

Site C Clean Energy Project

Fisheries and Aquatic Habitat Monitoring and Follow-up Program

Peace River and Site C Reservoir Water and Sediment Quality Monitoring Programs (Mon-8 and Mon-9)

Construction Year 4 (2018)

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Peace River and Site C Reservoir 2018 Water and Sediment Quality Monitoring Programs



PRESENTED TO British Columbia Hydro and Power Authority

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EXECUTIVE SUMMARY

As part of the Water and Sediment Quality Monitoring Programs, the Saulteau EBA Environmental Services Joint Venture (SEES JV) conducted the water and sediment quality sampling program associated with the Site C Clean Energy Project (the Project) on behalf of the BC Hydro and Power Authority (BC Hydro). The Project is located along the Peace River near the City of Fort St. John between the Districts of Hudson's Hope and Taylor, BC.

In accordance with the Provincial Environmental Assessment Certificate Condition No. 7 for the Project, BC Hydro has developed the Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP). The FAHMFP includes two monitoring programs focused on assessing the effects of the Project on water and sediment quality:

- Site C Mon-8 Site C Reservoir Water and Sediment Quality Monitoring Program. This program will
 investigate the effects of reservoir formation on water and sediment quality; and
- Site C Mon-9 Peace River Water and Sediment Quality Monitoring Program. This program will investigate the effects of the Project on water and sediment quality in the Peace River downstream of the Project.

Mon-8 and Mon-9 were developed to monitor water and sediment quality in the Site C Reservoir and Peace River and to address the management questions listed in the FAHMFP; several years of data collection are required before the questions can be definitively addressed. This report presents the third year of data collection for these two monitoring programs under the FAHMFP.

The Mon-8 study area includes monthly monitoring from May to October at eight stations within the Site C reach, defined as the portion of the Peace River that will be inundated by the Project and includes the Peace River from the Peace Canyon Dam downstream to the Site C Dam, and those sections of the Halfway and Moberly rivers that will be inundated following reservoir creation. Four reference stations were selected for monthly monitoring (May to October) to monitor water flowing into the Site C reach and are located near the Dinosaur and Williston reservoir outlets. The Mon-9 study area includes monthly monitoring from May to October at nine stations within the Peace River downstream of the Project to Many Islands, Alberta.

Similar to 2017, dissolved organic carbon (DOC) concentrations in 2018 were occasionally elevated above total organic carbon (TOC) concentrations. DOC concentrations of field blank samples collected during all sampling periods were reported to be below detection in field-filtered deionized water provided by the lab, which indicates field methodologies are not introducing cross contamination between samples. In 2018, SEES JV continued to flush field equipment to reduce the incidence of false positives for DOC. Although this still has not fully resolved the concern of organic carbon impacts from field equipment, improvements continued to be seen in 2018. The TOC concentrations are considered stable and mostly within natural levels for a lotic/lentic system with elevated background turbidity conditions (BC MELP 1998).

Overall, water quality parameters were consistently below the applicable BC Approved Water Quality Guidelines for water. During the May sampling period, regular exceedances of total arsenic, total copper, total iron and dissolved aluminum and intermittent exceedances of total silver, total zinc and dissolved iron were observed. During the October sampling period, intermittent exceedances of total and dissolved iron and dissolved aluminum were observed. During the June, July and August sampling periods, regular exceedances of temperature were observed and during the June sampling period one exceedance of pH was observed. Sediment quality parameters were consistently below the applicable BC Working Water Quality Guidelines for sediments except for regular exceedances of arsenic and nickel and intermittent exceedances of cadmium and iron. Source(s) of the exceeded parameters could not be conclusively determined. Many Peace River tributaries are large systems characterized by high, vertical banks composed of fine materials which are subject to erosion during high flow periods. Given the location and parameters involved, it is possible that the exceedances are the result of natural



processes (i.e., regional geology and erosion) and process error (i.e., natural variability among years). The 2018 results are comparable to 2016 and 2017 results in that most parameters were below the guidelines with some exceedances in water metals parameters (i.e., iron, copper, zinc, silver and aluminum) and some exceedances in sediment metals parameters (i.e., arsenic, cadmium, iron and nickel).

Each of the broad geospatial groups (Peace River, tributaries and reservoir) have unique geological and limnological characteristics that likely contribute to their water quality characteristics. Most notably:

- Reservoir sites are more lentic, which tends to be warmer, less oxygenated and less turbid (particulate matter has time to settle out). Parameter concentrations at the reservoir sites were generally lower than the Peace River or tributary sites which are located downstream of the Dinosaur Reservoir; and
- Tributary sites are located on tributaries to the Peace River which tend to flow through more erodible material. Notwithstanding other factors, water flowing over erodible surfaces tend to accumulate larger sediment loads and consequently may have higher total and dissolved mineral components.

May typically showed the greatest variability or spread for all parameters in all groups. The most extreme minimum and maximum values usually appeared in May through June; August also showed frequent extremes and outliers. Median concentrations of all parameters in all groups were also typically highest in May. May's variability and extreme values are likely the influence of spring freshet.



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LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of British Columbia Hydro and Power Authority and their agents. Saulteau EBA Environmental Services Joint Venture (SEES JV) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than British Columbia Hydro and Power Authority, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in Appendix A or Contractual Terms and Conditions executed by both parties.



1.0 BACKGROUND

As part of the Water and Sediment Quality Monitoring Programs, the Saulteau EBA Environmental Services Joint Venture (SEES JV) conducted water and sediment quality sampling (May to October 2018) associated with the Site C Clean Energy Project (the Project) on behalf of the BC Hydro and Power Authority (BC Hydro).

Historical baseline data collected in 2007, 2008, 2010, 2011, and 2015 were used as a design template to establish site locations, sampling frequency, and parameters analyzed for the Project. Historical data is documented within the "Site C Clean Energy Project Environmental Impact Statement Technical Appendix: Water Quality Baseline Conditions in the Peace River Volume 2 Appendix E" (Golder 2012). Upon collection of 2018 field data, SEES JV, in consultation with BC Hydro, determined that the data volume was sufficient to graphically represent within boxplots and provide a basic qualitative discussion of temporal and spatial results. The analysis incorporated historical baseline data for comparative purposes.

In accordance with Provincial Environmental Assessment Certificate Condition No. 7¹ for the Project, BC Hydro produced the Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP²). The FAHMFP includes two monitoring programs focused on assessment of Project effects on water and sediment quality:

- Site C Mon-8 Site C Reservoir Water and Sediment Quality Monitoring Program. This program will
 investigate the effects of reservoir formation on water and sediment quality; and
- Site C Mon-9 Peace River Water and Sediment Quality Monitoring Program. This program will investigate the effects of the Project on water and sediment quality in the Peace River downstream of the Project.

Mon-8 and Mon-9 conduct sampling in Construction Years 2 to 10 (2016 to 2024) and Operation Years 1 to 10 (2024 to 2033). This report is an overview of the Mon-8 and Mon-9 sampling conducted in Construction Year 4 (2018) from May to October.

The Project is located along the Peace River near the City of Fort St. John between the Districts of Hudson's Hope and Taylor, BC, accessible via Highways 97 and 29. A station location map is provided as Figure 1. All surface water monitoring stations (stations) are accessible by boat via public boat launch (road accessible). Station locations are shown in Figures 2a and 2b.

The Mon-8 study area includes monthly monitoring from May to October at eight stations within the Site C reach, defined as the portion of the Peace River that will be inundated by the Project and includes the Peace River from the Peace Canyon Dam downstream to the Site C Dam, and those sections of the Halfway and Moberly rivers that will be inundated following reservoir creation (approximately 10 km sections). Two of the eight stations are in the upstream reaches of the Halfway and Moberly rivers and will be sampled following reservoir filling in 2023 and 2024. Four reference stations (two shallow and two deep) were selected for monthly monitoring (May to October) to monitor water flowing into the Site C reach and are located near the Dinosaur and Williston reservoir outlets.

The Mon-9 study area includes monthly monitoring from May to October at nine stations within the Peace River from the Project downstream to the Many Islands area in Alberta, approximately 120 km.

² Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program available at https://www.sitecproject.com/documentlibrary/environmental-management-plans-and-reports



¹ The EAC Holder must develop a Fisheries and Aquatic Habitat Monitoring and Follow-up Program to assess the effectiveness of measures to mitigate Project effects on healthy fish populations in the Peace River and tributaries, and, if recommended by a QEP or FLNR, to assess the need to adjust those measures to adequately mitigate the Project's effects.

1.1 Program Objectives

The objectives of Mon-8 and Mon-9 in 2018 were to:

- Provide a qualitative description of the field site conditions, including representative photographs and geospatially referenced locations of each station;
- Collect field-measured and laboratory-analyzed parameters at each station;
- Provide a description of potential sources of error and steps taken as part of quality assurance; and
- Present the tabulated data in comparison to guidelines considered applicable to the monitoring programs.

Sampling under these programs will contribute to the information used to address the following primary fisheries management questions listed in the FAHMFP:

- Mon-8: Does the construction and operation of the Project affect fish and fish habitat (as measured through water and sediment quality) in the reservoir and lower sections of reservoir tributaries?
- Mon-9: Does the construction and operation of the Project affect fish and fish habitat (as measured through water and sediment quality) in the Peace River downstream of the Project?

These broad questions require several smaller questions to be answered because of the various ways that the Project can affect fish and fish habitat:

Mon-8:

- 1. Is there a change in water or sediment quality in the Site C reach during the construction of the Project?
- 2. Is there a change in water or sediment quality in the Site C reach during the operation of the Project?
- 3. How effective are proposed mitigation methods in maintaining/protecting water and sediment quality in the Site C reach?

Mon-9:

- 1. Is there a change in water or sediment quality in the Peace River between the Site C dam site and the Many Islands area in Alberta during the construction of the Project?
- 2. Is there a change in water or sediment quality in the Peace River between the Site C dam site and the Many Islands area in Alberta during the operation of the Project?
- 3. How effective are proposed mitigation methods in maintaining/protecting water and sediment quality in the Peace River between the Site C dam site and the Many Islands area in Alberta?

1.2 Management Hypotheses

To address the fisheries management questions, the programs will test the following hypotheses, as provided in the monitoring plan:

Mon-8:

H1: During construction, modeled water quality predictions presented in the Environmental Impact Statement (EIS) are like measured water quality in the Site C reach;



- H₂: During operation, modeled water quality predictions presented in the EIS are like measured water quality in the Site C reach;
- H₃: During construction, water and sediment quality for non-modeled parameters remain within background ranges of concentrations or comply with relevant environmental guidelines in the Site C reach; and
- H₄: During operation, water and sediment quality for non-modeled parameters remain within background ranges of concentrations or comply with relevant environmental guidelines in the Site C reach.

Two hypotheses related to the effectiveness of mitigation measures for water and sediment quality are:

- H₅: During construction, mitigation methods employed are effective in maintaining/protecting water and sediment quality in the Site C reach; and
- H₆: During operation, mitigation methods employed are effective in maintaining/protecting water and sediment quality in the Site C reach.

Mon-9:

- H₁: During construction, modeled water quality predictions presented in the EIS are similar to measured water quality in the Peace River between the Site C dam site and the Many Islands area in Alberta;
- H₂: During operation, modeled water quality predictions presented in the EIS are similar to measured water quality in the Peace River between the Site C dam site and the Many Islands area in Alberta;
- H₃: During construction, water and sediment quality for non-modeled parameters remain within background ranges of concentrations or comply with relevant environmental guidelines in the Peace River between the Site C dam site and the Many Islands area in Alberta; and
- H₄: During operation, water and sediment quality for non-modeled parameters remain within background ranges of concentrations or comply with relevant environmental guidelines in the Peace River between the Site C dam site and the Many Islands area in Alberta.

Two hypotheses related to the effectiveness of mitigation measures for water and sediment quality are:

- H₅: During construction, mitigation methods employed are effective in maintaining/protecting water and sediment quality in the Peace River between the Site C dam site and the Many Islands area in Alberta; and
- H₆: During operation, mitigation methods employed are effective in maintaining/protecting water and sediment quality in the Peace River between the Site C dam site and the Many Islands area in Alberta.

The fisheries management questions and management hypotheses require several years of data to be collected before the questions can be definitively addressed. This report is the third year of data collection for these programs under the FAHMFP.

2.0 METHODS

2.1 Field Methods

To maintain compliance with the objectives listed in the FAHMFP, we developed field sampling methodology for collecting water and sediment quality data representative of 17 stations included within the program. Standard practices available from the British Columbia Field Sampling Manual (BC MOE 2013) were used to develop the following procedures:



- Sampling within surface water flow and away from the watercourse banks provides information on the quality
 of the channel flow and a general overview of water quality in the system. Areas of unusual flow
 characteristics (e.g., eddies or backwater areas) or floating debris were avoided;
- Samples were collected from near the bow via the side access of a jet engine boat, pointing the vessel upstream to collect upstream flow representative samples and to avoid contamination that could be introduced to the sample from the vessel;
 - In September 2017, as per BC Hydro direction, collection by grab sampling (i.e., submerging sample bottle directly into flow 0.2 m below surface from the side of the vessel) was replaced by a peristaltic pump and HDPE tubing with a 5 m intake length. In October 2017, the peristaltic pump was replaced with an electric diaphragm-operated pump (Pentair Shurflo; Model 4048-153-E75) and inert platinum-rinsed silicone tubing operating at 15 L/minute. The purpose of this apparatus was for collecting and analyzing low-level concentrations of dissolved and total forms of mercury and methylmercury but was inherently used for collecting all water samples. The extension of the tubing allowed samples to be collected at least 5 m away from the aluminum hull of the jet boat, which could impact the results of low-level metals analysis.
- All samples were collected by boat, except for instances of low water conditions preventing boat access. In this case, samples were collected from the shore either by wading into the water towards the centre of channel or using a telescopic metal pole with a plastic container attached for collecting the water sample from flowing water conditions within the channel;
- Water quality samples were collected from each station within 0.2 m depth from surface;
- Water quality samples within the reservoirs were collected at least 25 m from the shoreline, within the middle
 of the reservoir towards the outlet. The shallow samples to be submitted for laboratory analysis from the
 reservoirs were collected within 0.2 m depth from the surface while the deep samples were collected at a
 depth of 5.0 m. Depth profiles were determined by measuring field parameters throughout the water column.
 Depth profile sample data were recorded at 0.5 m increments between 0.2 m and 5.0 m;
- Water quality samples were collected monthly from each station between May and October 2018; the first and final sampling periods included more extensive analytical testing than others;
- Sediment quality samples were collected from nearshore depositional areas of each lotic and lentic station during the October sampling period using primarily an Ekman sampling device. However, if field conditions weren't conducive for use of this device, a small spaded shovel was used to collect samples from the nearshore. Depths of samples were determined in the field resulting from accessibility and obtaining samples representative of adequate quantities of sediment deposition within the water body (i.e., low coarse material content). Sediment collected with either the Eckman or shovel were composited within a Rubbermaid tote and samples placed in laboratory supplied jars/bags;
- In situ surface water quality measurements were determined using with a YSI ProDSS Multimeter or YSI EXO Multimeter, both of which record sample depth, specific conductivity, electrical conductivity, pH, temperature, dissolved oxygen, salinity, Total Dissolved Solids (TDS) and turbidity of the source water;
- Water transparency within the reservoirs was recorded by measuring the depth of visibility of a Secchi disk;
- Where possible, laboratory analyte bottles were filled directly from the water source and/or tube sampling port to minimize cross contamination of samples collected at each station (i.e., surface water). Where additional handling was required, a new 1 L plastic bottle (i.e., routine sample bottle) was filled from the source, and sample water was decanted into other laboratory analysis bottles or filters. Depth profile samples were collected by weighing tubing down to the required depth by use of buoy and weight. The introduction of the diaphragm pump collection method made direct filling of each laboratory analyte bottle possible without



additional handling, including deep-water sample collection. The methodology for collecting depth profile measurements was developed in consultation with BC Hydro and with reference to the British Columbia Field Sampling Manual (BC MOE 2013);

- Decontamination of tubing was completed at each site by running source water through the tubing for a minimum of 10 minutes prior to sampling. When grab sampling was required, decontamination of sampling equipment between monitoring locations was completed by triple rinsing field sample collecting equipment;
- The use of clean, new nitrile gloves and filters at each new monitoring location during all water sampling;
- Required preservatives were added into the sample containers (e.g., dissolved metals and total metals nitric acid, dissolved and total nutrients – sulfuric acid, dissolved and total mercury – hydrochloric acid);
- Dissolved parameters were filtered in the field using new high capacity Waterra filters and then were field preserved after filtration;
- The sample ID, date and location on container label were recorded using water resistant labelling;
- One blind duplicate sample was submitted per every 10 ambient samples submitted;
- One trip blank and one field blank were submitted per sampling period, unless otherwise noted;
- Samples were stored in a cooler with ice packs to lower temperature and maintain them below 4°C;
- All field activities were recorded on formatted field data sheets concurrently with ongoing field activities and supported by GPS referencing at each monitoring station;
- Chain-of-custody forms including analytical selection were completed for the samples. The analytical testing for the 2018 monitoring Program is derived from the British Columbia Approved and Working Water Quality Guidelines (BC MOE 2017 and 2018); and
- Samples were delivered to the ALS Environmental laboratory depot in Fort St. John, BC.

Tables 1 and 2 in the Appendix summarize selected parameters from the program; the list is based on sampled parameters represented by available BC Water Quality Guidelines (BC WQG), subsequently discussed within the Results (Section 4.0). Note that the BC WQG does not include guidelines for all parameters included in the program (BC MOE 2018).

Field parameter measurements and laboratory analytical results have been compiled in Tables 3 to 11 in the Appendix; Laboratory Certificates of Analysis are included in Appendix B. Table 2-1 summarizes parameters sampled and collection periods for the program.



Table 2-1. Laboratory Analyzed Parameters and Sampling Collection Periods

		Sampling Period											
Parameters Sampled	May 8 to 11, 2018	June 18 to 23, 2018	July 16 to 19, 2018	July 30 to August 2, 2018	September 10 to 13, 2018	October 17 to 20, 2018							
Surface Water Parameters Sampled:	All Stations	All Stations	All Stations	All Stations	All Stations	All Stations							
Colour, alkalinity, pH, total dissolved solids, total suspended solids, dissolved organic carbon, total organic carbon, ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total nitrogen, total phosphorus, total dissolved phosphorus, soluble reactive phosphorus													
Surface Water Parameters Sampled:	All Stations					All Stations							
Major ions (calcium, magnesium, potassium, sodium), total and dissolved metals and metalloids (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, methylmercury, molybdenum, nickel, selenium, silver, thallium, tin, titanium, uranium, vanadium, and zinc)													
Surface Water Parameters Sampled:	All Stations					All Stations							
Low-level analysis of total and dissolved forms of mercury and methylmercury													
Surface Water Parameters Sampled:	W1 and D1	W1 and D1	W1 and D1	W1 and D1	W1 and D1	W1 and D1							
Chlorophyll a	(Deep and Shallow)	(Deep and Shallow)	(Deep and Shallow)	(Deep and Shallow)	(Deep and Shallow)	(Deep and Shallow)							
Sediment Parameters Sampled:						All Stations							
Particle size, nutrients, and total metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, tin, titanium, uranium, vanadium, and zinc)													



2.2 Boxplot Analysis Methods

Boxplots, constructed using Microsoft Excel 2016 (attached Figures 3a to 3e), were used to graphically depict the water quality data. In consultation with BC Hydro, five of the 19 parameters were selected for plotting: total nitrogen, total phosphorus, total organic carbon (TOC), total iron and chlorophyll *a*. A total of 19 sites were divided into five groups based on location (Table 2-2):

Table 2-2: Included Sites for Boxplot Representation

Reservoir	Peace	e River	Tributaries					
Reservoir	Upstream of Dam	Downstream of Dam	Upstream of Dam	Downstream or Dam				
Williston Deep (W1-Deep)	Peace Canyon Dam (PC1)	Peace at Pine (PD1)	Halfway River- Downstream (HD)	Pine River (PINE)				
Williston Shallow (W1-Shallow)	Peace 1: Site C Reservoir (PR1)	Peace at Beatton (PD2)	Moberly River – Downstream (MD)	Beatton River (BEA)				
Dinosaur Deep (D1-Deep)	Peace 2: Middle Site C Reservoir (PR2)	Peace at Kiskatinaw (PD3)		Kiskatinaw River (KR)				
Dinosaur Shallow (D1-Shallow)	Peace 3: Lower Site C Reservoir (PR3)	Peace at Pouce Coupe (PD4)		Pouce Coupe River (POUCE)				
		Peace at Many Islands (PD5)						

Data from each group were divided into Pre-Construction phase (July 27, 2015 and earlier) and Construction phase (after July 27, 2015). Where available, data for sampling conducted between May and October were included for each phase, where results from each month are referred to as "periods".

The following data sets were plotted:

- Pre-Construction phase:
 - Data collected in 2007, 2008, 2010, 2011 and 2015 sourced from: "Site C Clean Energy Project Environmental Impact Statement Technical Appendix: Water Quality Baseline Conditions in the Peace River Volume 2, Appendix E" (Golder 2012).
- Construction phase:
 - Data collected in 2016 sourced from: "Peace River and Site C Reservoir 2016 Water and Sediment Quality Monitoring Programs" (SEES JV 2017);
 - Data collected in 2017 sourced from: "Peace River Water Quality in the Vicinity of the Confluence with the Moberly River – Seasonal Trends in Metals that have British Columbia Water Quality Guidelines for the Protection of Aquatic Life" (Ecofish 2017);
 - Data collected in 2017 sourced from: "Peace River and Site C Reservoir 2017 Water and Sediment Quality Monitoring Programs" (SEES JV 2018); and
 - SEES JV's 2018 water quality data.



3.0 **REGULATORY GUIDELINES**

"The British Columbia Water Quality Guidelines (WQG) provide policy direction to those making decisions affecting water quality. Although WQGs do not have any direct legal standing, once approved, WQGs must be considered in any decision affecting water quality made within the British Columbia Ministry of Environment (BC MOE). WQGs are used to assess water quality and may be used as the basis for determining the allowable limits in waste discharge authorizations. Exceeding a WQG does not imply that unacceptable risk exists, but rather that the potential for adverse effects may be increased and additional investigation may be required" (BC MOE 2018).

Table 3-1 describes the application of the regulatory guidelines used in comparison with the Program data.

Regulatory Guideline	Monitoring Program Results Guidelines were Compared With	Rationale for Use
British Columbia Approved Water Quality Guidelines (BC AWQG), for freshwater aquatic life and short-term	All surface water quality results	The overall guidelines were developed to represent safe levels of substances that protect different water uses, including: drinking water, recreation, aquatic life, wildlife, and agriculture.
maximums (BC MOE 2018)		Short-term maximum or "acute" guidelines are set to protect against severe effects such as lethality or other equivalents to the most sensitive species and life stage over a defined short-term exposure period (BC MOE 2018). The requirement for applying long-term average guidelines is that five samples are collected at a station over a 30-day period.
British Columbia Working Water Quality Guidelines (BC WWQG; BC MOE 2017)	No application to surface water quality results	The BC WWQG were reviewed and determined not to be applicable for water quality parameters based on the sampling frequency selected (e.g., sampled parameters were presented as long-term averages within the guidelines, which do not apply to monitoring Program sampling frequency).
British Columbia Working Water Quality Guidelines (BC WWQG; BC MOE 2017)	Sediment quality results	The sediment quality results were compared to the BC WWQG because approved guidelines for sediment quality are not available. The BC WWQG for sediment quality parameters are applied using lower and upper surface water quality guidelines (SWQG). The Lower SWQG is based on "a concentration set to protect aquatic life from adverse effects of a toxic substance in most situations and is equivalent to the Canadian Council of Ministers of the Environment's (CCME) Threshold Effect Level or Interim Sediment Quality Guidelines (TEL or ISQGs; CCME 2001a)". The Upper SWQGs is based on "a concentration that if exceeded will likely cause severe effects on aquatic life (equivalent to CCME's Probable Effect Level (PEL; CCME 2001a)". As the guidelines are considered a working document, caution in applying the guidelines should be exercised. The sediment quality guidelines within the BC WWQG are based on levels of toxic substances found in the sediment where biological effects have been measured and are not based on cause- effect studies (BC MOE 2017).

Table 3-1. Application of Regulatory Guidelines within the Program



Guidelines determined to be applicable to the analyzed parameters were compiled from the BC AWQG and BC WWQG and are presented in Tables 1 and 2. Guidelines for cadmium, copper, fluoride, lead, manganese, silver, and zinc are provided, where applicable, in Tables 3 to 11 as a referenced equation, which vary with hardness, pH, and temperature. Parameter-specific equations used to calculate the applicable guideline values are provided in the notes of the tables.

4.0 RESULTS

Results, both *in situ* and laboratory, were compared among the sampling periods and among stations (from upstream to downstream reaches). The objective of plotting the data was to start to identify differences and parameter concentrations that differ from guidelines.

Water quality results are presented in Tables 3 to 11 and Appendix B (laboratory reports), attached to this report, and include the following for each sampling location:

- Field parameter measurements and field observations;
- Laboratory analytical results for each sample submitted, including duplicate, trip blank, and field blank analysis; and
- Exceedances of the BC AWQG and BC WWQG are bolded and shaded in grey.

The GPS coordinates of each station are provided in Figures 2a and 2b. Photographs of the stations (Photos 1 to 17) are presented within the Photograph section of this report.

4.1 Williston and Dinosaur Reservoirs Water and Sediment Quality Results

Four reference stations were selected to monitor water flowing into the Site C reach from Dinosaur and Williston reservoirs.

Reference Station Sample IDs:

- Williston (W1) Deep and Shallow; and
- Dinosaur (D1) Deep and Shallow.

Sediment quality samples were collected for D1 and W1 within the near-shore littoral zones near the water sample locations to collect samples with a high fine to coarse material ratio. Particle size analysis of each sample determined that Dinosaur Reservoir and Williston Reservoir sediment were both classified as silt loam (Table 5; Appendix B).

Reservoir depth profiles for W1 and D1 are provided in Tables 3 and 4; reservoir sediment quality results for W1 and D1 are presented in Table 5. Surface water quality results for both W1 and D1 (Shallow and Deep samples) are presented monthly in Tables 6 to 11; all are located in the Appendix.

Throughout the sampling periods, field measured dissolved oxygen, electrical conductivity and specific electrical conductivity remained generally stable within both W1 and D1; dissolved oxygen levels decreased slightly throughout the sampling periods but remained within guidelines and supportive of aquatic life. Field measured water temperatures generally increased then decreased with the seasonal changes from May to October; surface temperatures exceeded BC AWQG in June, July and August at D1 and throughout the water column (to the measured depth of 5 m) in July and August at W1. Throughout the water column, temperatures generally decreased with depth in the summer months, however a distinct hypolimnion was not identified as there was no clear stratification observed within the top 5 m at any time. Within the Williston Reservoir, the thermocline would



likely have existed below a depth of 5 m during the months of July and August. Measurements collected in June, July and August were the most elevated temperatures recorded over the course of each sampling period (Tables 3 and 4). In the spring and fall months (May, September and October), the water column in both reservoirs was uniformly mixed with consistent temperatures existing throughout the upper 5 m of the reservoirs.

The pH values remained within guidelines throughout the water column measurements of both reservoirs over the course of each sampling period. Laboratory-analyzed pH is considered secondary to field-measured pH by a calibrated instrument due to the exceeded hold times (15 minutes) of all laboratory analyzed pH values. Hardness concentrations ranged from 86.7 mg/L to 94.0 mg/L for samples collected in May and October, which is considered moderately soft/hard to hard water (ESRD 2018; Tables 6 and 11).

Colour, TSS, TDS, and turbidity were moderate to low throughout the dataset and over each sampling period, except for D1, where colour, TSS and turbidity levels during the May and August sampling periods were elevated (Tables 6 to 11). The increase in May was likely from the operation of W.A.C Bennett Dam and Peace Canyon Dam and the management of water levels during spring runoff conditions; however, the increase in August is unknown. Secchi depths ranged from 0.75 m to 7.5 m below surface for D1 and 3.5 m to 7.5 m for W1 (Tables 3 and 4).

Since the BC AWQG for turbidity and TSS rely on daily sample collection over a 30-day period (for long-term average guideline) or the use of automated data collection over a 24-hour period (short-term maximum guideline), the individual samples collected in 2018 were not compared to guidelines.

Anions and nutrients analyzed within the lentic (reservoir) dataset did not exceed available guidelines. TOC concentrations were within normal range (1 mg/L to 30 mg/L) for natural waterbodies (BC MELP 1998). Boxplots showed that median TOC concentrations measured in the reservoirs during the Construction phase are generally highest in May but are stable throughout the sampling period (Figure 3e). In some instances, dissolved organic carbon (DOC) concentrations were found to exceed the TOC concentration, which was attributed to the use of polyethersulfone based filters and is discussed within Section 5.0 (Discussion) of this report (Tables 6 to 11).

Two nutrients were plotted – nitrogen and phosphorus (Figures 3c and 3d). Median concentrations of both nitrogen and phosphorus within the reservoirs were similar throughout all periods in the Construction phase. Median concentrations observed in May were slightly higher and had a greater range of values. Nitrogen and phosphorus concentrations in the Pre-Construction phase were, however, dissimilar. Median concentrations of nitrogen in the Pre-Construction phase were more variable across the periods and showed a wide range of values (greater distance between minimum and maximum concentrations) compared to the Construction phase. In contrast, Pre-Construction median concentrations of phosphorus were similar across the periods and were comparable to the Construction phase.

Chlorophyll *a* was included as a parameter for plotting since it is commonly used as an indicator of algae abundance and productivity in aquatic environments (Figure 3a). Median concentrations of Chlorophyll *a* within the reservoirs generally increased between May and October, though not dramatically. Chlorophyll *a* concentrations are commonly highest during the warm, sunny summer months, however, in the case of this dataset, September and October had the highest median concentrations.

Total and dissolved metals and metalloid analysis for water quality was conducted for May and October sampling periods only. No exceedances of guidelines were observed within the lentic dataset for metals or metalloid parameters, except for dissolved aluminum at D1 shallow and deep in May (Tables 6 and 11). Boxplots of iron in the reservoirs during the Construction phase show that median concentrations are highest in May – likely the result of spring freshet – then very low (less than 0.1 mg/L) in the fall (Figure3b). Pre-Construction phase median concentrations were more stable, with a slight peak in August.



All samples analyzed for ultra-low-level detection of mercury and methylmercury resulted in concentrations either below or within an order of magnitude of detection limits (Tables 6 and 11).

Other than dissolved aluminum and temperature readings which occasionally exceeded the BC WQG, no other exceedances of the guidelines were observed within the datasets (Tables 6 to 11).

Sediment anions and nutrient levels were considered moderately low and close to detection limits, and pH was within a normal range. W1 exceeded the Lower SWQG guidelines for cadmium and nickel; D1 exceeded the Lower SWQG guidelines for arsenic, cadmium, and nickel. No metal concentrations within sediments collected from either reservoir exceeded the Upper SWQC (Table 5).

Other than the metals exceedances stated, no other exceedances of the BC WWQG were observed in 2018.

4.2 Peace River Water Quality Results: Site C Reservoir

The Mon-8 study area includes monthly monitoring from May to October at eight stations within the Site C Reach, defined as the portion of the Peace River that will be inundated by the Project and includes the Peace River from the Peace Canyon Dam downstream to the Site C Dam, and those sections of the Halfway and Moberly rivers that will be inundated following reservoir creation (approximately 10 km sections).

Site C Reservoir Station IDs:

- Peace Canyon (PC1);
- Upper Site C Reservoir (PR1);
- Middle Site C Reservoir (PR2);
- Halfway River Upstream (HU) and Downstream (HD);
- Lower Site C Reservoir (PR3); and
- Moberly River Upstream (MU) and Downstream (MD).

Following the 2016 field season, we determined that HU and MU would not be sampled until reservoir inundation due to access restrictions related to turbulent water conditions carrying large debris (i.e., safety hazard) or low water levels making the river impassable by boat. Following reservoir filling, HU and MU will be incorporated into the program again.

PC1 is considered the most upstream sample location and PR3 and MD (tributary) are considered the most downstream sample locations within the future Site C Reservoir. Samples were collected from designated stations relating to the sample names. Peace River samples were collected from mid-channel flow locations, isolating source water considered to be well mixed within the Peace River. Tributary river samples were collected upstream of the Peace River confluence to isolate mid-channel flow source prior to it mixing with the main Peace River channel.

All parameters analyzed were within the BC AWQG guidelines for the samples collected during 2018 except for intermittent exceedances above the guideline for total arsenic, total copper, total and dissolved iron and dissolved aluminum. During the June, July and August sampling periods, temperature readings were elevated above the BC AWQG for the tributaries as well as at PR2 in July. During the June sampling period, pH was elevated above the BC AWQG for PC 1 (Tables 6 to 11).



Intermittent samples analyzed throughout the May and October sampling periods exceeded the BC AWQG for total iron (Tables 6 and 11). Intermittent samples analyzed throughout the May sampling period exceeded the BC AWQG to dissolved iron (Table 6). Iron is a naturally occurring element due to the weathering of rocks and minerals but has also been associated with acidic mine water drainage, landfill leachates, sewage effluents and iron-related industries (Health Canada 1978).

All samples collected in May, except of PC1, exceeded the BC AWQG for dissolved aluminum (Table 6). Aluminum is a naturally occurring element due to erosion of watershed areas and is also used as a coagulant in drinking water treatment facilities (BC MOEAP 1988).

The HD and MD samples collected in May exceeded the BC AWQG for total copper (Table 6). Copper is a naturally occurring element due to the weathering of rocks and minerals (BC MOEAP 1987).

The HD and MD samples collected in May exceeded the BC AWQG for total arsenic (Table 6). Arsenic is a naturally occurring element entering surface waters from weathered rocks and soils. Smelting and refining are industry related sources of arsenic (CCME 2001b).

Field measurements of temperature from MD and HD in June through August indicated levels exceeding the BC AWQG (Tables 7 to 9). In addition, field measurement of temperature from PR2 in July indicated an exceedance of the BC AWQG (Table 8). Overall, the temperatures measured within tributaries were found to be higher than that of the Peace River, except for the October sampling period when temperatures within the tributaries were slightly lower relative to Peace River values.

The pH values remained within guidelines in 2018, except for an exceedance of 9.19 at PC1 during the June sampling period. Other than the one exceedance, the range of field measured pH values was 7.95 to 8.59 over the sampling periods. Laboratory-analyzed pH is considered secondary to field-measured pH by a calibrated instrument due to the exceeded hold times (15 minutes) of all laboratory-analyzed pH values (Tables 6 to 11).

TSS, TDS, and turbidity were consistent throughout the dataset and over each sample period, with elevated concentrations observed within the tributaries (HD and MD) as well as for all samples collected in May. These parameters were not compared against BC WQG, as short-term maximum guidelines were not provided in the guidelines (Tables 6 to 11).

Anions and nutrients analyzed within the dataset did not exceed the BC AWQG, however results for the tributary source waters were generally observed to be elevated relative to the Peace River samples. TOC concentrations were within normal range (1 mg/L to 30 mg/L) for natural waterbodies, except for the MD sample collected during the May sampling period, which was 45.5 mg/L (BC MELP 1998; Tables 6 to 11).

For both Tributaries Upstream and Peace River Upstream sites, median TOC concentrations were highest in May in both the Pre-Construction and Construction phases, likely the result of spring freshet (Figure 3e). Throughout the rest of the sampling periods, median TOC concentrations were reasonably consistent in both the Pre-Construction and Construction phases. However, the concentrations measured in the Peace River Upstream sites were much lower than those measured in the Tributaries.

DOC concentrations were occasionally found to exceed the TOC concentration, which was likely attributable to the use of polyethersulfone based filters and is discussed further within Section 5 of this report.

Median nitrogen and phosphorus concentrations were fairly consistent throughout all sampling periods in both the Pre-Construction and Construction phases for the Peace River Upstream sites (Figures 3c and 3d). For the Tributaries Upstream sites, median concentrations of nitrogen and phosphorus showed a generally decreasing trend through the periods (i.e., May to October) for both the Pre-Construction and Construction phases. Median



concentrations were highest during the spring freshet (May) and quickly decreased in subsequent sampling periods where they stabilized at very low concentrations.

For the Construction phase, median concentrations of nitrogen were slightly higher in the Tributary sites compared to the Peace River sites. Median concentrations of phosphorus, however, were approximately 8 times higher in the Peace River sites compared to the Tributary sites.

Pre-Construction phase median concentrations of Chlorophyll *a* were fairly consistent throughout all sampling periods in both Peace River and Tributary Upstream sites (Figure 3a). Construction phase sampling is more limited, with samples collected in only May and June. During this time, the median concentration increased from May to June at both Peace River and Tributary sites.

Hardness within the tributary source waters was generally higher than that of the Peace River; hardness varied between 83.8 mg/L to 216.0 mg/L for samples collected during the May and October sampling periods, which ranged from moderately soft/hard to hard to very hard water (ESRD 2018; Tables 6 and 11).

All samples analyzed for ultra-low-level detection of mercury and methylmercury resulted in concentrations either below or within an order of magnitude of detection limits (Tables 6 and 11).

Other than total arsenic, total copper, total and dissolved iron, dissolved aluminum, temperature and pH exceeding the BC AWQG, no other exceedances of the guidelines were observed within the datasets.

Median concentrations of iron in both the Peace River and Tributaries sites showed a generally decreasing trend for both the Pre-Construction and Construction phases from May to October (Figure 3b). The decreasing trend was more distinct during the Construction phase. For the data collected in May during the Construction phase, the median iron concentration exceeded the BC AWQG guidelines of 1 mg/L; subsequent periods were generally below the BC AWQG guideline.

Sediment quality samples were collected for all Site C Reservoir samples within the near-shore littoral zones near the water sample locations to collect samples with a high fine to moderately coarse material. Particle size analysis of each sample determined that sediment varied between silt loam, sandy loam and loamy sand soil textures (Table 5; Appendix B).

Sediment anions and nutrient levels were considered moderately low and close to detection limits, expect for ammonium at PR3 which was slightly elevated. pH was within a normal range for all samples. The BC WWQG Lower SWQG were exceeded for arsenic (PC1, PR1, PR2, HD, PR3 and MD), cadmium (PR1, PR2 and PR3), iron (PC1 and HD) and nickel (PC1, PR1, PR2, HD, PR3 and MD). No metal concentrations within sediments collected from the Site C reach exceeded the Upper SWQC (Table 5).

Other than the metals exceedances stated, no other exceedances of the BC WWQG were observed within the datasets.

4.3 Peace River Water Quality Results: Downstream Reach

The Mon-9 study area includes monthly monitoring from May to October of nine stations within the Peace River from the Site C Dam downstream to the Many Islands area in Alberta, approximately 120 km.

Downstream Reach Station IDs:

- Peace at Pine (PD1);
- Pine River (PINE);



- Peace at Beatton (PD2);
- Beatton River (BEA);
- Peace at Kiskatinaw River (PD3);
- Kiskatinaw River (KR);
- Peace at Pouce Coupe (PD4);
- Pouce Coupe (POUCE); and
- Peace at Many Islands (PD5).

PD1 is considered the most upstream sample location and PD5 is considered the most downstream sample location within the downstream reach dataset. Samples were collected from designated stations relating to the sample names. Peace River samples were collected from mid-channel flow locations, isolating source water considered to be well mixed within the Peace River. Tributary river samples were collected upstream of the Peace River confluence to isolate mid-channel flow source prior to it mixing with the main Peace River channel.

All parameters analyzed met the BC AWQG for the samples collected in 2018 except for intermittent exceedances above the guideline for total and dissolved iron, total silver, total zinc and dissolved aluminum. Total arsenic, total copper and total iron exceeded the BC AWQG at all stations in May. During the June, July and August sampling periods, temperature readings were elevated above the BC AWQG for all stations, except for PD1 in June, PD1 and PD5 in July and PD1 and PD2 in August (Tables 7 to 9).

All samples collected in the May sampling period exceeded the BC AWQG for total iron, while only total iron at BEA and KR exceeded the BC AWQG during the October sampling period. Samples collected in May (PD1, PINE, PD2 and BEA) and in October (BEA and KR) also exceeded the BC AWQG for dissolved iron (Tables 6 and 11).

Median concentrations of iron in both the Peace River and Tributaries Downstream sites showed a generally decreasing trend from May to October for both the Pre-Construction and Construction phases (Figure 3b). Most median iron concentrations in both the Pre-Construction and Construction phases exceeded the BC AWQG guideline of 1 mg/L.

The PD1, PINE, PD2 and BEA samples collected in May and the BEA and KR samples collected in October exceeded the BC AWQG for dissolved aluminum (Tables 6 and 11).

All samples collected in May exceeded the BC AWQG for total copper (Table 6).

All samples collected in May, except PD1, PINE, PD2 and BEA, exceeded the BC AWQG for total zinc (Table 6). Zinc is a naturally occurring element; however, is also related to industrial and domestic emissions (Health Canada 1987).

All samples collected in May, except PD1, PINE, PD2 and PD3, exceeded the BC AWQG for total silver (Table 6). Silver naturally occurs in the environment in low concentrations except in and near mineral deposits. Extraction, manufacture, use and disposal are other related sources of silver (CCME 2015).

All samples collected in May, except PD1, exceeded the BC AWQG for total arsenic (Table 6).

Field measurements of temperature in June through August indicated levels exceeding the BC AWQG for all stations except for PD1 in June, PD1 and PD5 in July and PD1 and PD2 in August (Tables 7 to 9). Overall, the temperatures measured in the tributaries were generally found to be higher than that of the Peace River, except



for the September and October sampling periods when temperatures within the tributaries were generally slightly lower relative to the Peace River.

The pH values remained within guidelines throughout the dataset and sampling period. The range of fieldmeasured pH values was 7.75 to 8.81 over the sampling period. Laboratory-analyzed pH is considered secondary to field-measured pH by a calibrated instrument due to the exceeded hold times (15 minutes) of all laboratoryanalyzed pH values (Tables 6 to 11).

TSS, TDS, and turbidity were generally consistent throughout the dataset and over each sample period, with elevated concentrations generally observed within the tributaries (PINE, BEA, KR and POUCE) compared to the Peace River samples. Measurements and concentrations observed in May during higher spring flows were generally higher than other sampling periods in the program (Tables 6 to 11). These parameters were not compared against BC WQG, as short-term maximum guidelines were not provided in the guidelines.

Anions and nutrients analyzed within the dataset did not exceed the BC AWQG, however results for the tributary source waters were generally observed to be elevated relative to the Peace River samples. TOC concentrations were within normal range (1 mg/L to 30 mg/L) for natural waterbodies, except for the BEA, KR, POUCE and PD5 samples collected during the May sampling period and the KR and POUCE samples collected during the August sampling period (BC MELP 1998; Tables 6 to 11). DOC concentrations were occasionally found to exceed the TOC concentration, which was likely attributable to the use of polyethersulfone based filters and is discussed further within Section 5.0 of this report.

During the Construction phase, median TOC concentrations in the Peace River Downstream sites were highest in May (approximately 4 times higher) then quickly decreased and stabilized over the subsequent periods (i.e., June to October) (Figure 3e). At the Tributaries Downstream sites, the median TOC concentrations showed a similar pattern, though the May concentrations were only approximately twice as high as the other subsequent periods.

Median concentrations of nitrogen showed a decreasing trend through the periods for the Peace River Downstream sites in both the Pre-Construction and Construction phases (Figure 3c). The Tributaries Downstream sites had fairly consistent median concentrations of nitrogen during all periods of the Construction phase; whereas during the Pre-Construction phase, May concentrations were almost double the other periods, which were all similar.

At both the Peace River and Tributaries Downstream sites in both phases, median concentrations of phosphorus were highest during the spring freshet (May) and decreased in subsequent sampling periods where they stabilized at very low concentrations (Figure3d).

Median Chlorophyll concentrations during the Pre-Construction phase were only available for Peace River Downstream sites (i.e., no Chlorophyll *a* data were collected at Tributaries Downstream sites in the Pre-Construction phase). For this phase, Chlorophyll *a* was relatively stable, with a slight increase in October (Figure 3a). During the Construction phase, Chlorophyll *a* was sampled only in May and June where it showed an increasing trend between the two months.

Hardness within the tributary source waters was generally lower than that of the Peace River during the May sampling period and generally higher than that of the Peace River during the October sampling period. Hardness varied between 57.6 mg/L to 364.0 mg/L for samples collected during the May and October sampling periods, which ranged from soft to moderately soft to very hard water (ESRD 2018; Tables 6 and 11).

All samples analyzed for ultra-low-level detection of mercury and methylmercury resulted in concentrations either below or within an order of magnitude of detection limits (Tables 6 and 11).



Other than intermittent exceedances above the BC AWQG for temperature, total and dissolved iron, total silver, total zinc and dissolved aluminum; regular exceedances above the BC AWQG of total arsenic in May; and all stations exceeding the BC AWQG for total copper and total iron in May, no other exceedances of the guidelines were observed within the datasets.

Sediment quality samples were collected for all downstream reach samples within the near-shore littoral zones near the water sample locations to collect samples with a high fine to moderately coarse material ratio. Particle size analysis of each sample determined that sediment varied between silt loam, loam, sandy loam, loamy sand and sand soil textures (Table 5; Appendix B).

Sediment anions and nutrient levels were considered moderately low and close to detection limits, except for ammonium at PD1 and PD3 which were slightly elevated. pH was within a normal range for all samples. All samples exceeded the BC WWQG Lower SWQG for arsenic and nickel; PD1, BEA and KR exceeded the BC WWQG for cadmium; and PINE, BEA and POUCE exceeded the BC WWQG for iron. All sediment samples collected from the Downstream Reach were within the BC WWQG Upper SWQG except for arsenic at BEA which slightly exceeded the guideline (Table 5).

Other than the metals exceedances stated, no other exceedances of the BC WWQG were observed within the datasets.

4.4 Quality Assurance and Quality Control

The quality assurance and quality control (QA/QC) programs for water and sediment quality sampling are implemented to assess and/or quantify field, laboratory and data reduction quality.

Laboratory QA/QC reports are required by environmental laboratories accredited by the Canadian Association of Environmental Analytical Laboratories (CAELA), such as ALS Environmental, and can be requested to be attached to the laboratory data or requested from the lab directly. Laboratory QA/QC data reviewed by the assessor is generally limited to percentage recovery of added surrogates. The reported detection limits (RDL) of the analytical methods are presented on the analytical reports and in Tables 12 to 14.

Field quality control includes procedures and documentation, and occasionally collection of quality assurance samples. Field quality assurance sampling programs are used to measure the precision and accuracy of the field sampling using blank and duplicate samples.

The field sampling and laboratory testing reproducibility of the sample-duplicate pairs is evaluated using the relative percentage difference (RPD) method, involving calculation of RPD as follows:

RPD % = [Sample – Duplicate]/(X)*100

where X is the average concentration of the sample and its duplicate.

The duplicate analysis is compared to the sample by evaluating the RPD, where the target RPD is less than a 20% difference for water and less than a 30% difference for sediment. RPD is calculated for results that are higher than five times the reported detection limit. Results of RPD analysis are presented in Tables 12 and 13. Approximately 3% of all water quality duplicates were found to generate an exceedance of 20% RPD analysis. Approximately 22% of all sediment quality duplicates were found to generate an exceedance of 30% RPD analysis. The water quality exceedances were attributed to the following parameters: colour, TSS, TDS, carbonate as CaCO₃, total ammonia (as N), total phosphorus and total manganese. The sediment quality exceedances were attributed to soil textures, antimony, arsenic, barium, calcium, copper, lead, magnesium, potassium, strontium, titanium and zinc. Overall, 3% exceedance of water quality parameters is within an



acceptable quality control range. The exceedance of 22% sediment quality parameters is higher; however, sediments tend to be heterogeneous due to differential factors such as deposition from the water column and upstream sources, therefore, there is a higher potential for variability within sediments than in water.

Trip or travel blanks are deionized water sealed in a bottle provided by the laboratory and are introduced for travelling with the samples for the duration of the sampling period. Elevations above the reported detection limit may indicate laboratory or transit introduced errors outside of the field methodology. Table 14 indicates that there were no elevations above reported detection limits for any parameters during all sampling periods.

Field blanks are deionized water filled into bottles using the same field methodology applied to the analyzed dataset. All bottles and water are provided by the laboratory and are introduced for evaluating the field methodology and potential for analytical interference using equipment or sampling practices. Elevations above the reported detection limit may indicate field level introduced errors. Table 14 indicates elevations above reported detection limits for TDS, turbidity, total zinc and dissolved tin in May; turbidity in June; turbidity in July; turbidity in August; turbidity and total phosphorus in September; and total manganese and dissolved ultra-low-level methylmercury in October.

The pH value reported for each field and trip blank were below the normal range of 6.5 to 9.0 and considered acidic. This is attributed to the acidity of the deionized water and not sampling and analytical methodologies. An ALS representative confirmed that the laboratory supplied deionized water typically has a low pH value. In addition, pH has a limited hold time of 15 minutes, therefore field measured pH and not laboratory analyzed pH is interpreted for data analysis of samples collected. Note that field measured pH data was not collected for field and trip blanks.

5.0 DISCUSSION

The objectives of Mon-8 and Mon-9 in 2018 were to contribute to the FAHMFP by characterizing the surface water and sediment conditions within the Peace River and its tributaries as it relates to the Project.

5.1 Management Hypotheses

Mon-8 and Mon-9 were developed to monitor water and sediment quality in the Site C Reservoir and Peace River to address the fisheries management questions listed in the FAHMFP (see Section 1.0).

The management questions and hypotheses outlined in Section 1.0 will require several years of data collection before the questions can be definitively addressed. This report is the third year of data collection for these two monitoring programs under the FAHMFP.

5.2 Discussion of Results

Similar to that reported in 2017, DOC concentrations in 2018 continued to occasionally be elevated above TOC concentrations. DOC concentrations of field blank samples collected during all sampling periods were reported to all be below detection in field-filtered deionized water provided by the lab, which indicates field methodologies are not introducing cross contamination between samples. In the 2017 report it was discussed that "*in 2016, one potential source of organic carbon was attributed to the field filtration equipment. ALS Environmental confirmed that this is a known contributor of organic carbon to analytical samples, and therefore, the concentrations reported are not considered to be an indicator of high concentrations of source water DOC". In 2017, SEES JV implemented flushing of the field equipment with a goal to reduce the incidence of false positives for DOC. In 2018, SEES JV continued with this methodology. Although this still has not fully resolved the concern of organic carbon impacts from field equipment, improvements continue to be seen 2018. The TOC concentrations are*



considered stable and mostly within natural levels for a lotic/lentic system with elevated background turbidity conditions (BC MELP 1998).

Overall, water quality parameters were consistently below the guidelines. During the May sampling period, regular exceedances of total arsenic, total copper, total iron and dissolved aluminum and intermittent exceedances of total silver, total zinc and dissolved iron were observed. During the October sampling period, intermittent exceedances of total and dissolved iron and dissolved aluminum were observed. During the June, July and August sampling periods, regular exceedances of temperature were observed and during the June sampling period one exceedance of pH was observed. Sediment quality parameters were consistently below the guidelines except for regular exceedances of arsenic and nickel and intermittent exceedances of cadmium and iron. Source(s) of the exceeded parameters could not be conclusively determined. Many Peace River tributaries are large systems characterized by high, vertical banks composed of fine materials which are subject to erosion during high flow periods. Given the location and parameters involved, it is possible that the exceedances are the result of natural processes (i.e., regional geology and erosion) and process error (i.e., natural variability among years).

5.3 Boxplots

The data are temporally limited between Pre-Construction and Construction phases, and among periods. Only four years of Pre-Construction and three years of Construction data are available and the number of sample points within each period is also limited and inconsistent (e.g., October may have 12 Construction sample points while July has none). Plotting these data may start to reveal spatial and temporal trends, however with limited data, we cannot draw meaningful inference from the results until more data are collected. Although the Pre-Construction dataset cannot be augmented, as future sampling occurs, the Construction dataset will become more robust.

5.4 Quality Assurance and Quality Control

The QA/QC programs for water and sediment quality sampling are implemented to assess and/or quantify field, laboratory and data reduction quality.

All elevations of field blank parameters above the RDL are likely attributed to residual water left in the sample tubing between samples. Sample tubing is rinsed for a minimum of 10 minutes prior to sampling and other field equipment (e.g., grab sampler) is triple rinsed between samples. Infrequent elevations do not indicate major error, however do suggest that additional flushing time and/or rinsing between samples is advised.

In general, the QA/QC program confirmed that most blank and duplicate parameter concentrations are within acceptable quality ranges, therefore the overall analytical program is considered to accurately characterize water and sediment quality conditions at the sample stations.



6.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted, Saulteau EBA Environmental Services Joint Venture

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TABLES

Table 1	Summary of Surface Water Quality Parameters Compared to BC Approved Water Quality Guidelines
Table 2	Summary of Sediment Quality Parameters Compared to BC Working Water Quality Guidelines
Table 3	Williston Reservoir Water Quality Depth Profile Summary
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Table 14	2018 Surface Water Quality Results Summary for Blank Analysis (May, June, July, August, September and October)
Table 15	Summary Statistics



Table 1: Summary of Surface Water Quality Parameters (Compared to BC A	pproved Water Quality	/ Guidelines	
Parameters Represented within the BC Approved Water	Unit	Reported Detection Limit (RDL)	BC MOE 2018 (Approved Guidelines for freshwater aquatic life and short-term maximum)	Common Sources of Parameter
Physical Parameters and Field Measurements Temperature	°C	-	15	The temperature guideline is designed to protect aquatic life in fresh, estuarine and coastal marine waters from excessive temperature fluctuations that are influenced by anthropogenic activities during sensitive periods. Given the large variation in water temperatures throughout British Columbia due both to the geographical range of the province as well as the large differences in elevation, ambient temperatures are factored into the guidelines so that they adhere closely to the natural temperature regime to which sensitive organisms have adapted through evolutionary processes (BC MOE 2018). Deviation from the guideline value indicates variance of water temperatures outside of normal environmental conditions; natural variance outside of the normal range due to seasonal ambient temperature extremes may cause water temperatures to exceed guidelines and is reported accordingly.
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 #1	Oxygen is the single most important component of surface water for self-purification processes and the maintenance of aquatic organisms which utilize aerobic respiration. The guideline value presented focuses on the effects of minimum oxygen levels on aquatic life. Dissolved oxygen is not a known concern for other water uses other than for some industries, where corrosion can be a concern (ESRD 2018).
Hardness as CaCO3	mg/L	0.5		The hardness of water is generally due to the presence of calcium and magnesium in the water; the main natural sources of hardness in water are sedimentary rocks and runoff from soils (Health Canada 1979a). The BC AWQG established for several water quality parameters, such as total copper, lead and zinc are hardness dependent. The toxicity of metals such as copper, lead and zinc can be reduced as hardness increases (BC MELP 1998). Water hardness varies from soit to hard water conditions based on the following scale: very soft water(0 - 30); soft to moderately soft (31 - 75 mg/L); moderately soft/hard to hard (76 - 180 mg/L), very hard (181 - 250 mg/L) (ESRD, 2014).
pH Anione and Nutriante	pH Units	-	6.5-9.0	The pH of water is determined by the geology of the watershed and is influenced by the seasonal and daily variations in photosynthesis, respiration and decomposition (Sanderson et al, 2012). pH is an important water quality parameter as it affects the solubility and bioavailability of some nutrients and metals. For example, heavy metals tend to be more toxic in water with lower pH because they are more soluble (Michaud 1991 in Sanderson et al 2012, page 92). Laboratory analyzed pH is considered secondary to field measured pH by a calibrated instrument due to the exceeded hold times (15 minutes) of all laboratory analyzed pH values.
Anions and Nutrients Ammonia as N	mg/L	0.005	See narrative #2	Naturally occurring; released from agricultural or industrial wastes; added as part of chloramination for drinking water disinfection (Health Canada 2017)
Chloride	mg/L	0.5	600	Naturally occurring (seawater intrusion); dissolved salt deposits, highway salt, industrial effluents, oil well operations, sewage, irrigation drainage, refuse leachates (Health Canada 2017).
Fluoride	mg/L	0.02	See equation #3	Naturally occurring (rock and soil erosion); may be added drinking water sources to promote dental health and subsequently present within anthropogenic effluents discharged into surface waters (Health Canada 2017).
Nitrate (as N)	mg/L	0.005	32.8	Naturally occurring; leaching or runoff from agricultural fertilizer use, manure and domestic sewage; may be produced from excess ammonia or nitirification in the distribution system (Health Canada 2017).
Nitrite (as N)	mg/L	0.001	0.06-0.60 #4	Naturally occurring; leaching or runoff from agricultural fertilizer use, manure and domestic sewage; may be produced from excess ammonia or nitirification in the distribution system (Health Canada 2017).
Total Metals				
Arsenic	μg/L	0.0005	0.005	Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land (WHO 2016). It Arsenic occurs naturally as a result of weathering of rock and soil. Levels of arsenic in natural source waters ranges between 2 and 50 µg/L (CCME 2001b). Arsenic is highly toxic in its inorganic form and long-term exposure can cause considerable health issues in humans.
Cobalt Copper	mg/L mg/L	0.0003	0.11 See equation #5	Copper is a natural constituent of most rock types, with igneous rock containing the highest concentrations, followed by sedimentary rocks such as shale, sandstone and limestone (BC MOEAP 1987b). Bertine and Goldberg (1971, in BC MOEAP 1987b), page 6) estimated that 40 to 67% of total copper inputs are the result of natural weathering. Copper is acutely toxic to most forms of aquatic life at relatively low concentrations but is generally found in freshwater at trace concentrations ranging from 1 to 10 µg/L (BC MELP 1989b), but can be as high as 50 µg/L (CCREM 1987). The toxicity of copper is highly influenced by water hardness, increasing with decreased hardness. The BC AWOG for copper is hardness dependent (calculated as 0.994(H)-2).
Iron	mg/L	0.03	1	Iron is a common element and is occurs naturally through weathering of sulphide ores and leaching of sandstones (CCREM 1987). Iron can be a significant constituent of soils, especially clays (Phippen et al 2008). Anthropogenic sources are often related to mining. It is a requirement for all lifeforms but can be toxic at high concentrations. The concentrations of iron in Canadian surface waters are generally below 10 mg/L (Health Canada 1978). The BC AWQG for total iron is 1 mg/L, the Health Canada aesthetic objective for iron in drinking water is ≤ 0.3 mg/L (Health Canada 1978).
Lead	mg/L	0.0005	See equation #6	Lead has been observed in natural waters ranging from trace levels up to 40 µg/L, in both the soluble and particulate forms (McNeely et al. 1979 in Sanderson et al 2012, page 174), and in regions with sulphide ores in the underlying geology, concentrations can reach 0.8 mg/L (BC MELP 1998). The toxicity of lead is dependent on the hardness, pH, alkalinity, and dissolved oxygen content of the water; toxicity increases as hardness decreases (CCREM 1987). The BC AWQG for total lead is hardness dependent (calculated as 3 µg/L at H<8 mg/L, or calculated as e(1.273*In(H)-1.460) when H>8 mg/L).
Manganese Molybdenum	mg/L	0.0001	See equation #7	Naturally occurring (erosion and weathering of rocks and minerals; Health Canada 2017).
woybdenam	mg/L	0.001	2	Molybdenum occurs in nature as a chemical combination with other elements (predomnately in porphyry copper ore deposits of molybdenite mined from central BC). Drainage from molybdenum-bearing mineral deposits and molybdenum mines is the only known source of molybdenum discharged to surface waters in BC (BC MOE 2018).
Selenium	mg/L	0.00005	0.002	Selenium occurs naturally in sedimentary rocks, shales, coal and phosphate deposits and soils and generally occurs together with sulfides of metals such as copper, zinc and lead (US EPA 2016). Selenium is bioaccumulative and can be toxic to aquatic life. Surface waters in most areas contain less than 1.0 µg/L (Lakin and Davidson 1967 in CCREM 1987 page 412). Concentrations of selenium in central Canadian waters typically range from 0.1 to 4 µg/L (CCREM 1987).
Silver	mg/L	0.00002	0.0001 or 0.003 "8	Naturally occurring (erosion and weathering of rocks and soils; Health Canada 2017).
2/110	mg/L	0.005	See equation #9	Although relatively non-toxic to terrestrial organisms, zinc can be both acutely and chronically toxic to aquatic organisms (MELP 1998). Several factors such as water hardness, salinity, temperature, and the presence of other contaminants influence zinc toxicity in aquatic environments (BC MOE 1999). Its toxicity decreases with increasing hardness, increases with increasing temperature, and increases with decreasing dissolved oxygen (BC MELP 1998). Natural concentrations range from 1 to 96 µg/L (0.001 to 0.0096 mg/L), but do not typically exceed 40 µg/L (0.04 mg/L) in river water (Environment Canada 1984 in Health Canada 1987, page 2). In certain waters, such as in mining areas or acidic waters, concentrations range from 1 to 1000 times greater can be found (CCREM 1987).
Dissolved Metals				
Aluminum (Filtered)	mg/L	0.005	0.1 #10	Aluminum is generally found in concentrations of less than 1000 µg/L (BC MELP 1998). The dissolved form of aluminum is more toxic than the particulate form, with the greatest toxicity occurring in waters with pH less than 6 (CCREM 1987). A large fraction of total aluminum may not be bioavailable so toxicity may be overestimated, especially in highly turbid water (BC MOEAP 1988).
Cadmium (Filtered)	mg/L	0.000005	See equation #11	Cadmium, which has been shown to bioaccumulate, is highly toxic in all its forms, though dissolved cadmium is more bioavailable. The toxicity of cadmium is highly influenced by water hardness; the toxicity increases with decreased water hardness (CME 2014). Presence of other heavy metals like zinc and copper have has been shown to increase cadmium is knicely (BC MELP 1998). Weathering of rock and forest fires are the most common natural pathways for cadmium to enter surface water therefore, cadmium may occur at higher concentrations naturally because of the underlying geology.
Iron (Filtered)	mg/L	0.03	0.35	Iron is a common element and is occurs naturally through weathering of sulphide ores and leaching of sandstones (CCREM 1987). Iron can be a significant constituent of soils, especially clays (Phippen et al 2008). Anthropogenic sources are often related to mining. It is a requirement for all lifeforms but can be toxic at high concentrations. The concentrations of iron in Canadian surface waters are generally below 10 mg/L (Health Canada 1978). The BC AWQG for total iron is 1 mg/L, the Health Canada assthetic objective for iron in drinking water is ≤ 0.3 mg/L (Health Canada 1978).

NOTES: BC MOE 2018

#1

#2

#3 #4 #5 #6 #0 #7 #8 #9 #10 #11 British Columbia Ministry of Environment (BC MOE). 2018. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.

Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required. Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement.

Guideline for ammonia nitrogen (NH₃) varies with pH and temperature, and is derived from Table 26D of the BC MOE, 2018 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0 degC.

Guideline for alimina introgen (intri) varies with H and is a fully when H < 10 mg/L. Calculated in mg/L and based on equation: $[-51.73 + 92.57^{+}log(Hardness)]x0.01$ when H =10-385 mg/L. Guideline for ritrite varies with this concentrations. Guideline for ritrite varies with H and is calculated in mg/L and based on equation: [0.094(H)+2/1000, when H =13-400 mg/L. Guideline for copper varies with H and is calculated in mg/L and based on equation: $[0.0102^{+}H)+0.54$, when H =13-400 mg/L. Guideline for ritrite varies with H. Guideline is 0.003 mg/L when H-88 mg/L. Guideline for ranganese varies with H and is calculated in mg/L and based on equation: $(0.01102^{+}H)+0.54$, when H =25-259 mg/L. Guideline for ranganese varies with H and is calculated in mg/L and based on equation: $(0.01102^{+}H)+0.54$, when H =25-259 mg/L. Guideline for ranganese varies with H. Guideline is 0.003 mg/L when H +100 mg/L or 0.003 mg/L when H=100 mg/L. Guideline for aluminum varies with H. Guideline is 0.033 mg/L when H =100 mg/L. Calculated in mg/L and based on equation: $(21-20-2250^{+}H)=0.01/1000$, when H =90-500 mg/L. Guideline for aluminum varies with H. Guideline is 0.1 mg/L if $H \ge 6.5$. Calculated in mg/L and based on equation: (21-20-2426(H)+0.226H) where K=(pH)² and pH < 6.5. Guideline for cadmium varies with H and is calculated in mg/L and based on equation: (21-20-2426(H)+0.226H) where K=(pH)² and pH < 6.5. Guideline for cadmium varies with H and is calculated in mg/L and based on equation: (21-20-2426(H)+0.26H) where K=(pH)² and pH < 6.5. Guideline for cadmium varies with H and is calculated in mg/L and based on equation: (21-20-2426(H)+0.26H) where K=(pH)² and pH < 6.5. Guideline for cadmium varies with H and is calculated in mg/L and based on equation: (21-20-2426(H)+0.26H) where K=(pH)² and pH < 6.5. Guideline for cadmium varies with H and is calculated in mg/L and based on equation: (21-20-2426(H)+0.26H) where K=(pH)² and pH < 6.5.

