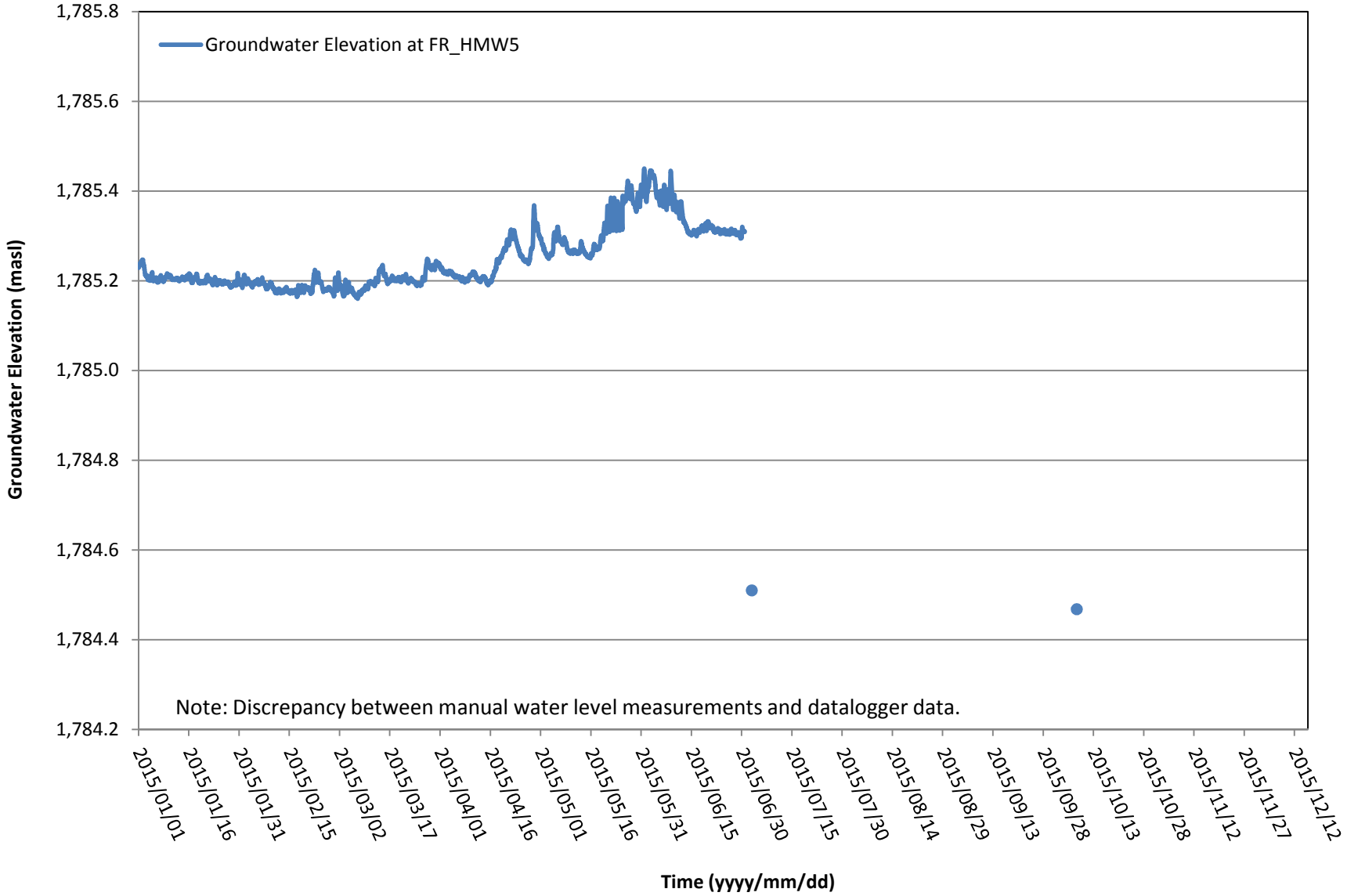
\\Sli2606\projects\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\Exports

MXD Path: P:\Current Projects\Teck Coal Ltd\SPO\635544\4.0 Execution\4.5 GIS and Drawings\GIS\MapSeries\635544-Figure 7-Spatial Distribution of Selected Groundwater Analytical Data – South Half of Study Area.mxd

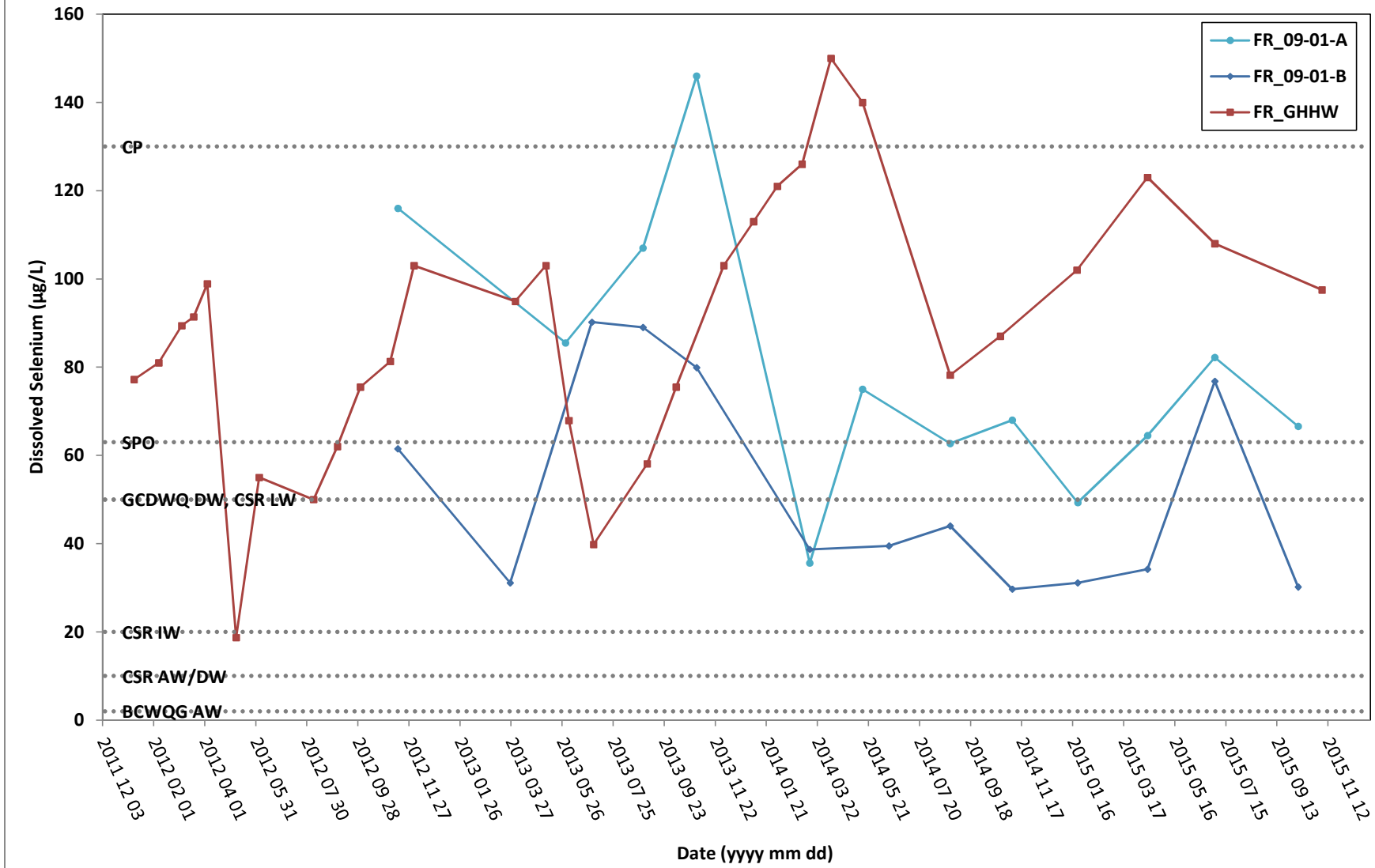
APPENDIX I

Time-Series Graphs

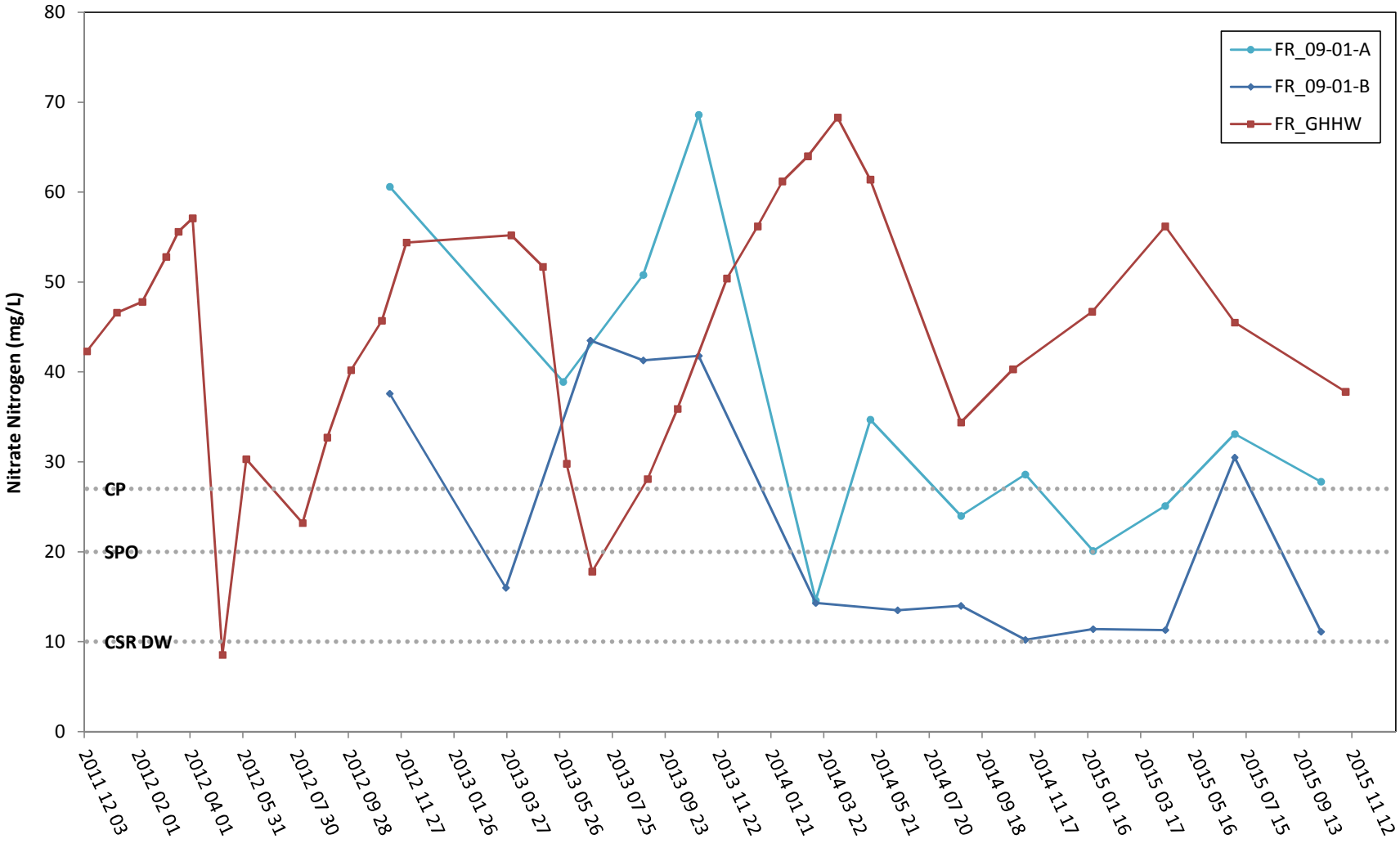
Graph B-1: Groundwater Elevation of FR_HMW5 (Background Well) (January to December 2015)



