

Kotaneelee Baseline Water Quality Characterization Report

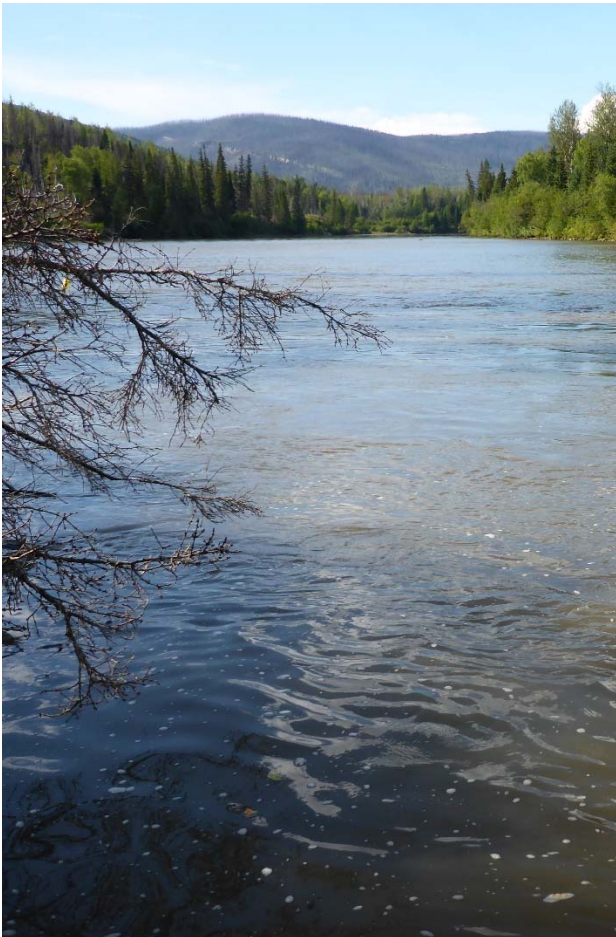


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March 29, 2019

Document Control			
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**Determined by Project Manager

Version Control			
Version	Date	Issued by	Description
1.0	March 19, 2019	Kristen Range	Issued for client review
2.0	March 27, 2019	Chuck Jochems	Internal Review
3.0	March 29, 2019	Kristen Range	Final

EXECUTIVE SUMMARY

Hemmera Envirochem Inc. (Hemmera), a wholly owned subsidiary of Ausenco Canada Inc. (Ausenco), was retained by the Site Assessment and Remediation Unit (SARU), on behalf of the Water Resources Branch (WRB), of the Yukon Government, Department of Environment (YG-ENV) to complete a baseline water quality characterization report for the Kotaneelee area in southeast Yukon.

This baseline project was initiated in response to the recommendation from the Yukon Government's Select Committee Regarding the Risks and Benefits of Hydraulic Fracturing (the Committee). This report documents the current conditions of the Kotaneelee area based on groundwater and surface water data collected by WRB from July 2014 to September 2018 in advance of any further development in the area.

Surface Water Quality

WRB field personnel collected 94 surface water samples from eight sampling locations along the Beaver River and the La Biche River within the Kotaneelee area. Two surface water sampling locations were in the Beaver River watershed and six locations were in the Liard River watershed. Surface water samples within the study area were generally neutral to slightly basic. Surface waters were generally well oxygenated; however, dissolved oxygen concentrations dropped to below the Canadian Council of Ministers of the Environment for the Protection of Freshwater Aquatic Life (CCME FAL) guideline during the summer months.

Specific conductance, total suspended solids (TSS), total dissolved solids (TDS), total and dissolved organic carbon concentrations varied between sampling locations and within sampling locations. Several samples collected exceeded the CCME FAL guideline for TSS.

Several samples exceeded the CCME FAL guideline for nitrite in the La Biche and Beaver River watersheds. Concentrations were varied, and several samples also had nitrite concentrations which were below the detection limit.

Most surface water samples collected were indicative of calcium-bicarbonate type waters. Surface water samples had concentrations of metals that exceeded the applicable guidelines for total aluminum, beryllium, cadmium, chromium, copper, iron, selenium, and zinc. The concentration of antimony, barium, boron, lead, mercury, nickel, silver, thallium, titanium and uranium were all below the British Columbia Ministry of Environment and Climate Change Strategy Water Quality Guidelines (BC-WQG) and the CCME guidelines in all surface water samples collected.

The concentration of volatile organic compounds (VOCs) and volatile petroleum hydrocarbons (VPHs) were below the detection limits for all surface water samples collected in the Kotaneelee area. Polycyclic aromatic hydrocarbons (PAHs) concentrations in surface waters were generally below the reporting limit, but detectable concentrations of PAHs were observed in each watershed. Higher concentrations of PAHs were found within the La Biche watershed compared to the Beaver River.

Groundwater Quality

WRB personnel collected 18 groundwater samples from one groundwater monitoring well, two drive point piezometers, one water supply well, and two groundwater seeps from August 2015 to September 2018. Groundwater samples were generally neutral within the Kotanelee study area. All groundwater samples collected exceeded the CCME FAL guideline for alkalinity. Several samples exceeded the CCME FAL for nitrite. The dominant ions within the groundwater were calcium, sodium, potassium, and bicarbonate. High TSS concentrations in many of the groundwater samples resulted in total metal concentrations which exceeded the guidelines for twenty elements. With the exception of selenium, dissolved metals concentrations were below the applicable standards.

The concentration of benzo(a)anthracene, benzo(a)pyrene, fluorene and pyrene exceeded the BC-WQG and CCME guidelines at YOWN-1507 in August 2015. It is unclear why the PAH concentrations were elevated in August 2015 but may have been caused by stagnant water in the well and high TSS from the sample collection process.

Seasonal Influences on Surface Water

Seasonality, geology and watershed were found to influence surface water quality.

Routine parameters which appeared to be influenced by seasonality included hardness, alkalinity, total organic carbon (TOC), dissolved organic carbon (DOC), and total and dissolved inorganic carbon. Hardness, alkalinity, bicarbonate, calcium, magnesium, sulphate had higher concentrations during the winter compared to other seasons. Phosphorus, TOC, DOC, and TSS had higher concentrations during the open water period in the summer and lower concentrations during the ice-covered winter periods.

Total aluminum, beryllium, chromium, copper, iron, thallium, and zinc and dissolved copper, iron and zinc showed strong seasonal variation, with higher concentrations being observed during the open water season at most stations. Seasonal variations of these metals were more pronounced in the Beaver River watershed compared to La Biche watershed. Dissolved selenium had strong seasonal variations at LBCH-001 and LBCH-002 with concentrations increasing during under ice conditions. Selenium concentrations experienced the reverse trend with highest concentrations in winter months at LBCH-t-001, LBCH-t-002, BEVR-001 and BEVR-t-001, although total selenium showed weaker seasonal variations in the Beaver River. The increased selenium concentrations in the winter months suggests that deeper groundwater originating from bedrock is the source of selenium at LBCH-001 and LBCH-002. The inverse trend observed at LBCH-t-001, LBCH-t-002, BEVR-001 and BEVR-t-001 suggests that groundwater discharging at those locations is either shallow and not affected by deeper regional groundwater flow regimes or that selenium is mobilized during freshet and precipitation events and may be associated with the increased suspended solids observed in surface water samples during summer months.

Groundwater and Surface Water Investigations

Generally, surface water and groundwater had similar pH, hardness, and electrical conductivity. Routine parameters including ammonia, bicarbonate, potassium, and phosphorus had higher concentrations in groundwater than surface water. Nitrite and dissolved inorganic carbon had similar concentrations between groundwater and surface water samples. Dissolved organic carbon, calcium, hardness, magnesium, sulphate, TDS, and sodium had higher concentrations in surface water than in groundwater. Most total metals which were dominant in groundwater compared were also dominant in surface water. Total and dissolved selenium concentrations were greater in surface water than in groundwater.

Groundwater had higher bicarbonate concentrations than the surface water samples, but the general proportions of the major ions were similar. Samples collected from LBCH-SEEP and LBRV-DP6 had the highest proportions of sodium and potassium but had similar composition of anions compared to the rest of the samples collected in the Kotaneelee area.

Groundwater discharge to surface water was most evident in baseflow samples acquired during under ice conditions in late winter.

Conclusions

In general, the Kotaneelee study successfully documented the surface water baseline conditions in the area prior to further development. The shallow groundwater aquifer located near the Kotaneelee Gas Plant was successfully characterized. However, no groundwater samples were collected from deeper overburden aquifer or bedrock to characterize deep groundwater, which may potentially be impacted by further resource development. Season and streamflow influence the concentration of many water quality parameters and water quality varied slightly between watersheds.

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
BC-WQG	British Columbia Ministry of Environment and Climate Change Strategy Water Quality Guidelines
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CCME-FAL	Canadian Council of Ministers of the Environment for the Protection of Freshwater Aquatic Life Guidelines
CSR-AL	Contaminated Site Regulation for Aquatic Life
DIC	Dissolved Inorganic Carbon
DOC	Dissolved Organic Carbon
GCDWQ	Guidelines for Canadian Drinking Water Quality
NA	Naphthenic Acids
PAH	Polycyclic Aromatic Hydrocarbons
SARU	Site Assessment and Remediation Unit
TDS	Total Dissolved Solids
TIC	Total Inorganic Carbon
TKN	Total Kjeldahl Carbon
TOC	Total Organic Carbon
TSS	Total Suspended Solids
VOC	Volatile Organic Compounds
VPH	Volatile Petroleum Hydrocarbons
VPHw	Volatile Petroleum Hydrocarbons in water
VSMOW	Vienna Standard Mean Ocean Water
WRB	Water Resources Branch
YG-ENV	Yukon Government, Department of Environment

LIST OF SYMBOLS AND UNITS OF MEASURE

Symbol / Unit of Measure	Definition
µg/L	Micrograms per liter
µS/cm	Micro siemens per centimeter
cm	Centimeters
km	Kilometer
km ²	Square Kilometer
L	Liter
m	Meter
m asl	Meters above sea level
m bg	Meters below ground
m/s	Meters per second
mbars	Millibars
mg	Milligrams

mg/L	Milligrams per Liter
mL	Milliliters
mm	Millimeters
ng/L	Nanograms per liter

1.0 INTRODUCTION

Hemmera Envirochem Inc. (Hemmera), a wholly owned subsidiary of Ausenco Canada Inc. (Ausenco), was retained by the Site Assessment and Remediation Unit (SARU), on behalf of the Water Resources Branch (WRB), of the Yukon Government, Department of Environment (YG-ENV) to complete a baseline water quality characterization report for the Kotaneelee area in southeast Yukon under the Standing Offer Agreement (SOA) No. SARU-2017-SOA-HEMMERA to provide environmental services related to contaminated sites for SARU.

This baseline project was initiated in response to the recommendations of Yukon Government's Select Committee Regarding the Risks and Benefits of Hydraulic Fracturing (the Committee). The Committee was tasked with gaining a science-based understanding of the various aspects of the process of hydraulic fracturing, as well as the current legislation and regulations relevant to the oil and gas industry. The Committee was dissolved after releasing its final report in January 2015, which recommended that baseline groundwater and surface water data be collected in order to ensure that comprehensive data are available prior to further resource development in the area. In general, these concerns were related to water contamination of Yukon streams, river and lakes, and the significant volumes of water needed for the process of hydraulic fracturing. In response to the recommendations from the Committee, WRB collected and analysed groundwater and surface water quality samples in the Kotaneelee region of the Liard Gas Basin from July 2014 to September 2018, in order to provide a general characterization of water quality in advance of further resource extraction development in the area. The area has been previously explored and developed for its resource potential. The Kotaneelee Gas Plant, now dormant, was in operation from 1978 to 2012.

This report contains an initial assessment of the baseline surface water and groundwater quality for the Kotaneelee area for two of the region's main water courses, the La Biche River and the Beaver River.

1.1 Scope of Work

In accordance with our proposal entitled "Work Plan and Cost Estimate – Kotaneelee Baseline Water Quality Characterization" dated February 5, 2019, the scope of work included:

- Project management, budget tracking, and progress updating;
- Review of available background information including surficial and bedrock geology maps, water well database, hydrometric stations, and hydrogeological data;
- Review of field methods and procedures of data collection;
- Data processing and entry into a usable database, including data QA/QC evaluation, and data validation;
- Comparison of all surface water and groundwater quality results to relevant standards;
- Baseline characterization of all water quality parameters by group to identify differences between sampling locations, streams and watersheds; and,
- Comparison of surficial water quality data to stream flow data to identify how season and/or flow variations affect the baseline water quality.

1.2 Study Objectives

The objectives of this Kotaneelee Baseline Study were to document the existing surface water and groundwater conditions in the area in advance of further resource extraction development in the area. Two watersheds fall within the Kotaneelee area; the La Biche River and the Beaver River watersheds. The study includes surface water and groundwater sampling stations within both watersheds. The objectives of the study are to characterize the surface and groundwater quality, determine the influence of seasonality, watershed characteristics (including bedrock and surficial geology), and streamflow on surface water and groundwater quality, and understand the groundwater-surface water interactions.

2.0 SITE DESCRIPTION

2.1 Physiography

The Kotanelee baseline monitoring area is in southeastern Yukon and extends to the borders with Northwest Territories to the east and British Columbia to the south (**Figure 1**). The Kotanelee Gas Plant, which is located within the La Biche River basin, is located approximately 250 km east of Watson Lake, Yukon, and 16 km north of the British Columbia border.

The Beaver River basin is located within the Liard Basin Ecoregion (Smith et al. 2004). The Liard Basin is characterized by low hills separated by broad plains, surrounded by mountains and plateaus. Most of this ecoregion lies below 900 m. The La Biche River Basin is in the Hyland Highland Ecoregion (Smith et al. 2004). The Hyland Highland is an area elevated higher than neighbouring plains and plateaus but lacking rugged summits of mountains or ranges. Both ecoregions are dominated by coniferous forests (Smith et al. 2004).

2.2 Climate

No climate stations exist within this ecoregion, but Smith et al. (2004) have made some inferences from data available from the Watson Lake, Tungsten, Fort Liard and Smith River weather stations. The Hyland Highlands have a mean annual temperature of -4°C, ranging from -20°C in January to 13°C in July. In comparison, the Liard Basin ecoregion has the same mean annual temperature of -4°C, but with slightly colder winters and slightly warmer summers with averages ranging from -25°C in January to 14°C in July. The mean average precipitation within the Hyland Highlands ranges from 500 mm to 600 mm, whereas the Liard Basin is slightly drier, receiving between 400 mm to 600 mm annually. Both ecoregions receive their peak precipitation between June and August.

2.3 Aquatic Life

Documented fish species within the La Biche River include Arctic Grayling (*Thymallus arcticus*), Bull Trout (*Salvelinus confluentus*), Round Whitefish (*Prosopium cylindraceum*), Longnose Sucker (*Catostomus catostomus*), Slimy Sculpin (*Cottus cognatus*), and Lake Chub (*Couesius plumbeus*) (Matrix, 2015). Twelve species of fish have been identified in the Liard River Basin, including Arctic grayling, chum salmon (*Oncorhynchus keta*), bull trout, inconnu (*Stenodus leucichthys*), lake whitefish (*Oregonus clupeaformis*), mountain whitefish (*Prosopium williamsoni*), northern pike (*Esox Lucius*) and burbot (*Lota lota*) (BC Parks, 2019). Arctic Grayling, Bull Trout, and Round Whitefish are sport fish that are targeted for recreational fishing. Bull Trout in this region are listed as a species of special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2012) and they are under consideration for listing as species of special concern under the federal Species at Risk Act. No other fish species within this region are considered at risk.

2.4 Hydrology

Stream flows in the Laird Basin and Hyland Highland ecoregions begin to rise in late April and peak in mid to late May as the snowpack accumulated over the winter months begins to melt (Smith et al., 2014). Secondary peaks are observed during summer and into the fall, which is caused by rainfall events and possibly discharge from the shallow groundwater system activated by the annual thaw (Smith et al., 2004). Mean annual runoff from the Laird Basin is estimated range from 249 mm to 260 mm within the Hyland Highland ecoregion (Smith et al., 2004). Minimum stream flow often occurs during March within both ecoregions (Smith et al., 2004).

Water Survey of Canada (WSC) discharge data is also available from two stations located within the study area:

- One on Beaver River (10BD001) with semi-continuous periods of record from 1979 to 1998 and from 2014 to 2015, and 2017. The gross drainage area of this river is 7,280 km² (Environment Canada, 2019); and,
- One on La Biche River (10DB001) with semi-continuous periods of record from 1979 to 1998 and 2015. The gross drainage area of this river is unavailable (Environment Canada, 2019)

2.5 Regional Vegetation

The Liard Basin and Hyland Highland Ecoregions are dominated by open boreal forest, and a limited portion of the ecoregion falls above treeline typically between 1,200 and 1,350 meters above sea level (m asl) (Smith et al., 2004). White spruce dominates well-drained fluvial terraces along major rivers, such as the benchlands adjacent to the La Biche River, while black spruce dominates cool, poorly-drained bogs, and areas with more poorly-drained, finer-grained soils (Smith et al., 2004). Subalpine fir with shrub birch and lichen is prevalent at higher elevations, replacing spruce as the dominant tree species (Smith et al., 2004).

2.6 Surficial Geology

Surficial geology of the Beaver River and La Biche River basins are presented in the appended **Figures 2** and **3**.

During the Late Pleistocene Cordilleran, ice sheets blanketed much of the Liard Basin and Hyland Highland ecoregions, with fine-textured morainal deposits along with some coarser-grained glaciofluvial deposits (Smith et al., 2004). Soils within the Laird Basin ecoregion basin are primarily morainal, glaciofluvial, and lacustrine in origin (Smith et al., 2004). Brunisolic soils, which have developed on clay rich moraine, are common in this area (Smith et al., 2004). Areas where the moraine is dominantly sandy loam have developed Eutric Brunisolic soils (Smith et. al., 2014). The sampling locations within the Beaver River Basin are located adjacent to the Beaver River and a smaller tributary which drains into the Beaver River. Based on surficial geological mapping, soils at the Beaver River sampling locations consist of slumped colluvium (C-Lme) and sands and gravels along the flood plain (gsFp-U) of the Beaver River (**Figure 2**). A detailed description of the Yukon Terrain Classification System is provided in **Appendix A**.

Alpine areas within the Hyland Highlands, at elevations higher than 1,050 m asl, consist of bedrock slopes and summits covered by a veneer of colluvium, thin moraines over bedrock, and weathered and mass-wasted bedrock (Smith et al., 2004). Moraine on lower slopes can be more than 30 m thick. Glaciolacustrine deposits are present in some valleys where ice-dammed lakes formed during glacial retreat. Where moraine is fine-grained, Brunisolic Gray Luvisols are common (Smith et al., 2004). Within areas of coarser materials, soils are generally classified as Eutric and Dystric Brunisols (Zoladeski and Cowell 1996). Local surficial geologic mapping indicates fluvial deposits (gsFp-U), glaciolacustrine (msLGpM) and colluvium (C-Lme) are the dominant materials present near the sampling stations within the La Biche River basin (**Figure 3**).

Previous investigations conducted by Matrix Solutions Inc, (Matrix) found that surficial geology in the area of the Kotanelee Gas Plant generally consisted of a shallow layer of organic soils extending to a depth of 0.5 m, underlain by silt dominated soil that transitions to interbedded coarse-grained sands and gravels extending to a depth of approximately 5.75 m bg, followed by a thick layer of glacial till. An exploration borehole (L-38) drilled by Devon Canada Corporation within the Kotanelee area encountered overburden to a depth of 135 m bg.

2.7 Bedrock Geology

Abundant rock exposure lies in the Kotaneelee and La Biche ranges in the east (Smith et al., 2014). Bedrock is predominantly composed of black shale, sandstone, clay and coal (Smith et al., 2014). The entire ecoregion lies within the miogeocline, which was formed along the continental shelf of ancient North America. The southern portions of the MacKenzie and Franklin Mountains, which are fold and thrust belts, extend along the eastern border of the ecoregion.

Exposed outcrops of the Permian Fantasque Formation and shale, sandstone and limestone of the Carboniferous Mattson Formation extend along the northeastern margins of the Liard River ecoregions. The valleys bottoms are underlain by the Lower Cretaceous Fort Saint John Group shale, siltstone and sandstone noted to contain gypsum (YGS, 2016). Bedrock immediately beneath the Beaver River is part of the Mattson Group, which is predominantly carbonaceous and dolomitic sandstone, shale and limestone with some coal (**Figure 4**) (YGS, 2016). The bedrock geology beneath the La Biche River basin is similar, with the addition of Ross Group and Kotaneelee Group rocks, which are claystone, siltstone and the carbonaceous sandstones of the Dunvegan group (**Figure 5**).

Despite the few areas of exposed bedrock, the region has significant mineral potential. Significant lead, zinc and barite deposits have been identified northeast of Watson Lake, are the most extensively explored of several dozen vein occurrences in the eastern part of the Liard ecoregion (Smith et al., 2014). Underlying Devonian limestone is a potential reservoir for natural gas, which were target host rocks of the Kotaneelee Gas Plant (Smith et al., 2014). A cross section of bedrock geology is shown on **Figure 2.1** and **Figure 2.2**.

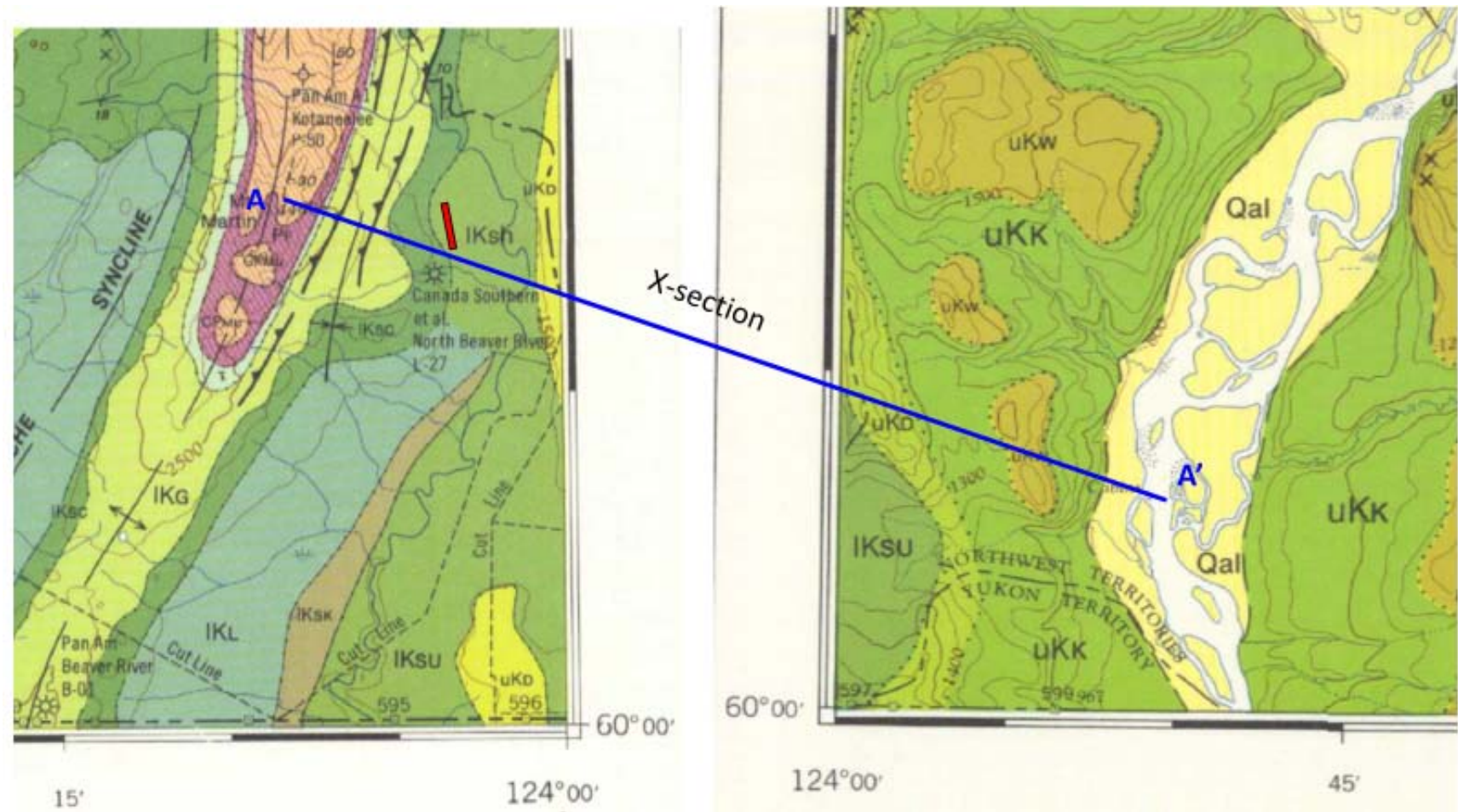
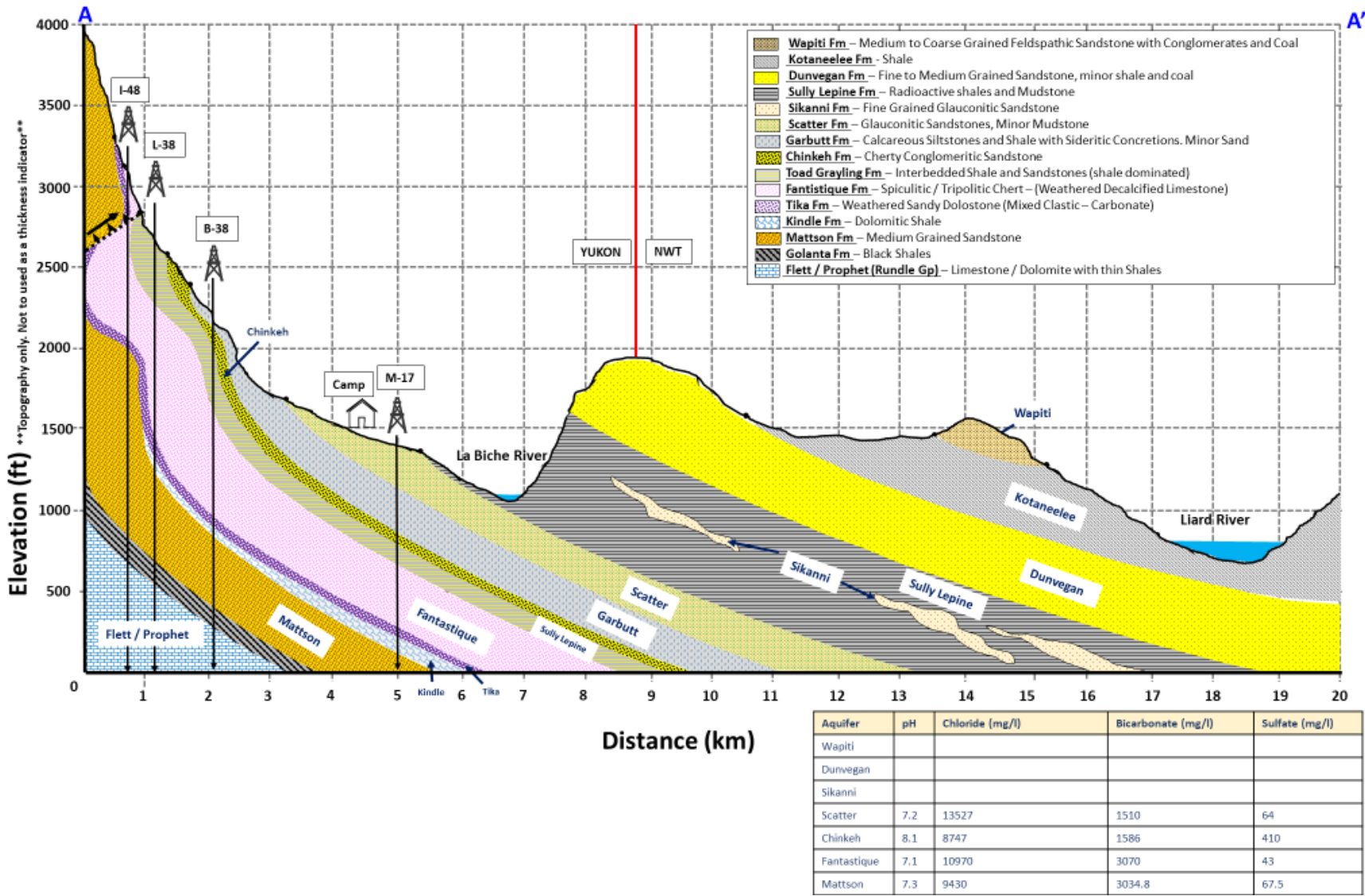


Figure 2.1 Location of Cross Section



Reference: Dr. Beth L. Parker, 360 Institute for Groundwater Research University of Guelph

Figure 2.2 Cross Section of Bedrock Geology in the Kotaneelee Gas Plant Area

2.8 Known Aquifers

Matrix describes a shallow, unconfined aquifer located within the shallow sands and gravels that extend to a depth of 5.75 m bg within the Kotaneelee Area. The hydraulic conductivity of the aquifer has been estimated to be approximately 3×10^{-5} m/s (Matrix, 2015). Hydraulic conductivity values of the underlying glacial till were 3×10^{-8} m/s, approximately three orders of magnitude lower than the overlying sands and gravels (Matrix, 2015). No other known aquifers exist within the study area.

2.9 Local Groundwater Users

Hemmera conducted a search on the Groundwater Information Network (GIN, 2014) for water wells within the study area. No water wells were reported in this database within the search area. However, the well YOWN-1507 was the water supply well for the Kotaneelee Gas Plant and was included in this study.

2.10 Land Use

The study area is located with the traditional territory of the Kaska Dena Council. The Kotaneelee Gas Plant is located on Commissioner's land and the current land use in areas immediately surrounding it are designated as industrial, commercial, or airport (Matrix, 2015). Based on observations at the Kotaneelee Gas Plant, the surrounding regional land use activities appear to be primarily oil and gas exploration, hunting, fishing, and trapping, in addition to forestry south of the BC border.

3.0 METHODS

3.1 Surface Water Sampling

WRB field personnel collected surface water samples from eight sampling locations along the Beaver River and the La Biche River within the Kotanelee area. Surface water sampling locations are shown in the appended **Figure 1**. Coordinates for each station and a station description are presented in **Table 3.1**.

Table 3.1 Summary of Surface Water Sampling Locations 2014-2018

Station Code	Latitude	Longitude	Station Description
BEVR-001	60.131	-124.889	Beaver River downstream of Whitefish River
BEVR-t-001	60.002	-124.4	Tributary of Beaver at BC border
LBCH-001	60.148	-124.063	La Biche River upstream of gas plant
LBCH-002	60.078	-124.036	La Biche River downstream of gas plant
LBCH-t-001	60.156	-124.211	Tributary of La Biche River upstream gas plant
LBCH-t-002	60.041	-124.095	Tributary of La Biche downstream of gas plant
LBCH-t-003	60.115	-124.054	Tributary of La Biche River near gas plant
SPX-Creek	60.126	-124.128	Sphinx Creek at Upper Well Site

Water samples were collected at multiple times of the year between July 2014 and September 2018. The frequency of sampling varied from year to year. Six surface water samples were collected in 2014. From 2015 to 2018, between twelve and twenty-four samples were collected annually, with samples collected in open water, during freshet and under ice conditions. The surface water condition (under ice, freshet, or open water) encountered during each sampling event are summarized in **Table 3.2**.

Table 3.2 Summary of Surface Water Conditions

Water Conditions	Season	Timing of Sampling
Under-ice	Winter	March
Freshet	Spring	May
Open Water	Late Spring	June
	Summer	July and August
	Fall	September and November

3.1.1 Surface Water Sampling Methods

Physio-chemical parameters, including specific conductivity, dissolved oxygen concentration (DO), pH, water temperature, and turbidity were collected at the time the surface water sample was collected.

During freshet and open-water conditions, surface water samples were collected by hand. Bottles were submerged below the water surface and filled with the opening facing upstream into the current. During under-ice conditions, a hole was chipped or augured through the ice and the surface water samples were collected with a sampling pole with a plastic 1 L sampling bottle attached to the end. Sample bottles were filled using the sampling pole, except for hydrocarbon bottles, which were filled by hand from the hole in the ice.

During the winter, an extra “Field” sampling container was filled at each station for subsequent filtering. The “Field” sampling container was used to filter water for dissolved constituent analysis (i.e., dissolved trace metals, dissolved mercury, and dissolved organic carbon). In summer months, samples were usually filtered in the field at the time of sample collection. After filtration, the samples were preserved: nutrient samples were preserved with sulphuric acid; total and dissolved organic carbon, and total and dissolved mercury samples were preserved with hydrochloric acid; total and dissolved metals, Radium 226, and naturally occurring radioactive materials (radionuclides) samples were preserved with nitric acid; benzene, toluene, ethylbenzene, styrene and xylenes (BTEX), volatile hydrocarbons (VH) and volatile petroleum hydrocarbons (VPH) vials were pre-preserved with sodium bisulphate; polycyclic aromatic hydrocarbons (PAH) samples were preserved with sodium azide.

Water samples for dissolved gas analysis were collected in 150mL glass serum bottles that were pre-sealed with butyl-blue stoppers and evacuated to 1×10^{-2} mbars. Gas samples were collected using an inverted bottle method, where an evacuated bottle is filled in an inverted position, underwater such that the container is filled without contact with the atmosphere. Gas samples were analyzed at the University of Calgary by the Applied Geochemistry Group. Prior to analysis, 25mL of headspace is created in each bottle by replacing 25 mL of water with ultra-pure helium. Gas samples were then analyzed on a gas chromatograph. Gas sampling and analysis was completed following EPA Standard Operating Procedures (EPA 2001, 2006). Isotope samples were collected by filling the sample bottle leaving no headspace. Isotope samples were analyzed at the Saskatchewan Research Council in Saskatoon, Saskatchewan.

Replicate samples, field blanks and/or trip blanks were collected for Quality Assurance/Quality Control purposes during each sampling event. Field blanks and trip blanks were provided by the analytical laboratory prior to each survey. Replicate samples were collected on-site immediately following the regular sample using the same methods. Field blanks were processed on-site by pouring blank water from de-ionized water supplied by the laboratory into the sample bottles, except for PAH and NA samples which were provided in the sample container and were briefly exposed to the sampling station environment by removing the lid. Trip blanks accompanied samplers for at least one day of each sampling event and were never opened.

Table 3.3 below summarizes the surface water samples collected and their representative analysis. Surface water quality samples were analyzed for a suite of constituents as follows:

- Conventional parameters: pH, specific conductivity, hardness, alkalinity, TDS, TSS, TOC, DOC, total inorganic carbon (TIC), and dissolved inorganic carbon (DIC);
- Major ions: bicarbonate, bromide, calcium, carbonate, chloride, hydroxide, magnesium, potassium, sodium, and sulphate;
- Nutrients: nitrate, nitrite, nitrate+nitrite, total ammonia, Total Kjeldahl nitrogen (TKN), total nitrogen, total phosphorus, dissolved phosphorus, and dissolved phosphorus as phosphate;

- Volatile petroleum hydrocarbons: (BTEX, VH and VPH);
- Total and dissolved metals; and,
- Radium 226.

Additionally, the following constituents were analyzed during a subset of sampling events:

- Naturally occurring radioactive materials (radionuclides), polycyclic aromatic hydrocarbons (PAHs), and naphthenic acids (NAs);
- Isotopes: oxygen-18 ($\delta^{18}\text{O}$) in water, deuterium ($\delta^2\text{H}$) in water, $\delta^{13}\text{C}$ in dissolved inorganic carbon (DIC), $\delta^{34}\text{S}$ in sulphate (SO_4) and $\delta^{18}\text{O}$ in SO_4 ; and
- Dissolved gases: methane (CH_4), C_2 and C_3 hydrocarbons (primarily ethane and propane), carbon dioxide (CO_2), nitrogen (N_2), and oxygen (O_2).

Table 3.3 Surface Water Quality Sampling Schedule

Site Code	2014		2015				2016					2017				2018		
	Jul	Nov	Mar	May	Aug	Nov	Mar	May	June	Aug	Nov	Mar	May	Aug	Nov	Mar	May	Sep
BEVR-001	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
LBCH-001	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
LBCH-002	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
BEVR-t-001									x	x	x		x	x	x	x	x	x
LBCH-t-001									x	x	x		x	x	x		x	x
LBCH-t-002									x	x	x		x	x	x		x	x
LBCH-t-003														x				
SPX-Creek														x				
	Metals total/dissolved, nutrients, general ions, physical parameters																	
		Hydrocarbons (VOCs)																
	NAs																	
	PAHs																	
	Ra226		Radionuclides (including Ra226)															
			Isotopes															
					Dissolved Gas													

Naphthenic acids and PAH sample collection was discontinued after March 2015. Some nutrient parameters (nitrate+nitrite, TKN, total phosphorus, and dissolved phosphorus) were not reported during sampling conducted in 2014. Ultra-trace PAH analysis was conducted and provided as non-blank corrected data.

Samples, including QA/QC samples were kept in coolers with ice packs during the survey and shipped back to Whitehorse typically within three days of sample collection. Samples were sent to Exova Canada Inc. based in Surrey, BC for laboratory analysis with the following exceptions:

- July 2014, September 2014, and March 2015 samples were analyzed by CARO Analytical Services, based in Richmond, BC;
- Radiometric parameters were analyzed by the Saskatchewan Research Council in Saskatoon, SK; and,
- PAHs and NAs samples were analyzed by AXYS Analytical Services in Sidney, BC.

Nutrients samples were preserved with sulphuric acid. Total and dissolved organic carbon, and total and dissolved mercury samples were preserved with hydrochloric acid. Total and dissolved metals, Radium 226, and NORMs samples were preserved with nitric acid. BTEX/VH/VPV vials were pre-preserved with sodium bisulphate. PAH samples were preserved with sodium azide.

3.2 Groundwater Sampling and Monitoring

3.2.1 Groundwater Monitoring Network

Groundwater data was collected from one groundwater monitoring well, eight drive point piezometers, one water well, and two groundwater seeps. Groundwater sampling location are described in **Table 3.4** are shown on **Figure 1**. Eight Solinst™ drive point piezometers were installed along the streambed beneath the streams to sample the groundwater in the transition zone between surface water and groundwater. The drive point piezometers were installed using a manual slide hammer. The drive points are hammered in, and then pulled back to expose a stainless mesh screen. All drive points were installed to an approximate depth of 1.0 – 2.0 m below ground (m bg). Two drive point piezometers were installed along the Beaver River and six drive point piezometers were installed along the La Biche River.

The water supply well for the Kotanelee Gas Plant, YOWN-1507, and the monitoring well MW15-1A, which was installed by Matrix during site remediation activities, were also monitored during the baseline study. MW15-1A has a screen length of 1.5 m and extends to a depth of 4.49 m within a unit of sand and silt. During groundwater sampling, YG-ENV staff noted that the depth to bottom of the well was approximately 5.0 m bg.

In addition to the drive point piezometers and monitoring wells, WRB field personnel collected samples from two groundwater seeps (BVRV-SEEP and LBCH-SEEP).

Table 3.4 Summary of Groundwater Monitoring and Sampling Locations

Station Code	Latitude	Longitude	Well Depth (m bg)	Station Description
BVRV-DP1	60.131	-124.889	-	Beaver River drive point well #1
BVRV-DP2	60.131	-124.888	-	Beaver River drive point well #2
BVRV-SEEP	60.131	-124.889	N/A	Beaver River bank seep
LBRV-DP1	60.142	-124.048	-	La Biche River drive point well #1
LBRV-DP2	60.143	-124.048	-	La Biche River drive point well #2
LBRV-DP3	60.078	-124.036	1.1	La Biche River drive point well #3
LBRV-DP4	60.078	-124.038	2.1	La Biche River drive point well #4
LBRV-DP5	60.04	-124.094	-	La Biche River drive point well #5
LBRV-DP6	60.04	-124.095	0.77	La Biche River drive point well #6
LBCH-SEEP	60.04	-124.095	N/A	La Biche River bank seep
MW-15-1A	60.116	-124.054	3.5	Monitoring Well near gas plant. Well is screened within sand and silt.
YOWN-1507	60.117	-124.056	5.0	Kotanelee Gas Plant Well

3.2.2 Groundwater Sampling Methods

WRB field personnel collected groundwater samples from the monitoring well, the water supply well, two drive point piezometers along the La Biche River and two of the seeps located along each river. Two groundwater samples were collected in 2015 and 2016 in August and September and three samples were collected in 2017 (March, August, and November) and 2018 (March, May, and September). The groundwater sampling schedule and parameters analyzed is summarized in **Table 3.5**.

Table 3.5 Groundwater Quality Sampling Schedule

Site Code	2015		2016		2017			2018		
	Aug	Nov	Aug	Nov	Mar	Aug	Nov	Mar	May	Sep
YOWN-1507	x	x	x	x		x	x	x	x	x
MW-15-1A						x				
BVRV-SEEP		x								
LBCH-SEEP					x	x				
LBRV-DP2	x									
LBRV-DP6						x	x		x	x
Metals (total/dissolved), nutrients, general ions, physical										
Hydrocarbons (VOCs)										
PAHs										
Radionuclides (including Ra2206)										
Isotopes										
Dissolved Gas										

Groundwater samples from the drive-point piezometers were acquired using either a peristaltic pump or a micro-flow Waterra™ foot valve. Samples were purged until stability of standard conductivity, temperature and pH was achieved.

Temperature, pH, specific conductivity, DO, redox potential, and turbidity were measured in the field.

Groundwater samples were analyzed for a similar suite of parameters as surface water (**Section 3.1.1**), including: conventional parameters (pH, conductivity, alkalinity, TDS, TSS, TIC and DIC), major ions, total and dissolved metals, volatile petroleum hydrocarbons, PAHs, Radium 226 and radionuclides, isotopes, and dissolved gases.

Water samples for dissolved gas analysis are collected in 150mL glass serum bottles that have been pre-sealed with butyl-blue stoppers and evacuated to 1×10^{-2} mbars. Gas samples were collected using an inverted bottle method, where an evacuated bottle is filled in an inverted position underwater such that the container is filled without contact with the atmosphere. Gas samples were analyzed at the University of Calgary Applied Geochemistry Group. Prior to analysis, 25 mL of headspace is created in each bottle by replacing 25 mL of water with ultra-pure helium. Gas samples were then analyzed on a gas chromatograph. Gas sampling and analysis was completed following EPA Standard Operating Procedures (EPA 2001, 2006).

Isotope samples were collected by filling the sample bottle with no headspace. Isotope samples were analyzed at the University of Calgary Applied Geochemistry - Isotope Science Laboratory.

An extra “Field” sampling container was filled at each sampling station for subsequent filtering. The “Field” sampling container was used for filtering dissolved samples (dissolved trace metals, dissolved mercury, and dissolved organic carbon).

Nutrients samples were preserved with sulphuric acid. Total and dissolved organic carbon, and total and dissolved mercury samples were preserved with hydrochloric acid. Total and dissolved metals, Radium 226, and radionuclides samples were preserved with nitric acid. BTEX/VH/VPV vials were pre-preserved with sodium bisulphate. PAH samples were preserved with sodium azide.

3.3 Continuous Data

Continuous water quality and groundwater level data was collected at six surface water sampling sites and three groundwater monitoring wells. Solinst and Hobo pressure transducers were used to record water level, barometric pressure, temperature and electrical conductivity as instantaneous values at 1 hour and 6-hour intervals. The monitoring data was collected between the following periods:

- BEVR-001: May 2016 to August 2016, May 2017 to August 2017 (temperature and conductivity);
- LBCH-001: May 2016 to August 2017 (temperature and conductivity);
- LBCH-002: June 2016 to August 2016, May 2017 to August 2017 (temperature and conductivity);
- BEVR-t-001: June 2016 to August 2016 (temperature and conductivity);
- LBCH-t-001: June 2016 to August 2016, May 2017 to September 2018 (temperature and conductivity);
- LBCH-t-002: June 2016 to August 2016, May 2017 to August 2017 (temperature and conductivity);

- YOWN-1507: August 2015 to September 2018 (level, temperature and conductivity);
- LBRV-DP5: August 2017 to September 2018 (level and temperature); and,
- LBRV-DP6: August 2017 to September 2018 (level and temperature).

Daily discharge and daily water levels were obtained from two Water Survey of Canada stations located on the La Biche River (WSC#10DB001) and Beaver River (WSC#10BD001). Both stations lacked a complete data set. The Beaver River (WSC#10BD001) data set included daily discharge and daily water levels for two periods from mid-September 2014 to the end of December 2015 and January 2017 to December 2017. Daily water levels were available from the La Biche River station (WSC#10DB001) for the latter half of 2015.

3.4 Data Compilation and Screening

3.4.1 Data Receipt and Upload to Database

Analytical results from surface water and groundwater samples collected from July 2014 to September 2018 in the Kotanelee study area were provided by WRB. Data provided included location coordinates (latitude and longitude), field sampling methodologies, field data (where available), and the original laboratory reports (i.e., electronic data files). Data was checked for completeness and initial quality assurance (QA) checks were conducted. Quality control (QC) samples (e.g., replicate samples, field blanks, and/or trip blanks) were identified for further assessment, and field data underwent a validation step.

Electronic versions of analytical results compatible with the ESdat software were obtained from Exova and Caro and were uploaded to ESdat to facilitate the data analyses to avoid transcription errors associated with manual data entry and to compare to multiple guidelines and standards. Field data and analytical results from AXYS and SRC were uploaded manually into the database. Continuous monitoring data was provided by WRB in Excel spreadsheet format. Hydrometric data was downloaded from two Water Survey of Canada stations (WSC#10BD001 and WSC#10DB001).

3.4.2 QA/QC Procedures

A rigorous QA/QC assessment was completed to determine whether data collected were of known, acceptable, and defensible quality. A brief description of the methods is provided below.

Field data underwent a validation step before loading to ESdat to verify that all necessary data were collected, and that outliers or suspect data were identified, and appropriate follow-up completed. Field sampling methodologies provided by WRB were reviewed for completeness and for consistency with CCME methodologies (CCME 2011, 2015). Continuous data was reviewed. Any outliers associated with temporarily removing the data logger during data downloads were removed from the data set.

The original laboratory reports were reviewed for deviations that could affect the integrity of the sample (e.g., sample storage, sample temperature, bottle breakage), the use of the appropriate detection limits, assignment of laboratory qualifiers, and the laboratory QC results (e.g., laboratory duplicates, spikes, and method blank samples). WRB was informed of any issues, and additional follow-up with the laboratories was completed, if and when required and appropriate.

Parameters with holding times longer than the laboratory recommended holding times (i.e., derived from American Public Health Association [APHA] 2012) were reviewed for patterns and the significance of not

meeting the recommended times. Total and dissolved concentrations for each parameter were compared to determine whether the dissolved concentration exceeded the total concentration.

Approximately 10% of the hard copies of the laboratory reports were reviewed and compared to the databased values. If any errors were identified, the errors were corrected within the database.

The available QC results from field blanks, travel blanks, replicates, or split samples were evaluated based on CCME protocols for water quality samples (CCME 2011) and were used to assess potential sample contamination during collection, shipping and analysis, as well as to check intra-station variation and precision of field sampling methods. Water quality data from the principal water samples were interpreted with any identified limitations or bias in mind.

3.4.3 Isotope Data

Isotopes are atoms of the same element (same atomic number, or number of protons) that have a different number of neutrons, and thus a different atomic weight. Isotopes that do not decay into other isotopes or elements are called stable isotopes and include the isotopes analyzed in this study ($\delta^{18}\text{O}$, $\delta^2\text{H}$, $\delta^{13}\text{C-DIC}$, $^{34}\text{S-SO}_4$ and $\delta^{18}\text{O-SO}_4$). Isotopes are expressed as a ratio between two isotopes of the same element. The isotopic ratio in the sample is compared to that of a standard to eliminate inconsistencies between laboratories and machines. Using $\delta^{18}\text{O}$ as an example, the isotopic ratio is calculated by:

$$\delta^{18}\text{O} = \left(\frac{(^{18}\text{O}/^{16}\text{O})_{\text{sample}}}{(^{18}\text{O}/^{16}\text{O})_{\text{reference}}} - 1 \right) * 1000\text{‰ VSMOW}$$

Vienna Standard Mean Ocean Water (VSMOW) is the standard for $\delta^{18}\text{O}$ and $\delta^2\text{H}$ and the results are expressed in per mille (‰). Different isotopes of the same element will behave differently during chemical and physical processes, causing the ratio between the isotopes to change. This process is called fractionation. Evaporation results in fractionation. During evaporation of water (H_2O), the lighter isotope (^{16}O or ^1H) is more easily incorporated into the vapour phase than the heavy isotope (^{18}O or ^2H). The remaining liquid water will be left with a greater abundance of the heavy isotope, and thus the ratio between the heavy isotope and the light isotope will increase and $\delta^{18}\text{O}$ and $\delta^2\text{H}$ will become greater or more positive. This is termed “enrichment”. The vapour phase will have a greater abundance of the light isotope, and thus the ratio will between isotopes will decrease and $\delta^{18}\text{O}$ and $\delta^2\text{H}$ values will become lower, or more negative. This is termed “depletion”. Due to fractionation effects, isotopic analysis can provide information on the physical and chemical processes that water, gases or dissolved or suspended components have undergone. Isotopic ratios can also be used to determine the source of water, gas or other components as constituents or fluids from a particular source, for example methane produced biogenically by bacteria or sulphate derived from the oxidation of pyrite, will fall within a characteristic range of values.

Isotopic data for $\delta^{18}\text{O}$ and $\delta^2\text{H}$ in surface water and groundwater samples was compared to isotopic data for precipitation from the International Atomic Energy Association (IAEA) Global Network of Isotopes in Precipitation (GNIP). The closest GNIP station is in Whitehorse, with an isotopic record from 1960 to 1990 (IAEA 2017). Years for which complete, or almost complete monthly datasets were available for two periods between 1961 to 1966 and 1985 to 1989. The local meteoric water line (LMWL), which represents the relationship between $\delta^{18}\text{O}$ and $\delta^2\text{H}$ in the local precipitation, was calculated by Hemmera for this project using data from 1986 to 1989 and was found to be $\delta^2\text{H} = 6.4 \delta^{18}\text{O} - 31$. Whitehorse is located approximately 550 km west of the Kotanelee Basin, at similar elevation, and as such the isotopic signature of precipitation

in the study area may differ slightly from that observed at the Whitehorse GNIP station. Isotopic data from Kotaneelee Basin was also compared to the isotopic data from the Mayo GNIP station, which is located approximately 650 km from the Kotaneelee Basin. The LWML for Mayo data was calculated to be $\delta^2\text{H} = 6.3 \delta^{18}\text{O} - 37$. The Whitehorse and Mayo LMWLs plot below the global meteoric water line (GMWL), defined as $\delta^2\text{H} = 8.2 \delta^{18}\text{O} + 11.3$ (Rozanski et al. 1993). The average values for $\delta^{18}\text{O}$ and $\delta^2\text{H}$ in Whitehorse and Mayo precipitation were weighted by the amount of precipitation each month from 1986 to 1988 and were found to be -21.7 and -167.4‰ and -22.6 and -176 ‰, respectively. The amount-weighted precipitation values for the Kotaneelee area, based on a map of precipitation values for Canada (Gibson et al. 2005) is approximately -23 and -177 ‰, respectively. In general, the trend in $\delta^{18}\text{O}$ and $\delta^2\text{H}$ at increasing latitude is towards more depleted (more negative) isotopic values.

3.5 Baseline Characterization

3.5.1 Water Quality Comparison to Water Quality Guidelines

In order to create the baseline groundwater characterization, surface water chemistry results were compared to the following regulatory guidelines and standards:

- Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME-FAL) (CCME, 1999, with updates to 2017) chronic long-term exposure. It is important to note that these guidelines only apply to total, unfiltered surface water. The guidelines have been applied to groundwater as reference; and,
- BC Approved Water Quality Guidelines and Working Water Quality Guidelines (BC-WQG) from the British Columbia Ministry of Environment and Climate Change Strategy (BC ENV, 2017) were used as supplemental comparison.

Groundwater chemistry results were also compared to the CCME-FAL guidelines and BC-WQG. In addition, groundwater data was also compared to the Yukon Contaminated Sites Regulation Schedule 3, Generic Numerical Water Quality Standards for Aquatic Life (CSR-AL) (Yukon Environment Act, Contaminated Sites Regulation, 2002). The Yukon CSR-AL standards apply to total metals in surface water; however, the CCME and BC-WQG were more useful for surface water comparisons. The comparison of the standards to total metals in groundwater is made for reference purposes only.

3.5.2 Groundwater-Surface Water Interactions

Groundwater and surface water were compared where data existed for both the Beaver River and La Biche River Watersheds. In order to assess the groundwater-surface water interactions, the following assumptions have been made:

- Groundwater samples collected from YOWN-1507 represents shallow, local groundwater;
- Water samples collected from drive point piezometers, which are installed into the shallow streambed, are influenced by surface water and represent a mixture of shallow groundwater and surface water;

- Groundwater seeps are groundwater fed with some proportion of surface water;
- Groundwater discharging to stream is a significant contributor to surface flow during the winter months when there is little to no inputs from precipitation (Smith, et al., 2004). Surface water samples collect in March are assumed to have the highest proportion of groundwater. Surface samples collected during the winter months are assumed to be the most representative mixture of groundwater and surface water; and,
- Stream flow during open water conditions is influenced by precipitation and snowmelt (Smith, et al., 2004). Water samples collected in open water conditions (May, June, July, August, September and November) are assumed to have the lowest proportion of groundwater.

To characterize the groundwater component in surface water, baseflow, streambed, and YOWN-1507 samples were compared to freshet and open water samples to determine which general parameters, metals, anions, and nutrients were typically elevated in groundwater.

4.0 RESULTS

4.1 QA/QC Summary

The QA/QC program included a review of the field data, field notes, analytical results provided by the laboratory. Duplicate water quality results were compared to the parent samples and relative percent differences (RPD) values were calculated. RPD values are summarized in Table 1 attached.

Samples for laboratory analyses were submitted as soon as possible after collection to maintain sample integrity. Analytical holding times were met for all surface water and groundwater samples, except for the following:

- pH (recommended holding time is 15 minutes) for all samples collected;
- Total phosphorus in Trip Blank from November 2014;
- Dissolved mercury in Trip blank of July 2014;
- Electrical conductivity in June 2016 (1146825);
- Total phosphorus in BEVR-001 March 2015;
- Nitrate and nitrite in all samples in August 2017;
- Nitrate and nitrite in YOWN-1507 and LBRV-DP6 in September 2018; and,
- Total carbon was less than dissolved organic carbon for BEVR-001 and its duplicate in August 2015. Results were verified and within the expected measurement of uncertainty.

Review of the field physio-chemical data indicated that the field measured data for surface water and groundwater samples were generally reliable and within range with exception of the following electrical conductivity measurements collected from LBCH-t-002 on August 28, 2016. The laboratory analytical result was 741 $\mu\text{S}/\text{cm}$ compared to field measurement of 8630 $\mu\text{S}/\text{cm}$. It is possible that there was a recording error as all other measurements taken during the same sampling event were within reasonable agreement to laboratory concentrations. This field measurement was invalidated.

The total and dissolved concentrations for all analysed metals were compared. Samples were screened using the RPD and their values relative to the detection limit for each parameter. If the dissolved concentration was 30% greater than the total concentration for a given metal parameter and both concentrations were more than 5 times the detection limit, the dissolved concentration was excluded from the results. The data that were invalidated are summarized in **Table 4.1** below.

Table 4.1 **Summary of Dissolved Metal Concentrations which exceed Total Metal Concentrations**

Sample Matrix	Sampling Location	Field ID	Sample Date	Parameter Invalidated	Rationale for Data Invalidation
Groundwater	BVRV-SEEP	2015175	3/11/2015	Dissolved Selenium	Total concentration was significantly below dissolved concentration
Groundwater	LBRV-DP2	2015105	04/08/2015	Dissolved Sodium ion	Total concentration was significantly below dissolved concentration
Surface Water	BEVR-001	2016242 – Replicate Sample	09/11/2016	Dissolved Lead	Total concentration was significantly below dissolved concentration
Surface Water	LBCH-001	2017278	08/11/2017	Dissolved Lead	Total concentration was significantly below dissolved concentration
Surface Water	LBCH-t-001	2016234 – Tributary to La Biche R. u/s of gas plant	09/11/2016	Dissolved Thorium, Dissolved Zinc, Dissolved Zirconium	Total concentrations were significantly below dissolved concentration

4.1.1 Field and Trip Blanks

Fifteen field blanks and fifteen trip blanks, consisting of samples of laboratory supplied de-ionised water, were submitted for analysis during the Kotaneelee Baseline Study. Samples were analysed for the same parameters as surface water samples.

Several samples had detectable concentrations of various parameters, generally that were within 5 times the detection limit. Trace concentrations of these parameters in the trip blanks are not considered to be an issue given they are substantially lower than concentrations detected in groundwater samples. Summary table with trip blank and field blank concentrations are attached in **Table 1-A**.

4.1.2 Replicate Samples

Fourteen replicate samples were collected during the Kotaneelee Baseline Study between July 2014 to September 2018.

Relative percent difference (RPD) calculations for duplicate samples are shown in **Table 1-B**, appended.

Most duplicate results showed an acceptable relative percent difference (RPD) of less than 30% when compared to concentrations measured in the respective sample from the same monitoring well for all concentrations greater than five times the method detection limit.

- Acceptance Criteria: RPD < 30%
- Groundwater and Surface Water Samples Analysed: 97

As shown above and in **Table 1-B**, a number of duplicates fell outside the typically acceptable 30% RPD range. Of the elevated RPDs, a number of exceedances are noted where concentrations are within 5 times the laboratory detection limit. Several of these elevated RPD values are total metals and PAHs, which given the high TSS in many of the samples, could potentially result in erroneously high concentrations (i.e. false positives) and high RPDs. Hemmera notes that while the RPD value can appear exaggerated where concentrations are close to the detection limit, there can be a comparatively low difference in concentrations between samples. Therefore, a reasonable level of confidence can still be obtained from results within 10 times the LDL when RPD values are over 30%.

A number of duplicate pairs with concentrations above 5 times the detection limit displayed RPD values in excess of the acceptable 30% range. There is no firm understanding as to the reason for these discrepancies, with various parameters displaying exceedances across the course of the monitoring program. This may be related to the sampling methodology. Replicate samples, two sets of samples collected immediately after each other, and not split duplicate samples were collected. This may lead to slight variation between the samples, resulting in the elevated RPD values between replicate samples. Discrepancies may be due to a number of factors including the high turbidity/ sediment content noted in some samples (potentially resulting in variability in dissolved metals concentrations after filtering), the long transit time to the lab (potentially allowing sample chemistry to alter) or laboratory analytical error.

Hemmera notes that where these duplicates exceeded the 30% RPD range, they were generally within the variability of results displayed across the monitoring program and within the range displayed across the study area. Where a duplicate pair exceeded the 30% RPD range, in all samples the maximum duplicate concentration was below the maximum site concentration and below all applicable water quality guidelines.

Hemmera considers that for the purpose of this baseline assessment, replicate results and the dataset as a whole are considered acceptable to characterize groundwater chemistry across the study area.

4.2 Surface Water Quality

This section of the report represents the analysis of the surface water samples collected within La Biche and Beaver River watershed located within the Kotanelee area. Analytical results of surface water are presented in appended **Table 2** and summary tables detailing parameters which exceeded the guidelines for surface water are presented in the appended **Table 3**.

4.2.1 Routine Parameters

Surface water samples were generally neutral to slightly basic ranging from 6.87 to 8.38. The reported pH values were within the acceptable CCME guidelines.

Surface water was generally well-oxygenated during under-ice and freshet conditions with all concentrations above 9.5 mg/L, the lowest acceptable concentration for early life stages in cold water (CCME, 1999). The concentration decreased in both watersheds from June to August 2016 and 2017. At least one measurement from each location during this period dropped below 9.5 mg/L (**Figure 4.1** and **Figure 4.2**). All other DO measurements were above the guideline value for early life stages in warm water, and other life stages in warm and cold water (CCME, 1999).

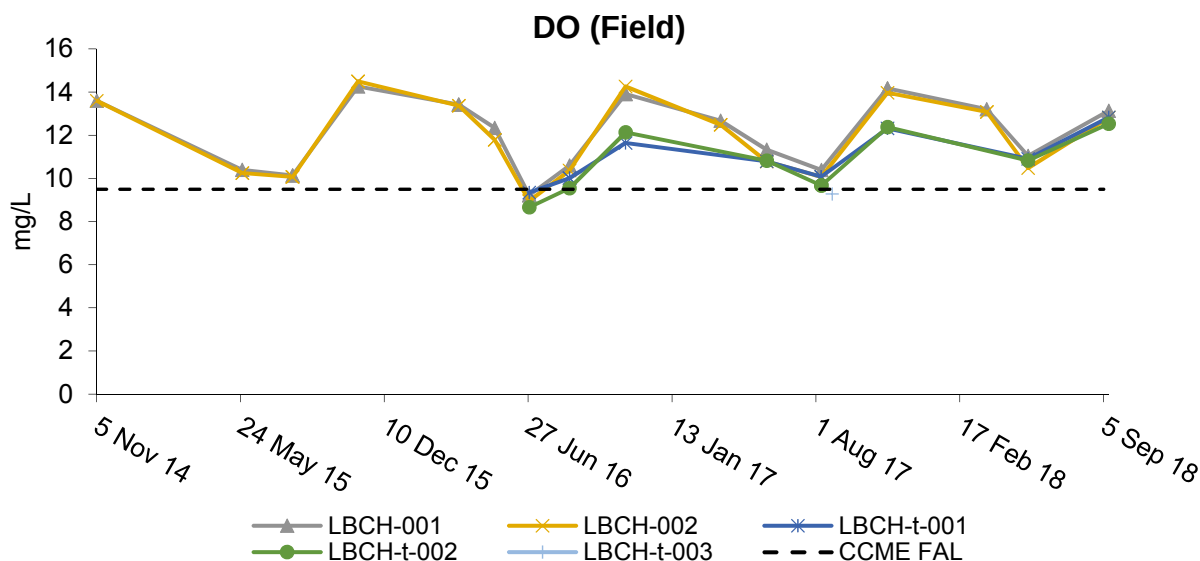


Figure 4.1 Dissolved Oxygen Concentrations within Surface Water Samples in La Biche Watershed

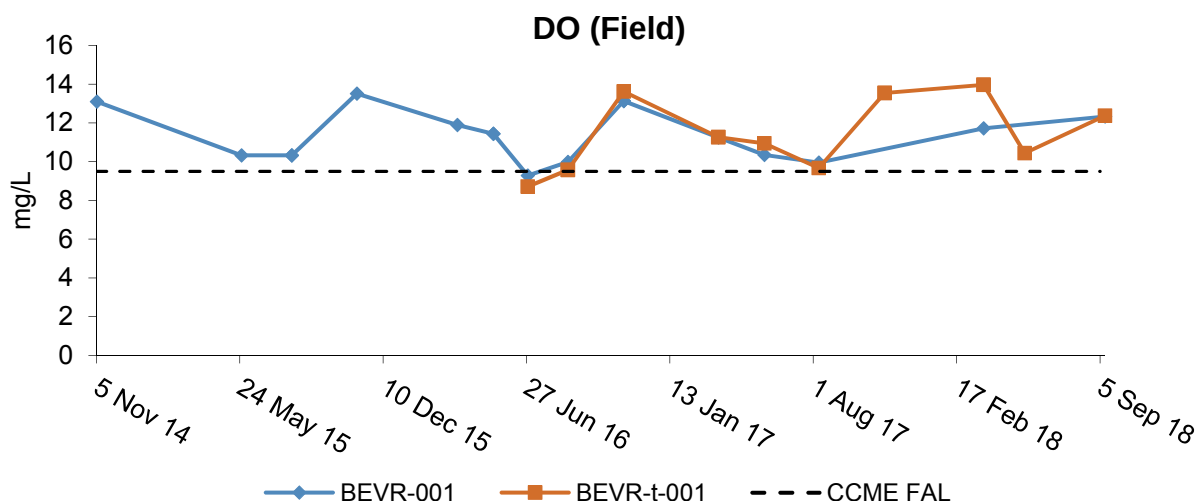


Figure 4.2 Dissolved Oxygen Concentrations within Surface Water Samples in Beaver River Watershed

Specific conductivity varied greatly, both between the various sampling location and within each sampling location. Surface water samples at LBCH-t-002 had the highest specific conductance measurement (741 $\mu\text{S}/\text{cm}$) in August 2016. The lowest specific conductance was measured at LBCH-001 in May 2017 (146.4 $\mu\text{S}/\text{cm}$) during freshet when contributions to stream flow are primarily from the melting snowpack.

All surface water samples collected within the Kotanelee area exceeded the BC WQG (10,000 $\mu\text{g}/\text{L}$) for total alkalinity. Alkalinity concentrations ranged from 48,000 $\mu\text{g}/\text{L}$ to 293,00 $\mu\text{g}/\text{L}$. Water that exceeds the 10,000 $\mu\text{g}/\text{L}$ is highly sensitive to acid inputs (BC ENV, 2017).

Total suspended solids concentrations ranged from 1.7 mg/L to 171 mg/L with an average concentration of 41.1 mg/L (**Figure 4.3** and **Figure 4.4**). Total dissolved solids ranged from 82 mg/L to 494 mg/L with an average concentration of 265 mg/L.

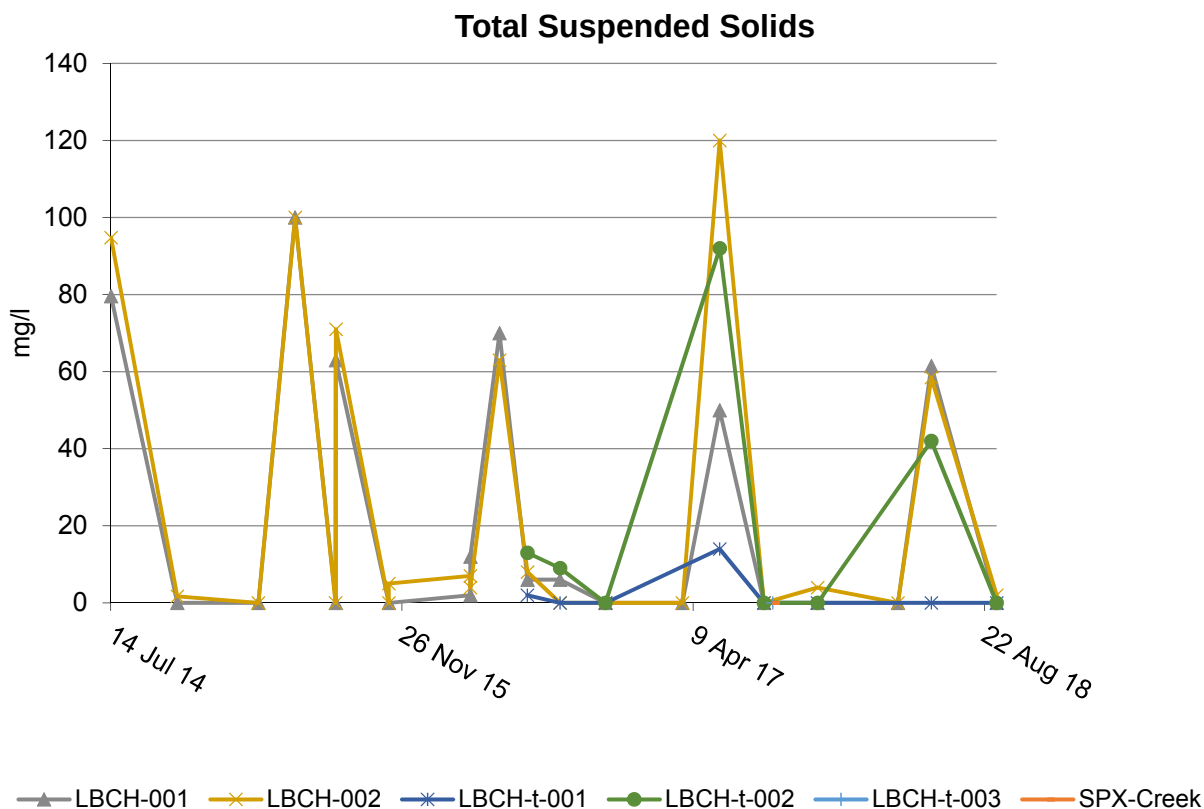


Figure 4.3 Total Suspended Solid Concentrations within Surface Water Samples in the La Biche Watershed

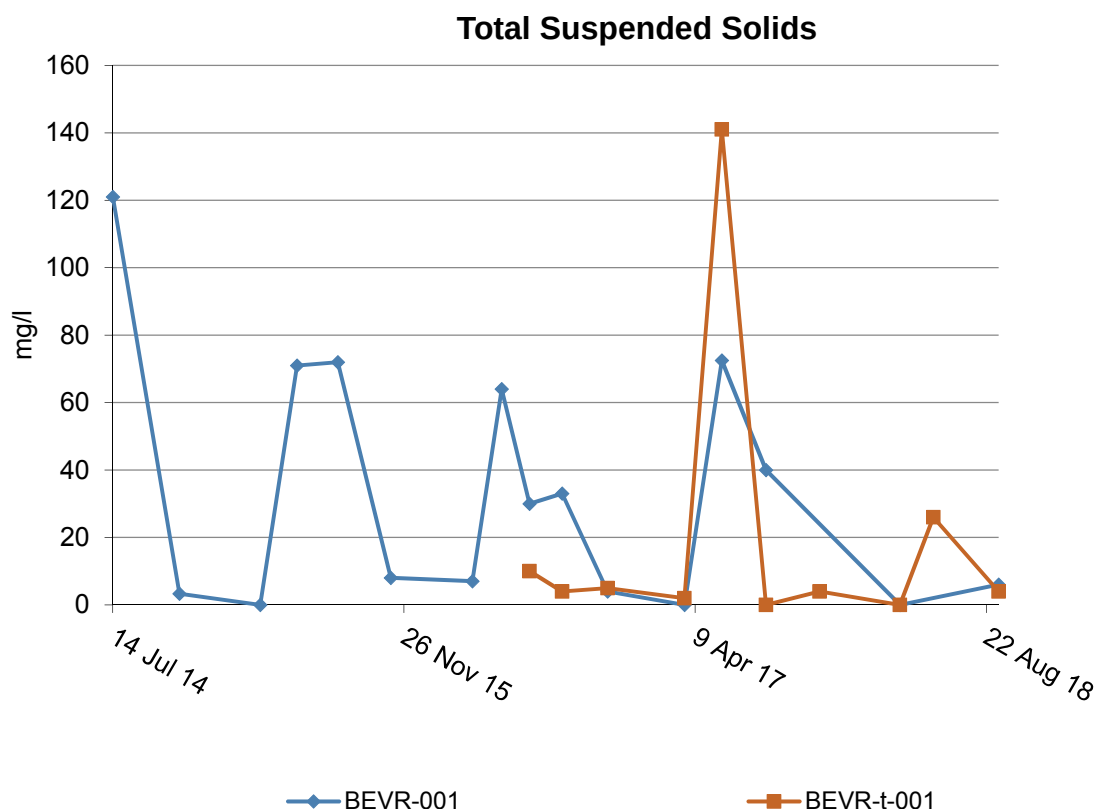


Figure 4.4 Total Suspended Solid Concentrations within Surface Water Samples in the Beaver River Watershed

Dissolved organic carbon concentrations ranged from 1.0 µg/L to 27.9 µg/L. Concentrations were generally elevated during open water conditions and decreased during under-ice conditions. The concentrations of nitrate, nitrate+nitrite and total ammonia were below the applicable guidelines in all surface water samples collected within the Kotaneelee area. Nitrite concentrations exceeded the CCME FAL guideline at LBCH-001, LBCH-002 and BEVR-001 in samples collected from May 2015 to March 2016, and in September 2016. The nitrite concentration at BEVR-t-001 exceeded the CCME FAL standard in September 2016. The concentrations of nitrite were below the detection limit in all other samples. Elevated concentrations of ammonia and DOC at LBCH-t-002 and DOC at LBCH-t-001 were observed compared to all other sampling locations.

