

# Appendix 11-B

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Surface Water Quality Baseline Report



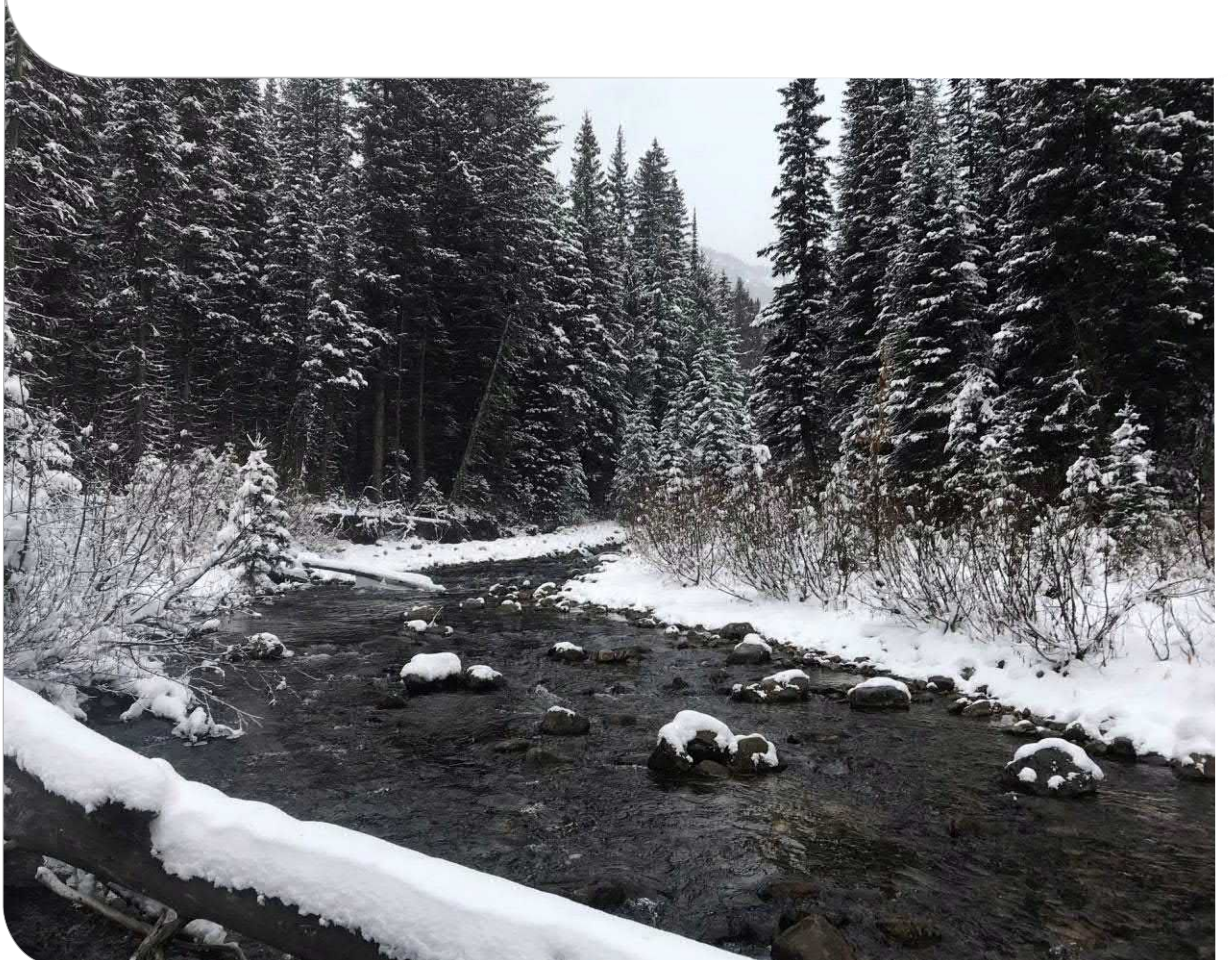
**DILLON**  
CONSULTING

**NWP COAL CANADA LTD**

# **Surface Water Quality Baseline Report**

*2012 to 2019 Surface Water Quality Sampling Results*

*Crown Mountain Coking Coal Project*



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## Executive Summary

NWP Coal Canada Ltd (NWP), a subsidiary of Jameson Resources Limited and Bathurst Resources Limited (Canada), is proposing to develop the Crown Mountain Coking Coal Project (the Project), which is intended as an open pit metallurgical coal mine located within the Elk Valley coal field in the East Kootenay Region of southeastern British Columbia. The Project area is located between several existing metallurgical coal mines in the Elk Valley and Crowsnest coal fields, with Teck Corporation's (Teck) Elkview mine located 8 km southwest of the Project area and their Line Creek mine located 12 km north of the Project area. The Project area is located approximately 30 km by road from Sparwood, British Columbia.

The anticipated production capacity of the Project is up to 4.0 million run-of-mine tonnes per annum for a duration of approximately 15 years, not including site decommissioning. This equates to a coal production capacity of approximately 10,150 tonnes per day. Under the *Canadian Environmental Assessment Act (2012)*, the Project is considered a designated Project under Regulations Designating Physical Projects since the mine will have a production capacity of more than 3,000 tonnes per day. Provincially, the Project is considered a Reviewable Project given that that production capacity of the mine will be greater than 250,000 tonnes per year of clean coal. A surface water quality baseline program commenced in May 2012 in support of the EA Application and is ongoing to date. The baseline program was initiated to characterize existing water quality conditions that would aid in assessing potential effects that the Project could have on the environment. Twelve lotic sampling locations were selected across Alexander Creek, West Alexander Creek, Grave Creek, and Michel Creek within the aquatic Local Study Area (LSA). The surface water quality baseline program focused on watercourses that have the potential to be impacted as a result of active open pit mining and waste rock management areas. Sampling was conducted on a monthly basis from May 2012 to 2015, with the addition of two intensive high-flow (spring freshet) sampling periods and two intensive low-flow sampling periods in 2014 and 2015. Sampling frequency was reduced to quarterly in late 2015. No sampling was completed between mid-2016 – mid-2018 as the Project was on hold; quarterly sampling resumed in mid-2018 and is on-going at the time of reporting.

Surface water quality results were compared to Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQG) and the British Columbia Water Quality Guidelines (BC WQG), in addition to site-specific targets for selenium outlined in the Elk Valley Water Quality Plan (EVWQP) by Teck. The remaining three Order of constituents (i.e., nitrate, sulphate, and cadmium) listed in the EVWQP follow guideline targets in line with the BC WQG and CWQG. With the exception of fluoride, total aluminum, dissolved copper, total iron, and total selenium, the majority of exceedances of the water quality guidelines occurred within two isolated sampling events: June 2013 and May 2014. Exceedances from the June 2013 sampling round were detected at sampling stations within the Alexander Creek watershed. Exceedances from the May 2014 sampling round were identified in the Michel Creek watershed. As these exceedances were isolated occurrences, they are not considered to

be representative of baseline conditions in the LSA. Exceedances of the BC WQGs and CCME CWQGs for polycyclic aromatic hydrocarbons (PAHs) have not been identified. The results of the surface water quality baseline program identify five parameters which were found to regularly exceed the applicable BC WQG and/or CWQG in the Project area: fluoride, aluminum, dissolved copper, iron, and selenium.

Regular long term CWQG exceedances of fluoride at each of the sampling locations were noted, with the exception of sampling stations A5 and G1 (i.e., the reference sites located at the headwaters of Alexander Creek and Grave Creek, respectively) which only had a few exceedances of fluoride. Long term CWQG exceedances of total aluminum were reported at each of the sampling locations, though fewer were identified within the upper reach of Alexander Creek (i.e., at sampling stations A5, A4, and A3(B)). Dissolved copper concentrations from four samples exceeded the short term BC WQG, and 21 samples exceeded the long term BC WQG, with no distinct seasonal or spatial trends. Total iron concentrations exceeded the CWQG at most stations in select sampling rounds, potentially higher during the spring freshet. Selenium exceeded the BC WQG and CWQG, with the majority of exceedances occurring at sampling stations G2, H1, A5, M1, and M2. Each of the samples collected from station H1 (i.e., Grave Creek downstream of confluence with Harmer Creek), and the majority of samples from station M2 (i.e. Michel Creek downstream of confluence with Alexander Creek), were found to exceed the guidelines for selenium.

Overall, there was moderate to low variability within sample sets at each location, particularly for fluoride, aluminum, copper, and iron. Selenium concentrations were considerably higher at M2 and H1 compared to the other sampling stations. These stations show moderate to high short term and long term variability, while other stations have generally low variability. Selenium concentrations appear to be higher during the low-flow seasons in August/September compared to the high-flow seasons in May/June.

The intensive sampling periods conducted in 2014 and 2015, representing variability, showed there was relatively low long term variability observed for fluoride, nitrate, sulphate, cadmium, dissolved copper, iron, and selenium. In contrast, aluminum concentrations had a higher short term variability. Aluminum, cadmium, and iron concentrations appear to be marginally lower during the high-flow spring freshet compared to the low-flow summer months which is likely due to reduced surface runoff and sedimentation during the summer months. In contrast, fluoride, sulphate, and selenium concentrations appear to be marginally elevated during the spring freshet. This is often associated with dissolved parameters as low flow periods result in higher concentrations due to longer contact times, more groundwater baseflow contribution, and higher concentration through evaporation processes.

Surface water quality baseline results were compared to other regional water quality data. Total selenium concentrations were compared to the 19 µg/L long term target identified in the EVWQP. A total of 40 samples had selenium concentrations that exceeded the EVWQP target, all occurring at station H1 in Grave Creek, upstream of the confluence to the Elk River. Selenium concentrations were

substantially lower at stations G1 and G2 (Grave Creek) upstream of Harmer Creek, suggesting that a potential source of selenium input to H1 could be from the adjacent train tracks as well as inputs from Harmer Creek which is adjacent to, and has tributaries within, Teck's Elkview Operations.

Comparison of the results with those from Teck's Elkview Operations Baldy Ridge Extension Project Surface Water and Sediment Quality Baseline Report (Golder Associates, 2015) revealed that the water quality at most sites sampled for the Crown Mountain baseline program were similar to Teck's reference sites, with the exception of H1 and M2, both of which are located downstream of anthropogenic activities. Comparing equivalent sites between the two projects, based on close proximity, showed that the key parameters identified for Crown Mountain baseline program were found at similar or lower concentrations compared the Teck's results. These comparisons suggest that the baseline surface water quality in the Project LSA is representative of existing conditions found in the Elk Valley.

Although nitrate and sulphate were identified as key parameters of concern along with selenium in the Elk Valley in the Aquatic Environment Synthesis Report (Windward et al., 2014), no exceedances of nitrate nor sulphate were observed in the 2012-2019 Crown Mountain baseline program. Other parameters which were found to exceed the applicable guidelines are generally consistent with those identified in the Aquatic Environment Synthesis Report (Windward et al., 2014), with the exception of fluoride and beryllium exceedances, which were not previously noted in the 2014 Aquatic Environment Synthesis Report (Windward et al., 2014).

The surface water quality sampling program is anticipated to continue to conduct long term monitoring from Project initiation through to operations and closure.



# Acronyms, Abbreviations, Definitions

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AIR	Application Information Requirements
BC	British Columbia
BC WQG	BC Water Quality Guidelines
CCME	Canadian Council of Ministers for the Environment
CWQG	Canadian Water Quality Guidelines
Dillon	Dillon Consulting Limited
EA	Environmental Assessment
EAO	Environmental Assessment Office
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMA	<i>Environmental Management Act</i>
EQL	Estimated Quantitation Limit
EVWQP	Elk Valley Water Quality Plan (also known as the Elk Valley Area Based Management Plan)
IAAC	Impact Assessment Agency of Canada
LSA	Local Study Area
MOE	Ministry of Environment and Climate Change Strategy (of British Columbia)
Nupqu	Nupqu Development Corporation
NWP	NWP Coal Canada Ltd
PAHs	Polycyclic aromatic hydrocarbons
Project	Crown Mountain Coking Coal Project
QA/QC	Quality Assurance and Quality Control

RPD	Relative Percent Difference
RSA	Regional Study Area
Teck	Teck Corporation or Teck Resources Limited
VC	Valued Component

## 1.0 Introduction

### 1.1 General Overview of the Project

NWP Coal Canada Ltd (NWP) is proposing to develop the Crown Mountain Coking Coal Project (the Project) which is intended as an open pit metallurgical coal mine located within the Elk Valley coal field in the East Kootenay Region of southeastern British Columbia. NWP is a subsidiary of Jameson Resources Limited and Bathurst Resources Limited (Canada). The Project comprises ten coal licenses. The Project area is located between several existing metallurgical coal mines in the Elk Valley and Crowsnest coal fields, with Teck Corporation's (Teck) Elkview mine located approximately 8 km southwest of the Project area and their Line Creek mine located approximately 12 km north of the Project area. The Project area is located approximately 30 km by road from Sparwood, British Columbia.

The anticipated production capacity of the Project is up to 4.0 million run-of-mine tonnes per annum for a duration of approximately 15 years, not including site decommissioning. This equates to a coal production capacity of approximately 10,150 tonnes per day. Exploration activities have indicated that the coal at the Project site is typical of coking coals produced from existing mines in the Elk Valley. The high quality metallurgical coal would be transported via railway to coastal BC, where it would be shipped overseas to be used in steelmaking.

The key project components include:

- Surface extraction areas (3 pits – north pit, east pit, and south pit);
- Waste rock management areas;
- Plant area (includes raw coal stockpile area, a processing plant, and site support facilities);
- Clean coal transportation route (via an overland conveyor and haul road);
- Rail load-out facility and rail siding (includes various auxiliary facilities such as a guard house; light vehicle wash; drug and alcohol testing/orientation building; and a small dry);
- Power supply;
- Natural gas supply;
- Explosives storage;
- Fuel storage;
- Sewage treatment; and
- Water supply.

## 1.2 Purpose and Objectives of the Baseline Study

NWP is submitting an Environmental Assessment (EA) Application to the British Columbia Environmental Assessment Office (BC EAO) and the Impact Assessment Agency of Canada (IAAC). The Application Information Requirements (AIR) pursuant to the BC *Environmental Assessment Act (EA Act)*, S.B.C. 2002, c.43 and the related “Guidelines for the Preparation of an Environmental Impact Statement (EIS)” pursuant to the *Canadian Environmental Assessment Act, 2012* stipulate that the EA Application will include baseline studies to characterize the existing environment and facilitate the EA process in which potential effects from the Project can be identified at the local scale.

Project-specific baseline studies were initiated in 2012 to support the EA process and currently on-going. The objective of the surface water quality baseline study was to characterize existing water quality conditions to aid in assessing potential effects may occur as a result of the Project. The baseline data will be used to support a Project-specific water quality model. This model will incorporate all planned mine water management activities for all phases of the Project and will be used to predict the future concentrations of water quality parameters and assess potential effects of the Project to surface water quality. The data presented in this report describe existing baseline conditions of surface water quality relevant to lotic sites within the Project area and provides the required supporting information to complete the effects assessment for other related components of the EA. Water quality at lentic sites is not included in the present study.

## 2.0 Background Information

### 2.1 Applicable Legislation, Regulations, and Guidelines

Water quality is subject to key federal legislation including the:

- *Canadian Environmental Protection Act (1999);*
- *Canadian Environmental Assessment Act (2012);*
- *Fisheries Act (1985, amended 2019); and*
- *International Boundary Waters Treaty Act (1985).*

Key provincial legislation that water quality is subjected to include the:

- *Environmental Assessment Act (2002);*
- *Environmental Management Act (EMA; 2003);*
- *Mines Act (1996);*
- *Oil and Gas Activities (2008);*
- *Riparian Areas Protection Act (1997);*
- *Water Sustainability Act (2016); and*
- *Drinking Water Protection Act (2001).*

In this report, water quality analytical results have been compared to both federal and provincial criteria. For use under the federal regulatory framework, refer to the Canadian Ministers of the Canadian Council of Ministers for the Environment (CCME) “Canadian Water Quality Guidelines for the Protection of Aquatic Life” (CWQG; [CCME, 1999, {updated 2007}]). For use under the provincial regulatory framework, refer to the BC Ministry of Environment and Climate Change Strategy (MOE) Water Quality Guidelines (WQG) for the Protection of Freshwater Aquatic Life (BC WQG; [MOE, 2019; MOE, 2017]).

Surface water quality data were compared to both short term and long term BC WQG (approved and working). The BC WQG provide short term maximum “acute” and long term “chronic” comparison values. Short term guidelines are intended to protect aquatic organisms against severe effects such as lethality due to short term intermittent or transient exposures to contaminants (e.g., spill events; infrequent releases of short-lived substances). Long term BC WQG are intended to protect all forms of aquatic life from lethal and sub-lethal effects over long term indefinite exposures. It should be noted that several guidelines for some parameters vary according to other parameters from that sample, such as hardness, pH, and/or temperature. For example, guidelines for aluminum, ammonia (as N), cadmium, copper, fluoride, iron, lead, manganese, nickel, nitrite, silver, sulphate and zinc are dependent on other parameters from the sample and calculated based on the analytical results for each sample.

The BC WQG guideline for copper is calculated using the Copper Biotic Ligand Model (BLM), a software model developed by BC MOE that is specific for copper, based on a set of linked equations. The BLM calculates guidelines for short term and for long term exposure specific to each sample, based on other



water quality measurements for that sample (e.g., pH, hardness, dissolved organic carbon, anion ratio etc.). The model is designed to consider uptake by fish across their gills, which is considered the most sensitive receptor within a typical ecosystem. The copper guidelines from the BLM explicitly addresses the issue of the inherent variability of environmental data. The guidance for applying the guideline allows for 20% of samples to exceed the respective guideline, so long as the average concentration of samples within a 30-day period does not exceed the average long term guideline and no sample exceeds its respective short term guideline. For samples collected outside of these intensive sampling rounds, the short term guidelines were considered on the basis that each isolated sample may represent a transient high-concentration condition. This rationale will continue to be applied, with the short term calculated guidelines applied except in cases of an intensive sampling period.

The Companion Document to: Ambient Water Quality Guidelines for Selenium Update (BC MOE, 2014) provides updated WQGs for selenium in water for the protection of aquatic life. The analytical results can be compared to the guideline value and alert value for selenium in water for comparison purposes.

Other relevant guidance documents, including the *Derivation of Water Quality Guidelines for the Protection of Aquatic Life in British Columbia* (MOE, 2019) were referenced during the guideline derivation and analysis process. Furthermore, the Elk Valley Water Quality Plan (EVWQP; [Teck, 2014]), also known as the Elk Valley Area Based Management Plan, was developed in response to a Ministerial Order issued in April 2013 under the *EMA* to manage the cumulative effects of coal mining on water quality in the Elk Valley. The EVWQP includes short, medium, and long term water quality targets for the four Order constituents as specified in the directive, namely: nitrate, sulphate, cadmium, and selenium, for the Elk Valley region (referred to in this report as the “four Order constituents”). In addition to the federal and provincial guidelines, the surface water quality data for the Project were also compared to the EVWQP targets for the four Order constituents.

## 2.2 Regional Setting and Study Areas

The Project is located in the southeast corner of BC in an area of steep topography of the Front Ranges Rocky Mountains and is within the Alexander Creek and Grave Creek watersheds. This region, known as the Elk Valley, has a long history of mining activity and is currently home to five metallurgical (coking) coal mines, all of which are operated by Teck, including:

- Ford River Operations (approximately 29 km northeast of Elkford);
- Coal Mountain Operations (approximately 30 km southeast of Sparwood);
- Elkview Operations (approximately 3 km east of Sparwood);
- Greenhills Operations (approximately 8 km northeast of Elkford); and
- Line Creek Operations (approximately 25 km north of Sparwood).

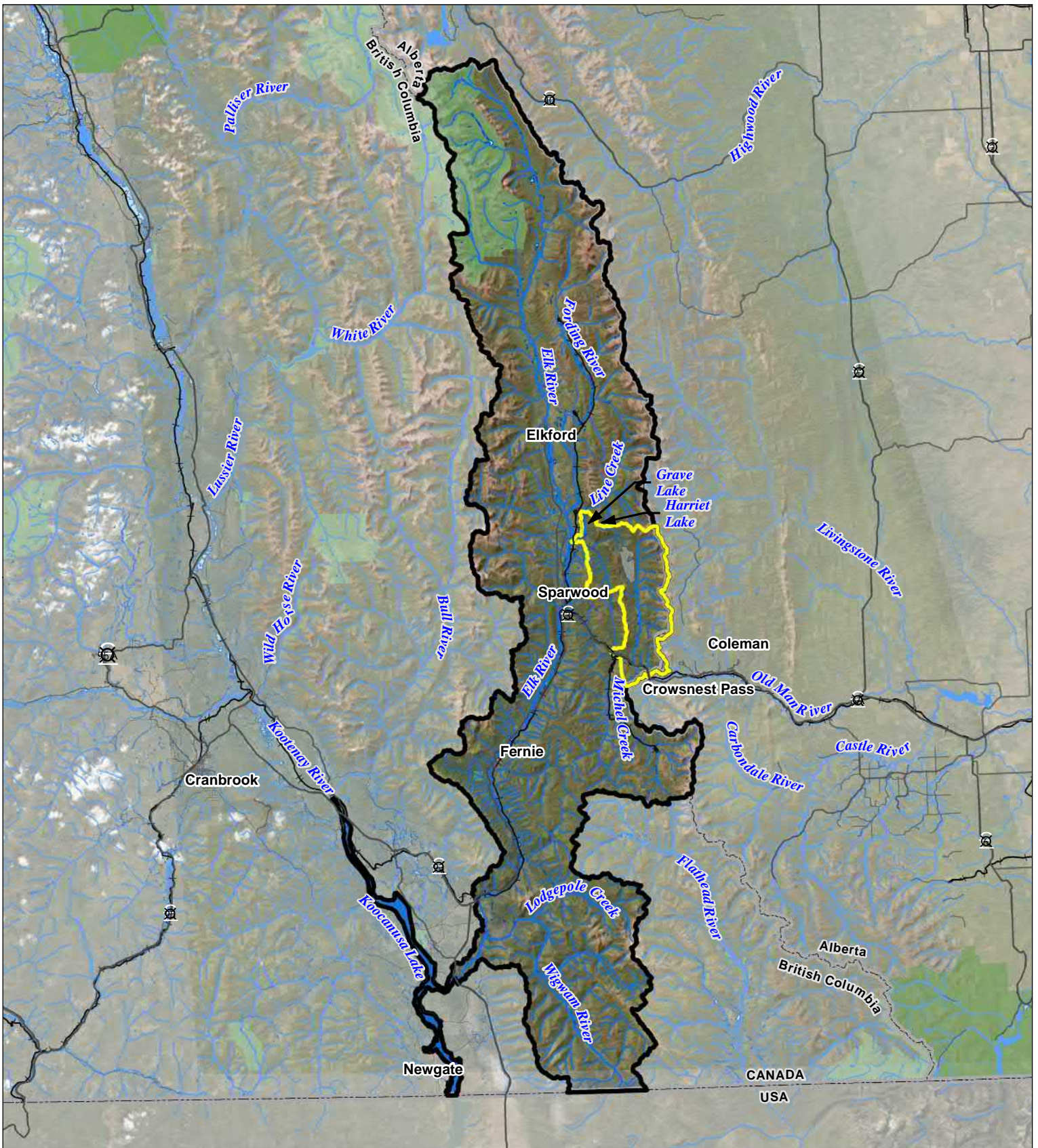
Two study areas were selected for the assessment of surface water quality baseline conditions and potential effects from the Project: the aquatic Regional Study Area (RSA) and the aquatic Local Study Area (LSA; **Figure 1** and **Figure 2**, respectively).

The boundaries of the aquatic RSA encompass an area that has the potential to be directly or indirectly affected by the Project and considers cumulative effects on surface water quality, hydrology, groundwater quality, hydrogeology, and fish and fish habitat. The aquatic RSA includes the Elk Valley watershed and a portion of Lake Koochanusa, which the Elk River enters near southern BC at the State of Montana border.

The boundaries of the aquatic LSA were selected based on the anticipated Project footprint. The aquatic LSA includes areas that have the immediate potential to be directly or indirectly affected by the Project, including Grave Creek, West Alexander Creek, and Alexander Creek. Watercourses that have the potential to directly overlap with the Project footprint include West Alexander Creek and Grave Creek.

There is extensive historical surface water quality information for the Elk River watershed and therefore, a site-specific surface water quality sampling program was carried out only in the LSA. The data presented in this baseline report will be incorporated with the information presented in the *Aquatic Effects Synthesis Report* (Windward et al., 2014) to evaluate potential effects resulting from the Project as part of the EA Application.


















Crown Mountain  
Coking Coal Project

Surface Water Quality Baseline Report  
Regional Study Area

Figure 1

LEGEND

- |   |                     |   |                            |
|---|---------------------|---|----------------------------|
|  | Regional Study Area |  | Watercourse                |
|  | Local Study Area    |  | Highways                   |
|  | Project Footprint   |  | Arterial Roads             |
|  | National Park       |  | Local/Resource Roads       |
|  | Provincial Park     |  | Railway (Canadian Pacific) |
|  | Waterbody           |  | BC/Alberta Border          |
|  | Wetland             |   |                            |

0 5 10 20 km  
SCALE 1:875,000

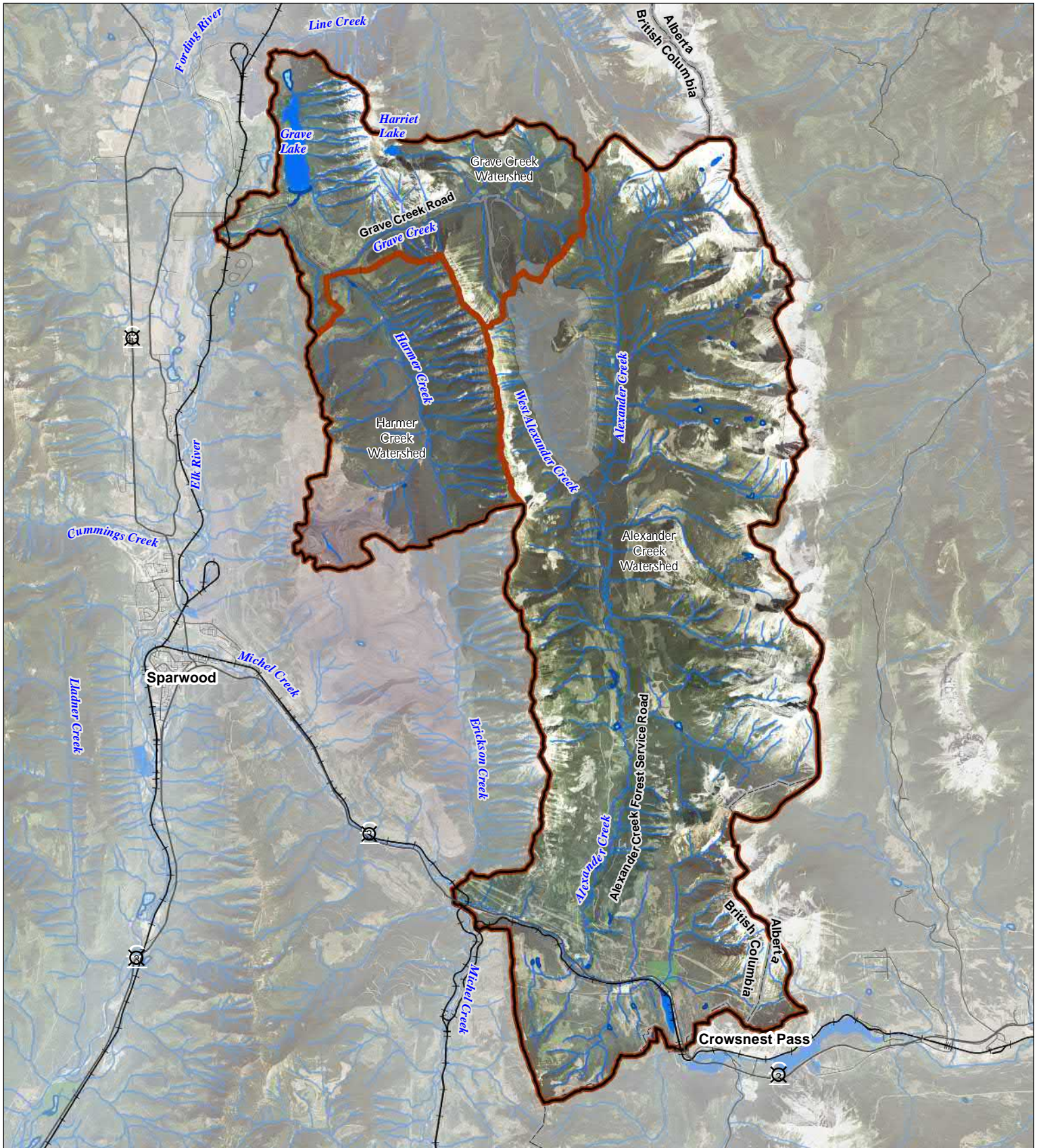
MAP DRAWING INFORMATION:  
Dillon Created; ESRI Base Layers, Province of British Columbia,  
GeoBC and Open Data BC, BC Water Resource Atlas, CANVEC.

MAP CREATED BY: RBB/JFC  
MAP CHECKED BY: CK  
MAP PROJECTION: NAD 1983 UTM Zone 11N



PROJECT: 12-6231  
STATUS: FINAL  
DATE: 2021-08-13





Crown Mountain  
Coking Coal Project

Surface Water Quality Baseline Report  
Local Study Area

Figure 2

LEGEND

- |  |                   |  |                            |
|--|-------------------|--|----------------------------|
|  | Local Study Area  |  | Watercourse                |
|  | Project Footprint |  | Highways                   |
|  | Provincial Park   |  | Arterial Roads             |
|  | Watershed         |  | Local/Resource Roads       |
|  | Waterbody         |  | Railway (Canadian Pacific) |
|  | Wetland           |  | BC/Alberta Border          |

0 0.5 1 2 3 4 5 km  
SCALE 1:145,000

MAP DRAWING INFORMATION:  
Dillon Created, ESRI Base Layers, Province of British Columbia GeoBC  
and Open Data BC, BC Water Resource Atlas, CANVEC.

MAP CREATED BY: RBB/JFC  
MAP CHECKED BY: CK  
MAP PROJECTION: NAD 1983 UTM Zone 11N



PROJECT: 12-6231  
STATUS: FINAL  
DATE: 2021-08-13



## 3.0 Methodology

### 3.1 Sampling Locations

Surface water quality was assessed at 12 lotic sites across the LSA and includes locations within Alexander Creek, West Alexander Creek, Grave Creek, and Michel Creek. The surface water quality baseline program focused on watercourses that may be directly affected as a result of the Project. It is anticipated that these stations will be monitored over the course of the Project, including operations through to post-closure. **Table 1** provides detail of the 12 sampling stations in order of surface flow pathway from upstream to downstream, and

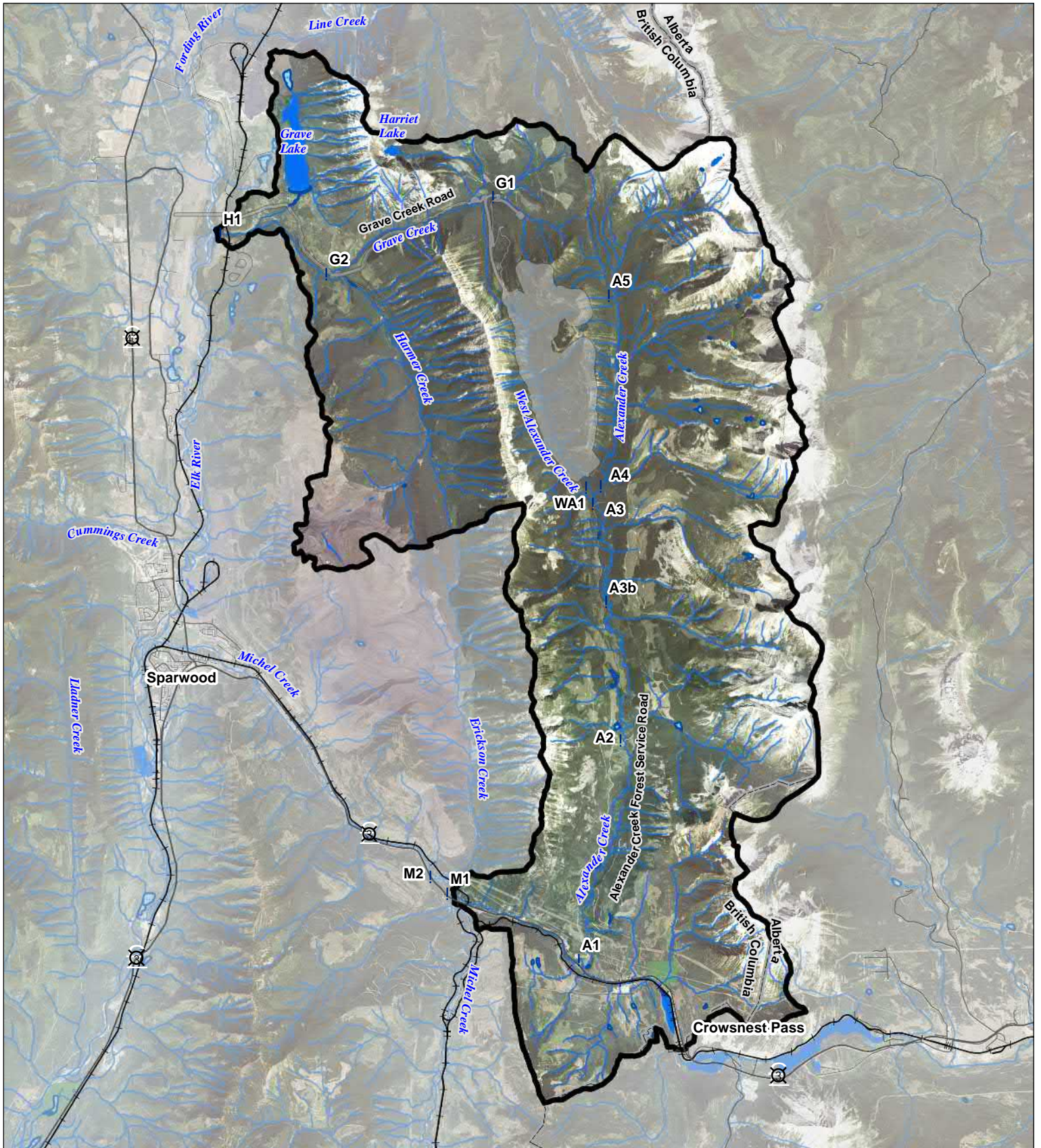
**Figure 3** shows the location of the sampling stations within the LSA.

**Table 1: Location of Surface Water Quality Sampling Stations, in Order of Surface Water Flow Path**

Station	Watercourse	Easting	Northing	Rationale for Station Location
A5	Alexander Creek	664645.61	5521631.72	Upper reach of Alexander Creek. Reference site to assess background conditions of Alexander Creek. Located upstream of mining activities.
A4		664408.79	5516214.21	Lower reach of Alexander Creek, upstream of confluence with West Alexander Creek.
WA1	West Alexander Creek	664001.00	5516179.34	Upstream of confluence with Alexander Creek.
A3	Alexander Creek	664187.64	5515723.91	Downstream of confluence with West Alexander Creek.
A3(B)		664564.92	5512938.89	Downstream of confluence with West Alexander Creek. A3 was relocated approximately 200 m downstream and renamed to A3(B) in June 2014 due to extreme flooding and morphological changes to Alexander Creek.
A2		664975.82	5509004.95	Middle reach of Alexander Creek downstream of confluence with West Alexander Creek.
A1		663787.73	5502797.16	Lower reach of Alexander Creek.
M1	Michel Creek	660056.45	5504669.21	Upstream of confluence with Alexander Creek.
M2		659580.18	5505145.27	Downstream of confluence with Alexander Creek.
G1	Grave Creek	661350.70	5524412.42	Upper reach of Grave Creek. Reference site to assess background conditions of Grave Creek. Located upstream of mining activities.
G2		656628.18	5522243.04	Lower reach of Grave Creek upstream of confluence with Harmer Creek.
H1		653610.43	5523377.69	Near confluence of Grave Creek with the Elk River; downstream of rail tracks.

**Note:** Coordinates in NAD83 UTM Zone 11





Crown Mountain  
Coking Coal Project

Surface Water Quality Baseline Report  
Surface Water Quality Stations  
Figure 3

LEGEND

- |   |                   |   |                                |
|---|-------------------|---|--------------------------------|
|  | Local Study Area  |  | Highways                       |
|  | Project Footprint |  | Arterial Roads                 |
|  | Provincial Park   |  | Local/Resource Roads           |
|  | Waterbody         |  | Railway (Canadian Pacific)     |
|  | Wetland           |  | BC/Alberta Border              |
|  | Watercourse       |  | Surface Water Quality Stations |

0 0.5 1 2 3 4 5 km  
SCALE 1:145,000

MAP DRAWING INFORMATION:  
Dillon Created, ESRI Base Layers, Province of British Columbia GeoBC  
and Open Data BC, BC Water Resource Atlas, CANVEC.

MAP CREATED BY: RBB/JFC  
MAP CHECKED BY: CK  
MAP PROJECTION: NAD 1983 UTM Zone 11N



PROJECT: 12-6231  
STATUS: FINAL  
DATE: 2021-08-13



## 3.2 Timing of Sampling

The surface water quality baseline sampling program has been ongoing since 2012. The program was initiated in May 2012 at 12 stations across the aquatic LSA. Monthly baseline water quality sampling was conducted from May 2012 to September 2015. Occasionally, some samples could not be collected at the desired frequency due to extreme flow velocities, lack of flow, frozen channel(s), or unsafe site access (e.g., winter avalanche risk). Surface water sampling results from May 2012 to June 2019 are presented for discussion in this report.

In addition to monthly sampling, two intensive high-flow (spring freshet) sampling periods were completed in May/June 2014 and May/June 2015; and two intensive low-flow sampling periods were conducted in August/September 2014 and August/September 2015. These intensive “5 samples in 30 days” sampling periods (also referred to as “5-in-30” samples) would allow for the comparison to the BC WQG long term average (i.e., chronic) comparison values. These long term BC WQGs allow concentrations of a substance to fluctuate above and below the guideline provided the BC WQG short term maximum is not exceeded and the average of results is met over five samples collected within 30 days.

A 2015 mid-term analysis of the surface water quality data from May 2012 to June 2015 was conducted to calculate statistical power for subsequent sampling years. The data analysis, submitted to BC MOE on September 2015, demonstrated that the potential temporal and spatial variability of water quality parameters had been firmly accounted for in the collection of 53 surveys over the span of 3.5 years. As supported by the findings of this analysis and with approval from BC MOE in accordance with the *Guidelines for Designing and Implementing a Water Quality Monitoring Program in British Columbia and Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operations* (MOE, 2016)<sup>1</sup>, the sampling frequency was reduced from monthly to quarterly. Quarterly baseline sampling commenced thereafter. Sampling was ceased for two years from June 2016 to 2018 while the Project was on hold. Quarterly sampling was re-initiated in July 2018 and is ongoing at the time of preparation of this report.

Fifty-eight sampling rounds have been conducted at the time of writing, for a total of 623 normal samples and 70 blind field duplicate samples (**Table 2**). Surface water analytical results compared to the BC WQG working and approved short term guidelines for freshwater aquatic life, CWQGs for freshwater aquatic life long term and short term, are provided in **Appendix A**. Surface water analytical results from the 5-in-30 sampling events compared to the BC WQG approved long term guidelines for aquatic life are

<sup>1</sup> The *Guidelines for Designing and Implementing a Water Quality Monitoring Program in British Columbia and Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operations* (2016) state that once the temporal and spatial variability of water quality parameters are firmly established through the baseline study and early operational phase monitoring, chemical constituents in water that have low variation from sample to sample and a low probability of exceeding guidelines may be collected and analyzed less frequently (MOE, 1996).

provided in **Appendix B**. Where discrete 5-in-30 samples exceed the long term guideline value, the average of discrete events from the corresponding time period have also been applied to the guideline.

**Table 2: Summary of Sampling Rounds Conducted for the 2012-2019 Surface Water Quality Baseline Program**

Sample Location	Number of Sampling Rounds								Total
	2012	2013	2014	2015	2016	2017	2018	2019	
A5	7 <sup>a</sup>	12	18	15	1	-	2	2	57
A4	8	12	18	15	1	-	2	2	58
WA1	8	11 <sup>b</sup>	16 <sup>c</sup>	15	1	-	2	1 <sup>d</sup>	54
A3	8	9 <sup>e</sup>	7 <sup>e</sup>	-	-	-	-	-	24
A3(B)	-	-	9	15	1	-	2	2	29
A2	8	12	18	15	1	-	2	2	58
A1	8	12	18	15	1	-	2	2	58
M1	8	12	18	15	1	-	1 <sup>f</sup>	2	57
M2	8	12	18	15	1	-	1 <sup>f</sup>	2	57
G1	8	11 <sup>g</sup>	18	15	1	-	2	2	57
G2	8	11 <sup>g</sup>	18	15	1	-	2	2	57
H1	8	11 <sup>g</sup>	18	15	1	-	2	2	57
								<b>Total</b>	<b>623</b>

<sup>a</sup> A5 not sampled in May 2012 (reasons not documented)

<sup>b</sup> WA1 not sampled in December 2013 due to frozen conditions

<sup>c</sup> WA1 not sampled in February and March 2014 due to avalanche risk and frozen conditions

<sup>d</sup> WA1 not sampled in March 2019 due to frozen conditions

<sup>e</sup> A3 not sampled in February 2013, March 2013, December 2013, February 2014, and March 2014 due to frozen conditions

<sup>f</sup> M1 and M2 not sampled in July 2018 (reasons not documented)

<sup>g</sup> G1, G2, and H1 not sampled in June 2013 due to high flows

### 3.3 Sampling Program

Surface water sample collection was conducted by Nupqu Development Corporation (Nupqu). Specific methods and standards used to collect baseline surface water quality data, including the sampling locations and analytical parameters, were conducted in accordance with MOE's *Guidelines for Designing and Implementing a Water Quality Monitoring Program in British Columbia and Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operations* (2016).

Surface water samples collected from each of the 12 sampling stations were analysed for the following parameters:

- Physical tests (general chemistry);
- Anions and nutrients;
- Total and dissolved organic carbon;
- Total and dissolved metals; and
- Polycyclic aromatic hydrocarbons (PAHs).

Grab samples were collected at each sampling station into clean, pre-labelled bottles supplied by the laboratory. Standard protocols were followed regarding sample handling and storage, holding times, test validity, and controls. Field personnel wore nitrile gloves, faced upstream, and submerged the sample bottles until they were full. Preservatives were used for total/dissolved metals, total/dissolved organic carbon, and PAHs. Field and trip blanks and field duplicate samples were collected during sampling events. In addition, general site observations, such as water clarity, colour of water, signs of bank erosion, presence of fish and wildlife, and representative photos were recorded. Samples were shipped to Bureau Veritas Laboratories (BV Labs; formerly Maxxam Analytics) in Burnaby, BC for the majority of the sampling analyses, with the exception of samples collected in 2018 and 2019 which were analyzed by ALS Environmental Ltd. (ALS) in Burnaby, BC.

### 3.4 Data Analysis

Surface water quality data were compared to the applicable long term and short term CWQG and long term and short term BC WQG. As per CCME protocols, unless otherwise specified in the technical document, WQGs were compared to the total concentration of the substance in an unfiltered sample. Concentrations of discrete and averaged 5-in-30 samples, collected during the 2014 and 2015 low-flow and high-flow intensive sampling periods, compared to the BC WQG long term. Guidelines reliant on toxicity-modifying factors, which vary with hardness, pH, temperature, organic carbon, and/or dissolved oxygen were calculated for each sample, where applicable. Where guidelines were calculated based on pH values, field pH was used; laboratory pH was applied in cases where field pH data was unavailable.

Surface water analytical results compared to the BC WQG working and approved short term guidelines for freshwater aquatic life, CWQGs for freshwater aquatic life long term and short term, are provided in **Appendix A**. Surface water analytical results from the 5-in-30 sampling events compared to the BC WQG approved long term guidelines for aquatic life are provided in **Appendix B**.

Basic summary statistics, including minimum, maximum, median, mean, standard deviation and standard error were calculated for each sampling station. Where concentrations were reported as non-detect a value of  $\frac{1}{2}$  the detection limit ( $\frac{1}{2}$  the RDL) was used for calculation of summary statistics.

Scatterplots were generated for parameters which were found to regularly exceed the CWQG and/or the BC WQG, to identify potential trends. For graphical purposes, the average results of 5-in-30 intensive sampling events have been applied. Box-and-whisker plots (box plots) were used for select parameters and 5-in-30 events to evaluate the variability of the data set and to identify potential spatial trends. Boxes show the 25th and 75th quartiles, where the midpoint indicates the median value and error bars indicate the deviation (mean - minimum and maximum - mean) for each population (**Appendix D**).

### 3.5 Regional Background Conditions

Results from the Project's surface water quality baseline program were compared to the long term site-specific benchmarks identified in the EVWQP for the four Order constituents. Other additional regional water quality data was reviewed to further characterize existing water quality conditions at a regional scale and included Teck's Elkview Operations Baldy Ridge Extension Surface Water and Sediment Quality Baseline Report (Golder Associates, 2015), Aquatic Environment Synthesis Report (Windward et al., 2014), and nearby Environment and Climate Change Canada's (ECCC) water quality monitoring stations.

### 3.6 Quality Assurance / Quality Control

The quality assurance and quality control procedures (QA/QC) for the surface water quality sampling program included the use of laboratory chain of custody forms, collection of blind field duplicate samples, field blanks, and trip blanks. Pre-labelled bottle orders were pre-arranged by Dillon and couriered to Nupqu's office in Fernie, BC. Field blanks allowed for identification of potential contamination from airborne dust, sample preservation, sample handling by field technicians, or other sources. Trip blanks were filled with distilled water at the laboratory and remained unopened during field activities. Trip blanks allowed for identification of potential contamination from the transportation, storage, and handling of samples. Sample collection information including in-situ sampling details, field observations and other pertinent information collected by Nupqu, including names of field technicians, access constraints, weather, and sampling date and times, were uploaded to the central data management platform.

Quality control measures included the collection and analysis of blind field duplicate samples at a rate of 11% normal samples during the program from 2012 to 2019, to evaluate potential contamination from field or lab protocols. Blind duplicate samples; meaning two samples collected simultaneously with no identification of the corresponding parent sample. Relative percent differences (RPDs) were calculated for parent and duplicate sample pairs. The RPD is the absolute difference between the parent and duplicate result values divided by the mean. Following BC standard practices, RPDs were considered calculable where one of the parent and duplicate result is greater than 5 times the laboratory reportable detection limit (RDL). When the calculable RPD between a parent-duplicate pair exceeds 30% for liquid samples, standard practice is to explore potential explanations with reference to other analyses from the same sampling point, and/or field observations.

BV Labs and ALS are the CALA accredited laboratories used to perform the sample analyses. Laboratory analytical QA/QC procedures involve the analysis of laboratory duplicates and method blanks, in addition to an overall quality program. Analytical data were received from the laboratory in electronic format. Data were uploaded to Dillon's environmental database for comparison to the applicable criteria.

The QA/QC procedures are intended to ensure that samples collected and tested during the program adequately represent conditions at the time of measurement on the site.



## 4.0 Results

### 4.1 Overview of Findings

Complete surface water analytical results compared to the BC WQG working and approved short term guidelines for freshwater aquatic life and CWQGs for freshwater aquatic life long term and short term, are provided in **Appendix A**. Exceedances of these guidelines are summarized in **Table 3** below.

Complete surface water analytical results including averaged 5-in-30 results (as applicable) compared to the BC WQG approved long term guidelines for freshwater aquatic life are provided in **Appendix B**. Five-in-30 discrete and averaged results which exceed the BC WQG long term guidelines are summarized in **Table 4**. The EVWQP (Teck, 2014) provides long term water quality target values for various management units within the Elk Valley. The LSA is located within Management Unit 4. Target values for this management unit have been compared to the Project surface water quality baseline data and exceedances of the targets are summarized in **Table 5**; complete results compared to the EVWQP long term targets are provided in **Appendix C**.

**Table 3: Summary of Exceedances of the BC WQG Short Term and CWQG Short Term and Long Term**

Sampling Station	Number of Sampling Events <sup>1</sup>	Parameter <sup>2</sup>	BC WQG Short Term Approved/Working <sup>3</sup>	CWQG Long Term <sup>4</sup>	CWQG Short Term <sup>4</sup>	Median Concentration	Maximum Concentration <sup>5</sup>
			(n=Number of Exceedances)	(n=Number of Exceedances)	(n=Number of Exceedances)		
A1	58	Fluoride	Variable	<u>0.12 mg/L (n=53)</u>	-	<u>0.16 mg/L</u>	<u>0.18 mg/L</u>
		Aluminum	-	<u>100 µg/L (n=12)</u>	-	11.2 µg/L	<u>2310 µg/L</u>
		Beryllium	<b>0.13 µg/L (n=1)</b>	-	-	0.01 µg/L	<b>0.5 µg/L</b>
		Cadmium	-	<u>Variable (n=1)</u>	Variable	0.009 µg/L	<u>0.862 µg/L</u>
		Copper	-	<u>Variable (n=1)</u>	-	0.21 µg/L	<u>10.3 µg/L</u>
		Copper (dissolved)	Variable (n=1)	-	-	0.16 µg/L	<b>8.34 µg/L</b>
		Iron	<b>1000 µg/L (n=1)</b>	<u>300 µg/L (n=6)</u>	-	25.3 µg/L	<b>4650 µg/L</b>
		Zinc	Variable (n=1)	-	-	0.82 µg/L	<b>46.7 µg/L</b>
		Ammonia	Variable	<u>Variable (n=1)</u>	-	0.012 mg/L	<u>0.43 mg/L</u>
		Fluoride	Variable	<u>0.12 mg/L (n=49)</u>	-	<u>0.16 mg/L</u>	<u>0.19 mg/L</u>
A2	58	Aluminum	-	<u>100 µg/L (n=12)</u>	-	10.3 µg/L	<u>2190 µg/L</u>
		Beryllium	<b>0.13 µg/L (n=1)</b>	-	-	0.01 µg/L	<b>0.47 µg/L</b>
		Cadmium	-	<u>Variable (n=1)</u>	Variable	0.006 µg/L	<u>0.714 µg/L</u>
		Copper	-	<u>Variable (n=2)</u>	-	0.21 µg/L	<u>8.39 µg/L</u>
		Iron	<b>1000 µg/L (n=1)</b>	<u>300 µg/L (n=5)</u>	-	22.3 µg/L	<b>3650 µg/L</b>
		Zinc	Variable (n=1)	-	-	0.64 µg/L	<b>36.4 µg/L</b>

Sampling Station	Number of Sampling Events <sup>1</sup>	Parameter <sup>2</sup>	BC WQG Short Term Approved/Working <sup>3</sup>	CWQG Long Term <sup>4</sup>	CWQG Short Term <sup>4</sup>	Median Concentration	Maximum Concentration <sup>5</sup>
			(n=Number of Exceedances)	(n=Number of Exceedances)	(n=Number of Exceedances)		
A3	24	Ammonia	Variable	Variable (n=1)	-	0.011 mg/L	0.39 mg/L
		Fluoride	Variable	0.12 mg/L (n=4)	-	0.12 mg/L	0.13 mg/L
		Aluminum	-	100 µg/L (n=8)	-	13.2 µg/L	5190 µg/L
		Beryllium	0.13 µg/L (n=1)	-	-	0.01 µg/L	1.5 µg/L
		Cadmium	-	Variable (n=1)	Variable (n=1)	0.01 µg/L	1.82 µg/L
		Copper	-	Variable (n=1)	-	0.25 µg/L	23.9 µg/L
		Iron	1000 µg/L (n=1)	300 µg/L (n=5)	-	13.5 µg/L	9720 µg/L
		Manganese	Variable (n=1)	-	-	0.94 µg/L	1350 µg/L
		Selenium	2 µg/L (n=1)	1 µg/L (n=1)	-	0.56 µg/L	2.06 µg/L
		Zinc	Variable (n=1)	-	-	0.94 µg/L	93.8 µg/L
A3(B)	29	Fluoride	Variable	0.12 mg/L (n=28)	-	0.18 mg/L	0.22 mg/L
		Aluminum	-	100 µg/L (n=1)	-	6.16 µg/L	101 µg/L
		Copper	-	Variable (n=1)	-	0.15 µg/L	6.23 µg/L
A4	58	Ammonia	Variable	Variable (n=1)	-	0.011 mg/L	0.35 mg/L
		Fluoride	Variable	0.12 mg/L (n=50)	-	0.25 mg/L	0.357 mg/L
		Aluminum	-	100 µg/L (n=2)	-	6.43 µg/L	2910 µg/L
		Beryllium	0.13 µg/L (n=1)	-	-	0.01 µg/L	0.57 µg/L
		Cadmium	-	Variable (n=1)	Variable (n=1)	0.01 µg/L	1.29 µg/L
		Copper	-	Variable (n=1)	-	0.17 µg/L	13.1 µg/L
		Iron	1000 µg/L (n=1)	300 µg/L (n=1)	-	3.8 µg/L	4860 µg/L
		Selenium	2 µg/L	1 µg/L (n=4)	-	0.72 µg/L	1.06 µg/L
Zinc	Variable (n=1)	-	-	1.34 µg/L	73.8 µg/L		
A5	57	Fluoride	Variable	0.12 mg/L (n=37)	-	0.14 mg/L	0.187 mg/L
		Aluminum	-	100 µg/L (n=1)	-	2.97 µg/L	226 µg/L
		Copper	-	Variable (n=1)	-	0.13 µg/L	3.21 µg/L
		Selenium	2 µg/L	1 µg/L (n=26)	-	0.96 µg/L	1.77 µg/L
G1	57	Fluoride	Variable	0.12 mg/L (n=5)	-	0.092 mg/L	0.22 mg/L
		Aluminum	-	100 µg/L (n=21)	-	73.2 µg/L	837 µg/L
		Copper	-	Variable (n=1)	-	0.64 µg/L	4.6 µg/L
		Iron	1000 µg/L (n=2)	300 µg/L (n=10)	-	85.4 µg/L	1560 µg/L
		Selenium	2 µg/L	1 µg/L (n=4)	-	0.37 µg/L	1.84 µg/L
G2	57	Ammonia	Variable	Variable (n=1)	-	0.013 mg/L	0.97 mg/L
		Fluoride	Variable	0.12 mg/L (n=37)	-	0.19 mg/L	0.285 mg/L
		Aluminum	-	100 µg/L (n=11)	-	12.5 µg/L	1040 µg/L
		Iron	1000 µg/L (n=2)	300 µg/L (n=6)	-	16.7 µg/L	1390 µg/L
		Selenium	2 µg/L (n=10)	1 µg/L (n=39)	-	1.55 µg/L	2.67 µg/L

Sampling Station	Number of Sampling Events <sup>1</sup>	Parameter <sup>2</sup>	BC WQG Short Term Approved/Working <sup>3</sup>	CWQG Long Term <sup>4</sup>	CWQG Short Term <sup>4</sup>	Median Concentration	Maximum Concentration <sup>5</sup>
			(n=Number of Exceedances)	(n=Number of Exceedances)	(n=Number of Exceedances)		
H1	57	Ammonia	Variable	Variable (n=1)	-	0.014 mg/L	0.26 mg/L
		Fluoride	Variable	0.12 mg/L (n=57)	-	0.23 mg/L	0.279 mg/L
		Aluminum	-	100 µg/L (n=9)	-	10.4 µg/L	407 µg/L
		Iron	1000 µg/L	300 µg/L (n=4)	-	18.9 µg/L	902 µg/L
		Selenium	2 µg/L (n=57)	1 µg/L (n=57)	-	22.7 µg/L	29.8 µg/L
M1	58	Ammonia	Variable	Variable (n=1)	-	0.018 mg/L	0.4 mg/L
		Fluoride	Variable	0.12 mg/L (n=26)	-	0.12 mg/L	0.18 mg/L
		Aluminum	-	100 µg/L (n=19)	-	27.1 µg/L	3200 µg/L
		Beryllium	0.13 µg/L (n=2)	-	-	0.01 µg/L	0.74 µg/L
		Cadmium	-	Variable (n=2)	Variable (n=1)	0.031 µg/L	2.72 µg/L
		Copper	-	Variable (n=3)	-	0.35 µg/L	17 µg/L
		Iron	1000 µg/L (n=3)	300 µg/L (n=10)	-	30.4 µg/L	6310 µg/L
		Selenium	2 µg/L (n=7)	1 µg/L (n=46)	-	1.51 µg/L	3.29 µg/L
M2	57	Fluoride	Variable	0.12 mg/L (n=30)	-	0.14 mg/L	0.18 mg/L
		Aluminum	-	100 µg/L (n=17)	-	24.2 µg/L	2200 µg/L
		Aluminum (dissolved)	100 µg/L (n=1)	-	-	2.88 µg/L	358 µg/L
		Beryllium	0.13 µg/L (n=2)	-	-	0.01 µg/L	0.65 µg/L
		Cadmium	-	Variable (n=2)	Variable (n=1)	0.024 µg/L	2.53 µg/L
		Copper	-	Variable (n=3)	-	0.31 µg/L	14.7 µg/L
		Iron	1000 µg/L (n=2)	300 µg/L (n=8)	-	26 µg/L	4580 µg/L
		Selenium	2 µg/L (n=34)	1 µg/L (n=45)	-	2.4 µg/L	10.6 µg/L
		Silver	Variable (n=1)	0.25 µg/L	-	0.003 µg/L	0.108 µg/L
WA1	54	Zinc	Variable (n=1)	-	-	1.04 µg/L	61.1 µg/L
		Fluoride	Variable	0.12 mg/L (n=11)	-	0.11 mg/L	0.131 mg/L
		Aluminum	-	100 µg/L (n=13)	-	9.3 µg/L	5730 µg/L
		Barium	1000 µg/L (n=1)	-	-	87 µg/L	1070 µg/L
		Beryllium	0.13 µg/L (n=1)	-	-	0.01 µg/L	1.42 µg/L
		Cadmium	-	Variable (n=1)	Variable (n=1)	0.008 µg/L	1.89 µg/L
		Copper	-	Variable (n=2)	-	0.25 µg/L	25.8 µg/L
		Iron	1000 µg/L (n=1)	300 µg/L (n=6)	-	12.1 µg/L	11800 µg/L
		Manganese	Variable (n=1)	-	-	0.69 µg/L	1580 µg/L
Zinc	Variable (n=1)	-	-	0.74 µg/L	101 µg/L		

1 – Includes discrete 5-in-30 sampling events. Where parent and field duplicate samples were collected, it is considered a single event. If an exceedance was identified for only one of the parent and duplicate result, it has been considered an exceedance as a conservative measure.