Parameter	Unit	Reported Detection Limit (RDL)	BC MOE 2017 (mg/kg in dry weight) Lower SWQG	BC MOE 2017 (mg/kg in dry weight) Upper SWQG	Common Sources of Parameter
Metals (Soil)					
Arsenic	mg/kg	0.1	5.9 ^{#1}	17 ^{#2}	Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water ar result of weathering of rock and soil. Arsenic is highly toxic in its inorganic form and long-term exposure can cause considered and the second secon
Cadmium	mg/kg	0.02	0.6 ^{#1}	3.5 ^{#2}	Cadmium, which has been shown to bioaccumulate, is highly toxic in all its forms, though dissolved cadmium is more bioa and copper have has been shown to increase cadmium's toxicity (BC MELP 1998). Weathering of rock and forest fires are enter surface water therefore sediments; cadmium may occur at higher concentrations naturally because of the underlying
Chromium	mg/kg	0.5	37.3 ^{#1}	90 ^{#2}	Leaching from topsoil and rocks is the most important natural source of chromium entry into bodies of water and u Substance Registry 2008). However, more than 70% of chromium in the environment comes from anthropogenic so foundries, wood treatment facilities, urban storm water runoff, and discharges from thermal generating stations (Health C present at low concentrations in Canadian surface waters (Health Canada 1979b).
Copper	mg/kg	0.5	35.7 ^{#1}	197 ^{#2}	Copper is a natural constituent of most rock types, with igneous rock containing the highest concentrations, followed by se limestone (BC MOEAP 1987b). Bertine and Goldberg (1971, in BC MOEAP 1987b, page 6) estimated that 40 to 67% of t weathering. Copper is acutely toxic to most forms of aquatic life at relatively low concentrations (BC MELP 1998).
Iron	mg/kg	50	21,200 (about 2%) ^{#3}	43,766 (about 4%) ^{#3}	Iron is a common element and is occurs naturally through weathering of sulphide ores and leaching of sandstones (CCRE especially clays (Phippen et al 2008). Anthropogenic sources are often related to mining. It is a requirement for all lifeform
Lead	mg/kg	0.5	35 ^{#1}	91.3 ^{#2}	Lead has been observed in natural environments, occurring either naturally but is also present in older infrastructure (e.g. Health Canada 2017).
Manganese	mg/kg	1	460 ^{#3}	1100 ^{#3}	Naturally occurring (erosion and weathering of rocks and minerals; Health Canada 2017).
Mercury	mg/kg	0.005	0.17 ^{#1}	0.486 ^{#2}	Mercury is found in the environment naturally from the weathering of rocks but atmospheric deposition is a major pathway
Nickel	mg/kg	0.5	16 ^{#3}	75 ^{#3}	Nickel naturally occurs as a chemical combination with other elements (erosion and weathering of rocks and minerals), an practices (BC MOE 2017).
Silver	mg/kg	0.1	0.5 ^{#4}	N/A ^{#4}	Naturally occurring (erosion and weathering of rocks and soils; Health Canada 2017).
Zinc	mg/kg	2	123 ^{#1}	315 ^{#2}	Although relatively non-toxic to terrestrial organisms, zinc can be both acutely and chronically toxic to aquatic organisms (I hardness, salinity, temperature, and the presence of other contaminants influence zinc toxicity in aquatic environments (Bo by mining or acidic water, concentrations, increased concentrations are found (CCREM 1987).

NOTES: BC MOE 2017

BC MOE. 2017. Working Water Quality Guidelines and Working Sediment Quality Guidelines for British Columbia. Water Protection and Sustainability Branch. British Columbia Ministry of Environment. A concentration that will protect aquatic life from adverse effects of toxic substance in most situations (equivalent to CCME's Threshold Effect Level or Interim Sediment Quality Guidelines (TEL or ISQGs; CCME 2001))

A concentration that if exceeded will likely cause severe effects on aquatic life (equivalent to CCME's Probably Effect Level (PEL; CCME (2001)). Canadian Council of Ministers of the Environment [CCME]. 2001. Canadian sediment quality guidelines. Canadian Council of Ministers of the Environment, Winnipeg. Accessed on-line at http://ceqg-rcqe.ccme.ca/en/index.html#void Apparent Effects Threshold

- Lower SWQG Upper SWQG CCME 2001 AET ΒA CoA EqP ISQG NSTPA PEL SLC #1
 - Background Approach Co-Occurrence analysis
 - Equilibrium Partitioning

Interim Sediment Quality Guideline

- National Status and Trends Program Approach
- Probable Effect Level
- Screening Level Concentration
- Lower SWQG is based on ISQG
- Upper SWQG is based on PEL #2
- #3 Effect levels based on SLC
- Based on Ontario sediment guideline #4

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and land (WHO 2016). It Arsenic occurs naturally as a siderable health issues in humans.

ioavailable. Presence of other heavy metals like zinc are the most common natural pathways for cadmium to ing geology.

underlying sediments (Agency for Toxic Disease and sources, such as tanneries, electroplating, non-ferrous Canada 2015; BC MELP 1998). Chromium is generally

sedimentary rocks such as shale, sandstone and of total copper inputs are the result of natural

REM 1987). Iron can be a significant constituent of soils, rms but can be toxic at high concentrations.

g. pipes, solder, brass fittings and lead service lines;

ay to aquatic systems (Sanderson et al 2012).

and is also widely used in mettalurgical industry

(BC MELP 1998). Several factors such as water (BC MOE 1999). Concentrations within areas affected

Field Parameter	Sample Depth	Secchi Depth	Total Depth	Temperature	Dissolved Oxygen	Specific Conductivity	Electrical Conductivity	Salinity	Total Dissolved Solids	рН	ORP	Tu
Units	m	m	m	°C	mg/L	SPCµS/cm	μS/cm	SAL-ppt	mg/L		mV	1
BC MOE 2013 Guidelines fo aquatic life an maxin	or freshwater nd short-term	-		15	Minimum 5 mg/L (All life stages other than buried embryo/alevin)	-	-	-	-	6.5-9.0	-	
Sample Date	m	m	m	°C	mg/L	SPCµS/cm	μS/cm	SAL-ppt	mg/L		mV	
	0.2			2.7	12.15	187.5	107.9	0.09	121.8	8.04	171.3	
	0.5			2.8 2.8	12.16 12.16	187.5 187.5	108.2 108.1	0.09	121.9 121.9	8.04 8.04	172.2 172.2	
	1.5			2.7	12.17	187.6	108.0	0.09	121.9	8.05	174.1	
11-May-18	2.0 2.5	6.50	137	2.8 2.7	12.15 12.14	187.6 187.6	107.8 107.8	0.09	122.0 122.0	8.07 8.04	173.7 176.7	
	3.0			2.8	12.14	187.6	108.0	0.09	122.0	8.02	178.3	
	3.5 4.0			2.7 2.8	12.14 12.14	187.7 187.6	107.8 108.1	0.09	122.0 121.9	8.02 8.02	178.7 179.8	-
	4.5			2.9	12.14	187.5	108.2	0.09	121.9	8.04	179.6	
	5.0 0.2			2.7 11.8	12.15 11.24	187.6	107.9 138.5	0.09	121.9 121.0	8.03 7.94	180.5 114.0	
	0.2			10.4	11.24	186.5 186.8	138.5	0.09	121.0	7.94	122.6	
	1.0			10.3	11.41	186.5	133.1	0.09	121.0	7.93	125.9	
	1.5 2.0			9.7 9.5	<u>11.43</u> 11.46	187.1 186.8	132.1 131.5	0.09	122.0 121.0	7.93 7.97	132.5 134.3	_
18-Jun-18	2.5	4.00	194	9.3	11.48	186.8	131.4	0.09	121.0	7.97	136.5	_
	3.0			9.1	11.46	187.2	130.8	0.09	122.0	7.96	140.2	_
	3.5 4.0			9.1 9.1	11.47 11.47	187.9 187.9	130.8 130.8	0.09	122.0 122.0	7.97 7.96	143.6 145.7	
	4.5			9.0	11.48	180.0	130.6	0.09	122.0	7.95	147.4	
	5.0 0.2			9.0 17.4	11.48 9.48	188.0 180.4	130.5 154.2	0.09	122.0 117.0	7.96 8.33	148.3 230.0	
	0.2			16.6	9.52	180.2	150.7	0.09	117.0	8.33	232.0	
	1.0			16.3	9.52	180.0	149.9	0.09	117.0	8.32	234.7	_
	1.5 2.0			16.2 16.1	9.52 9.52	180.0 180.1	149.8 149.6	0.09	117.0 117.0	8.32 8.32	236.0 236.9	-
17-Jul-18	2.5	3.50	30	16.1	9.52	180.0	149.3	0.09	117.0	8.32	237.8	
17-Jul-18	3.0 3.5			16.1 16.0	9.52 9.52	180.1 180.0	149.3 149.2	0.09	117.0 117.0	8.32 8.32	238.7 239.3	
	4.0			16.0	9.52	180.0	149.2	0.09	117.0	8.32	239.3	-
	4.5			16.0	9.52	180.0	149.2	0.09	117.0	8.31	241.2	
	5.0 0.2			16.0 19.4	9.52 9.23	180.0 172.7	149.1 154.0	0.09 0.08	117.0 112.0	8.32 8.38	241.6 225.2	
	0.5			18.7	9.31	172.6	153.4	0.08	112.0	8.36	228.7	
	1.0			18.4	9.25	172.6	148.1	0.08	112.0	8.34	235.1	
	1.5 2.0			17.7 17.5	9.36 9.37	172.3 174.4	149.6 147.9	0.08	112.0 112.0	8.34 8.36	238.4 240.1	-
31-Jul-18	2.5	4.50	57	17.4	9.38	172.2	147.2	0.08	112.0	8.33	242.1	
	3.0 3.5			17.3 17.2	9.40 9.41	171.9 172.0	146.9 146.4	0.08	112.0 112.0	8.33 8.31	243.7 246.7	_
	4.0			18.8	9.44	172.3	145.4	0.08	112.0	8.30	248.6	-
	4.5			16.4	9.46	172.8	144.0	0.08	112.0	8.29	250.2	
	5.0 0.2			16.2 14.6	9.42 9.24	173.0 176.8	143.7 141.7	0.08	112.0 116.3	8.27 8.22	252.1 240.9	
	0.5			14.6	9.24	176.8	141.7	0.08	114.8	8.19	233.3	
	1.0			14.8	9.24	176.3	141.2	0.08	114.5	8.19	232.4	
	1.5 2.0			14.6 14.6	9.24 9.24	175.9 175.7	141.0 140.8	0.08	114.4 114.2	8.17 8.18	232.1 231.5	
11-Sep-18	2.5	-	70	14.6	9.24	175.4	140.7	0.08	114.4	8.14	232.6	
	3.0 3.5			14.6 14.6	9.24 9.24	175.1 174.9	140.3 140.2	0.08	113.7 113.6	8.13 8.12	232.3 232.7	_
	4.0			14.6	9.24	174.7	140.0	0.08	113.5	8.10	230.6	
	4.5			14.6	9.22	174.4	139.8	0.08	113.4	8.11	229.9	_
	5.0 0.2			14.6 6.9	9.22 10.80	174.1 176.4	139.5 115.8	0.08	113.1 115.0	8.11 8.00	229.1 157.1	-
	0.5			6.9	10.81	177.1	115.8	0.08	115.0	8.00	157.1	1 .
	1.0 1.5			6.9 6.9	10.80 10.80	177.4 177.0	115.5 116.0	0.08	115.0 115.0	8.00 8.00	157.5 157.7	-
	2.0	7.50		6.9	10.80	175.4	115.6	0.08	115.0	8.00	157.9	-
19-Oct-18	2.5		82	6.9	10.79	177.3	116.3	0.08	115.0	7.99	158.1	
	3.0 3.5			6.9 6.9	10.79 10.79	177.0 176.1	116.0 115.8	0.08	115.0 115.0	7.99 7.99	158.3 158.6	-
	4.0			6.9	10.79	176.2	115.9	0.08	115.0	7.98	159.0	-
	4.5			6.9	10.78	177.5	115.6	0.08	115.0	7.98	159.3	·
	5.0			6.9	10.78	177.2	116.0	0.08	115.0	7.97	159.9	

Table 3: Williston Reservoir Water Quality Depth Profile Summary

NOTES:

BC MOE 2018 British Columbia Ministry of Environment (BC MOE). 2018. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.

No applicable standard/guideline or analysis was not conducted. -

Concentration is less than the laboratory detection limit indicated.
 Bold Bold and shaded indicates an exceedance of one of the applicable standards/guidelines.

Turbidi	ty
NTU	
-	
NTU	
0.09	
0.09	
0.90	
0.90	
1.00	
0.90	
0.90	
<u>1.00</u> 1.70	
1.85	
1.89	
1.89 1.92	
1.92	
1.92 1.98	
1.91	
1.88 1.96	
3.39	
3.41	
3.75 3.86	
3.72	
3.76 3.81	
3.80	
4.16	
3.96	
3.87 3.86	
3.80	
3.82	
3.97	
4.00	
4.03	
3.97	
4.01	
0.35	
0.37	
0.33	
0.38	
0.33	
0.30	
0.37	
-1.56	
-1.58 -1.56	
-1.57	
-1.54 -1.56	
-1.58	
-1.55	
-1.58 -1.53	
-1.57	

Field Sample Parameter Depth Sec		Secchi Depth	Total Depth	Temperature	Dissolved Oxygen	Specific Conductivity	Electrical Conductivity	Salinity	Total Dissolved Solids	рН	ORP	Turbidity																				
Units	m	m	m	°C	mg/L	SPCµS/cm	μS/cm	SAL-ppt	mg/L		mV	NTU																				
BC MOE 2018 (Approved Guidelines for freshwater aquatic life and short-term maximum)		-		15	Minimum 5 mg/L (All life stages other than buried embryo/alevin)				-	6.5-9.0	-	-																				
Sample Date	m	m	m	°C	mg/L	SPCµS/cm	µS/cm	SAL-ppt	mg/L		mV	NTU																				
	0.2			3.6	12.38	171.7	101.5	0.08	111.6	7.97	124.9	26.3																				
	0.5			3.6 3.6	12.43 12.46	171.8 171.8	101.7 101.6	0.08	111.7 111.6	7.95 7.93	124.5 133.5	25.0 24.7																				
	1.5			3.6	12.46	171.8	101.6	0.08	111.7	7.94	135.9	23.5																				
11-May-18	2.0	0.75	140	3.6	12.49 12.49	172.1 172.2	101.6 101.4	0.08	111.9 111.9	7.93 7.93	140.0 143.2	24.9 24.9																				
T T-Way-To	2.5 3.0	0.75	140	3.5 3.4	12.49	172.2	101.4	0.08	111.9	7.93	145.3	24.9																				
	3.5			3.4	12.50	172.2	101.2	0.08	111.9	7.94	147.6	25.5																				
	4.0 4.5			3.5 3.7	12.49 12.48	172.1 172.1	101.4 101.9	0.08	111.9 111.9	7.94 7.95	149.7 151.6	25.8 25.6																				
	5.0			3.7	12.40	172.1	101.9	0.08	111.9	7.96	153.1	34.0																				
	0.2			18.8	10.36	191.6	169.0	0.09	125.0	8.10	178.3	1.49																				
	0.5			14.8 13.0	10.92 11.32	192.9 189.7	152.1 145.7	0.09	125.0 123.0	8.10 8.10	181.7 182.2	1.51 1.54																				
	1.0			12.8	11.35	189.6	145.7	0.09	123.0	8.10	182.4	1.54																				
	2.0			12.4	11.49	189.6	143.8	0.09	123.0	8.11	182.6	1.56																				
18-Jun-18	2.5 3.0	5.00	42	11.7 11.6	11.47 11.52	189.4 189.4	141.8 141.1	0.09	123.0 123.0	8.10 8.11	183.5 183.4	1.57 1.59																				
	3.5			11.6	11.55	189.3	140.9	0.09	123.0	8.10	183.8	1.59																				
	4.0			10.9	11.63	189.2	137.4	0.09	123.0	8.10	184.7	1.56																				
	4.5 5.0			10.5 10.3	11.70 11.74	189.2 189.2	136.9 135.9	0.09	123.0 123.0	8.10 8.09	184.3 184.7	1.61 1.62																				
	0.2			16.7	10.03	189.2	155.4	0.09	123.0	8.30	184.8	1.91																				
	0.5			17.0	10.05	184.0	152.5	0.09	120.0	8.30	201.5	1.94																				
	1.0			16.0	10.13	184.4	151.2	0.09	120.0	8.31	205.7	2.06																				
	1.5 2.0			13.9 13.7	10.38 10.40	181.0 181.7	143.4 142.8	0.09	118.0 118.0	8.26 8.25	214.8 219.0	2.03 2.05																				
17-Jul-18	2.5	5.00	23	13.5	10.40	181.6	141.4	0.09	118.0	8.24	2213.0	2.09																				
	3.0			13.3	10.46	181.3	141.6	0.09	118.0	8.24	224.3	2.09																				
	3.5			13.5	10.46	181.6	142.6	0.09	118.0	8.24	226.9	2.09																				
	4.0 4.5												-	ŀ										12.8 12.6	10.51 10.47	181.3 181.0	141.2 137.9	0.09	118.0 118.0	8.23 8.21	230.4 232.7	2.15 2.17
	5.0			12.5	10.54	181.0	139.8	0.09	118.0	8.22	233.9	2.14																				
	0.2					20.3	9.50	179.0	163.3	0.08	116.0	8.22	250.9	17.52																		
	0.5			15.5 12.9	9.98 10.32	182.2 183.5	150.0 140.9	0.09	117.0 120.0	8.18 8.14	255.0 202.2	15.49 10.32																				
	1.5			11.8	10.52	179.4	132.5	0.09	120.0	8.15	202.2	8.92																				
	2.0			11.2	10.57	179.6	131.1	0.09	117.0	8.15	211.5	9.14																				
31-Jul-18	2.5	0.75	38	10.4	10.67	179.8	129.6	0.09	117.0	8.14	216.0	9.83																				
	3.0 3.5			10.3 10.2	10.67 10.68	179.8 179.8	129.2 129.1	0.09	117.0 117.0	8.14 8.14	219.7 222.8	10.12 10.72																				
	4.0			10.2	10.68	180.0	129.0	0.09	117.0	8.15	225.6	10.06																				
	4.5			10.1	10.69	179.9	128.8	0.09	117.0	8.15	227.7	10.06																				
	5.0 0.2			9.8 11.6	10.69 10.30	180.1 180.0	128.5 134.0	0.09	117.0 117.1	8.15 8.03	236.8 164.0	10.69 1.15																				
	0.2			11.6	10.04	179.3	133.5	0.09	116.6	8.04	164.8	1.15																				
	1.0			11.6	10.03	179.0	133.2	0.09	116.4	8.04	187.7	1.14																				
	1.5			11.6	10.02	179.1	133.2	0.09	116.4	8.01	190.2	1.17																				
11-Sep-18	2.0 2.5	3.50	35	<u>11.6</u> 11.6	10.02 10.02	179.9 179.2	133.1 133.2	0.09	116.3 116.5	8.03 8.01	189.8 191.1	1.17 1.17																				
	3.0	2.00	20	11.6	10.02	178.8	133.0	0.08	116.2	8.01	191.1	1.17																				
	3.5			11.6	10.01	178.2	132.5	0.08	115.8	8.03	192.0	1.09																				
	4.0 4.5			11.6 11.6	10.01 10.01	178.0 177.9	132.3 132.1	0.08	115.7 115.6	8.03 8.04	192.4 192.3	1.10 1.14																				
	4.5 5.0			11.6	10.01	177.7	132.1	0.08	115.5	8.04	192.3	1.14																				
	0.2			7.1	10.90	177.0	116.1	0.08	115.0	8.06	162.8	-1.26																				
	0.5			7.1	10.89	176.7	116.3	0.08	115.0	8.07	163.0	-1.28																				
		1.0 1.5 2.0 2.5 7.50		7.1 7.1	10.89 10.89	176.8 176.3	115.2 116.0	0.08	115.0 115.0	8.07 8.07	163.2 163.7	-1.24 -1.26																				
				7.1	10.88	176.7	116.2	0.08	115.0	8.07	163.9	-1.20																				
19-Oct-18	2.5		29	7.1	10.88	176.6	116.4	0.08	115.0	8.07	164.2	-1.18																				
	3.0			7.0	10.87	176.4	115.9	0.08	114.0	8.07	164.4	-1.19																				
	3.5 4.0			7.0 7.0	10.87 10.87	175.9 177.0	115.7 115.6	0.08	115.0 114.0	8.07 8.07	164.7 164.9	-1.20 -1.17																				
	4.0			7.0	10.86	177.3	116.8	0.08	114.0	8.07	165.2	-1.17																				
	5.0			7.0	10.87	177.0	116.4	0.08	115.0	8.07	165.5	-1.18																				

Table 4: Dinosaur Reservoir Water Quality Depth Profile Summary

NOTES:

BC MOE 2018 British Columbia Ministry of Environment (BC MOE). 2018. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.

No applicable standard/guideline or analysis was not conducted.
 Concentration is less than the laboratory detection limit indicated.
 Bold Bold and shaded indicates an exceedance of one of the applicable standards/guidelines.

Table 5: Summary of October Sedim	nent Quality Resu	ilts							<u> </u>												
		Reported	BC MOE 2017	BC MOE 2017				UPPER SITE C	MIDDLE SITE C	HALFWAY	LOWER SITE C	MOBERLY					PEACE AT		PEACE AT		
Parameter	Unit	Detection Limit	(mg/kg in dry	(mg/kg in dry	WILLISTON (W1)	DINOSAUR (D1)	PEACE CANYON	RESERVOIR	RESERVOIR	RIVER -	RESERVOIR	RIVER -	PEACE AT PINE		PEACE AT	BEATTON RIVER	KISKATINAW	KISKATINAW	POUCE COUPE	POUCE COUPE	PEACE AT MANY
		(RDL)	weight) Lower SWQG	weight) Upper SWQG			(PC1)	(PR1)	(PR2)	DOWNSTREAM (HD)	(PR3)	DOWNSTREAM (MD)	(PD1)	(PINE)	BEATTON (PD2)	(BEATTON)	(PD3)	RIVER (KR)	(PD4)	(POUCE)	ISLANDS (PD5)
Matrix			SWQG	SWQG	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil	soil
Sample Date					10/19/2018	10/19/2018	10/19/2018	10/19/2018	10/20/2018	10/20/2018	10/17/2018	10/17/2018	10/17/2018	10/17/2018	10/18/2018	10/18/2018	10/18/2018	10/18/2018	10/18/2018	10/18/2018	10/18/2018
Laboratory Identification Number					L2184475-1	L2184475-2	L2184475-4	L2184475-5	L2184608-2	L2184608-1	L2182906-2	L2182906-1	L2182906-3	L2182906-4	L2183717-1	L2183717-2	L2183717-3	L2183717-4	L2183717-5	L2183717-6	L2183717-7
Field Measurements	•					1				1											
Sample Depth (bottom)	m	-	-	-	0.50	1.00	0.20	0.20	1.50	0.20	0.50	0.20	0.50	0.50	0.50	0.20	0.50	0.50	0.50	0.20	0.50
Particle Size (Soil)	•	1				1				1											
% Sand (0.125mm - 0.063mm)	%	1.0	-	-	28.3	13.2	12.4	9.4	18.3	5.5	15.6	20.8	32.8	4.7	19.3	13.3	19.1	2.2	36.4	4.5	30.1
% Sand (0.25mm - 0.125mm)	%	1.0	-	-	<1	5.1	18.8	12	6	33.8	2.5	38.1	10.7	23.6	18.7	13.4	8.4	2.4	7.4	6.3	<1
% Sand (0.50mm - 0.25mm)	%	1.0	-	-	<1	<1	19	7.3	2.3	30.6	<1	14.3	<1	55.3	7.5	1.2	2.9	1	<1	28.1	<1
% Clay (<4um)	%	1.0	-	-	2.5	10.1	4.6	3.1	9.3	5.6	9.4	7.2	7.7	2.1	2.7	6.9	10	12.2	6.4	4.4	7.4
% Gravel (>2mm)	%	1.0	-	-	<1	<1	<1	27.2	1.7	1.1	<1	<1	<1	4.5	19.8	31.3	11.2	17	<1	37.3	<1
% Sand (1.00mm - 0.50mm)	%	1.0	-	-	<1	<1	11.9	4.4	<1	7.4	<1	<1	<1	2.7	7.4	<1	<1	<1	<1	6.7	<1
% Silt (0.0312mm - 0.004mm)	%	1.0	-	-	32.2	38.8	11.9	15.9	34.5	9	38.8	9.7	23.8	3.7	5.8	15.4	22.9	33.5	23	7.1	27.9
% Silt (0.063mm - 0.0312mm)	%	1.0	-	-	36	31.9	11	14	26.6	5.2	33.2	9.5	24.7	3	7.9	16.9	24.5	30.2	26.7	5.3	33.9
% Sand (2.00mm - 1.00mm)	%	1.0	-	-	<1	<1	10.4	6.7	<1	2	<1	<1	<1	<1	10.8	<1	<1	<1	<1	<1	<1
Carbon		•	•	•	•		•	•	•		•	•	•	•	•	•	•	•	•	•	•
Total Organic Carbon (TOC)	%	0.05			4.2	1.73	1.3	3.07	0.87	0.73	1.74	1.3	1.47	0.62	0.72	0.94	1.24	1.66	1.28	0.661	0.793
Physical Tests (Soil)		•	•	•	•		•	•	•		•	•	•	•	•	•	•	•	•	•	•
pH	pH Units	0.1	-	-	8.54	8.14	8.68	7.75	8.2	8.32	7.74	8.16	8.11	8.41	8.31	8.1	8.02	8.26	8.14	8.32	8.18
Anions and Nutrients (Soil)		•	•	•	•		•	•	•		•	•	•	•	•	•	•	•	•	•	•
Nitrogen (Total)	%	0.02	-	-	0.079	0.12	0.083	0.185	0.143	0.108	0.127	0.088	0.095	0.043	0.049	0.082	0.099	0.11	0.079	0.045	0.065
Plant Available Nutrients (Soil)	•		•			•	•		•			•	•	•			•	•	•	•	
Ammonium	mg/kg	1	-	-	<1	1.6	2.1	3.7	1.9	1.3	10.3	2.1	6.2	<1	1.1	1.4	5.4	2.4	3.8	1.6	2.7
Nitrate (as NO3-N)	mg/kg	2	-	-	<2	<2	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Nitrate and Nitrite (as N)	mg/kg	2	-	-	<2	<2	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Phosphate	mg/kg	2	-	-	<2	<2	<2	3.6	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	<2	2.5	2.1
Metals (Soil)								•		•	•										
Aluminum	mg/kg	50	-	-	5300	7590	7210	6110	8470	6390	5760	5840	5900	3760	5150	7980	9290	11,000	6410	5950	7100
Antimony	mg/kg	0.1	-	-	0.73	1.1	0.52	0.7	0.76	0.72	0.67	0.63	0.64	0.67	0.67	3.78	0.61	0.76	0.65	0.51	0.59
Arsenic	mg/kg	0.1	5.9 ^{#1}	17 ^{#2}	4.39	7.2	6.15	6.76	6.39	9.12	6.61	7.36	6.63	9.25	8.17	23	8.39	7.95	7.69	10.9	7.79
Barium	mg/kg	0.5	-	-	96.9	461	278	169	385	414	424	265	406	240	367	401	436	421	418	261	398
Beryllium	mg/kg	0.1	-	-	0.2	0.39	0.34	0.29	0.4	0.47	0.42	0.38	0.37	0.39	0.37	0.6	0.57	0.73	0.46	0.54	0.44
Bismuth	mg/kg	0.2	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron - soluble	mg/kg	5	-	-	<5	7.6	6.1	6.7	7.5	7.8	6.1	5.5	6	<5	5.2	7.7	8.3	8.6	6.5	7.9	6.8
Cadmium	mg/kg	0.02	0.6#1	3.5#2	0.882	0.963	0.588	0.822	0.846	0.495	0.752	0.488	0.649	0.458	0.476	0.614	0.492	0.701	0.568	0.276	0.409
Calcium	mg/kg	50	-	-	67,200	37,000	41,100	25,800	33,200	18,100	23,500	15,400	22,500	20,200	22,600	5390	13,800	21,200	20,000	7990	11,200
Chromium	mg/kg	0.5	37.3#1	90#2	17.1	18.1	26.4	16.6	19	11.6	13.1	12.4	13.3	8.88	11.1	16.7	19.1	21.6	14	12.1	15
Cobalt	mg/kg	0.1	-	-	5.59	6.98	6.5	5.6	7.64	7	6.65	7.31	6.37	5.46	6.96	12.8	8.84	9.69	7.36	7.4	7.46
Copper	mg/kg	0.5	35.7#1	197 ^{#2}	11.8	20.6	16.9	14	19.8	14.8	15.7	15.3	14.1	9.07	11.3	20.1	19	24.6	15.1	11.4	14.3
Iron	mg/kg	50	21,200 (about 2%)#3	3 43,766 (about 4%)#3	14,600	16,400	22,000	17,400	18,700	23,000	16,400	17,800	16,200	29,400	18,500	25,000	20,300	20,800	17,400	29,900	17,600
Lead	mg/kg	0.5	35"1	91.3 ^{#2}	5.88	9.63	9.07	7.53	8.09	8.39	7.83	7.69	7.35	6.37	6.89	20.2	10.2	11.7	8.46	7.21	8.87
Lithium	mg/kg	2		-	7.5	9.2	10.4	7.6	11.2	9.3	8.5	8	8.2	5.7	7.3	11.4	13.8	16.3	9.5	8.6	9.9
Magnesium	mg/kg	20	-	-	18,300	10,700	9300	10,300	12,700	4250	8560	5220	7630	3580	5120	3660	5560	7720	6480	3250	4810
Manganese	mg/kg	1	460#3	1100 ^{#3}	306	312	261	259	302	249	242	276	214	273	306	328	284	326	271	351	251
Mercury	mg/kg	0.005	0.17#1	0.486 ^{#2}	0.0295	0.0519	0.0405	0.0534	0.0542	0.0412	0.052	0.0339	0.045	0.0255	0.125	0.159	0.0754	0.0902	0.0646	0.038	0.0521
Molybdenum	mg/kg	0.1	-	-	1.22	1.36	0.84	1.16	1.23	1.85	1.55	1.51	1.35	1.92	1.26	1.93	1.22	1.13	1.28	1.03	1.08
Nickel	mg/kg	0.5	16 ^{#3}	75 ^{#3}	18.1	23.8	20.8	21.9	24.3	19.5	21.3	23.2	20.5	19	21.3	44	26.1	31.8	22.7	20.5	22.3
Phosphorus	mg/kg	50	-	-	894	809	781	910	822	1120	838	696	804	955	645	682	769	637	799	591	734
Potassium	mg/kg	100	-	-	550	1490	1100	1000	1400	1370	980	970	1030	740	860	1350	1540	1690	1100	1060	1240
Selenium	mg/kg	0.2	-	-	0.26	0.53	0.33	0.65	0.58	0.69	0.62	0.49	0.67	0.47	0.56	1.33	0.68	0.92	0.61	0.46	0.41
Silver	mg/kg	0.1	0.5#4	N/A ^{#4}	<0.1	0.28	0.15	0.16	0.21	0.15	0.18	0.13	0.16	0.11	0.11	0.3	0.17	0.25	0.16	<0.1	0.16
Sodium	mg/kg	50	-	-	91	109	112	85	133	86	81	84	74	170	61	118	93	111	78	113	77
Strontium	mg/kg	0.50		-	123 <1000	84.8 <1000	119 <1000	59	72.7	62.4 1700	61	47.2	61.3 1100	59.4	49.5	37.9	51.6 <1000	58.5	52.1	33.5 <1000	45.5
Sulphur Thallium	mg/kg	0.050	+ .		<1000	<1000 0.202	<1000	<1000 0.146	<1000 0.171	0.119	1400 0.155	<1000	0.141	1200 0.104	<1000	2900 0.331	<1000 0.167	<1000	<1000	<1000	1000 0.142
Tin	mg/kg ma/ka	2.0	-	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Titanium	mg/kg	1.0	-	-	298	96.7	159	133	169	<33	44.3	68	54.1	27.4	62.3	49.1	66	53.6	<51	55.6	65.9
Tungsten	mg/kg	0.5	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
Uranium	mg/kg	0.05	-		0.814	0.778	0.615	0.837	0.825	0.958	0.843	0.747	0.795	0.734	0.757	0.997	1.01	0.976	0.871	0.674	1.04
Vanadium	mg/kg	0.2	-	-	36.3	41.1	52	35.9	40.7	27	27.2	25.4	28	22.1	24.6	33.3	34.5	39.8	28.3	31	29.1
Zinc	mg/kg	2	123#1	315#2	48.7	77.9	77.8	66.5	78.3	82.6	82.9	68.9	75.4	73.2	70.5	103	89.3	104	81.4	70.8	77
Zirconium	mg/kg	1	-	-	3.6	1.8	2	<1	2.6	2.4	1.5	2.1	1.8	1.9	2.2	3.3	3.2	4.1	2.5	3	3.8
	iiig/ikg	1 1	-	1	0.0	1.0			2.0	2.7	1.0	2.1	1.0	1.5	2.2	0.0	0.2	7.1	2.0		0.0

NOTES:

 NOTES:

 BC MOE 2017
 BC MOE. 2017. Working Water Quality Guidelines and Working Sediment Quality Guidelines for British Columbia. Water Protection and Sustainability Branch. British Columbia Ministry of Environment. Lower SWQG

 Lower SWQG
 A concentration that if exceeded will likely cause severe effects on availability guidelines. Canadian Council of Ministers of the Environment (CCME). 2001. Canadian sediment quality guidelines. Canadian Council of Ministers of the Environment (CCME). 2001. Canadian sediment quality guidelines. Canadian Council of Ministers of the Environment (CCME). 2001. Canadian sediment quality guidelines. Canadian Council of Ministers of the Environment, Winnipeg. Accessed on-line at http://ceqg-rcqe.ccme.ca/en/index.html#void

 AC
 Concentration that if exceeded will likely cause severe effects on availability guidelines. Canadian Council of Ministers of the Environment, Winnipeg. Accessed on-line at http://ceqg-rcqe.ccme.ca/en/index.html#void

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 BA
 Ba/ground Approach

 EGP
 Equilibrium Parttioning

 ISOG
 Interim Sediment Quality Guideline

 NSTPA
 National Status and Trends Program Approach

 FEL
 Probable Effect Level

 Sc resening Level Concentration

 #1
 Lower SWQG is based on SLG

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					Williston and Din	iosaur Reservoirs			1	Future Sitr	e C Reservoir						Downs	tream of Site C Re	servoir	I.	r	
ameter	Unit	Reported Detection Limit (RDL)	BC MOE 2018 (Approved Guidelines for freshwater aquatic life and short-term maximum)	Williston Shallow (W1-SHALLOW)	Williston Deep (W1-DEEP)	Dinosaur Reservoir Shallow (D1-SHALLOW)	Dinosaur Reservoir Deep (D1-DEEP)	Peace Canyon Dam (PC1)	Peace 1: Upper Site C Reservoir (PR1)	Peace 2: Middle Site C Reservoir (PR2)	Halfway River - Downstream (HD)	Peace 3: Lower Site C Reservoir (PR3)	Moberly River - Downstream (MD)	Peace 1: Peace at Pine (PD1)	Pine River (PINE) ^I	Peace At Beatton (PD2)	Beatton River (BEA)	Peace at Kiskatinaw (PD3)	Kiskatinaw Rive (KR)	Peace at Pouce Coupe (PD4)	Pouce Coupe River (POUCE)	Peace at Ma Islands (PD5)
ple Date - Northing (10 UTM) - Easting (10 UTM)			1	5/11/2018 6209610	5/11/2018 6209610	5/11/2018 6203491	5/11/2018 6203491	5/11/2018 6205050	5/9/2018 6207857	5/9/2018 6229426	5/9/2018 6231488	5/10/2018 6231374	5/10/2018 6230146	5/10/2018 6226276	5/10/2018 6223596	5/10/2018 6220293	5/10/2018 6220613	5/8/2018 6220751	5/8/2018 6219559	5/8/2018 6224982	5/8/2018 6224275	5/8/2018 6242006
PS - Easting (10 UTM) aboratory Identification Number latrix			549540 L2093535-1 surface water	549540 L2093535-2	562028 L2093535-3 surface water	562028 L2093535-4 surface water	562934 L2093535-8	566122 L2092365-2 surface water	594889 L2092365-3	596649 L2092365-1 surface water	628028 L2093204-2 surface water	628620 L2093204-1	640247 L2093204-3	641710 L2093204-4	661946 L2093204-6	663060 L2093204-5 surface water	672509 L2091502-1	676408 L2091502-2	317950 L2091502-3 surface water	318943 L2091502-4 surface water	364653 L2091503 surface w	
Measurements le Depth	m			0.2	5.0	0.2	5.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ble Depth Depth perature	m °C	-	15	137.0	137.0	140.0 3.6	140.0	4.0	1.0	2.4 5.0	8.0	11.5	0.5	11.1	2.5	15.5 9.0	7.2	15.4 7.5	3.3 8.4	18.6	3.7	15.0 7.9
lved Oxygen (DO) fic Conductivity (SPC)	mg/L SPCµS/cm	-	Minimum 5 *1	12.15 187.5	12.15 187.6	12.38 171.7	12.47 172.1	12.81 194.4	12.88 181.4	12.46 184.6	11.52 223.3	11.81 203.8	11.16 196.7	11.64 203.0	11.96 197.3	11.62 200.2	11.05 110.2	11.50 196.9	11.08 151.2	11.50 181.8	10.51 204.9	11.41
rical Conductivity (EC) ity	SPCµS/cm parts per trillion			107.9 0.09	107.9	101.5 0.08 7.97	101.9	146.5 0.09	108.5	113.9 0.09	150.9 0.11	134.0 0.10	135.6	137.2	130.6 0.09	139.6	79.0 0.05 7.87	131.2	101.7	122.3	153.3 0.10	124.5
idity	pH Units ephelometric unit	-	6.5-9.0	8.04	8.03	7.97 26.3	7.96 34.0	8.49 58.2	8.19 22.5	8.00 96.4	8.14 313.8	8.02 203.7	8.05 488.4	8.11 205.4	8.15 301.4	8.12 237.2	7.87 536.5	8.05 422.0	8.03 1382.2	8.07 586.6	8.06 888.8	8.08 548.5
sical Parameters ur rical Conductivity (EC)	TCU	5		5.5	5.5	25.6	23.1	21.1	18.2	28 179	97.4 208	50.8	38.5	52.6	34.8 196	41 199	164 114	52.2 190	69.5 181	68.9 184	101 208	67.2 187
ness as CaCO3	µS/cm mg/L pH Units	0.5	6.5-9.0	93.2 8.04	91.7 8.01	94 8.03	86.8	92.5	83.8 8.06	106 8.06	208 141 7.98	116 7.98	128 7.99	127 8.02	196 118 8.06	111 7.99	57.6 7.37	104 8.13	90.7	91.6	90.4 7.9	94 8.02
Suspended Solids (TSS) Dissolved Solids (TDS)	mg/L mg/L	3		<3 103	<3 103	17.9 102	17.3 98.2	16.1 101	18	112 97.4	608 123	314 119	1500 140	316 182	697 152	593 139	1410 139	1030 139	2580 165	942 141	1590 171	1350 148
idity ns and Nutrients	NŤU	0.1		1.27	1.2	29.9	29.6	27.7	26.9	129	523	241	989	307	491	480	1170	787	>4000	916	2610	1200
inity (Bicarbonate as CaCO3) inity (Carbonate as CaCO3)	mg/L mg/L	1		85.5 <1	86.5 <1	81.6 <1	79.9 <1	81.9 <1	78.4	81.8 <1	86.5 <1	95.8 <1	109 <1	106 <1	108 <1	107 <1	32.7 <1	105 <1	117 <1	99.9 <1	71.7 <1	106
inity (Hydroxide) as CaCO3 inity (total as CaCO3)	mg/L mg/L	1	0	<1 85.5	<1 86.5	<1 81.6	<1 79.9	<1 81.9	<1 78.4	<1 81.8	<1 86.5	<1 95.8	<1 109	<1 106	<1 108	<1 107	<1 32.7	<1 105	<1 117	<1 99.9	<1 71.7	<1 106
ionia as N iide	mg/L mg/L	0.005	See narrative "2	<0.005 <0.05	<0.005	<0.005	<0.005	<0.005	0.0061 <0.05	0.0125 <0.05	0.0057 <0.05	0.0216	0.0483 <0.05	0.0217 <0.05	0.0241 <0.05	0.0281 <0.05	0.0621 <0.05	0.0264 <0.05	0.0911	0.033	0.15	0.0419
ride ide	mg/L mg/L	0.5	600 See equation *3	<0.5 0.035	<0.5	<0.5 0.045	<0.5 0.043	<0.5	<0.5	<0.5	<0.5 0.088	<0.5 0.063	<0.5	<0.5	<0.5 0.058	<0.5	0.51 0.063	<0.5	<0.5	<0.5 0.073	1.53 0.099	<0.5
te and Nitrite (as N) te (as N) e (as N)	mg/L mg/L	0.0051 0.005 0.001	32.8 0.06-0.60 ^{#4}	0.0605 0.0605 <0.001	0.0605 0.0605 <0.001	0.0914 0.0914 <0.001	0.0915 0.0915 <0.001	0.0921 0.0921 <0.001	0.0956 0.0956 <0.001	0.104 0.104 <0.001	0.0795 0.0795 <0.001	0.0931 0.0931 <0.001	0.13 0.13 <0.001	0.0981 0.0981 <0.001	0.141 0.141 <0.001	0.13 0.129 0.001	0.0216 0.0216 <0.001	0.158 0.157 0.0014	0.0582 0.0568 0.0014	0.125 0.125 <0.001	0.0779 0.0748 0.0031	0.13 0.129 0.0012
I Kjeldahl Nitrogen (TKN) Igen (Total)	mg/L mg/L mg/L	0.001 0.05 0.03	0.00-0.60	0.09	0.08	0.204	0.22	0.186	0.175	0.406	1.7	0.879	3.03 2.53	1.05	1.41	1.44	3.07 1.42	1.18	1.91 1.43	1.39	2.22	1.5
ophosphate (as P) (Filtered) sphorus (Total Dissolved)	mg/L mg/L	0.001 0.002		<0.001 <0.002	<0.001 <0.002	0.0025 0.0062	0.252	0.002 0.005	0.0012 0.0039	0.0033 0.0065	0.0078 0.0225	0.0064 0.0142	0.0066	0.0057 0.0149	0.0043 0.0097	0.0041 0.0106	0.005	0.0059	0.006	0.0059	0.0105	0.0071
sphorus hate	mg/L mg/L	0.002		0.0037 15.5	0.0042	0.0397 13.6	0.0405 13.6	0.0378	0.0353 14.8	0.165 15.4	0.727 26.7	0.36 20.8	1.52 9.85	0.483	0.861 9.33	1.1 12.1	1.34 20.8	0.87	2.13 7.23	0.953	1.44 34.4	1.2
a ns Total	mg/L meq/L	0.5		4.78 2.04	4.6 2.06	4.47 1.92	4.37 1.89	4.39 1.94	4.41 1.88	4.51 1.97	4.15 2.29	4.37 2.36	3.72 2.4	4.26 2.54	2.99 2.37	3.47 2.39	4.45 1.11	3.65 2.38	3.96 2.49	3.88 2.33	4.34 2.2	3.94 2.45
ions Total c Balance	meq/L N/A			1.86 -4.5	1.83 -5.7	1.91 -0.5	1.77 -3.3	1.86 -1.9	1.76	2.71 16	4.22 29.6	2.61 5.1	3.7 21.2	2.91 6.9	2.47 2.1	2.41 0.4	2.34 35.9	2.09 -6.5	1.95 -12.1	1.94 -9	2.16	-10.1
anic and Inorganic Carbon solved Organic Carbon (DOC) (Filtered)	mg/L	0.5		2.36	2.3	4.34	4.62	4.25	4.61	7.24	18.3	9.81	8.97	9.64	6.96	7.98	27.2	9.4	14.7	12.5	20.7	12.6
al Organic Carbon (TOC) al Metals minum	mg/L mg/L	0.5		2.43	2.37	4.87	5.12	4.83	4.56	8.06	28.8	4.21	45.5	16.9	20.1	20.5	57.4	24.9	51.8 25.3	29.6	49.6	32.2
mony	mg/L mg/L	0.0005	0.005	<0.0005 <0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005 0.00182	0.00054	<0.0005 0.00346	0.00058	<0.0005 0.0043	0.00055	<0.0006 0.00631	0.00055	0.00054	0.00063	0.00058	<0.0005 0.0241	0.00057
um Ilium	mg/L mg/L	0.02		0.033	0.033	0.072	0.072	0.067	0.064	0.115 0.00013	0.355	0.217 0.00029	0.697	0.278 0.00033	0.394 0.00054	0.382	0.607 0.00097	0.458 0.00063	1.09 0.00175	0.534 0.00078	0.823	0.553
iuth n - soluble nium	mg/L mg/L	0.2		<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1	<0.2 <0.1
cium	mg/L mg/L	0.000005 0.1 0.001		0.0000112 27.3 <0.001	0.0000138 26.9 <0.001	0.0000379 25.4 0.0017	0.0000388 25.3 0.0017	0.00004 26.2 0.0019	0.0000411 26 0.0012	0.00024 30.9 0.0047	0.000875 44.5	0.000461 42.8	0.00108 61.9 0.0212	0.000555 44.3	0.000705 57.1	0.000734 55.8	0.000975 21.6 0.0248	0.000862 50.6 0.017	0.00214 115	0.00104 51.4	0.000917 48.5	0.00102 49.8
omium alt	mg/L mg/L	0.0003	0.11	< 0.0003	< 0.0003	0.00039	0.0004	0.00034	0.00035	0.00171	0.0138 0.00635	0.0081 0.00351	0.0126	0.0099 0.00455	0.0135 0.00737	0.0131 0.00725	0.0146	0.00889	0.0429 0.0255	0.0204	0.0398	0.0221
per	mg/L mg/L	0.001	See equation *5	<0.001 0.04 <0.0005	<0.001 0.037 <0.0005	0.0024 0.967 <0.0005	0.0017 1.01 <0.0005	0.0017 0.81 <0.0005	0.002 0.88 <0.0005	0.0061 4.08 0.00219	0.0197 14.3 0.00819	0.0109 8.19 0.00423	0.0326 27.6 0.014	0.0133 9.94 0.0053	0.0181 19.1 0.00969	0.0182 18.3 0.00904	0.0403 31.4 0.0161	0.0229 20.9 0.011	0.0644 57.4 0.0297	0.0292 25.5 0.0137	0.0608 55 0.028	0.032 28.3 0.0142
d ium	mg/L mg/L	0.0005	See equation **	<0.0005 0.001 6.12	<0.0005 0.001 6.25	<0.0005 0.0022 6.18	<0.0005 0.0021 6.11	0.0005	<0.0005 0.0018 6.65	0.00219	0.00819 0.0125 13.8	0.00423	0.014 0.0192 18.6	0.0053	0.00969	0.00904	0.0161 0.0222 8.68	0.011 0.017 14.2	0.0297	0.0137	0.028	0.0142 0.0214 15
nesium Iganese cury	mg/L mg/L	0.0001	See equation #7	0.00301 0.0000056	0.003 0.00000051	0.0139	0.0143	0.013 0.0000042	0.0138	0.0645	0.195	0.118	0.522	0.158	0.299 0.000037	0.298	0.43	0.339	0.996	0.424	0.671	0.435
hyl mercury ybdenum	mg/L mg/L mg/L	0.0000002 0.001	2	<0.00000002 <0.001	<0.00000002 <0.001	0.00000448 0.00000043 <0.001	0.00000031 <0.001	0.00000042	<0.00000396 <0.00000002 <0.001	0.00000032	0.00000082 0.0023	<0.0000251 <0.0000001 0.0017	0.000000290 0.0011	<0.0000248 <0.0000001 0.0016	<0.000037 <0.0000001 0.0013	0.00000170 0.0013	0.0000092 0.000000410 0.0011	0.00000145 0.0014	<0.0000001 <0.0000001 0.0012	<0.0000002 <0.0000002	<0.0000123 <0.00000002 0.0014	<0.00000 <0.000000 0.0014
kel sphorus	mg/L mg/L	0.001	-	<0.001 <0.3	<0.001 <0.3	0.0023	0.0023	0.0022	0.0021	0.0074	0.0262	0.0142	0.0417	0.0172	0.0254	0.0251	0.0493	0.0305	0.0841	0.0387	0.0733	0.041
assium anium	mg/L mg/L	2 0.00005	0.002	<2 0.00029	<2 0.000243	<2 0.000275	<2 0.000275	<2 0.000269	<2 0.000306	<2 0.00039	3 0.00137	2 0.00079	3.6 0.000999	2.3 0.000766	2.5 0.000966	2.6	4.5	3.2 0.00104	5.8 0.00124	3.7	7.4	3.9
er	mg/L mg/L	0.1 0.00002	0.0001 or 0.003 *8	2.25 <0.00002	2.24 <0.00002	3.18 <0.00002	3.12 <0.00002	3 <0.00002	3.17 <0.00002	6.29 0.000044	12.9 0.000186	8.54 0.0001	18.4 0.00028	9.15 0.000129	11.6 0.000187	12.3 0.000176	0.00121 18.7 0.000341	14.7 0.000217	36.2 0.000575	0.00121 17.8 0.000298	0.00155 37.1 0.000404	0.00111 19.3 0.000295
lium Intium	mg/L mg/L	2 0.005		<2 0.118	<2 0.119	<2 0.106	<2 0.105	<2 0.111	<2 0.101	<2 0.109	3 0.167	2.5 0.158	2.2 0.159	2.4 0.154	<2 0.15	<2 0.156	4.6 0.105	2.1 0.16	3.5 0.27	2.6 0.151	6.2 0.212	2.8 0.164
llium	mg/L mg/L	0.00001 0.0005		<0.00001 <0.0005	<0.00001 <0.0005	0.000018 <0.0005	0.000019 <0.0005	0.000014	0.000017 <0.0005	0.000082	0.000251 <0.0005	0.000141 <0.0005	0.000264	0.000164	0.000223	0.000208	0.00031 <0.0005	0.000241	0.000578	0.000312	0.000435	0.000315
nium nium	mg/L mg/L	0.01 0.0002 0.0005		<0.01 0.00052 <0.001	<0.01 0.00052 <0.001	<0.01 0.00048 0.00318	<0.01 0.00049	<0.01 0.0005 0.00275	<0.01 0.00053 0.00265	0.04 0.00068 0.0107	0.041 0.00129 0.0324	0.04 0.00083 0.0189	0.062 0.00135 0.0422	0.045	0.029 0.00097 0.0294	0.033 0.00106 0.029	0.041 0.00171 0.0458	0.046 0.00126 0.0356	0.063 0.00263 0.0804	0.052 0.00153 0.0423	0.062 0.00291 0.0721	0.053
adium	mg/L mg/L	0.005	See equation #9	<0.005	<0.005	0.0059	0.00329 0.0053	0.00275	0.00265	0.0219	0.0837	0.0445	0.127	0.0223 0.0553	0.0879	0.0853	0.159	0.103	0.274	0.131	0.232	0.139
olved Metals inum (Filtered) nony (Filtered)	mg/L	0.005	0.1 #10	0.0136	0.0083	0.121 <0.0005	0.144 <0.0005	0.0735	0.636 <0.0005	3.49 <0.0005	8.3 <0.0005	0.817 <0.0005	7.1 <0.0005	1.25 <0.0005	0.485 <0.0005	1.17 <0.0005	5.5 <0.0005	0.0251	0.0179	0.0261	0.0251	0.0283
nic (Filtered) nic (Filtered) um (Filtered)	mg/L mg/L mg/L	0.0005		<0.0005 <0.031	<0.0005 <0.03	<0.0005 <0.0055	<0.0005 <0.054	<0.0005 <0.051	<0.0005 <0.0056	0.00121 0.126	0.00235	0.00111 0.109	0.00222	0.00123 0.145	0.00064	0.00074	0.00237 0.205	<0.0005 <0.0005 0.069	0.00053	<0.0005	0.00095	<0.0005
Ilium (Filtered) iuth (Filtered)	mg/L mg/L	0.0001		<0.001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	0.00017 <0.2	0.00033	0.00012	0.00029 <0.2	0.00013	<0.0001 <0.2	<0.0001 <0.2	0.00033	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2
n - soluble (Filtered) nium (Filtered)	mg/L mg/L	0.1	See equation #11	<0.1 0.0000068	<0.1 0.0000079	<0.1 0.0000176	<0.1 0.0000266	<0.1 0.0000143	<0.1 0.0000247	<0.1 0.000216	<0.1 0.000412	<0.1 0.000187	<0.1 0.000262	<0.1 0.00029	<0.1 0.0000914	<0.1 0.000111	<0.1 0.000287	<0.1 0.0000289	<0.1 0.0000237	<0.1 0.0000381	<0.1 0.00002	<0.1
um (Filtered) mium (Filtered)	mg/L mg/L	0.1		26.8 <0.001	26.3 <0.001	27.5 <0.001	24.4 <0.001	26.3 <0.001	23.4 0.0012	29.8 0.0051	39.1 0.0122	33.1 0.0049	35.7 0.0103	36 0.0027	34.2 0.0011	32.1 0.0021	15.8 0.0081	30.1 <0.001	26.1 <0.001	26.6 <0.001	26.5 <0.001	27.4 <0.001
alt (Filtered) per (Filtered)	mg/L mg/L	0.0003 0.001		<0.0003 <0.001	<0.0003 <0.001	<0.0003 0.0011	<0.0003 0.0012	<0.0003 0.0015	<0.0003 0.0012	0.00126 0.0045	0.0026 0.0085	0.00114 0.0042	0.00259 0.0081	0.00191 0.0062	0.0008 0.0026	0.00085 0.003	0.00344 0.0112	<0.0003 0.0022	<0.0003 0.0049	<0.0003 0.003	<0.0003 0.0058	<0.0003
(Filtered) I (Filtered)	mg/L mg/L	0.03	0.35	<0.03 <0.0005	<0.03 <0.0005	0.273 <0.0005	0.33	0.133	0.329 <0.0005	2.67 0.00157	5.06 0.00341	2.13 0.0015	4.83 0.00367	2.59 0.00223	1.23 0.0009	1.28 0.00117	6.09 0.00456	0.117 <0.0005	0.164	0.137	0.301 <0.0005	0.185
um (Filtered) hesium (Filtered)	mg/L mg/L	0.001 0.1 0.0001		<0.001 6.36	0.0011 6.34	0.0016 6.16	0.0015 6.31 0.00888	0.0014 6.51 0.00607	0.002 6.17 0.00923	0.0055 7.72 0.0562	0.0123 10.5 0.0967	0.0055 8.04 0.0456	0.009 9.48 0.121	0.0045 8.98 0.0743	0.0036 7.84 0.035	0.0043 7.37 0.0418	0.0101 4.38 0.131	0.0031 6.98 0.00372	0.0015 6.16	0.003 6.1 0.00328	0.0033 5.88 0.00394	0.003 6.19 0.0031
anese (Filtered) ury (Filtered) v mercury (Filtered)	mg/L mg/L mg/L	0.00001 0.000005 0.00000002		0.00223 <0.0000005 <0.0000002	0.00165 <0.0000005 <0.0000002	0.00786 0.00000060 0.00000026	0.00888 0.00000063 0.000000030	0.0000063 0.00000024	0.00923 0.0000032 <0.0000002	0.0562 0.00000964 0.00000052	0.0967 0.0000191 <0.0000002	0.0456 0.0000147 <0.0000001	0.121 0.0000139 0.000000111	0.000154	0.035 0.00000156 <0.0000001	0.0000179	0.131 0.0000143 0.000000240	0.00372 0.00000101 0.00000063	0.00421 0.00000102 <0.0000007	0.00000155	0.00394 0.00000146 <0.0000002	0.0031
idenum (Filtered)	mg/L mg/L	0.001		<0.00000002 <0.001 <0.001	<0.00000002 <0.001 <0.001	<0.001 <0.001 0.0014	<0.001 0.0015	<0.001 0.0013	<0.0000002 <0.001 0.0014	<0.001 <0.001 0.0052	0.0016	0.001	<0.001 <0.001 0.0102	<0.0000001 <0.001 0.0079	<0.0000001 <0.001 0.0035	<0.0000001 <0.001 0.0037	<0.001 <0.001 0.0135	<0.001 <0.001 0.002	<0.0000007 <0.001 0.0022	<0.001 0.0025	<0.00000002 <0.001 0.0037	<0.001
phorus (filtered) (Filtered) sium (Filtered)	mg/L mg/L	0.3		<0.3 <2	<0.3 <2	<0.3 <2	<0.3 <2	<0.3 <2	<0.3	<0.3 2.1	0.33 3.3	<0.3	0.31	<0.3 <2	<0.3	<0.3 <2	0.31	<0.3 <2	<0.3	<0.3	<0.3 3.3	<0.3
nium (Filtered) on (Filtered) r (Filtered)	mg/L mg/L	0.00005		0.000224 2.2	0.000265 2.22	0.000173 2.31	0.000223 2.41	0.000328 2.26	0.000254 3.52	0.000321 10	0.000816 22.3	0.000503 8.99	0.000302 19.8	0.000444 3.62	0.000372 1.91	0.000416 3.92	0.000339 15.2	0.000388	0.000363 1.93	0.000411 1.83	0.000435 2.15	0.00051
um (Filtered)	mg/L mg/L	0.00002		<0.00002 <2 0.104	<0.00002 <2 0.103	<0.00002 <2 0.0994	<0.00002 <2 0.0962	<0.00002	<0.00002 <2 0.0932	0.000029 <2 0.107	0.000066 2.8 0.143	0.000033 2.1 0.117	0.00008 <2 0.0904	0.000028 2.2 0.127	<0.00002 <2 0.101	<0.00002 <2 0.0939	0.000047 3.8	<0.00002 <2	<0.00002 2.8 0.0949	<0.00002 2.2 0.0844	<0.00002 5.6 0.105	<0.0000
ntium (Filtered) lium (Filtered)	mg/L mg/L	0.005		< 0.0002	< 0.0002	< 0.0002	<0.0002	0.0988	< 0.0002	< 0.0002	<0.0002	<0.0002	<0.0002	< 0.0002	<0.0002	< 0.0002	0.0607	0.0946	< 0.0002	< 0.0002	< 0.0002	0.0876
Filtered) nium (Filtered)	mg/L mg/L	0.0005		<0.0005 <0.01 0.00046	<0.0005 <0.01 0.00047	<0.0005 <0.01 0.00043	<0.0005 <0.01 0.00043	<0.0005 <0.01	<0.0005 <0.17	<0.0005 <0.16 0.00064	<0.0005 0.36 0.00098	<0.0005 0.123 0.00071	<0.0005 0.259	<0.0005 0.014 0.00067	<0.0005 <0.01 0.00032	<0.0005 <0.039	<0.0005 0.214 0.00084	<0.0005 <0.01	<0.0005 <0.01	<0.0005 <0.01	<0.0005 0.01 0.00062	<0.0005
nium (Filtered) adium (Filtered) : (Filtered)	mg/L mg/L mg/L	0.0002 0.0005 0.005		0.00046 <0.0005 <0.005	0.00047 <0.0005 <0.005	0.00043 0.00058 <0.005	0.00043 0.00066 <0.005	0.00047 <0.0005 <0.005	0.00044 0.00217 <0.005	0.00064 0.0124 0.0141	0.00098 0.031 0.0302	0.00071 0.00355 0.0124	0.00069 0.0236 0.0236	0.00067 0.00488 0.018	0.00032 0.00159 0.0068	0.00044 0.0044 0.0078	0.00084 0.0175 0.03	0.0004 <0.0005 <0.005	0.00054 0.00059 <0.005	0.00043 <0.0005 <0.005	0.00062 0.00083 <0.005	0.00047 0.00053 <0.005
		3.000					.0.000	10.000			3.0002		3.02.00	0.010		2.007.0	0.00	.0.000	-0.000			

#2

British Columbia Ministry of Environment (BC MOE). 2018. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Ca Hardness. Where hardness values exceed the traps applied for guideline use, site specific assessment may be required. Disoloved Oxygen guideline protection all fie stages of the Than brief ambroyleavin, based on instrantances manarement. Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H +0 mg/L. Calculated in mg/L and based on equation: [51-17.9 ± 0.277:0g/Hardness)[D.01 when H =10-385 mg/L. Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H +0 mg/L. Calculated in mg/L and based on equation: [61-77:49.4 ± 0.277:0g/Hardness)[D.01 when H =10-385 mg/L. Guideline for copper strike with H and I scalabilish mg/L and based on equation: [61-77:49.4 ± 0.277:0g/Hardness)[D.01 when H =10-385 mg/L. Guideline for copper strike with H and I scalabilish mg/L and based on equation: [61-77:49.4 ± 0.277:0g/Hardness][D.01 when H =0-300 mg/L. Guideline for copper strike with H and I scalabilish mg/L and based on equation: [01-77:49-13.4 ± 0.072] Guideline for anisymas with H. Guideline is 0.0001 mg/L when H +100 mg/L. Calculated in mg/L and based on equation: [01-77:49-13.4 ± 0.072] Guideline for anisymas with H. Guideline is 0.0001 mg/L when H +100 mg/L. Calculated in mg/L and based on equation: [01-77:49-13.4 ± 0.072] Guideline for alumixmus with H and I scalabilish in mg/L and based on equation: [01-77:49-75(H=0)](1000, when H=0-500 mg/L. Guideline for alumixmu varies with H and I scalability in U. Calculated in mg/L and based on equation: [13-17:27(H=0)](1000, when H=0-500 mg/L. Guideline for alumixmu varies with H and I scalability in U. Calculated in mg/L and based on equation: [13-17:27(H=0)](1000, when K=Ca[H]² and pH < 6.5. Guideline for alumixmu varies with H and I scalability in U. Calculated in mg/L and based on equation: [13-17:27(H=0)](1000, when K=Ca[H]² and pH #3 #4 #5 #6 #7 #8 #10 #11 < Bold MPN CFU

Table 7: June 2018 Surface Water Quality Re																							
					Williston and Din	osaur Reservoirs	s Future Site C Reservoir								Downstream of Site C Reservoir								
Parameter	Unit	Reported Detection Limit (RDL)	BC MOE 2018 (Approved Guidelines for freshwater aquatic life and short-term maximum)	Williston Shallow (W1-SHALLOW)	Williston Deep (W1-DEEP)	Dinosaur Reservoir Shallow (D1-SHALLOW)	Dinosaur Reservoir Deep (D1-DEEP)	Peace Canyon Dam (PC1)	Peace 1: Upper Site C Reservoir (PR1)	Peace 2: Middle Site C Reservoir (PR2)	Halfway River - Downstream (HD)	Peace 3: Lower Site C Reservoir (PR3)	Moberly River - Downstream (MD)	Peace 1: Peace at Pine (PD1)	Pine River (PINE)	Peace at Beatton (PD2)	Beatton River (BEA)	Peace at Kiskatinaw (PD3)	Kiskatinaw River (KR)	Peace at Pouce Coupe (PD4)	Pouce Coupe River (POUCE)	Peace at Many Islands (PD5)	
Sample Date				6/18/2018	6/18/2018	6/18/2018	6/18/2018	6/23/2018	6/19/2018	4/5/2018	6/19/2018	6/21/2018	6/21/2018	6/21/2018	6/21/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	
GPS - Northing (10 UTM)				6209610	6209610	6203491	6203491	6205050	6207857	6229426	6231488	6231374	6230146	6226276	6223596	6220293	6220613	6220751	6219559	6224982	6224275	6242006	
GPS - Easting (10 UTM)				549540	549540	562028	562028	562934	566122	594889	596649	628028	628620	640247	641710	661946	663060	672509	676408	317950	318943	364653	
Laboratory Identification Number				L2115009-1	L2115009-2	L2115009-3	L2115009-4	L2117855-3	L2115122-3	L2076609-2	L2115122-1	L2116982-2	L2116982-1	L2116982-3	L2116982-4	L2116460-1	L2116460-2	L2116460-3	L2116460-4	L2116460-5	L2116460-6	L2116460-7	
Matrix				surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	
Field Measurements											-												
Sample Depth	m	-		0.2	5.0	0.2	5.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Total Depth	m			194.0	194.0	42.0	42.0	1.0	6.1	1.4	1.7	3.5	1.0	2.6	1.6	3.6	0.9	2.5	2.4	2.7	0.5	12.0	
Temperature	°C	-	15	11.8	9.0	18.8	10.3	14.8	7.8	14.4	19.3	11.9	22.9	12.7	17.7	16.2	23.7	17.6	25.6	17.6	30.4	18.5	
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 ^{#1}	11.24	11.48	10.36	11.74	10.53	12.50	11.15	8.86	10.64	8.27	10.49	9.21	9.73	8.16	9.62	8.03	9.41	7.67	9.17	
Specific Conductivity (SPC)	SPCµS/cm	-		186.5	188.0	191.6	189.2	225.0	189.7	200.4	373.1	227.1	221.4	219.7	206.0	235.8	160.4	228.3	406.6	230.2	568.0	229.3	
Electrical Conductivity (EC)	SPCµS/cm	-		138.5	130.5	169.0	135.9	191.2	127.3	159.8	332.5	170.3	212.5	168.0	177.3	196.4	156.4	196.0	411.4	197.4	628.0	200.9	
Salinity	parts per trillion	-		0.09	0.09	0.09	0.09	0.11	0.09	0.10	0.18	0.11	0.10	0.10	0.10	0.11	0.07	0.11	0.19	0.11	0.27	0.11	
pH T I I I II	pH Units	-	6.5-9.0	7.94	7.96	8.10	8.09	9.19	7.95	8.24	8.32	8.20	8.59	8.17	8.27	7.99	7.75	8.25	8.65	8.40	8.74	8.22	
Turbidity Physical Parameters	ephelometric uni	t -		1.7	2.0	1.5	1.6	224.7	1.8	140.9	54.1	16.8	31.1	32.7	32.9	32.2	72.1	40.1	121.5	42.5	64.5	27.8	
Colour	TCU	F		<5	<5	<5	<5	7	8.1	6.9	14.2	8.1	28.9	9.1	6.3	10.2	153	9.3	29.7	13.1	72.4	17.5	
Electrical Conductivity (EC)	uS/cm	2		<5 187	<5 187	<5 183	<5 183	205	198	210	394	233	28.9	225	209	235	160	230	406	232	558	231	
	pH Units	0.1	6.5-9.0	8.15	8.07	8.1	8.1	7.7	8.19	8.29	8.48	8.29	8.21	8.26	8.28	8.27	7.8	8.27	8.55	8.26	8.3	8.28	
Total Suspended Solids (TSS)	ma/L	3	0.0 0.0	<3	<3	<3	<3	<3	4	11.8	95.2	23.9	37.9	44.1	42.5	26.3	51.1	28.7	66.9	50.9	46.5	43.7	
Total Dissolved Solids (TDS)	mg/L	1		120	116	101	101	121	104	110	218	131	126	125	116	149	173	143	305	159	429	162	
Turbidity	NTU	0.1		0.86	1.25	1.02	1.02	0.84	0.86	4.96	59.8	15.7	38.7	24.1	30.3	20.6	71.3	20	132	29.3	77.2	30.1	
Anions and Nutrients																							
Alkalinity (Bicarbonate as CaCO3)	mg/L	1		81.6	86	86.2	86.2	96	86.3	91.1	157	105	107	99.6	105	109	43.2	108	192	109	136	107	
Alkalinity (Carbonate as CaCO3)	mg/L	1		<1	<1	<1	<1	<1	<1	<1	2.6	<1	<1	<1	<1	<1	<1	<1	14.4	<1	<1	<1	
Alkalinity (Hydroxide) as CaCO3	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Alkalinity (total as CaCO3)	mg/L	1		81.6	86	86.2	86.2	96	86.3	91.1	159	105	107	99.6	105	109	43.2	108	207	109	136	107	
Ammonia as N	mg/L	0.005	See narrative #2	< 0.005	< 0.005	<0.005	<0.005	< 0.005	< 0.005	< 0.005	0.0061	< 0.005	0.0098	0.0061	< 0.005	<0.005	0.0317	< 0.005	0.0133	<0.005	0.0146	< 0.005	
Bromide	mg/L	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Chloride	mg/L	0.5	600	<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	0.74	<0.5	0.87	<0.5	11.7	<0.5	
Fluoride	mg/L	0.02	See equation #3	0.038	0.039	0.04	0.04	0.042	0.038	0.043	0.092	0.054	0.082	0.052	0.051	0.059	0.083	0.058	0.101	0.059	0.171	0.062	
Nitrate and Nitrite (as N)	mg/L	0.0051		0.0453	0.0452	0.0302	0.0302	0.0439	0.045	0.0301	< 0.0051	0.034	0.0127	0.0367	0.0314	0.03	0.0219	0.021	0.03	0.027	< 0.0051	0.0297	
Nitrate (as N)	mg/L	0.005	32.8	0.0453	0.0452	0.0302	0.0302	0.0439	0.045	0.0301	<0.005	0.034	0.0127	0.0367	0.0314	0.03	0.0115	0.021	0.03	0.027	<0.005	0.0297	
Nitrite (as N)	mg/L	0.001	0.06-0.60 #4	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0104	<0.001	<0.001	<0.001	<0.001	<0.001	
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05		0.078	0.061	0.081	0.081	0.093	0.079	0.097	0.233	0.114	0.296	0.182	0.12	0.147	0.733	0.137	0.572	0.218	1.07	0.2	
Nitrogen (Total)	mg/L	0.03		0.121	0.111	0.114	0.114	0.116	0.085	0.078	0.18	0.165	0.248	0.139	0.11	0.127	0.68	0.117	0.59	0.174	0.82	0.166	
Orthophosphate (as P) (Filtered)	mg/L	0.001		0.0015	0.0011	0.0014	0.0014	0.0023	0.0013	0.0017	0.0034	0.001	0.0024	0.0012	0.0012	0.0015	0.0091	0.0013	0.0018	0.0015	0.0024	0.0017	
Phosphorus (Total Dissolved)	mg/L	0.002		< 0.002	< 0.002	< 0.002	< 0.002	0.003	< 0.002	<0.002	0.0049	0.0025	0.0066	0.0027	0.0021	0.0023	0.0215	< 0.002	0.006	0.0033	0.0139	0.0044	
Phosphorus	mg/L	0.002		0.0027	0.0029	0.0039	0.0039	0.0031	0.0041	0.0117	0.0981	0.0312	0.0575	0.0533	0.0471	0.039	0.111	0.0393	0.117	0.0579	0.102	0.0609	
Sulphate	mg/L	0.3		15 4.29	15.3	15.2 4.49	15.2	15.1 4.42	15.1	16.4 4.39	43.4	21	9.38	19.7 4.21	10.7	19.2 3.35	32.6	17.4 2.95	23.2	18.3	139	20.1	
Silica Organic and Inorganic Carbon	mg/L	0.5	1	4.29	4.5	4.49	4.49	4.42	4.36	4.39	3.55	4.39	3.53	4.21	2.08	3.35	5.09	2.95	4.9	3.17	1.67	3.34	
Dissolved Organic Carbon (DOC) (Filtered)	mg/L	0.5		2.93	2.44	2.6	2.6	2.66	2.59	2.8	3.96	2.56	6.97	2.9	1.89	2.71	26	3	11.2	3.5	24.4	4.4	
Total Organic Carbon (TOC)	mg/L	0.5		2.59	2.44	2.0	2.0	2.66	2.39	3.06	5.72	3.3	7.72	3.36	2.7	3.39	28.1	3.5	13.5	4.15	25.9	5.48	

NOTES:

н #2

British Columbia Ministry of Environment (BC MOE). 2018. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British BC MOE 2018

Columbia, Canada.

Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required. Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement. Guideline for ammonia nitrogen (NH₃) varies with pH and temperature, and is derived from Table 26D of the BC MOE, 2017 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0

degC.

Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H <10 mg/L. Calculated in mg/L and based on equation: [-51.73 + 92.57*log(Hardness)]x0.01 when H =10-385 mg/L. Guideline for nitrite varies with chloride concentrations.

#3 #4

#5

#6

#7 #8

Guideline for intrite varies with hI and is calculated in mg/L and based on equation: [0.094(H)+2]/1000, when H =13-400 mg/L. Guideline for copper varies with H and is calculated in mg/L and based on equation: [0.094(H)+2]/1000, when H =13-400 mg/L. Guideline for lead varies with H. Guideline is 0.003 mg/L when H<8 mg/L. Calculated in mg/L and based on equation: $[e^{(1.273Hc(H)-1.460)}]/1000$ when H=8-360 mg/L Guideline for silver varies with H. Guideline is 0.003 mg/L when H<100 mg/L on 0.003 mg/L when H>100 mg/L Guideline for zinc varies with H. Guideline is 0.003 mg/L when H<100 mg/L calculated in mg/L and based on equation: $[34+0.75^{\circ}(H-90)]/1000$, when H=90-500 mg/L. Guideline for zinc varies with H. Guideline is 0.033 mg/L when H<100 mg/L calculated in mg/L and based on equation: [1.209-2.426(PH)+0.208(N)] when H=90-500 mg/L. Guideline for calmium varies with H. Guideline is 0.1 mg/L if PH ≥ 6.5. Calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where H=7.455 mg/L. #9

#10

#11

No applicable guideline or analysis was not conducted. Concentration is less than the laboratory detection limit indicated.

Bold and shaded indicates an exceedance of the applied guideline. Bold

MPN CFU Most Probable Number Colony Forming Units

Table 8: July 2018 Surface Water Quality Re	esults Summary																					
					Williston and Din	osaur Reservoirs				Future Site	e C Reservoir						Downs	stream of Site C F	Reservoir			
Parameter	Unit	Reported Detection Limit (RDL)	BC MOE 2018 (Approved Guidelines for freshwater aquatic life and short-term maximum)	Williston Shallow (W1-SHALLOW)	Williston Deep (W1-DEEP)	Dinosaur Reservoir Shallow (D1-SHALLOW)	Dinosaur Reservoir Deep (D1-DEEP)	Peace Canyon Dam (PC1)	Peace 1: Upper Site C Reservoir (PR1)	Peace 2: Middle Site C Reservoir (PR2)	Halfway River - Downstream (HD)	Peace 3: Lower Site C Reservoir (PR3)	Moberly River - Downstream (MD)	Peace 1: Peace at Pine (PD1)	Pine River (PINE)	Peace at Beatton (PD2)	Beatton River (BEA)	Peace at Kiskatinaw (PD3)	Kiskatinaw River (KR)	Peace at Pouce Coupe (PD4)	Pouce Coupe River (POUCE)	Peace at Many Islands (PD5)
Sample Date				7/17/2018	7/17/2018	7/17/2018	7/17/2018	7/17/2018	7/16/2018	7/16/2018	7/16/2018	7/18/2018	7/18/2018	7/18/2018	7/18/2018	7/19/2018	7/19/2018	7/19/2018	7/19/2018	7/19/2018	7/19/2018	7/19/2018
GPS - Northing (10 UTM)				6209610	6209610	6203491	6203491	6205050	6207857	6229426	6231488	6231374	6230146	6226276	6223596	6220293	6220613	6220751	6219559	6224982	6224275	6242006
GPS - Easting (10 UTM)				549540	549540	562028	562028	562934	566122	594889	596649	628028	628620	640247	641710	661946	663060	672509	676408	317950	318943	364653
Laboratory Identification Number				L2131545-1	L2131545-2	L2131545-3	L2131545-4	L2131545-6	L2130358-3	L2130358-2	L2130358-1	L2131720-2	L2131720-1	L2131720-3	L2131720-4	L2133123-1	L2133123-2	L2133123-3	L2133123-4	L2133123-5	L2133123-6	L2133123-7
Matrix				surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water
Field Measurements			•	•	•	•				•				•				•	•	•	•	
Sample Depth	m	-		0.2	5.0	0.2	5.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Depth	m	-		30.5	30.5	22.9	22.9	1.0	20.0	9.0	3.0	7.0	1.0	5.0	-	1.4	1.0	4.1	0.7	3.0	0.3	4.6
Temperature	°C	-	15	17.4	16.0	16.7	12.5	12.0	12.0	18.2	19.4	13.1	21.1	13.9	19.3	15.2	22.0	15.4	22.4	15.9	23.5	12.0
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 #1	9.48	9.52	10.03	10.54	10.39	10.60	9.75	8.90	10.26	8.51	10.14	8.93	9.64	8.14	9.84	8.84	9.77	9.34	9.53
Specific Conductivity (SPC)	SPCµS/cm	-		180.4	180.0	184.2	181.0	185.4	181.6	192.5	413.1	203.8	240.2	204.4	269.8	205.2	193.1	209.5	384.3	208.5	606.0	222.7
Electrical Conductivity (EC)	SPCµS/cm	-		154.2	149.1	155.4	139.8	146.2	136.4	167.7	369.0	157.5	222.3	161.1	240.4	164.2	193.1	171.3	366.0	172.3	588.0	188.6
Salinity	parts per trillion	-		0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.20	0.10	0.11	0.10	0.13	0.10	0.09	0.10	0.18	0.10	0.29	0.11
pH	pH Units	-	6.5-9.0	8.33	8.32	8.30	8.22	8.21	8.18	8.46	8.50	8.33	8.41	8.34	8.48	8.40	8.22	8.37	8.81	8.35	8.64	8.41
Turbidity	ephelometric unit	-		3.4	4.0	1.9	2.1	-	2.7	10.7	30.1	10.1	29.5	16.6	14.0	23.5	45.4	24.1	87.1	30.2	48.7	25.8
Physical Parameters																						
Colour	TCU	5		5.7	6	6.2	6	7.2	5.9	8.1	12.6	8.3	23.1	7.5	7.2	7.5	193	9.8	40.3	13.5	58.5	11.9
Electrical Conductivity (EC)	µS/cm pH Units	2 0.1	6.5-9.0	179 8.23	179 8.18	181 8.17	180 8.17	179 8.16	183 8.09	192 8.12	413 8.47	192 8.19	232	202	262 8.36	206	182 7.9	211	384	210	612 8.48	223 8.27
Total Suspended Solids (TSS)	mg/L	0.1	0.5-9.0	6.23 <3	<3	<3	<3	<3	5.4	0.12	27.4	22	8.29	46.6	0.30 12	8.22 72.2	29	8.25 75.8	8.58 45	8.22 93	33.8	83.4
Total Dissolved Solids (TDS)	mg/L	1		116	115	119	115	115	122	119	285	114	154	126	154	12.2	170	136	276	133	424	139
Turbidity	NTU	0.1		2.45	2.54	0.81	0.84	1.01	1.55	7.92	30.8	7.67	36.5	12.6	11.8	21.6	48.9	21.6	108	25.7	53.5	23.8
Anions and Nutrients	NIO	0.1		2.40	2.04	0.01	0.04	1.01	1.00	1.02	00.0	1.01	00.0	12.0	11.0	21.0	40.0	21.0	100	20.1	00.0	20.0
Alkalinity (Bicarbonate as CaCO3)	ma/L	1	1	81.8	80.8	81.3	79.4	81.3	82.5	86.9	167	87.2	117	90	126	89.6	55.4	93.3	175	93	158	99.5
Alkalinity (Carbonate as CaCO3)	ma/L	1	1	<1	<1	<1	<1	<1	<1	<1	10.6	<1	<1	<1	3.6	<1	<1	<1	15.6	<1	8.4	<1
Alkalinity (Hydroxide) as CaCO3	ma/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1		81.8	80.8	81.3	79.4	81.3	82.5	86.9	177	87.2	117	90	129	89.6	55.4	93.3	191	93	167	99.5
Ammonia as N	mg/L	0.005	See narrative #2	< 0.005	< 0.005	0.0074	0.0058	0.0091	0.0067	< 0.005	< 0.005	< 0.005	0.006	0.025	< 0.005	<0.005	0.0081	< 0.005	0.0119	< 0.005	0.0159	<0.005
Bromide	mg/L	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Chloride	mg/L	0.5	600	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.53	<0.5	0.68	<0.5	0.57	<0.5	0.77	<0.5	10	<0.5
Fluoride	mg/L	0.02	See equation #3	0.035	0.035	0.037	0.035	0.035	0.036	0.039	0.104	0.04	0.08	0.044	0.064	0.045	0.085	0.048	0.095	0.049	0.189	0.053
Nitrate and Nitrite (as N)	mg/L	0.0051		0.0527	0.0524	0.0494	0.061	0.0615	0.0593	0.0364	< 0.0051	0.0546	0.0144	0.0516	0.018	0.0534	< 0.0051	0.0494	0.0064	0.0472	< 0.0051	0.0371
Nitrate (as N)	mg/L	0.005	32.8	0.0527	0.0524	0.0494	0.061	0.0615	0.0593	0.0364	< 0.005	0.0546	0.0144	0.0516	0.018	0.0534	< 0.005	0.0494	0.0064	0.0472	< 0.005	0.0371
Nitrite (as N)	mg/L	0.001	0.06-0.60 #4	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	1	0.115	0.089	0.102	0.077	0.1	0.105	0.135	0.19	0.165	0.261	0.117	0.093	0.188	0.72	0.194	0.638	0.223	1.07	0.121
Nitrogen (Total)	mg/L	0.03		0.157	0.152	0.138	0.146	0.132	0.147	0.157	0.15	0.152	0.246	0.183	0.114	0.174	0.648	0.204	0.534	0.214	0.977	0.14
Orthophosphate (as P) (Filtered)	mg/L	0.001		0.0015	0.0012	0.0017	0.0012	<0.001	0.0017	0.0017	0.0025	0.0015	0.0027	0.0025	0.0021	0.0013	0.0052	0.0013	0.0017	0.0013	0.0016	0.001
Phosphorus (Total Dissolved)	mg/L	0.002		<0.002	<0.002	<0.002	<0.002	< 0.002	<0.002	0.0028	0.0045	0.0021	0.0049	0.0024	< 0.002	0.0031	0.017	0.0032	0.0069	0.0036	0.0128	0.0034
Phosphorus	mg/L	0.002		0.0059	0.006	0.0033	0.0044	0.0025	0.0058	0.0221	0.0522	0.0242	0.05	0.0022	0.0176	0.0696	0.0705	0.0836	0.09	0.092	0.078	0.0068
Sulphate	mg/L	0.3		13.5	13.4	13.9	13.5	13.6	13.3	14.6	50.7	15.4	10.5	16.9	17	16.4	31.7	16.6	17.7	17	134	18.8
Silica	mg/L	0.5		4.11	4.02	4.21	4.15	3.95	4.17	4.48	4	4.02	3.23	4.16	2.49	3.99	5.54	3.74	4.82	4.06	0.96	3.78
Organic and Inorganic Carbon	4																					
Dissolved Organic Carbon (DOC) (Filtered)	mg/L	0.5		2.9	2.82	2.78	3.09	3.54	2.8	3.25	4	3.19	6.94	2.93	2.91	3.04	27.2	3.27	12.7	4	21	3.73
Total Organic Carbon (TOC)	mg/L	0.5		2.91	2.85	2.85	3.31	3.03	2.85	3.49	4.79	3.09	7.57	3.17	2.93	3.11	27.8	3.88	14.9	4.62	24.1	3.65

н #2

British Columbia Ministry of Environment (BC MOE). 2018. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British BC MOE 2018

Columbia, Canada.

Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required. Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement. Guideline for ammonia nitrogen (NH₃) varies with pH and temperature, and is derived from Table 26D of the BC MOE, 2017 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0

degC.

Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H <10 mg/L. Calculated in mg/L and based on equation: [-51.73 + 92.57*log(Hardness)]x0.01 when H =10-385 mg/L. Guideline for nitrite varies with chloride concentrations.

#3 #4

#5

#6 #7

#8

Guideline for intrite varies with hI and is calculated in mg/L and based on equation: [0.094(H)+2]/1000, when H =13-400 mg/L. Guideline for copper varies with H and is calculated in mg/L and based on equation: [0.094(H)+2]/1000, when H =13-400 mg/L. Guideline for lead varies with H. Guideline is 0.003 mg/L when H<8 mg/L. Calculated in mg/L and based on equation: $[e^{(1.273Hc(H)-1.460)}]/1000$ when H=8-360 mg/L Guideline for silver varies with H. Guideline is 0.003 mg/L when H<100 mg/L on 0.003 mg/L when H>100 mg/L Guideline for zinc varies with H. Guideline is 0.003 mg/L when H<100 mg/L calculated in mg/L and based on equation: $[34+0.75^{\circ}(H-90)]/1000$, when H=90-500 mg/L. Guideline for zinc varies with H. Guideline is 0.033 mg/L when H<100 mg/L calculated in mg/L and based on equation: [1.209-2.426(PH)+0.208(N)] when H=90-500 mg/L. Guideline for calmium varies with H. Guideline is 0.1 mg/L if PH ≥ 6.5. Calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.309-1000)}$ when H=7-455 mg/L. #9

#10

#11

No applicable guideline or analysis was not conducted. Concentration is less than the laboratory detection limit indicated.

Bold and shaded indicates an exceedance of the applied guideline. Bold

MPN CFU Most Probable Number Colony Forming Units

Table 9: August 2018 Surface Water Quality	y nesults outfind	y		1	Million and Dis			1		Future Olta	0 D '-			1			B	1	!			
	1				Williston and Din	osaur Reservoirs				Future Site	C Reservoir		1				Downs	tream of Site C R	eservoir			
Parameter	Unit	Reported Detection Limit (RDL)	BC MOE 2018 (Approved Guidelines for freshwater aquatic life and short-term maximum)	Williston Shallow (W1-SHALLOW)	Williston Deep (W1-DEEP)	Dinosaur Reservoir Shallow (D1-SHALLOW)	Dinosaur Reservoir Deep (D1-DEEP)	Peace Canyon Dam (PC1)	Peace 1: Upper Site C Reservoir (PR1)	Peace 2: Middle Site C Reservoir (PR2)	Halfway River - Downstream (HD)	Peace 3: Lower Site C Reservoir (PR3)	Moberly River - Downstream (MD)	Peace 1: Peace at Pine (PD1)	Pine River (PINE)	Peace at Beatton (PD2)	Beatton River (BEA)	Peace at Kiskatinaw (PD3)	Kiskatinaw River (KR)	Peace at Pouce Coupe (PD4)	Pouce Coupe River (POUCE)	Peace at Man Islands (PD5)
Sample Date	1			7/31/2018	7/31/2018	7/31/2018	7/31/2018	7/31/2018	7/30/2018	7/30/2018	7/30/2018	8/2/2018	8/2/2018	8/2/2018	8/2/2018	8/1/2018	8/1/2018	8/1/2018	8/1/2018	8/1/2018	8/1/2018	8/1/2018
GPS - Northing (10 UTM)				6209610	6209610	6203491	6203491	6205050	6207857	6229426	6231488	6231374	6230146	6226276	6223596	6220293	6220613	6220751	6219559	6224982	6224275	6242006
GPS - Easting (10 UTM)				549540	549540	562028	562028	562934	566122	594889	596649	628028	628620	640247	641710	661946	663060	672509	676408	317950	318943	364653
Laboratory Identification Number				L2139662-1	L2139662-2	L2139662-3	L2139662-4	L2139662-6	L2138784-3	L2138784-2	L2138784-1	L2140599-2	L2140599-1	L2140599-3	L2140599-4	L2140393-1	L2140393-2	L2140393-3	L2140393-4	L2140393-5	L2140393-6	L2140393-7
Matrix				surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water
Field Measurements																						-
Sample Depth	m	-		0.2	5.0	0.2	5.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Depth	m	-		56.7	56.7	38.4	38.4	-	1.7	4.0	0.7	5.5	0.8	0.8	1.0	5.0	1.5	2.4	0.8	5.0	2.0	6.1
Temperature	°C	-	15	19.4	16.2	20.3	9.8	12.9	9.9	11.3	16.5	10.5	18.5	11.4	18.3	14.8	21.6	15.3	20.9	15.1	21.5	16.6
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 #1	9.23	9.42	9.50	10.69	10.36	10.81	10.94	9.40	10.59	8.77	10.38	8.86	9.75	8.28	9.70	8.62	9.78	8.41	9.39
Specific Conductivity (SPC)	SPCµS/cm	-		172.7	173.0	179.0	180.1	184.2	180.3	186.3	377.6	189.6	200.1	197.1	290.7	230.5	242.4	229.8	294.7	226.9	322.4	241.4
Electrical Conductivity (EC)	SPCµS/cm	-		154.0	143.7	163.3	128.5	147.6	128.1	137.2	316.4	137.0	175.2	148.0	253.5	185.6	226.7	187.3	271.8	184.0	301.0	203.2
Salinity	parts per trillion	-		0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.18	0.09	0.09	0.09	0.14	0.11	0.11	0.11	0.14	0.11	0.15	0.11
pH	pH Units	-	6.5-9.0	8.38	8.27	8.22	8.15	8.21	8.18	8.25	8.47	8.21	8.29	8.27	8.43	8.39	8.28	8.38	8.55	8.35	8.20	8.33
Turbidity	ephelometric uni	t -		3.9	4.0	17.5	10.7	20.4	8.9	12.6	48.2	21.2	127.9	32.1	39.7	43.2	52.8	39.0	478.7	51.4	1440.6	280.9
Physical Parameters																						
Colour	TCU	5	-	6.5	7.8	19.3	9.6	10	9.4	11.6	18.9	10.6	48.1	12.5	18.9	17.7	160	18.3	78.3	19.4	130	27.5
Electrical Conductivity (EC)	µS/cm pH Units	2	05.00	171	169	173	183	180	184	191	379	192	198	200	290	236	239	228	287 8.37	223	310	238
pn Total Suspended Solids (TSS)	ma/L	0.1	6.5-9.0	8.19 <3	8.2	8.19 4.5	8.24	8.09 13.1	8.18	8.2 9.2	<u>8.45</u> 69.8	8.11	8.15 214	69.2	8.35 37.2	8.29 80.6	8.14 28.4	8.28 82.4	754	8.18 85.8	7.93	8.21
Total Dissolved Solids (TDS)	mg/L	3	-	<3	<3	4.5	112	13.1	115	9.2	249	122	163	131	185	00.0	20.4	02.4	361	00.0 143	3460	202
Turbidity	NTU	0.1		1 71	1.72	16.5	18.2	21.1	5.42	9.8	67.3	20.9	188	35.1	46.5	50.6	59.5	47.8	985	57.2	>4000	393
Anions and Nutrients	NIO	0.1		1.7 1	1.72	10.0	10.2	21.1	0.42	5.0	01.0	20.0	100	00.1	40.0	00.0	00.0	47.0	500	01.2	24000	000
Alkalinity (Bicarbonate as CaCO3)	ma/L	1	1	77.5	78.5	81.1	85	87.3	84.1	87.9	164	92.2	109	94.2	144	111	84.1	109	160	102	117	110
Alkalinity (Carbonate as CaCO3)	ma/L	1		<1	<1	<1	<1	<1	<1	<1	9.2	<1	<1	<1	5	<1	<1	<1	4.8	<1	<1	<1
Alkalinity (Hydroxide) as CaCO3	ma/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1		77.5	78.5	81.1	85	87.3	84.1	87.9	173	92.2	109	94.2	149	111	84.1	109	164	102	117	110
Ammonia as N	mg/L	0.005	See narrative #2	< 0.005	< 0.005	< 0.005	< 0.005	0.0073	0.0062	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0493	0.006	0.0919	0.0165
Bromide	mg/L	0.05		<0.05	<0.05	< 0.05	<0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05
Chloride	mg/L	0.5	600	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.71	<0.5	0.98	<0.5	1.24	<0.5	5.41	0.67
Fluoride	mg/L	0.02	See equation #3	0.036	0.034	0.045	0.038	0.04	0.039	0.041	0.098	0.038	0.07	0.044	0.074	0.062	0.11	0.06	0.096	0.058	0.169	0.071
Nitrate and Nitrite (as N)	mg/L	0.0051	1	0.0528	0.0577	0.0506	0.0704	0.0684	0.0613	0.0552	< 0.0051	0.0611	0.0191	0.0582	0.0675	0.0579	< 0.0051	0.0556	0.0218	0.054	0.192	0.0641
Nitrate (as N)	mg/L	0.005	32.8	0.0528	0.0577	0.0506	0.0686	0.0672	0.0613	0.0552	<0.005	0.0611	0.0191	0.0582	0.0675	0.0579	<0.005	0.0556	0.0187	0.054	0.183	0.0631
Nitrite (as N)	mg/L	0.001	0.06-0.60 #4	<0.001	<0.001	<0.001	0.0017	0.0012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0031	<0.001	0.0098	0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	1	0.076	0.068	0.142	0.087	0.152	0.113	0.12	0.244	0.164	0.558	0.213	0.205	0.249	0.702	0.235	1.53	0.243	1.06	0.618
Nitrogen (Total)	mg/L	0.03		0.125	0.171	0.198	0.156	0.185	0.15	0.216	0.192	0.186	0.458	0.214	0.253	0.235	0.675	0.241	1.31	0.249	2.65	0.61
Orthophosphate (as P) (Filtered)	mg/L	0.001		<0.001	<0.001	0.0012	0.002	0.0021	0.0013	0.0016	0.0045	0.0017	0.0045	0.0021	0.0025	0.0027	0.0049	0.0027	0.0087	0.0029	0.0138	0.0063
Phosphorus (Total Dissolved)	mg/L	0.002		0.0052	0.0055	0.0237	0.0124	0.0322	0.01	0.0195	0.0948	0.0656	0.207	0.0974	0.0564	0.093	0.0793	0.116	0.584	0.112	2.04	0.376
Phosphorus	mg/L	0.002		<0.002	<0.002	0.0044	0.0041	0.0044	0.0021	0.0028	0.0057	0.0033	0.0106	0.004	0.0051	0.0048	0.0175	0.0049	0.0153	0.0058	0.0325	0.0094
Sulphate	mg/L	0.3		12.7	12.7	13.6	13.8	13.8	13.3	14	39.3	14.8	8.21	15.4	19.1	18.3	40.5	18.3	15.2	18.8	66.3	21.5
Silica	mg/L	0.5		3.98	3.81	4.4	4.25	4.24	4.13	4.25	3.98	4.3	3.69	4.27	3.85	3.82	6.06	4.07	4.78	3.94	5.88	3.9
Organic and Inorganic Carbon																						<u> </u>
Dissolved Organic Carbon (DOC) (Filtered)	mg/L	0.5		2.8	2.73	4.26	3.19	3.23	3.1	3.94	5.46	3.32	8.74	3.41	4.51	3.85	22.9	4.13	17.4	4.62	26.7	6.2
Total Organic Carbon (TOC)	mg/L	0.5		2.73	3.01	4.59	3.66	3.65	3.28	4	6.56	3.72	12	4.8	5.58	5.59	25.3	5.62	30.4	5.92	85.8	13.6

н #2

British Columbia Ministry of Environment (BC MOE). 2018. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British BC MOE 2018

Columbia, Canada.

Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required. Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement. Guideline for ammonia nitrogen (NH₃) varies with pH and temperature, and is derived from Table 26D of the BC MOE, 2017 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0

degC.

Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H <10 mg/L. Calculated in mg/L and based on equation: [-51.73 + 92.57*log(Hardness)]x0.01 when H =10-385 mg/L. Guideline for nitrite varies with chloride concentrations.

#3 #4

#5

#6

#7 #8

Guideline for intrite varies with hI and is calculated in mg/L and based on equation: [0.094(H)+2]/1000, when H =13-400 mg/L. Guideline for copper varies with H and is calculated in mg/L and based on equation: [0.094(H)+2]/1000, when H =13-400 mg/L. Guideline for lead varies with H. Guideline is 0.003 mg/L when H<8 mg/L. Calculated in mg/L and based on equation: $[e^{(1.273Hc(H)-1.460)}]/1000$ when H=8-360 mg/L Guideline for silver varies with H. Guideline is 0.003 mg/L when H<100 mg/L on 0.003 mg/L when H>100 mg/L Guideline for zinc varies with H. Guideline is 0.003 mg/L when H<100 mg/L calculated in mg/L and based on equation: $[34+0.75^{\circ}(H-90)]/1000$, when H=90-500 mg/L. Guideline for zinc varies with H. Guideline is 0.033 mg/L when H<100 mg/L calculated in mg/L and based on equation: [1.209-2.426(PH)+0.208(N)] when H=90-500 mg/L. Guideline for calmium varies with H. Guideline is 0.1 mg/L if PH ≥ 6.5. Calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.309-1000)}$ when H=7-455 mg/L. #9

#10

#11

No applicable guideline or analysis was not conducted. Concentration is less than the laboratory detection limit indicated.

Bold and shaded indicates an exceedance of the applied guideline. Bold

MPN CFU Most Probable Number Colony Forming Units

Table 10: September 2018 Surface Water Qu	in the second seco			1	Williston and Din	osaur Reservoirs				Euturo Cit	e C Reservoir			1			Downs	stream of Site C	Peservoir			
				+	TTINSION and DI	Iosaul Reservoirs		<u> </u>		Future Sit	e o ivesei voli	1		+	1		Downs		INCOCI VUII			τ
Parameter	Unit	Reported Detection Limit (RDL)	BC MOE 2018 (Approved Guidelines for freshwater aquatic life and short-term maximum)	Williston Shallow (W1-SHALLOW)	Williston Deep (W1-DEEP)	Dinosaur Reservoir Shallow (D1-SHALLOW)	Dinosaur Reservoir Deep (D1-DEEP)	Peace Canyon Dam (PC1)		Peace 2: Middle Site C Reservoir (PR2)	Halfway River - Downstream (HD)	Peace 3: Lower Site C Reservoir (PR3)	Moberly River - Downstream (MD)	Peace 1: Peace at Pine (PD1)	Pine River (PINE)	Peace at Beatton (PD2)	Beatton River (BEA)	Peace at Kiskatinaw (PD3)	Kiskatinaw River (KR)	Peace at Pouce Coupe (PD4)	Pouce Coupe River (POUCE)	Peace at Man Islands (PD5)
Sample Date				9/11/2018	9/11/2018	9/11/2018	9/11/2018	9/11/2018	9/13/2018	9/13/2018	9/13/2018	9/10/2018	9/10/2018	9/10/2018	9/10/2018	9/12/2018	9/12/2018	9/12/2018	9/12/2018	9/12/2018	9/12/2018	9/12/2018
GPS - Northing (10 UTM)				6209610	6209610	6203491	6203491	6205050	6207857	6229426	6231488	6231374	6230146	6226276	6223596	6220293	6220613	6220751	6219559	6224982	6224275	6242006
GPS - Easting (10 UTM)				549540	549540	562028	562028	562934	566122	594889	596649	628028	628620	640247	641710	661946	663060	672509	676408	317950	318943	364653
Laboratory Identification Number				L2162370-1	L2162370-2	L2162370-3	L2162370-4	L2162370-6	L2163952-3	L2163952-2	L2163952-1	L2161498-2	L2161498-1	L2161498-3	L2161498-4	L2163509-1	L2163509-2	L2163509-3	L2163509-4	L2163509-5	L2163509-6	L2163509-7
Matrix				surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water	surface water		surface water	surface water	surface water
Field Measurements			1	Surface water	Surface water	Surface water	Surface Water	Surface water	Surface water	Surface water	Surface water	Surface water	Surface water	Surface water	Surface water	Surface water	Surface water	Surface water	Surface water	Surface water	Sundee Water	Sundee Water
Sample Depth	m	-		0.2	5.0	0.2	5.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Depth	m			70.0	70.0	35.0	35.0	0.5	2.9	10.6	3.3	1.6	1.0	1.8	0.7	4.2	1.0	3.8	0.9	5.7	0.5	5.0
Temperature	°€	-	15	14.6	14.6	11.6	11.6	11.5	10.1	9.3	4.9	10.9	11.5	10.9	11.2	9.8	8.1	10.0	7.8	10.1	8.4	10.1
Dissolved Oxygen (DO)	mg/L	-	Minimum 5 ^{#1}	9.24	9.22	10.30	10.01	10.23	10.56	10.72	12.30	10.63	10.34	10.66	10.39	10.80	11.24	10.75	11.69	10.70	12.05	10.79
Specific Conductivity (SPC)	SPCµS/cm		c muminin	9.24	9.22	180.0	177.7	183.3	176.3	185.0	429.1	211.4	262.2	213.6	348.5	221.8	372.3	204.9	512.0	209.1	969.0	224.0
Electrical Conductivity (EC)	SPCµS/cm			141.7	139.5	134.0	132.1	136.0	126.0	129.6	264.6	154.3	194.6	155.9	256.5	157.5	253.1	146.4	343.7	149.8	662.0	160.0
		-		0.08	0.08	0.09	0.08	0.09	0.09	0.09	0.21	0.10	0.13	0.10	0.17	0.11	0.18	0.10		0.10	0.48	0.11
Salinity	parts per trillion	-	65.0.0		0.08	0.09 8.03	8.06	8.01	8.02		0.21	8.15	0.13	8.09	0.17	0.11 8.21	8.06	8.17	0.25		0.48	
pn Tradition	pH Units		6.5-9.0	8.22						8.21						-		17.7		8.21		8.29
Turbidity	ephelometric uni	-		0.3	0.4	1.2	1.1	1.2	0.8	1.4	22.8	6.9	110.4	9.6	230.0	23.5	50.4	17.7	239.7	26.5	38.6	33.5
Physical Parameters	TOU	5	1	5.0	0.0	0.0	8.1	6.1	0.0	0.7	40.0	5.0	04.0	6.1	7.4	7.1	400	0.0	40.0	5	00.0	5.0
Colour	TCU	5		5.8	6.6	6.2			6.2	6.7	10.9	5.8	24.9		7.4		106	9.2	13.8	<5	30.3	5.6
Electrical Conductivity (EC)	μS/cm	2		173	175	181	181	189	181	184	432	214	268	217	348	199	374	214	504	215	991	222
	pH Units	0.1	6.5-9.0	8.2	8.19	8.2	8.2	8.21	8.2	8.18	8.46	8.21	8.3	8.22	8.41	8.22	8.34	8.27	8.57	8.26	8.5	8.28
Total Suspended Solids (TSS)	mg/L	3		<3	<3	<3	<3	<3	<3	<3	33	9.4	88.6	12.8	289	21.4	35.8	35.8	347	55.4	27.8	42.6
Total Dissolved Solids (TDS)	mg/L	1		107	103	107	104	112	99.2	100	258	120	160	123	216	128	315	140	381	138	716	141
Turbidity	NTU	0.1		0.48	0.49	1.08	1.07	1.11	0.57	1.07	22.2	7.25	126	9.18	235	13.3	72.6	23.3	280	27.8	47.3	36.7
Anions and Nutrients										1												
Alkalinity (Bicarbonate as CaCO3)	mg/L	1		81.8	81	83.1	83.3	86.4	84.5	84.3	181	97.9	136	98.5	163	93.1	127	98.1	227	99	195	104
Alkalinity (Carbonate as CaCO3)	mg/L	1		<1	<1	<1	<1	<1	<1	<1	11	<1	<1	<1	7.8	<1	3.8	<1	20.4	<1	15.6	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1		81.8	81	83.1	83.3	86.4	84.5	84.3	192	97.9	136	98.5	171	93.1	131	98.1	247	99	211	104
Ammonia as N	mg/L	0.005	See narrative #2	<0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0079	0.0073	0.005	0.0103	<0.005	0.031	<0.005	0.03	< 0.005	0.0371	0.0058
Bromide	mg/L	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	<0.25	< 0.05
Chloride	mg/L	0.5	600	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	0.52	<0.5	<0.5	<0.5	1.27	<0.5	3.04	<0.5	1.75	<0.5	10.2	<0.5
Fluoride	mg/L	0.02	See equation #3	0.035	0.036	0.038	0.036	0.038	0.037	0.038	0.109	0.047	0.088	0.047	0.097	0.044	0.131	0.048	0.107	0.046	0.29	0.05
Nitrate and Nitrite (as N)	mg/L	0.0051		0.0481	0.0483	0.0607	0.0607	0.0625	0.0635	0.0577	<0.0051	0.0557	< 0.0051	0.0467	0.0663	0.057	0.0961	0.0581	0.118	0.056	0.202	0.0572
Nitrate (as N)	mg/L	0.005	32.8	0.0453	0.0454	0.0595	0.0595	0.0625	0.0635	0.0577	< 0.005	0.0541	< 0.005	0.0467	0.0663	0.057	0.0922	0.0581	0.115	0.056	0.192	0.0572
Nitrite (as N)	mg/L	0.001	0.06-0.60 #4	0.0027	0.0029	0.0012	0.0011	< 0.001	< 0.001	< 0.001	< 0.001	0.0016	<0.001	< 0.001	< 0.001	<0.001	0.0039	< 0.001	0.0024	< 0.001	0.0105	< 0.001
Total Kieldahl Nitrogen (TKN)	ma/L	0.05	0.00 0.00	0.12	0.106	0.103	0.103	0.101	0.084	0.091	0.172	0.099	0.432	0.118	0.636	0.128	0.704	0.152	0.962	0.173	0.838	0.181
Nitrogen (Total)	mg/L	0.03	1	0.147	0.146	0.146	0.148	0.145	0.147	0.143	0.137	0.136	0.291	0.143	0.34	0.120	0.746	0.173	0.541	0.177	1.01	0.202
Orthophosphate (as P) (Filtered)	mg/L	0.001		<0.001	0.001	0.0012	<0.001	<0.001	0.0013	0.0013	0.0028	0.0013	0.0038	0.0013	0.0026	0.002	0.0071	0.0016	0.0039	0.002	0.002	0.0022
Phosphorus (Total Dissolved)	mg/L	0.002		0.0022	<0.001	<0.0012	<0.001	<0.001	0.0031	0.0034	0.0046	<0.002	0.0058	<0.002	0.0020	0.002	0.0167	0.0023	0.0061	0.0027	0.0066	0.0033
Phosphorus	mg/L	0.002		0.0035	0.0035	0.003	0.0034	0.0037	0.0036	0.0053	0.0418	0.0119	0.138	0.0167	0.314	0.0215	0.0656	0.0392	0.182	0.0456	0.0531	0.0449
Sulphate	mg/L	0.002	1	12.7	12.7	13.7	13.7	14	13.4	13.6	54.3	19.3	16.5	19.9	34.2	15.8	64.2	17.1	47.1	17.1	321	18.8
Silica	mg/L	0.5		4.31	4.11	4.26	4.52	4.62	4.41	4.19	3.8	4.35	3.38	4.16	34.2	4.28	4.21	4.09	4,86	4.35	1.18	4.02
Drganic and Inorganic Carbon	nig/L	0.5	1	4.31	4.11	4.20	4.02	4.02	4.41	4.19	3.0	4.00	5.30	4.10	5.09	4.20	4.21	4.09	4.00	4.00	1.10	4.02
Dissolved Organic Carbon (DOC) (Filtered)	ma/L	0.5	1	2.91	2.91	2.68	2.88	2.82	2.59	2.77	3.53	3.03	6.95	3.01	3.32	2.8	19.5	2.87	7.84	3.21	15.6	3.12
Total Organic Carbon (TOC) (Filtered)	3	0.5	1	2.91	2.31	2.87	2.00	2.82	2.59	3.15	3.64	3.15	9.62	3.36	3.32 8.14	3.01	21.4	3.61	12.3	4.28	17.2	3.93
/ utai Organic Galboli (TOG)	mg/L	0.0	1	2.04	3	2.07	2.94	2.70	2.31	3.10	3.04	3.10	9.02	3.30	0.14	3.01	21.4	3.01	12.3	4.20	17.2	3.93

н #2

British Columbia Ministry of Environment (BC MOE). 2018. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British BC MOE 2018

Columbia, Canada.

Hardness. Where hardness values exceed the range applied for guideline use, site specific assessment may be required. Dissolved Oxygen guideline protects all life stages other than buried embryo/alevin, based on instantaneous measurement. Guideline for ammonia nitrogen (NH₃) varies with pH and temperature, and is derived from Table 26D of the BC MOE, 2017 BCWQGs, ranging from 0.681 to 28.7 mg/L for pH 6.5-9.0 and temperature 0.0-20.0

degC.

Guideline for fluoride varies with H. Guideline is 0.4 mg/L when H <10 mg/L. Calculated in mg/L and based on equation: [-51.73 + 92.57*log(Hardness)]x0.01 when H =10-385 mg/L. Guideline for nitrite varies with chloride concentrations.

#3 #4

#5

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#7 #8

#9

Guideline for intrite varies with hI and is calculated in mg/L and based on equation: [0.094(H)+2]/1000, when H =13-400 mg/L. Guideline for copper varies with H and is calculated in mg/L and based on equation: [0.094(H)+2]/1000, when H =13-400 mg/L. Guideline for lead varies with H. Guideline is 0.003 mg/L when H<8 mg/L. Calculated in mg/L and based on equation: $[e^{(1.273Hc(H)-1.460)}]/1000$ when H=8-360 mg/L Guideline for silver varies with H. Guideline is 0.003 mg/L when H<100 mg/L on 0.003 mg/L when H>100 mg/L Guideline for zinc varies with H. Guideline is 0.003 mg/L when H<100 mg/L calculated in mg/L and based on equation: $[34+0.75^{\circ}(H-90)]/1000$, when H=90-500 mg/L. Guideline for zinc varies with H. Guideline is 0.033 mg/L when H<100 mg/L calculated in mg/L and based on equation: [1.209-2.426(PH)+0.208(N)] when H=90-500 mg/L. Guideline for calmium varies with H. Guideline is 0.1 mg/L if PH ≥ 6.5. Calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.209-2.426(PH)+0.208(N))}$ where K=(pH)² and pH < 6.5. Guideline for calmium varies with H and is calculated in mg/L and based on equation: $e^{(1.309-1000)}$ when H=7-455 mg/L. #10

#11

No applicable guideline or analysis was not conducted. Concentration is less than the laboratory detection limit indicated.

Bold and shaded indicates an exceedance of the applied guideline. Bold

MPN CFU Most Probable Number Colony Forming Units

arameter	Unit	Reported Detection Limit (RDL)	BC MOE 2018 (Approved Guidelines for freshwater aquatic life and short-term maximum)	Williston Shallow (W1-SHALLOW)	Williston Deep (W1-DEEP)	Dinosaur Dinosaur Reservoir Shallow (D1-SHALLOW)	Dinosaur Reservoir Deep (D1-DEEP)	Peace Canyon Dam (PC1)	Site C Reservoir (PR1)	Peace 2: Middle Site C Reservoir (PR2)	a C Reservoir Halfway River - Downstream (HD)	Peace 3: Lower Site C Reservoir (PR3)	Moberly River - Downstream (MD)	Peace 1: Peace at Pine (PD1)	Pine River (PINE)	(PD2)	Downs Beatton River (BEA)	Peace at Kiskatinaw (PD3)	Kiskatinaw River (KR)	Peace at Pouce Coupe (PD4)	Pouce Coupe River (POUCE)	Islands (PD5)
ample Date PS - Northing (10 UTM) PS - Easting (10 UTM)			1	10/19/2018 6209610	10/19/2018 6209610	10/19/2018 6203491	10/19/2018 6203491	10/19/2018 6205050	10/19/2018 6207857	10/20/2018 6229426	10/20/2018 6231488	10/17/2018 6231374	10/17/2018 6230146	10/17/2018 6226276	10/17/2018 6223596	10/18/2018 6220293	10/18/2018 6220613	10/18/2018 6220751	10/18/2018 6219559	10/18/2018 6224982	10/18/2018 6224275	10/18/201 6242006
oratory Identification Number trix				549540 L2184476-1	549540 L2184476-2	562028 L2184476-3 surface water	562028 L2184476-4	562934 L2184476-6	566122 L2184476-7	594889 L2184609-2	596649 L2184609-1	628028 L2182905-2	628620 L2182905-1	640247 L2182905-3	641710 L2182905-4	661946 L2183715-1	663060 L2183715-2	672509 L2183715-3		317950 L2183715-5	318943 L2183715-6	
Id Measurements nple Depth	m	1	1	surface water	5.0	surface water	surface water	surface water	surface water	0.2		surface water 0.2	0.2	0.2	surface water	Sufface Water	sufface water	0.2	0.2	surface water	0.2	0.2
tal Depth mperature	m °C	-	15	81.7 6.9	81.7 6.9	28.8	28.8	3.2	4.3	8.0 6.8	0.2 5.0 3.5	12.8	1.7	8.7 6.9	3.5 5.3	19.4 7.1	3.5	12.9	4.6	18.5	0.5	14.7
solved Oxygen (DO)	mg/L	-	Minimum 5 *1	10.80	10.78	10.90	10.87	10.98	11.06	11.16	12.34	11.25	11.69	11.39	11.94	11.33	11.73	11.37	12.13	11.39	12.21	11.46
ecific Conductivity (SPC) ectrical Conductivity (EC)	SPCµS/cm SPCµS/cm	-		115.8	116.0	116.1	177.0 116.4	116.1	176.9 116.6	115.8	417.6 245.0	180.7 118.9	266.1 171.4	182.5 119.1	337.4 209.1	199.9 131.4	343.1 212.8	196.5 129.5	416.7 257.6	199.1 130.3	850.0 545.0	200.0
linity	parts per trillion pH Units		6.5-9.0	0.08 8.00	0.08 7.97	0.08 8.06	0.08	0.08 8.05	0.08	0.08 8.06	0.20 8.27	0.09 8.09	0.13 8.23	0.09 8.10	0.16 8.14	0.09 8.15	0.16 8.29	0.09 8.19	0.20 8.49	0.09 8.17	0.42 8.31	0.09
rbidity ysical Parameters	ephelometric unit	-		-1.6	-1.6	-1.3	-1.2	-1.2	-1.1	0.5	19.8	1.4	78.9	1.9	24.7	6.0	22.7	5.1	93.2	6.0	17.5	6.1
lour ctrical Conductivity (EC)	TCU µS/cm	2		6.7 184	5.8 186	5.7	6.2 186	8.2 187	6.8	184	14.3 420	6.6 183	27.6	7.2	9.4 333	7.9 211	164 354	206	24 429	8.3 207	43.5 882	210
rdness as CaCO3	mg/L pH Units	0.5	6.5-9.0	90.1 8.11	89.6 8.09	86.7 8.09	91.4 8.11	89.1 8.12	90.2 8.1	90.8 8.15	216 8.37	94.5 8.16	141 8.29	96.9 8.16	181 8.38	101 8.2	132 8.23	103 8.21	223 8.53	103 8.21	364 8.43	103 8.22
tal Suspended Solids (TSS) tal Dissolved Solids (TDS)	mg/L mg/L	3		<3 98.4	<3 97.9	<3 96.7	<3 98.3	<3 98.5	<3 97.8	3.3 99.8	18.3 248	6.4 102	24 158	5.4 104	20 201	11.2 113	7 235	11.2	63.6 261	12.6 114	7.2	9.2 114
rbidity ions and Nutrients	NTU	0.1		0.36	0.38	0.57	0.64	0.59	0.65	1.44	22	3.69	43.7	2.76	33	6.8	26.6	6.06	119	8.02	22.1	7.57
alinity (Bicarbonate as CaCO3) alinity (Carbonate as CaCO3)	mg/L mg/L	1		82.7 <1	82.4 <1	81.3 <1	81.8 <1	83.9	81.9 <1	84.4 <1	179 6.6	85.6	137	86.2	156 5.8	94.7	117 <1	94.1	214 15.8	94.9	199	95
alinity (Hydroxide) as CaCO3 alinity (total as CaCO3)	mg/L mg/L	1		<1 82.7	<1 82.4	<1 81.3	<1 81.8	<1 83.9	<1 81.9	<1 84.4	<1 186	<1 85.6	<1 137	<1 86.2	<1 162	<1 94.7	<1 117	<1 94.1	<1 230	<1 94.9	<1 209	<1 95
nmonia as N omide	mg/L mg/L	0.005	See narrative #2	<0.005 <0.05	<0.005 <0.05	<0.005 <0.05	<0.005	<0.005	<0.005 <0.05	<0.005 <0.05	<0.005 <0.05	<0.005 <0.05	<0.005 <0.05	<0.005 <0.05	<0.005	0.0051	0.0095 <0.05	0.011 <0.05	0.0179	<0.005 <0.05	0.0247	<0.005 <0.05
loride voride	mg/L mg/L	0.5	600 See equation #3	<0.5 0.038	<0.5 0.038	<0.5 0.038	<0.5 0.038	<0.5 0.038	<0.5 0.038	<0.5 0.037	0.64 0.099	<0.5 0.041	0.71 0.084	<0.5 0.041	1.43 0.082	<0.5 0.046	3.09 0.122	<0.5 0.044	1.74 0.087	<0.5 0.044	19.1 0.15	<0.5 0.044
rate and Nitrite (as N) rate (as N)	mg/L mg/L	0.0051 0.005	32.8	0.0582 0.0582	0.0598	0.0583 0.0583	0.0579	0.0576	0.0577 0.0577	0.0601 0.0601	<0.0051 <0.005	0.0549 0.0549	<0.0051 <0.005	0.0537 0.0537	0.0633 0.0623	0.0554 0.0554	0.0166 0.0151	0.0532	0.015	0.0533 0.0533	0.148	0.052
tal Kjeldahl Nitrogen (TKN)	mg/L mg/L	0.001	0.06-0.60 **	<0.001 0.101	<0.001 0.089	<0.001 0.08	<0.001 0.066	<0.001 0.073	<0.001 0.082	<0.001 0.068	<0.001 0.155	<0.001 0.097	<0.001	<0.001 0.083	0.001	<0.001 0.092	0.0015 0.649	<0.001	0.0012 0.536	<0.001 0.105	<0.005 0.812	<0.001
thophosphate (as P) (Filtered)	mg/L mg/L	0.03		0.134	0.142	0.129	0.136	0.135	0.137	0.15	0.149 0.0021	0.128	0.245	0.133	0.185	0.151 0.0028	0.605	0.163	0.427	0.155	0.858	0.144
osphorus (Total Dissolved) osphorus	mg/L mg/L	0.002		0.0036	0.0023	0.0032	0.003	0.003	0.0029	0.0023	0.0034 0.029	0.0021	0.0061	0.0028	0.0033	0.003	0.0241 0.0626	0.0027	0.005	0.0025	0.0139	0.0023
lphate ica	mg/L mg/L	0.3		13.9	13.9 4.31	13.8	13.8	13.8 4.24	13.8	13.9	52.5 3.58	14.4	13.5 3.38	14.9	29.9	16.6 4.03	64.3 2.22	16.2 4.26	19.7	16.4 4.23	232	16.9
ations Total	meq/L meq/L	0.0		1.95	1.94	1.92	1.93	1.97	1.93	1.98	4.83 4.48	2.02	3.04	2.04	3.91 3.84	2.25	3.78 3.91	2.22	5.05	2.24	9.57 9.75	2.26
ric Balance ganic and Inorganic Carbon	N/A			-3.9	-4.1	-5.1	-2.7	-5	-3.4	-4.4	-3.7	-3.2	-1.3	-2.6	-0.9	-5.2	1.7	-3.4	-1.2	-4.3	0.9	-4.5
ssolved Organic Carbon (DOC) (Filtered) tal Organic Carbon (TOC)	mg/L mg/L	0.5		2.6 2.57	2.38 2.45	2.44 2.65	2.6 2.67	2.51 2.54	2.41 2.6	2.67 2.65	3.8 4.17	2.68 2.66	7.27	2.79 2.67	3.36 3.87	2.9 3.12	21.6 22	3.14 3.25	10.1 12.1	3.05 3.38	19.1 19.3	3.22 3.24
ital Metals	mg/L	0.005	1	0.0137	0.0137	0.0188	0.0237	0.0196	0.0248	0.0506	0.553	0.0678	0.807	0.0857	0.679	0.208	0.929	0.188	2.32	0.198	0.29	0.2
timony senic	mg/L mg/L	0.0005	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
rium ryllium	mg/L	0.000	0.005	0.03	0.03	0.031	0.031	0.031	0.031	0.032	0.11	0.034	0.176	0.037	0.139	0.049	0.00127	0.047	0.0013	0.048	0.064	0.048
muth ron - soluble	mg/L mg/L	0.001		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
dmium Icium	mg/L mg/L mg/L	0.000005		0.0000146 26.9	0.0000128 25.8	0.0000149 26.7	0.0000172 26.6	0.0000144	0.0000165	0.0000165	0.0000551 58.6	0.0000214 28.1	0.0000555 41.8	0.0000278	0.0000456 50.3	0.0000299 28.4	0.000057 33.6	0.000032	0.000113 60.7	0.0000265	0.0000282 97.2	0.0000295
romium balt	mg/L mg/L	0.001	0.11	<0.001 <0.0003	<0.001 <0.0003	<0.001 <0.0003	<0.001 <0.0003	<0.001	<0.001	<0.001 <0.0003	0.0011 0.00036	<0.001	0.0014	<0.001	0.0012	<0.001	0.0017	<0.001 <0.0003	0.0036	<0.001	<0.001 0.00078	<0.001 <0.0003
pper	mg/L	0.001	See equation *5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0014	<0.001 0.083	0.0025	<0.0003	0.00045	<0.001	0.0027	< 0.001	0.0052	<0.001	0.0032	<0.001
n ad	mg/L mg/L	0.03 0.0005	1 See equation #6	<0.03 <0.0005	<0.03 <0.0005	<0.03 <0.0005	<0.03 <0.0005	< 0.0005	0.031 <0.0005	< 0.0005	0.798 <0.0005	<0.0005	1.36 0.00072	<0.0005	0.00052	0.299 <0.0005	2.63 0.00072	0.258	3.75 0.00199	0.272	0.934 <0.0005	0.304 <0.0005
hium agnesium	mg/L mg/L	0.001		0.001 6.35	0.001 6.28	0.0011 6.25	0.0011 6.46	0.0011 6.27	0.0011 6.48	0.0012 6.13	0.0075	0.0013 6.54	0.0049 11.6	0.0014 7.05	0.008	0.0019 7.47	0.0081 10.8	0.0018 7.34	0.0053	0.0018 7.28	0.0169 31.7	0.002 7.41
anganese arcury	mg/L mg/L	0.0001 0.000005	See equation *7	0.00109 <0.0000005	0.0011	0.00132	0.00149	0.00145	0.00154	0.00217 0.000001	0.0179 0.00000241	0.00349 0.0000063	0.033 0.00000335	0.00413 0.00000071	0.0189 0.00000285	0.00647 0.00000118	0.0522 0.00000428	0.0064	0.0685	0.00708	0.0385	0.00906
ethyl mercury olybdenum	mg/L mg/L	0.00000002 0.001	2	0.000000024 <0.001	<0.00000002 <0.001	<0.00000002 <0.001	<0.00000002 <0.001	0.000000088	<0.00000002 <0.001	<0.00000002 <0.001	0.000000026 0.0034	<0.00000002 <0.001	0.000000047 <0.001	<0.00000002 <0.001	0.000000023 <0.001	0.000000021 <0.001	0.000000251 <0.001	0.000000024 <0.001	0.000000068 <0.001	<0.00000002 <0.001	0.000000120	<0.0000000 <0.001
ckel nosphorus	mg/L mg/L	0.001		<0.001 <0.3	<0.001 <0.3	<0.001 <0.3	<0.001 <0.3	<0.001 <0.3	<0.001 <0.3	<0.001 <0.3	0.0026 <0.3	<0.001 <0.3	0.0035	<0.001 <0.3	0.0023 <0.3	0.001	0.0051 <0.3	<0.001 <0.3	0.0064 <0.3	0.0011 <0.3	0.0079 <0.3	0.0012
otassium elenium	mg/L mg/L	2 0.00005	0.002	<2 0.000224	<2 0.000278	<2 0.000298	<2 0.000222	<2 0.000268	<2 0.000284	<2 0.000281	<2 0.00127	<2 0.000286	<2 0.000212	<2 0.000303	<2 0.000558	<2 0.000354	<2 0.000244	<2 0.000341	<2 0.000292	<2 0.000335	5.5 0.000357	<2 0.000306
licon Iver	mg/L mg/L	0.1	0.0001 or 0.003 #8	2.07 <0.00002	2.1	2.09 <0.00002	2.08	2.07 <0.00002	2.1	2.15	2.65	2.07 <0.00002	2.63	2.12	2.43	2.29 <0.00002	2.92	2.23	5.65 0.000036	2.18	0.5	2.21
odium rontium	mg/L mg/L	2 0.005		<2 0.109	<2 0.108	<2 0.104	<2 0.104	<2 0.105	<2 0.105	<2 0.103	3.5 0.306	<2 0.106	3.3 0.0977	<2 0.103	4.3 0.182	<2 0.121	26.5 0.14	<2 0.114	9.5 0.256	<2 0.118	50.6 0.355	2
allium n	mg/L mg/L	0.00001		<0.00001 <0.0005	<0.00001 <0.0005	<0.00001 <0.0005	<0.00001 <0.0005	<0.00001 <0.0005	<0.00001 <0.0005	<0.00001 <0.0005	0.000019 <0.0005	<0.00001 <0.0005	0.000024	<0.00001 <0.0005	0.000019 <0.0005	<0.00001 <0.0005	0.000022	<0.00001 <0.0005	0.000061	<0.00001 <0.0005	0.000014 <0.0005	<0.00001 <0.0005
anium anium	mg/L mg/L	0.01		<0.01 0.00045	<0.01 0.00045	<0.01 0.00043	<0.01 0.00045	<0.01 0.00045	<0.01 0.00044	<0.01 0.00043	<0.01 0.0008	<0.01 0.00047	<0.01 0.00041	<0.01 0.00046	<0.01 0.00049	<0.01 0.00048	0.026	<0.01 0.00048	0.021	<0.01 0.00049	<0.01 0.00225	<0.01 0.00045
nadium	mg/L mg/L	0.0005	See equation #9	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005 <0.005	0.00056	0.00263	0.00055	0.00313 0.0072	0.00065	0.00249 0.0054	0.00106	0.00405	0.00099	0.00882 0.0185	0.00103	0.00121	0.00107
ssolved Metals			0.1 #10	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0065	0.0077	0.0055	0.0367	<0.005	0.189	0.0095	0.106	0.0525	0.226	0.0061	0.084	0.047
Iminum (Filtered) timony (Filtered)	mg/L mg/L	0.005	U.1 ***	<0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	<0.0005	< 0.0005	<0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
rium (Filtered) rium (Filtered)	mg/L mg/L	0.0005		<0.0005 0.03	<0.0005	<0.0005 0.032	<0.0005 0.031	<0.0005	<0.0005	<0.0005 0.033	<0.0005 0.098	<0.0005 0.031	<0.0005	<0.0005 0.033	<0.0005 0.126	<0.0005 0.043	0.00064	<0.0005	0.0006	<0.0005	0.0006	<0.0005
ryllium (Filtered) muth (Filtered)	mg/L mg/L	0.0001		<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001	<0.0001	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001 <0.2	<0.0001	<0.0001 <0.2	<0.0001
ron - soluble (Filtered) dmium (Filtered)	mg/L mg/L	0.1 0.000005	See equation #11	<0.1 0.0000104	<0.1 0.0000102	<0.1 0.0000104	<0.1 0.0000086	<0.1 0.0000079	<0.1 0.0000104	<0.1 0.0000118	<0.1 0.0000138	<0.1 0.0000093	<0.1 0.0000098	<0.1 0.0000068	<0.1 0.0000182	<0.1 0.0000111	<0.1 0.0000244	<0.1 0.0000174	<0.1 0.0000364	<0.1 0.0000145	<0.1 0.0000158	<0.1 0.000021
Icium (Filtered) romium (Filtered)	mg/L mg/L	0.1	-	25.8 <0.001	25.6 <0.001	25.7 <0.001	26.1 0.0017	25.2 <0.001	25.7 <0.001	26.1 <0.001	58.5 <0.001	27.4 <0.001	39 <0.001	28.1 <0.001	50.6 <0.001	28.1 <0.001	34.8 <0.001	29.5 <0.001	62.4 <0.001	29.6 <0.001	94.1 <0.001	29.2 <0.001
balt (Filtered) pper (Filtered)	mg/L mg/L	0.0003 0.001		<0.0003 <0.001	<0.0003 <0.001	<0.0003 <0.001	<0.0003 <0.001	<0.0003 <0.001	<0.0003 <0.001	<0.0003 <0.001	<0.0003 <0.001	<0.0003 <0.001	<0.0003 0.0011	<0.0003 <0.001	<0.0003 <0.001	<0.0003 <0.001	<0.0003 0.0015	<0.0003 <0.001	0.0004 0.002	<0.0003 <0.001	0.0005	<0.0003 <0.001
n (Filtered) ad (Filtered)	mg/L mg/L	0.03	0.35	<0.03 <0.0005	<0.03 <0.0005	<0.03 <0.0005	<0.03 <0.0005	<0.03 <0.0005	<0.03 <0.0005	<0.03 <0.0005	<0.03 <0.0005	<0.03 <0.0005	0.106	<0.03 <0.0005	0.174	<0.03 <0.0005	0.903 <0.0005	0.065	0.535 <0.0005	<0.03 <0.0005	0.094	0.057
ium (Filtered) gnesium (Filtered)	mg/L mg/L	0.001 0.1		0.001 6.24	0.001 6.24	0.001 5.46	0.001 6.34	0.001 6.33	0.001 6.32	0.0012 6.21	0.0073 17.1	0.0012 6.36	0.0036 10.5	0.0013 6.5	0.0076 13.3	0.0019 7.52	0.0079 10.9	0.0018 7.23	0.0037 16.2	0.0018 7.06	0.0161 31.3	0.0018 7.25
nganese (Filtered) rcury (Filtered) thyl mercury (Filtered) lybdenum (Filtered)	mg/L mg/L	0.0001		0.0002	0.00022	0.00042	0.00111 <0.0000005	0.00031 <0.0000005	0.00028	0.00051 <0.0000005	0.00746 0.00000079	0.00105	0.0133 0.0000098	0.00063	0.00766 0.0000014	0.00139	0.03 0.00000222	0.00315	0.0209 0.00000283	0.00104 <0.0000005	0.0197 0.00000148	0.00252
hyl mercury (Filtered) ybdenum (Filtered)	mg/L mg/L	0.00000002 0.001		0.000000026 <0.001	0.00000023	0.000000046 <0.001	0.000000028 <0.001	0.000000029 <0.001	0.000000033	0.000000031 <0.001	0.000000041 0.0033	0.000000021 <0.001	0.000000038	<0.00000002 <0.001	0.000000021 <0.001	0.000000021 <0.001	0.000000225 <0.001	0.000000022	0.000000045	<0.00000002 <0.001	0.00000082	<0.000000
kel (Filtered) osphorus (filtered) (Filtered)	mg/L mg/l	0.001 0.3		<0.001 <0.3	<0.001 <0.3	<0.001 <0.3	0.0048 <0.3	<0.001 <0.3	<0.001 <0.3	<0.001 <0.3	0.0016 <0.3	<0.001 <0.3	0.0018 <0.3	<0.001 <0.3	0.0013 <0.3	<0.001 <0.3	0.0039 <0.3	<0.001 <0.3	0.0024 <0.3	<0.001 <0.3	0.0069	<0.001 <0.3
assium (Filtered) enium (Filtered) con (Filtered)	mg/L mg/L	2 0.00005		<2 0.000257	<2 0.000259	<2 0.000225	<2 0.000292	<2 0.000268	<2 0.000306	<2 0.000266	<2 0.00122	<2 0.000273	<2 0.000151	<2 0.000264	<2 0.000576	<2 0.000327	<2 0.000184	<2 0.000315	<2 0.000141	<2 0.000358	6.2 0.000372	<2 0.000319
con (Filtered) ver (Filtered)	mg/L mg/L	0.05 0.00002		2.02 <0.00002	2.02 <0.00002	1.88 <0.00002	2 <0.00002	2.01 <0.00002	1.97 <0.00002	2.03 <0.00002	1.69 <0.00002	1.89 <0.00002	1.55 <0.00002	1.94 <0.00002	1.66 <0.00002	1.75 <0.00002	1.02 <0.00002	1.79 <0.00002	2.22 <0.00002	1.74 <0.00002	0.169 <0.00002	1.79 <0.00002
dium (Filtered) ontium (Filtered)	mg/L mg/L	2 0.005	1	<2 0.104	<2 0.103	<2 0.102	<2 0.104	<2 0.102	<2 0.103	<2 0.1	3.7 0.294	<2 0.103	3.2 0.0986	<2 0.104	4.4 0.175	<2 0.114	27.9 0.132	<2 0.114	9.9 0.243	<2 0.116	53 0.352	<2 0.115
allium (Filtered) (Filtered)	mg/L mg/L	0.0002		<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005	<0.0002 <0.0005
anium (Filtered) anium (Filtered)	mg/L mg/L	0.0003		<0.01 0.00042	<0.01 0.00042	<0.01 0.00047	<0.01 0.00042	<0.0003	<0.01	<0.0005	<0.0003	<0.01 0.00047	<0.01 0.00037	<0.01	<0.01	<0.00005	<0.01 0.00085	<0.01	<0.01	<0.01	<0.01	<0.01
nadium (Filtered)	mg/L	0.0005	1	<0.00042	< 0.00042	< 0.00047	< 0.00042	<0.0005	<0.0005	< 0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00064	< 0.0005	0.00052	<0.00045	0.00095	<0.0005	<0.0005	<0.00047 <0.0005

British Columbia Ministry of Environment (BC MOE). 2018. British Columbia approved water quality guidelines: Aquatic life, wildlife & agricuture. Water Protection and Sustainability Branch. Victoria, British Columbia, Ca Hardness. Where hardness values exceed the range applied for guideline use, alse specific assessment may be required. Dissolved Oxygoin guideline protects all life stages offers that builed etholyclient, based on instainability Branch. Victoria, British Columbia, Ca Guideline for ammoina nitrogen (NH₄) varies with pH and temperature, and is derived from Table 280 of the BC MOE. 2017 BC/WGSs, ranging from 0.861 to 28.7 mg/L for pH 6.5-0.0 and temperature 0.0-20.0 degC. Guideline for forditive varies with A Guideline is 0.4 mg/L, check H 4 Mg/L. Calculated in mg/L and based on equation: [51:73 + 92:57:10g/Hardness])bi0.01 when H = 10-385 mg/L. Guideline for forditive varies with A Guideline is 0.003 mg/L when H + 40 mg/L. Calculated in mg/L and based on equation: [61:779+64;779:100 when H = 40-360 mg/L. Guideline for longore varies with H and is calculated in mg/L and based on equation: [00:47!H+27!M00, when H = 40-360 mg/L. Guideline for transgance varies with H. Guideline is 0.001 mg/L when H + 40 mg/L. Calculated in mg/L and based on equation: [01:779+62]!M00 when H = 40-360 mg/L. Guideline for suries with H. Guideline is 0.001 mg/L when H + 40 mg/L. Calculated in mg/L and based on equation: [01:779+62]!M00 when H = 40-500 mg/L. Guideline for suries with H. Guideline is 0.001 mg/L when H + 40 mg/L. Calculated in mg/L and based on equation: [01:779+62]!M000 when H = 40-500 mg/L. Guideline for analysis was not conducted. Concentration is lass than h laboratory detection limit Indicated. Bod and shaded indicates an exceedance of the applied guideline. Most Protober Hamber 4 waters and the applied guideline. Most Protober 4 humber Colomy Forming Units British Columbia Ministry of Environment (BC MOE). 2018. British Columbia approved water quality guidelines: Aquatic life, wildlife & agriculture. Water Protection and Sustainability Branch. Victoria, British Columbia, Canada.