Total Kjeldahl Nitrogen (TKN) is a measure of ammonia and organic nitrogen and is an indicator for biological available nitrogen. TKN was analyzed in November 2014 and March 2015. TKN concentration ranged from 141 µg/L to 272 µg/L, indicating that there are moderate amounts of biologically available nitrogen in the surface waters within the Kotaneelee area.

Total phosphorus concentrations ranged from 3 µg/L to 434 µg/L. Total phosphorus concentrations tended to be low throughout the winter months (10-20 µg/L) and increased during freshet and the summer months with concentrations ranging from 50 µg/L to 200 µg/L. Elevated phosphorus concentrations peaked in May 2017 with concentrations ranging from 250 µg/L to 434 µg/L in all locations except LBCH-t-001.

4.2.2 Major Ions

The surface waters within the Beaver River and La Biche Watersheds were dominantly calcium magnesium bicarbonate type waters (**Figure 4.5**). The chemical composition of major cations and anions varied more significantly within the La Biche watershed than within the Beaver River watershed (**Figure 1**). The concentrations of chloride were below the detection limit in all samples collected. Samples were not analyzed for fluoride. The dominant anion was bicarbonate (between 40 to 80%) followed by sulphate (between 20 to 60%). The composition of the cations varied more significantly than the anions. All but two samples had more than 50% bicarbonate collected at LBCH-t-002 and SPX-Creek, which had higher proportions of sulphate (4.6). All samples within the La Biche River watershed had higher proportions of calcium (60 to 100%), magnesium (20 to 60%) and sodium and potassium (less than 40%). All samples collected from the Beaver River (BEVR-001) and its tributary (BEVR-t-001) were very similar (**Figure 4.6**). While calcium tended to dominate most surface water sampling locations, LBCH-t-002 had lowest proportion of calcium and the highest proportion of magnesium, sodium and potassium of all samples collected on site (**Figure 4.5**). These major ions are expected considering the local bedrock geology within the watersheds. The bedrock geology of the Beaver River is predominantly Mattson formation, composed of calcareous to dolomitic grey sandstone and shale, and Fort. St John formation, composed of weather shale, sandstone and shale which is noted to contain gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) within the La Biche Watershed. The slightly elevated sulphate concentrations within the La Biche watershed are likely due to the presence of weather gypsum within the Fort St John formation.

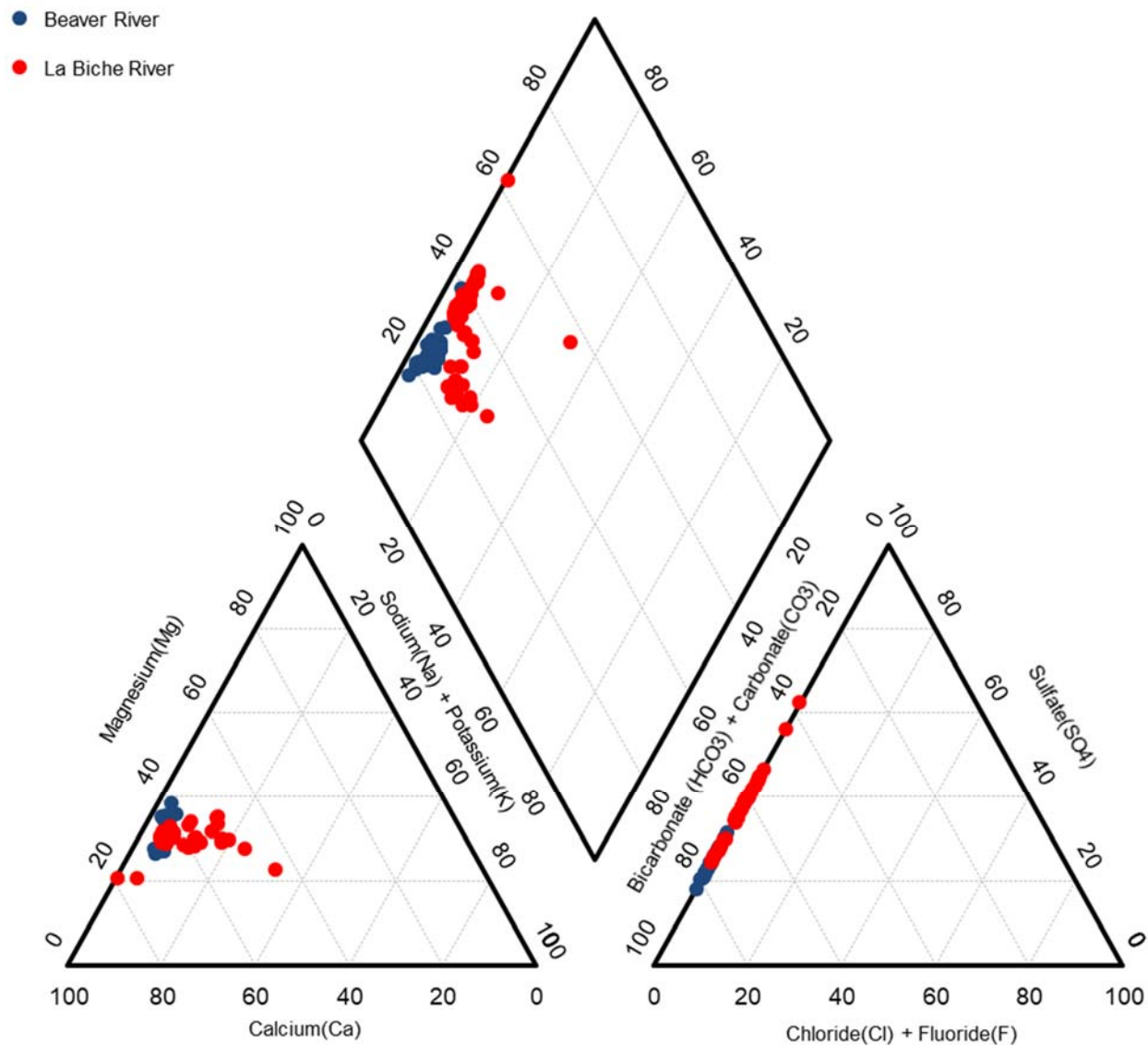


Figure 4.5 Piper Plot of Surface Water Samples Sorted by Watershed

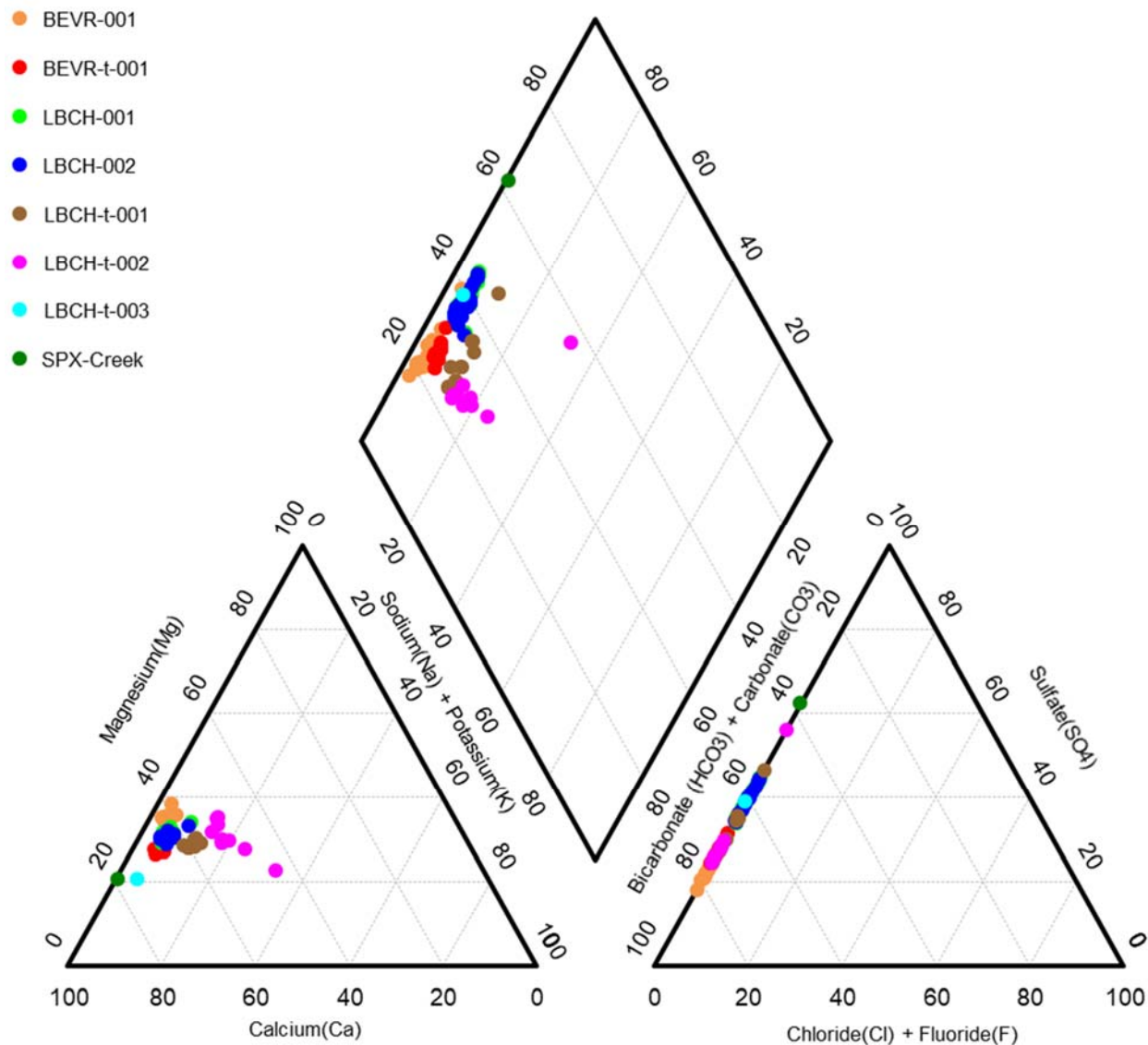


Figure 4.6 Piper Plot of Surface Water Samples Sorted by Sampling Locations

Surface water was generally hard to very hard ranging from 70 mg/L to 370 mg/L, with an average hardness of 206 mg/L (**Figure 4.7** and **Figure 4.8**). The highest seasonal hardness concentrations were recorded in March and the lowest concentrations were reported in May during freshet. Hardness concentrations slowly increased over the summer and fall. Correspondingly, the electrical conductivity was also high, ranging from 143 μ S/cm to 8630 μ S/cm. Hardness values were similar between the La Biche and Beaver River Watersheds.

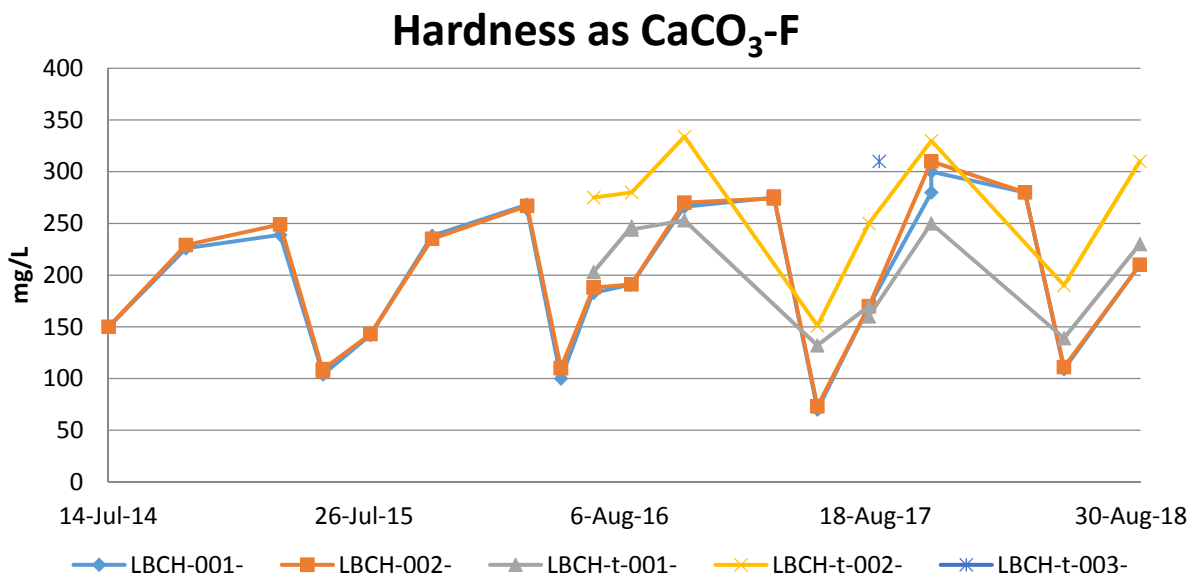


Figure 4.7 Hardness Concentrations within Surface Water Samples in La Biche Watershed

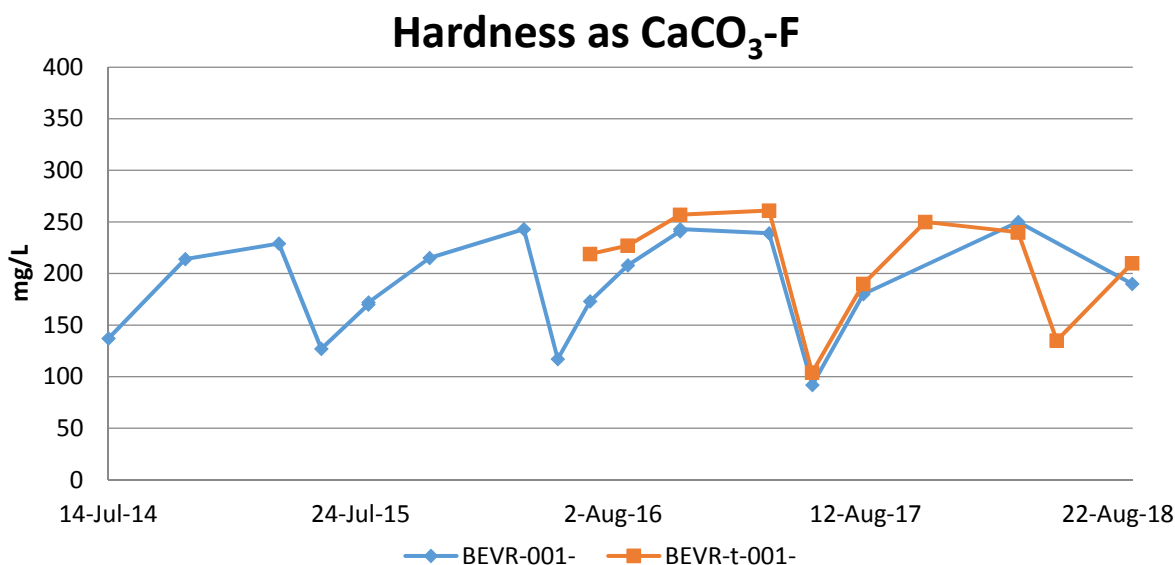


Figure 4.8 Hardness Concentrations within Surface Water Samples in Beaver River Watershed

Metals

Several total metals concentrations exceeded the guidelines including aluminum, beryllium, cadmium, chromium, copper, iron, selenium, and zinc at each surface water sampling location. The concentration of antimony, barium, boron, lead, mercury, nickel, silver, thallium, titanium and uranium were all below the BC WQGs and the CCME guidelines in all surface water samples collected. The metal concentrations which exceeded guidelines at each surface water sampling location are summarized below:

Beaver River

- BEVR-001 – total aluminum, beryllium, cadmium, chromium, copper, iron, selenium and zinc
- BEVR-t-001 – total aluminum, beryllium, chromium, copper, iron, and selenium

La Biche River

- LBCH-001 – total aluminum, beryllium, chromium, copper, iron, selenium and zinc, dissolved aluminum and selenium,
- LBCH-002 – total aluminum, beryllium, chromium, copper, iron, selenium, zinc and dissolved selenium.
- LBCH-t-001 – total aluminium, chromium, and iron
- LBCH-t-002 – total aluminum, beryllium, chromium, copper, and iron
- LBCH-t-003 – total selenium
- SPX-Creek – total and dissolved selenium

4.2.3 Volatile Petroleum Hydrocarbons, PAHs, Naphthenic Acids and Radionuclides

The concentration of BTEXs and VPHw were below the detection limit in all surface water samples collected in the Kotanelee area. PAH concentrations in surface waters were generally below the detection limit, but detectable concentrations of PAHs were observed in each watershed. Concentrations of PAHs in surface water samples were less than the CCME guidelines (**Tables 1 and 2**). **Figure 4.9** shows total PAH concentrations (the sum of all parent PAH compounds) in each watershed. Concentrations of PAHs varied between watersheds and sampling events. The La Biche River sampling sites had higher concentrations of PAH compounds, up to 0.124 µg/L total parent PAHs, compared to Beaver River, which had total concentrations of parent PAH less than 0.075 µg/L (**Figure 4.9** and **Figure 4.10**). The highest PAH concentrations in surface water samples were measured during the July 2014 sampling event. The total PAH concentrations were highest July 2014 and lowest during in March 2015 in all sampling locations (**Figure 4.10**).

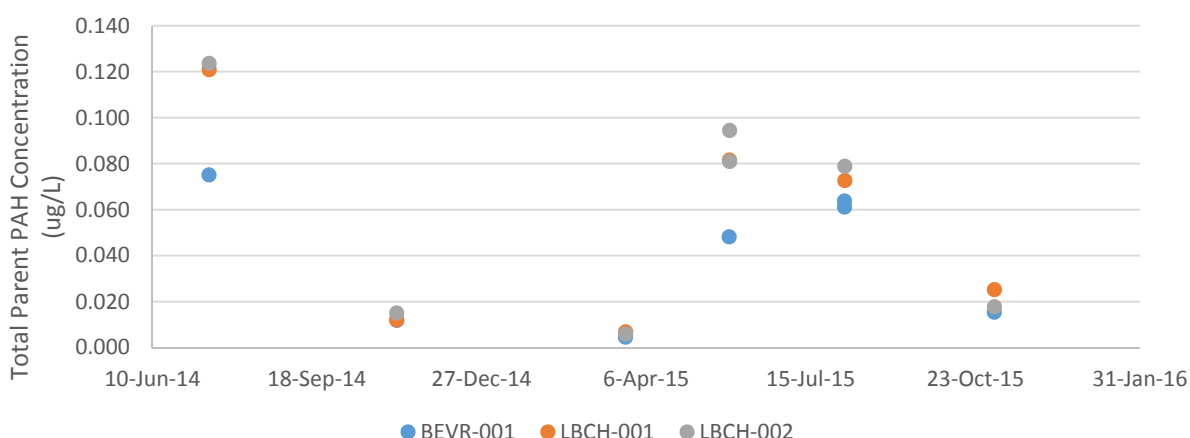


Figure 4.9 Total Parent Concentrations within Surface Water

Low parts per billion PAH concentrations have also been observed in other watersheds within the Yukon with known oil and gas reserves including the Peel Watershed and were attributed to natural hydrocarbon sources such as upstream petroleum and/or coal formations or forest fires (Golder, 2018). The bedrock in the Kotanelee area is known to contain coal and organic rich sediments. It is likely that the low concentrations of PAH compounds observed in surface waters are also derived from local petroleum-bearing formations.

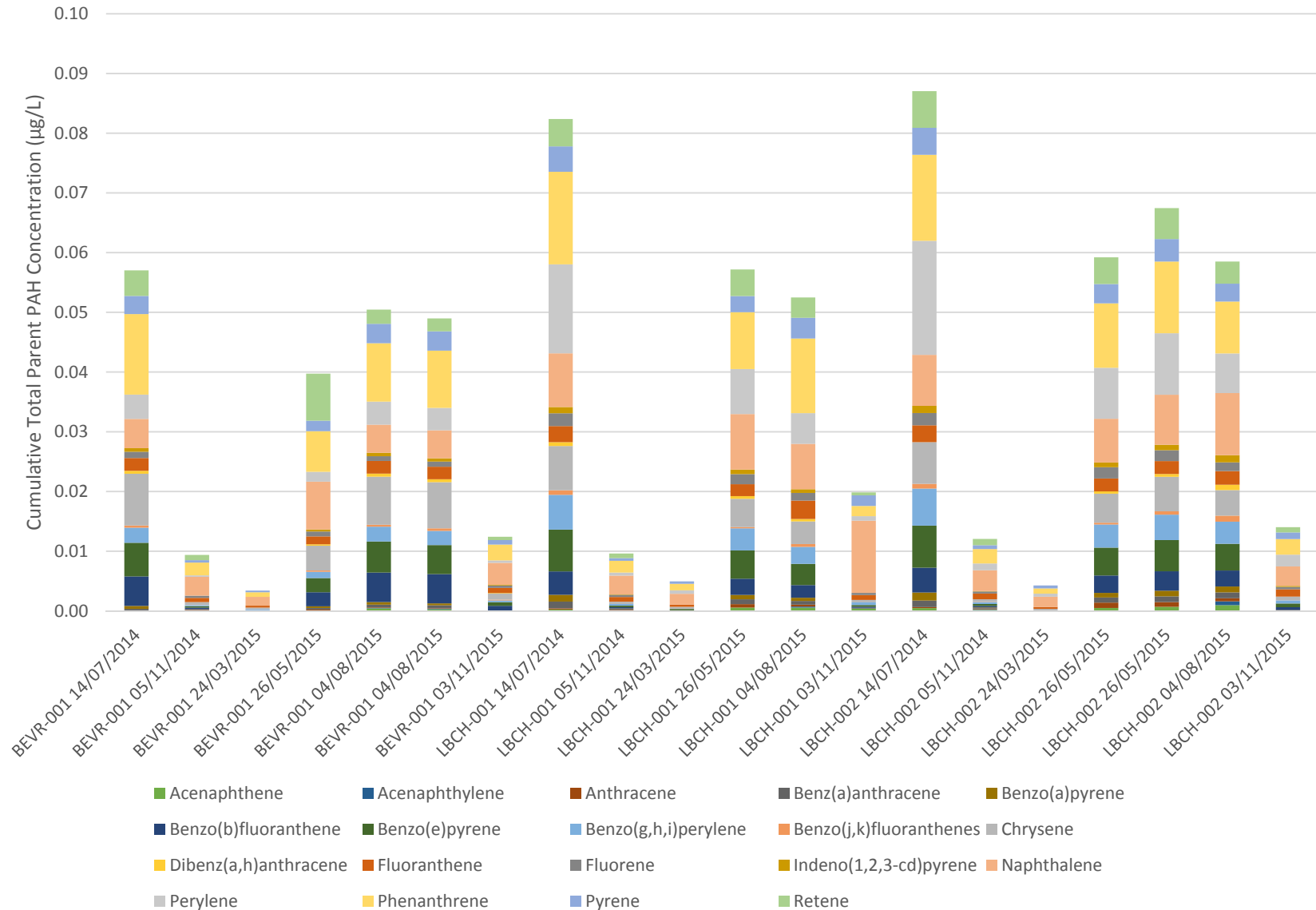


Figure 4.10 Parent PAH concentration in Surface Water Samples

There are no guidelines for naphthenic acids and radionuclides in the applied guidelines. However, Health Canada does provide guidelines for Lead-210 and Radium-226 in drinking water. The detection limit for Radium-226 was lower than the maximum acceptable concentration (0.5 Bq/L) outlined in the Guidelines for Canadian Drinking Water Quality (GCDWQ) in the surface water samples collected from November 2014 to May 2015. During these sampling events, several samples had detectable concentrations of Radium-226, between 0.005 and 0.02 Bq/L but none exceeded the guideline of 0.5 Bq/L. Although the concentration for all other sampling events was below the detection limit, the detection limit ranged between 2-5 Bq/L, which exceeded the drinking water guidelines of 0.5 mg/L. It is therefore unclear whether the concentration during these sample events exceeded the drinking water guidelines. Similarly, the concentrations of Lead-210 were below the detection limit (1 Bq/L) during all sampling event, but the detection limit exceeded the guideline of 0.2 Bq/L. The detection limits varied in the dataset, but there were some concentrations measured above the method detection limits of the individual constituents in samples from each area. Minimum and maximum values for radionuclides and naphthenic acids are provided in the summary tables in **Table 1**.

4.2.4 Isotopic Composition of Surface Waters

Surface waters in the Kotanelee area had $\delta^{18}\text{O}$ isotopic values that ranged from -22.4‰ to -19.4‰ and $\delta^2\text{H}$ from -173.2‰ to -157.7‰. **Figure 4.11** shows the $\delta^{18}\text{O}$ and $\delta^2\text{H}$ for surface waters and groundwater from YOWN-1507 as well as the local meteoric water lines (LMWL) for Mayo and Whitehorse, Yukon. Surface and groundwater generally fell above the Mayo LMWL and on the Whitehorse LMWL, but below the Global MWL. Surface water samples collected from open waters were slightly enriched in $\delta^{18}\text{O}$ and $\delta^2\text{H}$ compared to those collected under ice or during freshet, which were slightly depleted in $\delta^{18}\text{O}$ and $\delta^2\text{H}$ in comparison to samples collected under ice. Groundwater samples showed the highest variability, with both the highest and lowest $\delta^{18}\text{O}$ and $\delta^2\text{H}$ concentrations within all samples collected. Previous studies assessed the timing and relative contributions of snowmelt, groundwater and surface water sources to streamflow within the Liard basin indicated a strong decrease in heavy isotope content during spring freshet due to increased contributions of snowmelt to streamflow and a steady increase in heavy isotope content during the ice-off period due to inputs of summer precipitation, groundwater and surface water streamflow (Gibson et al., 2005). Heavy isotope content decreased during under-ice period, attributed to the increase in relative contribution of deep groundwater versus precipitation and surface water sources under ice (Gibson et al., 2005). YOWN-1507 represents shallow groundwater from a shallow, unconfined aquifer, which is dominantly influenced by snowmelt during freshet and infiltration of runoff from precipitation. Groundwater was relatively enriched in $\delta^{18}\text{O}$ and $\delta^2\text{H}$ compared to other samples. Various post depositional processes, such as melting and subsequent infiltration of surface layers and evaporation, may alter the isotopic content of the snow pack, often leading to meltwater values that become progressively enriched (Stichler, 1987). This could indicate that water within the shallow, unconfined aquifer encountered at YOWN-1507 is primarily influenced by snowmelt and run-off from precipitation and is not representative of deeper, regional groundwater. Additional samples from deep groundwater from various locations are required to confirm these observations.

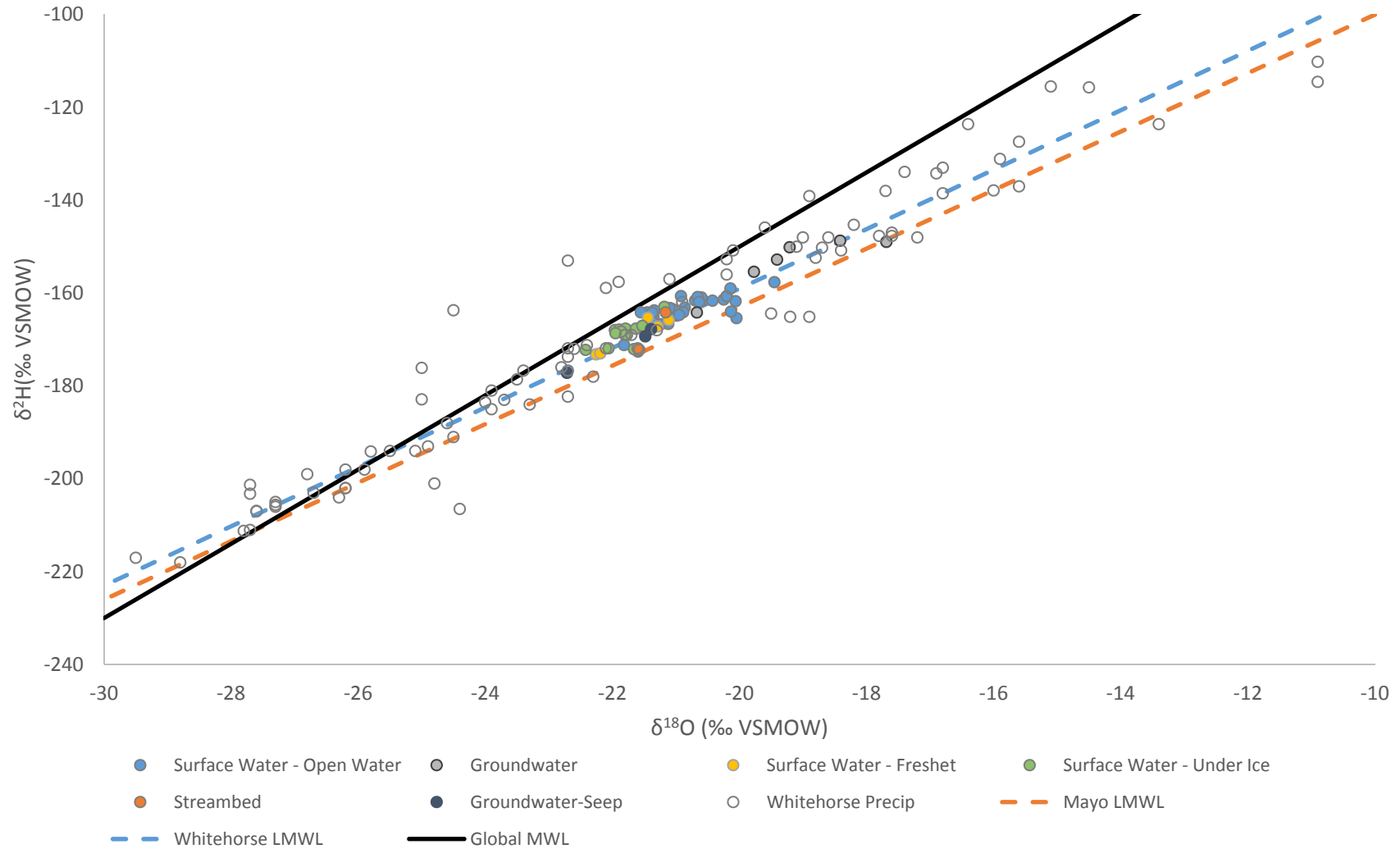


Figure 4.11 Oxygen-18 and Deuterium in Surface Water and Groundwater Samples

The carbon-13 concentration DIC in surface waters ranged from -17.8 ‰ to -7.3 ‰ (**Figure 4.12**). The samples collected during freshet had the lowest DIC concentration compared to the samples collected during open water and under ice conditions. Samples collected from open water were most depleted in Carbon-13. All the samples fall within the literature values for groundwater DIC, which generally ranges from -20 ‰ to 0 ‰ (Clark and Fritz, 1997). The negative carbon-13 ratios suggest that methane may be more dominant reaction rather than methanogenesis. However, due to the low concentration of methane within the surface water samples collected within the study area, the $\delta^{13}\text{C-CH}_4$ and $\delta^2\text{H-CH}_4$ proportions within surface water samples were not analyzed.

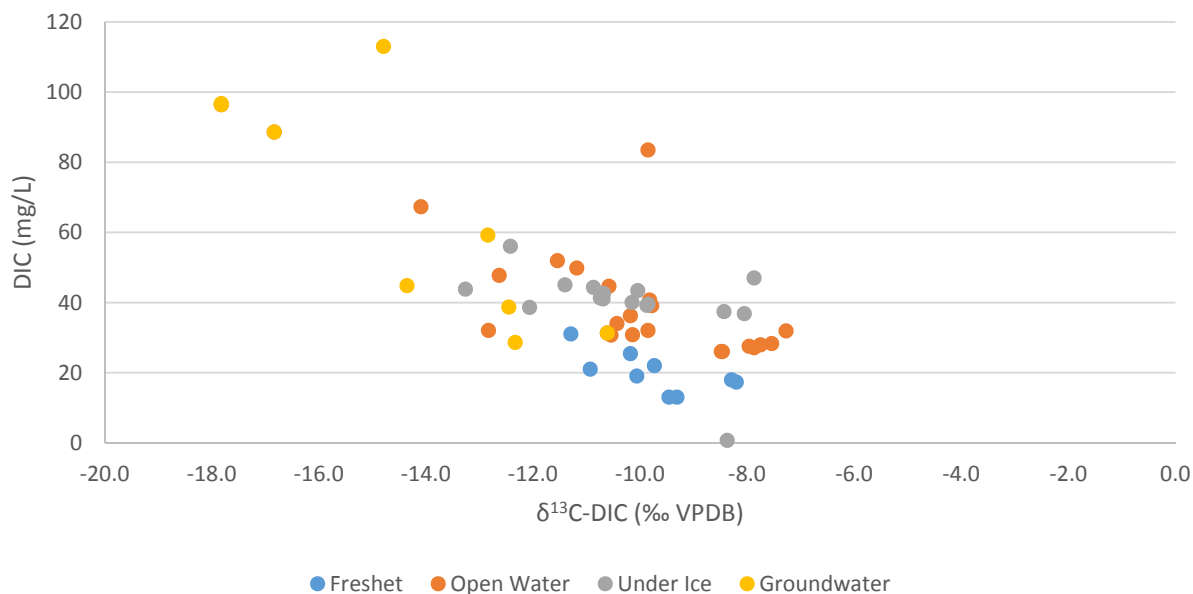


Figure 4.12 Carbon-13 and DIC in Surface Waters

Sulphur-34 and oxygen-18 of sulphate in surface water are plotted on **Figure 4.13**. $\delta^{34}\text{S-SO}_4$ ranged from 8.6 ‰ to 3.1 ‰ while $\delta^{18}\text{O-SO}_4$ ranged from -17.0 ‰ to 9.31 ‰. Surface water samples collected from open water conditions were enriched in $\delta^{34}\text{S}$ compared to samples collected during freshet and under-ice conditions. Various processes can contribute to the isotopic signature of sulfur. Deposition of atmospheric SO_4 , which has an enriched isotopic signature that varies throughout the year, may also be a source of sulphate in streams and rivers. Bacteria can reduce sulphate which may result in an enrichment in both $\delta^{34}\text{S}$ and $\delta^{18}\text{O}$ of SO_4 (Clark and Fritz 1997). Weathering and oxidation of minerals can also influence the isotopic signatures, CaSO_4 of marine origin, which can be found in limestone formations or other formations of marine origin, tends to have a more enriched isotopic signature, with $\delta^{34}\text{S}$ and $\delta^{18}\text{O}$ above 0 ‰ (Clark and Fritz, 1997). The range in sulphate isotopic signatures observed in the Kotanelee area are likely a result of the various sources and processes outlined above, with the dominant source possibly sulphide oxidation.

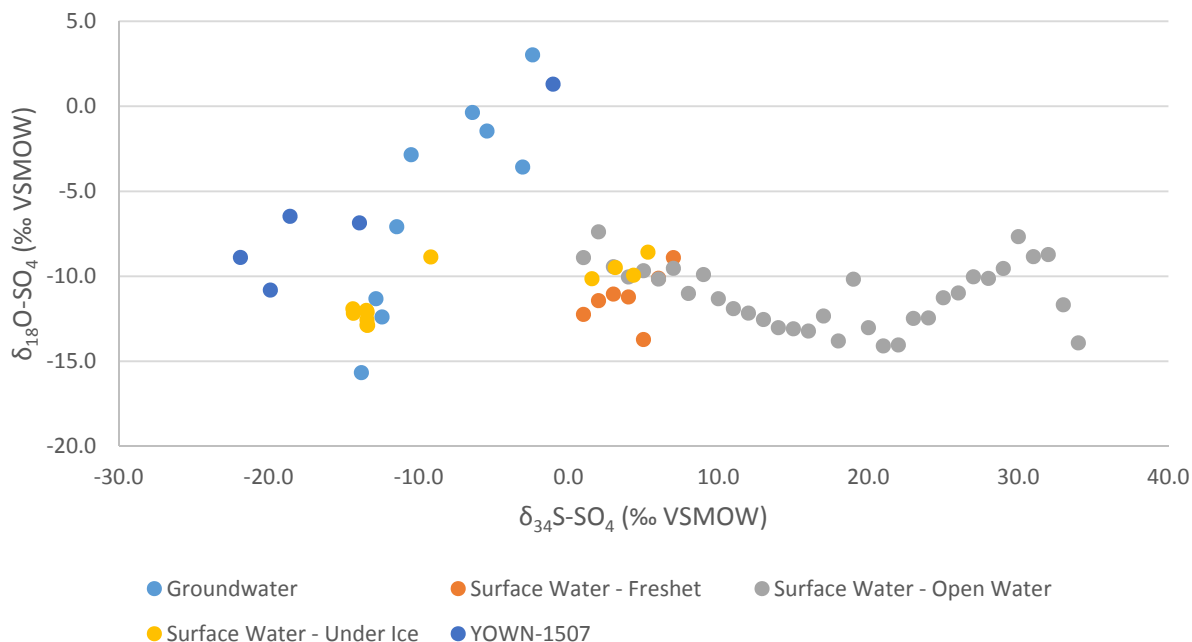


Figure 4.13 Sulphur-34 and Oxygen-18 Isotopic Compositions of Sulphate in Groundwater and Surface Water Samples

4.2.5 Dissolved Gas

Findings based on laboratory measured dissolved oxygen were similar to the field measured dissolved oxygen. Oxygen concentrations from dissolved gas sampling ranged from 0.9 mg/L to 28 mg/L. LBCH-t-002 had low concentrations of dissolved oxygen ranging from 2.4 mg/L to 8.9 mg/L. Surface water was generally well oxygenated during freshet and open-water season but had dissolved oxygen concentrations below CCME aquatic life guidelines during ice-cover season (**Table 1**).

CH₄ concentrations ranged from 0 mg/L to 2.4 mg/L, and CO₂ concentrations ranged from 1.1 mg/L to 51.0 mg/L. Typically, dissolved gas samples collected during the open water season are reflective of surface water at equilibrium with the atmosphere (approximately 10 to 20 mg/L oxygen, 5 to 10 mg/L CO₂ and less than 0.1 mg/L CH₄). CH₄ and CO₂ tended to be higher during the ice-covered season when exposure to the atmosphere is limited and gases released by biological, or potentially thermogenic, activity can become trapped under the ice. Ethane and propane were typically not detected or at very low concentrations (less than 0.002 mg/L). Dissolved nitrogen gas concentrations ranged from 18 mg/L to 35 mg/L, with no clear seasonal trend across all sampling stations.

The dry gas index is calculated by dividing the molar concentration of methane by the sum of the molar concentrations of C₂ and C₃ gas. High values for the dry gas index, over 1,000, indicate microbial production of methane while values less than 1,000 indicate thermogenic methane, such as natural gas seeps (Whiticar, 1999). In most samples where methane was observed, ethane (C₂) and propane (C₃) were below the detection limit, so the dry gas index could not be calculated. However, the low ethane and propane concentrations suggests the methane is of microbial origin.

4.3 Groundwater Quality

This section of the report represents the analysis of the groundwater samples collected within the Kotaneelee area. Summary tables of analytical results are presented in the appended **Table 4**. Summary tables detailing parameters which exceeded the guideline standards are presented in the appended **Tables 5-A through 5-C**.

4.3.1 Routine Parameters

Groundwater samples were generally neutral, with pH ranging from 6.82 to 7.82. The reported pH values were within the acceptable CCME guidelines.

Specific conductance varied greatly within the samples varying from 382 $\mu\text{S}/\text{cm}$ to 1,234 $\mu\text{S}/\text{cm}$. The highest specific conductance was measured at MW15-1A in August 2017. YOWN-1507 was sampled most frequently and did not show a strong seasonal trend.

All groundwater samples collected within the Kotaneelee area exceeded the BC WQG (10,000 $\mu\text{g}/\text{L}$) for total alkalinity. Alkalinity concentrations ranged from 128,000 $\mu\text{g}/\text{L}$ to 556,000 $\mu\text{g}/\text{L}$. Water that exceeds the 10,000 $\mu\text{g}/\text{L}$ is highly sensitive to acid inputs (BC ENV, 2017).

TSS varied dramatically across the site and within sampling locations, ranging from 2.0 mg/L to 14,900 mg/L. Large variations were recorded at LBRV-DP6, ranging from 34 mg/L to 1,600 mg/L and YOWN-1507 ranging from 2.0 mg/L to 14,900 mg/L.

The concentrations of nitrate, nitrate+nitrite and total ammonia were below the applicable guidelines in all groundwater samples collected within the Kotaneelee area. Nitrite concentrations exceeded the CCME chronic aquatic guideline at BVRV-SEEP, LBRV-DP2, and YOWN-1507 in samples collected between October 2015 and November 2016. The concentrations of nitrite were below the detection limit in all other samples.

Total phosphorus concentrations ranged from 4 $\mu\text{g}/\text{L}$ to 1,160 $\mu\text{g}/\text{L}$. Total phosphorus varied within sampling locations. The concentration at LBRV-DP6 ranged from 43 $\mu\text{g}/\text{L}$ to 700 $\mu\text{g}/\text{L}$ and from 4 $\mu\text{g}/\text{L}$ to 1,160 $\mu\text{g}/\text{L}$ at YOWN-1507. No seasonal trends were apparent.

4.3.2 Major Ions

The major ions in groundwater are controlled by local geology and by the length of time over which groundwater has interacted with the aquifer materials (Freeze and Cherry, 1979). Groundwater samples collected within the study area were generally calcium and magnesium bicarbonate type waters (**Figure 4.14**). The dominant anions were bicarbonate (between 60% to 100%) and sulphate (between 0% to 40%). The proportions of the cations were more varied than the anions. The dominant cation within the groundwater were calcium (40% to 100%), magnesium (5% to 35%), and sodium and potassium (0% to 60%). Only one groundwater sample was collected from the Beaver River basin, which had very low sodium or potassium proportions (**Figure 4.14**). These major ions are expected considering the local bedrock geology within the watersheds. The bedrock geology of the Beaver River is predominantly Mattson formation, composed of calcareous to dolomitic grey sandstone and shale, and Fort. St John formation, composed of weather shale, sandstone and shale which is noted to contain gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) within the La Biche Watershed. Sulphate concentrations are likely linked to weather gypsum within the Fort St John formation.

Chloride was found at low concentrations in both the streambed and seep samples (maximum of 3.49 mg/L) and YOWN-1507 (0.59 mg/L to 14.70 mg/L). The chloride concentration was the highest at MW15-1A (64.90 mg/L). Groundwater samples were not analyzed for fluoride.

Hardness ranged from 136 mg/L to 670 mg/L. Groundwater was slightly softer within the streambeds (240 mg/L to 370 mg/L) compared to the groundwater seeps (257 mg/L to 624 mg/L), and groundwater monitoring wells (270 mg/L to 670 mg/L). No seasonal trend was observed within the YOWN-1507 well.

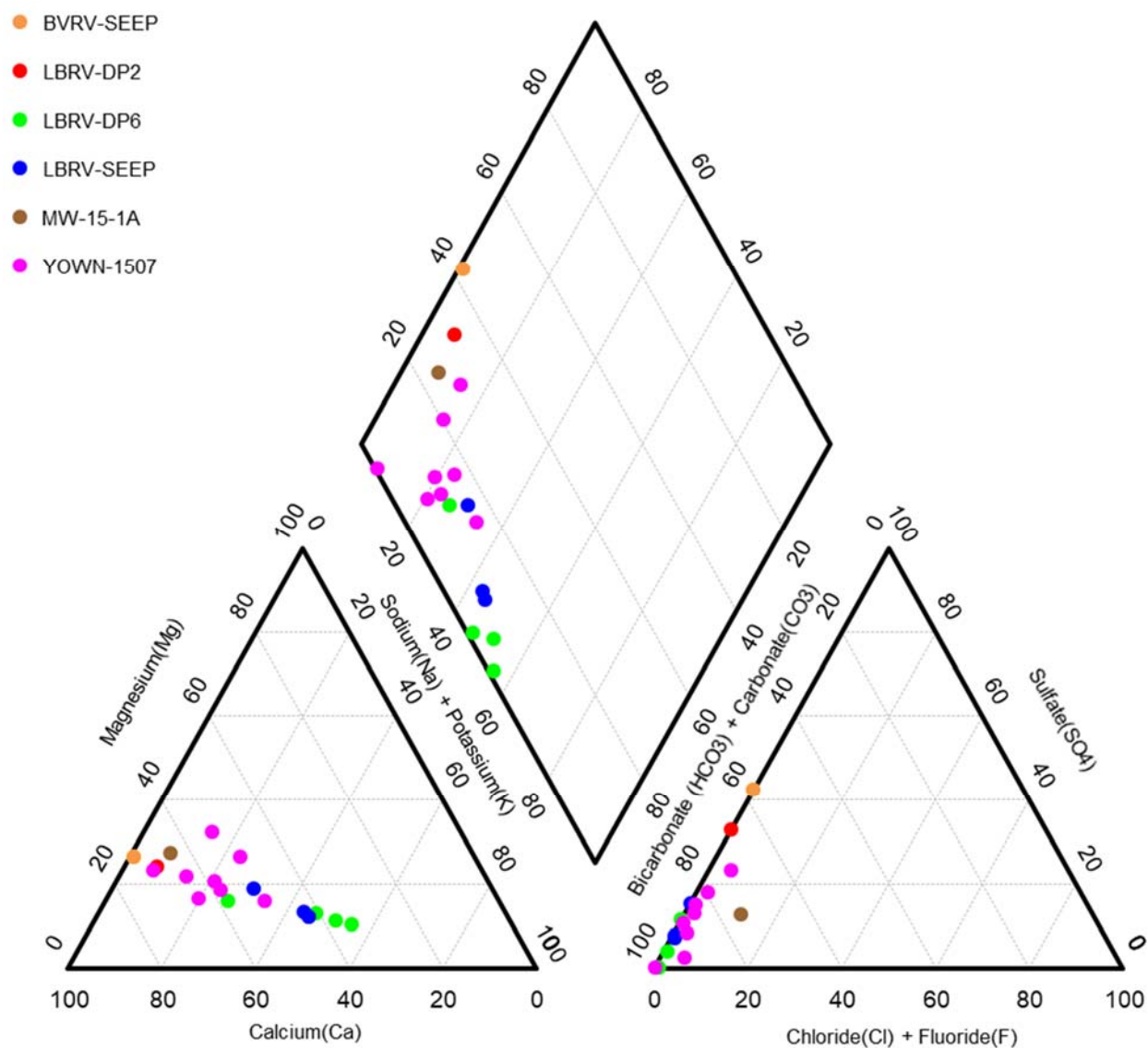


Figure 4.14 Piper Plot with all Groundwater Samples

4.3.3 Metals

Total metals in the streambed groundwater samples were generally higher than the dissolved metals concentrations and were generally similar to or elevated relative to the associated surface water samples. Total suspended solids were high in many of the streambed groundwater samples, complicating the interpretation of the total metal concentrations.

The groundwater samples collected from the groundwater seeps had the lowest total metals and TSS concentrations compared to the samples collected from the streambed piezometers and groundwater monitoring wells. Concentrations were compared to CCME-FAL and BC WQG guidelines. Key results include the following:

- The BEVR-SEEP exceeded the CCME-FAL and BC WQG for selenium.
- LBCH-SEEP exceeded the CCME-FAL for total iron in all sampling events and total arsenic in March 2018.
- LBRV-DP2 and LBRV-DP6 had concentrations of total aluminum, chromium, copper, iron and selenium which CCME-FAL and BC WQG guidelines. In addition, LBRV-DP6 also exceeded the guidelines for barium, beryllium, lead and zinc.
- MW15-1A exceeded the CCME-FAL and BC WQG guidelines for aluminum, arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lead, molybdenum, nickel, potassium, selenium, and zinc.
- YOWN-1507 exceeded the CCME-FAL and BC WQG guidelines for aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, mercury, molybdenum, nickel, selenium, silver, thallium, titanium, uranium and zinc.

All dissolved metals concentrations were below the guidelines except for selenium at BVRV-SEEP and LBRV-DP2. Selenium is likely naturally occurring with the local bedrock, which are Cretaceous in age. Extensive volcanism occurred through the land mass from which Cretaceous sediments were derived, and it is likely that much of the selenium in the sedimentary rocks was derived from volcanic dusts and gases (USGS, 2010).

4.3.4 Volatile Petroleum Hydrocarbons, PAHs, Naphthenic Acids and Radionuclides

The concentration of BTEX and VPHw were below the detection limit in all groundwater samples collected in the Kotanelee area. PAH concentrations in groundwater were generally below the detection limit, but detectable concentrations of PAHs were measured in BVRB-SEEP, LBRV-DP2 and YOWN-1507. PAH concentrations were 20-50 times higher at YOWN-1507 in August 2015 than PAH concentrations measured in other groundwater samples (**Figure 4.12**). The concentration of benzo(a)anthracene, benzo(a)pyrene, fluorene and pyrene exceeded the BC WQG and CCME-FAL guidelines at YOWN-1507 in August 2015. Concentrations of most PAHs were elevated in comparison to the November 2015 results at the same locations. **Figure 4.12** shows total PAH concentrations (the sum of all parent PAH compounds) in the wells.

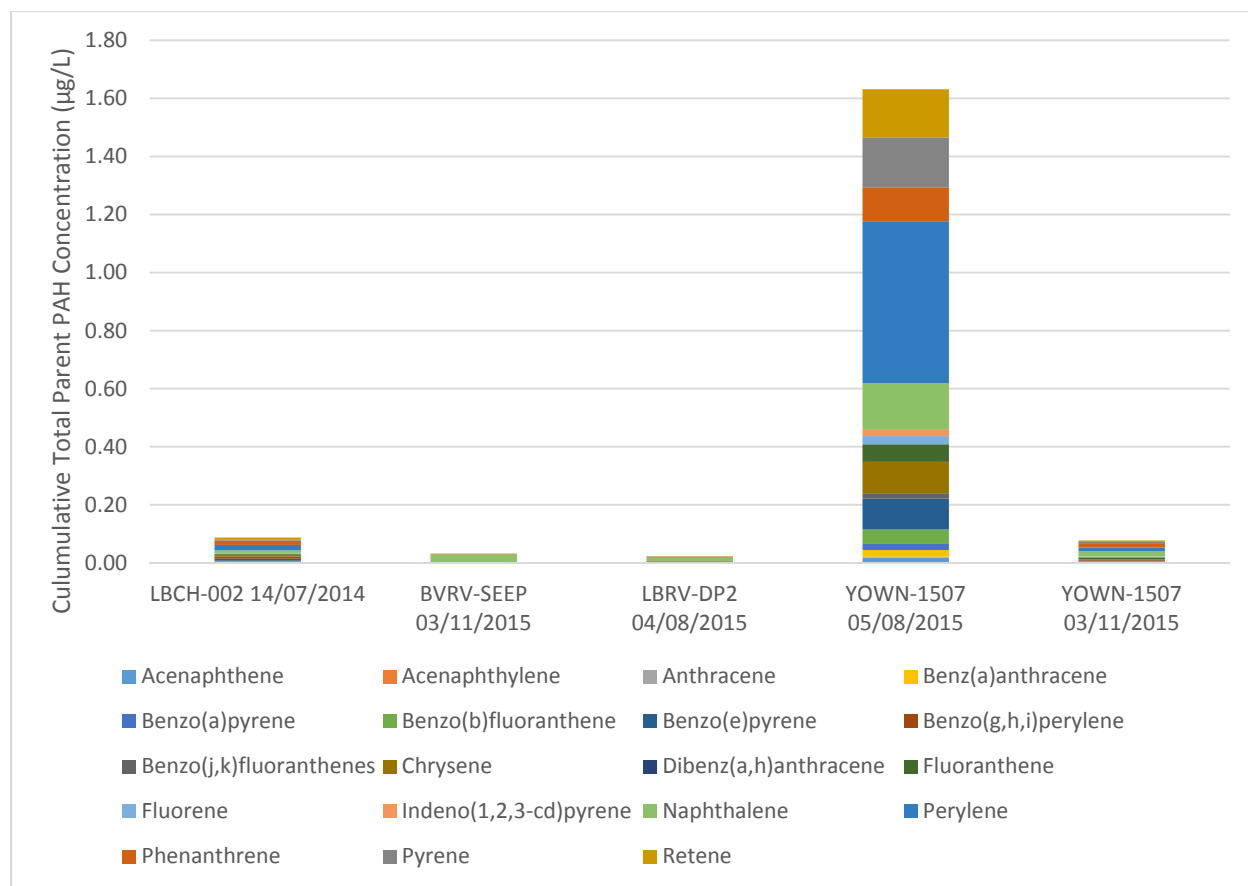


Figure 4.15 Parent PAH concentration in Groundwater Samples

There are no guidelines for naphthenic acids and radionuclides in the applied guidelines. However, Health Canada does provide guidelines for Lead-210 (1 Bq/L) and Radium-226 (0.5 Bq/L) for drinking water. The detection limit for both parameters ranged between 2 Bq/L to 5 Bq/L, which exceeds both guidelines. The concentrations of all radionuclides were below the detection limit with exception of LBCH-Seep, which had Lead-210 (7 Bq/L) and Radium-226 (8 Bq/L) concentrations which exceeded the Guidelines for Canadian Drinking Water Quality (GCDWQ) guidelines. Minimum and maximum values for radionuclides and naphthenic acids are provided in the summary tables in appended (**Table 4**). These concentrations appear to be much higher than background concentrations in other groundwater and surface water samples. It is suspected that PAH concentrations were elevated in August 2015 due to stagnant water in the well and high TSS from sample collection.

4.3.5 Isotopic Composition of Groundwaters

Two samples collected from groundwater seeps and streambed piezometers were submitted for isotope analysis. The $\delta^{18}\text{O}$ and $\delta^2\text{H}$ isotopic composition of streambed groundwater is similar to that observed in surface waters, most often similar to the open-water composition of surface water, but with some variation and plots on the Whitehorse LMWL (**Figure 4.8**). This indicates that either the streambed groundwater is mixing with the overlying surface water or that the shallow groundwater is derived from a similar source (i.e., local precipitation). Groundwater at YOWN-1507 is isotopically similar to average annual precipitation and plots on the Whitehorse LWML (**Figure 4.11**). This indicates that groundwater at YOWN-1507 likely

represents recharge of modern meteoric water, recharged under similar climatic conditions to those observed in the region today.

The carbon-13 isotopic signature of DIC was similar in the streambed groundwater (**Figure 4.12**) (-17.8‰ to -10.6‰), groundwater seeps (-17.8‰ to -16.8‰) and YOWN-1507 (-14.4‰ to -11.1‰). As noted for surface water, the negative Carbon-13 ratios suggest that methane oxidation may be a more dominant reaction than methanogenesis.

4.3.6 Dissolved Gas

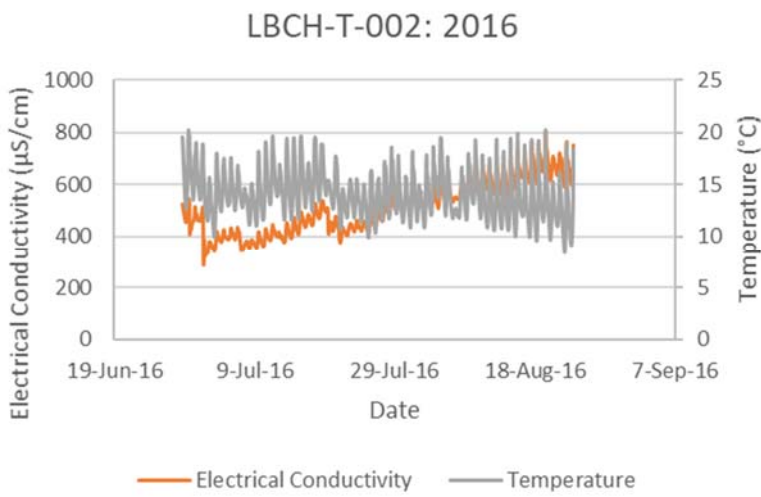
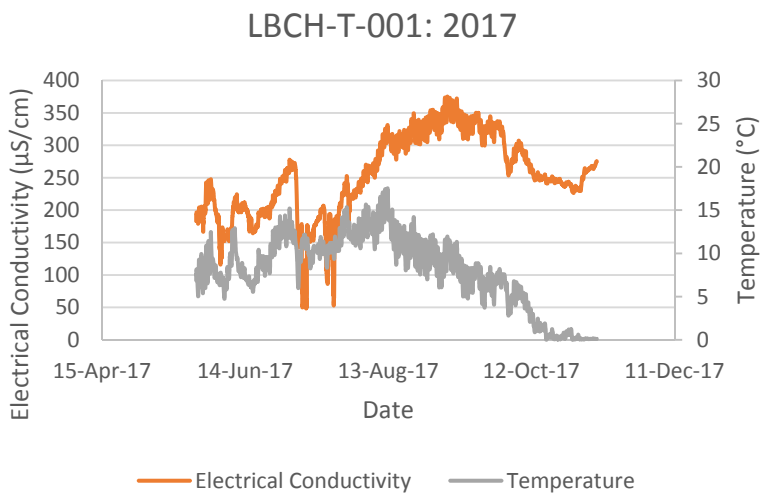
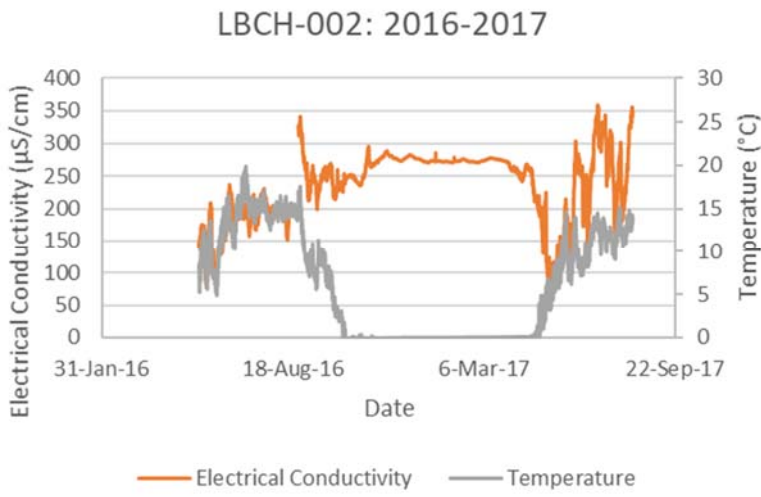
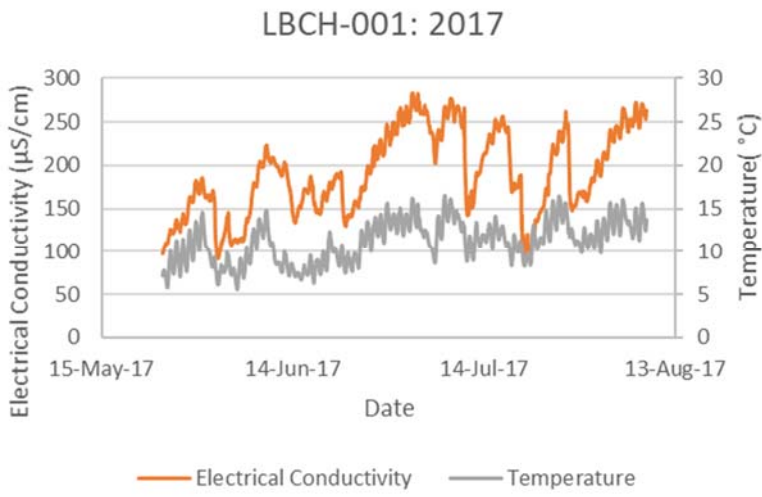
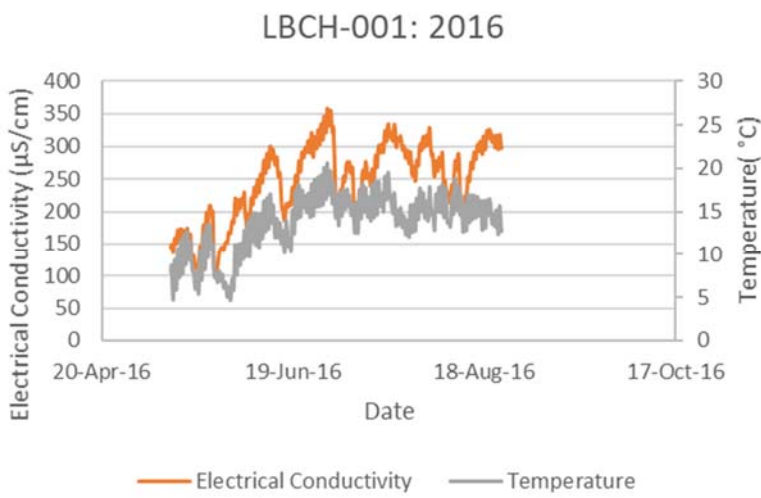
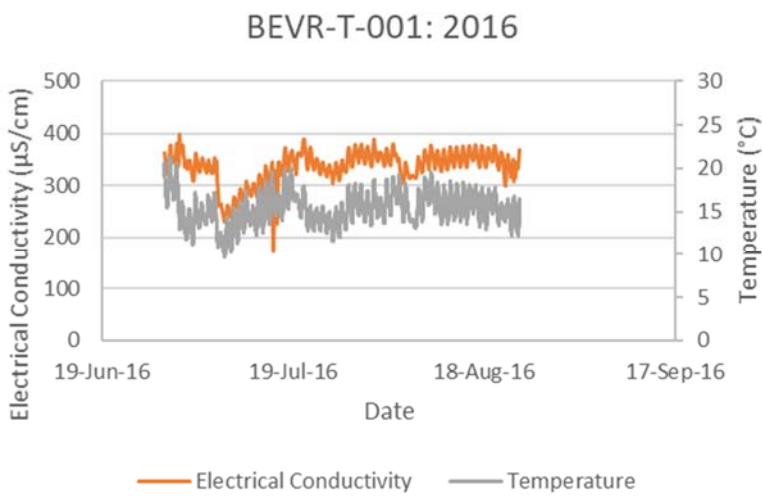
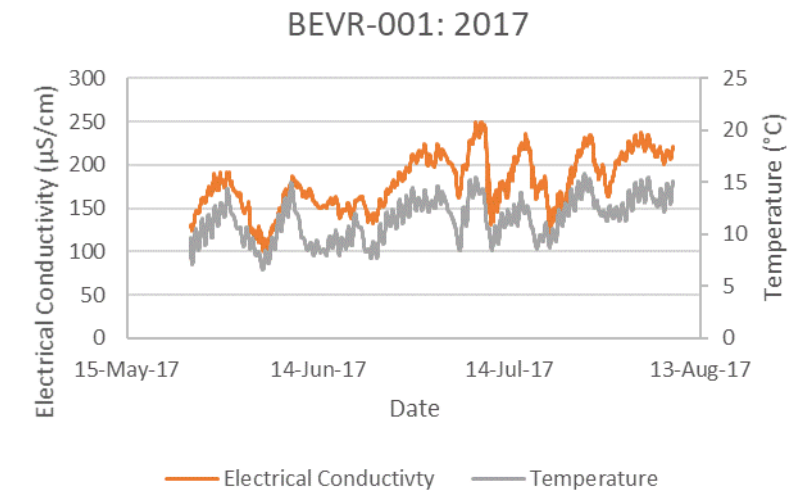
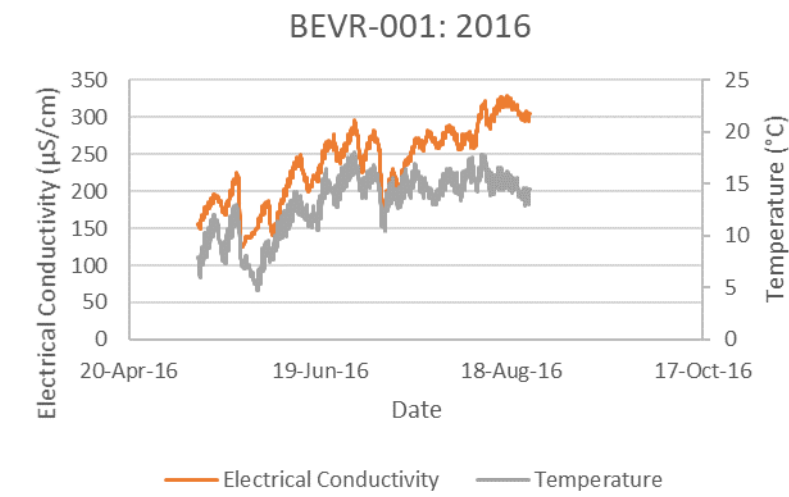
Three samples collected from LBRV-DP2, LBCH-SEEP and YOWN-1507 were submitted for dissolved gas analysis. Findings based on laboratory measured dissolved oxygen were lower than those for the field measured dissolved oxygen. Oxygen concentrations from dissolved gas sampling ranged from 0.9 mg/L to 6.854 mg/L. YOWN-1507 had the lowest dissolved oxygen measurement in November 2016 at 0.942 mg/L.

Proportions of dissolved oxygen were lower, and the proportions of methane, carbon dioxide, and nitrogen in LBRV-DP2 and YOWN-1507 were similar to concentrations found in the surface water samples collected. Groundwater collected at LBCH-Seep had less dissolved oxygen, less dissolved nitrogen and increased proportions of methane and carbon dioxide than in surface water.

LBCH-SEEP had relatively high concentrations of methane within all surface and groundwater samples collected (2.436 mg/L). However, ethane and propane were not detected within the samples, suggesting that the methane is likely biogenic in origin.

4.4 Continuous Monitoring

Electrical conductivity and temperature measurements collected from dataloggers at the surface water sampling locations BEVR-001, BEVR-t-001, LBCH-001, LBCH-002, LBCH-t-002 are presented in **Figure 4.16**. Electrical conductivity measurements fluctuate over the course of the summer months. Rainfall has low hydraulic conductivity, and variations in electrical conductivity values within surface water are likely influenced by precipitation events. A datalogger was left within the river at LBCH-002 over the winter months of 2016 to 2017. Electrical conductivity increased over the winter months and remained relatively stable during under ice conditions and decreased in late April early May, when concentrations decreased due to freshet. Electrical conductivity fluctuated significantly over the summer months, which is likely connected to precipitation events which mobilize sediment within the surface waters.