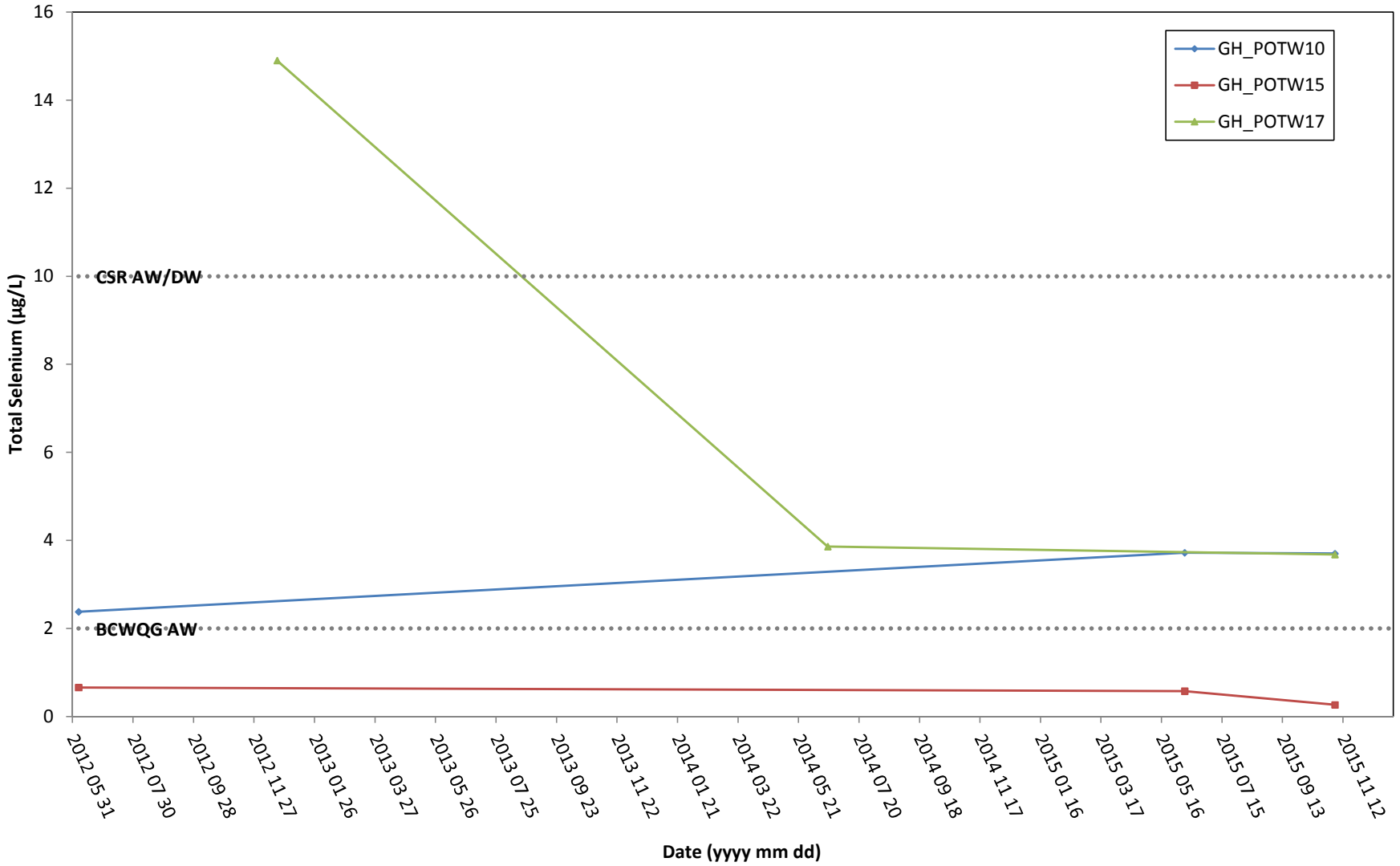
Graph 1-1: Selenium Concentrations for Wells in Key Area 1



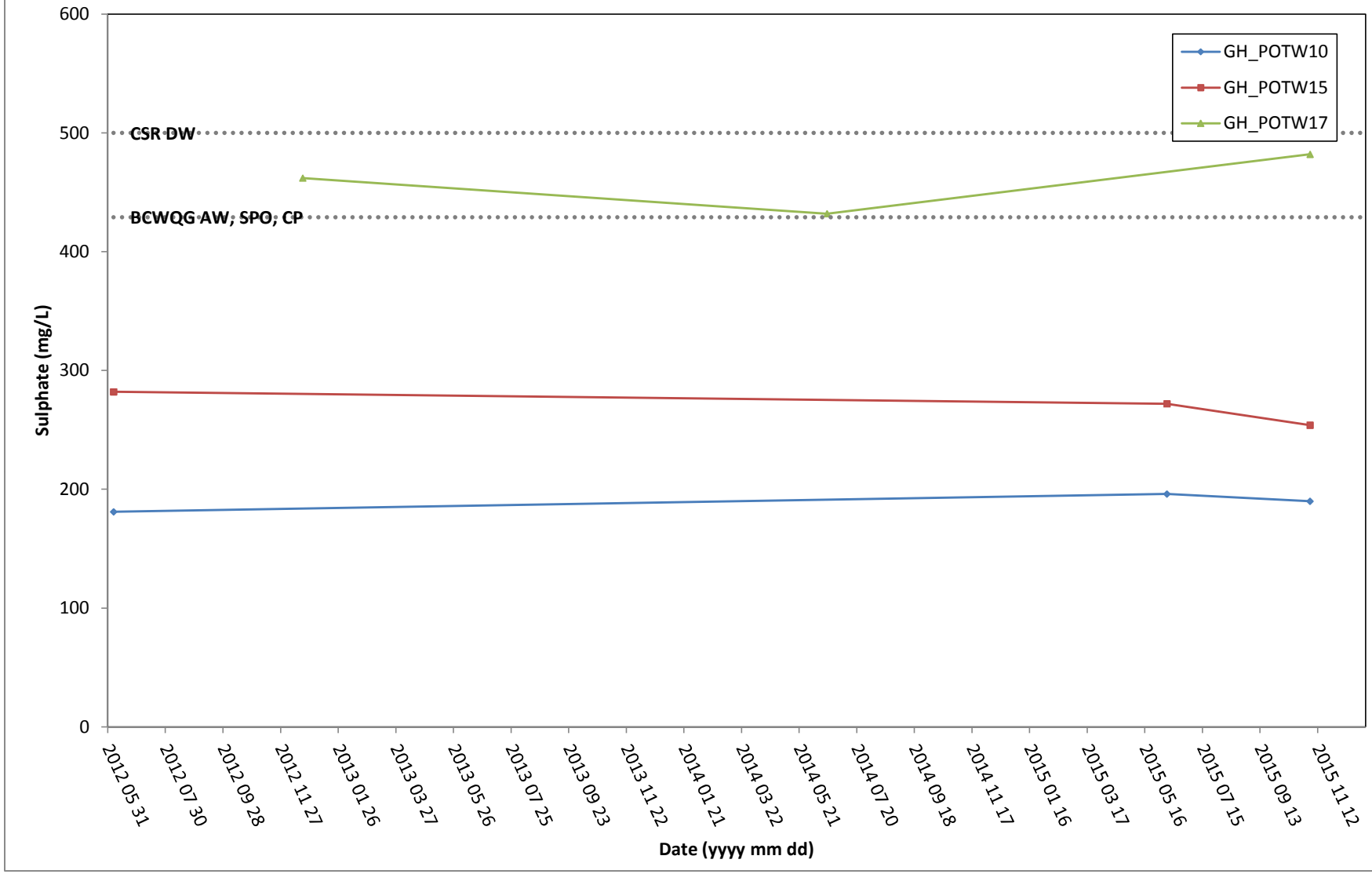
Graph 1-2: Nitrate Concentrations for Wells in Key Area 1