2 – Refers to total fraction, unless otherwise specified.

3 – BC WQG are for the protection of freshwater aquatic life, short term.

4 – CWQGs are for the protection of freshwater aquatic life, long term and short term, respectively.

5 – Where the maximum value exceeds the respective BC WQG (approved /working) it is indicated in **BOLD**. Where the maximum value exceeds the respective CWQG long term it is indicated by UNDERLINE. Where the maximum value exceeds the respective CWQG short term it is indicated by *ITALICS*. Where the maximum value exceeds more than one comparison criteria it is indicated by a combination these notations.

**Table 3** summarizes the surface water analytical results and exceedances of the BC WQG working and approved short term guidelines and CWQGs long term and short term. One or more exceedances of the BC WQG short term were identified for dissolved aluminum, barium, beryllium, dissolved copper, iron, manganese, selenium, silver and zinc. Exceedances of the CWQGs (short term and/or long term) were identified for one or more concentrations for ammonia, aluminum, fluoride, cadmium, copper, iron and selenium. For the majority of sampling stations, up to 58 sampling rounds have been conducted. Where exceedances of the guidelines have not been consistently identified, or appear to be relatively isolated occurrences, elevated concentrations are not considered parameters of concern. For instance, cadmium has been identified in exceedance of the CWQGs (short term and/or long term) a maximum of two sample events per sampling station; both exceedances are associated with significant precipitation events. Since cadmium is a known potential contaminant of concern for the Elk Valley area, and is listed in the EVWQP as one of the four Order parameters, it has been included in discussion of the results herein, however is not considered to represent elevated baseline conditions in the LSA. Exceedances of other parameters are further discussed in the following sub-sections.

**Table 4** below provides a summary of the 5-in-30 intensive sampling events and the identified exceedances of the BC WQG approved long term guidelines compared to discrete 5-in-30 sample results and averaged results. The findings indicate that one or more discrete results from A1, A2, A3, A3(B), A4, G1, G2, H1, M1, M2 and WA1 exceed the BC WQG long term for dissolved copper. Once results are averaged, A1, A3, G2, H1 and M2 continue to exceed the long term guideline for dissolved copper during one or more 5-in-30 intensive sampling events. Dissolved aluminum concentrations in surface water collected from A3 during the May/June 2014 event were found to exceed for one of five discrete samples, however averaged results were below the long term guideline. Each of four intensive sampling events conducted at sampling station H1 were found to contain concentrations of selenium in exceedance of the BC WQG long term, where each discrete and long term averaged result exceeded the guideline value. One discrete concentration of silver in surface water collected from M1 was found to exceed the long term BC WQG, however results were below the guideline once the long term average was applied. Both low-flow intensive sampling events (Aug/Sept 2014 and 2015) conducted at sampling station M2 identified discrete and averaged results for selenium in exceedance of the guideline. Discrete sample concentrations of silver and zinc were found to exceed the long term guidelines during the high-flow (May/Jun 2014) sampling event. The averaged result for silver was below the guideline during this event, however the averaged zinc result exceeded the long term guideline.

Table 4: Summary of Exceedances of the BC WQG Long Term

Sampling Station	Number of 5-in-30 Sampling Events <sup>1</sup>	Event Date	Parameter <sup>2</sup>	BC WQG Approved/Working <sup>3</sup> Long Term	Discrete Sample Concentrations <sup>4</sup>	Average Concentration <sup>5</sup>	
				(n=Number of Exceedances)			
A1	4	Aug/Sept 2015	Copper (dissolved)	Variable (n=1, and 5-in-30 Average)	0.139 µg/L	<b>0.6 µg/L</b>	
					<b>2.59 µg/L</b>		
					0.09 µg/L		
					0.114 µg/L		
A2	4	Aug/Sept 2014	Copper (dissolved)	Variable (n=1)	0.099 µg/L	0.22 µg/L	
					0.117 µg/L		
					<b>0.554 µg/L</b>		
					0.138 µg/L		
A3	1	May/June 2014	Aluminum (dissolved)	50 µg/L (n=1)	0.095 µg/L	19 µg/L	
					0.213 µg/L		
					5.62 µg/L		
					11.5 µg/L		
			Copper (dissolved)	Variable (n=1, and 5-in-30 Average)	8.66 µg/L		<b>1.2 µg/L</b>
					<b>53.6 µg/L</b>		
					16.8 µg/L		
					0.291 µg/L		
A3(B)	3	Aug/Sept 2014	Copper (dissolved)	Variable (n=1)	0.335 µg/L	0.11 µg/L	
					<b>0.571 µg/L</b>		
					0.112 µg/L		
					0.144 µg/L		
A4	4	Aug/Sept 2014	Copper (dissolved)	Variable (n=1)	0.132 µg/L	0.15 µg/L	
					0.107 µg/L		
					0.12 µg/L		
					0.078 µg/L		
A5	4	-	-	-	0.143 µg/L	-	
					0.107 µg/L		
					<b>0.318 µg/L</b>		
					0.143 µg/L		
G1	4	May/June 2014	Copper (dissolved)	Variable (n=1)	0.368 µg/L	0.8 µg/L	
					<b>2.65 µg/L</b>		
					0.348 µg/L		
					0.344 µg/L		
					0.276 µg/L		

Sampling Station	Number of 5-in-30 Sampling Events <sup>1</sup>	Event Date	Parameter <sup>2</sup>	BC WQG Approved/Working <sup>3</sup> Long Term	Discrete Sample Concentrations <sup>4</sup>	Average Concentration <sup>5</sup>
				(n=Number of Exceedances)		
G2	4	Aug/Sept 2014	Copper (dissolved)	Variable (n=1)	5.31 µg/L	<u>1.2 µg/L</u>
					0.145 µg/L	
					0.21 µg/L	
					0.132 µg/L	
					0.16 µg/L	
H1	4	May/June 2014	Selenium	2 µg/L (n=5, and 5-in-30 Average)	20.5 µg/L	<u>16 µg/L</u>
					14.1 µg/L	
					17.9 µg/L	
					13.5 µg/L	
					13.4 µg/L	
		Aug/Sept 2014	Selenium	2 µg/L (n=5, and 5-in-30 Average)	22.2 µg/L	<u>19 µg/L</u>
					22.1 µg/L	
					20.6 µg/L	
					23.6 µg/L	
					23 µg/L	
		0.577 µg/L (duplicate)				
		May/June 2015	Selenium	2 µg/L (n=5, and 5-in-30 Average)	16.5 µg/L	<u>11 µg/L</u>
					10.8 µg/L	
					8.8 µg/L	
					8.02 µg/L	
11.2 µg/L						
Aug/Sept 2015	Copper (dissolved)	Variable (n=1, and 5-in-30 Average)	0.158 µg/L	<u>2 µg/L</u>		
			9.3 µg/L			
			0.177 µg/L			
			0.175 µg/L			
			0.145 µg/L			
May/June 2015	Selenium	2 µg/L (n=5, and 5-in-30 Average)	22.6 µg/L	<u>23 µg/L</u>		
			22.8 µg/L			
			20.8 µg/L			
			22.9 µg/L			
			27.3 µg/L			
M1	4	May/June 2014	Silver	Variable (n=1)	0.016 µg/L	0.03 µg/L
					0.102 µg/L	
					<0.005 µg/L	
					0.018 µg/L	
					0.005 µg/L	
		May/June 2015	Copper (dissolved)	Variable (n=1)	0.256 µg/L	0.4 µg/L
					0.313 µg/L	
					0.308 µg/L	
					0.523 µg/L	
					0.512 µg/L	

Sampling Station	Number of 5-in-30 Sampling Events <sup>1</sup>	Event Date	Parameter <sup>2</sup>	BC WQG Approved/Working <sup>3</sup> Long Term	Discrete Sample Concentrations <sup>4</sup>	Average Concentration <sup>5</sup>		
				(n=Number of Exceedances)				
M2	4	May/June 2014	Silver	Variable (n=1)	0.02 µg/L	0.03 µg/L		
					<b>0.108 µg/L</b>			
					<0.005 µg/L			
					0.018 µg/L			
			Zinc		0.005 µg/L			
					5.49 µg/L			
					<b>23.4 µg/L</b>			
					4.52 µg/L			
		Aug/Sept 2014	Selenium	2 µg/L (n=5, and 5-in-30 Average)	6.22 µg/L	<b>2.4 µg/L</b>		
					1.87 µg/L			
					<b>2.64 µg/L</b>			
					<b>2.4 µg/L</b>			
			2.1 µg/L					
			<b>2.4 µg/L</b>					
			<b>2.39 µg/L</b>					
			0.182 µg/L					
Aug/Sept 2015	Copper (dissolved)	Variable (n=1)	<b>0.97 µg/L</b>	0.35 µg/L				
			0.206 µg/L					
			0.183 µg/L					
			0.205 µg/L					
	Selenium		2 µg/L (n=5, and 5-in-30 Average)		4.7 µg/L	<b>4.1 µg/L</b>		
					4.68 µg/L			
					3.99 µg/L			
					2.93 µg/L			
4.29 µg/L								
WA1	4	Aug/Sept 2015		Copper (dissolved)	Variable (n=1)		0.151 µg/L	0.4 µg/L
							<b>3.42 µg/L</b>	
							0.229 µg/L	
			0.112 µg/L					
			0.118 µg/L					

1 – Includes analytical data from 5-in-30 sampling events only. Where parent and field duplicate samples were collected, it is considered a discrete single event. If an exceedance was identified for only one of the parent and duplicate result, it has been considered an exceedance as a conservative measure.

2 – Refers to total fraction, unless otherwise specified.

3 – BC WQG are for the protection of freshwater aquatic life short term.

4 – Where a discrete result value exceeds the respective BC WQG (approved long term) it is indicated in **BOLD**.

5 – When the arithmetic average of the 5-in-30 discrete result values exceeds the respective BC WQG (approved long term) it is indicated in **BOLD UNDERLINE**.

In addition to the exceedances of the BC WQG long term identified in the above **Table 4**, several other exceedances of the BC WQG long term were identified in samples collected outside of 5-in-30 intensive events. These include isolated exceedance of ammonia (H1 and M1), aluminum (G2, H1 and M2), dissolved copper (A1, A2, A4, A5, G2, M1, M2 and WA1) and manganese (A3 and WA1). A number of exceedances of cobalt (A1, A2, A3, A4, M1, M2 and WA1), lead (A1, A2, A3, A1, M1, M2 and WA1), silver (M2 and WA1) and zinc (A1, A2, A3, A4, M1, M2 and WA1) were identified, and are associated with the extreme precipitation event of June, 2013. Isolated exceedances of the BC WQG long term for selenium in surface water were identified at station A3, however were more consistently identified at stations G2, H1, M1 and M2.

**Table 5** below provides a summary of the site-specific long term water quality targets which have been established for the Elk Valley and surrounding area. These values are provided in the EVWQP (Teck, 2014; Table S-1) and have been included herein for comparison and discussion purposes. Findings indicate that the results of surface water sampling in June 2013 identified cadmium concentrations above the target at sampling stations A1, A2, A3 and A4, M1, M2 and WA1. With the exception of M1 and M2, each of these represents an isolated occurrence with respect to cadmium. Concentrations of cadmium in surface water collected from M1 and M2 were also found to exceed the target during the May 2014 sampling event. Concentrations of cadmium from A5 were above the target in October 2012, and appear to be an isolated occurrence. Selenium concentrations in surface water are below the EVWQP long term target values for the sampling stations surveyed, with the exception of surface water at H1. Selenium concentrations in surface water collected from H1 were found to be above the target 40 of 57 sampling events. Concentrations of the other four Order parameters (e.g., nitrate and sulphate), were below the target values from 2012 to 2019 for the sampling stations within the LSA.

**Table 5: Summary of Exceedances of the EVWQP Long Term Water Quality Targets**

Sampling Station	Number of Sampling Events <sup>1</sup>	Parameter <sup>2</sup>	Number of Exceedances	Elk Valley Long Term Water Quality Targets <sup>3</sup>	Median Concentration <sup>5</sup>	Maximum Concentration <sup>5</sup>
A1	58	Nitrate	-	3 mg/L	0.04 mg/L	0.12 mg/L
		Sulphate <sup>4</sup>	-	429 mg/L	14.8 mg/L	19.7 mg/L
		Cadmium	1	0.24 µg/L	0.009 µg/L	0.86 µg/L
		Selenium	-	19 µg/L	0.6 µg/L	0.96 µg/L
A2	58	Nitrate	-	3 mg/L	0.05 mg/L	0.128 mg/L
		Sulphate <sup>4</sup>	-	429 mg/L	13.4 mg/L	23.3 mg/L
		Cadmium	1	0.24 µg/L	0.006	0.71 µg/L
		Selenium	-	19 µg/L	0.53 µg/L	0.67 µg/L
A3	24	Nitrate	-	3 mg/L	0.06 mg/L	0.246 mg/L
		Sulphate <sup>4</sup>	-	429 mg/L	16.3 mg/L	21.4 mg/L
		Cadmium	1	0.24 µg/L	0.01 µg/L	1.82 µg/L
		Selenium	-	19 µg/L	0.6 µg/L	2.06 µg/L



Sampling Station	Number of Sampling Events <sup>1</sup>	Parameter <sup>2</sup>	Number of Exceedances	Elk Valley Long Term Water Quality Targets <sup>3</sup>	Median Concentration <sup>5</sup>	Maximum Concentration <sup>5</sup>
A3(B)	29	Nitrate	-	<b>3 mg/L</b>	0.05 mg/L	0.091 mg/L
		Sulphate <sup>4</sup>	-	<b>429 mg/L</b>	15.6 mg/L	19.9 mg/L
		Cadmium	-	<b>0.24 µg/L</b>	0.006 µg/L	0.016 µg/L
		Selenium	-	<b>19 µg/L</b>	0.5 µg/L	0.70 µg/L
A4	58	Nitrate	-	<b>3 mg/L</b>	0.09 mg/L	0.20 mg/L
		Sulphate <sup>4</sup>	-	<b>429 mg/L</b>	23 mg/L	38.8 mg/L
		Cadmium	<b>1</b>	<b>0.24 µg/L</b>	0.01 µg/L	<b>1.29 µg/L</b>
		Selenium	-	<b>19 µg/L</b>	0.7 µg/L	1.06 µg/L
A5	57	Nitrate	-	<b>3 mg/L</b>	0.04 mg/L	0.11 mg/L
		Sulphate <sup>4</sup>	-	<b>429 mg/L</b>	19 mg/L	30.3 mg/L
		Cadmium	<b>1</b>	<b>0.24 µg/L</b>	0.006 µg/L	<b>0.29 µg/L</b>
		Selenium	-	<b>19 µg/L</b>	1.0 µg/L	1.77 µg/L
G1	57	Nitrate	-	<b>3 mg/L</b>	0.01 mg/L	0.14 mg/L
		Sulphate <sup>4</sup>	-	<b>429 mg/L</b>	23 mg/L	31 mg/L
		Cadmium	-	<b>0.24 µg/L</b>	0.02 µg/L	0.22 µg/L
		Selenium	-	<b>19 µg/L</b>	0.4 µg/L	1.84 µg/L
G2	57	Nitrate	-	<b>3 mg/L</b>	0.09 mg/L	0.219 mg/L
		Sulphate <sup>4</sup>	-	<b>429 mg/L</b>	23.6 mg/L	34.4 mg/L
		Cadmium	-	<b>0.24 µg/L</b>	0.009 µg/L	0.22 µg/L
		Selenium	-	<b>19 µg/L</b>	1.6 µg/L	2.67 µg/L
H1	57	Nitrate	-	<b>3 mg/L</b>	0.7 mg/L	1.04 mg/L
		Sulphate <sup>4</sup>	-	<b>429 mg/L</b>	137 mg/L	180 mg/L
		Cadmium	-	<b>0.24 µg/L</b>	0.02 µg/L	0.19 µg/L
		Selenium	<b>40</b>	<b>19 µg/L</b>	<b>22.7 µg/L</b>	<b>29.8 µg/L</b>
M1	58	Nitrate	-	<b>3 mg/L</b>	0.3 mg/L	0.50 mg/L
		Sulphate <sup>4</sup>	-	<b>429 mg/L</b>	49.3 mg/L	75.1 mg/L
		Cadmium	<b>2</b>	<b>0.24 µg/L</b>	0.03 µg/L	<b>2.72 µg/L</b>
		Selenium	-	<b>19 µg/L</b>	1.5 µg/L	3.29 µg/L
M2	57	Nitrate	-	<b>3 mg/L</b>	0.4 mg/L	1.14 mg/L
		Sulphate <sup>4</sup>	-	<b>429 mg/L</b>	46.8 mg/L	99 mg/L
		Cadmium	<b>2</b>	<b>0.24 µg/L</b>	0.02 µg/L	<b>2.53 µg/L</b>
		Selenium	-	<b>19 µg/L</b>	2.4 µg/L	10.6 µg/L
WA1	54	Nitrate	-	<b>3 mg/L</b>	0.04 mg/L	0.14 mg/L
		Sulphate <sup>4</sup>	-	<b>429 mg/L</b>	17.2 mg/L	21.5 mg/L
		Cadmium	<b>1</b>	<b>0.24 µg/L</b>	0.008 µg/L	<b>1.89 µg/L</b>
		Selenium	-	<b>19 µg/L</b>	0.5 µg/L	0.89 µg/L

1 – Includes discrete 5-in-30 sampling events. Where parent and field duplicate samples were collected, it is considered a single event. If an exceedance was identified for only one of the parent and duplicate result, it has been considered an exceedance as a conservative measure.

2 – Refers to total fraction, unless otherwise specified.

3 – Elk Valley Water Quality Target values appear as listed in Table S-1 of the EVWQP. Refer to the EVWQP for additional site-specific and guideline derivation information. Target values for Management Unit 4 are applicable to the LSA.

4 – Analytical results from 2012 to 2016 are for dissolved sulphate and results from 2018 to 2019 are for total sulphate.

5 – Result values which exceed the Target value are indicated in **BOLD**.

Based on the findings presented in **Table 3**, **Table 4** and **Table 5** above, specific parameters have been identified as parameters of interest and additional analysis was conducted. These parameters include the four Order parameters listed in the EVWQP (e.g., nitrate, sulphate, cadmium and selenium), and several additional parameters which were found to exceed the BC WQG approved/working short term and long term guidelines and the CWQG short term and long term guidelines. These additional parameters of interest include aluminum, fluoride, copper, dissolved copper and iron. Basic statistics (minimum, maximum, median, mean, standard deviation and standard error) for these select parameters of interest (herein referred to as key parameters) are provided in **Table 6**. Parameters which were not found to exceed the applicable guidelines, or where no comparison value exists, are not discussed further.

**Table 6: Summary Statistics for Key Parameters Measured in Surface Water in the LSA**

Sampling Station	Parameter <sup>1</sup>	Minimum	Maximum	Median	Mean	Standard Error	Standard Deviation
A1	Nitrate	<0.02	0.12	0.04	0.04	0.00	0.03
	Fluoride	0.11	0.18	0.2	0.2	0.0	0.0
	Sulphate <sup>2</sup>	5.98	19.7	14.8	14.0	0.5	3.7
	Aluminum	1.87	2310	11.2	80.7	37.0	294
	Cadmium	0.005	0.862	0.0	0.0	0.0	0.1
	Copper	<0.05	10.3	0.2	0.5	0.2	1.3
	Dissolved copper	0.05	8.34	0.2	0.4	0.2	1.1
	Iron	5.5	4650	25.3	156	74.1	588
	Selenium	0.254	0.694	0.5	0.5	0.0	0.1
A2	Nitrate	0.0133	0.128	0.0	0.1	0.0	0.0
	Fluoride	0.1	0.19	0.2	0.2	0.0	0.0
	Sulphate <sup>2</sup>	3.84	23.3	13.4	12.6	0.5	4.1
	Aluminum	2.1	2190	10.3	79.7	35.6	280
	Cadmium	<0.005	0.714	0.0	0.0	0.0	0.1
	Copper	<0.05	8.39	0.2	0.5	0.1	1.1
	Dissolved copper	0.05	0.55	0.2	0.2	0.0	0.1
	Iron	5.2	3650	22.3	141	59.5	469
	Selenium	0.247	0.67	0.5	0.5	0.0	0.1
A3	Nitrate	<0.02	0.246	0.1	0.1	0.0	0.1
	Fluoride	0.085	0.13	0.1	0.1	0.0	0.0
	Sulphate <sup>2</sup>	3.71	21.4	16.3	14.3	1.0	5.2
	Aluminum	2.69	5190	13.2	274	198	1008
	Cadmium	<0.005	1.82	0.0	0.1	0.1	0.4
	Copper	<0.05	23.9	0.2	1.4	0.9	4.6
	Dissolved copper	0.068	5.01	0.2	0.4	0.2	1.0
	Iron	2.4	9720	13.5	504	371	1891
	Selenium	0.296	2.06	0.6	0.6	0.1	0.3

Sampling Station	Parameter <sup>1</sup>	Minimum	Maximum	Median	Mean	Standard Error	Standard Deviation
A3(B)	Nitrate	0.0119	0.0908	0.1	0.1	0.0	0.0
	Fluoride	0.11	0.22	0.2	0.2	0.0	0.0
	Sulphate <sup>2</sup>	6.44	21.9	15.6	14.8	0.8	4.4
	Aluminum	1.97	101	6.2	19.1	4.8	27.0
	Cadmium	<0.005	0.016	0.0	0.0	0.0	0.0
	Copper	<0.5	6.23	0.1	0.4	0.2	1.1
	Dissolved copper	0.05	0.57	0.1	0.2	0.0	0.1
	Iron	2	146	9.9	27.3	6.9	38.5
	Selenium	0.241	0.703	0.5	0.5	0.0	0.1
A4	Nitrate	<0.02	0.197	0.1	0.1	0.0	0.0
	Fluoride	0.081	0.357	0.3	0.2	0.0	0.1
	Sulphate <sup>2</sup>	1.99	42.1	23.1	20.0	1.4	11.1
	Aluminum	1.91	2910	6.4	63.0	49.2	378
	Cadmium	0.0053	1.29	0.0	0.0	0.0	0.2
	Copper	<0.5	13.1	0.2	0.5	0.2	1.7
	Dissolved copper	0.05	1.25	0.1	0.2	0.0	0.2
	Iron	<1	4860	5.0	98.3	82.2	631
	Selenium	0.155	1.06	0.7	0.7	0.0	0.3
A5	Nitrate	<0.02	0.107	0.0	0.1	0.0	0.0
	Fluoride	0.058	0.187	0.1	0.1	0.0	0.0
	Sulphate <sup>2</sup>	2.66	33.5	18.9	16.7	1.1	8.8
	Aluminum	<3	226	3.0	8.7	3.7	28.9
	Cadmium	<0.005	0.293	0.0	0.0	0.0	0.0
	Copper	<0.5	3.21	0.1	0.3	0.1	0.6
	Dissolved copper	0.05	1.34	0.1	0.2	0.0	0.2
	Iron	<1	135	2.9	5.8	2.2	17.2
	Selenium	0.16	1.77	1.0	0.8	0.1	0.5
G1	Nitrate	<0.005	0.137	0.0	0.0	0.0	0.0
	Fluoride	0.065	0.22	0.1	0.1	0.0	0.0
	Sulphate <sup>2</sup>	8.91	37.3	23.3	20.6	0.9	6.8
	Aluminum	3.43	837	73.2	140	22.3	176
	Cadmium	0.006	0.22	0.0	0.0	0.0	0.0
	Copper	<0.5	4.6	0.6	0.8	0.1	0.7
	Dissolved copper	0.12	2.65	0.4	0.4	0.0	0.3
	Iron	3.7	1560	85.4	202	38.9	306
	Selenium	0.241	1.84	0.4	0.5	0.0	0.3
G2	Nitrate	<0.02	0.22	0.1	0.1	0.0	0.0
	Fluoride	0.093	0.29	0.2	0.2	0.0	0.1
	Sulphate <sup>2</sup>	10	34.4	23.6	22.2	0.8	6.4
	Aluminum	1.5	1040	12.5	71.2	19.2	157
	Cadmium	0.005	0.221	0.0	0.0	0.0	0.0
	Copper	<0.5	2.44	0.2	0.5	0.1	0.5
	Dissolved copper	0.072	5.31	0.2	0.3	0.1	0.7
	Iron	1.5	1390	16.7	119	30.8	252
	Selenium	0.309	2.67	1.6	1.4	0.1	0.7

Sampling Station	Parameter <sup>1</sup>	Minimum	Maximum	Median	Mean	Standard Error	Standard Deviation
H1	Nitrate	0.052	1.04	0.7	0.7	0.0	0.2
	Fluoride	0.13	0.28	0.2	0.2	0.0	0.0
	Sulphate <sup>2</sup>	14.1	181	137.0	121	5.4	42.1
	Aluminum	1.43	407	10.4	46.9	11.0	86.4
	Cadmium	0.01	0.19	0.0	0.0	0.0	0.0
	Copper	0.088	2.09	0.2	0.3	0.0	0.4
	Dissolved copper	0.085	9.3	0.2	0.4	0.2	1.2
	Iron	3.8	902	18.9	82.9	21.3	167
M1	Selenium	0.577	29.8	22.7	21.0	0.8	6.3
	Nitrate	0.0099	0.50	0.3	0.3	0.0	0.1
	Fluoride	0.082	0.18	0.1	0.1	0.0	0.0
	Sulphate <sup>2</sup>	9.82	76.8	50.0	45.7	2.6	20.8
	Aluminum	3.42	3200	27.1	196	63.3	507
	Cadmium	0.019	2.72	0.0	0.2	0.1	0.5
	Copper	<0.5	17	0.4	1.1	0.4	2.9
	Dissolved copper	0.16	0.82	0.3	0.4	0.0	0.8
M2	Iron	4.9	6310	30.4	317	120.5	964
	Selenium	0.673	3.29	1.5	1.5	0.1	0.5
	Nitrate	0.021	1.14	0.3	0.4	0.0	0.2
	Fluoride	0.09	0.18	0.1	0.1	0.0	0.0
	Sulphate <sup>2</sup>	11.9	99	47.1	46.0	2.9	21.7
	Aluminum	3.25	2200	24.2	139	44.7	341
	Cadmium	0.012	2.53	0.0	0.1	0.0	0.3
	Copper	0.12	14.7	0.3	0.9	0.3	2.1
WA1	Dissolved copper	0.11	1.39	0.3	0.3	0.0	0.8
	Iron	6.7	4580	26.0	222	86.9	662
	Selenium	0.62	10.6	2.4	3.1	0.3	2.2
	Nitrate	0.015	0.14	0.0	0.1	0.0	0.0
	Fluoride	<0.01	0.13	0.1	0.1	0.0	0.0
	Sulphate <sup>2</sup>	4.4	21.5	17.3	15.8	0.5	4.1
	Aluminum	2.55	5730	9.3	160	102	770
	Cadmium	0.005	1.89	0.0	0.1	0.0	0.3
WA1	Copper	<0.5	25.8	0.3	1.2	0.6	4.3
	Dissolved copper	0.086	3.42	0.2	0.3	0.1	0.5
	Iron	2	11800	12.1	312	210	1587
	Selenium	0.34	0.89	0.5	0.5	0.0	0.1

1 – Refers to total fraction, unless otherwise specified.

2 – Analytical results from 2012 to 2016 are for dissolved sulphate, and results from 2018 to 2019 are for total sulphate.

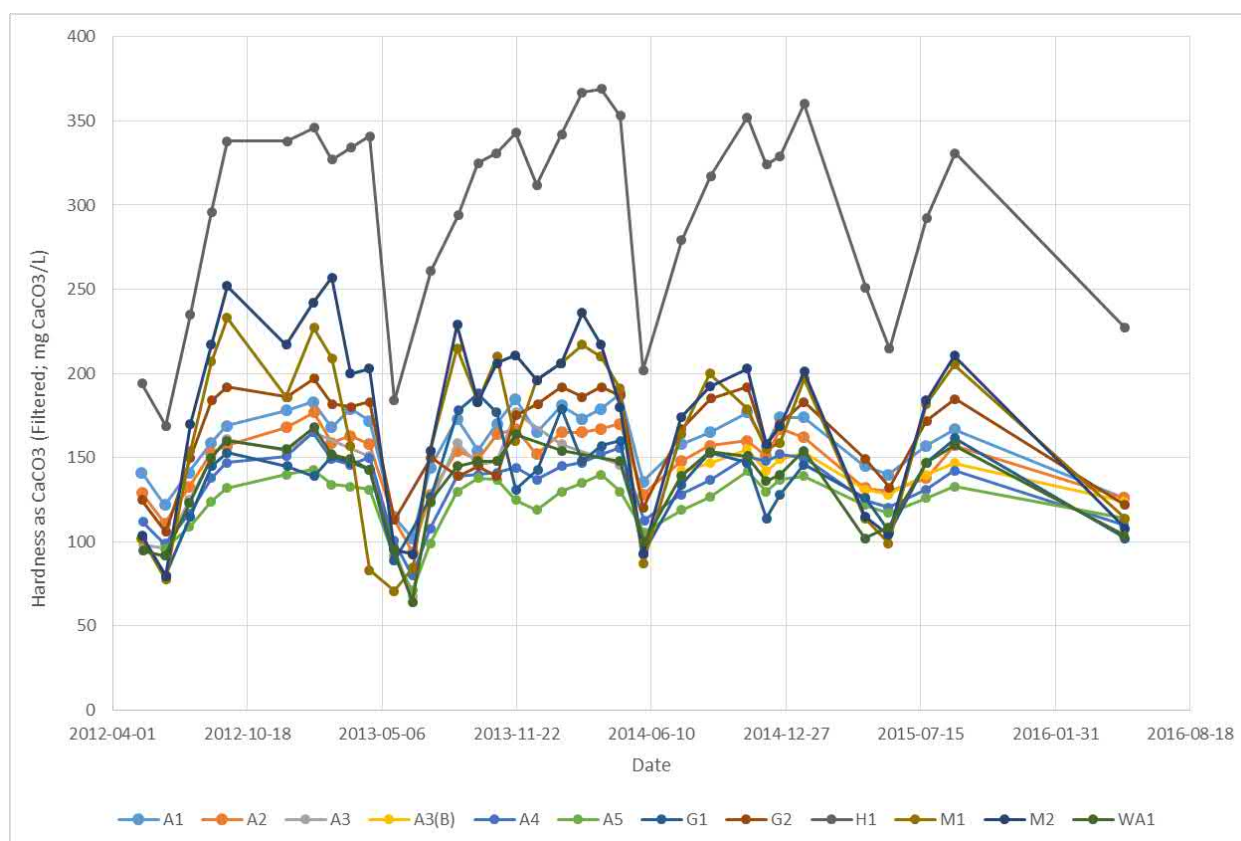
### 4.1.1 Physical Tests

Results of field pH readings indicated that surface water at each of the sampling locations is generally alkaline (e.g., pH >7; **Figure 4**). The acceptable pH range for long term exposure for freshwater aquatic life is between 6.5 and 9.0, as stipulated in the CWQG. Overall, the range of pH readings measured in the field over time is considered low (e.g., within one pH unit; generally range between 7.8 and 8.7) and is within the acceptable CWQG range. Lab pH results were found to indicate slightly more neutral waters than the field pH measurements. This can occur as samples that are acidic tend to lose CO<sub>2</sub> while in transit, and thereby become more neutral. Conversely, field measurements indicating basic waters were found to have lower lab pH results, which may be attributed to CO<sub>2</sub> in the air dissolving into the water samples prior to analysis. Field pH was used in the calculation of pH-dependant guidelines and to evaluate trends. Where field pH measurements were not available or lack of verifiable data attributed to field equipment or data collection error was identified, lab pH was used in lieu. Graphing of field pH measurements over time demonstrate that elevated pH levels occurred across each of the sampling stations during July and August 2012, compared to other events. Variation between stations is greater during the June 2019 sampling event and indicates generally more acidic surface water compared to typical conditions. Distinct seasonal trends in pH level are not apparent.



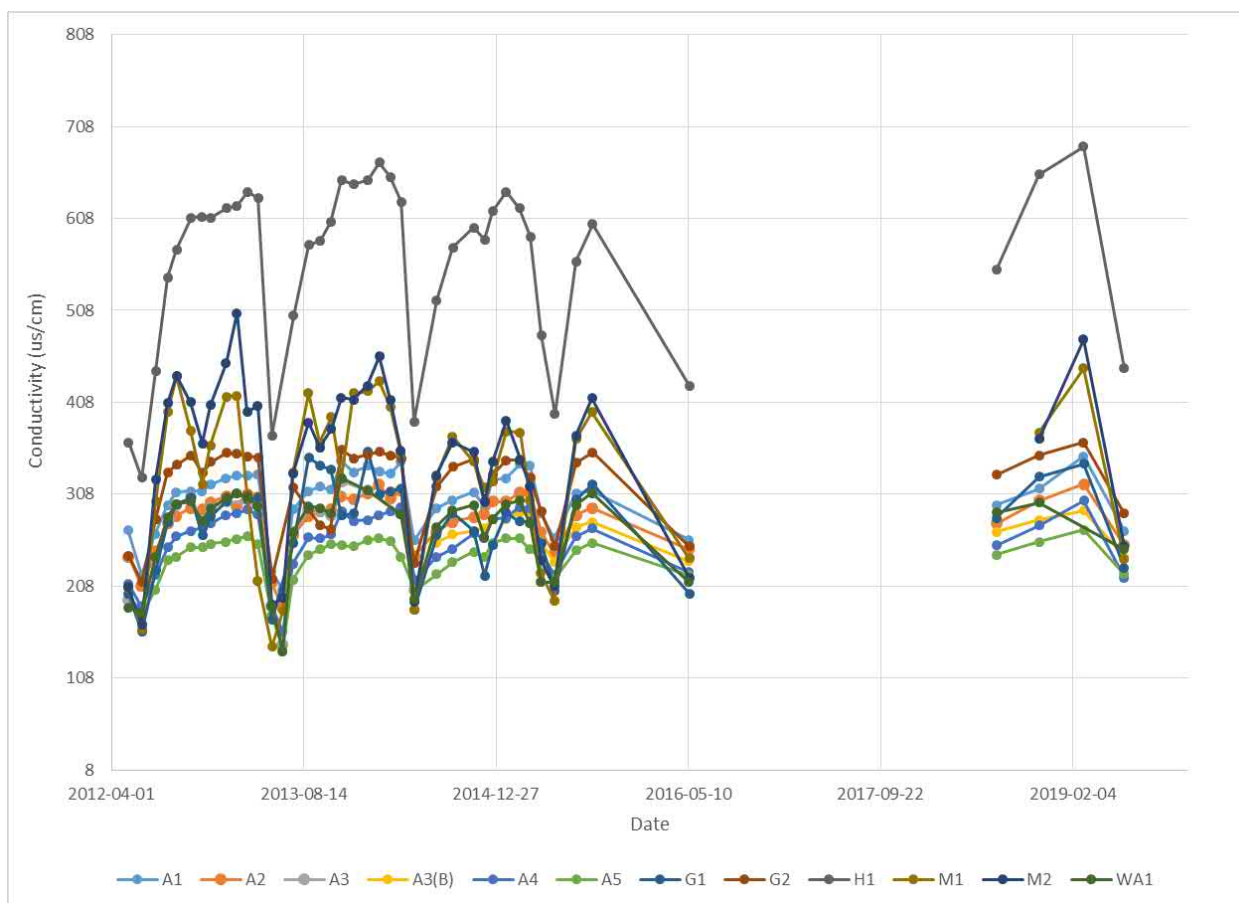
**Figure 4: Field pH measurements across the LSA over time.**

Water hardness ranged from 64 to 369 mg CaCO<sub>3</sub>/L, with an average result of 161 mg CaCO<sub>3</sub>/L. Hardness levels appear to fluctuate relatively consistently across the study area, as illustrated in **Figure 5**. Water hardness at station H1 was consistently higher compared to other sample locations. Seasonal trends can be observed, where lower water hardness tends to occur during the spring freshet (May-June) and higher water hardness during the fall and winter months. Note that analytical results for water hardness are not available beyond May 2016 and no guideline values are available for freshwater aquatic life for comparison purposes.



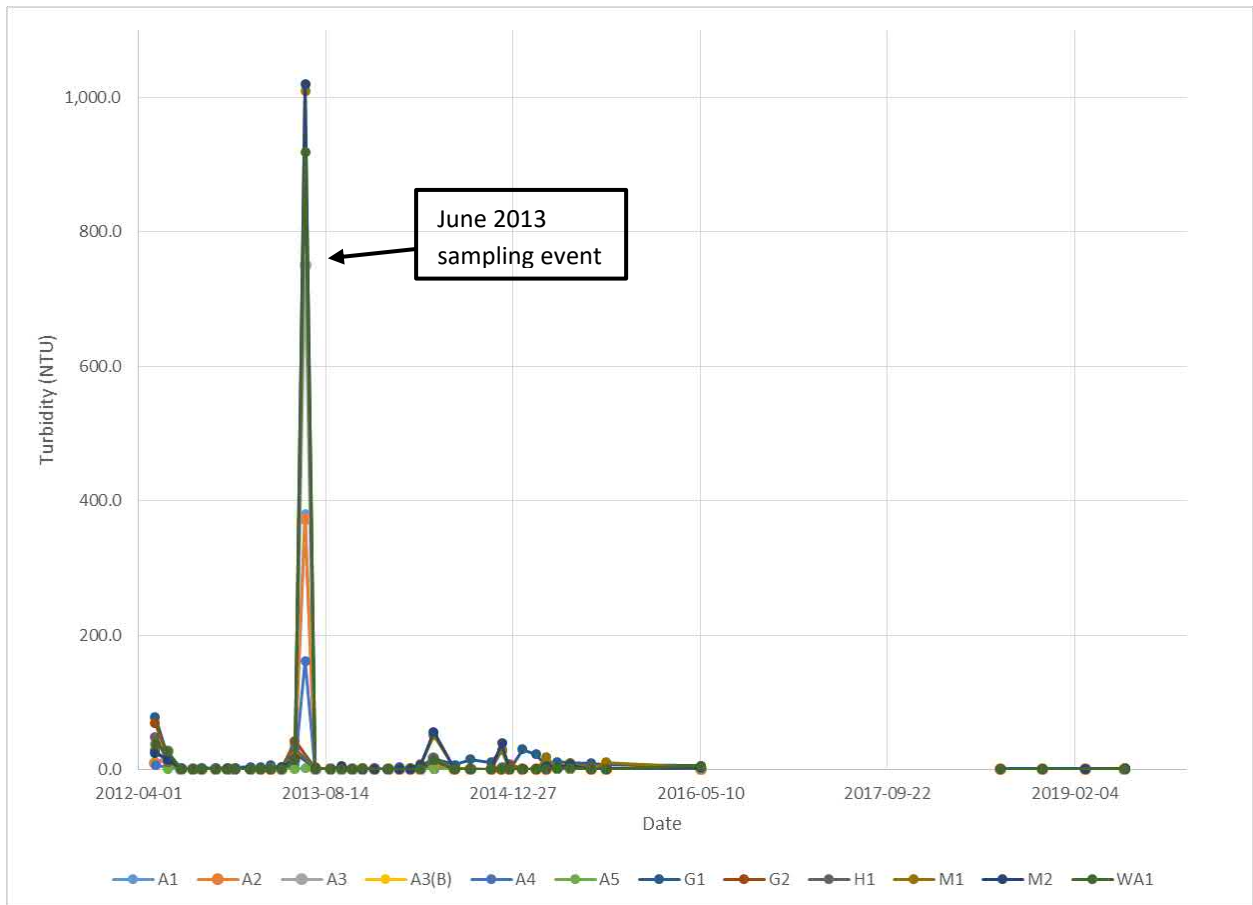
**Figure 5: Water hardness across the LSA over time.**

Conductivity ranged from 137 to 686  $\mu$ S/cm (**Figure 6**). Conductivity of surface water at station H1 was consistently higher than measured at other sampling stations. Seasonally, conductivity is generally lower during the high-flow spring freshet and higher during the low-flow fall and winter seasons. No guideline values are available for conductivity for comparison purposes.



**Figure 6: Conductivity results across LSA over time.**

Turbidity field measurements at each of the sampling stations are illustrated in **Figure 7**. Turbidity is generally low across the LSA, however distinct peaks are observed during the spring freshet and wet winter months. Increased turbidity levels are expected during high flow periods. Turbidity was exceptionally high in June 2013 within the Alexander Creek watershed (stations A1, A2, A3, A5, M1, M2, WA1) compared to turbidity results from other sampling stations for the same period (turbidity ranged from 162 to 1,020 NTU). Significant precipitation and extreme flooding were recorded in the Elk Valley and across the region in June 2013, with declaration of a Local State of Emergency. Atypically high turbidity levels measured in June 2013 are attributed to this period of significant precipitation. High turbidity was also observed in May 2012 and May 2014, and are also attributed to significant precipitation events. Outside of these high precipitation events, typical turbidity levels range from 0.1 to 42.7 NTU across the LSA. The overall mean and median turbidity levels are 11.7 NTU and 0.4 NTU, respectively.



**Figure 7: Turbidity levels across LSA over time.**

Similar to turbidity, total suspended solids were found to be elevated during the spring freshet and wet winter months (**Figure 8**). Total suspended solids were also atypically high in June 2013 throughout the Alexander Creek watershed (ranging from 532 to 2,610 mg/L). Relatively small increases in total suspended solids occurred in May 2012 and May 2014. Otherwise, total suspended solids ranged from 1 to 167 mg/L. The overall mean and median total suspended solids levels are 23.2 mg/L and 1.4 mg/L, respectively.



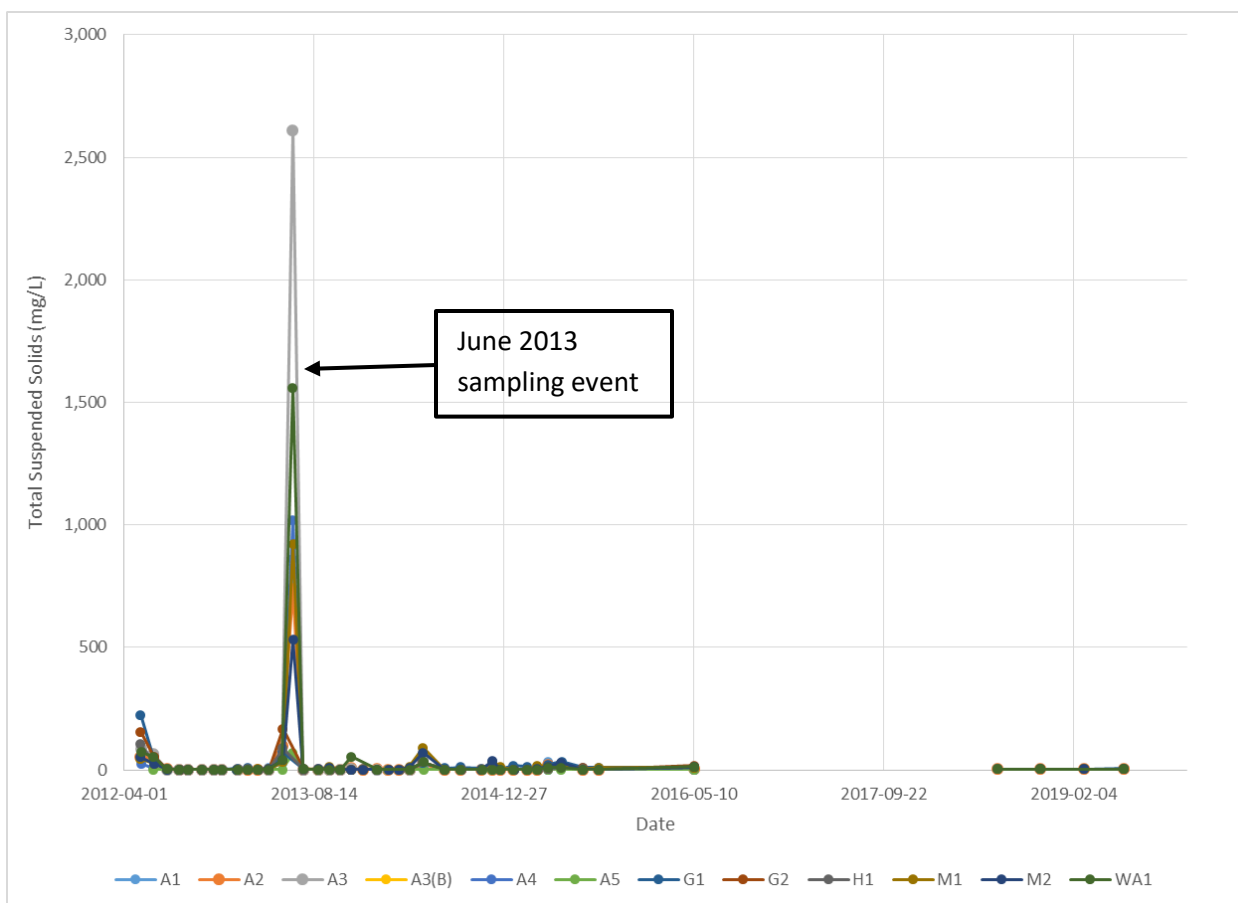


Figure 8: Total suspended solids levels across the LSA over time.

#### 4.1.2 Anions and Nutrients

BC WQG and CWQG for ammonia are pH and temperature dependent and were calculated for each sample. Of 623 samples, six samples were found to exceed the CWQG (long term) and two samples exceeded the BC WQG (long term). Exceedances of the CWQG (long term) were identified during the July 2012 sampling round at A2, A3, and M1 within the Alexander Creek watershed and at G2 and H1 within the Grave Creek watershed. There was also an exceedance at station M1 in July 2014. These exceedances ranged from 0.26 to 0.97 mg/L compared to the overall mean and median ammonia concentration of 0.02 mg/L and 0.01 mg/L, respectively. Isolated exceedances of the BC WQG long term were identified during two sample events which occurred outside of 5-in-30 sample events. These exceedances were identified in surface water collected from H1 and M1 in July 2012. Exceedances of ammonia in surface water represent concentrations which are significantly higher compared to typical results for the LSA. As such, they can be considered isolated occurrences and are not interpreted to represent elevated baseline condition within the LSA.

The BC WQG short term for fluoride is dependent on water hardness; calculated guideline values ranged from 1.16 to 1.86 mg/L. The CWQG is fixed at 0.12 mg/L. A total of 483 samples were found to contain concentrations of fluoride in exceedance of the CWQG long term, and no exceedances of the BC WQG short term were identified (**Figure 9**). Exceedances of the CWQG for fluoride were consistently

identified at the majority of sampling stations, with the exception of stations A3 and G1 which had 4 and 5 exceedances of 57 samples, respectively. Throughout the LSA, the overall mean and median concentrations of fluoride are 0.152 mg/L and 0.140 mg/L, respectively. Both the mean and median concentrations for the LSA slightly exceed the CWQG guideline, as do the mean and median concentrations for A1, A2, A3(B), A4, A5, G2, H1, M1 and M2. Overall, fluoride concentrations appear to be lower during the spring freshet, and higher during the fall and winter seasons.

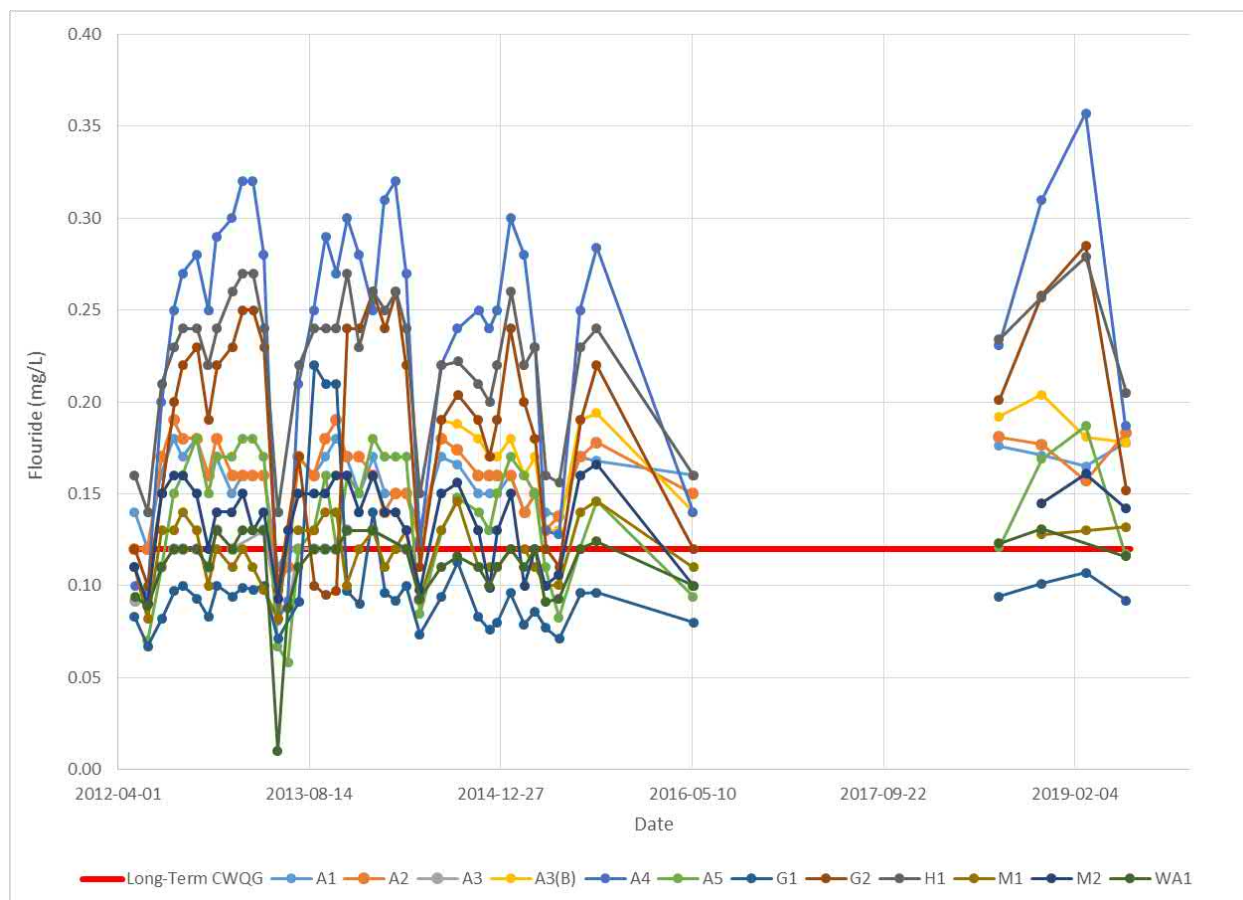


Figure 9: Fluoride concentrations across the LSA over time.

The BC WQG for nitrate (as N) is 32.8 mg/L for short term exposure and 3 mg/L for long term exposure. BC WQGs for long term exposure to nitrite (as N) are dependent on chloride concentrations. Nitrate (as N) is listed as one of the four Order constituent under the EVWQP. Analytical results for Nitrate (as N) have been compared to the EVWQP water quality targets in **Table 5**, and summary statistics are provided in **Table 6**. Exceedances of the BC WQG short term and long term, CWQG short term and long term and EVWQP water quality targets were not identified for the samples analyzed from the LSA.

shows temporal trends for nitrate (as N) concentrations across the LSA over time. Concentrations appear to be higher in surface water within Michel Creek (M1, M2) and near the downstream limit of Grave Creek (H1) compared to the other sampling stations. Though exceedances were not identified, nitrate (as N) concentrations at these stations are generally significantly higher than the overall LSA median and mean concentrations. Stations M1, M2, and H1 are situated in known mine-affected reaches of Michel Creek and Grave Creek. Seasonally, nitrate (as N) concentrations generally appear to be lower during the spring freshet and higher during the fall and winter.

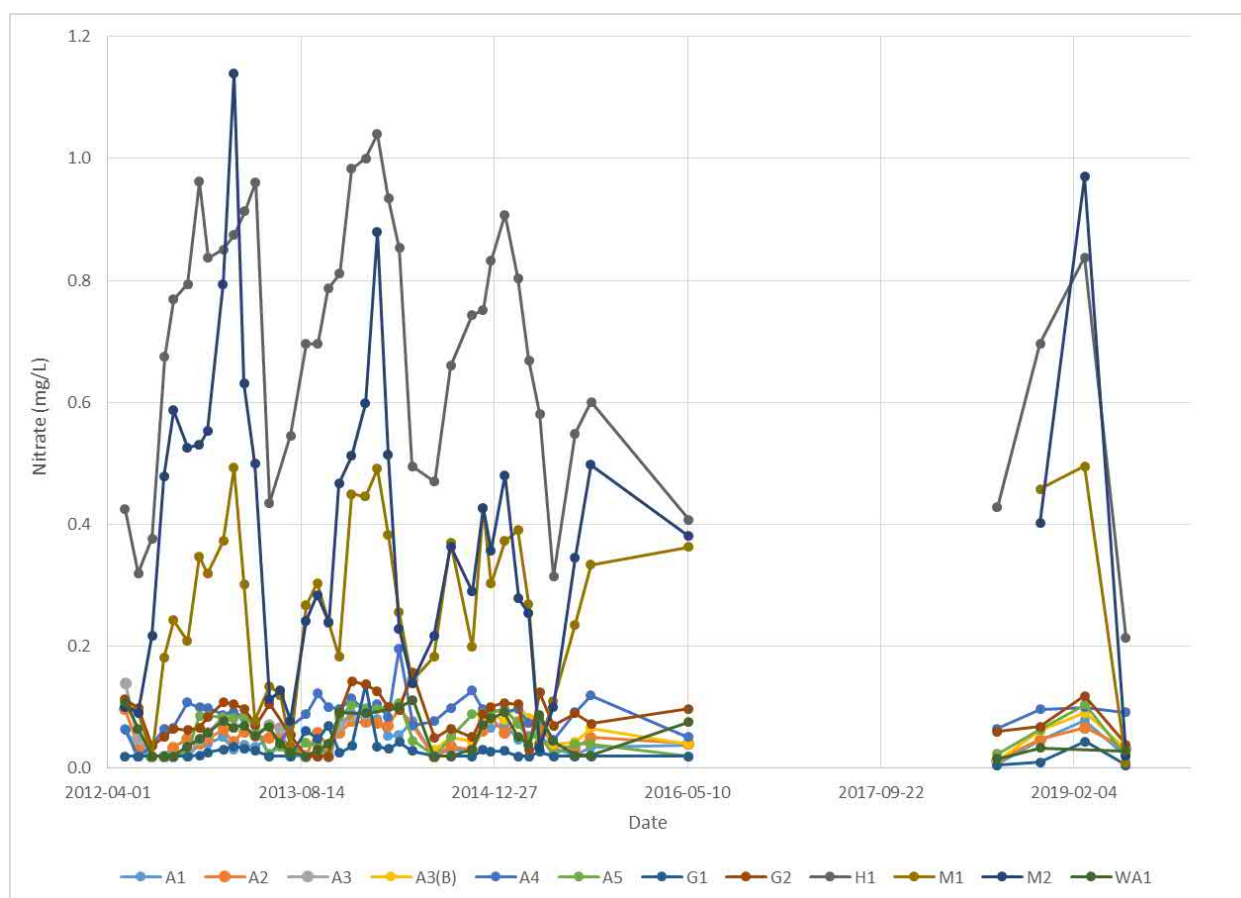
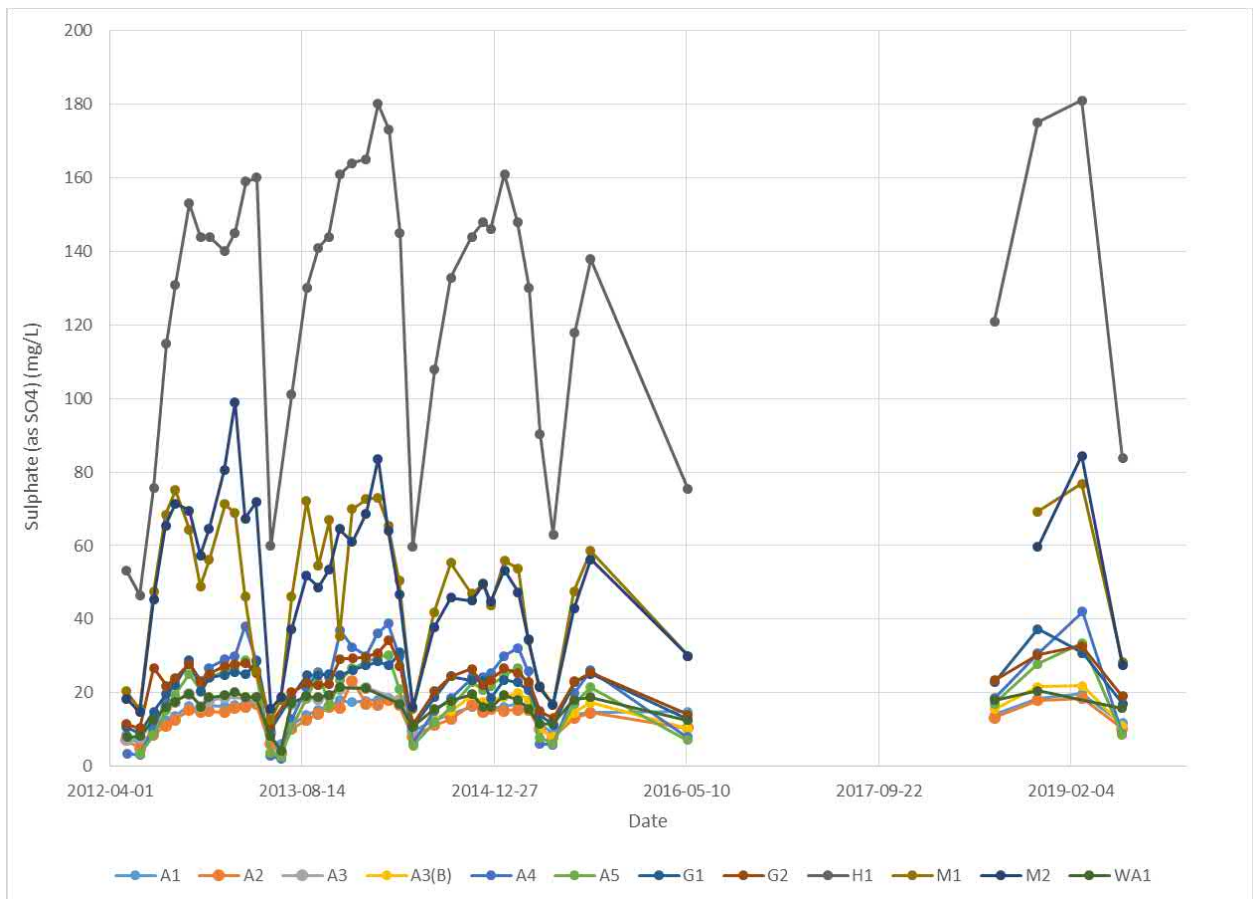


Figure 10: Nitrate (as N) concentrations across the LSA over time.