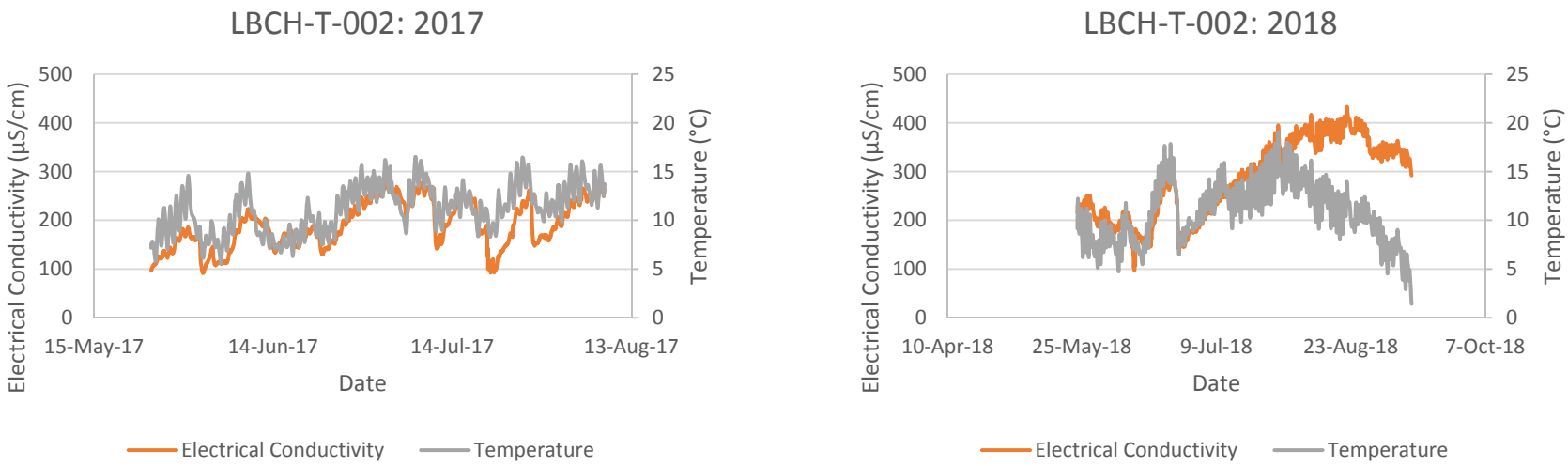


Figure 4.16 Continuous Monitoring Data Collected from Surface Water Sampling Sites

Daily discharge and daily water level data from the Water Survey of Canada stations located on the Beaver River and the La Biche River are shown on **Figure 4.17** by discharge year.

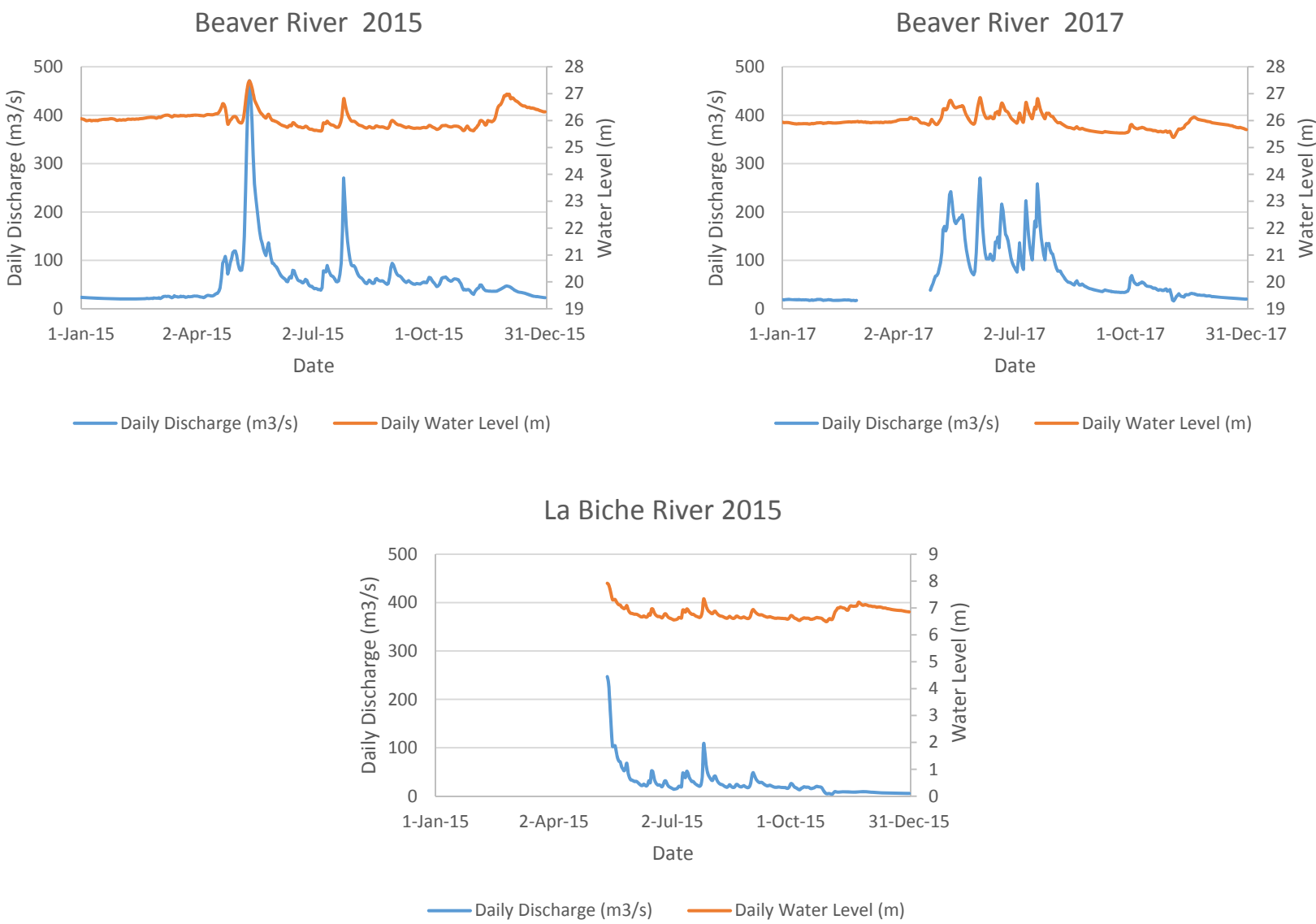
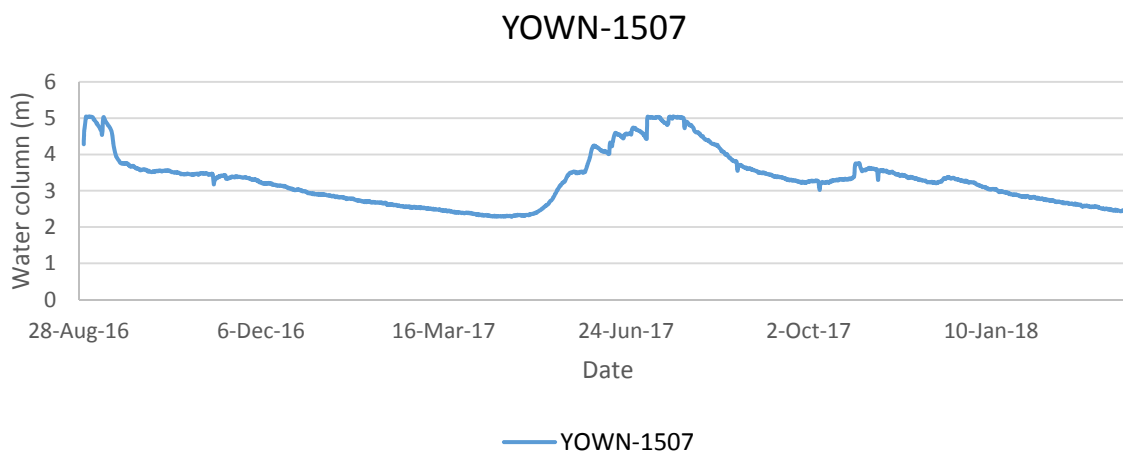


Figure 4.17 Water Survey of Canada Hydrometric Data

The pressure transducer installed at YOWN-1507 recorded total pressure (both water level and barometric pressure). The data collected were corrected or compensated for barometric pressure to reflect only changes in water level over time. The barologger within the Kotaneelee area was hung within the water supply well YOWN-1507 at the Kotaneelee Gas Plant. During the September 2018 monitoring event, YG-DE staff observed artesian conditions at YOWN-1507 and noted that the barologger had been submerged. A review of the water level data collected from datalogger installed into YOWN-1507 indicated that water levels periodically increase to the top of casing and it was possible that the barologger had been submerged more than once. The barometric pressure data was downloaded from Environment Canada weather station for the Watson Lake airport, located approximately 250 km east of the Kotaneelee Gas Plant. The two barometric pressures were to confirm whether the barologger had correctly been recording pressure. The barometric pressures varied slightly due to differences in elevation between the two locations, but the trends were nearly identical, confirming that the barometric pressure had been collected accurately despite being submerged in a small amount of water.

The data set for the barologger (August 2016 to March 2018) did not completely overlap with water level data collected from LBRV-DP5 and LBRV-DP6 (August 2017 to September 2018). Water level data from YOWN-1507 was missing from August 2015 to August 2016. Over this period, barometric pressure from the Watson Lake was used to compensate the data over this period in LBRV-DP5 and LBRV-DP6.

Water level data collected from YOWN-1507, LBRV-DP5 and LBRV-DP6 are presented on **Figure 4.18**.



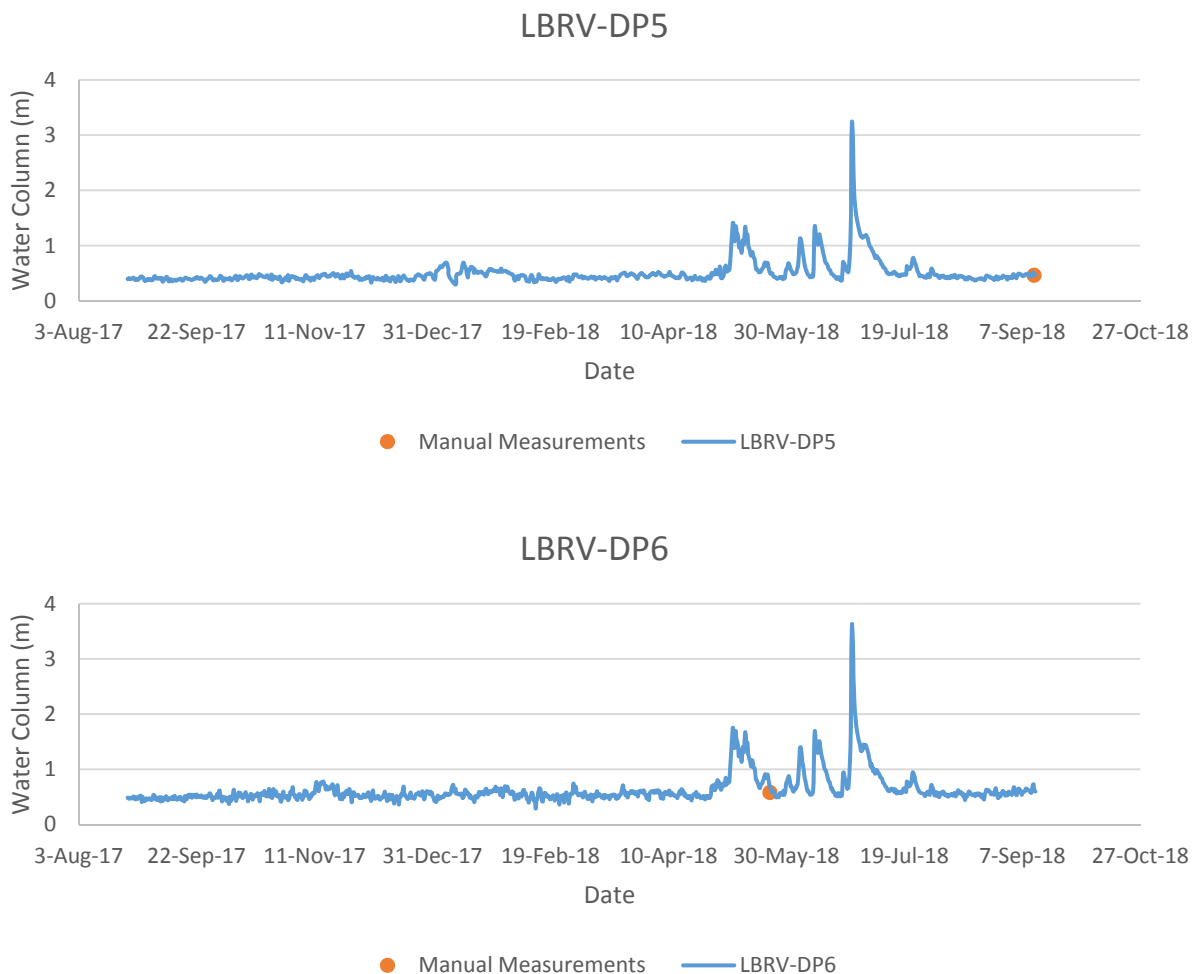


Figure 4.18 Depths of the water columns measured over time at YOWN-1507, LBRV-DP5 and LBRV-DP6.

Groundwater elevations at YOWN-1507 varied by approximately 3 m over the duration of monitoring. Groundwater elevations decreased over the fall and winter months until April or May, when groundwater elevations began to rise during freshet. Groundwater elevations fluctuated over the summer months, which likely indicates that that groundwater is influenced by precipitation events.

Groundwater elevations within streambed piezometers varied by approximately 3 m over the duration of monitoring. Groundwater elevations were relatively constant from late August 2017 to early May, coinciding with freshet. Maximum groundwater elevations peaked at both LBRV-DP5 and LBRV-DP6 in late June 2018. Streambed elevations appear to be more influenced by precipitation than freshet. Additional monitoring is required to confirm these trends.

5.0 DISCUSSION

5.1 Seasonal Variation in Surface Water Samples

5.1.1 Routine Parameters

Routine parameters which appeared to be influenced by seasonality were hardness, alkalinity, major ions, total and dissolved organic carbon, and total and dissolved inorganic carbon. Hardness, alkalinity, bicarbonate, calcium, magnesium, sulphate had higher concentrations during the under-ice period as compared to other seasons. Total and dissolved organic carbon and total suspended solids had higher concentrations during the open water period in the summer and lower concentrations during the under-ice period. A summary of key parameters within the La Biche River watershed and the Beaver River watershed including major ions and nutrients are presented in **Figure 5.1** and **Figure 5.2**.

Concentrations of routine parameters including alkalinity, bicarbonate, calcium, magnesium were generally similar within the La Biche and Beaver River watersheds except for LBCH-t-002, which had the highest concentrations of these parameters compared to all other surface water sampling locations. Sulphate concentrations were lowest at BEVR-001 and showed the smallest seasonal variation amongst all surface water sampling locations.

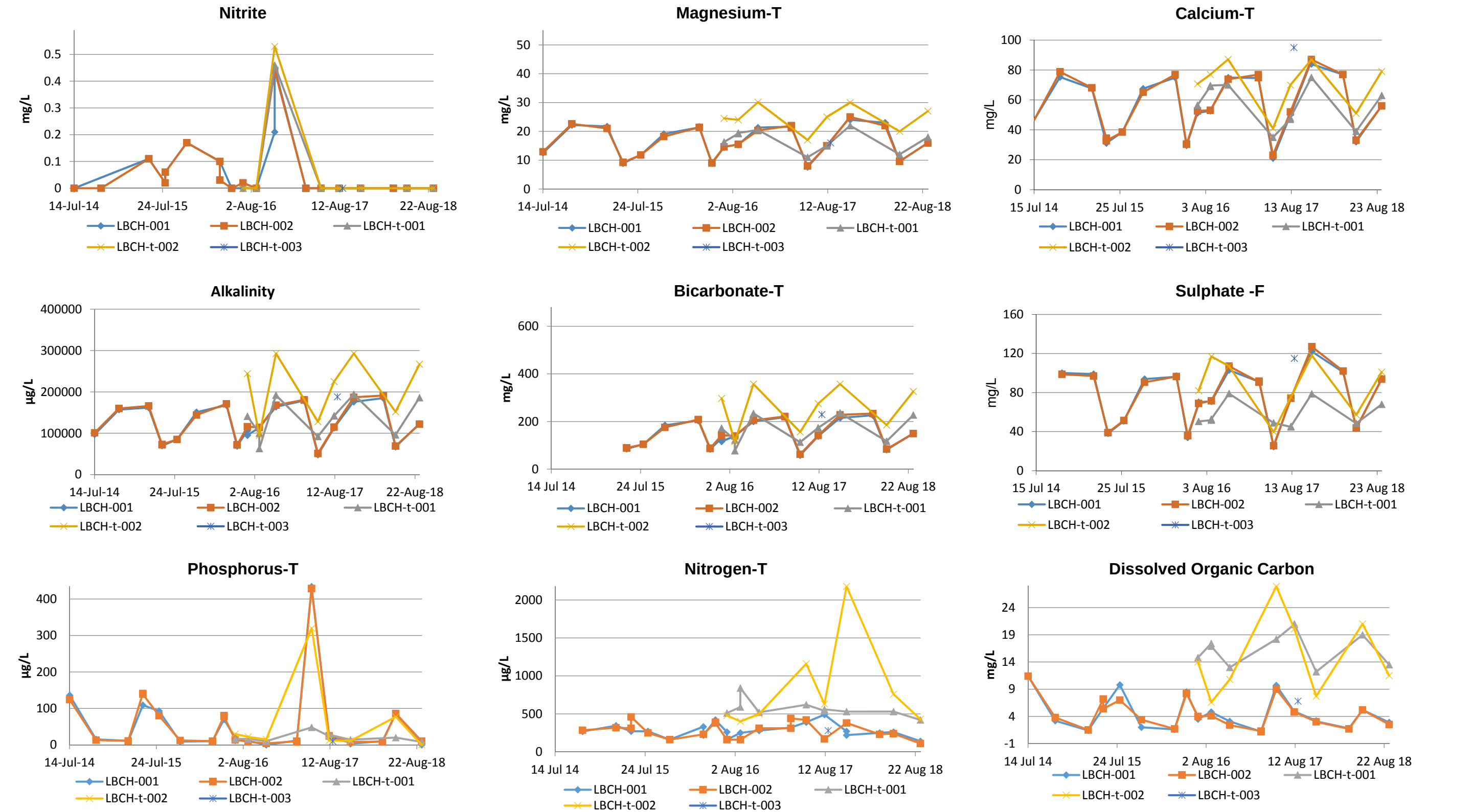


Figure 5.1 Key Parameters within the La Biche Watershed

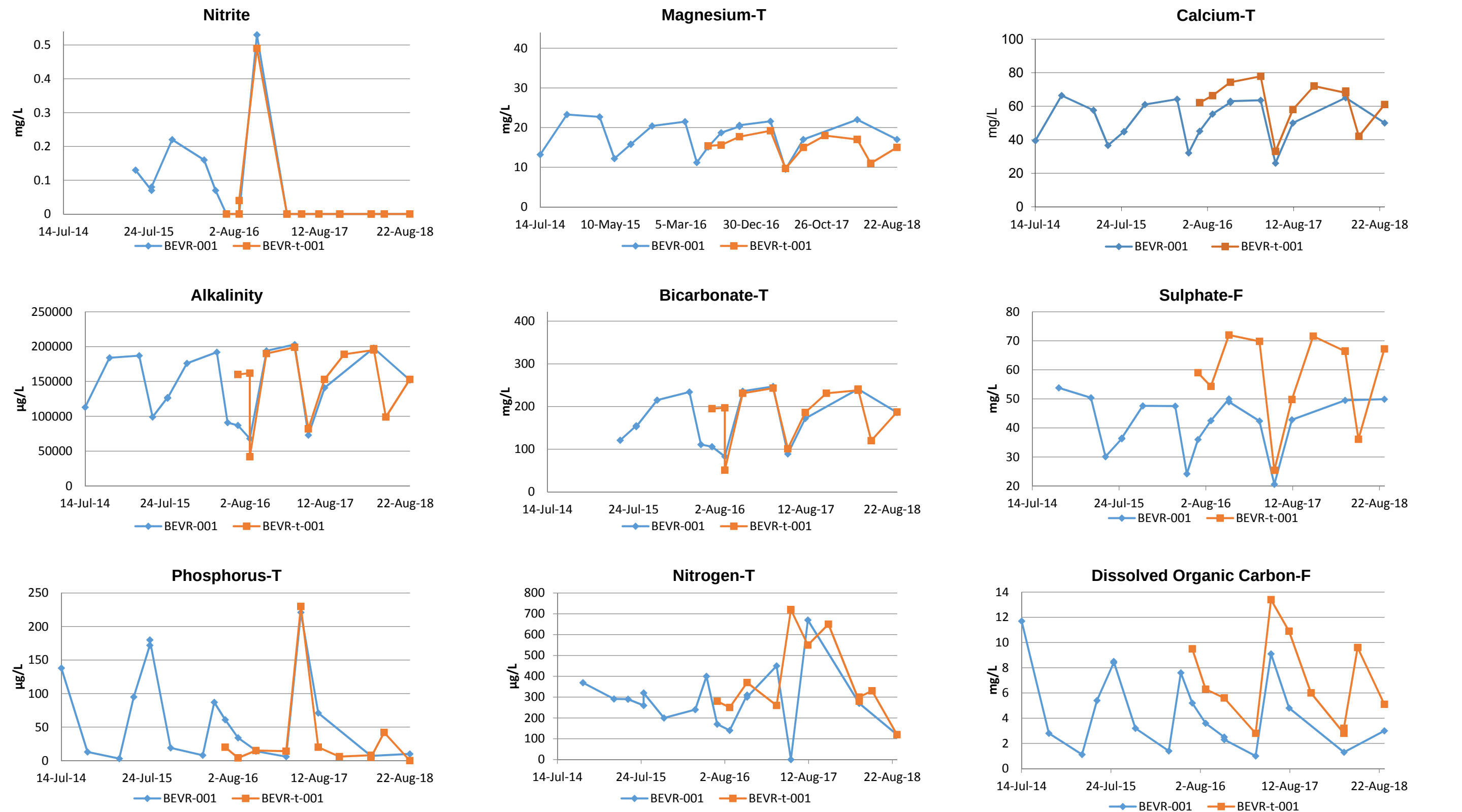


Figure 5.2 Key Parameters within the Beaver Watershed

5.1.2 Nutrients

Phosphorous showed strong seasonal variation, with higher concentrations in the open water samples compared to samples collected during freshet or under-ice conditions. DOC concentrations were highest during open water conditions in the summer months and lowest during the under-ice conditions in the winter months. Nitrogen and ammonia concentrations varied considerably within the sampling locations but did not show a strong seasonal trend. There were not enough data for TKN to draw any conclusions about seasonal trends.

Phosphorus and nitrite concentrations were elevated in all samples collected in May 2017. Phosphorus and nitrite concentrations in field and trip blanks samples were within 5 times the detection limit, suggesting that elevated concentrations in samples were not due to contamination from handling. It is unknown why elevated concentrations were noted during this sampling event. The nutrient concentrations were similar between the La Biche River and Beaver River Watersheds.

5.1.3 Metals

Total aluminum, beryllium, chromium, copper, iron, nickel, thallium, uranium and zinc, and dissolved aluminum, boron, copper, iron, uranium and zinc showed strong seasonal variation, with higher concentrations being observed during the open water at most stations. Dissolved boron and total selenium concentrations also varied seasonally with higher concentrations during winter months in under-ice conditions.

Parameters that frequently exceeded the applied BC WQG and CCME guidelines, such as aluminum, copper, chromium, iron, selenium, and zinc varied in their seasonal response between watersheds. Total aluminum concentrations showed strong seasonal variations (**Figure 5.3** and **Figure 5.4**). Selenium had strong seasonal variations at LBCH-001 and LBCH-002 with concentrations increasing during under ice conditions. Selenium concentrations experienced the reverse trend with highest concentrations in summer months at LBCH-t-001, LBCH-t-002, BEVR-001 and BEVR-t-001, although total selenium showed weaker seasonal variations in the Beaver River. Total aluminum, beryllium, chromium, copper, iron and zinc trends were more pronounced in the Beaver River watershed compared to La Biche River watershed.

The increased selenium concentrations observed in the winter months suggests that deeper groundwater originating from bedrock is likely the source of selenium at LBCH-001 and LBCH-002. The inverse trend observed at LBCH-t-001, LBCH-t-002, BEVR-001 and BEVR-t-001 suggests that groundwater discharging at those locations is either shallow, local groundwater originating from overburden and is not impacted by deeper, more regional groundwater flow regimes originating from bedrock, or that selenium is mobilized during freshet and precipitation and may be associated with the increased suspended solids observed in surface water samples during summer months.

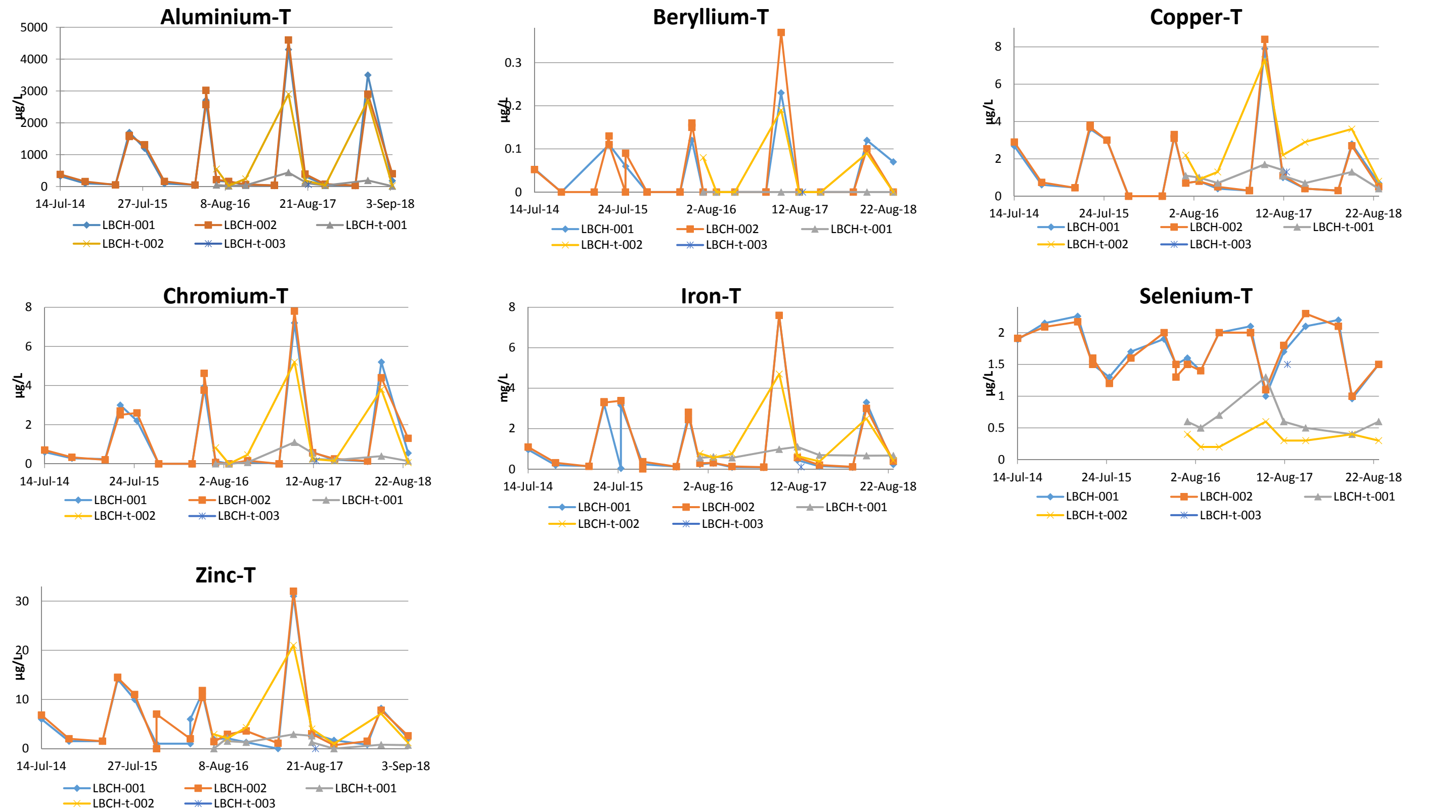


Figure 5.3 Key Metal Parameters in La Biche Watershed

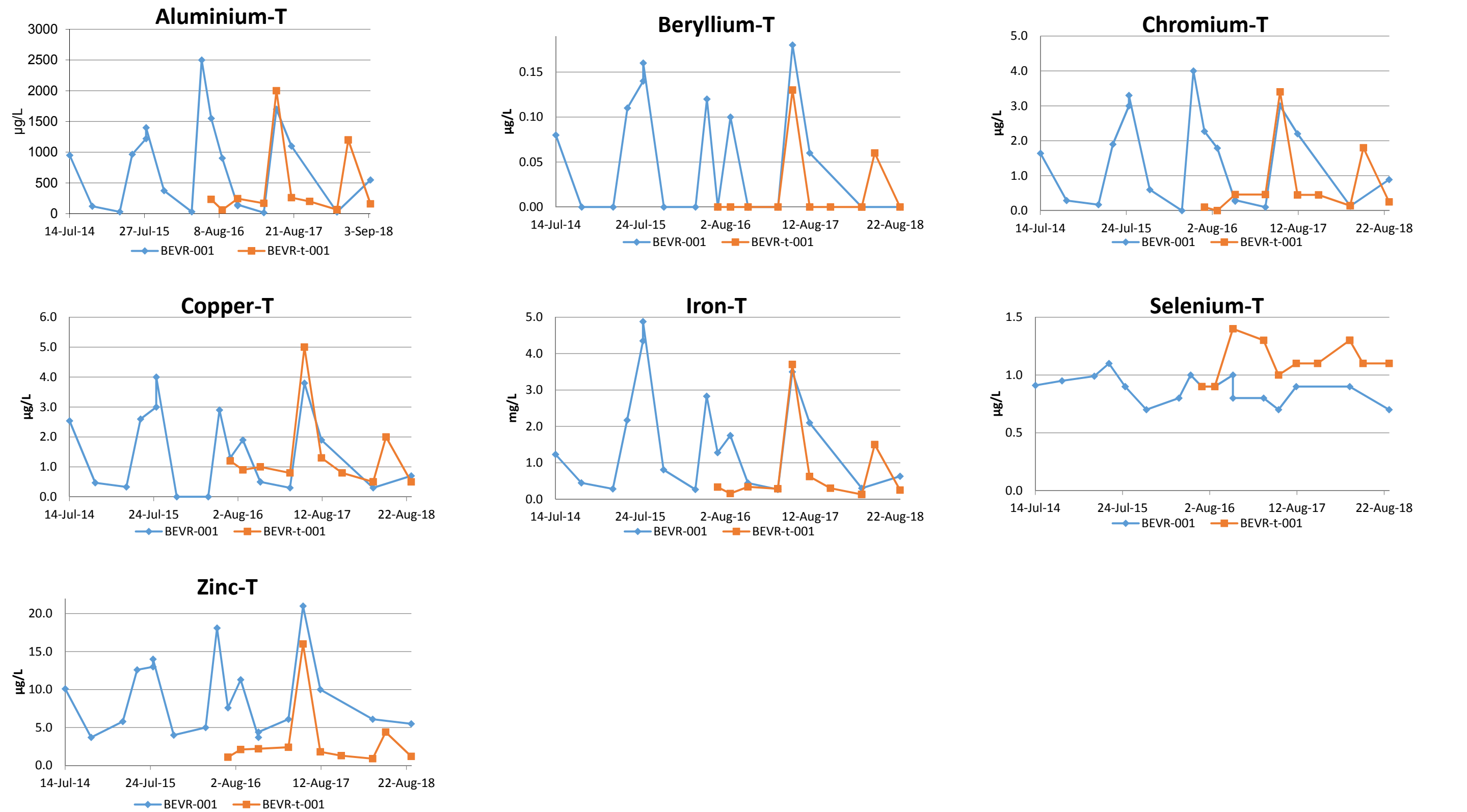


Figure 5.4 Key Metal Parameters in Beaver River Watershed

Total and dissolved bismuth, total and dissolved mercury, total and dissolved nickel, dissolved selenium, dissolved silver, and dissolved thorium, and did not have enough data above detection limits to determine if a seasonal trend exists. No seasonal trends in dissolved nickel, thorium, dissolved thallium, and total silver were observed.

5.1.4 Isotopes

The isotopic signatures of $\delta^{18}\text{O}$ and $\delta^2\text{H}$ of most surface waters within the Kotaneelee area showed some degree of season influence. The strongest seasonal trends were observed in BEVR-001, LBCH-001 and LBCH-002 and LBCH-t-001 (**Figure 5.5**). The lack of strong seasonal trends in the other sampling locations is likely due lack of seasonal data and fewer number of samples collected. Precipitation falling during the winter months when weather is cold with low relative humidity tends to have a more depleted isotopic signature than precipitation that falls during the warm and relatively humid summer months. This seasonal variability in the isotopic signature is reflected in surface water samples. As shown on **Figure 4.8** in **Section 4.2.4**, surface water samples collected during under-ice conditions were generally depleted in $\delta^{18}\text{O}$ and $\delta^2\text{H}$. Open-water $\delta^{18}\text{O}$ and $\delta^2\text{H}$ close to the meteoric water line are more similar to average precipitation values. $\delta^{18}\text{O}$ and $\delta^2\text{H}$ concentrations were similar across the Kotaneelee study area.

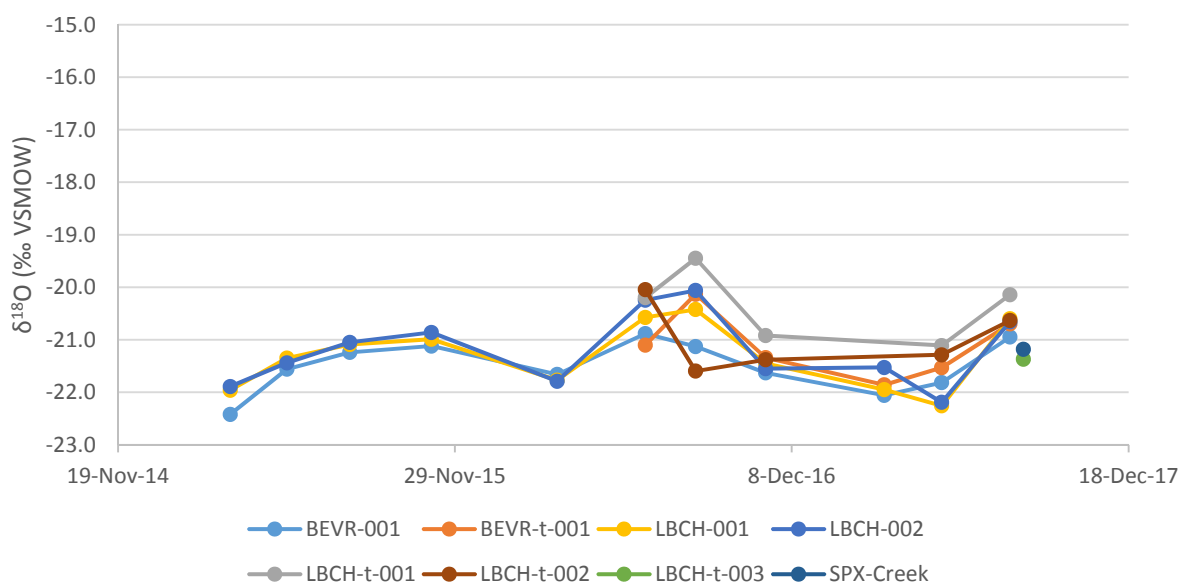


Figure 5.5 Seasonal variations in Oxygen-18

The Carbon-13 isotopic signatures varied by season. Carbon-13 concentrations increased during the warm summer months during open water conditions and decreased over the winter months during under-ice conditions (**Figure 5.6**). This trend corresponds to observed dissolved organic carbon on **Figure 5.1** and **Figure 5.2**, as described in **Section 5.1.1** above, where dissolved organic carbon was lowest during winter months and increased during open water conditions. Each sampling location appeared to have similar degrees of fluctuations, between 2-3%.

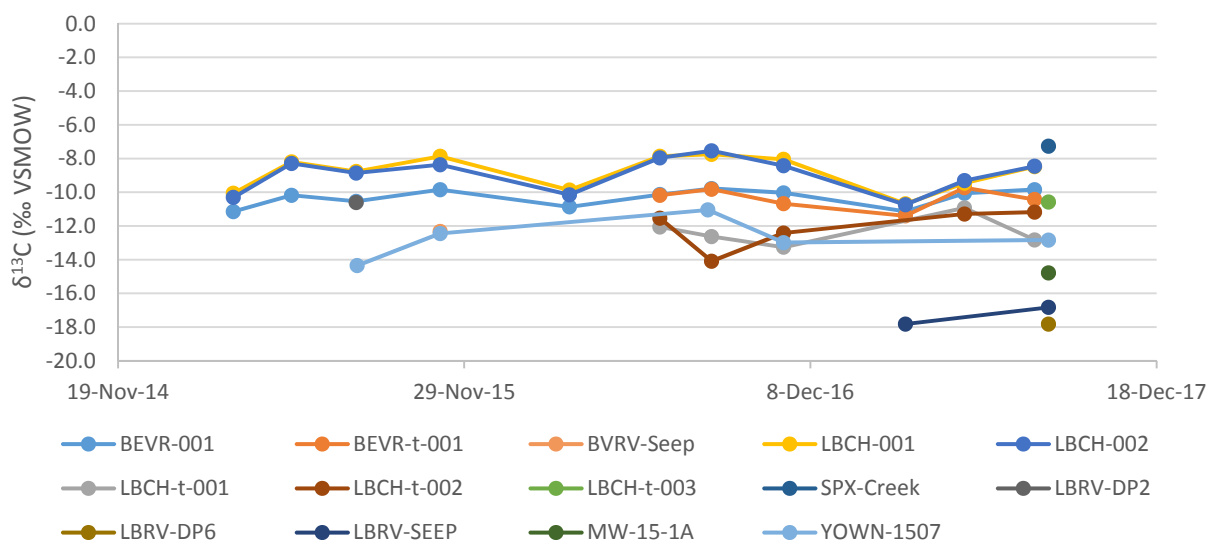


Figure 5.6 Seasonal variations in Carbon-13

In general, $\delta^{34}\text{S-SO}_4$ was more enriched during open water conditions rather than during freshet or under-ice conditions. When the sulphur-34 and oxygen-18 isotopic composition of surface water and groundwater samples are plotted based on the bedrock geology of each sampling location (**Figure 5.7**), surface and ground waters associated with some geological units, such as the Fort St. John formation (shale), shows a large range of isotopic values with others, such as the waters associated with the Mattson formation (sandstone), have a more limited range. It appears that the Fort St. John formation and the Ross Formation (claystone, siltstone, shale and coal) have similar isotopic signatures, while the Mattson formation has a relatively constant oxygen-18 concentration with a wider range of oxygen concentrations within sulphate. However, the sample size for the Ross and Mattson formations are smaller than the Fort St. John formation. It is possible that the difference in variation between samples is due to the limited sample size.

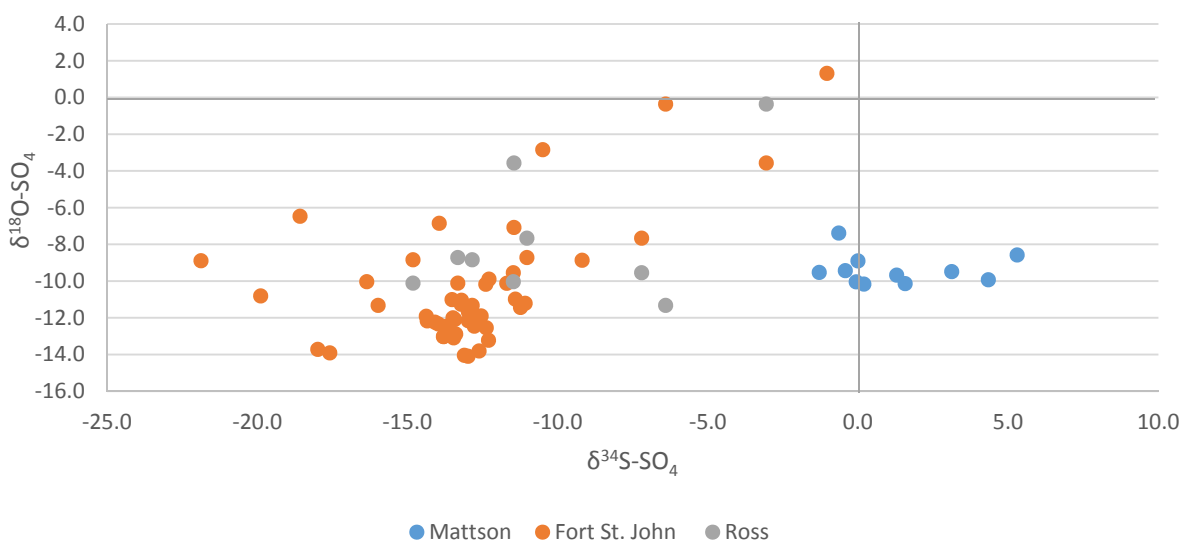


Figure 5.7 The Sulphur-34 and Oxygen-18 Isotopic Compositions of Sulphate in Surface Water and Groundwater Samples, Categorized by the Bedrock Geology at the Sampling Locations

5.2 Groundwater and Surface Water Investigations

5.2.1 Comparison of Groundwater and Surface Water Quality

Limited groundwater data were available within the Beaver River watershed. The Beaver River Seep was sampled once, and no samples were collected from the BEVR-DP1 or BEVR-DP2. Due to the lack of data, no groundwater-surface water comparisons could be made within the Beaver River watershed. All comparisons made are between samples collected within the La Biche River basin.

Electrical conductivities were similar between groundwater and surface water. Dissolved oxygen was significantly higher in surface water samples than groundwater samples. Routine parameters including ammonia, bicarbonate, potassium, and phosphorus had higher concentrations in groundwater than surface water. Nitrite and dissolved inorganic carbon inorganic carbon had similar concentrations between groundwater and surface water samples. Dissolved organic carbon, calcium, hardness, magnesium, sulphate, TDS, and sodium had higher concentration in surface water than in groundwater. Total metals which were dominant in groundwater included aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, mercury, molybdenum, nickel, selenium, silver, thallium, titanium, uranium and zinc. Total and dissolved selenium concentrations were greater in surface water than in groundwater.

Major ion composition of surface water compared to groundwater is shown in the piper plots in **Figure 5.8**, **Figure 5.9**, and **Figure 5.10**. The composition of major ions in surface water samples during various ice conditions were compared to groundwater samples collected from YOWN-1507, the deepest well that was routinely sampled during the study. YOWN-1507 had higher bicarbonate concentrations than the surface water samples, but the general proportions of the major ions were similar, indicating that groundwater at YOWN-1507 is influenced by infiltration of snowmelt and runoff from precipitation (**Figure 5.8**). The composition of major ions in groundwater and surface water samples were compared to the water conditions at the time that the samples were collected (**Figure 5.8**). No strong trends were apparent between groundwater and surface water samples and the timing of sample collection.

The major ionic composition of samples was compared based on sampling location (**Figure 5.10**). Samples collected from LBCH-SEEP and LBRV-DP6 had the highest proportions of sodium and potassium but had similar composition of anions compared to the rest of the samples collected in the Kotanelee area (**Figure 5.10**). Only one groundwater sample was collected from BEVR-SEEP (**Figure 5.10**). The major ionic composition is similar to other surface water samples collected within the Kotanelee watershed, indicating that this water may be shallow groundwater that is primarily influenced by surface water rather than groundwater originating from bedrock.

Hardness, alkalinity, and total and dissolved inorganic carbon had higher concentrations during the under-ice period as compared to other seasons, suggesting that groundwater dominates streamflow at this time. Groundwater samples collected from YOWN-1507 had lower concentrations of major ions compared to surface water samples, suggesting that YOWN-1507 is not representative of regional groundwater.

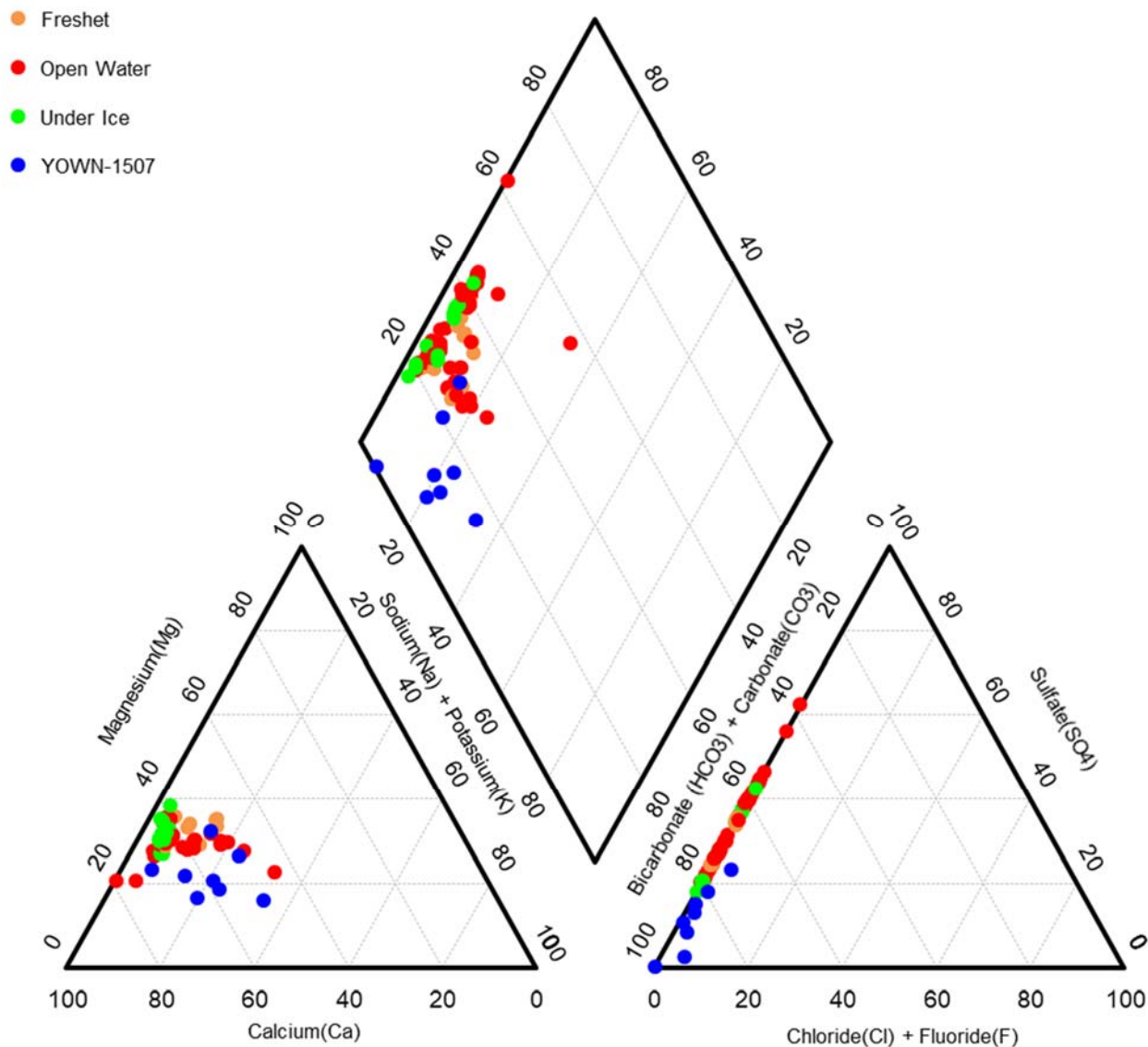


Figure 5.8 Piper Plot of All Surface Water sorted by Water Conditions compared to Groundwater Samples Collected from YOWN-1507

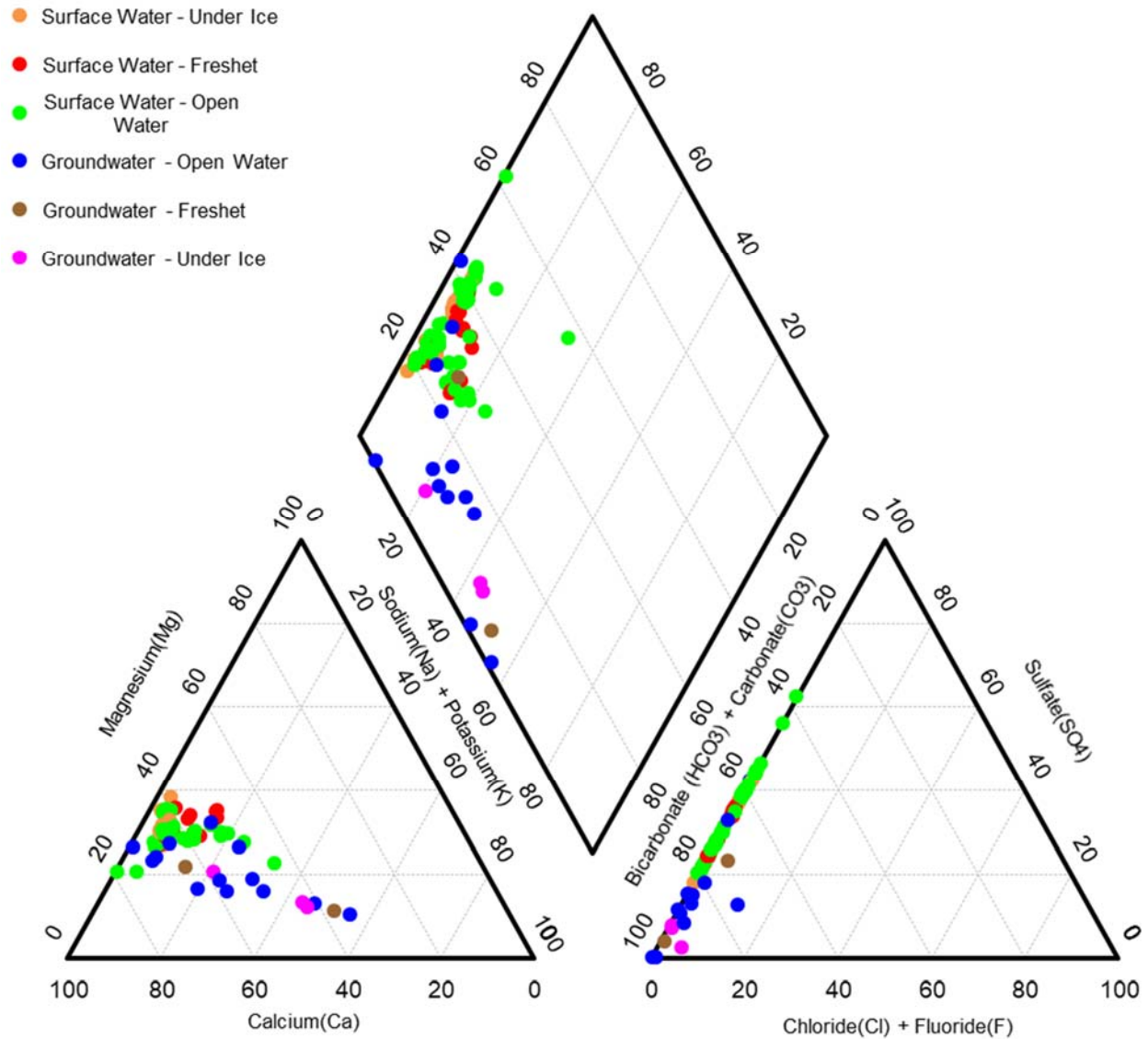


Figure 5.9 Piper Plot of All Groundwater and Surface Water Data sorted by Water Conditions

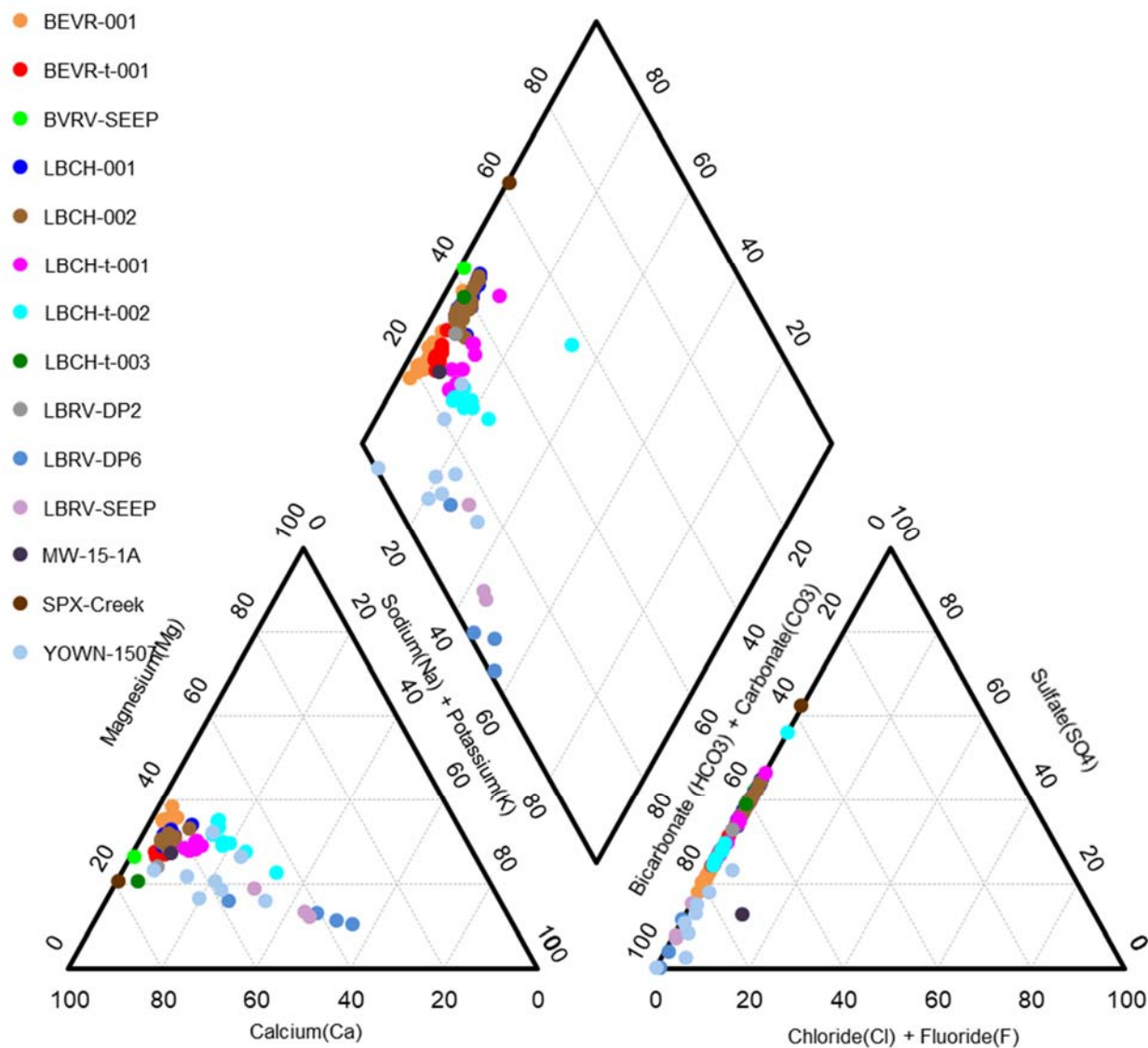


Figure 5.10 Piper Plot of Surface Water Samples, Groundwater Seeps and Drive Point Piezometers

We anticipated that groundwater collected within the study area would have higher concentrations of major ions and metals. As groundwater flows through the subsurface and interacts with the minerals in bedrock and overburden, the concentration of elements slowly increases. Groundwater located with deep bedrock generally has higher concentrations of metals compared to surface water. Groundwater samples within the study area generally followed pattern, having higher concentrations of various total metals compared to surface water samples (**Figure 5.11**). The concentration of dissolved metals including chromium, copper, mercury, and zinc had similar concentrations between surface water and groundwater (**Figure 5.3**). Dissolved concentrations of antimony, cobalt, copper, and nickel were higher in groundwater, but concentrations of aluminum and selenium were higher in surface water. The elevated total metals may be caused by sampling methods, which disturb the water resulting in high TSS in the groundwater sample. This in turn can result in a false positive attributed to entrained sediment in the groundwater sample.

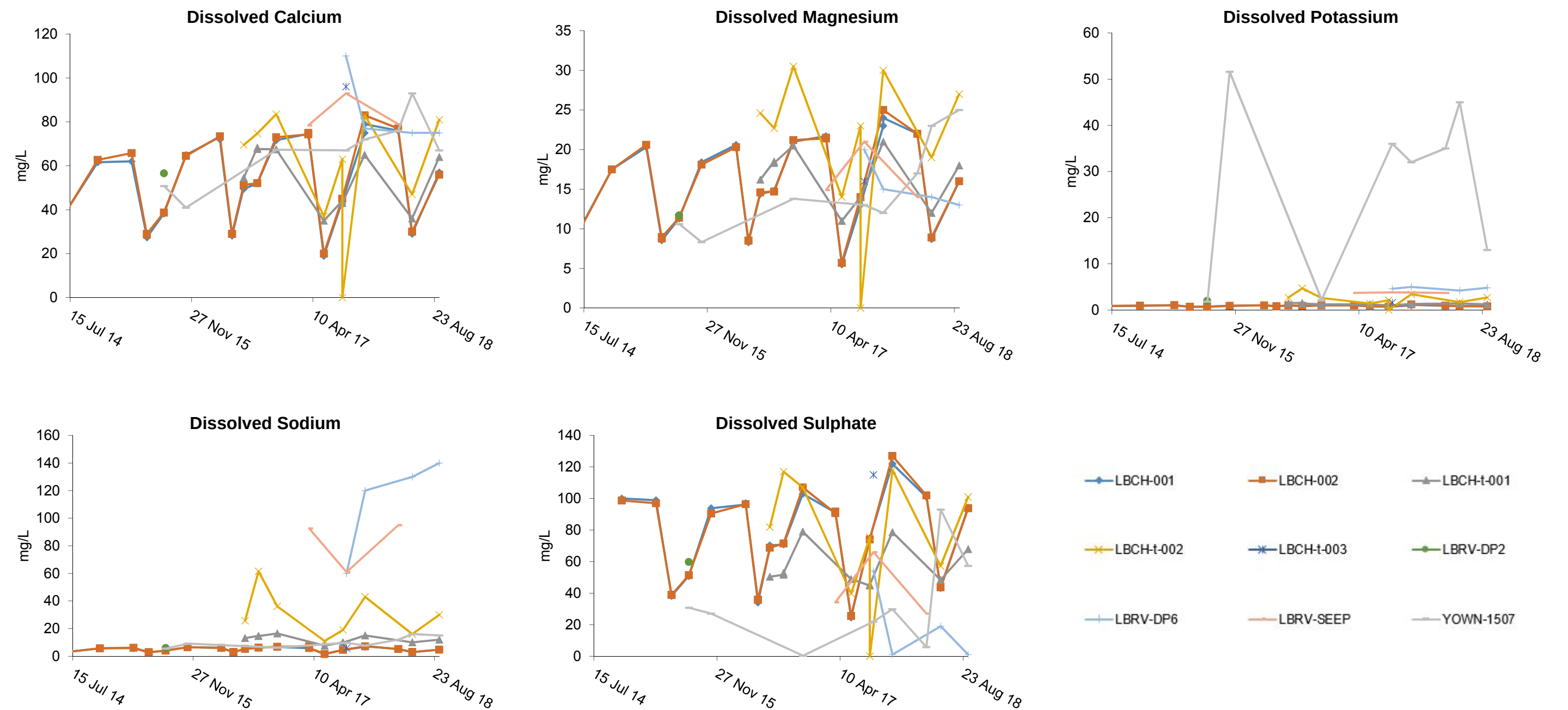


Figure 5.11 Comparison of Major Ions within Surface Water and Groundwater Samples Collected within the La Biche Watershed

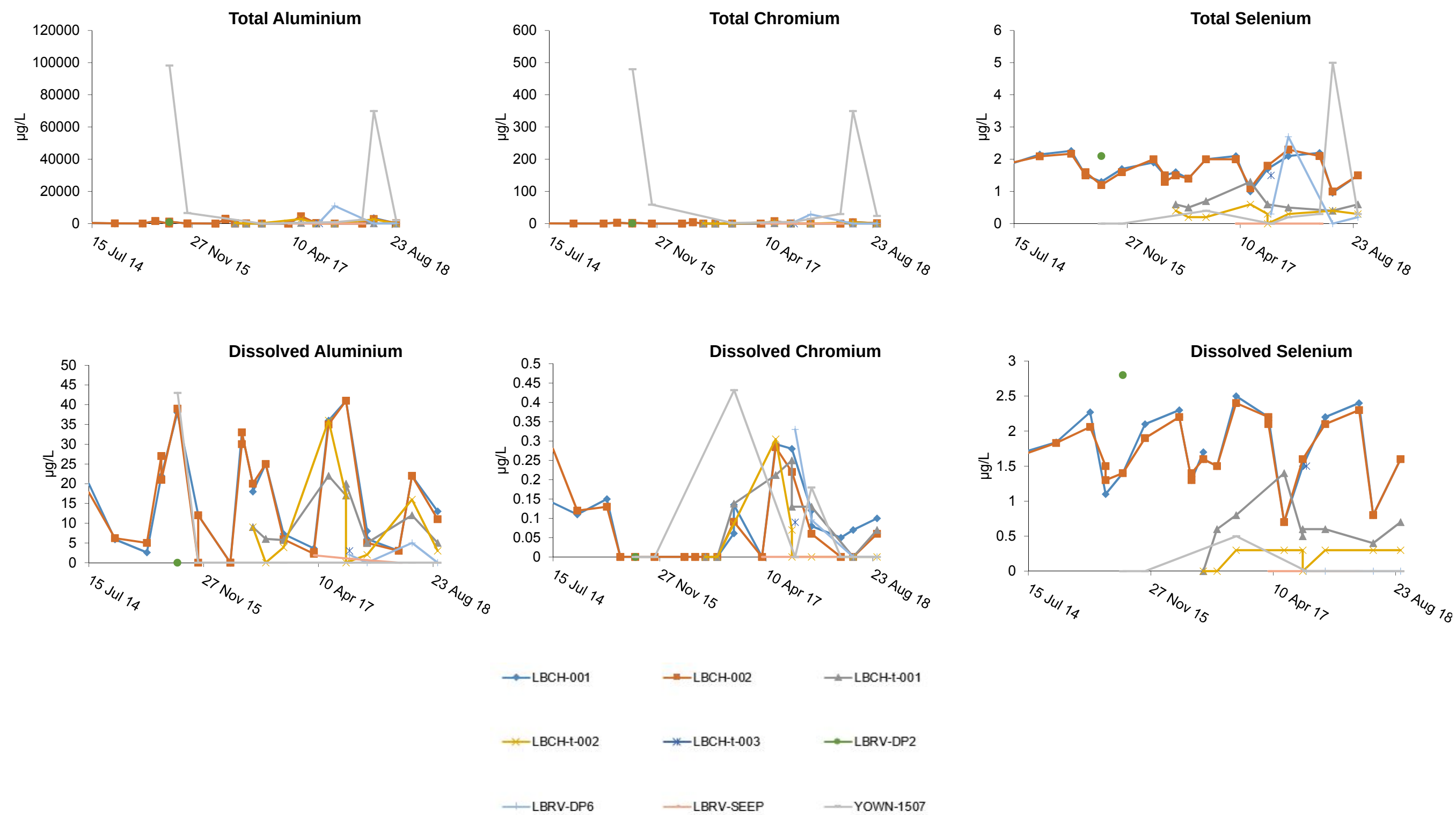


Figure 5.12 Comparison of Metals within Surface Water and Ground Water Samples Collected with the La Biche Watershed

5.2.2 Groundwater Discharge to Streams

Streams and rivers are linked in one of two ways – streams may gain water from groundwater (gaining streams) or streams may lose water to groundwater (losing streams) or may fluctuate between both depending on time of year and location. The type of stream is determined by the local groundwater flow regime. If groundwater elevations are higher than the stream level, then groundwater will discharge to the stream. Conversely, if the water level of the stream is greater than the groundwater elevation, then the stream will lose water to groundwater (Winter et al, 1998).

There were no surveyed groundwater or stream elevations that were collected as part of this study. However, groundwater seeps were noted within the La Biche and Beaver River watersheds, indicating that both rivers are likely gaining rivers. Additional studies comparing water levels within streambed piezometers compared to the river elevation would be required to confirm the vertical hydraulic gradient.

5.2.3 Groundwater Influence on Surface Water

Groundwater discharge to surface waters has the potential to influence surface water quality where concentrations are higher in groundwater as compared to surface water and the surface water is classified as a gaining stream (**Section 5.2.2**). From this study, it was determined that concentrations of alkalinity, bicarbonate, calcium, magnesium, and sulphate had higher concentrations during the under-ice period in surface water as compared to other seasons. The concentrations of several of these parameters were lower in groundwater wells during the winter months, suggesting that groundwater wells may not be representative of deeper regional groundwater that is contributing to base flow. Where groundwater discharges to surface water, the surrounding surface water may have higher concentrations of these constituents as compared to areas where surface water recharges groundwater.

Groundwater influence on surface water is most apparent in the surface water samples from the under-ice season. The under-ice season samples generally had higher concentrations of the parameters listed above and for total and dissolved selenium. Concentrations of total and dissolved selenium exceeded the guidelines (CCME-FAL or BC-WQG guidelines) in under-ice/baseflow samples in the La Biche watershed. Selenium was less likely to be found at concentrations exceeding guidelines in the open water or freshet surface water samples.

5.2.4 Surface Water Influence on Groundwater

Dataloggers installed in YOWN-1507, LBRV-DP2 and LBRV-DP6 indicated that groundwater levels were influenced by surface water. Groundwater elevations at YOWN-1507 decreased during the winter months and increased during freshet. Variations in water levels during the summer months indicated that it was affected by precipitation events and there was a direct connection to infiltration of snowmelt and precipitation. Water levels within streambed piezometers also showed a similar trend, with large increases corresponding to precipitation events.

In general, surface waters that recharge to groundwater may impact the groundwater chemistry during that time, resulting in a dilution effect. No apparent dilution trends were observed within the study area. This may be due to the limited groundwater data collected. Conversely, some parameters are more concentrated in surface water than groundwater. Surface water within the Kotanelee area had greater concentrations of several parameters including dissolved organic carbon, calcium, magnesium, sulphate, TDS, total and dissolved selenium, and sodium.

5.3 Regional Hydrogeology

Little information is known about the groundwater flow regime within the Kotaneelee area. However, groundwater within mountainous areas within the interior of Canada are controlled by climate and topography. In a semi-arid climate such as the Kotaneelee area, most groundwater recharge occurs during freshet when there is a surplus of precipitation accumulated. As such, the most significant recharge occurs in spring and early summer following the melting of the snowpack. For the remainder of the year, evapotranspiration exceeds precipitation and hence there is little to no groundwater recharge from precipitation. Groundwater elevations, as seen at YOWN-1507, will be highest in the summer (late May to August) and lowest in late winter or early spring (March to April) prior to recharge from freshet. (Environment Yukon 2011).

The main types of aquifers within the mountainous areas such as the Kotaneelee area often include shallow, unconfined fluvial or glaciofluvial aquifers along river valleys, aquifers of glacial, unconfined deltaic aquifers, unconfined alluvial fan or colluvial aquifers, confined and unconfined aquifers of glacial or pre-glacial origin, and bedrock aquifers within fractured bedrock (Wei, et. al, 2009).

Limited information is known about the groundwater flow in the Kotaneelee area. Previous studies conducted by Matrix noted that a shallow overburden aquifer was present below the Kotaneelee Gas Plant site and that a thick layer of glacial till was encountered at approximately 5.75 mbg. Groundwater elevations generally mimicked surficial topography and flowed to the west towards the La Biche River within the Kotaneelee Gas Plant site. Confined aquifers below or within the glacial till may be present. Additional monitoring wells would be required within the watershed to understand the groundwater flow regime within the study area.

6.0 SUMMARY

6.1 Surface Water Quality

Surface water samples within the study area were generally neutral to slightly basic. Surface waters were generally well oxygenated; however, dissolved oxygen concentration dropped to below the CCME-FAL guideline during the summer months.