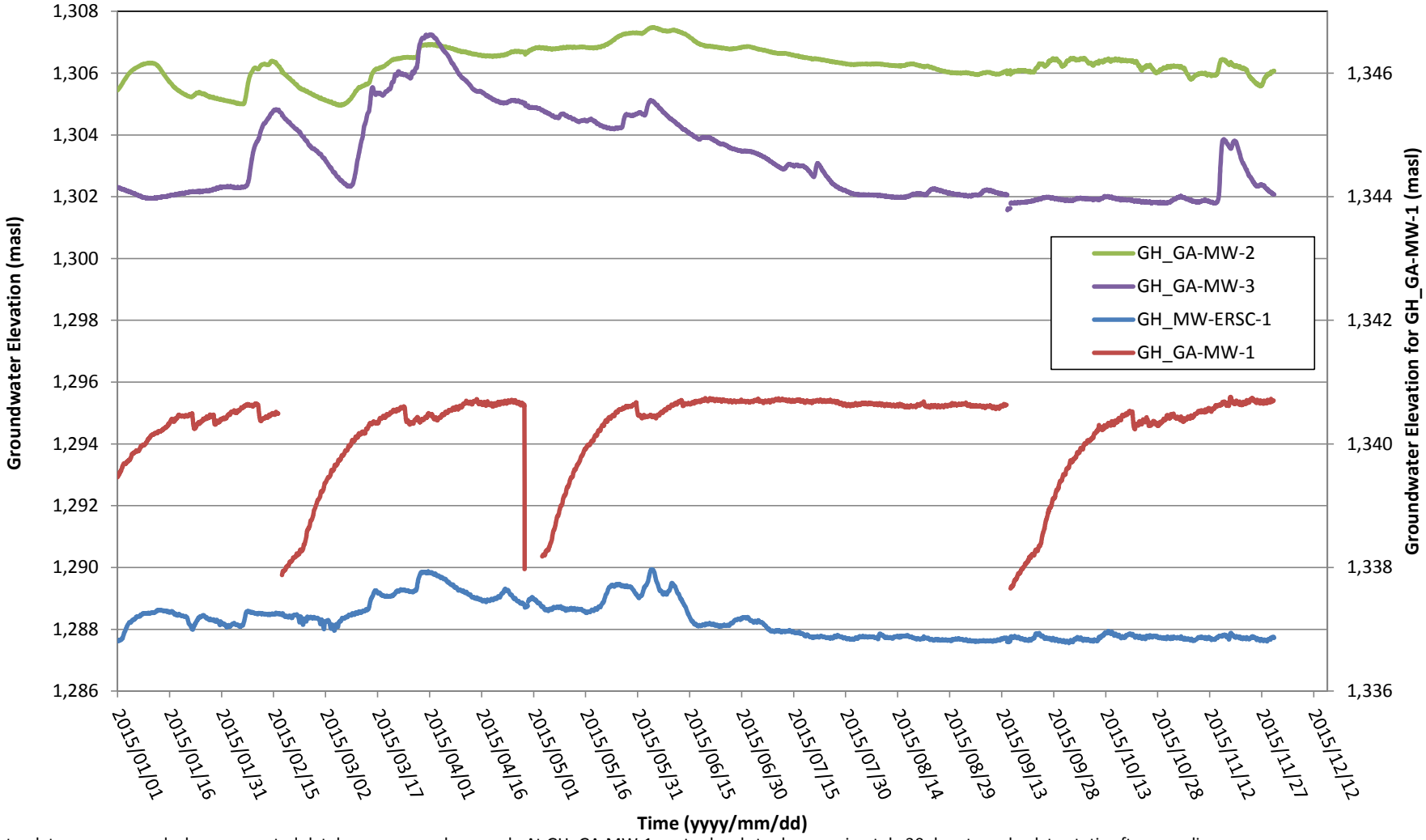
Graph 3-1: Total Selenium Concentrations for Wells in Key Area 3



Graph 3-2: Sulphate Concentrations for Wells in Key Area 3

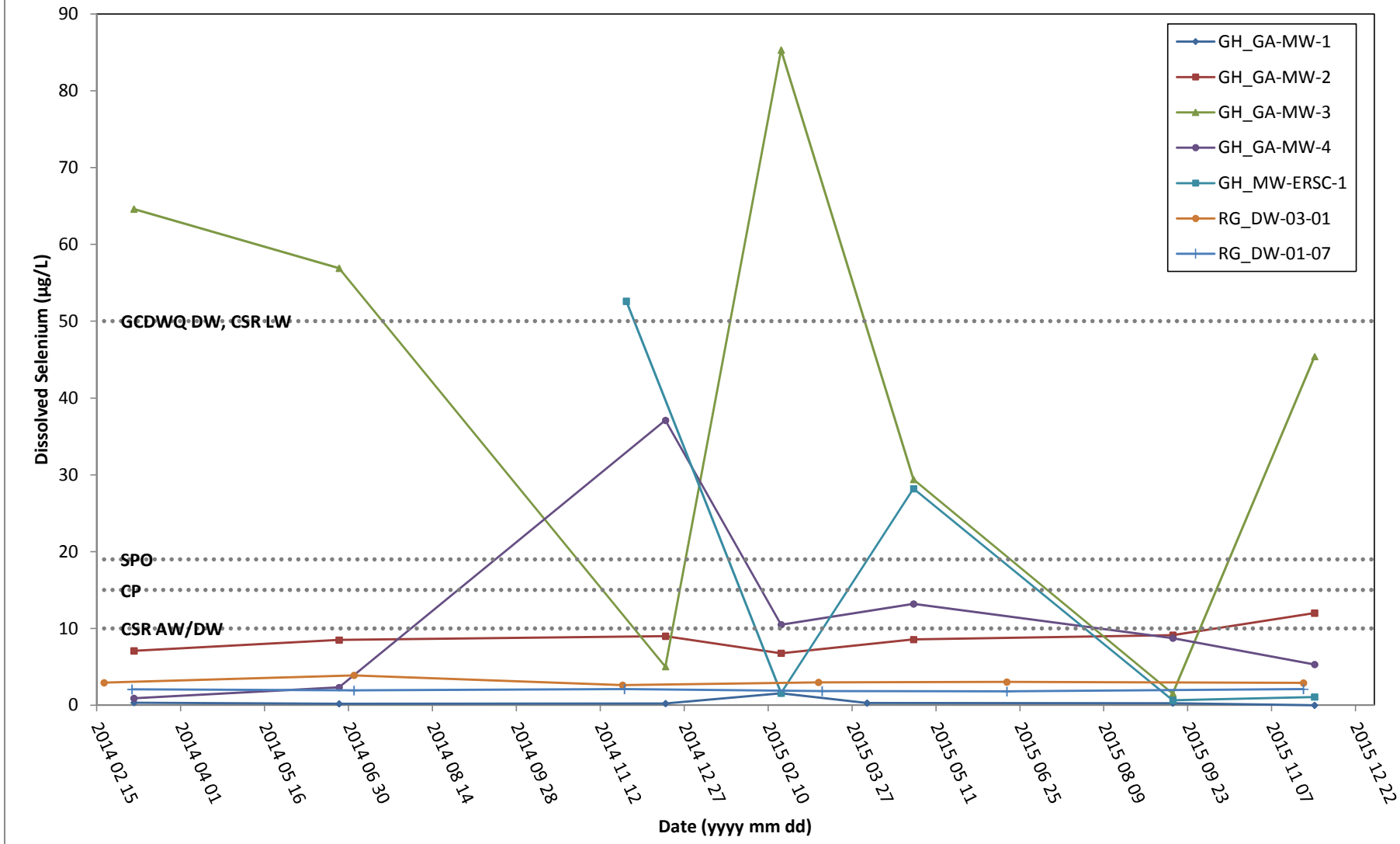


Graph 4-1: Groundwater Elevation of Key Area 4 Wells (January to December 2015)

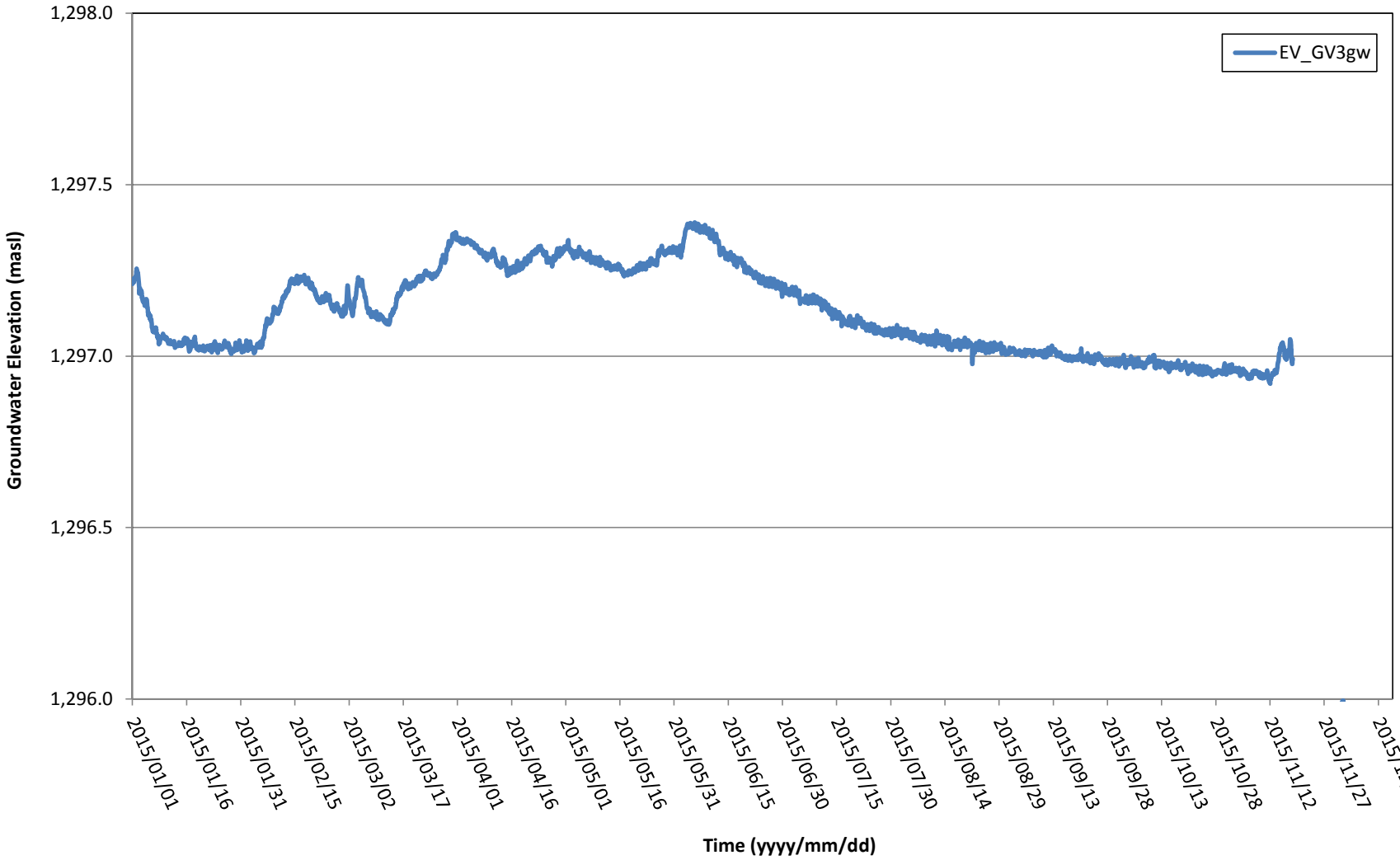


Note: data was removed where suspected datalogger removal occured. At GH_GA-MW-1, water levels took approximately 30 days to go back to static after sampling.