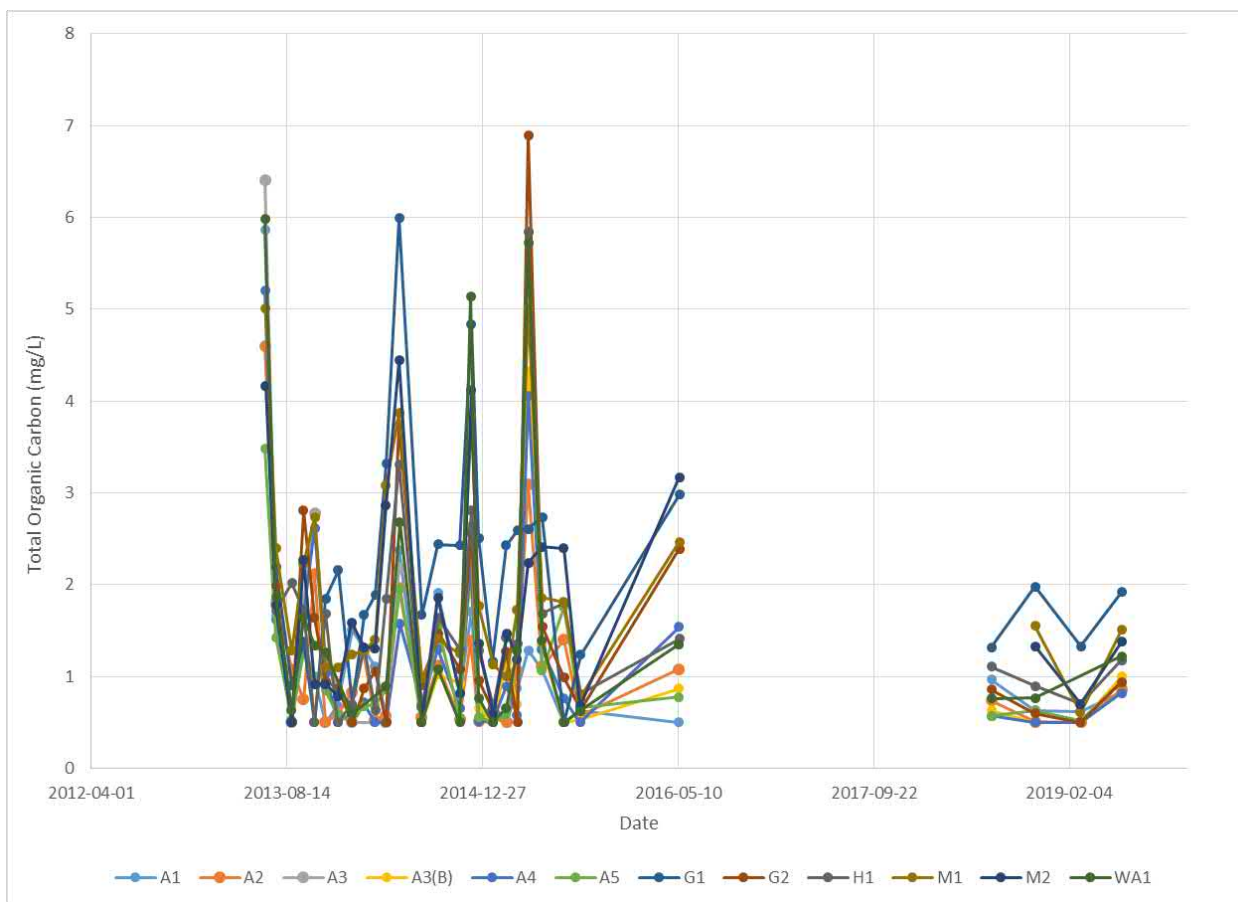
The BC WQG long term for dissolved sulphate ( $\text{SO}_4$ ) are hardness dependent and vary for each sample, where the lower limit value is 128 mg/L and the upper limit value is > 429 mg/L. Analytical results from 2012 to 2016 are for dissolved sulphate, and results from 2018 and 2019 are for total sulphate. Exceedances of the BC WQG long term were not identified in surface water samples collected from the LSA. As seen in **Figure 11**, concentrations appear to be higher at stations M1, M2, and H1 compared to other sampling stations. Elevated sulphate concentrations in surface water collected from these stations may be associated with mine impacts within Michel Creek and Grave Creek. Seasonally, sulphate concentrations are generally lower during the spring freshet and higher during the fall and winter months.



**Figure 11: Dissolved/total sulphate (as  $\text{SO}_4$ ) concentrations across the LSA over time.**

### 4.1.3 Organic Carbon

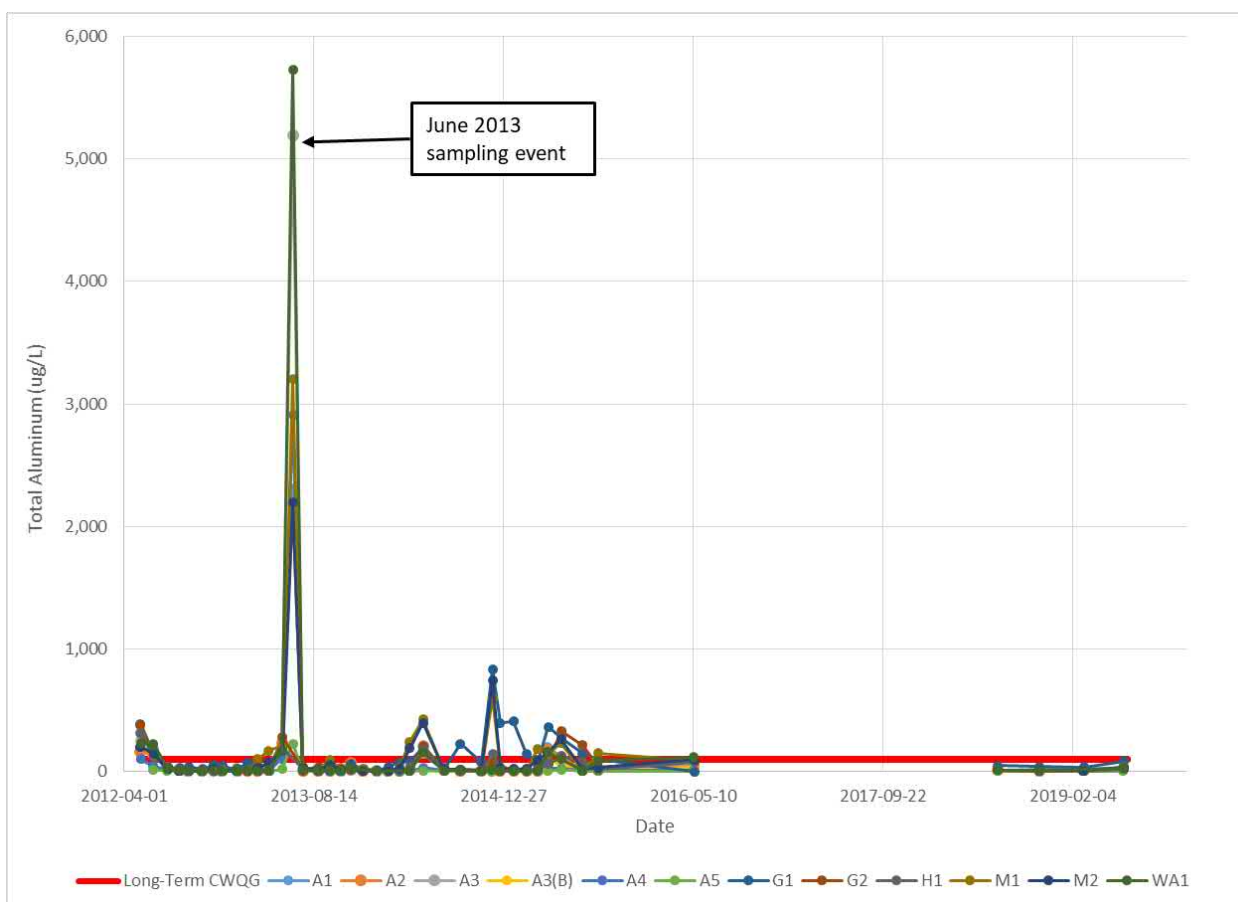
BC WQG and CWQG are not available for total and dissolved organic carbon. Since concentrations are similar for total and dissolved organic carbon, only total organic carbon was plotted (**Figure 12**). Total organic carbon generally varies between 0.5 mg/L and 3 mg/L but was distinctly elevated in June 2013, May 2014, November 2014 and April 2015 across the LSA. Elevated dissolved organic carbon concentrations are interpreted to be associated with high-magnitude precipitation events. Seasonally, organic carbon concentrations generally tend to increase during the spring freshet and are lower during fall and winter months.



**Figure 12: Total organic carbon concentrations across the LSA over time.**

#### 4.1.4 Metals

The CWQG long term for total aluminum is 100 µg/L (with the exception of one sample with a field pH measurement below 6.5 and therefore a calculated sample-specific guideline is applicable). Of 623 samples, 126 exceedances of the CWQG long term for total aluminum were identified. Exceedances were reported at each of the sampling stations, though fewer (i.e., <10% exceedances) were identified at stations A3(B), A4, and A5. Elevated concentrations of total aluminum were identified in surface water collected from each of the stations within the Alexander Creek watershed (i.e., stations A1, A2, A3, A4, M1, M2, and WA1) during the June 2013 high-magnitude precipitation event (**Figure 13**). Seasonally, total aluminum concentrations generally appear to be higher during the spring freshet and higher flow periods; this may be associated with terrestrial runoff caused by snowmelt.

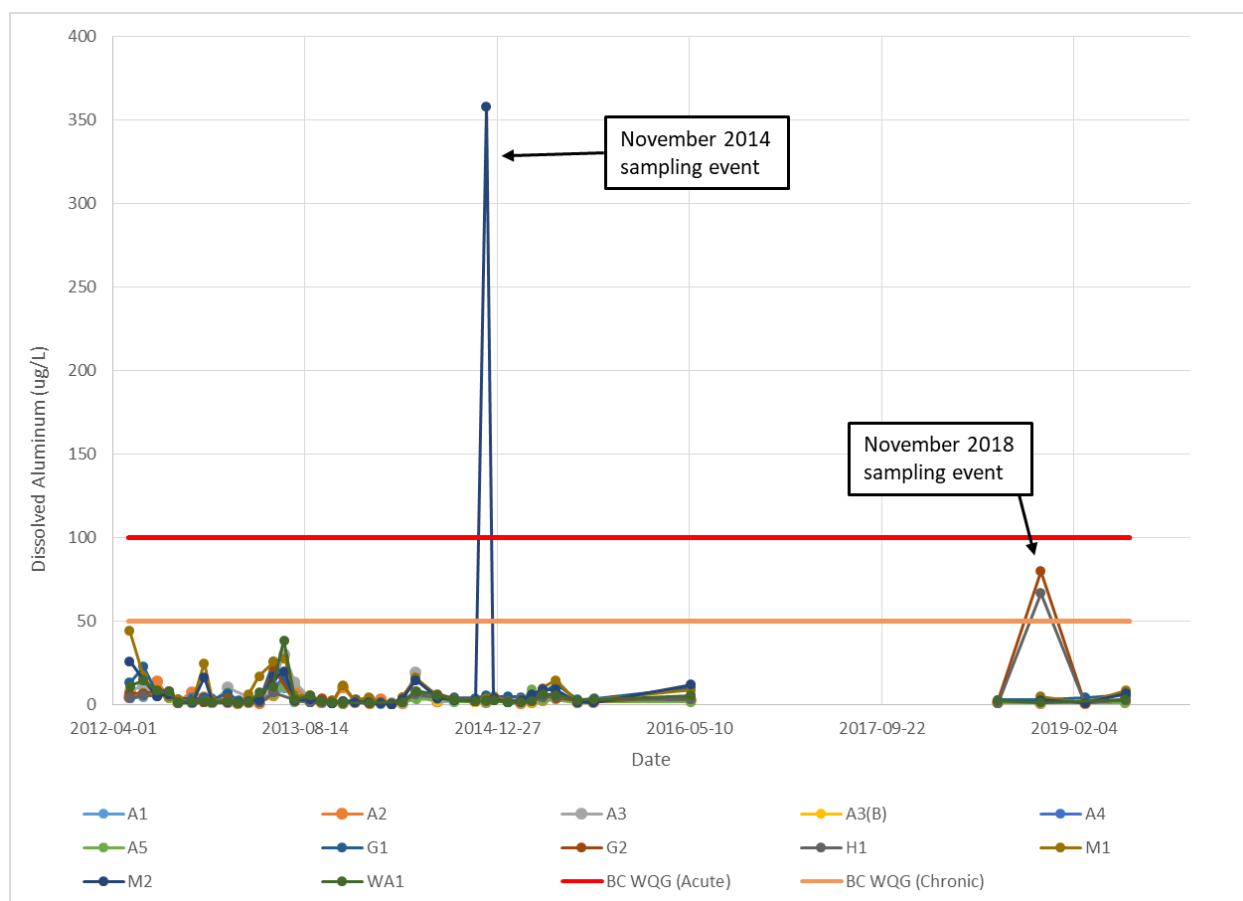


**Figure 13: Total aluminum concentrations across the LSA over time.**

The short term BC WQG for dissolved aluminum is 100 µg/L and the long term BC WQG is 50 µg/L (with the exception of one sample with a field pH measurement below 6.5 and therefore a calculated sample-specific guideline is applicable). One exceedance of the short term BC WQG was identified in surface water collected from station M2 in November 2014 (358 µg/L). This exceedance is an isolate event and is not considered to represent elevated background conditions in the LSA. The BC WQG long term has



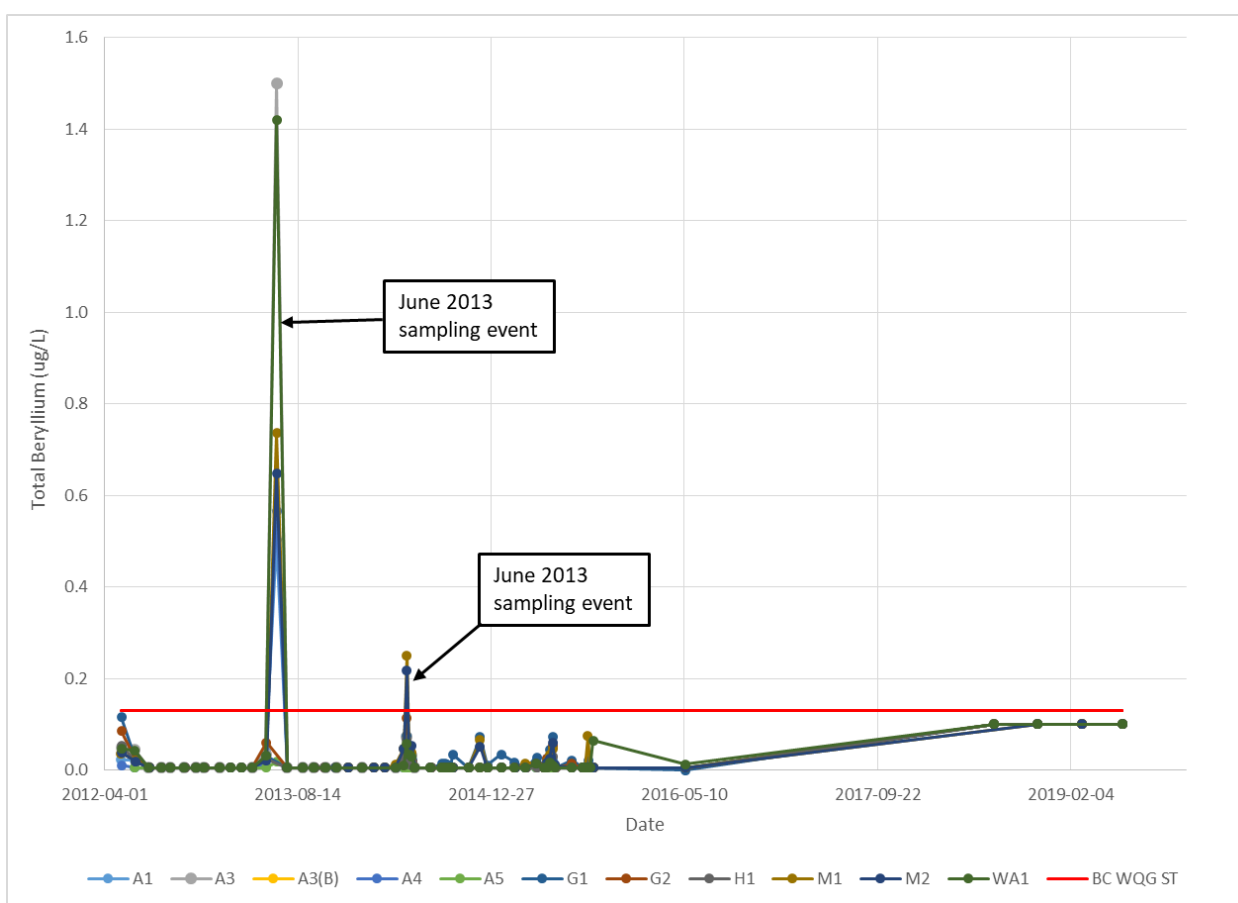
been applied to discrete and average 5-in-30 sample results. Several samples were found to exceed the BC WQG long term; M2 in November 2014, and G2 (80 µg/L) and H1 (66.9 µg/L) in November 2018. One discrete sample collected from A3 in June 2014 (53.6 µg/L) was found to exceed the BC WQG long term, however the averaged 5-in-30 result was below the calculated guideline. Dissolved aluminum results are illustrated in **Figure 14**, and tend to follow similar seasonal trends to total aluminum, with elevated concentrations occurring during the spring freshet and high flow periods.



**Figure 14: Dissolved aluminum concentrations across the LSA over time.**

Barium has a BC WQG working guideline of 1,000 µg/L. Of 623 samples, one sample collected from station WA1 in June 2013 (1,070 µg/L) was found to exceed the BC WQG for total barium. Median concentrations of total barium are equal to or less than 110 µg/L for each of the sample stations in the LSA, including the median concentration for WA1 (87 µg/L). Therefore, the identified total barium exceedances is considered an isolated occurrence and can be attributed to the June 2013 extreme precipitation event. As such, this exceedance is not interpreted to represent elevated baseline concentrations of barium within the LSA. Exceedances of dissolved barium were not identified for the samples analyzed.

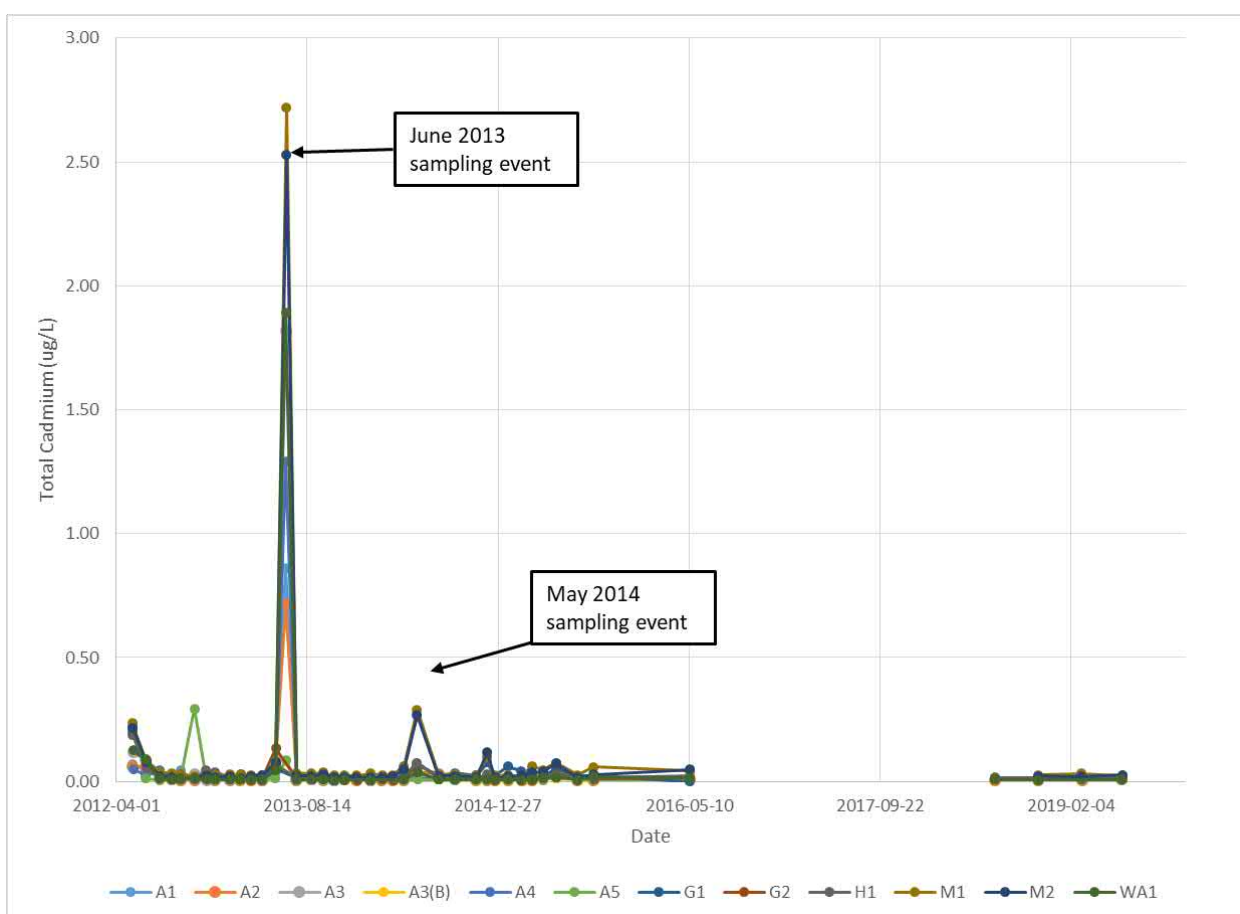
Total beryllium has a BC WQG short term guideline value of 0.13 µg/L. Nine exceedances of the guideline were identified at various stations across the LSA (**Figure 15**). Seven exceedances occurred during the June 2013 sampling event, at stations located within the Alexander Creek watershed (i.e., stations A1, A2, A3, A4, M1, M2 and WA1). Concentrations of total beryllium associated with this period of high-magnitude precipitation ranged from 0.467 to 1.5 µg/L. The remaining two exceedances occurred in May 2014 at stations M1 and M2, during the intensive 5-in-30 sampling event (0.251 µg/L and 0.217 µg/L, respectively). May 2014 is also considered a period of high-flow volume and significant precipitation. The overall mean and median concentration of total beryllium for samples collected from across the LSA are 0.01 µg/L and 0.03 µg/L, respectively. The identified exceedances are attributed to exceptionally high precipitation events in June 2013 and May 2014 and are not interpreted to represent typical baseline conditions in the LSA. Concentrations of dissolved beryllium were not identified in exceedance of the applicable guidelines for the samples tested.



**Figure 15: Total beryllium concentrations across the LSA over time.**

The CWQG short term for total cadmium varies per sample and ranges from 0.11 µg/L to 7.7 µg/L based on water hardness. The CWQG long term is also based on water hardness and ranges from 0.04 µg/L to 0.37 µg/L. Cadmium is considered one of the four Order constituent as per the EVWQP. Total cadmium concentrations which exceed the EVWQP target are summarized in **Table 5**, and summary statistics for

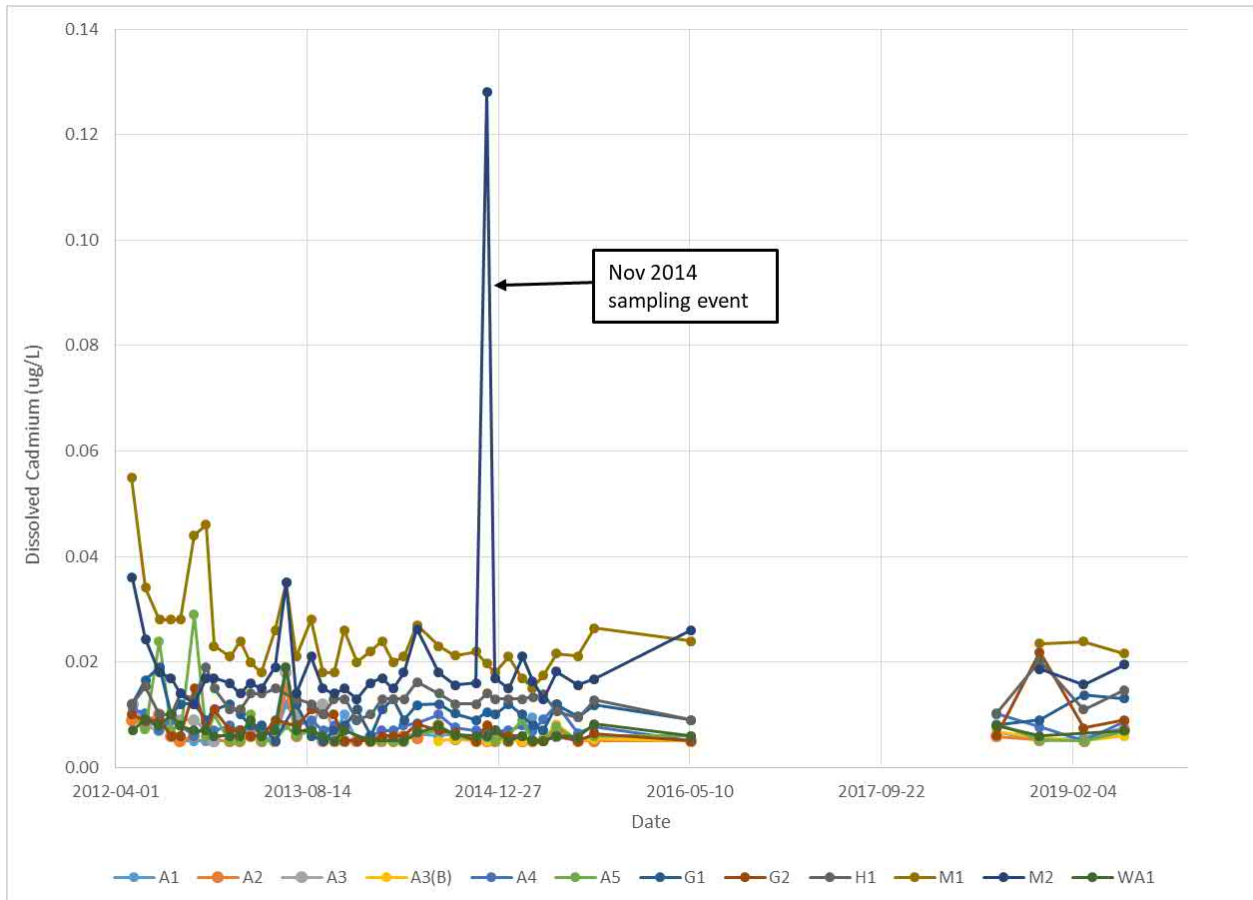
total cadmium are provided in **Table 6**. Nine exceedances of the CWQG long term for total cadmium were identified in surface water samples collected from across the LSA, ranging in concentration from 0.714 µg/L to 2.72 µg/L. Analytical results for total cadmium are illustrated in **Figure 16**. Seven of nine exceedances occurred within the Alexander Creek watershed during the June 2013 sampling round. Two exceedances occurred in the May 2014 sampling round at stations M1 and M2. Similar to exceedances of total beryllium, these elevated concentrations are associated with high flow volumes and significant precipitation events. Samples with water hardness above the guideline range of 250 mg/L were compared to the maximum guideline values (none of which were found to exceed the guideline). Throughout the LSA, the median and mean concentrations for total cadmium are 0.01 µg/L and 0.05 µg/L, respectively. Generally, total cadmium concentrations appear to be higher during the spring freshet and high-flow periods compared to other times of the year.



**Figure 16: Total cadmium concentrations across the LSA over time.**

Short term and long term BC WQG for dissolved cadmium are hardness dependent and vary per sample. Calculated long term BC WQG values for the samples collected from the LSA ranged from 0.153 µg/L to 0.457 µg/L. Calculated short term BC WQG values ranged from 0.373 µg/L to 2.8 µg/L. Exceedances of the BC WQG for dissolved cadmium were not identified for the samples tested across the LSA. However,

increased concentrations can be observed in surface water collected from station M2 in November 2014 (**Figure 17**). Overall, total and dissolved cadmium concentrations appear to be higher at Michel Creek (M1, M2) as compared to the other sampling stations. Throughout the LSA, median and mean concentrations for dissolved cadmium for each of the sampling stations are 0.01 µg/L and 0.01 µg/L, respectively. No distinct seasonal trends are observed from the graph in **Figure 17**, below.



**Figure 17: Dissolved cadmium concentrations across the LSA over time.**



The BC WQG long term (4 µg/L) and the BC WQG short term (110 µg/L) have been compared to sample results for total cobalt. The Several sample locations were found to exceed the long term guideline during the June 2013 extreme precipitation event; A1 (10.2 µg/L), A2 (5.11 µg/L), A3 (19.4 µg/L), A4 (7.19 µg/L), M1 (7.24 µg/L), M2 (6.12 µg/L) and WA1 (20.6 µg/L). As these elevated cobalt concentrations are attributed to severe precipitation and flooding, and have not been otherwise identified in surface water samples collected from the LSA, they are not interpreted to represent elevated baseline conditions.

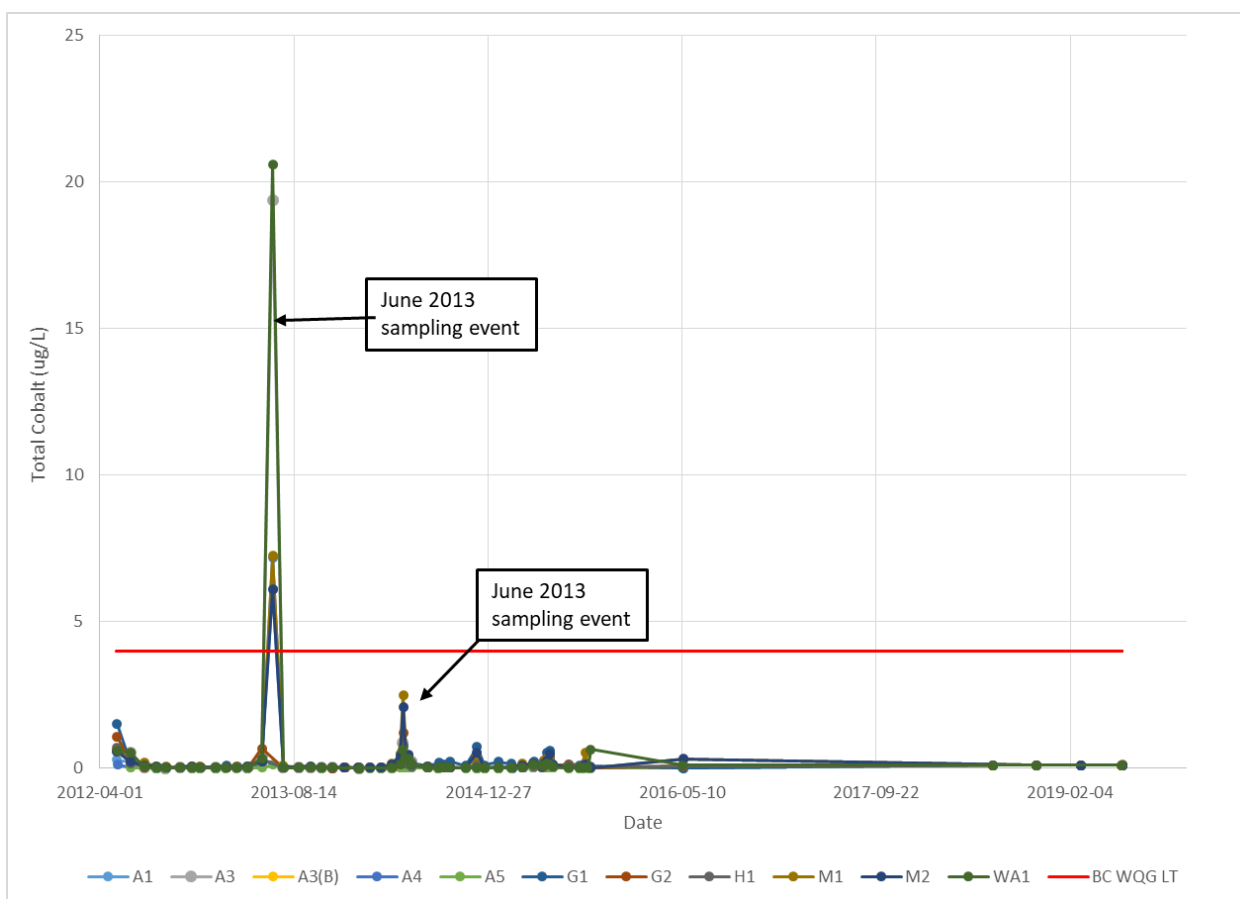
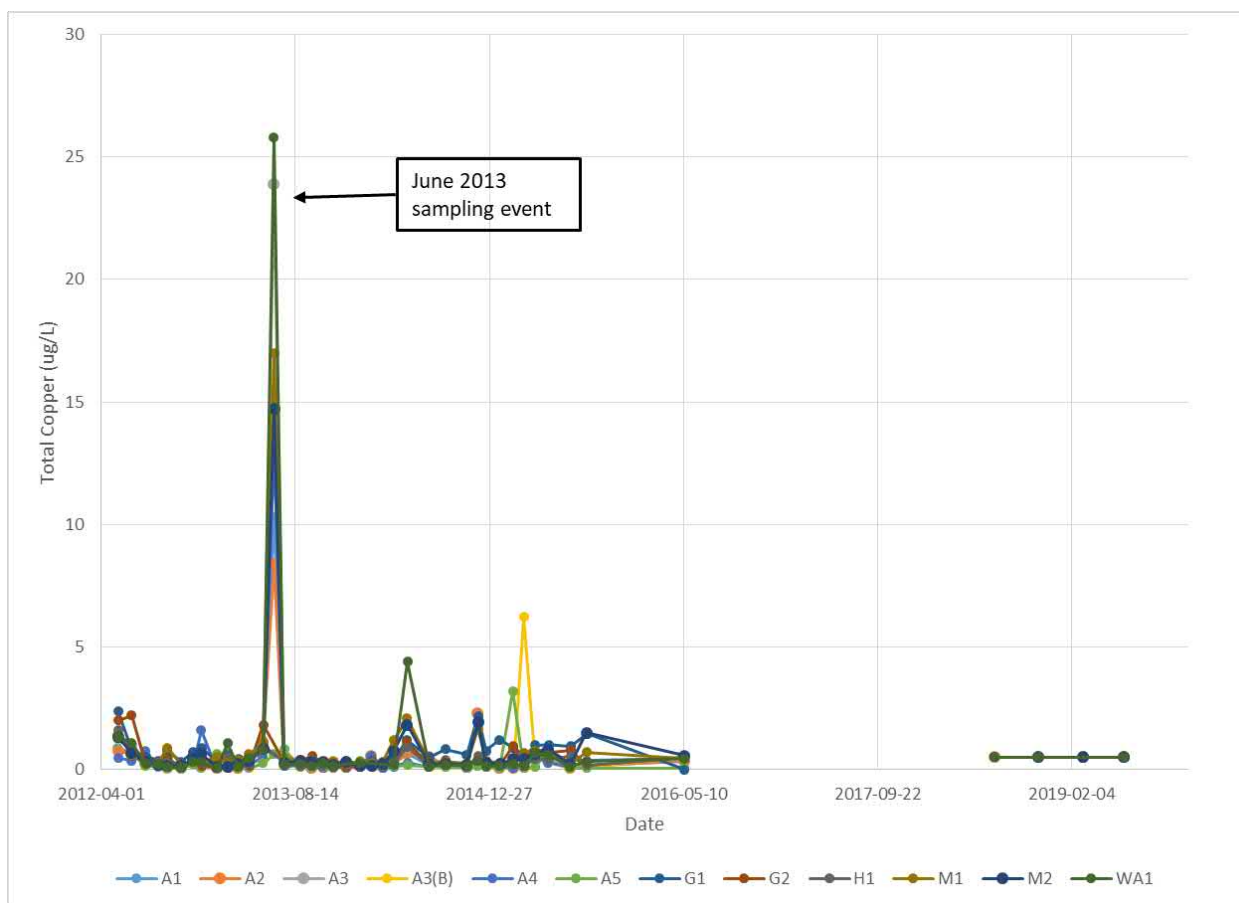


Figure 18: Total cobalt concentrations across the LSA over time.

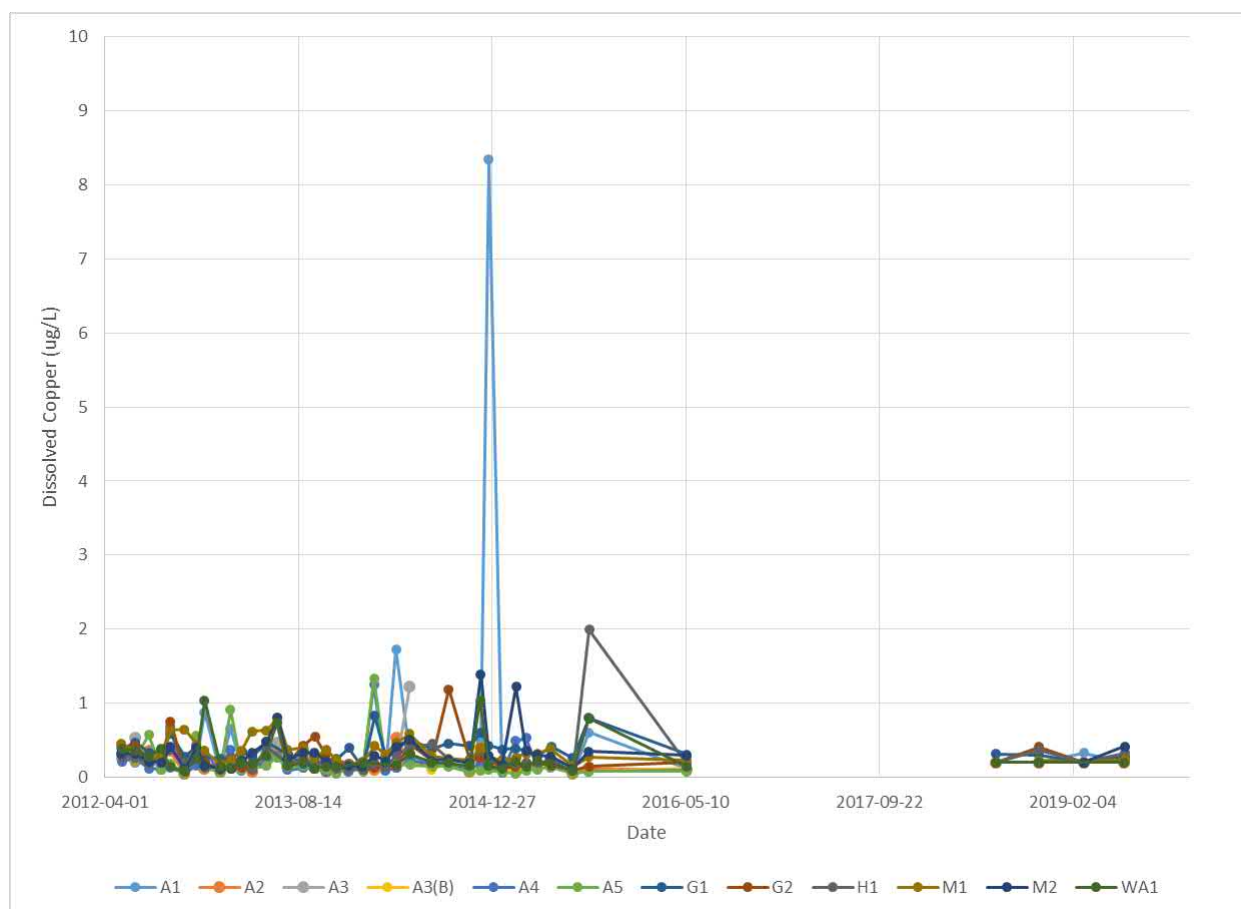
The CWQG for total copper varies per sample and range from 2.0 µg/L to 4.0 µg/L based on water hardness (**Figure 19**). Sixteen surface water samples were found to contain concentrations of total copper in exceedance of the long term CWQG, the majority of which occurred within the Alexander Creek watershed during the high-precipitation June 2013 sampling event. Median and mean concentrations of total copper for samples collected from across the LSA are 0.28 µg/L and 0.67 µg/L, respectively. In general, variability of concentrations of total copper are generally low, and distinct seasonal trends have not been identified.



**Figure 19: Total copper concentrations across the LSA over time.**

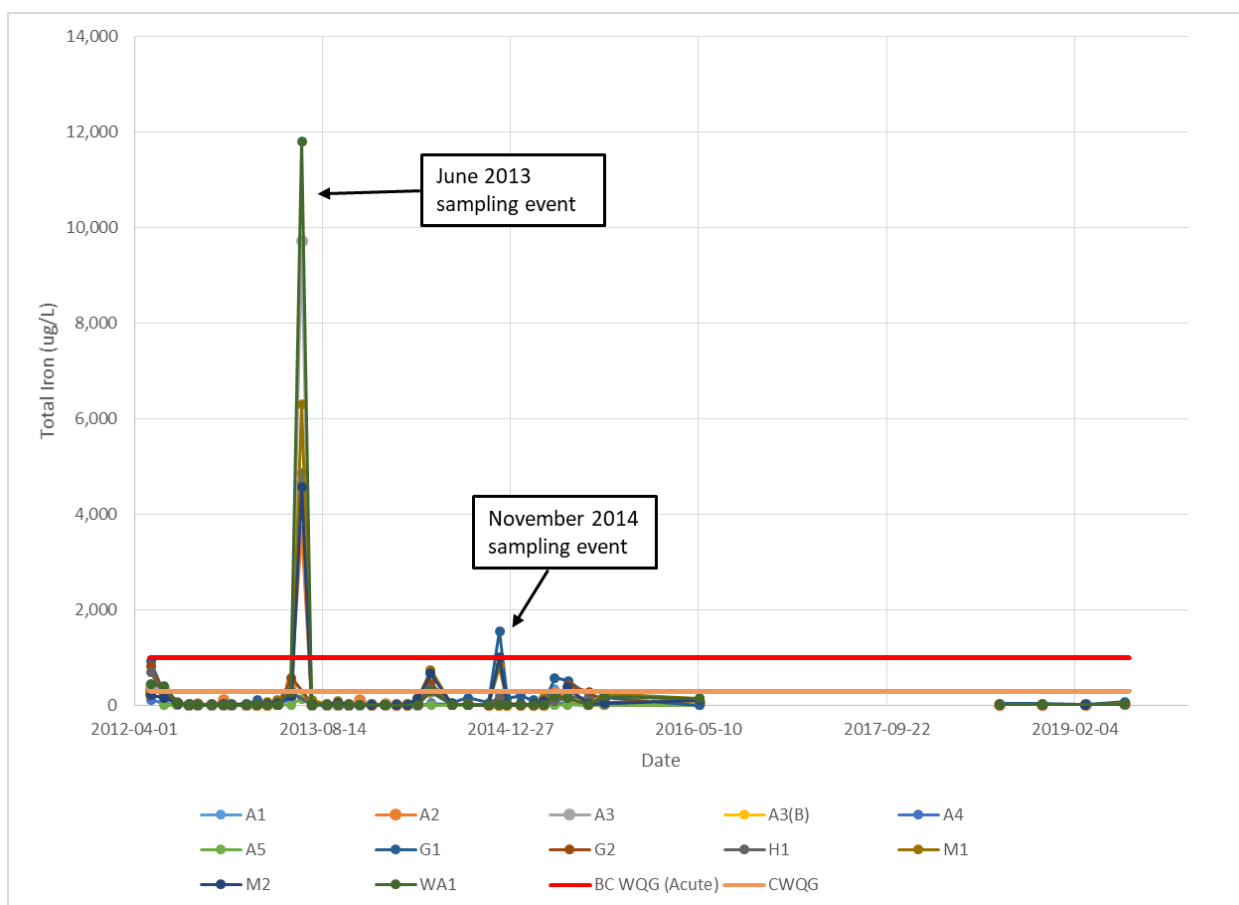
The BC WQG short term and long term for dissolved copper are pH, temperature, water hardness, and dissolved organic carbon dependent and were calculated using the BC BLM software. Calculated short term guideline values for the samples analyzed over the course of the program ranged from range from 1.7 µg/L to 19.5 µg/L and long term values ranged from 0.3 µg/L to 3.2 µg/L. Temporal trends are illustrated in **Figure 20**. Four dissolved copper samples exceeded BC WQG short term and 21 samples exceeded BC WQG long term; two samples collected from A1 and one sample each from H1 and WA1. Dissolved copper concentrations from one or more discrete results from intensive 5-in-30 sampling events collected from stations A1, A2, A3, A3(B), A4, G1, G2, H1, M1, M2 and WA1 were found to exceed the BC WQG long term, and of these, averaged results were found to exceed from A1 (Aug/Sept 2015), A3 (May/Jun 2014), G2 (Aug/Sept 2014) and H1 (Aug/Sept 2015). A summary of the exceedances of the BC WQG long term is provided in **Table 4**. In addition, several other sample results which are not associated with 5-in-30 sampling were found to exceed the BC WQG long term. These include two events from A1 (April and December 2014), one event from A2 (April 2014), three events from A4 (September 2012, February 2014 and March 2015), two events from A5 (July 2012 and February 2014), three events from G2 (May and August 2013, and November 2018), one event from M1 (May 2013), two events from M2 (May 2013 and February 2015) and one event from WA1 (May 2012). Median and mean concentrations for dissolved copper for the samples collected from across the LSA are 0.20 µg/L and

0.31 µg/L, respectively. The variability of dissolved copper concentrations are generally low with no distinct seasonal trends.



**Figure 20: Dissolved copper concentrations across the LSA over time.**

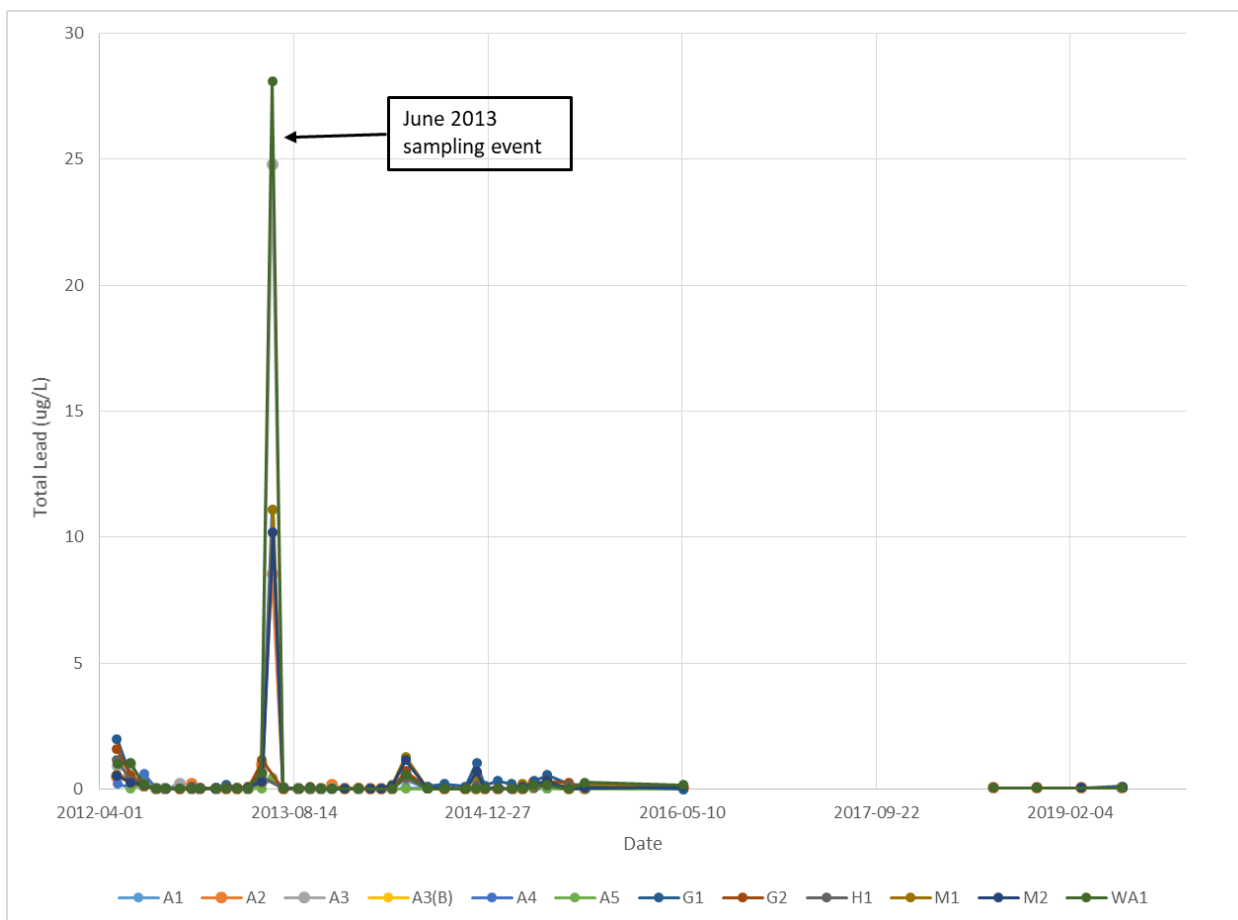
The short term BC WQG for total iron is 1,000 µg/L and the long term CWQG is 300 µg/L. A total of 15 short term BC WQG exceedances and 65 long term CWQG exceedances were identified (**Figure 21**). The majority of total iron concentration exceedances of the CWQG occurred during May through July 2012, May 2013, May-July 2014, November 2014, and April through May 2015. In general, total iron concentrations appear to be higher during the spring freshet season and lower during drier periods. Mean and median concentration for total iron for the samples collected from across the LSA are 172.43 µg/L and 19.40 µg/L, respectively. The BC WQG short term for dissolved iron is 350 µg/L and long term CWQG is 300 µg/L. Three exceedances of the short term BC WQG and long term CWQG were identified for dissolved iron, two of which occurred in November 2018 at stations G2 and H1. The third exceedance occurred in November 2014 at station M2. No distinct temporal trends have been identified for dissolved iron.



**Figure 21: Total iron concentrations across the LSA over time.**

The CWQG long term and BC WQG short term and long term for total lead are hardness dependent and vary for each sample. The CWQG long term ranges from 1 µg/L to 7 µg/L, and the BC WQG short term is 3 µg/L and the long term ranges from 5.12 µg/L to 19.57 µg/L for samples with water hardness > 8 mg/L CaCO<sub>3</sub>. A total of nine exceedances of the BC WQG long term and CWQG short term were identified in surface water samples collected from A1, A2, A3, A4, M1, M2 and WA1 for total lead (**Figure 22**). Each of the BC WQG exceedances occurred within the Alexander Creek watershed during the June 2013 extreme precipitation event. Two additional CWQG exceedances occurred at stations M1 and M2 during the May 2014 precipitation event. In general, total lead concentrations appear to be higher during the spring freshet and lower during lower flow periods.





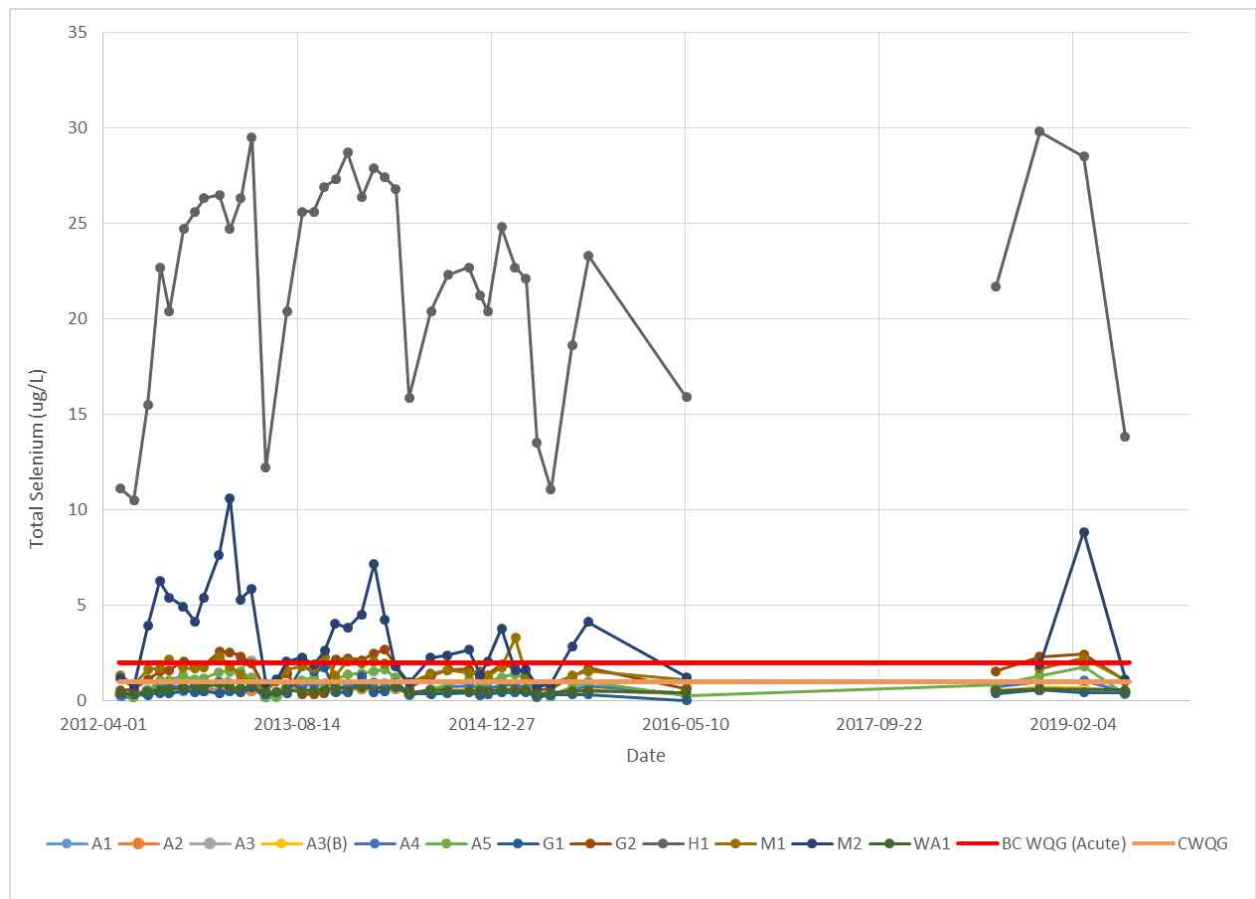
**Figure 22: Total lead concentrations across the LSA over time.**

The BC WQG short term and long term for total manganese are water hardness dependent and vary per sample. Two exceedances of the BC WQG short term and long term were identified; stations A3 and WA1 during the June 2013 event. As these elevated manganese concentrations are associated with extreme precipitation, these are unlikely to represent elevated baseline conditions in the LSA.

The long term and short term BC WQG for total selenium is 2 µg/L and the long term CWQG is 1 µg/L. No guideline values for dissolved selenium are provided in the BC WQG or CWQG. The Companion Document to: Ambient Water Quality Guidelines for Selenium Update (BC MOE, 2014) provides updated WQGs for selenium in water for the protection of aquatic life. For water, the guideline value of 2 µg/L can be compared to the averaged 5-in-30 intensive sampling results. In addition, an alert value of 1 µg/L, which is equivalent to the long term CWQG, can be compared to the analytical results. A total of 118 BC WQG long term and 246 CWQG long term exceedances for total selenium were identified over the sampling period (**Figure 23**). The majority of these exceedances occurred in surface water samples collected from stations G2, H1, A5, M1 and M2, and exceedances of the BC WQG long term were also identified at station A3. Selenium concentrations in each of 57 samples collected from H1 were found to exceed the BC WQG short term. The majority of samples collected from station M2 also exceeded the

applicable guidelines. Median and mean concentrations for total selenium for samples collected from across the LSA are 0.067 µg/L and 2.83 µg/L, respectively. Averaged results from the 5-in-30 events which exceeded the BC WQG long term were identified in each of the intensive events from H1 and two of four events from M2.