Specific conductance, total suspended solids, total dissolved solids, total and dissolved organic carbon concentrations varied between sampling locations and within sampling locations. Several samples collected exceeded the CCME FAL guideline for TSS.

Several samples exceeded the CCME FAL guideline for nitrite in the La Biche and Beaver River watersheds. Concentrations were varied, and several samples also had nitrite concentrations which were below the detection limit.

Dominant ions were calcium, magnesium, bicarbonate and sulphate. Surface water samples had concentrations of metals that exceeded the CCME-FAL and BC-WQG for total aluminum, beryllium, cadmium, chromium, copper, iron, selenium, and zinc. The concentration of antimony, barium, boron, lead, mercury, nickel, silver, thallium, titanium and uranium were all below the BC WQG and the CCME guidelines in all surface water samples collected.

The concentration of VOCs and VPHs were below the detection limit all surface water samples collected in the Kotanelee area. PAH concentrations in surface waters were generally below the reporting limit, but detectable concentrations of PAHs were observed in each watershed. Higher concentrations of PAHs were found within the La Biche watershed compared to the Beaver River.

Seasonality, geology and watershed were found to influence surface water quality.

Routine parameters which appeared to be influenced by seasonality were hardness, alkalinity, total and dissolved organic carbon, and total and dissolved inorganic carbon. Hardness, alkalinity, bicarbonate, calcium, magnesium, sulphate had higher concentrations during the winter compared to other seasons. Total and dissolved organic carbon, total suspended solids, phosphorus had higher concentrations during the open water period in the summer and lower concentrations during the winter periods.

Total aluminum, beryllium, chromium, copper, iron, thallium, and zinc and dissolved copper, iron and zinc showed strong seasonal variation, with higher concentrations being observed during the open water at most stations. Seasonal variations of these metals were more pronounced in the Beaver River watershed compared to La Biche water shed. Dissolved selenium had strong seasonal variations at LBCH-001 and LBCH-002 with concentrations increasing during under ice conditions. Selenium concentrations experienced the reverse trend with highest concentrations in summer months at LBCH-t-001, LBCH-t-002, BEVR-001 and BEVR-t-001, although total selenium showed weaker seasonal variations in the Beaver River. The increased selenium concentrations increasing in the winter months suggests that deeper groundwater originating from bedrock is the source of the source of selenium at LBCH-001 and LBCH-002. The inverse trend observed at LBCH-t-001, LBCH-t-002, BEVR-001 and BEVR-t-001 suggests that groundwater discharging at those locations is either shallow and not impacted by deeper regional groundwater flow regimes, or that selenium is mobilized during freshet and precipitation, and may be associated with the increased suspended solids observed in surface water samples during summer months.

Groundwater discharge to surface water was most evident in baseflow samples collected in late winter.

6.2 Groundwater Quality

Groundwater samples were generally neutral within the Kotaneelee study area. Specific conductance and All groundwater samples collected exceeded the CCME FAL guideline for alkalinity. Several samples exceeded the CCME FAL for nitrite. The dominant ions within the groundwater were calcium, sodium, potassium, and bicarbonate. High TSS concentrations in many of the groundwater samples resulted in total metal concentration which exceeded the applicable guidelines for aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, mercury, molybdenum, nickel, selenium, silver, thallium, titanium, uranium and zinc exceeded the applicable standards. With exception of selenium, dissolved metals concentrations were below the applicable standards.

The concentration of benzo(a)anthracene, benzo(a)pyrene, fluorene and pyrene exceeded the BC WQG and CCME guidelines at YOWN-1507 in August 2015.

6.3 Groundwater and Surface Water Investigations

Generally, surface water and groundwater had similar pH, hardness, and electrical conductivity. Routine parameters including ammonia, bicarbonate, potassium, and phosphorus and had higher concentrations in groundwater than surface water. Nitrite and dissolved inorganic carbon inorganic carbon had similar concentrations between groundwater and surface water samples. Dissolved organic carbon, calcium, hardness, magnesium, sulphate, total dissolved solids, and sodium had higher concentration in surface water than in groundwater. Total metals which were dominant in groundwater included aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, mercury, molybdenum, nickel, selenium, silver, thallium, titanium, uranium and zinc. Total and dissolved selenium concentrations were greater in surface water than in groundwater.

Groundwater had higher bicarbonate concentrations than surface water, but general proportions of the major ions were similar. Samples collected from LBCH-SEEP and LBRV-DP6 had the highest proportions of sodium and potassium but had similar composition of anions compared to the rest of the samples collected in the Kotaneelee area.

Groundwater discharge to surface water was most evident in baseflow samples acquired during under ice conditions in late winter.

7.0 CONCLUSION AND RECOMMENDATIONS

The surface water quality and shallow groundwater quality data collected to date provides spatial and temporal information on existing conditions for the study area. Dependant on future resource development and future management plans, additional data collection programs may be required. Conclusions and recommendations include the following:

Recommendations

- Currently there are no monitoring wells that are installed into bedrock. All monitoring wells and drive point piezometers were shallow and represented groundwater that was under the direct influence of surface water. Considering that resource development will target deep geological units and drilling will bisect potential deep aquifers, it is recommended that a network of monitoring wells be installed into bedrock to better understand baseline bedrock groundwater conditions within the Beaver River and La Biche River basins.
- YOWN-1507 was the only monitoring well that was installed into overburden that was not immediately adjacent to a river. There were no overburden monitoring wells that were installed within the Beaver River watershed. YOWN-1507 appeared to be impacted by industrial activities at the Kotaneelee Gas Plant during at least one sampling event and the water chemistry may not reflect background conditions. It is recommended that additional shallow monitoring wells be installed within the La Biche and Beaver River basins to better understand baseline shallow groundwater conditions in the Kotaneelee area.
- YOWN-1507 is a water supply well for the Kotaneelee Gas Plant. It was noted in September 2018 that the wellhead had been damaged and should either be repaired or decommissioned.
- Hydrometric stations should be installed at surface water monitoring sites to gain more accurate discharge/water level information within the watershed. The limited data from the Water Survey of Canada hydrometric stations limited the ability to understand seasonal influences on surface water chemistry within the study area.
- The preliminary assessment of groundwater and surface water in this baseline study is based on limited groundwater quality and level data. Should future sampling programs become possible, twice yearly groundwater sampling in combination with hydrometric, surface water quality and groundwater level data at the Beaver River and La Biche watersheds is recommended. This would provide a better basis to assess the influence of season, streamflow and hydraulic gradients on groundwater-surface water interaction.
- A more detailed discussion of the impact of geology on surface water and groundwater would benefit from a study intended to specifically answer this question. For example, selecting similar stream orders in areas of different bedrock geology and seeking through field work and a detailed literature review to better define the geology of the local drainage at the sampling stations. Many of the sites in this study were in broadly similar geologic units but specific details of the localized geology were less well understood.
- Dataloggers could continue to be used in-stream to further document the relationship of flow/discharge to specific conductivity. Changes to specific conductivity in streams could be a future indicator of climate change or oil and gas activities as both involve possible changes in the concentrations of ions (salts).

Conclusion

In general, the Kotaneelee study successfully documented the surface water baseline conditions in the area prior to potential future resource development. The shallow groundwater aquifer located near the Kotaneelee Gas Plant was successfully characterized. However, no groundwater samples were collected from deeper overburden aquifer or bedrock to characterize that groundwater, which would potentially be impacted by resource development. Season and streamflow influence the concentration of many water quality parameters and water quality varied slightly between watersheds.

8.0 CLOSURE

We sincerely appreciate the opportunity to have assisted you with this project and if there are any questions, please do not hesitate to contact the undersigned by phone at 604.669.0424.

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9.0 REFERENCES

- APHA (American Public Health Association). 2012. Standard Methods for the Examination of Water and Wastewater, 22nd Edition.
- Baker J.A., J.R. Elphick, C.A. McPherson and P.M. Chapman. 2015. Effect of total dissolved solids on fertilization and development of two salmonid species. *Bulletin of Environmental Contamination and Toxicology*, 95 (4): p. 488-493.
- BC Parks, 2019. Liard River Corridor Provincial Park.
http://www.env.gov.bc.ca/bcparks/explore/parkpgs/liard_rv_corr/nat_cul.html, access March 3, 2019.
- BC ENV (British Columbia Ministry of Environment). 2017. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. Water Protection & Sustainability Branch, Ministry of Environment, Victoria, BC.
- CCME (Canadian Council of Ministers of the Environment). 1999. Canadian Environmental Quality Guidelines, 1999. Canadian Environmental Quality Guidelines Summary Table, with updates to 2017. Winnipeg, MB, Canada. Available at: <http://st-ts.ccme.ca/>. Accessed January 2017.
- CCME 2001. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life: Introduction. Updated. Canadian Environmental Quality Guidelines, 1999. Winnipeg, MB, Canada.
- CCME 2004. Canadian Guidance Framework for the Management of Phosphorus in Freshwater Systems. Report No. 1-8, Ecosystem Health, Science-Based Solutions. National Guidelines and Standards Office, Environment Canada. Gatineau, QC.
- CCME 2011. Protocols Manual for Water Quality Sampling in Canada. Winnipeg, MB, Canada.
- CCME 2015. Guidance Manual for Optimizing Water Quality Monitoring Program. Winnipeg, MB, Canada.
- Chapman, P.M. and C.A. McPherson. 2015. Development of a total dissolved solids (TDS) chronic effects benchmark for a northern Canadian Lake. *Integrated Environmental Assessment and Management*, DOI 10.1007/s00128-015-1589-2.
- Clark and Fritz. 1997. *Environmental Isotopes in Hydrogeology*. CRC Press. Boca Raton, Florida.
- Environment Yukon. 2002. Contaminated Sites Regulation, Environment Act, Yukon Regulations, Environment Yukon, Whitehorse, Yukon. United States
- Environmental Protection Agency (EPA). 2001. Technical Guidance for the Natural Attenuation Indicators: Methane, Ethane and Ethene. Prepared by EPA New England. July, 2001. pp. 18. United States
- Environmental Protection Agency (EPA). 2006. Standard Operating Procedure: Sample Preparation and Calculations for Dissolved Gas Analysis in Water Samples Using a GC Headspace Equilibration Technique. RSKOP-175. August, 2006. pp.15.

- Freeze, R.A. and J.A. Cherry. 1979. Chapter 7: Chemical Evolution of Natural Groundwater. In: Groundwater. Prentice Hall, Englewood Cliffs, NJ. 237 – 295.
- Gabos, S., M.G. Ikononou, D. Schopflocher, B.R. Fowler, J. White, E. Prepas, D. Prince, and W. Chen. 2001. Characteristics of PAHs, PCDD/Fs and PCBs in sediment following forest fires in northern Alberta. *Chemosphere* 43: 709 – 719.
- Gibson, J.J., T.W.D. Edwards, S.J. Birks, N.A. St Amour, W.M. Buhay, P. McEachern, B.B. Wolfe, D.L. Peters. 2005. Progress in isotope tracer hydrology in Canada. *Hydrological Processes*, 19:303-327.
- Golder, 2018. Eagle Plains Baseline Water and Sediment Quality Report. Prepared for Environment Yukon Water Resources Branch.
- International Atomic Energy Association (IAEA), Global Network of Isotopes in Precipitation Station Data for Mayo and Whitehorse, 1985-1989. Accessed via the WISER database on March 11, 2018.
- Matrix Solutions Inc., 2016. 2015 Spill Response Summary Report. Prepared for Apache Canada Ltd.
- Meikle, J.C., and Roots, C.F. (editors), 2004. Ecoregions of the Yukon Territory: Biophysical properties of Yukon Landscapes. Agriculture and Agri-Food Canada, PARC Technical Bulletin No. 04-01, Summerland, BC, 313 p.
- Osadetz, K.G., Z. Chen and T.D. Bird. 2005. Petroleum Resource Assessment, Eagle Plain Basin and Environs, Yukon Territory, Canada. Produced by the Yukon Geological Survey for the Minister of Energy, Mines and Resources, Yukon Government.
- Rozanski, K., L. Araguas-Araguas, R. Gonfiantini. 1993. Isotopic patterns in modern global precipitation. American Geophysical Union Geophysical Monograph 78: Climate Change in Continental Isotopic Records.
- Smith, C.A.S, J.C. Meikle, and C.F. Roots (editors). 2004. Ecoregions of the Yukon Territory: biophysical properties of Yukon landscapes. Agriculture and Agri-Food Canada, PARC Technical Bulletin No. 04-01, Summerland, British Columbia, 313pp.
- Stichler, W. (1987). "Snow cover and snowmelt process studies by means of environmental isotopes", In: H.G. Jones and W.J. Orville-Thomas (Eds.), Seasonal Snow covers: Physics, Chemistry, Hydrology D. Reidel Publishers, pp. 673-726.
- US EPA (United States Environmental Protection Agency). 1973. Water Quality Criteria 1972. Environmental Study Board, U.S. Environmental Protection Agency, Washington, D.C. EPA-R-73-033. 127-129.
- WSC (Water Survey of Canada). 2017. Real-Time Hydrometric Data Map Search. Available at: https://wateroffice.ec.gc.ca/google_map/google_map_e.html?search_type=province&province=YT

- Whiticar, M.J. 1999. Carbon and hydrogen isotope systematics of bacterial formation and oxidation of methane. *Chemical Geology* 161: p. 291 – 314.
- Winter, T.C., J.W. Harvey, O.L. Franke and W.M. Alley. 1998. Ground Water and Surface Water A Single Resource. U.S. Geological Survey Circular 1139.
- Yukon Ecoregions Working Group, 2004. Yukon Coastal Plain. In: Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes, C.A.S. Smith, J.C. Meikle and C.F. Roots (eds.), Agriculture and Agri-Food Canada, PARC Technical Bulletin No. 04-01, Summerland, BC, p. 63-72.
- Yukon Geological Survey. 2017. Yukon Digital Bedrock Geology.
http://www.geology.gov.yk.ca/update_yukon_bedrock_geology_map.html, accessed: March 3, 2019.

TABLES

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Table 4	Surface Water Analytical Results
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Table 1-A: Summary of Field and Trip Blank Data

Lab Report Number		2059088	2090917	2103369	2114955	2127769	2148175	2177022	2193244	2213257	2242331	2326916	2326918	2323162	5031692	2103369
Field ID		2015174	2016035	2016085	2016106	2172 - Field B	2016239 - Field Blank	2017045	2017075	2017157	2017275	2018024	2018054	2018161	2015018-BEVR-001	2016086
Sampled_Date/Time		03/11/2015	22/03/2016	11/05/2016 17:40	28/06/2016	23/08/2016	09/11/2016 10:11	21/03/2017	24/05/2017 12:00	#####	08/11/2017 14:36	#####	23/05/2018	12/09/2018	24/03/2015 11:15	11/05/2016
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	Trip_B
ChemName	Units	EQL														
Field																
Alkalinity (carbonate as CaCO3)	µg/L	1000													<1000	
Alkalinity (hydroxide) as CaCO3	µg/L	1000													<1000	
Alkalinity (P)	µg/L	1000													<1000	
Alkalinity (total) as CaCO3	µg/L	1000	<5000	<5000	<5000	<5000	<5000	<5000	<5000	<5000	<5000	<5000	0	1000	<1000	<5000
Alkalinity, PP (as CaCO3)	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ammonia	mg/L	0.02													<0.02	
Ammonia (as N)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.01	<0.025	<0.01
Bicarbonate	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromide (Filtered)	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bromine	µg/L	100													<100	
Carbonate	mg/L	6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6
Chloride (Filtered)	mg/L	0.05	<0.05	<0.05	<0.05	0.1	0.06	0.65	<0.05	<0.05	<0.05	<0.05	<0.05	0.21	0.1	<0.1
Electrical Conductivity (lab)	µS/cm	1	<1	1	<1	<1	<1	<1	<1	<1	<1	1	1	1	<2	<1
Hardness as CaCO3 (Filtered)	mg/L	0.1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Hydroxide	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ionic Balance	%	1						>2	>4	>2	>1	>2	10	7		
Nitrate (as N) (Filtered)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
Nitrate and nitrite (as N)	mg/L	0.01														
Nitrite (as N) (Filtered)	mg/L	0.01	0.03	0.04	0.07	0.02	0.04	0.21	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07
Nitrite (as NO2-)	µg/L	10													<10	
Nitrogen (Total)	µg/L	50	<60	<60	110	90	60	90	<60	140	<60	<60	130	<60	<60	<50
pH (Lab)	pH_Units	0.01	5.72	6.39	6.17	6.73	5.89	6.53	5.65	6.22	6.39	5.74	5.65	5.59	5.79	6
Phosphorus	µg/L	2	<3	<3	<3	23	<3	<3	<3	3	4	<3	<3	<3	<5	<3
Phosphorus (Filtered)	µg/L	10													<10	
Sulphate	mg/L	1														
Sulphate (Filtered)	mg/L	0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<1
Total Dissolved Solids (Filtered)	mg/L	1	6	20	<5	48	<5	1630	<5	10	<5	<5	74	34	30	21
Total Kjeldahl Nitrogen	µg/L	50													<50	
Total Suspended Solids	mg/L	1	<3	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Organics																
Dissolved Inorganic Carbon (Filtered)	µg/L	500	500	600	800	600	500	<500	500	<500	<500	<500	<500	<500	<500	800
Dissolved Organic Carbon (Filtered)	mg/L	0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon	µg/L	500	<500	500	<500	700	500	<500	<500	600	<500	800	<500	<500	<500	<500
Total Inorganic Carbon	µg/L	500	600	600	900	700	500	<500	600	<500	<500	<500	<500	<500	<500	800
BTEX																
Benzene	µg/L	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
Ethylbenzene	µg/L	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	<1	<0.5
Styrene	µg/L	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	<1	<0.5
Toluene	µg/L	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	<1	<0.5
Xylenes, total	µg/L	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	<2	<0.5
VOCs																
Methyl tert-butyl ether [MTBE]	µg/L	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	<1	<0.5
VPH																
VHw6-10	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<100	<50
VPHw	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<100	<50

Table 1-A: Summary of Field and Trip Blank Data

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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	Trip_B
ChemName	Units	EQL														
Metals																
Aluminium	µg/L	1	<5	<5	<1	<1	<1	<1	2	<1	<1	<1	<1	<1	3.6	1
Aluminium (Filtered)	µg/L	1	<5	<5	<5	<5	<5	<1	<1	<1	<1	<1	<1	<1	<1	<5
Antimony	µg/L	0.02	<0.2	<0.2	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	0.11	<0.02	<0.02	<0.05	<0.02
Antimony (Filtered)	µg/L	0.02	<0.2	<0.2	<0.2	<0.2	<0.2	<0.02	<0.02	<0.02	<0.02	0.11	<0.02	<0.02	<0.05	<0.2
Arsenic	µg/L	0.05	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1
Arsenic (Filtered)	µg/L	0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2
Barium	µg/L	0.1	<1	<1	<0.1	<0.1	<0.1	0.3	0.2	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Barium (Filtered)	µg/L	0.1	<1	<1	<1	<1	<1	0.3	0.1	0.2	0.2	<0.1	<0.1	<0.1	<0.1	<1
Beryllium	µg/L	0.01	<0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05
Beryllium (Filtered)	µg/L	0.01	<0.04	<0.04	<0.04	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.04
Bismuth	µg/L	0.01	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.1
Bismuth (Filtered)	µg/L	0.01	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<1
Boron	µg/L	1	<5	<4	<2	<2	<2	<2	<2	<2	32	<2	<2	<2	<1	<2
Boron (Filtered)	µg/L	1	<4	<4	<4	<4	<4	<2	<2	<2	<2	<2	<2	<2	<1	<4
Cadmium	µg/L	0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.002	<0.01
Cadmium (Filtered)	µg/L	0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.002	<0.01
Calcium	mg/L	0.01	<0.05	<0.05	<0.05	<0.05	0.07	0.047	0.065	0.051	0.03	0.03	<0.01	0.01	0.03	<0.04
Calcium (Filtered)	mg/L	0.01	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.03	0.059	0.03	0.02	0.03	0.03	0.04	<0.1
Chromium	µg/L	0.05	<0.4	<0.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium (Filtered)	µg/L	0.05	<0.4	<0.4	<0.4	<0.4	<0.4	0.061	0.192	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.4
Cobalt	µg/L	0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.005	<0.02
Cobalt (Filtered)	µg/L	0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.005	<0.02
Copper	µg/L	0.1	<1	<1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2
Copper (Filtered)	µg/L	0.1	<1	<1	<0.2	<0.2	<0.2	21.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.12	<0.2
Iron	mg/L	0.002	<0.01	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.007	<0.002	<0.002	0.0022	<0.002
Iron (Filtered)	mg/L	0.002	<0.005	<0.005	<0.005	<0.005	<0.005	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005
Lead	µg/L	0.01	<0.1	<0.1	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.05	<0.01
Lead (Filtered)	µg/L	0.01	<0.1	<0.1	<0.1	<0.1	<0.1	0.738	<0.01	<0.01	<0.01	0.02	0.02	<0.01	<0.01	<0.1
Lithium	µg/L	0.05	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.5
Lithium (Filtered)	µg/L	0.05	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<1
Magnesium	mg/L	0.005	<0.05	<0.05	<0.05	<0.05	0.21	<0.02	<0.02	0.022	<0.02	<0.02	<0.02	<0.02	<0.005	<0.05
Magnesium (Filtered)	mg/L	0.005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.005	<0.1
Manganese	µg/L	0.05	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0.07	<1
Manganese (Filtered)	µg/L	0.05	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.05	<1
Mercury	µg/L	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01
Mercury (Filtered)	µg/L	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01
Molybdenum	µg/L	0.01	<0.1	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02
Molybdenum (Filtered)	µg/L	0.01	<0.1	<0.1	<0.1	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	0.03	<0.01	<0.1
Nickel	µg/L	0.02	<1	<1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.4	1.2	<0.2	<0.2	<0.02	<0.2
Nickel (Filtered)	µg/L	0.02	<1	<1	<1	<1	<1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.022	<1
Potassium	mg/L	0.01	<0.1	<0.1	<0.1	<0.1	0.2	<0.04	<0.04	<0.04	0.08	<0.04	<0.04	<0.04	0.04	<0.1
Potassium (Filtered)	mg/L	0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.1
Selenium	µg/L	0.1	<0.6	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2
Selenium (Filtered)	µg/L	0.1	<0.6	<0.6	<0.6	<0.6	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.6
Silicon	µg/L	5	<50	<50	<50	<50	<50	<5	<5	13	<5	<5	8	<5	<5	<50
Silicon (Filtered)	µg/L	5	<50	<50	<50	<50	<50	7	<5	<5	<5	<5	<5	<5	<50	<50
Silver	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
Silver (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
Sodium ion	mg/L	0.01	<0.02	<0.02	<0.02	<0.02	2.47	<0.1	0.101	0.2	0.1	<0.1	<0.1	<0.1	0.2	<0.02
Sodium ion (Filtered)	mg/L	0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.043	<0.1
Strontium	µg/L	0.1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium (Filtered)	µg/L	0.1	<1	<1	<1	<1	<1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1
Sulfur, elemental	µg/L	500													<500	

Table 1-A: Summary of Field and Trip Blank Data

Lab Report Number		2059088	2090917	2103369	2114955	2127769	2148175	2177022	2193244	2213257	2242331	2326916	2326918	2323162	5031692	2103369
Field ID		2015174	2016035	2016085	2016106	2172 - Field B	2016239 - Field Blank	2017045	2017075	2017157	2017275	2018024	2018054	2018161	2015018-BEVR-001	2016086
Sampled_Date/Time		03/11/2015	22/03/2016	11/05/2016 17:40	28/06/2016	23/08/2016	09/11/2016 10:11	21/03/2017	24/05/2017 12:00	#####	08/11/2017 14:36	#####	23/05/2018	12/09/2018	24/03/2015 11:15	11/05/2016
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	Trip_B
ChemName	Units	EQL														
Sulfur, elemental (Filtered)	µg/L	20	<200	<200	<200	<200	<200	40	90	28	30	30	<20	20	20	<500
Sulphur (S)	µg/L	20	<100	<100	<100	<100	200	40	30	30	20	30	<20	<20	<20	<100
Tellurium	µg/L	0.05	<0.1	<0.1	<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 (Filtered)	µg/L	0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.3	<0.1
Thallium	µg/L	0.004	<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
Thallium (Filtered)	µg/L	0.004	<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
Thorium	µg/L	0.01	<0.4	<0.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	0.07	0.12	<0.05	<0.05
Thorium (Filtered)	µg/L	0.01	<0.4	<0.4	<0.4	<0.4	<0.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.1
Tin	µg/L	0.05	<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
Tin (Filtered)	µg/L	0.05	<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
Titanium	µg/L	0.2	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<2	<2	<2	<1
Titanium (Filtered)	µg/L	0.2	<10	<10	<10	<10	<10	<2	<2	<2	<2	<2	<2	<2	<2	<10
Uranium	µg/L	0.001	<0.4	<0.4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium (Filtered)	µg/L	0.001	<0.4	<0.4	<0.4	<0.4	<0.4	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.4
Vanadium	µg/L	0.05	<0.1	<0.1	0.13	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.16	<0.05	0.22	<0.05	0.18
Vanadium (Filtered)	µg/L	0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	0.06	0.1	<0.05	<0.05	<0.1
Zinc	µg/L	0.5	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2	0.9	1.3	<0.5	1.1	<0.5
Zinc (Filtered)	µg/L	0.5	<1	<1	<0.5	<0.5	<0.5	15	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	1.4
Zirconium	µg/L	0.01	<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	0.01	<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
Radionuclides																
Actinium228	Bq/L		1	<0.7		<0.6	<0.4	<0.7	<1	<0.9	<1	<1	<0.9	<1	1	
Radon219	Bq/L		<1	<0.9		<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	
Thorium227	Bq/L		<0.8	<0.5		<0.6	<0.9	<1	<0.8	<0.7	<1	<0.5	<1	<1	<0.9	
Bismuth212	Bq/L		<1	2		<1	<2	<2	2	<2	<2	<2	<2	<2	<1	
Lead-210	Bq/L		<4	<3		<2	<3	<4	<4	<4	<4	<4	<5	<5	<4	
Lead211	Bq/L		<5	<3		<4	<5	<4	<4	<4	<2	<5	<4	<3	<4	
Lead212	Bq/L		0.4	0.7		<0.2	<0.3	<0.3	1	0.3	1.2	0.7	<0.4	<0.3	<0.3	
Radium223	Bq/L		<0.6	<0.8		<0.9	<0.4	<1	<1	<1	<0.6	<0.6	<1	0.7	<0.7	
Radium-226	Bq/L	0.005	<0.005	<4		<3	<5	<5	<5	<5	<5	<4	<4	<4	<4	<0.005
Thallium208	Bq/L		<0.2	0.2		<0.2	<0.2	<0.2	0.4	<0.3	0.4	0.4	<0.2	<0.2	<0.2	
NA																
12-Dimethylnaphthalene	ng/L	0.222	<0.536												<0.303	
C2-Fluoranthenes-Pyrenes	ng/L	0.0412	0.965												<0.294	
C2-Phenanthrenes-Anthracenes	ng/L	0.0191	0.815												<0.168	
3-Methylfluoranthene-Benzo-a-fluorene	ng/L	0.0823	0.236												<0.315	
C4-Fluoranthenes-Pyrenes	ng/L	0.0412	0.371												<0.189	
C4-Phenanthrenes-Anthracenes	ng/L	0.0629	0.903												<0.328	
17-Dimethylfluorene	ng/L	0.0959	<0.165												<0.612	
56-Methylchrysene	ng/L	0.0213	<0.0645												<0.0822	
59-Dimethylchrysene	ng/L	0.0343	<0.138												<0.141	
7-Methylbenzo-a-pyrene	ng/L	0.069	<0.197												<0.323	
94-Methylphenanthrene	ng/L	0.0347	0.232												<0.705	
C4-Benzo-a-anthracenes-Chrysenes	ng/L	0.0601	0.183												<0.184	
C3-Benzo-a-anthracenes-Chrysenes	ng/L	0.0472	0.432												<0.206	
23-Methyldibenzothiophenes	ng/L	0.0429	<0.15												<0.349	
24-Dimethyldibenzothiophene	ng/L	0.029	<0.0968												<0.221	
26-Dimethylphenanthrene	ng/L	0.0191	0.14												<0.168	
2-Methylfluorene	ng/L	0.0851	<0.226												<0.655	
C1-Benzo-a-anthracenes-Chrysenes	ng/L	0.0205	0.183												<0.0798	
C1-Benzofluoranthenes-Benzopyrenes	ng/L	0.069	1.09												<0.323	
C1-Fluoranthenes-Pyrenes	ng/L	0.0823	0.745												<0.315	
C1-Phenanthrenes-Anthracenes	ng/L	0.0344	0.943												<0.691	
C2-Benzo-a-anthracenes-Chrysenes	ng/L	0.0343	0.192												<0.141	
C2-Benzofluoranthenes-Benzopyrenes	ng/L	0.0388	0.988												<0.182	
C3-Fluoranthenes-Pyrenes	ng/L	0.0457	0.474												<0.315	
C3-Phenanthrenes-Anthracenes	ng/L	0.0252	0.457												<0.272	
1-Methylchrysene	ng/L	0.0198	<0.0592												<0.0775	

Table 1-A: Summary of Field and Trip Blank Data

Lab Report Number		2059088	2090917	2103369	2114955	2127769	2148175	2177022	2193244	2213257	2242331	2326916	2326918	2323162	5031692	2103369
Field ID		2015174	2016035	2016085	2016106	2172 - Field B	2016239 - Field Blank	2017045	2017075	2017157	2017275	2018024	2018054	2018161	2015018-BEVR-001	2016086
Sampled_Date/Time		03/11/2015	22/03/2016	11/05/2016 17:40	28/06/2016	23/08/2016	09/11/2016 10:11	21/03/2017	24/05/2017 12:00	#####	08/11/2017 14:36	#####	23/05/2018	12/09/2018	24/03/2015 11:15	11/05/2016
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	Trip_B
ChemName	Units	EQL														
PAH																
1,4,6,7-tetramethylnaphthalene	µg/L	0.0000959	<0.000193												<0.000159	
1,8-dimethylphenanthrene	µg/L	0.0000191	<9.13e-005												<0.000168	
1-methylphenanthrene	µg/L	0.0000344	0.000267												<0.000691	
2-methylantracene	µg/L	0.0000354	<0.000177												<0.000722	
3-methylphenanthrene	µg/L	0.0000347	0.000353												<0.000705	
Acenaphthene	µg/L	0.00016	<0.000346												<0.000178	
Acenaphthylene	µg/L	0.0000623	<0.000113												<7.79e-005	
Anthracene	µg/L	0.0000333	8.5e-005												<0.000257	
Benz(a)anthracene	µg/L	0.0000244	<7.71e-005												<7.95e-005	
Benzo(a)pyrene	µg/L	0.0000412	<0.000139												<0.000279	
Benzo(b)fluoranthene	µg/L	0.0000267	<9.91e-005												<0.000179	
Benzo(e)pyrene	µg/L	0.000042	<0.000145												<0.000282	
Benzo(g,h,i)perylene	µg/L	0.000029	<9.09e-005												<0.000155	
Benzo(j,k)fluoranthenes	µg/L	0.0000279	<0.000103												<0.000184	
Chrysene	µg/L	0.0000208	0.000172												0.000153	
Dibenz(a,h)anthracene	µg/L	0.0000362	<8.49e-005												<0.000307	
Dimethylnaphthalene, 2,6-	µg/L	0.000188	0.000412												<0.000257	
Dimethylphenanthrene, 1,7-	µg/L	0.0000186	<8.89e-005												<0.000165	
Dimethylphenanthrene, 3,6-	µg/L	0.0000195	<9.37e-005												<0.000171	
Fluoranthene	µg/L	0.0000112	0.000587												0.00024	
Fluorene	µg/L	0.0000341	0.000321												<0.000301	
Indeno(1,2,3-cd)pyrene	µg/L	0.0000283	<9.4e-005												<0.000297	
Methylnaphthalene, 1-	µg/L	0.0000963	0.000722												0.000724	
Methylnaphthalene, 2-	µg/L	0.00009	0.00203												0.00344	
Methylphenanthrene, 2-	µg/L	0.0000342	0.000358												<0.0007	
Naphthalene	µg/L	0.0000949	0.00222												0.00233	
Perylene	µg/L	0.0000448	<0.000149												<0.000297	
Phenanthrene	µg/L	0.0000332	0.00168												0.000764	
Pyrene	µg/L	0.0000108	0.000418												0.000278	
Retene	µg/L	0.0000629	0.000224												<0.000328	
Trimethylphenanthrene, 1,2,6-	µg/L	0.0000252	<0.000127												<0.000272	
Alkylated PAHs																
C1 - Acenaphthenes	µg/L	0.0000431	<0.00018												<0.000313	
C1 - Biphenyls	µg/L	0.0000428	0.000592												0.000979	
C1 - Fluorenes	µg/L	0.0000851	0.00135												0.00121	
C1 - Naphthalenes	µg/L	0.00009	0.00275												0.00416	
C2 - Biphenyls	µg/L	0.0000599	0.00083												0.00258	
C2 - Fluorenes	µg/L	0.0000975	0.00144												0.002	
C2 - Naphthalenes	µg/L	0.000222	0.00433												0.00398	
C3 - Fluorenes	µg/L	0.0000719	0.00254												<0.000637	
C3 - Naphthalenes	µg/L	0.000086	0.00207												0.00139	
C4 - Dibenzothiophenes	µg/L	0.0000338	0.0011												0.000718	
C4 - Naphthalenes	µg/L	0.0000959	0.000928												<0.000159	
Organosulfur																
C1 - Dibenzothiophenes	µg/L	0.0000429	<0.00015												<0.000349	
C2 - Dibenzothiophenes	µg/L	0.000029	0.000796												<0.000221	
C3 - Dibenzothiophenes	µg/L	0.0000387	0.00123												<0.000288	
Dibenzothiophene	µg/L	0.000027	0.000117												<0.000202	

Table 1-A: Summary of Field and Trip Blank Data

Lab Report Number		2114955	2127769	2148175	2177022	2193244	2213257	2217546	2242331	2326916	2326918	2323162	4071115	4110428	5031692
Field ID		2016107	6173 - Trip Blank	2016240 - Trip Blank	2017044	2017076	2017158	2017194	2017274	2018023	2018053	2018160	2014025 - Trip Blank	2014099-Trip Blank	2015017-Trip Blank
Sampled_Date/Time		28/06/2016 15:00	#####	09/11/2016	#####	24/05/2017	08/08/2017	23/08/2017 16:20	08/11/2017	26/03/2018	23/05/2018	12/09/2018	14/07/2014	05/11/2014	24/03/2015
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
ChemName	Units	EQL													
Field															
Alkalinity (carbonate as CaCO3)	µg/L	1000											<1000	<1000	<1000
Alkalinity (hydroxide) as CaCO3	µg/L	1000											<1000	<1000	<1000
Alkalinity (P)	µg/L	1000											<1000	<1000	<1000
Alkalinity (total) as CaCO3	µg/L	1000	<5000	42000	<5000	<5000	<5000	<5000	<5000	<5000	1000	1000	<1000	<1000	<1000
Alkalinity, PP (as CaCO3)	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5			
Ammonia	mg/L	0.02											<0.02	<0.02	<0.02
Ammonia (as N)	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.025		
Bicarbonate	mg/L	5	<5	51	<5	<5	<5	<5	<5	<5	<5	<5			
Bromide (Filtered)	mg/L	0.02	0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		
Bromine	µg/L	100											<100	<100	<100
Carbonate	mg/L	6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6			
Chloride (Filtered)	mg/L	0.05	0.11	0.06	0.63	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	<0.05		<0.1	<0.1
Electrical Conductivity (lab)	µS/cm	1	<1	<1	<1	<1	<1	<1	<1	1	2	1	1	<2	<2
Hardness as CaCO3 (Filtered)	mg/L	0.1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<0.1	1.79	<0.1
Hydroxide	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5			
Ionic Balance	%	1				>5	>1.1	<1	>2		>1	8	6		
Nitrate (as N) (Filtered)	mg/L	0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Nitrate and nitrite (as N)	mg/L	0.01											<0.02	<0.01	<0.01
Nitrite (as N) (Filtered)	mg/L	0.01	0.02	0.04	0.23	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrite (as NO2-)	µg/L	10													<10
Nitrogen (Total)	µg/L	50	<60	120	180	<60	<60	<60	<60	330	<60	<60	<60	<50	<50
pH (Lab)	pH_Units	0.01	5.94	5.11	7.27	6.09	5.76	7.67	6.35	6.38	6.43	6.39	6.41	5.64	6.52
Phosphorus	µg/L	2	<3	5	<3	<3	<3	3	<3	5	<3	<3	<5	<2	<2
Phosphorus (Filtered)	µg/L	10												<10	<10
Sulphate	mg/L	1												<1	
Sulphate (Filtered)	mg/L	0.1	<0.5	<0.5	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<1	<1
Total Dissolved Solids (Filtered)	mg/L	1	74	<5	<5	<5	<5	10	6	<5	10	8	6	<10	<10
Total Kjeldahl Nitrogen	µg/L	50												<50	<50
Total Suspended Solids	mg/L	1	2	2	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<2
Organics															
Dissolved Inorganic Carbon (Filtered)	µg/L	500	<500	600	<500	500	<500	<500	<500	500	<500	<500	<500	<500	<500
Dissolved Organic Carbon (Filtered)	mg/L	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
Total Organic Carbon	µg/L	500	700	<500	<500	600	<500	<500	<500	1000	700	<500	<500	<500	<500
Total Inorganic Carbon	µg/L	500	700	600	<500	600	<500	<500	<500	600	500	<500	<500	<500	<500
BTEX															
Benzene	µg/L	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
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1
Styrene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<1
Toluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1
Xylenes, total	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<2	<2
VOCs															
Methyl tert-butyl ether [MTBE]	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<1
VPH															
VHw6-10	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<100	<100
VPHw	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<100	<100

Table 1-A: Summary of Field and Trip Blank Data

Lab Report Number		2114955	2127769	2148175	2177022	2193244	2213257	2217546	2242331	2326916	2326918	2323162	4071115	4110428	5031692
Field ID		2016107	6173 - Trip B	2016240 - Trip Blank	2017044	2017076	2017158	2017194	2017274	2018023	2018053	2018160	2014025 - Trip Blank	2014099-Trip Blank	2015017-Trip Blank
Sampled_Date/Time		28/06/2016 15:00	#####	09/11/2016	#####	24/05/2017	08/08/2017	23/08/2017 16:20	08/11/2017	26/03/2018	23/05/2018	12/09/2018	14/07/2014	05/11/2014	24/03/2015
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
ChemName	Units	EQL													
Metals															
Aluminium	µg/L	1	<1	<1	2	3	<1	<1	1	<1	1	<1	<1	<1	2.8
Aluminium (Filtered)	µg/L	1	<5	<5	1.996	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Antimony	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.17	<0.02	<0.02	<0.05	<0.05
Antimony (Filtered)	µg/L	0.02	<0.2	<0.2	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	0.1	0.03	<0.02	<0.05	<0.05
Arsenic	µg/L	0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05
Arsenic (Filtered)	µg/L	0.05	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05
Barium	µg/L	0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	<0.1	<0.1
Barium (Filtered)	µg/L	0.1	<1	<1	<0.1	0.2	<0.1	0.2	0.2	<0.1	0.2	<0.1	<0.1	<0.1	<0.1
Beryllium	µg/L	0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01
Beryllium (Filtered)	µg/L	0.01	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01
Bismuth	µg/L	0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01
Bismuth (Filtered)	µg/L	0.01	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01
Boron	µg/L	1	<2	<2	<2	<2	<2	<2	<2	57	<2	<2	<2	<1	1
Boron (Filtered)	µg/L	1	<4	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	1.9
Cadmium	µg/L	0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.002	<0.002
Cadmium (Filtered)	µg/L	0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.002	0.005	<0.002
Calcium	mg/L	0.01	<0.05	<0.05	<0.01	0.098	0.013	0.02	0.03	0.01	<0.01	0.01	<0.01	<0.04	<0.04
Calcium (Filtered)	mg/L	0.01	<0.1	<0.1	0.01	0.1	<0.01	0.02	0.03	<0.01	0.03	0.03	0.03	<0.04	0.089
Chromium	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	<0.1	<0.1
Chromium (Filtered)	µg/L	0.05	<0.4	<0.4	<0.05	<0.05	0.0989	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1
Cobalt	µg/L	0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.005	<0.005
Cobalt (Filtered)	µg/L	0.005	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.005	<0.005
Copper	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	<0.1	<0.1
Copper (Filtered)	µg/L	0.1	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	2.3
Iron	mg/L	0.002	<0.002	0.084	0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron (Filtered)	mg/L	0.002	<0.005	<0.005	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead	µg/L	0.01	<0.01	<0.01	0.011	0.04	<0.01	<0.01	0.02	<0.01	0.03	<0.01	<0.01	<0.05	<0.05
Lead (Filtered)	µg/L	0.01	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.01	<0.05	<0.05
Lithium	µg/L	0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05
Lithium (Filtered)	µg/L	0.05	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05
Magnesium	mg/L	0.005	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.005	<0.005
Magnesium (Filtered)	mg/L	0.005	<0.1	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.005	0.38
Manganese	µg/L	0.05	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<0.05	<0.05
Manganese (Filtered)	µg/L	0.05	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.05	0.46
Mercury	µg/L	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005
Mercury (Filtered)	µg/L	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005
Molybdenum	µg/L	0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	<0.02	<0.01	<0.01
Molybdenum (Filtered)	µg/L	0.01	<0.1	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	<0.02	<0.01	<0.01
Nickel	µg/L	0.02	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.02	<0.02
Nickel (Filtered)	µg/L	0.02	<1	<1	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	1.1	<0.2	<0.2	<0.02	0.143
Potassium	mg/L	0.01	<0.1	<0.1	<0.04	<0.04	<0.04	0.07	<0.04	<0.04	<0.04	<0.04	0.05	<0.01	<0.01
Potassium (Filtered)	mg/L	0.01	<0.1	<0.1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01
Selenium	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	<0.1	<0.1
Selenium (Filtered)	µg/L	0.1	<0.6	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1
Silicon	µg/L	5	<50	<50	<5	<5	10	<5	58	<5	<5	<5	<5	<50	<50
Silicon (Filtered)	µg/L	5	<50	<50	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50
Silver	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
Silver (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	0.232
Sodium ion	mg/L	0.01	<0.02	0.32	<0.1	0.113	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01
Sodium ion (Filtered)	mg/L	0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	0.066
Strontium	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium (Filtered)	µg/L	0.1	<1	<1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3
Sulfur, elemental	µg/L	500											<500	<500	<500

Table 1-A: Summary of Field and Trip Blank Data

Lab Report Number		2114955	2127769	2148175	2177022	2193244	2213257	2217546	2242331	2326916	2326918	2323162	4071115	4110428	5031692
Field ID		2016107	6173 - Trip Blank	2016240 - Trip Blank	2017044	2017076	2017158	2017194	2017274	2018023	2018053	2018160	2014025 - Trip Blank	2014099-Trip Blank	2015017-Trip Blank
Sampled_Date/Time		28/06/2016 15:00	#####	09/11/2016	#####	24/05/2017	08/08/2017	23/08/2017 16:20	08/11/2017	26/03/2018	23/05/2018	12/09/2018	14/07/2014	05/11/2014	24/03/2015
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
ChemName	Units	EQL													
Sulfur, elemental (Filtered)	µg/L	20	<200	<200	<20	200	27	<20	40	30	<20	30	<20	<500	<500
Sulphur (S)	µg/L	20	<100	<100	30	40	32	30	<20	20	<20	<20	<20		
Tellurium	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	0.06	0.06	<0.05	<0.05
Tellurium (Filtered)	µg/L	0.05	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Thallium	µg/L	0.004	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.004	<0.004
Thallium (Filtered)	µg/L	0.004	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.004	<0.004
Thorium	µg/L	0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	0.2	<0.05	<0.01	<0.01
Thorium (Filtered)	µg/L	0.01	<0.4	<0.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01
Tin	µg/L	0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05
Tin (Filtered)	µg/L	0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05
Titanium	µg/L	0.2	<1	<1	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0.2	<0.2
Titanium (Filtered)	µg/L	0.2	<10	<10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0.2	<0.2
Uranium	µg/L	0.001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.001	<0.001
Uranium (Filtered)	µg/L	0.001	<0.4	<0.4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.001	0.0016
Vanadium	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	<0.05	0.28	<0.05	<0.2	<0.2
Vanadium (Filtered)	µg/L	0.05	<0.1	<0.1	<0.05	<0.05	0.056	<0.05	<0.05	0.05	0.11	<0.05	<0.05	<0.2	<0.2
Zinc	µg/L	0.5	<0.5	1.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1
Zinc (Filtered)	µg/L	0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<1	<1
Zirconium	µg/L	0.01	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01
Zirconium (Filtered)	µg/L	0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01
Radionuclides															
Actinium228	Bq/L		<0.7	<1	<1	<0.9	<1	<0.6	<1	<1	<0.8	<1	<0.7		
Radon219	Bq/L		<0.7	<0.8	<0.6	<1	<1	<0.6	<1	<1	<0.6	<1	<1		
Thorium227	Bq/L		<0.8	<0.7	<0.8	<1	<0.9	<0.7	<1	<1	<0.9	<0.9	<0.9		
Bismuth212	Bq/L		<1	<2	<2	<1	<2	<2	<3	<2	<2	<3	<0.6		
Lead-210	Bq/L		<2	<4	<4	<4	<5	<4	<4	<5	4	<4	<3		
Lead211	Bq/L		<3	<8	<6	<7	<4	<4	<5	<4	<4	<5	<4		
Lead212	Bq/L		<0.2	0.5	<0.3	1.3	0.7	1.1	0.5	0.7	<0.4	<0.4	<0.3		
Radium223	Bq/L		<0.3	<1	<1	<1	<0.6	<1	<0.8	<1	<0.8	<0.9	<0.6		
Radium-226	Bq/L	0.005	<3		<4	<5	<5	<4	<5	<5	<4	<5	<3	<0.005	<0.005
Thallium208	Bq/L		<0.2	<0.4	<0.2	<0.3	<0.3	<0.2	<0.3	<0.3	<0.2	<0.3	<0.3		
NA															
12-Dimethylnaphthalene	ng/L	0.222											<0.281	<0.222	<0.55
C2-Fluoranthenes-Pyrenes	ng/L	0.0412											0.369	0.69	<0.169
C2-Phenanthrenes-Anthracenes	ng/L	0.0191											0.486	0.382	<0.135
3-Methylfluoranthene-Benzo-a-fluorene	ng/L	0.0823											<0.261	0.35	<0.226
C4-Fluoranthenes-Pyrenes	ng/L	0.0412											0.205	<0.0412	<0.0988
C4-Phenanthrenes-Anthracenes	ng/L	0.0629											0.82	1.03	0.736
17-Dimethylfluorene	ng/L	0.0959											<0.221	<0.0959	<0.378
56-Methylchrysene	ng/L	0.0213											<0.0427	0.081	<0.0966
59-Dimethylchrysene	ng/L	0.0343											<0.0535	0.058	<0.0994
7-Methylbenzo-a-pyrene	ng/L	0.069											<0.14	0.084	<0.27
94-Methylphenanthrene	ng/L	0.0347											<0.111	0.146	<0.412
C4-Benzo-a-anthracenes-Chrysenes	ng/L	0.0601											0.195	<0.0601	<0.115
C3-Benzo-a-anthracenes-Chrysenes	ng/L	0.0472											0.195	0.11	<0.107
23-Methylidibenzothiophenes	ng/L	0.0429											<0.19	0.121	<0.217
24-Dimethyldibenzothiophene	ng/L	0.029											<0.0852	0.061	<0.219
26-Dimethylphenanthrene	ng/L	0.0191											<0.0658	0.065	<0.135
2-Methylfluorene	ng/L	0.0851											<0.17	0.103	<0.422
C1-Benzo-a-anthracenes-Chrysenes	ng/L	0.0205											0.133	0.268	<0.0938
C1-Benzofluoranthenes-Benzopyrenes	ng/L	0.069											<0.14	0.478	<0.27
C1-Fluoranthenes-Pyrenes	ng/L	0.0823											<0.261	0.977	0.31
C1-Phenanthrenes-Anthracenes	ng/L	0.0344											0.286	1.01	<0.404
C2-Benzo-a-anthracenes-Chrysenes	ng/L	0.0343											0.201	0.266	<0.0994
C2-Benzofluoranthenes-Benzopyrenes	ng/L	0.0388											0.338	0.789	<0.142
C3-Fluoranthenes-Pyrenes	ng/L	0.0457											0.23	<0.0457	<0.198
C3-Phenanthrenes-Anthracenes	ng/L	0.0252											0.264	0.512	<0.139
1-Methylchrysene	ng/L	0.0198											<0.0401	0.074	<0.0911

Table 1-A: Summary of Field and Trip Blank Data

Lab Report Number		2114955	2127769	2148175	2177022	2193244	2213257	2217546	2242331	2326916	2326918	2323162	4071115	4110428	5031692
Field ID		2016107	6173 - Trip Blank	2016240 - Trip Blank	2017044	2017076	2017158	2017194	2017274	2018023	2018053	2018160	2014025 - Trip Blank	2014099-Trip Blank	2015017-Trip Blank
Sampled_Date/Time		28/06/2016 15:00	#####	09/11/2016	#####	24/05/2017	08/08/2017	23/08/2017 16:20	08/11/2017	26/03/2018	23/05/2018	12/09/2018	14/07/2014	05/11/2014	24/03/2015
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
ChemName	Units	EQL													
PAH															
1,4,6,7-tetramethylnaphthalene	µg/L	0.0000959											<0.000143	<9.59e-005	0.000173
1,8-dimethylphenanthrene	µg/L	0.0000191											<6.58e-005	<1.91e-005	<0.000135
1-methylphenanthrene	µg/L	0.0000344											<0.000111	0.000259	<0.000404
2-methylantracene	µg/L	0.0000354											<0.00011	<3.54e-005	<0.000422
3-methylphenanthrene	µg/L	0.0000347											0.000125	0.000244	<0.000412
Acenaphthene	µg/L	0.00016											<0.000199	<0.00016	<0.000164
Acenaphthylene	µg/L	0.0000623											<0.000144	9.6e-005	<0.000125
Anthracene	µg/L	0.0000333											<9.44e-005	0.000152	<0.00018
Benz(a)anthracene	µg/L	0.0000244											<4.23e-005	0.000137	5.8e-005
Benzo(a)pyrene	µg/L	0.0000412											<8.19e-005	<4.12e-005	<0.000216
Benzo(b)fluoranthene	µg/L	0.0000267											<5.68e-005	8.4e-005	<0.000141
Benzo(e)pyrene	µg/L	0.000042											<8.4e-005	0.000118	<0.000218
Benzo(g,h,i)perylene	µg/L	0.000029											<6.64e-005	0.000132	<0.000243
Benzo(j,k)fluoranthenes	µg/L	0.0000279											<6.09e-005	0.000107	<0.000143
Chrysene	µg/L	0.0000208											8e-005	0.000239	8.8e-005
Dibenz(a,h)anthracene	µg/L	0.0000362											<5.32e-005	0.000121	<0.000366
Dimethylnaphthalene, 2,6-	µg/L	0.000188											<0.000235	0.000254	<0.000465
Dimethylphenanthrene, 1,7-	µg/L	0.0000186											<6.46e-005	0.00012	<0.000133
Dimethylphenanthrene, 3,6-	µg/L	0.0000195											6.9e-005	5.2e-005	<0.000137
Fluoranthene	µg/L	0.0000112											0.000199	0.00066	0.000345
Fluorene	µg/L	0.0000341											0.000104	0.000323	<0.000234
Indeno(1,2,3-cd)pyrene	µg/L	0.0000283											<6.69e-005	0.000116	<0.000344
Methylnaphthalene, 1-	µg/L	0.0000963											0.000337	0.000709	0.000692
Methylnaphthalene, 2-	µg/L	0.00009											0.000629	0.00126	0.00342
Methylphenanthrene, 2-	µg/L	0.0000342											0.000161	0.000363	<0.000409
Naphthalene	µg/L	0.0000949											0.00188	0.00399	0.00229
Perylene	µg/L	0.0000448											<8.95e-005	8.1e-005	<0.000221
Phenanthrene	µg/L	0.0000332											0.00053	0.00213	0.000737
Pyrene	µg/L	0.0000108											0.000306	0.00032	0.000327
Retene	µg/L	0.0000629											<0.000535	0.000496	<0.000286
Trimethylphenanthrene, 1,2,6-	µg/L	0.0000252											<0.00012	3.9e-005	<0.000139
Alkylated PAHs															
C1 - Acenaphthenes	µg/L	0.0000431											<0.000109	4.9e-005	<0.000223
C1 - Biphenyls	µg/L	0.0000428											0.00243	0.000972	0.00124
C1 - Fluorenes	µg/L	0.0000851											0.0017	0.000903	0.00065
C1 - Naphthalenes	µg/L	0.00009											0.000966	0.00196	0.00411
C2 - Biphenyls	µg/L	0.0000599											0.0119	0.00246	0.00301
C2 - Fluorenes	µg/L	0.0000975											0.000692	0.00101	0.00175
C2 - Naphthalenes	µg/L	0.000222											0.0024	0.00331	0.00481
C3 - Fluorenes	µg/L	0.0000719											0.00118	0.00185	0.000651
C3 - Naphthalenes	µg/L	0.000086											0.00132	0.00224	0.0014
C4 - Dibenzothiophenes	µg/L	0.0000338											0.000956	0.00128	0.000733
C4 - Naphthalenes	µg/L	0.0000959											0.00148	<9.59e-005	0.000211
Organosulfur															
C1 - Dibenzothiophenes	µg/L	0.0000429											<0.00019	0.000247	<0.000217
C2 - Dibenzothiophenes	µg/L	0.000029											0.000637	0.000731	<0.000219
C3 - Dibenzothiophenes	µg/L	0.0000387											0.000924	0.00073	<0.000146
Dibenzothiophene	µg/L	0.000027											0.000204	0.00047	<0.000141

Table 1-B: Summary of Duplicate Samples and RPD Values

Field Duplicates (Surface Water)
Filter: [Sampled_Date_Time] <= '21 Mar 2019'

		Lab Report Number	2014013	2014013		2103369	2103369		2114955	2114955		2127769	2127769		2148175
		Field ID	2015037	2015038	RPD	2016082	2016083	RPD	2016110	2016108	RPD	2016175 - Tributary to Labiche R. u/s of gas plant	2016174 - Replicate Sample	RPD	2016241 - Beaver R. at hydrometric station
		Sampled Date/Time	26/05/2015 16:50	26/05/2015 16:50		11/05/2016 13:15	11/05/2016 13:15		28/06/2016 13:30	28/06/2016 13:30		23/08/2016 11:00	23/08/2016 11:00		09/11/2016 14:40
ChemName	Units	DL													
Inorganics															
Alkalinity (total) as CaCO3	µg/L	5000	72000	73000	1	72000	72000	0	106000	95000	11	100000	63000	45	192000
Alkalinity, PP (as CaCO3)	mg/L	5	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5
Ammonia (as N)	mg/L	0.025													
Ammonia (as N)	mg/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
Bicarbonate	mg/L	5	88	89	1	87	88	1	129	116	11	122	77	45	234
Bromide (Filtered)	mg/L	0.02	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.2
Carbonate	mg/L	6	<6	<6	0	<6	<6	0	<6	<6	0	<6	<6	0	<6
Chloride (Filtered)	mg/L	0.05	0.22	0.22	0	0.41	0.44	7	0.4	0.42	5	0.69	0.42	49	0.82
Electrical Conductivity (lab)	µS/cm	1	222	233	5	200	201	0	359	359	0	477	474	1	420
Hardness as CaCO3 (Filtered)	mg/L	5	107	109	2	110	110	0	185	183	1	247	244	1	241
Hydroxide	mg/L	5	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5
Ionic Balance	%	1													
Nitrate (as N) (Filtered)	mg/L	0.01	0.04	0.04	0	0.04	0.04	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.1
Nitrite (as N) (Filtered)	mg/L	0.01	0.11	0.11	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	0.53
Nitrogen (Total)	µg/L	60	310	460	39	390	380	3	260	160	48	590	840	35	310
pH (Lab)	pH_Units	0.01	7.46	7.38	1	7.53	7.56	0	7.68	7.53	2	7.76	7.55	3	7.67
Phosphorus	µg/L	5													
Phosphorus	µg/L	3	141	139	1	80	78	3	19	12	45	16	16	0	15
Sulphate (Filtered)	mg/L	0.1	38.8	38.9	0	35.8	35.8	0	68.6	70.2	2	51.7	52.8	2	50
Total Dissolved Solids (Filtered)	mg/L	5	146	174	18	124	108	14	268	274	2	318	316	1	256
Total Dissolved Solids (Filtered)	mg/L	1													
Total Suspended Solids	mg/L	2	100	98	2	63	73	15	6	4	40	<2	<2	0	4
Organics															
Dissolved Inorganic Carbon (Filtered)	µg/L	500	17900	17900	0	16900	16900	0	27100	27100	0	49000	47700	3	43400
Dissolved Organic Carbon (Filtered)	mg/L	0.5	7.2	5.4	29	8.2	8.2	0	3.8	3.5	8	17.4	16.9	3	2.5
Total Organic Carbon	µg/L	500	7200	6100	17	8800	9000	2	4900	4100	18	19400	18500	5	2700
Total Inorganic Carbon	µg/L	500	18000	18000	0	17000	17000	0	27000	27000	0	50000	47400	5	43300
BTEX															
Benzene	µg/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
Ethylbenzene	µg/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
Styrene	µg/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
Toluene	µg/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
Xylenes, total	µg/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
VPH															
VHw6-10	µg/L	50	52	<50	4	<50	<50	0	<50	<50	0	<50	<50	0	<50
VPHw	µg/L	50	52	<50	4	<50	<50	0	<50	<50	0	<50	<50	0	<50
VOCs															
Methyl tert-butyl ether [MTBE]	µg/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
Metals															
Aluminium	µg/L	5	1570	1600	2										
Aluminium	µg/L	1				2570	3020	16	182	173	5	20	18	11	130
Aluminium (Filtered)	µg/L	1	27	21	25	30	33	10	20	18	11	6	6	0	2.384
Antimony	µg/L	0.1	<0.1	<0.1	0										
Antimony	µg/L	0.02				0.06	0.05	18	0.1	0.04	86	0.06	0.06	0	0.14
Antimony (Filtered)	µg/L	0.02	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	0.125
Arsenic	µg/L	0.1				1.2	1.3	8	0.4	0.4	0	0.8	0.8	0	0.7
Arsenic	µg/L	0.05	1.53	1.46	5										
Arsenic (Filtered)	µg/L	0.1	0.3	0.3	0	0.3	0.3	0	0.3	0.3	0	0.7	0.8	13	0.4
Barium	µg/L	0.1				43.8	46	5	36.6	37	1	51.8	51.3	1	97
Barium	µg/L	0.05	48.9	49.7	2										
Barium (Filtered)	µg/L	0.1	23	24	4	21	21	0	32	32	0	45	47	4	91.2
Beryllium	µg/L	0.05	0.13	0.11	17	0.15	0.16	6	<0.05	<0.05	0	<0.05	<0.05	0	<0.05
Beryllium (Filtered)	µg/L	0.05	<0.04	<0.04	0	<0.04	<0.04	0	<0.04	<0.04	0	<0.04	<0.04	0	<0.05
Bismuth	µg/L	0.1	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1
Bismuth (Filtered)	µg/L	0.1	<1	<1	0	<1	<1	0	<1	<1	0	<1	<1	0	<0.1
Boron	µg/L	2	21	20	5	21	21	0	27	25	8	46	45	2	13
Boron (Filtered)	µg/L	2	15	14	7	14	15	7	26	25	4	48	46	4	13
Cadmium	µg/L	0.01	0.05	0.05	0	0.04	0.04	0	0.01	0.01	0	0.02	0.01	67	0.03
Cadmium (Filtered)	µg/L	0.01	<0.01	<0.01	0	0.01	0.02	67	<0.01	<0.01	0	0.01	0.01	0	<0.01
Calcium	mg/L	0.05	34.4	32.7	5										
Calcium	mg/L	0.01				30.5	30.3	1	51.5	51.3	0	69	69.6	1	62.2

Table 1-B: Summary of Duplicate Samples and RPD Values

Field Duplicates (Surface Water)
Filter: [Sampled_Date_Time] <= '21 Mar 2019'

Lab Report Number		2014013	2014013		2103369	2103369		2114955	2114955		2127769		2127769		2148175	
Field ID		2015037	2015038	RPD	2016082	2016083	RPD	2016110	2016108	RPD	2016175 - Tributary to Labiche R. u/s of gas plant		2016174 - Replicate Sample	RPD	2016241 - Beaver R. at hydrometric station	
Sampled Date/Time		26/05/2015 16:50	26/05/2015 16:50		11/05/2016 13:15	11/05/2016 13:15		28/06/2016 13:30	28/06/2016 13:30		23/08/2016 11:00		23/08/2016 11:00		09/11/2016 14:40	
ChemName	Units	DL														
Calcium (Filtered)	mg/L	0.01	28.6	29	1	29	29	0	50.1	49.5	1	68.3	67.6	1	61.6	
Chromium	µg/L	0.5	2.7	2.5	8											
Chromium	µg/L	0.05				3.76	4.62	21	0.06	0.14	80	<0.05	<0.05	0	0.27	
Chromium (Filtered)	µg/L	0.05	<0.4	<0.4	0	<0.4	<0.4	0	<0.4	<0.4	0	<0.4	<0.4	0	0.089	
Cobalt	µg/L	0.1	1.5	1.5	0											
Cobalt	µg/L	0.02				0.99	1.13	13	0.11	0.1	10	0.13	0.13	0	0.19	
Cobalt (Filtered)	µg/L	0.02	0.16	0.16	0	0.16	0.16	0	0.03	0.03	0	0.11	0.11	0	0.1	
Copper	µg/L	0.2				3.1	3.3	6	0.8	0.7	13	1	1	0	0.5	
Copper	µg/L	0.1	3.8	3.7	3											
Copper (Filtered)	µg/L	0.5	1	1	0	1.4	1.4	0	0.7	0.6	15	0.9	0.9	0	<0.5	
Iron	mg/L	0.002	3.33	3.29	1	2.45	2.81	14	0.253	0.234	8	0.603	0.61	1	0.441	
Iron (Filtered)	mg/L	0.004	0.068	0.054	23	0.235	0.238	1	0.029	0.016	58	0.501	0.519	4		
Iron (Filtered)	mg/L	0.002													0.019	
Lead	µg/L	0.1	1.6	1.6	0											
Lead	µg/L	0.01				1.21	1.29	6	0.11	0.1	10	0.04	0.04	0	0.169	
Lead (Filtered)	µg/L	0.01	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	0.035	
Lithium	µg/L	0.5	6.6	6.2	6	7.2	8	11	7.5	7.7	3	15.8	15.9	1	5.9	
Lithium (Filtered)	µg/L	0.5	5	5	0	4	4	0	7	7	0	16	15	6	5.4	
Magnesium	mg/L	0.04	9.25	9.18	1											
Magnesium	mg/L	0.02				8.99	9.04	1	14.5	14.6	1	19.2	19.4	1	20.3	
Magnesium (Filtered)	mg/L	0.02	8.77	8.96	2	8.5	8.5	0	14.5	14.4	1	18.5	18.3	1	21.2	
Manganese	µg/L	1	50.3	50.8	1	41	42	2	10	10	0	28	28	0	36	
Manganese (Filtered)	µg/L	1	12	13	8	16	16	0	4	4	0	27	26	4	33	
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	
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	
Molybdenum	µg/L	0.05	0.7	0.68	3											
Molybdenum	µg/L	0.02				0.6	0.63	5	0.88	0.83	6	0.54	0.55	2	2.1	
Molybdenum (Filtered)	µg/L	0.02	0.59	0.61	3	0.5	0.5	0	0.8	0.8	0	0.5	0.5	0	1.94	
Nickel	µg/L	0.2	6.4	6.5	2	5.4	5.9	9	2	1.8	11	1.9	2	5	2.6	
Nickel (Filtered)	µg/L	0.2	3	3	0	3	3	0	1	1	0	2	2	0	2.2	
Potassium	mg/L	0.1	1.5	1.3	14											
Potassium	mg/L	0.04				1.7	1.9	11	1	1	0	1.5	1.5	0	0.9	
Potassium (Filtered)	mg/L	0.04	0.7	0.7	0	0.8	0.8	0	1	1	0	1.5	1.4	7	0.9	
Selenium	µg/L	0.2				1.5	1.3	14	1.6	1.6	0	0.5	0.5	0	1	
Selenium	µg/L	0.1	1.5	1.6	6											
Selenium (Filtered)	µg/L	0.2	1.5	1.3	14	1.3	1.4	7	1.7	1.6	6	0.6	<0.6	0	1	
Silicon	µg/L	5				9760	10700	9	2570	2560	0	3500	3540	1	3150	
Silicon	µg/L	20	4440	4620	4											
Silicon (Filtered)	µg/L	5	1930	1950	1	1840	1840	0	2150	2130	1	3420	3380	1	2930	
Silver	µg/L	0.05	0.06	<0.05	18											
Silver	µg/L	0.01				<0.01	<0.01	0	0.02	<0.01	67	<0.01	<0.01	0	<0.01	
Silver (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	
Sodium ion	mg/L	0.1	3.4	2.8	19	3	3.03	1	5.39	5.36	1	14.9	15.1	1	3.31	
Sodium ion (Filtered)	mg/L	0.1	2.8	2.9	4	3	3	0	5.2	5.1	2	14.7	14.6	1	3.4	
Strontium	µg/L	0.1	63.4	62.6	1	53.3	54.4	2	87.7	87.3	0	167	169	1	92.9	
Strontium (Filtered)	µg/L	0.1	60	59	2	51	52	2	84	84	0	156	156	0	89.9	
Sulfur, elemental (Filtered)	µg/L	20	13700	13900	1	12600	12300	2	24200	23700	2	19600	19700	1	18200	
Sulphur (S)	µg/L	20				12700	12700	0	24000	23800	1	20800	21000	1	17600	
Tellurium	µg/L	0.05				<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	
Tellurium (Filtered)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.05	
Thallium	µg/L	0.01	0.05	0.05	0	0.04	0.05	22	0.02	<0.01	67	<0.01	<0.01	0	0.012	
Thallium (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	
Thorium	µg/L	0.05				0.51	0.59	15	0.44	<0.05	159	<0.05	<0.05	0	<0.05	
Thorium	µg/L	0.01	0.49	0.49	0											
Thorium (Filtered)	µg/L	0.05	<0.4	<0.4	0	<0.4	<0.4	0	<0.4	<0.4	0	<0.4	<0.4	0	<0.05	
Tin	µg/L	0.1	<0.1	0.2	67	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	
Tin (Filtered)	µg/L	0.1	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	
Titanium	µg/L	2				139	154	10	13	15	14	10	11	10	13	
Titanium	µg/L	0.5	13.5	12.5	8											
Titanium (Filtered)	µg/L	2	<10	<10	0	<10	<10	0	<10	<10	0	<10	<10	0	9	
Uranium	µg/L	0.01	0.56	0.54	4	0.52	0.55	6	0.6	0.59	2	0.62	0.64	3	1.66	
Uranium (Filtered)	µg/L	0.01	0.4	0.4	0	<0.4	<0.4	0	0.6	0.6	0	0.5	0.6	18	1.624	

Table 1-B: Summary of Duplicate Samples and RPD Values

Field Duplicates (Surface Water)
Filter: [Sampled_Date_Time] <= '21 Mar 2019'