#10 #11

< Bold MPN CFU

H #1 #2 #3 #4 #5 #6 #7

Table 12: May 2018 Surface Water Qual Parameter		Analysis	D1-SHALLOW	DUP1		PR2	DUP2	
Sample Date	Reported Detection Limit (RDL)	Unit	5/11/2018	5/11/2018	RPD Analysis	5/9/2018	5/9/2018	RPD Analysis
Laboratory Identification Number	(=)		L2093535-3	L2093535-5		L2092365-3	L2092365-4	
Physical Parameters Colour	5	Col. Unit	25.6	23.6	8.1	28	28.4	1.4
Electrical Conductivity (EC) Hardness as CaCO ₃	2 0.5	μS/cm mg/L	- 94	- 89.6	4.8	179 106	<u>181</u> 118	1.1
рН	0.1	pH Units	8.03	8.03	0.0	8.06	8.07	0.1
Total Suspended Solids (TSS) Total Dissolved Solids (TDS)	3	mg/L mg/L	17.9 102	15.9 137	12 29	112 97.4	<u>131</u> 123	15.6 23
Turbidity	0.1	NŤU	29.9	30.7	2.6	129	134	3.8
Anions and Nutrients Bicarbonate as CaCO ₃	1	mg/L	81.6	81	0.7	81.8	80.7	1.4
Carbonate as CaCO ₃	1	mg/L	<1	<1		<1	<1	
Hydroxide as CaCO ₃ Total Alkalinity as CaCO ₃	1	mg/L mg/L	<1 81.6	<1 81	0.7	<1 81.8	<1 80.7	1.4
Ammonia, Total (as N)	0.005	mg/L	<0.005	0.0055	0.1	0.0125	0.009	33
Bromide Chloride	0.05	mg/L mg/L	<0.05 <0.5	<0.05 <0.5		<0.05 <0.5	<0.05 <0.5	
Fluoride Nitrate and Nitrite (as N)	0.02	mg/L mg/L	0.045	0.042	2.3	0.048	0.048	1.0
Nitrate (as N)	0.005	mg/L	0.0914	0.0935	2.3	0.104	0.105	1.0
Nitrite (as N) Total Kjeldahl Nitrogen	0.001	mg/L mg/L	<0.001 0.204	<0.001 0.196		<0.001 0.406	<0.001 0.39	4.0
Total Nitrogen	0.03	mg/L	0.253 0.0025	0.274 0.0025	8.0	0.36 0.0033	0.341 0.0029	5.4
Orthophosphate (as P) Phosphorus (P)-Dissolved	0.001	mg/L mg/L	0.0025	0.0025		0.0033	0.0029	
Phosphorus (P)-Total Sulphate (SO4)	0.002	mg/L mg/L	0.0397 13.6	0.0403	1.5 0.0	0.165 15.4	0.156 15.5	<u>5.6</u> 0.6
Silica	0.5	mg/L	4.47	4.64	3.7	4.51	4.56	1.1
Anions Total Cations Total		meq/L meq/L	1.92 1.91	<u>1.91</u> 1.82	<u> </u>	1.97 2.71	<u>1.94</u> 2.98	
Ionic Balance		N/A	-0.5	-2.4	1	16	21.1	
Organic and Inorganic Carbon Dissolved Organic Carbon (DOC)	0.5	mg/L	4.34	5	14	7.24	7.77	7
Total Organic Carbon (TOC) Total Metals	0.5	mg/L	4.87	5.54	13	8.06	7.8	3
Aluminum	0.005	mg/L	0.654	0.677	3	2.56	2.48	3
Antimony Arsenic	0.0005	mg/L mg/L	<0.0005 0.00059	<0.0005 0.00059		<0.0005 0.00182	<0.0005 0.00184	
Barium Beryllium	0.02	mg/L mg/L	0.072	0.071 <0.0001	1.4	0.115 0.00013	0.109 0.00013	5.4
Bismuth	0.2	mg/L	<0.2	<0.2		<0.2	<0.2	
Boron Cadmium	0.1	mg/L mg/L	<0.1 0.0000379	<0.1 0.000044	15	<0.1 0.00024	<0.1 0.000259	8
Calcium	0.1	mg/L	25.4	25.4	0	30.9	32.8	6
Chromium Cobalt	0.001 0.0003	mg/L mg/L	0.0017 0.00039	0.0021		0.0047 0.00171	0.0047	2.3
Copper Iron	0.001	mg/L mg/L	0.0024	0.0026	3.2	0.0061 4.08	0.0062	<u>1.6</u> 0.0
Lead	0.0005	mg/L	<0.0005	0.00055	0.2	0.00219	0.00214	0.0
Lithium Magnesium	0.001	mg/L mg/L	0.0022	0.002	0.3	0.004 8.41	0.0044 8.64	3
Manganese Mercury	0.0001 0.000005 or 0.0000005	mg/L	0.0139 0.00000448	0.014 0.00000449	0.7	0.0645 0.0000116	0.0649 0.0000115	0.6
Methyl mercury	0.0000002	mg/L mg/L	0.00000043	0.00000028	0.2	0.00000032	0.00000074	0.9
Molybdenum Nickel	0.001	mg/L mg/L	<0.001 0.0023	<0.001 0.0024		<0.001 0.0074	<0.001 0.0075	1.3
Phosphorus	0.3	mg/L	<0.3	<0.3		<0.3	<0.3	
Potassium Selenium	0.00005	mg/L mg/L	<2 0.000275	<2 0.000281	2.2	<2 0.00039	<2 0.000404	3.5
Silicon Silver	0.05	mg/L mg/L	3.18 <0.00002	3.11 <0.00002	2.2	6.29 0.000044	6.05 0.000041	3.9
Sodium	2	mg/L	<2	<2		<2	<2	
Strontium Thallium	0.005 0.0002	mg/L mg/L	0.106 0.000018	0.107 0.000017	0.9	0.109 0.000082	0.108	0.9
Tin Titanium	0.0005	mg/L mg/L	<0.0005 <0.01	<0.0005 <0.01		<0.0005 0.04	<0.0005 0.037	
Uranium	0.0002	mg/L	0.00048	0.00049		0.00068	0.00068	
Vanadium Zinc	0.0005	mg/L mg/L	0.00318 0.0059	0.00327 0.0061	2.8	0.0107 0.0219	0.0105 0.0231	
Dissolved Metals Aluminum	0.005	mg/L	0.121	0.132	8.7	3.49	3.59	2.8
Antimony	0.0005	mg/L	<0.0005	<0.0005	0.1	<0.0005	<0.0005	2.0
Arsenic Barium	0.0005	mg/L mg/L	<0.0005 0.055	<0.0005 0.054		0.00121 0.126	0.00143 0.134	6.2
Beryllium Bismuth	0.001	mg/L mg/L	<0.0001 <0.2	<0.0001 <0.2		0.00017 <0.2	0.00017 <0.2	
Boron	0.1	mg/L	<0.1	<0.1		<0.1	<0.1	
Cadmium Calcium	0.000005	mg/L mg/L	0.0000176 27.5	0.0000206 25.2	8.7	0.000216 29.8	0.000238 33.5	9.7 12
Chromium	0.001	mg/L	<0.001	<0.001		0.0051	0.0057	11.1
Cobalt Copper	0.0003	mg/L mg/L	<0.0003 0.0011	<0.0003 0.0011		0.00126 0.0045	0.00146	
Iron Ferrous Iron	0.03 0.02	mg/L mg/L	0.273	0.29	6.0	2.67	3.13 -	15.9
Lead	0.0005	mg/L	<0.0005	<0.0005	+	0.00157	0.0019	
Lithium Magnesium	0.001 0.0001	mg/L mg/L	0.0016 6.16	0.0014 6.49	5.2	0.0055 7.72	0.0058 8.3	5.3
Manganese Mercury	0.1 0.000005 or 0.0000005	mg/L mg/L	0.00786	0.00814 0.00000054	3.5 3.5	0.0562 0.0000964	0.0649	14
Methyl mercury	0.0000002	mg/L	0.00000026	0.0000002	3.0	0.00000052	0.0000006	14
Molybdenum Nickel	0.001 0.001	mg/L mg/L	<0.001 0.0014	<0.001 0.0014		<0.001 0.0052	<0.001 0.0062	18
Phosphorus	0.3	mg/L	<0.3	<0.3		<0.3	<0.3	
Potassium Selenium	2 0.00005	mg/L mg/L	<2 0.000173	<2 0.000233		2.1 0.000321	2.2 0.000377	16
Silicon Silver	0.05 0.00002	mg/L mg/L	2.31 <0.00002	2.32 <0.00002	0.4	10 0.000029	10.4 0.000044	4
Sodium	2	mg/L	<2	<2		<2	<2	
Strontium Thallium	0.005 0.0002	mg/L mg/L	0.0994 <0.0002	0.0971 <0.0002	2.3	0.107 <0.0002	0.11 <0.0002	2.8
Tin	0.0005	mg/L	<0.0005	<0.0005		<0.0005	<0.0005	
Titanium Uranium	0.01	mg/L mg/L	<0.01 0.00043	<0.01 0.00043		<0.16 0.00064	0.22 0.00075	
Vanadium Zinc	0.0005	mg/L mg/L	0.00058	0.0006 <0.005	3.4	0.0124 0.0141	0.0125 0.0158	0.8
NOTES:	0.000	g/ L	-0.000	-0.000	1	0.0171	0.0100	1

< RPD

BOLD MPN

Analysis was not conducted. Concentration is less than the laboratory detection limit indicated. RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively. RPDs have only been considered where a concentration is 5 times greater than the RDL RPDs greater than 20% are shaded in grey and bolded Most Probable Number

Parameter			HD	DUPLICATE 1		D1-DEEP	DUP 2	
Sample Date	Reported Detection Limit (RDL)	Unit	6/19/2018	6/19/2018	RPD Analysis	6/18/2018	6/18/2018	RPD Analysis
Laboratory Identification Number			L2115122-1	L2115122-4		L2115009-4	L2115009-5	
Physical Parameters					•			
Colour	5	Col. Unit	14.2	14.5	2	<5	<5	
Electrical Conductivity (EC)	2	µS/cm	394	389	1	183	184	1
рН	0.1	pH Units	8.48	8.46	0	8.1	8.09	0
Total Suspended Solids (TSS)	3	mg/L	95.2	68.4	33	<3	<3	
Total Dissolved Solids (TDS)	1	mg/L	218	219	0	101	94	7
Turbidity	0.1	NTU	59.8	64.8	8	1.02	0.93	9
Anions and Nutrients								
Bicarbonate as CaCO ₃	1	mg/L	157	157	0	86.2	85.5	1
Carbonate as CaCO ₃	1	mg/L	2.6	5.8	76	<1	<1	
Hydroxide as CaCO ₃	1	mg/L	<1	<1		<1	<1	
Total Alkalinity as CaCO ₃	1	mg/L	159	163	2	86.2	85.5	1
Ammonia, Total (as N)	0.005	mg/L	0.0061	0.0073		<0.005	0.0063	
Bromide	0.05	mg/L	<0.05	<0.05		<0.05	<0.05	
Chloride	0.5	mg/L	<0.5	<0.5		<0.5	<0.5	
Fluoride	0.02	mg/L	0.092	0.096		0.04	0.04	
Nitrate and Nitrite (as N)	0.0051	mg/L	<0.0051	<0.0051		0.0302	0.0307	2
Nitrate (as N)	0.005	mg/L	<0.005	<0.005		0.0302	0.0307	2
Nitrite (as N)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Total Kjeldahl Nitrogen	0.05	mg/L	0.233	0.235		0.081	0.13	
Total Nitrogen	0.03	mg/L	0.18	0.196	9	0.114	0.109	4
Orthophosphate (as P)	0.001	mg/L	0.0034	0.0036		0.0014	0.0016	
Phosphorus (P)-Dissolved	0.002	mg/L	0.0049	0.0055		<0.002	<0.002	
Phosphorus (P)-Total	0.002	mg/L	0.0981	0.0908	8	0.0039	0.0032	
Sulphate (SO4)	0.3	mg/L	43.4	43.5	0	15.2	15.2	0
Silica	0.5	mg/L	3.55	3.84	8	4.49	4.36	3
Organic and Inorganic Carbon								
Dissolved Organic Carbon (DOC)	0.5	mg/L	3.96	3.93	1	2.6	2.81	8
Total Organic Carbon (TOC)	0.5	mg/L	5.72	5.64	1	2.7	3.05	12

Table 12: June 2018 Surface Water Quality Results Summary for Duplicate Analysis

Analysis was not conducted.

Concentration is less than the laboratory detection limit indicated.

< RPD

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RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.

RPDs have only been considered where a concentration is 5 times greater than the RDL

RPDs greater than 20% are shaded in grey and bolded Most Probable Number

BOLD MPN

Table 12: July 2018 Surface Water Quality Results Summary for Duplicate Analysis

Parameter			PD2	DUPLICATE 1		PD2	DUP-1A		D1-SHALLOW	DUPLICATE 2	
Sample Date	Reported Detection Limit (RDL)	Unit	7/19/2018	7/19/2018	RPD Analysis	7/19/2018	7/19/2018	RPD Analysis	7/17/2018	7/17/2018	RPD Analysis
Laboratory Identification Number	• • • •		L2133123-1	L2133123-8		L2133123-1	L2133123-9		L2131545-3	L2131545-5	
Physical Parameters											
Colour	5	Col. Unit	7.5	6.9	8	7.5	-		6.2	8.6	32
Electrical Conductivity (EC)	2	µS/cm	206	200	3	206	-		181	183	1
рН	0.1	pH Units	8.22	8.2	0	8.22	-		8.17	8.2	0
Total Suspended Solids (TSS)	3	mg/L	72.2	81.8	12	72.2	-		<3	<3	
Total Dissolved Solids (TDS)	1	mg/L	129	122	6	129	-		119	112	6
Turbidity	0.1	NTU	21.6	23.2	7	21.6	-		0.81	0.87	7
Anions and Nutrients	· · · · ·		-								
Bicarbonate as CaCO ₃	1	mg/L	89.6	85.8	4	89.6	-		81.3	83.3	2
Carbonate as CaCO ₃	1	mg/L	<1	<1		<1	-		<1	<1	
Hydroxide as CaCO ₃	1	mg/L	<1	<1		<1	-		<1	<1	
Total Alkalinity as CaCO ₃	1	mg/L	89.6	85.8	4	89.6	-		81.3	83.3	2
Ammonia, Total (as N)	0.005	mg/L	< 0.005	0.0055		<0.005	-		0.0074	<0.005	
Bromide	0.05	mg/L	<0.05	<0.05		<0.05	-		<0.05	<0.05	
Chloride	0.5	mg/L	<0.5	<0.5		<0.5	-		<0.5	<0.5	
Fluoride	0.02	mg/L	0.045	0.045		0.045	-		0.037	0.037	
Nitrate and Nitrite (as N)	0.0051	mg/L	0.0534	0.0535	0	0.0534	-		0.0494	0.0495	0
Nitrate (as N)	0.005	mg/L	0.0534	0.0535	0	0.0534	-		0.0494	0.0495	0
Nitrite (as N)	0.001	mg/L	<0.001	<0.001		<0.001	-		<0.001	<0.001	
Total Kjeldahl Nitrogen	0.05	mg/L	0.188	0.2		0.188	-		0.102	0.08	
Total Nitrogen	0.03	mg/L	0.174	0.181	4	0.174	-		0.138	0.131	
Orthophosphate (as P)	0.001	mg/L	0.0013	0.0012		0.0013	-		0.0017	0.0013	
Phosphorus (P)-Dissolved	0.002	mg/L	0.0031	0.0023		0.0031	-		<0.002	<0.002	
Phosphorus (P)-Total	0.002	mg/L	0.0696	0.0673	3	0.0696	-		0.0033	0.0039	
Sulphate (SO4)	0.3	mg/L	16.4	16.4	0	16.4	-		13.9	13.8	1
Silica	0.5	mg/L	3.99	4.11	3	3.99	-		4.21	4.03	4
Organic and Inorganic Carbon											
Dissolved Organic Carbon (DOC)	0.5	mg/L	3.04	3.26	7	3.04	2.82	7	2.78	3.02	8
Total Organic Carbon (TOC)	0.5	mg/L	3.11	3.46	11	3.11	-		2.85	2.82	1

NOTES: -

Analysis was not conducted.

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RPD

Concentration is less than the laboratory detection limit indicated.

RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.

RPDs have only been considered where a concentration is 5 times greater than the RDL

BOLD MPN

RPDs greater than 30% are shaded in grey and bolded

Most Probable Number

3 of 6

Parameter			PD2	DUPLICATE 1		D1-SHALLOW	DUPLICATE 2	
Sample Date	Reported Detection Limit (RDL)	Unit	8/1/2018	8/1/2018	RPD Analysis	7/31/2018	7/31/2018	RPD Analysis
Laboratory Identification Number			L2140393-1	L2140393-8		L2139662-3	L2139662-5	
Physical Parameters					•			
Colour	5	Col. Unit	17.7	18.5	4	19.3	17	13
Electrical Conductivity (EC)	2	µS/cm	236	238	1	173	180	4
рН	0.1	pH Units	8.29	8.31	0	8.19	8.25	1
Total Suspended Solids (TSS)	3	mg/L	80.6	86.2	7	4.5	4.8	6
Total Dissolved Solids (TDS)	1	mg/L	171	161	6	110	112	2
Turbidity	0.1	NTU	50.6	47.5	6	16.5	16.4	1
Anions and Nutrients								
Bicarbonate as CaCO ₃	1	mg/L	111	109	2	81.1	83.5	3
Carbonate as CaCO ₃	1	mg/L	<1	2.6		<1	<1	
Hydroxide as CaCO ₃	1	mg/L	<1	<1		<1	<1	
Total Alkalinity as CaCO ₃	1	mg/L	111	112	1	81.1	83.5	3
Ammonia, Total (as N)	0.005	mg/L	<0.005	<0.005		<0.005	<0.005	
Bromide	0.05	mg/L	<0.05	<0.05		<0.05	<0.05	
Chloride	0.5	mg/L	<0.5	<0.5		<0.5	<0.5	
Fluoride	0.02	mg/L	0.062	0.061		0.045	0.045	
Nitrate and Nitrite (as N)	0.0051	mg/L	0.0579	0.0576	1	0.0506	0.0499	1
Nitrate (as N)	0.005	mg/L	0.0579	0.0576	1	0.0506	0.0499	1
Nitrite (as N)	0.001	mg/L	<0.001	<0.001		<0.001	<0.001	
Total Kjeldahl Nitrogen	0.05	mg/L	0.249	0.258		0.142	0.122	
Total Nitrogen	0.03	mg/L	0.235	0.253	7	0.198	0.192	3
Orthophosphate (as P)	0.001	mg/L	0.0027	0.0026	4	0.0012	0.0013	
Phosphorus (P)-Dissolved	0.002	mg/L	0.093	0.098	5	0.0237	0.02	17
Phosphorus (P)-Total	0.002	mg/L	0.0048	0.004		0.0044	0.0045	2
Sulphate (SO4)	0.3	mg/L	18.3	18.3	0	13.6	13.6	0
Silica	0.5	mg/L	3.82	3.99	4	4.4	4.39	0
Organic and Inorganic Carbon								
Dissolved Organic Carbon (DOC)	0.5	mg/L	3.85	4.13	7	4.26	4.09	4
Total Organic Carbon (TOC)	0.5	mg/L	5.59	5.31	5	4.59	4.59	0

Table 12: August 2018 Surface Water Quality Results Summary for Duplicate Analysis

Analysis was not conducted.

Concentration is less than the laboratory detection limit indicated.

< RPD

-

RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively. RPDs have only been considered where a concentration is 5 times greater than the RDL

RPDs greater than 30% are shaded in grey and bolded

BOLD MPN

Most Probable Number

Parameter			PR2	DUPLICATE 1		D1-SHALLOW	DUP 2	
Sample Date	Reported Detection Limit (RDL)	Unit	9/13/2018	9/13/2018	RPD Analysis	9/11/2018	9/11/2018	RPD Analysis
Laboratory Identification Number			L2163952-2	L2163952-4		L2162370-5	L2162370-5	
Physical Parameters								
Colour	5	Col. Unit	6.7	6.2	8	6.2	7.2	15
Electrical Conductivity (EC)	2	µS/cm	184	184	0	181	182	1
рН	0.1	pH Units	8.18	8.21	0	8.2	8.21	0
Total Suspended Solids (TSS)	3	mg/L	<3	<3		<3	<3	
Total Dissolved Solids (TDS)	1	mg/L	100	100	0	107	104	3
Turbidity	0.1	NTU	1.07	1.14		1.08	1.21	11
Anions and Nutrients								
Bicarbonate as CaCO ₃	1	mg/L	84.3	84.3	0	83.1	83.6	1
Carbonate as CaCO ₃	1	mg/L	<1	<1		<1	<1	
Hydroxide as CaCO ₃	1	mg/L	<1	<1		<1	<1	
Total Alkalinity as CaCO ₃	1	mg/L	84.3	84.3	0	83.1	83.6	1
Ammonia, Total (as N)	0.005	mg/L	<0.005	<0.005		<0.005	<0.005	
Bromide	0.05	mg/L	<0.05	<0.05		<0.05	<0.05	
Chloride	0.5	mg/L	<0.5	<0.5		<0.5	<0.5	
Fluoride	0.02	mg/L	0.038	0.038		0.038	0.038	0
Nitrate and Nitrite (as N)	0.0051	mg/L	0.0577	0.0635	10	0.0607	0.0596	2
Nitrate (as N)	0.005	mg/L	0.0577	0.0635	10	0.0595	0.0585	2
Nitrite (as N)	0.001	mg/L	<0.001	<0.001		0.0012	0.0011	
Total Kjeldahl Nitrogen	0.05	mg/L	0.091	0.095		0.103	0.114	
Total Nitrogen	0.03	mg/L	0.143	0.147		0.146	0.155	
Orthophosphate (as P)	0.001	mg/L	0.0013	0.0013		0.0012	<0.001	
Phosphorus (P)-Dissolved	0.002	mg/L	0.0034	0.003		<0.002	<0.002	
Phosphorus (P)-Total	0.002	mg/L	0.0053	0.0038		0.003	0.0049	
Sulphate (SO4)	0.3	mg/L	13.6	13.6	0	13.7	13.7	0
Silica	0.5	mg/L	4.19	4.44	6	4.26	4.27	0
Organic and Inorganic Carbon								
Dissolved Organic Carbon (DOC)	0.5	mg/L	2.77	2.54	9	2.68	2.79	4
Total Organic Carbon (TOC)	0.5	mg/L	3.15	2.85	10	2.87	2.97	3

Table 12: September 2018 Surface Water Quality Results Summary for Duplicate Analysis

Analysis was not conducted.

Concentration is less than the laboratory detection limit indicated.

< RPD

-

RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively. RPDs have only been considered where a concentration is 5 times greater than the RDL

BOLD RPDs greater than 20% are shaded in grey and bolded MPN

Most Probable Number

Parameter Sample Date	Reported Detection Limit (RDL)	Unit	PD5 10/18/2018	DUP1 10/18/2018	RPD Analysis	D1-SHALLOW 10/19/2018	DUP2 10/19/2018	RPD Analysis
Laboratory Identification Number			L2183715-7	L2183715-8		L2184476-3	L2184476-5	
Physical Parameters Colour	5	Col. Unit	7.7	8.1	5.1	5.7	6.7	16.1
Electrical Conductivity (EC)	2	µS/cm	210 103	210 102	0.0	185	187 91	1.1
Pardness as CaCO ₃	0.5	mg/L pH Units	8.22	8.22	1.0	86.7 8.09	8.1	5
Total Suspended Solids (TSS)	3	mg/L	9.2	9.4		<3	<3	
Total Dissolved Solids (TDS) Turbidity	0.1	mg/L NTU	114 7.57	113 6.61	1 13.5	96.7 0.57	97 0.51	0 11.1
Anions and Nutrients Bicarbonate as CaCO ₃			95	93.6	1 45	81.3	80.2	
Carbonate as CaCO ₃	1	mg/L mg/L	<1	<1	1.5	<1	<1	1.4
Hydroxide as CaCO ₃	1	mg/L	<1	<1		<1	<1	
Total Alkalinity as CaCO ₃	1	mg/L	95	93.6	1.5	81.3	80.2	1.4
Ammonia, Total (as N) Bromide	0.005	mg/L mg/L	<0.005	<0.005		<0.005 <0.05	<0.005	
Chloride	0.5	mg/L	<0.5 0.044	<0.5 0.045		<0.5 0.038	<0.5 0.038	
Fluoride Nitrate and Nitrite (as N)	0.002	mg/L mg/L	0.052	0.045	0.6	0.0583	0.0596	2.2
Nitrate (as N) Nitrite (as N)	0.005 0.001	mg/L	0.052	0.0517	0.6	0.0583	0.0596	2.2
Total Kjeldahl Nitrogen	0.05	mg/L mg/L	0.098	0.086		0.08	0.086	7.2
Total Nitrogen Orthophosphate (as P)	0.03 0.001	mg/L mg/L	0.144 0.0023	0.151 0.0019		0.129 0.001	0.13	
Phosphorus (P)-Dissolved	0.002	mg/L	0.0092	0.0021		0.0032	0.003	
Phosphorus (P)-Total Sulphate (SO4)	0.002	mg/L mg/L	0.0197 16.9	0.0151	26.4 0.6	0.0028 13.8	0.0042	0.0
Silica	0.5	mg/L	4.21	4.03	4.4	4.46	4.46	0.0
Anions Total Cations Total		meq/L meq/L	2.26 2.06	2.23 2.05		1.92 1.73	1.9 1.82	
Ionic Balance		N/A	-4.5	-4.3		-5.1	-2.1	
Organic and Inorganic Carbon Dissolved Organic Carbon (DOC)	0.5	mg/L	3.22	3.14	3	2.44	2.5	
Total Organic Carbon (TOC)	0.5	mg/L	3.24	3.17	2	2.65	2.44	1
Total Metals Aluminum	0.005	mg/L	0.2	0.199	1	0.0188	0.0168	
Antimony	0.0005	mg/L	<0.0005	< 0.0005	-	<0.0005	< 0.0005	
Arsenic Barium	0.0005	mg/L mg/L	<0.0005 0.048	<0.0005 0.049	+	<0.0005 0.031	<0.0005 0.031	-
Beryllium	0.001	mg/L	<0.0001	< 0.0001		< 0.0001	< 0.0001	
Bismuth Boron	0.2	mg/L mg/L	<0.2 <0.1	<0.2 <0.1		<0.2 <0.1	<0.2 <0.1	
Cadmium	0.000005	mg/L	0.0000295	0.00003	2	0.0000149	0.0000139	
Calcium Chromium	0.1 0.001	mg/L mg/L	31.5 <0.001	29.6	6	26.7 <0.001	26.6	0
Cobalt	0.0003	mg/L	< 0.0003	< 0.0003		< 0.0003	< 0.0003	
Copper Iron	0.001 0.03	mg/L mg/L	<0.001 0.304	<0.001 0.296	2.7	<0.001 <0.03	<0.001 <0.03	
Lead Lithium	0.0005	mg/L	<0.0005 0.002	<0.0005 0.002		<0.0005 0.0011	<0.0005 0.0011	0
Magnesium	0.001	mg/L mg/L	7.41	7.51	1.3	6.25	6.33	1
Manganese	0.0001 0.000005 or 0.0000005	mg/L	0.00906 0.00000108	0.0074 0.0000103	20.2	0.00132	0.00132	0.0
Mercury Methyl mercury	0.0000002	mg/L mg/L	< 0.0000002	< 0.0000002		< 0.0000002	< 0.0000002	
Molybdenum Nickel	0.001	mg/L mg/L	<0.001 0.0012	<0.001 0.0013	8.0	<0.001 <0.001	<0.001	
Phosphorus	0.3	mg/L	<0.3	<0.3	0.0	<0.3	<0.3	
Potassium Selenium	2 0.00005	mg/L mg/L	<2 0.000306	<2 0.000321	4.8	<2 0.000298	<2 0.00027	9.9
Silicon	0.05	mg/L	2.21	2.22	0.5	2.09	2.07	1.0
Silver Sodium	0.00002	mg/L mg/L	<0.0002	<0.00002		<0.00002	<0.00002	
Strontium	0.005	mg/L	0.117	0.117	0.0	0.104	0.105	1.0
Thallium Tin	0.0002	mg/L mg/L	<0.00001 <0.0005	<0.0001 <0.0005		<0.00001 <0.0005	<0.0001 <0.0005	
Titanium	0.01	mg/L	<0.01	<0.01		<0.01	<0.01	
Uranium Vanadium	0.0002	mg/L mg/L	0.00045	0.00046 0.00111		0.00043 <0.0005	0.00045	
Zinc	0.005	mg/L	<0.005	<0.005		<0.005	<0.005	
Dissolved Metals Aluminum	0.005	mg/L	0.047	0.0404	15.1	<0.005	<0.005	
Antimony	0.0005	mg/L	<0.0005	< 0.0005		< 0.0005	< 0.0005	
Arsenic Barium	0.0005	mg/L mg/L	<0.0005 0.043	<0.0005 0.042	+	<0.0005 0.032	<0.0005 0.031	
Beryllium	0.001	mg/L	<0.0001	<0.0001		<0.0001	<0.0001	
Bismuth Boron	0.2	mg/L mg/L	<0.2 <0.1	<0.2 <0.1		<0.2 <0.1	<0.2 <0.1	
Cadmium Calcium	0.000005	mg/L	0.000021 29.2	0.0000221 28.9	1.0	0.0000104 25.7	0.0000087 25.9	1
Chromium	0.001	mg/L mg/L	<0.001	<0.001	1.0	<0.001	<0.001	
Cobalt Copper	0.0003	mg/L	<0.0003 <0.001	<0.0003 <0.001	+	<0.0003 <0.001	<0.0003 <0.001	
Iron	0.03	mg/L mg/L	0.057	0.056		<0.001	< 0.03	
Ferrous Iron (Filtered) Lead	mg/L 0.0005	0.02 mg/L	- <0.0005	- <0.0005	+	- <0.0005	- <0.0005	
Lithium	0.001	mg/L	0.0018	0.0018		0.001	0.001	
Magnesium Manganese	0.1 0.0001	mg/L mg/L	7.25 0.00252	7.26	0.1 2.4	5.46 0.00042	6.37 0.00033	15.4
Mercury	0.000005 or 0.0000005	mg/L	<0.0000005	0.00000050	2.4	<0.0000005	< 0.0000005	
Methyl mercury Molybdenum	0.0000002	mg/L mg/L	<0.0000002 <0.001	<0.0000002 <0.001	+	0.000000046 <0.001	0.00000003 0.0012	
Nickel	0.001	mg/L	<0.001	< 0.001		< 0.001	<0.001	
Phosphorus Potassium	0.3	mg/L mg/L	<0.3	<0.3	+	<0.3	<0.3 <2	
Selenium	0.00005	mg/L	0.000319	0.000332	4.0	0.000225	0.000259	
Silicon	0.05 0.00002	mg/L mg/L	1.79 <0.00002	1.82 <0.00002	1.7	1.88 <0.00002	1.98 <0.00002	5
	2	mg/L mg/L	<2	<2		<2	<2	
	0.005	mg/L	0.115	0.113 <0.0002	1.8	0.102 <0.0002	0.104 <0.0002	1.9
Sodium Strontium				~0.0002	-			-
Silver Sodium Strontium Thallium Tin	0.0002	mg/L mg/L	<0.0005	< 0.0005		< 0.0005	< 0.0005	
Sodium Strontium Thallium Tin Titanium	0.0002 0.0005 0.01	mg/L mg/L	<0.0005 <0.01	<0.01		<0.01	<0.01	
Sodium Strontium Thallium Tin	0.0002 0.0005	mg/L	<0.0005					

RPDs Reader than 20% are shaded in grey and bolded Most Probable Number RPD BOLD MPN

Parameter			PD5	DUP1		W1	DUP2	1
Sample Date	Reported Detection Limit (RDL)	Unit	10/18/2018	10/18/2018	RPD Analysis	10/19/2018	10/19/2018	RPD Analysis
Laboratory Identification Number			L2183717-7	L2183717-8		L2184475-1	L2184475-3	
Particle Size (Soil)					•			
% Sand (0.125mm - 0.063mm)	%	1	30.1	29.2	3.0	13.2	27.1	69.0
% Sand (0.25mm - 0.125mm)	%	1	<1	<1		5.1	<1	
% Sand (0.50mm - 0.25mm)	%	1	<1	<1		<1	<1	
% Clay (<4um)	%	1	7.4	8.1	9.0	10.1	2.7	115.6
% Gravel (>2mm)	%	1	<1	<1	5.0	<1	<1	110.0
% Sand (1.00mm - 0.50mm)	%	1	<1	<1		<1	<1	
% Silt (0.0312mm - 0.004mm)	%	1	27.9	28.5	2.1	38.8	32.8	16.8
% Silt (0.063mm - 0.0312mm)	<u> </u>	1	33.9	33.7	0.6	31.9	36.5	13.5
% Sand (2.00mm - 1.00mm)	<u> </u>	1		<1	0.0	<1	<1	15.5
	70	I	<1	<1		<1	<1	
Carbon	0/	0.05	0.700	0.004	50	4 70	4.00	01.0
Total Organic Carbon (TOC)	%	0.05	0.793	0.834	5.0	1.73	1.39	21.8
Physical Tests (Soil)								
pH	pH Units	0.1	8.18	8.13	0.6	8.14	8.57	5.1
Anions and Nutrients (Soil)			-	-	1		-	1
Nitrogen (Total)	%	0.02	0.065	0.07		0.12	0.03	
Plant Available Nutrients (Soil)				1			1	
Ammonium	mg/kg	1	2.7	2.4		1.6	<1	
Nitrate (as NO3-N)	mg/kg	2	<2	<2		<2	<2	
Nitrate and Nitrite (as N)	mg/kg	2	<2	<2		<2	<2	
Phosphate	mg/kg	2	2.1	<2		<2	<2	
Metals (Soil)				•			•	•
Aluminum	mg/kg	50	7100	7040	0.8	7590	5650	29.3
Antimony	mg/kg	0.1	0.59	0.58	1.7	1.1	0.72	41.8
Arsenic	mg/kg	0.1	7.79	7.8	0.1	7.2	4.7	42.0
Barium	mg/kg	0.5	398	395	0.8	461	105	125.8
Beryllium	mg/kg	0.0	0.44	0.44	0.0	0.39	0.19	123.0
Bismuth		0.1	<0.2	<0.2		<0.2	<0.2	
	mg/kg	5	6.8	6.7		7.6	<0.2	
Boron - soluble	mg/kg				0.0			0.4
Cadmium	mg/kg	0.02	0.409	0.408	0.2	0.963	0.888	8.1
Calcium	mg/kg	50	11200	11400	1.8	37000	68300	59.4
Chromium	mg/kg	0.5	15	14.7	2.0	18.1	18.3	1.1
Cobalt	mg/kg	0.1	7.46	7.72	3.4	6.98	5.74	19.5
Copper	mg/kg	0.5	14.3	14.2	0.7	20.6	11.9	53.5
Iron	mg/kg	50	17600	18000	2.2	16400	14600	11.6
Lead	mg/kg	0.5	8.87	8.68	2.2	9.63	5.84	49.0
Lithium	mg/kg	2	9.9	10		9.2	7.6	
Magnesium	mg/kg	20	4810	4830	0.4	10700	19700	59.2
Manganese	mg/kg	1	251	252	0.4	312	314	0.6
Mercury	mg/kg	0.005	0.0521	0.0578	10.4	0.0519	0.0181	
Molybdenum	mg/kg	0.1	1.08	1.04	3.8	1.36	1.15	16.7
Nickel	mg/kg	0.5	22.3	22.6	1.3	23.8	18.6	24.5
Phosphorus	mg/kg	50	734	699	4.9	809	881	8.5
Potassium	mg/kg	100	1240	1190	4.1	1490	630	81.1
Selenium	mg/kg	0.2	0.41	0.52		0.53	0.2	
Silver	mg/kg	0.2	0.16	0.15	1	0.28	<0.1	1
Sodium	mg/kg	50	77	81		109	93	1
Strontium	mg/kg	0.5	45.5	43.3	5.0	84.8	126	39.1
Sulphur		1000	1000	1000	3.0	<1000	<1000	39.1
-	mg/kg							
Thallium	mg/kg	0.05	0.142	0.135		0.202	0.13	
Tin	mg/kg	2	<2	<2		<2	<2	
Titanium	mg/kg	1	65.9	63.7	3.4	96.7	338	111.0
Tungsten	mg/kg	0.5	<0.5	<0.5		<0.5	<0.5	
Uranium	mg/kg	0.05	1.04	0.973	6.7	0.778	0.853	9.2
Vanadium	mg/kg	0.2	29.1	28.8	1.0	41.1	38.6	6.3
Zinc	mg/kg	2	77	78.1	1.4	77.9	49.6	44.4
Zirconium	mg/kg	1	3.8	3.7	2.7	1.8	3.7	

Analysis was not conducted. Concentration is less than the laboratory detection limit indicated.

< RPD

RPD is Relative Percentage Difference calculated as RPD=[C2-C1]/[(C1+C2)/2] where C1,C2 = concentrations of parameters in 1st and 2nd sample respectively.

RPDs have only been considered where a concentration is 5 times greater than the RDL RPDs greater than 30% are shaded in grey and bolded

BOLD

Table 14: May 2018 Surface Water Quality Results Summary for Blank Analysis **Reported Detection** FIELD BLANK TRIP BLANK Unit Parameter Limit (RDL) 5/11/2018 Sample Date 5/11/2018 Laboratory Identification Number L2093535-6 L2093535-7 Deionized Water Deionized Water Matrix Physical Parameters Colour TCU 5 <5 <5 Electrical Conductivity (EC) 2 µS/cm <0.5 <0.5 Hardness as CaCO3 0.5 mg/L 0.1 <u>5.49</u> <u>5.37</u> pН pH Units <3 100 Total Suspended Solids (TSS) mg/L 3 <3 Total Dissolved Solids (TDS) mg/L 1 <1 NTU 0.1 <u>0.18</u> <0.1 Turbidity Anions and Nutrients Alkalinity (Bicarbonate as CaCO3) mg/L 1 <1 <1 Alkalinity (Carbonate as CaCO3) mg/L 1 <1 <1 <1 <1 Alkalinity (Hydroxide) as CaCO3 mg/L 1 <1 Alkalinity (total as CaCO3) 1 <1 mg/L < 0.005 < 0.005 Ammonia as N 0.005 mg/L Bromide mg/L 0.05 < 0.05 < 0.05 Chloride mg/L 0.5 <0.5 <0.5 Fluoride < 0.02 < 0.02 0.02 mg/L Nitrate and Nitrite (as N) < 0.0051 < 0.0051 mg/L 0.0051 Nitrate (as NO3-N) 0.005 < 0.005 mg/l < 0.005 Nitrite (as NO2-N) <0.001 < 0.001 0.001 mg/L Total Kjeldahl Nitrogen (TKN) mg/L 0.05 < 0.05 < 0.05 0.03 Nitrogen (Total) < 0.03 < 0.03 mg/L Orthophosphate (as P) (Filtered) 0.001 < 0.001 <0.001 mg/L Phosphorus (Filtered) mg/L 0.002 < 0.002 < 0.002 Phosphorus mg/L 0.002 < 0.002 < 0.002 Sulphate mg/L 0.3 <0.3 <0.3 0.5 <0.5 Silica <0.5 mg/L Anions Total <0.1 <0.1 meq/L Cations Total meq/L <0.1 <0.1 Ionic Balance N/A 0 0 Organic and Inorganic Carbon <0.5 0.5 Dissolved Organic Carbon (DOC) mg/L Total Organic Carbon (TOC) 0.5 <0.5 <0.5 mg/L **Total Metals** Aluminum mg/L 0.005 < 0.005 < 0.005 Antimony mg/L 0.0005 < 0.0005 < 0.0005 < 0.0005 Arsenic mg/L 0.0005 < 0.0005 Barium < 0.02 < 0.02 mg/L 0.02 Beryllium mg/l 0.001 < 0.000 <0.0001 Bismuth mg/L 0.2 <0.2 <0.2 Boron - soluble mg/L 0.1 <0.1 <0.1 0.000005 < 0.000005 < 0.000005 Cadmium mg/L Calcium mg/L 0.1 <0.1 <0.1 Chromium mg/l 0.001 <0.001 < 0.001 Cobalt mg/L 0.0003 < 0.0003 < 0.0003 Copper mg/L 0.001 < 0.001 < 0.001 Iron mg/L 0.03 < 0.03 < 0.03 Lead mg/L 0.0005 < 0.0005 < 0.0005 Lithium mg/L 0.001 <0.001 <0.001 Magnesium mg/L 0.1 <0.1 <0.1 Manganese mg/L 0.0001 < 0.0001 < 0.0001 Mercury mg/l 0.000005 or 0.00000 < 0.000000 < 0.0000005 Methyl mercury mg/L 0.0000002 < 0.0000002 < 0.0000002 Molybdenum < 0.001 mg/L 0.001 < 0.001 Nickel < 0.001 < 0.001 0.001 mg/L 0.3 <0.3 <0.3 Phosphorus mg/L Potassium mg/l 2 <2 <2 Selenium mg/L 0.00005 < 0.00005 < 0.00005 Silicon mg/L 0.05 <0.1 <0.1 < 0.00002 < 0.00002 Silver 0.00002 mg/L Sodium <2 <2 mg/L 2 0.005 < 0.005 < 0.005 Strontium mg/L 0.0002 < 0.00001 < 0.00001 Thallium mg/L Tin 0.0005 < 0.0005 < 0.0005 mg/L Titanium mg/L 0.01 <0.01 < 0.01 Uranium mg/L 0.0002 < 0.0002 < 0.0002 < 0.000 < 0.0005 0.0005 Vanadium mg/L 0.0055 < 0.005 Zinc 0.005 mg/L Dissolved Metals < 0.005 Aluminum (Filtered) mg/L 0.005 -Antimony (Filtered) mg/L 0.0005 < 0.0005 -0.0005 < 0.0005 Arsenic (Filtered) mg/L -Barium (Filtered) < 0.02 0.02 mg/L Beryllium (Filtered) 0.001 <0.0001 mg/L Bismuth (Filtered) mg/L 0.2 <0.2 Boron - soluble (Filtered) mg/L 0.1 < 0.1 < 0.000005 Cadmium (Filtered) mg/L 0.000005 -Calcium (Filtered) mg/L 0.1 <0.1 0.001 < 0.001 Chromium (Filtered) mg/L Cobalt (Filtered) < 0.0003 0.0003 mg/l Copper (Filtered) 0.001 <0.001 mg/l Iron (Filtered) 0.03 < 0.03 mg/l

Leau (I litereu)	IIIg/L	0.0005	<0.0005	-
Lithium (Filtered)	mg/L	0.001	<0.001	-
Magnesium (Filtered)	mg/L	0.1	<0.1	-
Manganese (Filtered)	mg/L	0.0001	<0.0001	-
Mercury (Filtered)	mg/L	0.000005 or 0.0000005	<0.000005	-
Methyl mercury (Filtered)	mg/L	0.0000002	<0.0000002	-
Molybdenum (Filtered)	mg/L	0.001	<0.001	-
Nickel (Filtered)	mg/L	0.001	<0.001	-
Phosphorus (filtered) (Filtered)	mg/l	0.3	<0.3	-
Potassium (Filtered)	mg/L	2	<2	-
Selenium (Filtered)	mg/L	0.00005	<0.00005	-
Silicon (Filtered)	mg/L	0.05	<0.05	-
Silver (Filtered)	mg/L	0.00002	<0.00002	-
Sodium (Filtered)	mg/L	2	<2	-
Strontium (Filtered)	mg/L	0.005	<0.005	-
Thallium (Filtered)	mg/L	0.0002	<0.0002	-
Tin (Filtered)	mg/L	0.0005	0.00068	-
Titanium (Filtered)	mg/L	0.01	<0.01	-
Uranium (Filtered)	mg/L	0.0002	<0.0002	-
Vanadium (Filtered)	mg/L	0.0005	<0.0005	-
Zinc (Filtered)	mg/L	0.005	<0.005	-

0.02

0.0005

< 0.000

mg/L

NOTES:

Ferrous Iron (Filtered)

ead (Filtered)

-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and underlined indicates an exceedance of the RDL.
RDL	Reported Detection Limit

Parameter	Unit	Reported Detection Limit (RDL)	FIELD BLANK-SW	TRAVEL BLANK
Sample Date			6/23/2018	
Laboratory Identification Number			L2117855-2	L2117855-1
Matrix			Deionized Water	Deionized Water
Physical Parameters			-	-
Colour	TCU	5	<5	<5
Electrical Conductivity (EC)	µS/cm	2	<2	<2
рН	pH Units	0.1	<u>5.89</u>	<u>5.38</u>
Total Suspended Solids (TSS)	mg/L	3	<3	<3
Total Dissolved Solids (TDS)	mg/L	1	<1	-
Turbidity	NTU	0.1	0.18	<0.1
Anions and Nutrients				
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1	<1	<1
Ammonia as N	mg/L	0.005	<0.005	<0.005
Bromide	mg/L	0.05	<0.05	<0.05
Chloride	mg/L	0.5	<0.5	<0.5
Fluoride	mg/L	0.02	<0.02	<0.02
Nitrate and Nitrite (as N)	mg/L	0.0051	<0.0051	<0.0051
Nitrate (as NO3-N)	mg/L	0.005	<0.005	<0.005
Nitrite (as NO2-N)	mg/L	0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	< 0.05	<0.05
Nitrogen (Total)	mg/L	0.03	<0.03	<0.03
Orthophosphate (as P) (Filtered)	mg/L	0.001	<0.001	<0.001
Phosphorus (Filtered)	mg/L	0.002	<0.002	<0.002
Phosphorus	mg/L	0.002	<0.002	<0.002
Sulphate	mg/L	0.3	<0.3	<0.3
Silica			<0.5	<0.5
Organic and Inorganic Carbon	-		-	
Dissolved Organic Carbon (DOC)	mg/L	0.5	<0.5	-
Total Organic Carbon (TOC)	mg/L	0.5	<0.5	<0.5

Table 14: June 2018 Surface Water Quality Results Summary for Blank Analysis

NOTES:

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No applicable guideline or analysis was not conducted.

Concentration is less than the laboratory detection limit indicated. Bold and underlined indicates an exceedance of the RDL.

< Bold RDL

Reported Detection Limit

Parameter	Parameter Unit Report		FIELD BLANK	FIELD 1A	TRIP BLANK	
Sample Date						
Laboratory Identification Number			L2133123-11	L2133123-12	L2133123-10	
Matrix			Deionized Water	Deionized Water	Deionized Water	
Physical Parameters				-		
Colour	TCU	5	<5	-	<5	
Electrical Conductivity (EC)	µS/cm	2	<2	-	<2	
рН	pH Units	0.1	<u>5.67</u>	-	<u>5.47</u>	
Total Suspended Solids (TSS)	mg/L	3	<3	-	<3	
Total Dissolved Solids (TDS)	mg/L	1	<10	-	<10	
Turbidity	NTU	0.1	<u>0.17</u>	-	<0.1	
Anions and Nutrients						
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	-	<1	
Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	-	<1	
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	-	<1	
Alkalinity (total as CaCO3)	mg/L	1	<1	-	<1	
Ammonia as N	mg/L	0.005	<0.005	-	<0.005	
Bromide	mg/L	0.05	< 0.05	-	< 0.05	
Chloride	mg/L	0.5	<0.5	-	<0.5	
Fluoride	mg/L	0.02	<0.02	-	<0.02	
Nitrate and Nitrite (as N)	mg/L	0.0051	<0.0051	-	<0.0051	
Nitrate (as NO3-N)	mg/L	0.005	< 0.005	-	<0.005	
Nitrite (as NO2-N)	mg/L	0.001	<0.001	-	<0.001	
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	<0.05	-	< 0.05	
Nitrogen (Total)	mg/L	0.03	< 0.03	-	< 0.03	
Orthophosphate (as P) (Filtered)	mg/L	0.001	<0.001	-	<0.001	
Phosphorus (Filtered)	mg/L	0.002	<0.002	-	< 0.002	
Phosphorus	mg/L	0.002	<0.002	-	<0.002	
Sulphate	mg/L	0.3	<0.3	-	<0.3	
Silica	Ĭ		<0.5	-	<0.5	
Organic and Inorganic Carbon	•			•	•	
Dissolved Organic Carbon (DOC)	mg/L	0.5	<0.5	<0.5	-	
Total Organic Carbon (TOC)	mg/L	0.5	<0.5	-	<0.5	

-< <u>Bold</u> No applicable guideline or analysis was not conducted.

Concentration is less than the laboratory detection limit indicated.

Bold and underlined indicates an exceedance of the RDL.

RDL

Reported Detection Limit

Parameter	Unit	Reported Detection Limit (RDL)	FIELD BLANK	TRIP BLANK
Sample Date		8/1/2018		
Laboratory Identification Number			L2140393-9	L2140599-5
Matrix			Deionized Water	Deionized Water
Physical Parameters				-
Colour	TCU	5	<5	<5
Electrical Conductivity (EC)	µS/cm	2	<2	<2
рН	pH Units	0.1	<u>5.54</u>	<u>5.65</u>
Total Suspended Solids (TSS)	mg/L	3	<3	<3
Total Dissolved Solids (TDS)	mg/L	1	<10	<10
Turbidity	NTU	0.1	<u>0.16</u>	<0.1
Anions and Nutrients				
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1	<1	<1
Ammonia as N	mg/L	0.005	<0.005	<0.005
Bromide	mg/L	0.05	<0.05	<0.05
Chloride	mg/L	0.5	<0.5	<0.5
Fluoride	mg/L	0.02	<0.02	<0.02
Nitrate and Nitrite (as N)	mg/L	0.0051	<0.0051	<0.0051
Nitrate (as NO3-N)	mg/L	0.005	<0.005	<0.005
Nitrite (as NO2-N)	mg/L	0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	<0.05	<0.05
Nitrogen (Total)	mg/L	0.03	< 0.03	<0.03
Orthophosphate (as P) (Filtered)	mg/L	0.001	<0.001	<0.001
Phosphorus (Filtered)	mg/L	0.002	<0.002	<0.002
Phosphorus	mg/L	0.002	<0.002	<0.002
Sulphate	mg/L	0.3	<0.3	<0.3
Silica			<0.5	<0.5
Organic and Inorganic Carbon				
Dissolved Organic Carbon (DOC)	mg/L	0.5	<0.5	-
Total Organic Carbon (TOC)	mg/L	0.5	<0.5	<0.5

Table 14: August 2018 Surface Water Quality Results Summary for Blank Analysis

NOTES:

-

No applicable guideline or analysis was not conducted.

Concentration is less than the laboratory detection limit indicated.

< <u>Bold</u> RDL

Bold and underlined indicates an exceedance of the RDL.

Reported Detection Limit

Parameter	Unit	Reported Detection Limit (RDL)	FIELD BLANK	TRAVEL BLANK
Sample Date		1	9/13/2018	9/13/2018
Laboratory Identification Number			L2163952-5	L2163952-6
Matrix			Deionized Water	Deionized Water
Physical Parameters				
Colour	TCU	5	<5	<5
Electrical Conductivity (EC)	µS/cm	2	<2	<2
рН	pH Units	0.1	<u>5.41</u>	<u>5.34</u>
Total Suspended Solids (TSS)	mg/L	3	<3	<3
Total Dissolved Solids (TDS)	mg/L	1	<1	<1
Turbidity	NTU	0.1	<u>0.17</u>	<0.1
Anions and Nutrients				
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1	<1	<1
Ammonia as N	mg/L	0.005	<0.005	<0.005
Bromide	mg/L	0.05	<0.05	<0.05
Chloride	mg/L	0.5	<0.5	<0.5
Fluoride	mg/L	0.02	<0.02	<0.02
Nitrate and Nitrite (as N)	mg/L	0.0051	<0.0051	<0.0051
Nitrate (as NO3-N)	mg/L	0.005	< 0.005	<0.005
Nitrite (as NO2-N)	mg/L	0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	<0.05	<0.05
Nitrogen (Total)	mg/L	0.03	< 0.03	< 0.03
Orthophosphate (as P) (Filtered)	mg/L	0.001	<0.001	<0.001
Phosphorus (Filtered)	mg/L	0.002	<0.002	<0.002
Phosphorus	mg/L	0.002	0.0068	<0.002
Sulphate	mg/L	0.3	<0.3	<0.3
Silica			<0.5	<0.5
Organic and Inorganic Carbon				
Dissolved Organic Carbon (DOC)	mg/L	0.5	<0.5	-
Total Organic Carbon (TOC)	mg/L	0.5	<0.5	<0.5

Table 14: September 2018 Surface Water Quality Results Summary for Blank Analysis

NOTES:

-

No applicable guideline or analysis was not conducted.

Concentration is less than the laboratory detection limit indicated.