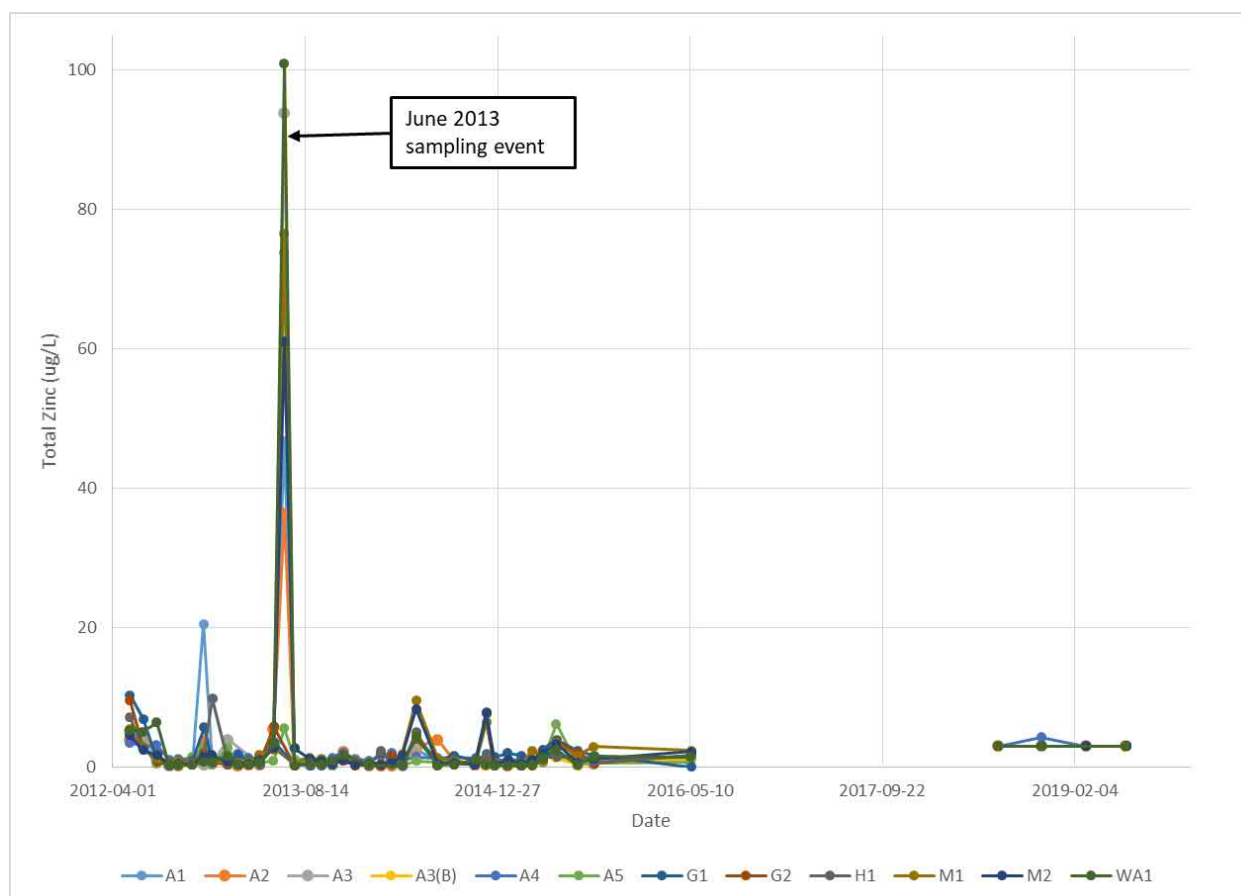
Five-in-30 sample results are summarized in **Table 4**. Generally, and in contrast to other metals, total selenium concentrations appear to be lower during the spring freshet and higher during drier periods.



**Figure 23: Total selenium concentrations across the LSA over time.**

The BC WQG short term and long term for total silver are dependent on water hardness; samples with water hardness <100 mg/L have a long term comparison value of 0.05 µg/L and a short term value of 0.1 µg/L, and samples with water hardness >100 mg/L have a long term comparison value of 1.5 µg/L and a short term value of 3.0 µg/L. The CWQG long term is 0.25 µg/L. Two exceedances of the BC WQG short term and four exceedances of the BC WQG long term were identified across the LSA. The concentrations of total silver exceeded both the short term and long term BC WQG at stations M1 and M2 in May 2014 during the high-flow intensive sampling period, however the averaged results were compliant with the guideline. Slight exceedances of the BC WQG long term also occurred in June 2013 at stations M2 and

WA1. Overall, concentrations of silver in surface water are compliant with CWQG long term and are generally compliant with the BC WQG for short term and long term exposure. BC WQG short term and long term for total zinc are hardness dependent and CWQG short term and long term for dissolved zinc are hardness, pH, and dissolved organic carbon dependent. The calculated BC WQG short term values which were calculated for the samples analyzed during this program ranged from 33 µg/L to 242.25 µg/L and the long term range from 7.5 to 216.75 µg/L. The calculated CWQG short term values ranged from 28.05 µg/L to 183.17 µg/L and the long term values ranged from 6.97 µg/L to 35.04 µg/L. A total of seven exceedances of the BC WQG short term, and nine exceedances of the BC WQG long term were identified for total zinc (**Figure 24**). The exceedances of the BC WQG short term occurred during the June 2013 extreme precipitation event within the Alexander Creek watershed. Two of the nine identified exceedances of the BC WQG long term occurred at stations M1 and M2 during the May 2014 high-flow intensive sampling period; once averaged, results were compliant with the long term guideline. Total zinc concentrations were below the laboratory reportable detection limit (3 µg/L) during the 2018 and 2019 sampling events. Seasonal trends for total zinc concentrations have not been identified for the LSA over time.



**Figure 24: Total zinc concentrations across the LSA over time.**

#### 4.1.5 Polycyclic Aromatic Hydrocarbons

The following PAHs were analyzed in the surface water samples:

- 1-Methylnaphthalene
- 2-Methylnaphthalene
- Acenaphthene;
- Acenaphthylene;
- Acridine;
- Anthracene;
- Benzo(a)anthracene;
- Benzo(a)pyrene;
- Benzo(b,j,k)fluoranthene;
- Benzo(g,h,i)perylene;
- Chrysene;
- Dibenz(a,h)anthracene;
- Fluoranthene;
- Fluorene;
- Indeno(1,2,3-c,d)pyrene;
- Naphthalene;
- Phenanthrene;
- Pyrene; and
- Quinoline.

Concentrations of PAH parameters were found to be below the BC WQG short term and long term and CWQG short term and long term for the parameters tested for the sampling stations across the LSA. Generally speaking, analytical results are below laboratory reportable detection limits. Each of the laboratory reportable detection limits are below the respective guideline values.

#### 4.1.6 Summary

With the exception of fluoride, aluminum, dissolved copper, iron, and selenium, the majority of guideline exceedances occurred during two specific sampling events: June 2013 and May 2014. In general, exceedances from the June 2013 sampling round were identified at stations within the Alexander Creek watershed, and exceedances from the May 2014 sampling round were identified at stations M1 and M2. As such, many of the isolated exceedances identified during these events are attributed to high precipitation events and are not considered reflective of typical baseline conditions for the LSA.

Exceedances of the CWQG long term were consistently identified at each of the sampling stations (with the exception of A5 and G1). CWQG long term exceedances of total aluminum were reported at each of the sampling stations, though fewer were identified within the upper reach of Alexander Creek (i.e., stations A5, A4, and A3(B)). Four dissolved copper samples were found to exceed the BC WQG short term and 27 samples exceeded the BC WQG long term; no distinct seasonal or trends were identified.

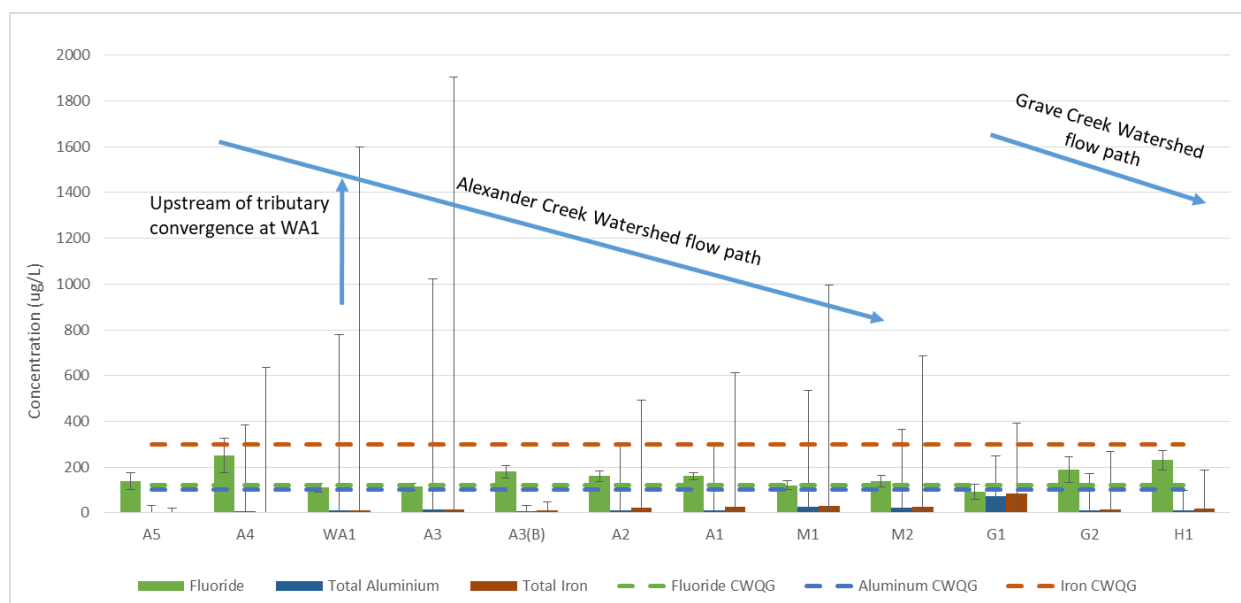
Total iron concentrations exceeded the CWQG long term at the majority of sampling stations during specific sampling rounds; elevated concentrations of total iron may be associated with spring freshet periods. Concentrations of selenium and numerous exceedances of the BC WQG short term and long term and CWQG long term were identified in surface water from the LSA, with the majority occurring in samples collected from stations G2, H1, A5, M1 and M2. Each of the samples collected from H1 and the majority of samples collected from M2 exceeded one or more guidelines for selenium in surface water.

Several parameters in the surface waters of the LSA were found to consistently exceed the applicable guidelines and have therefore been identified as key parameters: fluoride, aluminum, dissolved copper, iron, and selenium. These and other select parameters are discussed with respect to their spatial distribution in **Section 4.2**.

## 4.2 Spatial Analysis

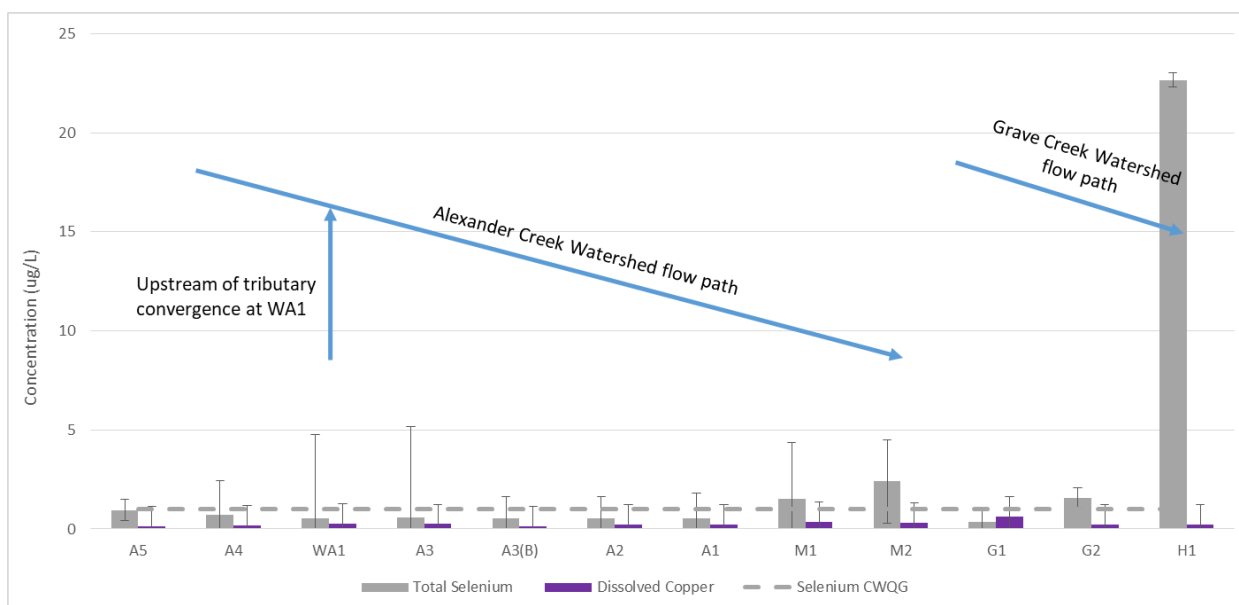
Bar charts and box plots have been generated to visualize the distribution and variability of the analytical data set and may illustrate spatial trends. Box plots show the 25th and 75th quartiles, where the midpoint indicates the median value and error bars indicate the deviation (mean - minimum and maximum – mean) for each population. Error! Reference source not found.

Median concentrations of the key parameters with higher frequency of exceedances (i.e., fluoride, aluminum, dissolved copper, iron and selenium) are presented in **Figure 25** and **Figure 26** in order of surface water flow pathway. Median concentrations of aluminum and iron are below the CWQG long term. Median fluoride concentrations exceed the CWQG long term of 120 µg/L at each of the sampling stations with the exception of stations WA1 and G1. Median selenium concentrations exceed the CWQG long term of 1 µg/L at stations M1, M2, G2 and H1.



**Figure 25: Median concentrations of fluoride, total aluminum and total iron at select sampling stations**





**Figure 26: Median concentrations of total selenium and dissolved copper at select sampling stations**

A slight increase in selenium concentrations can be seen as surface water travels from the headwaters of Alexander Creek at A5 downstream to Michel Creek at M1 and M2. The same occurs within the Grave Creek watershed, however a dramatic increase in selenium concentrations in surface water is observed between G2 and H1. Concentrations of aluminum and iron show a slight decreasing trend from the headwaters of Alexander Creek at A5 to A2, however concentrations are higher at A1, M1, and M2. No distinct spatial trends for fluoride, aluminum or copper are observed for the Alexander/Michel Creek and Grave/Harmer Creek watersheds.

#### 4.2.1 Alexander Creek and Michel Creek

The Alexander Creek watershed includes Alexander Creek and West Alexander Creek and these flow into Michel Creek which is in the Michel Creek watershed. Sampling stations are situated in the following order of surface water flow pathway from the most upstream to the downstream limit: A5, A4, WA1, A3, A3(B), A2, A1, M1, and M2.

Box plots for fluoride, aluminum, copper, iron, and selenium within the Alexander Creek and Michel Creek watershed are presented in **Figure 27** to **Figure 31**. Error bars which are beyond the scale of the y-axis of the graphs are associated with atypical precipitation events (e.g., June 2013 and May 2014), and as such are not interpreted to represent baseline conditions in the LSA. Spatially, selenium concentrations are generally higher at Michel Creek (M1 and M2) compared to the other sampling stations; this may be attributed by nearby mining activities. Median selenium concentrations appear to decrease and median iron concentrations tend to increase as surface water flows from the headwaters of Alexander Creek downstream to Michel Creek. Overall, box plots indicate generally low variability in the dataset for each of the sampling stations, with the exception of aluminum and iron. Box plots for fluoride, aluminum, copper, and iron do not provide visual trends with respect to surface water flow path.

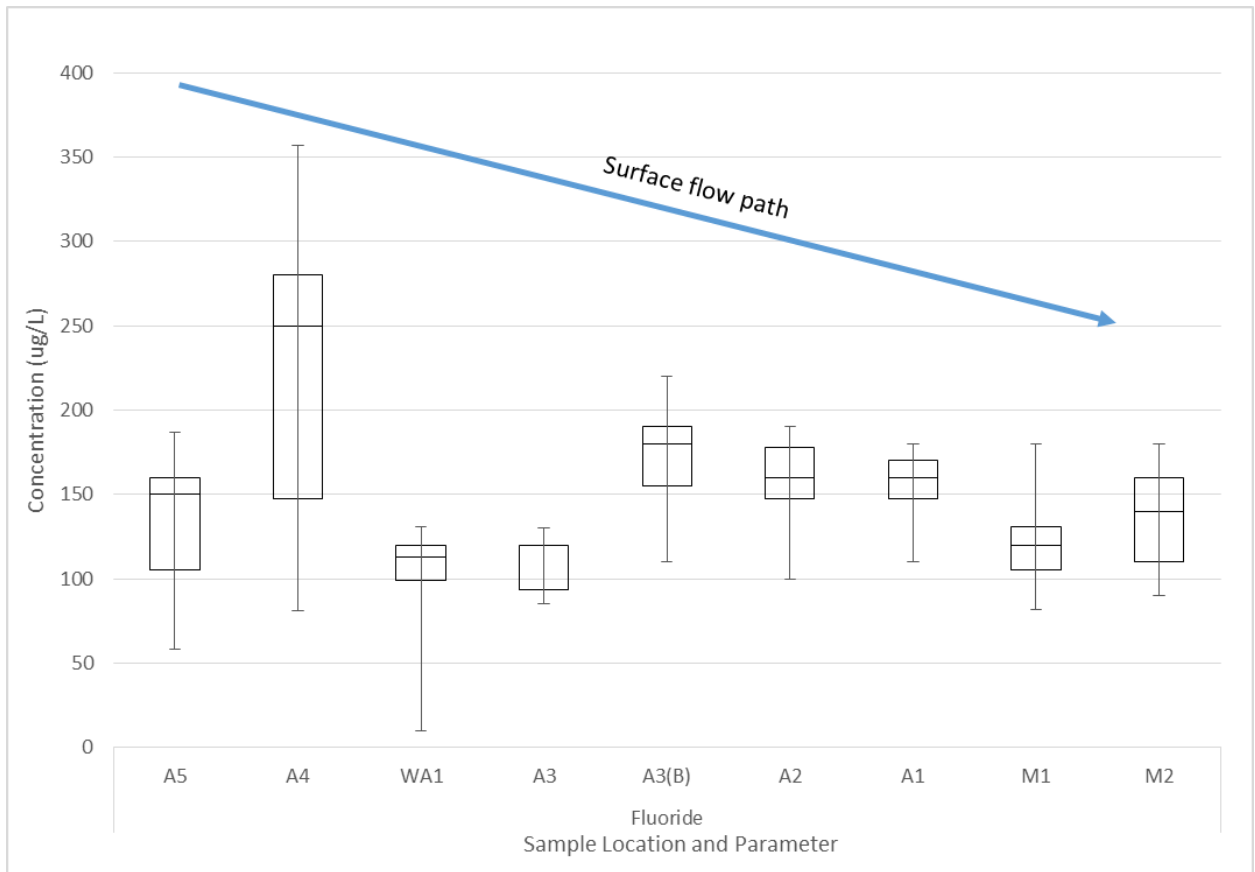


Figure 27: Fluoride concentrations in Alexander Creek watershed

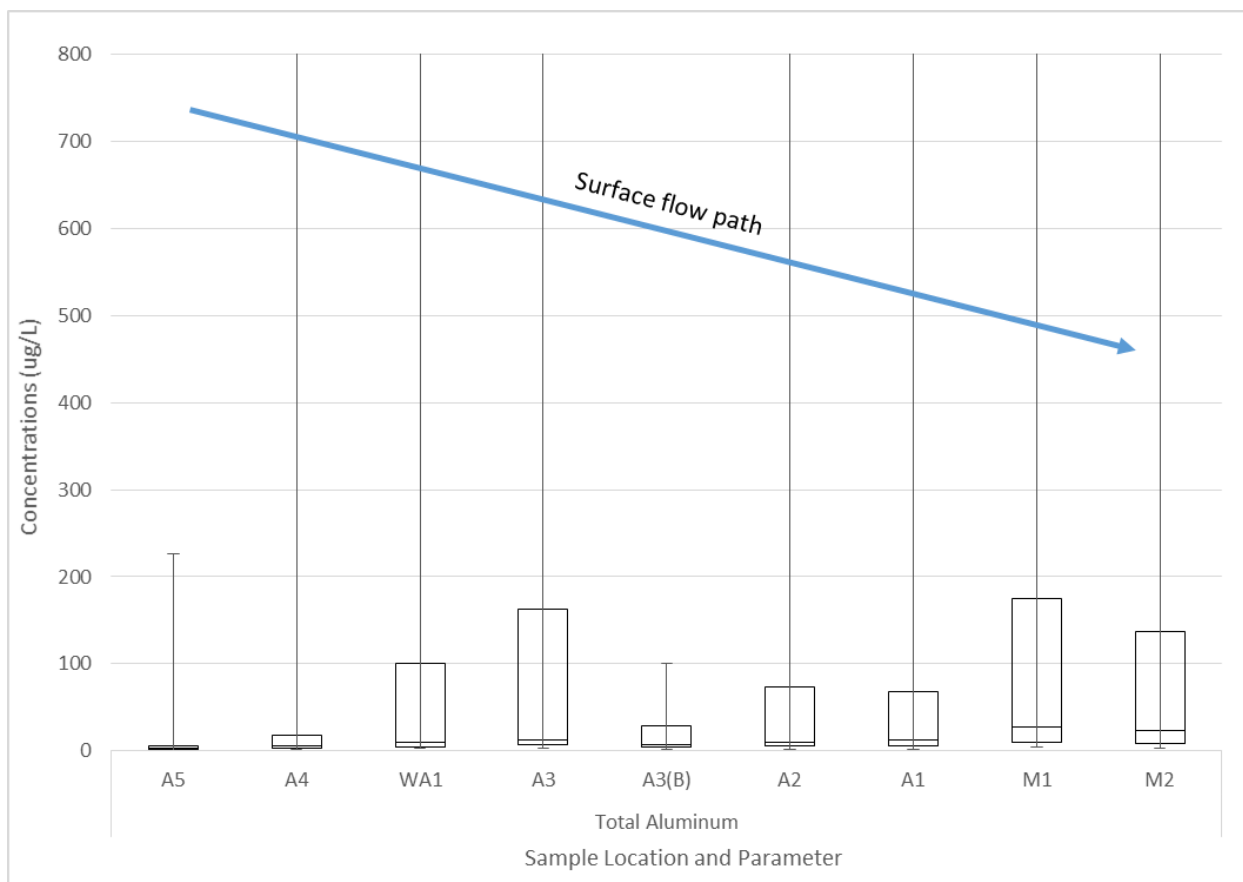
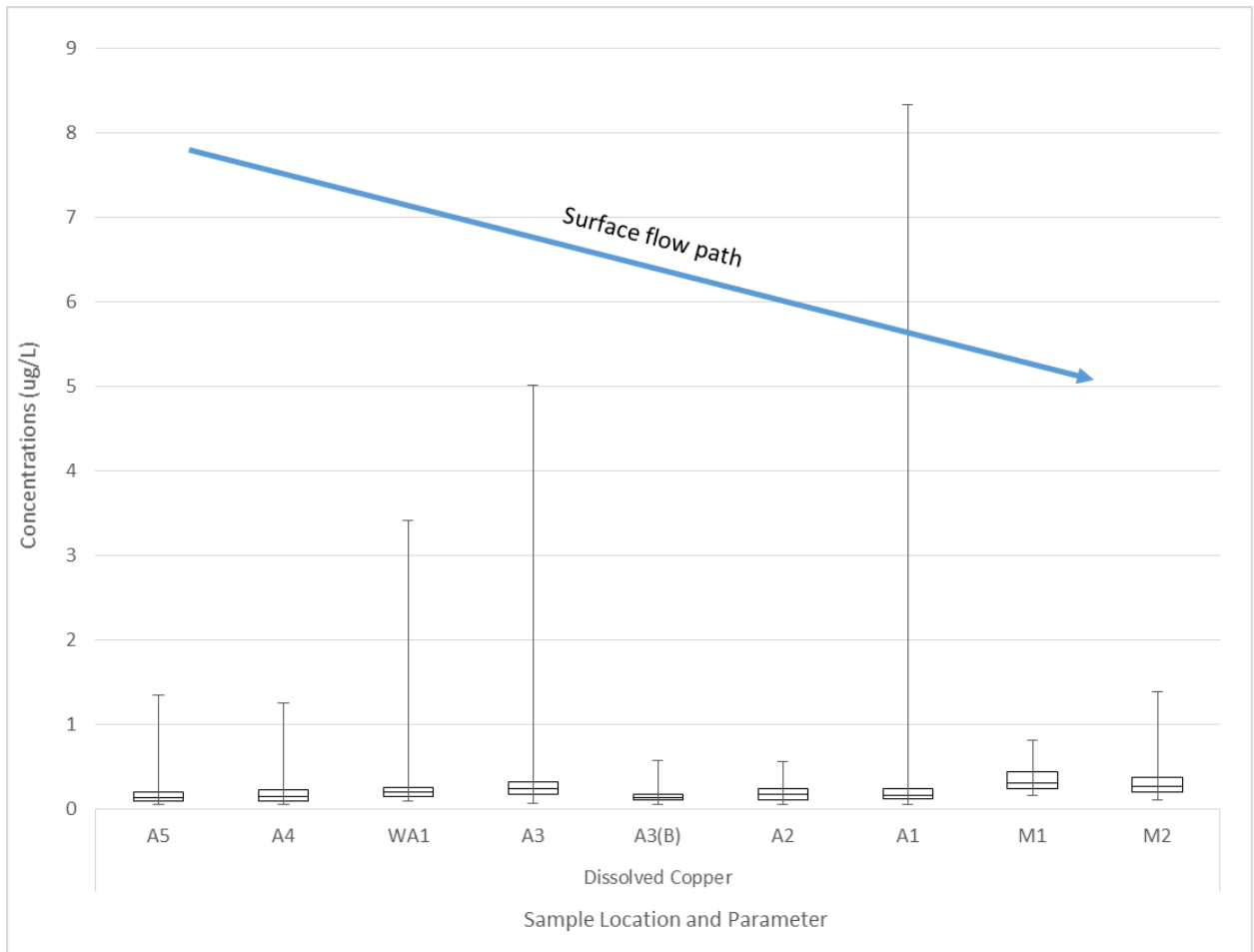


Figure 28: Aluminum concentrations in Alexander Creek watershed



**Figure 29: Dissolved copper concentrations in Alexander Creek watershed**

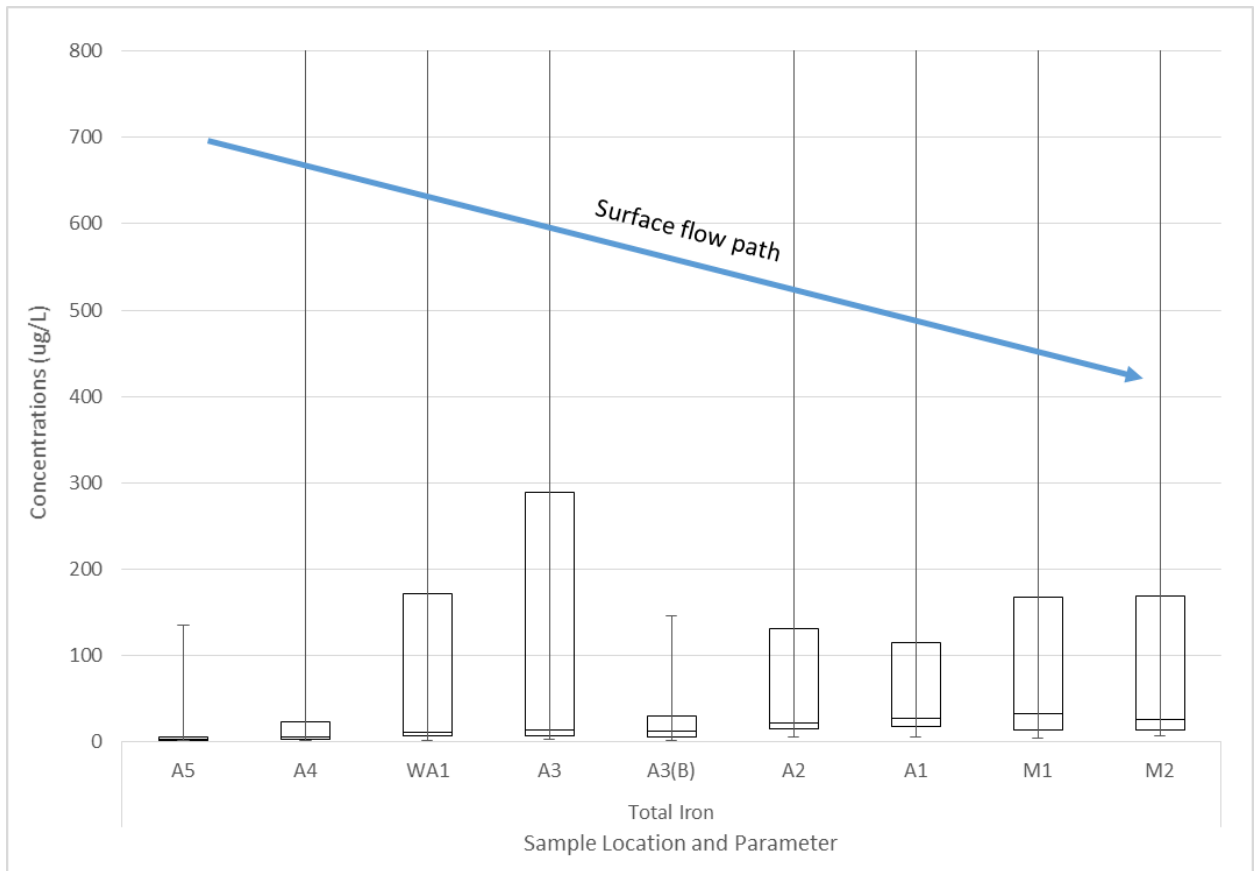


Figure 30: Total iron concentrations in Alexander Creek watershed



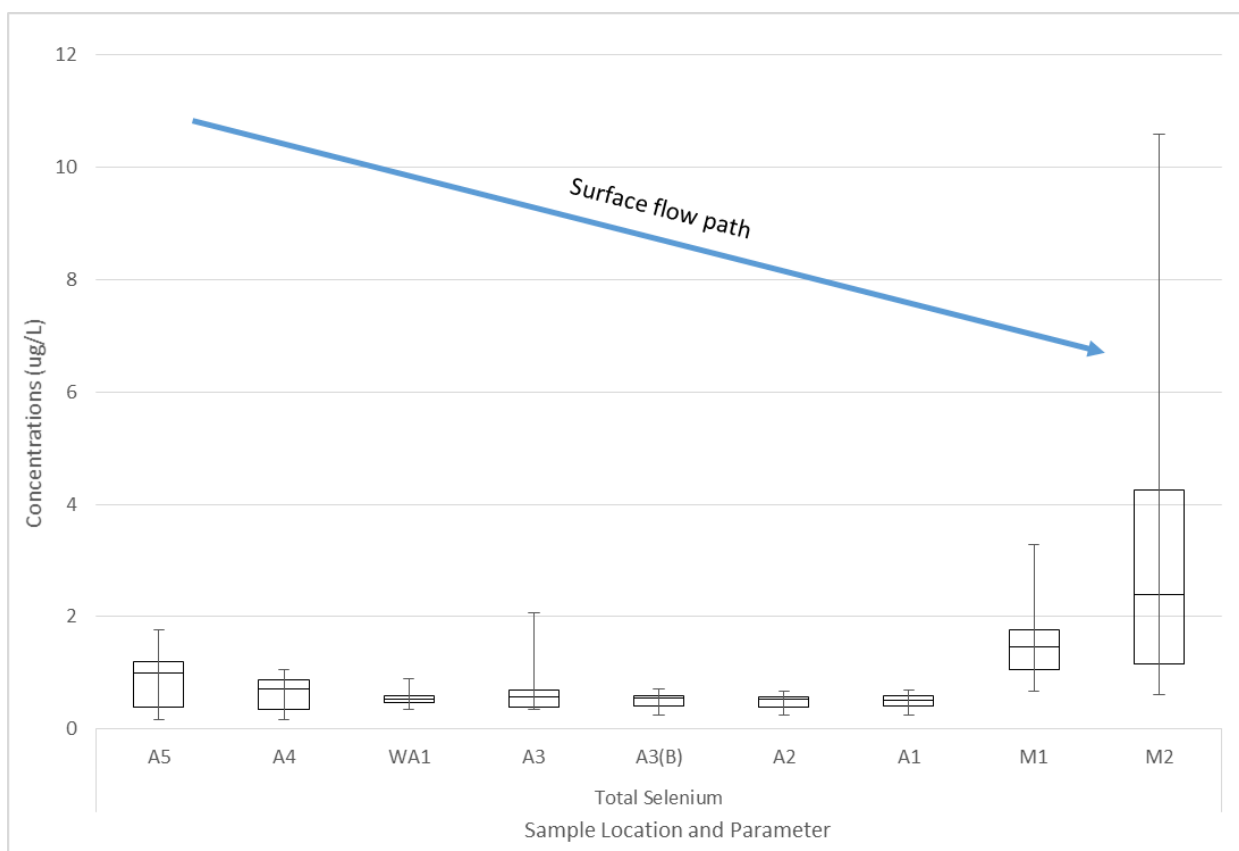


Figure 31: Selenium concentrations in Alexander Creek watershed

#### 4.2.2 Grave Creek

The Grave Creek Watershed includes Grave Creek and Harmer Creek. Sampling stations are situated in the following order of surface flow pathway from the most upstream to the downstream limit: G1, G2, and H1.

Box plots for fluoride, aluminum, copper, iron, and selenium within the Grave Creek watershed are presented in **Figure 32** to **Figure 36**. Similar to concentrations in the Alexander Creek watershed, there is generally low variability within populations for each sampling station, with the exception of selenium. There may be an increasing trend of fluoride concentrations from the upper to lower portions of the Grave Creek watershed. Selenium concentrations at station H1 appear to be substantially greater with higher variability than at stations G1 and G2.

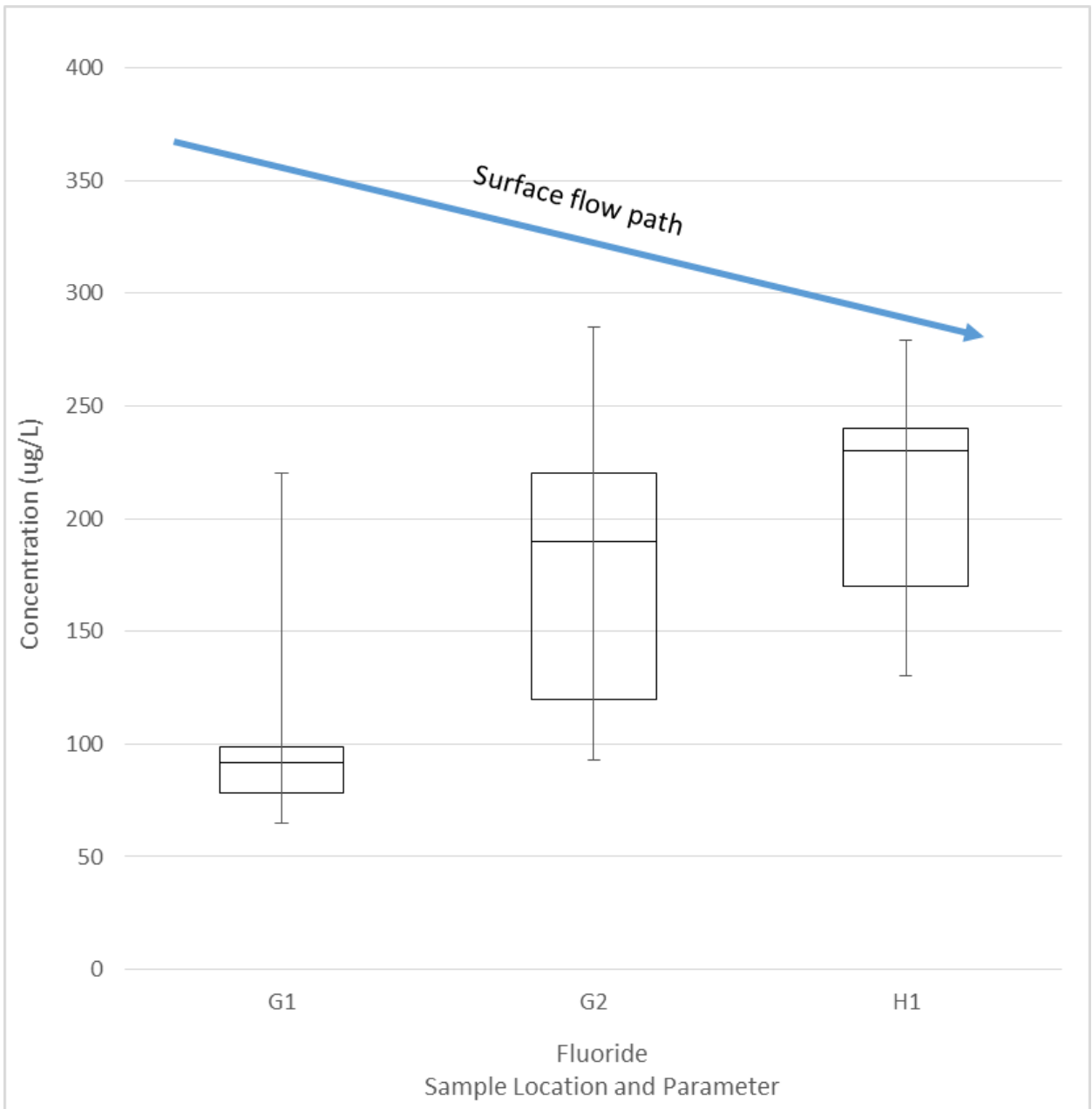


Figure 32: Fluoride concentrations in Grave Creek watershed

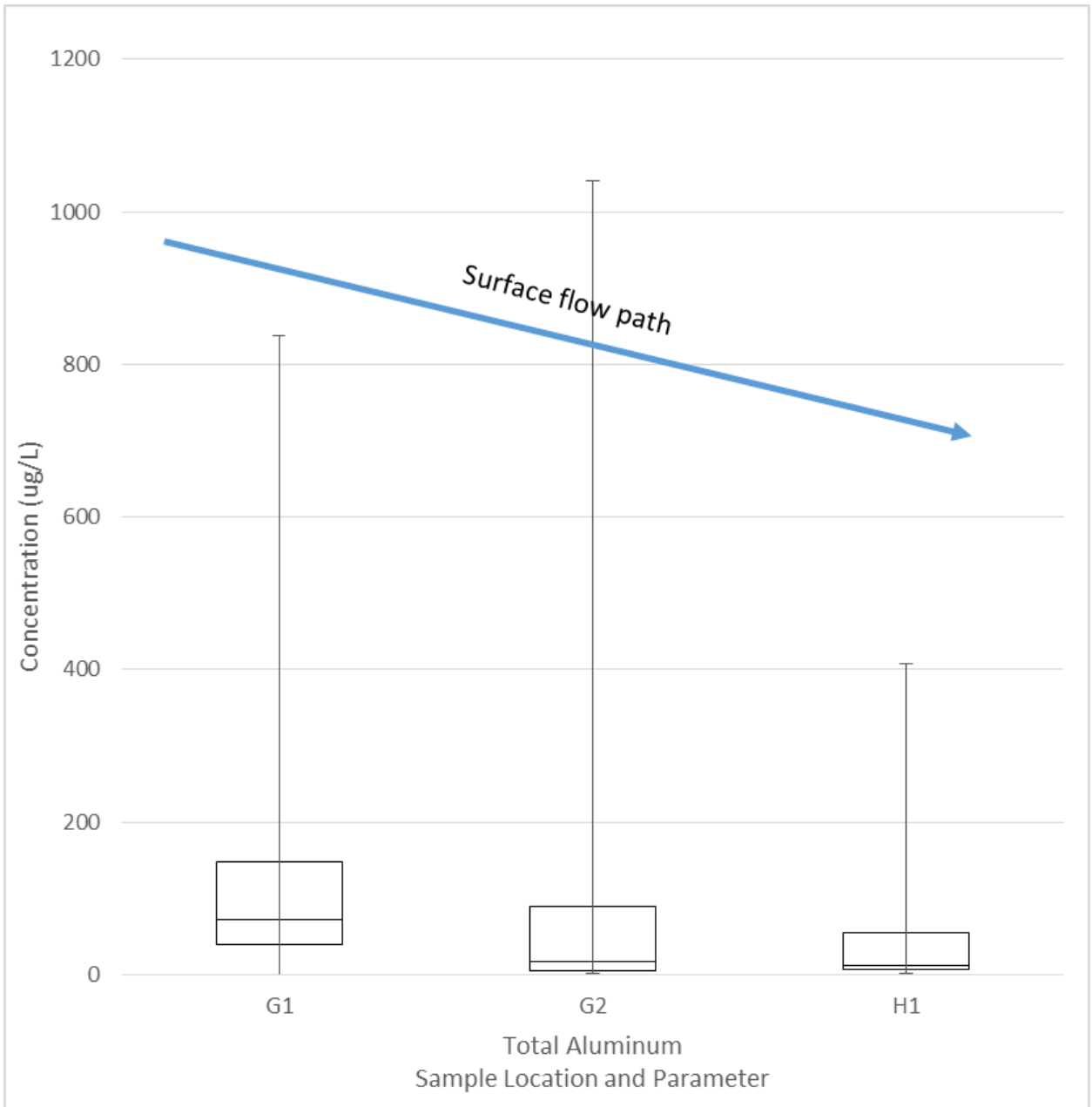


Figure 33: Total aluminum concentrations in Grave Creek watershed

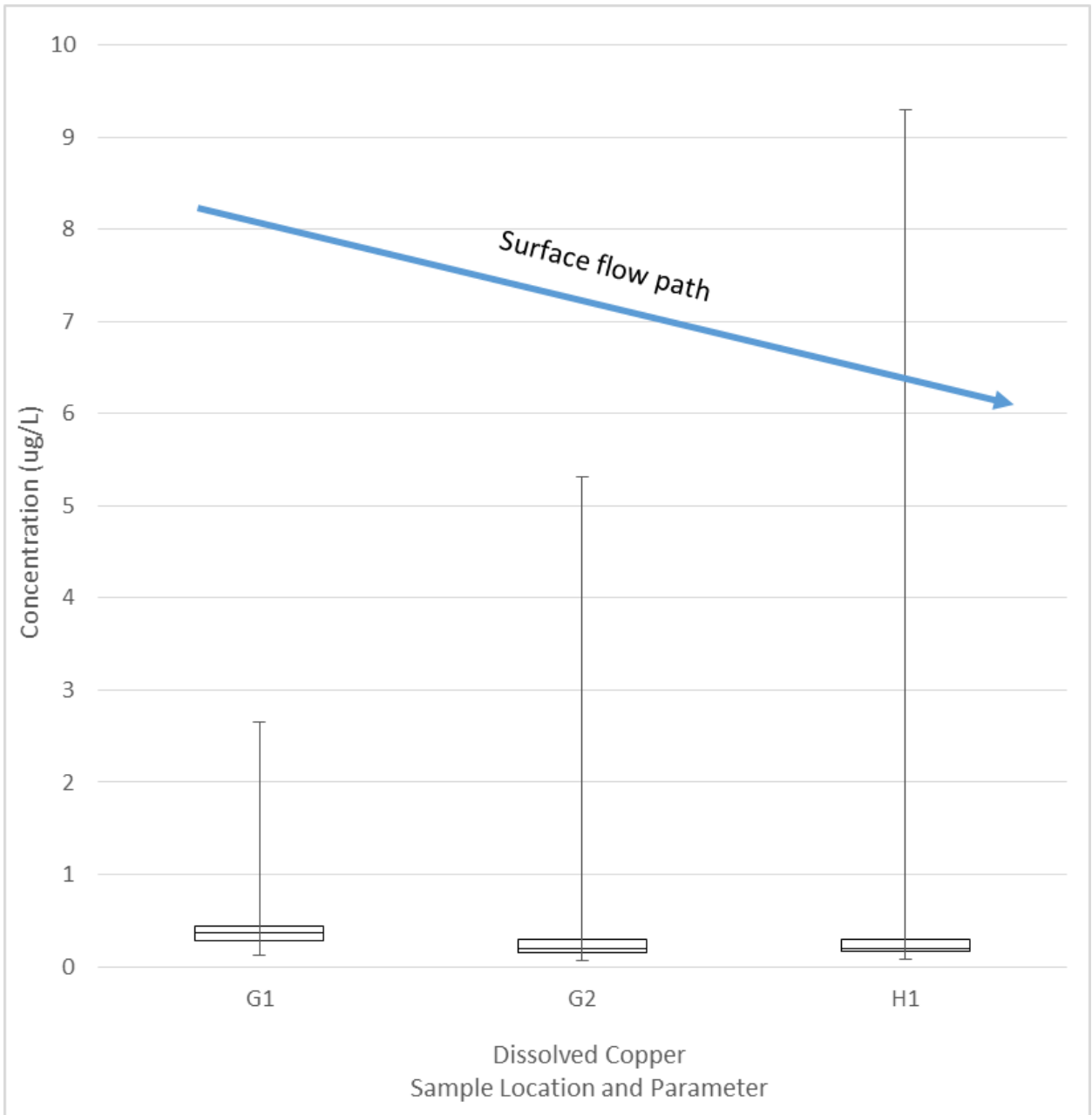


Figure 34: Dissolved copper concentrations in Grave Creek watershed

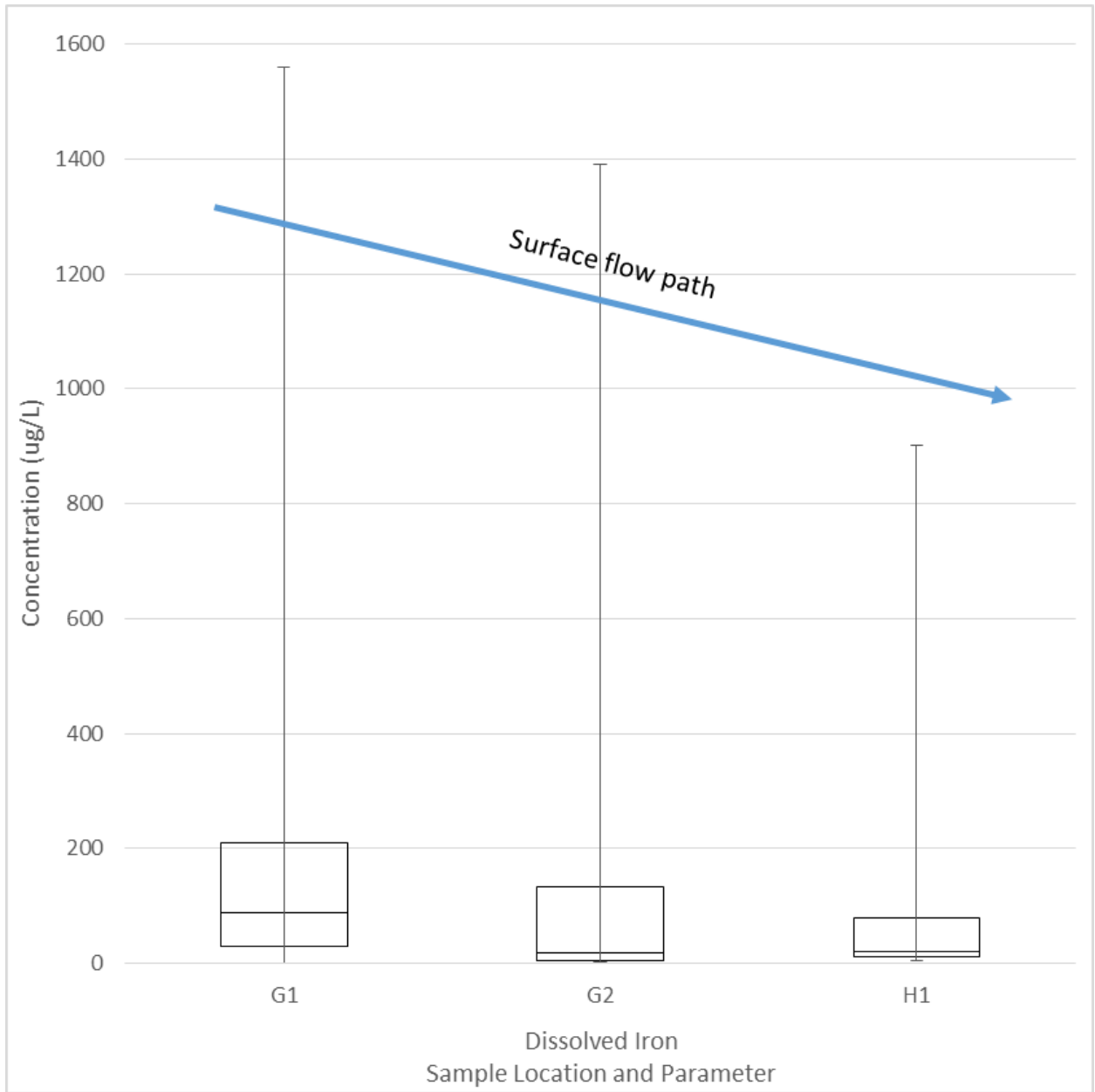


Figure 35: Total iron concentrations in Grave Creek watershed



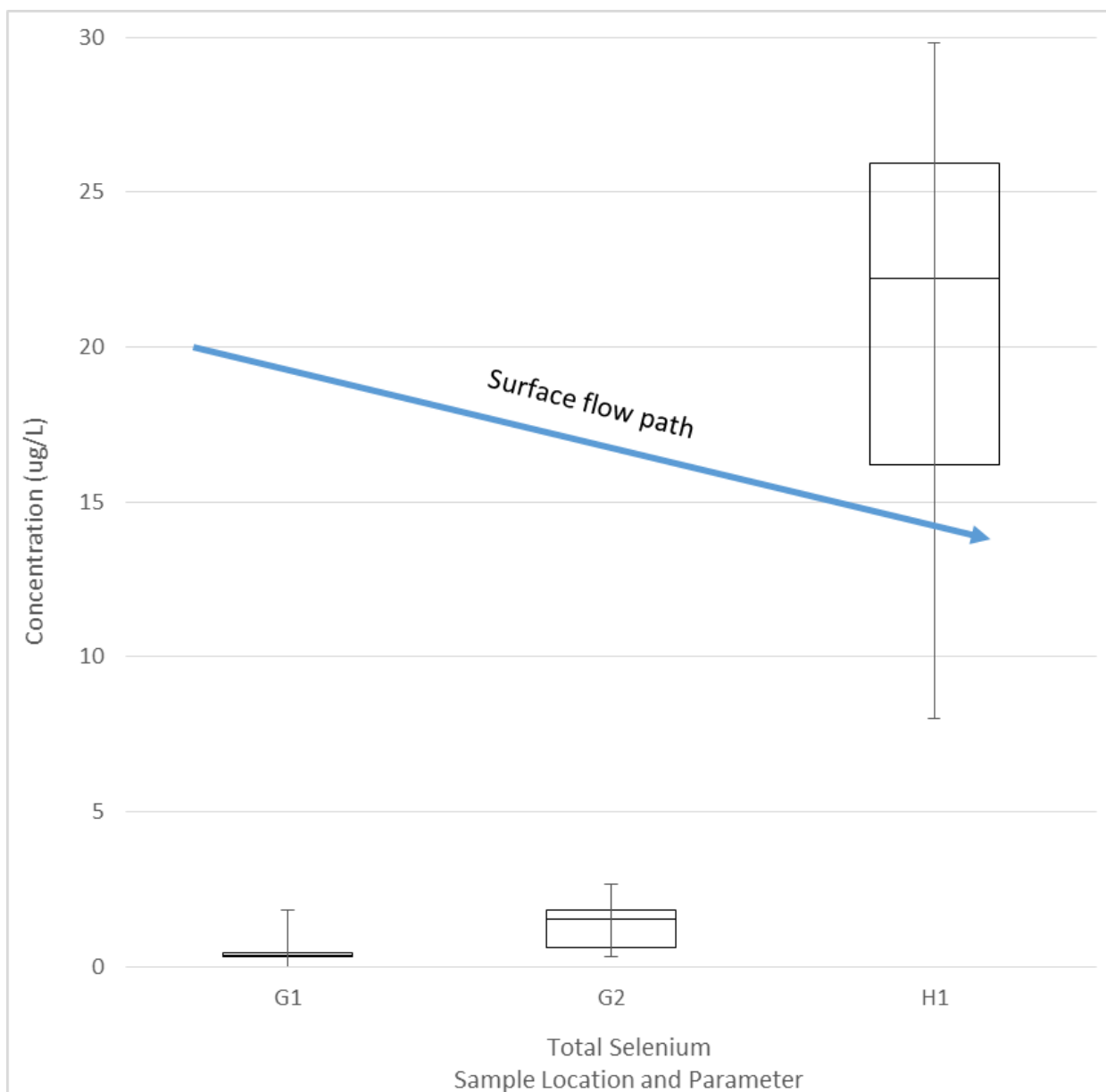


Figure 36: Total selenium concentrations in Grave Creek watershed

#### 4.2.3

#### Summary

Overall, the analytical data for aluminum, copper, and iron from across the LSA shows generally low variability. Results for fluoride and selenium tend to show a greater degree of variability (i.e., separation between the 1<sup>st</sup> and 3<sup>rd</sup> quartiles for each population). High upper error bar values generally represent elevated concentrations associated with the abnormally high-volume precipitation events which occurred in June 2013 and May 2014. Fluoride, aluminum, copper, and iron concentrations did not show distinct spatial trends in the Alexander Creek and Grave Creek watersheds.

A distinct increase in selenium concentrations is observed within the larger creek systems (i.e., Michel Creek and Grave Creek downstream of the confluence with Harmer Creek) compared to the tributaries. Stations M1 and M2 are located downstream of the confluence of Alexander and Michel Creeks and upstream of the confluence of Michel and Erikson Creeks. Michel Creek is a larger creek than Alexander Creek, and is also adjacent to Highway 3 and downstream of historic mining activities south of the highway at the M1 and M2 locations. Therefore, elevated key parameters in these locations are likely attributed to increased sediment loadings associated with larger creek systems and high precipitation events, and may also be influenced by historic mining activities upstream of these stations.

Station G2 is located just upstream of the confluence of Grave and Harmer Creeks, and H1 is located further downstream, just upstream of the confluence of Grave Creek and the Elk River, and is adjacent to railway tracks. It is likely that the consistently elevated selenium found at H1 could be influenced by increased sediment loadings due to it being a larger part of Grave Creek compared to where G2 and G1 are located, and may also be impacted from the train tracks and surface water run-off from Harmer Creek, which is adjacent to and has tributaries in Teck's Elkview Operations Mine.

### 4.3 Intensive "5 Samples in 30 Days" Sampling

A total of four intensive surveys were conducted during 2014/2015 high-flow periods in May/June and 2014/2015 low-flow periods in August/September to meet the specified averaging period required to calculate long term water quality guidelines. Complete surface water analytical results including averaged 5-in-30 results (as applicable) compared to the BC WQG approved long term long term guidelines for freshwater aquatic life are provided in **Appendix B**. A summary of the identified exceedances of the BC WQG long term for the discrete and averaged 5-in-30 sampling results are provided in **Table 4**. Summary statistics for key parameters and four Order constituents are provided in **Table 6**. Box plots showing for key parameters and four Order constituents for each intensive sampling period are presented in **Appendix D**.

Box plots showing concentrations of fluoride for each intensive sampling event across the LSA indicate that fluoride has relatively low short term variability (indicated by small error bars). However comparison between high and low-flow intensive events reveals that long term variability of fluoride is greater. Fluoride concentrations appear to be slightly higher during the low-flow season in August/September, with the majority of concentrations above the CWQG value, compared to the high-flow periods in May/June where median values tend to fluctuate around the guideline value. This is often associated with dissolved parameters as low flow periods result in higher concentrations due to longer contact times, more groundwater baseflow contribution, and higher concentration through evaporation processes. Fluoride concentrations fluctuate around the CWQG of 120 µg/L during high-flow periods. In contrast, fluoride concentrations are on average higher than the CWQG during the low-flow periods.

Box plots of nitrate (as N) concentrations within each intensive sampling period indicate overall low variability of nitrate concentrations within each intensive sampling period. Nitrate concentrations were higher at station H1 during both low- and high-flow season in 2014 compared to other sampling stations and 2015 results. In contrast, nitrate concentrations were comparatively higher at station M1 during the 2015 high-flow sampling period and higher at stations A3, M2 and G1 during the 2015 low-flow sampling period compared to other sampling stations. No distinct seasonal trends are demonstrated in the box plots for high flow and low flow periods.

Box plots of sulphate (as SO<sub>4</sub>) concentrations within each intensive sampling period show relatively small error bars, indicating low variability of sulphate concentrations in each sampling period. Similar to nitrate, sulphate concentrations were higher at station H1 during both low- and high-flow seasons in 2014 compared to other sampling stations and the 2015 event. In addition, sulphate concentrations appear to be slightly higher in Michel Creek and Grave Creek during the August/September 2014 sampling period compared to other sampling stations. Sulphate concentrations at station A3 were higher than those at other sampling locations. Sulphate concentrations appear to be marginally higher during the low-flow season in August/September compared to the high-flow season in May/June. This may be associated with longer contact time during periods of greater groundwater baseflow contribution, and increased concentration through evaporative processes.