Files Duplicates (Surface Water) Filter: [Sampled_Date_Time] <= '21 Mar 2019'		Lab Report Number	2014013	2014013		2103369	2103369		2114955	2114955		2127769	2127769		2148175
		Field ID	2015037	2015038	RPD	2016082	2016083	RPD	2016110	2016108	RPD	2016175 - Tributary to Labiche R. u/s of gas plant	2016174 - Replicate Sample	RPD	2016241 - Beaver R. at hydrometric station
		Sampled Date/Time	26/05/2015 16:50	26/05/2015 16:50		11/05/2016 13:15	11/05/2016 13:15		28/06/2016 13:30	28/06/2016 13:30		23/08/2016 11:00	23/08/2016 11:00		09/11/2016 14:40
ChemName	Units	DL													
Vanadium	µg/L	0.1	5.3	5.2	2										
Vanadium	µg/L	0.05				6.38	7.5	16	0.41	0.42	2	<0.05	<0.05	0	0.836
Vanadium (Filtered)	µg/L	0.05	0.27	0.2	30	0.1	0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	0.209
Zinc	µg/L	0.5	14.5	14.4	1	10.4	11.8	13	1.2	1.9	45	2.2	1.5	38	3.7
Zinc (Filtered)	µg/L	0.5	2	1	67	1.4	1.3	7	<0.5	<0.5	0	0.6	0.5	18	2.1
Zirconium	µg/L	0.5	<0.5	0.5	0										
Zirconium	µg/L	0.1				2.9	2.9	0	0.4	0.1	120	0.7	0.5	33	0.6
Zirconium (Filtered)	µg/L	0.1	0.19	0.15	24	0.2	0.6	100	<0.1	<0.1	0	0.3	0.4	29	0.1
Radionuclides															
Actinium228	Bq/L								1	<0.7	35	<1	<1	0	<0.7
Radon219	Bq/L								<1	<0.8	0	<2	<0.9	0	<1
Thorium227	Bq/L								<0.5	<0.7	0	<0.8	<1	0	<1
Bismuth212	Bq/L								<1	<1	0	<1	<3	0	<2
Lead-210	Bq/L								<3	<3	0	<4	<4	0	<4
Lead211	Bq/L								<3	<4	0	<4	<5	0	<4
Lead212	Bq/L								0.3	<0.3	0	<0.4	0.7	55	<0.3
Radium223	Bq/L								<0.7	1	35	<1	<1	0	<1
Radium-226	Bq/L		<0.005	0.02	120				<3	<4	0	<5	<4	0	<4
Thallium208	Bq/L								<0.2	<0.2	0	<0.3	0.5	50	0.3
PAHs															
12-Dimethylnaphthalene	ng/L	0.231 : 0.649 (Dupe)	2.69	3.41	24										
C2-Fluoranthenes-Pyrenes	ng/L	0.182 : 0.134 (Dupe)	16	17	6										
C2-Phenanthrenes-Anthracenes	ng/L	0.0554 : 0.118 (Dupe)	12.5	13.7	9										
3-Methylfluoranthene-Benzo-a-fluorene	ng/L	0.208 : 0.101 (Dupe)	5.52	6.42	15										
C4-Fluoranthenes-Pyrenes	ng/L	0.156 : 0.141 (Dupe)	1.7	1.81	6										
C4-Phenanthrenes-Anthracenes	ng/L	0.325 : 0.22 (Dupe)	17.2	18.8	9										
17-Dimethylfluorene	ng/L	0.147 : 0.211 (Dupe)	0.201	0.306	41										
56-Methylchrysene	ng/L	0.123 : 0.113 (Dupe)	0.341	0.438	25										
59-Dimethylchrysene	ng/L	0.119 : 0.173 (Dupe)	0.898	0.831	8										
7-Methylbenzo-a-pyrene	ng/L	0.262 : 0.182 (Dupe)	0.545	0.892	48										
94-Methylphenanthrene	ng/L	0.136 : 0.169 (Dupe)	4.81	5.78	18										
C4-Benzo-a-anthracenes-Chrysenes	ng/L	0.114 : 0.12 (Dupe)	<0.114	<0.12	0										
C3-Benzo-a-anthracenes-Chrysenes	ng/L	0.128 : 0.106 (Dupe)	0.535	0.684	24										
23-Methyldibenzothiophenes	ng/L	0.122 : 0.161 (Dupe)	2.18	2.5	14										
24-Dimethyldibenzothiophene	ng/L	0.104 : 0.247 (Dupe)	0.685	0.823	18										
26-Dimethylphenanthrene	ng/L	0.0554 : 0.118 (Dupe)	0.788	0.587	29										
2-Methylfluorene	ng/L	0.156 : 0.151 (Dupe)	1.11	1.29	15										
C1-Benzo-a-anthracenes-Chrysenes	ng/L	0.12 : 0.11 (Dupe)	5.52	6.75	20										
C1-Benzofluoranthenes-Benzopyrenes	ng/L	0.262 : 0.182 (Dupe)	7.01	8.63	21										
C1-Fluoranthenes-Pyrenes	ng/L	0.208 : 0.101 (Dupe)	14.2	17.1	19										
C1-Phenanthrenes-Anthracenes	ng/L	0.133 : 0.166 (Dupe)	17.2	22.2	25										
C2-Benzo-a-anthracenes-Chrysenes	ng/L	0.119 : 0.173 (Dupe)	3.18	4.39	32										
C2-Benzofluoranthenes-Benzopyrenes	ng/L	0.27 : 0.285 (Dupe)	2.63	2.85	8										
C3-Fluoranthenes-Pyrenes	ng/L	0.15 : 0.229 (Dupe)	6.59	7.58	14										
C3-Phenanthrenes-Anthracenes	ng/L	0.124 : 0.112 (Dupe)	7.73	8.33	7										
1-Methylchrysene	ng/L	0.116 : 0.107 (Dupe)	0.705	0.887	23										
1,4,6,7-tetramethylnaphthalene	µg/L	0.000279 : 0.000387 (Dupe)	0.00114	0.00226	66										
1,8-dimethylphenanthrene	µg/L	5.54e-005 : 0.000118 (Dupe)	0.000627	0.000667	6										
1-methylphenanthrene	µg/L	0.000133 : 0.000166 (Dupe)	0.00474	0.00578	20										
2-methylanthracene	µg/L	0.000139 : 0.000173 (Dupe)	0.00093	0.0015	47										
3-methylphenanthrene	µg/L	0.000136 : 0.000169 (Dupe)	0.00313	0.00381	20										
Acenaphthene	µg/L	9.43e-005 : 0.000269 (Dupe)	0.000483	0.000673	33										
Acenaphthylene	µg/L	0.000102 : 7.61e-005 (Dupe)	<0.000102	<0.0000761	0										
Anthracene	µg/L	9.76e-005 : 7.81e-005 (Dupe)	0.000902	0.000789	13										
Benz(a)anthracene	µg/L	6.25e-005 : 9.23e-005 (Dupe)	0.000856	0.000973	13										
Benzo(a)pyrene	µg/L	0.000125 : 0.000168 (Dupe)	0.000767	0.00093	19										
Benzo(b)fluoranthene	µg/L	8.78e-005 : 0.000122 (Dupe)	0.00292	0.00326	11										
Benzo(e)pyrene	µg/L	0.000126 : 0.000169 (Dupe)	0.00466	0.00522	11										
Benzo(g,h,i)perylene	µg/L	0.00011 : 0.000133 (Dupe)	0.00387	0.00427	10										
Benzo(j,k)fluoranthenes	µg/L	9.25e-005 : 0.000129 (Dupe)	0.000308	0.000564	59										
Chrysene	µg/L	6.39e-005 : 9.51e-005 (Dupe)	0.00486	0.00578	17										
Dibenz(a,h)anthracene	µg/L	0.000179 : 0.000167 (Dupe)	0.000383	0.000455	17										

Table 1-B: Summary of Duplicate Samples and RPD Values

Field Duplicates (Surface Water)
Filter: [Sampled_Date_Time] <= '21 Mar 2019'

Lab Report Number		2014013	2014013		2103369	2103369		2114955	2114955		2127769		2127769		2148175	
Field ID		2015037	2015038	RPD	2016082	2016083	RPD	2016110	2016108	RPD	2016175 - Tributary to Labiche R. u/s of gas plant		2016174 - Replicate Sample	RPD	2016241 - Beaver R. at hydrometric station	
Sampled Date/Time		26/05/2015 16:50	26/05/2015 16:50		11/05/2016 13:15	11/05/2016 13:15		28/06/2016 13:30	28/06/2016 13:30		23/08/2016 11:00		23/08/2016 11:00		09/11/2016 14:40	
ChemName	Units	DL														
Dimethylnaphthalene, 2,6-	µg/L	0.000195 : 0.000548 (Dupe)	0.00526	0.00632	18											
Dimethylphenanthrene, 1,7-	µg/L	5.44e-005 : 0.000116 (Dupe)	0.00133	0.002	40											
Dimethylphenanthrene, 3,6-	µg/L	5.63e-005 : 0.00012 (Dupe)	0.000783	0.00115	38											
Fluoranthene	µg/L	4.59e-005 : 5.94e-005 (Dupe)	0.00216	0.00217	0											
Fluorene	µg/L	0.0001 : 8.76e-005 (Dupe)	0.00189	0.00183	3											
Indeno(1,2,3-cd)pyrene	µg/L	0.000118 : 0.000154 (Dupe)	0.000788	0.000908	14											
Methylnaphthalene, 1-	µg/L	0.000225 : 0.000295 (Dupe)	0.00788	0.00999	24											
Methylnaphthalene, 2-	µg/L	0.00021 : 0.000276 (Dupe)	0.00929	0.0116	22											
Methylphenanthrene, 2-	µg/L	0.000135 : 0.000168 (Dupe)	0.00451	0.00535	17											
Naphthalene	µg/L	0.000148 : 0.00019 (Dupe)	0.00732	0.00838	14											
Perylene	µg/L	0.000135 : 0.000191 (Dupe)	0.00855	0.0103	19											
Phenanthrene	µg/L	9.88e-005 : 7.91e-005 (Dupe)	0.0108	0.012	11											
Pyrene	µg/L	4.41e-005 : 5.7e-005 (Dupe)	0.00322	0.00377	16											
Retene	µg/L	0.000325 : 0.00022 (Dupe)	0.00449	0.00519	14											
Trimethylphenanthrene, 1,2,6-	µg/L	0.000124 : 0.000112 (Dupe)	0.000393	0.000485	21											
Alkylated PAHs																
C1 - Acenaphthenes	µg/L	0.000195 : 0.000246 (Dupe)	<0.000195	<0.000246	0											
C1 - Biphenyls	µg/L	0.000114 : 0.000331 (Dupe)	0.00405	0.00539	28											
C1 - Fluorenes	µg/L	0.000156 : 0.000151 (Dupe)	0.00308	0.00457	39											
C1 - Naphthalenes	µg/L	0.00021 : 0.000276 (Dupe)	0.0172	0.0216	23											
C2 - Biphenyls	µg/L	0.000103 : 0.000235 (Dupe)	0.00403	0.00566	34											
C2 - Fluorenes	µg/L	0.000147 : 0.000211 (Dupe)	0.00536	0.00667	22											
C2 - Naphthalenes	µg/L	0.000231 : 0.000649 (Dupe)	0.0278	0.0402	36											
C3 - Fluorenes	µg/L	0.000217 : 0.000203 (Dupe)	0.00761	0.00904	17											
C3 - Naphthalenes	µg/L	0.000227 : 0.00031 (Dupe)	0.0232	0.0293	23											
C4 - Dibenzothiophenes	µg/L	0.000111 : 0.000207 (Dupe)	0.00493	0.00398	21											
C4 - Naphthalenes	µg/L	0.000279 : 0.000387 (Dupe)	0.0158	0.0266	51											
Organosulfur																
C1 - Dibenzothiophenes	µg/L	0.000122 : 0.000161 (Dupe)	0.00382	0.0072	61											
C2 - Dibenzothiophenes	µg/L	0.000104 : 0.000247 (Dupe)	0.00941	0.0115	20											
C3 - Dibenzothiophenes	µg/L	0.000125 : 0.000151 (Dupe)	0.00764	0.00897	16											
Dibenzothiophene	µg/L	7.48e-005 : 7.27e-005 (Dupe)	0.00183	0.00206	12											

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 80 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Table 1-B: Summary of Duplicate Samples and RPD Values

Lab Report Number		2148175		2177022		2177022		2193244		2193244		2242331		2242331		2326916		2326916		2326918		2326918		2323162		2323162	
Field ID		2016242 - Replicate Sample	RPD	2017039	2017038	RPD	2017072	2017073	RPD	2017277	2017278	RPD	2018029	2018030	RPD	2018062	2018063	RPD	2018062	2018063	RPD	2018163	2018164	RPD	2018163	2018164	RPD
Sampled Date/Time		09/11/2016 14:40		21/03/2017 12:30	21/03/2017 12:30		24/05/2017 16:30	24/05/2017 16:30		08/11/2017 10:25	08/11/2017 10:25		26/03/2018 14:40	26/03/2018 14:40		23/05/2018	23/05/2018		23/05/2018	23/05/2018		12/09/2018	12/09/2018		12/09/2018	12/09/2018	
Units	DL																										
µg/L	5000	194000	1	181000	180000	1	128000	123000	4	177000	176000	1	195000	197000	1	99000	98000	1	120000	123000	2						
mg/L	5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0						
mg/L	0.025																										
mg/L	0.01	0.01	0	<0.01	<0.01	0	0.05	0.05	0	<0.01	<0.01	0	0.01	0.01	0	0.02	0.02	0									
mg/L	5	236	1	221	220	0	156	150	4	216	215	0	238	241	1	120	120	0	146	150	3						
mg/L	0.02	<0.2	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0						
mg/L	6	<6	0	<6	<6	0	<6	<6	0	<6	<6	0	<6	<6	0	<6	<6	0	<6	<6	0						
mg/L	0.05	0.8	2	0.764	0.782	2	0.137	<0.5	0	0.75	0.74	1	0.21	0.21	0	0.16	0.13	21	0.48	0.5	4						
µS/cm	1	424	1	499	498	0	312	306	2	545	542	1	483	491	2	270	270	0	418	418	0						
mg/L	5	243	1	274	276	1	150	151	1	280	300	7	240	240	0	135	134	1	210	210	0						
mg/L	5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0	<5	<5	0						
%	1			105	105	0	100	110	10	98	100	2	97	97	0	110	110	0	100	100	0						
mg/L	0.01	<0.1	0	0.292	0.259	12	0.28	0.15	60	0.03	0.03	0	0.18	0.18	0	0.02	0.02	0	<0.01	<0.01	0						
mg/L	0.01	0.53	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						
µg/L	60	300	3	310	440	35	1020	1160	13	270	220	20	280	300	7	290	330	13	130	140	7						
pH_Units	0.01	7.76	1	7.78	7.77	0	7.81	7.84	0	8.13	8.15	0	8.38	8.38	0	7.9	7.93	0	7.95	7.93	0						
µg/L	5																										
µg/L	3	14	7	10	8	22	318	320	1	7	3	80	8	5	46	42	32	27									
mg/L	0.1	49	2	90.7	91.7	1	39.7	39.3	1	122	122	0	66.4	66.5	0	36.1	36.1	0	94	94.2	0						
mg/L	5	268	5	298	294	1	260	260	0	350	370	6	310	370	18	170	160	6	280	270	4						
mg/L	1			312	312	0	187	184	2	343	348	1															
mg/L	2	8	67	<2	<2	0	92	98.5	7	<2	<2	0	<2	<2	0	26	20	26	<2	<2	0						
µg/L	500	43300	0	41300	41400	0	31000	31000	0	41000	41000	0	40000	39800	1	23500	23700	1	30700	30600	0						
mg/L	0.5	2.3	8	1.3	1.2	8	27.9	27.4	2	3.2	3.1	3	2.8	3.2	13	9.6	8.7	10	2.9	2.5	15						
µg/L	500	2900	7	1700	1600	6	31100	30900	1	4000	3600	11	3300	3000	10	12800	13000	2	3300	3400	3						
µg/L	500	43300	0	41800	41700	0	32000	33000	3	42000	41000	2	40000	40000	0	23700	23700	0	30600	30700	0						
µg/L	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						
µg/L	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						
µg/L	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						
µg/L	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						
µg/L	50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0						
µg/L	50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0	<50	<50	0						
µg/L	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						
µg/L	5																										
µg/L	1	147	12	34	40	16	2900	2900	0	51	54	6	65	61	6	960	1200	22	180	180	0						
µg/L	1	2.743	14	2.239	2.652	17	34	36	6	8	6	29	2	2	0	20	20	0	13	12	8						
µg/L	0.1																										
µg/L	0.02	0.13	7	0.04	0.04	0	0.17	0.17	0	0.04	0.04	0	0.07	0.07	0	0.08	0.09	12	0.08	0.04	67						
µg/L	0.02	0.139	11	0.029	0.029	0	0.136	0.13	5	0.08	0.03	91	0.07	0.07	0	0.04	0.03	29	0.03	0.04	29						
µg/L	0.1	0.7	0	0.2	0.2	0	2.6	2.6	0	0.3	0.3	0	0.3	0.3	0	0.7	0.8	13	0.3	0.3	0						
µg/L	0.05																										
µg/L	0.1	0.4	0	0.2	0.2	0	0.5	0.5	0	0.3	0.2	40	0.2	0.2	0	0.3	0.3	0	0.2	0.2	0						
µg/L	0.1	97.1	0	42.6	42.6	0	98	98	0	47	47	0	46	46	0	45	45	0	34	34	0						
µg/L	0.05																										
µg/L	0.1	91	0	39.8	38.8	3	40.7	40.8	0	41.6	41.9	1	44.2	43.8	1	28.7	28.4	1	33.9	34.3	1						
µg/L	0.05	<0.05	0	<0.05	<0.05	0	0.19	0.18	5	<0.05	<0.05	0	<0.05	<0.05	0	0.06	<0.05	18	0.07	<0.05	33						
µg/L	0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0						
µg/L	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						
µg/L	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						
µg/L	2	15	14	21	24	13	33	37	11	34	34	0	17	18	6	19	19	0	22	22	0						
µg/L	2	13	0	19	20	5	38	36	5	29	31	7	20	19	5	16	16	0	23	23	0						
µg/L	0.01	0.03	0	<0.01	<0.01	0	0.1	0.1	0	0.01	0.01	0	<0.01	<0.01	0	0.03	0.03	0	0.06	0.01	143						
µg/L	0.01	<0.01	0	<0.01	<0.01	0	0.025	0.023	8	0.03	<0.01	100	<0.01	<0.01	0	0.01	0.01	0	<0.01	<0.01	0						
mg/L	0.05																										
mg/L	0.01	63	1	76.9	74.9	3	40	41	2	86	84	2	68	69	1	42	41	2	54	56	4						

Table 1-B: Summary of Duplicate Samples and RPD Values

Lab Report Number		2148175		2177022		2177022		2193244		2193244		2242331		2242331		2326916		2326916		2326918		2326918		2323162		2323162												
Field ID		2016242 - Replicate Sample	RPD	2017039		2017038		2017072		2017073		2017277		2017278		2018029		2018030		2018062		2018063		2018163		2018164												
Sampled Date/Time		09/11/2016 14:40		21/03/2017 12:30		21/03/2017 12:30		24/05/2017 16:30		24/05/2017 16:30		08/11/2017 10:25		08/11/2017 10:25		26/03/2018 14:40		26/03/2018 14:40		23/05/2018		23/05/2018		12/09/2018		12/09/2018												
Units	DL																																					
mg/L	0.01	62.1	1	74.3		75		36		37		3		75		79		5		69		69		0		38		37		3		56		57		2		
µg/L	0.5																																					
µg/L	0.05	0.3	11	<0.05		<0.05		0		4.9		5.2		6		0.19		0.21		10		0.14		0.14		0		1.5		1.8		18		0.55		0.54		2
µg/L	0.05	1.839	182	<0.05		<0.05		0		0.218		0.305		33		0.12		0.08		40		0.06		<0.05		18		0.19		0.06		104		0.1		<0.05		67
µg/L	0.1																																					
µg/L	0.02	0.21	10	0.05		0.05		0		2.1		2.1		0		0.1		0.12		18		0.06		0.06		0		0.41		0.46		11		0.27		0.12		77
µg/L	0.02	0.104	4	0.024		0.033		32		0.306		0.308		1		0.11		0.06		59		0.02		<0.02		0		0.08		0.08		0		0.06		0.06		0
µg/L	0.2	0.5	0	0.3		0.3		0		7.3		7.2		1		0.4		0.4		0		0.5		0.5		0		1.9		2		5		0.4		0.7		55
µg/L	0.1																																					
µg/L	0.5	<0.5	0	0.5		<0.5		0		2.2		2.2		0		<0.5		<0.5		0		<0.5		<0.5		0		0.9		0.9		0		<0.5		<0.5		0
mg/L	0.002	0.443	0	0.094		0.1		6		4.7		4.7		0		0.14		0.15		7		0.13		0.13		0		1.1		1.5		31		0.21		0.23		9
mg/L	0.004																																					
mg/L	0.002	0.026	31	0.006		0.006		0		0.183		0.193		5		0.021		0.017		21		0.017		0.017		0		0.082		0.081		1		0.017		0.016		6
µg/L	0.1																																					
µg/L	0.01	0.175	3	0.025		0.029		15		3		3		0		0.03		0.05		50		0.05		0.06		18		0.54		0.72		29		0.09		0.05		57
µg/L	0.01	0.307	159	<0.01		<0.01		0		0.066		0.073		10		0.06		0.29		131		<0.01		0.01		0		0.03		0.03		0		<0.01		<0.01		0
µg/L	0.5	6.1	3	7.7		7.5		3		9.6		9.4		2		9		9.4		4		4.4		4.5		2		4.2		4.6		9		7		7.1		1
µg/L	0.5	5.5	2	7.6		7.3		4		6		6.2		3		8.8		9.2		4		4.1		4.3		5		3		3		0		7.4		6.5		13
mg/L	0.04																																					
mg/L	0.02	20.6	1	22		21.3		3		17		17		0		25		24		4		17		17		0		11		10		10		16		16		0
mg/L	0.02	21.4	1	21.4		21.5		0		14		14		0		23		24		4		17		17		0		10		10		0		16		16		0
µg/L	1	37	3	10		9		11		57		56		2		16		16		0		10		11		10		19		18		5		9		9		0
µg/L	1	32	3	7		7		0		18		18		0		14		14		0		7		7		0		7		7		0		6		6		0
µg/L	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
µg/L	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
µg/L	0.05																																					
µg/L	0.02	2.12	1	1.08		1.04		4		0.84		0.84		0		1.2		1.2		0		1.1		1.1		0		0.87		0.92		6		0.89		0.85		5
µg/L	0.02	2.048	5	0.895		0.9		1		<0.02		<0.02		0		1.09		1.1		1		1.1		1.09		1		0.75		0.76		1		0.81		0.79		2
µg/L	0.2	2.7	4	1		0.9		11		9.3		9.2		1		2.5		2.2		13		0.9		0.6		40		2.6		2.8		7		2.6		8.1		103
µg/L	0.2	2.7	20	0.9		0.9		0		3.1		3.1		0		1.5		1.5		0		0.5		0.4		22		1.4		1.4		0		2.1		2		5
mg/L	0.1																																					
mg/L	0.04	1	11	1.1		1		10		4		4.1		2		1.2		1.1		9		0.85		0.86		1		1.1		1.2		9		0.88		0.91		3
mg/L	0.04	0.9	0	1		1		0		1.4		1.4		0		1		1.1		10		0.82		0.81		1		0.82		0.81		1		0.78		0.8		3
µg/L	0.2	0.8	22	2		2		0		0.6		0.6		0		2.1		2.1		0		1.3		1.3		0		1.1		1.1		0		1.5		1.5		0
µg/L	0.1																																					
µg/L	0.2	1	0	2.2		2.1		5		0.3		0.3		0		2.2		2.2		0		1.5		1.4		7		1		1		0		1.6		1.5		6
µg/L	5	3220	2	2720		2680		1		27000		28000		4		3000		2900		3		2500		2600		4		4000		4700		16		2100		2300		9
µg/L	20																																					
µg/L	5	2950	1	2630		2600		1		2500		2500		0		2500		2600		4		2300		2300		0		2100		2100		0		1900		2000		5
µg/L	0.05																																					
µg/L	0.01	<0.01	0	<0.01		<0.01		0		0.043		0.045		5		<0.01		0.01		0		<0.01		<0.01		0		<0.01		0.01		0		0.08		<0.01		156
µg/L	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
mg/L	0.1	3.39	2	6.09		6.03		1		11		11		0		8.4		8.2		2		8		8.1		1		3.7		3.7		0		4.6		4.7		2
mg/L	0.1	3.4	0	7.2		5.9		20		11		11		0		6.8		7.3		7		7.6		7.7		1		3.9		3.8		3		4.7		4.7		0
µg/L	0.1	92.6	0	127		124		2		96		98		2		140		140		0		97		96		1		63		62		2		100		100		0
µg/L	0.1	90.8	1	108.4		110.8		2		86.1		86.5		0		136.6		135.1		1		95		94.5		1		56.7		57.6		2		95.4		95.2		0
µg/L	20	18100	1	34100		34400		1		14000		14000		0		39000		41000		5		22000		21000		5		11000		12000		9		25000		26000		4
µg/L	20	17600	0	34500		33800		2		14000		15000		7		43000		43000		0		22000		22000		0		12000		12000		0		28000		29000		4
µg/L	0.05	<0.05	0	<0.05		<0.05		0		<0.05		<0.05		0		<0.05		<0.05		0		<0.05		<0.05		0		<0.05		<0.05		0		<0.05		<0.05		0
µg/L	0.05	<0.05	0	<0.05		<0.05		0		<																												

Table 1-B: Summary of Duplicate Samples and RPD Values

Lab Report Number		2148175		2177022		2177022		2193244		2193244		2242331		2242331		2326916		2326916		2326918		2326918		2323162		2323162	
Field ID		2016242 - Replicate Sample	RPD	2017039	2017038	RPD	2017072	2017073	RPD	2017277	2017278	RPD	2018029	2018030	RPD	2018062	2018063	RPD	2018062	2018063	RPD	2018163	2018164	RPD	2018163	2018164	RPD
Sampled Date/Time		09/11/2016 14:40		21/03/2017 12:30	21/03/2017 12:30		24/05/2017 16:30	24/05/2017 16:30		08/11/2017 10:25	08/11/2017 10:25		26/03/2018 14:40	26/03/2018 14:40		23/05/2018	23/05/2018		23/05/2018	23/05/2018		12/09/2018	12/09/2018		12/09/2018	12/09/2018	
Units	DL																										
µg/L	0.000195 : 0.000548 (Dupe)																										
µg/L	5.44e-005 : 0.000116 (Dupe)																										
µg/L	5.63e-005 : 0.00012 (Dupe)																										
µg/L	4.59e-005 : 5.94e-005 (Dupe)																										
µg/L	0.0001 : 8.76e-005 (Dupe)																										
µg/L	0.000118 : 0.000154 (Dupe)																										
µg/L	0.000225 : 0.000295 (Dupe)																										
µg/L	0.00021 : 0.000276 (Dupe)																										
µg/L	0.000135 : 0.000168 (Dupe)																										
µg/L	0.000148 : 0.00019 (Dupe)																										
µg/L	0.000135 : 0.000191 (Dupe)																										
µg/L	9.88e-005 : 7.91e-005 (Dupe)																										
µg/L	4.41e-005 : 5.7e-005 (Dupe)																										
µg/L	0.000325 : 0.00022 (Dupe)																										
µg/L	0.000124 : 0.000112 (Dupe)																										
µg/L	0.000195 : 0.000246 (Dupe)																										
µg/L	0.000114 : 0.000331 (Dupe)																										
µg/L	0.000156 : 0.000151 (Dupe)																										
µg/L	0.00021 : 0.000276 (Dupe)																										
µg/L	0.000103 : 0.000235 (Dupe)																										
µg/L	0.000147 : 0.000211 (Dupe)																										
µg/L	0.000231 : 0.000649 (Dupe)																										
µg/L	0.000217 : 0.000203 (Dupe)																										
µg/L	0.000227 : 0.00031 (Dupe)																										
µg/L	0.000111 : 0.000207 (Dupe)																										
µg/L	0.000279 : 0.000387 (Dupe)																										
µg/L	0.000122 : 0.000161 (Dupe)																										
µg/L	0.000104 : 0.000247 (Dupe)																										
µg/L	0.000125 : 0.000151 (Dupe)																										
µg/L	7.48e-005 : 7.27e-005 (Dupe)																										

Table 2-A: Surface Water Analytical Results

				Sampling Location		BEVR-001																		
				Sampling Date	14/07/2014	05/11/2014	24/03/2015	26/05/2015	04/08/2015	04/08/2015	03/11/2015	22/03/2016	11/05/2016	28/06/2016	23/08/2016	09/11/2016	09/11/2016	21/03/2017	24/05/2017	08/08/2017	26/03/2018	12/09/2018		
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)																		
Chem Group	Paramter	Unit	DL																					
Field	Temperature (Field)	°C			-	-	14	0	-	10.7	13.1	13.1	0	0.1	7.7	17.4	14.2	0	0	0	9.3	14.8	0	5.6
	DO (Field)	mg/L		Varies - see Notes	>5.5-	-	-	13.1	-	10.32	10.32	10.32	13.51	11.89	11.44	9.28	9.98	13.13	13.13	11.25	10.35	9.95	11.72	12.33
	Field Conductance, Specific	µS/cm		-	-	-	-	441	-	257	319.9	319.9	404	436	222.9	319	391.6	441	441	446	181.7	329.2	456.7	378.7
	Field ORP (mV)	mV		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-6.1	111.4
	Field Air Temperature	°C		-	-	-	-	-	-	-	-	-	-	-10	16	28.1	21.2	-7.6	-7.6	5.6	-	-	-6.1	1.5
	Turbidity (NTU)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inorganics	pH (Field)	pH_Units			-	-	-	8.1	-	7.55	8.06	8.06	7.96	7.9	7.7	8	8.14	7.83	7.83	7.59	7.73	7.82	7.75	8.23
	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000		-	-	113,000	184,000	187,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Alkalinity (total) as CaCO3	µg/L	1,000	Varies - see Notes	-	-	113,000	184,000	187,000	99,000	127,000	126,000	176,000	192,000	91,000	87,000	68,000	192,000	194,000	203,000	73,000	141,000	198,000	152,000
	Alkalinity, PP (as CaCO3)	mg/L	5	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
	Ammonia	mg/L	0	-	0.502 0.715 0.749 0.767	1.31 3.7 11.3 18.4 18.5	0.022	0.022	0.204	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ammonia (as N)	mg/L	0	-	2 1.97 2.69 2.78 3.97 3.99	-	-	-	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01	0.02	<0.01	0.01	<0.025	
	Bicarbonate	mg/L	5	-	-	-	-	-	121	155	153	215	234	111	106	83	234	236	247	89	172	241	186	
	Bromide (Filtered)	mg/L	0	-	-	-	<100	<100	<100	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02	<0.02	
	Carbonate	mg/L	6	-	-	-	-	-	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	
	Chloride (Filtered)	mg/L	0	150	120	-	-	0.3	0.35	0.23	0.18	0.19	0.26	0.26	0.2	0.23	0.24	0.82	0.8	0.382	0.114	0.18	0.46	0.3
	Electrical Conductivity (lab)	µS/cm	1	-	-	-	273	442	443	245	325	326	372	431	206	322	143	420	424	437	178	319	460	390
	Hardness as CaCO3 (Filtered)	mg/L	0	-	-	-	137	214	229	127	170	172	215	243	117	173	208	241	243	239	92	180	250	190
	Hydroxide	mg/L	5	-	-	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
	Nitrate (as N) (Filtered)	mg/L	0	3	-	400	0.066	0.102	-	0.07	0.03	0.03	0.06	0.09	0.04	<0.01	<0.01	<0.1	<0.1	0.239	<0.1	0.02	0.16	0.01
	Nitrate and nitrite (as N)	mg/L	0	-	-	400	0.0657	0.102	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<10	<10	0.13	0.07	0.08	0.22	0.16	<0.01	<0.01	<0.01	0.53	0.53	<0.01	<0.01	<0.01	<0.01	<0.01
	Nitrogen (Total)	µg/L	50	-	-	-	-	369	291	290	260	320	200	240	400	170	140	310	300	450	<60	670	270	120
	pH (Lab)	pH_Units	0	-	-	-	7.83	8.22	7.98	7.47	7.84	7.79	7.79	7.8	7.63	7.82	6.87	7.67	7.76	7.82	7.53	7.85	8.25	8.03
	Phosphorus	µg/L	2	-	Note	-	60 - 138	7 - 13	<10 - 3	95	172	180	19	8	87	61	34	15	14	6	221	71	7	10
	Phosphorus (Filtered)	µg/L	10	-	Note	-	70	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Sulphate	mg/L	1	Varies - see Notes	-	1000	22.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Sulphate (Filtered)	mg/L	0	-	-	1000	-	53.8	50.4	30.1	36.3	36.5	47.6	47.5	24.2	36	42.5	50	49	42.4	20.6	42.8	49.5	49.9
	Total Dissolved Solids (Filtered)	mg/L	1	-	-	-	171	273	269	178	210	206	220	292	120	210	244	256	268	232 - 259	103 - 150	170 - 199	280	220
	Total Kjeldahl Nitrogen	µg/L	50	-	-	-	-	267	141	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Total Suspended Solids	mg/l	1	-	25	-	121	3.3	<2	71	72	116	8	7	64	30	33	4	8	<2	72.5	40	<2	6
Organics	Dissolved Inorganic Carbon (Filtered)	µg/L	500	-	-	-	15,500	41,000	-	25,400	30,800	30,700	83,500	44,300	21,600	30,800	39,100	43,400	43,300	45,100	19,000	32,000	42,200	38,000
	Dissolved Organic Carbon (Filtered)	mg/L	1	-	-	-	11.7	2.8	1.12	5.4	8.4	8.5	3.2	1.4	7.6	5.2	3.6	2.5	2.3	1	9.1	4.8	1.3	3
	Total Organic Carbon	µg/L	500	-	-	-	11,800	2800	1180	7400	7300	7400	3300	1900	8200	5600	4400	2700	2900	1200	9200	9700	1800	3700
	Total Inorganic Carbon	µg/L	500	-	-	-	17,200	43,600	38,400	25,500	31,600	31,600	83,200	45,000	21,700	30,800	40,000	43,300	43,300	47,000	23,000	34,000	42,600	38,000
Total Metals	Aluminium	µg/L	1	-	5 100	-	950	121	29.8	966	1220	1400	375	31	2500	1550	903	130	147	16	1700	1100	27	550
	Antimony	µg/L	0	9	-	200	0.233	0.165	0.125	0.2	0.2	0.2	<0.2	<0.2	0.2	0.18	0.2	0.14	0.13	0.13	0.22	0.2	0.16	0.14
	Arsenic	µg/L	0	5	5	50	1.16	0.657	0.519	1.56	1.9	2.1	0.6	0.5	1.9	1.1	1.5	0.7	0.7	0.5	2.4	1.5	0.5	0.7
	Barium	µg/L	0	1000	-	10000	110	110	109	93.9	114	116	93	99	105	103	109	97	97.1	102	100	110	110	89
	Beryllium	µg/L	0	0.13	-	53	0.08	<0.01	<0.01	0.11	0.14	0.16	<0.04	<0.05	0.12	<0.05	0.1	<0.05	<0.05	<0.05	0.18	0.06	<0.05	<0.05
	Bismuth	µg/L	0	-	-	-	<0.01	<0.01	<0.01	<0.1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Boron	µg/L	1	1200	1500	-	17.9	14.6	14	17	16	15	15	11	15	17	17	13	15	10	9.8	16	9	13
	Cadmium	µg/L	0	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6	0.114	0.0347	0.035	0.09	0.14	0.15	0.04	0.03	0.13	0.05	0.07	0.03	0.03	0.04	0.18	0.07	0.02	0.03
	Calcium	mg/L	0	-	-	-	39.4	66.4	57.6	36.6	44.8	44.8	61	64.2	32.1	45.1	55.3	62.2	63	63.5	26	50	65	50
	Chromium	µg/L	0	1	1	10	1.64	0.29	0.17	1.9	3	3.3	0.6	<0.4	4	2.27	1.79	0.27	0.3	0.1	3	2.2	0.13	0.89
	Cobalt	µg/L	0	4	-	9	0.679	0.19	0.0714	0.8	1.16	1.28	0.24	0.07	0.99	0.43	0.63	0.19	0.21	0.05	1.4	0.71	0.06	0.21
	Copper	µg/L	0	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90	2.54	0.47	0.33	2.6	3	4	<1	<1	2.9	1.3	1.9	0.5	0.5	0.3	3.8	1.9	0.3	0.7
	Iron	mg/L	0	-	0.3	-	1.23	0.449	0.282	2.17	4.35	4.88	0.81											

Table 2-A: Surface Water Analytical Results

				Sampling Location		BEVR-1-001													
				Sampling Date		28/06/2016	23/08/2016	09/11/2016	21/03/2017	24/05/2017	08/08/2017	08/11/2017	26/03/2018	26/03/2018	23/05/2018	23/05/2018	12/09/2018		
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)													
Chem Group	Paramter	Unit	DL																
Field	Temperature (Field)	°C			-	-	20.6	16.5	0	0.1	7.5	15.8	-0.1	0	0	11.6	11.6	5	
	DO (Field)	mg/L		Varies - see Notes	>5.5-	-	8.71	9.57	13.62	11.26	10.94	9.67	13.54	13.96	13.96	10.44	10.44	12.37	
	Field Conductance, Specific	µS/cm		-	-	-	403.4	425	478.5	511	208.6	363.4	467	462.6	462.6	259.5	259.5	412.7	
	Field ORP (mV)	mV		-	-	-	-	-	-	-	-	-	66.8	-5.9	-5.9	203	203	90.8	
	Field Air Temperature	°C		-	-	-	28.1	21.2	-	5.7	-	-	-12.3	-5.9	-5.9	23	23	5.4	
	Turbidity (NTU)																		
	pH (Field)	pH_Units			-	-	8.71	8.24	7.85	7.47	7.8	7.93	7.83	7.81	7.81	7.98	7.98	8.29	
Inorganics	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Alkalinity (total) as CaCO3	µg/L	1,000	Varies - see Notes	-	-	160,000	162,000	190,000	199,000	82,000	153,000	189,000	195,000	197,000	99,000	98,000	153,000	
	Alkalinity, PP (as CaCO3)	mg/L	5	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
	Ammonia	mg/L	0	-	9[0.502]0.715[0.749]0.767]	1.31[3.7]11.3[18.4]18.5	-	-	-	-	-	-	-	-	-	-	-	-	
	Ammonia (as N)	mg/L	0	-	2[1.97]2.69[2.78]3.97[3.99]	-	<0.01	<0.01	<0.01	<0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.02	<0.025	
	Bicarbonate	mg/L	5	-	-	-	195	197	231	243	101	186	231	238	241	120	120	187	
	Bromide (Filtered)	mg/L	0	-	-	-	<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
	Carbonate	mg/L	6	-	-	-	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	
	Chloride (Filtered)	mg/L	0	150	120	-	0.19	0.12	0.75	0.228	0.08	0.08	0.25	0.21	0.21	0.16	0.13	0.15	
	Electrical Conductivity (lab)	µS/cm	1	-	-	-	401	420	446	490	205	352	467	483	491	270	270	423	
	Hardness as CaCO3 (Filtered)	mg/L	0	-	-	-	219	227	257	261	104	190	250	240	240	135	134	210	
	Hydroxide	mg/L	5	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
	Nitrate (as N) (Filtered)	mg/L	0	3	-	400	<0.01	<0.01	<0.1	0.24	<0.1	<0.01	0.09	0.18	0.18	0.02	0.02	<0.01	
	Nitrate and nitrite (as N)	mg/L	0	-	-	400	-	-	-	-	-	-	-	-	-	-	-	-	
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<0.01	0.49	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	Nitrogen (Total)	µg/L	50	-	-	-	280	250	370	260	720	550	650	280	300	290	330	120	
	pH (Lab)	pH_Units	0	-	-	-	8.02	8.04	7.72	7.74	7.73	7.99	8.08	8.38	8.38	7.9	7.93	8.06	
	Phosphorus	µg/L	2	-	Note	-	20	4	15	14	230	20	6	8	5	42	32	<5	
	Phosphorus (Filtered)	µg/L	10	-	Note	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Sulphate	mg/L	1	Varies - see Notes	-	1000	-	-	-	-	-	-	-	-	-	-	-	-	
	Sulphate (Filtered)	mg/L	0	-	-	1000	59	54.3	72	69.8	25.4	49.8	71.6	66.4	66.5	36.1	36.1	67.2	
	Total Dissolved Solids (Filtered)	mg/L	1	-	-	-	398	270	358	296 - 299	120 - 180	180 - 219	280 - 288	310	370	170	160	260	
	Total Kjeldahl Nitrogen	µg/L	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Total Suspended Solids	mg/l	1	-	25	-	10	4	5	2	141	<2	4	<2	<2	26	20	4	
	Organics	Dissolved Inorganic Carbon (Filtered)	µg/L	500	-	-	-	36,200	40,700	42,600	45,000	22,000	34,000	37,000	40,000	39,800	23,500	23,700	38,000
Dissolved Organic Carbon (Filtered)		mg/L	1	-	-	-	9.5	6.3	5.6	2.8	13.4	10.9	6	2.8	3.2	9.6	8.7	5.1	
Total Organic Carbon		µg/L	500	-	-	-	9800	6800	6100	3400	15,400	15,300	6900	3300	3000	12,800	13,000	5600	
Total Inorganic Carbon		µg/L	500	-	-	-	36,100	41,200	42,600	46,000	21,000	36,000	43,000	40,000	40,000	23,700	23,700	39,000	
Total Metals	Aluminium	µg/L	1	-	5[100	-	233	60	245	169	2000	260	200	65	61	960	1200	160	
	Antimony	µg/L	0	9	-	200	0.07	0.07	0.05	0.07	0.11	0.08	0.05	0.07	0.07	0.08	0.09	0.05	
	Arsenic	µg/L	0	5	5	50	0.6	0.5	0.4	0.4	2	0.6	0.4	0.3	0.3	0.7	0.8	0.4	
	Barium	µg/L	0	1000	-	10000	50.3	46.3	47.3	50.9	74	51	51	46	46	45	45	42	
	Beryllium	µg/L	0	0.13	-	53	<0.05	<0.05	<0.05	<0.05	0.13	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	
	Bismuth	µg/L	0	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
	Boron	µg/L	1	1200	1500	-	25	26	22	22	17	23	22	17	18	19	19	18	
	Cadmium	µg/L	0	-	Eqn[0.04]0.37	0.1[0.3]0.5[0.6	0.02	0.01	0.02	0.03	0.12	0.03	0.01	<0.01	<0.01	0.03	0.03	0.01	
	Calcium	mg/L	0	-	-	-	62.1	66.3	74.3	77.8	33	58	72	68	69	42	41	61	
	Chromium	µg/L	0	1	1	10	0.1	<0.05	0.46	0.46	3.4	0.45	0.45	0.14	0.14	1.5	1.8	0.25	
	Cobalt	µg/L	0	4	-	9	0.16	0.09	0.19	0.14	1.6	0.22	0.16	0.06	0.06	0.41	0.46	0.13	
	Copper	µg/L	0	Varies - see Notes	Eqn[2]4	20[30]40[50]60[70]80[90	1.2	0.9	1	0.8	5	1.3	0.8	0.5	0.5	1.9	2	0.5	
	Iron	mg/L	0	-	0.3	-	0.333	0.155	0.339	0.286	3.7	0.62	0.3	0.13	0.13	1.1	1.5	0.25	
	Lead	µg/L	0	-	Eqn[1]7	40[50]60[110]160	0.15	0.06	0.147	0.148	2.2	0.25	0.12	0.05	0.06	0.54	0.72	0.07	
	Lithium	µg/L	0	-	-	-	6	5.7	6.1	4.9	5.2	5	5.3	4.4	4.5	4.2	4.6	4.9	
	Magnesium	mg/L	0	-	-	-	15.4	15.6	17.7	19.2	9.7	15	18	17	17	11	10	15	
	Manganese	µg/L	0	-	-	-	21	13	23	22	64	24	21	10	11	19	18	19	
	Mercury	µg/L	0	-	0.026	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	Molybdenum	µg/L	0	1000	73	10000	0.98	1.13	1.01	1.18	0.81	1	1	1.1	1.1	0.87	0.92	1	
	Nickel	µg/L	0	Varies - see Notes	Eqn[25]150	250[650]1100[1500	1.7	1.1	1.4	1.2	6.1	1.9	1.7	0.9	0.6	2.6	2.8	1.2	
	Potassium	mg/L	0	-	-	-	1.1	1	1	1.2	2.2	1.1	0.97	0.85	0.86	1.1	1.2	0.85	
	Selenium	µg/L	0	2	1	10	0.9	0.9	1.4	1.3	1	1.1	1.1	1.3	1.3	1.1	1.1	1.1	
	Silicon	µg/L	5	-	-	-	2840	1820	3210	3250	15,000	3600	2900	2500	2600	4000	4700	2200	
	Silver	µg/L	0	Varies - see Notes	0.25	0.5[15	<0.01	<0.01	<0.01	0.012	0.037	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	
	Sodium ion	mg/L	0	-	-	-	6.25	5.67	6.55	8.18	3.2	5.1	6.9	8	8.1	3.7	3.7	4.6	
	Strontium	µg/L	0	-	-	-	99.1	87.4	93.3	99.9	51	97	110	97	96	63	62	97	
	Sulphur	µg/L	20	-	-	-	19,900	20,600	24,900	26,700	9100	18,000	25,000	22,000	22,000	12,000	12,000	21,000	
	Tellurium	µg/L	0	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Thallium	µg/L	0	0.8	0.8	3	0.01	0.01	<0.01	0.018	0.059	0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	
	Thorium	µg/L	0	-	-	-	0.11	<0.05	<0.05	0.092	0.78	0.17	<0.05	0.06	<0.05	0.28	0.28	0.14	
	Tin	µg/L	0	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
	Titanium	µg/L	0	-	-	1000	19	11	32	20	200	32	22	9	9	38	48	19	
	Uranium	µg/L	0	8.5	15	3000	0.71	0.69	1.01	1.02	0.61	0.7	0.95	0.91	0.93	0.54	0.53	0.8	
	Vanadium	µg/L	0	-	-	-	0.71	0.15	0.92	0.539	6.5	0.87	0.92	0.13	0.13	3.1	5.2	0.35	
	Zinc	µg/L	1	Varies - see Notes	30	75[150]900[1650]2400	1.1	2.1	2.2	2.4	16	1.8	1.3	<0.5	0.9	3.4	4.4	1.2	
	Zirconium	µg/L	0	-	-	-	0.7	0.3	0.7	0.2	1.1	0.6	0.4	0.2	0.2	2	2.2	0.3	

Table 2-A: Surface Water Analytical Results

				Sampling Location		LBCH-001																							
				Sampling Date	14/07/2014	05/11/2014	24/03/2015	26/05/2015	04/08/2015	03/11/2015	22/03/2016	22/03/2016	11/05/2016	28/06/2016	28/06/2016	23/08/2016	09/11/2016	21/03/2017	24/05/2017	08/08/2017	08/11/2017	08/11/2017	26/03/2018	23/05/2018	12/09/2018	12/09/2018			
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)																							
Chem Group	Paramter	Unit	DL																										
Field	Temperature (Field)	°C			-	-	16	0.1	-	11.7	12.6	0	0	0	5.9	18.9	18.9	13.9	0	0	6.7	13.4	-0.1	-0.1	0	10.4	3	3	
	DO (Field)	mg/L		Varies - see Notes	>5.5-	-	-	13.6	-	10.4	10.14	14.26	13.42	13.42	12.34	9.22	9.22	10.6	13.91	12.67	11.33	10.39	14.17	14.17	13.21	11.04	13.13	13.13	
	Field Conductance, Specific	µS/cm		-	-	-	-	497	-	222	279.6	462	497	497	208.7	361	361	380.2	497	513	146.4	347.6	542	544	527	218.3	410.6	410.6	
	Field ORP (mV)	mV		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37.5	28.3	-16.9	232.5	177	177	
	Field Air Temperature	°C		-	-	-	-	-	-	-	-	-	-6	-6	16	28.1	28.1	21.2	-	-0.1	17.8	22.5	-6.9	-	-16.9	23.1	0.9	0.9	
	Turbidity (NTU)																											6	
Inorganics	pH (Field)	pH_Units			-	-	-	8.2	-	10.4	8.15	8.21	7.8	7.8	5.9	8.17	8.17	8.29	8.04	7.6	7.61	7.75	8.1	8.08	7.78	7.86	8.08	8.08	
	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000		-	-	97,100	157,000	162,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Alkalinity (total) as CaCO3	µg/L	1,000	Varies - see Notes	-	-	97,100	157,000	162,000	70,000	85,000	151,000	168,000	169,000	69,000	95,000	106,000	114,000	164,000	179,000	48,000	113,000	177,000	176,000	185,000	67,000	120,000	123,000	
	Alkalinity, PP (as CaCO3)	mg/L	5	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
	Ammonia	mg/L	0	-	-	0.502 0.715 0.749 0.767	1.31 3.7 11.3 18.4 18.5	0.031	<0.02	0.156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Ammonia (as N)	mg/L	0	-	-	2 1.97 2.69 2.78 3.97 3.99	-	-	-	-	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	0.02	<0.025	<0.025		
	Bicarbonate	mg/L	5	-	-	-	-	-	-	85	104	184	204	206	84	116	129	139	200	218	58	138	216	215	226	81	146	150	
	Bromide (Filtered)	mg/L	0	-	-	-	-	<100	<100	<100	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
	Carbonate	mg/L	6	-	-	-	-	-	-	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	
	Chloride (Filtered)	mg/L	0	150	120	-	-	-	0.55	0.72	0.21	0.23	0.51	0.51	0.52	0.47	0.42	0.4	0.36	0.99	0.769	0.116	0.34	0.75	0.74	0.73	0.33	0.48	0.5
	Electrical Conductivity (lab)	µS/cm	1	-	-	-	310	486	492	216	283	425	483	482	194	359	359	377	470	496	144	334	545	542	551	227	418	418	
	Hardness as CaCO3 (Filtered)	mg/L	0	-	-	-	150	226	239	104	142	238	268	264	100	183	185	191	266	275	70	170	280	300	280	109	210	210	
	Hydroxide	mg/L	5	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
	Nitrate (as N) (Filtered)	mg/L	0	3	-	-	400	0.074	0.022	-	0.04	0.02	0.02	0.09	0.09	0.04	<0.01	<0.01	<0.01	<0.1	0.248	<0.1	<0.01	0.03	0.03	0.17	0.04	<0.01	<0.01
	Nitrate and nitrite (as N)	mg/L	0	-	-	-	400	0.0743	0.022	0.154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	-	-	0.11	0.06	0.17	0.1	0.1	<0.01	<0.01	<0.01	<0.01	0.45	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	Nitrogen (Total)	µg/L	50	-	-	-	-	268	344	270	270	160	330	220	420	160	260	250	280	320	390	490	270	220	250	260	130	140	
	pH (Lab)	pH_Units	0	-	-	-	7.85	8.24	7.88	7.41	7.8	7.9	7.86	7.88	7.45	7.53	7.68	7.77	7.75	7.8	7.48	7.79	8.13	8.15	8.18	7.68	7.95	7.93	
	Phosphorus	µg/L	2	-	Note	-	60 - 136	10 - 15	6 - 11	109	93	9	10	11	70	12	19	11	<3	12	434	19	7	3	10	86	<5	<5	
	Phosphorus (Filtered)	µg/L	10	-	Note	-	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Sulphate	mg/L	1	Varies - see Notes	-	1000	50.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Sulphate (Filtered)	mg/L	0	-	-	1000	-	100	98.9	38.2	50.8	93.8	96.2	97	34	70.2	68.6	70.9	103	91.1	24.6	74.7	122	122	101	43.2	94	94.2	
	Total Dissolved Solids (Filtered)	mg/L	1	-	-	-	194	326	324	146	176	272	332	248	82	274	268	286	390	286 - 310	83 - 130	180 - 211	343 - 350	348 - 370	340	150	280	270	
	Total Kjeldahl Nitrogen	µg/L	50	-	-	-	-	246	190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Total Suspended Solids	mg/l	1	-	25	-	79.6	<1	<2	100	63	<3	2	12	70	4	6	6	<2	<2	50	<2	<2	<2	<2	61.5	<2	<2	
Organics	Dissolved Inorganic Carbon (Filtered)	µg/L	500	-	-	-	19,200	36,100	-	17,300	20,600	47,000	39,200	39,500	16,300	27,100	27,100	27,900	36,800	41,000	13,000	26,000	41,000	41,000	39,200	15,800	30,700	30,600	
	Dissolved Organic Carbon (Filtered)	mg/L	1	-	-	-	11.4	3.2	1.43	5.5	9.8	2	1.6	1.7	8.5	3.5	3.8	4.8	3.1	1.2	9.7	4.9	3.2	3.1	1.8	5.2	2.9	2.5	
	Total Organic Carbon	µg/L	500	-	-	-	11,500	3700	1560	7100	10,100	3900	2500	3800	9700	4100	4900	4900	3300	1700	12,300	5400	4000	3600	1900	7100	3300	3400	
	Total Inorganic Carbon	µg/L	500	-	-	-	19,700	36,700	33,600	17,400	20,800	47,100	40,000	40,000	16,500	27,000	27,000	28,300	36,500	41,200	14,000	27,000	42,000	41,000	39,500	15,900	30,600	30,700	
Total Metals	Aluminium	µg/L	1	-	5 100	-	326	97.3	63.5	1700	1200	90	51	34	2710	173	182	155	53	28	4300	320	51	54	26	3500	180	180	
	Antimony	µg/L	0	9	-	200	0.074	0.06	<0.05	<0.1	<0.2	<0.2	<0.2	<0.2	0.05	0.04	0.1	0.12	0.04	0.04	0.095	0.098	0.04	0.04	0.12	0.07	0.08	0.04	
	Arsenic	µg/L	0	5	5	50	0.675	0.333	0.26	1.42	1.1	0.2	0.2	0.2	1.2	0.4	0.4	0.3	0.2	3	0.4	0.3	0.3	0.2	1.2	0.3	0.3		
	Barium	µg/L	0	1000	-	10000	49.5	44.5	42.9	49	48	38	39	38	41.6	37	36.6	34.7	40.6										

Table 2-A: Surface Water Analytical Results

				Sampling Location		LBCH-002																							
				Sampling Date		14/07/2014	05/11/2014	24/03/2015	26/05/2015	26/05/2015	04/08/2015	03/11/2015	22/03/2016	11/05/2016	11/05/2016	28/06/2016	23/08/2016	09/11/2016	21/03/2017	21/03/2017	24/05/2017	08/08/2017	08/11/2017	26/03/2018	23/05/2018	12/09/2018			
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)																							
Chem Group	Paramter	Unit	DL																										
Field	Temperature (Field)	°C		-	-	-	16	0	-	12.84	12.84	13.1	0	0	8.1	8.1	21.3	16	0	0	0	8.6	15.5	-0.1	0	13.2	5.1		
	DO (Field)	mg/L		Varies - see Notes	>5.5-	-	-	13.6	-	10.25	10.25	10.07	14.5	13.37	11.79	11.79	8.95	10.37	14.26	12.49	12.49	10.78	10.07	13.97	13.08	10.48	12.82		
	Field Conductance, Specific	µS/cm		-	-	-	-	504	-	228	228	281.7	436	501	213.7	213.7	365	382.2	503	518	518	154.9	351.2	563	524	223.8	412.4		
	Field ORP (mV)	mV		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44.6	-8.5	219.2	113.7			
	Field Air Temperature	°C		-	-	-	-	-	-	-	-	-	-	-6.7	16	16	28.1	21.2	-	1.5	1.5	19.7	32.1	-6.6	-8.5	25.1	8.4		
	Turbidity (NTU)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Inorganics	pH (Field)	pH_Units		-	-	-	-	8.1	-	7.46	7.46	8.18	8.29	7.77	8.1	8.1	8.95	8.31	8.11	7.54	7.54	7.47	7.77	8.01	7.73	7.85	8.22		
	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000	-	-	-	101,000	160,000	166,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Alkalinity (total) as CaCO3	µg/L	1,000	Varies - see Notes	-	-	101,000	160,000	166,000	72,000	73,000	85,000	144,000	171,000	72,000	72,000	116,000	114,000	168,000	180,000	181,000	51,000	115,000	187,000	191,000	69,000	122,000		
	Alkalinity, PP (as CaCO3)	mg/L	5	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		
	Ammonia	mg/L	0	-	0.502 0.715 0.749 0.767	1.31 3.7 11.3 18.4 18.5	0.028	<0.02	0.162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Ammonia (as N)	mg/L	0	-	2 1.97 2.69 2.78 3.97 3.99	-	-	-	-	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	0.01	0.02	<0.025			
	Bicarbonate	mg/L	5	-	-	-	-	-	-	88	89	104	175	208	87	88	142	139	205	220	221	62	141	228	233	84	149		
	Bromide (Filtered)	mg/L	0	-	-	-	<100	<100	<100	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		
	Carbonate	mg/L	6	-	-	-	-	-	-	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6		
	Chloride (Filtered)	mg/L	0	150	120	-	-	0.54	0.73	0.22	0.22	0.24	0.48	0.51	0.41	0.44	0.4	0.29	1.35	0.782	0.764	0.117	0.21	0.75	0.72	0.31	0.48		
	Electrical Conductivity (lab)	µS/cm	1	-	-	-	314	491	502	222	233	285	402	485	200	201	362	378	473	498	499	151	347	565	553	231	423		
	Hardness as CaCO3 (Filtered)	mg/L	0	-	-	-	150	229	249	107	109	143	235	267	110	110	188	191	270	276	274	73	170	310	280	111	210		
	Hydroxide	mg/L	5	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		
	Nitrate (as N) (Filtered)	mg/L	0	3	-	400	0.07	0.012	-	0.04	0.04	0.02	<0.01	0.08	0.04	0.04	<0.01	<0.01	0.15	0.259	0.292	<0.1	<0.01	0.02	0.17	0.03	<0.01		
	Nitrate and nitrite (as N)	mg/L	0	-	-	400	0.0702	0.012	0.157	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<0.01	<10	0.11	0.11	0.06	0.17	0.1	<0.01	<0.01	<0.01	<0.01	0.44	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
	Nitrogen (Total)	µg/L	50	-	-	-	-	284	318	310	460	250	160	230	390	380	160	160	310	440	310	420	170	380	230	240	110		
	pH (Lab)	pH_Units	0	-	-	-	7.87	8.24	7.92	7.46	7.38	7.6	7.96	7.85	7.53	7.56	7.74	7.86	7.79	7.77	7.78	7.5	7.82	8.13	8.35	7.7	7.96		
	Phosphorus	µg/L	2	-	Note	-	65 - 124	8 - 13	5 - 11	141	139	80	12	10	80	78	14	9	4	8	10	429	25	8	9	86	10		
	Phosphorus (Filtered)	µg/L	10	-	Note	-	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Sulphate	mg/L	1	Varies - see Notes	-	1000	51.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Sulphate (Filtered)	mg/L	0	-	-	1000	-	98.7	97	38.8	38.9	51.4	90.5	96.4	35.8	35.8	68.8	71.5	107	91.7	90.7	25.5	74.1	127	102	43.7	93.8		
	Total Dissolved Solids (Filtered)	mg/L	1	-	-	-	199	319	329	146	174	146	264	316	124	108	254	314	382	294 - 312	298 - 312	88 - 140	200 - 213	360 - 364	350	140	310		
	Total Kjeldahl Nitrogen	µg/L	50	-	-	-	-	272	161	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total Suspended Solids	mg/l	1	-	25	-	94.8	1.7	<2	100	98	71	5	7	63	73	8	<2	<2	<2	<2	120	<2	4	<2	58.5	2			
Organics	Dissolved Inorganic Carbon (Filtered)	µg/L	500	-	-	-	19,500	37,000	-	17,900	17,900	20,800	34,800	40,000	16,900	16,900	27,500	28,300	37,400	41,400	41,300	13,000	26,000	43,000	39,900	16,500	31,100		
	Dissolved Organic Carbon (Filtered)	mg/L	1	-	-	-	11.4	3.8	1.5	7.2	5.4	7	3.4	1.7	8.2	8.2	4	4.1	2.4	1.2	1.3	9	4.8	3	1.7	5.2	2.5		
	Total Organic Carbon	µg/L	500	-	-	-	11,400	4000	1640	7200	6100	8400	3700	3100	8800	9000	4300	4500	3300	1600	1700	12,400	5800	3900	2100	11,000	3100		
	Total Inorganic Carbon	µg/L	500	-	-	-	19,900	-	-	18,000	18,000	21,300	34,700	40,000	17,000	17,000	27,500	28,600	37,400	41,700	41,800	15,000	28,000	43,000	40,100	16,400	31,100		
Total Metals	Aluminium	µg/L	1	-	5 100	-	379	154	49.4	1570	1600	1310	159	45	2570	3020	214	161	63	40	34	4600	390	73	31	2900	400		
	Antimony	µg/L	0	9	-	200	0.084	0.067	<0.05	<0.1	<0.1	<0.2	<0.2	0.06	0.05	0.07	0.07	0.04	0.04	0.04	0.086	0.08	0.04	0.09	0.06	0.06	0.06		
	Arsenic	µg/L	0	5	5	50	0.751	0.383	0.248	1.53	1.46	1.1	0.3	0.2	1.2	1.3	0.4	0.4	0.3	0.2	3.2	0.5	0.4	0.3	1.1	0.4			
	Barium	µg/L	0	1000	-	10000	54.5	48.3	43.9	48.9	49.7	50	37	41	43.8	46	39.2	35	37.8	42.6	42.6	76	40	51	44	46	37		
	Beryllium	µg/L	0	0.13	-	53	0.052	<0.01	<0.01	0.13	0.11	0.09	<0.04	<0.05	0.15	0.16	<0.05	<0.05	<0.05	<0.05	<0.05	0.37	<0.05	<0.05	<0.05	0.1	<0.05		
	Bismuth	µg/L	0	-	-	-	<0.01	<0.01	<0.01	<0.1	<0.1	<1	<1	<1	<0.1	<													

Table 2-A: Surface Water Analytical Results

						LBCH-I-001										LBCH-I-002										LBCH-I-003 SPX-Creek	
						Sampling Location		Sampling Date																			
						28/06/2016	23/08/2016	23/08/2016	09/11/2016	24/05/2017	08/08/2017	08/08/2017	08/11/2017	23/05/2018	12/09/2018	28/06/2016	23/08/2016	09/11/2016	24/05/2017	24/05/2017	08/08/2017	08/11/2017	23/05/2018	12/09/2018	23/08/2017	23/08/2017	
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)																					
Chem Group	Paramter	Unit	DL																								
Field	Temperature (Field)	°C			-	-	14.4	11.4	11.4	0	6.9	11.8	11.8	-0.1	9.2	1.4	19.5	17.4	0	7.7	7.7	16.8	-0.1	9.8	3.6	11.6	7
	DO (Field)	mg/L		Varies - see Notes	>5.5-	-	9.34	10.01	10.01	11.64	10.79	10.08	10.08	12.32	10.91	12.83	8.66	9.54	12.13	10.82	10.82	9.67	12.38	10.83	12.53	9.28	11.68
	Field Conductance, Specific	µS/cm		-	-	-	405.6	480	480	504	279.2	340.7	340.7	501	287.6	483.6	566	741	706	308	308	523	726	389.7	668	546	650
	Field ORP (mV)	mV		-	-	-	-	-	-	-	-	-	-	48.3	207.5	191.1	-	-	-	-	-	-	5.5	189.4	105.5	11.2	-46.6
	Field Air Temperature	°C		-	-	-	28.1	21.2	21.2	-10	16.3	22.5	22.5	-12.6	19.2	-2.1	28.1	21.2	-	16.3	16.3	-	-	20.1	-	-	-
	Turbidity (NTU)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inorganics	pH (Field)	pH_Units		-	-	-	7.82	7.93	7.93	7.45	7.68	7.43	7.43	8.08	7.81	7.96	8.66	8.01	8.6	7.89	7.89	8	7.73	7.91	7.97	7.72	7.88
	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Alkalinity (total) as CaCO3	µg/L	1,000	Varies - see Notes	-	-	141,000	63,000	100,000	192,000	92,000	142,000	142,000	194,000	96,000	186,000	244,000	95,000	293,000	128,000	123,000	225,000	293,000	152,000	267,000	188,000	139,000
	Alkalinity, PP (as CaCO3)	mg/L	5	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Ammonia	mg/L	0	-	0.502 0.715 0.749 0.767	1.31 3.7 11.3 18.4 18.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ammonia (as N)	mg/L	0	-	2 1.97 2.69 2.78 3.97 3.99	-	0.01	<0.01	0.01	<0.01	0.03	0.02	0.02	0.01	0.02	<0.025	0.02	0.09	0.05	0.05	0.05	0.02	0.06	0.03	<0.025	<0.01	<0.01
	Bicarbonate	mg/L	5	-	-	-	172	77	122	234	113	173	173	236	117	227	297	116	357	156	150	275	357	185	326	229	169
	Bromide (Filtered)	mg/L	0	-	-	-	<0.02	<0.02	<0.02	<0.2	0.046	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.2	<0.02	<0.02	<0.02	<0.2
	Carbonate	mg/L	6	-	-	-	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6
	Chloride (Filtered)	mg/L	0	150	120	-	0.35	0.42	0.69	0.95	0.175	0.19	0.21	0.86	0.44	0.53	0.32	0.47	1.01	0.137	<0.5	0.19	0.71	0.36	0.43	<0.5	<0.5
	Electrical Conductivity (lab)	µS/cm	1	-	-	-	404	474	477	470	272	327	327	500	301	489	559	8630	659	312	306	511	726	408	683	538	632
	Hardness as CaCO3 (Filtered)	mg/L	0	-	-	-	203	244	247	253	132	170	160	250	139	230	275	280	334	150	151	250	330	190	310	310	370
	Hydroxide	mg/L	5	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Nitrate (as N) (Filtered)	mg/L	0	3	-	400	<0.01	<0.01	<0.01	<0.1	<0.1	0.02	0.01	0.05	0.05	0.01	<0.01	<0.01	0.13	0.28	0.15	<0.01	0.096	0.15	0.03	<0.01	<0.1
	Nitrate and nitrite (as N)	mg/L	0	-	-	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<0.01	<0.01	0.46	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.53	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1
	Nitrogen (Total)	µg/L	50	-	-	-	510	840	590	520	620	540	560	530	530	420	480	400	500	1020	1160	630	2180	760	430	280	330
	pH (Lab)	pH_Units	0	-	-	-	7.77	7.55	7.76	7.37	7.62	7.68	7.75	7.92	7.66	7.93	8.05	6.99	7.67	7.81	7.84	8.13	8.07	7.98	8.07	7.74	7.89
	Phosphorus	µg/L	2	-	Note	-	16	16	16	10	48	24	28	14	20	8	30	22	15	318	320	12	11	77	<5	10	19
	Phosphorus (Filtered)	µg/L	10	-	Note	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphate	mg/L	1	Varies - see Notes	-	1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sulphate (Filtered)	mg/L	0	-	-	1000	50.4	52.8	51.7	79	48.9	44.8	45.3	78.6	48.4	67.9	81.9	117	107	39.7	39.3	75.4	118	57.2	101	115	220
	Total Dissolved Solids (Filtered)	mg/L	1	-	-	-	318	316	318	372	165 - 240	180 - 207	100 - 206	307 - 410	190	330	266	468	492	187 - 260	184 - 260	300 - 326	460 - 464	310	440	330 - 355	410 - 450
	Total Kjeldahl Nitrogen	µg/L	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Suspended Solids	mg/l	1	-	25	-	2	<2	<2	<2	14	<2	<2	<2	<2	<2	13	9	<2	92	98.5	<2	<2	42	<2	<8	<8
Organics	Dissolved Inorganic Carbon (Filtered)	µg/L	500	-	-	-	38,600	47,700	49,000	43,800	21,000	32,000	32,000	14,400	25,000	47,000	51,900	67,300	56,000	31,000	31,000	49,800	66,700	37,000	66,400	44,600	31,900
	Dissolved Organic Carbon (Filtered)	mg/L	1	-	-	-	14.8	16.9	17.4	13	18.2	20.9	21	12.2	19	13.5	14	6.6	10.8	27.9	27.4	20.1	7.7	21	11.5	6.8	3.3
	Total Organic Carbon	µg/L	500	-	-	-	15,800	18,500	19,400	13,400	18,800	20,800	20,300	13,300	18,500	14,400	15,300	7300	11,200	31,100	30,900	23,100	8300	23,200	12,100	7400	4400
	Total Inorganic Carbon	µg/L	500	-	-	-	38,200	47,400	50,000	43,700	26,000	34,000	34,000	46,000	24,000	47,000	52,000	69,400	56,900	32,000	33,000	52,600	68,700	37,000	67,000	44,500	31,900
Total Metals	Aluminium	µg/L	1	-	5 100	-	49	18	20	35	440	140	110	33	190	11	552	25	240	2900	2900	190	35	2700	26	64	3
	Antimony	µg/L	0	9	-	200	0.05	0.06	0.06	0.04	0.097	0.15	0.1	0.04	0.06	0.05	0.16	0.08	0.07	0.17	0.17	0.14	0.06	0.15	0.08	0.07	0.04
	Arsenic	µg/L	0	5	5	50	0.7	0.8	0.8	0.5	0.7	0.9	0.9	0.5	0.6	0.6	1	1	0.7	2.6	2.6	0.9	0.6	1.4	0.5	0.4	0.3
	Barium	µg/L	0	1000	-	10000	52.4	51.3	51.8	48.4	44	51	51	55	41	47	74.1	74.7	62.5	98	98	73	70	83	58	79	38
	Beryllium	µg/L	0	0.13	-																						