Graph 4-2: Selenium Concentrations for Wells in Key Area 4

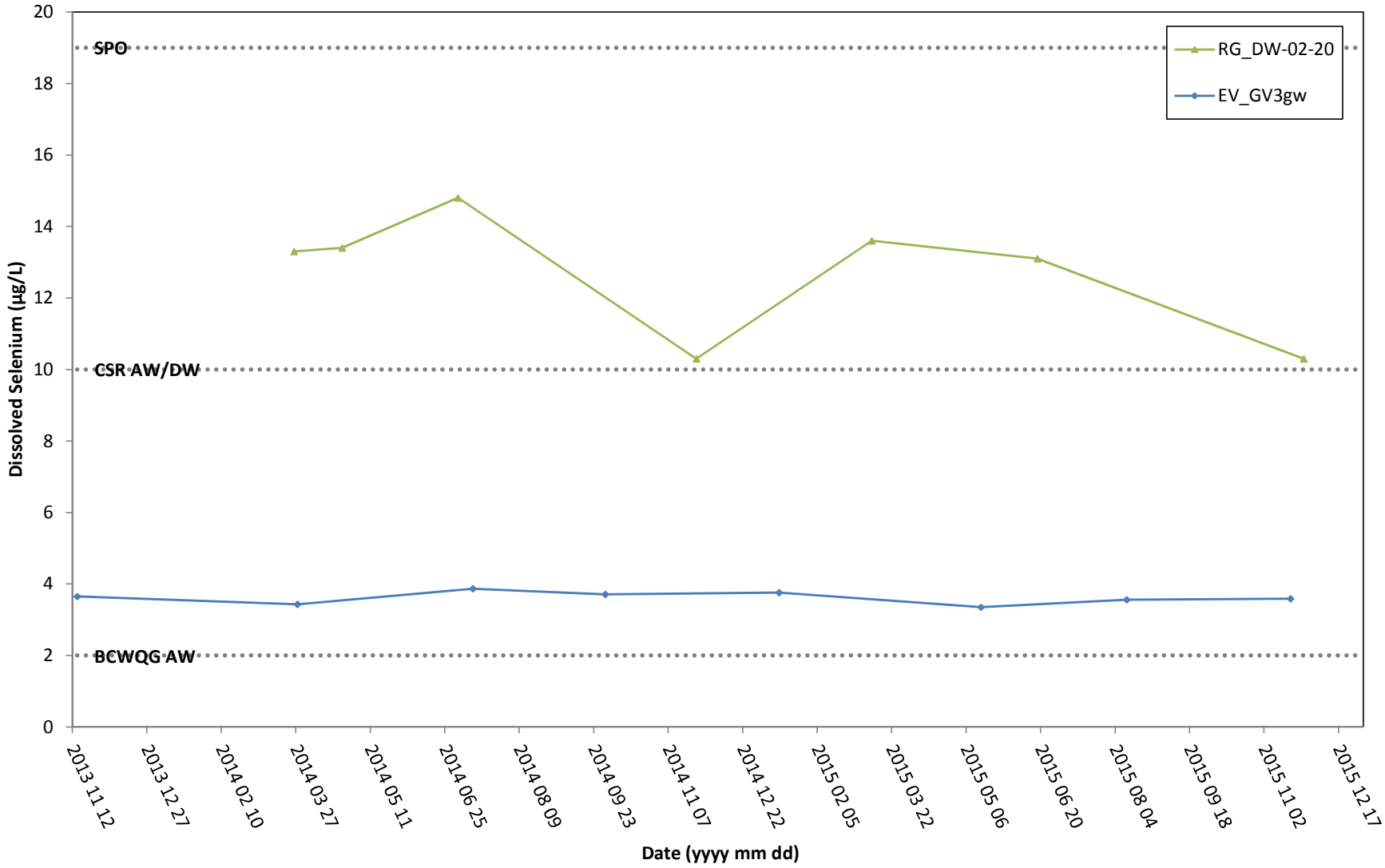


Graph 7-1: Groundwater Elevation of Key Area 7 Well (January to December 2015)

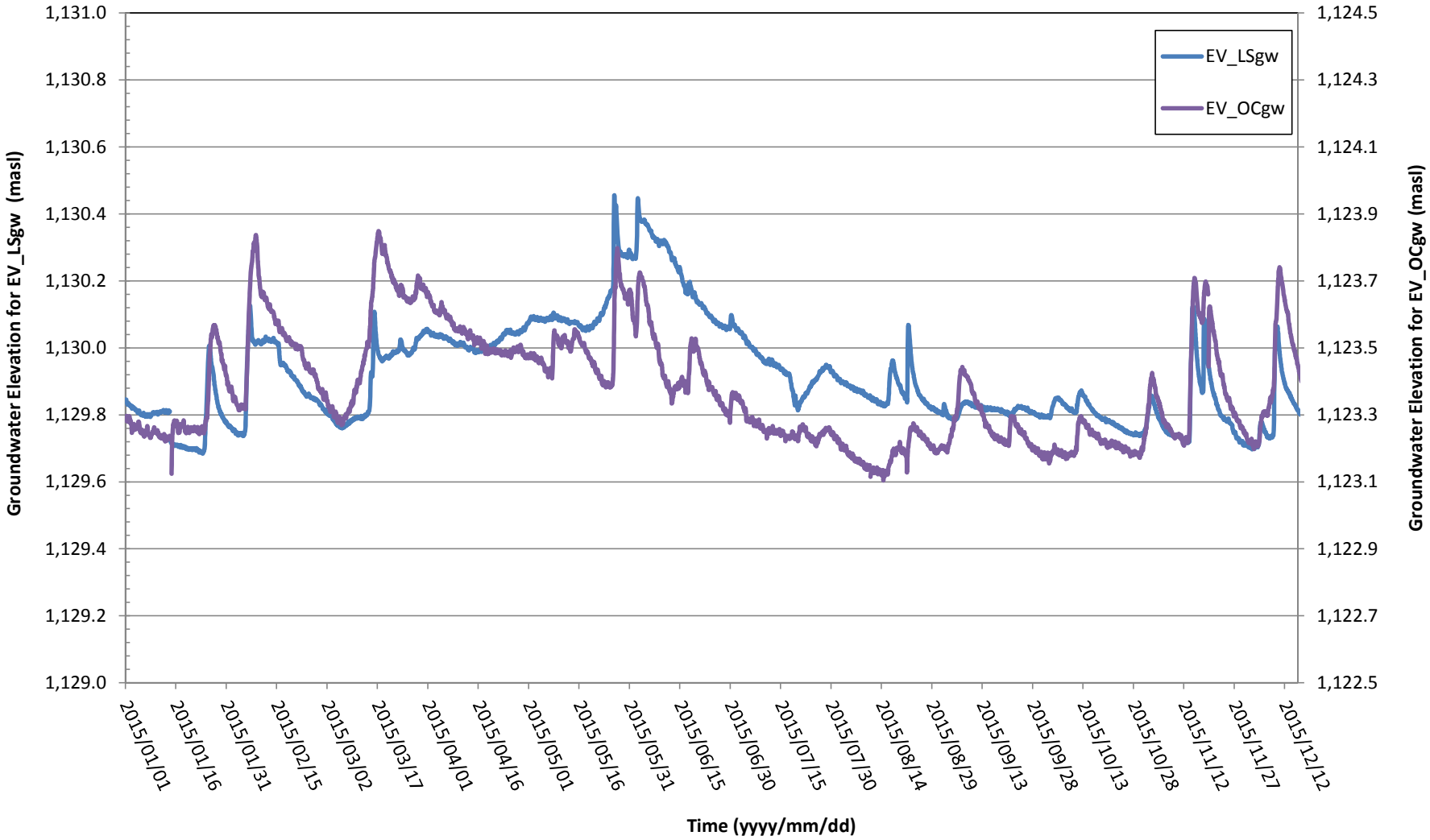


Note: data was removed where suspected datalogger removal occured; datalogger readings were decreased by 1.2m on November 18, 2015 due to suspected shortening of datalogger cable