Box plots of aluminum concentrations within each intensive sampling period indicate higher variability within Michel Creek and Grave Creek as compared to Alexander Creek. Variability in aluminum concentrations is considerably lower during low-flow intensive sampling periods compared to high-flow periods. Aluminum concentrations at the A5 reference station for the Alexander Creek watershed are consistently low, with low variability throughout the sampling period. In contrast, aluminum concentrations in surface water samples collected from G1, the reference station for the Grave Creek watershed, show significant variation during the 2014 low-flow event compared to the rest of the LSA and other events. Overall, aluminum concentrations appear to be significantly lower, with median concentrations generally below the CWQG, during the low-flow seasons in August/September compared to the high-flow seasons in May and June, where median concentrations consistently exceed the guideline. Lower concentrations during low-flow periods are likely due to reduced surface runoff during the drier summer months.

Box plots of cadmium concentrations within each intensive sampling period are generally low and indicate low variability for each sampling period, with the exception of May/June of 2014, where concentrations are higher with greater fluctuations, particularly at Michel Creek. Median concentrations for cadmium are below the CWQG of 100 µg/L, with the exception of those from station G1 during the 2014 low-flow sampling period. Median concentrations of cadmium during the 2014 high-flow sampling period are above the CWQG, with the exception of stations A5 and A4. Median concentrations during the 2015 high-flow sampling period fluctuate around the CWQG. Similar to other metals, cadmium

concentrations appear to be lower during low-flow seasons in August/September compared to high-flow seasons in May and June, which is likely due to reduced surface runoff during drier summer months.

Box plots of dissolved copper concentrations within each intensive sampling period are generally low for each of the intensive sampling periods, with the exception of: A3 during the 2014 high-flow period, G2 during the 2014 low-flow period and WA1, A3, M1 and G2 during the 2015 low-flow period. No distinct spatial trends of dissolved copper were observed between the low flow and high flow periods.

Box plots of iron concentrations indicate that long term variability is consistently low at stations A5 and A4, however tends to vary more significantly at the other stations depending on the flow-state. Median iron concentrations are below the BC WQG, however exceed the CWQG during the 2014 high-flow sampling period. Overall, long term variability of iron concentrations can be considered moderate to high. Similar to other metals, iron concentrations appear to be lower during the low-flow season in August/September compared to the high-flow season in May/June, which may be due to reduced surface runoff and sedimentation during the drier summer months.

Box plots of selenium concentrations within each intensive sampling indicate concentrations generally meet the CWQG long term of 1 µg/L at the majority of sampling locations. However, selenium concentrations are exceptionally high at station H1 during the 2014 low- and high-flow sampling periods and exceed the CWQG long term and BC WQG short term and long term, however are considerably lower during the 2015 sampling periods. In addition, surface water samples collected from stations M1 and A3 exceed the CWQG long term in 2015. Selenium concentrations appear to be higher during the low-flow seasons in August/September compared to the high-flow seasons in May/June.

#### 4.3.1 Summary

Overall, relatively low long term variability can be observed during the intensive sampling periods for fluoride, nitrate, sulphate, cadmium, dissolved copper and selenium. In contrast, aluminum and iron concentrations have higher short term variability. Aluminum, cadmium and iron concentrations appear to be lower during the high-flow spring freshet compared to the low-flow summer months. In contrast, fluoride, and sulphate concentrations appear to be marginally elevated during the spring freshet. Selenium concentrations appear to be higher during the low-flow seasons in August/September compared to the high-flow seasons in May/June.

#### 4.4 Reference Sites

Reference stations A5 and G1 are located at the headwaters of the Alexander Creek and Grave Creek watersheds, respectively, and have been selected to assess local upstream conditions within the LSA. Based on the box plots in **Section 4.2.1 (Figure 27 to Figure 36)**, median aluminum and iron concentrations appear to be lower at stations A5 and G1 compared to the other sampling locations. Furthermore, variability of aluminum and iron concentrations throughout the sampling period are much less at station A5 than at other stations. In contrast, concentrations of fluoride, nitrate, sulphate,

cadmium, copper and selenium at stations A5 and G1 are comparable to other non-reference sites. In general, the range of concentrations for each of the key parameters at station A5 overlaps with the other sites, and indicate overall similarity in the character of the surface water quality between the reference site and other sampling stations. Greater variability is observed between reference site G1 and other non-reference stations within the Grave Creek watershed. Median fluoride and selenium concentrations are considerably lower in surface water collected from G1, compared to G2 and H1, however concentrations of aluminum, copper and iron are generally equivalent across the watershed.

## 4.5 Regional Background Conditions

### 4.5.1 Elk Valley Water Quality Plan (EVWQP)

Teck developed the EVWQP in 2014 to ensure the health of the watershed while allowing for continued sustainable mining. As part of the EVWQP, baseline conditions of nitrate, sulphate, selenium, and cadmium were evaluated in the Elk River, Fording River, Lake Koochanusa, and tributaries. Selenium and nitrate were two main constituents observed to most frequently exceed the BC WQG. The purpose of the EVWQP was to identify a strategy and implement solutions to address increasing selenium and nitrate concentrations in water within the Valley. A site-specific long term water quality target of 19 µg/L was identified for selenium in the Elk River from Fording River to Michel Creek. The remaining three parameters within this reach of Elk River follow guideline targets in line with the BC WQG and CWQG.

Total selenium concentrations were compared to the 19 µg/L long term target identified in the EVWQP (**Appendix C**). A total of 40 samples were found to contain selenium concentrations above the EVWQP target, each of which occurred at station H1 in Grave Creek, upstream of the confluence to Elk River. Selenium concentrations were substantially lower at stations G1 and G2 (Grave Creek) upstream of Harmer Creek, suggesting that potential sources of selenium input to H1 could be from the adjacent train tracks, and inputs from Harmer Creek which is adjacent to, and has tributaries within, Teck's Elkview Operations.

### 4.5.2 Regional Baseline Studies

Two regional surface water quality studies were reviewed to provide context to the Crown Mountain baseline surface water quality conditions: Teck's Elkview Operations Baldy Ridge Extension Project (Baldy Ridge; Golder Associates, 2015) and the Aquatic Environment Synthesis Report (Windward, *et. al.*, 2014).

#### ***Elkview Operations - Baldy Ridge Extension Project***

A baseline surface water quality data collection program was conducted by Teck from 2013 to 2014 as part of the Baldy Ridge Extension Project for the existing Elkview Operations located directly west of the Crown Mountain proposed project area (west of Erickson Creek and Harmer Creek; east of Sparwood; north of Michel Creek). This study considered water quality at three types of sites: reference sites, upstream of mining activities; mainstem sites, downstream of mining activities along the Elk River and

Michel Creek; and tributary sites, downstream of mining activities along tributaries draining into the Elk River and Michel Creek.

The Baldy Ridge baseline study compared surface water quality results from mine-exposed sites to BC WQG (MOE, 2015), the EVWQP, and 95<sup>th</sup> percentile concentrations measured at reference sites from Teck's Coal Mountain Operations sites (CMO1 and CMO2), and the Elkview Operations (EVO) in order to establish the baseline conditions for their study area. BC WQG parameter-dependent guidelines used in the Baldy Ridge study were calculated conservatively based on a hardness of 250 mg/L as CaCO<sub>3</sub>, temperature of 10°C and a pH of 8.0.

Median and maximum concentrations of constituents were generally below the BC WQG for the reference sites, with the exception of the maximum concentrations for pH, total phosphorus, total chromium, total iron, total selenium, dissolved aluminium, phenanthrene, and pyrene. The mainstem sites generally exceeded the BC WQG for median total selenium, while median concentrations of all other parameters were below the BC WQG. Maximum concentrations of nitrate, dissolved aluminium, pH, and all metals except total barium, total nickel, total manganese, total thallium, total uranium, and dissolved cadmium exceeded the BC WQG in surface water samples collected from at least one site.

In general, the tributary sites had the most exceedances of the BC WQG, where median concentrations in at least one tributary site showed exceedances of total selenium, sulphate, nitrate, total phosphorus, total chromium, and pyrene. Further exceedances of the BC WQG by maximum concentrations included ammonia, chloride, nitrite, all total metals, dissolved aluminium, dissolved cadmium, dissolved iron, PAHs, and pH values. Exceedances of total metals were largely attributed to high total suspended solids in the water samples.

The results of the Crown Mountain surface water quality baseline program generally reflect the results found for the reference sites for Baldy Ridge, where the majority of exceedances of the BC WQG were from maximum concentrations for the five key parameters: fluoride, total aluminium, dissolved copper, total iron, and total selenium. To further compare the results from these two studies, results from five sampling sites from each project were compared for the key parameters identified for Crown Mountain. These five sampling sites were chosen based on proximity to each other (approximately 0 – 385 m away) (**Table 7**). The median concentrations from these locations for the key parameters identified for Crown Mountain, along with the Baldy Ridge reference concentrations and the BC WQG, were compared to provide context for the Crown Mountain surface water quality results (**Table 8**).



**Table 7: Sampling Locations from Teck's Elkview Operations Baldy Ridge Extension Project Baseline Water Quality Program in 2013/2014 and Equivalent Crown Mountain Water Quality Sampling Stations**

Elkview Operations Baldy Ridge Extension Project			Equivalent Crown Mountain Sampling Location	Linear Distance Between Locations (m)
Sample Location	Site Description	UTM NAD 83 11U Easting/Northing		
MW_AC1	Alexander Creek; Reference Site	663831 5502654	A1	150
EV_MC3	Michel Creek upstream of Erickson Creek; Mainstem Site	659972 5505057	M1	385
EV_MC3A	Michel Creek downstream of Erickson Creek, upstream of South Pit Creek; Mainstem Site	659468 5505252	M2	130
EV_GV3	Grave Creek upstream of Harmer Creek; Reference Site	656625 5522243	G2	0
EV_GV1	Grave Creek at mouth; Tributary Site	653637 5523376	H1	25

The median concentrations of the key parameters between the two projects at each location were similar for fluoride and selenium, with the exception of Crown Mountain location M2 which had lower selenium concentrations compared to the similar Baldy Ridge location (EV\_MC3A). At each of the sampling locations, median fluoride concentrations were below the Baldy Ridge reference concentrations and the BC WQG calculated for the Crown Mountain Project. Total selenium was elevated above both the Baldy Ridge reference concentration and BC WQG at M2/EV\_MC3A and H1/EV\_GV1, and below the guidelines and reference concentrations for the three other sites. Median total aluminum and total iron were lower in the Crown Mountain samples compared to the Baldy Ridge samples, and each of the locations were below the Baldy Ridge reference concentrations and the BC WQG, with the exception of two Baldy Ridge locations (Crown M1 and M2 equivalents). Dissolved copper was below the detection limits for each of the Baldy Ridge locations, which were higher than the detection limits for the Crown Mountain samples, making them difficult to compare. However, each of the Crown Mountain concentrations were below the Baldy Ridge reference concentrations and the BC WQG. M1 and M2 had dissolved copper concentrations at the lower range of the long term BC WQG, however as these guidelines are parameter-dependent, the lower and upper bounds of this range relate to specific samples and the range itself is reported to provide context to the guideline variability for the dataset.

These comparisons indicate that the key parameter median concentrations at Crown Mountain are generally consistent with or lower than results from comparable sample locations within the Baldy Ridge project area for both reference and mine-exposed sites. Therefore, the baseline surface water quality for Crown Mountain is considered representative of reference conditions in the Elk Valley, with the

exception of H1 and M2 for total selenium. These areas for both the Crown Mountain and Baldy Ridge projects are influenced by anthropogenic activities and associated increased sediment loadings, which is reflected in the elevated selenium concentrations identified in the surface water.

**Table 8: Median Concentrations of the Crown Mountain Key Parameters at Comparable Locations from the Baldy Ridge and Crown Mountain Projects**

Sample Location	Project	Fluoride	Total Aluminium	Dissolved Copper	Total Iron	Total Selenium
		mg/L	µg/L			
<u>Baldy 95<sup>th</sup> Percentile Reference Concentrations<sup>a</sup></u>		<u>0.28</u>	<u>703</u>	<u>0.43</u>	<u>766</u>	<u>1.9</u>
<b>BC WQG<sup>b</sup></b>		<b>1.16 – 1.86</b>	<b>50</b>	<b>1.7 – 19.5 (ST) 0.3 – 3.2 (LT)</b>	<b>1000</b>	<b>2.0</b>
MW_AC1 (R)	Baldy	0.17	41	<0.2	54	0.5
A1	Crown	0.18	11	0.2	25	0.5
EV_MC3	Baldy	0.15	<b>87</b>	<0.5	72	1.2
M1	Crown	0.12	27	<b>0.3</b>	30	1.5
EV_MC3A	Baldy	0.16	<b>56</b>	<0.5	52	<u><b>7.3</b></u>
M2	Crown	0.14	24	<b>0.3</b>	26	<u><b>2.4</b></u>
EV_GV3 (R)	Baldy	0.21	18	<0.5	<30	1.7
G2	Crown	0.19	13	0.2	17	1.6
EV_GV1	Baldy	0.24	39	<0.5	49	<u><b>24.0</b></u>
H1	Crown	0.23	10	0.2	19	<u><b>22.7</b></u>

<sup>a</sup> 95<sup>th</sup> percentile concentrations calculated using concentrations from reference sites at CMO1, CMO2, and EVO.

<sup>b</sup> BC WQG: BC Water Quality Guidelines; for parameter-dependent guidelines (fluoride, copper), calculated ranges for Crown Mountain were used for reference. ST = short term; LT = long term.

Underlined values indicate exceedances of the 95<sup>th</sup> percentile reference concentrations used for the Baldy Ridge Extension Project.

Bold values indicate exceedances of the BC WQG.

### ***Aquatic Environment Synthesis Report (Windward et al., 2014)***

The Aquatic Environment Synthesis Report summarizes monitoring studies completed by Teck from 2011 to 2013. Overall, nitrate, selenium, and sulphate were identified as primary parameters of concern within the Elk River Watershed. These parameters show an increasing trend at most mainstem stations. Other parameters with at least one sample with a concentration above BC WQG or EVWQP targets included nitrite, ammonia, aluminum, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, silver, thallium, uranium, vanadium, zinc, benzo(a)pyrene, phenanthrene, and pyrene. Elevated selenium concentrations were observed in Lake Koochanusa, south of the RSA, but only exceeded the BC WQG of 2 µg/L in two samples.

Though nitrate and sulphate were identified as primary parameters of concern within the Elk Valley, no exceedances were observed in the Crown Mountain baseline program. Other parameters which were found to exceed the applicable guidelines are generally consistent with those identified in the Aquatic Environment Synthesis Report, with the exception beryllium exceedances, which were not previously noted in the 2014 Aquatic Environment Synthesis Report.

### 4.5.3 Environment Canada Monitoring Stations

There are two Environment and Climate Change Canada (ECCC) Water Quality Monitoring Stations in the Elk Valley. Details of the monitoring stations are provided in **Table 9** below.

**Table 9: Environment Canada Water Quality Monitoring Stations Nearest to Proposed Project Area**

	<b>BC08NK0004 ELK RIVER SOUTH OF SPARWOOD</b>	<b>BC08NK0003 ELK RIVER AT HWY 93 NEAR ELKO</b>
Site Type	River	River
Latitude/Longitude Coordinates	49.6643, -114.9041	49.1797, -115.167
Approximate Linear Distance from Centre of Proposed Project Area	19 km Southwest	75 km Southwest

Basic summary statistics for the last 10 years of data at these two stations from February 2009 to 2019, including minimum, maximum, median, mean, standard deviation, standard error, for select parameters, are presented in **Table 10** and **Table 11**. Complete results are provided in Table E-1 and Table E-2 of **Appendix E**. A number of parameters have greater mean and median at both ECCC Monitoring Stations compared to total results from the Crown Mountain baseline program, including cadmium, fluoride, iron, nitrate, selenium and sulphate (bolded in the summary statistics tables in **Table 10** and **Table 11**). Aluminum mean and median concentrations were greatest at the BC08NK0003 Monitoring Station compared to the BC08NK0004 and Crown Mountain sampling locations.

**Table 10: Surface Water Quality Summary Statistics for Elk River Downstream of Sparwood (ECCC Monitoring Station BC08NK0004; February 3, 2009 to February 3, 2019) for Select Parameters**

Analyte	Unit	All Years Combined (February 3, 2009-2019)							
		Count	Minimum	Maximum	Median	Mean	Standard Deviation	Standard Error of the Mean	95% UCL
<b>Physical Tests</b>									
Total Hardness (Calcd.) CaCO <sub>3</sub>	mg/L	214	141.0	309	<b>233</b>	<b>228</b>	34.2	2.3	232.3
pH	-	214	7.9	8.5	<b>8.3</b>	<b>8.3</b>	0.1	0.01	8.3
<b>Major Ions</b>									
Fluoride	mg/L	86	34.9	108	<b>76.5</b>	<b>74.3</b>	17.7	1.9	78.0
Sulphate	mg/L	99	8.1	31.6	<b>22.8</b>	<b>21.0</b>	5.9	0.6	22.2
<b>Nutrients</b>									
Ammonia	mg/L	1	1.3	1.3	<b>1.3</b>	<b>1.3</b>	-	-	-
Nitrate (as N)	mg/L	86	1.2	2.9	<b>2.0</b>	<b>2.04</b>	0.4	0.05	2.1
<b>Total Metals</b>									
Aluminum	µg/L	208	0.5	1200	10.7	63.4	155.6	10.8	84.6
Cadmium	µg/L	208	0.0	0.4	<b>0.02</b>	0.03	0.05	0	0.04
Copper	µg/L	207	0.1	3.3	0.2	0.3	0.5	0.03	0.4
Iron	µg/L	208	1.2	2080	<b>21.6</b>	116.5	286.9	19.9	155.5
Selenium	µg/L	208	3.2	15.9	<b>9.5</b>	<b>9.0</b>	2.8	0.2	9.4

**BOLD** = median or mean is higher than total mean and median of all sampling results from the Crown water sampling program

Dashed line “-” indicates statistic could not be calculated.

See Appendix E for complete results.

**Table 11: Surface Water Quality Summary Statistics for Elk River at Hwy 93 Near Elko – Upstream of Lake Koocanusa (ECCC Monitoring Station BC08NK0003; February 3, 2009 to February 3, 2019)**

Analyte	Unit	All Years Combined (February 3, 2009-2019)						
		Count	Minimum	Maximum	Median	Mean	Standard Deviation	95% UCL
<b>Conventional Parameters</b>								
Total Hardness (Calcd.) CaCO <sub>3</sub>	mg/L	211	113	269	<b>188</b>	<b>183.6</b>	31.8	187.9
pH	-	211	7.9	8.6	<b>8.3</b>	<b>8.3</b>	0.1	8.3
<b>Major Ions</b>								
Fluoride	mg/L	82	0.1	0.2	<b>0.2</b>	<b>0.2</b>	0.02	0.2
Sulphate	mg/L	82	22.1	65.7	<b>53.0</b>	<b>48.8</b>	12.7	51.5
<b>Nutrients</b>								
Ammonia	mg/L	82	0.01	0.04	0.01	0.01	0.01	0.01
Nitrate (as N)	mg/L	1	0.8	0.8	<b>0.8</b>	<b>0.8</b>	-	-
<b>Total Metals</b>								
Aluminum	µg/L	206	4	2,380	<b>42</b>	<b>187</b>	369	238
Cadmium	µg/L	207	0.01	0.4	<b>0.02</b>	0.04	0.06	0.04
Copper	µg/L	207	0.05	4.8	0.3	0.6	0.8	0.71
Iron	µg/L	206	11	3,810	<b>76</b>	<b>319</b>	621	404
Selenium	µg/L	206	1.8	8.5	<b>5.1</b>	<b>5.1</b>	1.5	5.3

**BOLD** = median or mean is higher than total mean and median of all sampling results from the Crown water sampling program  
Dashed line “-” indicates statistic could not be calculated.  
See Appendix E for complete results.

## 4.6 Quality Assurance and Quality Control

Trip and field blank analytical results are presented in **Appendix F**. The following parameters are regularly greater than the detection limit for both trip and field blanks:

- Alkalinity;
- Barium (total) ;
- Bicarbonate;
- Ammonia;
- Conductivity;
- pH;
- Aluminum (total and dissolved);
- Barium (dissolved);
- Copper (total and dissolved);
- Lead (total and dissolved);
- Nickel (total and dissolved); and
- Zinc (total and dissolved).

The following parameters had occasional concentrations above detection limits for both trip and field blanks:

- Calcium (total and dissolved) (n=2 and 3, respectively);
- Iron (total and dissolved) (n=18 and 14, respectively);
- Manganese (total and dissolved) (n=15 and 12, respectively);
- Mercury (total and dissolved) (n=9 and 11, respectively);
- Molybdenum (total) (n=1);
- Selenium (total) (n=1);
- Silver (total and dissolved) (n=1);
- Strontium (total and dissolved) (n=5 and 8, respectively);
- Thallium (total) (n=1);
- Tin (total and dissolved) (n=6 and 2, respectively);
- Uranium (total and dissolved) (n=5 and 10, respectively); and
- Vanadium (dissolved) (n=4).

Due to the presence of carbon dioxide in air and the resulting dissolution of  $\text{CO}_2$  (creating  $\text{H}_2\text{CO}_3$ ) and dissociation into  $\text{H}^+$  and  $\text{HCO}_3^-$  blank water will almost always have some small measureable amount of alkalinity, bicarbonate, and a slightly acidic pH. Also the presence of dust which includes simple minerals including salt, aluminosilicates, rust, and other particulate, trace metals will frequently have near detection limit concentrations; as such these detection limit or near detection limit values are considered acceptable.



Relative percent difference (RPD) calculations for duplicate samples are available in **Appendix G**. The RPD was within the acceptable range of 30% for a majority of parameters; several calculated RPD values outside of the acceptable range were identified for a few parent-duplicate pairs. These results indicate that the water quality data are reliable. Only one sample collected at H1 on September 19, 2014 has consistent RPD ranges above 30%. The parent sample had higher concentrations compared to the duplicate sample for all parameters. As the higher of the two parent and duplicate sample values were used in guideline calculations and comparisons as a conservative approach, the results of the RPD calculations do not adversely affect the results of the surface water quality baseline analysis.

## 5.0 Conclusion

A total of 623 samples were collected over 58 sampling rounds at 12 sampling locations from May 2012 to June 2019 to characterize surface water quality in the Crown Mountain aquatic LSA. Concentrations of fluoride, total aluminum, dissolved copper, total iron and total selenium in surface water were consistently identified in exceedance of the applicable BC WQG and CCME CWQG. Other parameters with concentrations exceeding the guidelines included ammonia, barium, beryllium, lead, manganese, silver, and zinc. The majority of these exceedances were isolated occurrences and were associated with significant precipitation and flood events (i.e., June 2013), and as such, were not considered representative of typical baseline conditions in the LSA. Although identified as key parameters in the regional EVWQP, nitrate, cadmium, and sulphate were not consistently identified above the applicable guidelines or EVWQP targets for the Crown Mountain LSA. The only exceedance of the EVWQP targets was found for selenium at station H1. The surface water in this area could be influenced by increased sediment loadings due to it being a larger part of Grave Creek, and may also be impacted from the adjacent railway tracks and surface water run-off from Harmer Creek, which is adjacent to and has tributaries in Teck's Elkview Operations Mine. The findings of the Crown Mountain surface water quality baseline program are largely consistent with other regional baseline studies showing consistently elevated concentrations of selenium and variable exceedances in aluminium, copper, and iron concentrations.

## 6.0 Disclaimer

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This surface water baseline report has been prepared based on information provided by NWP Coal Canada Ltd or available to Dillon Consulting Limited at the time of preparing this report. This report is intended to provide a reasonable review of available information within an agreed work scope, schedule and budget. This report was prepared by Dillon for the sole benefit of NWP Coal Canada Ltd and regulatory agencies in decision-making regarding the Crown Mountain Coking Coal Project. The material in the report reflects Dillon's judgment in light of the information available to Dillon at the time of this report preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

## 7.0 References

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## **Appendix A**

### ***Surface Water Analytical Results compared to BC WQG Short Term and CWQG Short Term and Long Term***



































## **Appendix B**

### ***Surface Water Analytical Results compared to BC WQG Long Term***

































## Appendix C

### *Surface Water Analytical Results compared to EVWQP Targets*



Location Code	Sample Date	Sample ID	Lab Report Number	Nitrate (as N)	Sulphate (SO4)*	Cadmium	Selenium
Units				mg/L	mg/L	µg/L	µg/L
IDL				0.005	0.5	0.005	0.04
<b>Elk Valley Long-term Water Quality Targets (EWWQP)</b>							
				8	428	0.24	18
				0.065	8.73	0.009	0.4
				0.032	5.98	0.044	0.286
				0.01	9.6	0.013	0.417
				0.01	12.6	0.007	0.562
				0.01	16.7	0.004	0.512
				-	16.5	0.007	0.495
				15	19	0.01	0.468
				0.041	16.4	0.005	0.463
				0.045	16.4	0.009	0.517
				0.051	16	0.005	0.463
				0.031	16.3	0.008	0.481
				0.038	17.2	0.009	0.621
				0.035	18.6	0.014	0.694
				0.05	7.84	0.004	0.281
				0.05	6.05	0.002	0.315
				0.01	11.5	0.005	0.598
				0.01	13.9	0.009	0.497
				0.029	15.4	0.006	0.498
				0.025	16.7	0.006	0.517
				0.067	18	0.006	0.617
				0.091	17.3	0.007	0.611
				0.089	17.5	0.007	0.64
				0.081	17.7	0.005	0.576
				0.078	17.9	0.006	0.61
				0.081	18.2	0.007	0.638
				0.053	18.7	0.006	0.682
				0.055	18	0.012	0.658
				0.074	14.7	0.014	0.562
				0.12	8.58	0.08	0.399
				0.086	9.14	0.03	0.333
				7.13	0.011	0.309	
				0.029	7.64	0.015	0.35
				0.01	12.4	0.01	0.424
				0.028	13.4	0.009	0.493
				0.028	14.3	0.007	0.514
				0.037	14.8	0.008	0.563
				0.038	13.4	0.007	0.595
				0.024	14.3	0.007	0.53
				0.029	16.3	0.005	0.525
				0.079	15.2	0.0125	0.533
				0.067	15.8	0.0064	0.5
				0.073	16.2	0.009	0.581
				-	17.1	0.0061	0.627
				-	16.6	0.0074	0.572
				-	16.4	0.0072	0.56
				0.055	11.6	0.03	0.346
				0.01	11.5	0.0131	0.4
				0.01	8.44	0.013	0.311
				0.042	7.94	0.026	0.353
				0.041	6.51	0.0161	0.254
				0.042	9.27	0.0117	0.402
				0.021	14.1	0.0065	0.466
				0.031	14.1	0.007	0.491
				0.028	14.6	0.01	0.47
				0.037	14.7	0.022	0.397
				0.044	14.8	0.007	0.536
				0.033	14.9	0.005	0.621
				0.038	14.9	0.013	0.408
				0.007	14.0	0.0057	0.465
				0.0455	-	0.0069	0.585
				0.0788	-	0.0145	0.574
				0.0761	-	0.0059	0.677
				0.0184	-	0.0101	0.467
				0.097	7.17	0.063	0.212
				0.036	4.84	0.0576	0.266
				0.01	8.51	0.012	0.387
				0.01	11.1	0.009	0.555
				0.034	12.7	0.006	0.507
				-	15.3	0.005	0.67
				-	14.7	0.0025	0.568
				-	14.8	0.022	0.67
				0.048	15	0.005	0.564
				0.064	14.4	0.005	0.542
				0.043	15.9	0.0025	0.659
				0.06	16.1	0.005	0.588
				0.036	17.1	0.005	0.563
				0.05	6.16	0.08	0.303
				0.052	3.84	0.074	0.263
				0.034	10.4	0.005	0.51
				0.021	12.7	0.007	0.539
				0.059	14.2	0.005	0.566
				0.035	16.2	0.0025	0.589
				0.058	15.9	0.018	0.565
				0.077	23.3	0.0025	0.583
				0.076	17.1	0.0025	0.628
				0.075	16.8	0.005	0.538
				0.069	18.1	0.005	0.601
				0.1	16.7	0.005	0.628
				0.097	13.2	0.041	0.544
				0.128	7.18	0.087	0.314
				0.094	7.38	0.026	0.324
				-	5.73	0.023	0.313
				-	5.77	0.023	0.298
				0.041	6.63	0.018	0.333
				0.01	11.2	0.03	0.42
				0.01	12	0.009	0.477
				0.038	13.3	0.007	0.508
				0.041	13.6	0.006	0.543
				0.045	12.4	0.007	0.579
				0.024	13.1	0.007	0.538
				0.03	16.8	0.0025	0.547
				0.062	14.7	0.0025	0.537
				0.083	14.9	0.0025	0.507
				0.081	15.3	0.0057	0.489
				0.059	15.1	0.005	0.59
				-	15.4	0.0025	0.575
				-	15.4	0.0025	0.527
				0.07	10.3	0.0226	0.306
				0.025	10.5	0.0101	0.387
				0.01	8.44	0.015	0.327
				0.01	7.75	0.014	0.307
				0.049	6.54	0.027	0.249
				0.046	5.67	0.0272	0.247
				0.05	8.32	0.0184	0.347
				0.033	13.1	0.005	0.441
				0.038	13.5	0.0025	0.493
				0.052	13.4	0.005	0.471
				0.054	13.9	0.005	0.499
				0.051	16.2	0.006	0.583
				0.057	16.2	0.0025	0.629
				0.041	10.4	0.009	0.371
				0.0133	-	0.0025	0.54
				0.0471	-	0.0025	0.573
				0.0667	-	0.0063	0.574
				0.0329	-	0.0077	0.438
				0.14	7.33	0.117	0.358
				0.048	7.71	0.0869	0.362
				0.01	12.3	0.013	0.56
				0.01	16.3	0.01	0.718
				0.01	17.6	0.007	0.617
				-	19.8	0.011	0.604
				-	16.3	0.006	0.604
				0.058	17.9	0.009	0.564
				0.085	18.8	0.01	0.892
				0.056	18.6	0.006	2.36
				0.071	8.32	0.039	0.296
				0.065	9.13	0.047	0.366
				0.066	3.71	0.048	0.46
				0.027	15.3	0.0025	0.57
				0.022	17	0.007	0.587
				0.01	18.3	0.009	0.66
				0.021	18.4	0.007	0.533
				0.02	19.2	0.006	0.592
				0.072	21.1	0.007	0.738
				0.089	21.4	0.005	0.751
				0.104	18.2	0.007	0.72
				0.246	11.5	0.026	0.46
				0.178	8.89	0.106	0.356
				0.101	10.1	0.017	0.346
				-	8.13	0.042	0.376
				0.054	9.77	0.012	0.415
				0.03	12.8	0.008	0.45
				0.039	15.7	0.008	0.544
				0.048	15.8	0.007	0.542
				0.062	14.8	0.006	0.595
				0.054	14.8	0.008	0.601
				0.053	14.1	0.006	0.544
				0.045	19.3	0.006	0.574
				0.085	17.4	0.0054	0.579
				0.087	17.8	0.0025	0.528
				0.08	19	0.005	0.558
				-	18.1	0.0025	0.617
				-	18.2	0.0025	0.593
				0.087	10.2	0.0119	0.285
				0.034	10.5	0.0103	0.358
				0.031	10.6	0.0108	0.375
				0.023	7.28	0.011	0.27
				0.053	6.47	0.016	0.278
				0.036	6.44	0.0149	0.241
				0.05	9.01	0.01	0.336
				0.043	14.4	0.0019	0.462
				0.046	15.7	0.006	0.548
				0.063	15.9	0.007	0.489

Location Code	Sample Date	Sample ID	Lab Report Number	Nitrate (as N)	Sulphate (SO4)*	Cadmium	Selenium
Units				mg/L	mg/L	µg/L	µg/L
A4	16/05/2012	A4	B240844	0.005	0.5	0.005	0.04
	18/06/2012	A4	B252527	0.01	3.07	0.0228	0.173
	24/07/2012	A4	B265706	0.037	10.3	0.044	0.487
	25/08/2012	A4	B276608	0.065	17.6	0.01	0.686
	17/09/2012	A4	B283851	0.066	23.2	0.009	0.784
	24/10/2012	A4	B297129	-	28	0.01	0.739
	24/11/2012	A4	B247294	-	23.1	0.013	0.787
	15/12/2012	A4	B284014	0.099	26.8	0.01	0.773
	24/03/2013	A4	B306701	0.088	29.1	0.008	1.03
	20/03/2013	A4	B314388	0.095	30	0.017	0.905
	20/03/2013	A4	B322778	0.083	38.2	0.008	1.03
	12/04/2013	A4	B330966	0.072	3	0.008	0.819
	23/05/2013	A4	B341817	0.021	3	0.015	0.155
	20/06/2013	A4	B351922	0.042	1.99	0.296	0.235
	11/07/2013	A4	B361290	0.069	12.8	0.009	0.718
	26/08/2013	A4	B376591	0.089	21.5	0.013	0.762
	26/09/2013	A4	B388572	0.121	25.7	0.008	0.873
	24/10/2013	A4	B399672	0.1	24.2	0.009	0.903
	21/11/2013	A4	B348725	0.095	28	0.007	1.05
	21/11/2013	A4-DUP	B348725	0.098	37	0.009	1.02
	22/12/2013	A4	B37732	0.135	35.5	0.009	0.778
	28/01/2014	A4	B407113	0.095	30	0.006	0.904
	26/02/2014	A4	B416171	0.105	36.1	0.011	0.904
	27/03/2014	A4	B424028	0.085	38.8	0.007	0.924
	24/04/2014	A4	B432952	0.197	30	0.008	0.882
	15/05/2014	A4	B439868	0.102	12.7	0.016	0.999
	12/05/2014	A4	B442060	0.07	1.93	0.013	0.217
	30/05/2014	A4	B444272	0.061	6.35	0.012	0.211
	05/06/2014	A4	B446972	-	3.52	0.01	0.201
	12/06/2014	A4	B449500	0.05	4.72	0.008	0.243
	24/07/2014	A4	B464009	0.077	15	0.012	0.584
	21/08/2014	A4	B474408	0.063	22.7	0.01	0.681
	28/08/2014	A4	B476541	0.107	21.1	0.01	0.7
	05/09/2014	A4	B479154	0.123	16.6	0.011	0.699
	12/09/2014	A4	B481292	0.1	17.1	0.01	0.805
	18/09/2014	A4	B483962	0.104	15.1	0.01	0.689
	31/10/2014	A4	B499587	0.128	24.2	0.009	0.796
	27/11/2014	A4	B480993	0.098	24.3	0.008	0.72
	18/12/2014	A4	B485326	0.095	25.3	0.0078	0.665
	22/01/2015	A4	B505986	0.093	30.1	0.01	0.79
	26/02/2015	A4	B516449	0.095	32.2	0.0096	0.883
	26/03/2015	A4	B525184	-	25.9	0.0081	0.645
	23/04/2015	A4	B533584	0.081	6.11	0.0117	0.188
	14/05/2015	A4	B540628	0.01	8.15	0.0274	0.281
	21/05/2015	A4	B542667	0.043	5.11	0.009	0.21
	28/05/2015	A4	B545872	0.048	4.84	0.014	0.216
	05/06/2015	A4	B547761	0.05	4.6	0.0142	0.215
	11/06/2015	A4	B549906	0.072	7.63	0.0109	0.341
	23/07/2015	A4	B564721	0.092	19.9	0.0089	0.57
	20/08/2015	A4	B572515	0.084	24.8	0.008	0.764
	27/08/2015	A4	B575103	0.127	24.4	0.006	0.673
	03/09/2015	A4	B579658	0.107	26.6	0.008	0.722
	10/09/2015	A4	B579637	0.119	28.3	0.012	0.901
	17/09/2015	A4	B582068	0.159	26.6	0.01	0.841
	12/05/2016	A4	B637198	0.051	8	0.01	0.35
	20/07/2018	A4	L2133661	0.0651	-	0.013	0.74
	09/11/2018	A4	L2195291	0.0965	-	0.0052	0.968
	05/03/2019	A4	L2240838	0.0998	-	0.0096	1.06
	17/06/2019	A4	L2295044	0.0918	-	0.0096	0.469
	18/06/2012	A5	B252527	0.01	3.45	0.0114	0.182
	24/07/2012	A5	B265706	0.01	8.59	0.006	0.499
	25/08/2012	A5	B276608	0.01	15.3	0.01	1.09
	25/09/2012	A5	B283851	0.01	21.3	0.006	1.07
	24/10/2012	A5	B297129	-	25.1	0.293	1.31
	24/11/2012	A5	B247294	-	20.3	0.009	1.11
	15/12/2012	A5	B284014	0.086	24.1	0.006	1.16
	24/01/2013	A5	B306701	0.084	25.7	0.009	1.49
	20/02/2013	A5	B314388	0.082	27	0.006	1.55
	20/03/2013	A5	B322778	0.086	28.9	0.006	1.52
	17/04/2013	A5	B330966	0.069	26	0.006	1.2
	23/05/2013	A5	B341817	0.024	3.7	0.012	0.203
	20/06/2013	A5	B351922	0.035	2.66	0.005	0.34
	17/07/2013	A5	B361290	0.021	10.7	0.0025	0.787
	26/08/2013	A5	B376591	0.042	18.6	0.008	1.07
	26/09/2013	A5	B388572	0.038	25.2	0.006	1.1
	26/09/2013	A5-DUP	B388572	0.036	21.9	0.008	1.21
	24/10/2013	A5	B399672	0.01	15.5	0.006	0.997
	21/11/2013	A5	B348725	0.084	28.6	0.006	1.13
	22/12/2013	A5	B37732	0.104	26.6	0.006	1.37
	28/01/2014	A5	B407113	0.099	28.5	0.0025	1.44
	26/02/2014	A5	B416171	0.098	29.6	0.006	1.52
	27/03/2014	A5	B424028	0.101	30.3	0.0025	1.66
	24/04/2014	A5	B432952	0.107	21.1	0.006	1.21
	15/05/2014	A5	B439868	0.056	9.7	0.008	0.553
	22/05/2014	A5	B442060	0.072	4.23	0.011	0.205
	30/05/2014	A5	B444272	0.036	1.87	0.007	0.208
	05/06/2014	A5	B446972	-	4.07	0.008	0.173
	12/06/2014	A5	B449500	0.01	4.67	0.0025	0.227
	25/07/2014	A5	B464009	0.01	12	0.008	0.611
	21/08/2014	A5	B474408	0.039	20	0.007	1.01
	28/08/2014	A5	B476541	0.044	18.9	0.007	0.949
	05/09/2014	A5	B479154	0.05	13.6	0.006	0.787
	12/09/2014	A5	B481292	0.037	15.1	0.006	0.832
	18/09/2014	A5	B483962	0.088	13	0.007	0.81
	11/10/2014	A5	B499587	0.089	22.9	0.005	0.851
	27/11/2014	A5	B480993	0.09	20.9	0.0025	0.887
	18/12/2014	A5	B485326	0.091	21.9	0.0055	0.984
	22/01/2015	A5	B505986	0.098	24.8	0.006	1.24
	26/02/2015	A5	B516449	-	26.8	0.0059	1.4
	26/03/2015	A5	B525184	-	22.1	0.0025	1.1
23/04/2015	A5	B533584	0.054	7.87	0.006	0.418	
14/05/2015	A5	B540628	0.01	7.86	0.17	0.313	
21/05/2015	A5	B542667	0.029	5.75	0.008	0.232	
28/05/2015	A5	B545872	0.023	4.78	0.007	0.219	
28/05/2015	A5-DUP	B545872	0.021	4.79	0.01	0.227	
05/06/2015	A5	B547761	0.01	4.92	0.0073	0.211	
05/06/2015	A5-DUP	B547761	0.01	4.98	0.0373	0.215	
11/06/2015	A5	B549906	0.01	7.81	0.007	0.248	
11/06/2015	A5-DUP	B549906	0.01	7.54	0.0073	0.287	
23/07/2015	A5	B564721	0.041	17	0.0057	0.751	
20/08/2015	A5	B572515	0.05	20.4	0.007	1	
27/08/2015	A5	B575103	0.038	21.5	0.007	0.826	
03/09/2015	A5	B579658	0.042	21.5	0.005	0.959	
11/09/2015	A5	B582068	0.039	21.9	0.005	1.05	
18/09/2015	A5	B582068	0.029	22.2	0.005	1.09	
12/05/2016	A5	B637198	0.01	7.12	0.006	0.253	
20/07/2018	A5	L2133661	0.0238	-	0.0088	0.845	
09/11/2018	A5	L2195291	0.0636	-	0.0025	1.31	
05/03/2019	A5	L2240838	0.105	-	0.0086	1.77	
17/06/2019	A5	L2295044	0.0918	-	0.0025	0.37	
15/05/2012	G1	B240844	0.01	10.7	0.22	0.365	
19/06/2012	G1	B252527	0.01	8.91	0.0096	0.352	
25/07/2012	G1	B265706	0.01	14.9	0.018	0.296	
26/08/2012	G1	B276608	0.01	19.8	0.012	0.397	
18/09/2012	G1	B283851	0.01	21.6	0.015	0.487	
18/09/2012	G1-DUP	B283851	0.01	22.2	0.015	0.387	
25/10/2012	G1	B297129	-	28.8	0.012	0.541	
24/11/2012	G1	B247294	-	20.6	0.018	0.452	
16/12/2012	G1	B284014	0.026	24.2	0.013	0.494	
25/01/2013	G1	B306701	0.031	24.9	0.012	0.383	
21/02/2013	G1	B314388	0.036	25.7	0.008	0.478	
21/03/2013	G1	B322778	0.033	25	0.017	0.426	
18/04/2013	G1	B331290	0.029	28.5	0.015	0.48	
24/05/2013	G1	B341817	0.01	19.1	0.01	0.327	
18/07/2013	G1	B361290	0.01	19	0.016	0.411	
27/08/2013	G1	B376591	0.062	24.7	0.007	1.84	
26/09/2013	G1	B388572	0.048	24.9	0.007	1.52	
23/10/2013	G1	B399672	0.07	25	0.006	1.72	
21/11/2013	G1	B348725	0.025	28.7	0.01	0.861	
21/12/2013	G1	B388112	0.037	26.2	0.013	0.438	
28/01/2014	G1	B407113	0.137	27.5	0.007	1.27	
27/02/2014	G1	B416171	0.036	28.6	0.014	0.441	
28/03/2014	G1	B424028	0.032	27.4	0.01	0.489	
25/04/2014	G1	B432952	0.043	31	0.018	0.529	
18/05/2014	G1	B439868	0.05	13.2	0.007	0.461	
23/05/2014	G1	B442060	0.025	9.74	0.008	0.33	
23/05/2014	G1-DUP	B442060	0.023	9.65	0.147	0.271	
29/05/2014	G1	B444272	0.01	11.5	0.008	0.327	
06/06/2014	G1	B446972	-	9.46	0.051	0.362	
13/06/2014	G1	B449500	0.01	10	0.033	0.327	
13/06/2014	G1-DUP	B449500	0.01	9.57	0.007	0.328	
25/07/2014	G1	B464009	0.01	18.8	0.025	0.356	
22/08/2014	G1	B474408	0.01	23.9	0.041	0.321	
29/08/2014	G1	B476541	0.01	24.1	0.012	0.319	
28/08/2014	G1-DUP	B476541	0.01	23.8	0.032	0.355	
05/09/2014	G1-DUP	B479154	0.01	24.9	0.01	0.413	
06/09/2014	G1	B479154	0.01	23.9	0.03	0.45	
12/09/2014	G1	B481292	0.01	25.1	0.027	0.448	
19/09/2014	G1	B483962	0.01	24	0.044	0.445	
30/10/2014	G1	B499587	0.01	23.4	0.025	0.418	
28/11/2014	G1	B480993	0.03	23.3	0.0771	0.303	
18/12/2014	G1	B485326	0.039	18.5	0.012	0.35	
22/01/2015	G1	B5					

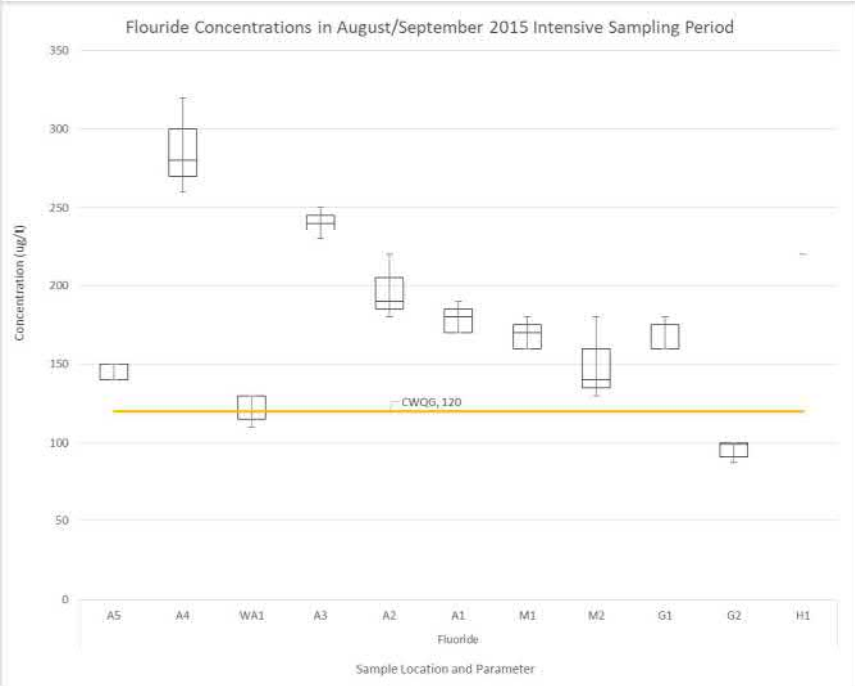
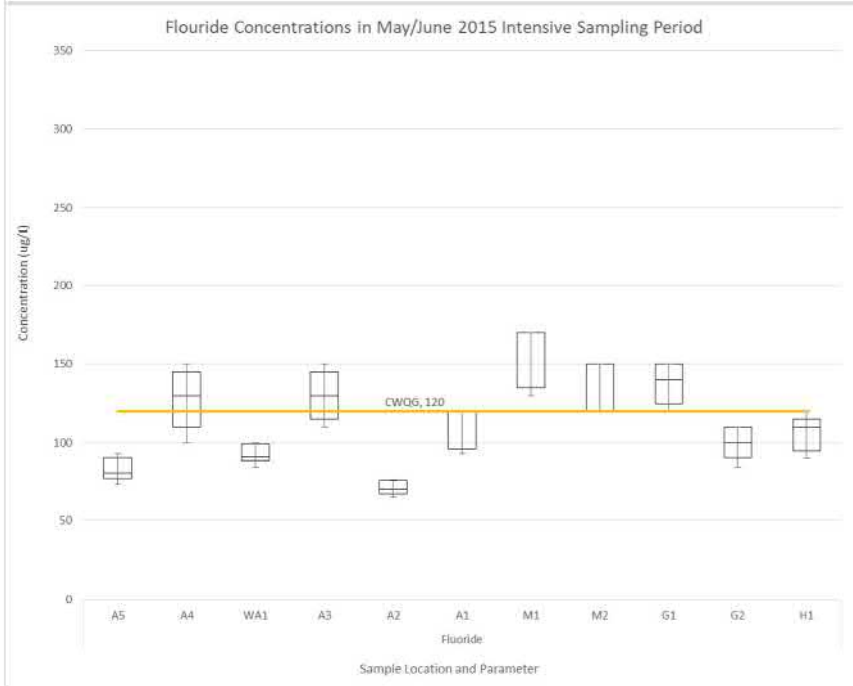
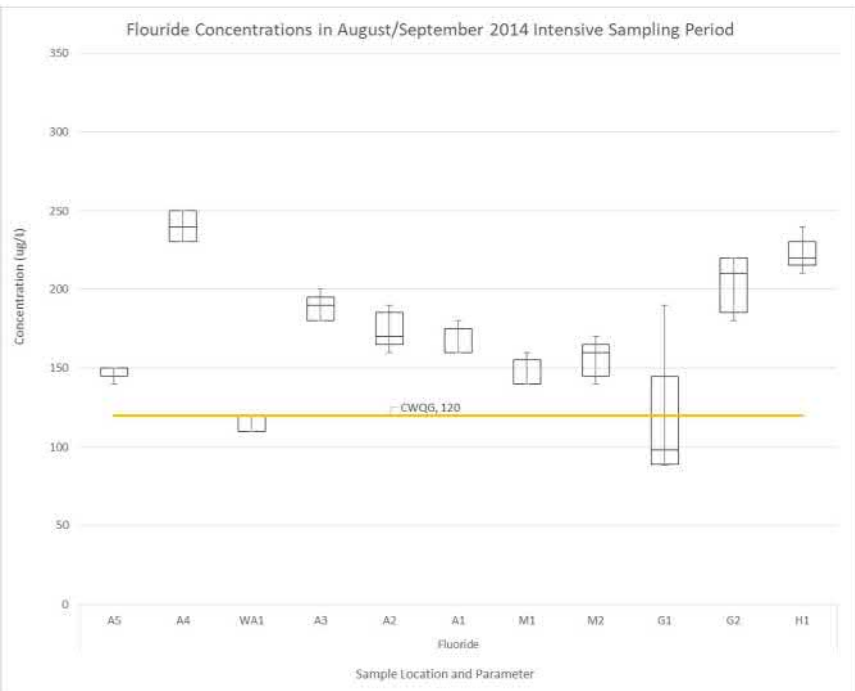
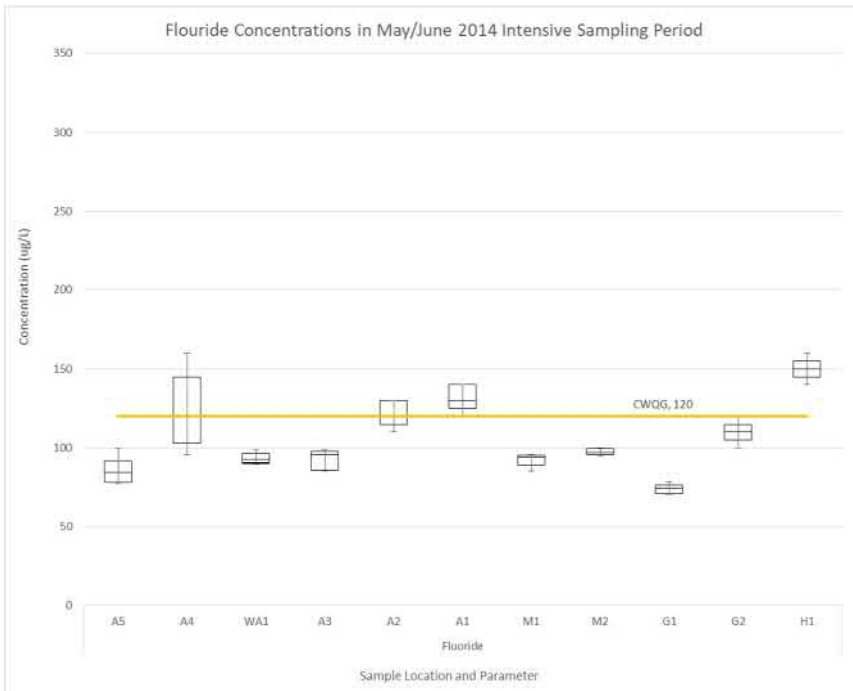


Location Code	Sample Date	Sample ID	Lab Report Number	Nitrate (as N)	Sulphate (SO4)*	Cadmium	Selenium
Units				mg/L	mg/L	µg/L	µg/L
MDL				0.005	0.5	0.005	0.04
H1	15/05/2012	H1	B240844	0.425	53.2	0.187	11.1
H1	19/06/2012	H1	B252527	0.32	46.6	0.054	10.5
H1	25/07/2012	H1	B265706	0.377	75.8	0.057	15.5
H1	26/08/2012	H1	B276608	0.676	115	0.015	23.7
H1	18/09/2012	H1	B283851	0.769	133	0.028	20.4
H1	25/10/2012	H1	B297129	-	153	0.012	24.7
H1	21/11/2012	H1	B297294	-	144	0.046	26.6
H1	16/12/2012	H1	B284014	0.837	144	0.039	26.3
H1	25/01/2013	H1	B306701	0.851	140	0.015	26.5
H1	21/02/2013	H1	B314388	0.861	145	0.015	24.7
H1-DUP	21/02/2013	H1-DUP	B314388	0.874	144	0.017	23.6
H1	21/03/2013	H1	B322778	0.909	158	0.015	25.8
H1-DUP	21/03/2013	H1-DUP	B322778	0.913	159	0.015	26.3
H1	18/04/2013	H1	B331290	0.963	160	0.02	29.5
H1	24/05/2013	H1	B341818	0.435	59.9	0.068	12.2
H1	18/07/2013	H1	B361929	0.546	101	0.015	20.4
H1	27/08/2013	H1	B376651	0.696	130	0.016	25.6
H1	26/09/2013	H1	B385732	0.697	143	0.01	25.6
H1	23/10/2013	H1	B399458	0.787	144	0.013	26.9
H1	21/11/2013	H1	B387725	0.831	165	0.014	27.9
H1	22/12/2013	H1	B387792	0.983	164	0.017	28.7
H1	28/01/2014	H1	B407113	1	165	0.011	26.4
H1	27/02/2014	H1	B416171	1.03	178	0.013	27.4
H1-DUP	27/02/2014	H1-DUP	B416171	1.04	180	0.015	27.9
H1	28/03/2014	H1	B424928	0.934	173	0.014	27.4
H1	25/04/2014	H1	B432952	0.853	145	0.021	26.8
H1	16/05/2014	H1	B439804	0.588	80.2	0.075	20.5
H1	23/05/2014	H1	B442060	0.497	54	0.176	14.1
H1	28/05/2014	H1	B444272	0.547	60.1	0.085	17.9
H1	06/06/2014	H1	B446972	0.506	50.6	0.045	13.5
H1	13/06/2014	H1	B449900	0.348	54.4	0.022	13.4
H1	25/07/2014	H1	B464609	0.471	108	0.015	20.4
H1	22/08/2014	H1	B474408	0.646	139	0.016	22.2
H1	29/08/2014	H1	B476541	0.657	137	0.016	22.1
H1	06/09/2014	H1	B479164	0.628	123	0.017	20.6
H1	12/09/2014	H1	B481292	0.656	127	0.014	23.6
H1	19/09/2014	H1	B483962	0.734	140	0.014	24.1
H1-DUP	19/09/2014	H1-DUP	B483962	0.752	143	0.01	0.577
H1	30/10/2014	H1	B499587	0.744	144	0.012	22.7
H1	28/11/2014	H1	B480093	0.751	148	0.011	21.2
H1	18/12/2014	H1	B485326	0.832	146	0.015	20.4
H1	22/01/2015	H1	B505986	0.908	159	0.014	24.3
H1-DUP	23/01/2015	H1-DUP	B505986	0.905	163	0.013	24.8
H1	26/02/2015	H1	B516449	-	148	0.015	22.7
H1	27/03/2015	H1	B525384	-	130	0.0167	22.1
H1	24/04/2015	H1	B533584	0.541	90.4	0.011	13.5
H1	14/05/2015	H1	B540628	0.456	84.1	0.0129	16.5
H1	21/05/2015	H1	B542667	0.303	65.5	0.019	10.8
H1	29/05/2015	H1	B545872	0.27	49.3	0.014	8.8
H1	04/06/2015	H1	B547761	0.207	51.6	0.0482	8.02
H1	12/06/2015	H1	B549906	0.339	64.7	0.0186	11.2
H1	24/07/2015	H1	B564711	0.549	118	0.0197	18.4
H1	21/08/2015	H1	B572515	0.563	135	0.018	22.6
H1	28/08/2015	H1	B575103	0.639	137	0.016	22.8
H1	04/09/2015	H1	B579658	0.683	134	0.016	20.8
H1	10/09/2015	H1	B579637	0.443	143	0.014	22.9
H1	18/09/2015	H1	B582068	0.681	142	0.013	22.8
H1	13/09/2016	H1	B617198	0.408	79.4	0.011	15.9
H1	20/07/2018	H1	L2133661	0.428	-	0.0166	21.7
H1	09/11/2018	H1	L2195291	0.697	-	0.0124	28.5
H1	04/03/2019	H1	L2240838	0.838	-	0.0124	28.5
M1	18/06/2019	M1	L2295044	0.214	-	0.012	13.8
M1	14/05/2012	M1	B240844	0.109	20.8	0.207	1.4
M1-DUP	14/05/2012	M1-DUP	B240844	0.099	20	0.235	1.33
M1	19/06/2012	M1	B252527	0.092	15.6	0.085	0.823
M1	25/07/2012	M1	B265706	0.091	47.5	0.018	1.63
M1	25/08/2012	M1	B276608	0.181	68.4	0.033	1.71
M1-DUP	18/09/2012	M1-DUP	B283851	0.241	73.3	0.027	1.44
M1	24/10/2012	M1	B297129	-	64.4	0.02	1.74
M1	23/11/2012	M1	B297294	-	49	0.028	1.68
M1	15/12/2012	M1	B306701	0.319	95.1	0.014	1.74
M1	25/01/2013	M1	B306701	0.373	71.3	0.028	2.34
M1	21/02/2013	M1	B314388	0.493	68.9	0.028	1.8
M1	20/03/2013	M1	B322778	0.502	46.1	0.027	1.39
M1	17/04/2013	M1	B330896	0.078	25.8	0.027	0.932
M1	21/05/2013	M1	B341818	0.135	12.7	0.071	0.673
M1	21/06/2013	M1	B352218	0.12	18.1	2.66	1.03
M1-DUP	21/06/2013	M1-DUP	B352218	0.12	15.7	2.72	0.895
M1	11/07/2013	M1	B361929	0.033	46.4	0.014	1.41
M1	26/08/2013	M1	B376591	0.267	72.1	0.013	1.82
M1	25/09/2013	M1	B378769	0.304	54.7	0.017	1.69
M1	24/10/2013	M1	B399472	0.238	66.9	0.02	2.17
M1-DUP	24/10/2013	M1-DUP	B399472	0.237	66.9	0.024	2.28
M1	20/11/2013	M1	B408655	0.184	35.5	0.024	1.11
M1	22/12/2013	M1	B408778	0.45	70	0.014	2.06
M1	27/01/2014	M1	B408674	0.446	72.7	0.012	1.93
M1	27/02/2014	M1	B416171	0.491	73	0.026	2.04
M1	27/03/2014	M1	B424928	0.383	65.5	0.027	1.95
M1	24/04/2014	M1	B432952	0.255	50.4	0.056	1.81
M1-DUP	24/04/2014	M1-DUP	B432952	0.256	50.5	0.061	1.87
M1	15/05/2014	M1	B439804	0.181	25.3	0.183	1.25
M1	23/05/2014	M1	B442060	0.16	18.2	0.916	0.816
M1	29/05/2014	M1	B444272	0.146	15.7	0.182	0.92
M1	05/06/2014	M1	B446972	0.14	12.1	0.154	0.803
M1	12/06/2014	M1	B449900	0.078	14.8	0.062	0.924
M1	24/07/2014	M1	B464609	0.183	41.8	0.03	1.43
M1	22/08/2014	M1	B474408	0.443	65.9	0.011	1.68
M1	29/08/2014	M1	B476541	0.378	52.3	0.013	1.47
M1	05/09/2014	M1	B479164	0.345	47.3	0.019	1.55
M1-DUP	11/09/2014	M1-DUP	B481292	0.342	55.4	0.033	1.65
M1	12/09/2014	M1	B481292	0.341	51.7	0.024	1.64
M1	19/09/2014	M1	B483962	0.348	55.5	0.015	1.66
M1	30/10/2014	M1	B499587	0.199	47	0.015	1.45
M1	28/11/2014	M1	B480093	0.427	49.6	0.094	1.56
M1	18/12/2014	M1	B485326	0.503	43.8	0.015	1.27
M1	22/01/2015	M1	B505986	0.373	55.9	0.027	1.75
M1	27/02/2015	M1	B516449	-	53.9	0.019	3.29
M1	26/03/2015	M1	B525384	-	34.2	0.0616	1.29
M1	23/04/2015	M1	B533584	0.041	21.9	0.0463	0.774
M1	15/05/2015	M1	B540628	0.075	22.9	0.0274	1.65
M1	21/05/2015	M1	B542667	0.098	16.1	0.06	0.74
M1	28/05/2015	M1	B545872	0.108	12.7	0.108	0.686
M1	04/06/2015	M1	B549906	0.127	14.5	0.111	0.793
M1	11/06/2015	M1	B549906	0.146	18.7	0.045	0.889
M1	23/07/2015	M1	B564711	0.236	47.6	0.0257	1.31
M1	20/08/2015	M1	B572515	0.303	60.3	0.028	1.34
M1	27/08/2015	M1	B575103	0.343	60.1	0.027	1.41
M1	03/09/2015	M1	B579658	0.349	56.1	0.17	1.3
M1	10/09/2015	M1	B579637	0.33	46.2	0.016	1.77
M1	17/09/2015	M1	B582068	0.34	56.4	0.028	1.79
M1	13/09/2016	M1	B617198	0.363	30	0.042	1.08
M1-DUP	09/11/2018	M1-DUP	L2195291	0.457	-	0.0218	1.64
M1-DUP	09/11/2018	M1-DUP	L2195291	0.458	-	0.0218	1.69
M1	04/03/2019	M1	L2240838	0.495	-	0.0322	2.4
M1	18/06/2019	M1	L2295044	0.099	-	0.015	1.07
M2	14/05/2012	M2	B240844	0.101	18.4	0.214	1.15
M2	19/06/2012	M2	B252527	0.091	14.8	0.0784	0.752
M2	25/07/2012	M2	B265706	0.218	45.4	0.021	3.91
M2	26/08/2012	M2	B276608	0.478	65.5	0.018	6.26
M2	18/09/2012	M2	B283851	0.587	71.4	0.012	5.4
M2	24/10/2012	M2	B297129	-	69.5	0.013	4.92
M2	23/11/2012	M2	B297294	-	57.4	0.026	4.13
M2	15/12/2012	M2	B306701	0.553	64.7	0.018	5.4
M2	24/01/2013	M2	B306701	0.794	80.9	0.02	7.65
M2	21/02/2013	M2	B314388	1.14	99	0.013	10.6
M2	20/03/2013	M2	B322778	0.631	67.4	0.02	5.29
M2	17/04/2013	M2	B330896	0.495	71.8	0.025	5.79
M2-DUP	17/04/2013	M2-DUP	B330896	0.499	71.2	0.045	5.84
M2	24/05/2013	M2	B341818	0.133	15.7	0.076	0.886
M2	21/06/2013	M2	B352218	0.128	18.8	2.58	1.11
M2	17/07/2013	M2	B361929	0.078	27.3	0.024	2.03
M2	26/08/2013	M2	B376591	0.242	53.8	0.023	2.27
M2	25/09/2013	M2	B378769	0.284	48.7	0.029	1.88
M2	24/10/2013	M2	B399472	0.24	53.8	0.017	2.82
M2	20/11/2013	M2	B408655	0.467	64.5	0.017	4.06
M2	22/12/2013	M2	B408778	0.512	63	0.017	3.8
M2	27/01/2014	M2	B408674	0.598	68.3	0.016	4.51
M2	27/02/2014	M2	B416171	0.88	83.6	0.018	7.18
M2	27/03/2014	M2	B424928	0.514	64.1	0.02	4.22
M2	24/04/2014	M2	B432952	0.229	46.8	0.05	1.79
M2	15						