Table 2-A: Surface Water Analytical Results

				Sampling Location		BEVR-001																			
				Sampling Date		14/07/2014	05/11/2014	24/03/2015	26/05/2015	04/08/2015	04/08/2015	03/11/2015	22/03/2016	11/05/2016	28/06/2016	23/08/2016	09/11/2016	09/11/2016	21/03/2017	24/05/2017	08/08/2017	26/03/2018	12/09/2018		
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)																			
Chem Group	Paramter	Unit	DL																						
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	10.9	2.5	1.2	14	9	9	<5	<5	23	12	<5	2,384	2,743	1,363	32	17	<1	6	
	Antimony (Filtered)	µg/L	0	9	-	200	0.141	0.162	0.139	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.125	0.139	0.111	0.129	0.14	0.17	0.14	
	Arsenic (Filtered)	µg/L	0	-	-	50	0.472	0.311	0.248	0.4	0.4	0.4	0.3	0.3	0.4	0.5	0.5	0.4	0.4	0.3	0.4	0.4	0.3	0.4	
	Barium (Filtered)	µg/L	0	1000	-	10000	73.4	93.1	102	63	78	76	84	94	53	79	83	91.2	91	94.6	45.6	77.5	100.8	82.6	
	Beryllium (Filtered)	µg/L	0	0.13	-	53	<0.01	<0.01	<0.01	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Bismuth (Filtered)	µg/L	0	-	-	-	<0.01	<0.01	<0.01	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
	Boron (Filtered)	µg/L	1	-	-	-	12.9	13.1	13.3	11	12	13	14	11	10	13	16	13	13	10	8	14	11	15	
	Cadmium (Filtered)	µg/L	0	-	-	0.1 0.3 0.5 0.6	0.0158	0.0175	0.0224	<0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.01	<0.01	<0.01	0.026	0.022	0.02	0.02	0.01	
	Calcium (Filtered)	mg/L	0	-	-	-	35.8	55.1	56.4	31.7	43.6	43.9	55.6	62.9	29.9	44.4	54.4	61.6	62.1	61.3	24	45	65	50	
	Chromium (Filtered)	µg/L	0	-	-	10	0.13	<0.1	<0.1	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.089	1.839	0.155	0.265	<0.05	<0.05	<0.05	
	Cobalt (Filtered)	µg/L	0	-	-	9	0.107	0.116	0.0475	0.11	0.07	0.08	0.09	0.04	0.1	0.05	0.05	0.1	0.104	0.036	0.116	0.07	0.04	0.05	
	Copper (Filtered)	µg/L	0	-	-	20 30 40 50 60 70 80 90	1.02	0.37	0.25	<1	<1	<1	<1	<1	0.9	0.6	0.5	<0.5	<0.5	<0.5	1.1	0.6	<0.5	<0.5	
	Iron (Filtered)	mg/L	0	-	-	-	0.0496	0.0275	0.0118	0.068	0.027	0.026	0.026	0.024	0.197	0.047	0.019	0.019	0.026	0.028	0.21	0.057	0.009	0.024	
	Lead (Filtered)	µg/L	0	-	-	40 50 60 110 160	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.035	0.307	0.031	0.066	<0.01	<0.01	<0.01
	Lithium (Filtered)	µg/L	0	-	-	-	4.17	5.18	4.61	5	6	5	5	5	4	5	6	5.4	5.5	4.6	3.5	5.7	4.7	5.6	
	Magnesium (Filtered)	mg/L	0	-	-	-	11.4	18.6	21.4	11.7	14.9	15	18.6	20.9	10.4	15	17.6	21.2	21.4	20.8	8	15	22	16	
	Manganese (Filtered)	µg/L	0	-	-	-	11.5	40	19.4	9	9	10	29	19	12	11	13	33	32	21	11	13	22	18	
	Mercury (Filtered)	µg/L	0	-	-	1	-	<0.01	<0.005	<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	
	Molybdenum (Filtered)	µg/L	0	-	-	10000	1.19	2.23	2.58	1.51	1.62	1.6	2	2.3	1.3	1.6	2	1.94	2.048	2.026	0.303	1.75	2.32	1.81	
	Nickel (Filtered)	µg/L	0	-	-	250 650 1100 1500	2.47	2.21	2.54	3	2	2	2	2	3	2	2	2.2	2.7	2.3	3	2.3	3.4	2.2	
	Potassium (Filtered)	mg/L	0	-	-	-	0.604	0.802	0.878	0.6	0.7	0.8	0.8	1	0.7	0.8	0.9	0.9	0.9	0.8	0.62	0.73	0.84	0.74	
	Selenium (Filtered)	µg/L	0	2	-	10	0.75	0.76	0.98	<0.6	0.9	0.8	0.8	0.8	0.8	0.8	0.8	1	1	0.8	0.5	0.7	0.9	0.7	
	Silicon (Filtered)	µg/L	5	-	-	-	2530	2700	3590	2370	2460	2470	2650	2960	2190	2450	2350	2930	2950	3120	1800	2500	3100	2200	
	Silver (Filtered)	µg/L	0	-	-	0.5 15	<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	
	Sodium ion (Filtered)	mg/L	0	-	-	-	1.82	3.11	2.81	2.2	2.7	2.7	3.3	3.4	1.9	2.6	3.1	3.4	3.4	2.4	1.4	2.7	2.9	2.9	
	Strontium (Filtered)	µg/L	0	-	-	-	62.3	99.1	113	64	78	80	89	97	49	74	79	89.9	90.8	93.1	39.3	76.5	112.5	88.4	
	Sulfur, elemental (Filtered)	µg/L	20	-	-	-	7650	15,400	18,200	10,300	12,600	12,800	16,200	16,800	8900	12,300	15,800	18,200	18,100	15,500	6900	14,000	16,000	14,000	
	Tellurium (Filtered)	µg/L	0	-	-	-	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Thallium (Filtered)	µg/L	0	-	-	3	0.0106	0.0095	0.0134	<0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	<0.01	<0.01	0.019	0.013	<0.01	0.02	<0.01	
	Thorium (Filtered)	µg/L	0	-	-	-	<0.01	<0.01	<0.01	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Tin (Filtered)	µg/L	0	-	-	-	<0.05	<0.05	<0.05	<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	
	Titanium (Filtered)	µg/L	0	-	-	1000	0.25	<0.2	<0.2	<10	<10	<10	<10	<10	<10	<10	<10	9	9	9	6	8	7	5	
	Uranium (Filtered)	µg/L	0	-	-	3000	0.858	1.53	1.66	0.8	1	1.1	1.4	1.8	0.7	0.9	1.3	1.624	1.546	1.946	0.572	1	1.94	1.21	
	Vanadium (Filtered)	µg/L	0	-	-	-	0.5	<0.2	<0.2	0.45	0.24	0.22	<0.1	<0.1	0.3	0.2	<0.1	0.209	0.202	0.052	0.33	0.26	0.07	0.09	
	Zinc (Filtered)	µg/L	1	-	-	75 150 900 1650 2400	1.3	3	4.6	1	<1	1	2	4	1.8	1.1	4	2.1	1.9	5.2	1.1	1	4.5	<0.5	
	Zirconium (Filtered)	µg/L	0	-	-	-	0.176	0.068	0.043	0.23	0.19	0.17	0.1	<0.1	0.3	<0.1	<0.1	0.1	0.1	<0.1	0.3	0.2	<0.1	0.1	
Radionuclides	Actinium228	Bq/L	-	-	-	-	-	-	-	<0.9	<0.3	-	<0.4	-	<1	<0.3	<0.7	2	<1	<0.8	<1	<0.9	<0.8		
	Radon219	Bq/L	-	-	-	-	-	-	-	<1	<1	-	<0.6	-	<1	<0.6	<1	<2	<1	<2	<1	<1	<1		
	Thorium227	Bq/L	-	-	-	-	-	-	-	<1	<1	-	<0.3	-	<1	<0.3	<1	<1	<0.9	<0.6	<1	<1	<0.8		
	Bismuth212	Bq/L	-	-	-	-	-	-	-	<2	<2	-	<0.7	-	<1	<0.7	<2	<2	<2	<2	<2	<2	2		
	Lead-210	Bq/L	-	-	-	-	-	-	-	<4	<4	-	<2	-	<4	<1	<4	<4	<5	<4	<4	<6	<5		
	Lead211	Bq/L	-	-	-	-	-	-	-	<4	<5	-	<2	-	<4	<2	<4	<4	<4	<3	<5	<5	<5		
	Lead212	Bq/L	-	-	-	-	-	-	-	<0.4	<0.4	-	<0.1	-	<0.4	<0.1	<0.3	0.8	1.2	1.2	1	<0.4	<0.3		
	Radium223	Bq/L	-	-	-	-	-	-	-	<1	<1	-	<0.2	-	<0.8	<0.3	<1	<0.9	<1	<0.7	<0.9	<0.8	<0.8		
	Radium-226	Bq/L	-	-	-	-	-	<0.005	<0.005	0.008	0.02	0.02	<0.005	<2	-	<5	<1	<4	<4	<5	<5	<4	<5	<4	
	Thallium208	Bq/L	-	-	-	-	-	-	-	<0.3	<0.2	-	<0.1	-	<0.2	<0.09	0.3	<0.3	0.3	0.4	0.3	<0.2	<0.2		
BTEX	Benzene	µg/L	1	40	370	4000	-	<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		
	Ethylbenzene	µg/L	1	200	90	2000	-	<1	<1	<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		
	Styrene	µg/L	1	72	72	720	-	-	<1	<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		
	Toluene	µg/L	1	0.5	2	390	-	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<						

Table 2-A: Surface Water Analytical Results

						Sampling Location	BEVR-1-001												
						Sampling Date	28/06/2016	23/08/2016	09/11/2016	21/03/2017	24/05/2017	08/08/2017	08/11/2017	26/03/2018	26/03/2018	23/05/2018	23/05/2018	12/09/2018	
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)													
Chem Group	Parameter	Unit	DL																
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	9	<5	3.719	3.469	33	13	2	2	2	20	20	4	
	Antimony (Filtered)	µg/L	0	9	-	200	<0.2	<0.2	0.039	0.038	0.09	0.06	0.04	0.07	0.07	0.04	0.03	0.07	
	Arsenic (Filtered)	µg/L	0	-	-	50	0.5	0.4	0.3	0.2	0.3	0.4	0.3	0.2	0.2	0.3	0.3	0.3	
	Barium (Filtered)	µg/L	0	1000	-	10000	45	43	43.7	45.3	24.1	43.3	46.4	44.2	43.8	28.7	28.4	41.4	
	Beryllium (Filtered)	µg/L	0	0.13	-	53	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Bismuth (Filtered)	µg/L	0	-	-	-	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
	Boron (Filtered)	µg/L	1	-	-	-	25	24	20	18	16	22	20	20	19	16	16	21	
	Cadmium (Filtered)	µg/L	0	-	-	0.1 0.3 0.5 0.6	0.02	0.01	<0.01	0.016	0.017	0.02	<0.01	<0.01	<0.01	0.01	0.01	<0.01	
	Calcium (Filtered)	mg/L	0	-	-	-	62.1	65.9	73	74.2	29	53	71	69	69	38	37	61	
	Chromium (Filtered)	µg/L	0	-	-	10	<0.4	<0.4	0.107	<0.05	0.321	0.21	0.08	0.06	<0.05	0.19	0.06	<0.05	
	Cobalt (Filtered)	µg/L	0	-	-	9	0.08	0.05	0.064	0.038	0.116	0.1	0.06	0.02	<0.02	0.08	0.08	0.05	
	Copper (Filtered)	µg/L	0	-	-	20 30 40 50 60 70 80 90	1.1	0.8	0.8	0.5	1.4	0.9	0.7	<0.5	<0.5	0.9	0.9	0.6	
	Iron (Filtered)	mg/L	0	-	-	-	0.073	0.061	0.047	0.016	0.136	0.208	0.042	0.017	0.017	0.082	0.081	0.043	
	Lead (Filtered)	µg/L	0	-	-	40 50 60 110 160	<0.1	<0.1	0.046	0.02	0.063	<0.01	0.01	<0.01	0.01	0.03	0.03	<0.01	
	Lithium (Filtered)	µg/L	0	-	-	-	5	5	5.2	4.9	2.6	4.4	5	4.1	4.3	3	3	5	
	Magnesium (Filtered)	mg/L	0	-	-	-	15.6	15.1	18.2	18.3	7.7	14	18	17	17	10	10	14	
	Manganese (Filtered)	µg/L	0	-	-	-	17	10	18	14	9.9	17	16	7	7	7	7	16	
	Mercury (Filtered)	µg/L	0	-	-	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	Molybdenum (Filtered)	µg/L	0	-	-	10000	0.9	1	0.927	1.006	<0.02	0.93	1.01	1.1	1.09	0.75	0.76	0.95	
	Nickel (Filtered)	µg/L	0	-	-	250 650 1100 1500	1	<1	1	0.6	1.7	1.6	1.1	0.5	0.4	1.4	1.4	1.1	
	Potassium (Filtered)	mg/L	0	-	-	-	1.1	1	0.9	1.1	0.73	0.76	0.92	0.82	0.81	0.82	0.81	0.75	
	Selenium (Filtered)	µg/L	0	2	-	10	1	1	1.6	1.4	0.8	1	1.2	1.5	1.4	1	1	1.1	
	Silicon (Filtered)	µg/L	5	-	-	-	2170	1670	2220	2590	1800	2200	2400	2300	2300	2100	2100	1900	
	Silver (Filtered)	µg/L	0	-	-	0.5 15	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	Sodium ion (Filtered)	mg/L	0	-	-	-	6.2	5.5	6.6	7.8	2.9	4.5	6.2	7.6	7.7	3.9	3.8	4.6	
	Strontium (Filtered)	µg/L	0	-	-	-	95	84	93	88.3	43.5	84.3	106.5	95	94.5	56.7	57.6	94.7	
	Sulfur, elemental (Filtered)	µg/L	20	-	-	-	20,500	19,600	25,600	26,000	8500	16,000	24,000	22,000	21,000	11,000	12,000	19,000	
	Tellurium (Filtered)	µg/L	0	-	-	-	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	0.09	<0.05	<0.05	<0.05	<0.05	
	Thallium (Filtered)	µg/L	0	-	-	3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	Thorium (Filtered)	µg/L	0	-	-	-	<0.4	<0.4	<0.05	<0.05	0.067	0.05	0.07	0.07	<0.05	<0.05	<0.05	<0.05	
	Tin (Filtered)	µg/L	0	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
	Titanium (Filtered)	µg/L	0	-	-	1000	<10	<10	11	11	7	9.7	15	8	7	5	6	6	
	Uranium (Filtered)	µg/L	0	-	-	3000	0.7	0.6	0.868	0.968	0.388	0.62	0.84	0.88	0.88	0.42	0.41	0.78	
	Vanadium (Filtered)	µg/L	0	-	-	-	0.1	<0.1	0.072	<0.05	0.22	0.14	<0.05	<0.05	<0.05	0.17	0.16	<0.05	
	Zinc (Filtered)	µg/L	1	-	-	75 150 900 1650 2400	<0.5	4.1	1.1	1.9	0.6	<0.5	5.1	0.7	<0.5	0.8	1.7	<0.5	
	Zirconium (Filtered)	µg/L	0	-	-	-	0.1	0.1	0.2	<0.1	0.3	0.3	0.2	0.2	0.1	0.2	0.2	0.1	
Radionuclides	Actinium228	Bq/L		-	-	-	<0.9	0.6	<1	<0.8	<1	<0.9	<0.4	<0.6	<1	<0.8	0.9	<0.6	
	Radon219	Bq/L		-	-	-	<2	<0.5	<2	<1	<0.6	<1	<0.5	<1	<1	<2	<1	<1	
	Thorium227	Bq/L		-	-	-	<0.5	<0.4	<1	<0.5	<1	<1	<0.3	<0.8	<1	<0.9	<1	<1	
	Bismuth212	Bq/L		-	-	-	<2	<0.6	<2	<0.6	<2	<2	1	<2	<2	<0.8	<2	<2	
	Lead-210	Bq/L		-	-	-	<3	<1	<5	<4	<4	<4	<2	<5	<5	<5	<5	<4	
	Lead211	Bq/L		-	-	-	<5	<2	<8	<5	<2	<2	<2	<2	<4	<4	<4	<4	
	Lead212	Bq/L		-	-	-	0.3	<0.1	<0.4	1.1	1.4	0.8	0.3	<0.4	<0.3	<0.4	<0.4	0.4	
	Radium223	Bq/L		-	-	-	<0.5	<0.3	<2	<0.8	<1	<1	<0.4	<0.8	<0.9	<0.9	<0.9	<0.9	
	Radium-226	Bq/L		-	-	-	<4	<2	<5	<4	<5	<5	<2	<5	<4	<5	<5	<5	
	Thallium208	Bq/L		-	-	-	0.2	<0.09	<0.4	<0.2	0.4	<0.2	<0.09	<0.2	<0.2	<0.2	<0.2	<0.3	
BTEX	Benzene	µg/L	1	40	370	4000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Ethylbenzene	µg/L	1	200	90	2000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Styrene	µg/L	1	72	72	720	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Toluene	µg/L	1	0.5	2	390	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Xylenes, total	µg/L	1	30	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
VOCs	Methyl tert-butyl ether [MTBE]	µg/L	1	1000	10000	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
VPH	VHw6-10	µg/L	50	-	-	15,000	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	VPHw	µg/L	50	-	-	1500	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	

Table 2-A: Surface Water Analytical Results

						Sampling Location		LBCH-001																											
						Sampling Date		14/07/2014	05/11/2014	24/03/2015	26/05/2015	04/08/2015	03/11/2015	22/03/2016	22/03/2016	11/05/2016	28/06/2016	28/06/2016	23/08/2016	09/11/2016	21/03/2017	24/05/2017	08/08/2017	08/11/2017	08/11/2017	26/03/2018	23/05/2018	12/09/2018	12/09/2018						
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)																													
Chem Group	Paramter	Unit	DL																																
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	20	5.9	2.6	22	38	12	<5	<5	33	18	20	25	7.274	3.62	36	41	8	6	3	22	13	12							
	Antimony (Filtered)	µg/L	0	9	-	200	0.06	0.063	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.037	0.033	0.091	0.05	0.08	0.03	0.11	0.03	0.03	0.04							
	Arsenic (Filtered)	µg/L	0	-	-	50	0.302	0.173	0.165	0.3	0.3	<0.2	<0.2	<0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2							
	Barium (Filtered)	µg/L	0	1000	-	10000	32.7	36.9	41.6	22	28	39	38	39	20	32	32	32	36.9	38.3	16.8	31.5	41.6	41.9	40.9	20.3	33.9	34.3							
	Beryllium (Filtered)	µg/L	0	0.13	-	53	<0.01	<0.01	<0.01	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05							
	Bismuth (Filtered)	µg/L	0	-	-	-	<0.01	<0.01	<0.01	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1							
	Boron (Filtered)	µg/L	1	-	-	-	24.2	22.3	22.5	13	19	24	22	22	17	25	26	27	24	22	10	23	29	31	19	12	23	23							
	Cadmium (Filtered)	µg/L	0	-	-	0.1[0.3]0.5[0.6]	0.0072	0.006	0.006	<0.01	0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.02	<0.01	<0.01	0.012	<0.01	0.03	<0.01	0.01	<0.01	<0.01	<0.01							
	Calcium (Filtered)	mg/L	0	-	-	-	42.1	61.6	62	27.4	38.2	64.9	73.2	72	28.2	49.5	50.1	52	71.7	74.5	19	44	75	79	76	29	56	57							
	Chromium (Filtered)	µg/L	0	-	-	10	0.14	0.11	0.15	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.135	<0.05	0.292	0.28	0.12	0.08	0.05	0.07	0.1	<0.05							
	Cobalt (Filtered)	µg/L	0	-	-	9	0.136	0.0597	0.0278	0.14	0.09	0.07	<0.02	<0.02	0.16	0.03	0.03	0.04	0.042	0.021	0.159	0.07	0.11	0.06	0.03	0.06	0.06	0.06							
	Copper (Filtered)	µg/L	0	-	-	20[30]40[50]60[70]80[90]	1.31	0.48	0.36	1	1	<1	<1	<1	1.4	0.6	0.7	0.6	<0.5	<0.5	1.6	0.7	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5						
	Iron (Filtered)	mg/L	0	-	-	-	0.027	0.0183	0.0066	0.057	0.065	0.027	0.008	0.006	0.263	0.016	0.029	0.054	0.02	0.006	0.166	0.069	0.021	0.017	0.006	0.079	0.017	0.016							
	Lead (Filtered)	µg/L	0	-	-	40[50]60[110]160	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	0.041	0.059	<0.01	0.06	0.29	0.01	0.03	<0.01	<0.01						
	Lithium (Filtered)	µg/L	0	-	-	-	5.86	7.05	6.52	5	6	8	7	7	4	7	7	7	8	7.8	7.6	2.8	7.6	8.8	9.2	6.5	3.4	7.4	6.5						
	Magnesium (Filtered)	mg/L	0	-	-	-	10.9	17.5	20.3	8.55	11.3	18.4	20.6	20.4	8.3	14.4	14.5	14.8	21	21.7	5.5	13	23	24	22	8.7	16	16							
	Manganese (Filtered)	µg/L	0	-	-	-	15.6	12.6	5.78	10	6	18	5	5	15	4	4	4	7	5	12	5	14	14	5	3	6	6							
	Mercury (Filtered)	µg/L	0	-	-	1	-	<0.01	<0.005	<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							
	Molybdenum (Filtered)	µg/L	0	-	-	10000	0.497	1.02	1.18	0.56	0.6	0.95	1	1	0.5	0.8	0.8	0.7	0.88	0.956	<0.02	0.75	1.09	1.1	1.1	0.47	0.81	0.79							
	Nickel (Filtered)	µg/L	0	-	-	250[650]1100[1500]	2.31	1.52	1.02	3	3	2	<1	<1	3	1	1	2	1.8	0.9	2.8	2.4	1.5	1.5	0.9	2	2.1	2							
	Potassium (Filtered)	mg/L	0	-	-	-	0.846	0.899	0.988	0.7	0.7	0.9	1	1	0.8	1	1	0.8	1	1	0.81	0.68	1	1.1	0.9	0.83	0.78	0.8							
	Selenium (Filtered)	µg/L	0	2	-	10	1.72	1.84	2.27	1.1	1.4	2.1	2.3	2.2	1.3	1.6	1.7	1.5	2.5	2.2	0.7	1.5	2.2	2.2	2.4	0.8	1.6	1.5							
	Silicon (Filtered)	µg/L	5	-	-	-	2280	2130	2840	1890	2160	2290	2450	2410	1830	2130	2150	1730	2330	2660	1200	1900	2500	2600	2600	1700	1900	2000							
	Silver (Filtered)	µg/L	0	-	-	0.5[15]	<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							
	Sodium ion (Filtered)	mg/L	0	-	-	-	3.45	5.69	5.89	2.7	4	6.5	6	5.9	2.9	5.1	5.2	6.2	6.6	5.8	1.6	4.5	6.8	7.3	5.1	2.9	4.7	4.7							
	Strontium (Filtered)	µg/L	0	-	-	-	80.1	114	132	57	68	108	117	114	49	84	84	80	102.6	110	33	79.8	136.6	135.1	127.8	49.2	95.4	95.2							
	Sulfur, elemental (Filtered)	µg/L	20	-	-	-	16,500	29,300	34,000	13,300	17,800	31,700	34,000	33,400	12,300	23,700	24,200	25,900	37,100	34,700	8200	24,000	39,000	41,000	34,000	14,000	25,000	26,000							
	Tellurium (Filtered)	µg/L	0	-	-	-	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05							
	Thallium (Filtered)	µg/L	0	-	-	3	0.0046	<0.004	<0.004	<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	0.03	<0.01	0.01	<0.01	<0.01	<0.01							
	Thorium (Filtered)	µg/L	0	-	-	-	0.011	<0.01	<0.01	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.05	<0.05	0.073	0.14	0.06	<0.05	0.06	0.08	<0.05	<0.05						
	Tin (Filtered)	µg/L	0	-	-	-	<0.05	<0.05	<0.05	<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							
	Titanium (Filtered)	µg/L	0	-	-	1000	0.22	<0.2	<0.2	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	11	11	5	8	15	17	8	5	6					
	Uranium (Filtered)	µg/L	0	-	-	3000	0.623	0.904	0.945	0.4	0.5	0.9	1	1.1	<0.4	0.6	0.6	0.6	0.967	1.137	0.232	0.59	1.08	1.05	1.16	0.31	0.74	0.75							
Vanadium (Filtered)	µg/L	0	-	-	-	<0.2	<0.2	<0.2	0.23	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.062	<0.05	0.158	0.06	0.1	<0.05	<0.05	0.09	<0.05	<0.05							
Zinc (Filtered)	µg/L	1	-	-	75[150]900[1650]2400	1.1	1.7	1.7	1	1	1	<1	1	1.7	<0.5	<0.5	1.2	1.2	1.4	0.6	0.8	0.7	<0.5	0.8	0.9	<0.5	<0.5								
Zirconium (Filtered)	µg/L	0	-	-	-	0.136	0.065	0.037	0.2	0.27	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.2	0.3	0.1	<0.1	0.1	0.2	<0.1	<0.1						
Radionuclides	Actinium228	Bq/L		-	-	-	-	-	-	<0.8	<0.6	<0.9	<0.8	<0.7	1	<0.7	<0.8	0.7	1	<0.9	<0.8	<0.9	<1	1	<0.9	<0.9	<0.3								
	Radon219	Bq/L		-	-	-	-	-	-	<2	<1	<2	<1	<1	<1	<0.8	<1	<0.8	<2	<1	<1	<2	<1	<1	<1	<1	<0.8								
	Thorium227	Bq/L		-	-	-	-	-	-	<1	<1	<1	<0.4	<0.4	<0.5	<0.7	<1	<1	<1	<0.9	<1	<2	<0.9	<1	<0.6	<0.5									
	Bismuth212	Bq/L		-	-	-	-	-	-	<2	<1	<2	<2	<1	<1	<2	<1	<2	<3	<1	1	<3	<1	1	<2	<2									
	Lead-210	Bq/L		-	-	-	-	-	-	<4	<4	<4	<3	<3	<3	<3	<3	<3	<4	<4	<5	<5	<4	<4	<4	<3									
	Lead211	Bq/L		-	-	-	-	-	-	<4	<6	<4	<2	<3	<3	<4	<4	<5	<4	<6	<2	<5	<8	<5	<3	<2	<5								
	Lead212	Bq/L		-	-	-	-	-	-	<0.4	0.4	<0.4	<0.3	0.3	0.3	<0.3	0.4	<0.2	0.7	0.6	0.7	0.9	0.6	<0.3	<0.3	<0.4	<0.3								
	Radium223	Bq/L		-	-	-	-	-	-	<1	<0.8	<1	<0.8	<0.7	1	<1	<0.7	<0.7	<1	<0.9	<0.7	<1	<0.6	<0.6	<0.9	<0.7									
	Radium-226	Bq/L		-	-	-	-	0.006	0.005	0.01	<0.005	0.01	<0.005	<4	<3	<3	<4	<4	<4	<5	<5	<5	<5	<4	<5	<5	<4								
	Thallium208	Bq/L		-	-	-	-	-	-	<0.2	<0.3	<0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.3	<0.2	0.4	<0.3	<0.3	<0.2	0.3	<0.2								
	BTEx	Benzene	µg/L	1	40	370	4000	-	<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							
		Ethylbenzene	µg/L	1	200	90	2000	-	<1	<1	<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							
Styrene		µg/L	1	72	72	720	-	-	<1	<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								
Toluene		µg/L	1	0.5	2	390	-	<1	<1	<0.5	<0.5	<																							

Table 2-A: Surface Water Analytical Results

						Sampling Location		LBCH-002																									
						Sampling Date		14/07/2014	05/11/2014	24/03/2015	26/05/2015	26/05/2015	04/08/2015	03/11/2015	22/03/2016	11/05/2016	11/05/2016	28/06/2016	23/08/2016	09/11/2016	21/03/2017	21/03/2017	24/05/2017	08/08/2017	08/11/2017	26/03/2018	23/05/2018	12/09/2018					
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)																											
Chem Group	Paramter	Unit	DL																														
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	17.8	6.2	5	27	21	39	12	<5	30	33	20	25	5.914	2.852	2.239	35	41	5	3	22	11						
	Antimony (Filtered)	µg/L	0	9	-	200	0.079	0.06	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.031	0.029	0.029	0.072	0.05	0.03	0.09	0.04	0.09						
	Arsenic (Filtered)	µg/L	0	-	-	50	0.31	0.175	0.152	0.3	0.3	0.3	<0.2	<0.2	0.3	0.3	0.3	0.3	0.031	0.029	0.029	0.072	0.05	0.03	0.2	0.2	0.2						
	Barium (Filtered)	µg/L	0	1000	-	10000	34.9	39.2	43.1	23	24	29	39	40	21	21	34	32	38.1	38.8	39.8	17.7	32.8	45.3	42.4	21.3	34.2						
	Beryllium (Filtered)	µg/L	0	0.13	-	53	<0.01	<0.01	<0.01	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05						
	Bismuth (Filtered)	µg/L	0	-	-	-	<0.01	<0.01	<0.01	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1						
	Boron (Filtered)	µg/L	1	-	-	-	23.9	22	24.5	15	14	20	27	19	14	15	26	25	24	20	19	11	25	27	19	13	25						
	Cadmium (Filtered)	µg/L	0	-	-	0.1 0.3 0.5 0.6	0.0115	0.0078	0.0092	<0.01	<0.01	0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	<0.01	<0.01	<0.01	<0.01						
	Calcium (Filtered)	mg/L	0	-	-	-	42.1	62.7	65.8	28.6	29	38.7	64.5	73.4	29	29	51.3	52.1	73	75	74.3	20	45	83	77	30	56						
	Chromium (Filtered)	µg/L	0	-	-	10	0.28	0.12	0.13	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.091	<0.05	<0.05	0.284	0.22	0.06	<0.05	<0.05	<0.05						
	Cobalt (Filtered)	µg/L	0	-	-	9	0.181	0.101	0.0619	0.16	0.16	0.1	0.08	0.04	0.16	0.16	0.03	0.04	0.063	0.033	0.024	0.16	0.08	0.06	0.04	0.07	0.05						
	Copper (Filtered)	µg/L	0	-	-	20 30 40 50 60 70 80 90	1.35	0.48	0.38	1	1	1	<1	<1	1.4	1.4	0.7	0.7	<0.5	<0.5	0.5	1.5	0.7	<0.5	<0.5	1	<0.5						
	Iron (Filtered)	mg/L	0	-	-	-	0.0392	0.0155	0.0055	0.068	0.054	0.071	0.021	0.006	0.235	0.238	0.026	0.039	0.016	0.006	0.006	0.152	0.064	0.015	0.007	0.085	0.013						
	Lead (Filtered)	µg/L	0	-	-	40 50 60 110 160	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.015	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	0.06	<0.01						
	Lithium (Filtered)	µg/L	0	-	-	-	5.78	7	6.95	5	5	6	8	7	4	4	7	9	7.9	7.3	7.6	2.9	7.3	8.9	6.8	3.6	6.7						
	Magnesium (Filtered)	mg/L	0	-	-	-	10.8	17.5	20.6	8.77	8.96	11.4	18.1	20.3	8.5	8.5	14.6	14.7	21.2	21.5	21.4	5.7	14	25	22	8.9	16						
	Manganese (Filtered)	µg/L	0	-	-	-	18.5	18.6	7.78	12	13	7	20	7	16	16	6	5	10	7	7	13	7	19	7	5	8						
	Mercury (Filtered)	µg/L	0	-	-	1	-	<0.01	<0.005	<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							
	Molybdenum (Filtered)	µg/L	0	-	-	10000	0.529	1.03	1.1	0.59	0.61	0.61	0.92	0.9	0.5	0.5	0.8	0.7	0.887	0.9	0.895	<0.02	0.72	1.09	1.05	0.5	0.81						
	Nickel (Filtered)	µg/L	0	-	-	250 650 1100 1500	3.1	1.62	1.08	3	3	3	2	<1	3	3	2	2	1.5	0.9	0.9	2.8	2.2	1.5	1	2	1.9						
	Potassium (Filtered)	mg/L	0	-	-	-	0.888	0.929	1.04	0.7	0.7	0.7	0.9	1	0.8	0.8	1	0.9	1	1	1	0.82	0.71	1.2	0.93	0.83	0.79						
	Selenium (Filtered)	µg/L	0	2	-	10	1.69	1.83	2.06	1.5	1.3	1.4	1.9	2.2	1.3	1.4	1.6	1.5	2.4	2.1	2.2	0.7	1.6	2.1	2.3	0.8	1.6						
	Silicon (Filtered)	µg/L	5	-	-	-	2260	2110	2780	1930	1950	2150	2220	2400	1840	1840	2160	1580	2290	2600	2630	1300	1900	2600	2500	1800	1900						
	Silver (Filtered)	µg/L	0	-	-	0.5 15	<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						
	Sodium ion (Filtered)	mg/L	0	-	-	-	3.5	5.73	6.1	2.8	2.9	4	6.5	6	3	3	5.3	6.2	6.8	5.9	7.2	1.6	4.6	7.1	5.2	3	4.7						
	Strontium (Filtered)	µg/L	0	-	-	-	82.5	115	133	60	59	68	104	119	51	52	86	83	104.5	110.8	108.4	35.4	80.9	138	128.7	50.4	94.9						
	Sulfur, elemental (Filtered)	µg/L	20	-	-	-	16,400	29,600	34,600	13,700	13,900	18,000	30,500	33,000	12,600	12,300	23,900	26,500	36,700	34,400	34,100	8600	23,000	42,000	34,000	14,000	25,000						
	Tellurium (Filtered)	µg/L	0	-	-	-	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05						
	Thallium (Filtered)	µg/L	0	-	-	3	0.0049	<0.004	<0.004	<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						
	Thorium (Filtered)	µg/L	0	-	-	-	0.011	<0.01	<0.01	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.05	<0.05	<0.05	0.07	0.08	<0.05	<0.05	0.08	0.06						
	Tin (Filtered)	µg/L	0	-	-	-	<0.05	<0.05	<0.05	<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						
	Titanium (Filtered)	µg/L	0	-	-	1000	0.3	<0.2	<0.2	<10	<10	<10	10	<10	<10	<10	<10	<10	11	11	11	4	8	17	9	4	5						
	Uranium (Filtered)	µg/L	0	-	-	3000	0.633	0.918	0.985	0.4	0.4	0.5	0.9	1.1	<0.4	<0.4	0.6	0.6	0.971	1.139	1.08	0.255	0.58	1.1	1.14	0.32	0.73						
	Vanadium (Filtered)	µg/L	0	-	-	-	0.24	<0.2	<0.2	0.27	0.2	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	0.06	<0.05	<0.05	0.16	0.06	<0.05	<0.05	0.1	<0.05					
Zinc (Filtered)	µg/L	1	-	-	75 150 900 1650 2400	<1	2.3	1.7	2	1	3	1	<1	1.4	1.3	0.6	4	1	1	1.2	<0.5	0.8	<0.5	0.9	1	<0.5							
Zirconium (Filtered)	µg/L	0	-	-	-	0.137	0.055	0.034	0.19	0.15	0.26	<0.1	0.1	0.2	0.6	<0.1	<0.1	0.1	<0.1	<0.1	0.2	0.3	<0.1	0.1	0.2	0.1							
Radionuclides	Actinium228	Bq/L		-	-	-	-	-	-	-	<0.8	<0.8	<0.9	-	-	<0.5	<0.9	<0.8	1	1	<0.9	<0.9	<0.4	<0.7	<0.9	<0.9							
	Radon219	Bq/L		-	-	-	-	-	-	-	<0.8	<1	<0.7	-	-	<1	<1	<2	<1	<1	<0.9	<0.8	<0.8	<0.5	<1	<1							
	Thorium227	Bq/L		-	-	-	-	-	-	<0.6	<1	<0.7	-	-	<0.8	<1	<1	<0.9	<0.7	<1	<1	<0.8	<0.5	<1	<0.9								
	Bismuth212	Bq/L		-	-	-	-	-	-	<1	<0.8	2	-	-	<2	<2	<3	3	<2	<2	<2	<2	<1	<0.8	<2								
	Lead-210	Bq/L		-	-	-	-	-	-	<1	<0.6	<3	-	-	<4	<3	<4	<4	<3	<5	<4	<4	<5	<4	<4								
	Lead211	Bq/L		-	-	-	-	-	-	<2	<2	<5	-	-	<6	<3	<6	<4	<5	<2	<2	<2	<2	<3	<5								
	Lead212	Bq/L		-	-	-	-	-	-	<2	<3	0.3	-	-	0.5	<0.3	<0.4	0.7	1	<0.8	0.9	0.6	<0.4	<0.3	<0.3								
	Radium223	Bq/L		-	-	-	-	-	-	<0.4	<0.4	<0.9	-	-	<0.6	0.7	<1	<0.7	<0.9	<0.5	<1	<0.8	<0.9	<0.8	<0.7								
	Radium-226	Bq/L		-	-	-	-	0.008	0.009	<0.005	0.02	<0.6	<0.8	<4	-	-	<4	<4	<5	<4	<5	<4	<4	<4	<4								
	Thallium208	Bq/L		-	-	-	-	-	-	<0.3	<0.2	<0.2	-	-	<0.2	<0.2	<0.3	0.3	0.3	0.3	<2	<0.2	<0.2	<0.2	<0.3								
BTEx	Benzene	µg/L	1	40	370	4000	-	<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							
	Ethylbenzene	µg/L	1	200	90	2000	-	<1	<1	<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								
	Styrene	µg/L	1	72	72	720	-	-	<1	<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								
	Toluene	µg/L	1	0.5	2	390	-	<1	<1	<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								
	Xylenes, total	µg/L	1	30	-	-	-	<2	<2	<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								
VOCs	Methyl tert-butyl ether [MTBE]	µg/L	1	1000	10000	-	-	-	<1	<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							
VPH	VHw6-10	µg/L	50	-	-	15																											

Table 2-A: Surface Water Analytical Results

				Sampling Location		LBCH-I-001												LBCH-I-002										LBCH-I-003		SPX-Creek
				Sampling Date		28/06/2016	23/08/2016	23/08/2016	09/11/2016	24/05/2017	08/08/2017	08/08/2017	08/11/2017	23/05/2018	12/09/2018	28/06/2016	23/08/2016	09/11/2016	24/05/2017	24/05/2017	08/08/2017	08/11/2017	23/05/2018	12/09/2018	23/08/2017	23/08/2017				
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)																								
Chem Group	Paramter	Unit	DL																											
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	9	6	6	5.725	22	17	20	5	12	5	9	<5	3.874	34	36	17	2	16	3	3	1			
	Antimony (Filtered)	µg/L	0	9	-	200	<0.2	<0.2	<0.2	0.053	0.095	0.07	0.06	0.05	0.06	0.04	<0.2	<0.2	0.063	0.136	0.13	0.11	0.06	0.09	0.1	0.09	0.07			
	Arsenic (Filtered)	µg/L	0	-	-	50	0.6	0.8	0.7	0.4	0.4	0.7	0.8	0.4	0.4	0.6	0.6	0.8	0.5	0.5	0.6	0.4	0.5	0.4	0.3	0.2				
	Barium (Filtered)	µg/L	0	1000	-	10000	48	47	45	46.3	36.7	45.4	45.4	50.6	35.2	49.3	64	65	57.2	40.7	40.8	64	64.8	47	54.4	71.7	35			
	Beryllium (Filtered)	µg/L	0	0.13	-	53	<0.04	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
	Bismuth (Filtered)	µg/L	0	-	-	-	<1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
	Boron (Filtered)	µg/L	1	-	-	-	45	46	48	39	37	43	47	37	35	40	58	49	40	38	36	51	42	36	48	30	6			
	Cadmium (Filtered)	µg/L	0	-	-	0.1 0.3 0.5 0.6	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02	0.014	0.025	0.023	0.02	0.01	0.01	0.01	0.01	0.02			
	Calcium (Filtered)	mg/L	0	-	-	-	54.5	67.6	68.3	67.5	35	44	43	65	36	64	69.5	74.7	83.5	36	37	63	83	47	81	96	120			
	Chromium (Filtered)	µg/L	0	-	-	10	<0.4	<0.4	<0.4	0.138	0.212	0.25	0.13	0.13	<0.05	0.07	<0.4	<0.4	0.086	0.218	0.305	0.07	<0.05	<0.05	<0.05	0.09	0.07			
	Cobalt (Filtered)	µg/L	0	-	-	9	0.09	0.11	0.11	0.098	0.124	0.13	0.13	0.11	0.09	0.12	0.15	0.23	0.27	0.306	0.308	0.27	0.24	0.21	0.17	0.04	0.02			
	Copper (Filtered)	µg/L	0	-	-	20 30 40 50 60 70 80 90	1.1	0.9	0.9	0.8	1.1	0.97	0.9	0.8	1	0.6	1.8	0.8	1	2.2	2.2	1.7	0.96	1.6	0.9	1.3	<0.5			
	Iron (Filtered)	mg/L	0	-	-	-	0.463	0.519	0.501	0.364	0.359	0.821	0.829	0.478	0.396	0.532	0.118	0.209	0.116	0.183	0.193	0.248	0.134	0.213	0.111	0.02	0.007			
	Lead (Filtered)	µg/L	0	-	-	40 50 60 110 160	<0.1	<0.1	<0.1	0.014	0.06	<0.01	<0.01	0.02	0.05	<0.01	<0.1	<0.1	0.014	0.066	0.073	<0.01	0.02	0.08	<0.01	<0.01	0.01			
	Lithium (Filtered)	µg/L	0	-	-	-	14	15	16	16.6	8.7	12.2	12.7	14.4	9.5	13.9	16	31	18.7	6	6.2	15.1	22.9	7.5	17.9	5.2	1.1			
	Magnesium (Filtered)	mg/L	0	-	-	-	16.2	18.3	18.5	20.5	11	14	14	21	12	18	24.6	22.7	30.5	14	14	23	30	19	27	16	18			
	Manganese (Filtered)	µg/L	0	-	-	-	17	26	27	41	15	17	17	46	9	27	44	149	76	18	18	36	107	13	50	3	<1			
	Mercury (Filtered)	µg/L	0	-	-	1	<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				
	Molybdenum (Filtered)	µg/L	0	-	-	10000	0.4	0.5	0.5	0.413	<0.02	0.36	0.33	0.42	0.31	0.45	0.9	0.7	0.619	<0.02	<0.02	0.77	0.73	0.65	0.7	2.09	1.44			
	Nickel (Filtered)	µg/L	0	-	-	250 650 1100 1500	2	2	2	1.4	1.8	2	1.9	1.7	1.6	1.6	3	2	2.5	3.1	3.1	3.5	2.1	3	2.6	1.5	1.1			
	Potassium (Filtered)	mg/L	0	-	-	-	1.5	1.4	1.5	1.2	1.2	0.99	0.97	1.3	1.4	1.2	2.7	4.7	2.6	1.4	1.4	2.1	3.4	1.7	2.7	1.6	0.78			
	Selenium (Filtered)	µg/L	0	2	-	10	<0.6	<0.6	0.6	0.8	1.4	0.5	0.6	0.6	0.4	0.7	<0.6	<0.6	0.3	0.3	0.3	0.3	0.3	0.3	0.3	1.5	6.2			
	Silicon (Filtered)	µg/L	5	-	-	-	2880	3380	3420	3470	2200	2900	2800	3400	2200	2900	2850	3300	3060	2500	2500	2900	3200	2700	2800	2900	1900			
	Silver (Filtered)	µg/L	0	-	-	0.5 15	<0.01	<0.01	<0.01	0.075	<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				
	Sodium ion (Filtered)	mg/L	0	-	-	-	13.1	14.6	14.7	16.5	7.6	10	9.8	15	10	12	25.7	61.5	36.1	11	11	19	43	16	30	5.8	0.4			
	Strontium (Filtered)	µg/L	0	-	-	-	143	156	156	154.6	86.1	123.7	124.7	176.5	99.3	168.3	189	241	208.8	86.1	86.5	176.5	266.7	114.2	218	107.8	98.8			
	Sulfur, elemental (Filtered)	µg/L	20	-	-	-	17,900	19,700	19,600	28,600	17,000	15,000	14,000	26,000	15,000	21,000	29,200	41,500	37,700	14,000	14,000	25,000	39,000	18,000	28,000	39,000	75,000			
	Tellurium (Filtered)	µg/L	0	-	-	-	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05			
	Thallium (Filtered)	µg/L	0	-	-	3	<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				
	Thorium (Filtered)	µg/L	0	-	-	-	<0.4	<0.4	<0.4	0.153	0.092	0.25	0.17	<0.05	0.18	<0.05	<0.4	<0.4	<0.05	0.117	0.109	0.1	0.19	0.12	<0.05	0.11	0.19			
	Tin (Filtered)	µg/L	0	-	-	-	<0.1	<0.1	<0.1	0.2	<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				
	Titanium (Filtered)	µg/L	0	-	-	1000	<10	<10	<10	10	8	8	8	14	5	6	<10	<10	12	9	8	11	17	6	7	16	18			
	Uranium (Filtered)	µg/L	0	-	-	3000	0.5	0.6	0.5	0.626	0.379	0.33	0.33	0.53	0.28	0.65	1.2	1	1.409	0.801	0.793	1.16	1.38	0.93	1.29	1.16	1.68			
	Vanadium (Filtered)	µg/L	0	-	-	-	0.2	<0.1	<0.1	0.104	0.198	0.23	0.24	0.07	0.16	0.07	0.1	<0.1	0.073	0.282	0.301	0.21	<0.05	0.23	<0.05	0.07	0.12			
	Zinc (Filtered)	µg/L	1	-	-	75 150 900 1650 2400	<0.5	0.5	0.6	4.9	0.6	1.1	0.8	0.7	0.9	<0.5	0.7	0.8	4.7	0.9	0.97	1	0.6	1.1	<0.5	0.9	1.3			
	Zirconium (Filtered)	µg/L	0	-	-	-	0.3	0.4	0.3	1.2	0.4	0.7	0.6	0.3	0.4	0.3	0.4	0.2	0.4	0.6	0.6	0.7	0.4	0.5	0.3	0.3	0.2			
Radionuclides	Actinium228	Bq/L		-	-	-	<0.6	<1	<1	<0.7	<1	<1	<0.7	<0.5	<0.7	<0.8	0.7	<0.4	<1	<0.9	<0.4	<0.7	0.9	<0.9	<0.8	1	<1			
	Radon219	Bq/L		-	-	-	<0.8	<2	<0.9	<1	<2	<1	<0.9	<2	<1	<1	<1	<0.9	<2	<1	<1	<1	<0.6	<0.6	<0.7	<1	<1			
	Thorium227	Bq/L		-	-	-	<0.7	<0.8	<1	<1	<0.7	<1	<0.4	<1	<0.8	<1	<1	<1	<1	<1	<0.9	<1	<0.4	<1	<1	<1				
	Bismuth212	Bq/L		-	-	-	<2	<1	<3	<2	<3	<1	2	<2	<1	<2	<2	<1	<2	<2	<2	<2	1	2	<2	<2	<1			
	Lead-210	Bq/L		-	-	-	<3	<4	<4	<3	<4	<4	<4	<4	<3	<4	<4	<4	<4	<4	<4	<2	<4	<5	<4	<5				
	Lead211	Bq/L		-	-	-	<4	<4	<5	<5	<7	<2																		

Table 2-B: Surface Water Analytical Results

						Sampling Location	BEVR-001							LBCH-001					
						Sampling Date	14/07/2014	05/11/2014	24/03/2015	26/05/2015	04/08/2015	04/08/2015	03/11/2015	14/07/2014	05/11/2014	24/03/2015	26/05/2015	04/08/2015	03/11/2015
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long	Yukon CSR Schedule 3 AW (Fresh)													
Chemical Goup	Parameter	Unit	DL																
PAH	1,4,6,7-tetramethylnaphthalene	µg/L	0	-	-	-	0.000674	0.00011	<0.000139	0.000574	0.000695	0.00076	<0.000177	0.00178	0.000101	<0.000193	0.00136	0.00103	<0.000348
	1,8-dimethylphenanthrene	µg/L	0	-	-	-	0.000561	<0.0000235	<0.000281	0.000369	0.000575	0.000536	<0.0000725	0.00105	<0.000042	<0.0000941	0.000709	0.000512	<0.0000743
	1-methylphenanthrene	µg/L	0	-	-	-	0.00373	0.000416	<0.000625	0.00229	0.00367	0.00328	0.000462	0.00683	0.0004	<0.000645	0.00481	0.00346	0.000458
	2-methylantracene	µg/L	0	-	-	-	0.000122	0.00008	<0.000653	0.000768	0.000796	0.000673	<0.000152	0.000189	<0.0000396	<0.000674	0.0006	0.000664	0.000114
	3-methylphenanthrene	µg/L	0	-	-	-	0.00455	0.00033	<0.000638	0.00158	0.00339	0.00314	0.000588	0.0063	0.000451	<0.000658	0.00304	0.00322	0.00053
	Acenaphthene	µg/L	0	6	5.8	-	<0.000129	<0.000113	<0.000218	<0.000321	0.00041	0.000274	<0.000244	0.000232	<0.000139	<0.000205	0.000538	0.000558	0.000383
	Acenaphthylene	µg/L	0	-	-	-	<0.0000931	0.000108	<0.000118	<0.000181	0.000121	0.00012	<0.000151	<0.000109	0.000095	<0.0000919	<0.000138	0.000157	<0.000226
	Anthracene	µg/L	0	4	0.012	1	<0.0002	0.000081	<0.000268	0.000226	0.000082	0.000089	<0.0000743	0.000188	0.00009	<0.000221	0.000593	0.000316	<0.000089
	Benz(a)anthracene	µg/L	0	0.1	0.018	1	0.000337	0.000095	0.000099	0.000264	0.000433	0.000443	0.000085	0.00113	0.000148	<0.0000957	0.000818	0.000629	0.00013
	Benzo(a)pyrene	µg/L	0	0.01	0.015	0.1	0.000484	<0.000033	<0.00029	0.000267	0.000422	0.000324	<0.000124	0.00114	0.000072	<0.000282	0.000717	0.000539	<0.000178
	Benzo(b)fluoranthene	µg/L	0	-	-	-	0.00495	0.000258	<0.000181	0.00237	0.00495	0.0049	0.000758	0.00391	0.000205	<0.000176	0.00273	0.00211	0.000185
	Benzo(e)pyrene	µg/L	0	-	-	-	0.00564	0.000241	<0.000293	0.00236	0.00521	0.00486	0.000606	0.00701	0.00025	0.000308	0.00473	0.00356	0.000285
	Benzo(g,h,i)perylene	µg/L	0	-	-	-	0.00252	0.000174	0.000174	0.00105	0.00247	0.00238	0.000302	0.00583	0.000285	<0.000316	0.0037	0.00286	0.000439
	Benzo(j,k)fluoranthenes	µg/L	0	-	-	-	0.000362	<0.0000241	<0.000177	0.000226	0.00032	0.000428	0.00013	0.000774	<0.0000222	<0.000182	0.000213	0.000461	<0.000134
	Chrysene	µg/L	0	-	-	-	0.00867	0.000504	0.000283	0.00415	0.00806	0.00774	0.00103	0.0074	0.000398	0.000359	0.00472	0.0038	0.000407
	Dibenz(a,h)anthracene	µg/L	0	-	-	-	0.00049	<0.0000244	<0.000251	0.00023	0.000514	0.000478	0.000088	0.000641	<0.0000515	<0.000436	0.000468	0.000405	<0.0000892
	Dimethylnaphthalene, 2,6-	µg/L	0	-	-	-	0.00449	0.000292	<0.000327	0.00175	0.00322	0.00347	0.000619	0.009	0.000237	<0.000374	0.00535	0.00459	0.000985
	Dimethylphenanthrene, 1,7-	µg/L	0	-	-	-	0.00164	0.000167	<0.000276	0.000639	0.00152	0.00142	0.000251	0.00305	0.000165	<0.0000926	0.00113	0.00147	0.000226
	Dimethylphenanthrene, 3,6-	µg/L	0	-	-	-	0.0011	0.000084	<0.000286	0.000495	0.00082	0.000749	0.000138	0.00164	0.000128	<0.0000957	0.000732	0.00076	0.000143
	Fluoranthene	µg/L	0	4	0.04	2	0.00215	0.000705	0.000314	0.00133	0.00212	0.00211	0.000853	0.0027	0.000785	0.000365	0.00198	0.00307	0.000823
	Fluorene	µg/L	0	12	3	120	0.00105	0.000365	<0.000384	0.000807	0.000798	0.00086	0.00041	0.00213	0.00036	<0.0004	0.00169	0.00128	0.000348
	Indeno(1,2,3-cd)pyrene	µg/L	0	-	-	-	0.000586	<0.0000431	<0.000199	0.000348	0.000564	0.00056	0.000103	0.00105	0.00006	<0.000609	0.00078	0.000629	<0.000141
	Methylnaphthalene, 1-	µg/L	0	-	-	-	0.00455	0.000735	0.000417	0.00258	0.00338	0.00314	0.000827	0.0133	0.000754	0.000785	0.00861	0.00692	0.00188
	Methylnaphthalene, 2-	µg/L	0	-	-	-	0.00683	0.00119	0.000699	0.00318	0.00475	0.00427	0.00135	0.0166	0.00114	0.00106	0.0107	0.00884	0.00295
	Methylphenanthrene, 2-	µg/L	0	-	-	-	0.00662	0.000539	<0.000633	0.00261	0.00513	0.00466	0.000765	0.00851	0.000507	<0.000654	0.00503	0.00432	0.000496
	Naphthalene	µg/L	0	-	1.1	10	0.00492	0.00317	0.00148	0.00801	0.00472	0.00467	0.00368	0.00901	0.00315	0.00183	0.00928	0.0076	0.0121
	Perylene	µg/L	0	-	-	-	0.00406	0.000253	<0.000326	0.00164	0.00384	0.00376	0.000394	0.0149	0.000527	0.000586	0.00754	0.00514	0.000759
	Phenanthrene	µg/L	0	0.3	0.4	3	0.0135	0.00213	0.000774	0.00682	0.0098	0.0096	0.00267	0.0155	0.00197	0.00109	0.00953	0.0125	0.00172
	Pyrene	µg/L	0	-	0.025	0.2	0.00303	0.000408	0.000281	0.00176	0.00325	0.00322	0.000744	0.00425	0.000434	0.000391	0.00271	0.00347	0.00177
	Retene	µg/L	0	-	-	-	0.00429	0.000873	<0.000378	0.00787	0.00238	0.00217	0.000567	0.00459	0.000779	<0.00046	0.00444	0.00342	0.000493
	Trimethylphenanthrene, 1,2,6-	µg/L	0	-	-	-	0.00045	<0.0000553	<0.000231	0.000211	0.000465	0.000467	<0.0000757	0.000747	<0.000052	<0.00017	0.000429	0.000462	<0.000106
	12-Dimethylnaphthalene	ng/L	0	-	-	-	1.02	<0.242	<0.387	<0.516	0.847	0.684	<0.487	3.16	0.207	<0.443	2.76	1.7	<0.739
	C2-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	14.8	0.854	<0.22	6.77	11.1	13.9	1.95	28.5	1.14	0.976	14.9	12.9	2.42
	C2-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	13.8	0.581	<0.281	6.28	11.5	10.9	1.52	20.7	0.745	0.439	12	10.4	1.64
	3-Methylfluoranthene-Benzo-a-fluorene	ng/L	0	-	-	-	5.42	0.507	<0.374	2.33	4.63	4.56	0.497	10.2	0.504	0.27	5.65	4.67	0.444
	C4-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	1.78	<0.0542	<0.22	0.168	1.5	1.85	0.124	6.83	<0.0425	<0.177	1.04	1.48	0.606
	C4-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	20.4	1.23	1	15.9	19.6	22.8	2.62	30.3	1.67	1.33	18.5	17.9	4.24
	17-Dimethylfluorene	ng/L	0	-	-	-	0.415	<0.113	<0.474	0.311	1.09	2.76	<0.282	3.22	<0.151	<0.618	1.83	1.68	<0.263
	56-Methylchrysene	ng/L	0	-	-	-	0.533	0.042	<0.124	0.234	0.497	0.518	<0.0699	0.974	0.033	<0.104	0.35	0.473	<0.072
	59-Dimethylchrysene	ng/L	0	-	-	-	1.06	<0.0194	<0.125	0.263	0.82	0.945	<0.0994	1.7	0.019	<0.179	0.652	0.635	<0.115
	7-Methylbenzo-a-pyrene	ng/L	0	-	-	-	0.474	<0.0605	<0.395	<0.172	0.585	0.436	<0.201	0.671	<0.085	<0.339	0.336	0.348	<0.661
	94-Methylphenanthrene</																		

Table 2-B: Surface Water Analytical Results

						Sampling Location	LBCH-002						
						Sampling Date	14/07/2014	05/11/2014	24/03/2015	26/05/2015	26/05/2015	04/08/2015	03/11/2015
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long	Yukon CSR Schedule 3 AW (Fresh)							
Chemical Goup	Parameter	Unit	DL										
PAH	1,4,6,7-tetramethylnaphthalene	µg/L	0		-	-	0.00163	<0.000121	<0.000217	0.00114	0.00226	0.00168	<0.000167
	1,8-dimethylphenanthrene	µg/L	0	-	-	-	0.000977	<0.0000644	<0.000168	0.000627	0.000667	0.000502	0.000108
	1-methylphenanthrene	µg/L	0	-	-	-	0.00663	0.000483	<0.000827	0.00474	0.00578	0.00386	0.000675
	2-methylantracene	µg/L	0	-	-	-	0.000162	<0.000051	<0.000864	0.00093	0.0015	0.000954	<0.000115
	3-methylphenanthrene	µg/L	0	-	-	-	0.00579	0.000433	<0.000844	0.00313	0.00381	0.00303	0.000778
	Acenaphthene	µg/L	0	6	5.8	-	0.00046	0.000171	<0.000279	0.000483	0.000673	0.000959	<0.000315
	Acenaphthylene	µg/L	0	-	-	-	<0.000099	0.000097	<0.00012	<0.000102	<0.0000761	0.000646	<0.000158
	Anthracene	µg/L	0	4	0.012	1	0.000174	0.000108	<0.000214	0.000902	0.000789	0.000508	<0.0000957
	Benz(a)anthracene	µg/L	0	0.1	0.018	1	0.0011	0.000105	<0.000122	0.000856	0.000973	0.000993	0.000187
	Benzo(a)pyrene	µg/L	0	0.01	0.015	0.1	0.00133	0.000091	<0.000271	0.000767	0.00093	0.000974	<0.000174
	Benzo(b)fluoranthene	µg/L	0	-	-	-	0.00416	0.000263	<0.000177	0.00292	0.00326	0.00267	0.000418
	Benzo(e)pyrene	µg/L	0	-	-	-	0.00705	0.00032	<0.000274	0.00466	0.00522	0.00448	0.000621
	Benzo(g,h,i)perylene	µg/L	0	-	-	-	0.00621	0.000285	<0.000243	0.00387	0.00427	0.00371	0.000525
	Benzo(j,k)fluoranthenes	µg/L	0	-	-	-	0.000798	0.000055	<0.000178	0.000308	0.000564	0.001	<0.000134
	Chrysene	µg/L	0	-	-	-	0.00698	0.000443	0.000326	0.00486	0.00578	0.00429	0.000638
	Dibenz(a,h)anthracene	µg/L	0	-	-	-	<0.00165	<0.000041	<0.00053	0.000383	0.000455	0.000896	<0.000132
	Dimethylnaphthalene, 2,6-	µg/L	0	-	-	-	0.00899	0.000368	<0.000526	0.00526	0.00632	0.00493	0.000864
	Dimethylphenanthrene, 1,7-	µg/L	0	-	-	-	0.00289	0.000202	<0.000166	0.00133	0.002	0.00189	0.000351
	Dimethylphenanthrene, 3,6-	µg/L	0	-	-	-	0.00153	0.000114	<0.000171	0.000783	0.00115	0.00119	0.000222
	Fluoranthene	µg/L	0	4	0.04	2	0.00282	0.00097	0.000334	0.00216	0.00217	0.00228	0.00123
	Fluorene	µg/L	0	12	3	120	0.00205	0.000328	<0.000349	0.00189	0.00183	0.00147	0.000397
	Indeno(1,2,3-cd)pyrene	µg/L	0	-	-	-	0.00121	0.000074	<0.000478	0.000788	0.000908	0.0012	0.000169
	Methylnaphthalene, 1-	µg/L	0	-	-	-	0.013	0.000991	0.000726	0.00788	0.00999	0.00729	0.00117
	Methylnaphthalene, 2-	µg/L	0	-	-	-	0.0159	0.00135	0.000948	0.00929	0.0116	0.00877	0.00172
	Methylphenanthrene, 2-	µg/L	0	-	-	-	0.00756	0.000625	<0.000838	0.00451	0.00535	0.00427	0.000802
	Naphthalene	µg/L	0	-	1.1	10	0.00854	0.00349	0.00171	0.00732	0.00838	0.0104	0.00326
	Perylene	µg/L	0	-	-	-	0.0191	0.00113	0.000518	0.00855	0.0103	0.00664	0.00197
	Phenanthrene	µg/L	0	0.3	0.4	3	0.0144	0.00243	0.000879	0.0108	0.012	0.0087	0.00261
	Pyrene	µg/L	0	-	0.025	0.2	0.00452	0.000629	0.000477	0.00322	0.00377	0.00298	0.00111
	Retene	µg/L	0	-	-	-	0.00615	0.00105	<0.000635	0.00449	0.00519	0.00371	0.000887
	Trimethylphenanthrene, 1,2,6-	µg/L	0	-	-	-	0.000752	<0.0000606	<0.000195	0.000393	0.000485	0.000874	<0.000102
	12-Dimethylnaphthalene	ng/L	0	-	-	-	3.01	0.164	<0.623	2.69	3.41	2.19	<0.376
	C2-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	26.3	1.33	0.584	16	17	13.8	2.86
	C2-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	20.3	0.877	0.198	12.5	13.7	10.3	2.51
	3-Methylfluoranthene-Benzo-a-fluorene	ng/L	0	-	-	-	10.1	0.655	<0.384	5.52	6.42	4.79	0.657
	C4-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	4.32	0.233	<0.181	1.7	1.81	1.94	0.454
	C4-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	32.9	2.45	1.24	17.2	18.8	20.6	2.72
	17-Dimethylfluorene	ng/L	0	-	-	-	0.382	<0.0967	<0.599	0.201	0.306	2.69	0.154
	56-Methylchrysene	ng/L	0	-	-	-	0.982	0.044	<0.104	0.341	0.438	0.737	<0.111
	59-Dimethylchrysene	ng/L	0	-	-	-	1.4	0.037	<0.123	0.898	0.831	0.637	<0.103
	7-Methylbenzo-a-pyrene	ng/L	0	-	-	-	0.647	<0.0527	<0.329	0.545	0.892	0.881	<0.284
	94-Methylphenanthrene	ng/L	0	-	-	-	7.74	0.456	<0.844	4.81	5.78	3.94	0.689
	C4-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	0.32	<0.0665	<0.168	<0.114	<0.12	<0.198	0.47
	C3-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	0.65	0.144	<0.168	0.535	0.684	1.03	0.393
	23-Methyldibenzothiophenes	ng/L	0	-	-	-	2.4	0.05	<0.416	2.18	2.5	1.35	0.21
	24-Dimethyldibenzothiophene	ng/L	0	-	-	-	0.93	0.087	<0.369	0.685	0.823	1.12	<0.132
	26-Dimethylphenanthrene	ng/L	0	-	-	-	1.42	0.133	<0.168	0.788	0.587	0.79	0.224
	2-Methylfluorene	ng/L	0	-	-	-	0.964	0.177	<0.802	1.11	1.29	1.41	0.221
	C1-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	9.97	0.498	0.188	5.52	6.75	5.54	0.868
	C1-Benzofluoranthenes-Benzopyrenes	ng/L	0	-	-	-	14	0.256	<0.329	7.01	8.63	7.31	1.69
	C1-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	26	2.09	<0.384	14.2	17.1	13.6	2.76
	C1-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	27.9	2	<0.827	17.2	22.2	15.1	2.94
	C2-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	8.14	0.221	<0.123	3.18	4.39	3.48	0.687
	C2-Benzofluoranthenes-Benzopyrenes	ng/L	0	-	-	-	3.07	0.494	<0.247	2.63	2.85	2.07	0.575
	C3-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	9.81	0.454	<0.361	6.59	7.58	7.07	0.441
	C3-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	13.8	0.988	0.394	7.73	8.33	7.93	1.42
	1-Methylchrysene	ng/L	0	-	-	-	1.28	0.101	<0.0976	0.705	0.887	1.04	0.134

Table 2-B: Surface Water Analytical Results

						Sampling Location	BEVR-001							LBCH-001					
						Sampling Date	14/07/2014	05/11/2014	24/03/2015	26/05/2015	04/08/2015	04/08/2015	03/11/2015	14/07/2014	05/11/2014	24/03/2015	26/05/2015	04/08/2015	03/11/2015
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long	Yukon CSR Schedule 3 AW (Fresh)													
Chemical Goup	Parameter	Unit	DL																
Organosulfur	C1 - Dibenzothiophenes	µg/L	0	-	-	-	0.00444	<0.0000437	<0.00036	0.00303	0.00405	0.00388	0.000489	0.00776	<0.0000733	<0.000423	0.00596	0.00344	0.000182
	C2 - Dibenzothiophenes	µg/L	0	-	-	-	0.00661	0.000829	<0.000194	0.00765	0.00905	0.00813	0.00127	0.0114	0.00076	<0.000483	0.00912	0.00784	0.00122
	C3 - Dibenzothiophenes	µg/L	0	-	-	-	0.00437	0.000601	<0.000238	0.00655	0.00849	0.00756	0.00125	0.00828	0.000914	<0.000219	0.00674	0.00637	0.00305
	Dibenzothiophene	µg/L	0	-	-	-	0.00192	0.000378	<0.00022	0.00104	0.00174	0.00159	0.000252	0.00317	0.000417	<0.000507	0.00169	0.00157	0.000205
Alkylated PAHs	C1 - Acenaphthenes	µg/L	0	-	-	-	0.000076	<0.0000564	<0.000262	<0.000265	<0.000137	0.000141	<0.000202	<0.000239	<0.0000668	<0.000223	<0.00017	0.00177	<0.000258
	C1 - Biphenyls	µg/L	0	-	-	-	0.00937	0.0011	0.00122	0.00339	0.00426	0.00415	0.000955	0.0095	0.00123	0.00131	0.00347	0.00374	0.00179
	C1 - Fluorenes	µg/L	0	-	-	-	0.00456	0.000475	<0.000502	0.00359	0.00317	0.00301	0.000953	0.00764	0.000859	0.00147	0.0043	0.00428	0.00438
	C1 - Naphthalenes	µg/L	0	-	-	-	0.0114	0.00193	0.00112	0.00577	0.00813	0.00741	0.00218	0.0299	0.0019	0.00185	0.0193	0.0158	0.00483
	C2 - Biphenyls	µg/L	0	-	-	-	0.0228	0.00323	0.00296	0.00428	0.00346	0.00316	0.00143	0.023	0.00369	0.00371	0.00342	0.00299	0.00209
	C2 - Fluorenes	µg/L	0	-	-	-	0.00626	0.000861	<0.000474	0.0028	0.00481	0.00613	0.00109	0.0106	0.000897	0.0017	0.0052	0.00587	0.00221
	C2 - Naphthalenes	µg/L	0	-	-	-	0.0196	0.00114	0.00233	0.00863	0.0151	0.0145	0.00461	0.046	0.00233	0.00402	0.0295	0.0221	0.00563
	C3 - Fluorenes	µg/L	0	-	-	-	0.00761	0.0014	<0.000355	0.00571	0.00758	0.00954	0.00229	0.011	0.00207	<0.000595	0.00686	0.00816	0.00277
	C3 - Naphthalenes	µg/L	0	-	-	-	0.0146	0.00165	0.00155	0.00699	0.0135	0.013	0.00228	0.0356	0.00225	0.00205	0.0227	0.065	0.00449
	C4 - Dibenzothiophenes	µg/L	0	-	-	-	0.00128	0.00102	0.000532	0.00347	0.00449	0.00437	0.000831	0.00372	0.000957	0.000701	0.00335	0.0039	0.00255
	C4 - Naphthalenes	µg/L	0	-	-	-	0.00789	0.00042	0.000359	0.0059	0.0095	0.00728	0.00156	0.0211	0.000635	0.000325	0.0143	0.0131	0.00616