Graph 7-2: Selenium Concentrations for Wells in Key Area 7

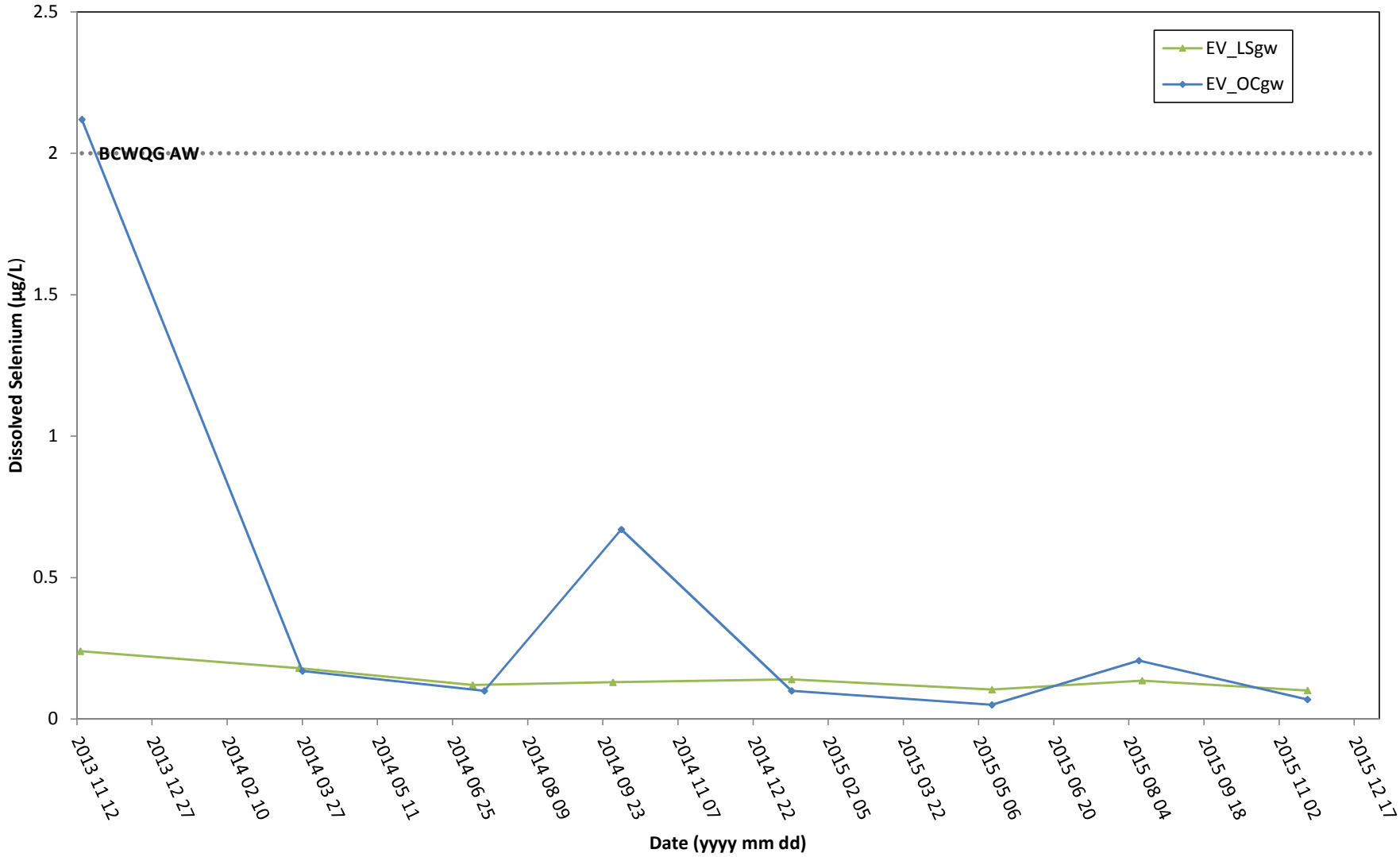


Graph 8-1: Groundwater Elevation of Key Area 8 Wells (January to December 2015)

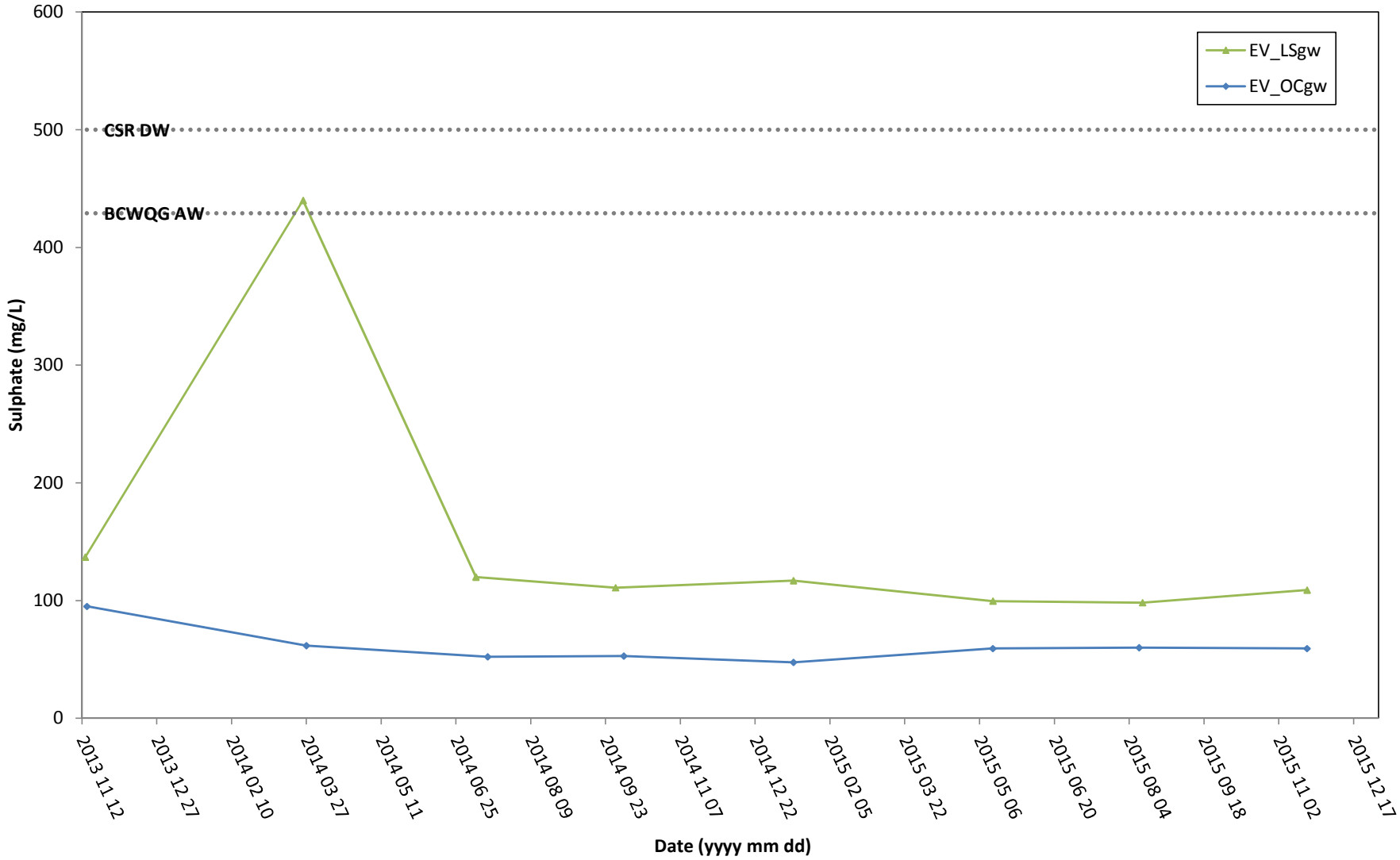


Note: data was removed where suspected datalogger removal occured

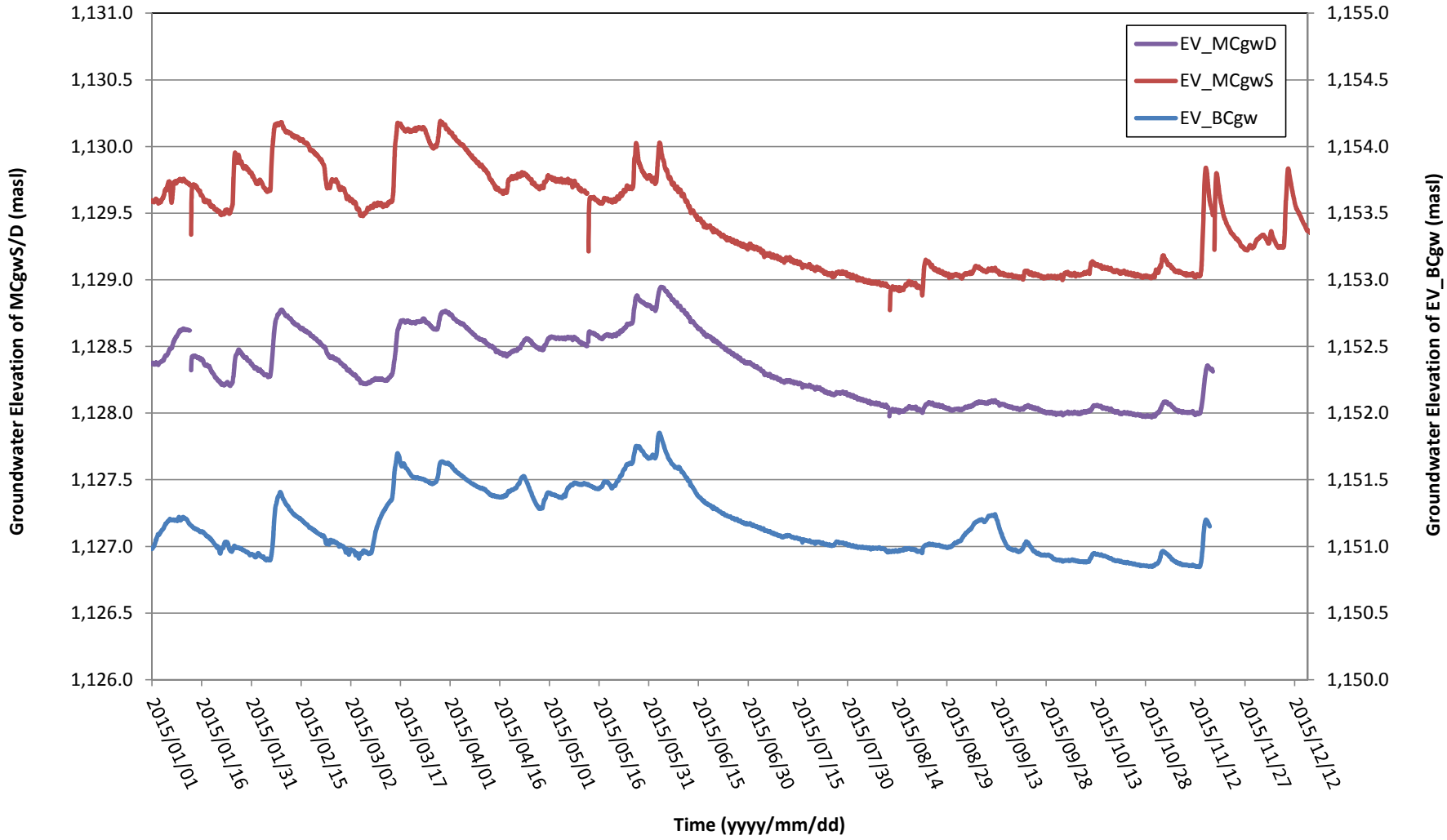
Graph 8-2: Selenium Concentrations for Monitoring Wells in Key Area 8