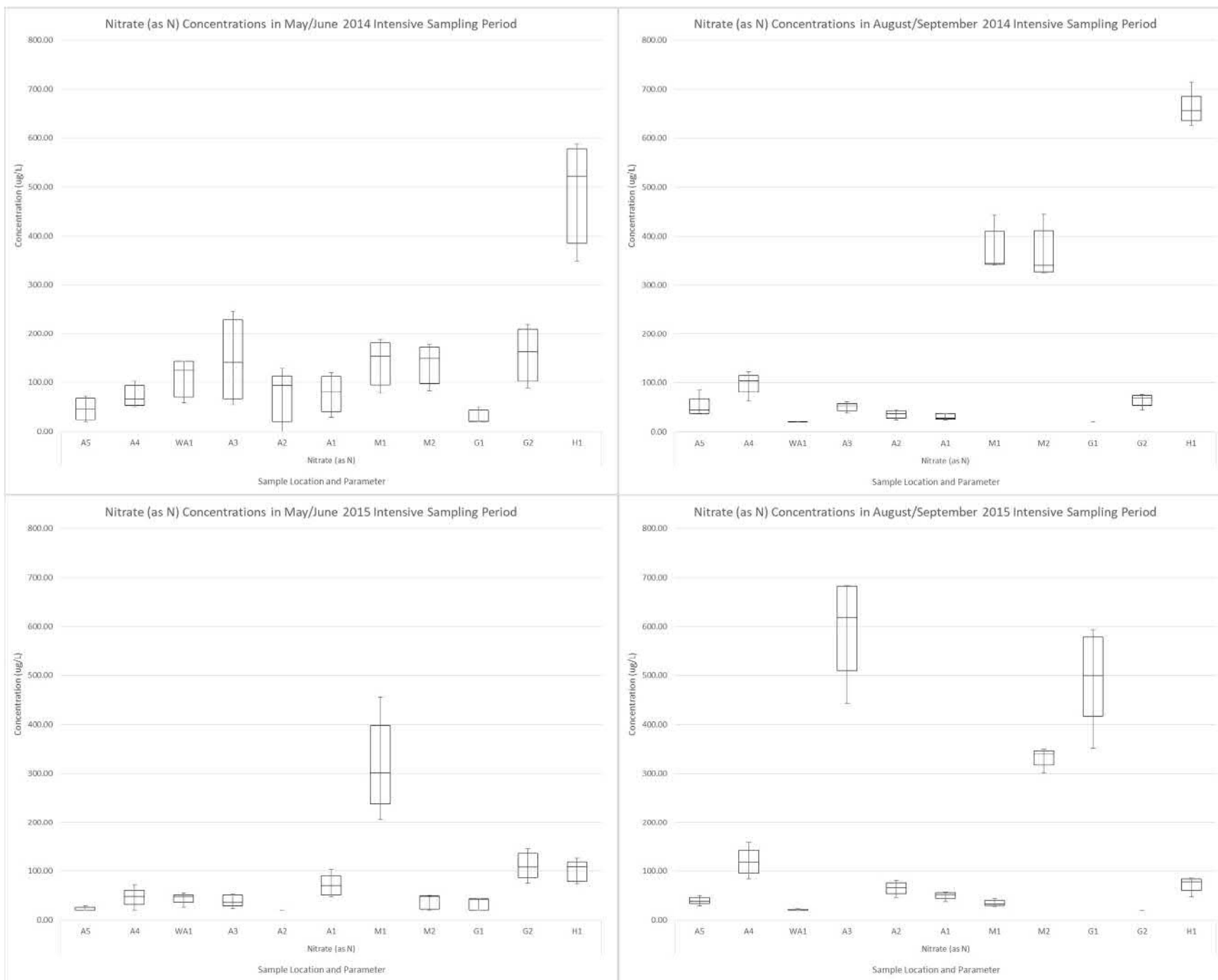
# Appendix D

## *5-in-30 Box Plots*

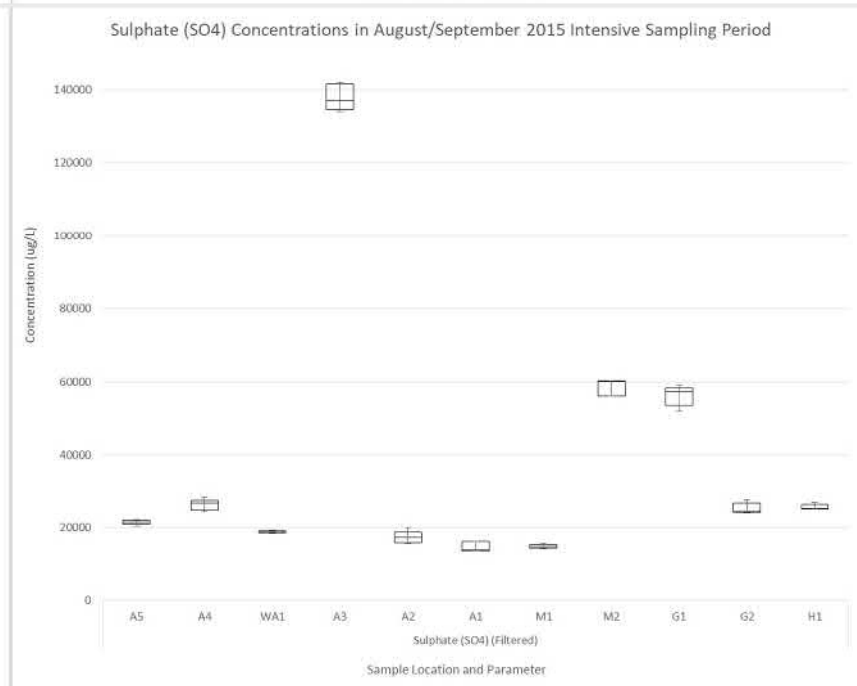
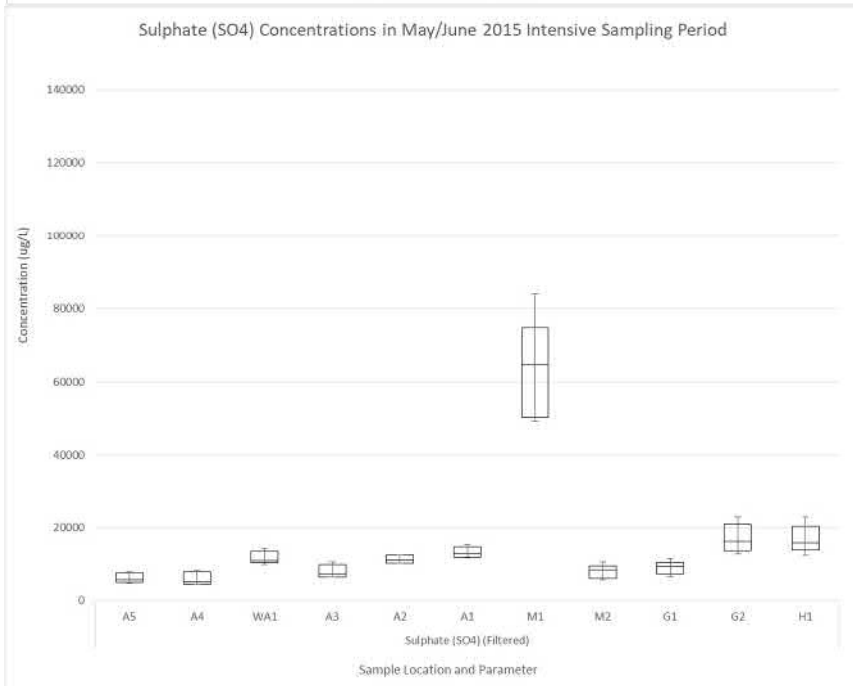
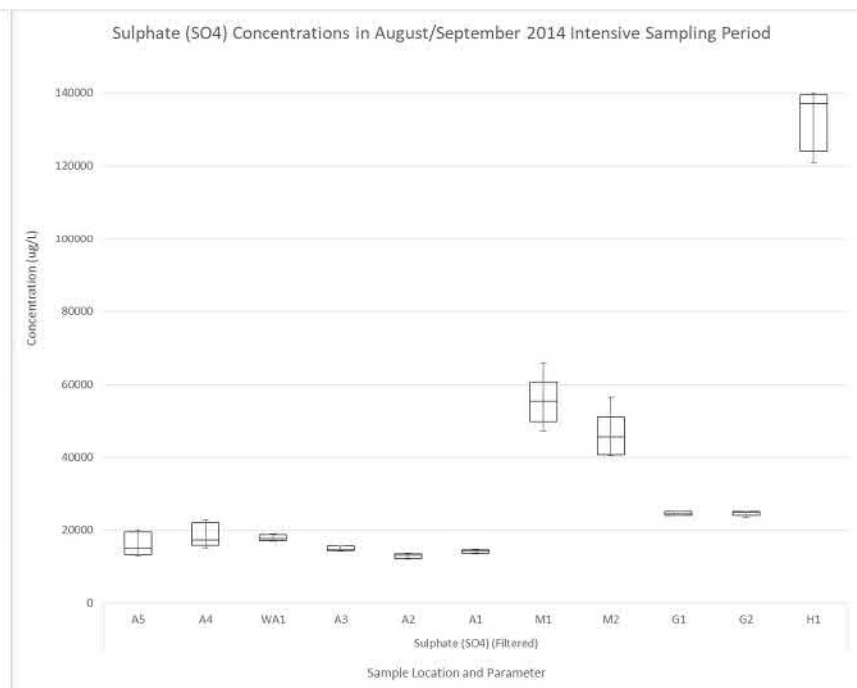
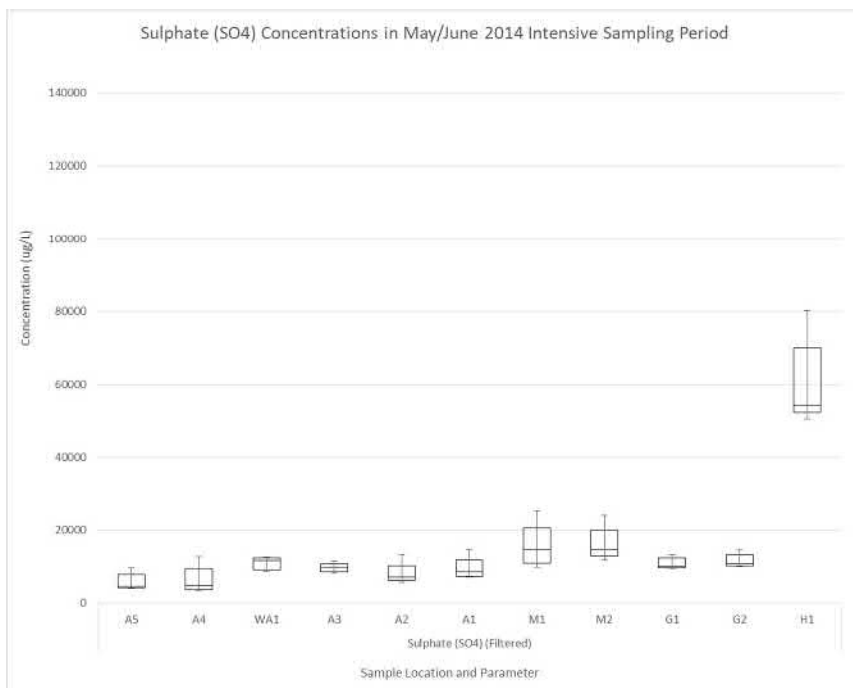
Appendix D: 5-in-30 Box Plots



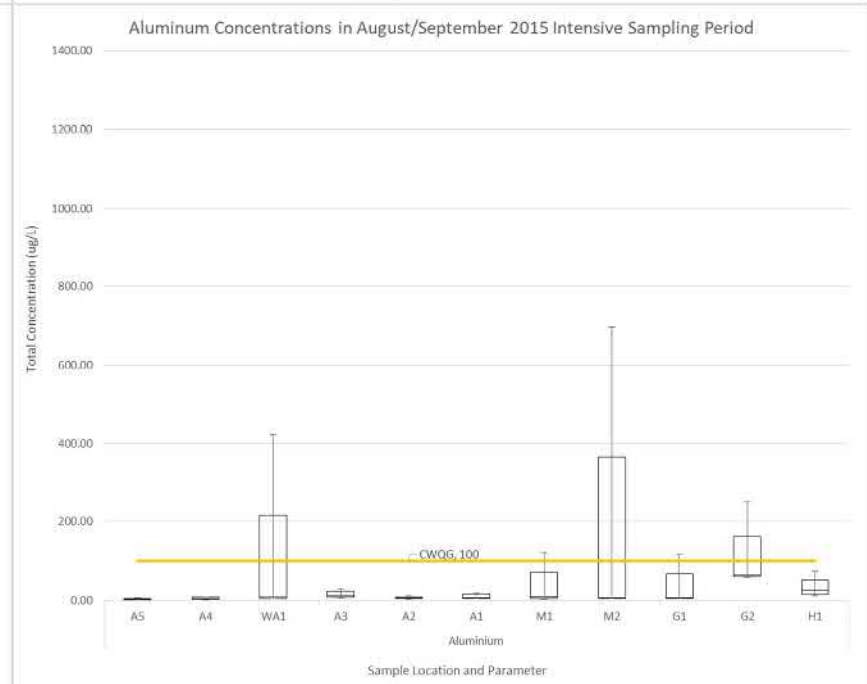
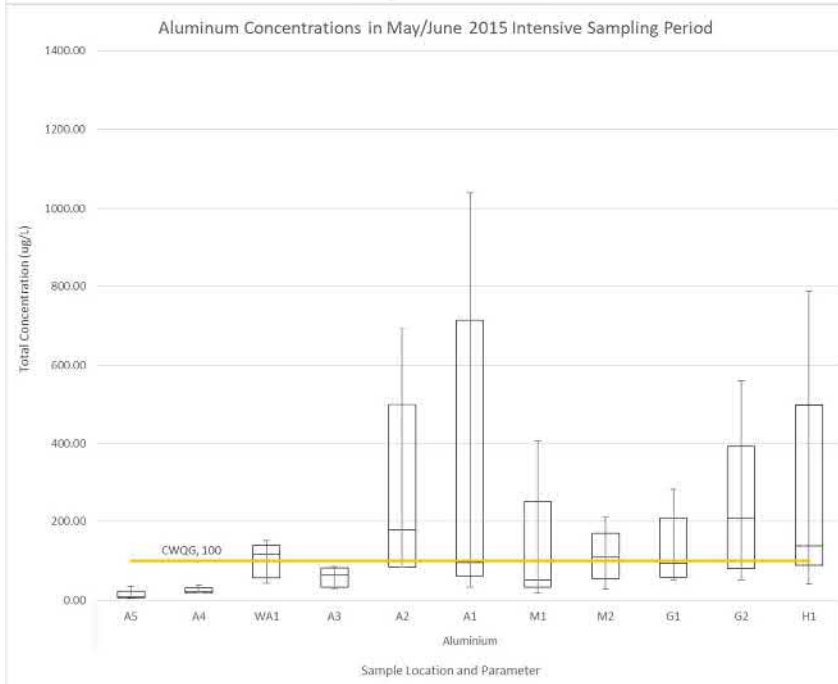
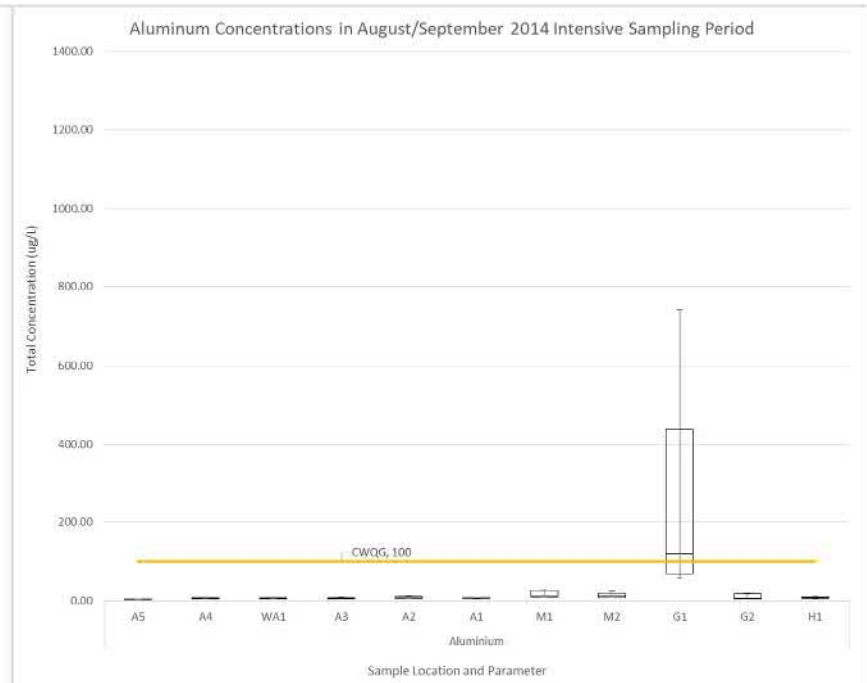
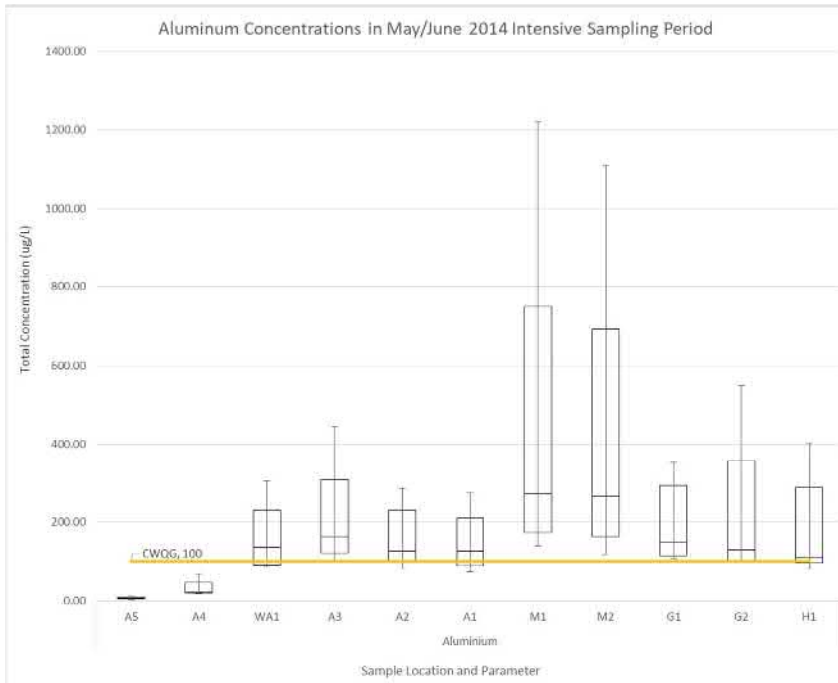
Appendix D: 5-in-30 Box Plots



Appendix D: 5-in-30 Box Plots

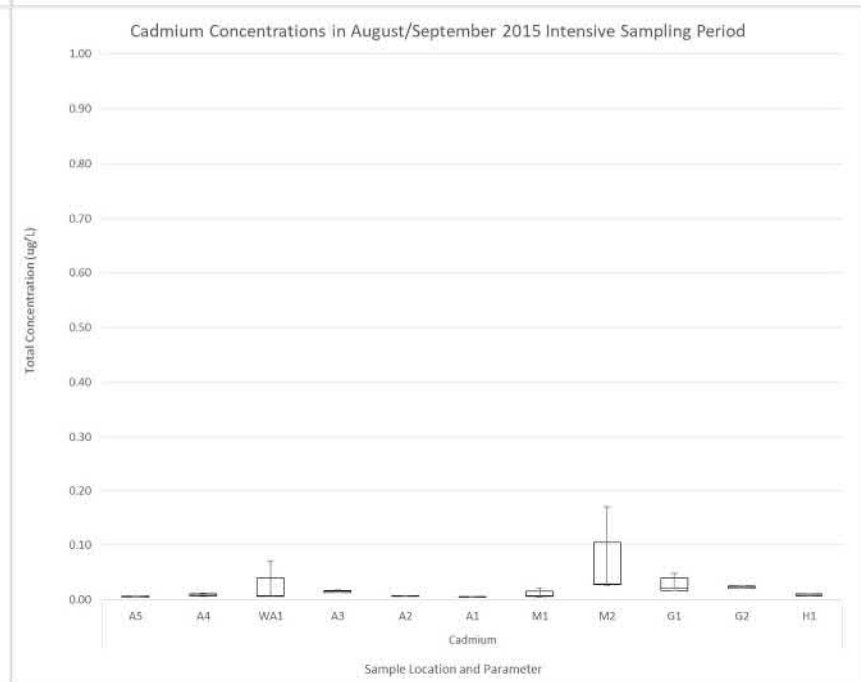
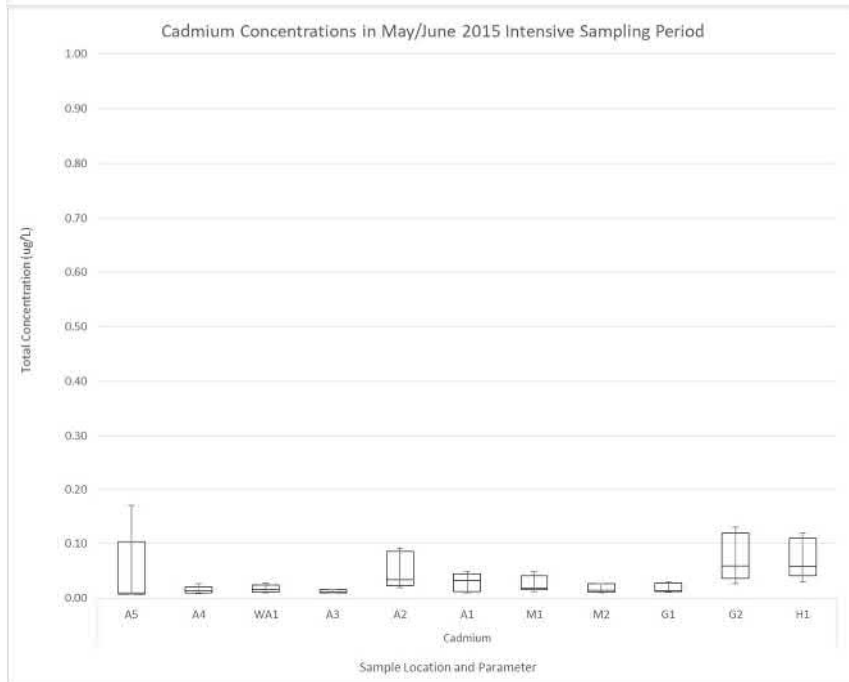
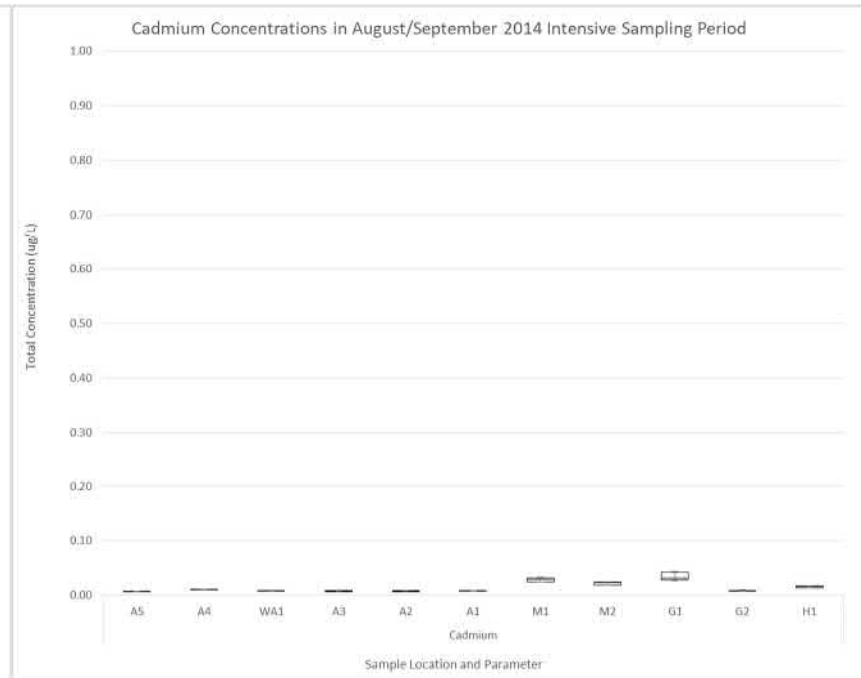
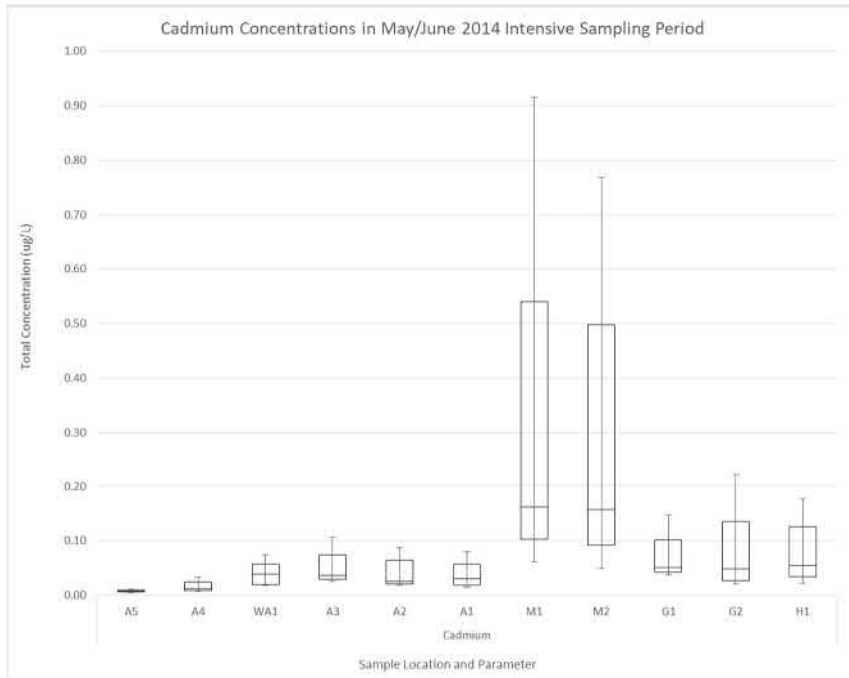


Appendix D: 5-in-30 Box Plots

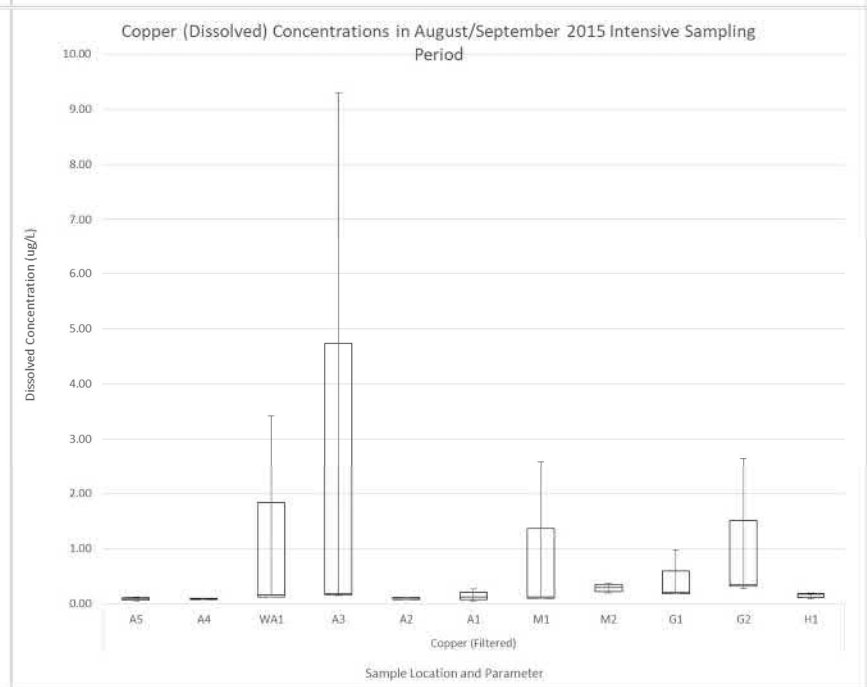
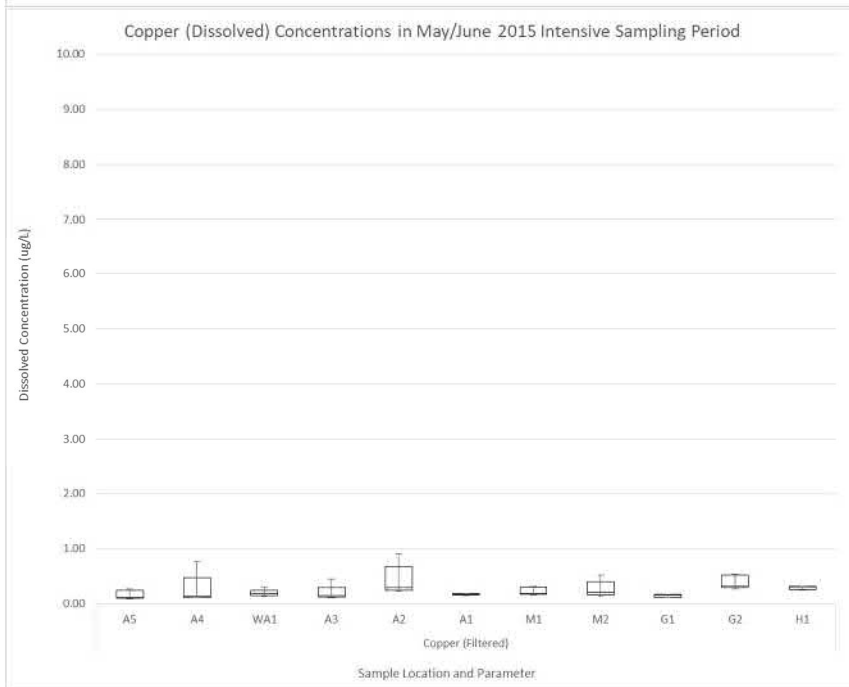
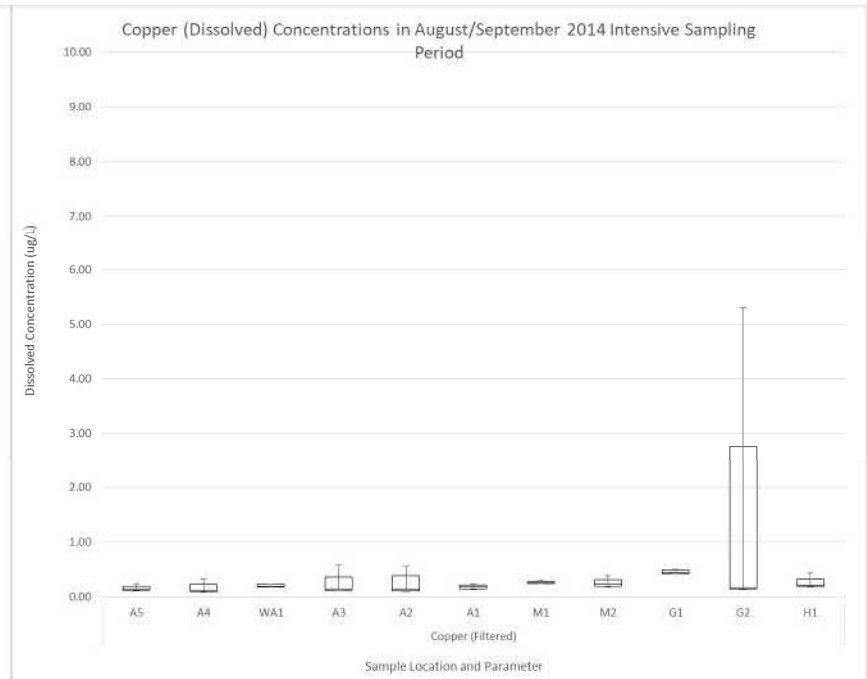
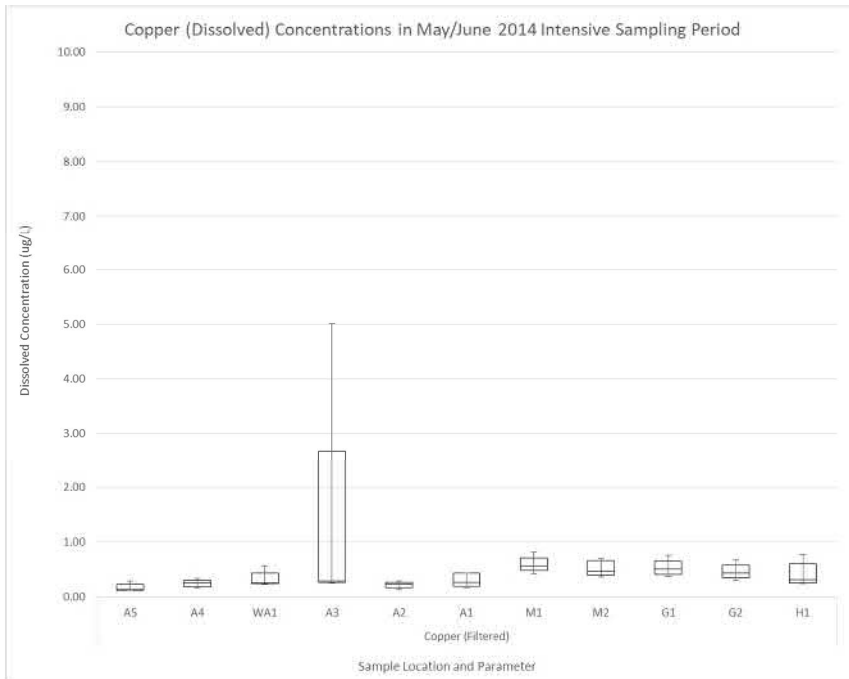




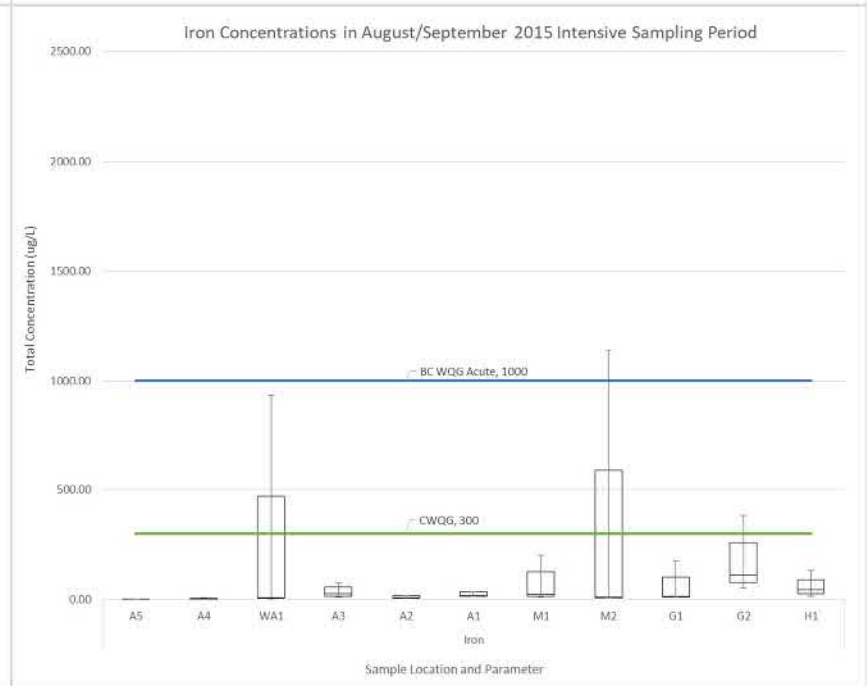
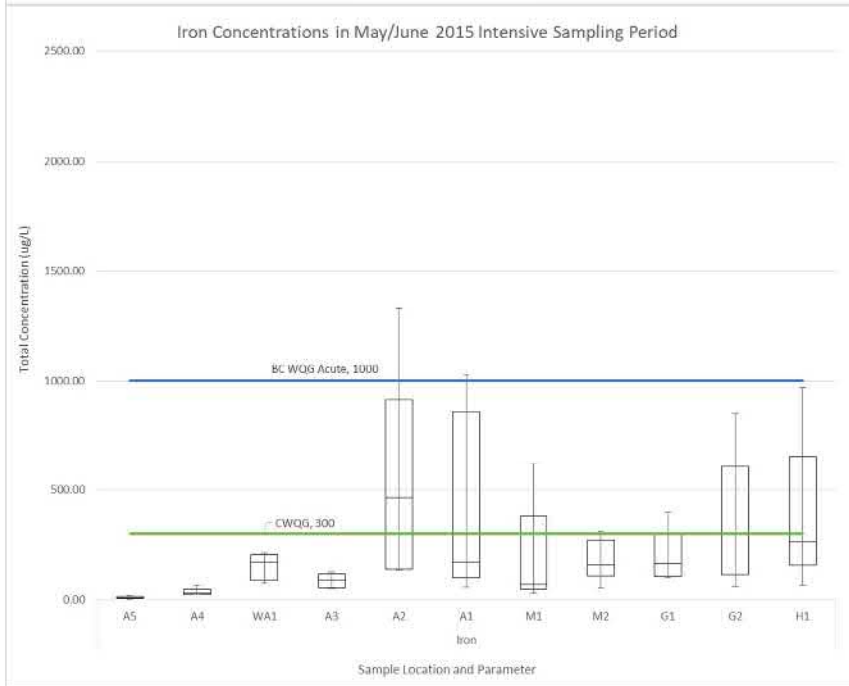
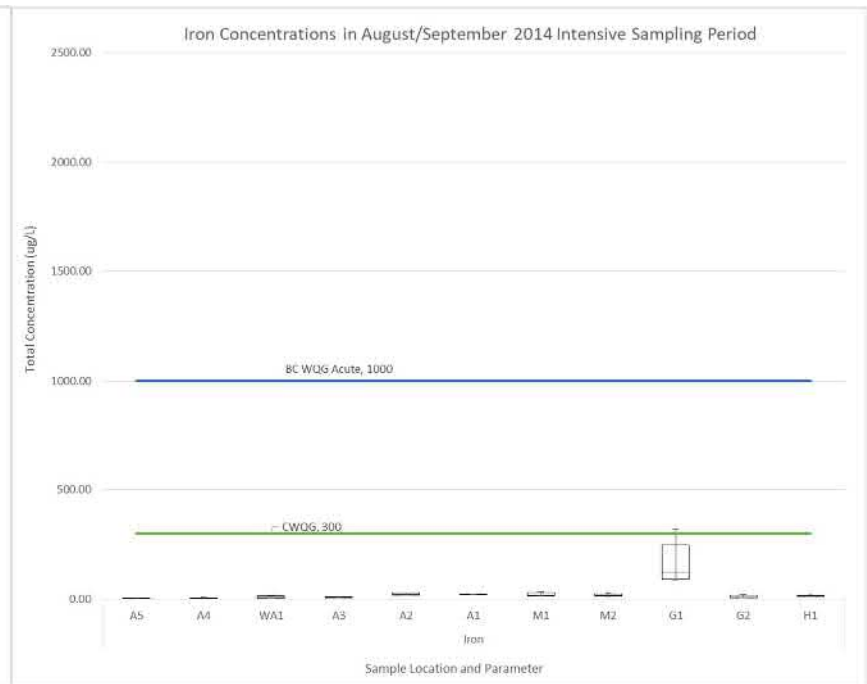
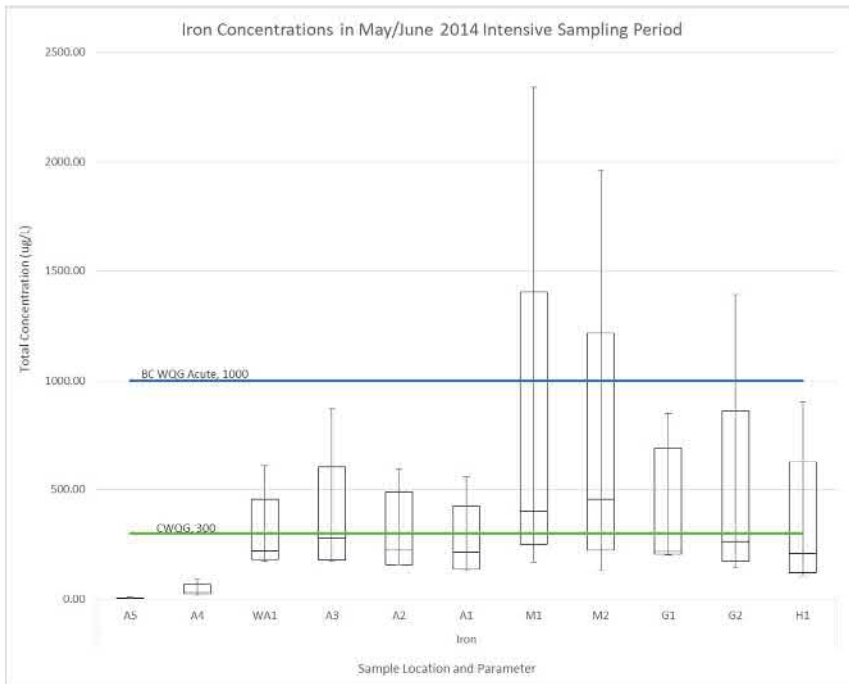
Appendix D: 5-in-30 Box Plots



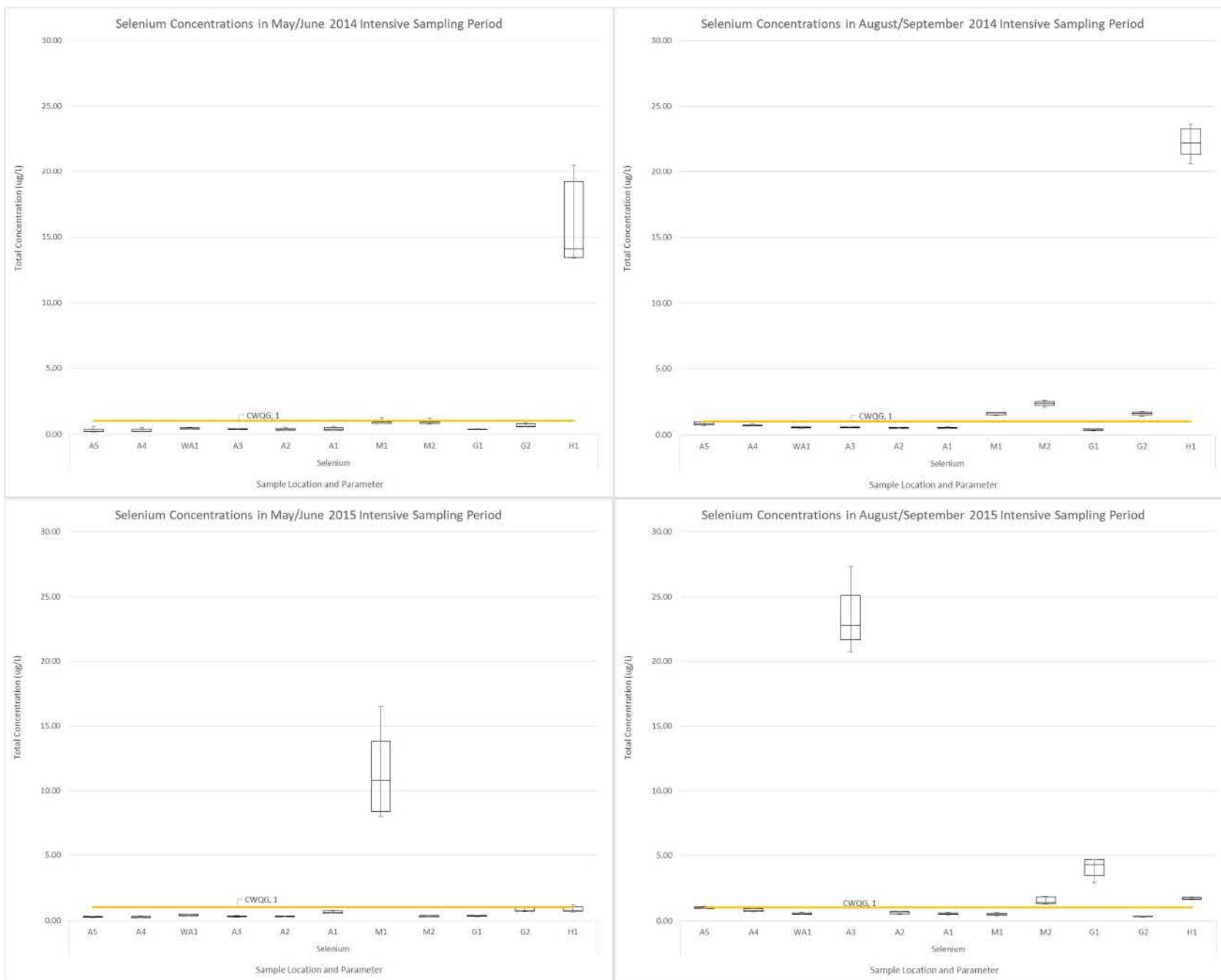
Appendix D: 5-in-30 Box Plots



Appendix D: 5-in-30 Box Plots



Appendix D: 5-in-30 Box Plots



# Appendix E

## *Regional Analytical Data*

Appendix E: Regional Analytical Data

Table E-1: Surface Water Quality Summary Statistics for Elk River Downstream of Sparwood (ECCC Monitoring Station BC08NK0004; February 3, 2009 to February 3, 2019)

Analyte	Unit	All Years Combined (February 3, 2009-2019)							
		Count	Minimum	Maximum	Median	Mean	Standard Deviation	Standard Error of the Mean	95% UCL
Total Hardness (Calcd.) CaCO <sub>3</sub>	mg/L	214	141.0	309	233	228	34.2	2.3	232.3
pH	-	214	7.9	8.5	8.3	8.3	0.1	0.01	8.3
Temperature (Water)	°C	214	-0.5	18.0	6.9	6.6	4.8	0.3	7.3
Fluoride	mg/L	86	0.1	0.2	0.2	0.2	0.02	0	0.2
Sulphate	mg/L	86	34.9	108	76.5	74.3	17.7	1.9	78.0
Sulphur	mg/L	99	8.1	31.6	22.8	21.0	5.9	0.6	22.2
Ammonia	mg/L	85	0.0	0.0	0.01	0.01	0	0	0.01
Nitrate (as N)	mg/L	1	1.3	1.3	1.3	1.3	-	-	-
Nitrite and Nitrate (as N)	mg/L	86	1.2	2.9	2.0	2.04	0.4	0.05	2.1
Nitrite and Nitrate (as N)	mg/L	120	0.0	0.0	0	0	0	0	0
Nitrogen Nitrite	mg/L	86	0.0	0.0	0	0	0	0	0
Nitrogen	mg/L	194	0.7	3.1	1.8	1.8	0.6	0.04	1.9
Nitrogen (Dissolved)	mg/L	213	0.6	3.0	1.8	1.8	0.6	0.04	1.9
Nitrogen (Kjeldahl)	mg/L	7	0.1	0.3	0.24	0.2	0.1	0.04	0.3
Nitrogen (Organic)	mg/L	3	0.1	0.1	0.09	0.09	0.01	0.01	0.1
Phosphorus	mg/L	207	0.0	0.3	0.01	0.02	0.04	0	0.0
Aluminum	µg/L	208	0.5	1200	10.7	63.4	155.6	10.8	84.6
Antimony	µg/L	208	0.1	0.2	0.08	0.08	0.02	0	0.09
Arsenic	µg/L	208	0.1	1.1	0.18	0.2	0.1	0.01	0.2
Barium	µg/L	208	56.6	135	82.6	81.9	11.8	0.8	83.5



Appendix E: Regional Analytical Data

Analyte	Unit	All Years Combined (February 3, 2009-2019)							
		Count	Minimum	Maximum	Median	Mean	Standard Deviation	Standard Error of the Mean	95% UCL
Beryllium	µg/L	208	0.0	0.1	0	0.01	0.02	0	0.01
Bismuth	µg/L	208	0.0	0.0	0	0	0	0	0
Boron	µg/L	208	4.1	11.9	7.5	7.6	1.3	0.09	7.8
Cadmium	µg/L	208	0.0	0.4	0.02	0.03	0.05	0	0.04
Cerium	µg/L	208	0.0	4.4	0.03	0.2	0.5	0.03	0.3
Cesium	µg/L	208	0.0	0.2	0.01	0.02	0.03	0	0.02
Chromium	µg/L	208	0.1	2.1	0.3	0.3	0.3	0.02	0.4
Cobalt	µg/L	208	0.0	1.4	0.03	0.09	0.2	0.01	0.11
Copper	µg/L	207	0.1	3.3	0.2	0.3	0.5	0.03	0.4
Gallium	µg/L	208	0.0	0.3	0.01	0.02	0.04	0	0.03
Iron	µg/L	208	1.2	2080	21.6	116.5	286.9	19.9	155.5
Lanthanum	µg/L	208	0.0	2.3	0.02	0.1	0.3	0.02	0.1
Lead	µg/L	208	0.0	2.1	0.02	0.12	0.3	0.02	0.2
Lithium	µg/L	208	3.7	11.5	7.0	7.1	1.6	0.1	7.3
Manganese	µg/L	208	0.6	129	2.8	8.8	17.5	1.2	11.1
Molybdenum	µg/L	208	0.6	1.4	1.1	1.1	0.2	0.01	1.1
Nickel	µg/L	208	0.2	5.5	0.6	0.8	0.7	0.05	0.9
Niobium	µg/L	208	0.0	0.0	0	0	0	0	0
Platinum	µg/L	208	0.0	0.0	0	0	0	0	0
Rubidium	µg/L	208	0.1	2.3	0.4	0.5	0.3	0.02	0.5
Selenium	µg/L	208	3.2	15.9	9.5	9.0	2.8	0.2	9.4
Silver	µg/L	208	0.0	0.1	0	0	0.01	0	0



Appendix E: Regional Analytical Data

Analyte	Unit	All Years Combined (February 3, 2009-2019)							
		Count	Minimum	Maximum	Median	Mean	Standard Deviation	Standard Error of the Mean	95% UCL
Strontium	µg/L	208	120.0	245	207.5	199.8	28.9	2.0	203.7
Thallium	µg/L	208	0.0	0.1	0.01	0.01	0.01	0	0.01
Tin	µg/L	208	0.0	0.0	0.01	0.01	0	0	0.01
Titanium	µg/L	63	0.1	5.1	0.09	0.42	0.9	0.1	0.6
Tungsten	µg/L	206	0.0	0.1	0.01	0.01	0	0	0.01
Uranium	µg/L	208	0.7	1.5	1.1	1.1	0.2	0.01	1.1
Vanadium	µg/L	208	0.1	3.7	0.2	0.4	0.5	0.04	0.4
Yttrium	µg/L	208	0.0	4.5	0.04	0.2	0.5	0.03	0.3
Zinc	µg/L	208	0.3	16.9	0.7	1.5	2.4	0.2	1.8

BOLD = median or mean is higher than total mean and median of all sampling results from the Crown Mountain water sampling program.

Dashed line "-" indicates statistic could not be calculated.