Table 2-B: Surface Water Analytical Results

				BC WQG FW Aquatic Life - Working and Approved		CCME Protection of Aquatic Life (FAL, long		Sampling Location		LBCH-002						
								Sampling Date		14/07/2014	05/11/2014	24/03/2015	26/05/2015	26/05/2015	04/08/2015	03/11/2015
								Yukon CSR Schedule 3 AW (Fresh)								
Chemical Goup	Parameter	Unit	DL													
Organosulfur	C1 - Dibenzothiophenes	µg/L	0	-	-	-	0.0077	0.000246	<0.000416	0.00382	0.0072	0.00447	0.000548			
	C2 - Dibenzothiophenes	µg/L	0	-	-	-	0.0114	0.000699	<0.000369	0.00941	0.0115	0.00773	0.00152			
	C3 - Dibenzothiophenes	µg/L	0	-	-	-	0.00935	0.00129	<0.00029	0.00764	0.00897	0.00695	0.00198			
	Dibenzothiophene	µg/L	0	-	-	-	0.003	0.000496	<0.000396	0.00183	0.00206	0.00184	0.000206			
Alkylated PAHs	C1 - Acenaphthenes	µg/L	0	-	-	-	0.000164	<0.000144	<0.000279	<0.000195	<0.000246	0.00013	<0.000107			
	C1 - Biphenyls	µg/L	0	-	-	-	0.00853	0.00125	0.000959	0.00405	0.00539	0.00332	0.000915			
	C1 - Fluorenes	µg/L	0	-	-	-	0.00779	0.000848	<0.000802	0.00308	0.00457	0.00471	0.00135			
	C1 - Naphthalenes	µg/L	0	-	-	-	0.0289	0.00235	0.00167	0.0172	0.0216	0.0161	0.00289			
	C2 - Biphenyls	µg/L	0	-	-	-	0.0194	0.00437	0.0018	0.00403	0.00566	0.00261	0.00125			
	C2 - Fluorenes	µg/L	0	-	-	-	0.00908	0.000516	0.00141	0.00536	0.00667	0.00659	0.00182			
	C2 - Naphthalenes	µg/L	0	-	-	-	0.0458	0.00143	0.00327	0.0278	0.0402	0.0225	0.00545			
	C3 - Fluorenes	µg/L	0	-	-	-	0.00903	0.00134	<0.000689	0.00761	0.00904	0.00779	0.00296			
	C3 - Naphthalenes	µg/L	0	-	-	-	0.0356	0.00327	0.00166	0.0232	0.0293	0.0211	0.00384			
	C4 - Dibenzothiophenes	µg/L	0	-	-	-	0.00473	0.00119	0.000937	0.00493	0.00398	0.00369	0.00171			
	C4 - Naphthalenes	µg/L	0	-	-	-	0.0123	0.00113	0.000745	0.0158	0.0266	0.0151	0.00234			

Table 2-B: Surface Water Analytical Results

						Sampling Location	BEVR-001							LBCH-001					
						Sampling Date	14/07/2014	05/11/2014	24/03/2015	26/05/2015	04/08/2015	04/08/2015	03/11/2015	14/07/2014	05/11/2014	24/03/2015	26/05/2015	04/08/2015	03/11/2015
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long	Yukon CSR Schedule 3 AW (Fresh)													
Chemical Goup	Parameter	Unit	DL																
	C12H18O2	ng/L	0	-	-	-	8.03	5.94	<4.96	<5.54	-	-	-	-	-	12.1	9.88	<5.28	-
	C12H20O2	ng/L	0	-	-	-	14.20	15.3	<4.96	<5.54	-	-	-	-	-	17.1	21.7	9.71	-
	C12H22O2	ng/L	0	-	-	-	<4.96	24.2	<4.96	<5.54	-	-	-	-	-	8.23	28.4	<5.28	-
	C12H24O2	ng/L	0	-	-	-	<4.96	46.3	<4.96	<5.54	-	-	-	-	-	<5.04	43.2	<5.28	-
	C13H20O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	8.52	12.6	8.92	-
	C13H22O2	ng/L	0	-	-	-	11.50	16.9	<4.96	<5.54	-	-	-	-	-	14.6	28.8	13.5	-
	C13H24O2	ng/L	0	-	-	-	<4.96	18.7	<4.96	<5.54	-	-	-	-	-	<5.04	20.2	<5.28	-
	C13H26O2	ng/L	0	-	-	-	24.70	43.4	10.5	6.49	-	-	-	-	-	16.3	37.2	<5.28	-
	C14H20O2	ng/L	0	-	-	-	7.52	8.04	<4.96	<5.54	-	-	-	-	-	8.58	12.1	<5.28	-
	C14H22O2	ng/L	0	-	-	-	9.37	9.39	<4.96	<5.54	-	-	-	-	-	12.7	26	20.4	-
	C14H24O2	ng/L	0	-	-	-	10.50	11	<4.96	<5.54	-	-	-	-	-	14.7	21.5	14.3	-
	C14H26O2	ng/L	0	-	-	-	<4.96	15.1	<4.96	<5.54	-	-	-	-	-	<5.04	14	<5.28	-
	C14H28O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-
	C15H18O2	ng/L	0	-	-	-	35.20	9.34	<4.96	6.44	-	-	-	-	-	25.7	8.66	6.69	-
	C15H20O2	ng/L	0	-	-	-	<4.96	<4.92	6.12	<5.54	-	-	-	-	-	<5.04	7.56	10.1	-
	C15H22O2	ng/L	0	-	-	-	36.30	14.7	6.72	<5.54	-	-	-	-	-	25.9	16.6	10.8	-
	C15H24O2	ng/L	0	-	-	-	91.60	31.8	8.92	<5.54	-	-	-	-	-	63.5	49	29.4	-
	C15H26O2	ng/L	0	-	-	-	21.90	15.9	<4.96	<5.54	-	-	-	-	-	23.7	23.2	15.7	-
	C15H28O2	ng/L	0	-	-	-	<4.96	7.42	<4.96	<5.54	-	-	-	-	-	<5.04	6.31	<5.28	-
	C15H30O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-
	C16H20O2	ng/L	0	-	-	-	49.20	23.4	25.8	26.4	-	-	-	-	-	36.7	22.1	24.8	-
	C16H22O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<7.22	8.63	9.06	-
	C16H24O2	ng/L	0	-	-	-	<4.96	383	<4.96	<5.54	-	-	-	-	-	8.04	1320	78.6	-
	C16H26O2	ng/L	0	-	-	-	37.20	10.4	5.37	<5.54	-	-	-	-	-	49.6	33.7	28	-
	C16H28O2	ng/L	0	-	-	-	<4.96	9.93	<4.96	<5.54	-	-	-	-	-	<5.04	19.9	13.2	-
	C16H30O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-
	C16H32O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.23	<5	<5.28	-
	C17H22O2	ng/L	0	-	-	-	<4.96	13.8	<4.96	5.72	-	-	-	-	-	20.9	19.4	11.6	-
	C17H24O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	10.1	10	9.43	-
	C17H26O2	ng/L	0	-	-	-	12.60	6.99	<4.96	<5.54	-	-	-	-	-	16.6	19.2	15.3	-
	C17H28O2	ng/L	0	-	-	-	5.84	7.67	<4.96	<5.54	-	-	-	-	-	11.5	16.6	17.1	-
	C17H30O2	ng/L	0	-	-	-	<4.96	6.24	<4.96	<5.54	-	-	-	-	-	<5.04	8.82	7.56	-
	C17H32O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-
	C17H34O2	ng/L	0	-	-	-	<6.27	<6.98	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-
	C18H24O2	ng/L	0	-	-	-	67.80	191	46	54.7	-	-	-	-	-	85.3	141	83.2	-
	C18H26O2	ng/L	0	-	-	-	10.70	12.8	<4.96	<5.54	-	-	-	-	-	13.8	22.3	20.6	-
	C18H28O2	ng/L	0	-	-	-	<4.96	65.2	<4.96	<5.54	-	-	-	-	-	<5.04	180	<5.28	-
	C18H30O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-
	C18H32O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-
	C18H34O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-
C18H36O2	ng/L	0	-	-	-	<8.58	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-	
C19H26O2	ng/L	0	-	-	-	107.00	42.1	<4.96	<5.54	-	-	-	-	-	75.7	43.3	<5.28	-	
C19H28O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	8.01	18.3	-	
C19H30O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	9.55	19.3	-	
C19H32O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	6.44	-	
C19H34O2	ng/L	0	-	-	-	12.40	5.08	<4.96	<5.54	-	-	-	-	-	34.6	6.02	13.8	-	
C19H36O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-	
C19H38O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	28.8	<5	40.3	-	
C20H28O2	ng/L	0	-	-	-	<954	<10.8	<4.96	<6.5	-	-	-	-	-	128	<5	<5.28	-	
C20H30O2	ng/L	0	-	-	-	181.00	88.8	45.6	27.7	-	-	-	-	-	79.5	63.8	45.1	-	
C20H32O2	ng/L	0	-	-	-	26.70	46.5	31.8	16.1	-	-	-	-	-	28.7	113	439	-	
C20H34O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	5.63	13.4	-	
C20H36O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-	
C20H38O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-	
C21H30O2	ng/L	0	-	-	-	<27.3	37.4	12.3	14	-	-	-	-	-	<24	31.3	26.3	-	
C21H32O2	ng/L	0	-	-	-	<4.96	15	<4.96	<5.54	-	-	-	-	-	<5.04	51.5	22.4	-	
C21H34O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5.16	<5.65	-	
C21H36O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-	
C21H38O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-	
C21H40O2	ng/L	0	-	-	-	<4.96	<4.92	<4.96	<5.54	-	-	-	-	-	<5.04	<5	<5.28	-	

Table 2-B: Surface Water Analytical Results

						Sampling Location	LBCH-002						
						Sampling Date	14/07/2014	05/11/2014	24/03/2015	26/05/2015	26/05/2015	04/08/2015	03/11/2015
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long	Yukon CSR Schedule 3 AW (Fresh)							
Chemical Goup	Parameter	Unit	DL										
	C12H18O2	ng/L	0	-	-	-	11.2	<4.93	9.76	<4.88	-	-	-
	C12H20O2	ng/L	0	-	-	-	21.4	<4.93	19.7	6.18	-	-	-
	C12H22O2	ng/L	0	-	-	-	<8.6	<4.93	22.9	<4.88	-	-	-
	C12H24O2	ng/L	0	-	-	-	21.6	<4.93	54	<4.88	-	-	-
	C13H20O2	ng/L	0	-	-	-	7.71	<4.93	11.8	6.89	-	-	-
	C13H22O2	ng/L	0	-	-	-	16.4	<4.93	26.8	11.9	-	-	-
	C13H24O2	ng/L	0	-	-	-	7.1	<4.93	21.4	<4.88	-	-	-
	C13H26O2	ng/L	0	-	-	-	29.1	<9.48	55	9.79	-	-	-
	C14H20O2	ng/L	0	-	-	-	9.19	12.1	12.6	<4.88	-	-	-
	C14H22O2	ng/L	0	-	-	-	13.1	<4.93	26.3	18.4	-	-	-
	C14H24O2	ng/L	0	-	-	-	17.8	<4.93	23	13.9	-	-	-
	C14H26O2	ng/L	0	-	-	-	<4.92	<4.93	13.9	<4.88	-	-	-
	C14H28O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-
	C15H18O2	ng/L	0	-	-	-	27.4	39.9	9.82	7.57	-	-	-
	C15H20O2	ng/L	0	-	-	-	7.43	<4.93	14.2	<5.52	-	-	-
	C15H22O2	ng/L	0	-	-	-	32.6	<4.93	26.5	12.5	-	-	-
	C15H24O2	ng/L	0	-	-	-	59.8	30.5	43.8	27.8	-	-	-
	C15H26O2	ng/L	0	-	-	-	27.2	7.36	23.6	16.5	-	-	-
	C15H28O2	ng/L	0	-	-	-	<4.92	<4.93	10.6	<4.88	-	-	-
	C15H30O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-
	C16H20O2	ng/L	0	-	-	-	29.9	36.2	29	33.7	-	-	-
	C16H22O2	ng/L	0	-	-	-	9.04	<4.93	8.79	10.4	-	-	-
	C16H24O2	ng/L	0	-	-	-	12.4	<4.93	765	14.6	-	-	-
	C16H26O2	ng/L	0	-	-	-	49.3	22.1	37	24.4	-	-	-
	C16H28O2	ng/L	0	-	-	-	<4.92	<4.93	18.1	13.6	-	-	-
	C16H30O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-
	C16H32O2	ng/L	0	-	-	-	<4.92	<9.55	<4.9	<4.88	-	-	-
	C17H22O2	ng/L	0	-	-	-	18.6	<4.93	23.4	12.1	-	-	-
	C17H24O2	ng/L	0	-	-	-	13.2	<4.93	9.88	8.56	-	-	-
	C17H26O2	ng/L	0	-	-	-	19.3	9.92	14.1	13.1	-	-	-
	C17H28O2	ng/L	0	-	-	-	11.6	<4.93	19.1	23.1	-	-	-
	C17H30O2	ng/L	0	-	-	-	<4.92	<4.93	9.04	8.89	-	-	-
	C17H32O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-
	C17H34O2	ng/L	0	-	-	-	<8.88	<9.66	<7.86	<4.88	-	-	-
	C18H24O2	ng/L	0	-	-	-	77.6	89.5	132	69.8	-	-	-
	C18H26O2	ng/L	0	-	-	-	14.5	<4.93	17.4	10.1	-	-	-
	C18H28O2	ng/L	0	-	-	-	<4.92	<4.93	267	11.7	-	-	-
	C18H30O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	10.6	-	-	-
	C18H32O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-
	C18H34O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-
	C18H36O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-
	C19H26O2	ng/L	0	-	-	-	89.7	<67.4	60.8	<4.88	-	-	-
	C19H28O2	ng/L	0	-	-	-	6.04	<4.93	10.8	10.6	-	-	-
	C19H30O2	ng/L	0	-	-	-	<4.92	<4.93	10.8	9.25	-	-	-
	C19H32O2	ng/L	0	-	-	-	<4.92	<4.93	5.13	<4.88	-	-	-
	C19H34O2	ng/L	0	-	-	-	35.4	169	7.49	5.05	-	-	-
	C19H36O2	ng/L	0	-	-	-	<5.33	<8.55	<4.9	<4.88	-	-	-
	C19H38O2	ng/L	0	-	-	-	32.2	49.5	<4.9	<4.88	-	-	-
	C20H28O2	ng/L	0	-	-	-	<136	177	<4.9	9.95	-	-	-
	C20H30O2	ng/L	0	-	-	-	106	134	125	70.5	-	-	-
C20H32O2	ng/L	0	-	-	-	24.2	30.2	126	39.5	-	-	-	
C20H34O2	ng/L	0	-	-	-	5.16	4.93	7.53	6.74	-	-	-	
C20H36O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-	
C20H38O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-	
C21H30O2	ng/L	0	-	-	-	<18.3	<4.93	37.6	21.9	-	-	-	
C21H32O2	ng/L	0	-	-	-	<315	<4.93	<109	<4.88	-	-	-	
C21H34O2	ng/L	0	-	-	-	<4.92	<4.93	5.07	<4.88	-	-	-	
C21H36O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-	
C21H38O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-	
C21H40O2	ng/L	0	-	-	-	<4.92	<4.93	<4.9	<4.88	-	-	-	

Notes - Surface Water Analytical Results

- (1) All values are reported as µg/L unless otherwise noted.
- (2) - = No guideline or not analyzed.
- (3) BC WQG - Approved = Approved - BC Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture Summary Report. Water Protection & Sustainability Branch, MOE & Climate Change Strategy. March 2018.
- (4) BC WQG - Working = Working - BC Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. Water Protection & Sustainability Branch, MOE & Climate Change Strategy. June 2017.
- (5) Aluminum - Long-term average WQGs calculated using the median of pH values of samples collected over the long-term averaging period.
- (6) Benzene - Interim BC WQG based on review of Canadian Council of Ministers of the Environment (1999) WQG.
- (7) Ethylbenzene - Revised interim BC WQGs based on review of Canadian Council of Ministers of the Environment (1996) WQGs.
- (8) Nitrogen - When nitrate and nitrite are present, total nitrate- plus nitrite-nitrogen should not exceed the nitrate WQG.
- (9) Nitrite - standard of 0.02 mg/L is for when $\text{Cl}^- \leq 2 \text{ mg/L}$. Also see Table 26B of BC Approved WQG. The long-term average Cl⁻ concentration should be used to find the appropriate long-term average NO₂- WQG.
- (10) Ammonia Nitrogen to protect freshwater aquatic life - BC Approved WQG, Table 26C. The average of the five measured NH₃ concentrations must be less than the corresponding tabled NH₃ value (WQG) found by using the average of the five measured pH, temperature, and salinity values. No more than one of five of the measured values can exceed 1.5 times the WQG.
- (11) Organic Carbon - The 30-day median for both DOC and TOC shall be within 20% of seasonally adjusted median background levels. The 30-day median calculation should be based on a minimum of five weekly samples taken over 30 days.
- (12) Dissolved oxygen - the most stringent life stage guideline was used.
- (13) PAHs - WQGs are for sediment containing 1% organic carbon (OC).
- (14) Selenium - The most stringent of the long term WQGs was used for both aquatic life and wildlife.
- (15) Temperature - Refer to BC Approved WQG, Table 42A & 42B.
- (16) Turbidity (clear flow) - Change of 2 NTU from background level at any one time for a duration of 30 d during clear flows or in clear water.
- (17) Turbidity (turbid flow) - Change of 5 NTU from background level when background is 8-50 NTU during high flows or turbid waters.
- (18) Turbidity (turbid flow) - Change from background of 10% when background is > 50 NTU at any time during high flows or turbid waters.
- (19) Total Suspended Solids (clear flow) - Change of 5 mg/L from background level at any one time for a duration of 30 d during clear flows or in clear water.
- (20) Total Suspended Solids (turbid flow) - Change of 10 mg/L from background level when background is 25-100 mg/L during high flows or turbid waters.
- (21) Total Suspended Solids (turbid flow) - Change from background of 10% when background is > 100 mg/L at any time during high flows or turbid waters.
- (22) CCME = Canadian Council of Ministers of the Environment, Canadian Environmental Quality Guidelines, 1999, updated to 2018.
- (23) CCME FAL = Canadian Water Quality Guidelines for the Protection of Aquatic Life, Freshwater, updated to 2018.
- (24) CCME MAL = Canadian Water Quality Guidelines for the Protection of Aquatic Life, Marine, updated to 2018.
- (25) CWQG = Canadian Water Quality Guidelines.
- (26) NGR = No Recommended Guideline
- (27) Ammonia (total) FAL CWQG varies with pH and temperature. See CWQG for the Protection of Aquatic Life, Ammonia Factsheet, CCME 2010.
- (28) Boron CWQG varies for short and long term for both FAL and MAL.
- (29) pH MAL - the pH of marine and estuarine waters should be within 7.0 - 8.7, unless it can be demonstrated that a pH outside of this range is a result of natural processes.
- (30) Dissolved Oxygen (DO) FAL CWQG varies with life stages of water biota. The lowest acceptable DO concentrations are as follows:
 - 6000 µg/L for warm water biota, early life stages
 - 5500 µg/L for warm water biota, other life stages
 - 9500 µg/L for cold water biota, early life stages
 - 6500 µg/L for cold water biota, other life stages
- (31) DO MAL recommended minimum concentration in marine and estuarine waters is 8 mg/L. When the natural DO level is less than the recommended interim guideline, the natural concentration should become the interim guideline at the site. When ambient DO concentrations are > 8.0 mg/L, human activities should not cause DO levels to decrease by more than 10% of the natural concentration expected in the receiving environment at that time.
- (32) YKCSR = *Yukon Environment Act*, Contaminated Sites Regulation, Y.O.I.C. 2002/171, effective September 30, 2002.
- (33) YKCSR Aquatic Water (AW) = Schedule 3, Column II
- (34) Aquatic life standards are to protect freshwater life, unless otherwise indicated.

Table 3: Summary of Surface Water Parameters Exceeding the Applicable Guidelines

						Sampling Location	BEVR-001													
						Sampled_Date_Time	14/07/2014	05/11/2014	26/05/2015	04/08/2015	04/08/2015	03/11/2015	22/03/2016	11/05/2016	28/06/2016	23/08/2016	09/11/2016	09/11/2016	21/03/2017	
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)														
Chem_Group	ChemName	output unit	EQL																	
Inorganics	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000		-	-	113,000	184,000	-	-	-	-	-	-	-	-	-	-	-	
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<10	0.13	0.07	0.08	0.22	0.16	<0.01	<0.01	<0.01	0.53	0.53	<0.01	
	Total Suspended Solids	mg/l	1	-	25	-	121	3.3	71	72	116	8	7	64	30	33	4	8	<2	
Total Metals	Aluminium	µg/L	1		5 100	-	950	121	966	1220	1400	375	31	2500	1550	903	130	147	16	
	Beryllium	µg/L	0	0.13	-	53	0.08	<0.01	0.11	0.14	0.16	<0.04	<0.05	0.12	<0.05	0.1	<0.05	<0.05	<0.05	
	Cadmium	µg/L	0	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6	0.114	0.0347	0.09	0.14	0.15	0.04	0.03	0.13	0.05	0.07	0.03	0.03	0.04	
	Chromium	µg/L	0	1	1	10	1.64	0.29	1.9	3	3.3	0.6	<0.4	4	2.27	1.79	0.27	0.3	0.1	
	Copper	µg/L	0	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90	2.54	0.47	2.6	3	4	<1	<1	2.9	1.3	1.9	0.5	0.5	0.3	
	Iron	mg/L	0	-	0.3	-	1.23	0.449	2.17	4.35	4.88	0.81	0.267	2.83	1.28	1.75	0.441	0.443	0.268	
	Selenium	µg/L	0	2	1	10	0.91	0.95	1.1	0.9	0.9	0.7	0.8	1	0.9	0.9	1	0.8	0.8	
	Zinc	µg/L	1	Varies - see Notes	30	75 150 900 1650 2400	10.1	3.7	12.6	13	14	4	5	18.1	7.6	11.3	3.7	4.4	6.1	
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	10.9	2.5	14	9	9	<5	<5	23	12	<5	2.384	2.743	1.363	
	Selenium (Filtered)	µg/L	0	2	-	10	0.75	0.76	<0.6	0.9	0.8	0.8	0.8	0.8	0.8	0.8	1	1	0.8	

Table 3: Summary of Surface Water Parameters Exceeding the Applicable Guidelines

							Sampling Location				BEVR-001				BEVR-t-001								
							Sampled_Date_Time				24/05/2017	08/08/2017	26/03/2018	12/09/2018	28/06/2016	23/08/2016	09/11/2016	21/03/2017	24/05/2017	08/08/2017	08/11/2017	26/03/2018	26/03/2018
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)																	
Chem_Group	ChemName	output unit	EQL																				
Inorganics	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.49	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
	Total Suspended Solids	mg/l	1	-	25	-	72.5	40	<2	6	10	4	5	2	141	<2	4	<2	<2	<2			
Total Metals	Aluminium	µg/L	1		5 100	-	1700	1100	27	550	233	60	245	169	2000	260	200	65	61				
	Beryllium	µg/L	0	0.13	-	53	0.18	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	0.13	<0.05	<0.05	<0.05	<0.05	<0.05				
	Cadmium	µg/L	0	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6	0.18	0.07	0.02	0.03	0.02	0.01	0.02	0.03	0.12	0.03	0.01	<0.01	<0.01				
	Chromium	µg/L	0	1	1	10	3	2.2	0.13	0.89	0.1	<0.05	0.46	0.46	3.4	0.45	0.45	0.14	0.14				
	Copper	µg/L	0	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90	3.8	1.9	0.3	0.7	1.2	0.9	1	0.8	5	1.3	0.8	0.5	0.5				
	Iron	mg/L	0	-	0.3	-	3.5	2.1	0.3	0.63	0.333	0.155	0.339	0.286	3.7	0.62	0.3	0.13	0.13				
	Selenium	µg/L	0	2	1	10	0.7	0.9	0.9	0.7	0.9	0.9	1.4	1.3	1	1.1	1.1	1.3	1.3				
	Zinc	µg/L	1	Varies - see Notes	30	75 150 900 1650 2400	21	10	6.1	5.5	1.1	2.1	2.2	2.4	16	1.8	1.3	<0.5	0.9				
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	32	17	<1	6	9	<5	3.719	3.469	33	13	2	2	2				
	Selenium (Filtered)	µg/L	0	2	-	10	0.5	0.7	0.9	0.7	1	1	1.6	1.4	0.8	1	1.2	1.5	1.4				

Table 3: Summary of Surface Water Parameters Exceeding the Applicable Guidelines

							Sampling Location			BEVR-t-001			LBCH-001									
							Sampled_Date_Time			23/05/2018	23/05/2018	12/09/2018	14/07/2014	05/11/2014	24/03/2015	26/05/2015	04/08/2015	03/11/2015	22/03/2016	22/03/2016	11/05/2016	28/06/2016
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)																
Chem_Group	ChemName	output unit	EQL																			
Inorganics	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000		-	-	-	-	-	97,100	157,000	162,000	-	-	-	-	-	-	-	-		
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<0.01	<0.01	<0.01	-	-	0.11	0.06	0.17	0.1	0.1	<0.01	<0.01			
	Total Suspended Solids	mg/l	1	-	25	-	26	20	4	79.6	<1	<2	100	63	<3	2	12	70	4			
Total Metals	Aluminium	µg/L	1		5 100	-	960	1200	160	326	97.3	63.5	1700	1200	90	51	34	2710	173			
	Beryllium	µg/L	0	0.13	-	53	0.06	<0.05	<0.05	0.054	<0.01	<0.01	0.11	0.06	<0.04	<0.05	<0.05	0.12	<0.05			
	Cadmium	µg/L	0	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6	0.03	0.03	0.01	0.0446	0.0134	0.0094	0.04	0.08	0.02	<0.01	<0.01	0.04	0.01			
	Chromium	µg/L	0	1	1	10	1.5	1.8	0.25	0.6	0.28	0.24	3	2.2	<0.4	<0.4	<0.4	3.94	0.14			
	Copper	µg/L	0	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90	1.9	2	0.5	2.68	0.61	0.46	3.6	3	<1	<1	<1	3.2	0.7			
	Iron	mg/L	0	-	0.3	-	1.1	1.5	0.25	0.96	0.193	0.152	3.21	3.16	0.235	0.125	0.105	2.66	0.234			
	Selenium	µg/L	0	2	1	10	1.1	1.1	1.1	1.89	2.15	2.26	1.5	1.3	1.7	1.9	1.9	1.5	1.6			
	Zinc	µg/L	1	Varies - see Notes	30	75 150 900 1650 2400	3.4	4.4	1.2	6	1.5	1.5	14.1	10	1	1	6	11.3	1.9			
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	20	20	4	20	5.9	2.6	22	38	12	<5	<5	33	18			
	Selenium (Filtered)	µg/L	0	2	-	10	1	1	1.1	1.72	1.84	2.27	1.1	1.4	2.1	2.3	2.2	1.3	1.6			

Table 3: Summary of Surface Water Parameters Exceeding the Applicable Guidelines

						Sampling Location	LBCH-001											
						Sampled_Date_Time	28/06/2016	23/08/2016	09/11/2016	21/03/2017	24/05/2017	08/08/2017	08/11/2017	08/11/2017	26/03/2018	23/05/2018	12/09/2018	12/09/2018
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)												
Chem_Group	ChemName	output unit	EQL															
Inorganics	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<0.01	0.45	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Total Suspended Solids	mg/l	1	-	25	-	6	6	<2	<2	50	<2	<2	<2	<2	61.5	<2	<2
Total Metals	Aluminium	µg/L	1		5 100	-	182	155	53	28	4300	320	51	54	26	3500	180	180
	Beryllium	µg/L	0	0.13	-	53	<0.05	<0.05	<0.05	<0.05	0.23	<0.05	<0.05	<0.05	<0.05	0.12	0.07	<0.05
	Cadmium	µg/L	0	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6	0.01	0.02	0.01	<0.01	0.09	0.02	0.01	0.01	<0.01	0.03	0.06	0.01
	Chromium	µg/L	0	1	1	10	0.06	<0.05	0.1	<0.05	7.2	0.6	0.19	0.21	0.12	5.2	0.55	0.54
	Copper	µg/L	0	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90	0.8	0.8	0.4	0.3	7.9	1	0.4	0.4	0.3	2.8	0.4	0.7
	Iron	mg/L	0	-	0.3	-	0.253	0.297	0.092	0.083	7.6	0.44	0.14	0.15	0.091	3.3	0.21	0.23
	Selenium	µg/L	0	2	1	10	1.6	1.4	2	2.1	1	1.7	2.1	2.1	2.2	0.96	1.5	1.5
	Zinc	µg/L	1	Varies - see Notes	30	75 150 900 1650 2400	1.2	2.1	1.3	<0.5	31	3.1	<0.5	1.7	0.8	8.2	2.1	2.1
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	20	25	7.274	3.62	36	41	8	6	3	22	13	12
	Selenium (Filtered)	µg/L	0	2	-	10	1.7	1.5	2.5	2.2	0.7	1.5	2.2	2.2	2.4	0.8	1.6	1.5

Table 3: Summary of Surface Water Parameters Exceeding the Applicable Guidelines

						Sampling Location	LBCH-002												
						Sampled_Date_Time	14/07/2014	05/11/2014	24/03/2015	26/05/2015	26/05/2015	04/08/2015	03/11/2015	22/03/2016	11/05/2016	11/05/2016	28/06/2016	23/08/2016	09/11/2016
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)													
Chem_Group	ChemName	output unit	EQL																
Inorganics	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000		-	-	101,000	160,000	166,000	-	-	-	-	-	-	-	-	-	-
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<0.01	<10	0.11	0.11	0.06	0.17	0.1	<0.01	<0.01	<0.01	<0.01	0.44
	Total Suspended Solids	mg/l	1	-	25	-	94.8	1.7	<2	100	98	71	5	7	63	73	8	<2	<2
Total Metals	Aluminium	µg/L	1		5 100	-	379	154	49.4	1570	1600	1310	159	45	2570	3020	214	161	63
	Beryllium	µg/L	0	0.13	-	53	0.052	<0.01	<0.01	0.13	0.11	0.09	<0.04	<0.05	0.15	0.16	<0.05	<0.05	<0.05
	Cadmium	µg/L	0	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6	0.0483	0.0183	0.01	0.05	0.05	0.08	<0.01	<0.01	0.04	0.04	0.01	0.01	0.01
	Chromium	µg/L	0	1	1	10	0.7	0.33	0.2	2.7	2.5	2.6	<0.4	<0.4	3.76	4.62	0.07	<0.05	0.16
	Copper	µg/L	0	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90	2.9	0.74	0.45	3.8	3.7	3	<1	<1	3.1	3.3	0.7	0.8	0.5
	Iron	mg/L	0	-	0.3	-	1.09	0.316	0.135	3.33	3.29	3.38	0.366	0.121	2.45	2.81	0.287	0.312	0.129
	Selenium	µg/L	0	2	1	10	1.91	2.09	2.17	1.5	1.6	1.2	1.6	2	1.5	1.3	1.5	1.4	2
	Zinc	µg/L	1	Varies - see Notes	30	75 150 900 1650 2400	6.8	2	1.5	14.5	14.4	11	7	2	10.4	11.8	1.4	2.9	3.6
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	17.8	6.2	5	27	21	39	12	<5	30	33	20	25	5.914
	Selenium (Filtered)	µg/L	0	2	-	10	1.69	1.83	2.06	1.5	1.3	1.4	1.9	2.2	1.3	1.4	1.6	1.5	2.4

Table 3: Summary of Surface Water Parameters Exceeding the Applicable Guidelines

						Sampling Location	LBCH-002							
						Sampled_Date_Time	21/03/2017	21/03/2017	24/05/2017	08/08/2017	08/11/2017	26/03/2018	23/05/2018	12/09/2018
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)								
Chem_Group	ChemName	output unit	EQL											
Inorganics	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000		-	-	-	-	-	-	-	-	-	-
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Total Suspended Solids	mg/l	1	-	25	-	<2	<2	120	<2	4	<2	58.5	2
Total Metals	Aluminium	µg/L	1		5 100	-	40	34	4600	390	73	31	2900	400
	Beryllium	µg/L	0	0.13	-	53	<0.05	<0.05	0.37	<0.05	<0.05	<0.05	0.1	<0.05
	Cadmium	µg/L	0	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6	<0.01	<0.01	0.1	0.02	0.02	<0.01	0.03	0.01
	Chromium	µg/L	0	1	1	10	<0.05	<0.05	7.8	0.57	0.25	0.14	4.4	1.3
	Copper	µg/L	0	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90	0.3	0.3	8.4	1.1	0.4	0.3	2.7	0.5
	Iron	mg/L	0	-	0.3	-	0.1	0.094	7.6	0.57	0.2	0.11	3	0.39
	Selenium	µg/L	0	2	1	10	2	2	1.1	1.8	2.3	2.1	1	1.5
	Zinc	µg/L	1	Varies - see Notes	30	75 150 900 1650 2400	1.1	<0.5	32	3	0.7	1.5	7.8	2.6
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	2.652	2.239	35	41	5	3	22	11
	Selenium (Filtered)	µg/L	0	2	-	10	2.1	2.2	0.7	1.6	2.1	2.3	0.8	1.6

Table 3: Summary of Surface Water Parameters Exceeding the Applicable Guidelines

				Sampling Location		LBCH-t-001									
				Sampled_Date_Time		28/06/2016	23/08/2016	23/08/2016	09/11/2016	24/05/2017	08/08/2017	08/08/2017	08/11/2017	23/05/2018	12/09/2018
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)									
Chem_Group	ChemName	output unit	EQL												
Inorganics	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000		-	-	-	-	-	-	-	-	-	-	-
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<0.01	<0.01	0.46	<0.01	<0.01	<0.01	<0.01	<0.01
	Total Suspended Solids	mg/l	1	-	25	-	2	<2	<2	<2	14	<2	<2	<2	<2
Total Metals	Aluminium	µg/L	1		5 100	-	49	18	20	35	440	140	110	33	190
	Beryllium	µg/L	0	0.13	-	53	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Cadmium	µg/L	0	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6	0.01	0.01	0.02	0.01	0.018	0.01	0.01	<0.01	<0.01
	Chromium	µg/L	0	1	1	10	<0.05	<0.05	<0.05	0.07	1.1	0.55	0.26	0.19	0.39
	Copper	µg/L	0	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90	1.1	1	1	0.7	1.7	1.4	1.1	0.7	1.3
	Iron	mg/L	0	-	0.3	-	0.559	0.61	0.603	0.559	0.98	1.1	1.1	0.69	0.66
	Selenium	µg/L	0	2	1	10	0.6	0.5	0.5	0.7	1.3	0.6	0.6	0.5	0.4
	Zinc	µg/L	1	Varies - see Notes	30	75 150 900 1650 2400	<0.5	1.5	2.2	1.3	2.9	2.6	1.3	<0.5	0.8
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	9	6	6	5.725	22	17	20	5	12
	Selenium (Filtered)	µg/L	0	2	-	10	<0.6	<0.6	0.6	0.8	1.4	0.5	0.6	0.6	0.4

Table 3: Summary of Surface Water Parameters Exceeding the Applicable Guidelines

				Sampling Location		LBCH-t-002										LBCH-t-003	SPX-Creek
				Sampled_Date_Time		28/06/2016	23/08/2016	09/11/2016	24/05/2017	24/05/2017	08/08/2017	08/11/2017	23/05/2018	12/09/2018	23/08/2017	23/08/2017	
				BC WQG FW Aquatic Life - Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)											
Chem_Group	ChemName	output unit	EQL														
Inorganics	Alkalinity (bicarbonate as CaCO3)	µg/L	1,000		-	-	-	-	-	-	-	-	-	-	-	-	
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	<0.01	<0.01	0.53	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	
	Total Suspended Solids	mg/l	1	-	25	-	13	9	<2	92	98.5	<2	<2	42	<2	<8	
Total Metals	Aluminium	µg/L	1		5 100	-	552	25	240	2900	2900	190	35	2700	26	64	3
	Beryllium	µg/L	0	0.13	-	53	0.08	<0.05	<0.05	0.19	0.18	<0.05	<0.05	0.09	<0.05	<0.05	<0.05
	Cadmium	µg/L	0	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6	0.04	0.03	0.02	0.1	0.1	0.03	0.02	0.05	0.02	0.01	0.02
	Chromium	µg/L	0	1	1	10	0.82	<0.05	0.46	4.9	5.2	0.24	0.15	3.8	0.06	0.15	<0.05
	Copper	µg/L	0	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90	2.2	0.9	1.3	7.3	7.2	2.2	2.9	3.6	0.8	1.3	0.4
	Iron	mg/L	0	-	0.3	-	0.769	0.564	0.767	4.7	4.7	0.64	0.38	2.5	0.43	0.11	0.004
	Selenium	µg/L	0	2	1	10	0.4	0.2	0.2	0.6	0.6	0.3	0.3	0.4	0.3	1.5	6.3
	Zinc	µg/L	1	Varies - see Notes	30	75 150 900 1650 2400	2.9	2.1	4.3	21	21	4	0.97	7.1	1.2	<0.5	1
Dissolved Metals	Aluminium (Filtered)	µg/L	1	Varies - see Notes	-	-	9	<5	3.874	34	36	17	2	16	3	3	1
	Selenium (Filtered)	µg/L	0	2	-	10	<0.6	<0.6	0.3	0.3	0.3	0.3	0.3	0.3	0.3	1.5	6.2

Table 4: Surface Water Analytical Results

						Sampling Location		BVRV-SEEP	LBRV-DP2	LBRV-DP6	LBRV-DP6	LBRV-DP6	LBRV-DP6	LBRV-SEEP	LBRV-SEEP	LBRV-SEEP	MW-15-1A
						Sampled Date Time		03/11/2015	04/08/2015	23/08/2017	08/11/2017	23/05/2018	12/09/2018	21/03/2017	23/08/2017	26/03/2018	23/08/2017
				BC WQG FW Aquatic Life Working and Approved		CCME Protection of Aquatic Life (FAL, long term)		Yukon CSR Schedule 3 AW (Fresh)									
Chem Group	Parameter	Unit	EQL														
Field	Temperature (Field)	°C				-	-	-	-	12.1	2.2	4.7	7.6	2.1	15.1	-	11.7
	DO (Field)	mg/L		Varies - see Notes		>5.5-	-	-	5.38	0.37	0.13	1.98	1.86	2.42	-	3.34	
	Field Conductance, Specific	µS/cm				-	-	-	876	865	939	1008	822	780	-	1095	
	Field ORP (mV)	mV				-	-	-	-122.2	-	-183.3	-137.6	-	-99	-	-40	
	Field Air Temperature	°C				-	-	-	-	-	-	8.7	6.7	-	-	-	
	pH (Field)	pH Units				-	-	-	6.92	7.61	7.41	7.38	7.09	6.97	-	6.82	
Inorganics	Alkalinity (total) as CaCO3	µg/L	5,000	Varies - see Notes		-	-	345,000	128,000	433,000	529,000	468,000	530,000	427,000	377,000	361,000	556,000
	Alkalinity, PP (as CaCO3)	mg/L	5			-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Ammonia (as N)	mg/L	0			-	-	<0.01	0.02	0.3	1.28	1.2	1.09	0.52	0.26	0.61	0.08
	Bicarbonate	mg/L	5			-	-	421	156	528	645	571	646	520	459	441	678
	Bromide (Filtered)	mg/L	0			-	-	<0.02	<0.02	<0.2	0.09	<0.2	0.1	<0.02	<0.2	<0.2	<0.2
	Carbonate	mg/L	6			-	-	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6
	Chloride (Filtered)	mg/L	0	150		120	-	0.45	0.28	0.7	3.49	3.4	3.38	2.02	0.8	2.3	64.9
	Electrical Conductivity (lab)	µS/cm	1			-	-	989	382	817	942	930	992	782	748	713	1234
	Hardness as CaCO3 (Filtered)	mg/L	5			-	-	624	189	370	250	250	240	257	320	260	670
	Hydroxide	mg/L	5			-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Ionic Balance	%	1			-	-	-	-	100	98.5	110	101	100	100	120	98.3
	Nitrate (as N) (Filtered)	mg/L	0	3		-	400	1.74	0.02	<0.1	0.01	<0.1	<0.01	<0.01	<0.1	<0.1	1.1
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes		0.06	0.2-2	0.25	0.07	<0.1	<0.01	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1
	Nitrogen (Total)	µg/L	60			-	-	2060	560	690	2310	1610	1780	870	660	1140	1470
	pH (Lab)	pH Units	0			-	-	6.96	7.53	7.19	7.91	7.85	7.94	7.39	7.48	8.22	7.08
	Phosphorus	µg/L	3			-	Note	17	29	122	700	40	43	43	25	55	481
	Sulphate (Filtered)	mg/L	0			-	1000	244	59.8	54	0.98	19	1	34.2	66	27	91
	Total Dissolved Solids (Filtered)	mg/L	1			-	-	726	258	460 - 530	550 - 570	580	570	486 - 491	280 - 482	500	740 - 780
	Total Suspended Solids	mg/l	2			-	25	-	5	10	60	1600	34	50	18	<8	35
Organics	Dissolved Inorganic Carbon (Filtered)	µg/L	500			-	-	28,600	31,300	96,400	128,000	114,000	138,000	96,700	88,600	98,400	113,000
	Dissolved Organic Carbon (Filtered)	mg/L	1			-	-	4.9	3.8	9.5	7.7	7.5	8	6.1	8.3	6.3	5
	Total Organic Carbon	µg/L	500			-	-	4900	3900	9400	14,000	11,700	11,000	8100	9800	9300	7300
	Total Inorganic Carbon	µg/L	500			-	-	31,700	32,900	104,000	128,000	122,000	142,000	109,000	89,500	101,000	158,000
Total Metals	Aluminium	µg/L	1			5 100	-	29	986	760	11,000	43	220	4	39	11	10,000
	Antimony	µg/L	0	9		-	200	<0.2	<0.2	0.18	0.27	<0.02	0.03	0.03	0.1	0.13	1.6
	Arsenic	µg/L	0	5		5	50	0.2	0.4	9.3	25	3.1	4.3	3.2	2.6	5.5	22
	Barium	µg/L	0	1000		-	10000	37	72	330	640	350	390	220	210	310	670
	Beryllium	µg/L	0	0.13		-	53	<0.04	<0.04	0.07	0.65	<0.05	<0.05	<0.05	<0.05	<0.05	0.77
	Bismuth	µg/L	0			-	-	<1	<1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2
	Boron	µg/L	2	1200		1500	-	20	19	49	120	93	130	61	67	67	51
	Cadmium	µg/L	0			-	0.1 0.3 0.5 0.6	0.02	0.02	0.09	1.1	<0.01	<0.01	0.01	0.02	<0.01	0.7
	Calcium	mg/L	0			-	-	198	60.5	120	110	83	77	81.5	94	82	210
	Chromium	µg/L	0	1		1	10	<0.4	1.2	4.9	29	0.19	0.27	<0.05	<0.05	0.17	19
	Cobalt	µg/L	0	4		-	9	0.09	0.23	1.7	13	0.8	0.7	0.53	0.6	0.43	15
	Copper	µg/L	0	Varies - see Notes		Eqn 2 4	20 30 40 50 60 70 80 90	<1	2	6.3	26	<0.2	<0.2	0.3	0.8	<0.2	25
	Iron	mg/L	0			-	0.3	0.099	0.782	23	72	16	16	12.2	6.3	18	34
	Lead	µg/L	0			-	Eqn 1 7	<0.1	<0.1	1.3	14	0.07	0.17	<0.01	0.01	0.04	11
	Lithium	µg/L	1			-	-	7	7	13	28	14	16	12.9	16	13	25
	Magnesium	mg/L	0			-	-	43.5	12.7	20	21	15	14	15.3	21	14	54
	Manganese	µg/L	1			-	-	<5	9.3	1800	2100	1300	1200	1110	800	1300	1800
	Mercury	µg/L	0			-	0.026	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Molybdenum	µg/L	0	1000		73	10000	1.4	1.5	2.1	4.8	5.8	6	2.02	1.4	2.5	3.3
	Nickel	µg/L	0	Varies - see Notes		Eqn 25 150	250 650 1100 1500	1	2	6.2	51	2.3	2.8	1.8	2.7	2.8	27
	Potassium	mg/L	0			-	-	1.13	1.66	4.9	7.6	4.4	5	3.8	3.9	3.7	5.6
	Selenium	µg/L	0	2		1	10	6.8	2.1	0.3	2.7	<0.2	0.2	<0.2	<0.2	<0.2	2.1
	Silicon	µg/L	5			-	-	3560	4260	6200	29,000	3800	4200	3670	3900	3900	36,000
	Silver	µg/L	0	Varies - see Notes		0.25	0.5 15	<0.01	<0.01	0.04	0.21	<0.01	<0.01	<0.01	<0.01	<0.01	0.24
	Sodium ion	mg/L	0			-	-	2.74	4.22	60	140	130	140	93.1	62	98	28
	Strontium	µg/L	0			-	-	192	98	260	310	240	250	199	240	220	380
	Sulphur	µg/L	20			-	-	96,000	21,700	20,000	3300	6600	1700	12,900	23,000	9200	30,000
	Tellurium	µg/L	0			-	-	<0.1	<0.1	<0.05	0.38	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Thallium	µg/L	0	0.8		0.8	3	0.02	0.02	0.02	0.18	<0.01	<0.01	<0.01	<0.01	<0.01	0.36
	Thorium	µg/L	0			-	-	<0.4	<0.4	1.2	4.1	0.21	0.13	0.073	0.36	0.19	7.6
	Tin	µg/L	0			-	-	2.4	<0.1	0.3	0.1	<0.1	<0.1	<0.1	<0.1	0.2	2
	Titanium	µg/L	2			-	1000	20.7	45.1	43	200	9	19	13	18	9	340
	Uranium	µg/L	0	8.5		15	3000	6.4	0.8	0.61	1.6	0.3	0.4	0.468	0.91	0.3	7.9
	Vanadium	µg/L	0			-	-	0.1	1.8	3.9	40	0.59	0.83	0.327	0.25	0.4	29
	Zinc	µg/L	1	Varies - see Notes		30	75 150 900 1650 2400	2	6	22	12,000	690	690	<0.5	0.6	1.7	65
	Zirconium	µg/L	0			-	-	0.3	0.7	2.3	4.7	0.7	0.6	0.4	0.99	1.1	4.3

Table 4: Surface Water Analytical Results

				BC WQG FW Aquatic Life Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Sampling Location	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507
						Sampled Date Time	05/08/2015	03/11/2015	10/11/2016	23/08/2017	08/11/2017	26/03/2018	23/05/2018	12/09/2018
						Yukon CSR Schedule 3 AW (Fresh)								
Chem Group	Parameter	Unit	EQL											
Field	Temperature (Field)	°C			-	-	-	-	7.9	3.8	0	4.2	5.2	
	DO (Field)	mg/L		Varies - see Notes	>5.5-	-	-	-	2.3	3.7	11.26	1.82	5	
	Field Conductance, Specific	µS/cm		-	-	-	-	592	527	563	814	598		
	Field ORP (mV)	mV		-	-	-	-	-181	-	-11.8	-144.5	-51.1		
	Field Air Temperature	°C		-	-	-	-	-	-	-11.8	-	-		
	pH (Field)	pH Units			-	-	-	7.55	7.51	7.82	7.34	7.42		
Inorganics	Alkalinity (total) as CaCO3	µg/L	5,000	Varies - see Notes	-	-	180,000	186,000	223,000	248,000	256,000	220,000	299,000	268,000
	Alkalinity, PP (as CaCO3)	mg/L	5	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5
	Ammonia (as N)	mg/L	0	-	3 1.92 1.97 2.69 2.78 3.97 3.99 5.75	-	0.88	0.09	<0.01	0.14	0.12	0.18	0.27	0.136
	Bicarbonate	mg/L	5	-	-	-	220	227	271	302	312	269	365	326
	Bromide (Filtered)	mg/L	0	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.2	0.03
	Carbonate	mg/L	6	-	-	-	<6	<6	<6	<6	<6	<6	<6	<6
	Chloride (Filtered)	mg/L	0	150	120	-	2.19	3.73	0.594	6.06	2.15	8.92	14.7	6.38
	Electrical Conductivity (lab)	µS/cm	1	-	-	-	472	410	427	502	535	464	793	624
	Hardness as CaCO3 (Filtered)	mg/L	5	-	-	-	170	136	225	220	230	260	330	270
	Hydroxide	mg/L	5	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5
	Ionic Balance	%	1	-	-	-	-	-	-	100	100	140	100	94
	Nitrate (as N) (Filtered)	mg/L	0	3	-	400	<0.01	<0.01	0.012	<0.01	0.05	<0.01	<0.1	0.06
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	0.11	0.58	0.062	<0.01	<0.01	<0.01	<0.1	<0.01
	Nitrogen (Total)	µg/L	60	-	-	-	1700	1070	290	340	600	1900	390	380
	pH (Lab)	pH Units	0	-	-	-	7.52	7.45	7.4	7.61	7.82	8.03	7.75	7.86
	Phosphorus	µg/L	3	-	Note	-	108	174	4	92	80	234	1160	132
	Sulphate (Filtered)	mg/L	0	-	-	1000	30.7	27	0.3	21.9	29.8	5.8	93	57.3
	Total Dissolved Solids (Filtered)	mg/L	1	-	-	-	360	224	318	260 - 307	300 - 315	380	460	350
	Total Suspended Solids	mg/l	2	-	25	-	14,900	660	2	78	141	290	550	235
Organics	Dissolved Inorganic Carbon (Filtered)	µg/L	500	-	-	44,800	38,700	48,500	59,200	57,800	67,400	67,200	64,200	
	Dissolved Organic Carbon (Filtered)	mg/L	1	-	-	2.5	2.5	2.1	1.8	3.7	2.9	3.5	1.2	
	Total Organic Carbon	µg/L	500	-	-	8600	5600	2400	2600	28,000	7500	20,000	2400	
	Total Inorganic Carbon	µg/L	500	-	-	46,000	39,400	48,700	59,800	58,900	70,000	68,500	64,900	
Total Metals	Aluminium	µg/L	1		5 100	-	98,300	6640	15	690	860	2400	70,000	2100
	Antimony	µg/L	0	9	-	200	40	5.3	0.09	0.33	1.1	2.5	18	1.6
	Arsenic	µg/L	0	5	5	50	800	38	0.5	4.5	6.5	13	190	17
	Barium	µg/L	0	1000	-	10000	5800	360	86.7	210	250	270	1300	150
	Beryllium	µg/L	0	0.13	-	53	6	<0.2	<0.05	<0.05	0.07	0.14	2	0.14
	Bismuth	µg/L	0	-	-	-	<100	<5	<0.1	<0.1	0.1	<0.5	<0.1	<0.1
	Boron	µg/L	2	1200	-	1500	-	<500	210	5	220	190	280	200
	Cadmium	µg/L	0	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6	47	1.37	0.02	0.13	0.28	0.59	5.7	0.22
	Calcium	mg/L	0	-	-	-	142	56.1	69.2	67	76	84	200	71
	Chromium	µg/L	0	1	1	10	480	59.1	2.04	5.5	15	30	350	24
	Cobalt	µg/L	0	4	-	9	237	18.5	0.17	1.2	4.5	8.7	130	6.4
	Copper	µg/L	0	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90	3400	310	3.5	12	49	130	1200	86
	Iron	mg/L	0	-	0.3	-	5760	239	1.85	20	54	70	1000	79
	Lead	µg/L	0	-	Eqn 1 7	40 50 60 110 160	280	11	11.1	2.1	2.5	6.3	82	3.2
	Lithium	µg/L	1	-	-	-	122	10	1.4	4.2	2.9	7.5	51	7.2
	Magnesium	mg/L	0	-	-	-	45.4	10.9	13.4	13	12	18	41	26
	Manganese	µg/L	1	-	-	-	21,800	1480	22	420	660	760	6300	1300
	Mercury	µg/L	0	-	0.026	1	0.85	0.05	-	<0.01	<0.01	<0.01	<0.01	<0.01
	Molybdenum	µg/L	0	1000	73	10000	930	57.6	1.54	4.8	7.6	12	210	18
	Nickel	µg/L	0	Varies - see Notes	Eqn 25 150	250 650 1100 1500	1400	130	1.6	7.3	30	70	850	44
	Potassium	mg/L	0	-	-	-	113	58.3	2.2	36	31	37	62	13
	Selenium	µg/L	0	2	1	10	<60	<3	0.4	<0.2	0.2	0.3	5	0.3
	Silicon	µg/L	5	-	-	-	166,000	23,500	5520	6100	5000	7800	140,000	7600
	Silver	µg/L	0	Varies - see Notes	0.25	0.5 15	5.64	0.22	<0.01	0.03	0.04	0.11	0.99	0.05
	Sodium ion	mg/L	0	-	-	-	11.1	9.69	6.22	9.6	8.3	13	16	15
	Strontium	µg/L	0	-	-	-	600	130	209	170	180	230	430	290
	Sulphur	µg/L	20	-	-	-	67,500	11,700	2200	8400	12,000	2800	48,000	18,000
	Tellurium	µg/L	0	-	-	-	<10	<0.5	<0.05	<0.05	<0.05	0.2	<0.3	<0.05
	Thallium	µg/L	0	0.8	0.8	3	4.2	0.19	<0.01	0.02	0.03	0.08	0.89	0.04
	Thorium	µg/L	0	-	-	-	42.4	<2	0.865	0.38	0.39	1.7	14	0.8
	Tin	µg/L	0	-	-	-	80	17	<0.1	0.7	2.4	6.1	82	4.4
	Titanium	µg/L	2	-	-	1000	1640	254	12	72	36	40	1800	60
	Uranium	µg/L	0	8.5	15	3000	<40	<2	0.807	0.24	1	1.2	8.7	0.94
	Vanadium	µg/L	0	-	-	-	330	22	0.485	2.5	3.8	8.8	160	7.1
	Zinc	µg/L	1	Varies - see Notes	30	75 150 900 1650 2400	7500	290	246	58	47	100	1200	110
	Zirconium	µg/L	0	-	-	-	30	5.8	0.4	0.7	0.4	1.4	25	0.7

Table 4: Surface Water Analytical Results

						Sampling Location	BVRV-SEEP	LBRV-DP2	LBRV-DP6	LBRV-DP6	LBRV-DP6	LBRV-DP6	LBRV-SEEP	LBRV-SEEP	LBRV-SEEP	MW-15-1A	
						Sampled Date Time	03/11/2015	04/08/2015	23/08/2017	08/11/2017	23/05/2018	12/09/2018	21/03/2017	23/08/2017	26/03/2018	23/08/2017	
				BC WQG FW Aquatic Life Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)											
Chem Group	Parameter	Unit	EQL														
Dissolved Metals	Aluminium	µg/L	1	Varies - see Notes	-	-	<5	<5	2	<1	5	<1	1.866	1	<1	1	
	Antimony	µg/L	0	9	-	200	<0.2	<0.2	0.13	0.08	<0.02	<0.02	<0.02	0.11	0.05	0.19	
	Arsenic	µg/L	0	-	-	50	0.2	<0.2	7.9	1.4	3.1	1	1.5	1.6	1.6	0.9	
	Barium	µg/L	0	1000	-	10000	37	63	275.6	312.6	318.8	259	167.9	170	204.7	182.3	
	Beryllium	µg/L	0	0.13	-	53	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Bismuth	µg/L	0	-	-	-	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
	Boron	µg/L	2	-	-	-	22	22	46	113	86	143	57	60	68	48	
	Cadmium	µg/L	0	-	-	0.1 0.3 0.5 0.6	0.03	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.07	
	Calcium	mg/L	0	-	-	-	184	56.6	110	77	75	75	78.4	93	79	190	
	Chromium	µg/L	0	-	-	10	<0.4	<0.4	0.33	0.096	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Cobalt	µg/L	0	-	-	9	0.07	0.03	0.38	1.02	0.7	0.47	0.497	0.53	0.4	2.8	
	Copper	µg/L	1	-	-	20 30 40 50 60 70 80 90	<1	1	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	0.8	
	Iron	mg/L	0	-	-	-	0.009	0.009	15.6	2.52	15.8	0.098	3.94	2.74	5.53	0.506	
	Lead	µg/L	0	-	-	40 50 60 110 160	<0.1	<0.1	0.01	0.02	0.03	<0.01	0.02	<0.01	<0.01	0.03	
	Lithium	µg/L	1	-	-	-	7	6	11.1	14.8	12.1	15.9	13.2	14.5	11.8	16.5	
	Magnesium	mg/L	0	-	-	-	40.3	11.7	20	15	14	13	14.9	21	14	50	
	Manganese	µg/L	1	-	-	-	2	2	1750	1370	1250	1090	986	730	1100	1220	
	Mercury	µg/L	0	-	-	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	Molybdenum	µg/L	0	-	-	10000	1.35	1.31	1.59	6	5.03	5.28	1.778	1.3	2.34	1.75	
	Nickel	µg/L	0	-	-	250 650 1100 1500	1	<1	2.2	3.9	2	2	1.6	3.4	1.2	5.4	
	Potassium	mg/L	0	-	-	-	1.1	2	4.6	5	4.2	4.8	3.7	3.8	3.7	2.9	
	Selenium	µg/L	0	2	-	10	9.7	2.8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
	Silicon	µg/L	5	-	-	-	3240	2070	4300	3800	3900	3700	3460	3600	3400	7800	
	Silver	µg/L	0	-	-	0.5 15	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
	Sodium ion	mg/L	0	-	-	-	2.5	6	60	120	130	140	92.6	61	95	25	
	Strontium	µg/L	0	-	-	-	186	89	234	225	222.8	217.8	170.5	225.5	202	311.6	
	Sulfur, elemental	µg/L	20	-	-	-	85,500	18,900	20,000	1600	6700	1500	12,400	23,000	9300	32,000	
	Tellurium	µg/L	0	-	-	-	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
	Thallium	µg/L	0	-	-	3	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.04	
	Thorium	µg/L	0	-	-	-	<0.4	<0.4	0.28	0.06	0.22	<0.05	<0.05	0.29	0.05	<0.5	
	Tin	µg/L	0	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
	Titanium	µg/L	2	-	-	-	1000	24	<10	18	16	8	6	12	15	8	25
	Uranium	µg/L	0	-	-	-	3000	6.9	0.7	0.41	0.41	0.26	0.36	0.44	0.85	0.28	6.76
	Vanadium	µg/L	0	-	-	-	-	<0.1	<0.1	0.41	0.11	0.31	<0.05	0.078	<0.05	0.07	0.13
	Zinc	µg/L	1	-	-	-	75 150 900 1650 2400	1	5	6.4	1657	176.6	107.5	1	1.2	0.9	2.6
	Zirconium	µg/L	0	-	-	-	-	0.3	<0.1	0.6	0.5	0.6	0.3	0.2	0.5	0.4	0.4
Radionuclides	Actinium228	Bq/L		-	-	-	-	-	0.9	-	<0.8	<0.6	1	<0.8	<1	<1	
	Radon219	Bq/L		-	-	-	-	-	<1	-	<0.9	<2	<1	<1	<2	<1	
	Thorium227	Bq/L		-	-	-	-	-	<0.9	-	<1	<0.6	<0.9	<0.6	<0.6	<1	
	Bismuth212	Bq/L		-	-	-	-	-	<1	-	<2	<2	<2	<1	<2	<2	
	Lead-210	Bq/L		-	-	-	<4	-	<4	-	<5	<5	<4	<4	8	<4	
	Lead211	Bq/L		-	-	-	-	-	<6	-	<4	<2	<5	<5	<6	<5	
	Lead212	Bq/L		-	-	-	-	-	1.1	-	<0.4	<0.4	1.2	0.8	0.5	0.8	
	Radium223	Bq/L		-	-	-	-	-	<0.8	-	<0.8	<1	<0.7	<0.7	<1	<1	
	Radium-226	Bq/L		-	-	-	-	-	<5	-	<4	<4	<4	<5	7	<5	
	Thallium208	Bq/L		-	-	-	-	-	0.3	-	<0.2	<0.2	0.4	<0.2	<0.3	0.5	
BTEX	Benzene	µg/L	1	40	370	4000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Ethylbenzene	µg/L	1	200	90	2000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Styrene	µg/L	1	72	72	720	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Toluene	µg/L	1	0.5	2	390	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Xylenes, total	µg/L	1	30	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
VPH	VHw6-10	µg/L	50	-	-	15,000	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	VPHw	µg/L	50	-	-	1500	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
VOCs	Methyl tert-butyl ether [MTBE]	µg/L	1	1000	10000	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	

Table 4: Surface Water Analytical Results

				BC WQG FW Aquatic Life Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Sampling Location	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507
						Sampled Date Time	05/08/2015	03/11/2015	10/11/2016	23/08/2017	08/11/2017	26/03/2018	23/05/2018	12/09/2018
						Yukon CSR Schedule 3 AW (Fresh)								
Chem Group	Parameter	Unit	EQL											
Dissolved Metals	Aluminium	µg/L	1	Varies - see Notes	-	-	43	<5	<1	<1	<1	<1	<1	<1
	Antimony	µg/L	0	9	-	200	<0.2	0.4	0.104	0.04	0.098	0.22	0.14	0.22
	Arsenic	µg/L	0	-	-	50	0.5	1	0.3	1.2	0.4	0.7	3.1	0.8
	Barium	µg/L	0	1000	-	10000	248	114	80.8	178.3	171	145.2	218.5	75.2
	Beryllium	µg/L	0	0.13	-	53	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Bismuth	µg/L	0	-	-	-	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Boron	µg/L	2	-	-	-	259	189	3	212	212	172	164	211
	Cadmium	µg/L	0	-	-	0.1 0.3 0.5 0.6	0.02	0.01	0.013	<0.01	<0.01	<0.01	<0.01	<0.01
	Calcium	mg/L	0	-	-	-	50.8	40.9	67.3	67	72	76	93	67
	Chromium	µg/L	0	-	-	10	<0.4	<0.4	0.432	<0.05	0.18	<0.05	<0.05	<0.05
	Cobalt	µg/L	0	-	-	9	0.13	0.54	0.089	0.08	0.81	0.98	1.12	1.41
	Copper	µg/L	1	-	-	20 30 40 50 60 70 80 90	<1	<1	1	<0.5	<0.5	<0.5	<0.5	<0.5
	Iron	mg/L	0	-	-	-	0.01	0.055	0.177	9.27	0.632	0.059	10.5	0.179
	Lead	µg/L	0	-	-	40 50 60 110 160	<0.1	<0.1	0.2	<0.01	0.01	<0.01	<0.01	<0.01
	Lithium	µg/L	1	-	-	-	4	4	1.3	3.3	1.9	3.5	5	5.1
	Magnesium	mg/L	0	-	-	-	10.6	8.32	13.8	13	12	17	23	25
	Manganese	µg/L	1	-	-	-	<1	156	20	383	359	374	608	557
	Mercury	µg/L	0	-	-	1	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01
	Molybdenum	µg/L	0	-	-	10000	7.54	18	1.441	3.51	2.65	5.33	6.57	9.02
	Nickel	µg/L	0	-	-	250 650 1100 1500	2	10	0.9	1	6.3	13.5	13.3	15.1
	Potassium	mg/L	0	-	-	-	1.8	51.6	2.2	36	32	35	45	13
	Selenium	µg/L	0	2	-	10	<0.6	<0.6	0.5	<0.2	<0.2	<0.2	<0.2	<0.2
	Silicon	µg/L	5	-	-	-	1350	1230	5360	2100	2100	2000	2400	2500
	Silver	µg/L	0	-	-	0.5 15	<0.01	<0.01	0.022	<0.01	<0.01	<0.01	<0.01	<0.01
	Sodium ion	mg/L	0	-	-	-	5.5	9.1	6.2	9.7	7.7	12	16	15
	Strontium	µg/L	0	-	-	-	136	109	203.1	154.4	166.6	200.3	253.3	258.9
	Sulfur, elemental	µg/L	20	-	-	-	17,500	7700	2300	8200	11,000	2000	29,000	16,000
	Tellurium	µg/L	0	-	-	-	<0.1	<0.1	0.131	<0.05	<0.05	<0.05	<0.05	<0.05
	Thallium	µg/L	0	-	-	3	<0.01	<0.01	0.032	<0.01	<0.01	<0.01	<0.01	<0.01
	Thorium	µg/L	0	-	-	-	<0.4	<0.4	<0.05	0.14	<0.05	<0.05	0.17	0.11
	Tin	µg/L	0	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Titanium	µg/L	2	-	-	1000	<10	<10	10	12	15	8	9	5
	Uranium	µg/L	0	-	-	3000	<0.4	0.5	0.748	0.099	0.44	0.33	0.61	0.39
	Vanadium	µg/L	0	-	-	-	<0.1	<0.1	0.169	<0.05	<0.05	<0.05	<0.05	<0.05
	Zinc	µg/L	1	-	-	75 150 900 1650 2400	2	<1	209.2	4.7	0.6	<0.5	0.7	<0.5
	Zirconium	µg/L	0	-	-	-	<0.1	<0.1	0.2	0.2	<0.1	<0.1	<0.1	0.1
Radionuclides	Actinium228	Bq/L			-	-	-	-	<1	<0.3	<0.8	1	<0.8	
	Radon219	Bq/L		-	-	-	-	-	<2	<0.2	<0.8	<1	<0.7	
	Thorium227	Bq/L		-	-	-	-	-	<0.9	<0.3	<1	<1	<0.5	
	Bismuth212	Bq/L		-	-	-	-	-	<2	<0.7	<0.9	<2	<2	
	Lead-210	Bq/L		-	-	-	-	-	<4	<2	<5	<4	<4	
	Lead211	Bq/L		-	-	-	-	-	<6	<2	<5	<3	<4	
	Lead212	Bq/L		-	-	-	-	-	0.8	<0.1	<0.4	<0.4	<0.4	
	Radium223	Bq/L		-	-	-	-	-	<0.8	<0.4	<0.8	<0.8	<1	
	Radium-226	Bq/L		-	-	-	-	-	<5	<2	<4	<5	<5	
Thallium208	Bq/L		-	-	-	-	-	0.3	<0.1	<0.3	<0.2	0.4		
BTEX	Benzene	µg/L	1	40	370	4000	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
	Ethylbenzene	µg/L	1	200	90	2000	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
	Styrene	µg/L	1	72	72	720	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
	Toluene	µg/L	1	0.5	2	390	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylenes, total	µg/L	1	30	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
VPH	VHw6-10	µg/L	50	-	-	15,000	<50	<50	-	<50	<50	<50	<50	<50
	VPHw	µg/L	50	-	-	1500	<50	<50	-	<50	<50	<50	<50	<50
VOCs	Methyl tert-butyl ether [MTBE]	µg/L	1	1000	10000	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5