Graph 8-3: Sulphate Concentrations for Monitoring Wells in Key Area 8

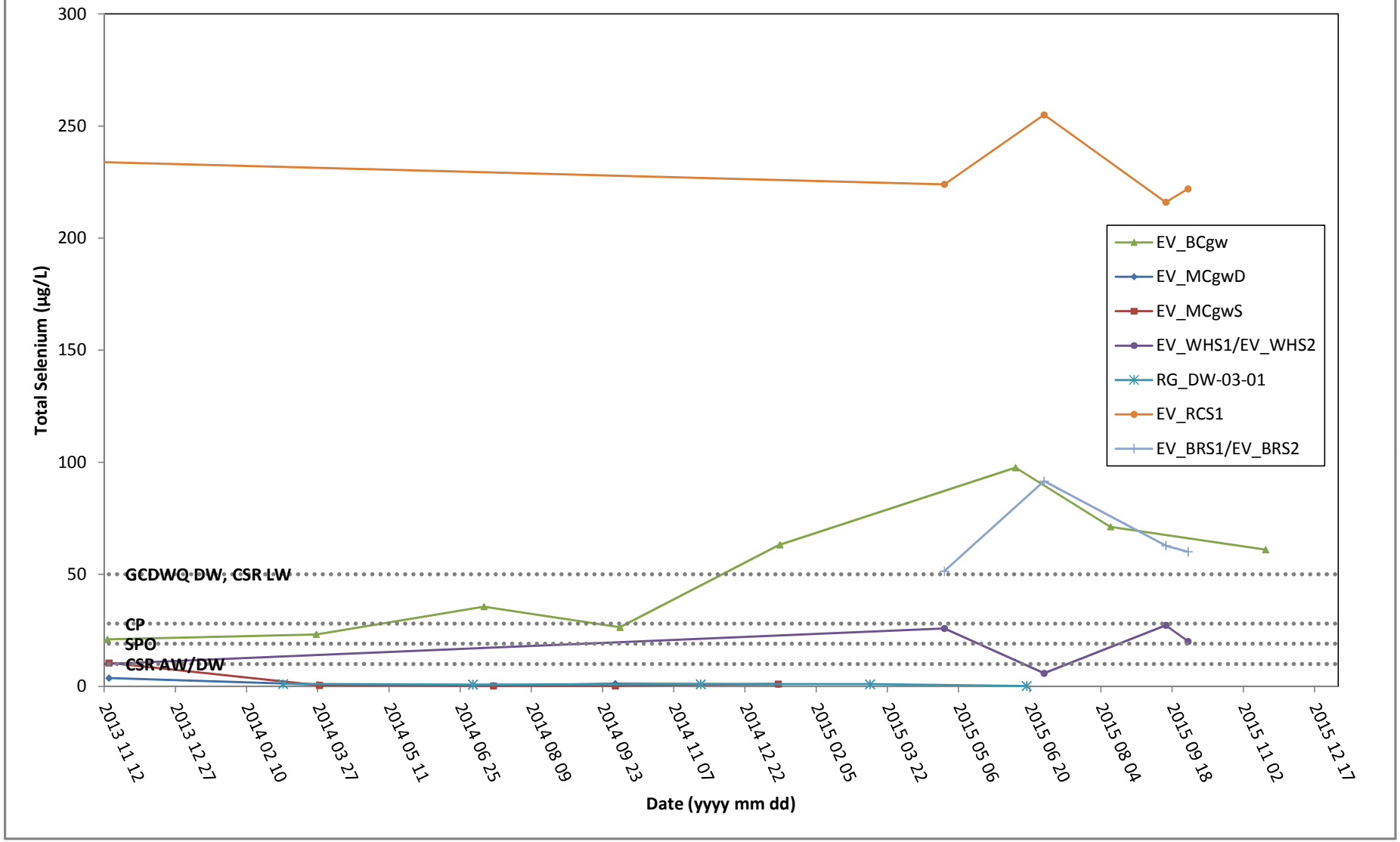


Graph 9-1: Groundwater Elevation of Key Area 9 Wells (January to December 2015)

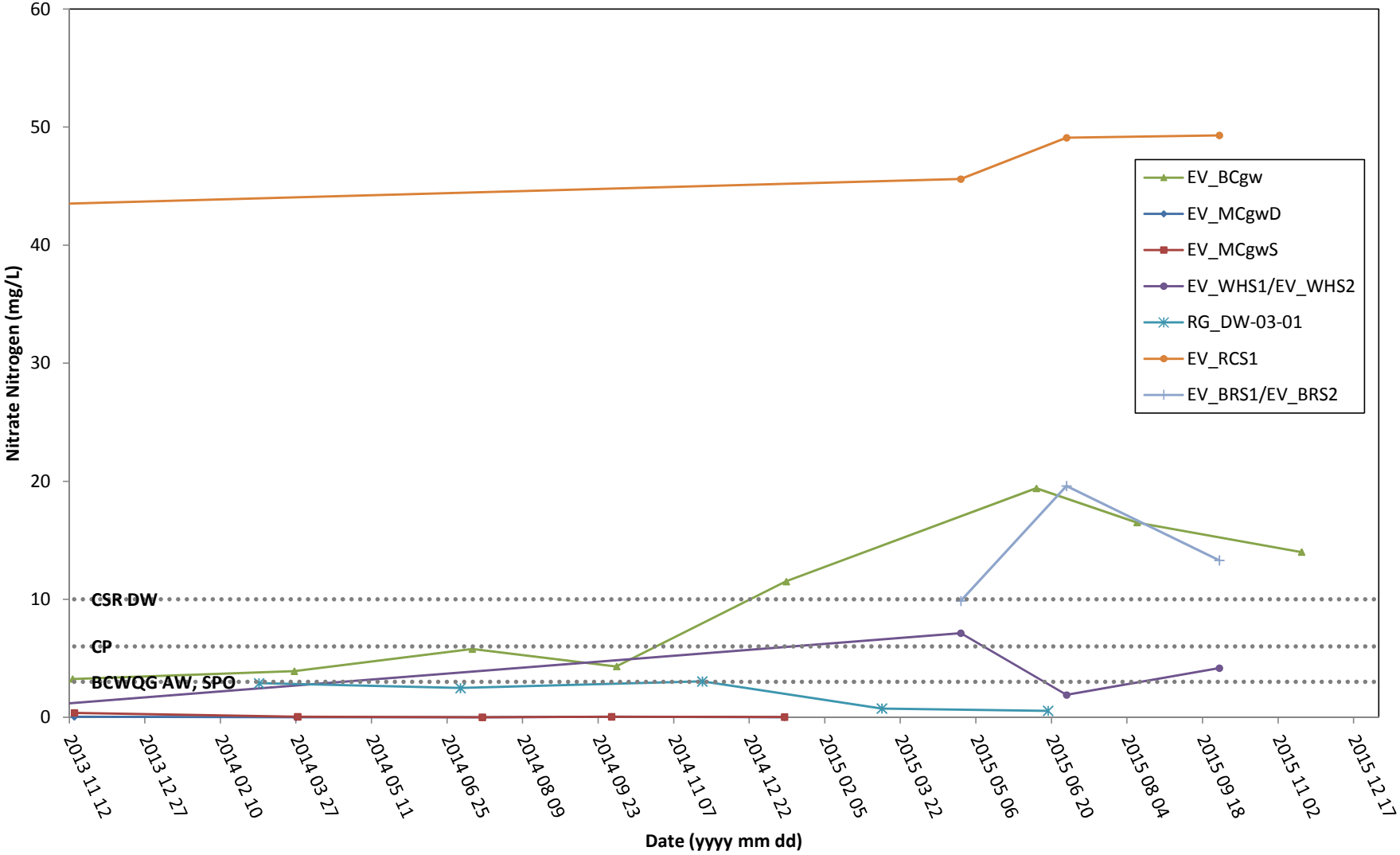


Note: data was removed where suspected datalogger removal occured, dataloggers MCgwD and MCgwS were switched on November 17, 2015

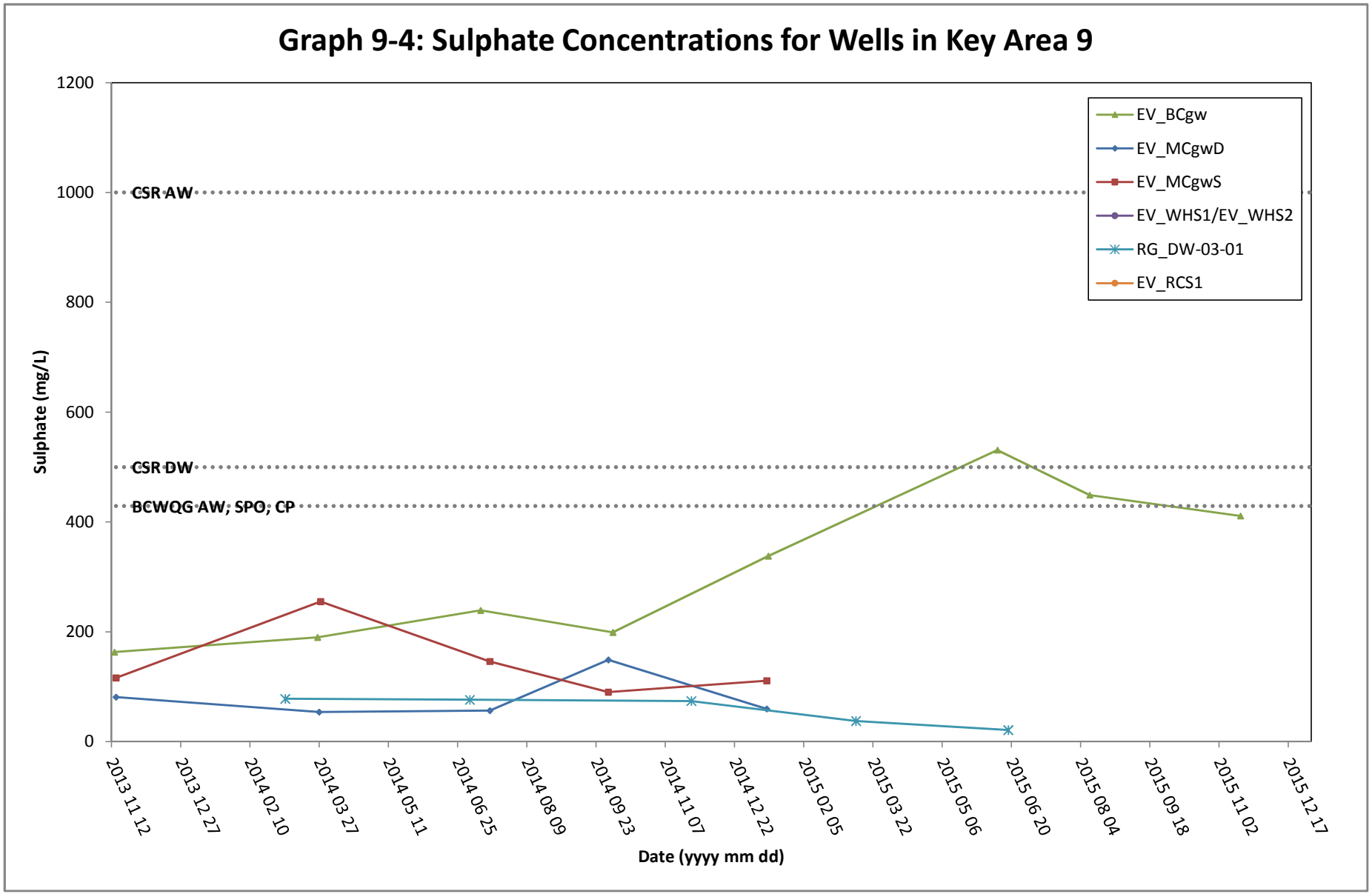
Graph 9-2: Total Selenium Concentrations for Wells in Key Area 9