Appendix E: Regional Analytical Data

Table E-2: Surface Water Quality Summary Statistics for Elk River at Hwy 93 near Elko – Upstream of Lake Koocanusa (ECCC Monitoring Station BC08NK0003; February 3, 2009 to February 3, 2019)

Analyte	Unit	All Years Combined (February 3, 2009-2019)						
		Count	Minimum	Maximum	Median	Mean	Standard Deviation	95% UCL
Conventional Parameters								
Total Alkalinity (CaCO <sub>3</sub> )	mg/L	1	150	150	150	150	-	-
Total Hardness (Calcd.) CaCO <sub>3</sub>	mg/L	211	113	269	188	183.6	31.8	187.9
pH	-	211	7.9	8.6	8.3	8.3	0.1	8.3
Temperature (Water)	°C	211	-0.7	17.5	7	7.0	5.2	7.7
Major Ions								
Fluoride	mg/L	82	0.1	0.2	0.2	0.2	0.02	0.2
Sulphate	mg/L	82	22.1	65.7	53.0	48.8	12.7	51.5
Sulphur	mg/L	99	5.3	23.2	14.1	13.8	4.1	14.6
Nutrients								
Ammonia	mg/L	82	0.01	0.04	0.01	0.01	0.01	0.01
Nitrate (as N)	mg/L	1	0.8	0.8	0.8	0.8	-	-
Nitrite and Nitrate (as N)	mg/L	82	0.6	1.7	1.2	1.2	0.3	1.2
Nitrite and Nitrate (as N)	mg/L	81	0.6	1.7	1.2	1.2	0.3	1.2
Nitrogen Nitrite	mg/L	203	0	0.01	0	0	0	0
Nitrogen	mg/L	193	0.4	1.8	1.1	1.1	0.3	1.1
Nitrogen (Dissolved)	mg/L	210	0.3	1.8	1.1	1.1	0.31	1.1
Nitrogen (Kjeldahl)	mg/L	7	0.1	0.3	0.2	0.2	0.07	0.2
Nitrogen (Organic)	mg/L	3	0.1	0.1	0.08	0.08	0.02	0.1
Phosphorus	mg/L	206	0	0.4	0.01	0.03	0.06	0.04

Appendix E: Regional Analytical Data

Analyte	Unit	All Years Combined (February 3, 2009-2019)						
		Count	Minimum	Maximum	Median	Mean	Standard Deviation	95% UCL
Total Metals								
Aluminum	µg/L	206	4	2,380	42	187	369	238
Antimony	µg/L	207	0.04	0.15	0.07	0.07	0.02	0.08
Arsenic	µg/L	207	0.2	1.4	0.3	0.3	0.2	0.4
Barium	µg/L	207	58.8	146	92.1	91.4	13.5	93.3
Beryllium	µg/L	207	0	0.2	0	0.02	0.03	0.02
Bismuth	µg/L	207	0	0.03	0	0	0	0
Boron	µg/L	207	3.7	11	6.8	6.8	1.3	7.0
Cadmium	µg/L	207	0.01	0.4	0.02	0.04	0.06	0.04
Cerium	µg/L	207	0.01	5.5	0.1	0.5	1.0	0.62
Cesium	µg/L	207	0	0.3	0.01	0.04	0.06	0.05
Chromium	µg/L	207	0.2	3.5	0.25	0.43	0.5	0.5
Cobalt	µg/L	206	0.01	2.02	0.05	0.17	0.3	0.22
Copper	µg/L	207	0.05	4.8	0.3	0.6	0.8	0.71
Gallium	µg/L	206	0	0.7	0.02	0.05	0.1	0.07
Iron	µg/L	206	11	3,810	76	319	621	404
Lanthanum	µg/L	207	0.01	2.68	0.05	0.24	0.47	0.3
Lead	µg/L	207	0.01	4.32	0.07	0.31	0.63	0.4
Lithium	µg/L	207	3.1	8.4	5.7	5.6	1.1	5.8
Manganese	µg/L	207	1.0	176	4.5	16.1	30.0	20.2
Molybdenum	µg/L	206	0.4	1.6	1.0	0.9	0.2	0.9
Nickel	µg/L	207	0.1	6.9	0.5	0.8	1.0	0.9
Niobium	µg/L	207	0	0.02	0	0	0	0
Platinum	µg/L	206	0	0	0	0	0	0

Appendix E: Regional Analytical Data

Analyte	Unit	All Years Combined (February 3, 2009-2019)						
		Count	Minimum	Maximum	Median	Mean	Standard Deviation	95% UCL
Rubidium	µg/L	207	0.3	3.8	0.4	0.6	0.5	0.7
Selenium	µg/L	206	1.8	8.5	5.1	5.1	1.5	5.3
Silver	µg/L	207	0	0.07	0	0.01	0.01	0.01
Strontium	µg/L	207	95	249	177	168	34	172
Thallium	µg/L	207	0	0.08	0.01	0.01	0.01	0.01
Tin	µg/L	206	0.01	0.01	0.01	0.01	0	0.01
Titanium	µg/L	60	0.05	10	0.2	1	1.8	1.5
Tungsten	µg/L	206	0	0.05	0.01	0.01	0	0.01
Uranium	µg/L	207	0.5	1.1	0.8	0.8	0.2	0.8
Vanadium	µg/L	207	0.1	5.4	0.2	0.5	0.8	0.6
Yttrium	µg/L	207	0.01	4.2	0.08	0	0.7	0
Zinc	µg/L	206	0.2	28	0.7	2	4	3

BOLD = median or mean is higher than total mean and median of all sampling results from the Crown water sampling program

Dashed line "-" indicates statistic could not be calculated.

## **Appendix F**

### ***Field Blank and Trip Blank Analytical Results***



Lab Report Number	B240844	B252527	B262527	B265705	B276405	B283851	B297129	B2B4014	B2B4014	B306701	B314188	B322778	B331290	B341818	B351922	B361290	B376191	B388572	B399458
Field ID	F1	F1	TB2	F1	FB1	FB	FB	FB1	TB2	FB	FIELD BLANK	FIELD BLANK	FB1	FB1	FB1	FIELD BLANK	FB1	FB1	FB1
Sampled_Date/Time	6/14/2012 18:00	6/19/2012	8/18/2012	7/23/2012	8/25/2012	9/18/2012	10/25/2012				2/21/2013	3/20/2013	4/18/2013	5/24/2013	6/20/2013	7/17/2013	8/28/2013	9/26/2013	10/23/2013
Sample Type	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B

Chem_Group	ChemName	Units	EQ																			
Calculated Parameters	Alkalinity (Bicarbonate as CaCO3)	µg/l	1000																			
	Alkalinity (Carbonate as CaCO3)	µg/l	500																			
	Alkalinity (Hydroxide) as CaCO3	µg/l	1000																			
	Alkalinity (total) as CaCO3	µg/l	500	570	800	920	570	1340	820	<500	970	1380	840	730	930	630	900	860	<500	<500	580	510
	Sulphur (as S)	µg/l	500	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000
	Sulphur (as S) (Filtered)	µg/l	500	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000
	Hardness as CaCO3	µg/l	500																			
	Hardness as CaCO3 (Filtered)	µg/l	500	<500	610	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
	Bicarbonate	µg/l	500	700	990	1120	700	1640	1000	<500	1180	1680	1030	890	1140	770	1100	1050	<500	<500	710	620
	Carbonate	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
General Chemistry	Hydroxide	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500		
	phenolphthalein alkalinity	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500		
	Ammonia	µg/l	5	18	5.1	<5	200	<5	8.6	<5	<5	<5	8	5.7	<5	5.5	6.7	13	7.8	9	9.8	5.5
	Ammonia (as N)	µg/l	5																			
	Kjeldahl Nitrogen Total	µg/l	50																			
	Nitrate (as N)	µg/l	5	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
	Nitrate (as N) (Filtered)	µg/l	10																			
	Nitrate (as NO3-)	µg/l	20																			
	Nitrate (as NO3-) (Filtered)	µg/l	44																			
	Nitrate + Nitrite (as N)	µg/l	5.1	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
	Nitrite (as N)	µg/l	1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Nitrite (as N) (Filtered)	µg/l	10																			
	Nitrite (as NO2-) (Filtered)	µg/l	33																			
	Nitrogen (N)	µg/l	20																			
	Phosphorus	µg/l	2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Phosphorus (Filtered)	µg/l	2																			
	Ortho Phosphorus (as P)	µg/l	3	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Ortho Phosphorus (as P) (Filtered)	µg/l	1																			
	Electrical conductivity (lab)	µS/cm	1	1.1	1.3	1.2	1.1	1.4	1.1	1.3	<1	1.1	1.1	1.3	1.3	2	1.1	1	1.5	1.2	1.4	1.3
	Chloride	µg/l	500																			
Chloride (Filtered)	µg/l	500	<500	<500	<500	<500	<500	660	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
Fluoride	µg/l	10	<10	<10	<10	<10	<10	<10	<10	18	18	13	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Bromide	µg/l	3	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Bromide (Filtered)	µg/l	10																				
Dissolved Organic Carbon (Filtered)	µg/l	500														<500			<500	<500	<500	
Total Organic Carbon (TOC)	µg/l	500														<500			<500	<500	<500	
pH (Lab)	pH Unit	0.1	5.95	6.01	5.85	5.58	6.38	5.61	6.54	5.84	6.18	5.55	5.63	5.61	5.98	6.02	5.88	5.31	4.84	6.46	5.86	
Sulphate (SO4)	µg/l	300																				
Sulphate (SO4) (Filtered)	µg/l	500	<500	<500	<500	1440	<500	<500	<500	<500	<500	540	<500	<500	550	710	<500	570	740	<500	<500	
Hardness	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
Dissolved Hardness (Filtered)	µg/l	500																				
Total Suspended Solids (TSS)	µg/l	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	
Turbidity	NTU	0.1	0.21	0.15	<0.1	<0.1	<0.1	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	0.15	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Metals	Sulfur (Filtered)	µg/L	3000																			
	Aluminium	µg/L	0.2	0.55	1.34	0.43	2.34	0.34	0.49	0.37	0.26	1.62	0.37	0.67	0.5	0.34	0.6	0.72	0.93	4.78	<0.6	<0.5
	Aluminium (Filtered)	µg/l	0.2	0.56	0.97	0.29	1.45	0.56	0.44	0.88	0.37	0.62	0.62	0.38	0.67	0.24	<0.5	0.82	0.9	2.78	0.5	0.73
	Antimony	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Antimony (Filtered)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Arsenic	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Arsenic (Filtered)	µg/l	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Barium	µg/L	0.02	<0.02	0.022	<0.02	0.131	0.024	<0.02	0.021	0.033	0.033	<0.02	<0.02	<0.02	<0.02	0.038	<0.02	<0.02	0.154	<0.02	<0.02
	Barium (Filtered)	µg/L	0.02	0.043	0.024	<0.02	0.038	0.032	<0.02	0.04	0.032	<0.02	<0.02	<0.02	0.04	<0.02	0.023	0.152	0.024	0.023	<0.02	0.031
	Beryllium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Beryllium (Filtered)	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Bismuth	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Bismuth (Filtered)	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Boron	µg/L	10	<50	<50	<50	<50															







Lab Report Number Field ID Sampled Date/Time Sample Type			B3A8725	B3B8312	B407313	B416171	B424928	B432952	B439804	B442060	B444272	B446972	B449500	B474408	B476541	B479164	B481292	B483962	B499587	B4A9093	B4B5326	B505986		
			FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1
			11/21/2013 Field_B	12/23/2013 Field_B	1/28/2014 Field_B	2/27/2014 Field_B	3/28/2014 Field_B	4/26/2014 Field_B	5/16/2014 Field_B	5/23/2014 Field_B	5/30/2014 Field_B	6/6/2014 Field_B	8/13/2014 Field_B	8/22/2014 Field_B	9/5/2014 Field_B	9/11/2014 Field_B	10/30/2014 Field_B	11/28/2014 Field_B	12/18/2014 Field_B	1/23/2015 Field_B				
Metals	Magnesium	µg/l	5	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	Magnesium (Filtered)	µg/l	5	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	Manganese	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	0.065	<0.05	0.066	<0.05	<0.05	<0.05	0.165	<0.05	<0.05	<0.05	<0.05	<0.05	3.79	<0.05	<0.05	<0.05	
	Manganese (Filtered)	µg/L	0.05	0.064	<0.05	<0.05	<0.05	<0.05	<0.05	0.057	<0.05	<0.05	<0.05	0.063	<0.05	<0.05	<0.05	<0.05	<0.05	0.059	<0.05	<0.05	<0.05	
	Mercury	µg/L	0.002	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0076	0.0028	0.0027	<0.002	<0.002	<0.002	<0.002	<0.002	0.0033	
	Mercury (Filtered)	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0025	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0052	<0.002	<0.002	<0.002	<0.002	<0.002	
	Molybdenum	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Molybdenum (Filtered)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.092	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Nickel	µg/L	0.02	0.022	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.036	<0.02	0.037	0.082	0.038	<0.02	<0.02	<0.02	0.107	<0.02	0.035	<0.02	
	Nickel (Filtered)	µg/L	0.02	0.024	0.021	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.033	<0.02	0.03	<0.02	<0.02	0.07	<0.02	<0.02	0.027	<0.02	0.03	<0.02	
	Potassium	µg/l	10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	Potassium (Filtered)	µg/l	10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	Rubidium	µg/l	0.2																					
	Rubidium (Filtered)	µg/l	0.2																					
	Selenium	µg/l	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
	Selenium (Filtered)	µg/l	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
	Silicon	µg/L	50	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
	Silicon (Filtered)	µg/L	50	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
	Silver	µg/l	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
	Silver (Filtered)	µg/l	0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
	Sodium	µg/l	10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	Sodium (Filtered)	µg/l	10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	Strontium	µg/l	0.05	0.141	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Strontium (Filtered)	µg/l	0.05	0.182	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Tellurium	µg/l	0.2																					
	Tellurium (Filtered)	µg/l	0.2																					
	Thallium	µg/l	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
	Thallium (Filtered)	µg/l	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
	Thorium	µg/l	0.1																					
	Thorium (Filtered)	µg/l	0.1																					
	Tin	µg/l	0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.38	<0.2	<0.2	<0.2	<0.2	
	Tin (Filtered)	µg/l	0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.24	<0.2	<0.2	<0.2	<0.2	
	Titanium	µg/L	0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Titanium (Filtered)	µg/L	0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Tungsten	µg/l	0.1																					
	Tungsten (Filtered)	µg/l	0.1																					
	Uranium	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
	Uranium (Filtered)	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
	Vanadium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
	Vanadium (Filtered)	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
	Zinc	µg/L	0.1	0.83	0.16	<0.1	0.23	0.16	<0.1	0.19	0.41	0.35	<0.1	0.66	0.12	0.18	<0.1	<0.1	0.35	0.22	<0.1	<0.1	<0.1	
	Zinc (Filtered)	µg/L	0.1	<0.1	<0.1	<0.1	0.12	0.13	<0.1	<0.1	0.34	<0.1	0.34	<0.1	0.11	0.11	<0.1	<0.1	0.62	0.3	0.14	<0.1	<0.1	
	Zirconium	µg/L	0.06	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
	Zirconium (Filtered)	µg/L	0.06	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Physical Properties	Filter and Presene	-	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	
Polycyclic Aromatic Hydrocarbons (PAHs)	1-Methylnaphthalene	µg/L	0.05																					
	2-Methylnaphthalene	µg/L	0.02			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
	Acenaphthene	µg/L	0.01		</																			

Lab Report Number	B533584	B540628	B542667	B545672	B545872	B547761	B549906	B563471	B572516	B576103	B577658	B579637	B582068	B537198	L2133661	L2196291	L2240836	L2295044	B240844	B240844	
Field ID	FB1	FB1	FB1	FB1	TB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB1	FB	FB	FB	FB	TRIP BLANK 1	TRIP BLANK 2	
Sampled Date/Time	4/24/2015	5/14/2015	5/21/2015	5/29/2015	6/29/2015	6/4/2015	6/12/2015	7/23/2015	8/20/2015	8/27/2015	9/3/2015	9/10/2015	9/17/2015	5/13/2016	7/20/2018	11/9/2018	3/6/2019	8/18/2019	5/17/2012	6/17/2012	
Sample Type	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Field_B	Trip_B	Trip_B	
Chem_Group	ChemName	Units	EQL																		
Calculated Parameters	Alkalinity (Bicarbonate as CaCO3)	µg/l	1000																		
	Alkalinity (Carbonate as CaCO3)	µg/l	500																		
	Alkalinity (Hydroxide) as CaCO3	µg/l	1000																		
	Alkalinity (total) as CaCO3	µg/l	500	870	720	<500	1000	<500	970	<500	860	<500	920	1070	960	<500	650	<1000	<1000	<1000	<1000
	Sulphur (as S)	µg/l	500	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<500	<500	<500	<500
	Sulphur (as S) (Filtered)	µg/l	500	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<500	<500	<500	<500
	Hardness as CaCO3	µg/l	500																		
	Hardness as CaCO3 (Filtered)	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
	General Chemistry	Bicarbonate	µg/l	500	1060	880	<500	1220	<500	1180	<500	1050	<500	1120	1310	1170	<500	790			
		Carbonate	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500			
Hydroxide		µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500				
phenolphthalein alkalinity		µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500				
Ammonia		µg/l	5	<5	11	6.6	<5	6.7	<5	15	9.7	8.3	<5	<5	9.9	13	<5				
Ammonia (as N)		µg/l	5																		
Kjeldahl Nitrogen Total		µg/l	50																		
Nitrate (as N)		µg/l	5	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<5	<5	<5	<5
Nitrate (as N) (Filtered)		µg/l	10																		
Nitrate (as NO3-)		µg/l	20																		
Nitrate (as NO3-) (Filtered)		µg/l	44																		
Nitrate + Nitrite (as N)		µg/l	5.1	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<5.1	<5.1	<5.1	<5.1
Nitrite (as N)		µg/l	1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<1	<1	<1	<1
Nitrite (as N) (Filtered)		µg/l	10																		
Nitrite (as NO2-) (Filtered)		µg/l	33																		
Nitrogen (N)		µg/l	20																		
Phosphorus		µg/l	2	<5	<2	<5	<5	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	<50	<50
Phosphorus (Filtered)		µg/l	2																		
Ortho Phosphorus (as P)		µg/l	3	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Ortho Phosphorus (as P) (Filtered)		µg/l	1																		
Electrical conductivity (lab)	µS/cm	1	1.2	1.2	1.4	1.7	1.2	1.1	1.3	1.1	1.8	1.5	1.1	1.2	1.3	1	<2	<2	<2	<2	
Chloride	µg/l	500																			
Chloride (Filtered)	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	550	<500						
Fluoride	µg/l	10	<10	16	<10	14	<10	<10	<10	<10	<10	<10	<10	<10	12	<20	<20	<20	<20		
Bromide	µg/l	3	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<50	<50	<50		
Bromide (Filtered)	µg/l	10																			
Dissolved Organic Carbon (Filtered)	µg/l	500	<500	<500	<500	<500	<500	870	<500	<500	<500	<500	<500	590	<500	<500	<500	<500	<500		
Total Organic Carbon (TOC)	µg/l	500	<500	590	550	<500	<500	770	<500	<500	<500	<500	<500	540	<500	<500	<500	<500	<500		
pH (Lab)	pH Unit	0.1	8.08	5.97	6.2	5.79	6.15	5.92	6.17	6.15	5.67	6.29	5.78	6.11	5.78	5.81	5.39	5.51	5.49		
Sulphate (SO4)	µg/l	300																			
Sulphate (SO4) (Filtered)	µg/l	500	<500	<500	<500	<500	<500	880	600	<500	<500	<500	<500	680	<500						
Hardness	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500						
Dissolved Hardness (Filtered)	µg/l	500																			
Total Suspended Solids (TSS)	µg/l	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<3000	<3000	<3000	<3000		
	Turbidity	NTU	0.1	0.17	0.16	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Metals	Sulfur (Filtered)	µg/L	3000																		
	Aluminium	µg/L	0.2	2.34	1.23	5.49	<0.5	<0.5	8.45	<0.5	0.67	0.6	0.74	1.69	2.14	0.55	<0.5	<3	<3		
	Aluminium (Filtered)	µg/L	0.2	<0.5	<0.5	0.56	<0.5	<0.5	<0.5	0.6	2.7	<0.5	4.89	0.77	2.85	0.71	0.61	<1	<1		
	Antimony	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.1	<0.1		
	Antimony (Filtered)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.1	<0.1		
	Arsenic	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.1	<0.1		
	Arsenic (Filtered)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.1	<0.1		
	Barium	µg/L	0.02	<0.02	<0.02	0.023	<0.02	<0.02	0.067	<0.02	<0.02	<0.02	<0.02	0.023	0.029	<0.02	<0.02	<0.1	<0.1		
	Barium (Filtered)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.115	0.024	0.026	<0.02	<0.02	<0.1	0.57		
	Beryllium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1		
	Beryllium (Filtered)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1		
	Bismuth	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.05	<0.05		
	Bismuth (Filtered)	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.05	<0.05		
	Boron	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		
	Boron (Filtered)	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		
	Cadmium	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	0.0096	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
	Cadmium (Filtered)	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
	Calcium	µg/L	10	<50	<50	<50	<50	54	<50	<50	<50	&lt									







Lab Report Number	B262627	B265706	B265706	B276408	B276408	B283851	B283851	B297129	B297129	B2A7294	B2A7294	B2B4014	B306701	B306701	B314188	B322778	B322778	B331290	B341818	B341818				
Field ID	TB1	TB1	TB2	TB1	TB2	TB1	TB1A	TRIP BLANK 1	TRIP BLANK 2	TB1	TB2	TB1	TB1A	TRIP BLANK	TRIP BLANK	TRIP BLANK A	TRIP BLANK	TRIP BLANK 1	TRIP BLANK 1	TRIP BLANK 2				
Sample Type	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B			
<b>Chem Group</b>	<b>ChemName</b>	<b>Units</b>	<b>EQL</b>																					
Calculated Parameters	Alkalinity (Bicarbonate as CaCO3)	µg/l	1000																					
	Alkalinity (Carbonate as CaCO3)	µg/l	500																					
	Alkalinity (Hydroxide) as CaCO3	µg/l	1000																					
	Alkalinity (total) as CaCO3	µg/l	500	980	1390	870	<500	1120	720	1160	<500	<500	1280	950	610	<500	950	<500	690	<500	<500	600	<500	
	Sulphur (as S)	µg/l	500	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	
	Sulphur (as S) (Filtered)	µg/l	500	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	
	Hardness as CaCO3	µg/l	500																					
	Hardness as CaCO3 (Filtered)	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
	General Chemistry	Bicarbonate	µg/l	500	1200	1700	1060	<500	1370	880	1420	<500	<500	1560	1160	750	<500	1160	<500	840	<500	<500	730	<500
		Carbonate	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Hydroxide		µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
phenolphthalein alkalinity		µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
Ammonia		µg/l	5	<5	130	130	<5	<5	9.7	7.6	<5	<5	<5	<5	11	<5	<5	8.2	14	13	21	11		
Ammonia (as N)		µg/l	5																					
Kjeldahl Nitrogen Total		µg/l	50																					
Nitrate (as N)		µg/l	5	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Nitrate (as N) (Filtered)		µg/l	10																					
Nitrate (as NO3-)		µg/l	20																					
Nitrate (as NO3-) (Filtered)		µg/l	44																					
Nitrate + Nitrite (as N)		µg/l	5.1	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Nitrite (as N)		µg/l	1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Nitrite (as N) (Filtered)		µg/l	10																					
Nitrite (as NO2-) (Filtered)		µg/l	33																					
Nitrogen (N)		µg/l	20																					
Phosphorus		µg/l	2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Phosphorus (Filtered)		µg/l	2																					
Ortho Phosphorus (as P)		µg/l	3	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ortho Phosphorus (as P) (Filtered)		µg/l	1																					
Electrical conductivity (lab)	µS/cm	1	1.9	1.4	1.5	1.1	1.5	1.1	1.3	1.3	1.4	1.7	1.3	1.2	1.2	1.5	1.2	1.3	1.2	1.7	1.2	1.2	1.2	
Chloride	µg/l	500																						
Chloride (Filtered)	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	520	<500	610	<500	<500	<500	<500	<500	500		
Fluoride	µg/l	10	<10	<10	<10	<10	<10	<10	11	13	<10	<10	19	12	15	<10	<10	<10	<10	<10	<10	<10	<10	
Bromide	µg/l	3	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Bromide (Filtered)	µg/l	10																						
Dissolved Organic Carbon (Filtered)	µg/l	500																						
Total Organic Carbon (TOC)	µg/l	500																						
pH (Lab)	pH Unit	0.1	5.98	6.13	6.36	5.96	6.38	5.48	5.98	5.43	5.44	6.33	6	6.21	5.5	6.01	5.24	5.55	5.24	5.82	5.41	4.91		
Sulphate (SO4)	µg/l	300																						
Sulphate (SO4) (Filtered)	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	620	<500	<500	<500	<500	<500	<500	
Hardness	µg/l	500	<500	<500	<500	710	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
Dissolved Hardness (Filtered)	µg/l	500																						
Total Suspended Solids (TSS)	µg/l	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	
Turbidity	NTU	0.1	<0.1	<0.1	<0.1	0.13	<0.1	<0.1	<0.1	<0.1	<0.1	0.14	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Metals	Sulfur (Filtered)	µg/L	3000																					
	Aluminum	µg/L	0.2	0.45	1.1	<0.2	2.43	3.69	3.37	3.66	0.87	1.63	3.7	0.58	2.26	0.8	0.51	0.35	0.42	<0.2	0.62	0.76	0.74	
	Aluminum (Filtered)	µg/l	0.2	0.24	1.4	1.83	<0.2	<0.2	2.19	2.32	1.5	2.23	0.28	0.54	3.67	0.5	0.56	0.44	0.36	0.95	1.18			
	Antimony	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Antimony (Filtered)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Arsenic	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Arsenic (Filtered)	µg/l	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Barium	µg/L	0.02	<0.02	<0.02	0.033	0.104	0.21	<0.02	0.021	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Barium (Filtered)	µg/L	0.02	<0.02	<0.02	0.021	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Beryllium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Beryllium (Filtered)	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Bismuth	µg/L	0.005	<0.005	<0.005	<0.005																		





Lab Report Number	B362218	B361929	B376651	B399472	B3A8725	B3B8312	B416171	B424928	B432962	B439804	B442060	B444272	B446972	B449500	B464009	B464009	B474408	B476541	B479164	B481292	B483962				
Field ID	TB1	TRAVEL BLANK	TRIP BLANK	TRIP BLANK	TRIP BLANK	TRIP BLANK	TB1	TB1	TB1	TB1	TB1	TB1	TRIP BLANK	TB1	FB1	TB1	TB1	TB1	TB1	TB1	TB1				
Sample Type	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B				
Sample Date/Time			8/27/2013	10/24/2013							5/23/2014				7/24/2014	7/24/2014	8/22/2014		9/5/2014	9/11/2014					
Chem_Group	ChemName	Units	EGL																						
Calculated Parameters	Alkalinity (Bicarbonate as CaCO3)	ug/l	1000																						
	Alkalinity (Carbonate as CaCO3)	ug/l	600																						
	Alkalinity (Hydroxide) as CaCO3	ug/l	1000																						
	Alkalinity (total) as CaCO3	ug/l	500	<500	<500	530	510	880	<500	940	<500	630	<500	<500	900	<500	<500	830	820	<500	720	860	810	<500	
	Sulphur (as S)	ug/l	500	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000
	Sulphur (as S) (Filtered)	ug/l	600	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000
	Hardness as CaCO3	ug/l	600																						
	Hardness as CaCO3 (Filtered)	ug/l	500	<500	<500	<500	<500	560	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
	General Chemistry	Bicarbonate	ug/l	500	<500	<500	650	620	1070	<500	1150	<500	770	<500	<500	1100	<500	<500	1010	1000	<500	880	1050	990	<500
		Carbonate	ug/l	600	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Hydroxide		ug/l	600	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
phenolphthalein alkalinity		ug/l	600	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
Ammonia		ug/l	5	22	18	22	18	22	9.9	9.7	28	12	<5	24	27	<5	33	8.6	8.2	24	27	26	16	7.5	
Ammonia (as N)		ug/l	5																						
Kjeldahl Nitrogen Total		ug/l	50																						
Nitrate (as N)		ug/l	5	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Nitrate (as N) (Filtered)		ug/l	10																						
Nitrate (as NO3-)		ug/l	20																						
Nitrate (as NO3-) (Filtered)		ug/l	44																						
Nitrate + Nitrite (as N)		ug/l	5.1	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Nitrite (as N)		ug/l	1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Nitrite (as N) (Filtered)		ug/l	10																						
Nitrite (as NO2-) (Filtered)		ug/l	33																						
Nitrogen (N)		ug/l	20																						
Phosphorus		ug/l	2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Phosphorus (Filtered)		ug/l	2																						
Ortho Phosphorus (as P)		ug/l	3	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ortho Phosphorus (as P) (Filtered)		ug/l	1																						
Electrical conductivity (lab)	uS/cm	1	1.2	1.4	1.5	1.6	1.2	1.3	1.7	1.3	1.7	1.1	1.2	1.5	1.1	1.1	<1	1.1	1.1	1.2	1.2	1.3	1.1	1.1	
Chloride	ug/l	600																							
Chloride (Filtered)	ug/l	600	<600	<600	<600	<600	<600	<600	660	<600	<600	<600	<600	760	<600	<600	<600	<600	<600	<600	<600	<600	<600	<600	
Fluoride	ug/l	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Bromide	ug/l	3	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Bromide (Filtered)	ug/l	10																							
Dissolved Organic Carbon (Filtered)	ug/l	600	<500	<500	<500	<500	<500	<500	<500	630	<500	<500	1060	<500	<500	<500	<500	<500	<500	<500	<500	650	880	880	
Total Organic Carbon (TOC)	ug/l	600	<500	<500	740	510	<500	<500	<500	<500	<500	<500	660	<500	<500	<500	<500	<500	<500	<500	<500	990	<500	<500	
pH (Lab)	pH Unit	0.1	6.15	6.07	5.98	5.96	5.46	5.4	6.25	5.3	6.36	5.73	5.92	6.23	6.1	5.77	5.89	5.94	5.35	5.83	5.89	5.88	5.88	5.88	
Sulphate (SO4)	ug/l	300																							
Sulphate (SO4) (Filtered)	ug/l	500	980	530	570	620	<500	<500	<500	<500	<500	600	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
Hardness	ug/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
Dissolved Hardness (Filtered)	ug/l	600																							
Total Suspended Solids (TSS)	ug/l	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	
Turbidity	NTU	0.1	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Metals	Sulfur (Filtered)	ug/L	3000																						
	Aluminium	ug/L	0.2	<0.5	<0.5	0.63	1.16	1.23	22	<0.5	<0.5	1.04	1.88	1.07	1.22	<0.5	0.51	<0.5	<0.5	0.81	1.24	0.73	0.94	0.94	
	Aluminium (Filtered)	ug/l	0.2	<0.5	<0.5	0.89	1.04	14.1	0.84	<0.5	<0.5	0.95	1.7	1.18	1.21	<0.5	3.05	<0.5	<0.5	1.13	1.33	0.58	0.86	0.86	
	Antimony	ug/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Antimony (Filtered)	ug/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Arsenic	ug/l	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Arsenic (Filtered)	ug/l	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Barium	ug/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Barium (Filtered)	ug/L	0.02	0.032	<0.02	<0.02	<0.02																		



Lab Report Number	B499667	B4A9083	B4B5326	B505986	B533684	B540628	B542667	B547761	B549906	B572515	B579637	B582068	B637198
Field ID	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1
Sampled_Date/Time	10/30/2014	11/28/2014	12/18/2014	1/23/2015	4/24/2015	5/15/2015	6/21/2015		8/13/2015	8/21/2015	9/11/2015	9/18/2015	5/13/2016
Sample Type	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B	Trip_B

Chem_Group	ChemName	Units	EGL													
Calculated Parameters	Alkalinity (Bicarbonate as CaCO3)	µg/l	1000													
	Alkalinity (Carbonate as CaCO3)	µg/l	500													
	Alkalinity (Hydroxide) as CaCO3	µg/l	1000													
	Alkalinity (total) as CaCO3	µg/l	500	780	510	680	<500	610	750	<500	<500	780	630	740	<500	<500
	Sulphur (as S)	µg/l	500	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000
	Sulphur (as S) (Filtered)	µg/l	500	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000
General Chemistry	Hardness as CaCO3	µg/l	500													
	Hardness as CaCO3 (Filtered)	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
	Bicarbonate	µg/l	500	950	620	890	<500	740	920	<500	<500	950	770	900	<500	<500
	Carbonate	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
	Hydroxide	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
	phenolphthalein alkalinity	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
	Ammonia	µg/l	5	39	<5	14	6.6	12	18	<5	<5	<5	8.4	7.8	6.9	<5
	Ammonia (as N)	µg/l	5													
	Kjeldahl Nitrogen Total	µg/l	50													
	Nitrate (as N)	µg/l	5	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
	Nitrate (as N) (Filtered)	µg/l	10													
	Nitrate (as NO3-)	µg/l	20													
	Nitrate (as NO3-) (Filtered)	µg/l	44													
	Nitrate + Nitrite (as N)	µg/l	5.1	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
	Nitrite (as N)	µg/l	1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Nitrite (as N) (Filtered)	µg/l	10													
	Nitrite (as NO2-) (Filtered)	µg/l	33													
	Nitrogen (N)	µg/l	20													
	Phosphorus	µg/l	2	<5	<5	<5	<5	<2	<2	<2	<5	<2	<2	<2	<2	<2
	Phosphorus (Filtered)	µg/l	2													
	Ortho Phosphorus (as P)	µg/l	3	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Ortho Phosphorus (as P) (Filtered)	µg/l	1													
	Electrical conductivity (lab)	µS/cm	1	1.2	1.5	1.3	1.6	1.3	1.3	1.2	1.2	1.3	<1	1	1.8	1.3
	Chloride	µg/l	500													
Chloride (Filtered)	µg/l	500	<500	640	960	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
Fluoride	µg/l	10	<10	<10	<10	<10	<10	15	<10	<10	<10	<10	<10	<10	13	
Bromide	µg/l	3	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Bromide (Filtered)	µg/l	10														
Dissolved Organic Carbon (Filtered)	µg/l	500	<500	760	<500	<500	<500	<500	<500	<500	900	<500	<500	<500	<500	
Total Organic Carbon (TOC)	µg/l	500	<500	<500	<500	<500	640	<500	<500	<500	590	<500	<500	<500	<500	
pH (Lab)	pH Unit	0.1	5.85	6.09	5.81	5.36	5.99	6.13	6.12	5.05	6.04	5.45	6.01	5.83		
Metals	Sulphate (SO4)	µg/l	300													
	Sulphate (SO4) (Filtered)	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	750	500	
	Hardness	µg/l	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
	Dissolved Hardness (Filtered)	µg/l	500													
	Total Suspended Solids (TSS)	µg/l	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	
	Turbidity	NTU	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
	Sulfur (Filtered)	µg/L	3000													
	Aluminum	µg/L	0.2	3.02	1.12	0.71	0.79	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.86	0.74
	Aluminum (Filtered)	µg/l	0.2	2.75	0.82	1.39	0.79	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Antimony	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Antimony (Filtered)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Arsenic	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Arsenic (Filtered)	µg/l	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Barium	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Barium (Filtered)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.047	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
	Beryllium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Beryllium (Filtered)	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Bismuth	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Bismuth (Filtered)	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Boron	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Boron (Filtered)	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Cadmium	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Cadmium (Filtered)	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Calcium	µg/l	10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Calcium (Filtered)	µg/l	10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
Cesium	µg/l	0.01														
Cesium (Filtered)	µg/l	0.01														
Chromium Total (III+VI)	µg/l	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Chromium Total (III+VI) (Filtered)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Cobalt	µg/l	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt (Filtered)	µg/l	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Copper	µg/L	0.05	<0.05	0.071	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Copper (Filtered)	µg/L	0.05	0.089	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.059	<0.05	
Iron	µg/L	1	<1	<1	1	1.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Iron (Filtered)	µg/L	1	<1	<1	1.6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Lead	µg/l	0.005	<0.005	0.0094	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Lead (Filtered)	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Lithium	µg/L	0.5	<0.5	<0.5	<0.5											



	Lab Report Number Field ID Sampled_Date/Time Sample Type		B499667	B4A9083	B4B5326	B505986	B533684	B540628	B542667	B547761	B549906	B572515	B579637	B582068	B637198		
			TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1	TB1
			10/30/2014 Trip_B	11/28/2014 Trip_B	12/18/2014 Trip_B	1/23/2015 Trip_B	4/24/2015 Trip_B	5/15/2015 Trip_B	6/21/2015 Trip_B	6/13/2015 Trip_B	8/21/2015 Trip_B	9/11/2015 Trip_B	9/18/2015 Trip_B	5/13/2016 Trip_B			
Metals	Magnesium	µg/l	5	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50		
	Magnesium (Filtered)	µg/l	5	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50		
	Manganese	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.061	<0.05	<0.05	<0.05	<0.05		
	Manganese (Filtered)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
	Mercury	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
	Mercury (Filtered)	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
	Molybdenum	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
	Molybdenum (Filtered)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
	Nickel	µg/L	0.02	<0.02	<0.02	0.038	<0.02	<0.02	<0.02	<0.02	<0.02	0.038	<0.02	<0.02	<0.02	<0.02	
	Nickel (Filtered)	µg/L	0.02	<0.02	0.225	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
	Potassium	µg/l	10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	Potassium (Filtered)	µg/l	10	<50	<50	<50	<50	<100	<50	<50	<50	<50	<50	<50	<50	<50	
	Rubidium	µg/l	0.2														
	Rubidium (Filtered)	µg/l	0.2														
	Selenium	µg/l	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
	Selenium (Filtered)	µg/l	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
	Silicon	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	Silicon (Filtered)	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	Silver	µg/l	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
	Silver (Filtered)	µg/l	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Sodium	µg/l	10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50		
Sodium (Filtered)	µg/l	10	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50		
Strontium	µg/l	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Strontium (Filtered)	µg/l	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Tellurium	µg/l	0.2															
Tellurium (Filtered)	µg/l	0.2															
Thallium	µg/l	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
Thallium (Filtered)	µg/l	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
Thorium	µg/l	0.1															
Thorium (Filtered)	µg/l	0.1															
Tin	µg/l	0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		
Tin (Filtered)	µg/l	0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		
Titanium	µg/L	0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Titanium (Filtered)	µg/L	0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Tungsten	µg/l	0.1															
Tungsten (Filtered)	µg/l	0.1															
Uranium	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
Uranium (Filtered)	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002		
Vanadium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		
Vanadium (Filtered)	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		
Zinc	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.16	0.32		
Zinc (Filtered)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	0.12		
Zirconium	µg/L	0.06	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Zirconium (Filtered)	µg/L	0.06	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
Physical Properties	Filter and Preserve	-	999	999	999	999	999				999	999	999	999			
Polycyclic Aromatic Hydrocarbons (PAHs)	1-Methylnaphthalene	µg/L	0.05														
	2-Methylnaphthalene	µg/L	0.02														
	Acenaphthene	µg/L	0.01														
	Acenaphthylene	µg/L	0.01														
	Acridine	µg/L	0.01														
	Anthracene	µg/l	0.01														
	Benzo(a)anthracene	µg/L	0.01														
	Benzo(a)pyrene	µg/l	0.005														
	Benzo(b+g)fluoranthene	µg/l	0.01														
	Benzo(b+k)fluoranthene	µg/l	0.015														
	Benzo(g,h,i)perylene	µg/L	0.01														
	Benzo(k)fluoranthene	µg/l	0.01														
	Chrysene	µg/L	0.01														
	Dibenz(a,h)anthracene	µg/l	0.003														
	Fluorenone	µg/L	0.01														
	Fluorene	µg/l	0.01														
	Indeno(1,2,3-c,d)pyrene	µg/L	0.01														
Naphthalene	µg/L	0.02															
Phenanthrene	µg/L	0.02															
Pyrene	µg/L	0.01															
Quinoline	µg/l	0.02															
Light Molecular Weight (PAH Sum)	µg/L	0.1															
Heavy Molecular Weight (PAH Sum)	µg/L	0.05															
PAHs (Sum of total)	µg/L	0.1															



## Appendix G

### *Field Duplicate Relative Percent Difference Calculations*

Field Duplicates (water)  
Filter: ALL

Lab Report Number	B240844	B240844	RPD	B283851	B283851	RPD	B283851	B283851	RPD	B297129	B297129	RPD	B297129	B297129	RPD	B306701	B306701	RPD	B306701	B306701	RPD	B314188	B314188	RPD			
Field ID	M1	M1-DUP		G1	G1-DUP		M1	M1-DUP		A2	A2-DUP		G2	G2-DUP		A1	A1-DUP		G2	G2-DUP		H1	H1-DUP				
Sampled Date/Time	5/14/2012	5/14/2012		9/18/2012	9/18/2012		9/18/2012	9/18/2012		10/24/2012	10/24/2012		10/25/2012	10/25/2012		1/24/2013	1/24/2013		1/25/2013	1/25/2013		2/21/2013	2/21/2013				
Number of RPDs over standard range	6			8			8			3			3			3			3			3					
<b>Chemical</b>	<b>Chemical Name</b>	<b>Units</b>	<b>EQL</b>																								
Calculated	Alkalinity (Bicarbonate as CaCO3)	ug/l	1000																								
	Alkalinity (Carbonate as CaCO3)	ug/l	500							1310	<500	90	1280	<500	88												
	Alkalinity (Carbonate as CaCO3)	ug/l	1000																								
	Alkalinity (Hydroxide) as CaCO3	ug/l	1000																								
	Alkalinity (total) as CaCO3	ug/l	500	82400	81800	1	133000	132000	1	153000	150000	2	141000	139000	1	161000	160000	1	155000	154000	1	157000	160000	2	185000	184000	1
	Alkalinity (total) as CaCO3	ug/l	1000																								
	Sulphur (as S)	ug/l	500																								
	Sulphur (as S)	ug/l	3000																								
	Sulphur (as S)	ug/l	2000							<10000	<10000	0	<10000	<10000	0	5800	6500	11	10100	10500	4	50900	50700	0			
	Sulphur (as S)	ug/l	15000																								
	Sulphur (as S)	ug/l	10000	<10000	<10000	0	<10000	<10000	0	28000	29000	4															
	Sulphur (as S) (Filtered)	ug/l	500																								
	Sulphur (as S) (Filtered)	ug/l	3000																								
	Sulphur (as S) (Filtered)	ug/l	2000							<10000	<10000	0	<10000	<10000	0	5800	5000	15	9800	10600	8	48100	48900	2			
	Sulphur (as S) (Filtered)	ug/l	10000	<10000	<10000	0	<10000	<10000	0	26000	29000	11															
	Hardness as CaCO3	ug/l	500																								
	Hardness as CaCO3 (Filtered)	ug/l	500	102000	102000	0	153000	140000	9	233000	212000	9															
	Parameters																										
	Physical Properties																										
	Filter and Preserve			999	999	0	999	999	0	999	999	0	999	999	0	999	999	0	999	999	0	999	999	0	999		
	General Chemistry																										
	Bicarbonate	ug/l	500	101000	99800	1							169000	170000	1	194000	195000	1	189000	188000	1	192000	195000	2	221000	224000	1
	Carbonate	ug/l	500	<500	<500	0							1570	<500	103	1540	<500	102	<500	<500	0	<500	<500	0	1960	650	100
	Hydroxide	ug/l	500	<500	<500	0							<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0
	phenolphthalein alkalinity	ug/l	500	<500	<500	0	<500	<500	0	2100	900	80	<1310	<500	90	1280	<500	88	<500	<500	0	<500	<500	0	1630	540	100
	Ammonia	ug/l	5	18	21	15	9.5	12	23	22	22	0	18	9.9	58	6.8	27	120	11	17	43	26	9	97	18	14	25
	Ammonia (as N)	ug/l	5																								
	Kjeldahl Nitrogen Total	ug/l	50																								
	Nitrate (as N)	ug/l	5																								
	Nitrate (as N)	ug/l	20	109	99	10	<20	<20	0	243	241	1															
	Nitrate (as NO3-)	ug/l	20										48	47	2	59	63	7									
	Nitrate + Nitrite (as N)	ug/l	5.1																								
	Nitrate + Nitrite (as N)	ug/l	20	109	107	2	<20	<20	0	243	241	1	48	47	2	59	63	7	45	51	13	108	99	9	863	874	1
	Nitrite (as N)	ug/l	5	<5	7.8	44	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0
	Nitrite (as N)	ug/l	1																								
	Nitrogen (N)	ug/l	20										48	47	2	59	63	7									
	Phosphorus	ug/l	50																								
	Phosphorus	ug/l	5 : 50 (Dupe)																								
	Phosphorus	ug/l	5	94.3	109	14	16.9	17.3	2	<5	<5	0	<5	<5	0	<5	<5	0	6	7.2	18	5.7	5.9	3	7.7	7.4	4
	Phosphorus	ug/l	2																								
	Phosphorus (Filtered)	ug/l	50																								
	Ortho Phosphorus (as P)	ug/l	5	19.4	20.1	4	13.7	12.8	7	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0
	Ortho Phosphorus (as P) (Filtered)	ug/l	1																								
	Electrical conductivity (lab)	uS/cm	2																								
	Electrical conductivity (lab)	uS/cm	1	206	202	2	292	297	2	434	436	0	292	293	0	350	350	0	322	325	1	349	353	1	622	622	0
	Chloride	ug/l	500																								
	Chloride (Filtered)	ug/l	500	1400	1500	7	970	590	49	2300	1600	36	<500	<500	0	700	720	3	1500	1600	6	1000	1000	0	1600	1200	29
	Fluoride	ug/l	20																								
	Fluoride	ug/l	10	100	110	10	95	100	5	130	140	7	180	180	0	230	230	0	150	150	0	230	230	0	270	270	0
	Bromide	ug/l	50																								
	Bromide	ug/l	10 : 100 (Dupe)																								
	Bromide	ug/l	10	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0
	Dissolved Organic Carbon (Filtered)	ug/l	500																								
	Total Organic Carbon (TOC)	ug/l	500																								
	pH (Lab)	pH Unit	0.1																								
	pH (Lab)	pH Unit		7.97	8.02	1	8.14	8.3	2	8.36	8.33	0	8.36	8.31	1	8.34	8.11	3	8.16	8.19	0	8.08	8.2	1	8.33	8.31	0
	Sulphate (SO4)	ug/l	300																								
	Sulphate (SO4) (Filtered)	ug/l	500	20500	20000	2	21600	22200	3	73300	75100	2	15300	14700	4	27600	27900	1	16400	16000	2	26900	27300	1	145000	144000	1
	Hardness	ug/l	500	104000	106000	2	140000	159000	13	209000	250000	18	151000	153000	1	178000	181000	2	167000	164000	2	178000	180000	1	340000	333000	2
	Dissolved Hardness (Filtered)	ug/l	500																								
	Total Suspended Solids (TSS)	ug/l	5000 : 4000 (Dupe)																								
	Total Suspended Solids (TSS)	ug/l	3000																								
	Total Suspended Solids (TSS)	ug/l	20000																								
	Total Suspended Solids (TSS)	ug/l	1000 : 2000 (Dupe)																								
	Total Suspended Solids (TSS)	ug/l	1000	44800	47200	5	1900	1600	17	1200	1600	29	<1000	<1000	0	<1000	<1000	0	1900	1900	0	<1000	<1000	0	2800	2700	4

Field Duplicates (water)  
Filter: ALL

Lab Report Number		B240844	B240844	RPD	B283851	B283851	RPD	B283851	B283851	RPD	B297129	B297129	RPD	B297129	B297129	RPD	B306701	B306701	RPD	B306701	B306701	RPD	B314188	B314188	RPD	
Field ID		M1	M1-DUP		G1	G1-DUP		M1	M1-DUP		A2	A2-DUP		G2	G2-DUP		A1	A1-DUP		G2	G2-DUP		H1	H1-DUP		
Sampled Date/Time		5/14/2012	5/14/2012		9/18/2012	9/18/2012		9/18/2012	9/18/2012		10/24/2012	10/24/2012		10/25/2012	10/25/2012		1/24/2013	1/24/2013		1/25/2013	1/25/2013		2/21/2013	2/21/2013		
Number of RPDs over standard range		6			8			8			3			3			3			3						
Bismuth (Filtered)	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0
Boron	µg/L	50	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0
Boron	µg/L	20																								
Boron	µg/L	10																								
Boron (Filtered)	µg/L	50	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0
Boron (Filtered)	µg/L	20																								
Boron (Filtered)	µg/L	10																								
Cadmium	µg/l	0.005	0.207	0.235	13	0.015	0.015	0	0.027	0.03	11	0.005	<0.005	0	0.018	0.007	88	0.009	0.005	57	0.009	0.005	57	0.015	0.017	13
Cadmium (Filtered)	µg/L	0.005	0.055	0.05	10	0.01	0.012	18	0.028	0.023	20	0.006	<0.005	18	0.009	0.015	50	<0.005	<0.005	0	0.006	0.007	15	0.009	0.011	20
Calcium	µg/l	50	28400	28700	1	36700	42000	13	56400	70100	22							46900	46000	2	46800	47500	1	77100	74900	3
Calcium	µg/l	250																								
Calcium	µg/l	10																								
Calcium (Filtered)	µg/l	50	27700	27600	0	40000	35700	11	64900	57500	12	42100	42900	2	46100	47300	3									
Calcium (Filtered)	µg/l	10										43700	42700	2	47500	47000	1	43400	52800	20	51900	51300	1	72900	73700	1
Cesium	µg/l	0.01																								
Cesium (Filtered)	µg/l	0.01																								
Chromium Total (III+VI)	µg/L	0.5																								
Chromium Total (III+VI)	µg/l	0.1	0.28	0.37	28	<0.1	<0.1	0	<0.1	<0.1	0	0.13	0.11	17	0.13	<0.1	26	0.16	<0.1	46	0.12	0.13	8	0.13	0.13	0
Chromium Total (III+VI) (Filtered)	µg/L	0.1	<0.1	0.18	57	<0.1	<0.1	0	0.15	0.12	22	0.12	0.12	0	0.11	<0.1	10	0.14	0.18	25	0.21	0.19	10	<0.1	<0.1	0
Cobalt	µg/l	0.01																								
Cobalt	µg/L	0.01																								
Cobalt (Filtered)	µg/L	0.005	0.524	0.613	16	0.014	0.025	56	0.045	0.049	9	0.011	0.009	20	0.009	0.007	25	0.022	0.021	5	0.009	0.01	11	0.022	0.033	40
Cobalt (Filtered)	µg/l	0.1																								
Cobalt (Filtered)	µg/L	0.005	0.124	0.086	36	0.012	0.006	67	0.038	0.038	0	0.014	0.008	55	0.008	0.007	13	0.011	0.01	10	0.008	0.007	13	0.023	0.017	30
Copper	µg/l	0.5																								
Copper	µg/L	0.2																								
Copper	µg/L	0.05	1.24	1.42	14	0.239	0.754	104	0.218	0.885	121	0.073	0.051	35	0.054	0.142	90	0.092	0.097	5	0.078	0.058	29	0.147	0.48	106
Copper (Filtered)	µg/l	0.2																								
Copper (Filtered)	µg/L	0.05	0.456	0.388	16	0.353	0.59	50	0.637	0.473	30	<0.05	<0.05	0	0.065	0.072	10	0.058	0.094	47	0.11	0.11	0	0.159	0.117	30
Iron	µg/L	5																								
Iron	µg/l	10																								
Iron	µg/L	1	191	208	9	18.3	21.7	17	4.9	8.5	54	15.8	16.6	5	3.5	3.3	6	26.5	25.3	5	2.5	3	18	27.6	26.1	6
Iron (Filtered)	µg/l	10																								
Iron (Filtered)	µg/L	1	26.9	12.4	74	3.4	7.9	80	4.4	4.6	4	29	11.9	84	1.2	<1	18	4.8	4.9	2	<1	1.1	10	4.9	4.4	11
Lead	µg/l	0.05																								
Lead	µg/L	0.005	0.505	0.553	9	0.019	0.022	15	0.009	0.018	67	0.013	0.011	17	0.008	0.01	22	0.033	0.029	13	<0.005	<0.005	0	0.023	0.025	8
Lead (Filtered)	µg/l	0.05																								
Lead (Filtered)	µg/L	0.005	0.046	0.009	135	0.006	0.038	145	0.017	0.005	109	0.032	0.006	137	0.006	<0.005	18	<0.005	0.008	46	0.007	0.007	0	0.016	0.019	17
Lithium	µg/l	1																								
Lithium	µg/L	0.5	2.24	2.3	3	9.7	9.91	2	6.75	7.27	7	2.39	2.48	4	5.35	5.3	1	3.71	3.68	1	5.31	5.1	4	6.38	6.34	1
Lithium (Filtered)	µg/l	1																								
Lithium (Filtered)	µg/L	0.5	2.34	2.28	3	9.72	8.68	11	7.33	5.91	21	2.47	2.34	5	5.14	5.24	2	3.56	3.77	6	4.9	5.13	5	6.24	6.06	3
Magnesium	µg/l	50	8060	8260	2	11800	13200	11	16500	18300	10							12200	11900	2	15000	15000	0	35800	35500	1
Magnesium	µg/l	5																								
Magnesium	µg/l	250																								
Magnesium	µg/l	10										11100	11200	1	15300	15300	0									
Magnesium (Filtered)	µg/l	50	7940	8120	2	12900	12200	6	17300	16700	4							11700	12500	7	16100	16700	4	34900	34800	0
Magnesium (Filtered)	µg/l	5																								
Magnesium (Filtered)	µg/l	10										11300	11200	1	15700	15800	1									
Manganese	µg/l	0.1																								
Manganese	µg/L	0.05	20.3	22.4	10	1.42	1.63	14	1.18	1.38	16	2.3	2.21	4	0.281	0.276	2	1.93	1.9	2	0.2	0.229	14	2.75	2.54	8
Manganese (Filtered)	µg/l	0.1																								
Manganese (Filtered)	µg/L	0.05	2.45	1.09	77	0.31	0.332	7	0.822	0.721	13	2.46	2.16	13	0.11	0.118	7	0.738	0.825	11	0.052	0.122	80	0.537	0.525	2
Mercury	µg/L	0.01																								
Mercury	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Mercury	µg/l	0.005																								
Mercury	µg/L	0.002																								
Mercury (Filtered)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0				<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Mercury (Filtered)	µg/L	0.01																								
Mercury (Filtered)	µg/l	0.005																								
Mercury (Filtered)	µg/L	0.002																								
Molybdenum	µg/l	0.05	0.458	0.448	2	1.21	1.41	15	0.706	0.826	16	0.53	0.518	2	1.43	1.43	0	0.601	0.658	9	1.61	1.63	1	1.14	1.13	1
Molybdenum (Filtered)	µg/L	0.05	0.521	0.463	12	1.31	1.36	4	0.837	0.765	9	0.525	0.546	4	1.41	1.42	1	0.621	0.668	7	1.61	1.69	5	1.1	1.07	3
Nickel	µg/l	0.5																								
Nickel	µg/L	0.1																								
Nickel	µg/L	0.02	1.97	2.21	11	0.242	0.349	36	0.828	1.14	32	0.098	0.109	11	0.088	0.125	35	0.153	0.131	15	0.069	0.142	69	0.458	0.592	26
Nickel (Filtered)	µg/l	0.5																								

Field Duplicates (water)  
Filter: ALL

Lab Report Number Field ID	B240844 M1	B240844 M1-DUP	RPD	B283851 G1	B283851 G1-DUP	RPD	B283851 M1	B283851 M1-DUP	RPD	B297129 A2	B297129 A2-DUP	RPD	B297129 G2	B297129 G2-DUP	RPD	B306701 A1	B306701 A1-DUP	RPD	B306701 G2	B306701 G2-DUP	RPD	B314188 H1	B314188 H1-DUP	RPD			
Sampled Date/Time	5/14/2012	5/14/2012		9/18/2012	9/18/2012		9/18/2012	9/18/2012		10/24/2012	10/24/2012		10/25/2012	10/25/2012		1/24/2013	1/24/2013		1/25/2013	1/25/2013		2/21/2013	2/21/2013				
Number of RPDs over standard range	6			8			8			3			3			3			3			3			3		
Strontium (Filtered)	ug/l	0.2																									
Strontium (Filtered)	ug/L	0.05	77.7	77.1	1	173	165	5	168	171	2	91.2	89.6	2	125	127	2	118	114	3	132	129	2	155	154	1	
Tellurium	ug/l	0.2																									
Tellurium (Filtered)	ug/l	0.2																									
Thallium	ug/l	0.01																									
Thallium	ug/L	0.002	0.025	0.022	13	0.006	0.006	0	0.005	0.006	18	0.002	0.002	0	0.002	0.002	0	0.002	0.003	40	0.002	0.002	0	0.005	0.005	0	
Thallium (Filtered)	ug/l	0.01																									
Thallium (Filtered)	ug/L	0.002	0.009	0.007	25	0.006	0.008	29	0.008	0.007	13	0.002	0.002	0	0.002	0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	0.004	0.003	29	
Thorium	ug/l	0.1																									
Thorium (Filtered)	ug/l	0.1																									
Tin	ug/L	0.2	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	
Tin	ug/l	0.1																									
Tin (Filtered)	ug/L	0.2	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	0.21	<0.2	5	
Tin (Filtered)	ug/l	0.1																									
Titanium	ug/L	5																									
Titanium	ug/l	1.5																									
Titanium	ug/L	0.5	3.94	4.66	17	1.22	0.77	45	<0.5	0.64	25	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	
Titanium	ug/l	0.3																									
Titanium (Filtered)	ug/L	0.5	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	
Titanium (Filtered)	ug/l	0.3																									
Tungsten	ug/l	0.1																									
Tungsten (Filtered)	ug/l	0.1																									
Uranium	ug/l	0.01																									
Uranium	ug/L	0.005																									
Uranium	ug/L	0.002	0.345	0.349	1	0.22	0.246	11	0.654	0.778	17	0.546	0.559	2	1.2	1.23	2	0.575	0.573	0	1.31	1.27	3	2.13	2.15	1	
Uranium (Filtered)	ug/l	0.01																									
Uranium (Filtered)	ug/L	0.002	0.266	0.272	2	0.224	0.229	2	0.757	0.697	8	0.553	0.541	2	1.13	1.19	5	0.551	0.559	1	1.32	1.29	2	2.08	2.07	0	
Vanadium	ug/l	0.5																									
Vanadium	ug/L	0.2	0.82	0.84	2	<0.2	<0.2	0	<0.2	0.24	18	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	
Vanadium (Filtered)	ug/l	0.5																									
Vanadium (Filtered)	ug/L	0.2	0.35	0.3	15	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	
Zinc	ug/l	3																									
Zinc	ug/L	1																									
Zinc	ug/L	0.1	4.5	5.48	20	0.36	0.67	60	0.46	0.87	62	0.44	0.41	7	0.28	0.64	78	1.34	0.87	43	0.37	0.31	18	0.64	0.68	6	
Zinc (Filtered)	ug/l	1																									
Zinc (Filtered)	ug/L	0.1	0.97	0.49	66	0.41	2.2	137	0.5	1.42	96	0.56	0.44	24	0.4	0.3	29	0.23	0.33	36	0.31	0.41	28	0.63	0.4	45	
Zirconium	ug/l	0.2																									
Zirconium	ug/L	0.1	0.18	0.18	0	0.19	<0.1	62	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	
Zirconium	ug/l	0.06																									
Zirconium (Filtered)	ug/l	0.2																									
Zirconium (Filtered)	ug/L	0.1	0.12	0.12	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	
Zirconium (Filtered)	ug/l	0.06																									
Polycyclic 1-Methylnaphthalene	ug/l	0.05																									
2-Methylnaphthalene	ug/L	0.1																									
2-Methylnaphthalene	ug/l	0.05																									
Acenaphthene	ug/L	0.05																									
Acenaphthene	ug/l	0.01																									
Acenaphthylene	ug/L	0.05																									
Acenaphthylene	ug/l	0.01																									
Acridine	ug/L	0.05																									
Acridine	ug/l	0.01																									
Anthracene	ug/l	0.01																									
Benzo(a)anthracene	ug/l	0.01																									
Benzo(a)pyrene	ug/L	0.009																									
Benzo(a)pyrene	ug/l	0.005																									
Benzo(b+j)fluoranthene	ug/L	0.05																									
Benzo(b+j)fluoranthene	ug/l	0.01																									
Benzo(b & k)fluoranthene	ug/l	0.015																									
Benzo(g,h,i)perylene	ug/L	0.05																									
Benzo(g,h,i)perylene	ug/l	0.01																									
Benzo(k)fluoranthene	ug/L	0.05																									
Benzo(k)fluoranthene	ug/l	0.01																									
Chrysene	ug/L	0.05																									
Chrysene	ug/l	0.01																									
Dibenz(a,h)anthracene	ug/L	0.05																									
Dibenz(a,h)anthracene	ug/l	0.005																									
Fluoranthene	ug/L	0.02																									
Fluoranthene	ug/l	0.01																									
Fluorene	ug/L	0.05																									
Fluorene	ug/l	0.01																									
Indeno(1,2,3-c,d)pyrene	ug/L	0.05																									
Indeno(1,2,3-c,d)pyrene	ug/l	0.01																									
Naphthalene	ug/L	0.1																									
Naphthalene	ug/l	0.05																									
Phenanthrene	ug/L	0.05																									
Phenanthrene	ug/l	0.02																									
Pyrene	ug/L	0.02																									
Pyrene	ug/l	0.01																									
Quinoline	ug/L	0.5																									
Quinoline	ug/L	0.24																									
Quinoline	ug/l	0.05																									