< <u>Bold</u> RDL

Bold and underlined indicates an exceedance of the RDL. Reported Detection Limit

Parameter	Parameter Unit Reported Detection Limit (RDL)		FIELD BLANK	TRIP BLANK	
Sample Date			10/20/2018	10/20/2018	
Laboratory Identification Number			L2184609-3 Deionized Water	L2184609-4	
Matrix Physical Parameters			Deionized water	Deionized Wate	
Colour	TCU	5	<5	<5	
Electrical Conductivity (EC)	µS/cm	2	<2	<2	
Hardness as CaCO3	mg/L	0.5	<0.5	<0.5	
	pH Units	0.1	5.44	<u>5.4</u>	
Total Suspended Solids (TSS) Total Dissolved Solids (TDS)	mg/L	3	<3 <1	<3 <1	
Turbidity	mg/L NTU	0.1	<0.1	<0.1	
Anions and Nutrients	iiio	0.1	\$0.1	\$0.1	
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	<1	
Alkalinity (Carbonate as CaCO3)	mg/L	1	<1	<1	
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	
Alkalinity (total as CaCO3)	mg/L	1	<1	<1	
Ammonia as N	mg/L	0.005	<0.005	< 0.005	
Bromide Chloride	mg/L	0.05	<0.05 <0.5	<0.05 <0.5	
Fluoride	mg/L mg/L	0.02	<0.02	<0.02	
Nitrate and Nitrite (as N)	mg/L	0.02	<0.002	<0.002	
Nitrate (as NO3-N)	mg/L	0.005	< 0.005	<0.005	
Nitrite (as NO2-N)	mg/L	0.001	<0.000	< 0.001	
Total Kjeldahl Nitrogen (TKN)	mg/L	0.05	<0.05	<0.05	
Nitrogen (Total)	mg/L	0.03	<0.03	<0.03	
Orthophosphate (as P) (Filtered)	mg/L	0.001	<0.001	<0.001	
Phosphorus (Filtered)	mg/L	0.002	<0.002	< 0.002	
Phosphorus	mg/L	0.002	<0.002	< 0.002	
Sulphate Silica	mg/L	0.3 0.5	<0.3 <0.5	<0.3 <0.5	
Silica Anions Total	mg/L meg/L	0.0	<0.5 <0.1	<0.5	
Cations Total	meq/L		<0.1	<0.1	
onic Balance	N/A		0	0	
Organic and Inorganic Carbon		1			
Dissolved Organic Carbon (DOC)	mg/L	0.5	<0.5	-	
Total Organic Carbon (TOC)	mg/L	0.5	<0.5	<0.5	
Fotal Metals		1	1		
Aluminum	mg/L	0.005	< 0.005	< 0.005	
Antimony Arsenic	mg/L mg/L	0.0005	<0.0005 <0.0005	<0.0005	
Barium	mg/L	0.0005	<0.000	<0.0005	
Beryllium	mg/L	0.001	<0.0001	<0.0001	
Bismuth	mg/L	0.2	<0.2	<0.2	
Boron - soluble	mg/L	0.1	<0.1	<0.1	
Cadmium	mg/L	0.000005	<0.000005	<0.000005	
Calcium	mg/L	0.1	<0.1	<0.1	
	mg/L	0.001	< 0.001	< 0.001	
Cobalt Copper	mg/L	0.0003	<0.0003 <0.001	<0.0003 <0.001	
	mg/L	0.001			
ron _ead	mg/L	0.03 0.0005	<0.03 <0.0005	<0.03	
Lithium	mg/L mg/L	0.0005	<0.0003	<0.0003	
Magnesium	mg/L	0.001	<0.001	<0.001	
Vagnesian	mg/L	0.0001	0.00011	<0.0001	
Mercury	mg/L	0.000005 or 0.0000005	< 0.0000005	<0.0000005	
Methyl mercury	mg/L	0.0000002	<0.00000002	<0.00000002	
Molybdenum	mg/L	0.001	<0.001	<0.001	
Nickel	mg/L	0.001	<0.001	<0.001	
Phosphorus	mg/L	0.3	<0.3	<0.3	
Potassium	mg/L	2	<2	<2	
Selenium	mg/L	0.00005	<0.00005	<0.00005	
Silicon Silver	mg/L	0.05	<0.1 <0.00002	<0.1	
	mg/L	0.00002			
Sodium Strontium	mg/L mg/L	2 0.005	<2 <0.005	<2 <0.005	
Fhallium	mg/L mg/L	0.005	<0.005	<0.005	
Fin	mg/L	0.0002	<0.0005	<0.0005	
Fitanium	mg/L	0.01	<0.01	<0.01	
Jranium	mg/L	0.0002	<0.0002	<0.0002	
/anadium	mg/L	0.0005	<0.0005	<0.0005	
Zinc	mg/L	0.005	<0.005	<0.005	
Dissolved Metals		 			
Aluminum (Filtered)	mg/L	0.005	<0.005	-	
Antimony (Filtered)	mg/L	0.0005	< 0.0005	-	
Arsenic (Filtered)	mg/L	0.0005	< 0.0005	-	
Barium (Filtered)	mg/L	0.02	<0.02 <0.0001		
Beryllium (Filtered) Bismuth (Filtered)	mg/L mg/L	0.001	<0.0001 <0.2	-	
Boron - soluble (Filtered)	mg/L mg/L	0.2	<0.2	-	
Cadmium (Filtered)	mg/L	0.000005	<0.000005		
Calcium (Filtered)	mg/L	0.000005	<0.1	-	
Chromium (Filtered)	mg/L	0.001	<0.001		
Cobalt (Filtered)	mg/L	0.0003	<0.0003	-	
Copper (Filtered)	mg/L	0.001	<0.001	-	
Copper (Filtered) ron (Filtered)	mg/L mg/L	0.03	<0.001 <0.03	-	
Copper (Filtered) Iron (Filtered) Ferrous Iron (Filtered) Lead (Filtered)				_	

Leau (I litereu)	IIIg/L	0.0005	<0.0005	-
Lithium (Filtered)	mg/L	0.001	<0.001	-
Magnesium (Filtered)	mg/L	0.1	<0.1	-
Manganese (Filtered)	mg/L	0.0001	<0.0001	-
Mercury (Filtered)	mg/L	0.000005 or 0.0000005	<0.000005	-
Methyl mercury (Filtered)	mg/L	0.0000002	0.00000071	-
Molybdenum (Filtered)	mg/L	0.001	<0.001	-
Nickel (Filtered)	mg/L	0.001	<0.001	-
Phosphorus (filtered) (Filtered)	mg/l	0.3	<0.3	-
Potassium (Filtered)	mg/L	2	<2	-
Selenium (Filtered)	mg/L	0.00005	<0.00005	-
Silicon (Filtered)	mg/L	0.05	<0.05	-
Silver (Filtered)	mg/L	0.00002	<0.00002	-
Sodium (Filtered)	mg/L	2	<2	-
Strontium (Filtered)	mg/L	0.005	<0.005	-
Thallium (Filtered)	mg/L	0.0002	<0.0002	-
Tin (Filtered)	mg/L	0.0005	< 0.0005	-
Titanium (Filtered)	mg/L	0.01	<0.01	-
Uranium (Filtered)	mg/L	0.0002	<0.0002	-
Vanadium (Filtered)	mg/L	0.0005	< 0.0005	-
Zinc (Filtered)	mg/L	0.005	<0.005	-

-	No applicable guideline or analysis was not conducted.
<	Concentration is less than the laboratory detection limit indicated.
Bold	Bold and underlined indicates an exceedance of the RDL.
RDL	Reported Detection Limit

Table 15: Summary Statistics

Table 15: Summary	Statistics	-		-					-	
	Peace River Upstream Preconstruction	Peace River Upstream Construction	Peace River Downstream Preconstruction	Peace River Downstream Construction	Tributatries Upstream Preconstruction	Tributaries Upstream Construction	Tributaries Downstream Preconstruction	Tributaries Downstream Construction	Reservoirs Preconstruction	Reservoirs Construction
NITROGEN										
Mean	0.23	0.17	0.35	0.27	0.64	0.43	1.03	0.77	0.17	0.15
Standard Error	0.03	0.01	0.05	0.03	0.16	0.11	0.23	0.07	0.02	0.00
Median	0.18	0.14	0.25	0.17	0.29	0.24	0.76	0.68	0.17	0.14
Mode	0.05	0.14	0.05	0.21	#N/A	#N/A	0.05	1.02	0.05	0.14
Standard Deviation	0.22	0.12	0.29	0.27	0.82	0.66	1.03	0.60	0.10	0.03
Sample Variance	0.05	0.01	0.08	0.07	0.68	0.44	1.07	0.36	0.01	0.00
Kurtosis Skewness	30.24 4.84	26.48 4.89	7.43 2.36	7.59 2.86	5.03 2.28	11.65 3.38	2.60 1.52	3.52 1.65	1.15 1.02	3.87 1.91
Range	1.62	0.85	1.50	1.30	3.39	3.36	4.00	2.81	0.39	0.16
Minimum	0.05	0.08	0.05	0.12	0.05	0.07	0.05	0.08	0.05	0.10
Maximum	1.67	0.93	1.55	1.42	3.44	3.24	4.05	2.89	0.44	0.27
Sum	13.85	12.43	13.47	23.21	17.87	15.07	20.62	53.47	3.51	9.83
Count	60	72	39	86	28	35	20	69	21	66
PHOSPHORUS										
Mean	0.05	1.33	0.12	0.15	0.21	0.22	0.22	0.29	0.01	0.01
Standard Error	0.02	0.28	0.04	0.03	0.05	0.08	0.08	0.06	0.00	0.00
Median	0.01	0.02	0.06	0.04	0.12	0.05	0.07	0.09	0.01	0.00
Mode	0.01	0.00	#N/A	0.13	#N/A	#N/A	#N/A	#N/A	#N/A	0.00
Standard Deviation	0.13	2.38	0.23	0.30	0.23	0.49	0.29	0.48	0.00	0.01
Sample Variance	0.02	5.65	0.05	0.09	0.05	0.24	0.08	0.23	0.00	0.00
Kurtosis	36.56 5.85	15.40 3.24	20.42 4.32	8.42 2.92	0.00	9.83 3.16	4.91 2.12	5.33 2.42	0.56	16.26 3.93
Skewness Range	5.85 0.85	3.24	4.32	2.92	0.64	2.26	2.12	2.42	0.92	0.04
Minimum	0.00	0.00	0.01	0.00	0.04	0.01	0.01	0.00	0.01	0.04
Maximum	0.85	15.10	1.17	1.59	0.65	2.27	1.01	2.13	0.01	0.00
Sum	2.08	95.67	3.03	12.93	3.91	7.67	2.59	20.02	0.11	0.38
Count	44	72	26	86	19	35	12	69	13	66
TOTAL ORGANIC CAR	BON									
Mean	3.36	2.63	3.76	6.71	10.14	9.78	-	22.29	-	3.01
Standard Error	0.32	0.50	0.55	0.73	6.07	1.81	-	2.05	-	0.07
Median	3.02	2.75	3.17	4.17	4.62	6.56	-	19.30	-	2.86
Mode	2.65	2.73	#N/A	3.89	#N/A	6.56	-	#N/A	-	2.70
Standard Deviation	1.66	4.23	1.64	6.73	13.58	10.72	-	17.00	-	0.61
Sample Variance	2.77	17.91	2.69	45.28	184.49	114.89	-	288.87	-	0.37
Kurtosis	20.48	47.60	5.01	6.22	4.78	6.14	-	1.49	-	6.49
Skewness	4.33	6.30	2.19	2.61	2.17	2.59	-	1.04	-	2.54
Range	8.77	34.70	5.19	30.45	32.35	43.93	-	84.13	-	3.01
Minimum	2.43	0.00	2.56	2.65	1.95	1.57	-	1.67	-	2.37
Maximum	11.20	34.70	7.75	33.10	34.30	45.50	-	85.80	-	5.38
Sum	90.82	189.07	33.85	576.67	50.70	342.29	-	1538.15	-	210.64
Count	27	72	9	86	5	35	-	69	-	70
IRON										
Mean	1.00	1.33	2.70	6.26	7.44	6.35	9.46	13.19	0.11	0.19
Standard Error	0.51	0.64	0.81	1.45	2.92	2.30	5.05	3.11	0.03	0.07
Median	0.16	0.14	0.77	1.16	1.81	1.46	3.32	3.77	0.08	0.04
Mode	0.07	0.06	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.08	0.03
Standard Deviation	3.28	4.03	3.95	8.95 80.02	12.05 145.17	10.53 110.92	15.95	17.59	0.09	0.38
Sample Variance Kurtosis	10.76 36.63	16.25 26.49	15.60 6.14	0.33	3.93	3.26	254.53 7.52	309.42 0.92	9.64	0.14 2.62
Skewness	5.91	4.91	2.35	1.36	2.19	2.07	2.68	1.47	3.04	2.02
Range	21.07	23.87	16.56	28.18	38.20	36.87	52.50	57.33	0.33	1.18
Minimum	0.03	0.03	0.04	0.12	0.20	0.13	0.20	0.07	0.05	0.03
Maximum	21.10	23.90	16.60	28.30	38.40	37.00	52.70	57.40	0.37	1.21
Sum	41.93	53.04	64.90	237.70	126.45	133.35	94.62	421.98	1.19	5.06
Count	42	40	24	38	17	21	10	32	11	26
CHLOROPHYLL A										
Mean	0.78	1.00	0.87	1.51	0.37	3.17	-	4.31	-	0.92
Standard Error	0.05	0.26	0.09	0.17	0.11	0.75	-	1.07	-	0.06
Median	0.79	0.83	0.76	1.45	0.41	3.17	-	5.19	-	0.80
Mode	0.83	#N/A	#N/A	#N/A	#N/A	#N/A	-	#N/A	-	0.74
Standard Deviation	0.28	0.52	0.28	0.34	0.24	1.07	-	2.15	-	0.47
Sample Variance	0.08	0.27	0.08	0.12	0.06	1.14	-	4.62	-	0.22
Kurtosis	0.42	0.87	1.04	2.08	-2.84	#DIV/0!	-	3.43	-	-0.15
Skewness	0.24	1.28	1.15	1.04	-0.22	#DIV/0!	-	-1.84	-	0.52
	1.15	1.11	0.86	0.82	0.51	1.51	-	4.61	-	2.14
Range								1 1 1 0		0.11
Minimum	0.24	0.61	0.58	1.16	0.09	2.41	-	1.13	-	
Minimum Maximum	1.39	1.72	1.44	1.98	0.61	3.92	-	5.74	-	2.25
Minimum										



PHOTOS

Photos 1 to 17





Photo 1: W1 Sampling Location, September 11, 2018



Photo 2: D1 Sampling Location, September 11, 2018



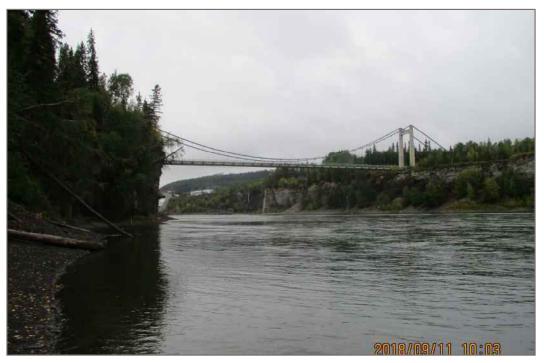


Photo 3: PC1 Sampling Location, September 11, 2018



Photo 4: PR1 Sampling Location, September 13, 2018





Photo 5: PR2 Sampling Location, September 13, 2018



Photo 6: HD Sampling Location, September 13, 2018





Photo 7: PR3 Sampling Location, September 10, 2018



Photo 8: MD Sampling Location, September 10, 2018





Photo 9: PD1 Sampling Location, September 10, 2018



Photo 10: Pine River Sampling Location, September 10, 2018





Photo 11: PD2 Sampling Location, September 12, 2018



Photo 12: Beatton River Sampling Location, September 12, 2018





Photo 13: PD3 Sampling Location, September 12, 2018



Photo 14: Kiskatinaw River Sampling Location, September 12, 2018





Photo 15: PD4 Sampling Location, September 12, 2018



Photo 16: Pouce Coupe Sampling Location, September 12, 2018





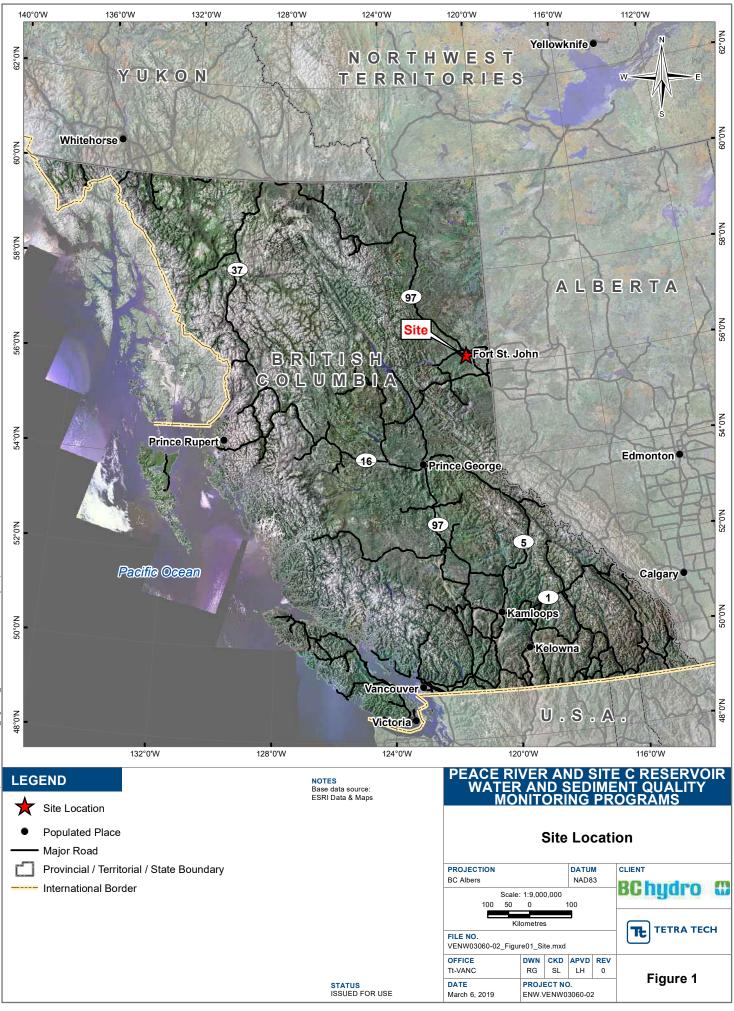
Photo 17: PD5 Sampling Location, September 12, 2018



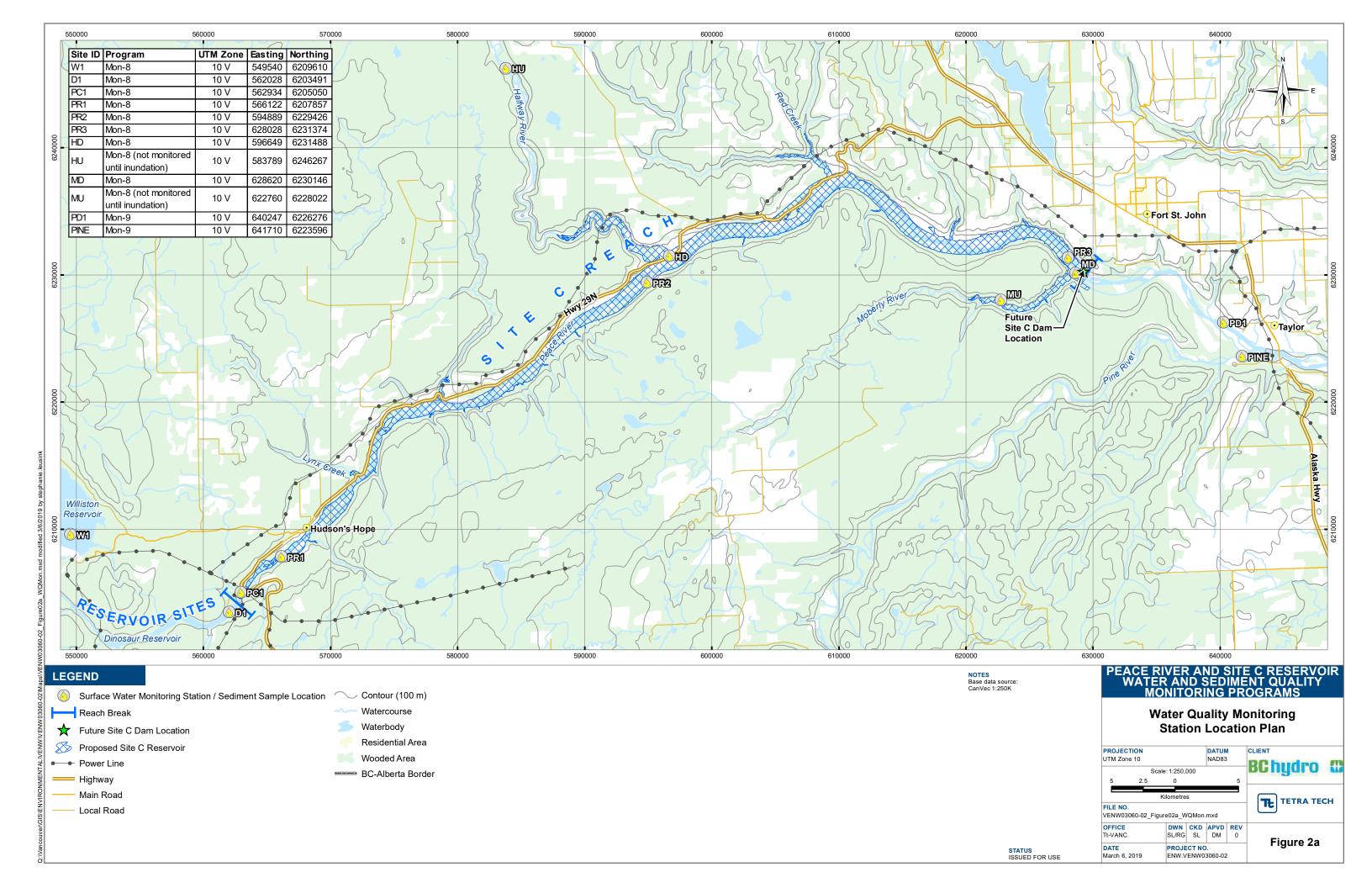
FIGURES

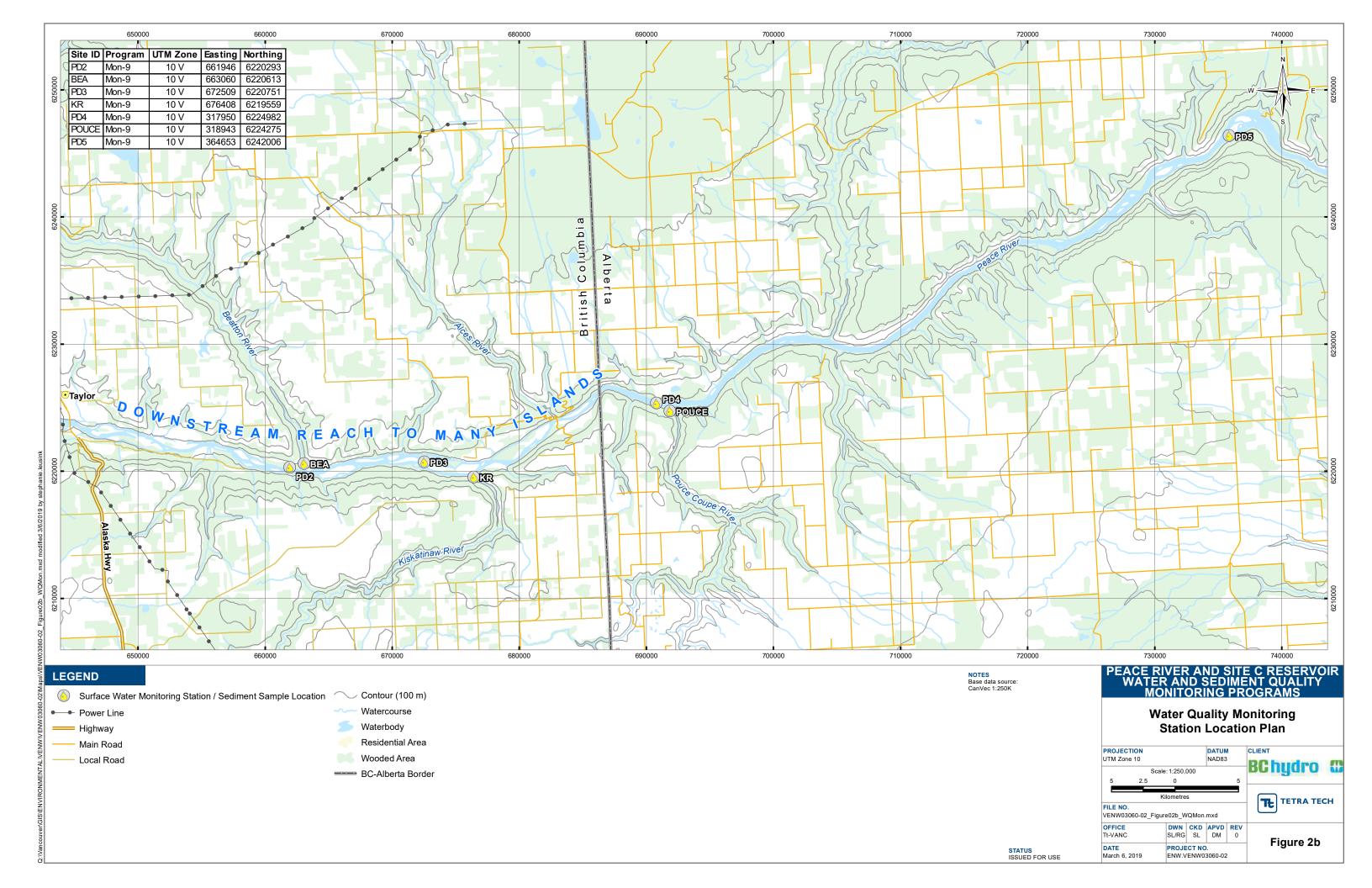
Figure 1	Site Location
Figure 2a	Water Quality Monitoring Station Location Plan
Figure 2b	Water Quality Monitoring Station Location Plan
Figure 3a	Descriptive Analysis of Chlorophyll a
Figure 3b	Descriptive Analysis of Iron
Figure 3c	Descriptive Analysis of Nitrogen
Figure 3d	Descriptive Analysis of Phosphorus
Figure 3e	Descriptive Analysis of TOC

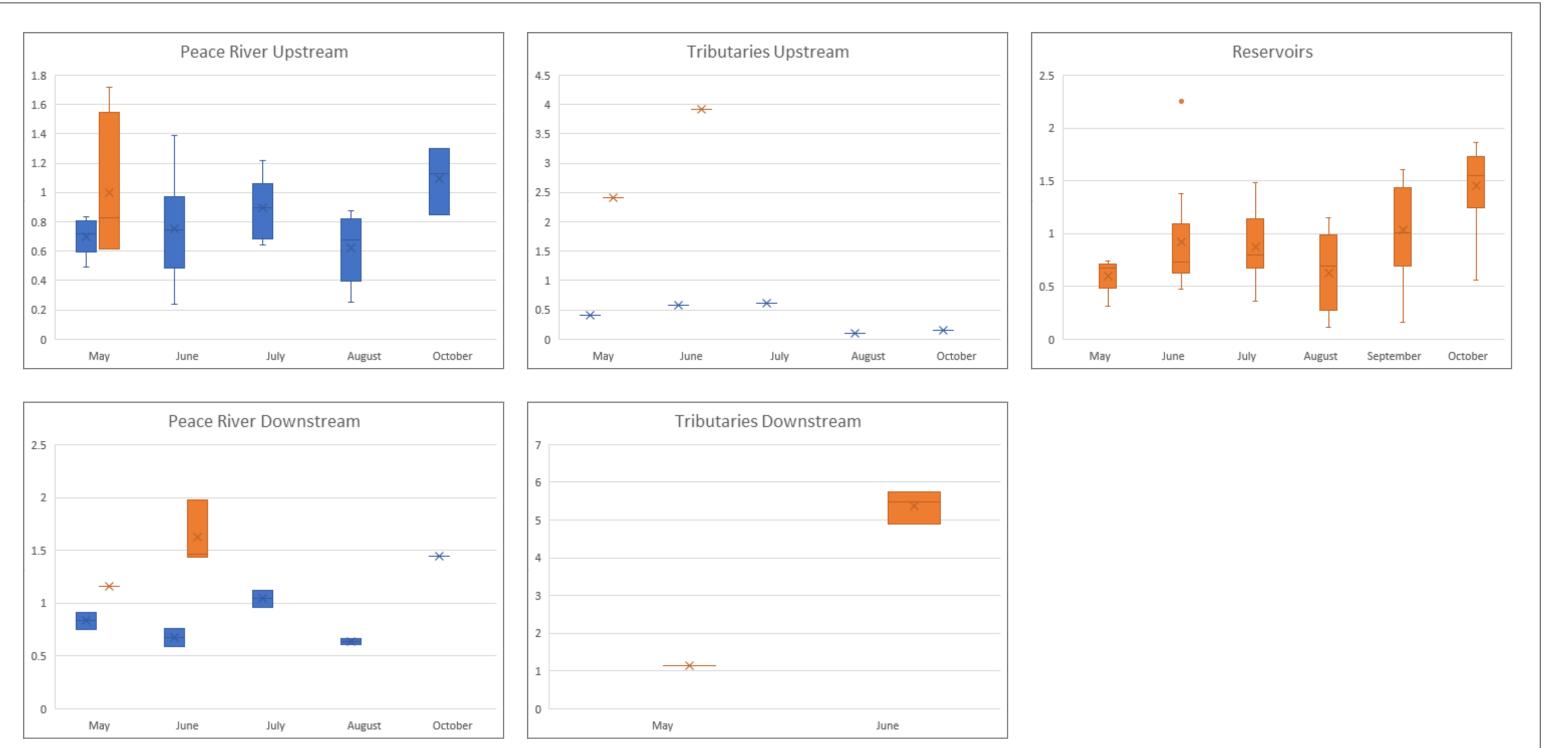




Q:\Vancouver\GIS\ENVIRONMENTAL\VENW03060-02\Maps\VENW03060-02_Figure01_Site.mxd modfifed 3/6/2019 by stephanie.leusink







LEGEND

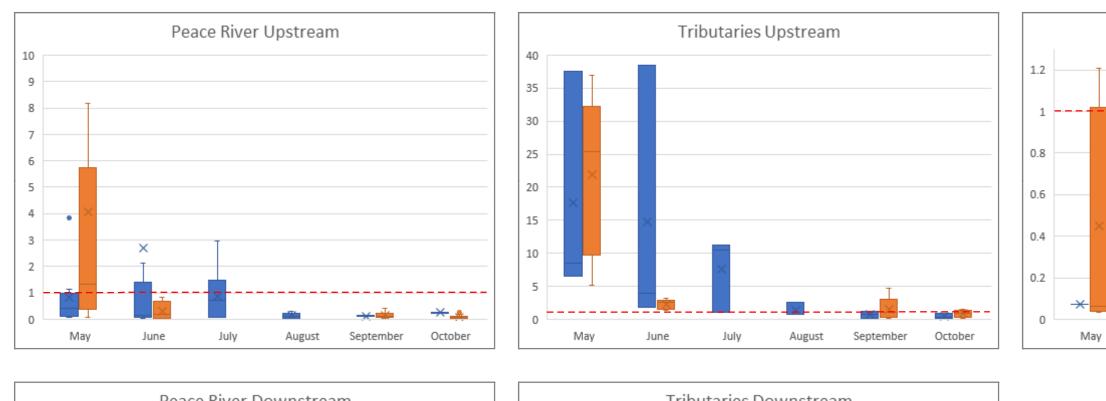
Pre-Construction

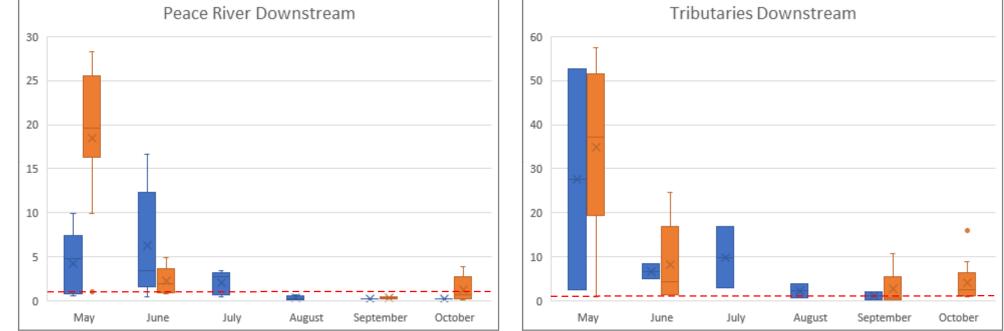
Construction

PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS

Descriptive Analysis of Chlorophyll A

PROJECTION N/A			DATUN N/A	Λ	CLIENT
NOTES 1. Y-axis is mg/L					BChydro @
2. Scale of y-axis var FILE NO. VENW03060-02_Fig		TETRA TECH			
OFFICE Tt-VANC	DWN SL	CKD LH	APVD SW	REV 0	
DATE March 6, 2019		ECT NO). 3060-02	2	Figure 3a





LEGEND

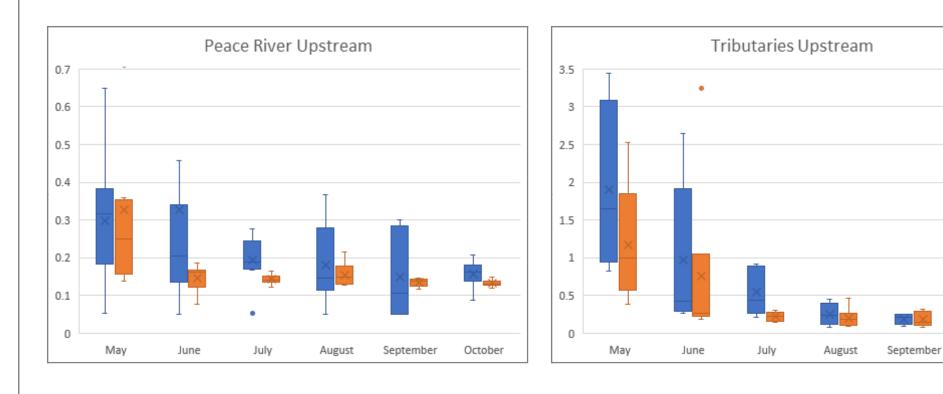
Pre-Construction

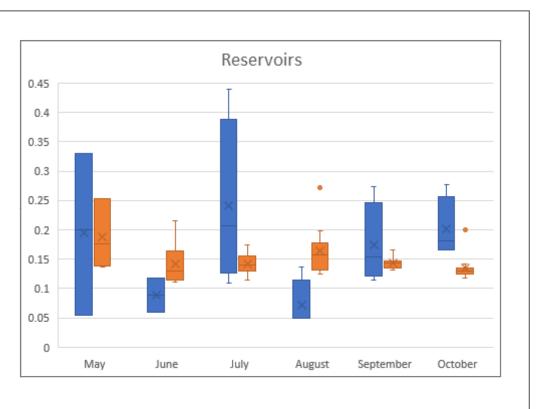
Construction

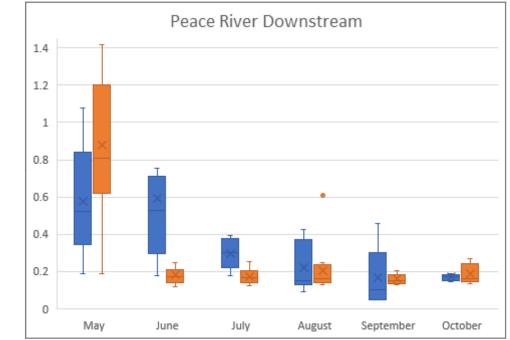
--- BC AWQG Guideline Limit for Total Iron (1 mg/L)

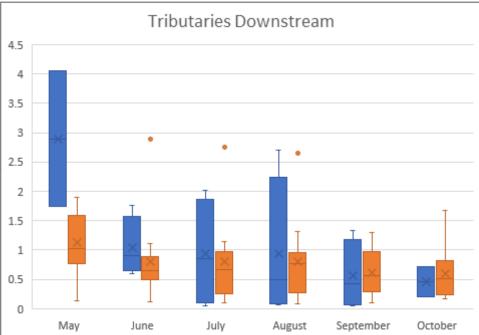
	Reservoirs						
		×					
\times			* *	**			
June	July	August	September	October			

PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS						
Descriptive Analysis of Iron						
PROJECTION			JM	CLIENT		
N/A				PC hudro M		
NOTES 1. Y-axis is mg/L 2. Scale of y-axis y/	aries in each n	BChydro C				
 Scale of y-axis varies in each panel BC AWQG for total iron = 1 mg/L 				TETRA TECH		
FILE NO. VENW03060-02_Figure03b_Iron.mxd						
OFFICE	DWN CH	CD APV	D REV			
Tt-VANC	SL L	.H SW	0	Eiguro 2h		
DATE March 6, 2019	PROJECT ENW.VEN	Figure 3b				









October

LEGEND

Pre-Construction

Construction

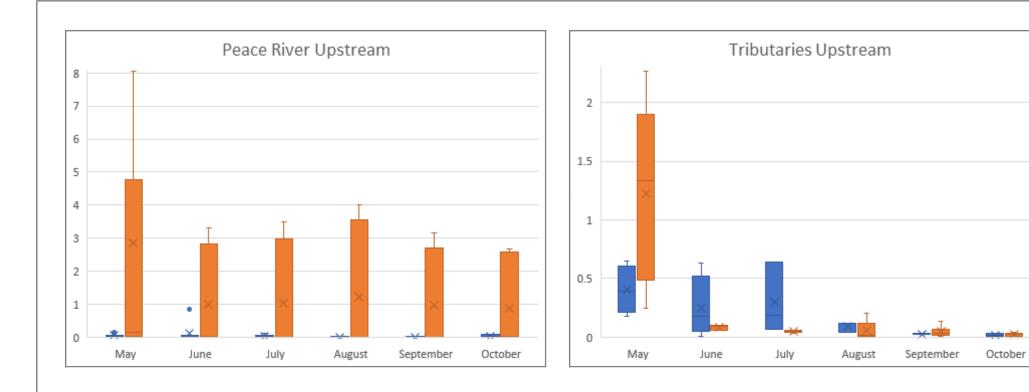
WATER AND SEDIMENT QUALITY MONITORING PROGRAMS							
Dese	criptiv	ve A	nal	ysis	of Nitrogen		
PROJECTION N/A			DATUM N/A				
NOTES 1. Y-axis is mg/L 2. Scale of y-axis v	varies in eac						
FILE NO. VENW03060-02_F	-igure03c_N						
OFFICE Tt-VANC	DWN SL	CKD LH	APVD SW	REV 0	-		

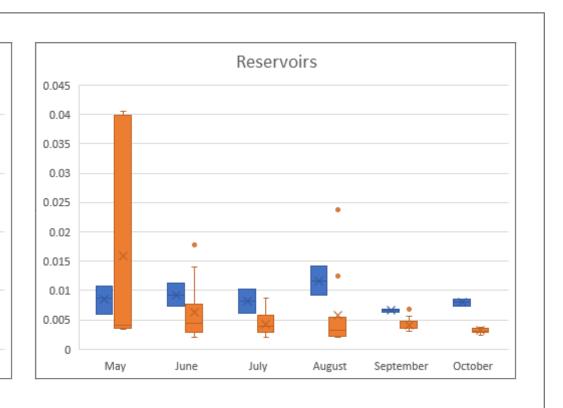
PROJECT NO. ENW.VENW03060-02 Figure 3c

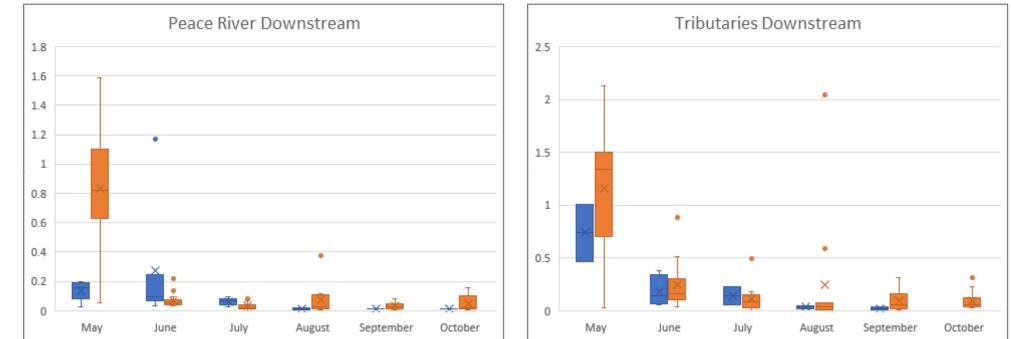
PEACE RIVER AND SITE C RESERVOIR

DATE

March 6, 2019





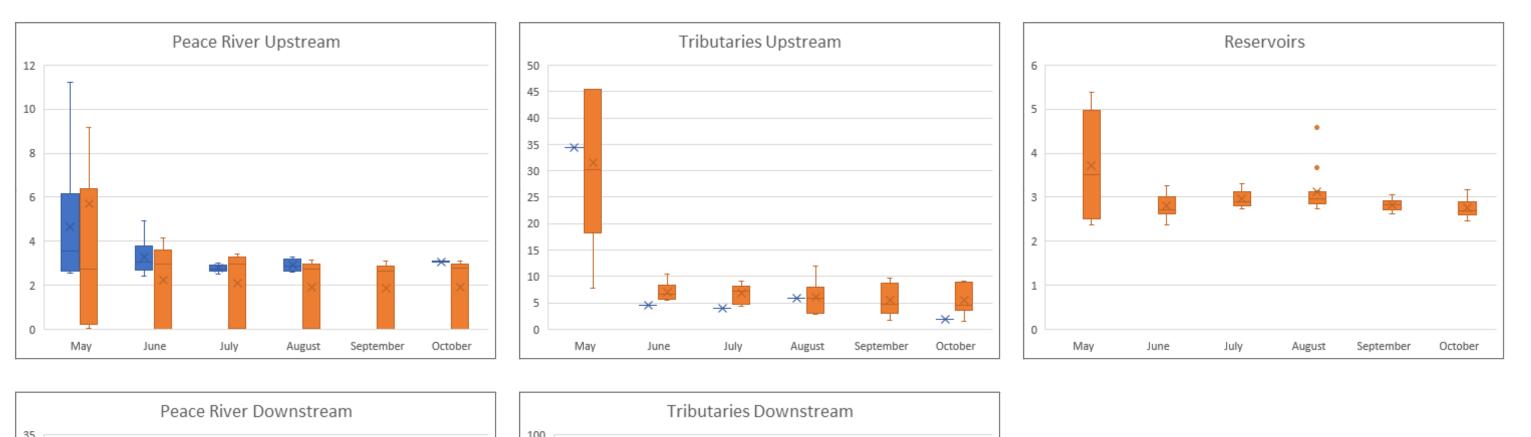


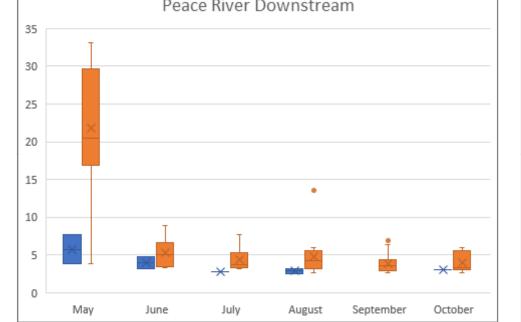
Pre-Construction

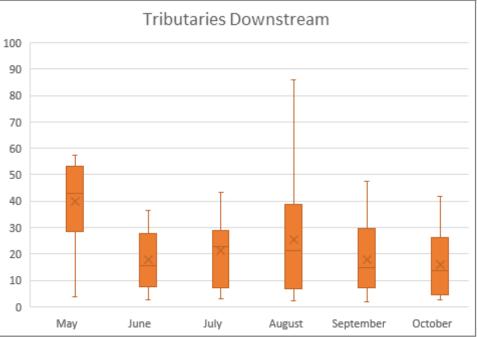
Construction

PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS Descriptive Analysis of Phosphorus

PROJECTION N/A		DATUM N/A		Λ	CLIENT	
NOTES 1. Y-axis is mg/L		BChydro @				
2. Scale of y-axis va FILE NO. VENW03060-02_Fig		TETRA TECH				
OFFICE Tt-VANC	DWN SL PROJE		APVD SW	REV 0	Figure 3d	
March 6, 2019			3060-02	2		







LEGEND

Pre-Construction

Construction

PEACE RIVER AND SITE C RESERVOIR WATER AND SEDIMENT QUALITY MONITORING PROGRAMS							
Descriptive Analysis of TOC							
PROJECTION DATUM N/A N/A			1				
NOTES 1. Y-axis is mg/L 2. Scale of y-axis varie	s in ear	h nane			BChydro C		
FILE NO.					TE TETRA TECH		
VENW03060-02_Figu							
OFFICE Tt-VANC	DWN SL	CKD LH	APVD SW	REV 0	Figure 3e		
DATE March 6, 2019		ECT NC). 3060-02	!	i igule se		

APPENDIX A LIMITATIONS ON THE USE OF THIS DOCUMENT



NATURAL SCIENCES

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The ability to rely upon and generalize from environmental baseline data is dependent on data collection activities occurring within biologically relevant survey windows.

It is incumbent upon the Client and any Authorized Party, to be knowledgeable of the level of risk that has been incorporated into the project design or scope, in consideration of the level of the environmental baseline information that was reasonably acquired to facilitate completion of the scope.

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Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4

Date Received: 12-MAY-18 Report Date: 01-JUN-18 18:39 (MT) Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2093535 Project P.O. #: Job Reference: C of C Numbers:

Legal Site Desc:

NOT SUBMITTED VENW03060-02.002

Brent Mack, B.Sc. Account Manager

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L2093535 CONTD.... PAGE 2 of 13 01-JUN-18 18:39 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2093535-1 Water 11-MAY-18 11:30 WILLISTON SHALLOW (W1- SHALLOW)	L2093535-2 Water 11-MAY-18 12:00 WILLISTON DEEP (W1-DEEP)	L2093535-3 Water 11-MAY-18 15:00 WILLISTON SHALLOW (D1- SHALLOW)	L2093535-4 Water 11-MAY-18 15:30 WILLISTON DEEP (D1-DEEP)	L2093535-5 Water 11-MAY-18 DUPLICATE 1 (DUP 1)
Grouping	Analyte						
FILTER							
Plant Pigments	Chlorophyll a (ug/L)		0.722	0.706	0.742	0.682	0.709

L2093535 CONTD.... PAGE 3 of 13 01-JUN-18 18:39 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2093535-6 Water 11-MAY-18 FIELD BLANK		
Grouping	Analyte				
FILTER					
Plant Pigments	Chlorophyll a (ug/L)		<0.010		

L2093535 CONTD.... PAGE 4 of 13 01-JUN-18 18:39 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2093535-1 Water 11-MAY-18 11:30 WILLISTON SHALLOW (W1- SHALLOW)	L2093535-2 Water 11-MAY-18 12:00 WILLISTON DEEP (W1-DEEP)	L2093535-3 Water 11-MAY-18 15:00 WILLISTON SHALLOW (D1- SHALLOW)	L2093535-4 Water 11-MAY-18 15:30 WILLISTON DEEP (D1-DEEP)	L2093535-5 Water 11-MAY-18 DUPLICATE 1 (DUP 1)
Grouping	Analyte	, , , , , , , , , , , , , , , , , , ,		,		
WATER						
Physical Tests	Colour, True (CU)	5.5	5.5	25.6	23.1	23.6
	Conductivity (umhos/cm)	187	186	172	171	169
	Hardness (as CaCO3) (mg/L)	93.2	91.7	94.0	86.8	89.6
	pH (pH units)	8.04	8.01	8.03	8.00	8.03
	Total Suspended Solids (mg/L)	<3.0	<3.0	17.9	17.3	15.9
	TDS (Calculated) (mg/L)	103	103	102	98.2	100
	Turbidity (NTU)	1.27	1.20	29.9	29.6	30.7
Anions and	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	85.5	86.5	81.6	79.9	81.0
Nutrients	Alleginity Corborate (co. CoCC2) (mg/l.)					
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	85.5	86.5	81.6	79.9	81.0
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0055
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.035	0.036	0.045	0.043	0.042
	Nitrate and Nitrite (as N) (mg/L)	0.0605	0.0605	0.0914	0.0915	0.0935
	Nitrate (as N) (mg/L)	0.0605	0.0605	0.0914	0.0915	0.0935
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.090	0.080	0.204	0.220	0.196
	Total Nitrogen (mg/L)	0.202	0.149	0.253	0.252	0.274
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	0.0025	0.0025	0.0025
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0062	0.0057	0.0061
	Phosphorus (P)-Total (mg/L)	0.0037	0.0042	0.0397	0.0405	0.0403
	Silicate (as SiO2) (mg/L)	4.78	4.60	4.47	4.37	4.64
	Sulfate (SO4) (mg/L)	15.5	15.5	13.6	13.6	13.6
	Anion Sum (meq/L)	2.04	2.06	1.92	1.89	1.91
	Cation Sum (meq/L)	1.86	1.83	1.91	1.77	1.82
	Cation - Anion Balance (%)	-4.5	-5.7	-0.5	-3.3	-2.4
Organic / Inorganic Carbon		2.36	2.30	4.34	4.62	5.00
	Total Organic Carbon (mg/L)	2.43	2.37	4.87	5.12	5.54
Total Metals	Aluminum (Al)-Total (mg/L)	0.0228	0.0256	0.654	0.678	0.677
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050	0.00059	0.00062	0.00059
	Barium (Ba)-Total (mg/L)	0.033	0.033	0.072	0.072	0.071
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

L2093535 CONTD.... PAGE 5 of 13 01-JUN-18 18:39 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2093535-6 Water 11-MAY-18 FIELD BLANK	L2093535-7 Water 11-MAY-18 TRAVEL BLANK	L2093535-8 Water 11-MAY-18 20:00 PEACE CANYON DAM (PC1)	
Grouping	Analyte				
WATER					
Physical Tests	Colour, True (CU)	<5.0	<5.0	21.1	
	Conductivity (umhos/cm)	<1.0	<1.0	175	
	Hardness (as CaCO3) (mg/L)	<0.50	нтс <0.50	92.5	
	pH (pH units)	5.49	5.37	8.00	
	Total Suspended Solids (mg/L)	<3.0	<3.0	16.1	
	TDS (Calculated) (mg/L)	<1.0	<1.0	101	
	Turbidity (NTU)	RRV 0.18	<0.10	27.7	
Anions and	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0	<1.0	81.9	
Nutrients	Alkalinity Carbonato (as CaCO2) (ma/l.)				
	Alkalinity, Carbonate (as CaCO3) (mg/L) Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	
		<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	<1.0	81.9	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	
	Fluoride (F) (mg/L)	<0.020	<0.020	0.042	
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	<0.0051	0.0921	
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.0921	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	<0.050	<0.050	0.186	
	Total Nitrogen (mg/L)	<0.030 HTD	<0.030	0.248	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	0.0020	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0050	
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	0.0378	
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	4.39	
	Sulfate (SO4) (mg/L)	<0.30	<0.30	14.0	
	Anion Sum (meq/L)	<0.10	<0.10	1.94	
	Cation Sum (meq/L)	<0.10	<0.10	1.86	
	Cation - Anion Balance (%)	0.0	0.0	-1.9	
Organic / Inorganic Carbon		<0.50	SP	4.25	
T -4-184 4 5	Total Organic Carbon (mg/L)	<0.50	<0.50	4.83	
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0050	<0.0050	0.531	
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050	0.00055	
	Barium (Ba)-Total (mg/L)	<0.020	<0.020	0.067	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	

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	Sample ID Description Sampled Date Sampled Time Client ID	L2093535-1 Water 11-MAY-18 11:30 WILLISTON SHALLOW) (W1- SHALLOW)	L2093535-2 Water 11-MAY-18 12:00 WILLISTON DEEP (W1-DEEP)	L2093535-3 Water 11-MAY-18 15:00 WILLISTON SHALLOW (D1- SHALLOW)	L2093535-4 Water 11-MAY-18 15:30 WILLISTON DEEP (D1-DEEP)	L2093535-5 Water 11-MAY-18 DUPLICATE 1 (DUP 1)
Grouping	Analyte					
WATER						
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.0000112	0.0000138	0.0000379	0.0000388	0.0000440
	Calcium (Ca)-Total (mg/L)	27.3	26.9	25.4	25.3	25.4
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	0.0017	0.0017	0.0021
	Cobalt (Co)-Total (mg/L)	<0.00030	<0.00030	0.00039	0.00040	0.00039
	Copper (Cu)-Total (mg/L)	<0.0010	<0.0010	0.0024	0.0017	0.0026
	Iron (Fe)-Total (mg/L)	0.040	0.037	0.967	1.01	0.998
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00055
	Lithium (Li)-Total (mg/L)	0.0010	0.0010	0.0022	0.0021	0.0020
	Magnesium (Mg)-Total (mg/L)	6.12	6.25	6.18	6.11	6.16
	Manganese (Mn)-Total (mg/L)	0.00301	0.00300	0.0139	0.0143	0.0140
	Mercury (Hg)-Total (ug/L)	0.00056	0.00051	0.00448	0.00446	0.00449
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	<0.0010	<0.0010	0.0023	0.0023	0.0024
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	0.000290	0.000243	0.000275	0.000275	0.000281
	Silicon (Si)-Total (mg/L)	2.25	2.24	3.18	3.12	3.11
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Strontium (Sr)-Total (mg/L)	0.118	0.119	0.106	0.105	0.107
	Thallium (TI)-Total (mg/L)	<0.000010	<0.000010	0.000018	0.000019	0.000017
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total (mg/L)	0.00052	0.00052	0.00048	0.00049	0.00049
	Vanadium (V)-Total (mg/L)	DLB <0.0010	DLB <0.0010	0.00318	0.00329	0.00327
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050	0.0059	0.0053	0.0061
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Mercury Filtration Location	LAB	LAB	LAB	LAB	LAB
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (AI)-Dissolved (mg/L)	0.0136	0.0083	0.121	0.144	0.132
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Barium (Ba)-Dissolved (mg/L)	0.031	0.030	0.055	0.054	0.054
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10

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	Sample ID Description Sampled Date Sampled Time Client ID	L2093535-6 Water 11-MAY-18 FIELD BLANK	L2093535-7 Water 11-MAY-18 TRAVEL BLANK	L2093535-8 Water 11-MAY-18 20:00 PEACE CANYON DAM (PC1)
Grouping	Analyte			
WATER				
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.000050	0.0000400
	Calcium (Ca)-Total (mg/L)	<0.10	<0.10	26.2
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	0.0019
	Cobalt (Co)-Total (mg/L)	<0.00030	<0.00030	0.00034
	Copper (Cu)-Total (mg/L)	<0.0010	<0.0010	0.0017
	Iron (Fe)-Total (mg/L)	<0.030	<0.030	0.810
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	0.0019
	Magnesium (Mg)-Total (mg/L)	<0.10	<0.10	6.35
	Manganese (Mn)-Total (mg/L)	<0.00010	<0.00010	0.0130
	Mercury (Hg)-Total (ug/L)	<0.00050	<0.00050	0.00420
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	<0.0010	<0.0010	0.0022
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	0.000269
	Silicon (Si)-Total (mg/L)	<0.10	<0.10	3.00
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0
	Strontium (Sr)-Total (mg/L)	<0.0050	<0.0050	0.111
	Thallium (TI)-Total (mg/L)	<0.000010	<0.000010	0.000014
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010
	Uranium (U)-Total (mg/L)	<0.00020	<0.00020	0.00050
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	0.00275
	Zinc (Zn)-Total (mg/L)	0.0055	<0.0050	0.0082
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD		FIELD
	Dissolved Mercury Filtration Location	LAB		LAB
	Dissolved Metals Filtration Location	FIELD		FIELD
	Aluminum (AI)-Dissolved (mg/L)	<0.0050		0.0735
	Antimony (Sb)-Dissolved (mg/L)	<0.00050		<0.00050
	Arsenic (As)-Dissolved (mg/L)	<0.00050		<0.00050
	Barium (Ba)-Dissolved (mg/L)	RRV <0.020		0.051
	Beryllium (Be)-Dissolved (mg/L)	<0.00010		<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.20		<0.20
	Boron (B)-Dissolved (mg/L)	<0.10		<0.10

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	Sample ID Description Sampled Date Sampled Time Client ID	L2093535-1 Water 11-MAY-18 11:30 WILLISTON SHALLOW (W1- SHALLOW)	L2093535-2 Water 11-MAY-18 12:00 WILLISTON DEEP (W1-DEEP)	L2093535-3 Water 11-MAY-18 15:00 WILLISTON SHALLOW (D1- SHALLOW)	L2093535-4 Water 11-MAY-18 15:30 WILLISTON DEEP (D1-DEEP)	L2093535-5 Water 11-MAY-18 DUPLICATE 1 (DUP 1)
Grouping	Analyte					
WATER						
Dissolved Metals	Cadmium (Cd)-Dissolved (mg/L)	0.000068	0.0000079	0.0000176	0.0000266	0.0000206
	Calcium (Ca)-Dissolved (mg/L)	26.8	26.3	27.5	24.4	25.2
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	0.0011	0.0012	0.0011
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	0.273	0.330	0.290
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	0.0011	0.0016	0.0015	0.0014
	Magnesium (Mg)-Dissolved (mg/L)	6.36	6.34	6.16	6.31	6.49
	Manganese (Mn)-Dissolved (mg/L)	0.00223	0.00165	0.00786	0.00888	0.00814
	Mercury (Hg)-Dissolved (ug/L)	<0.00050	<0.00050	0.00060	0.00063	0.00054
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Dissolved (mg/L)	<0.0010	<0.0010	0.0014	0.0015	0.0014
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Dissolved (mg/L)	0.000224	0.000265	0.000173	0.000223	0.000233
	Silicon (Si)-Dissolved (mg/L)	2.20	2.22	2.31	2.41	2.32
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Strontium (Sr)-Dissolved (mg/L)	0.104	0.103	0.0994	0.0962	0.0971
	Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00046	0.00047	0.00043	0.00043	0.00043
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	0.00058	0.00066	0.00060
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	<0.000020	<0.000020	0.000026	0.000030	0.000024
	Methylmercury (as MeHg)-Total (ug/L)	<0.000020	<0.000020	0.000043	0.000031	0.000028

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	Sample ID Description Sampled Date Sampled Time Client ID	L2093535-6 Water 11-MAY-18 FIELD BLANK	L2093535-7 Water 11-MAY-18 TRAVEL BLANK	L2093535-8 Water 11-MAY-18 20:00 PEACE CANYON DAM (PC1)	
Grouping	Analyte				
WATER					
Dissolved Metals	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050		0.0000143	
	Calcium (Ca)-Dissolved (mg/L)	<0.10		26.3	
	Chromium (Cr)-Dissolved (mg/L)	<0.0010		<0.0010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00030		<0.00030	
	Copper (Cu)-Dissolved (mg/L)	<0.0010		0.0015	
	Iron (Fe)-Dissolved (mg/L)	<0.030		0.133	
	Lead (Pb)-Dissolved (mg/L)	<0.00050		<0.00050	
	Lithium (Li)-Dissolved (mg/L)	<0.0010		0.0014	
	Magnesium (Mg)-Dissolved (mg/L)	<0.10		6.51	
	Manganese (Mn)-Dissolved (mg/L)	<0.00010		0.00607	
	Mercury (Hg)-Dissolved (ug/L)	<0.00050		0.00063	
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010		<0.0010	
	Nickel (Ni)-Dissolved (mg/L)	<0.0010		0.0013	
	Phosphorus (P)-Dissolved (mg/L)	<0.30		<0.30	
	Potassium (K)-Dissolved (mg/L)	<2.0		<2.0	
	Selenium (Se)-Dissolved (mg/L)	<0.000050		0.000328	
	Silicon (Si)-Dissolved (mg/L)	<0.050		2.26	
	Silver (Ag)-Dissolved (mg/L)	<0.000020		<0.000020	
	Sodium (Na)-Dissolved (mg/L)	<2.0		<2.0	
	Strontium (Sr)-Dissolved (mg/L)	<0.0050		0.0988	
	Thallium (TI)-Dissolved (mg/L)	<0.00020		<0.00020	
	Tin (Sn)-Dissolved (mg/L)	RRV 0.00068		<0.00050	
	Titanium (Ti)-Dissolved (mg/L)	<0.010		<0.010	
	Uranium (U)-Dissolved (mg/L)	<0.00020		0.00047	
	Vanadium (V)-Dissolved (mg/L)	<0.00050		<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0050		<0.0050	
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	<0.000020		0.000024	
	Methylmercury (as MeHg)-Total (ug/L)	<0.000020	<0.000020	0.000026	

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QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Arsenic (As)-Total	MB-LOR	L2093535-1, -2, -3, -4, -5, -6, -7, -8
Method Blank	Chromium (Cr)-Total	MB-LOR	L2093535-1, -2, -3, -4, -5, -6, -7, -8
Method Blank	Manganese (Mn)-Total	MB-LOR	L2093535-3, -4, -5, -6, -7, -8
Method Blank	Vanadium (V)-Total	MB-LOR	L2093535-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Dissolved Organic Carbon	MS-B	L2093535-1, -2, -3, -4, -5, -6, -8
Matrix Spike	Total Organic Carbon	MS-B	L2093535-1, -3, -4, -5, -6, -7, -8
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2093535-1, -2, -3, -4, -5, -6, -8
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2093535-6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2093535-1, -2, -3, -4, -5, -6, -8
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2093535-6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2093535-1, -2, -3, -4, -5, -6, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2093535-6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2093535-6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2093535-1, -2, -3, -4, -5, -6, -8
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2093535-6
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2093535-6
Matrix Spike	Calcium (Ca)-Total	MS-B	L2093535-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2093535-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Manganese (Mn)-Total	MS-B	L2093535-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Potassium (K)-Total	MS-B	L2093535-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sodium (Na)-Total	MS-B	L2093535-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Total	MS-B	L2093535-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Total Nitrogen	MS-B	L2093535-1, -2, -3, -4, -5, -7, -8
Matrix Spike	Total Nitrogen	MS-B	L2093535-1, -2, -3, -4, -5, -7, -8
Matrix Spike	Phosphorus (P)-Total	MS-B	L2093535-1, -2, -3, -4, -5, -6, -7, -8

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SP	Sample was Preserved at the laboratory

Test Method References:

electrometrically.

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-CO3-CALC-WP	Water	Alkalinity, Carbonate (as CaCO3)	CALCULATION
		its acid neutralizing capacity.Alkalinity is impain uted by carbonate is calculated and reported as	rted by bicarbonate, carbonate and hydroxide components of s mg/L CaCO3.
ALK-HCO3-CALC-WP	Water	Alkalinity, Bicarbonate (as CaCO3)	CALCULATION
3		its acid neutralizing capacity.Alkalinity is impain uted by bicarbonate is calculated and reported	rted by bicarbonate, carbonate and hydroxide components of as mg/L CaCO3.
ALK-OH-CALC-WP	Water	Alkalinity, Hydroxide (as CaCO3)	CALCULATION
		its acid neutralizing capacity.Alkalinity is impain uted by hydroxide is calculated and reported as	rted by bicarbonate, carbonate and hydroxide components of s mg/L CaCO3.
ALK-TITR-WP	Water	Alkalinity, Total (as CaCO3)	APHA 2320B
			rted by bicarbonate, carbonate and hydroxide components of the successive HCO3- and H2CO3 endpoints indicated

ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is	a calculated	parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy:	zed by Ion C	hromatography with conductivity and/or UV detectio	n.
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B
		dures adapted from APHA Method 5310 "Total Orga igh a 0.45 micron membrane filter prior to analysis.	anic Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out	using proce	dures adapted from APHA Method 5310 "Total Orga	anic Carbon (TOC)".
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0
		modified from EPA Method 445.0. Chlorophyll-a is cidification procedure. This method is not subject to	determined by a routine acetone extraction followed with o interferences from chlorophyll b.
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion C	hromatography with conductivity and/or UV detectio	n.
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
is determined by filtering a method.	sample throu	ugh a 0.45 micron membrane filter followed by analy	I Manual "Colour- Single Wavelength." Colour (True Colour) ysis of the filtrate using the platinum-cobalt colourimetric
Colour measurements can Concurrent measurement of		I dependent, and apply to the pH of the sample as r I is recommended.	eceived (at time of testing), without pH adjustment.
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of cond	ductivity whe	re required during preparation of other tests - e.g. T	DS, metals, etc.
EC-WP	Water	Conductivity	APHA 2510B
Conductivity of an aqueous and chemically inert electron		ers to its ability to carry an electric current. Conduc	tance of a solution is measured between two spatially fixed
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion C	hromatography with conductivity and/or UV detectio	on.
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
		ss) is calculated from the sum of Calcium and Magr centrations are preferentially used for the hardness	nesium concentrations, expressed in CaCO3 equivalents.
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
American Public Health As (EPA). The procedure may	sociation, an y involve prei r to a purge a	d with procedures adapted from Method 1631 Rev. iminary sample treatment by filtration (APHA 3030E and trap concentration step and final reduction of th	mination of Water and Wastewater" published by the . E. by the United States Environmental Protection Agency B) and involves a cold-oxidation of the acidified sample using he sample with stannous chloride. Instrumental analysis is
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
procedure involves a cold-	oxidation of t	dures adapted from Method 1631 Rev. E. by the Un he acidified sample using bromine monochloride pri chloride. Instrumental analysis is by cold vapour ato	
IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E
			nce from APHA Standard Methods (1030E Checking ated ion balance (% difference of cations minus anions)
Cation and Anion Sums are included where data is pres		· ·	ssolved species are used where available. Minor ions are
Ion Balance (%) = [Cation 5	Sum-Anion S	Sum] / [Cation Sum+Anion Sum]	
MEHG-D-GCAF-VA	Water	Diss. Methylmercury in Water by GCAFS	EPA 1630
interferences. The distillate	is analyzed	e US EPA. Samples are distilled under an inert gas by aqueous phase ethylation, purge and trap, deso d by cold vapour atomic flourescence spectroscopy.	rption and GC separation. The separated species are then

MEHG-T-GCAF-VA	Water	Total Methylmercury in Water by GCAFS	EPA 1630
interferences. The distillate	is analyzed b	US EPA. Samples are distilled under an inert gas flow by aqueous phase ethylation, purge and trap, desorptio by cold vapour atomic flourescence spectroscopy. Res	n and GC separation. The separated species are then
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered	(0.45 um), pr	eserved with nitric acid, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulfu	ur): Sulfide ar	nd volatile sulfur species may not be recovered by this r	nethod.
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digeste	d with nitric a	nd hydrochloric acids, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulfu	ur): Sulfide ar	nd volatile sulfur species may not be recovered by this r	nethod.
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
		lures adapted from APHA Method 4500-P (J) "Persulph ational Environmental Methods Index - Nemi method 57	
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, of Chemistry, "Flow-injectic al.	, on sulfuric a n analysis wi	cid preserved samples, using procedures modified from th fluorescence detection for the determination of trace	n J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyz	zed by Ion Ch	romatography with conductivity and/or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyz	zed by Ion Ch	romatography with conductivity and/or UV detection.	
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestion Samples with very high disa available for these types of	of the sample solved solids samples.	(i.e. seawaters, brackish waters) may produce a negati	
		itive interference on colourimetric phosphate analysis.	
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
colourimetrically after persu	ulphate digest solved solids	lures adapted from APHA Method 4500-P "Phosphorus tion of a sample that has been lab or field filtered throug (i.e. seawaters, brackish waters) may produce a negati	gh a 0.45 micron membrane filter.
Arsenic (5+), at elevated le	vels, is a pos	itive interference on colourimetric phosphate analysis.	
PH-WP	Water	рН	APHA 4500H
The pH of a sample is the of a reference electrode.	determination	of the activity of the hydrogen ions by potentiometric n	neasurement using a standard hydrogen electrode and
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a samp	ble that has be solved solids	lures adapted from APHA Method 4500-P "Phosphorus een lab or field filtered through a 0.45 micron membran (i.e. seawaters, brackish waters) may produce a negati	e filter.
Arsenic (5+), at elevated le	vels, is a pos	itive interference on colourimetric phosphate analysis.	
SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
This analysis is carried out the molybdosilicate-heterop		ures adapted from APHA Method 4500-SiO2 E. "Silica urimetric method.	". Silicate (molybdate-reactive silica) is determined by
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyz	zed by Ion Ch	romatography with conductivity and/or UV detection.	
TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses". The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

L2093535 CONTD.... PAGE 13 of 13 01-JUN-18 18:39 (MT) Version: FINAL

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D. This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. **TURBIDITY-VA** Water Turbidity by Meter APHA 2130 Turbidity This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location WP ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA VA

VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION. Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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ALS Sample # (lab use only)	•	on and/or Coordinates		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-Spe	Color-True,	Turbidity,	TOC, TI	200	otal M	Dissolv	otal H	Vissolv	otal M	Dissolv	hlorop	
	Williston Shallow (W1 - Shallow)	rappear on the report		Maul	11:30	Water	l ∢ R	R	R	R	R	R	R	R	R	R	R	R	11
2	Williston Deep (W1 - Deep)			in the second	12:00	Water	R	R	R	R	R	R	R	R	R	R	R	R	1
	Dinosaur Shallow (D1 - Shallow)			2018	15.00	Water	R	R	R	R	R	R	R	R	R	R	R	R	1 i
	Dinosaur Deep (D1 - Deep)				15:30	Water	R	Ŕ	R	R	R	R	R	R	R	R	R	R	T
5	Duplicate 1 (DUP 1)					Water	R	R	R	R	R	R	R	R	R	R	R	R	T
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Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4

Date Received: 10-MAY-18 Report Date: 04-JUN-18 11:28 (MT) Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2092365 Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

NOT SUBMITTED **VENW03060**

Brent Mack, B.Sc. Account Manager

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L2092365 CONTD.... PAGE 2 of 8 04-JUN-18 11:28 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2092365-1 Water 09-MAY-18 HD	L2092365-2 Water 09-MAY-18 PR1	L2092365-3 Water 09-MAY-18 PR2	L2092365-4 Water 09-MAY-18 DUP2	
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	97.4	18.2	28.0	28.4	
	Conductivity (uS/cm)	208	177	179	181	
	Hardness (as CaCO3) (mg/L)	141	83.8	106	118	
	рН (рН)	7.98	8.06	8.06	8.07	
	Total Suspended Solids (mg/L)	608	18.0	112	131	
	TDS (Calculated) (mg/L)	177	97.4	119	123	
	Turbidity (NTU)	523	26.9	129	134	
Anions and	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	86.5	78.4	81.8	80.7	
Nutrients	Alkelinity Corbonate (as CaCO2) (mail)					
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	86.5 PEHT	78.4	81.8	80.7	
	Ammonia, Total (as N) (mg/L)	0.0057	0.0061	0.0125	0.0090	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Fluoride (F) (mg/L)	0.088	0.042	0.048	0.048	
	Nitrate and Nitrite (as N) (mg/L)	0.0795	0.0956	0.104	0.105	
	Nitrate (as N) (mg/L)	0.0795	0.0956	0.104	0.105	
	Nitrite (as N) (mg/L)	<0.0010 PEHT	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	1.70 RRV	0.175	0.406	0.390	
	Total Nitrogen (mg/L)	0.76	0.242	0.360	0.341	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0078	0.0012	0.0033	0.0029	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0225	0.0039	0.0065	0.0062	
	Phosphorus (P)-Total (mg/L)	0.727	0.0353	0.165	0.156	
	Silicate (as SiO2) (mg/L)	4.15	4.41	4.51	4.56	
	Sulfate (SO4) (mg/L)	26.7	14.8	15.4	15.5	
	Anion Sum (meq/L)	2.29	1.88	1.97	1.94	
	Cation Sum (meq/L)	4.22	1.76	2.71	2.98	
	Cation - Anion Balance (%)	29.6	-3.3	16.0	21.1	
Organic / Inorganic Carbon		18.3	4.61	7.24	7.77	
	Total Organic Carbon (mg/L)	28.8	4.56	8.06	7.80	
Total Metals	Aluminum (Al)-Total (mg/L)	7.20	0.594	2.56	2.48	
	Antimony (Sb)-Total (mg/L)	0.00054	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Total (mg/L)	0.00622	0.00056	0.00182	0.00184	
	Barium (Ba)-Total (mg/L)	0.355	0.064	0.115	0.109	
	Beryllium (Be)-Total (mg/L)	0.00051	<0.00010	0.00013	0.00013	
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	