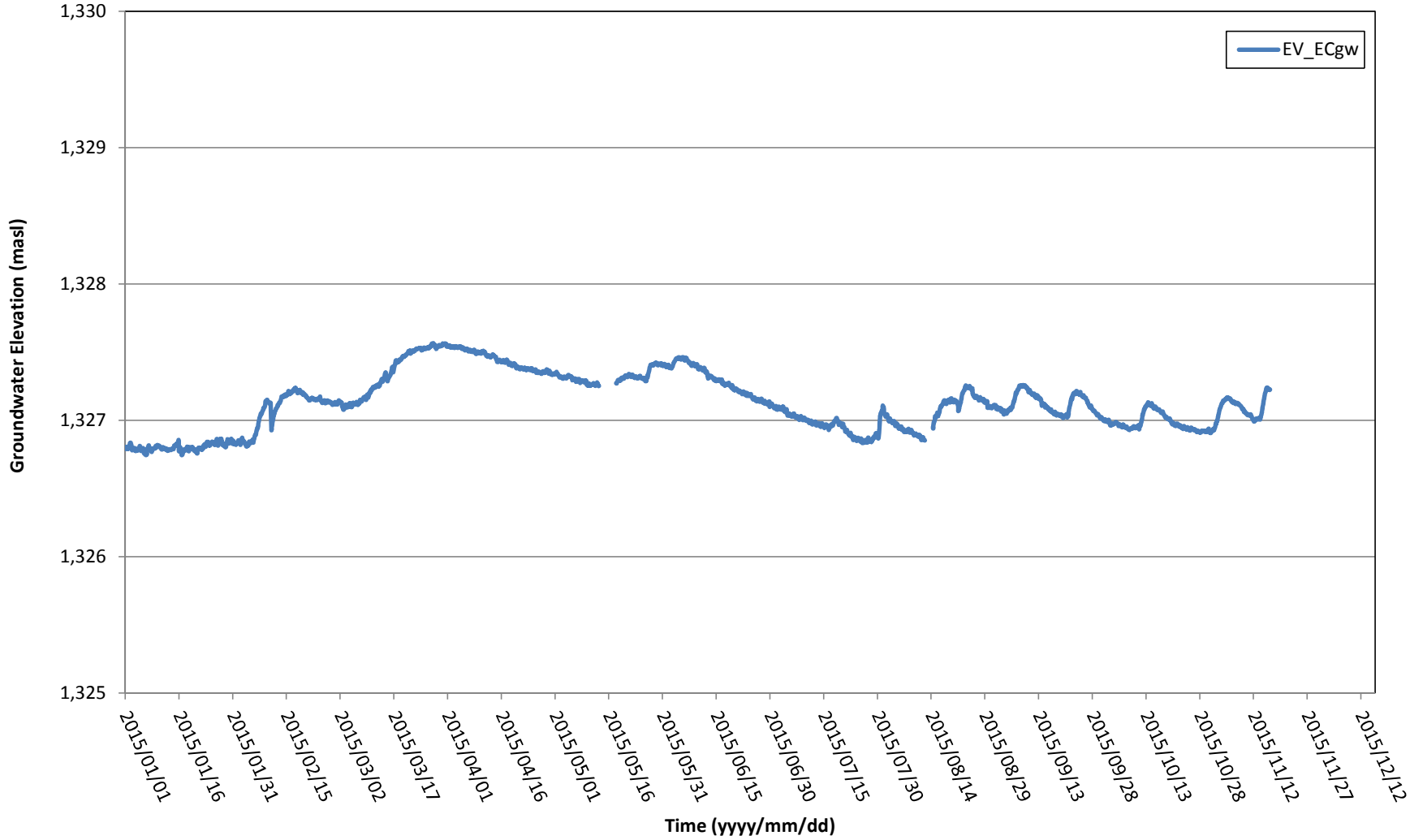
Graph 9-3: Nitrate Concentrations for Wells in Key Area 9



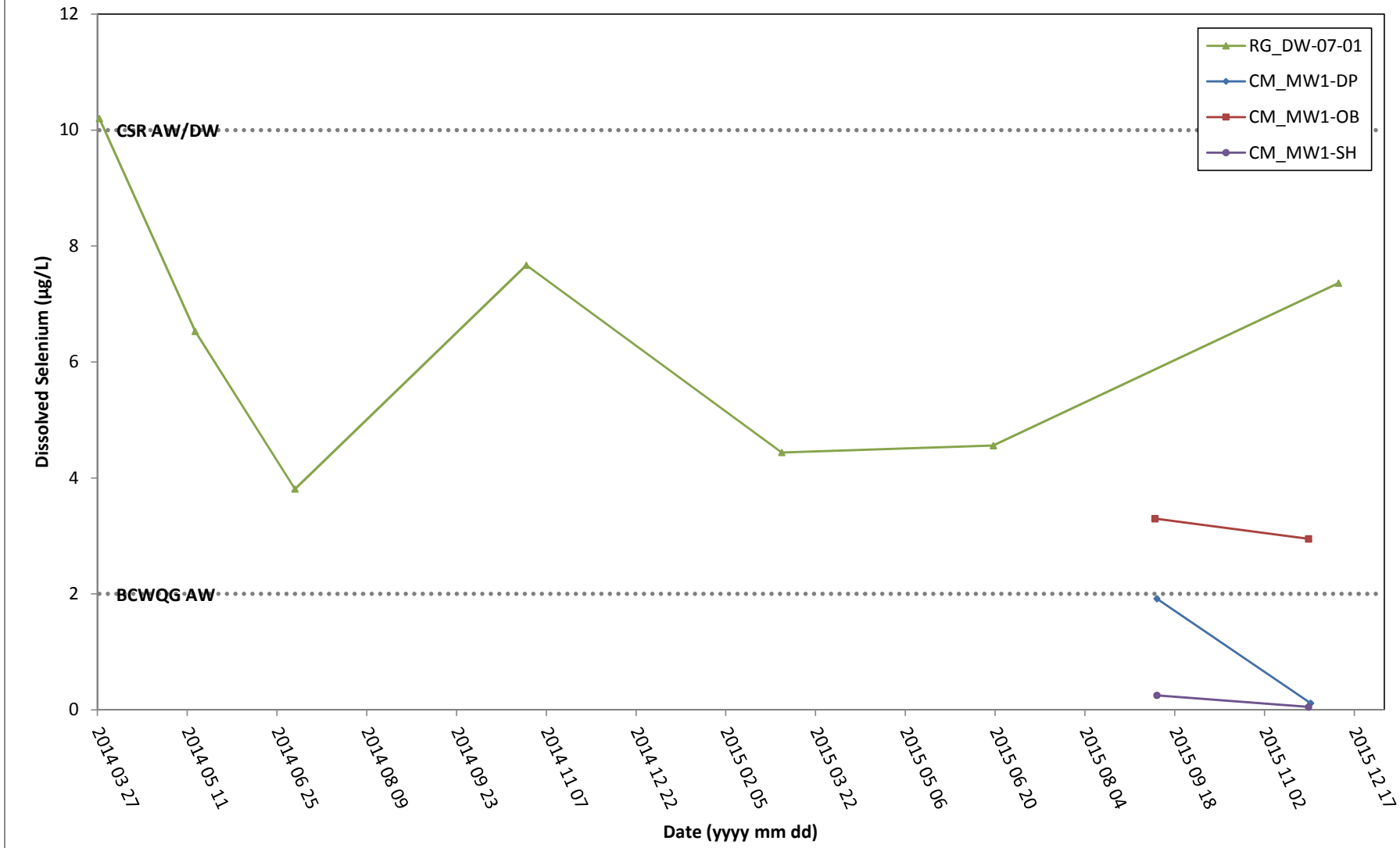
Graph 9-4: Sulphate Concentrations for Wells in Key Area 9