Field Duplicates (water)  
Filter: ALL

Lab Report Number Field ID	B322778 H1	B322778 H1-DUP	RPD	B330896 M2	B330896 M2-DUP	RPD	B341817 A3	B341817 A3-DUP	RPD	B352218 M1	B352218 M1-DUP	RPD	B361290 A3	B361290 A3-DUP	RPD	B376651 G2	B376651 G2-DUP	RPD	B388572 A5	B388572 A5-DUP	RPD	B399472 M1	B399472 M1-DUP	RPD	
Sampled Date/Time	3/21/2013	3/21/2013		4/17/2013	4/17/2013		5/23/2013	5/23/2013		6/21/2013	6/21/2013		7/17/2013	7/17/2013		8/27/2013	8/27/2013		9/26/2013	9/26/2013		10/24/2013	10/24/2013		
Number of RPDs over standard range	1			4			1			12			9			4			1			4			
Bismuth (Filtered)	0.005	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0
Boron	50	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0
Boron (Filtered)	20	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0
Boron (Filtered)	10																								
Boron (Filtered)	50																								
Boron (Filtered)	20																								
Boron (Filtered)	10																								
Cadmium	0.005	0.015	0.015	0	0.025	0.025	0	0.039	0.047	19	2.66	2.72	2	<0.005	0.007	33	0.014	0.012	15	0.006	0.008	29	0.022	0.024	9
Cadmium (Filtered)	0.005	0.011	0.014	24	0.013	0.015	14	<0.005	0.007	33	0.035	0.029	19	0.01	0.006	50	0.011	0.01	10	0.005	<0.005	0	0.017	0.018	6
Calcium	50	73800	73600	0	54600	52500	4	29700	26800	10	79800	81900	3	36500	34500	6	36900	35900	3	32800	34100	4	57000	56100	2
Calcium	250																								
Calcium	10																								
Calcium (Filtered)	50	74300	75200	1	52000	51600	1	28200	26800	5	24400	24500	0	34100	33400	2	35900	35300	2	33300	35200	6	57200	56400	1
Calcium (Filtered)	10																								
Cesium	0.01																								
Cesium (Filtered)	0.01																								
Chromium Total (III+VI)	0.5																								
Chromium Total (III+VI)	0.1	0.13	0.16	21	0.26	0.23	12	0.26	0.24	8	3.3	5.01	41	<0.1	<0.1	0	<0.1	<0.1	0	0.36	0.31	15	0.11	0.1	10
Chromium Total (III+VI) (Filtered)	0.1	0.16	0.13	21	0.12	0.13	8	0.11	0.11	0	<0.1	<0.1	0	0.1	<0.1	0	<0.1	<0.1	0	0.26	0.3	14	0.12	0.14	15
Cobalt	0.1																								
Cobalt	0.01																								
Cobalt (Filtered)	0.1	0.028	0.026	7	0.072	0.059	20	0.347	0.399	14	6.38	7.24	13	0.014	0.017	19	0.023	0.02	14	0.01	0.011	10	0.024	0.024	0
Cobalt (Filtered)	0.005	0.023	0.031	30	0.032	0.033	3	0.016	0.023	36	0.075	0.057	27	0.019	0.013	38	0.01	0.009	11	0.005	0.011	75	0.026	0.026	0
Copper	0.5																								
Copper	0.2																								
Copper	0.05	0.138	0.157	13	0.324	0.356	9	0.756	0.85	12	15.7	17	8	0.218	0.235	8	0.363	0.377	4	0.059	0.126	72	0.205	0.283	32
Copper (Filtered)	0.2																								
Copper (Filtered)	0.05	0.183	0.227	21	0.141	0.329	80	0.341	0.317	7	0.804	0.737	9	0.204	0.187	9	0.429	0.38	12	0.086	0.122	35	0.221	0.379	53
Iron	5																								
Iron	10																								
Iron	1	14.9	13.2	12	58.3	58.3	0	293	285	3	3980	6310	45	2.7	9.2	109	21.4	20	7	<1	<1	0	16.5	16	3
Iron (Filtered)	10																								
Iron (Filtered)	1	7.5	6.4	16	4.3	4.5	5	10.9	11.9	9	78.4	53.4	38	11.4	2.1	138	7.1	6.9	3	1.8	<1	57	4.5	5.3	16
Lead	0.05																								
Lead	0.005	0.011	0.012	9	0.065	0.064	2	0.577	0.658	13	10.2	11.1	8	0.042	0.019	75	0.023	0.016	36	0.015	0.017	13	0.019	0.029	42
Lead (Filtered)	0.05																								
Lead (Filtered)	0.005	0.009	0.011	20	0.005	0.007	33	0.013	0.011	17	0.076	0.041	60	0.023	0.011	71	0.022	0.006	114	0.007	<0.005	33	0.008	0.014	55
Lithium	1																								
Lithium	0.5	6.79	6.78	0	4.8	4.77	1	3.52	3.72	6	3.76	5.14	31	6.81	6.5	5	8.79	8.33	5	<0.5	<0.5	0	4.69	4.72	1
Lithium (Filtered)	1																								
Lithium (Filtered)	0.5	6.7	6.85	2	4.41	4.51	2	3.29	3.63	10	1.61	1.62	1	6.89	6.88	0	8.63	9.14	6	<0.5	<0.5	0	4.7	4.74	1
Magnesium	50	35700	36900	3	17600	17300	2	6950	6910	1	16300	16400	1	9430	8940	5	12500	12000	4	12400	13000	5	15700	15700	0
Magnesium	5																								
Magnesium	250																								
Magnesium	10																								
Magnesium (Filtered)	50	35700	35400	1	17300	18000	4	6580	6490	1	5840	5780	1	9250	9030	2	12000	12000	0	11600	12200	5	16400	16700	2
Magnesium (Filtered)	5																								
Magnesium (Filtered)	10																								
Manganese	0.1																								
Manganese	0.05	1.43	1.28	11	3.2	2.92	9	23.7	29	20	644	664	3	0.207	0.817	119	2.71	2.4	12	<0.05	0.054	8	1.71	1.79	5
Manganese (Filtered)	0.1																								
Manganese (Filtered)	0.05	0.846	0.745	13	0.627	0.689	9	0.395	0.444	12	5.01	4.48	11	0.913	0.265	110	1.49	1.53	3	<0.05	0.114	78	1.18	1.25	6
Mercury	0.01																								
Mercury	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	0.011	0.012	9	<0.01	<0.01	0			
Mercury	0.005																								
Mercury	0.002																								
Mercury (Filtered)	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.002	<0.002	0
Mercury (Filtered)	0.01																								
Mercury (Filtered)	0.005																								
Mercury (Filtered)	0.002																								
Molybdenum	0.05	1.1	0.984	11	0.																				





Field Duplicates (water)  
Filter: ALL

Lab Report Number Field ID Sampled Date/Time	B3A8725 A4 11/21/2013	B3A8725 A4-DUP 11/21/2013	RPD	B3B7782 A1 12/22/2013	B3B7782 A1-DUP 12/22/2013	RPD	B407313 A1 1/28/2014	B407313 A1-DUP 1/28/2014	RPD	B416171 H1 2/27/2014	B416171 H1-DUP 2/27/2014	RPD	B424928 G2 3/28/2014	B424928 G2-DUP 3/28/2014	RPD	B432952 M1 4/24/2014	B432952 M1-DUP 4/24/2014	RPD	B439804 G2 5/16/2014	B439804 G2-DUP 5/16/2014	RPD	B442060 G1 5/23/2014	B442060 G1-DUP 5/23/2014	RPD		
Number of RPDs over standard range	1			3			2			3			3			4			7							
Bismuth (Filtered)	ug/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0			
Boron	ug/L	50	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0			
Boron	ug/L	20																								
Boron	ug/L	10																								
Boron (Filtered)	ug/L	50	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0			
Boron (Filtered)	ug/L	20																								
Boron (Filtered)	ug/L	10																								
Cadmium	ug/l	0.005	0.007	0.009	25	0.007	0.007	0	0.005	0.006	18	0.013	0.015	14	0.006	0.005	18	0.056	0.063	12	0.049	0.048	2	<b>0.108</b>	<b>0.147</b>	<b>31</b>
Cadmium (Filtered)	ug/L	0.005	<0.005	<0.005	0	<0.005	0.005	0	<0.005	0.005	0	0.012	0.013	8	0.006	<0.005	18	0.021	0.02	5	0.007	0.008	13	0.012	0.011	9
Calcium	ug/l	50	38500	39600	3	46500	45700	2	48900	48100	2	81600	79300	3	48200	48100	0	49800	49400	1	37300	38400	3	28400	27500	3
Calcium	ug/l	250																								
Calcium	ug/l	10																								
Calcium (Filtered)	ug/l	50	36800	38000	3	45000	45700	2	51900	48400	7	79000	82200	4	50000	49600	1	54300	48300	12	37100	36800	1	22800	24200	6
Calcium (Filtered)	ug/l	10																								
Cesium	ug/l	0.01																								
Cesium (Filtered)	ug/l	0.01																								
Chromium Total (III+VI)	ug/L	0.5																								
Chromium Total (III+VI)	ug/l	0.1	0.2	0.26	26	0.18	0.19	5	<0.1	0.12	18	0.14	0.14	0	0.2	0.18	11	0.27	0.36	29	0.5	0.38	27	0.33	0.41	22
Chromium Total (III+VI) (Filtered)	ug/L	0.1	0.27	0.27	0	0.2	0.22	10	<0.1	0.12	18	0.15	0.15	0	0.14	0.17	19	<0.1	<0.1	0	0.19	0.19	0	0.18	<0.1	57
Cobalt	ug/l	0.01																								
Cobalt	ug/L	0.005	<0.005	0.009	57	0.018	0.017	6	0.012	0.015	22	0.025	0.021	17	0.007	0.008	13	0.147	0.151	3	0.215	0.212	1	0.638	0.753	17
Cobalt (Filtered)	ug/l	0.1																								
Cobalt (Filtered)	ug/L	0.005	0.005	0.008	46	0.015	0.012	22	0.006	0.006	0	0.018	0.018	0	0.009	0.008	12	0.055	0.056	2	0.021	0.026	21	0.03	0.024	22
Copper	ug/l	0.5																								
Copper	ug/L	0.2																								
Copper	ug/L	0.05	0.085	0.081	5	<b>0.285</b>	<b>0.152</b>	<b>61</b>	0.187	0.151	21	0.282	0.218	26	0.187	0.115	48	<b>1.2</b>	<b>0.68</b>	<b>55</b>	1.31	1.01	26	1.72	1.97	14
Copper (Filtered)	ug/l	0.2																								
Copper (Filtered)	ug/L	0.05	0.098	0.243	85	0.105	0.101	4	0.093	0.112	19	0.19	0.156	20	0.117	0.15	25	0.436	0.466	7	<b>0.482</b>	<b>0.672</b>	<b>33</b>	0.501	0.493	2
Iron	ug/l	5																								
Iron	ug/l	10																								
Iron	ug/L	1	1.6	2.5	44	17	16.9	1	15.8	20.8	27	7.7	8.5	10	1.9	2.7	35	137	151	10	332	337	1	726	850	16
Iron (Filtered)	ug/l	10																								
Iron (Filtered)	ug/L	1	<1	<1	0	<b>3.7</b>	<b>5.7</b>	<b>43</b>	8.1	7	15	3.5	1.9	59	<1	1.2	18	10.8	10	8	13.8	12.6	9	27.6	21.7	24
Lead	ug/l	0.05																								
Lead	ug/L	0.005	0.017	0.019	11	<b>0.044</b>	<b>0.018</b>	<b>84</b>	0.016	0.018	12	0.007	0.009	25	<0.005	<0.005	0	0.174	0.186	7	0.412	0.384	7	1.06	1.42	29
Lead (Filtered)	ug/l	0.05																								
Lead (Filtered)	ug/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	0.009	<0.005	57	0.005	<0.005	0	0.006	0.015	86	0.007	0.012	53	<b>0.033</b>	<b>0.012</b>	<b>93</b>
Lithium	ug/l	1																								
Lithium	ug/L	0.5	1.13	1.42	23	4.1	4.12	0	3.85	3.75	3	6.31	6.57	4	4.47	4.39	2	4.18	4.19	0	5.07	4.58	10	3.89	4.17	7
Lithium (Filtered)	ug/l	1																								
Lithium (Filtered)	ug/L	0.5	1.35	1.54	13	4.21	4.11	2	3.85	3.8	1	6.69	6.37	5	4.76	4.96	4	3.92	3.82	3	4.22	4.37	3	3.42	3.27	4
Magnesium	ug/l	50	11900	12200	2	12400	12600	2	12700	12800	1	38000	38100	0	16200	16100	1	14200	14000	1	12000	11800	2	8300	8510	2
Magnesium	ug/l	5																								
Magnesium	ug/l	250																								
Magnesium	ug/l	10																								
Magnesium (Filtered)	ug/l	50	11800	11800	0	12200	12400	2	12500	12400	1	38500	39300	2	16200	16200	0	13400	14100	5	12600	12400	2	7970	8000	0
Magnesium (Filtered)	ug/l	5																								
Magnesium (Filtered)	ug/l	10																								
Manganese	ug/l	0.1																								
Manganese	ug/L	0.05	0.092	0.182	66	1.36	1.31	4	1.35	1.79	28	0.9	0.903	0	0.122	0.178	37	7.3	7.54	3	22.8	21.9	4	61.3	72	16
Manganese (Filtered)	ug/l	0.1																								
Manganese (Filtered)	ug/L	0.05	0.067	0.054	21	0.726	0.804	10	0.922	1.04	12	0.275	0.278	1	<0.05	<0.05	0	1.2	1.14	5	0.614	0.642	4	1.02	0.949	7
Mercury	ug/L	0.01																								
Mercury	ug/L	0.01	<0.01	<0.01	0																					
Mercury	ug/l	0.005																								
Mercury	ug/L	0.002				<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	0.0024	18	0.002	<0.002	0
Mercury (Filtered)	ug/L	0.01																								
Mercury (Filtered)	ug/L	0.01																								
Mercury (Filtered)	ug/l	0.005																								
Mercury (Filtered)	ug/L	0.002	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	0.0035	55	0.0027	0.0027	0
Molybdenum	ug/l	0.05	0.755	0.805	6	0.749	0.672	11	0.668	0.64	4	1.1	1.06	4	1.74	1.68	4	0.679	0.688	1	0.78	0.801	3	0.581	0.56	4
Molybdenum (Filtered)	ug/L	0.05	0.866	0.856	1	0.674	0.675	0	0.685	0.675	1	1.1	1.08	2	1.77	1.74	2	0.699	0.701	0	0.903	0.906	0	0.642	0.642	0
Nickel	ug/l	0.5																								
Nickel	ug/L	0.1																								
Nickel	ug/L	0.02	0.214	0.258	19	0.097	0.098	1	<b>0.221</b>	<b>0.138</b>	<b>46</b>	0.384	0.366	5	<b>0.337</b>	<b>0.094</b>	<b>113</b>	0.992	1.07	8	1	0.914	9	2.01	2.33	15
Nickel (Filtered)	ug/l	0.5																								
Nickel (Filtered)	ug/L	0.02	0.208	0.189	10	0.106	0.083	24	0.111	0.104	7	0.344	0.404	16	<b>0.109</b>	<b>0.212</b>	<b>64</b>	0.68	0.653	4	0.294	0.371	23	0.472	0.451	5
Potassium	ug/l	50	257	287	11	396	413	4	4																	



Field Duplicates (water)  
Filter: ALL

Lab Report Number	B444272	B444272	RPD	B446972	B446972	RPD	B449500	B449500	RPD	B464009	B464009	RPD	B474408	B474408	RPD	B476541	B476541	RPD	B479164	B479164	RPD	B481292	B481292	RPD			
Field ID	WA1	WA1-DUP		A2	A2-DUP		G1	G1-DUP		G2	G2-DUP		G2	G2-DUP		G1	G1-DUP		G1	G1-DUP		M1	M1-DUP				
Sampled Date/Time	5/30/2014	5/30/2014		6/5/2014	6/5/2014		6/13/2014	6/13/2014		7/25/2014	7/25/2014		8/22/2014	8/22/2014		8/29/2014	8/29/2014		9/6/2014	9/6/2014		9/12/2014	9/12/2014				
Number of RPDs over standard range	1			2			8			4			4			3			2			2					
<b>Chemical</b>	<b>Chemical Name</b>	<b>Units</b>	<b>EQL</b>																								
Calculated	Alkalinity (Bicarbonate as CaCO3)	ug/l	1000																								
	Alkalinity (Carbonate as CaCO3)	ug/l	500																								
	Alkalinity (Carbonate as CaCO3)	ug/l	1000																								
	Alkalinity (Hydroxide) as CaCO3	ug/l	1000																								
	Alkalinity (total) as CaCO3	ug/l	500	91100	90100	1	111000	110000	1	76500	75900	1	151000	148000	2	162000	160000	1	137000	135000	1	121000	122000	1	140000	142000	1
	Alkalinity (total) as CaCO3	ug/l	1000																								
	Sulphur (as S)	ug/l	500																								
	Sulphur (as S)	ug/l	3000	3100	3300	6	<3000	<3000	0	3100	3500	12	8900	8400	6	9100	8700	4	8200	8400	2	8900	8800	1	22900	20800	10
	Sulphur (as S)	ug/l	2000																								
	Sulphur (as S)	ug/l	15000																								
	Sulphur (as S)	ug/l	10000																								
	Sulphur (as S) (Filtered)	ug/l	500																								
	Sulphur (as S) (Filtered)	ug/l	3000	4200	3700	13	<3000	<3000	0	3700	3800	3	7200	7200	0	9200	9300	1	8100	7400	9	8000	8900	11	21500	19600	9
	Sulphur (as S) (Filtered)	ug/l	2000																								
	Sulphur (as S) (Filtered)	ug/l	10000																								
	Hardness as CaCO3	ug/l	500																								
	Hardness as CaCO3 (Filtered)	ug/l	500	101000	102000	1	126000	115000	9	80200	82800	3	162000	167000	3	186000	181000	3	147000	151000	3	143000	150000	5	211000	203000	4
Parameters	Filter and Preserve	-		999	999	0	999	999	0	999	999	0	999	999	0	999	999	0	999	999	0	999	999	0	999	999	0
Physical Properties	Bicarbonate	ug/l	500	111000	110000	1	135000	134000	1	93400	92600	1	184000	181000	2	192000	191000	1	165000	165000	0	148000	148000	0	171000	173000	1
General Chemistry	Carbonate	ug/l	500	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	2560	2080	21	1020	<500	68	<500	<500	0	<500	<500	0
	Hydroxide	ug/l	500	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0
	phenolphthalein alkalinity	ug/l	500	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	2130	1730	21	850	<500	52	<500	<500	0	<500	<500	0
	Ammonia	ug/l	5	15	15	0	16	13	21	6.7	24	113	14	12	15	26	22	17	15	16	6	29	11	90	33	32	3
	Ammonia (as N)	ug/l	5																								
	Kjeldahl Nitrogen Total	ug/l	50																								
	Nitrate (as N)	ug/l	5																								
	Nitrate (as N)	ug/l	20	104	106	2				<20	<20	0	49	50	2	73	71	3	<20	<20	0	<20	<20	0	341	342	0
	Nitrate (as NO3-)	ug/l	20																								
	Nitrate + Nitrite (as N)	ug/l	5.1																								
	Nitrate + Nitrite (as N)	ug/l	20	109	111	2	63	64	2	<20	<20	0	49	50	2	73	71	3	<20	<20	0	<20	<20	0	341	342	0
	Nitrite (as N)	ug/l	5	5.6	5.5	2				<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	5	5.2	4	<5	<5	0
	Nitrite (as N)	ug/l	1																								
	Nitrogen (N)	ug/l	20																								
	Phosphorus	ug/l	50																								
	Phosphorus	ug/l	5 . 50 (Dupe)																								
	Phosphorus	ug/l	5	83.5	96.4	14	<5	16.7	108	69.1	53.5	25	6.5	6.8	5	<5	<5	0	43.3	39	10	37.1	44.2	17	8.5	7.1	18
	Phosphorus	ug/l	2																								
	Phosphorus (Filtered)	ug/l	50																								
	Ortho Phosphorus (as P)	ug/l	5	48.1	44.9	7	8.5	8.6	1	26.4	25.7	3	<5	<5	0	<5	<5	0	36.5	37.5	3	21.2	22.1	4	<5	<5	0
	Ortho Phosphorus (as P) (Filtered)	ug/l	1																								
	Electrical conductivity (lab)	uS/cm	2																								
	Electrical conductivity (lab)	uS/cm	1	197	195	1	221	220	0	168	167	1	314	316	1	343	345	1	296	296	0	274	274	0	368	369	0
	Chloride	ug/l	500																								
	Chloride (Filtered)	ug/l	500	550	<500	10	<500	670	29	<500	<500	0	1900	<500	117	740	660	11	660	870	27	580	800	32	1500	1500	0
	Fluoride	ug/l	20																								
	Fluoride	ug/l	10	98	99	1	120	120	0	74	73	1	190	180	5	210	210	0	99	99	0	86	88	2	140	130	7
	Bromide	ug/l	50																								
	Bromide	ug/l	10 : 100 (Dupe)																								
	Bromide	ug/l	10	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0
	Dissolved Organic Carbon (Filtered)	ug/l	500	1860	1730	7	1490	1030	37	2580	4490	54	<500	2020	121	970	1480	42	2200	1450	41	2850	2900	2	830	1970	81
	Total Organic Carbon (TOC)	ug/l	500	3200	1990	47	1240	1400	12	4380	6160	34	910	<500	58	630	660	5	1620	1430	12	3270	2800	15	1140	910	22
	pH (Lab)	pH Unit	0.1																								
	pH (Lab)	pH Unit		8.05	8.07	0	8.16	8.14	0	8.07	8.06	0	8.29	8.24	1	8.37	8.34	0	8.31	8.29	0	8.19	8.24	1	8.26	8.23	0
	Sulphate (SO4)	ug/l	300																								
	Sulphate (SO4) (Filtered)	ug/l	500	11700	11600	1	5730	5770	1	10000	9570	4	20400	20200	1	24600	25100	2	24300	23800	2	23900	24900	4	51700	55400	7
	Hardness	ug/l	500	103000	103000	0	118000	120000	2	87500	86600	1	177000	170000	4	176000	175000	1	147000	154000	5	140000	135000	4	233000	223000	4
	Dissolved Hardness (Filtered)	ug/l	500																								
	Total Suspended Solids (TSS)	ug/l	5000 : 4000 (Dupe)																								
	Total Suspended Solids (TSS)	ug/l	3000																								
	Total Suspended Solids (TSS)	ug/l	20000																								
	Total Suspended Solids (TSS)	ug/l	1000 : 2000 (Dupe)																								
	Total Suspended Solids (TSS)	ug/l	1000	29900	32800	9	14500	16500	13	13500	14300	6	<1000	<1000	0	<1000	<1000	0	7500	10200	31	12100	13000	7	<1000	1600	46
	Turbidity	NTU	0.1	1																							



Field Duplicates (water)  
Filter: ALL

Lab Report Number Field ID	B444272 WA1 5/30/2014	B444272 WA1-DUP 5/30/2014	RPD	B446972 A2 6/5/2014	B446972 A2-DUP 6/5/2014	RPD	B449500 G1 6/13/2014	B449500 G1-DUP 6/13/2014	RPD	B464009 G2 7/25/2014	B464009 G2-DUP 7/25/2014	RPD	B474408 G2 8/22/2014	B474408 G2-DUP 8/22/2014	RPD	B476541 G1 8/29/2014	B476541 G1-DUP 8/29/2014	RPD	B479164 G1 9/6/2014	B479164 G1-DUP 9/6/2014	RPD	B481292 M1 9/12/2014	B481292 M1-DUP 9/12/2014	RPD
Number of RPDs over standard range	1			2			8			4			4			3			2			2		
Bismuth (Filtered)	ug/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	
Boron	ug/L	50	<50	<50	0	<50	<50	0	<50	<50	0	<20	<20	0	<20	<20	0	20	20	0	<20	<20	0	
Boron (Filtered)	ug/L	20	<50	<50	0	<50	<50	0	<50	<50	0	<20	<20	0	<20	<20	0	21	<20	5	<20	<20	0	
Boron (Filtered)	ug/L	50	<50	<50	0	<50	<50	0	<50	<50	0	<20	<20	0	<20	<20	0	21	<20	5	<20	<20	0	
Boron (Filtered)	ug/L	20	<50	<50	0	<50	<50	0	<50	<50	0	<20	<20	0	<20	<20	0	21	<20	5	<20	<20	0	
Boron (Filtered)	ug/L	10	<50	<50	0	<50	<50	0	<50	<50	0	<20	<20	0	<20	<20	0	21	<20	5	<20	<20	0	
Cadmium	ug/l	0.005	0.036	0.039	8	0.023	0.023	0	0.033	0.047	35	0.01	0.009	11	0.007	0.007	0	0.032	0.032	0	0.03	0.03	0	
Cadmium (Filtered)	ug/L	0.005	0.007	0.006	15	0.006	0.006	0	0.013	0.009	36	0.007	0.005	33	0.008	0.007	13	0.01	0.009	11	0.012	0.011	9	
Calcium	ug/l	50	29100	28900	1	34400	34600	1	23600	23500	0	44600	43800	2	44000	43700	1	38000	40600	7	37400	35500	5	
Calcium	ug/l	250																						
Calcium	ug/l	10																						
Calcium (Filtered)	ug/l	50	28000	28600	2	37400	33500	11	20600	21300	3	41800	43300	4	47800	46100	4	38600	39700	3	38700	39800	3	
Calcium (Filtered)	ug/l	10																						
Cesium	ug/l	0.01																						
Cesium (Filtered)	ug/l	0.01																						
Chromium Total (III+VI)	ug/L	0.5																						
Chromium Total (III+VI)	ug/l	0.1	0.23	0.23	0	0.27	0.31	14	0.19	0.16	17	0.19	0.2	5	0.16	0.18	12	<0.1	0.11	10	<0.1	0.17	52	
Chromium Total (III+VI) (Filtered)	ug/L	0.1	0.13	0.11	17	0.18	0.19	5	0.13	0.12	8	0.23	0.26	12	0.19	0.17	11	<0.1	<0.1	0	<0.1	<0.1	0	
Cobalt	ug/l	0.01																						
Cobalt	ug/L	0.005	0.288	0.331	14	0.122	0.133	9	0.135	0.177	27	0.02	0.02	0	0.005	0.008	46	0.108	0.137	24	0.113	0.111	2	
Cobalt (Filtered)	ug/l	0.1																						
Cobalt (Filtered)	ug/L	0.005	0.016	0.019	17	0.013	0.017	27	0.024	0.02	18	0.011	0.013	17	0.011	0.008	32	0.012	0.012	0	0.019	0.02	5	
Copper	ug/l	0.5																						
Copper	ug/L	0.2																						
Copper	ug/L	0.05	0.629	0.63	0	0.365	0.364	0	0.579	0.702	19	0.187	0.213	13	0.171	0.17	1	0.779	0.829	6	0.673	0.657	2	
Copper (Filtered)	ug/l	0.2																						
Copper (Filtered)	ug/L	0.05	0.236	0.234	1	0.189	0.206	9	0.393	0.434	10	0.227	0.191	17	0.531	0.159	188	0.397	0.417	5	0.434	0.508	16	
Iron	ug/l	5																						
Iron	ug/l	10																						
Iron	ug/L	1	302	294	3	137	156	13	193	201	4	12.3	16.7	30	4.8	5.1	6	74.2	123	49	75.2	88.8	17	
Iron (Filtered)	ug/l	10																						
Iron (Filtered)	ug/L	1	8.1	8.4	4	5.8	5	15	20.5	18	13	2.4	4.1	52	2.1	<1	71	5.6	5.8	4	9.9	11.2	12	
Lead	ug/l	0.05																						
Lead	ug/L	0.005	0.554	0.595	7	0.236	0.251	6	0.225	0.27	18	0.017	0.025	38	0.007	0.006	15	0.163	0.193	17	0.149	0.164	10	
Lead (Filtered)	ug/l	0.05																						
Lead (Filtered)	ug/L	0.005	0.008	0.005	46	<0.005	0.009	57	0.032	0.017	61	0.017	0.007	83	0.008	<0.005	46	0.009	<0.005	57	0.005	0.022	126	
Lithium	ug/l	1																						
Lithium	ug/L	0.5	4.34	4.36	0	1.6	1.72	7	3.32	3.36	1	5.28	4.84	9	5.66	5.62	1	10.6	10.2	4	9.35	9.4	1	
Lithium (Filtered)	ug/l	1																						
Lithium (Filtered)	ug/L	0.5	3.95	3.95	0	1.48	1.5	1	3.35	3.35	0	5	5.04	1	5.03	5.38	7	9.7	10.3	6	9.63	9.69	1	
Magnesium	ug/l	50	7900	7440	2	7900	8150	3	6950	6760	3	16000	14700	8	16200	16000	1	12600	12800	2	11400	11300	1	
Magnesium	ug/l	5																						
Magnesium	ug/l	250																						
Magnesium	ug/l	10																						
Magnesium (Filtered)	ug/l	50	7510	7390	2	7930	7500	6	6980	7210	3	13900	14200	2	16100	16000	1	12400	12600	2	11300	12400	9	
Magnesium (Filtered)	ug/l	5																						
Magnesium (Filtered)	ug/l	10																						
Manganese	ug/l	0.1																						
Manganese	ug/L	0.05	20.4	20.5	0	9.98	9.63	4	11.3	16.3	36	1.06	1.11	5	0.433	0.426	2	15.3	16.4	7	13.8	14.3	4	
Manganese (Filtered)	ug/l	0.1																						
Manganese (Filtered)	ug/L	0.05	0.349	0.309	12	0.515	0.455	12	1.17	0.569	69	0.252	0.29	14	0.167	0.101	49	0.524	0.541	3	0.612	0.66	8	
Mercury	ug/L	0.01																						
Mercury	ug/L	0.01																						
Mercury	ug/l	0.005																						
Mercury	ug/L	0.002	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	0.0021	5	<0.002	0.0021	5	<0.002	0.0042	71	0.0043	0.0045	5	0.0056	0.0087	43	
Mercury (Filtered)	ug/L	0.01																						
Mercury (Filtered)	ug/L	0.01																						
Mercury (Filtered)	ug/l	0.005																						
Mercury (Filtered)	ug/L	0.002	<0.002	<0.002	0	<0.002	<0.002	0	0.0057	0.0029	65	<0.002	<0.002	0	0.0035	0.0026	30	0.0054	0.0039	32	<0.002	0.0049	84	
Molybdenum	ug/l	0.05	0.311	0.322	3	0.298	0.296	1	0.58	0.636	9	1.35	1.3	4	1.54	1.51	2	1.37	1.37	0	1.26	1.1	14	
Molybdenum (Filtered)	ug/L	0.05	0.398	0.359	10	0.315	0.329	4	0.572	0.596	4	1.45	1.38	5	1.57	1.44	9	1.55	1.48	5	1.21	1.25	3	
Nickel	ug/l	0.5																						
Nickel	ug/L	0.1																						
Nickel	ug/L	0.02	0.796	0.775	3	0.436	0.6	32	1.62	0.852	62	0.277	0.305	10	0.139	0.129	7	0.583	0.694	17	0.611	0.635	4	
Nickel (Filtered)	ug/l	0.5																						
Nickel (Filtered)	ug/L	0.02	0.259	0.238	8	0.187	0.184	2	0.417	0.384	8	0.165	0.37	77	0.733	0.106	149	0.464	0.375	21	0.475	0.385	21	
Potassium	ug/l	50	457	449	2	292	303	4	422	420	0	598	554	8	538	501	7	631	727	14	608	608	0	
Potassium	ug/l	250																						
Potassium	ug/l	10																						
Potassium (Filtered)	ug/l	50	426	397	7	267	243	9	397	393	1	530	562	6	533	542	2	593	619	4	573	647	12	
Potassium (Filtered)	ug/l	100																						
Potassium (Filtered)	ug/l	10																						
Rubidium	ug/l	0.2																						
Rubidium (Filtered)	ug/l	0.2																						
Selenium	ug/l	0.05																						
Selenium	ug/L	0.04	0.414	0.4																				



Field Duplicates (water)  
Filter: ALL

Lab Report Number	B483962	B483962	RPD	B499587	B499587	RPD	B4A9093	B4A9093	RPD	B4B5326	B4B5326	RPD	B505986	B505986	RPD	B516449	B516449	RPD	B525184	B525184	RPD	B533584	B533584	RPD			
Field ID	H1	H1-DUP		G2	G2-DUP		G2	G2-DUP		A2	A2-DUP		H1	H1-DUP		A3 (B)	A3(B)-DUP		A1	A1-DUP		G2	G2-DUP				
Sampled Date/Time	9/19/2014	9/19/2014		10/30/2014	10/30/2014		11/28/2014	11/28/2014		12/18/2014	12/18/2014		1/22/2015	1/22/2015		2/27/2015	2/27/2015		3/26/2015	3/26/2015		4/24/2015	4/24/2015				
Number of RPDs over standard range	43			3			11			1			4			3			3			3					
<b>Chemical</b>	<b>Chemical Name</b>	<b>Units</b>	<b>EQL</b>																								
Calculated	Alkalinity (Bicarbonate as CaCO3)	ug/l	1000																								
	Alkalinity (Carbonate as CaCO3)	ug/l	500																								
	Alkalinity (Carbonate as CaCO3)	ug/l	1000																								
	Alkalinity (Hydroxide) as CaCO3	ug/l	1000																								
	Alkalinity (total) as CaCO3	ug/l	500	184000	125000	38	160000	160000	0	134000	135000	1	148000	146000	1	185000	185000	0	135000	134000	1	154000	155000	1	136000	138000	1
	Alkalinity (total) as CaCO3	ug/l	1000																								
	Sulphur (as S)	ug/l	500																								
	Sulphur (as S)	ug/l	3000	49900	5100	163	9000	7900	13	7400	7400	0	4200	4100	2	54900	55900	2	6200	6300	2	5900	5900	0			
	Sulphur (as S)	ug/l	2000																								
	Sulphur (as S)	ug/l	15000																								
	Sulphur (as S)	ug/l	10000																								
	Sulphur (as S) (Filtered)	ug/l	500																								
	Sulphur (as S) (Filtered)	ug/l	3000	48400	5400	160	9000	8600	5	7400	7200	3	4600	5300	14	56600	54000	5									
	Sulphur (as S) (Filtered)	ug/l	2000																								
	Sulphur (as S) (Filtered)	ug/l	10000																								
	Hardness as CaCO3	ug/l	500																								
	Hardness as CaCO3 (Filtered)	ug/l	500	335000	146000	79	192000	185000	4	156000	157000	1	167000	159000	5	360000	340000	6									
Parameters																											
Physical Properties	Filter and Preserve	-		999	999	0	999	999	0	999	999	0	999	999	0	999	999	0	999	999	0	999	999	0	999	999	0
General Chemistry	Bicarbonate	ug/l	500	214000	153000	33	195000	196000	1	163000	165000	1	180000	178000	1	225000	225000	0	164000	163000	1	187000	189000	1	166000	169000	2
	Carbonate	ug/l	500	4820	<500	162	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0
	Hydroxide	ug/l	500	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0
	phenolphthalein alkalinity	ug/l	500	4020	<500	156	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0	<500	<500	0
	Ammonia	ug/l	5	9.2	7.7	18	5.3	17	105	6.8	5.8	16	9	24	91	5.6	<5	11	6.6	50	153	16	19	17	8.5	11	26
	Ammonia (as N)	ug/l	5																								
	Kjeldahl Nitrogen Total	ug/l	50																								
	Nitrate (as N)	ug/l	5																								
	Nitrate (as N)	ug/l	20	714	52	173	51	45	13	85	89	5	83	81	2	908	905	0	103	105	2	54	51	6	123	124	1
	Nitrate (as NO3-)	ug/l	20																								
	Nitrate + Nitrite (as N)	ug/l	5.1																								
	Nitrate + Nitrite (as N)	ug/l	20	714	52	173	51	45	13	85	89	5	83	81	2	908	905	0	103	105	2	54	51	6	123	124	1
	Nitrite (as N)	ug/l	5	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0
	Nitrite (as N)	ug/l	1																								
	Nitrogen (N)	ug/l	20																								
	Phosphorus	ug/l	50																								
	Phosphorus	ug/l	5 : 50 (Dupe)																								
	Phosphorus	ug/l	5	5.8	13.1	77	5.4	9.4	54	13	64	132	7.5	<5	40	5	<5	0	<5	<5	0	9.4	46.1	132	15.1	14.3	5
	Phosphorus	ug/l	2																								
	Phosphorus (Filtered)	ug/l	50																								
	Ortho Phosphorus (as P)	ug/l	5	<5	<5	0	<5	<5	0	6.4	<5	25	<5	<5	0	<5	<5	0	<5	<5	0	8.8	<5	55	9.7	7.4	27
	Ortho Phosphorus (as P) (Filtered)	ug/l	1																								
	Electrical conductivity (lab)	uS/cm	2																								
	Electrical conductivity (lab)	uS/cm	1	593	258	79	336	346	3	299	297	1	300	300	0	634	637	0	288	288	0	339	337	1	288	289	0
	Chloride	ug/l	500																								
	Chloride (Filtered)	ug/l	500	1500	<500	100	730	830	13	1100	870	23	760	720	5	1400	1400	0	<500	<500	0	1800	1800	0	<500	620	21
	Fluoride	ug/l	20																								
	Fluoride	ug/l	10	240	200	18	190	190	0	170	170	0	160	160	0	250	260	4	160	160	0	150	150	0	120	120	0
	Bromide	ug/l	50																								
	Bromide	ug/l	10 : 100 (Dupe)																								
	Bromide	ug/l	10	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0
	Dissolved Organic Carbon (Filtered)	ug/l	500	1210	1200	1	1090	1280	16	2560	2510	2	650	500	26	<500	780	44	<500	<500	0	1050	1030	2	3570	2190	48
	Total Organic Carbon (TOC)	ug/l	500	1590	2770	54	560	1080	63	2320	2560	10	520	<500	4	660	670	2	1140	<500	78	870	620	34	6890	3270	71
	pH (Lab)	pH Unit	0.1																								
	pH (Lab)	pH Unit		8.42	8.23	2	8.27	8.29	0	8.16	8.16	0	8.27	8.22	1	8.29	8.3	0	8.25	8.24	0	8.22	8.27	1	8.24	8.27	0
	Sulphate (SO4)	ug/l	300																								
	Sulphate (SO4) (Filtered)	ug/l	500	140000	14100	163	26500	25800	3	22000	21700	1	14900	15500	4	159000	161000	1	19900	18100	9	16600	16400	1	15000	14900	1
	Hardness	ug/l	500	336000	147000	78	183000	172000	6	160000	164000	2	151000	149000	1	355000	351000	1	155000	150000	3	175000	175000	0	142000	148000	4
	Dissolved Hardness (Filtered)	ug/l	500																								
	Total Suspended Solids (TSS)	ug/l	5000 : 4000 (Dupe)																								
	Total Suspended Solids (TSS)	ug/l	3000																								
	Total Suspended Solids (TSS)	ug/l	20000																								
	Total Suspended Solids (TSS)	ug/l	1000 : 2000 (Dupe)																								
	Total Suspended Solids (TSS)	ug/l	1000	<1000	<1000	0	<1000	<1000	0	9500	3800	86	<1000	<1000	0	<1000	<1000	0	<1000	<1000	0	2000	1400	35	4900	4900	0
	Turbidity	NTU	0.1	0.18	0.11	48	0.2	0.22	10	2.29	2.38	4	0.13	0.15	14	0.16	<0.1	46	<0.1	<0.1	0	0.5	<0.1	133	2.59	1.09	82
Chemistry				</																							

Field Duplicates (water)  
Filter: ALL

Lab Report Number Field ID Sampled Date/Time	B483962 H1 9/19/2014	B483962 H1-DUP 9/19/2014	RPD	B499587 G2 10/30/2014	B499587 G2-DUP 10/30/2014	RPD	B4A9093 G2 11/28/2014	B4A9093 G2-DUP 11/28/2014	RPD	B4B5326 A2 12/18/2014	B4B5326 A2-DUP 12/18/2014	RPD	B505986 H1 1/22/2015	B505986 H1-DUP 1/22/2015	RPD	B516449 A3 (B) 2/27/2015	B516449 A3(B)-DUP 2/27/2015	RPD	B525184 A1 3/26/2015	B525184 A1-DUP 3/26/2015	RPD	B533584 G2 4/24/2015	B533584 G2-DUP 4/24/2015	RPD		
<b>Number of RPDs over standard range</b>																										
	43			3			11			1			4			3			3							
Bismuth (Filtered)	ug/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0
Boron	ug/L	50	<20	<20	0																					
Boron	ug/L	20	<20	<20	0																					
Boron (Filtered)	ug/L	50																								
Boron (Filtered)	ug/L	20	<20	<20	0																					
Boron (Filtered)	ug/L	10																								
Boron (Filtered)	ug/L	10																								
Cadmium	ug/L	0.005	0.014	0.01	33	0.006	0.009	40	0.0119	0.022	60	<0.005	0.0057	13	0.014	0.013	7	0.0056	<0.005	11	0.0074	0.0072	3	0.0081	0.0132	48
Cadmium (Filtered)	ug/L	0.005	0.012	0.006	67	0.005	0.005	0	0.0063	0.0081	25	<0.005	0.005	0	0.013	0.013	0	0.005	<0.005	0	0.0096	0.0053	58	<0.005	<0.005	0
Calcium	ug/L	50	75100	40900	59	45800	44000	4	41100	42300	3	43200	42200	2	78300	77000	2	43300	41300	5	49400	48700	1	36400	38300	5
Calcium	ug/L	250																								
Calcium	ug/L	10																								
Calcium (Filtered)	ug/L	50	75300	40800	59	50000	47400	5	39200	39400	1	46800	43300	8	79300	75200	5	42600	40400	5	49100	51600	5	38700	37800	2
Calcium (Filtered)	ug/L	10																								
Cesium	ug/L	0.01																								
Cesium (Filtered)	ug/L	0.01																								
Chromium Total (III+VI)	ug/L	0.5																								
Chromium Total (III+VI)	ug/L	0.1	0.15	0.28	60	0.2	0.16	22	0.1	0.12	18	0.2	0.21	5	0.14	0.15	7	0.25	0.23	8	0.16	0.17	6	<0.5	<0.5	0
Chromium Total (III+VI) (Filtered)	ug/L	0.1	0.13	0.22	51	0.18	0.17	6	<0.1	<0.1	0	0.21	0.24	13	0.14	0.19	30	0.23	0.23	0	0.16	0.17	6	0.19	0.19	0
Cobalt	ug/L	0.1																								
Cobalt	ug/L	0.01																								
Cobalt (Filtered)	ug/L	0.1	0.026	0.015	54	0.01	0.014	33	0.0355	0.0687	64	0.0107	0.0142	28	0.021	0.023	9	0.0069	0.01	37	0.0168	0.0222	28			
Cobalt (Filtered)	ug/L	0.005	0.022	0.009	84	0.008	0.007	13	0.0103	0.0102	1	0.005	0.007	33	0.021	0.018	15	0.007	0.006	15	0.0125	0.0109	14	0.0101	0.0101	0
Copper	ug/L	0.5																								
Copper	ug/L	0.2																								
Copper	ug/L	0.05	0.169	0.19	12	0.146	0.183	22	0.361	0.411	13	0.16	0.13	21	0.267	0.152	55	0.109	0.093	16	0.165	0.131	23	0.51	0.5	2
Copper (Filtered)	ug/L	0.2																								
Copper (Filtered)	ug/L	0.05	0.433	0.126	110	0.159	0.237	39	0.264	0.264	0	0.196	0.102	63	0.236	0.149	45	0.098	0.098	0	0.147	0.199	30	0.192	0.186	3
Iron	ug/L	5																								
Iron	ug/L	10																								
Iron	ug/L	1	12.6	9.2	31	3.9	7.4	62	56.1	83.5	39	11.1	13	16	8.2	8.3	1	4.2	3.1	30	22.4	24.4	9			
Iron (Filtered)	ug/L	10																								
Iron (Filtered)	ug/L	1	3.5	1.3	92	1.1	1.2	9	7.1	2.8	87	3.9	3.2	20	10.8	1.7	146	<1	<1	0	6.5	6	8	3.7	3.2	14
Lead	ug/L	0.05																								
Lead	ug/L	0.005	0.025	0.034	31	0.005	0.013	89	0.0604	0.137	78	0.0078	0.0152	64	0.014	0.02	35	0.0052	0.009	54	0.0224	0.0181	21	0.094	0.085	10
Lead (Filtered)	ug/L	0.05																								
Lead (Filtered)	ug/L	0.005	<0.005	0.035	150	0.014	<0.005	95	0.0126	0.011	14	0.011	<0.005	75	<0.005	<0.005	0	0.006	<0.005	18	<0.005	<0.005	0	<0.005	<0.005	0
Lithium	ug/L	1																								
Lithium	ug/L	0.5	6.69	2.05	106	5.57	5.73	3	5.28	6.26	17	2.34	2.23	5	7.04	6.91	2	2.74	2.6	5	4.2	4.02	4	4.29	4.65	8
Lithium (Filtered)	ug/L	1																								
Lithium (Filtered)	ug/L	0.5	6.83	2.01	109	5.82	5.71	2	5.43	5.77	6	1.97	2.28	15	6.78	6.84	1	2.46	2.28	8	4.25	4.16	2	4.32	4.44	3
Magnesium	ug/L	50	36100	11000	107	16600	15100	9	14000	14300	2	10500	10600	1	38800	38500	1	11500	11500	0	12700	13000	2			
Magnesium	ug/L	5																								
Magnesium	ug/L	250																								
Magnesium	ug/L	10																								
Magnesium (Filtered)	ug/L	50	35700	10700	108	16400	16100	2	14000	14100	1	12200	12400	2	39300	37000	6	11800	11900	1	13700	13300	3	12800	12900	1
Magnesium (Filtered)	ug/L	5																								
Magnesium (Filtered)	ug/L	10																								
Manganese	ug/L	0.1																								
Manganese	ug/L	0.05	1.62	0.554	98	0.419	0.629	40	3.13	7.43	81	0.999	1.02	2	0.877	0.965	10	0.229	0.213	7	1.56	1.72	10	4.59	4.77	4
Manganese (Filtered)	ug/L	0.1																								
Manganese (Filtered)	ug/L	0.05	0.71	0.179	119	0.119	0.115	3	0.543	0.335	47	0.799	0.76	5	0.271	0.244	10	0.259	0.097	91	0.806	0.991	21	0.151	0.149	1
Mercury	ug/L	0.01																								
Mercury	ug/L	0.01																								
Mercury	ug/L	0.005																								
Mercury	ug/L	0.002	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0
Mercury (Filtered)	ug/L	0.01																								
Mercury (Filtered)	ug/L	0.01																								
Mercury (Filtered)	ug/L	0.005																								
Mercury (Filtered)	ug/L	0.002																								







Field Duplicates (water)  
Filter: ALL

Lab Report Number	B540628	B540628	RPD	B542667	B542667	RPD	B545872	B545872	RPD	B547761	B547761	RPD	B549906	B549906	RPD	L2195291	L2195291	RPD	L2240838	L2240838	RPD	L2295044	L2295044	RPD		
Field ID	A3(B)	A3(B)-DUP		A2	A2-DUP		A5	A5-DUP		A5	A5-DUP		A5	A5-DUP		M1	M1-DUP		A1	A1-DUP		G1	G1-DUP			
Sampled Date/Time	5/15/2015	5/15/2015		5/21/2015	5/21/2015		5/28/2015	5/28/2015		6/5/2015	6/5/2015		6/11/2015	6/11/2015		11/9/2018	11/9/2018		3/4/2019	3/4/2019		6/17/2019	6/17/2019			
Number of RPDs over standard range	15			8			7			6			5			1			2			0				
Bismuth (Filtered)	ug/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0												
Boron	ug/L	50																								
Boron	ug/L	20																								
Boron (Filtered)	ug/L	10	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	10	0	<10	<10	0	<10	<10	0	12	12	0
Boron (Filtered)	ug/L	50																								
Boron (Filtered)	ug/L	20																								
Boron (Filtered)	ug/L	10	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	13	13	0
Cadmium	ug/l	0.005	0.0105	0.0108	3	0.015	0.014	7	0.007	0.01	35	<b>0.0073</b>	<b>0.0373</b>	<b>135</b>	0.007	0.0073	4	0.026	0.0218	18	0.0145	0.0059	84	0.0181	0.0148	20
Cadmium (Filtered)	ug/L	0.005	0.0154	0.0088	55	0.006	0.011	59	0.006	0.006	0	0.0061	0.0074	19	0.0066	0.0056	16	0.0235	0.0227	3	0.0053	0.0056	6	0.0131	0.0081	47
Calcium	ug/l	50	38600	40800	6	35300	33600	5	29400	31000	5	30600	31600	3	29200	29400	1	50300	51000	1	48200	51200	6	28100	28000	0
Calcium	ug/l	250																								
Calcium	ug/l	10																								
Calcium (Filtered)	ug/l	50	45800	34100	29	31900	35600	11	29700	31800	7	30600	30800	1	30600	29900	2	52800	53100	1	49400	49800	1	32400	32800	1
Calcium (Filtered)	ug/l	10																								
Cesium	ug/l	0.01																								
Cesium (Filtered)	ug/l	0.01																								
Chromium Total (III+VI)	ug/L	0.5																								
Chromium Total (III+VI)	ug/l	0.1	0.26	0.25	4	0.31	0.33	6	0.23	0.26	12	0.24	0.27	12	0.27	0.3	11	0.14	0.22	44	0.25	0.23	8	0.15	0.17	13
Chromium Total (III+VI) (Filtered)	ug/L	0.1	0.29	0.21	32	0.18	0.22	20	0.28	0.28	0	0.26	0.26	0	0.28	0.3	7	0.13	0.17	27	0.2	0.18	11	0.12	<0.1	18
Cobalt	ug/l	0.1																								
Cobalt	ug/L	0.01																								
Cobalt	ug/L	0.005	0.0326	0.0298	9	<b>0.126</b>	<b>0.063</b>	<b>67</b>	0.008	0.013	48	0.0117	0.0134	14	0.0096	0.0093	3									
Cobalt (Filtered)	ug/l	0.1																								
Cobalt (Filtered)	ug/L	0.005	<b>0.0388</b>	<b>0.0099</b>	<b>119</b>	0.012	0.019	45	0.01	0.008	22	0.0101	0.0095	6	0.008	0.0082	2	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0
Copper	ug/l	0.5																								
Copper	ug/L	0.2																								
Copper	ug/L	0.05	<b>0.166</b>	<b>0.335</b>	<b>67</b>	0.254	0.222	13	0.09	0.1	11	<b>0.117</b>	<b>0.487</b>	<b>123</b>	0.113	0.099	13									
Copper (Filtered)	ug/l	0.2																								
Copper (Filtered)	ug/L	0.05	<b>0.44</b>	<b>0.109</b>	<b>121</b>	<b>0.085</b>	<b>0.27</b>	<b>104</b>	0.085	0.065	27	0.082	0.089	8	0.08	0.213	91	0.21	0.23	9	<0.2	0.33	49	0.24	0.28	15
Iron	ug/l	5																								
Iron	ug/l	10																								
Iron	ug/L	1	<b>51.9</b>	<b>36.8</b>	<b>34</b>	141	161	13	<b>4.1</b>	<b>10.4</b>	<b>87</b>	<b>3.6</b>	<b>8.9</b>	<b>85</b>	2.9	4.1	34									
Iron (Filtered)	ug/l	10																								
Iron (Filtered)	ug/L	1	<b>16.1</b>	<b>1.2</b>	<b>172</b>	<b>2.9</b>	<b>12.1</b>	<b>123</b>	<1	<1	0	<1	1.1	10	2.7	2	30	<b>68</b>	<b>23</b>	<b>99</b>	<10	<10	0	<10	<10	0
Lead	ug/l	0.05																								
Lead	ug/L	0.005	0.0426	0.0386	10	0.099	0.108	9	0.005	0.023	129	<b>0.005</b>	<b>0.0264</b>	<b>136</b>	0.0064	0.0057	12	<0.05	<0.05	0	<0.05	<0.05	0	0.104	0.082	24
Lead (Filtered)	ug/l	0.05																								
Lead (Filtered)	ug/L	0.005	<b>0.0258</b>	<b>&lt;0.005</b>	<b>135</b>	<0.005	0.018	113	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	5.9	5.9	0	4	4.1	2	5	5.1	2
Lithium	ug/l	1																								
Lithium	ug/L	0.5	1.87	1.78	5	2.28	2.35	3	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0									
Lithium (Filtered)	ug/l	1																								
Lithium (Filtered)	ug/L	0.5	2.53	1.99	24	1.98	2	1	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	5.7	5.8	2	4.1	4.1	0	5.2	5.1	2
Magnesium	ug/l	50	10200	10400	2	9920	10200	3	9250	8860	4	8830	8850	0	9290	8980	3									
Magnesium	ug/l	5																								
Magnesium	ug/l	250																								
Magnesium	ug/l	10																								
Magnesium (Filtered)	ug/l	50	10900	11300	4	8690	9760	12	9370	8890	5	8960	9140	2	9250	9420	2									
Magnesium (Filtered)	ug/l	5																								
Magnesium (Filtered)	ug/l	10																								
Manganese	ug/l	0.1																								
Manganese	ug/L	0.05	1.24	1.24	0	<b>3.3</b>	<b>4.53</b>	<b>31</b>	<b>0.194</b>	<b>0.526</b>	<b>92</b>	<b>0.194</b>	<b>0.424</b>	<b>74</b>	0.154	0.154	0	1.14	1.17	3	<b>1.49</b>	<b>1.06</b>	<b>34</b>	2.91	2.75	6
Manganese (Filtered)	ug/l	0.1																								
Manganese (Filtered)	ug/L	0.05	<b>2.41</b>	<b>0.12</b>	<b>181</b>	<b>0.497</b>	<b>1.28</b>	<b>88</b>	<0.05	<0.05	0	<0.05	<0.05	0	0.059	0.067	13	0.82	0.77	6	0.69	0.71	3	0.35	0.33	6
Mercury	ug/L	0.01																								
Mercury	ug/L	0.01																								
Mercury	ug/l	0.005																								
Mercury	ug/L	0.002	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0									
Mercury (Filtered)	ug/L	0.01																								
Mercury (Filtered)	ug/L	0.01																								
Mercury (Filtered)	ug/l	0.005																								
Mercury (Filtered)	ug/L	0.002	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0
Molybdenum	ug/l	0.05	0.472	0.502	6	0.432	0.441	2	0.181	0.177	2	0.162	0.168	4	0.218	0.253	15	0.838	0.842	0	0.642	0.673	5	0.818	0.811	1
Molybdenum (Filtered)	ug/L	0.05	0.531	0.471	12	0.347	0.44	24	0.17	0.167	2	0.17	0.179	5	0.242	0.203	18	0.843	0.803	5	0.632	0.683	8	0.87	0.825	5
Nickel	ug/l	0.5																								
Nickel	ug/L	0.1																								
Nickel	ug/L	0.02	0.24	0.316	27	0.349	0.359	3	<b>0.174</b>	<b>0.264</b>	<b>41</b>	0.205	0.207	1	<b>0.248</b>	<b>0.121</b>	<b>69</b>									
Nickel (Filtered)	ug/l	0.5																								
Nickel (Filtered)	ug/L	0.02	<b>0.386</b>	<b>0.16</b>	<b>83</b>	<b>0.142</b>	<b>0.257</b>	<b>58</b>	<b>0.201</b>	<b>0.14</b>	<b>36</b>	0.156	0.167	7	<b>0.114</b>	<b>0.281</b>	<b>85</b>	1.33	1.34	1	<0.5	<0.5				