L2092365 CONTD.... PAGE 3 of 8 04-JUN-18 11:28 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2092365-1 Water 09-MAY-18 HD	L2092365-2 Water 09-MAY-18 PR1	L2092365-3 Water 09-MAY-18 PR2	L2092365-4 Water 09-MAY-18 DUP2	
Grouping	Analyte					
WATER						
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Total (mg/L)	0.000875	0.0000411	0.000240	0.000259	
	Calcium (Ca)-Total (mg/L)	44.5	26.0	30.9	32.8	
	Chromium (Cr)-Total (mg/L)	0.0138	0.0012	0.0047	0.0047	
	Cobalt (Co)-Total (mg/L)	0.00635	0.00035	0.00171	0.00175	
	Copper (Cu)-Total (mg/L)	0.0197	0.0020	0.0061	0.0062	
	Iron (Fe)-Total (mg/L)	14.3	0.880	4.08	4.08	
	Lead (Pb)-Total (mg/L)	0.00819	<0.00050	0.00219	0.00214	
	Lithium (Li)-Total (mg/L)	0.0125	0.0018	0.0040	0.0044	
	Magnesium (Mg)-Total (mg/L)	13.8	6.65	8.41	8.64	
	Manganese (Mn)-Total (mg/L)	0.195	0.0138	0.0645	0.0649	
	Mercury (Hg)-Total (ug/L)	0.0466	0.00396	0.0116	0.0115	
	Molybdenum (Mo)-Total (mg/L)	0.0023	<0.0010	<0.0010	<0.0010	
	Nickel (Ni)-Total (mg/L)	0.0262	0.0021	0.0074	0.0075	
	Phosphorus (P)-Total (mg/L)	0.66	<0.30	<0.30	<0.30	
	Potassium (K)-Total (mg/L)	3.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Total (mg/L)	0.00137	0.000306	0.000390	0.000404	
	Silicon (Si)-Total (mg/L)	12.9	3.17	6.29	6.05	
	Silver (Ag)-Total (mg/L)	0.000186	<0.000020	0.000044	0.000041	
	Sodium (Na)-Total (mg/L)	3.0	<2.0	<2.0	<2.0	
	Strontium (Sr)-Total (mg/L)	0.167	0.101	0.109	0.108	
	Thallium (TI)-Total (mg/L)	0.000251	0.000017	0.000082	0.000072	
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Total (mg/L)	0.041	<0.010	0.040	0.037	
	Uranium (U)-Total (mg/L)	0.00129	0.00053	0.00068	0.00068	
	Vanadium (V)-Total (mg/L)	0.0324	0.00265	0.0107	0.0105	
	Zinc (Zn)-Total (mg/L)	0.0837	0.0059	0.0219	0.0231	
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	8.30	0.636	3.49	3.59 DTC	
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Dissolved (mg/L)	0.00235	<0.00050	0.00121	0.00143	
	Barium (Ba)-Dissolved (mg/L)	0.253	0.056	0.126	0.134	
	Beryllium (Be)-Dissolved (mg/L)	0.00033	<0.00010	0.00017	0.00017	
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	

L2092365 CONTD.... PAGE 4 of 8 04-JUN-18 11:28 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2092365-1 Water 09-MAY-18 HD	L2092365-2 Water 09-MAY-18 PR1	L2092365-3 Water 09-MAY-18 PR2	L2092365-4 Water 09-MAY-18 DUP2	
Grouping	Analyte					
WATER						
Dissolved Metals	Cadmium (Cd)-Dissolved (mg/L)	0.000412	0.0000247	0.000216	0.000238	
	Calcium (Ca)-Dissolved (mg/L)	39.1	23.4	29.8	33.5	
	Chromium (Cr)-Dissolved (mg/L)	0.0122	0.0012	0.0051	0.0057	
	Cobalt (Co)-Dissolved (mg/L)	0.00260	<0.00030	0.00126	0.00146	
	Copper (Cu)-Dissolved (mg/L)	0.0085	0.0012	0.0045	0.0050	
	Iron (Fe)-Dissolved (mg/L)	5.06	0.329	2.67	3.13	
	Lead (Pb)-Dissolved (mg/L)	0.00341	<0.00050	0.00157	0.00190	
	Lithium (Li)-Dissolved (mg/L)	0.0123	0.0020	0.0055	0.0058	
	Magnesium (Mg)-Dissolved (mg/L)	10.5	6.17	7.72	8.30	
	Manganese (Mn)-Dissolved (mg/L)	0.0967	0.00923	0.0562	0.0649	
	Mercury (Hg)-Dissolved (ug/L)	0.0191	0.00320	0.00964	0.00818	
	Molybdenum (Mo)-Dissolved (mg/L)	0.0016	<0.0010	<0.0010	<0.0010	
	Nickel (Ni)-Dissolved (mg/L)	0.0114	0.0014	0.0052	0.0062	
	Phosphorus (P)-Dissolved (mg/L)	0.33	<0.30	<0.30	<0.30	
	Potassium (K)-Dissolved (mg/L)	3.3	<2.0	2.1	2.2	
	Selenium (Se)-Dissolved (mg/L)	0.000816	0.000254	0.000321	0.000377	
	Silicon (Si)-Dissolved (mg/L)	DTMF 22.3	3.52	10.0	отс 10.4	
	Silver (Ag)-Dissolved (mg/L)	0.000066	<0.000020	0.000029	0.000044	
	Sodium (Na)-Dissolved (mg/L)	2.8	<2.0	<2.0	<2.0	
	Strontium (Sr)-Dissolved (mg/L)	0.143	0.0932	0.107	0.110	
	Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Dissolved (mg/L)	0.36	<0.17	<0.16	0.22 DLM	
	Uranium (U)-Dissolved (mg/L)	0.00098	0.00044	0.00064	0.00075	
	Vanadium (V)-Dissolved (mg/L)	0.0310	0.00217	0.0124	0.0125	
	Zinc (Zn)-Dissolved (mg/L)	0.0302	<0.0050	0.0141	0.0158	
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	<0.000020	<0.000020	0.000052	0.000055	
	Methylmercury (as MeHg)-Total (ug/L)	0.000082	<0.000020	0.000032	0.000074	

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)	
Method Blank	Alkalinity, Total (as CaCO3)	В	L2092365-1, -2, -3, -4	
Method Blank	Total Nitrogen	В	L2092365-2, -3, -4	
Matrix Spike	Total Organic Carbon	MS-B	L2092365-1, -2, -3, -4	
Matrix Spike	Aluminum (AI)-Total	MS-B	L2092365-1, -2, -3, -4	
Matrix Spike	Barium (Ba)-Total	MS-B	L2092365-1, -2, -3, -4	
Matrix Spike	Calcium (Ca)-Total	MS-B	L2092365-1, -2, -3, -4	
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2092365-1, -2, -3, -4	
Matrix Spike	Strontium (Sr)-Total	MS-B	L2092365-1, -2, -3, -4	
Matrix Spike	Total Nitrogen	MS-B	L2092365-2, -3, -4	
Matrix Spike	Total Nitrogen	MS-B	L2092365-1	

Qualifiers for Individual Parameters Listed:

Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
		edures adapted from APHA Method 2320 "Alkalinity te and hydroxide alkalinity are calculated from pher	". Total alkalinity is determined by potentiometric titration to a nolphthalein alkalinity and total alkalinity values.
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is	s a calculated	d parameter. Nitrate and Nitrite (as N) = Nitrite (as I	N) + Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion C	Chromatography with conductivity and/or UV detecti	on.
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B
		edures adapted from APHA Method 5310 "Total Orguns adapted from APHA Method 5310 "Total Orguns and the second s	ganic Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried ou	t using proce	edures adapted from APHA Method 5310 "Total Org	ganic Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion C	Chromatography with conductivity and/or UV detecti	on.
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
is determined by filtering a method.	a sample thro	hugh a 0.45 micron membrane filter followed by ana	al Manual "Colour- Single Wavelength." Colour (True Colour) Ilysis of the filtrate using the platinum-cobalt colourimetric
Colour measurements car Concurrent measurement			received (at time of testing), without pH adjustment.
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried ou electrode.	t using proce	edures adapted from APHA Method 2510 "Conducti	ivity". Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of con	ductivity whe	ere required during preparation of other tests - e.g.	TDS, metals, etc.
	Water	Fluoride in Water by IC	EPA 300.1 (mod)

HARDNESS-CALC-VA Water Hardness **APHA 2340B** Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation. Diss. Mercurv in Water by CVAFS (Ultra) APHA 3030 B / EPA 1631 REV. E HG-D-U-CVAF-VA Water This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry. HG-T-U-CVAF-VA Total Mercury in Water by CVAFS (Ultra) EPA 1631 REV. E Water This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry. **IONBALANCE-VA** Water Ion Balance Calculation **APHA 1030F** Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero. Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor jons are included where data is present. Ion Balance is calculated as: Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum] **MEHG-D-GCAF-VA** Diss. Methylmercury in Water by GCAFS Water EPA 1630 This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg". Total Methylmercury in Water by GCAFS **MEHG-T-GCAF-VA** Water FPA 1630 This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg". Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod) Water MET-D-CCMS-VA Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. **MET-T-CCMS-VA** Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod) Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174 This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735. NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al. NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

(EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field. Water PO4-DO-COL-VA Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E. This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. **TDS-CALC-VA** Water TDS (Calculated) APHA 1030E (20TH EDITION) This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses". The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample. TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC TSS-VA Water This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. Water Turbidity by Meter APHA 2130 Turbidity TURBIDITY-VA This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA **Chain of Custody Numbers:**

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental Canada Toll Free: 1 800 668 9878



Page <u>1</u> of <u>1</u>

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ALS Sample # (lab use only)		tification and/or Coordinates ption will appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-Spe	Color-True,	Turbidity,	TOC, TI	DOC	Total M	Dissolv	Total H	Dissolv	Total M	Dissolved			
	Moberly River - Downstream (MD)))		Water	R	R	R	R	R	R	R	R	R	R	R			
	Lower Site C Reservoir (PR3)			5		Water	R	R	R	R	R	R	R	R	R	R	R			
	Peace at Pine (PD1)			May 09/18	5	Water	R	Ŕ	R	R	R	R	R	R	R	R	R			
	Pine River (Pine)			May 091		Water	R	R	R	R	R	R	R	R	R	R	R			
	BEATTON River	- (BEA)				1	R	R	R	R	R	R	R	R	R	R	R			
	BEATton River Prace above to	Seaton (PD2)	<u>`````````````````````````````````````</u>	<u></u>			R	R	R	R	R	R	K	R			R			
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Failure to complete all portions of this form may delay-analysis. Please fill-in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy. 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4

Date Received: 11-MAY-18 Report Date: 04-JUN-18 14:10 (MT) Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2093204 Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

NOT SUBMITTED VENW03060-02.002

Brent Mack, B.Sc. Account Manager

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L2093204 CONTD.... PAGE 2 of 11 04-JUN-18 14:10 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2093204-1 Water 10-MAY-18 15:57 MOBERLY RIVER- DOWNSTREAM (MD)	L2093204-2 Water 10-MAY-18 15:09 LOWER SITE C RESERVOIR (PR3)	L2093204-3 Water 10-MAY-18 16:44 PEACE AT PINE (PD1)	L2093204-4 Water 10-MAY-18 17:06 PINE RIVER (PINE)	L2093204-5 Water 10-MAY-18 18:38 BEATTON RIVER (BEA)
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	38.5	50.8	52.6	34.8	164
	Conductivity (uS/cm)				нтр 196	нтр 114
	Conductivity (umhos/cm)	197	203	195		
	Hardness (as CaCO3) (mg/L)	128	116	127	118	57.6
	pH (pH)	7.99	7.98	8.02	8.06	7.37
	Total Suspended Solids (mg/L)	1500	314	316	697	1410
	TDS (Calculated) (mg/L)	182	140	152	139	137
	Turbidity (NTU)	989	241	307	491	1170
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	109	95.8	106	108 HTD	32.7 HTD
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	109	95.8	106	108	32.7
	Ammonia, Total (as N) (mg/L)	0.0483	0.0216	0.0217	0.0241	0.0621
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (CI) (mg/L)	<0.50	<0.50	<0.50	<0.50	0.51
	Fluoride (F) (mg/L)	0.072	0.063	0.064	0.058	0.063
	Nitrate and Nitrite (as N) (mg/L)	0.130	0.0931	0.0981	0.141	0.0216
	Nitrate (as N) (mg/L)	0.130	0.0931	0.0981	0.141	0.0216
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	^{рент} 3.03	0.879	1.05	1.41	^{РЕНТ} 3.07
	Total Nitrogen (mg/L)	2.53	0.71	0.81	0.80	1.42
	Orthophosphate-Dissolved (as P) (mg/L)	0.0066	0.0064	0.0057	0.0043	0.0050
	Phosphorus (P)-Total Dissolved (mg/L)	0.0120	0.0142	0.0149	0.0097	0.0259
	Phosphorus (P)-Total (mg/L)	1.52	0.360	0.483	0.861	1.34
	Silicate (as SiO2) (mg/L)	3.72	4.37	4.26	2.99	4.45
	Sulfate (SO4) (mg/L)	9.85	20.8	19.7	9.33	20.8
	Anion Sum (meq/L)	2.40	2.36	2.54	2.37	1.11
	Cation Sum (meq/L)	3.70	2.61	2.91	2.47	2.34
	Cation - Anion Balance (%)	21.2	5.1	6.9	2.1	35.9
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	нтр 8.97	нтр 9.81	9.64	6.96 ^{HTP}	нтр 27.2
	Total Organic Carbon (mg/L)	45.5	15.1	16.9	20.1	57.4
Total Metals	Aluminum (Al)-Total (mg/L)	11.5	4.21	5.14	7.36	12.9
	Antimony (Sb)-Total (mg/L)	0.00058	<0.00050	<0.00050	0.00055	0.00055
	Arsenic (As)-Total (mg/L)	0.00936	0.00346	0.00430	0.00649	0.0128
	Barium (Ba)-Total (mg/L)	0.697	0.217	0.278	0.394	0.607
	Beryllium (Be)-Total (mg/L)	0.00080	0.00029	0.00033	0.00054	0.00097

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	Sample ID Description Sampled Date Sampled Time Client ID	L2093204-6 Water 10-MAY-18 18:09 PEACE RIVER ABOVE BEATTON (PD2)		
Grouping	Analyte			
WATER				
Physical Tests	Colour, True (CU)	41.0		
	Conductivity (uS/cm)	199		
	Conductivity (umhos/cm)			
	Hardness (as CaCO3) (mg/L)	111		
	рН (рН)	7.99		
	Total Suspended Solids (mg/L)	593		
	TDS (Calculated) (mg/L)	139		
	Turbidity (NTU)	480		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	107		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	107		
	Ammonia, Total (as N) (mg/L)	0.0281		
	Bromide (Br) (mg/L)	<0.050		
	Chloride (CI) (mg/L)	<0.50		
	Fluoride (F) (mg/L)	0.060		
	Nitrate and Nitrite (as N) (mg/L)	0.130		
	Nitrate (as N) (mg/L)	0.129		
	Nitrite (as N) (mg/L)	0.0010 PEHT		
	Total Kjeldahl Nitrogen (mg/L)	1.44		
	Total Nitrogen (mg/L)	1.20 RRV		
	Orthophosphate-Dissolved (as P) (mg/L)	0.0041		
	Phosphorus (P)-Total Dissolved (mg/L)	0.0106		
	Phosphorus (P)-Total (mg/L)	1.10		
	Silicate (as SiO2) (mg/L)	3.47		
	Sulfate (SO4) (mg/L)	12.1		
	Anion Sum (meq/L)	2.39		
	Cation Sum (meq/L)	2.41		
	Cation - Anion Balance (%)	0.4 HTP		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	7.98		
T	Total Organic Carbon (mg/L)	20.5		
Total Metals	Aluminum (Al)-Total (mg/L)	7.15 _{DLB}		
	Antimony (Sb)-Total (mg/L)	<0.00060		
	Arsenic (As)-Total (mg/L)	0.00631		
	Barium (Ba)-Total (mg/L)	0.382		
	Beryllium (Be)-Total (mg/L)	0.00053		

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	Sample ID Description Sampled Date Sampled Time Client ID	L2093204-1 Water 10-MAY-18 15:57 MOBERLY RIVER- DOWNSTREAM (MD)	L2093204-2 Water 10-MAY-18 15:09 LOWER SITE C RESERVOIR (PR3)	L2093204-3 Water 10-MAY-18 16:44 PEACE AT PINE (PD1)	L2093204-4 Water 10-MAY-18 17:06 PINE RIVER (PINE)	L2093204-5 Water 10-MAY-18 18:38 BEATTON RIVER (BEA)
Grouping	Analyte					
WATER						
Total Metals	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.00108	0.000461	0.000555	0.000705	0.000975
	Calcium (Ca)-Total (mg/L)	61.9	42.8	44.3	57.1	21.6
	Chromium (Cr)-Total (mg/L)	0.0212	0.0081	0.0099	0.0135	0.0248
	Cobalt (Co)-Total (mg/L)	0.0126	0.00351	0.00455	0.00737	0.0146
	Copper (Cu)-Total (mg/L)	0.0326	0.0109	0.0133	0.0181	0.0403
	Iron (Fe)-Total (mg/L)	27.6	8.19	9.94	19.1	31.4
	Lead (Pb)-Total (mg/L)	0.0140	0.00423	0.00530	0.00969	0.0161
	Lithium (Li)-Total (mg/L)	0.0192	0.0081	0.0092	0.0147	0.0222
	Magnesium (Mg)-Total (mg/L)	18.6	11.0	11.7	14.2	8.68
	Manganese (Mn)-Total (mg/L)	0.522	0.118	0.158	0.299	0.430
	Mercury (Hg)-Total (mg/L)	олы со.00010	DLM <0.00010	DLM <0.00010	DLM <0.00010	0.00010
	Mercury (Hg)-Total (ug/L)	0.0572	0.0251	0.0248	0.0370	0.0920
	Molybdenum (Mo)-Total (mg/L)	0.0011	0.0017	0.0016	0.0013	0.0011
	Nickel (Ni)-Total (mg/L)	0.0417	0.0142	0.0172	0.0254	0.0493
	Phosphorus (P)-Total (mg/L)	1.38	0.35	0.44	0.79	1.11
	Potassium (K)-Total (mg/L)	3.6	2.0	2.3	2.5	4.5
	Selenium (Se)-Total (mg/L)	0.000999	0.000790	0.000766	0.000966	0.00121
	Silicon (Si)-Total (mg/L)	18.4	8.54	9.15	11.6	18.7
	Silver (Ag)-Total (mg/L)	0.000280	0.000100	0.000129	0.000187	0.000341
	Sodium (Na)-Total (mg/L)	2.2	2.5	2.4	<2.0	4.6
	Strontium (Sr)-Total (mg/L)	0.159	0.158	0.154	0.150	0.105
	Thallium (TI)-Total (mg/L)	0.000264	0.000141	0.000164	0.000223	0.000310
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	0.062	0.040	0.045	0.029	0.041
	Uranium (U)-Total (mg/L)	0.00135	0.00083	0.00086	0.00097	0.00171
	Vanadium (V)-Total (mg/L)	0.0422	0.0189	0.0223	0.0294	0.0458
	Zinc (Zn)-Total (mg/L)	0.127	0.0445	0.0553	0.0879	0.159
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Mercury Filtration Location	LAB	LAB	LAB	LAB	LAB
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	7.10	0.817	1.25	0.485	5.50
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	0.00222	0.00111	0.00123	0.00064	0.00237
	Barium (Ba)-Dissolved (mg/L)	0.257	0.109	0.145	0.096	0.205
	Beryllium (Be)-Dissolved (mg/L)	0.00029	0.00012	0.00013	<0.00010	0.00033

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	Sample ID Description Sampled Date Sampled Time Client ID	L2093204-6 Water 10-MAY-18 18:09 PEACE RIVER ABOVE BEATTON (PD2)		
Grouping	Analyte			
WATER				
Total Metals	Bismuth (Bi)-Total (mg/L)	<0.20		
	Boron (B)-Total (mg/L)	<0.10		
	Cadmium (Cd)-Total (mg/L)	0.000734		
	Calcium (Ca)-Total (mg/L)	55.8		
	Chromium (Cr)-Total (mg/L)	0.0131		
	Cobalt (Co)-Total (mg/L)	0.00725		
	Copper (Cu)-Total (mg/L)	0.0182		
	Iron (Fe)-Total (mg/L)	18.3		
	Lead (Pb)-Total (mg/L)	0.00904		
	Lithium (Li)-Total (mg/L)	0.0136		
	Magnesium (Mg)-Total (mg/L)	14.3		
	Manganese (Mn)-Total (mg/L)	0.298		
	Mercury (Hg)-Total (mg/L)	<0.00010		
	Mercury (Hg)-Total (ug/L)	0.0350		
	Molybdenum (Mo)-Total (mg/L)	0.0013		
	Nickel (Ni)-Total (mg/L)	0.0251		
	Phosphorus (P)-Total (mg/L)	0.87		
	Potassium (K)-Total (mg/L)	2.6		
	Selenium (Se)-Total (mg/L)	0.000920		
	Silicon (Si)-Total (mg/L)	12.3		
	Silver (Ag)-Total (mg/L)	0.000176		
	Sodium (Na)-Total (mg/L)	<2.0		
	Strontium (Sr)-Total (mg/L)	0.156		
	Thallium (TI)-Total (mg/L)	0.000208		
	Tin (Sn)-Total (mg/L)	<0.000200		
	Titanium (Ti)-Total (mg/L)	0.033		
	Uranium (U)-Total (mg/L)	0.0030		
	Vanadium (V)-Total (mg/L)	0.0290		
	Zinc (Zn)-Total (mg/L)	0.0290		
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD		
	Dissolved Mercury Filtration Location	LAB		
	Dissolved Metals Filtration Location	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	1.17		
	Antimony (Sb)-Dissolved (mg/L)	<0.00050		
	Arsenic (As)-Dissolved (mg/L)	<0.00050		
	Barium (Ba)-Dissolved (mg/L)	0.00074		
	Beryllium (Be)-Dissolved (mg/L)	<0.00010		

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	Sample ID Description Sampled Date Sampled Time Client ID	L2093204-1 Water 10-MAY-18 15:57 MOBERLY RIVER- DOWNSTREAM (MD)	L2093204-2 Water 10-MAY-18 15:09 LOWER SITE C RESERVOIR (PR3)	L2093204-3 Water 10-MAY-18 16:44 PEACE AT PINE (PD1)	L2093204-4 Water 10-MAY-18 17:06 PINE RIVER (PINE)	L2093204-5 Water 10-MAY-18 18:38 BEATTON RIVER (BEA)
Grouping	Analyte					
WATER						
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	0.000262	0.000187	0.000290	0.0000914	0.000287
	Calcium (Ca)-Dissolved (mg/L)	35.7	33.1	36.0	34.2	15.8
	Chromium (Cr)-Dissolved (mg/L)	0.0103	0.0049	0.0027	0.0011	0.0081
	Cobalt (Co)-Dissolved (mg/L)	0.00259	0.00114	0.00191	0.00080	0.00344
	Copper (Cu)-Dissolved (mg/L)	0.0081	0.0042	0.0062	0.0026	0.0112
	Iron (Fe)-Dissolved (mg/L)	4.83	2.13	2.59	1.23	6.09
	Lead (Pb)-Dissolved (mg/L)	0.00367	0.00150	0.00223	0.00090	0.00456
	Lithium (Li)-Dissolved (mg/L)	0.0090	0.0055	0.0045	0.0036	0.0101
	Magnesium (Mg)-Dissolved (mg/L)	9.48	8.04	8.98	7.84	4.38
	Manganese (Mn)-Dissolved (mg/L)	0.121	0.0456	0.0743	0.0350	0.131
	Mercury (Hg)-Dissolved (mg/L)	0.0000139	0.0000147	0.0000154	<0.0000050	0.0000143
	Mercury (Hg)-Dissolved (ug/L)	0.00106	0.00100	0.00104	0.00156	0.00203
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Dissolved (mg/L)	0.0102	0.0056	0.0079	0.0035	0.0135
	Phosphorus (P)-Dissolved (mg/L)	0.31	<0.30	<0.30	<0.30	0.31
	Potassium (K)-Dissolved (mg/L)	3.1	<2.0	<2.0	<2.0	3.0
	Selenium (Se)-Dissolved (mg/L)	0.000302	0.000503	0.000444	0.000372	0.000339
	Silicon (Si)-Dissolved (mg/L)	19.8	8.99	3.62	1.91	15.2
	Silver (Ag)-Dissolved (mg/L)	0.000080	0.000033	0.000028	<0.000020	0.000047
	Sodium (Na)-Dissolved (mg/L)	<2.0	2.1	2.2	<2.0	3.8
	Strontium (Sr)-Dissolved (mg/L)	0.0904	0.117	0.127	0.101	0.0607
	Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	DTMF 0.259	0.123	0.014	<0.010	о.214 DTM
	Uranium (U)-Dissolved (mg/L)	0.00069	0.00071	0.00067	0.00032	0.00084
	Vanadium (V)-Dissolved (mg/L)	0.0236	0.00355	0.00488	0.00159	0.0175
	Zinc (Zn)-Dissolved (mg/L)	0.0236	0.0124	0.0180	0.0068	0.0300
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	0.000111	DLIS <0.00010	DLIS <0.00010	DLIS <0.00010	0.00024
	Methylmercury (as MeHg)-Total (ug/L)	0.00029	DLIS <0.00010	DLIS <0.00010	DLIS <0.00010	0.00041
	Methylmercury (as Meng)-rotal (ug/L)	0.00029	<0.00010	<0.00010	<0.00010	0.00041

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	Sample ID Description Sampled Date Sampled Time Client ID	L2093204-6 Water 10-MAY-18 18:09 PEACE RIVER ABOVE BEATTON (PD2)		
Grouping	Analyte	(192)		
WATER				
Dissolved Metals	Bismuth (Bi)-Dissolved (mg/L)	<0.20		
	Boron (B)-Dissolved (mg/L)	<0.10		
	Cadmium (Cd)-Dissolved (mg/L)	0.000111		
	Calcium (Ca)-Dissolved (mg/L)	32.1		
	Chromium (Cr)-Dissolved (mg/L)	0.0021		
	Cobalt (Co)-Dissolved (mg/L)	0.00085		
	Copper (Cu)-Dissolved (mg/L)	0.0030		
	Iron (Fe)-Dissolved (mg/L)	1.28		
	Lead (Pb)-Dissolved (mg/L)	0.00117		
	Lithium (Li)-Dissolved (mg/L)	0.0043		
	Magnesium (Mg)-Dissolved (mg/L)	7.37		
	Manganese (Mn)-Dissolved (mg/L)	0.0418		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050		
	Mercury (Hg)-Dissolved (ug/L)	0.00179		
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010		
	Nickel (Ni)-Dissolved (mg/L)	0.0037		
	Phosphorus (P)-Dissolved (mg/L)	<0.30		
	Potassium (K)-Dissolved (mg/L)	<2.0		
	Selenium (Se)-Dissolved (mg/L)	0.000416		
	Silicon (Si)-Dissolved (mg/L)	3.92		
	Silver (Ag)-Dissolved (mg/L)	<0.000020		
	Sodium (Na)-Dissolved (mg/L)	<2.0		
	Strontium (Sr)-Dissolved (mg/L)	0.0939		
	Thallium (TI)-Dissolved (mg/L)	<0.00020		
	Tin (Sn)-Dissolved (mg/L)	<0.00050		
	Titanium (Ti)-Dissolved (mg/L)	olum<0.039		
	Uranium (U)-Dissolved (mg/L)	0.00044		
	Vanadium (V)-Dissolved (mg/L)	0.00440		
	Zinc (Zn)-Dissolved (mg/L)	0.0078		
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	DLIS <0.00010		
	Methylmercury (as MeHg)-Total (ug/L)	0.00017		

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Manganese (Mn)-Dissolved	MB-LOR	L2093204-1, -2, -5, -6
Method Blank	Antimony (Sb)-Total	MB-LOR	L2093204-1, -2, -3, -4, -5, -6
Matrix Spike	Dissolved Organic Carbon	MS-B	L2093204-3, -4, -5, -6
Matrix Spike	Dissolved Organic Carbon	MS-B	L2093204-1, -2
Matrix Spike	Total Organic Carbon	MS-B	L2093204-3, -4, -6
Matrix Spike	Total Organic Carbon	MS-B	L2093204-2
Matrix Spike	Total Organic Carbon	MS-B	L2093204-1
Matrix Spike	Total Organic Carbon	MS-B	L2093204-5
Matrix Spike	Total Organic Carbon	MS-B	L2093204-5
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L2093204-1, -2, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2093204-1, -2, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2093204-1, -2, -5, -6
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2093204-1, -2, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2093204-1, -2, -5, -6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2093204-1, -2, -5, -6
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2093204-1, -2, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2093204-1, -2, -5, -6
Matrix Spike	Titanium (Ti)-Dissolved	MS-B	L2093204-1, -2, -5, -6
Matrix Spike	Aluminum (Al)-Total	MS-B	L2093204-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Total	MS-B	L2093204-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Total	MS-B	L2093204-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2093204-1, -2, -3, -4, -5, -6
Matrix Spike	Manganese (Mn)-Total	MS-B	L2093204-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Total	MS-B	L2093204-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Total	MS-B	L2093204-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLIS	Detection Limit Adjusted: Insufficient Sample
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
HTP	Sample preparation or preservation hold time was exceeded.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-CO3-CALC-WP	Water	Alkalinity, Carbonate (as CaCO3)	CALCULATION
		its acid neutralizing capacity.Alkalinity is impar uted by carbonate is calculated and reported as	ted by bicarbonate, carbonate and hydroxide components of s mg/L CaCO3.
ALK-HCO3-CALC-WP	Water	Alkalinity, Bicarbonate (as CaCO3)	CALCULATION

The Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by bicarbonate is calculated and reported as mg/L CaCO3.

ALK-OH-CALC-WP Water

Alkalinity, Hydroxide (as CaCO3)

CALCULATION

The Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by hydroxide is calculated and reported as mg/L CaCO3.

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ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
		ures adapted from APHA Method 2320 "Alkalinity". Tot and hydroxide alkalinity are calculated from phenolpht	tal alkalinity is determined by potentiometric titration to a thalein alkalinity and total alkalinity values.
ALK-TITR-WP	Water	Alkalinity, Total (as CaCO3)	APHA 2320B
		s acid neutralizing capacity. Alkalinity is imparted by bio tration with a strong standard mineral acid to the succe	
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is	a calculated p	parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + N	Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyz	ed by Ion Ch	romatography with conductivity and/or UV detection.	
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B
		ures adapted from APHA Method 5310 "Total Organic gh a 0.45 micron membrane filter prior to analysis.	Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out	using proced	ures adapted from APHA Method 5310 "Total Organic	Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyz	ed by Ion Ch	romatography with conductivity and/or UV detection.	
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
is determined by filtering a s		ures adapted from British Columbia Environmental Mar gh a 0.45 micron membrane filter followed by analysis	nual "Colour- Single Wavelength." Colour (True Colour) of the filtrate using the platinum-cobalt colourimetric
method. Colour measurements can l Concurrent measurement o		dependent, and apply to the pH of the sample as recein is recommended.	ved (at time of testing), without pH adjustment.
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out electrode.	using proced	ures adapted from APHA Method 2510 "Conductivity".	Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of cond	uctivity where	e required during preparation of other tests - e.g. TDS,	metals, etc.
EC-WP	Water	Conductivity	APHA 2510B
Conductivity of an aqueous and chemically inert electro		rs to its ability to carry an electric current. Conductanc	e of a solution is measured between two spatially fixed
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyz	ed by Ion Ch	romatography with conductivity and/or UV detection.	
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
		s) is calculated from the sum of Calcium and Magnesiu centrations are preferentially used for the hardness calc	
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered with stannous chloride, and	\ // I	eserved with hydrochloric acid, then undergo a cold-ox CVAAS or CVAFS.	idation using bromine monochloride prior to reduction
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
American Public Health Ass (EPA). The procedure may	sociation, and involve prelin to a purge a	nd trap concentration step and final reduction of the sa	by the United States Environmental Protection Agency ad involves a cold-oxidation of the acidified sample using
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a c	cold-oxidation	using bromine monochloride prior to reduction with sta	annous chloride, and analyzed by CVAAS or CVAFS.
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E

This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry. **IONBALANCE-VA** Water Ion Balance Calculation **APHA 1030F** Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero. Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as: Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum] **MEHG-D-GCAF-VA** Water Diss. Methylmercury in Water by GCAFS EPA 1630 This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg". **MEHG-T-GCAF-VA** Total Methylmercury in Water by GCAFS EPA 1630 Water This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg". Dissolved Metals in Water by CRC ICPMS Water APHA 3030B/6020A (mod) **MET-D-CCMS-VA** Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. **MET-T-CCMS-VA** Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod) Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174 N-T-COL-VA Water This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735. NH3-F-VA Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al. NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

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It is recommended that this analysis be conducted in the field. PH-WP Water **APHA 4500H** pН The pH of a sample is the determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode. PO4-DO-COL-VA Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus Water This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E. This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Water Sulfate in Water by IC EPA 300.1 (mod) SO4-IC-N-VA Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. TDS (Calculated) APHA 1030E (20TH EDITION) **TDS-CALC-VA** Water This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses". The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample. Water TKN in Water by Fluorescence APHA 4500-NORG D. **TKN-F-VA** This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kieldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. Water **TSS-VA** Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. **TURBIDITY-VA** Water Turbidity by Meter APHA 2130 Turbidity This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location WP ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA **Chain of Custody Numbers:**

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to gualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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COC Number: 14 -

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	cochurchain of Custody (COC) / Analytical
	Request Form
ALS Environment	Canada Toll Free: 1 800 668 9878

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ALS Sample # (lab use only)	· ·	ation and/or Coordinates will appear on the report)			Daté nmm-yy)	Time (ħh:mm)	Sample Type	Alk-Spe	Color-True,	Turbidity,	тос, ті	DOC	Total M	Dissolve	Total H _§	Dissolve	Total M	Dissolve		
	Moberly River - Downstream (MD)	•		Ma	y 10	15:57	Water	R	R	R	R	R	R	R	R	R	R	R		77
	Lower Site C Reservoir (PR3)			2	318	15:09	Water	R	R	R	R	R	R	R	R	R	R	R		4
	Peace at Pine (PD1)					16:44	Water	R	R	R	R	R	R	R	R	R	R	R		6
	Pine River (Pine)					17:06	Water	R	R	R	R	R	R	R	R	R	R	R	+	
		(00)					· · · · · · · · · · · · · · · · · · ·	+	2	P.,	R		R	2	R	R	10	$\overline{\rho}$	+	6
	BEATTON RIVER	(BEA)				18:38	Water	IB-	K -	5		R		15			₽¦	<u> </u>	+	
	PEACE ABOVE B	EATION CPD2	_)	· V		18:09	water	<u>R</u>	14	<u>~</u>	R	R	R	K		R	R	<u>k</u> -	+	Ť
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Drinking	g Water (DW) Samples ¹ (client use)	Specia	I Instructions / Spec	city Crite	ria to add o	on report (client U	se)	Froze	en					SIF	Obser	rvation	is `	Yes	No	
re samples tak በግጉ	ken from a Regulated DW System? Yes 🛛 🔽 No	Please use criteria: B	and Health Canad	la Cuida	lines for Dr	rinking 18/242,	molon wara	Cooli	acks ing Initi	ated		-	-	Cust	ody s	eal int	tact	Yes 🗖] No	
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1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4

Date Received: 09-MAY-18 Report Date: 23-MAY-18 15:01 (MT) Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2091502 Project P.O. #: Job Reference:

C of C Numbers: Legal Site Desc:

NOT SUBMITTED VENW003060-02.002

Brent Mack, B.Sc. Account Manager

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	Sample ID Description Sampled Date Sampled Time Client ID	L2091502-1 WATER 08-MAY-18 PEACE AT KISKATINAW (PD3)	L2091502-2 WATER 08-MAY-18 KISKATINAW RIVER (KR)	L2091502-3 WATER 08-MAY-18 PEACE AT POUCE COUPE (PD4)	L2091502-4 WATER 08-MAY-18 POUCE COUPE (POUCE)	L2091502-5 WATER 08-MAY-18 PEACE AT MANY ISLANDS (PD5)
Grouping	Analyte	()				
WATER						
Physical Tests	Colour, True (CU)	52.2	69.5	68.9	101	67.2
	Conductivity (uS/cm)	190	181	184	208	187
	Hardness (as CaCO3) (mg/L)	104	90.7	91.6	90.4	94.0
	рН (рН)	8.13	8.04	8.00	7.90	8.02
	Total Suspended Solids (mg/L)	1030	2580	942	1590	1350
	TDS (Calculated) (mg/L)	139	165	141	171	148
	Turbidity (NTU)	787	×4000	916	2610	1200
Anions and	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	105	117	99.9	71.7	106
Nutrients		105		33.5	11.1	100
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	105	117	99.9	71.7	106
	Ammonia, Total (as N) (mg/L)	0.0264	0.0911	0.0330	0.150	0.0419
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	1.53	<0.50
	Fluoride (F) (mg/L)	0.072	0.074	0.073	0.099	0.076
	Nitrate and Nitrite (as N) (mg/L)	0.158	0.0582	0.125	0.0779	0.130
	Nitrate (as N) (mg/L)	0.157	0.0568	0.125	0.0748	0.129
	Nitrite (as N) (mg/L)	0.0014	0.0014	<0.0010	0.0031	0.0012
	Total Kjeldahl Nitrogen (mg/L)	1.18	1.91	1.39	2.22	1.50
	Total Nitrogen (mg/L)	1.06	1.43	1.42	1.90	1.25
	Orthophosphate-Dissolved (as P) (mg/L)	0.0059	0.0060	0.0059	0.0105	0.0071
	Phosphorus (P)-Total Dissolved (mg/L)	0.0129	0.0165	0.0155	0.0308	0.0155
	Phosphorus (P)-Total (mg/L)	0.870	2.13	0.953	1.44	1.20
	Silicate (as SiO2) (mg/L)	3.65	3.96	3.88	4.34	3.94
	Sulfate (SO4) (mg/L)	13.0	7.23	15.2	34.4	15.6
	Anion Sum (meq/L)	2.38	2.49	2.33	2.20	2.45
	Cation Sum (meq/L)	2.09	1.95	1.94	2.16	2.00
	Cation - Anion Balance (%)	-6.5	-12.1	-9.0	-0.9	-10.1
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	-0.3 _{НТР} 9.40	-12.1 _{HTP} 14.7	-9.0 нтр 12.5	-0.9 _{НТР} 20.7	-10.1 _{нтр} 12.6
	Total Organic Carbon (mg/L)	24.9	51.8	29.6	49.6	32.2
Total Metals	Aluminum (Al)-Total (mg/L)	8.97	25.3	11.2	23.3	12.1
	Antimony (Sb)-Total (mg/L)	0.00054	0.00063	0.00058	<0.00050	0.00057
	Arsenic (As)-Total (mg/L)	0.00775	0.0167	0.00977	0.0241	0.0104
	Barium (Ba)-Total (mg/L)	0.458	1.09	0.534	0.823	0.553
	Beryllium (Be)-Total (mg/L)	0.00063	0.00175	0.00078	0.00159	0.00082
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

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	Sample ID Description Sampled Date Sampled Time Client ID	L2091502-1 WATER 08-MAY-18 PEACE AT KISKATINAW (PD3)	L2091502-2 WATER 08-MAY-18 KISKATINAW RIVER (KR)	L2091502-3 WATER 08-MAY-18 PEACE AT POUCE COUPE (PD4)	L2091502-4 WATER 08-MAY-18 POUCE COUPE (POUCE)	L2091502-5 WATER 08-MAY-18 PEACE AT MANY ISLANDS (PD5)
Grouping	Analyte					
WATER						
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.000862	0.00214	0.00104	0.000917	0.00102
	Calcium (Ca)-Total (mg/L)	50.6	115	51.4	48.5	49.8
	Chromium (Cr)-Total (mg/L)	0.0170	0.0429	0.0204	0.0398	0.0221
	Cobalt (Co)-Total (mg/L)	0.00889	0.0255	0.0114	0.0241	0.0120
	Copper (Cu)-Total (mg/L)	0.0229	0.0644	0.0292	0.0608	0.0320
	Iron (Fe)-Total (mg/L)	20.9	57.4	25.5	55.0	28.3
	Lead (Pb)-Total (mg/L)	0.0110	0.0297	0.0137	0.0280	0.0142
	Lithium (Li)-Total (mg/L)	0.0170	0.0386	0.0197	0.0414	0.0214
	Magnesium (Mg)-Total (mg/L)	14.2	31.5	14.8	17.5	15.0
	Manganese (Mn)-Total (mg/L)	0.339	0.996	0.424	0.671	0.435
	Mercury (Hg)-Total (ug/L)	0.0470	0.122	0.0630	0.123	0.0710
	Molybdenum (Mo)-Total (mg/L)	0.0014	0.0012	0.0016	0.0014	0.0014
	Nickel (Ni)-Total (mg/L)	0.0305	0.0841	0.0387	0.0733	0.0410
	Phosphorus (P)-Total (mg/L)	0.92	2.17	1.04	1.65	1.01
	Potassium (K)-Total (mg/L)	3.2	5.8	3.7	7.4	3.9
	Selenium (Se)-Total (mg/L)	0.00104	0.00124	0.00121	0.00155	0.00111
	Silicon (Si)-Total (mg/L)	14.7	36.2	17.8	37.1	19.3
	Silver (Ag)-Total (mg/L)	0.000217	0.000575	0.000298	0.000404	0.000295
	Sodium (Na)-Total (mg/L)	2.1	3.5	2.6	6.2	2.8
	Strontium (Sr)-Total (mg/L)	0.160	0.270	0.151	0.212	0.164
	Thallium (TI)-Total (mg/L)	0.000241	0.000578	0.000312	0.000435	0.000315
	Tin (Sn)-Total (mg/L)	< 0.00050	< 0.00050	<0.00050	< 0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	0.046	0.063	0.052	0.062	0.053
	Uranium (U)-Total (mg/L)	0.00126	0.00263	0.00153	0.00291	0.00152
	Vanadium (V)-Total (mg/L)	0.0356	0.0804	0.0423	0.0721	0.0437
	Zinc (Zn)-Total (mg/L)	0.103	0.274	0.131	0.232	0.139
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Mercury Filtration Location	LAB	LAB	LAB	LAB	LAB
	Dissolved Metals Filtration Location	LAB	LAB	LAB	LAB	LAB
	Aluminum (Al)-Dissolved (mg/L)	0.0251	0.0179	0.0261	0.0251	0.0283
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	<0.00050	0.00053	<0.00050	0.00095	<0.00050
	Barium (Ba)-Dissolved (mg/L)	0.069	0.074	0.060	0.045	0.063
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10

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	Sample ID Description Sampled Date Sampled Time Client ID	L2091502-1 WATER 08-MAY-18 PEACE AT KISKATINAW (PD3)	L2091502-2 WATER 08-MAY-18 KISKATINAW RIVER (KR)	L2091502-3 WATER 08-MAY-18 PEACE AT POUCE COUPE (PD4)	L2091502-4 WATER 08-MAY-18 POUCE COUPE (POUCE)	L2091502-5 WATER 08-MAY-18 PEACE AT MANY ISLANDS (PD5)
Grouping	Analyte	x - /				
WATER						
Dissolved Metals	Cadmium (Cd)-Dissolved (mg/L)	0.0000289	0.0000237	0.0000381	0.0000200	0.0000319
	Calcium (Ca)-Dissolved (mg/L)	30.1	26.1	26.6	26.5	27.4
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Dissolved (mg/L)	0.0022	0.0049	0.0030	0.0058	0.0034
	Iron (Fe)-Dissolved (mg/L)	0.117	0.164	0.137	0.301	0.185
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	0.0031	0.0015	0.0030	0.0033	0.0030
	Magnesium (Mg)-Dissolved (mg/L)	6.98	6.16	6.10	5.88	6.19
	Manganese (Mn)-Dissolved (mg/L)	0.00372	0.00421	0.00328	0.00394	0.00318
	Mercury (Hg)-Dissolved (ug/L)	0.00101	0.00102	0.00155	0.00146	0.00126
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Dissolved (mg/L)	0.0020	0.0022	0.0025	0.0037	0.0025
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	3.3	<2.0
	Selenium (Se)-Dissolved (mg/L)	0.000388	0.000363	0.000411	0.000435	0.000514
	Silicon (Si)-Dissolved (mg/L)	1.70	1.93	1.83	2.15	1.82
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Dissolved (mg/L)	<2.0	2.8	2.2	5.6	2.4
	Strontium (Sr)-Dissolved (mg/L)	0.0946	0.0949	0.0844	0.105	0.0876
	Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00040	0.00054	0.00043	0.00062	0.00047
	Vanadium (V)-Dissolved (mg/L)	<0.00050	0.00059	<0.00050	0.00083	0.00053
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	0.000063	DLIS <0.00010	0.000025	<0.000020	0.000031
	Methylmercury (as MeHg)-Total (ug/L)	0.000145	<0.00010	<0.000020	<0.000020	<0.000020

L2091502 CONTD.... PAGE 5 of 8 23-MAY-18 15:01 (MT) Version: FINAL

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)	
Method Blank	Total Nitrogen	В	L2091502-1, -2, -3, -4, -5	
Method Blank	Manganese (Mn)-Total	MB-LOR	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Dissolved Organic Carbon	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Dissolved Organic Carbon	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Total Organic Carbon	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Barium (Ba)-Total	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Calcium (Ca)-Total	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Manganese (Mn)-Total	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Sodium (Na)-Total	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Strontium (Sr)-Total	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Uranium (U)-Total	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Total Nitrogen	MS-B	L2091502-1, -2, -3, -4, -5	
Matrix Spike	Nitrate (as N)	MS-B	L2091502-1, -2, -3, -4, -5	

Qualifiers for Individual Parameters Listed:

Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLIS	Detection Limit Adjusted: Insufficient Sample
HTP	Sample preparation or preservation hold time was exceeded.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
TMV	Turbidity exceeded upper limit of the nephelometric method. Minimum value reported.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
	0.	edures adapted from APHA Method 2320 "Alkalinity te and hydroxide alkalinity are calculated from phe	y". Total alkalinity is determined by potentiometric titration to a nolphthalein alkalinity and total alkalinity values.
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) i	is a calculated	d parameter. Nitrate and Nitrite (as N) = Nitrite (as	N) + Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are anal	yzed by Ion C	hromatography with conductivity and/or UV detect	ion.
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
, , , , , , , , , , , , , , , , , , ,	01	edures adapted from APHA Method 5310 "Total Or ugh a 0.45 micron membrane filter prior to analysis	ganic Carbon (TOC)". Dissolved carbon (DOC) fractions are s.
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried ou	ut using proce	dures adapted from APHA Method 5310 "Total Or	ganic Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are anal	yzed by Ion C	hromatography with conductivity and/or UV detect	ion.
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
			tal Manual "Colour- Single Wavelength." Colour (True Colour) alysis of the filtrate using the platinum-cobalt colourimetric

method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

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EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out electrode.	using proced	lures adapted from APHA Method 2510 "Conductivity".	Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conc	luctivity wher	e required during preparation of other tests - e.g. TDS,	metals, etc.
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyz	ed by Ion Ch	rromatography with conductivity and/or UV detection.	
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
		s) is calculated from the sum of Calcium and Magnesiu centrations are preferentially used for the hardness calc	
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
American Public Health As (EPA). The procedure may	sociation, and involve preli to a purge a	nd trap concentration step and final reduction of the sa	by the United States Environmental Protection Agency dinvolves a cold-oxidation of the acidified sample using
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
procedure involves a cold-c	xidation of th	lures adapted from Method 1631 Rev. E. by the United he acidified sample using bromine monochloride prior to hloride. Instrumental analysis is by cold vapour atomic	a purge and trap concentration step and final
IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E
		ce (as % difference) are calculated based on guidance to queous solutions are electrically neutral, the calculated	
Cation and Anion Sums are included where data is pres		eq/L concentration of major cations and anions. Dissolv ance is calculated as:	red species are used where available. Minor ions are
Ion Balance (%) = [Cation §	Sum-Anion S	um] / [Cation Sum+Anion Sum]	
MEHG-D-GCAF-VA	Water	Diss. Methylmercury in Water by GCAFS	EPA 1630
interferences. The distillate	is analyzed l	US EPA. Samples are distilled under an inert gas flow by aqueous phase ethylation, purge and trap, desorptio I by cold vapour atomic flourescence spectroscopy. Res	n and GC separation. The separated species are then
MEHG-T-GCAF-VA	Water	Total Methylmercury in Water by GCAFS	EPA 1630
interferences. The distillate	is analyzed l	US EPA. Samples are distilled under an inert gas flow by aqueous phase ethylation, purge and trap, desorptio I by cold vapour atomic flourescence spectroscopy. Res	n and GC separation. The separated species are then
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered	(0.45 um), pr	reserved with nitric acid, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulfu	ır): Sulfide ar	nd volatile sulfur species may not be recovered by this r	nethod.
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digeste	d with nitric a	nd hydrochloric acids, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulfu	ır): Sulfide ar	nd volatile sulfur species may not be recovered by this r	nethod.
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
		lures adapted from APHA Method 4500-P (J) "Persulph ational Environmental Methods Index - Nemi method 57	
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
			n J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		promatography with conductivity and/or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

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Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field. PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. Water Silicate by Colourimetric analysis APHA 4500-SiO2 E. SILICATE-COL-VA This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. **TDS-CALC-VA** Water TDS (Calculated) APHA 1030E (20TH EDITION) This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses". The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample. TKN-F-VA TKN in Water by Fluorescence APHA 4500-NORG D. This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC **TSS-VA** Water This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. Water Turbidity by Meter APHA 2130 Turbidity **TURBIDITY-VA** This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. *mg/kg* - *milligrams per kilogram based on dry weight of sample.*

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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	Peace at Beatton (PD2) PD2 to	be sampled on h	lay 9 -	A		-Water	-R-	- R-	-R-	- R	R	R.	R	R	R	R	R		- 1	
	Beatton River (Beatton) -3EA	<u> </u>	incl	May 8		Water	-8-	- א	R			R	R	R	B.					9
 				+ 0				-			<u> </u>			,						
	Peace at Kiskatinaw (PD3)			<u>_</u> 7018		Water	R	R	R	R	R	R	R	R	R	R	R			9
	Kiskatinaw River (KR)					Water	R	R	R	R	R	R	R	R	R	R	R			9
	Peace at Pouce Coupe (PD4)	· · · ·				Water	R	R	R	R	R	R	R	R	R	R	R		_	9
	Pouce Coupe (Pouce)					Water	R	R	R	R	R	R	R	R	R	R	R			9
	Peace at Many Islands (PD5)					Water	R	R	R	R	R	R	R	R	R	R	R			9
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Drinking	Water (DW) Samples ¹ (client use)	Special In	structions / Speci	fy Criteria to add o	n report (client !!					SAMP	LE CO	NDIT	_	_	CEIVE			only		
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REFER TO BACK	K PAGE FOR ALS LOCATIONS AND SAMPLIN	NG INFORMATION		WHI	TE - LABORATOR	RY COPY YEL	LOW -	CLIEN	T COP	Y					NA-FM-032	26e v09 Fri	ont/04 Janu	ary 2014		

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy. 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received: 19-JUN-18 Report Date: 10-JUL-18 10:27 (MT) Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2115009

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW03060 - 02.002

Brent Mack, B.Sc. Account Manager

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L2115009 CONTD.... PAGE 2 of 6 10-JUL-18 10:27 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2115009-1 Water 18-JUN-18 14:15 W1 - SHALLOW	L2115009-2 Water 18-JUN-18 14:45 W1 - DEEP	L2115009-3 Water 18-JUN-18 17:50 D1 - SHALLOW	L2115009-4 Water 18-JUN-18 17:35 D1 - DEEP	L2115009-5 Water 18-JUN-18 DUP 2
Grouping	Analyte						
FILTER							
Plant Pigments	Chlorophyll a (ug/L)		0.609	1.38	1.04	2.25	0.158

L2115009 CONTD.... PAGE 3 of 6 10-JUL-18 10:27 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2115009-1 Water 18-JUN-18 14:15 W1 - SHALLOW	L2115009-2 Water 18-JUN-18 14:45 W1 - DEEP	L2115009-3 Water 18-JUN-18 17:50 D1 - SHALLOW	L2115009-4 Water 18-JUN-18 17:35 D1 - DEEP	L2115009-5 Water 18-JUN-18 DUP 2
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0	5.4	<5.0	<5.0
	Conductivity (uS/cm)	187	187	185	183	184
	рН (рН)	8.15	8.07	8.06	8.10	8.09
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	120	116	104	89	94
	Turbidity (NTU)	0.86	1.25	1.04	1.02	0.93
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	81.6	86.0	85.7	86.2	85.5
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	81.6	86.0	85.7	86.2	85.5
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0096	<0.0050	0.0063
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.038	0.039	0.041	0.040	0.040
	Nitrate and Nitrite (as N) (mg/L)	0.0453	0.0452	0.0300	0.0302	0.0307
	Nitrate (as N) (mg/L)	0.0453	0.0452	0.0300	0.0302	0.0307
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.078	0.061	0.104	0.081	0.130
	Total Nitrogen (mg/L)	0.121	0.111	0.114	0.114	0.109
	Orthophosphate-Dissolved (as P) (mg/L)	0.0015	0.0011	0.0017	0.0014	0.0016
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0027	0.0029	0.0049	0.0039	0.0032
	Silicate (as SiO2) (mg/L)	4.29	4.50	4.26	4.49	4.36
	Sulfate (SO4) (mg/L)	15.0	15.3	15.2	15.2	15.2
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.93	2.44	2.97	2.60	2.81
	Total Organic Carbon (mg/L)	2.59	2.49	2.71	2.70	3.05

Qualifier

Applies to Sample Number(s)

QC Samples with Qualifiers & Comments:

Parameter

QC Type Description

		1 didifictor	Quanner	
Matrix Spike		Dissolved Organic Carbon	MS-B	L2115009-1, -2, -3, -4
Matrix Spike		Dissolved Organic Carbon	MS-B	L2115009-1, -2, -3, -4
Matrix Spike		Dissolved Organic Carbon	MS-B	L2115009-1, -2, -3, -4
Matrix Spike		Total Organic Carbon	MS-B	L2115009-1, -2, -3, -4
Matrix Spike		Total Organic Carbon	MS-B	L2115009-1, -2, -3, -4
Matrix Spike		Total Organic Carbon	MS-B	L2115009-1, -2, -3, -4
Matrix Spike		Total Nitrogen	MS-B	L2115009-1, -2, -3, -4, -5
Matrix Spike		Total Nitrogen	MS-B	L2115009-1, -2, -3, -4, -5
Matrix Spike		Phosphorus (P)-Total	MS-B	L2115009-1, -2, -3, -4, -5
Qualifiers for Indivi		Listed:		
	scription			
MS-B Mat	trix Spike recovery	could not be accurately calculated du	e to high analyte	background in sample.
Test Method Refere				
ALS Test Code	Matrix	Test Description		Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration		APHA 2320 Alkalinity
				otal alkalinity is determined by potentiometric titration to a hthalein alkalinity and total alkalinity values.
ANIONS-N+N-CALC-	VA Water	Nitrite & Nitrate in Water (Calculation	on)	EPA 300.0
Nitrate and Nitrite (as	s N) is a calculate	d parameter. Nitrate and Nitrite (as N)	= Nitrite (as N) +	Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level))	EPA 300.1 (mod)
Inorganic anions are	analyzed by Ion C	Chromatography with conductivity and/	or UV detection.	
CARBONS-DOC-VA	Water	Dissolved organic carbon by combu	ustion	APHA 5310B
		edures adapted from APHA Method 53 ugh a 0.45 micron membrane filter pric		c Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-VA	Water	Total organic carbon by combustior	า	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carri	ed out using proce	edures adapted from APHA Method 53	10 "Total Organio	c Carbon (TOC)".
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter	·)	EPA 445.0
		s modified from EPA Method 445.0. C acidification procedure. This method is		termined by a routine acetone extraction followed with terferences from chlorophyll b.
CL-IC-N-VA	Water	Chloride in Water by IC		EPA 300.1 (mod)
Inorganic anions are	analyzed by Ion C	Chromatography with conductivity and/	or UV detection.	
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer		BCMOE Colour Single Wavelength
is determined by filte method.	ering a sample thro	ough a 0.45 micron membrane filter fol	lowed by analysis	anual "Colour- Single Wavelength." Colour (True Colour) s of the filtrate using the platinum-cobalt colourimetric eived (at time of testing), without pH adjustment.
Concurrent measure	ment of sample pl	H is recommended.		
EC-PCT-VA	Water	Conductivity (Automated)		APHA 2510 Auto. Conduc.
This analysis is carri electrode.	ed out using proce	edures adapted from APHA Method 25	10 "Conductivity"	. Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use C	Only)	APHA 2510
Qualitative analysis	of conductivity whe	ere required during preparation of othe	r tests - e.g. TDS	, metals, etc.
F-IC-N-VA	Water	Fluoride in Water by IC		EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

	\//atan	Total Nitroman in water by Colour
N-T-COL-VA	Water	Total Nitrogen in water by Colour

APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et aL NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. Total Dissolved P in Water by Colour P-TD-COL-VA Water APHA 4500-P Phosphorous This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field. PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. APHA 4500-SiO2 E. SILICATE-COL-VA Water Silicate by Colourimetric analysis This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. APHA 2540 C - GRAVIMETRIC **TDS-VA** Water Total Dissolved Solids by Gravimetric This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius. **TKN-F-VA** Water TKN in Water by Fluorescence APHA 4500-NORG D This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC **TSS-VA** Water This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. **TURBIDITY-VA** Water Turbidity by Meter APHA 2130 Turbidity This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code

Laboratory Location

VA

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. mg/kg - milligrams per kilogram based on dry weight of sample. mg/kg wwt - milligrams per kilogram based on wet weight of sample. mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample. mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION. Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review. n Gustoby (000) (wiai n.a.b.c) Request for all fear to the

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(lab use only)	(This description will ap	opear on the report)		(dd-mmm-yy)	(hħ:mតា)	Sample Type	Alk	00	Tur	Ρ́	000	Tot	Dis	ă	Dis	Ĕ	ä		Ē	
	Williston Shallow (W1 - Shallow)			June	14:15	Water	R	R	R	R	R	•							R	4
	Williston Deep (W1 - Deep)			18	14:45	Water	R	R	R	R	R								R	4
	Dinosaur Shallow (D1 - Shallow)			2018	17:50	Water	R	R	R	R	R								R	A
	Dinosaur Deep (D1 - Deep)				11:35	Water	R	R	R	R	R								R	4
	Duplicate (DUP)					Water	R	R	R	R	R						-	_	R	À
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Drinking		Special In	etructione / Spor	cify Criteria to add o	on report (client U	;e)				SAMP	E CO	NDIT		_	· · · · · · · · · · · · · · · · · · ·		_			
Drinking	9 Water (DW) Samples ¹ (client use)						Froze								vation		Yes		No	
Are samples tak 기록 위	4	Please use criteria: BC reshwater aquatic life a	MOE 2018 Appre ind Health Canad	oved and Working V to Guidelines for Dr	water Quality Gu: inking Water, sar	delines for noles' were	- i	acks			No		Cust	ody se	eal int	act	Yes		No	
	- 10 NO	aken from pre-treatmer			• •			ng Initi								2001 5		PERAT	UPEC .	
Are samples for	i human drinking water use? 'es IV No	Chlomphull	fillement	thinks	200ml	Canarla		AL CO	OLER	TEMPER	ALURE	5°C	<u> -</u>	<u>v</u> '					URES	<u> </u>
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	SAIPMENT RELEASE (client use)	Time Receiv		SHIPMENT RECEP	TION (lab use on		Rec	eived b	vr.	FIN			INI RI	Date		<u>` </u>	se on Time:		7 /	
Released by	Date: Ine 18/18	Con Receiv	cu by.	Geoff	June 19/18	Time: 9:15					HP	ł			ไปข		Ĭ	21	26	P
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proving * Failure to complete all portions of this forminay delay analysis. Please fill in this form LEGIBLY By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the while - report copy. 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form. .



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received: 23-JUN-18 Report Date: 10-JUL-18 16:14 (MT) Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2117855 Project P.O. #: NOT SUBMIT Job Reference: VENW03060

C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW03060-02.002

Comments:

Brent Mack, B.Sc. Account Manager

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L2117855 CONTD.... PAGE 2 of 9 10-JUL-18 16:14 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2117855-2 water 23-JUN-18 16:30 FIELD BLANK-SW		
Grouping	Analyte				
FILTER					
Plant Pigments	Chlorophyll a (ug/L)		<0.010		

L2117855 CONTD.... PAGE 3 of 9 10-JUL-18 16:14 (MT) Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2117855-1 water TRAVEL BLANK	L2117855-2 water 23-JUN-18 16:30 FIELD BLANK-SW	L2117855-3 water 23-JUN-18 15:45 PC-1	
Grouping	Analyte				
WATER					
Physical Tests	Colour, True (CU)	<5.0	<5.0	7.0	
	Conductivity (uS/cm)	<2.0	<2.0	205	
	Hardness (as CaCO3) (mg/L)	нтс <0.50	<0.50		
	рН (рН)	5.38	5.89	7.70	
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	
	Total Dissolved Solids (mg/L)			121	
	TDS (Calculated) (mg/L)	<1.0	<1.0		
	Turbidity (NTU)	<0.10	0.18	0.84	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0	<1.0	96.0	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	<1.0	96.0	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	
	Fluoride (F) (mg/L)	<0.020	<0.020	0.042	
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	<0.0051	0.0439	
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.0439	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	<0.050	<0.050	0.093	
	Total Nitrogen (mg/L)	<0.030	<0.030	0.116	
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	0.0023	
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0030	
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020	0.0031	
	Silicate (as SiO2) (mg/L)	<0.50	<0.50	4.42	
	Sulfate (SO4) (mg/L)	<0.30	<0.30	15.1	
	Anion Sum (meq/L)	<0.10	<0.10		
	Cation Sum (meq/L)	<0.10	<0.10		
	Cation - Anion Balance (%)	0.0	0.0		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)		<0.50	2.66	
	Total Organic Carbon (mg/L)	<0.50	<0.50	2.66	
Bacteriological Tests	E. coli (MPN/100mL)	<1	<1		
	HPC (CFU/1mL)	<1	<1		
Tatal Martal	Coliform Bacteria - Total (MPN/100mL)	<1	<1		
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0050	<0.0050		
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050		

L2117855 CONTD.... PAGE 4 of 9 10-JUL-18 16:14 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2117855-1 water TRAVEL BLANK	L2117855-2 water 23-JUN-18 16:30 FIELD BLANK-SW	L2117855-3 water 23-JUN-18 15:45 PC-1	
Grouping	Analyte				
WATER					
Total Metals	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050		
	Barium (Ba)-Total (mg/L)	<0.020	<0.020		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20		
	Boron (B)-Total (mg/L)	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050		
	Calcium (Ca)-Total (mg/L)	<0.10	0.11		
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010		
	Cobalt (Co)-Total (mg/L)	<0.00030	<0.00030		
	Copper (Cu)-Total (mg/L)	<0.0010	<0.0010		
	Iron (Fe)-Total (mg/L)	<0.030	<0.030		
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050		
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010		
	Magnesium (Mg)-Total (mg/L)	<0.10	<0.10		
	Manganese (Mn)-Total (mg/L)	<0.00010	0.00022		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010		
	Nickel (Ni)-Total (mg/L)	<0.0010	<0.0010		
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30		
	Potassium (K)-Total (mg/L)	<2.0	<2.0		
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050		
	Silicon (Si)-Total (mg/L)	<0.10	<0.10		
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020		
	Sodium (Na)-Total (mg/L)	<2.0	<2.0		
	Strontium (Sr)-Total (mg/L)	<0.0050	<0.0050		
	Thallium (TI)-Total (mg/L)	<0.000010	<0.000010		
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050		
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010		
	Uranium (U)-Total (mg/L)	<0.00020	<0.00020		
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050		
Dissolved Metals	Dissolved Fe2 Filtration Location		FIELD		
	Dissolved Mercury Filtration Location		FIELD		
	Dissolved Metals Filtration Location		FIELD		
	Aluminum (AI)-Dissolved (mg/L)		<0.0050		
	Antimony (Sb)-Dissolved (mg/L)		<0.00050		
	Arsenic (As)-Dissolved (mg/L)		<0.00050		

L2117855 CONTD.... PAGE 5 of 9 10-JUL-18 16:14 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2117855-1 water TRAVEL BLANK	L2117855-2 water 23-JUN-18 16:30 FIELD BLANK-SW	L2117855-3 water 23-JUN-18 15:45 PC-1	
Grouping	Analyte				
WATER					
Dissolved Metals	Barium (Ba)-Dissolved (mg/L)		<0.020		
	Beryllium (Be)-Dissolved (mg/L)		<0.00010		
	Bismuth (Bi)-Dissolved (mg/L)		<0.20		
	Boron (B)-Dissolved (mg/L)		<0.10		
	Cadmium (Cd)-Dissolved (mg/L)		<0.0000050		
	Calcium (Ca)-Dissolved (mg/L)		<0.10		
	Chromium (Cr)-Dissolved (mg/L)		<0.0010		
	Cobalt (Co)-Dissolved (mg/L)		<0.00030		
	Copper (Cu)-Dissolved (mg/L)		<0.0010		
	Iron (Fe)-Dissolved (mg/L)		<0.030		
	Ferrous Iron, Dissolved (mg/L)		<0.020		
	Lead (Pb)-Dissolved (mg/L)		<0.00050		
	Lithium (Li)-Dissolved (mg/L)		<0.0010		
	Magnesium (Mg)-Dissolved (mg/L)		<0.10		
	Manganese (Mn)-Dissolved (mg/L)		<0.00010		
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)		<0.0010		
	Nickel (Ni)-Dissolved (mg/L)		<0.0010		
	Phosphorus (P)-Dissolved (mg/L)		<0.30		
	Potassium (K)-Dissolved (mg/L)		<2.0		
	Selenium (Se)-Dissolved (mg/L)		<0.000050		
	Silicon (Si)-Dissolved (mg/L)		<0.050		
	Silver (Ag)-Dissolved (mg/L)		<0.000020		
	Sodium (Na)-Dissolved (mg/L)		<2.0		
	Strontium (Sr)-Dissolved (mg/L)		<0.0050		
	Thallium (TI)-Dissolved (mg/L)		<0.00020		
	Tin (Sn)-Dissolved (mg/L)		<0.00050		
	Titanium (Ti)-Dissolved (mg/L)		<0.010		
	Uranium (U)-Dissolved (mg/L)		<0.00020		
	Vanadium (V)-Dissolved (mg/L)		<0.00050		
	Zinc (Zn)-Dissolved (mg/L)		<0.0050		

QC Samples with Qualifiers & Comments:

QC Type Descri	iption	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank		Copper (Cu)-Dissolved	MB-LOR	L2117855-2
Method Blank		Antimony (Sb)-Total	MB-LOR	L2117855-2
Matrix Spike		Total Nitrogen	MS-B	L2117855-1, -2, -3
Matrix Spike		Phosphorus (P)-Total	MS-B	L2117855-1, -2, -3
Qualifiers for I	ndividual Parameters	Listed:		
Qualifier	Description			
HTC	Hardness was calcula	ted from Total Ca and/or Mg concent	rations and may be	e biased high (dissolved Ca/Mg results unavailable).
MB-LOR	Method Blank exceeds	s ALS DQO. Limits of Reporting have	e been adjusted for	samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery	could not be accurately calculated du	ue to high analyte b	background in sample.
RRV	Reported Result Verifi	ed By Repeat Analysis		
est Method R	eferences:			
ALS Test Code	Matrix	Test Description		Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration		APHA 2320 Alkalinity
				tal alkalinity is determined by potentiometric titration to a the the transformation and total alkalinity values.
ANIONS-N+N-C		Nitrite & Nitrate in Water (Calculati		EPA 300.0
Nitrate and Nitr	ite (as N) is a calculated	I parameter. Nitrate and Nitrite (as N)) = Nitrite (as N) + I	Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Leve	1)	EPA 300.1 (mod)
-		hromatography with conductivity and	,	
CARBONS-DOC	-VA Water	Dissolved organic carbon by comb	oustion	APHA 5310B
		dures adapted from APHA Method 5 ugh a 0.45 micron membrane filter pr		Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC	-VA Water	Total organic carbon by combustic	n	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is	carried out using proce	dures adapted from APHA Method 5	310 "Total Organic	Carbon (TOC)".
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filte	er)	EPA 445.0
		modified from EPA Method 445.0. (cidification procedure. This method		ermined by a routine acetone extraction followed with terferences from chlorophyll b.
CL-IC-N-VA	Water	Chloride in Water by IC		EPA 300.1 (mod)
Inorganic anion	s are analyzed by Ion C	hromatography with conductivity and	/or UV detection.	
COLOUR-TRUE	-VA Water	Colour (True) by Spectrometer		BCMOE Colour Single Wavelength
This analysis is is determined b method.	carried out using proce by filtering a sample thro	dures adapted from British Columbia ugh a 0.45 micron membrane filter fo	llowed by analysis	anual "Colour- Single Wavelength." Colour (True Colour) of the filtrate using the platinum-cobalt colourimetric ived (at time of testing), without pH adjustment.
	asurement of sample pH			
EC-PCT-VA	Water	Conductivity (Automated)		APHA 2510 Auto. Conduc.
This analysis is electrode.	carried out using proce	dures adapted from APHA Method 2	510 "Conductivity".	Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use	Only)	APHA 2510
Qualitative anal	lysis of conductivity whe	re required during preparation of othe	er tests - e.g. TDS,	metals, etc.
ECOLI-COLI-BC	DW-VA Water	E.coli by Colilert		APHA METHOD 9223
LCOLI-COLI-DC				
This analysis is determined sim incubated for 18	ultaneously. The sample	e is mixed with a mixture hydrolyzabl he number of wells exhibiting a positi	e substrates and th	strate Coliform Test". E. coli and Total Coliform are nen sealed in a multi-well packet. The packet is punted. The final result is obtained by comparing the

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

FE2-D-COL-VA Water Diss. Ferrous Iron in Water by Colour

APHA 3500-Fe B/James Ball et al (1999)

This analysis is carried out using procedures adapted from APHA 3500-Fe B and "A New Method for the Direct Determination of Dissolved Iron

Concentration in Acid Mine Waters" published by James W. Ball et al (1999). The procedure involves preliminary sample filtration, and ferrous iron is

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

APHA 2340B

determined using the "FerroZine" colourimetric method.