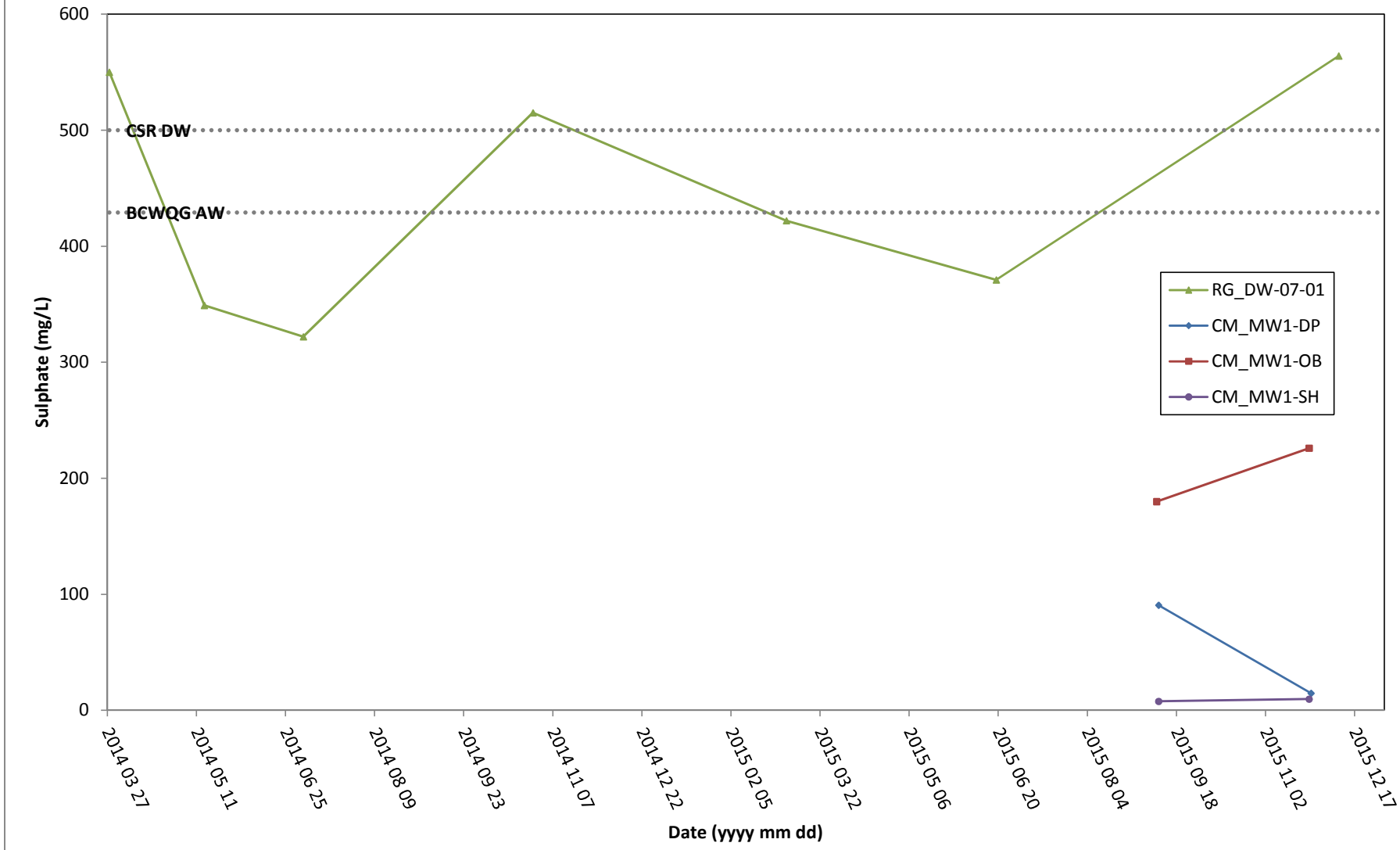
Graph 10-1: Groundwater Elevation of Key Area 10 (January to December 2015)



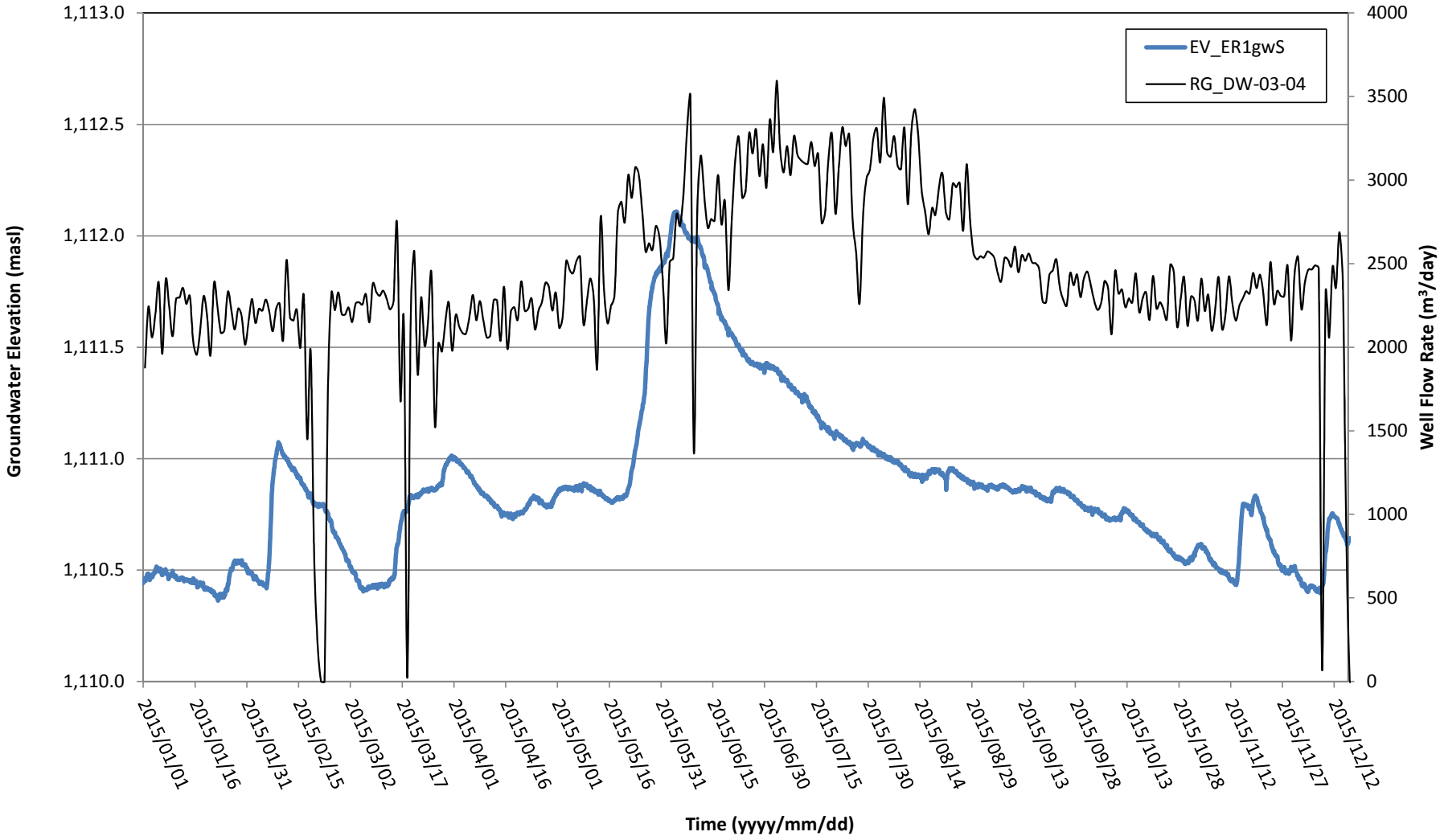
Graph 11-1: Selenium Concentrations for Wells in Key Area 11



Graph 11-2: Sulphate Concentrations for Wells in Key Area 11

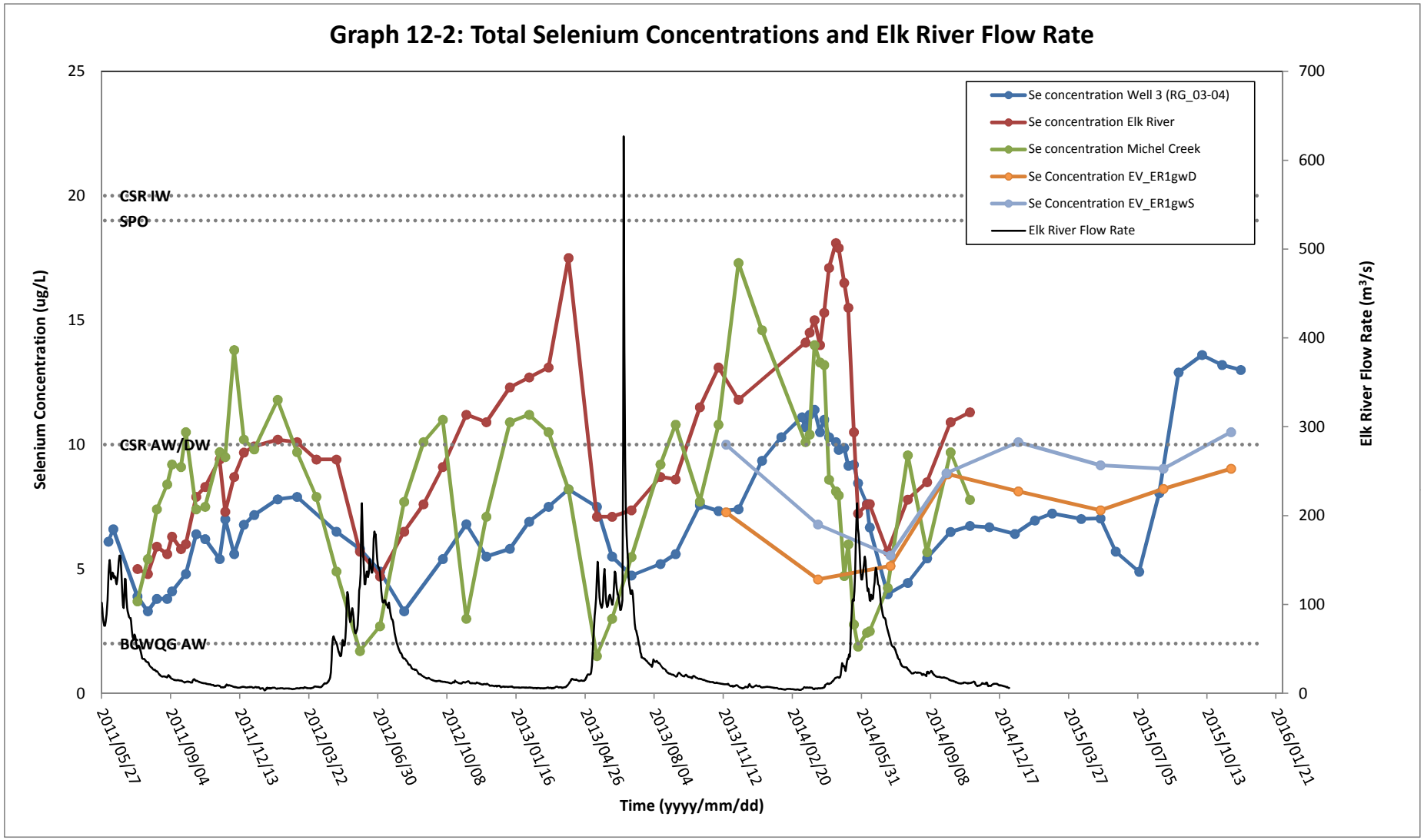


Graph 12-1: Groundwater Elevation and Pumping Rate in Key Area 12 (January to December 2015)



Note: data was removed where suspected datalogger removal occured

Graph 12-2: Total Selenium Concentrations and Elk River Flow Rate



SNC·LAVALIN

#3 - 520 Lake Street

Nelson, British Columbia
Canada V1L 4C6
Tel.: 250-354-1664
www.snclavalin.com