Table 4: Surface Water Analytical Results

Chem Group	Parameter	Unit	EQL	BC WQG FW Aquatic Life Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Sampling Location Sampled Date Time	BVRV-SEEP	LBRV-DP2	LBRV-DP6	LBRV-DP6	LBRV-DP6	LBRV-DP6	LBRV-SEEP	LBRV-SEEP	LBRV-SEEP	MW-15-1A
							03/11/2015	04/08/2015	23/08/2017	08/11/2017	23/05/2018	12/09/2018	21/03/2017	23/08/2017	26/03/2018	23/08/2017
							Yukon CSR Schedule 3 AW (Fresh)									
PAHs	1,4,6,7-tetramethylnaphthalene	µg/L	0		-	-	<0.000471	0.000372	-	-	-	-	-	-	-	-
	1,8-dimethylphenanthrene	µg/L	0	-	-	-	<0.0000755	0.000171	-	-	-	-	-	-	-	-
	1-methylphenanthrene	µg/L	0	-	-	-	0.000229	0.00101	-	-	-	-	-	-	-	-
	2-methylantracene	µg/L	0	-	-	-	<0.000144	0.000443	-	-	-	-	-	-	-	-
	3-methylphenanthrene	µg/L	0	-	-	-	0.000372	0.00102	-	-	-	-	-	-	-	-
	Acenaphthene	µg/L	0	6	5.8	-	<0.000705	0.000481	-	-	-	-	-	-	-	-
	Acenaphthylene	µg/L	0	-	-	-	<0.000228	0.000402	-	-	-	-	-	-	-	-
	Anthracene	µg/L	0	4	0.012	1	<0.0000952	0.000138	-	-	-	-	-	-	-	-
	Benz(a)anthracene	µg/L	0	0.1	0.018	1	0.000084	0.000189	-	-	-	-	-	-	-	-
	Benzo(a)pyrene	µg/L	0	0.01	0.015	0.1	<0.000236	0.000105	-	-	-	-	-	-	-	-
	Benzo(b)fluoranthene	µg/L	0	-	-	-	<0.000178	0.000548	-	-	-	-	-	-	-	-
	Benzo(e)pyrene	µg/L	0	-	-	-	<0.000247	0.00102	-	-	-	-	-	-	-	-
	Benzo(g,h,i)perylene	µg/L	0	-	-	-	<0.000107	0.000763	-	-	-	-	-	-	-	-
	Benzo(j,k)fluoranthenes	µg/L	0	-	-	-	<0.000185	0.000135	-	-	-	-	-	-	-	-
	Chrysene	µg/L	0	-	-	-	0.000304	0.0011	-	-	-	-	-	-	-	-
	Dibenz(a,h)anthracene	µg/L	0	-	-	-	<0.000104	0.000091	-	-	-	-	-	-	-	-
	Dimethylnaphthalene, 2,6-	µg/L	0	-	-	-	0.00112	0.00222	-	-	-	-	-	-	-	-
	Dimethylphenanthrene, 1,7-	µg/L	0	-	-	-	0.00016	0.000345	-	-	-	-	-	-	-	-
	Dimethylphenanthrene, 3,6-	µg/L	0	-	-	-	0.000138	0.000211	-	-	-	-	-	-	-	-
	Fluoranthene	µg/L	0	4	0.04	2	0.000509	0.000575	-	-	-	-	-	-	-	-
	Fluorene	µg/L	0	12	3	120	0.000325	0.000636	-	-	-	-	-	-	-	-
	Indeno(1,2,3-cd)pyrene	µg/L	0	-	-	-	<0.000114	0.000193	-	-	-	-	-	-	-	-
	Methylnaphthalene, 1-	µg/L	0	-	-	-	0.00307	0.00521	-	-	-	-	-	-	-	-
	Methylnaphthalene, 2-	µg/L	0	-	-	-	0.00552	0.00883	-	-	-	-	-	-	-	-
	Methylphenanthrene, 2-	µg/L	0	-	-	-	0.000466	0.0012	-	-	-	-	-	-	-	-
	Naphthalene	µg/L	0	-	1.1	10	0.0282	0.0113	-	-	-	-	-	-	-	-
	Perylene	µg/L	0	-	-	-	<0.00027	0.001	-	-	-	-	-	-	-	-
	Phenanthrene	µg/L	0	0.3	0.4	3	0.00152	0.00268	-	-	-	-	-	-	-	-
	Pyrene	µg/L	0	-	0.025	0.2	0.000469	0.000915	-	-	-	-	-	-	-	-
	Retene	µg/L	0	-	-	-	0.000347	0.000577	-	-	-	-	-	-	-	-
	Trimethylphenanthrene, 1,2,6-	µg/L	0	-	-	-	<0.0000732	0.000126	-	-	-	-	-	-	-	-
	12-Dimethylnaphthalene	ng/L	0	-	-	-	<1.31	0.775	-	-	-	-	-	-	-	-
	C2-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	1.26	4.12	-	-	-	-	-	-	-	-
	C2-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	1.4	2.82	-	-	-	-	-	-	-	-
	3-Methylfluoranthene-Benzo-a-fluorene	ng/L	0	-	-	-	0.196	1.23	-	-	-	-	-	-	-	-
	C4-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	0.806	0.695	-	-	-	-	-	-	-	-
	C4-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	4.96	5.26	-	-	-	-	-	-	-	-
	17-Dimethylfluorene	ng/L	0	-	-	-	<0.201	0.523	-	-	-	-	-	-	-	-
	56-Methylchrysene	ng/L	0	-	-	-	<0.0707	0.126	-	-	-	-	-	-	-	-
	59-Dimethylchrysene	ng/L	0	-	-	-	<0.202	0.226	-	-	-	-	-	-	-	-
	7-Methylbenzo-a-pyrene	ng/L	0	-	-	-	<0.329	0.133	-	-	-	-	-	-	-	-
	94-Methylphenanthrene	ng/L	0	-	-	-	0.374	1.16	-	-	-	-	-	-	-	-
	C4-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	1.1	<0.0705	-	-	-	-	-	-	-	-
	C3-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	0.424	0.388	-	-	-	-	-	-	-	-
	23-Methyldibenzothiophenes	ng/L	0	-	-	-	<0.201	0.482	-	-	-	-	-	-	-	-
	24-Dimethyldibenzothiophene	ng/L	0	-	-	-	0.161	0.216	-	-	-	-	-	-	-	-
	26-Dimethylphenanthrene	ng/L	0	-	-	-	0.166	0.26	-	-	-	-	-	-	-	-
	2-Methylfluorene	ng/L	0	-	-	-	<0.184	0.295	-	-	-	-	-	-	-	-
	C1-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	0.423	1.44	-	-	-	-	-	-	-	-
	C1-Benzofluoranthenes-Benzopyrenes	ng/L	0	-	-	-	0.761	2.11	-	-	-	-	-	-	-	-
	C1-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	0.789	3.39	-	-	-	-	-	-	-	-
	C1-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	1.44	4.39	-	-	-	-	-	-	-	-
	C2-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	0.298	1.28	-	-	-	-	-	-	-	-
	C2-Benzofluoranthenes-Benzopyrenes	ng/L	0	-	-	-	0.312	1.06	-	-	-	-	-	-	-	-
	C3-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	0.791	2.23	-	-	-	-	-	-	-	-
	C3-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	1.31	2.12	-	-	-	-	-	-	-	-
	1-Methylchrysene	ng/L	0	-	-	-	<0.0739	0.179	-	-	-	-	-	-	-	-

Table 4: Surface Water Analytical Results

				BC WQG FW Aquatic Life Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Sampling Location	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507
						Sampled Date Time	05/08/2015	03/11/2015	10/11/2016	23/08/2017	08/11/2017	26/03/2018	23/05/2018	12/09/2018
						Yukon CSR Schedule 3 AW (Fresh)								
Chem Group	Parameter	Unit	EQL											
PAHs	1,4,6,7-tetramethylnaphthalene	µg/L	0		-	-	0.0506	0.00112	-	-	-	-	-	-
	1,8-dimethylphenanthrene	µg/L	0	-	-	-	0.0199	0.000383	-	-	-	-	-	-
	1-methylphenanthrene	µg/L	0	-	-	-	0.0744	0.00202	-	-	-	-	-	-
	2-methylantracene	µg/L	0	-	-	-	0.00458	0.000298	-	-	-	-	-	-
	3-methylphenanthrene	µg/L	0	-	-	-	0.0697	0.00282	-	-	-	-	-	-
	Acenaphthene	µg/L	0	6	5.8	-	0.0164	0.000752	-	-	-	-	-	-
	Acenaphthylene	µg/L	0	-	-	-	0.00179	0.000227	-	-	-	-	-	-
	Anthracene	µg/L	0	4	0.012	1	0.00326	0.00135	-	-	-	-	-	-
	Benz(a)anthracene	µg/L	0	0.1	0.018	1	0.0226	0.000982	-	-	-	-	-	-
	Benzo(a)pyrene	µg/L	0	0.01	0.015	0.1	0.0209	0.000727	-	-	-	-	-	-
	Benzo(b)fluoranthene	µg/L	0	-	-	-	0.0499	0.0012	-	-	-	-	-	-
	Benzo(e)pyrene	µg/L	0	-	-	-	0.106	0.00202	-	-	-	-	-	-
	Benzo(g,h,i)perylene	µg/L	0	-	-	-	<0.000133	0.00264	-	-	-	-	-	-
	Benzo(j,k)fluoranthenes	µg/L	0	-	-	-	0.0188	0.000547	-	-	-	-	-	-
	Chrysene	µg/L	0	-	-	-	0.108	0.00278	-	-	-	-	-	-
	Dibenz(a,h)anthracene	µg/L	0	-	-	-	<0.000167	0.000189	-	-	-	-	-	-
	Dimethylnaphthalene, 2,6-	µg/L	0	-	-	-	0.0768	0.00285	-	-	-	-	-	-
	Dimethylphenanthrene, 1,7-	µg/L	0	-	-	-	0.0568	0.00114	-	-	-	-	-	-
	Dimethylphenanthrene, 3,6-	µg/L	0	-	-	-	0.0312	0.000791	-	-	-	-	-	-
	Fluoranthene	µg/L	0	4	0.04	2	0.0606	0.00561	-	-	-	-	-	-
	Fluorene	µg/L	0	12	3	120	0.0285	0.00181	-	-	-	-	-	-
	Indeno(1,2,3-cd)pyrene	µg/L	0	-	-	-	0.0238	0.000726	-	-	-	-	-	-
	Methylnaphthalene, 1-	µg/L	0	-	-	-	0.089	0.00601	-	-	-	-	-	-
	Methylnaphthalene, 2-	µg/L	0	-	-	-	0.114	0.0102	-	-	-	-	-	-
	Methylphenanthrene, 2-	µg/L	0	-	-	-	0.0869	0.00317	-	-	-	-	-	-
	Naphthalene	µg/L	0	-	1.1	10	0.159	0.0182	-	-	-	-	-	-
	Perylene	µg/L	0	-	-	-	0.557	0.0134	-	-	-	-	-	-
	Phenanthrene	µg/L	0	0.3	0.4	3	0.117	0.0144	-	-	-	-	-	-
	Pyrene	µg/L	0	-	0.025	0.2	0.172	0.00668	-	-	-	-	-	-
	Retene	µg/L	0	-	-	-	0.166	0.00291	-	-	-	-	-	-
	Trimethylphenanthrene, 1,2,6-	µg/L	0	-	-	-	0.0255	0.000498	-	-	-	-	-	-
	12-Dimethylnaphthalene	ng/L	0	-	-	-	24.6	0.849	-	-	-	-	-	-
	C2-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	763	14.7	-	-	-	-	-	-
	C2-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	436	8.91	-	-	-	-	-	-
	3-Methylfluoranthene-Benzo-a-fluorene	ng/L	0	-	-	-	151	3.4	-	-	-	-	-	-
	C4-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	163	2.43	-	-	-	-	-	-
	C4-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	1390	17.9	-	-	-	-	-	-
	17-Dimethylfluorene	ng/L	0	-	-	-	43.2	0.501	-	-	-	-	-	-
	56-Methylchrysene	ng/L	0	-	-	-	23.1	0.495	-	-	-	-	-	-
	59-Dimethylchrysene	ng/L	0	-	-	-	60.5	0.779	-	-	-	-	-	-
	7-Methylbenzo-a-pyrene	ng/L	0	-	-	-	18.4	<0.285	-	-	-	-	-	-
	94-Methylphenanthrene	ng/L	0	-	-	-	102	2.72	-	-	-	-	-	-
	C4-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	39.7	0.653	-	-	-	-	-	-
	C3-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	90.6	1.02	-	-	-	-	-	-
	23-Methyldibenzothiophenes	ng/L	0	-	-	-	37.9	1.22	-	-	-	-	-	-
	24-Dimethyldibenzothiophene	ng/L	0	-	-	-	37.9	0.771	-	-	-	-	-	-
	26-Dimethylphenanthrene	ng/L	0	-	-	-	34.8	0.728	-	-	-	-	-	-
	2-Methylfluorene	ng/L	0	-	-	-	35.8	0.754	-	-	-	-	-	-
	C1-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	225	4.54	-	-	-	-	-	-
	C1-Benzofluoranthenes-Benzopyrenes	ng/L	0	-	-	-	310	4.1	-	-	-	-	-	-
	C1-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	533	12.8	-	-	-	-	-	-
	C1-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	333	11	-	-	-	-	-	-
	C2-Benzo-a-anthracenes-Chrysenes	ng/L	0	-	-	-	272	3.76	-	-	-	-	-	-
	C2-Benzofluoranthenes-Benzopyrenes	ng/L	0	-	-	-	91.1	1.47	-	-	-	-	-	-
	C3-Fluoranthenes-Pyrenes	ng/L	0	-	-	-	550	5.71	-	-	-	-	-	-
	C3-Phenanthrenes-Anthracenes	ng/L	0	-	-	-	570	10.2	-	-	-	-	-	-
	1-Methylchrysene	ng/L	0	-	-	-	33.6	0.795	-	-	-	-	-	-

Table 4: Surface Water Analytical Results

						Sampling Location	BVRV-SEEP	LBRV-DP2	LBRV-DP6	LBRV-DP6	LBRV-DP6	LBRV-DP6	LBRV-SEEP	LBRV-SEEP	LBRV-SEEP	MW-15-1A
						Sampled Date Time	03/11/2015	04/08/2015	23/08/2017	08/11/2017	23/05/2018	12/09/2018	21/03/2017	23/08/2017	26/03/2018	23/08/2017
				BC WQG FW Aquatic Life Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)										
Chem Group	Parameter	Unit	EQL													
Alkylated PAHs	C1 - Acenaphthenes	µg/L	0		-	-	<0.00057	0.000187	-	-	-	-	-	-	-	-
	C1 - Biphenyls	µg/L	0	-	-	-	0.00157	0.00186	-	-	-	-	-	-	-	-
	C1 - Fluorenes	µg/L	0	-	-	-	0.00629	0.00238	-	-	-	-	-	-	-	-
	C1 - Naphthalenes	µg/L	0	-	-	-	0.00859	0.014	-	-	-	-	-	-	-	-
	C2 - Biphenyls	µg/L	0	-	-	-	0.00288	0.00151	-	-	-	-	-	-	-	-
	C2 - Fluorenes	µg/L	0	-	-	-	0.00202	0.00256	-	-	-	-	-	-	-	-
	C2 - Naphthalenes	µg/L	0	-	-	-	0.00732	0.0104	-	-	-	-	-	-	-	-
	C3 - Fluorenes	µg/L	0	-	-	-	0.00201	0.00407	-	-	-	-	-	-	-	-
	C3 - Naphthalenes	µg/L	0	-	-	-	0.00797	0.00702	-	-	-	-	-	-	-	-
	C4 - Dibenzothiophenes	µg/L	0	-	-	-	0.0023	0.00289	-	-	-	-	-	-	-	-
	C4 - Naphthalenes	µg/L	0	-	-	-	0.0126	0.00437	-	-	-	-	-	-	-	-
Organosulfur	C1 - Dibenzothiophenes	µg/L	0		-	-	<0.000201	0.00133	-	-	-	-	-	-	-	-
	C2 - Dibenzothiophenes	µg/L	0	-	-	-	0.00151	0.00315	-	-	-	-	-	-	-	-
	C3 - Dibenzothiophenes	µg/L	0	-	-	-	0.00263	0.0028	-	-	-	-	-	-	-	-
	Dibenzothiophene	µg/L	0	-	-	-	0.000128	0.000477	-	-	-	-	-	-	-	-

Table 4: Surface Water Analytical Results

				BC WQG FW Aquatic Life Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Sampling Location	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507	YOWN-1507
						Sampled Date Time	05/08/2015	03/11/2015	10/11/2016	23/08/2017	08/11/2017	26/03/2018	23/05/2018	12/09/2018
						Yukon CSR Schedule 3 AW (Fresh)								
Chem Group	Parameter	Unit	EQL											
Alkylated PAHs	C1 - Acenaphthenes	µg/L	0		-	-	0.00388	<0.000351	-	-	-	-	-	-
	C1 - Biphenyls	µg/L	0	-	-	-	0.0603	0.00206	-	-	-	-	-	-
	C1 - Fluorenes	µg/L	0	-	-	-	0.121	0.00344	-	-	-	-	-	-
	C1 - Naphthalenes	µg/L	0	-	-	-	0.203	0.0162	-	-	-	-	-	-
	C2 - Biphenyls	µg/L	0	-	-	-	0.0849	0.00342	-	-	-	-	-	-
	C2 - Fluorenes	µg/L	0	-	-	-	0.323	0.00595	-	-	-	-	-	-
	C2 - Naphthalenes	µg/L	0	-	-	-	0.368	0.0141	-	-	-	-	-	-
	C3 - Fluorenes	µg/L	0	-	-	-	0.431	0.0118	-	-	-	-	-	-
	C3 - Naphthalenes	µg/L	0	-	-	-	0.522	0.012	-	-	-	-	-	-
	C4 - Dibenzothiophenes	µg/L	0	-	-	-	0.399	0.00777	-	-	-	-	-	-
	C4 - Naphthalenes	µg/L	0	-	-	-	0.527	0.0102	-	-	-	-	-	-
Organosulfur	C1 - Dibenzothiophenes	µg/L	0		-	-	0.101	0.0035	-	-	-	-	-	-
	C2 - Dibenzothiophenes	µg/L	0	-	-	-	0.459	0.00938	-	-	-	-	-	-
	C3 - Dibenzothiophenes	µg/L	0	-	-	-	0.534	0.0136	-	-	-	-	-	-
	Dibenzothiophene	µg/L	0	-	-	-	0.0283	0.00194	-	-	-	-	-	-

Notes: Surface Water Analytical Results

- (1) All values are reported as µg/L unless otherwise noted.
- (2) - = No guideline or not analyzed.
- (3) BC WQG - Approved = Approved - BC Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture Summary Report. Water Protection & Sustainability Branch, MOE & Climate Change Strategy. March 2018.
- (4) BC WQG - Working = Working - BC Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. Water Protection & Sustainability Branch, MOE & Climate Change Strategy. June 2017.
- (5) Aluminum - Long-term average WQGs calculated using the median of pH values of samples collected over the long-term averaging period.
- (6) Benzene - Interim BC WQG based on review of Canadian Council of Ministers of the Environment (1999) WQG.
- (7) Ethylbenzene - Revised interim BC WQGs based on review of Canadian Council of Ministers of the Environment (1996) WQGs.
- (8) Nitrogen - When nitrate and nitrite are present, total nitrate- plus nitrite-nitrogen should not exceed the nitrate WQG.
- (9) Nitrite - standard of 0.02 mg/L is for when $\text{Cl}^- \leq 2 \text{ mg/L}$. Also see Table 26B of BC Approved WQG. The long-term average Cl^- concentration should be used to find the appropriate long-term average NO_2^- WQG.
- (10) Ammonia Nitrogen to protect freshwater aquatic life - BC Approved WQG, Table 26C. The average of the five measured NH_3 concentrations must be less than the corresponding tabled NH_3 value (WQG) found by using the average of the five measured pH, temperature, and salinity values. No more than one of five of the measured values can exceed 1.5 times the WQG.
- (11) Organic Carbon - The 30-day median for both DOC and TOC shall be within 20% of seasonally adjusted median background levels. The 30-day median calculation should be based on a minimum of five weekly samples taken over 30 days.
- (12) Dissolved oxygen - the most stringent life stage guideline was used.
- (13) PAHs - WQGs are for sediment containing 1% organic carbon (OC).
- (14) Selenium - The most stringent of the long term WQGs was used for both aquatic life and wildlife.
- (15) Temperature - Refer to BC Approved WQG, Table 42A & 42B.
- (16) Turbidity (clear flow) - Change of 2 NTU from background level at any one time for a duration of 30 d during clear flows or in clear water.
- (17) Turbidity (turbid flow) - Change of 5 NTU from background level when background is 8-50 NTU during high flows or turbid waters.
- (18) Turbidity (turbid flow) - Change from background of 10% when background is > 50 NTU at any time during high flows or turbid waters.
- (19) Total Suspended Solids (clear flow) - Change of 5 mg/L from background level at any one time for a duration of 30 d during clear flows or in clear water.
- (20) Total Suspended Solids (turbid flow) - Change of 10 mg/L from background level when background is 25-100 mg/L during high flows or turbid waters.
- (21) Total Suspended Solids (turbid flow) - Change from background of 10% when background is > 100 mg/L at any time during high flows or turbid waters.
- (22) CCME = Canadian Council of Ministers of the Environment, Canadian Environmental Quality Guidelines, 1999, updated to 2018.
- (23) CCME FAL = Canadian Water Quality Guidelines for the Protection of Aquatic Life, Freshwater, updated to 2018.
- (24) CCME MAL = Canadian Water Quality Guidelines for the Protection of Aquatic Life, Marine, updated to 2018.
- (25) CWQG = Canadian Water Quality Guidelines.
- (26) NGR = No Recommended Guideline
- (27) Ammonia (total) FAL CWQG varies with pH and temperature. See CWQG for the Protection of Aquatic Life, Ammonia Factsheet, CCME 2010.
- (28) Boron CWQG varies for short and long term for both FAL and MAL.
- (29) pH MAL - the pH of marine and estuarine waters should be within 7.0 - 8.7, unless it can be demonstrated that a pH outside of this range is a result of natural processes.
- (30) Dissolved Oxygen (DO) FAL CWQG varies with life stages of water biota. The lowest acceptable DO concentrations are as follows:
 - 6000 µg/L for warm water biota, early life stages
 - 5500 µg/L for warm water biota, other life stages
 - 9500 µg/L for cold water biota, early life stages
 - 6500 µg/L for cold water biota, other life stages
- (31) DO MAL recommended minimum concentration in marine and estuarine waters is 8 mg/L. When the natural DO level is less than the recommended interim guideline, the natural concentration should become the interim guideline at the site. When ambient DO concentrations are > 8.0 mg/L, human activities should not cause DO levels to decrease by more than 10% of the natural concentration expected in the receiving environment at that time.
- (32) YKCSR = *Yukon Environment Act*, Contaminated Sites Regulation, Y.O.I.C. 2002/171, effective September 30, 2002.
- (33) YKCSR Aquatic Water (AW) = Schedule 3, Column II
- (34) Aquatic life standards are to protect freshwater life, unless otherwise indicated.

Table 5-A: Summary of Exceedances in Groundwater Monitoring Wells

						Sampling Location		MW-15-1A		YOWN-1507						
						Sample Date		23/08/2017	05/08/2015	03/11/2015	10/11/2016	23/08/2017	08/11/2017	26/03/2018	23/05/2018	12/09/2018
Chem_Group	ChemName	output unit	EQL	BC WQG FW Aquatic Life Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)										
Inorganics	Alkalinity (total) as CaCO3	µg/L	5,000	Varies - see Notes	-	-		556,000	180,000	186,000	223,000	248,000	256,000	220,000	299,000	268,000
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2		<0.1	0.11	0.58	0.062	<0.01	<0.01	<0.01	<0.1	<0.01
	Total Suspended Solids	mg/l	2	-	25	-		5000	14,900	660	2	78	141	290	550	235
Total Metals	Aluminium	µg/L	1.00		5 100	-		10,000	98,300	6640	15	690	860	2400	70,000	2100
	Antimony	µg/L	0.02	9	-	200		1.6	40	5.3	0.09	0.33	1.1	2.5	18	1.6
	Arsenic	µg/L	0.10	5	5	50		22	800	38	0.5	4.5	6.5	13	190	17
	Barium	µg/L	0.10	1000	-	10000		670	5800	360	86.7	210	250	270	1300	150
	Beryllium	µg/L	0.05	0.13	-	53		0.77	6	<0.2	<0.05	<0.05	0.07	0.14	2	0.14
	Cadmium	µg/L	0.01	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6		0.7	47	1.37	0.02	0.13	0.28	0.59	5.7	0.22
	Chromium	µg/L	0.05	1	1	10		19	480	59.1	2.04	5.5	15	30	350	24
	Cobalt	µg/L	0.02	4	-	9		15	237	18.5	0.17	1.2	4.5	8.7	130	6.4
	Copper	µg/L	0.20	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90		25	3400	310	3.5	12	49	130	1200	86
	Iron	mg/L	0.00	-	0.3	-		34	5760	239	1.85	20	54	70	1000	79
	Lead	µg/L	0.01	-	Eqn 1 7	40 50 60 110 160		11	280	11	11.1	2.1	2.5	6.3	82	3.2
	Mercury	µg/L	0.01	-	0.026	1		<0.01	0.85	0.05	-	<0.01	<0.01	<0.01	<0.01	<0.01
	Molybdenum	µg/L	0.02	1000	73	10000		3.3	930	57.6	1.54	4.8	7.6	12	210	18
	Nickel	µg/L	0.20	Varies - see Notes	Eqn 25 150	250 650 1100 1500		27	1400	130	1.6	7.3	30	70	850	44
	Selenium	µg/L	0.20	2	1	10		2.1	<60	<3	0.4	<0.2	0.2	0.3	5	0.3
	Silicon	µg/L	5.00	-	-	-		36,000	166,000	23,500	5520	6100	5000	7800	140,000	7600
	Silver	µg/L	0.01	Varies - see Notes	0.25	0.5 15		0.24	5.64	0.22	<0.01	0.03	0.04	0.11	0.99	0.05
	Thallium	µg/L	0.01	0.8	0.8	3		0.36	4.2	0.19	<0.01	0.02	0.03	0.08	0.89	0.04
	Titanium	µg/L	2.00	-	-	1000		340	1640	254	12	72	36	40	1800	60
	Uranium	µg/L	0.01	8.5	15	3000		7.9	<40	<2	0.807	0.24	1	1.2	8.7	0.94
	Zinc	µg/L	0.50	Varies - see Notes	30	75 150 900 1650 2400		65	7500	290	246	58	47	100	1200	110
Dissolved Metals	Selenium	µg/L	0.20	2	-	10		<0.2	<0.6	<0.6	0.5	<0.2	<0.2	<0.2	<0.2	<0.2
PAHs	Benz(a)anthracene	µg/L	0.00	0.1	0.018	1		-	0.0226	0.000982	-	-	-	-	-	-
	Benzo(a)pyrene	µg/L	0.00	0.01	0.015	0.1		-	0.0209	0.000727	-	-	-	-	-	-
	Fluoranthene	µg/L	0.00	4	0.04	2		-	0.0606	0.00561	-	-	-	-	-	-
	Pyrene	µg/L	0.00	-	0.025	0.2		-	0.172	0.00668	-	-	-	-	-	-

Table 5-B: Summary of Exceedances in Streambed Drive Point Piezometers

						Sampling Location	BVRV-SEEP	LBRV-DP2	LBRV-DP6				LBRV-SEEP		
						Sample Date	03/11/2015	04/08/2015	23/08/2017	08/11/2017	23/05/2018	12/09/2018	21/03/2017	23/08/2017	26/03/2018
				BC WQG FW Aquatic Life Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)									
Chem_Group	ChemName	output unit	EQL												
Inorganics	Alkalinity (total) as CaCO3	µg/L	5,000	Varies - see Notes	-	-	345,000	128,000	433,000	529,000	468,000	530,000	427,000	377,000	361,000
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	0.25	0.07	<0.1	<0.01	<0.1	<0.01	<0.01	<0.1	<0.1
	Total Suspended Solids	mg/l	2	-	25	-	5	10	60	1600	34	50	18	<8	35
Total Metals	Aluminium	µg/L	1.00		5 100	-	29	986	760	11,000	43	220	4	39	11
	Antimony	µg/L	0.02	9	-	200	<0.2	<0.2	0.18	0.27	<0.02	0.03	0.03	0.1	0.13
	Arsenic	µg/L	0.10	5	5	50	0.2	0.4	9.3	25	3.1	4.3	3.2	2.6	5.5
	Barium	µg/L	0.10	1000	-	10000	37	72	330	640	350	390	220	210	310
	Beryllium	µg/L	0.05	0.13	-	53	<0.04	<0.04	0.07	0.65	<0.05	<0.05	<0.05	<0.05	<0.05
	Cadmium	µg/L	0.01	-	Eqn 0.04 0.37	0.1 0.3 0.5 0.6	0.02	0.02	0.09	1.1	<0.01	<0.01	0.01	0.02	<0.01
	Chromium	µg/L	0.05	1	1	10	<0.4	1.2	4.9	29	0.19	0.27	<0.05	<0.05	0.17
	Cobalt	µg/L	0.02	4	-	9	0.09	0.23	1.7	13	0.8	0.7	0.53	0.6	0.43
	Copper	µg/L	0.20	Varies - see Notes	Eqn 2 4	20 30 40 50 60 70 80 90	<1	2	6.3	26	<0.2	<0.2	0.3	0.8	<0.2
	Iron	mg/L	0.00	-	0.3	-	0.099	0.782	23	72	16	16	12.2	6.3	18
	Lead	µg/L	0.01	-	Eqn 1 7	40 50 60 110 160	<0.1	<0.1	1.3	14	0.07	0.17	<0.01	0.01	0.04
	Mercury	µg/L	0.01	-	0.026	1	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
	Molybdenum	µg/L	0.02	1000	73	10000	1.4	1.5	2.1	4.8	5.8	6	2.02	1.4	2.5
	Nickel	µg/L	0.20	Varies - see Notes	Eqn 25 150	250 650 1100 1500	1	2	6.2	51	2.3	2.8	1.8	2.7	2.8
	Selenium	µg/L	0.20	2	1	10	6.8	2.1	0.3	2.7	<0.2	0.2	<0.2	<0.2	<0.2
	Silicon	µg/L	5.00	-	-	-	3560	4260	6200	29,000	3800	4200	3670	3900	3900
	Silver	µg/L	0.01	Varies - see Notes	0.25	0.5 15	<0.01	<0.01	0.04	0.21	<0.01	<0.01	<0.01	<0.01	<0.01
	Thallium	µg/L	0.01	0.8	0.8	3	0.02	0.02	0.02	0.18	<0.01	<0.01	<0.01	0.01	<0.01
	Titanium	µg/L	2.00	-	-	1000	20.7	45.1	43	200	9	19	13	18	9
	Uranium	µg/L	0.01	8.5	15	3000	6.4	0.8	0.61	1.6	0.3	0.4	0.468	0.91	0.3
	Zinc	µg/L	0.50	Varies - see Notes	30	75 150 900 1650 2400	2	6	22	12,000	690	690	<0.5	0.6	1.7
Dissolved Metals	Selenium	µg/L	0.20	2	-	10	9.7	2.8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PAHs	Benz(a)anthracene	µg/L	0.00	0.1	0.018	1	0.000084	0.000189	-	-	-	-	-	-	-
	Benzo(a)pyrene	µg/L	0.00	0.01	0.015	0.1	<0.000236	0.000105	-	-	-	-	-	-	-
	Fluoranthene	µg/L	0.00	4	0.04	2	0.000509	0.000575	-	-	-	-	-	-	-
	Pyrene	µg/L	0.00	-	0.025	0.2	0.000469	0.000915	-	-	-	-	-	-	-

Table 5-B: Summary of Exceedances in Streambed Drive Point Piezometers

						Sampling Location		MW-15-1A		YOWN-1507															
						Sample Date		23/08/2017		05/08/2015		03/11/2015		10/11/2016		23/08/2017		08/11/2017		26/03/2018		23/05/2018		12/09/2018	
				BC WQG FW Aquatic Life Working and Approved		CCME Protection of Aquatic Life (FAL, long term)		Yukon CSR Schedule 3 AW (Fresh)																	
Chem_Group	ChemName	output unit	EQL																						
Inorganics	Alkalinity (total) as CaCO3	µg/L	5,000	Varies - see Notes		-		-		556,000	180,000	186,000	223,000	248,000	256,000	220,000	299,000	268,000							
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes		0.06		0.2-2		<0.1	0.11	0.58	0.062	<0.01	<0.01	<0.01	<0.1	<0.01							
	Total Suspended Solids	mg/l	2	-		25		-		5000	14,900	660	2	78	141	290	550	235							
Total Metals	Aluminium	µg/L	1.00			5 100		-		10,000	98,300	6640	15	690	860	2400	70,000	2100							
	Antimony	µg/L	0.02	9		-		200		1.6	40	5.3	0.09	0.33	1.1	2.5	18	1.6							
	Arsenic	µg/L	0.10	5		5		50		22	800	38	0.5	4.5	6.5	13	190	17							
	Barium	µg/L	0.10	1000		-		10000		670	5800	360	86.7	210	250	270	1300	150							
	Beryllium	µg/L	0.05	0.13		-		53		0.77	6	<0.2	<0.05	<0.05	0.07	0.14	2	0.14							
	Cadmium	µg/L	0.01	-		Eqn 0.04 0.37		0.1 0.3 0.5 0.6		0.7	47	1.37	0.02	0.13	0.28	0.59	5.7	0.22							
	Chromium	µg/L	0.05	1		1		10		19	480	59.1	2.04	5.5	15	30	350	24							
	Cobalt	µg/L	0.02	4		-		9		15	237	18.5	0.17	1.2	4.5	8.7	130	6.4							
	Copper	µg/L	0.20	Varies - see Notes		Eqn 2 4		20 30 40 50 60 70 80 90		25	3400	310	3.5	12	49	130	1200	86							
	Iron	mg/L	0.00	-		0.3		-		34	5760	239	1.85	20	54	70	1000	79							
	Lead	µg/L	0.01	-		Eqn 1 7		40 50 60 110 160		11	280	11	11.1	2.1	2.5	6.3	82	3.2							
	Mercury	µg/L	0.01	-		0.026		1		<0.01	0.85	0.05	-	<0.01	<0.01	<0.01	<0.01	<0.01							
	Molybdenum	µg/L	0.02	1000		73		10000		3.3	930	57.6	1.54	4.8	7.6	12	210	18							
	Nickel	µg/L	0.20	Varies - see Notes		Eqn 25 150		250 650 1100 1500		27	1400	130	1.6	7.3	30	70	850	44							
	Selenium	µg/L	0.20	2		1		10		2.1	<60	<3	0.4	<0.2	0.2	0.3	5	0.3							
	Silicon	µg/L	5.00	-		-		-		36,000	166,000	23,500	5520	6100	5000	7800	140,000	7600							
	Silver	µg/L	0.01	Varies - see Notes		0.25		0.5 15		0.24	5.64	0.22	<0.01	0.03	0.04	0.11	0.99	0.05							
	Thallium	µg/L	0.01	0.8		0.8		3		0.36	4.2	0.19	<0.01	0.02	0.03	0.08	0.89	0.04							
	Titanium	µg/L	2.00	-		-		1000		340	1640	254	12	72	36	40	1800	60							
	Uranium	µg/L	0.01	8.5		15		3000		7.9	<40	<2	0.807	0.24	1	1.2	8.7	0.94							
	Zinc	µg/L	0.50	Varies - see Notes		30		75 150 900 1650 2400		65	7500	290	246	58	47	100	1200	110							
Dissolved Metals	Selenium	µg/L	0.20	2		-		10		<0.2	<0.6	<0.6	0.5	<0.2	<0.2	<0.2	<0.2	<0.2							
PAHs	Benz(a)anthracene	µg/L	0.00	0.1		0.018		1		-	0.0226	0.000982	-	-	-	-	-	-							
	Benzo(a)pyrene	µg/L	0.00	0.01		0.015		0.1		-	0.0209	0.000727	-	-	-	-	-	-							
	Fluoranthene	µg/L	0.00	4		0.04		2		-	0.0606	0.00561	-	-	-	-	-	-							
	Pyrene	µg/L	0.00	-		0.025		0.2		-	0.172	0.00668	-	-	-	-	-	-							

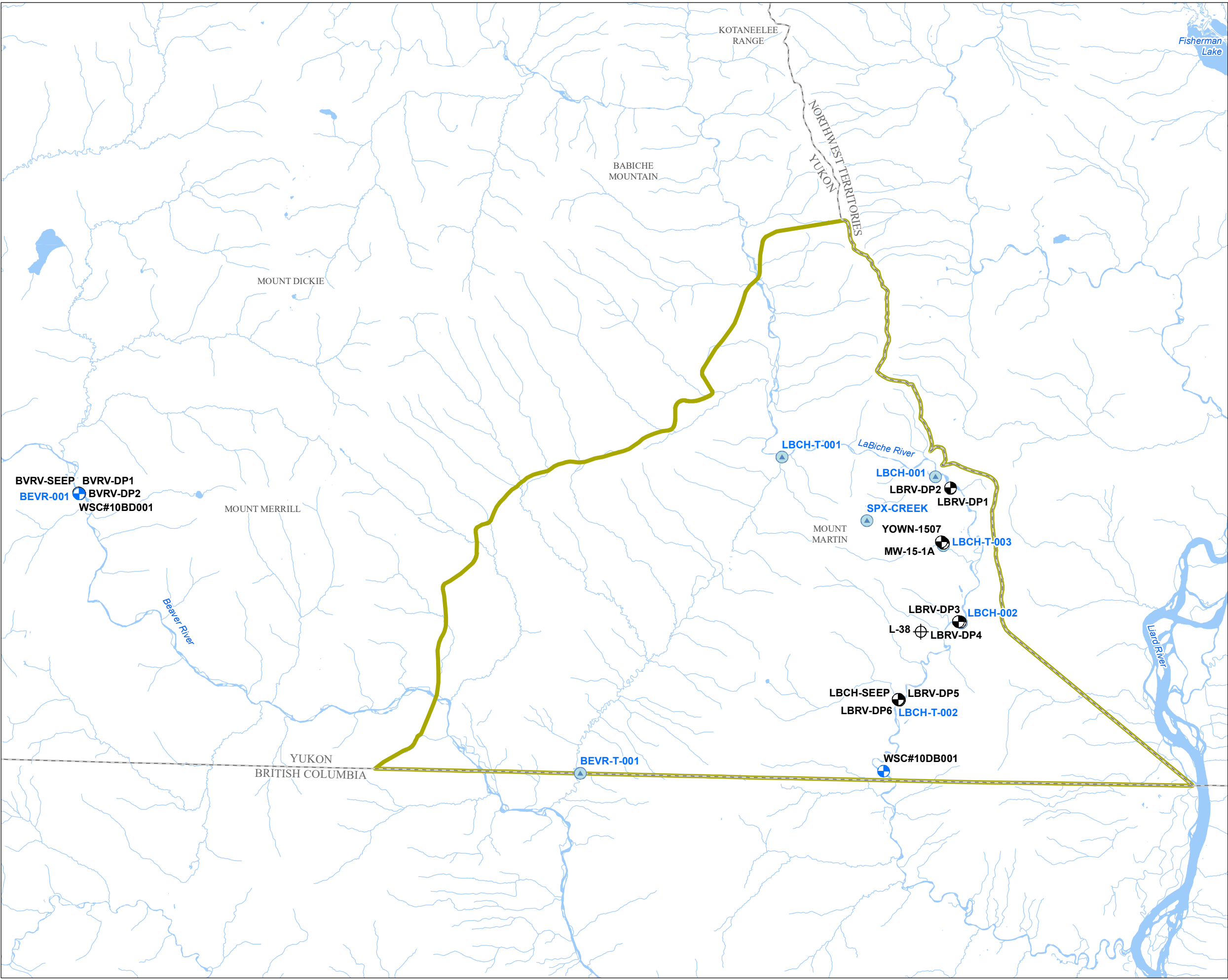
Table 5-C: Summary of Exceedances in Seeps

							BVRV-SEEP	LBCH-SEEP		
							03/11/2015	21/03/2017	23/08/2017	26/03/2018
Chem Group	Parameter	Unit	EQL	BC WQG FW Aquatic Life Working and Approved	CCME Protection of Aquatic Life (FAL, long term)	Yukon CSR Schedule 3 AW (Fresh)				
Inorganics	Alkalinity (total) as CaCO3	µg/L	5,000	Varies - see Notes	-	-	345,000	427,000	377,000	361,000
	Nitrite (as N) (Filtered)	mg/L	0	Varies - see Notes	0.06	0.2-2	0.25	<0.01	<0.1	<0.1
	Total Suspended Solids	mg/l	2	-	25	-	5	18	<8	35
Total Metals	Arsenic	µg/L	0.10	5	5	50	0.2	3.2	2.6	5.5
	Iron	mg/L	0.00	-	0.3	-	0.099	12.2	6.3	18
	Selenium	µg/L	0.20	2	1	10	6.8	<0.2	<0.2	<0.2
Dissolved Metals	Selenium	µg/L	0.20	2	-	10	9.7	<0.2	<0.2	<0.2

FIGURES

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| Figure 2 | Surficial Geology – Beaver River Basin |
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| Figure 4 | Bedrock Geology – Beaver River Basin |
| Figure 5 | Bedrock Geology – La Biche River Basin |

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Kotaneelee Baseline Water Quality Characterization
Kotaneelee Area, YT

Groundwater and Surface
Water Sampling Locations

YUKON
TERRITORY

NORTHWEST
TERRITORIES

BRITISH
COLUMBIA

ALBERTA

Map Extent

0100200
Kilometres

Legend

Exploration Borehole Location

Groundwater Site Location

Surface Water Site Location

Water Survey Station of Canada Station

Liard Basin Assessment Area

Provincial or Territory Boundary

Watercourse

Waterbody

Notes

1. All mapped features are approximate and should be used for discussion purposes only.

2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Basedata: Yukon Government

- Basemap: ESRI World Topographic Map

- Inset Basemap: ESRI World Topographic Map

N

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0246810
Kilometres

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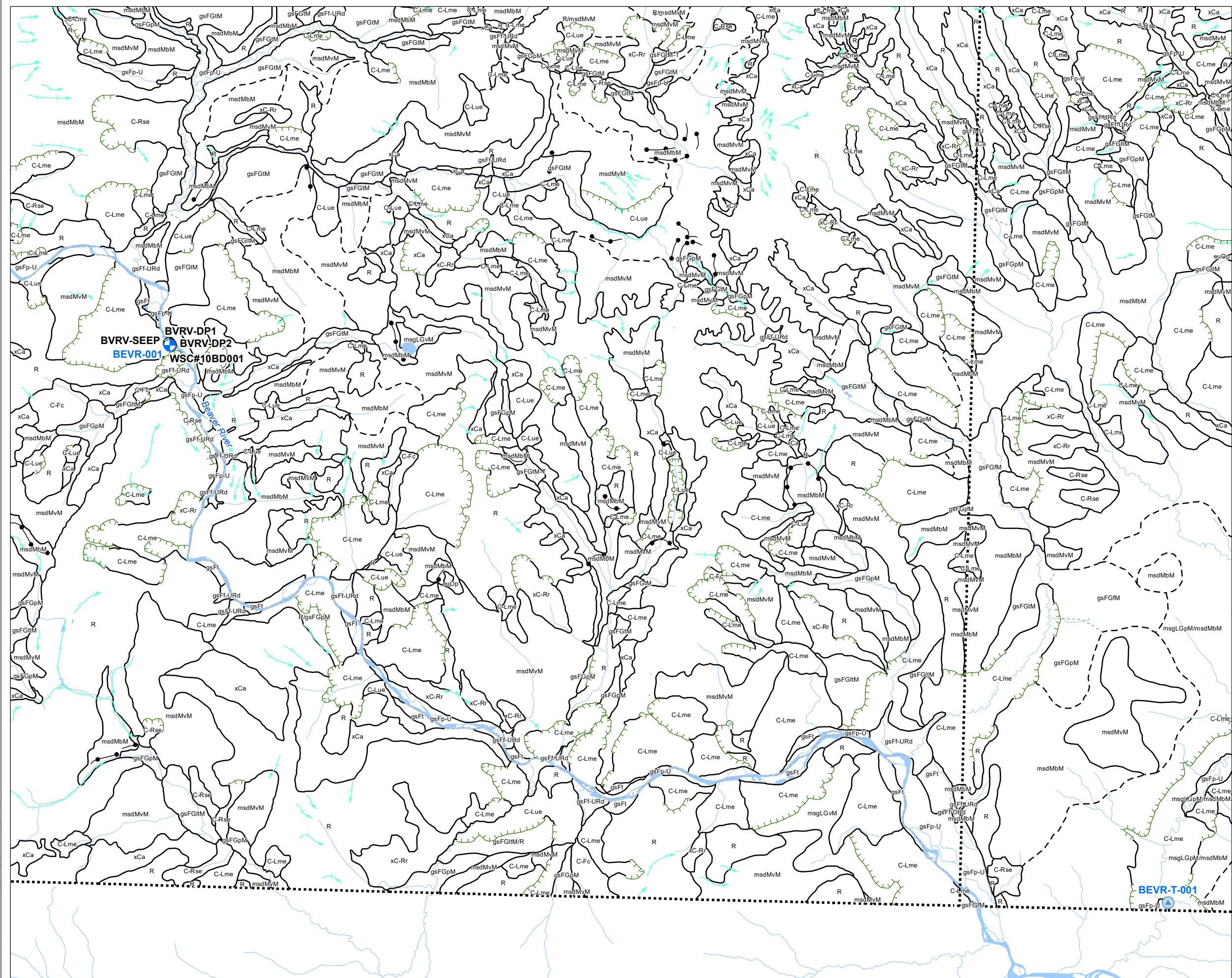
103554-01

Production Date: Nov 5, 2019

Figure 1

Hemmera
An Ausenco Company

Government
of Yukon



Kotaneetlee Baseline Water Quality Characterization

Kotaneetlee Area, YT

Surficial Geology - Beaver River

Legend

-  Exploration Borehole Location
-  Groundwater Site Location
-  Surface Water Site Location
-  Water Survey Station of Canada Station
-  Waterbody
-  Watercourse
-  escarpment, unclassified
-  map edge, unclassified
-  meltwater channel, minor, flow direction known, lateral
-  meltwater channel, minor, flow direction known, subglacial or proglacial
-  moraine ridge, unclassified
-  geological boundary, defined
-  geological boundary, approximate
-  geological boundary, arbitrary
-  moraine ridge, unclassified, M

Surficial Geology

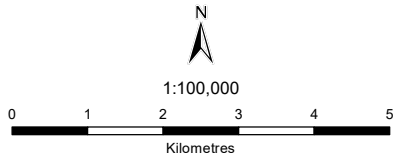
Simplified Key to the Yukon Terrain Classification System & Surficial Geology Maps Labels is in Appendix A

Notes

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Sources

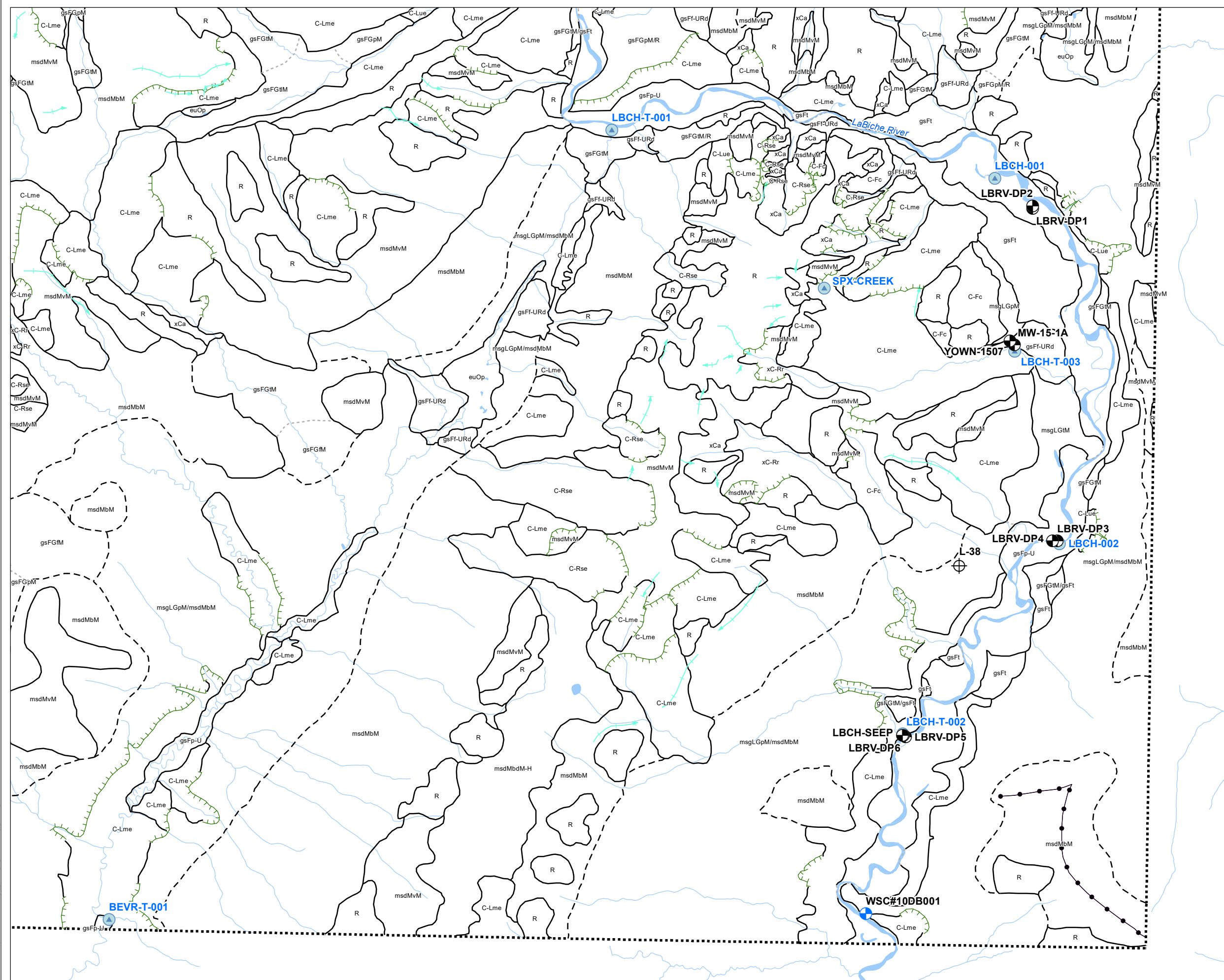
- Contains information licensed under the Open Government Licence - Yukon Government
- Surficial Geology: Yukon Geological Survey (YGS), 2014
- Basemap: ESRI World Topographic Map



NAD 1983 UTM Zone 10N

Page Size: 11" x 17"

103554-01	Production Date: Nov 5, 2019	Figure 2
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Kotaneetlee Baseline Water Quality Characterization
Kotaneetlee Area, YT

Surficial Geology - LaBiche

Legend

-  Exploration Borehole Location
-  Groundwater Site Location
-  Surface Water Site Location
-  Water Survey Station of Canada Station
-  Waterbody
-  Watercourse
-  escarpment, unclassified
-  map edge, unclassified
-  meltwater channel, minor, flow direction known, lateral
-  meltwater channel, minor, flow direction known, subglacial or proglacial
-  moraine ridge, unclassified
-  geological boundary, defined
-  geological boundary, approximate
-  geological boundary, arbitrary
-  moraine ridge, unclassified, M

Surficial Geology

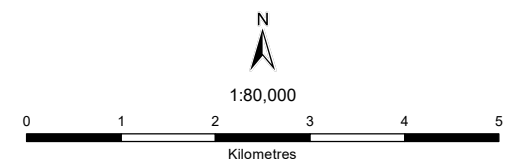
Simplified Key to the Yukon Terrain Classification System & Surficial Geology Maps Labels is in Appendix A

Notes

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- Surficial Geology: Yukon Geological Survey (YGS), 2014
- Basemap: ESRI World Topographic Map



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Page Size: 11" x 17"

103554-01

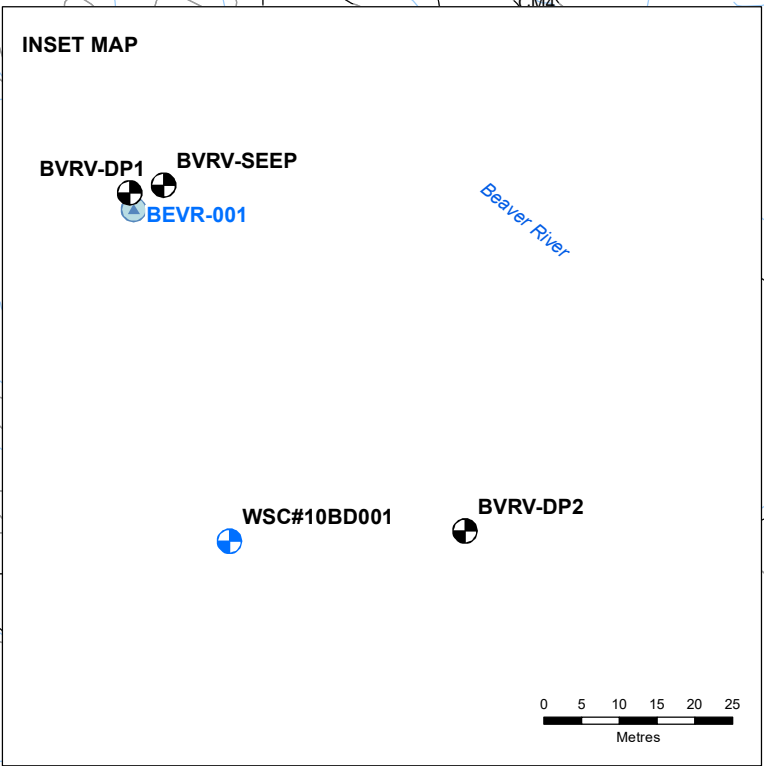
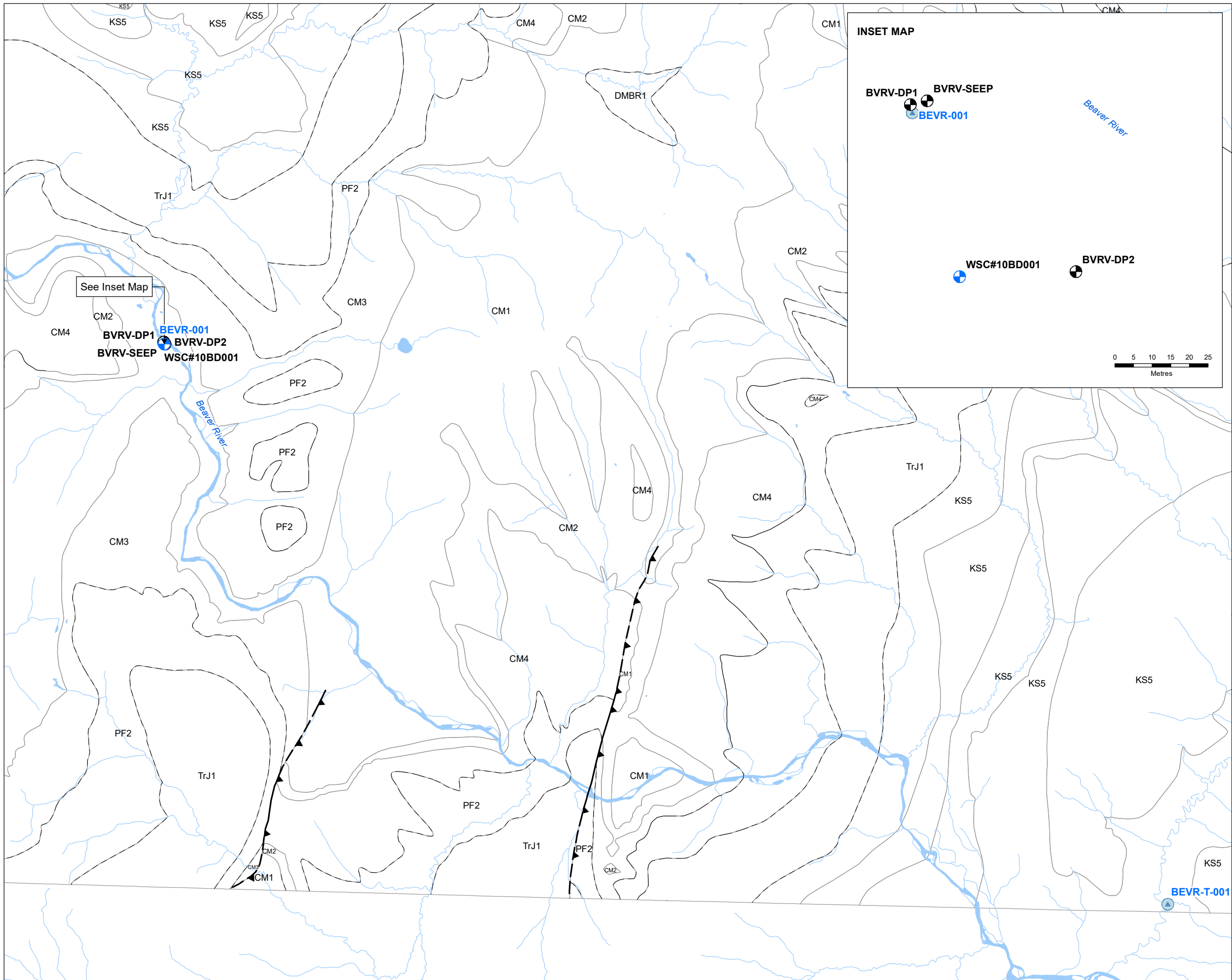
Production Date: Mar 29, 2019

Figure 3



Government
of Yukon

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Kotaneelee Baseline Water Quality Characterization Kotaneelee Area, YT

Bedrock Geology - Beaver River

Legend

- Exploration Borehole Location
- Groundwater Site Location
- Surface Water Site Location
- Water Survey Station of Canada Station
- Waterbody
- Watercourse

Faults

- thrust, approximate
- thrust, defined

Contacts

- stratigraphic, approximate
- stratigraphic, defined
- stratigraphic, inferred

Bedrock

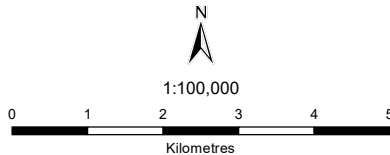
- KS5: FORT ST. JOHN: concretionary dark grey and rusty weathering shale
- TrJ1: JONES LAKE: calcareous siltstone, shale, and fine sandstone
- PF2: TIKA, FANTASQUE: limestone, dolostone, chert, shale
- CM1: MATTSON: thinly bedded grey sandstone, shale and coal
- CM2: MATTSON: massive bedded, grey to brown sandstone
- CM3: MATTSON: grey sandstone, limestone and shale
- CM4: MATTSON: undivided sandstone, limestone and shale
- DMBR1: BESA RIVER: black, brown and green shale and argillite; cherty argillite

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

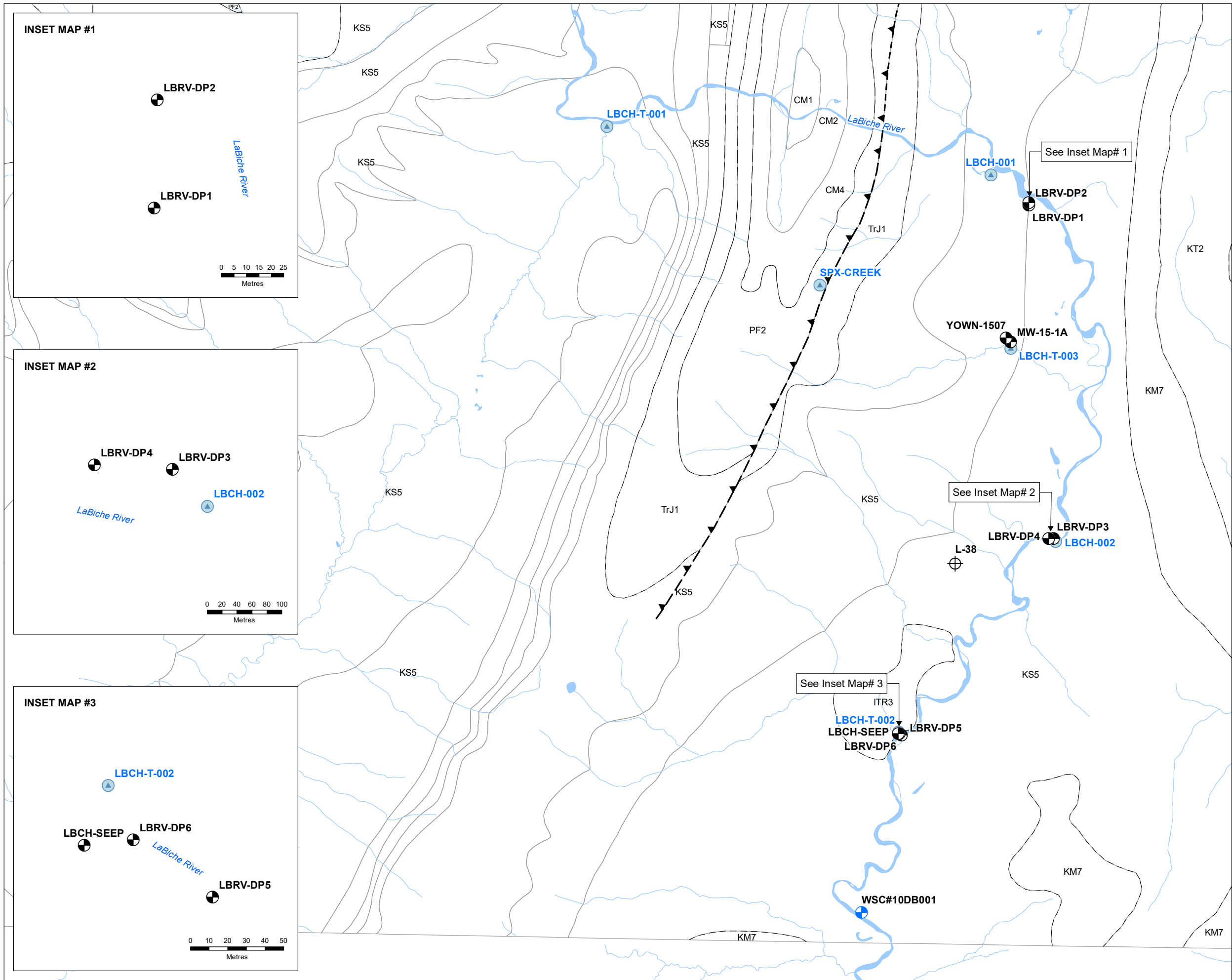
- Basemap: ESRI World Topographic Map
- Bedrock Geology: Yukon Geological Survey, 2017
- Inset Basemap: ESRI World Topographic Map



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103554-01	Production Date: Nov 5, 2019	Figure 4
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Kotaneelee Baseline Water Quality Characterization Kotaneelee Area, YT

Bedrock Geology - LaBiche River

Legend

- Exploration Borehole Location
- Groundwater Site Location
- Surface Water Site Location
- Water Survey Station of Canada Station
- Waterbody
- Watercourse

Faults

- thrust, approximate
- thrust, inferred

Contacts

- stratigraphic, approximate
- stratigraphic, defined
- stratigraphic, inferred

Bedrock

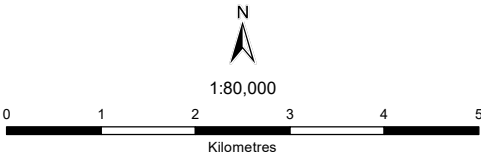
- ITR3: ROSS: brown, thin-bedded, claystone, siltstone, shale and coal
- KT2: KOTANEELEE: dark grey concretionary shale; mudstone; grey sandstone
- KTB2: WAPITI: banded, feldspathic sandstone, coal
- KS5: FORT ST. JOHN: concretionary dark grey and rusty weathering shale
- KM7: DUNVEGAN: carbonaceous sandstone and pebble conglomerate
- TrJ1: JONES LAKE: calcareous siltstone, shale, and fine sandstone
- PF2: TIKA, FANTASQUE: limestone, dolostone, chert, shale
- CM1: MATTSON: thinly bedded grey sandstone, shale and coal
- CM2: MATTSON: massive bedded, grey to brown sandstone
- CM4: MATTSON: undivided sandstone, limestone and shale

Notes

- All mapped features are approximate and should be used for discussion purposes only.
- This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Basemap: ESRI World Topographic Map
- Bedrock Geology: Yukon Geological Survey, 2017
- Inset Basemaps: ESRI World Topographic Map



NAD 1983 UTM Zone 10N
Page Size: 11" x 17"

PHOTOGRAPHS

Photo 1	BEVR-001
Photo 2	BEVR-t-001
Photo 3	BEVR-DP1
Photo 4	LBCH-001
Photo 5	LBCH-002
Photo 6	LBCH-t-001
Photo 7	LBCH-t-002
Photo 8	LBCH-t-003
Photo 9	LBRV-DP3
Photo 10	LBRV-DP5
Photo 11	LBRV-DP6
Photo 12	LBCH-SEEP
Photo 13	YOWN-1507



Photo 1 [BEVR-001]



Photo 2 [BEVR-t-001]



Photo 3 [BEVR-DP1]



Photo 4 [LBCH-001]



Photo 5 [LBCH-002]



Photo 6 [LBCH-t-001]



Photo 7 [LBCH-t-002]



Photo 8 [LBCH-t-003]



Photo 9 [LBRV-DP3]



Photo 10 [LBRV-DP5]



Photo 11 [LBRV-DP6]



Photo 12 [LBCH-SEEP]



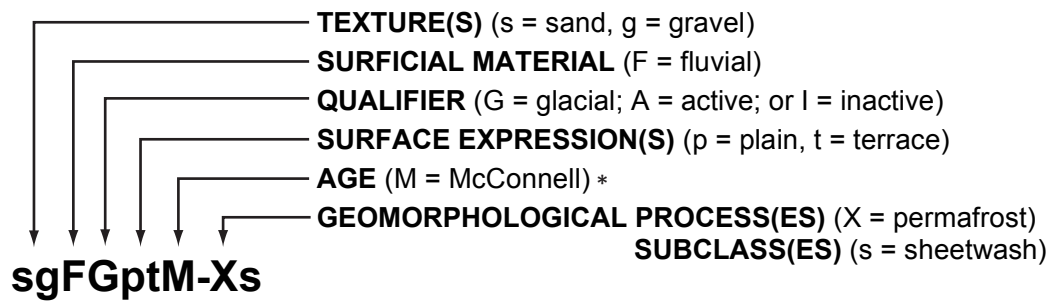
Photo 13 [YOWN-1507]

APPENDIX A

Simplified Key to Yukon Terrain Classification System & Surficial Geology Map Labels

Simplified Key to Yukon Terrain Classification System & Surficial Geology Map Labels

Based on the Terrain Classification System for British Columbia (Howes & Kenk, 1997).
Yukon custom modifications written in *italicized text* and highlighted by asterisks (*).



TEXTURE - up to 3 lower case letters in front of surficial material, *in order of decreasing dominance* *

a	blocks (>256 mm, angular)
b	boulders (>256 mm, rounded)
k	cobble (64-256 mm, rounded)
p	pebbles (2-64 mm, rounded)
s	sand (0.062 - 2 mm)
z	silt (0.002 - 0.062 mm)
c	clay (<0.002 mm)
m	mud (mix of silt and clay)
d	mixed fragments (>2 mm, rounded and angular)
g	gravel (>2 mm, rounded; mix of b, k, p)
x	angular fragments (>2 mm; mix of r & a)
r	rubble (2-256 mm, angular particles)
y	shells (shells or shell fragments)
e	fibric organic (poorly decomposed)
u	mesic organic (intermediate decomposition)
h	humic organic (highly decomposed)

SURFICIAL MATERIAL - first single upper case letter shown in map unit. (Upper case letter immediately following surficial material is the glacial or activity **QUALIFIER**.)

A	Anthropogenic
C	Colluvium
D	Weathered Bedrock
E	Eolian
F	Fluvial (FA = Active Fluvial)
FG	Glaciofluvial
I	Ice (Glacier)
L	Lacustrine
LG	Glaciolacustrine
M	Morainal (till)
O	Organic
R	Bedrock
U	Undifferentiated materials (<i>UG = Glacial Drift</i>) *
V	Volcanic

- * H Water bodies
- * S Snow patches

SURFACE EXPRESSION - up to 3 lower case letters following surficial material

* a	<i>apron</i> (BC steepness codes “j”, “a”, “k” and “s” not used)
b	blanket (>1 m thick)
c	cone(s)
d	depression(s)
f	fan(s)
h	hummock(s)
* l	<i>delta</i>
m	rolling
p	plain
r	ridge(s)
t	terrace(s)
u	undulating
v	veneer (0.1 - 1 m thick)
w	mantle of variable thickness
x	thin veneer (2 - 20 cm thick)

COMPONENT DELIMITERS - separators for up to 4 components that may be included in a map unit label. All components are listed before process(es), e.g.

sgFGptM.dsmMbM/xsCv\zclGpM-XsV

.	components on either side of the "." symbol are of approximately equal proportion
/	the component in front of the "/" symbol is more extensive than the one that follows
//	the component in front of the "//" symbol is considerably more extensive than the one that follows
\	the component(s) in front of the "\" symbol stratigraphically overlies the component(s) that follows

* **AGE** - single upper case letter following surface expression

H	Holocene
>H	pre-Holocene
N	Neoglacial
<M	Postglacial
M	McConnell (late Wisconsinan)
>M	pre-McConnell
S	Laurentide, Tutsieta (late Wisconsinan)
L	Laurentide, maximum (late Wisconsinan)
G	Gladstone (early Wisconsinan)
>G	pre-Gladstone
R	Reid (Illinoian)
>R	pre-Reid (Pliocene - early Pleistocene)
P	Pleistocene undifferentiated
Q	Quaternary
>Q	pre-Quaternary
T	Tertiary
U	undifferentiated

GEOMORPHOLOGICAL PROCESS - up to 3 upper case letters following dash “-”. Lower case letters indicate subclasses.

-V	Gully erosion
-B	Braided floodplain
-I	Irregularly sinuous floodplain
-J	Anastomosing floodplain
-M	Meandering floodplain
-A	Snow avalanches
-F	Slow landslide (subclasses: g = rock creep)
-R	Rapid landslide (subclasses: b = rockfall; d = debris flow)
* -L	<i>Undifferentiated landslide</i> (subclasses: s = slide; u = slump)
-C	Cryoturbation
-N	Nivation
-S	Solifluction
-Z	General periglacial processes (<i>subclass: c = cryoplanation</i>)
* -X	<i>Permafrost</i> (<i>subclasses: s = sheetwash; n = pingo; l = seg. ice</i>)
-E	Glacial meltwater channels
-H	Kettled
* -T	<i>Glacial ice-contact</i>
* -U	<i>Inundation</i> (<i>subclass: b = beaver damming</i>)