Water

Hardness

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HARDNESS-CALC-VA

L2117855 CONTD.... PAGE 7 of 9 10-JUL-18 16:14 (MT) Version: FINAL

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod) Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS. Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod) HG-T-CVAA-VA Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS. HPC by pour plate **HPC-PP-ENV-VA** Water APHA METHOD 9215 This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria. **HPC-PP-HLTH-VA** Water HPC by pour plate APHA METHOD 9215 This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria. **IONBALANCE-VA** Water Ion Balance Calculation **APHA 1030E** Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero. Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as: Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum] Dissolved Metals in Water by CRC ICPMS MET-D-CCMS-VA Water APHA 3030B/6020A (mod) Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. **MET-T-CCMS-VA** Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod) Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174 This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735. NH3-F-VA Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC Water This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al. EPA 300.1 (mod) Water Nitrite in Water by IC (Low Level) NO2-L-IC-N-VA Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field. PO4-DO-COL-VA APHA 4500-P Phosphorus Water Diss. Orthophosphate in Water by Colour This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 F. This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. TCOLI-COLI-BCDW-VA Water Total coliform by Colilert APHA METHOD 9223 This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number). **TDS-CALC-VA** Water TDS (Calculated) APHA 1030E (20TH EDITION) This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses". The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample. TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter. TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius. TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC **TSS-VA** Water This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. **TURBIDITY-VA** Water Turbidity by Meter APHA 2130 Turbidity This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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•	en from a Regulated DW System?	Please use criteria: Hea	alth Canada Guid	elines for Drinking	Water. samples	vere taken from	ice pa	acks	Yes		No		Custo	ody se	eal int	act	Yes		No	
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Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received:19-JUN-18Report Date:11-JUL-18 13:09 (MT)Version:FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2115122

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED ENW.VENW03058-02A.002

Brent Mack, B.Sc. Account Manager

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L2115122 CONTD.... PAGE 2 of 8 11-JUL-18 13:09 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2115122-1 Water 19-JUN-18 13:45 HALFWAY RIVER - DOWNSTREAM (HD)	L2115122-2 Water 19-JUN-18 13:00 MIDDLE SITE C RESERVOIR (PR2)	L2115122-3 Water 19-JUN-18 11:40 UPPER SITE C RESERVOIR (PR1)	L2115122-4 Water 19-JUN-18 DUPLICATE 1	
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	14.2	6.9	8.1	14.5	
	Conductivity (uS/cm)	394	210	198	389	
	Hardness (as CaCO3) (mg/L)	202	100	96.1	202	
	рН (рН)	8.48	8.29	8.19	8.46	
	Total Suspended Solids (mg/L)	95.2	11.8	4.0	68.4	
	TDS (Calculated) (mg/L)	218	110	104	219	
	Turbidity (NTU)	59.8	4.96	0.86	64.8	
Anions and	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	157	91.1	86.3	157	
Nutrients	Alkalinity, Carbonate (as CaCO3) (mg/L)				5.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	2.6	<1.0	<1.0	5.8	
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Ammonia, Total (as N) (mg/L)	159	91.1	86.3	163	
	Bromide (Br) (mg/L)	0.0061	<0.0050	<0.0050	0.0073	
	Chloride (Cl) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Fluoride (F) (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Nitrate and Nitrite (as N) (mg/L)	0.092	0.043	0.038	0.096	
	Nitrate (as N) (mg/L)	<0.0051	0.0301	0.0450	<0.0051	
	Nitrite (as N) (mg/L)	<0.0050	0.0301	0.0450	<0.0050	
	Total Kjeldahl Nitrogen (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
		0.233	0.097	0.079	0.235	
	Total Nitrogen (mg/L)	0.180	0.078	0.085	0.196	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0034	0.0017	0.0013	0.0036	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0049	<0.0020	<0.0020	0.0055	
	Phosphorus (P)-Total (mg/L)	0.0981	0.0117	0.0041	0.0908	
	Silicate (as SiO2) (mg/L)	3.55	4.39	4.36	3.84	
	Sulfate (SO4) (mg/L)	43.4	16.4	15.1	43.5	
	Anion Sum (meq/L)	4.09	2.17	2.04	4.16	
	Cation Sum (meq/L)	4.15	2.00	1.92	4.13	
Ormania /	Cation - Anion Balance (%)	0.7	-4.1	-3.1	-0.3	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.96	2.80	2.59	3.93	
	Total Organic Carbon (mg/L)	5.72	3.06	2.86	5.64	
Bacteriological Tests	E. coli (MPN/100mL)	21	66	<1	22	
	HPC (CFU/1mL)	PEHR 130	PEHR 91	PEHR 10	^{РЕНК} 190	
	Coliform Bacteria - Total (MPN/100mL)	145	201	4	165	
Total Metals	Aluminum (Al)-Total (mg/L)	1.53	0.104	0.0216	1.56	
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Total (mg/L)	0.00121	<0.00050	<0.00050	0.00124	

L2115122 CONTD.... PAGE 3 of 8 11-JUL-18 13:09 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2115122-1 Water 19-JUN-18 13:45 HALFWAY RIVER - DOWNSTREAM (HD)	L2115122-2 Water 19-JUN-18 13:00 MIDDLE SITE C RESERVOIR (PR2)	L2115122-3 Water 19-JUN-18 11:40 UPPER SITE C RESERVOIR (PR1)	L2115122-4 Water 19-JUN-18 DUPLICATE 1	
Grouping	Analyte					
WATER						
Total Metals	Barium (Ba)-Total (mg/L)	0.149	0.041	0.034	0.129	
	Beryllium (Be)-Total (mg/L)	0.00010	<0.00010	<0.00010	0.00011	
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Total (mg/L)	0.000178	0.0000288	0.0000158	0.000167	
	Calcium (Ca)-Total (mg/L)	57.9	29.3	27.7	56.8	
	Chromium (Cr)-Total (mg/L)	0.0028	<0.0010	<0.0010	0.0027	
	Cobalt (Co)-Total (mg/L)	0.00116	<0.00030	<0.00030	0.00113	
	Copper (Cu)-Total (mg/L)	0.0036	<0.0010	<0.0010	0.0036	
	Iron (Fe)-Total (mg/L)	2.53	0.171	0.034	2.47	
	Lead (Pb)-Total (mg/L)	0.00143	<0.00050	<0.00050	0.00137	
	Lithium (Li)-Total (mg/L)	0.0067	0.0017	0.0013	0.0071	
	Magnesium (Mg)-Total (mg/L)	16.4	7.03	6.70	16.4	
	Manganese (Mn)-Total (mg/L)	0.0442	0.00673	0.00266	0.0420	
	Mercury (Hg)-Total (mg/L)	0.0000058	<0.0000050	<0.0000050	0.0000054	
	Molybdenum (Mo)-Total (mg/L)	0.0035	<0.0010	<0.0010	0.0036	
	Nickel (Ni)-Total (mg/L)	0.0051	<0.0010	<0.0010	0.0050	
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Total (mg/L)	0.00155	0.000298	0.000278	0.00150	
	Silicon (Si)-Total (mg/L)	4.24	2.28	2.27	4.24	
	Silver (Ag)-Total (mg/L)	0.000034	<0.000020	<0.000020	0.000029	
	Sodium (Na)-Total (mg/L)	2.3	<2.0	<2.0	2.3	
	Strontium (Sr)-Total (mg/L)	0.274	0.112	0.104	0.269	
	Thallium (TI)-Total (mg/L)	0.000063	<0.000010	<0.000010	0.000062	
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	< 0.00050	
	Titanium (Ti)-Total (mg/L)	0.021	<0.010	<0.010	0.020	
	Uranium (U)-Total (mg/L)	0.00092	0.00052	0.00049	0.00092	
	Vanadium (V)-Total (mg/L)	0.00728	0.00074	< 0.00050	0.00759	
	Zinc (Zn)-Total (mg/L)	0.0154	<0.0050	<0.0050	0.0150	
Dissolved Metals	Dissolved Fe2 Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0151	<0.0050	< 0.0050	0.0139	
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Barium (Ba)-Dissolved (mg/L)	<0.00050	0.039	<0.00050	<0.00050	

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	Sample ID Description Sampled Date Sampled Time Client ID	L2115122-1 Water 19-JUN-18 13:45 HALFWAY RIVER - DOWNSTREAM (HD)	L2115122-2 Water 19-JUN-18 13:00 MIDDLE SITE C RESERVOIR (PR2)	L2115122-3 Water 19-JUN-18 11:40 UPPER SITE C RESERVOIR (PR1)	L2115122-4 Water 19-JUN-18 DUPLICATE 1	
Grouping	Analyte					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Dissolved (mg/L)	0.0000180	0.0000084	0.0000069	0.0000159	
	Calcium (Ca)-Dissolved (mg/L)	55.0	28.5	27.8	54.2	
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	
	Ferrous Iron, Dissolved (mg/L)	<0.020	<0.020	<0.020	<0.020	
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Lithium (Li)-Dissolved (mg/L)	0.0061	0.0016	0.0013	0.0056	
	Magnesium (Mg)-Dissolved (mg/L)	15.7	7.02	6.48	16.1	
	Manganese (Mn)-Dissolved (mg/L)	0.00356	0.00169	0.00075	0.00353	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.000050	
	Molybdenum (Mo)-Dissolved (mg/L)	0.0034	<0.0010	<0.0010	0.0034	
	Nickel (Ni)-Dissolved (mg/L)	0.0014	<0.0010	<0.0010	0.0015	
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Dissolved (mg/L)	0.00132	0.000291	0.000246	0.00142	
	Silicon (Si)-Dissolved (mg/L)	1.70	2.02	2.05	1.66	
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Sodium (Na)-Dissolved (mg/L)	2.4	<2.0	<2.0	2.4	
	Strontium (Sr)-Dissolved (mg/L)	0.278	0.112	0.109	0.274	
	Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	< 0.00050	<0.00050	
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Uranium (U)-Dissolved (mg/L)	0.00081	0.00050	0.00048	0.00081	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	< 0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	

QC Samples with Qualifiers & Comments:

	otion	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike		Dissolved Organic Carbon	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Total Organic Carbon	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Barium (Ba)-Dissolved	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Boron (B)-Dissolved	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Calcium (Ca)-Dissolved	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Magnesium (Mg)-Dissolved	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Manganese (Mn)-Dissolved	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Potassium (K)-Dissolved	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Sodium (Na)-Dissolved	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Strontium (Sr)-Dissolved	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Calcium (Ca)-Total	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Copper (Cu)-Total	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Magnesium (Mg)-Total	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Sodium (Na)-Total	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Strontium (Sr)-Total	MS-B	L2115122-1, -2, -3, -4
Matrix Spike		Total Nitrogen	MS-B	L2115122-2, -3
Matrix Spike		Total Nitrogen	MS-B	L2115122-1, -4
Matrix Spike		Silicate (as SiO2)	MS-B	L2115122-1, -2, -3, -4
Qualifiers for In	dividual Parameters	Listed:		
Qualifier	Description			
MOD	•			
MS-B	, ,	could not be accurately calculated due	0 ,	5 I
PEHR	Parameter Exceeded	Recommended Holding Time On Rece	eipt: Proceed Wit	h Analysis As Requested.
est Method Re	ferences:			
ALS Test Code	Matrix	Test Description		Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Litration		APHA 2320 Alkalinity
This analysis is a				
This analysis is opH 4.5 endpoint.	carried out using proce . Bicarbonate, carbonat	dures adapted from APHA Method 232	ed from phenolph	•
This analysis is o pH 4.5 endpoint.	carried out using proce Bicarbonate, carbonat LC-VA Water	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio	ed from phenolph n)	otal alkalinity is determined by potentiometric titration to a thalein alkalinity and total alkalinity values. EPA 300.0
This analysis is o pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit	carried out using proce Bicarbonate, carbonat LC-VA Water e (as N) is a calculated	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) =	ed from phenolph n) = Nitrite (as N) +	otal alkalinity is determined by potentiometric titration to thalein alkalinity and total alkalinity values. EPA 300.0 Nitrate (as N).
This analysis is o pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA	carried out using proce . Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) = Bromide in Water by IC (Low Level)	ed from phenolph n) = Nitrite (as N) +	otal alkalinity is determined by potentiometric titration to a thalein alkalinity and total alkalinity values. EPA 300.0
This analysis is o pH 4.5 endpoint. NIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA	carried out using proce . Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) =	ed from phenolph n) = Nitrite (as N) +	otal alkalinity is determined by potentiometric titration to thalein alkalinity and total alkalinity values. EPA 300.0 Nitrate (as N).
This analysis is o pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA Inorganic anions	carried out using proce . Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water s are analyzed by Ion C	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) = Bromide in Water by IC (Low Level)	ed from phenolph n) = Nitrite (as N) + or UV detection.	otal alkalinity is determined by potentiometric titration to thalein alkalinity and total alkalinity values. EPA 300.0 Nitrate (as N).
This analysis is o pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA Inorganic anions CARBONS-DOC- This analysis is o	carried out using proce Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water s are analyzed by lon C VA Water carried out using proce	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) = Bromide in Water by IC (Low Level) hromatography with conductivity and/o Dissolved organic carbon by combu	ed from phenolph n) = Nitrite (as N) + or UV detection. stion 10 "Total Organic	otal alkalinity is determined by potentiometric titration to athalein alkalinity and total alkalinity values. EPA 300.0 Nitrate (as N). EPA 300.1 (mod)
This analysis is of pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA Inorganic anions CARBONS-DOC- This analysis is of determined by fil	carried out using proce Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water are analyzed by Ion C VA Water carried out using proce Itering the sample throu	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) = Bromide in Water by IC (Low Level) hromatography with conductivity and/o Dissolved organic carbon by combu dures adapted from APHA Method 53	ed from phenolph n) = Nitrite (as N) + or UV detection. stion 10 "Total Organic r to analysis.	otal alkalinity is determined by potentiometric titration to thalein alkalinity and total alkalinity values. EPA 300.0 Nitrate (as N). EPA 300.1 (mod) APHA 5310B
This analysis is of pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA Inorganic anions CARBONS-DOC- This analysis is of determined by fil CARBONS-TOC-	carried out using proce Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water s are analyzed by lon C VA Water carried out using proce Itering the sample throu VA Water	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) = Bromide in Water by IC (Low Level) hromatography with conductivity and/c Dissolved organic carbon by combu dures adapted from APHA Method 537 ugh a 0.45 micron membrane filter prio	ed from phenolph n) = Nitrite (as N) + or UV detection. stion 10 "Total Organic r to analysis.	APHA 5310B TOTAL ORGANIC CARBON (TOC)
pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA Inorganic anions CARBONS-DOC- This analysis is of determined by fil CARBONS-TOC-	carried out using proce Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water s are analyzed by lon C VA Water carried out using proce Itering the sample throu VA Water	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) = Bromide in Water by IC (Low Level) hromatography with conductivity and/c Dissolved organic carbon by combu dures adapted from APHA Method 537 ugh a 0.45 micron membrane filter prio Total organic carbon by combustion	ed from phenolph n) = Nitrite (as N) + or UV detection. stion 10 "Total Organic r to analysis.	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is of pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA Inorganic anions CARBONS-DOC- This analysis is of determined by fil CARBONS-TOC- This analysis is of CL-IC-N-VA	carried out using proce Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water s are analyzed by lon C VA Water carried out using proce Itering the sample throu VA Water carried out using proce carried out using proce Water	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) = Bromide in Water by IC (Low Level) hromatography with conductivity and/c Dissolved organic carbon by combu dures adapted from APHA Method 537 ugh a 0.45 micron membrane filter prio Total organic carbon by combustion dures adapted from APHA Method 537	ed from phenolph n) = Nitrite (as N) + or UV detection. stion 10 "Total Organic r to analysis.	APHA 5310B Carbon (TOC)".
This analysis is of pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA Inorganic anions CARBONS-DOC- This analysis is of determined by fil CARBONS-TOC- This analysis is of CL-IC-N-VA Inorganic anions COLOUR-TRUE-	carried out using proce Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water s are analyzed by lon C VA Water carried out using proce ltering the sample throu VA Water carried out using proce water s are analyzed by lon C WA Water	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) = Bromide in Water by IC (Low Level) hromatography with conductivity and/c Dissolved organic carbon by combu dures adapted from APHA Method 537 ugh a 0.45 micron membrane filter prio Total organic carbon by combustion dures adapted from APHA Method 537 Chloride in Water by IC hromatography with conductivity and/c Colour (True) by Spectrometer	ed from phenolph n) = Nitrite (as N) + or UV detection. stion 10 "Total Organic n to analysis. 10 "Total Organic or UV detection.	APHA 5310B Carbon (TOC)". EPA 300.1 (mod) BCMOE Colour Single Wavelength
This analysis is a pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA Inorganic anions CARBONS-DOC- This analysis is a determined by fil CARBONS-TOC- This analysis is a CL-IC-N-VA Inorganic anions COLOUR-TRUE-N This analysis is a is determined by method.	carried out using proce Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water are analyzed by lon C VA Water carried out using proce tering the sample throuv VA Water carried out using proce water are analyzed by lon C VA Water carried out using proce are analyzed by lon C	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) = Bromide in Water by IC (Low Level) hromatography with conductivity and/or Dissolved organic carbon by combut dures adapted from APHA Method 533 ugh a 0.45 micron membrane filter prior Total organic carbon by combustion dures adapted from APHA Method 533 Chloride in Water by IC hromatography with conductivity and/or Colour (True) by Spectrometer dures adapted from British Columbia E ugh a 0.45 micron membrane filter follo	ed from phenolph n) = Nitrite (as N) + or UV detection. stion 10 "Total Organic r to analysis. 10 "Total Organic or UV detection.	APHA 5310B Carbon (TOC)". EPA 300.1 (mod) BCMOE Colour Single Wavelength
This analysis is a pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA Inorganic anions CARBONS-DOC- This analysis is a determined by fil CARBONS-TOC- This analysis is a CL-IC-N-VA Inorganic anions COLOUR-TRUE-N This analysis is a is determined by method. Colour measured	carried out using proce Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water are analyzed by lon C VA Water carried out using proce tering the sample throuv VA Water carried out using proce water are analyzed by lon C VA Water carried out using proce are analyzed by lon C	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) = Bromide in Water by IC (Low Level) hromatography with conductivity and/c Dissolved organic carbon by combu dures adapted from APHA Method 537 ugh a 0.45 micron membrane filter prio Total organic carbon by combustion dures adapted from APHA Method 537 Chloride in Water by IC hromatography with conductivity and/c Colour (True) by Spectrometer dures adapted from British Columbia E ugh a 0.45 micron membrane filter follo 4 dependent, and apply to the pH of the	ed from phenolph n) = Nitrite (as N) + or UV detection. stion 10 "Total Organic r to analysis. 10 "Total Organic or UV detection.	 batal alkalinity is determined by potentiometric titration to the titrate in alkalinity and total alkalinity values. EPA 300.0 Nitrate (as N). EPA 300.1 (mod) APHA 5310B Carbon (TOC)". Dissolved carbon (DOC) fractions are APHA 5310B TOTAL ORGANIC CARBON (TOC) Carbon (TOC)". EPA 300.1 (mod) BCMOE Colour Single Wavelength anual "Colour- Single Wavelength." Colour (True Colour soft the filtrate using the platinum-cobalt colourimetric
This analysis is a pH 4.5 endpoint. ANIONS-N+N-CA Nitrate and Nitrit BR-L-IC-N-VA Inorganic anions CARBONS-DOC- This analysis is a determined by fil CARBONS-TOC- This analysis is a CL-IC-N-VA Inorganic anions COLOUR-TRUE-N This analysis is a is determined by method. Colour measured	carried out using proce Bicarbonate, carbonat LC-VA Water e (as N) is a calculated Water are analyzed by lon C VA Water carried out using proce Itering the sample throu VA Water carried out using proce Water are analyzed by lon C VA Water carried out using proce of the sample throu water carried out using proce	dures adapted from APHA Method 232 te and hydroxide alkalinity are calculate Nitrite & Nitrate in Water (Calculatio I parameter. Nitrate and Nitrite (as N) = Bromide in Water by IC (Low Level) hromatography with conductivity and/c Dissolved organic carbon by combu dures adapted from APHA Method 537 ugh a 0.45 micron membrane filter prio Total organic carbon by combustion dures adapted from APHA Method 537 Chloride in Water by IC hromatography with conductivity and/c Colour (True) by Spectrometer dures adapted from British Columbia E ugh a 0.45 micron membrane filter follo 4 dependent, and apply to the pH of the	ed from phenolph n) = Nitrite (as N) + or UV detection. stion 10 "Total Organic r to analysis. 10 "Total Organic or UV detection.	 batal alkalinity is determined by potentiometric titration to the titrate in alkalinity and total alkalinity values. EPA 300.0 Nitrate (as N). EPA 300.1 (mod) APHA 5310B Carbon (TOC)". Dissolved carbon (DOC) fractions are APHA 5310B TOTAL ORGANIC CARBON (TOC) Carbon (TOC)". EPA 300.1 (mod) BCMOE Colour Single Wavelength anual "Colour- Single Wavelength." Colour (True Colour soft the filtrate using the platinum-cobalt colourimetric
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APHA METHOD 9223

E.coli by Colilert

Water

ECOLI-COLI-ENV-VA

L2115122 CONTD.... PAGE 6 of 8 11-JUL-18 13:09 (MT) Version: FINAL

ECOLI-COLI-ENV-VA	water	E.coll by Collien	APHA METHOD 9223				
This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.							
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)				
Inorganic anions are analy		hromatography with conductivity and/or UV detection.					
FE2-D-COL-VA	Water	Diss. Ferrous Iron in Water by Colour	APHA 3500-Fe B/James Ball et al (1999)				
	e Waters" pu	dures adapted from APHA 3500-Fe B and "A New Mett blished by James W. Ball et al (1999). The procedure ir rimetric method.					
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B				
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.							
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)				
Water samples are filtered with stannous chloride, an		preserved with hydrochloric acid, then undergo a cold-ox y CVAAS or CVAFS.	xidation using bromine monochloride prior to reduction				
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)				
Water samples undergo a	cold-oxidatic	on using bromine monochloride prior to reduction with st	annous chloride, and analyzed by CVAAS or CVAFS.				
HPC-PP-ENV-VA	Water	HPC by pour plate	APHA METHOD 9215				
This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria.							
IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E				
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero. Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:							
Ion Balance (%) = [Cation	Sum-Anion S	Sum] / [Cation Sum+Anion Sum]					
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)				
		preserved with nitric acid, and analyzed by CRC ICPMS					
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.							
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)				
	ed with nitric	and hydrochloric acids, and analyzed by CRC ICPMS.					
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.							
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174				
This analysis is carried ou	t using proce	dures adapted from APHA Method 4500-P (J) "Persulp lational Environmental Methods Index - Nemi method 5	hate Method for Simultaneous Determination of Total				
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC				
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.							
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)				
Inorganic anions are analy	zed by Ion C	hromatography with conductivity and/or UV detection.					
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)				
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.							
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus				

APHA 4500-P Phosphorous PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined Water Silicate by Colourimetric analysis APHA 4500-SiO2 E. Sulfate in Water by IC Water EPA 300.1 (mod) Water Total coliform by Colilert APHA METHOD 9223 **TDS-CALC-VA** Water TDS (Calculated) APHA 1030E (20TH EDITION) Water TKN in Water by Fluorescence APHA 4500-NORG D Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC Water APHA 2130 Turbidity Water Turbidity by Meter Laboratory Location ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

P-TD-COL-VA Water Total Dissolved P in Water by Colour

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

SILICATE-COL-VA

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

SO4-IC-N-VA

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TCOLI-COLI-ENV-VA

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is quantified by a statistical estimation of bacteria density (most probable number).

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses". The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample. TKN-F-VA This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. TSS-VA This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. **TURBIDITY-VA** This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code VA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received: 21-JUN-18 Report Date: 09-JUL-18 13:56 (MT) Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2116982 Project P.O. #: NOT SUBMIT

Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW03060-02.002

Brent Mack, B.Sc. Account Manager

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L2116982 CONTD.... PAGE 2 of 8 09-JUL-18 13:56 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2116982-1 WATER 21-JUN-18 15:10 MOBERLY RIVER - DOWNSTREAM (MD)	L2116982-2 WATER 21-JUN-18 15:30 LOWER SITE C RESERVOIR (PR3)	L2116982-3 WATER 21-JUN-18 16:10 PEACE AT PINE (PD1)	L2116982-4 WATER 21-JUN-18 16:40 PINE RIVER (PINE)
Grouping	Analyte				
WATER					
Physical Tests	Colour, True (CU)	28.9	8.1	9.1	6.3
	Conductivity (uS/cm)	215	233	225	209
	Hardness (as CaCO3) (mg/L)	120	123	119	111
	рН (рН)	8.21	8.29	8.26	8.28
	Total Suspended Solids (mg/L)	37.9	23.9	44.1	42.5
	TDS (Calculated) (mg/L)	126	131	125	116
	Turbidity (NTU)	38.7	15.7	24.1	30.3
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	107	105	99.6	105
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	107	105	99.6	105
	Ammonia, Total (as N) (mg/L)	0.0098	<0.0050	0.0061	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.082	0.054	0.052	0.051
	Nitrate and Nitrite (as N) (mg/L)	0.0127	0.0340	0.0367	0.0314
	Nitrate (as N) (mg/L)	0.0127	0.0340	0.0367	0.0314
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.296	0.114	0.182	0.120
	Total Nitrogen (mg/L)	0.248	0.165	0.139	0.110
	Orthophosphate-Dissolved (as P) (mg/L)	0.0024	0.0010	0.0012	0.0012
	Phosphorus (P)-Total Dissolved (mg/L)	0.0066	0.0025	0.0027	0.0021
	Phosphorus (P)-Total (mg/L)	0.0575	0.0312	0.0533	0.0471
	Silicate (as SiO2) (mg/L)	3.53	4.39	4.21	2.08
	Sulfate (SO4) (mg/L)	9.38	21.0	19.7	10.7
	Anion Sum (meq/L)	2.33	2.54	2.41	2.32
	Cation Sum (meq/L)	2.50	2.45	2.38	2.22
	Cation - Anion Balance (%)	3.5	-1.8	-0.6	-2.0
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	6.97	2.56	2.90	1.89
	Total Organic Carbon (mg/L)	7.72	3.30	3.36	2.70
Bacteriological Tests	E. coli (MPN/100mL)	37	91	138	24
	HPC (CFU/1mL)	210 PEHR	84	^{РЕНК} 120	PEHR 66
	Coliform Bacteria - Total (MPN/100mL)	629	219	411	101
Total Metals	Aluminum (Al)-Total (mg/L)	0.817	0.399	0.686	0.787
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	0.00077	<0.00050	0.00067	0.00060

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	Sample ID Description Sampled Date Sampled Time Client ID	L2116982-1 WATER 21-JUN-18 15:10 MOBERLY RIVER - DOWNSTREAM (MD)	L2116982-2 WATER 21-JUN-18 15:30 LOWER SITE C RESERVOIR (PR3)	L2116982-3 WATER 21-JUN-18 16:10 PEACE AT PINE (PD1)	L2116982-4 WATER 21-JUN-18 16:40 PINE RIVER (PINE)	
Grouping	Analyte					
WATER						
Total Metals	Barium (Ba)-Total (mg/L)	0.156	0.056	0.073	0.089	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Total (mg/L)	0.0000642	0.0000579	0.0000919	0.0000543	
	Calcium (Ca)-Total (mg/L)	30.1	33.5	33.6	30.8	
	Chromium (Cr)-Total (mg/L)	0.0015	<0.0010	0.0013	0.0013	
	Cobalt (Co)-Total (mg/L)	0.00057	<0.00030	0.00054	0.00051	
	Copper (Cu)-Total (mg/L)	0.0027	0.0014	0.0020	0.0016	
	Iron (Fe)-Total (mg/L)	1.40	0.623	1.13	1.25	
	Lead (Pb)-Total (mg/L)	0.00078	<0.00050	0.00064	0.00073	
	Lithium (Li)-Total (mg/L)	0.0043	0.0027	0.0029	0.0043	
	Magnesium (Mg)-Total (mg/L)	7.96	8.22	8.23	7.24	
	Manganese (Mn)-Total (mg/L)	0.0300	0.0155	0.0285	0.0217	
	Mercury (Hg)-Total (mg/L)	0.0000070	<0.0000050	<0.0000050	<0.000050	
	Molybdenum (Mo)-Total (mg/L)	<0.0010	0.0013	0.0012	<0.0010	
	Nickel (Ni)-Total (mg/L)	0.0033	0.0018	0.0025	0.0020	
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Total (mg/L)	0.000255	0.000499	0.000435	0.000360	
	Silicon (Si)-Total (mg/L)	2.91	2.69	3.08	2.03	
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Strontium (Sr)-Total (mg/L)	0.0769	0.140	0.134	0.0939	
	Thallium (TI)-Total (mg/L)	0.000027	0.000017	0.000027	0.000027	
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	0.012	<0.010	
	Uranium (U)-Total (mg/L)	0.00028	0.00059	0.00061	0.00028	
	Vanadium (V)-Total (mg/L)	0.00337	0.00205	0.00327	0.00305	
	Zinc (Zn)-Total (mg/L)	0.0068	<0.0050	0.0067	0.0098	
Dissolved Metals	Dissolved Fe2 Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0080	<0.0050	<0.0050	0.0090	
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Barium (Ba)-Dissolved (mg/L)	0.141	0.047	0.048	0.069	

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WATER Dissolved Metals Ber Bis Boo Ca Ca Ch Co Co Co Fer Lea	Analyte sryllium (Be)-Dissolved (mg/L) smuth (Bi)-Dissolved (mg/L) fron (B)-Dissolved (mg/L) idmium (Cd)-Dissolved (mg/L) ilcium (Ca)-Dissolved (mg/L) inomium (Cr)-Dissolved (mg/L) obalt (Co)-Dissolved (mg/L) opper (Cu)-Dissolved (mg/L) n (Fe)-Dissolved (mg/L)	<0.00010 <0.20 <0.10 0.0000135 33.3 <0.0010 <0.00030	<0.00010 <0.20 <0.10 0.0000107 34.7 <0.0010	<0.00010 <0.20 <0.10 0.0000105 33.7	<0.00010 <0.20 <0.10 0.0000095
Dissolved Metals Ber Bis Bo Ca Ca Ch Co Co Co Iro Fer Lea	smuth (Bi)-Dissolved (mg/L) fron (B)-Dissolved (mg/L) idmium (Cd)-Dissolved (mg/L) ilcium (Ca)-Dissolved (mg/L) iromium (Cr)-Dissolved (mg/L) ibalt (Co)-Dissolved (mg/L) ipper (Cu)-Dissolved (mg/L) n (Fe)-Dissolved (mg/L)	<0.20 <0.10 0.0000135 33.3 <0.0010 <0.00030	<0.20 <0.10 0.0000107 34.7 <0.0010	<0.20 <0.10 0.0000105 33.7	<0.20 <0.10
Bis Bo Ca Ca Ch Co Co Iro Fei Lea	smuth (Bi)-Dissolved (mg/L) fron (B)-Dissolved (mg/L) idmium (Cd)-Dissolved (mg/L) ilcium (Ca)-Dissolved (mg/L) iromium (Cr)-Dissolved (mg/L) ibalt (Co)-Dissolved (mg/L) ipper (Cu)-Dissolved (mg/L) n (Fe)-Dissolved (mg/L)	<0.20 <0.10 0.0000135 33.3 <0.0010 <0.00030	<0.20 <0.10 0.0000107 34.7 <0.0010	<0.20 <0.10 0.0000105 33.7	<0.20 <0.10
Bo Ca Ch Co Co Iroi Fei Lea	ron (B)-Dissolved (mg/L) Idmium (Cd)-Dissolved (mg/L) Ilcium (Ca)-Dissolved (mg/L) Iromium (Cr)-Dissolved (mg/L) Ibalt (Co)-Dissolved (mg/L) Ipper (Cu)-Dissolved (mg/L) n (Fe)-Dissolved (mg/L)	<0.10 0.0000135 33.3 <0.0010 <0.00030	<0.10 0.0000107 34.7 <0.0010	<0.10 0.0000105 33.7	<0.10
Ca Ca Ch Co Co Iroi Fei Lea	ndmium (Cd)-Dissolved (mg/L) nlcium (Ca)-Dissolved (mg/L) nromium (Cr)-Dissolved (mg/L) nbalt (Co)-Dissolved (mg/L) n (Fe)-Dissolved (mg/L)	0.0000135 33.3 <0.0010 <0.00030	0.0000107 34.7 <0.0010	0.0000105 33.7	
Ca Ch Co Co Iroi Fei Lea	Ilcium (Ca)-Dissolved (mg/L) fromium (Cr)-Dissolved (mg/L) abalt (Co)-Dissolved (mg/L) pper (Cu)-Dissolved (mg/L) n (Fe)-Dissolved (mg/L)	33.3 <0.0010 <0.00030	34.7 <0.0010	33.7	0.0000095
Ch Co Co Iroi Fei Lea	romium (Cr)-Dissolved (mg/L) balt (Co)-Dissolved (mg/L) pper (Cu)-Dissolved (mg/L) n (Fe)-Dissolved (mg/L)	<0.0010 <0.00030	<0.0010		
Co Co Iroi Fei Lea	balt (Co)-Dissolved (mg/L) pper (Cu)-Dissolved (mg/L) n (Fe)-Dissolved (mg/L)	<0.00030			31.7
Co Iroi Fei Lea	pper (Cu)-Dissolved (mg/L) n (Fe)-Dissolved (mg/L)			<0.0010	<0.0010
Iroi Fei Lea	n (Fe)-Dissolved (mg/L)	0.0014	<0.00030	<0.00030	<0.00030
Fei Lea	() ()	0.0014	<0.0010	<0.0010	<0.0010
Lea		<0.030	<0.030	<0.030	<0.030
	rrous Iron, Dissolved (mg/L)	<0.020	<0.020	<0.020	<0.020
Lith	ad (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	hium (Li)-Dissolved (mg/L)	0.0037	0.0024	0.0023	0.0035
Ma	agnesium (Mg)-Dissolved (mg/L)	8.96	8.77	8.48	7.78
Ма	anganese (Mn)-Dissolved (mg/L)	0.00485	0.00196	0.00316	0.00175
Me	ercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	0.0000065	<0.000050
Мо	olybdenum (Mo)-Dissolved (mg/L)	<0.0010	0.0013	0.0011	<0.0010
Nic	ckel (Ni)-Dissolved (mg/L)	0.0015	<0.0010	0.0012	<0.0010
Ph	osphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30
Pot	tassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0
Sel	lenium (Se)-Dissolved (mg/L)	0.000200	0.000455	0.000418	0.000320
Sili	icon (Si)-Dissolved (mg/L)	1.69	1.98	2.01	0.963
Silv	ver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020
So	dium (Na)-Dissolved (mg/L)	2.3	<2.0	<2.0	<2.0
Str	rontium (Sr)-Dissolved (mg/L)	0.0791	0.141	0.136	0.0953
Tha	allium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020
Tin	n (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
Tita	anium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
Ura	anium (U)-Dissolved (mg/L)	0.00023	0.00056	0.00050	0.00023
Va	nadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
Zin	nc (Zn)-Dissolved (mg/L)	0.0064	<0.0050	<0.0050	<0.0050

Description

Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier
L2116982-2	LOWER SITE C RESERVOIF	WSMT

Water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L2116982-1, -2, -4
Matrix Spike	Dissolved Organic Carbon	MS-B	L2116982-3
Matrix Spike	Dissolved Organic Carbon	MS-B	L2116982-3
Matrix Spike	Total Organic Carbon	MS-B	L2116982-1, -2, -3, -4
Matrix Spike	Aluminum (AI)-Dissolved	MS-B	L2116982-1, -2
Matrix Spike	Antimony (Sb)-Dissolved	MS-B	L2116982-1, -2, -3, -4
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L2116982-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2116982-1, -2, -3, -4
Aatrix Spike	Barium (Ba)-Dissolved	MS-B	L2116982-1, -2
Matrix Spike	Cadmium (Cd)-Dissolved	MS-B	L2116982-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2116982-1, -2, -3, -4
Aatrix Spike	Calcium (Ca)-Dissolved	MS-B	L2116982-1, -2
Matrix Spike	Copper (Cu)-Dissolved	MS-B	L2116982-1, -2, -3, -4
Aatrix Spike	Copper (Cu)-Dissolved	MS-B	L2116982-1, -2
/latrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2116982-1, -2, -3, -4
Aatrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2116982-1, -2
Aatrix Spike	Manganese (Mn)-Dissolved	MS-B	L2116982-1, -2, -3, -4
/latrix Spike	Manganese (Mn)-Dissolved	MS-B	L2116982-1, -2
Aatrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L2116982-1, -2, -3, -4
Aatrix Spike	Nickel (Ni)-Dissolved	MS-B	L2116982-1, -2
Aatrix Spike	Potassium (K)-Dissolved	MS-B	L2116982-1, -2, -3, -4
/latrix Spike	Sodium (Na)-Dissolved	MS-B	L2116982-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2116982-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2116982-1, -2
Matrix Spike	Zinc (Zn)-Dissolved	MS-B	L2116982-1, -2
Matrix Spike	Calcium (Ca)-Total	MS-B	L2116982-1, -2, -3, -4
Aatrix Spike	Magnesium (Mg)-Total	MS-B	L2116982-1, -2, -3, -4
Aatrix Spike	Manganese (Mn)-Total	MS-B	L2116982-1, -2, -3, -4
Aatrix Spike	Sodium (Na)-Total	MS-B	L2116982-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L2116982-1, -2, -3, -4
Matrix Spike	Total Nitrogen	MS-B	L2116982-1, -2, -3, -4
Matrix Spike	Total Nitrogen	MS-B	L2116982-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHR	Parameter Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested.

Test Method References:

lest method References	5.		
ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
			nity". Total alkalinity is determined by potentiometric titration to a henolphthalein alkalinity and total alkalinity values.
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is	s a calculate	d parameter. Nitrate and Nitrite (as N) = Nitrite (a	as N) + Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
In a second second second second second			a than

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

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CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B
		lures adapted from APHA Method 5310 "Total Organic gh a 0.45 micron membrane filter prior to analysis.	Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out	using proced	lures adapted from APHA Method 5310 "Total Organic	Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyz	zed by Ion Ch	romatography with conductivity and/or UV detection.	
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
is determined by filtering a method.	sample throu	lures adapted from British Columbia Environmental Mai gh a 0.45 micron membrane filter followed by analysis dependent, and apply to the pH of the sample as recei	- .
Concurrent measurement of			ved (at time of testing), without pri adjustment.
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out electrode.	using proced	lures adapted from APHA Method 2510 "Conductivity".	Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conc	luctivity wher	e required during preparation of other tests - e.g. TDS,	metals, etc.
ECOLI-COLI-ENV-VA	Water	E.coli by Colilert	APHA METHOD 9223
determined simultaneously	. The sample s and then th	lures adapted from APHA Method 9223 "Enzyme Subs is mixed with a mixture hydrolyzable substrates and th e number of wells exhibiting a positive response are co	en sealed in a multi-well packet. The packet is
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyz	zed by Ion Ch	romatography with conductivity and/or UV detection.	
FE2-D-COL-VA	Water	Diss. Ferrous Iron in Water by Colour	APHA 3500-Fe B/James Ball et al (1999)
	Waters" pub	lures adapted from APHA 3500-Fe B and "A New Meth lished by James W. Ball et al (1999). The procedure in imetric method.	
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
		s) is calculated from the sum of Calcium and Magnesiu centrations are preferentially used for the hardness calc	
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered with stannous chloride, and		eserved with hydrochloric acid, then undergo a cold-oxi CVAAS or CVAFS.	idation using bromine monochloride prior to reduction
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a o	cold-oxidatior	n using bromine monochloride prior to reduction with sta	annous chloride, and analyzed by CVAAS or CVAFS.
HPC-PP-ENV-VA	Water	HPC by pour plate	APHA METHOD 9215
	s determined	lures adapted from APHA Method 9215 "Heterotropic P by culturing and colony counting using the pour plate n bic bacteria.	
IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E
		ce (as % difference) are calculated based on guidance queous solutions are electrically neutral, the calculated	
Cation and Anion Sums are included where data is pres		q/L concentration of major cations and anions. Dissolv ance is calculated as:	red species are used where available. Minor ions are
Ion Balance (%) = [Cation S	Sum-Anion S	um] / [Cation Sum+Anion Sum]	
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered	(0.45 um), pr	eserved with nitric acid, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulfu	ır): Sulfide ar	nd volatile sulfur species may not be recovered by this r	nethod.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digeste	ed with nitric a	and hydrochloric acids, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulf	ur): Sulfide a	nd volatile sulfur species may not be recovered by this r	method.
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
		dures adapted from APHA Method 4500-P (J) "Persulph ational Environmental Methods Index - Nemi method 57	
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
			n J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion Cł	nromatography with conductivity and/or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		nromatography with conductivity and/or UV detection.	
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
		dures adapted from APHA Method 4500-P "Phosphorus	". Total Phosphorus is determined colourimetrically
after persulphate digestion Samples with very high dis available for these types of	solved solids	e. (i.e. seawaters, brackish waters) may produce a negat	ive bias by this method. Alternate methods are
Arsenic (5+), at elevated le	evels, is a pos	sitive interference on colourimetric phosphate analysis.	
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
colourimetrically after pers	ulphate diges solved solids	dures adapted from APHA Method 4500-P "Phosphorus tion of a sample that has been lab or field filtered throu (i.e. seawaters, brackish waters) may produce a negat	gh a 0.45 micron membrane filter.
Arsenic (5+), at elevated le	evels, is a pos	sitive interference on colourimetric phosphate analysis.	
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out electrode	using proced	dures adapted from APHA Method 4500-H "pH Value".	The pH is determined in the laboratory using a pH
It is recommended that this	s analysis be	conducted in the field.	
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a same	ole that has b solved solids	dures adapted from APHA Method 4500-P "Phosphorus een lab or field filtered through a 0.45 micron membran (i.e. seawaters, brackish waters) may produce a negat	ne filter.
Arsenic (5+), at elevated le	vels, is a pos	sitive interference on colourimetric phosphate analysis.	
SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
This analysis is carried out the molybdosilicate-hetero		dures adapted from APHA Method 4500-SiO2 E. "Silica purimetric method.	a". Silicate (molybdate-reactive silica) is determined by
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion Cł	nromatography with conductivity and/or UV detection.	
TCOLI-COLI-ENV-VA	Water	Total coliform by Colilert	APHA METHOD 9223
determined simultaneously	The sample rs and then the	dures adapted from APHA Method 9223 "Enzyme Subs is mixed with a mixture hydrolyzable substrates and th ne number of wells exhibiting a positive response are co bable number).	en sealed in a multi-well packet. The packet is
TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)
		dures adapted from APHA 1030E "Checking Correctnes sulated from measured concentrations of anions and ca	
TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
This analysis is carried out	using proced	dures adapted from APHA Method 4500-Norg D. "Block	Digestion and Flow Injection Analysis". Total Kjeldahl

Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-VA	Nater	Total Suspended Solids by Gravime	etric APHA 2540 D - GRAVIMETRIC								
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.											
TURBIDITY-VA	Nater	Turbidity by Meter	APHA 2130 Turbidity								
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.											
** ALS test methods may incorp	orate modi	fications from specified reference me	thods to improve performance.								
The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:											
Laboratory Definition Code	Labora	tory Location									
VA	ALS EN	VIRONMENTAL - VANCOUVER, BR	RITISH COLUMBIA, CANADA								

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. mg/kg - milligrams per kilogram based on dry weight of sample. mg/kg wwt - milligrams per kilogram based on wet weight of sample. mg/L - milligrams per kilogram based on lipid-adjusted weight of sample. mg/L - milligrams per litre. < - Less than. D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



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1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received:21-JUN-18Report Date:12-JUL-18 11:54 (MT)Version:FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2116460 Project P.O. #: NOT SUBMIT

Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW003060-02.002

Brent Mack, B.Sc. Account Manager

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L2116460 CONTD.... PAGE 2 of 6 12-JUL-18 11:54 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2116460-1 Water 20-JUN-18 11:40 PEACE AT BEATTON (PD2)	L2116460-2 Water 20-JUN-18 11:10 BEATTON RIVER (BEATTON)	L2116460-3 Water 20-JUN-18 12:40 PEACE AT KISKATINAW (PD3)	L2116460-4 Water 20-JUN-18 13:20 KISKATINAW RIVER (KR)	L2116460-5 Water 20-JUN-18 14:05 PEACE AT POUCE COUPE (PD4)
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	10.2	153	9.3	29.7	13.1
	Conductivity (uS/cm)	235	160	230	406	232
	рН (рН)	8.27	7.80	8.27	8.55	8.26
	Total Suspended Solids (mg/L)	26.3	51.1	28.7	66.9	50.9
	Total Dissolved Solids (mg/L)	149	173	143	305	159
	Turbidity (NTU)	20.6	71.3	20.0	132	29.3
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	109	43.2	108	192	109
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	14.4	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	109	43.2	108	207	109
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0317	<0.0050	0.0133	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	0.74	<0.50	0.87	<0.50
	Fluoride (F) (mg/L)	0.059	0.083	0.058	0.101	0.059
	Nitrate and Nitrite (as N) (mg/L)	0.0300	0.0219	0.0210	0.0300	0.0270
	Nitrate (as N) (mg/L)	0.0300	0.0115	0.0210	0.0300	0.0270
	Nitrite (as N) (mg/L)	<0.0010	0.0104	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.147	0.733	0.137	0.572	0.218
	Total Nitrogen (mg/L)	0.127	0.68	0.117	0.59	0.174
	Orthophosphate-Dissolved (as P) (mg/L)	0.0015	0.0091	0.0013	0.0018	0.0015
	Phosphorus (P)-Total Dissolved (mg/L)	0.0023	0.0215	<0.0020	0.0060	0.0033
	Phosphorus (P)-Total (mg/L)	0.0390	0.111	0.0393	0.117	0.0579
	Silicate (as SiO2) (mg/L)	3.35	5.09	2.95	4.90	3.17
	Sulfate (SO4) (mg/L)	19.2	32.6	17.4	23.2	18.3
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.71	26.0	3.00	11.2	3.50
	Total Organic Carbon (mg/L)	3.39	28.1	3.50	13.5	4.15

L2116460 CONTD.... PAGE 3 of 6 12-JUL-18 11:54 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2116460-6 Water 20-JUN-18 15:10 POUCE COUPE (POUCE)	L2116460-7 Water 20-JUN-18 16:35 PEACE AT MANY ISLANDS
Grouping	Analyte		
WATER			
Physical Tests	Colour, True (CU)	72.4	17.5
	Conductivity (uS/cm)	558	231
	рН (рН)	8.30	8.28
	Total Suspended Solids (mg/L)	46.5	43.7
	Total Dissolved Solids (mg/L)	429	162
	Turbidity (NTU)	77.2	30.1
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	136	107
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	136	107
	Ammonia, Total (as N) (mg/L)	0.0146	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050
	Chloride (Cl) (mg/L)	11.7	<0.50
	Fluoride (F) (mg/L)	0.171	0.062
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0297
	Nitrate (as N) (mg/L)	<0.0050	0.0297
	Nitrite (as N) (mg/L)	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	1.07	0.200
	Total Nitrogen (mg/L)	0.82	0.166
	Orthophosphate-Dissolved (as P) (mg/L)	0.0024	0.0017
	Phosphorus (P)-Total Dissolved (mg/L)	0.0139	0.0044
	Phosphorus (P)-Total (mg/L)	0.102	0.0609
	Silicate (as SiO2) (mg/L)	1.67	3.34
	Sulfate (SO4) (mg/L)	139	20.1
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	24.4	4.40
	Total Organic Carbon (mg/L)	25.9	5.48

Qualifier

Applies to Sample Number(s)

Parameter

QC Samples with Qualifiers & Comments:

QC Type Description

QC Type Desci	iption	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike		Dissolved Organic Carbon	MS-B	L2116460-1, -2, -3, -4, -5, -6, -7
Matrix Spike		Total Organic Carbon	MS-B	L2116460-1, -2, -3, -4, -5, -6, -7
Matrix Spike		Total Nitrogen	MS-B	L2116460-1, -2, -3, -7
Matrix Spike		Total Nitrogen	MS-B	L2116460-1, -2, -3, -7
Matrix Spike		Total Nitrogen	MS-B	L2116460-5
Matrix Spike		Phosphorus (P)-Total	MS-B	L2116460-1, -2, -3, -4, -5, -6, -7
Qualifiers for	Individual Parameters	Listed:		
Qualifier	Description			
MS-B	Matrix Spike recovery	v could not be accurately calculated du	e to high analyte	background in sample.
est Method R	eferences:			
ALS Test Code	Matrix	Test Description		Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration		APHA 2320 Alkalinity
				otal alkalinity is determined by potentiometric titration to a nthalein alkalinity and total alkalinity values.
NIONS-N+N-C		Nitrite & Nitrate in Water (Calculatio		EPA 300.0
Nitrate and Nitr	rite (as N) is a calculate	d parameter. Nitrate and Nitrite (as N)	,	Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level))	EPA 300.1 (mod)
Inorganic anior	ns are analyzed by Ion (Chromatography with conductivity and/	or UV detection.	
CARBONS-DOC	-VA Water	Dissolved organic carbon by combu	ustion	APHA 5310B
		edures adapted from APHA Method 53 bugh a 0.45 micron membrane filter price		c Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC	•	Total organic carbon by combustion	-	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is	s carried out using proce	edures adapted from APHA Method 53	10 "Total Organic	c Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC		EPA 300.1 (mod)
Inorganic anior	ns are analyzed by Ion (Chromatography with conductivity and/	or UV detection.	
COLOUR-TRUE	-VA Water	Colour (True) by Spectrometer		BCMOE Colour Single Wavelength
				anual "Colour- Single Wavelength." Colour (True Colour) s of the filtrate using the platinum-cobalt colourimetric
	ements can be highly p asurement of sample p		e sample as rece	eived (at time of testing), without pH adjustment.
EC-PCT-VA	Water	Conductivity (Automated)		APHA 2510 Auto. Conduc.
This analysis is electrode.	s carried out using proce	edures adapted from APHA Method 25	10 "Conductivity"	. Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use C	Only)	APHA 2510
Qualitative ana	lysis of conductivity who	ere required during preparation of othe	r tests - e.g. TDS	, metals, etc.
-IC-N-VA	Water	Fluoride in Water by IC		EPA 300.1 (mod)
	ns are analyzed by Ion (Chromatography with conductivity and/	or UV detection.	
N-T-COL-VA	Water	Total Nitrogen in water by Colour		APHA4500-P(J)/NEMI9171/USGS03-4174
		edures adapted from APHA Method 45 National Environmental Methods Index		hate Method for Simultaneous Determination of Total
NH3-F-VA	Water	Ammonia in Water by Fluorescence		J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
				m J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society e levels of ammonium in seawater", Roslyn J. Waston e
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)		EPA 300.1 (mod)
		Chromatography with conductivity and/	or UV detection.	
J				
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)		EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field. PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. Water Silicate by Colourimetric analysis APHA 4500-SiO2 E. SILICATE-COL-VA This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. **TDS-VA** Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius. Water TKN in Water by Fluorescence APHA 4500-NORG D This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC **TSS-VA** Water This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. Water Turbidity by Meter APHA 2130 Turbidity **TURBIDITY-VA** This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. *mg/kg* - *milligrams per kilogram based on dry weight of sample.*

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

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PO/AFE:		·	Activity Code:		<u> </u>		ц Ц Д	TSS,	Ortho I	TKN, NH3		(CCME+ICP+Hardness)	Dissolved Metals (CCME+JCP+Hardness)	Total Hg (ultra low detection limit)		Total MeHg (ultra low detection limit)	ē g			Number of Containers
LSD:			Location:				2 E	표	ŏ	L d		Ш.	Ξğ.	w de	Dissolved Hg (ultra low	<u>0</u>	(ultra			htt
						MacDonald	Alk-SpeciesAnions	с Ш	Silicate.	TP, TDP,		8	etals	몓	n) B	Elt	Dissolved MeHg			z
ALS Lab Wo	rk Order # (lab use only)	16460	ALS Contact:	Brent Mack	Sampler:	agrette	cies/	e,	Sil	14		etals	Σ	CII (ΉΡ	문	Νp			
ALS Sample #	Sample Identificatio	n and/or Coordinates	.	Date	Time	<u>, , ,</u>	be l	Color-True, EC,	Turbidity,	, T		Fotal Metals	olve	E H	olve	Ň	PV0			
(lab use only)	. (This description will	appear on the report)		(dd-mmm-yy)	(hh:mm)	Sample Type	Alk-	Š	E E	То С	DOC	Tota	Ó iss	Tota	Diss	Tota	Diss			
	Peace at Beatton (PD2)			Jine	11:40	Water	R	R	R	R	R		ŀ	[\neg	3
	Beatton River (Beatton)			10	11:0	Water	R	R	R	R	R									3
	Peace at Kiskatinaw (PD3)			2018	12:40	Water	R	R	R	R	R	1								3
	Kiskatinaw River (KR)				13:20	Water	R	R	R	R	R	1								3
	Peace at Pouce Coupe (PD4)				1405	Water	R	R	R	R	R									3
	Pouce Coupe (Pouce)				1510	Water	R	R	R	R	R	T								3
-	Peace at Many Islands (PD5)				1635	Water	R	R	R	R	Ŕ									3
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1		-			1				-	ľ		T							-+	
				L	· · · · · · · · ·	· · ·		<u> </u>		SAMP	LE CO		ION A	SRE	CEIV	ED (la	ab use	only)	L	
Drinking	g Water (DW) Samples ¹ (client use)	Special In	nstructions / Spec	ify Criteria to add o	n report (client Us	ie) :	Froze	en				·			vatio		Yes		No	
· · ·	ten from a Regulated DW System?	Please use criteria: BC				defines for	lce pa	acks	Yes		No		Cust	ody s	eal in	tact	Yes		No	ā
Г Г Y	•	freshwater aquatic life. s	samples were tak	en πom surface wa	iter .			ng Initia												·
1 '	human drinking water use?	l `	-			*			OLER	TEMPE			<u> </u>		FINAL	COOL	ER TEM	IPERATI	JRES *	c
L LA	′es ∏⊽ No						8	00				5								
	SHIPMENT RELEASE (client use)			HIPMENT RECEP	TION (lab use on	ly)				FIN	IAL SH	IPME	NT R			l (lab	use on	ily)		
Released by:	le Mor Don & Bate: 2000	Time: Receiv	ed by: Shy bi	•	Date: June of 18	Time: 9.0000m	Rece	eived b	y:	,	, 1	3		Date	9.1-	17	Time:	12	1-	•
	2000	1 me 20/18	Singlin	1 	-inversition	7.004m					<u>µ</u>	<u>4</u>		<u> </u>		12	rof/04 Jacus	_	1	



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received:18-JUL-18Report Date:30-JUL-18 17:24 (MT)Version:FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2131545

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW03060 - 02.002 14-

Brent Mack, B.Sc. Account Manager

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L2131545 CONTD.... PAGE 2 of 7 30-JUL-18 17:24 (MT) Version: FINAL

Grouping	Analyte	Sample ID Description Sampled Date Sampled Time Client ID	L2131545-1 Water 17-JUL-18 11:15 WILLISTON SHALLOW (W1- SHALLOW)	L2131545-2 Water 17-JUL-18 11:40 WILLISTON DEEP (W1-DEEP)	L2131545-3 Water 17-JUL-18 16:15 DINOSAUR SHALLOW (D1- SHALLOW)	L2131545-4 Water 17-JUL-18 17:00 DINOSAUR DEEP(D1-DEEP)	L2131545-5 Water DUPLICATE 2 (DUP 2)
	Analyte						
FILTER							
Plant Pigments	Chlorophyll a (ug/L)		1.09	1.48	0.804	0.769	0.903

L2131545 CONTD.... PAGE 3 of 7 30-JUL-18 17:24 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time	L2131545-1 Water 17-JUL-18 11:15	L2131545-2 Water 17-JUL-18 11:40	L2131545-3 Water 17-JUL-18 16:15	L2131545-4 Water 17-JUL-18 17:00	L2131545-5 Water
	Client ID	WILLISTON SHALLOW (W1- SHALLOW)	WILLISTON DEEP (W1-DEEP)	DINOSAUR SHALLOW (D1- SHALLOW)	DINOSAUR DEEP(D1-DEEP)	DUPLICATE 2 (DUP 2)
Grouping	Analyte			,		
WATER						
Physical Tests	Colour, True (CU)	5.7	6.0	6.2	6.0	8.6
	Conductivity (uS/cm)	179	179	181	180	183
	рН (рН)	8.23	8.18	8.17	8.17	8.20
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	116	115	119	115	112
	Turbidity (NTU)	2.45	2.54	0.81	0.84	0.87
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	81.8	80.8	81.3	79.4	83.3
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	81.8	80.8	81.3	79.4	83.3
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0074	0.0058	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.035	0.035	0.037	0.035	0.037
	Nitrate and Nitrite (as N) (mg/L)	0.0527	0.0524	0.0494	0.0610	0.0495
	Nitrate (as N) (mg/L)	0.0527	0.0524	0.0494	0.0610	0.0495
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.115	0.089	0.102	0.077	0.080
	Total Nitrogen (mg/L)	0.157	0.152	0.138	0.146	0.131
	Orthophosphate-Dissolved (as P) (mg/L)	0.0015	0.0012	0.0017	0.0012	0.0013
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0059	0.0060	0.0033	0.0044	0.0039
	Silicate (as SiO2) (mg/L)	4.11	4.02	4.21	4.15	4.03
	Sulfate (SO4) (mg/L)	13.5	13.4	13.9	13.5	13.8
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.90	2.82	2.78	3.09	3.02
	Total Organic Carbon (mg/L)	2.91	2.85	2.85	3.31	2.82

L2131545 CONTD.... PAGE 4 of 7 30-JUL-18 17:24 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2131545-6 Water 17-JUL-18 18:30 PEACE CANYON (PC1)		
Grouping	Analyte			
WATER				
Physical Tests	Colour, True (CU)	7.2		
	Conductivity (uS/cm)	179		
	рН (рН)	8.16		
	Total Suspended Solids (mg/L)	<3.0		
	Total Dissolved Solids (mg/L)	115		
	Turbidity (NTU)	1.01		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	81.3		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	81.3		
	Ammonia, Total (as N) (mg/L)	0.0091		
	Bromide (Br) (mg/L)	<0.050		
	Chloride (Cl) (mg/L)	<0.50		
	Fluoride (F) (mg/L)	0.035		
	Nitrate and Nitrite (as N) (mg/L)	0.0615		
	Nitrate (as N) (mg/L)	0.0615		
	Nitrite (as N) (mg/L)	<0.0010		
	Total Kjeldahl Nitrogen (mg/L)	0.100		
	Total Nitrogen (mg/L)	0.132		
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010		
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020		
	Phosphorus (P)-Total (mg/L)	0.0025		
	Silicate (as SiO2) (mg/L)	3.95		
	Sulfate (SO4) (mg/L)	13.6		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.54		
	Total Organic Carbon (mg/L)	3.03		

QC Samples wit	h Qualifiers & Comm	Reference In ents:	nformatio	on	Version:	FINAL
QC Type Descri	ption	Parameter	Qualifier	Applies to Sample Number(s)		
Method Blank		Alkalinity, Total (as CaCO3)	В	L2131545-2, -3, -4, -6		
Matrix Spike		Total Nitrogen	MS-B	L2131545-1, -2, -3, -4, -5, -6		
Matrix Spike		Silicate (as SiO2)	MS-B	L2131545-1, -2, -3, -4, -5, -6		
Matrix Spike		Sulfate (SO4)	MS-B	L2131545-1, -2, -3, -4, -5, -6		
Qualifiers for In	ndividual Parameters	Listed:				
Qualifier	Description					
В	Method Blank exceed reliable.	ds ALS DQO. Associated sample result	ts which are < Li	mit of Reporting or > 5 times blan	k level are co	nsidered
MS-B	Matrix Spike recovery	y could not be accurately calculated due	e to high analyte	background in sample.		
est Method Re	eferences:					
ALS Test Code	Matrix	Test Description		Method Reference**		
ALK-TITR-VA	Water	Alkalinity Species by Titration		APHA 2320 Alkalinity		
,	01	edures adapted from APHA Method 232 ate and hydroxide alkalinity are calculate	,	, , , , , , , , , , , , , , , , , , , ,		ration to a
ANIONS-N+N-CA	ALC-VA Water	Nitrite & Nitrate in Water (Calculatio	n)	EPA 300.0		
Nitrate and Nitri	te (as N) is a calculate	ed parameter. Nitrate and Nitrite (as N) =	= Nitrite (as N) +	Nitrate (as N).		
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)		EPA 300.1 (mod)		
Inorganic anions	s are analyzed by Ion (Chromatography with conductivity and/c	or UV detection.			
CARBONS-DOC	-VA Water	Dissolved organic carbon by combu	stion	APHA 5310B		
		edures adapted from APHA Method 53' bugh a 0.45 micron membrane filter prio		c Carbon (TOC)". Dissolved carbo	on (DOC) fract	tions are
CARBONS-TOC-	-VA Water	Total organic carbon by combustion		APHA 5310B TOTAL ORGANI	C CARBON (TOC)
This analysis is	carried out using proc	edures adapted from APHA Method 537	10 "Total Organio	c Carbon (TOC)".		
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter))	EPA 445.0		
		s modified from EPA Method 445.0. Ch acidification procedure. This method is			raction follow	ed with
CL-IC-N-VA	Water	Chloride in Water by IC		EPA 300.1 (mod)		

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

COLOUR-TRUE-VA Water Colour (True) by Spectrometer

Water

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment.

Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-PCT-VAWaterConductivity (Automated)APHA 2510 Auto. Conduc.This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivityEC-SCREEN-VAWaterConductivity Screen (Internal Use Only)APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

 F-IC-N-VA
 Water
 Fluoride in Water by IC
 EPA 300.1 (mod)

 Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
 EPA 300.1 (mod)

N-T-COL-VA Water Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

NH3-F-VA

Ammonia in Water by Fluorescence

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA

BCMOE Colour Single Wavelength

J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

Inorganic anions are analyze	ed by Ion Ch	nromatography with conductivity and/or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyze	ed by Ion Ch	nromatography with conductivity and/or UV detection.	
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestion of	f the sample olved solids	dures adapted from APHA Method 4500-P "Phosphorus e. (i.e. seawaters, brackish waters) may produce a negati	
Arsenic (5+), at elevated leve	els, is a pos	itive interference on colourimetric phosphate analysis.	
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
colourimetrically after persulp	phate diges	dures adapted from APHA Method 4500-P "Phosphorus tion of a sample that has been lab or field filtered throug (i.e. seawaters, brackish waters) may produce a negati	gh a 0.45 micron membrane filter.
Arsenic (5+), at elevated leve	els, is a pos	itive interference on colourimetric phosphate analysis.	
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out u electrode	sing proced	lures adapted from APHA Method 4500-H "pH Value". ⊺	The pH is determined in the laboratory using a pH
It is recommended that this a	analysis be	conducted in the field.	
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a sample Samples with very high disso available for these types of s	e that has b olved solids amples.	Jures adapted from APHA Method 4500-P "Phosphorus een lab or field filtered through a 0.45 micron membran (i.e. seawaters, brackish waters) may produce a negati	e filter.
		itive interference on colourimetric phosphate analysis.	
	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
This analysis is carried out u the molybdosilicate-heteropo		dures adapted from APHA Method 4500-SiO2 E. "Silica purimetric method.	". Silicate (molybdate-reactive silica) is determined by
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyze	ed by Ion Ch	nromatography with conductivity and/or UV detection.	
TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC
		dures adapted from APHA Method 2540 "Solids". Solids ple through a glass fibre filter, TDS is determined by even	are determined gravimetrically. Total Dissolved Solids aporating the filtrate to dryness at 180 degrees celsius.
TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
		lures adapted from APHA Method 4500-Norg D. "Block stion followed by Flow-injection analysis with fluorescen	
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
Solids (TSS) are determined	by filtering h dissolved	dures adapted from APHA Method 2540 "Solids". Solids a sample through a glass fibre filter, TSS is determined solid content (i.e. seawaters, brackish waters) may pro- f samples.	by drying the filter at 104 degrees celsius.
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out u	ising proced	dures adapted from APHA Method 2130 "Turbidity". Tur	bidity is determined by the nephelometric method.
** ALS test methods may incorp	porate modi	fications from specified reference methods to improve p	performance.
The last two letters of the abo	ve test code	e(s) indicate the laboratory that performed analytical an	alysis for that test. Refer to the list below:
Laboratory Definition Code	Labora	tory Location	
VA	ALS EN	VIRONMENTAL - VANCOUVER, BRITISH COLUMBIA	A, CANADA
Chain of Custody Numbers:			

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. *mg/kg* - *milligrams per kilogram based on dry weight of sample.*

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

		Chain of Cust Rec	ody (COC) / quest Form										co) Num	nber:	14	-			
ALS	Environmental	Canada Tol	II Free: 1 800 66	~ 38 9878	- I	L213154	45=COFC						Page of1							
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Contact:	Danielle MacDonald		-	(QC) Report with R		es ⊑No	P											_S to con		
Address:	14940-123 Ave NW			ort - provide details belo	_		E											act ALS t		m tat
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Filone.	780-886-3055			danielle.macdonal	d@tetratech.con	1	Spec	ify Dat	e Req	uired f	or E2,E		-	L_						
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Company:			Email 1 or Fax	ebaaccountspaya	ble@tetratech.co	m	Γ													
Contact:			Email 2	danielle.macdonal	d@tetratech.com	<u></u> - גריי	<u> </u>	i.	ĝ				(ss				Ê	·		ι Δ
	Project Information		Oil	and Gas Require	d Fields (client	use)	IC,NO2+NO2Calc	0	Baiance			ŝ	due	! '	(<u></u>	a l	Ē			Number of Containers
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	k Order # (lab use only) L213	1545	ALS Contact:	Brent Mack	Sampler:		ciesAnions	ue, EC, pH.	Silicate.	TN, TP, TDP,		Total Metals (CCME+ICP+Hardness)	Dissolved Metals (CCME+ICP+Hardness)	fotal Hg (uttra low detection limit)	ed Hg (ultra low detection limit)	otal MeHg (ultra low detection limit)	Dissolved MeHg (uttra low detection limit)		chlorophyll a (field filtefed 250 mL)	Ň
ALS Sample #	Sample Identification ar	d/or Coordinates		Date	Time	Sample Type	Alk-Spe	Color-Tr	Turbidity,	F ガ	0	Ň	solve	L H	Dissolved	Ň	sake		fo	1
(lab use only)	(This description will app	ear on the report)		(dd-mmm-yy)	(hh:mm)	Sample Type	¥	0 C	15 15	TOC,	200	Tota	Dise	Tot	Ōŝ	Tots	ÖİS	1	말	
	Williston Shallow (W1 - Shallow)			July	11:15	Water	R	R	R	R	R				\square				R	4
	Williston Deep (W1 - Deep)			- 0.1-	14:40	Water	R	R	R	R	R								R	4
	Dinosaur Shallow (D1 - Shallow)	· · · · · ·		2018	16:15	Water	R	R	R	R	R			┝─┦					R	-4
-	Dinosaur Deep (D1 - Deep)	•			11 m	Water	R	R	R	R	R								R	
	Duplicate + (BUP T) - Duplicate	2. CDUP	2)		-	Water	R	R	R	R	R			┢──┦					R	4
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[[]			j			L	 	L	╘╾╼╾┙	SAMP	LE CO	NDITI		S RE		D (la	b use	only)		
Drinking	Water (DW) Samples ¹ (client use)	Special In	nstructions / Speci	fy Criteria to add on	report (client Use	3)	Froze	en -	`						vation		Yes		No	
	es I⊽ No fre. Jtak	ase use criteria: BC M shwater aquatic life ar en from pre-treatmen	nd Health Canada				lce p Cooli	acks ng Initi	ated		No	_		ody se	eal int	act	Yes		No	
Are samples for in	uman drinking water use? ≘s IV-⊱No					•	L			CMPE	ATURE	8°C				JUULE	ar iem	IPERATI	JRES "	
\square							<u>5</u>	°C -									L	K	<u> </u>	
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Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy. 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

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Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received:17-JUL-18Report Date:27-JUL-18 15:06 (MT)Version:FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2130358

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW03060-02.002 14-

Brent Mack, B.Sc. Account Manager

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L2130358 CONTD.... PAGE 2 of 5 27-JUL-18 15:06 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2130358-1 Water 16-JUL-18 16:53 HALFWAY RIVER- DOWNSTREAM (HD)	L2130358-2 Water 16-JUL-18 16:15 MIDDLE SITE C RESERVOIR (PR2)	L2130358-3 Water 16-JUL-18 16:35 UPPER SITE C RESERVOIR (PR1)	
Grouping	Analyte				
WATER					
Physical Tests	Colour, True (CU)	12.6	8.1	5.9	
	Conductivity (uS/cm)	413	192	183	
	рН (рН)	8.47	8.12	8.09	
	Total Suspended Solids (mg/L)	27.4	15.4	5.4	
	Total Dissolved Solids (mg/L)	285	119	122	
	Turbidity (NTU)	30.8	7.92	1.55	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	167	86.9	82.5	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	10.6	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	177	86.9	82.5	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0067	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	
	Fluoride (F) (mg/L)	0.104	0.039	0.036	
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0364	0.0593	
	Nitrate (as N) (mg/L)	<0.0050	0.0364	0.0593	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.190	0.135	0.105	
	Total Nitrogen (mg/L)	0.150	0.157	0.147	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0025	0.0017	0.0017	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0045	0.0028	<0.0020	
	Phosphorus (P)-Total (mg/L)	0.0522	0.0221	0.0058	
	Silicate (as SiO2) (mg/L)	4.00	4.48	4.17	
	Sulfate (SO4) (mg/L)	50.7	14.6	13.3	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	4.00	3.25	2.80	
	Total Organic Carbon (mg/L)	4.79	3.49	2.85	

QC Samples with Qualifiers & Comments:

QC Type Descript	ion	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike		Dissolved Organic Carbon	MS-B	L2130358-1, -2
Matrix Spike		Total Organic Carbon	MS-B	L2130358-3
Qualifiers for Inc	dividual Parameters	Listed:		
Qualifier	Description			
MS-B	Matrix Spike recovery	could not be accurately calculated due	e to high analyte	background in sample.
est Method Ref	erences:			
ALS Test Code	Matrix	Test Description		Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration		APHA 2320 Alkalinity
				otal alkalinity is determined by potentiometric titration to a nthalein alkalinity and total alkalinity values.
ANIONS-N+N-CAL	-C-VA Water	Nitrite & Nitrate in Water (Calculatio	n)	EPA 300.0
Nitrate and Nitrite	e (as N) is a calculated	d parameter. Nitrate and Nitrite (as N) =	= Nitrite (as N) +	Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)		EPA 300.1 (mod)
Inorganic anions	are analyzed by Ion C	Chromatography with conductivity and/c		
CARBONS-DOC-V	A Water	Dissolved organic carbon by combu	stion	APHA 5310B
This analysis is c	arried out using proce	o ,	10 "Total Organic	c Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-V	5 1	Total organic carbon by combustion	,	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is c	arried out using proce	edures adapted from APHA Method 53	10 "Total Organic	Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC		EPA 300.1 (mod)
		Chromatography with conductivity and/o	or UV detection	
Ū				
COLOUR-TRUE-V		Colour (True) by Spectrometer		BCMOE Colour Single Wavelength
is determined by method.	filtering a sample thro	ough a 0.45 micron membrane filter foll	owed by analysis	anual "Colour- Single Wavelength." Colour (True Colour) s of the filtrate using the platinum-cobalt colourimetric
	urement of sample pl		e sample as rece	eived (at time of testing), without pH adjustment.
EC-PCT-VA	Water	Conductivity (Automated)		APHA 2510 Auto. Conduc.
This analysis is c electrode.	arried out using proce	edures adapted from APHA Method 25	10 "Conductivity"	. Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use C	only)	APHA 2510
Qualitative analys	sis of conductivity whe	ere required during preparation of other	tests - e.g. TDS	, metals, etc.
F-IC-N-VA	Water	Fluoride in Water by IC		EPA 300.1 (mod)
	are analyzed by Ion C	Chromatography with conductivity and/c	or UV detection.	
	Water	Total Nitrogon in water by Colour		ADHA4500 D(1)/NEMI0171/190002 4174
	arried out using proce			APHA4500-P(J)/NEMI9171/USGS03-4174 hate Method for Simultaneous Determination of Total
Nitrogen and Tota	Water	National Environmental Methods Index Ammonia in Water by Fluorescence		J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is c	arried out, on sulfuric	acid preserved samples, using proced	ures modified fro	m J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society e levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)		EPA 300.1 (mod)
	are analyzed by Ion C	Chromatography with conductivity and/o	or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)		EPA 300.1 (mod)
		Chromatography with conductivity and/c	or UV detection.	
morganic amons				
P-T-PRES-COL-V		Total P in Water by Colour		APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

Water Total Dissolved P in Water by Colour P-TD-COL-VA APHA 4500-P Phosphorous This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. PH-PCT-VA pH by Meter (Automated) APHA 4500-H pH Value Water This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field. PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E. This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius. TKN in Water by Fluorescence APHA 4500-NORG D. TKN-F-VA Water This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. **TURBIDITY-VA** Water Turbidity by Meter APHA 2130 Turbidity This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

14-

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Chain of Custody (COC) / Analytical **Request Form**



COC Number: 14 -

Page <u>1</u> of <u>1</u>

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(lab use only)	(This description will			(dd-mmm-yy)	(hh:mm)	Sample Type	¥ ·	Color-True,	Turb	TOC	20C	Tota	Diss	Total	Diss	Total	Diss	Total	Ferrous Iron	
	Halfway River - Downstream (HD)			July 16	1653	Water	R	R	R	R	R									3
	Middle Site C Reservoir (PR2)			10	1615	Water	R	R	R	R	R									3
	Peace Canyon (PC1)			-2010-	Hers_	Water	- R-	R	R	-R-							· ·	-	-	-
	Upper Site C Reservoir (PR1)			-12-	1435	Water	R	R	R	R	R	_					-			3
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Drinking	g Water (DW) Samples ¹ (client use)	Spec	cial Instructions / Speci	ify Criteria to add o	n report (client Us	e)	Froze	20			LECO		-		vation		ouse Yes		No	
Are samples take	en from a Regulated DW System?	Please use criteria: I	BC MOE 2018 Appro	ved and Working \	Nater Quality Gui	delines for	-		Yes	H	No	П	Cust					Н	No	H
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Are samples for	human drinking water use?	taken from pre-treat	ment water sources.	•							RATURE	S *C	-		FINAL	COOLE	RITEM	PERAT	URES *	c
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REFER TO DACK PASE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE LABORATORY COPY YELLOW - CLIENT COPY Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the while - report copy. 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received:18-JUL-18Report Date:30-JUL-18 11:02 (MT)Version:FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2131720 Project P.O. #: NOT SUBMITTED

Job Reference:

C of C Numbers: Legal Site Desc: VENW03060 - 02.002

Brent Mack, B.Sc. Account Manager

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L2131720 CONTD.... PAGE 2 of 5 30-JUL-18 11:02 (MT) Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2131720-1 Water 18-JUL-18 10:40 MOBERLY RIVER - DOWNSTREAM (MD)	L2131720-2 Water 18-JUL-18 10:10 LOWER SITE C RESERVOIR (PR3)	L2131720-3 Water 18-JUL-18 11:00 PEACE AT PINE (PD1)	L2131720-4 Water 18-JUL-18 11:30 PINE RVER (PINE)	
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	23.1	8.3	7.5	7.2	
	Conductivity (uS/cm)	232	192	202	262	
	рН (рН)	8.29	8.19	8.09	8.36	
	Total Suspended Solids (mg/L)	39.0	22.0	46.6	12.0	
	Total Dissolved Solids (mg/L)	154	114	126	154	
	Turbidity (NTU)	36.5	7.67	12.6	11.8	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	117	87.2	90.0	126	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	3.6	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	117	87.2	90.0	129	
	Ammonia, Total (as N) (mg/L)	0.0060	<0.0050	0.0250	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	0.53	<0.50	<0.50	0.68	
	Fluoride (F) (mg/L)	0.080	0.040	0.044	0.064	
	Nitrate and Nitrite (as N) (mg/L)	0.0144	0.0546	0.0516	0.0180	
	Nitrate (as N) (mg/L)	0.0144	0.0546	0.0516	0.0180	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.261	0.165	0.117	0.093	
	Total Nitrogen (mg/L)	0.246	0.152	0.183	0.114	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0027	0.0015	0.0025	0.0021	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0049	0.0021	0.0024	<0.0020	
	Phosphorus (P)-Total (mg/L)	0.0500	0.0242	0.0022	0.0176	
	Silicate (as SiO2) (mg/L)	3.23	4.02	4.16	2.49	
	Sulfate (SO4) (mg/L)	10.5	15.4	16.9	17.0	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	6.94	3.19	2.93	2.91	
	Total Organic Carbon (mg/L)	7.57	3.09	3.17	2.93	

Qualifier

Applies to Sample Number(s)

QC Samples with Qualifiers & Comments:

Parameter

QC Type Description

Method Blank		Alkalinity, Total (as CaCO3)	В	L2131720-1
Matrix Spike		Total Nitrogen	MS-B	L2131720-1, -2, -3, -4
Matrix Spike		Silicate (as SiO2)	MS-B	L2131720-1, -2, -3, -4
Qualifiers for In	dividual Parameters	Listed:		
Qualifier	Description			
В	Method Blank exceed reliable.	s ALS DQO. Associated sample result	s which are < L	imit of Reporting or > 5 times blank level are considered
MS-B	Matrix Spike recovery	could not be accurately calculated due	to high analyte	background in sample.
est Method Re	ferences:			
ALS Test Code	Matrix	Test Description		Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration		APHA 2320 Alkalinity
				otal alkalinity is determined by potentiometric titration to a hthalein alkalinity and total alkalinity values.
ANIONS-N+N-CA	LC-VA Water	Nitrite & Nitrate in Water (Calculation	n)	EPA 300.0
Nitrate and Nitrit	e (as N) is a calculated	d parameter. Nitrate and Nitrite (as N) =	Nitrite (as N) +	Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)		EPA 300.1 (mod)
	are analyzed by Ion C	Chromatography with conductivity and/o	r UV detection.	
CARBONS-DOC-	VA Water	Dissolved organic carbon by combu	stion	APHA 5310B
This analysis is o	carried out using proce	с ,	0 "Total Organi	c Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-		Total organic carbon by combustion	· · · · · · · · · · · · · · · · · · ·	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is o	carried out using proce	edures adapted from APHA Method 531	0 "Total Organi	c Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC		EPA 300.1 (mod)
Inorganic anions		Chromatography with conductivity and/o	r UV detection.	
COLOUR-TRUE-	VA Water	Colour (True) by Spectrometer		BCMOE Colour Single Wavelength
This analysis is o is determined by	carried out using proce	edures adapted from British Columbia E		lanual "Colour- Single Wavelength." Colour (True Colour) s of the filtrate using the platinum-cobalt colourimetric
method. Colour measurer Concurrent meas	ments can be highly pl surement of sample pl	H dependent, and apply to the pH of the H of the	e sample as rec	eived (at time of testing), without pH adjustment.
EC-PCT-VA	Water	Conductivity (Automated)		APHA 2510 Auto. Conduc.
This analysis is a electrode.	carried out using proce	edures adapted from APHA Method 251	0 "Conductivity	". Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use O	nly)	APHA 2510
Qualitative analy	sis of conductivity whe	ere required during preparation of other	tests - e.g. TDS	S, metals, etc.
F-IC-N-VA	Water	Fluoride in Water by IC		EPA 300.1 (mod)
	are analyzed by Ion C	Chromatography with conductivity and/o	r UV detection.	
N-T-COL-VA	Water	Total Nitrogen in water by Colour		APHA4500-P(J)/NEMI9171/USGS03-4174
This analysis is o	carried out using proce	•		phate Method for Simultaneous Determination of Total
NH3-F-VA	Water	Ammonia in Water by Fluorescence		J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
				om J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society ce levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)		EPA 300.1 (mod)
Inorganic anions	are analyzed by Ion C	Chromatography with conductivity and/o	r UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)		EPA 300.1 (mod)

L2131720 CONTD PAGE 4 of 5 30-JUL-18 11:02 (MT) Version: FINAL

P-T-PRES-COL-VA Wate	er Total P in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestion of the	solids (i.e. seawaters, brackish waters) may produce a negative	
Arsenic (5+), at elevated levels, i	s a positive interference on colourimetric phosphate analysis.	
P-TD-COL-VA Wate	er Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
colourimetrically after persulphate	procedures adapted from APHA Method 4500-P "Phosphorus" e digestion of a sample that has been lab or field filtered throug solids (i.e. seawaters, brackish waters) may produce a negative les.	h a 0.45 micron membrane filter.
Arsenic (5+), at elevated levels, i	s a positive interference on colourimetric phosphate analysis.	
PH-PCT-VA Wate	er pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out using electrode	procedures adapted from APHA Method 4500-H "pH Value". T	he pH is determined in the laboratory using a pH
It is recommended that this analy	sis be conducted in the field.	
PO4-DO-COL-VA Wate	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a sample that	procedures adapted from APHA Method 4500-P "Phosphorus" t has been lab or field filtered through a 0.45 micron membrane solids (i.e. seawaters, brackish waters) may produce a negativ les.	e filter.
Arsenic (5+), at elevated levels, i	s a positive interference on colourimetric phosphate analysis.	
SILICATE-COL-VA Wate	er Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
This analysis is carried out using the molybdosilicate-heteropoly bl	procedures adapted from APHA Method 4500-SiO2 E. "Silica ue colourimetric method.	". Silicate (molybdate-reactive silica) is determined by
SO4-IC-N-VA Wate	er Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by	Ion Chromatography with conductivity and/or UV detection.	
TDS-VA Wate	er Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC
	procedures adapted from APHA Method 2540 "Solids". Solids a sample through a glass fibre filter, TDS is determined by eva	
TKN-F-VA Wate	er TKN in Water by Fluorescence	APHA 4500-NORG D.
	procedures adapted from APHA Method 4500-Norg D. "Block k digestion followed by Flow-injection analysis with fluorescene	
TSS-VA Wate	er Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
Solids (TSS) are determined by f	procedures adapted from APHA Method 2540 "Solids". Solids Itering a sample through a glass fibre filter, TSS is determined solved solid content (i.e. seawaters, brackish waters) may proc ypes of samples.	by drying the filter at 104 degrees celsius.
TURBIDITY-VA Wate	er Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out using	procedures adapted from APHA Method 2130 "Turbidity". Turb	bidity is determined by the nephelometric method.
** ALS test methods may incorporate	e modifications from specified reference methods to improve p	performance.
The last two letters of the above te	st code(s) indicate the laboratory that performed analytical ana	alysis for that test. Refer to the list below:
Laboratory Definition Code	aboratory Location	
VA	LS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA	, CANADA
Chain of Custody Numbers:		

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. *mg/kg* - *milligrams per kilogram based on dry weight of sample.*

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

<u>A</u>	Chain of Custody (COC) / Analytical Request Form
(ALS) Environmental	Canada Toll Free: 1 800 668 9878
www.alsglobal.com	
	Dense 4 E. J.



COC Number: **14** -

Page <u>1</u> of ---1

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	Moberly River - Downstream	n (MD)		e live	10:40	Water	R	R	R	R	R	<u> </u>	1	†	<u> </u>	ا ا				3
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Drinking) Water (DW) Samples ¹ (clier	nt use)	Special Instructions / Spec	Ify Criteria to add o	n report (client Use	· •)	-			SAMP	LE CC	NDIT				-		e only;		
Are samples take				wed and Working	Alator Quality Gui	delines for	Froze			띧		_			rvatio		Yes	H	No	H
	e samples taken from a Regulated DW System? Please use criteria: BC			a Guidelines for D	rinking Water, sar	nples were			Yes	Ч	No		Cust	ody s	ieal in	tact	Yes		No	
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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the while - report copy. 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received:20-JUL-18Report Date:02-AUG-18 11:50 (MT)Version:FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2133123 Project P.O. #: NOT SUBMIT

Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW003060-02.002

Brent Mack, B.Sc. Account Manager

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L2133123 CONTD.... PAGE 2 of 8 02-AUG-18 11:50 (MT) Version: FINAL

	s	Description ^W Sampled Date Sampled Time	3123-11 Jater D BLANK		
Grouping	Analyte				
FILTER					
Plant Pigments	Chlorophyll a (ug/L)	<0	0.010		

L2133123 CONTD.... PAGE 3 of 8 02-AUG-18 11:50 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2133123-1 Water 19-JUL-18 11:45 PEACE AT BEATTON (PD2)	L2133123-2 Water 19-JUL-18 12:55 BEATTON RIVER (BEATTON)	L2133123-3 Water 19-JUL-18 13:30 PEACE AT KISKATINAW (PD3)	L2133123-4 Water 19-JUL-18 13:50 KISKATINAW RIVER (KR)	L2133123-5 Water 19-JUL-18 15:15 PEACE AT POUCE COUPE (PD4)
Grouping	Analyte			(1 20)		
WATER						
Physical Tests	Colour, True (CU)	7.5	193	9.8	40.3	13.5
	Conductivity (uS/cm)	206	182	211	384	210
	рН (рН)	8.22	7.90	8.25	8.58	8.22
	Total Suspended Solids (mg/L)	72.2	29.0	75.8	45.0	93.0
	Total Dissolved Solids (mg/L)	129	170	136	276	133
	Turbidity (NTU)	21.6	48.9	21.6	108	25.7
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	89.6	55.4	93.3	175	93.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	15.6	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	89.6	55.4	93.3	191	93.0
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0081	<0.0050	0.0119	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (CI) (mg/L)	<0.50	0.57	<0.50	0.77	<0.50
	Fluoride (F) (mg/L)	0.045	0.085	0.048	0.095	0.049
	Nitrate and Nitrite (as N) (mg/L)	0.0534	<0.0051	0.0494	0.0064	0.0472
	Nitrate (as N) (mg/L)	0.0534	<0.0050	0.0494	0.0064	0.0472
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.188	0.720	0.194	0.638	0.223
	Total Nitrogen (mg/L)	0.174	0.648	0.204	0.534	0.214
	Orthophosphate-Dissolved (as P) (mg/L)	0.0013	0.0052	0.0013	0.0017	0.0013
	Phosphorus (P)-Total Dissolved (mg/L)	0.0031	0.0170	0.0032	0.0069	0.0036
	Phosphorus (P)-Total (mg/L)	0.0696	0.0705	0.0836	0.0900	0.0920
	Silicate (as SiO2) (mg/L)	3.99	5.54	3.74	4.82	4.06
	Sulfate (SO4) (mg/L)	16.4	31.7	16.6	17.7	17.0
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.04	27.2	3.27	12.7	4.00
	Total Organic Carbon (mg/L)	3.11	27.8	3.88	14.9	4.62

L2133123 CONTD.... PAGE 4 of 8 02-AUG-18 11:50 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2133123-6 Water 19-JUL-18 16:00 POUCE COUPE (POUCE)	L2133123-7 Water 19-JUL-18 17:00 PEACE AT MANY ISLANDS (PD5)	L2133123-8 Water DUPLICATE 1 (DUP 1)	L2133123-9 Water DUP-1A	L2133123-10 Water TRIP BLANK
rouping	Analyte					
VATER						
Physical Tests	Colour, True (CU)	58.5	11.9	6.9		<5.0
	Conductivity (uS/cm)	612	223	200		<2.0
	рН (рН)	8.48	8.27	8.20		5.47
	Total Suspended Solids (mg/L)	33.8	83.4	81.8		<3.0
	Total Dissolved Solids (mg/L)	424	139	122		<10
	Turbidity (NTU)	53.5	23.8	23.2		<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	158	99.5	85.8		<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	8.4	<1.0	<1.0		<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	167	99.5	85.8		<1.0
	Ammonia, Total (as N) (mg/L)	0.0159	<0.0050	0.0055		<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050		<0.050
	Chloride (Cl) (mg/L)	10.0	<0.50	<0.50		<0.50
	Fluoride (F) (mg/L)	0.189	0.053	0.045		<0.020
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0371	0.0535		<0.0051
	Nitrate (as N) (mg/L)	<0.0050	0.0371	0.0535		<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010		<0.0010
	Total Kjeldahl Nitrogen (mg/L)	1.07	0.121	0.200		<0.050
	Total Nitrogen (mg/L)	0.977	0.140	0.181		<0.030
	Orthophosphate-Dissolved (as P) (mg/L)	0.0016	0.0010	0.0012		<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0128	0.0034	0.0023		<0.0020
	Phosphorus (P)-Total (mg/L)	0.0780	0.0068	0.0673		<0.0020
	Silicate (as SiO2) (mg/L)	0.96	3.78	4.11		<0.50
	Sulfate (SO4) (mg/L)	134	18.8	16.4		<0.30
Drganic / norganic Carbon	Dissolved Organic Carbon (mg/L)	21.0	3.73	3.26	2.82	нт
	Total Organic Carbon (mg/L)	24.1	3.65	3.46		<0.50

L2133123 CONTD.... PAGE 5 of 8 02-AUG-18 11:50 (MT) Version: FINAL

	Sample ID Description Sampled Date	L2133123-11 Water	L2133123-12 Water		
	Sampled Time Client ID	FIELD BLANK	FIELD 1A		
Grouping	Analyte				
WATER					
Physical Tests	Colour, True (CU)	<5.0			
	Conductivity (uS/cm)	<2.0			
	рН (рН)	5.67			
	Total Suspended Solids (mg/L)	<3.0			
	Total Dissolved Solids (mg/L)	<10			
	Turbidity (NTU)	0.17			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0			
	Ammonia, Total (as N) (mg/L)	<0.0050			
	Bromide (Br) (mg/L)	<0.050			
	Chloride (Cl) (mg/L)	<0.50			
	Fluoride (F) (mg/L)	<0.020			
	Nitrate and Nitrite (as N) (mg/L)	<0.0051			
	Nitrate (as N) (mg/L)	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	<0.050			
	Total Nitrogen (mg/L)	<0.030			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010			
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020			
	Phosphorus (P)-Total (mg/L)	<0.0020			
	Silicate (as SiO2) (mg/L)	<0.50			
	Sulfate (SO4) (mg/L)	<0.30			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50	<0.50		
	Total Organic Carbon (mg/L)	<0.50			

Atrix Spike Dissolved Organic Carbon MS-B L2133123-1 Atrix Spike Phosphorus (P)-Total MS-B L2133123-1, -10, -11, -2, -3, Atrix Spike Silicate (as SiO2) MS-B L2133123-1, -10, -11, -2, -3, Atrix Spike Description B Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times bla reliable. HTP Sample preparation or preservation hold time was exceeded. MS-B Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. RRV Reported Result Verified By Repeat Analysis st Method References: LS Test Code Matrix Test Description Method 2320 "Alkalinity". Total alkalinity is determined by pc pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalini NIONS-N-N-CALC-VA Water Nitrite & Nitrate in Water (Calculation) EPA 300.0 Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N). RR-LI-C-N-VA Water Dissolved organic carbon by combustion APHA 5310B This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carb determined by analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carb determined by analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carb determined by analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carb determined by a 0.45 micron membrane filter prior to analysis. ARBONS-DOC-VA Water Dissolved organic carbon by combustion APHA 5310B This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". HLORA-F-VA Filter Chlorophyll a by Fluorometer (Filter) EPA 445.0 This analysis is is done using procedures modified from EPA Method 5310 "Total Organic Carbon (TOC)". HLORA-F-VA Water Chloride in Water by IC EPA 300.1 (mod) Inorgan		Version:	FINAL				
				Qualifier	Applies to Sample Number(s)		
Method Blank							
Matrix Spike			Ũ				
Matrix Spike			Ũ	MS-B	L2133123-1, -10, -11, -2, -3, -4	, -5, -6, -7, -8	3
Matrix Spike			Silicate (as SiO2)	MS-B	L2133123-1, -10, -2, -3, -4, -5,	-6, -7, -8	
Qualifiers for	· Individual Pa	arameters	Listed:				
Qualifier	Descriptior	า					
В		ank exceed	s ALS DQO. Associated sample resul	ts which are < Li	mit of Reporting or > 5 times blank	clevel are cor	nsidered
HTP	Sample pre	eparation o	r preservation hold time was exceeded				
MS-B	Matrix Spik	ke recovery	could not be accurately calculated due	e to high analyte	background in sample.		
RRV	Reported F	Result Verif	ied By Repeat Analysis				
est Method I	References:						
ALS Test Code	9	Matrix	Test Description		Method Reference**		
ALK-TITR-VA		Water	Alkalinity Species by Titration		APHA 2320 Alkalinity		
							ration to
ANIONS-N+N-(CALC-VA	Water	Nitrite & Nitrate in Water (Calculatio	n)	EPA 300.0		
Nitrate and Ni	trite (as N) is a	a calculated	d parameter. Nitrate and Nitrite (as N) =	= Nitrite (as N) +	Nitrate (as N).		
BR-L-IC-N-VA		Water	Bromide in Water by IC (Low Level)		EPA 300.1 (mod)		
Inorganic anic	ons are analyz	ed by Ion C	Chromatography with conductivity and/o	or UV detection.			
CARBONS-DO	C-VA	Water	Dissolved organic carbon by combu	stion	APHA 5310B		
					Carbon (TOC)". Dissolved carbon	า (DOC) fract	ions are
CARBONS-TO	C-VA	Water	Total organic carbon by combustion		APHA 5310B TOTAL ORGANIO	CARBON (TOC)
This analysis	is carried out	using proce	dures adapted from APHA Method 53	10 "Total Organic	carbon (TOC)".		
CHLOROA-F-V	/A	Filter	Chlorophyll a by Fluorometer (Filter))	EPA 445.0		
						action followe	ed with
CL-IC-N-VA		Water	Chloride in Water by IC		EPA 300.1 (mod)		
Inorganic anic	ons are analyz	ed by Ion C	Chromatography with conductivity and/o	or UV detection.			
COLOUR-TRU	E-VA	Water	Colour (True) by Spectrometer		BCMOE Colour Single Waveler	ngth	
is determined method.	by filtering a s	sample thro	ugh a 0.45 micron membrane filter foll	owed by analysis	of the filtrate using the platinum-	cobalt colourii	metric
			H dependent, and apply to the pH of the H of the H of the H is recommended.	e sample as rece	eived (at time of testing), without p	H adjustment	í.
EC-PCT-VA		Water	Conductivity (Automated)		APHA 2510 Auto. Conduc.		

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VAWaterConductivity Screen (Internal Use Only)APHA 2510

 $\label{eq:Qualitative analysis of conductivity where required during preparation of other tests - e.g. \ TDS, \ metals, \ etc.$

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are a	nalyzed by Ion C	Chromatography with conductivity and/or UV	detection.
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
	0.	edures adapted from APHA Method 4500-P (National Environmental Methods Index - Nem	J) "Persulphate Method for Simultaneous Determination of Total i method 5735.
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		nromatography with conductivity and/or UV detection.	
	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyze	ed by Ion Cl	nromatography with conductivity and/or UV detection.	
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestion o	f the sampl	dures adapted from APHA Method 4500-P "Phosphorus e. ; (i.e. seawaters, brackish waters) may produce a negati	
available for these types of s	amples.		
	els, is a pos	sitive interference on colourimetric phosphate analysis.	
	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
colourimetrically after persul	phate diges plved solids	dures adapted from APHA Method 4500-P "Phosphorus tion of a sample that has been lab or field filtered throug (i.e. seawaters, brackish waters) may produce a negati	gh a 0.45 micron membrane filter.
Arsenic (5+), at elevated leve	els, is a pos	sitive interference on colourimetric phosphate analysis.	
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out u electrode	ising proced	dures adapted from APHA Method 4500-H "pH Value".	The pH is determined in the laboratory using a pH
It is recommended that this a	analysis be	conducted in the field.	
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a sample	e that has b olved solids	dures adapted from APHA Method 4500-P "Phosphorus been lab or field filtered through a 0.45 micron membran (i.e. seawaters, brackish waters) may produce a negati	e filter.
Arsenic (5+), at elevated leve	els, is a pos	sitive interference on colourimetric phosphate analysis.	
	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
This analysis is carried out u the molybdosilicate-heteropo		dures adapted from APHA Method 4500-SiO2 E. "Silica burimetric method.	". Silicate (molybdate-reactive silica) is determined by
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyze	ed by Ion Cł	nromatography with conductivity and/or UV detection.	
TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC
This analysis is carried out u	ising proced	dures adapted from APHA Method 2540 "Solids". Solids ple through a glass fibre filter, TDS is determined by eva	are determined gravimetrically. Total Dissolved Solids
	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
This analysis is carried out u	ising proced	dures adapted from APHA Method 4500-Norg D. "Block stion followed by Flow-injection analysis with fluorescen	Digestion and Flow Injection Analysis". Total Kjeldahl
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
Solids (TSS) are determined	by filtering h dissolved	dures adapted from APHA Method 2540 "Solids". Solids a sample through a glass fibre filter, TSS is determined solid content (i.e. seawaters, brackish waters) may pro f samples.	by drying the filter at 104 degrees celsius.
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out u	ising proced	dures adapted from APHA Method 2130 "Turbidity". Tur	bidity is determined by the nephelometric method.
** ALS test methods may incorp	porate mod	ifications from specified reference methods to improve p	performance.
The last two letters of the abo	ve test cod	e(s) indicate the laboratory that performed analytical and	alysis for that test. Refer to the list below:
Laboratory Definition Code	Labora	tory Location	
VA	ALS EN	VIRONMENTAL - VANCOUVER, BRITISH COLUMBIA	A, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION. Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.



Chain of Custody (COC) / Analytical **Request Form**



COC Number: 14 -

Page 1 of ____1

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Canada Toll Free: 1 800 668 9878

Report To			T	Banord Forme	t / Distribution						•			_								
Company:	Tetratech		Select Report											umaround Time (TAT) Is not available for all tests) 9 pm - business days)								
Contact;	Danielle MacDonaid		-	(QC) Report with i		EDD (DIGITAL)																
Address;	14940-123 Ave NW			port - provide details bei		es 🗔 No	P		ority (2	-4 bus, (days if re	ecelved	by 3pm) 50%	surchar	rge - co	intact A	LS to conf	firm TA1	r		
	Edmonton, AB_T5V 1B4		Select Distribu			FAX	E											tact ALS to	o confirm	n TAT		
Phone:	780-886-3055						Specify Date Required for E2.E or P;							contact ALS to confirm TAT and surcharge								
			Email 1 or Fax danielle.macdonald@tetratech.com Email 2				Spe	city Da	le Red	uired	for E2,											
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ALS LAD WO	rk Order # (lab use only)	33123	ALS Contact:	Brent Mack	Sampler: Da	melle 1	sAni	ы	Silicate	Ц, Ч		otal Metals (CCME+ICP+Hardness)	Dissolved Metals (CCME+ICP+Hardness)	Total Hg (ultra low	Dissolved Hg (ultra low	fotal MeHg (utra low detection limit)	Dissolved MeHg (ultra low detection limit)	20		2		
ALS Sample #		on and/or Coordinates	<u> </u>	Date		acDoneld	ecie	Color-True,	s, ≱	Ϋ́,		leta	Pe -	2	- Fe	le Hg	2					
(lab use only)		I appear on the report)		(dd-mmm-yy)	(hh:mm)	Sample Type	Alk-Spec		lurbidity,	.'. 10C,	bo		l de	Ē	solv	N	Solv	Cr				
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	Peace at Kiskatinaw (PD3)	········		2018	1255	Water Water	R	R	R	R	R	<u> </u>	┢		\square			_ _	-+	3		
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Drinking	Water (DW) Samples ¹ (client use)	Special in	structions / Spec	ily Criteria to add on	report (cilent Use)					100	NDITH	ON A	REC	EIVE	D (lat	o use	only)	<u> </u>	<u></u>		
Are samples take	n from a Regulated DW System?	Please use criteria: BC M				della	Froze						SIF C	bser	vation	\$	Yes	N D	Vo'			
ΓY	es 🔽 No	ampies were tak	en from surface wa	ter		ice pa	· · · · ·	Yes		No		Custo	dy se	al inte	act	Yes		lo i				
Are samples for h	ruman drinking water use?	+ DUPIA analyze for				Cooling Initiated																
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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-032Ge v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy. 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received:01-AUG-18Report Date:13-AUG-18 11:46 (MT)Version:FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2139662 Project P.O. #: NOT SUBMIT

Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW03060-02.002

Brent Mack, B.Sc. Account Manager

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L2139662 CONTD.... PAGE 2 of 7 13-AUG-18 11:46 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2139662-1 Water 31-JUL-18 13:30 WILLISTON SHALLOW (W1- SHALLOW)	L2139662-2 Water 31-JUL-18 14:30 WILLISTON DEEP (W1 - DEEP)	L2139662-3 Water 31-JUL-18 17:30 DINOSAUR SHALLOW (D1 - SHALLOW)	L2139662-4 Water 31-JUL-18 18:30 DINOSAUR DEEP (D1 - DEEP)	L2139662-5 Water DUPLICATE 2 (DUP 2)
Grouping	Analyte						
FILTER							
Plant Pigments	Chlorophyll a (ug/L)		1.15	0.286	0.872	1.03	0.799

L2139662 CONTD.... PAGE 3 of 7 13-AUG-18 11:46 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time	L2139662-1 Water 31-JUL-18 13:30	L2139662-2 Water 31-JUL-18 14:30	L2139662-3 Water 31-JUL-18 17:30	L2139662-4 Water 31-JUL-18 18:30	L2139662-5 Water
	Client ID	WILLISTON SHALLOW (W1- SHALLOW)	WILLISTON DEEP (W1 - DEEP)	DINOSAUR SHALLOW (D1 - SHALLOW)	DINOSAUR DEEP (D1 - DEEP)	DUPLICATE 2 (DUP 2)
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	6.5	7.8	19.3	9.6	17.0
	Conductivity (uS/cm)	171	169	173	183	180
	рН (рН)	8.19	8.20	8.19	8.24	8.25
	Total Suspended Solids (mg/L)	<3.0	<3.0	4.5	10.9	4.8
	Total Dissolved Solids (mg/L)	108	103	110	112	112
	Turbidity (NTU)	1.71	1.72	16.5	18.2	16.4
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	77.5	78.5	81.1	85.0	83.5
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	77.5	78.5	81.1	85.0	83.5
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.036	0.034	0.045	0.038	0.045
	Nitrate and Nitrite (as N) (mg/L)	0.0528	0.0577	0.0506	0.0704	0.0499
	Nitrate (as N) (mg/L)	0.0528	0.0577	0.0506	0.0686	0.0499
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	0.0017	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.076	0.068	0.142	0.087	0.122
	Total Nitrogen (mg/L)	0.125	0.171	0.198	0.156	0.192
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	0.0012	0.0020	0.0013
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020	<0.0020	0.0044	0.0041	0.0045
	Phosphorus (P)-Total (mg/L)	0.0052	0.0055	0.0237	0.0124	0.0200
	Silicate (as SiO2) (mg/L)	3.98	3.81	4.40	4.25	4.39
	Sulfate (SO4) (mg/L)	12.7	12.7	13.6	13.8	13.6
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.80	2.73	4.26	3.19	4.09
	Total Organic Carbon (mg/L)	2.73	3.01	4.59	3.66	4.59

L2139662 CONTD.... PAGE 4 of 7 13-AUG-18 11:46 (MT) Version: FINAL

	Sample ID	L2139662-6 Water
	Description Sampled Date	31-JUL-18
	Sampled Time	20:00 PEACE CANYON
	Client ID	(PC1)
Grouping	Analyte	
WATER		
Physical Tests	Colour, True (CU)	10.0
	Conductivity (uS/cm)	180
	рН (рН)	8.09
	Total Suspended Solids (mg/L)	13.1
	Total Dissolved Solids (mg/L)	114
	Turbidity (NTU)	21.1
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	87.3
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	87.3
	Ammonia, Total (as N) (mg/L)	0.0073
	Bromide (Br) (mg/L)	<0.050
	Chloride (Cl) (mg/L)	<0.50
	Fluoride (F) (mg/L)	0.040
	Nitrate and Nitrite (as N) (mg/L)	0.0684
	Nitrate (as N) (mg/L)	0.0672
	Nitrite (as N) (mg/L)	0.0012
	Total Kjeldahl Nitrogen (mg/L)	0.152
	Total Nitrogen (mg/L)	0.185
	Orthophosphate-Dissolved (as P) (mg/L)	0.0021
	Phosphorus (P)-Total Dissolved (mg/L)	0.0044
	Phosphorus (P)-Total (mg/L)	0.0322
	Silicate (as SiO2) (mg/L)	4.24
	Sulfate (SO4) (mg/L)	13.8
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.23
	Total Organic Carbon (mg/L)	3.65

QC Samples with Qualifiers & Comments:

QC Type Descrip	otion	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike		Dissolved Organic Carbon	MS-B	L2139662-1, -2, -3, -4, -5, -6
Matrix Spike		Dissolved Organic Carbon	MS-B	L2139662-1, -2, -3, -4, -5, -6
Matrix Spike		Total Organic Carbon	MS-B	L2139662-1, -2, -3, -4, -5, -6
Qualifiers for In	dividual Parameters	Listed:		
Qualifier	Description			
MS-B	Matrix Spike recovery	could not be accurately calculated due	e to high analyte	background in sample.
est Method Re	ferences:			
LS Test Code	Matrix	Test Description		Method Reference**
LK-TITR-VA	Water	Alkalinity Species by Titration		APHA 2320 Alkalinity
				otal alkalinity is determined by potentiometric titration to a hthalein alkalinity and total alkalinity values.
NIONS-N+N-CA	LC-VA Water	Nitrite & Nitrate in Water (Calculatio	n)	EPA 300.0
Nitrate and Nitrite	e (as N) is a calculated	I parameter. Nitrate and Nitrite (as N) =	= Nitrite (as N) +	Nitrate (as N).
R-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)		EPA 300.1 (mod)
Inorganic anions	are analyzed by Ion C	hromatography with conductivity and/o	or UV detection.	
ARBONS-DOC-	VA Water	Dissolved organic carbon by combu	stion	APHA 5310B
		dures adapted from APHA Method 53 ugh a 0.45 micron membrane filter pric		c Carbon (TOC)". Dissolved carbon (DOC) fractions are
ARBONS-TOC-	VA Water	Total organic carbon by combustion		APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is o	carried out using proce	dures adapted from APHA Method 53	10 "Total Organic	c Carbon (TOC)".
HLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0
		modified from EPA Method 445.0. Cl acidification procedure. This method is		termined by a routine acetone extraction followed with terferences from chlorophyll b.
L-IC-N-VA	Water	Chloride in Water by IC		EPA 300.1 (mod)
Inorganic anions	are analyzed by lon C	hromatography with conductivity and/o	or UV detection.	
OLOUR-TRUE-	VA Water	Colour (True) by Spectrometer		BCMOE Colour Single Wavelength
is determined by method.	filtering a sample thro	ugh a 0.45 micron membrane filter foll	owed by analysis	anual "Colour- Single Wavelength." Colour (True Colour) s of the filtrate using the platinum-cobalt colourimetric
	surement of sample p		e sample as rece	vived (at time of testing), without pH adjustment.
C-PCT-VA	Water	Conductivity (Automated)		APHA 2510 Auto. Conduc.
This analysis is o electrode.	carried out using proce	dures adapted from APHA Method 25	10 "Conductivity"	. Conductivity is determined using a conductivity
C-SCREEN-VA	Water	Conductivity Screen (Internal Use C	only)	APHA 2510
Qualitative analy	vsis of conductivity whe	re required during preparation of other	tests - e.g. TDS	, metals, etc.
-IC-N-VA	Water	Fluoride in Water by IC		EPA 300.1 (mod)
Inorganic anions	are analyzed by lon C	hromatography with conductivity and/o	or UV detection.	
I-T-COL-VA	Water	Total Nitrogen in water by Colour		APHA4500-P(J)/NEMI9171/USGS03-4174
This analysis is o	carried out using proce	o <i>i</i>		hate Method for Simultaneous Determination of Total
NH3-F-VA	Water	Ammonia in Water by Fluorescence		J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
				m J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society e levels of ammonium in seawater", Roslyn J. Waston et
IO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)		EPA 300.1 (mod)
		hromatography with conductivity and/o	or UV detection.	\
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)		EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field. PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. Water Silicate by Colourimetric analysis APHA 4500-SiO2 E. SILICATE-COL-VA This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. **TDS-VA** Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius. Water TKN in Water by Fluorescence APHA 4500-NORG D This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC **TSS-VA** Water This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. Water Turbidity by Meter APHA 2130 Turbidity **TURBIDITY-VA** This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. *mg/kg* - *milligrams per kilogram based on dry weight of sample.*

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received: 30-JUL-18 Report Date: 13-AUG-18 11:45 (MT) Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2138784 Project P.O. #: NOT SUBMIT

Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW03060-02.002

Brent Mack, B.Sc. Account Manager

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L2138784 CONTD.... PAGE 2 of 5 13-AUG-18 11:45 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2138784-1 Water 30-JUL-18 14:48 HALFWAY RIVER - DOWNSTREAM (HD)	L2138784-2 Water 30-JUL-18 14:21 MIDDLE SITE C RESERVOIR (PR2)	L2138784-3 Water 30-JUL-18 12:48 UPPER SITE C RESERVOIR (PR1)	
Grouping	Analyte				
WATER					
Physical Tests	Colour, True (CU)	18.9	11.6	9.4	
	Conductivity (uS/cm)	379	191	184	
	рН (рН)	8.45	8.20	8.18	
	Total Suspended Solids (mg/L)	69.8	9.2	6.0	
	Total Dissolved Solids (mg/L)	249	121	115	
	Turbidity (NTU)	67.3	9.80	5.42	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	164	87.9	84.1	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	9.2	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	173	87.9	84.1	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0062	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	
	Fluoride (F) (mg/L)	0.098	0.041	0.039	
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0552	0.0613	
	Nitrate (as N) (mg/L)	<0.0050	0.0552	0.0613	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.244	0.120	0.113	
	Total Nitrogen (mg/L)	0.192	0.216	0.150	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0045	0.0016	0.0013	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0057	0.0028	0.0021	
	Phosphorus (P)-Total (mg/L)	0.0948	0.0195	0.0100	
	Silicate (as SiO2) (mg/L)	3.98	4.25	4.13	
	Sulfate (SO4) (mg/L)	39.3	14.0	13.3	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	5.46	3.94	3.10	
	Total Organic Carbon (mg/L)	6.56	4.00	3.28	

Qualifier

MS-B

MS-B

Applies to Sample Number(s)

L2138784-1, -2

L2138784-3

QC Samples with Qualifiers & Comments:

Parameter

Dissolved Organic Carbon

Dissolved Organic Carbon

QC Type Description

Matrix Spike

Matrix Spike

Matrix Spike		Total Organic Carbon	MS-B	L2138784-1, -2
Matrix Spike		Total Organic Carbon	MS-B	L2138784-3
Matrix Spike		Fluoride (F)	MS-B	L2138784-1, -2, -3
Matrix Spike		Total Nitrogen	MS-B	L2138784-1, -2, -3
Matrix Spike		Sulfate (SO4)	MS-B	L2138784-1, -2, -3
Qualifiers for Individu	al Paramotors	Listod		
Qualifier Descri				
	·			
		could not be accurately calculated due	e to high analyte	background in sample.
RRV Report	ted Result Verif	fied By Repeat Analysis		
est Method Reference	ces:			
ALS Test Code	Matrix	Test Description		Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration		APHA 2320 Alkalinity
				otal alkalinity is determined by potentiometric titration to a hthalein alkalinity and total alkalinity values.
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation	on)	EPA 300.0
Nitrate and Nitrite (as N	I) is a calculate	d parameter. Nitrate and Nitrite (as N)	= Nitrite (as N) +	· Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level))	EPA 300.1 (mod)
		Chromatography with conductivity and/		
C C				
CARBONS-DOC-VA	Water	Dissolved organic carbon by combu		APHA 5310B
		edures adapted from APHA Method 53 ough a 0.45 micron membrane filter price		ic Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-VA	Water	Total organic carbon by combustion	١	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried	out using proce	edures adapted from APHA Method 53	10 "Total Organi	c Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC		EPA 300.1 (mod)
Inorganic anions are an	alyzed by lon C	Chromatography with conductivity and/o	or UV detection.	
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer		BCMOE Colour Single Wavelength
		()) (Environmental M	fanual "Colour- Single Wavelength." Colour (True Colour)
This analysis is carried	out using proce			is of the filtrate using the platinum-cobalt colourimetric
is determined by filterin method.	ig a sample thro	-	e sample as rec	- ·
is determined by filterin method.	ng a sample thro can be highly pl	H dependent, and apply to the pH of th	ie sample as rec	eived (at time of testing), without pH adjustment.
is determined by filterin method. Colour measurements of Concurrent measurement	ng a sample thro can be highly pl	H dependent, and apply to the pH of th	ie sample as rec	
is determined by filterin method. Colour measurements of Concurrent measurement EC-PCT-VA This analysis is carried	ng a sample thro can be highly pl ent of sample pl Water	H dependent, and apply to the pH of th H is recommended. Conductivity (Automated)	·	eived (at time of testing), without pH adjustment.
is determined by filterin method. Colour measurements of Concurrent measurement EC-PCT-VA This analysis is carried electrode.	ng a sample thro can be highly pl ent of sample pl Water out using proce	H dependent, and apply to the pH of th H is recommended. Conductivity (Automated) edures adapted from APHA Method 25	10 "Conductivity	eived (at time of testing), without pH adjustment. APHA 2510 Auto. Conduc. ". Conductivity is determined using a conductivity
is determined by filterin method. Colour measurements of Concurrent measurement EC-PCT-VA This analysis is carried electrode. EC-SCREEN-VA	ag a sample thro can be highly pl ent of sample pl Water out using proce Water	H dependent, and apply to the pH of th H is recommended. Conductivity (Automated)	i10 "Conductivity Dnly)	eived (at time of testing), without pH adjustment. APHA 2510 Auto. Conduc. ". Conductivity is determined using a conductivity APHA 2510
is determined by filterin method. Colour measurements of Concurrent measurement EC-PCT-VA This analysis is carried electrode. EC-SCREEN-VA Qualitative analysis of c	ag a sample thro can be highly pl ent of sample pl Water out using proce Water conductivity whe	H dependent, and apply to the pH of th H is recommended. Conductivity (Automated) edures adapted from APHA Method 25 Conductivity Screen (Internal Use C ere required during preparation of other	i10 "Conductivity Dnly)	eived (at time of testing), without pH adjustment. APHA 2510 Auto. Conduc. ". Conductivity is determined using a conductivity APHA 2510 S, metals, etc.
is determined by filterin method. Colour measurements of Concurrent measurement EC-PCT-VA This analysis is carried electrode. EC-SCREEN-VA Qualitative analysis of of F-IC-N-VA	ag a sample thro can be highly pl ent of sample pl Water out using proce Water conductivity whe Water	H dependent, and apply to the pH of th H is recommended. Conductivity (Automated) edures adapted from APHA Method 25 Conductivity Screen (Internal Use C ere required during preparation of other Fluoride in Water by IC	10 "Conductivity Dnly) r tests - e.g. TDS	eived (at time of testing), without pH adjustment. APHA 2510 Auto. Conduc. ". Conductivity is determined using a conductivity APHA 2510
is determined by filterin method. Colour measurements of Concurrent measurement EC-PCT-VA This analysis is carried electrode. EC-SCREEN-VA Qualitative analysis of of E-IC-N-VA	ag a sample thro can be highly pl ent of sample pl Water out using proce Water conductivity whe Water	H dependent, and apply to the pH of th H is recommended. Conductivity (Automated) edures adapted from APHA Method 25 Conductivity Screen (Internal Use C ere required during preparation of other	10 "Conductivity Dnly) r tests - e.g. TDS	eived (at time of testing), without pH adjustment. APHA 2510 Auto. Conduc. ". Conductivity is determined using a conductivity APHA 2510 S, metals, etc.
is determined by filterin method. Colour measurements of Concurrent measurement EC-PCT-VA This analysis is carried electrode. EC-SCREEN-VA Qualitative analysis of of E-IC-N-VA Inorganic anions are an	ag a sample thro can be highly pl ent of sample pl Water out using proce Water conductivity whe Water	H dependent, and apply to the pH of th H is recommended. Conductivity (Automated) edures adapted from APHA Method 25 Conductivity Screen (Internal Use C ere required during preparation of other Fluoride in Water by IC	10 "Conductivity Dnly) r tests - e.g. TDS	eived (at time of testing), without pH adjustment. APHA 2510 Auto. Conduc. ". Conductivity is determined using a conductivity APHA 2510 S, metals, etc.
is determined by filterin method. Colour measurements of Concurrent measurement EC-PCT-VA This analysis is carried electrode. EC-SCREEN-VA Qualitative analysis of of F-IC-N-VA Inorganic anions are an N-T-COL-VA This analysis is carried	ng a sample thro can be highly pl ent of sample pl Water out using proce Water conductivity whe Water nalyzed by Ion C Water out using proce	H dependent, and apply to the pH of th H is recommended. Conductivity (Automated) edures adapted from APHA Method 25 Conductivity Screen (Internal Use C ere required during preparation of other Fluoride in Water by IC Chromatography with conductivity and/o Total Nitrogen in water by Colour	510 "Conductivity Dnly) r tests - e.g. TDS or UV detection. 500-P (J) "Persulp	every devery and the every served (at time of testing), without pH adjustment. APHA 2510 Auto. Conduc. ". Conductivity is determined using a conductivity APHA 2510 S, metals, etc. EPA 300.1 (mod) APHA4500-P(J)/NEMI9171/USGS03-4174 phate Method for Simultaneous Determination of Total
is determined by filterin method. Colour measurements of Concurrent measurements EC-PCT-VA This analysis is carried electrode. EC-SCREEN-VA Qualitative analysis of c F-IC-N-VA Inorganic anions are an N-T-COL-VA This analysis is carried Nitrogen and Total Pho	ng a sample thro can be highly pl ent of sample pl Water out using proce Water conductivity whe Water nalyzed by Ion C Water out using proce	H dependent, and apply to the pH of th H is recommended. Conductivity (Automated) edures adapted from APHA Method 25 Conductivity Screen (Internal Use C ere required during preparation of other Fluoride in Water by IC Chromatography with conductivity and/o Total Nitrogen in water by Colour edures adapted from APHA Method 45	10 "Conductivity Dnly) r tests - e.g. TDS or UV detection. 500-P (J) "Persulp - Nemi method 5	every devery and the every served (at time of testing), without pH adjustment. APHA 2510 Auto. Conduc. ". Conductivity is determined using a conductivity APHA 2510 S, metals, etc. EPA 300.1 (mod) APHA4500-P(J)/NEMI9171/USGS03-4174 phate Method for Simultaneous Determination of Total
is determined by filterin method. Colour measurements of Concurrent measurements EC-PCT-VA This analysis is carried electrode. EC-SCREEN-VA Qualitative analysis of of F-IC-N-VA Inorganic anions are an N-T-COL-VA This analysis is carried Nitrogen and Total Pho NH3-F-VA This analysis is carried	ag a sample thro can be highly pl ent of sample pl Water out using proce Water conductivity whe Water nalyzed by lon C Water out using proce sphorus" and N Water out, on sulfuric	H dependent, and apply to the pH of th H is recommended. Conductivity (Automated) edures adapted from APHA Method 25 Conductivity Screen (Internal Use C ere required during preparation of other Fluoride in Water by IC Chromatography with conductivity and/o Total Nitrogen in water by Colour edures adapted from APHA Method 45 National Environmental Methods Index Ammonia in Water by Fluorescence	10 "Conductivity Dnly) r tests - e.g. TDS or UV detection. 00-P (J) "Persult - Nemi method s e dures modified fro	eeived (at time of testing), without pH adjustment. APHA 2510 Auto. Conduc. ". Conductivity is determined using a conductivity APHA 2510 S, metals, etc. EPA 300.1 (mod) APHA4500-P(J)/NEMI9171/USGS03-4174 phate Method for Simultaneous Determination of Total 5735.

Chain of Custody Numbers	5:		
VA	ALS E	ENVIRONMENTAL - VANCOUVER, BRITISH C	OLUMBIA, CANADA
Laboratory Definition Coc		ratory Location	
I he last two letters of the a	bove test co	de(s) indicate the laboratory that performed ana	lytical analysis for that test. Refer to the list below:
		bilications from specified reference methods to	
	01		
		, ,	idity". Turbidity is determined by the nephelometric method.
	nigh dissolve	ed solid content (i.e. seawaters, brackish waters)	etermined by drying the filter at 104 degrees celsius.) may produce a positive bias by this method. Alternate analysis APHA 2130 Turbidity
			s". Solids are determined gravimetrically. Total Suspended
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
		•	D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl luorescence detection.
TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
This analysis is carried ou		edures adapted from APHA Method 2540 "Solid	s". Solids are determined gravimetrically. Total Dissolved Solids ned by evaporating the filtrate to dryness at 180 degrees celsius.
TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC
Inorganic anions are analy	yzed by Ion (Chromatography with conductivity and/or UV det	tection.
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
This analysis is carried ou the molybdosilicate-hetero			E. "Silica". Silicate (molybdate-reactive silica) is determined by
SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
Arsenic (5+), at elevated I	evels, is a p	ositive interference on colourimetric phosphate a	analysis.
colourimetrically on a sam	ple that has solved solid	been lab or field filtered through a 0.45 micron	osphorus". Dissolved Orthophosphate is determined membrane filter. e a negative bias by this method. Alternate methods are
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
It is recommended that th	is analysis b	e conducted in the field.	
electrode	it using proc	edures adapted from APHA Method 4500-h ph	Fixade . The phase determined in the laboratory using a ph
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value I Value". The pH is determined in the laboratory using a pH
	•	ositive interference on colourimetric phosphate a	
Samples with very high dia available for these types of	ssolved solid of samples.		e a negative bias by this method. Alternate methods are
			osphorus". Total Dissolved Phosphorus is determined
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
Arsenic (5+), at elevated I	evels, is a p	ositive interference on colourimetric phosphate a	analysis.
after persulphate digestion	n of the sam ssolved solid	ple.	e a negative bias by this method. Alternate methods are
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus osphorus". Total Phosphorus is determined colourimetrically
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level) Chromatography with conductivity and/or UV det	EPA 300.1 (mod)
Inorganic anions are analy	yzed by Ion (Chromatography with conductivity and/or UV det	tection.

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. *mg/kg* - *milligrams per kilogram based on dry weight of sample.*

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

	Re	ody (COC) / Analytical quest Form									CO	C Nur	_	14				
(ALS)	Environmental Canada Tol	II Free: 1 800 668 9878		L213878	3784-COFC Page													
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Contact:	Danielle MacDonald	Quality Control (QC) Report with F												•••	optact A	ALS to co	onfirm 3	тат
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ALS Lab Wor	k Order # (lab use only) L2138784	ALS Contact: Brent Mack	Sampler: D 🎙	JacDonek	iesAnion	le, EC, p	Turbidity, Silicate.	Ę.		Fotal Metals (CCME+)CP+Hardnes	oletaML	(ultra to	alle) gitt	blg (ultra) GHOM 1	E E	ŧ	ž
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Alk-Spec	Color-True, EC,	Furbidity	TOC, TN,	DOC	fotal Me	Dis <u>solved M</u> e	Tatel.Hg	Disso hred H g	gi rleM leic	Discolve.	Tetal Coliform	Ferroust	
	Halfway River - Downstream (HD)	والثالم	14:48	Water	R	R	R	R	R								╞╴╽	3
	Middle Site C Reservoir (PR2)	20	14:21	Water	R	R	R	R	R		1						-+	3
	Rence Canyon (PCT)	2018		- Water				R	- R-1	<u> </u>	-				-		_	0
	Upper Site C Reservoir (PR1)		12:48	Water	R	R	R	R	R		<u> </u>			·	-+			3
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Are samples take Γ_Υα	en from a Regulated DW System? Please use criteria: BC I freshwater aquatic life a taken from pre-treatmen	MOE 2018 Approved and Working V nd Health Canada Guidelines for Dri t water sources	Vater Quality Gu inking Water. sa	idelines for	lce pa	ucks ng Initia			No					act			No	
Are samples for h	numan drinking water use?	· · · · · · · · · · · · · · · · · · ·					OLER	TEMPER	RATURE	s °C		F		-		PERATU	IRES ?	c
1. TO	SHIPMENT RELEASE (client use)				FINAL SHIPMENT RECEPTION (lab use only)													
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Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy. 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received: 02-AUG-18 Report Date: 13-AUG-18 15:12 (MT) Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2140599 Project P.O. #: NOT SUBMIT

Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW03060-02.002

Brent Mack, B.Sc. Account Manager

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L2140599 CONTD.... PAGE 2 of 5 13-AUG-18 15:12 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2140599-1 WATER 02-AUG-18 09:39 MOBERLY RIVER - DOWNSTREAM (MD)	L2140599-2 WATER 02-AUG-18 09:15 LOWER SITE C RESERVOIR (PR3)	L2140599-3 WATER 02-AUG-18 10:12 PEACE AT PINE (PD1)	L2140599-4 WATER 02-AUG-18 10:47 PINE RIVER (PINE)	L2140599-5 WATER TRIP
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	48.1	10.6	12.5	18.9	<5.0
	Conductivity (uS/cm)	198	192	200	290	<2.0
	рН (рН)	8.15	8.11	8.07	8.35	5.65
	Total Suspended Solids (mg/L)	214	44.4	69.2	37.2	<3.0
	Total Dissolved Solids (mg/L)	163	122	131	185	<10
	Turbidity (NTU)	188	20.9	35.1	46.5	<0.10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	109	92.2	94.2	144	<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	5.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	109	92.2	94.2	149	<1.0
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.71	<0.50
	Fluoride (F) (mg/L)	0.070	0.038	0.044	0.074	<0.020
	Nitrate and Nitrite (as N) (mg/L)	0.0191	0.0611	0.0582	0.0675	<0.0051
	Nitrate (as N) (mg/L)	0.0191	0.0611	0.0582	0.0675	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.558	0.164	0.213	0.205	<0.050
	Total Nitrogen (mg/L)	0.458	0.186	0.214	0.253	<0.030
	Orthophosphate-Dissolved (as P) (mg/L)	0.0045	0.0017	0.0021	0.0025	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0106	0.0033	0.0040	0.0051	<0.0020
	Phosphorus (P)-Total (mg/L)	0.207	0.0656	0.0974	0.0564	<0.0020
	Silicate (as SiO2) (mg/L)	3.69	4.30	4.27	3.85	<0.50
	Sulfate (SO4) (mg/L)	8.21	14.8	15.4	19.1	<0.30
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	8.74	3.32	3.41	4.51	
	Total Organic Carbon (mg/L)	12.0	3.72	4.80	5.58	<0.50

Qualifier

Applies to Sample Number(s)

Parameter

QC Samples with Qualifiers & Comments:

QC Type Description

QC Type Description		Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike		Dissolved Organic Carbon	MS-B	L2140599-1, -2, -3, -4
Matrix Spike		Dissolved Organic Carbon	MS-B	L2140599-1, -2, -3, -4
Matrix Spike		Total Organic Carbon	MS-B	L2140599-1, -2, -3, -4, -5
Matrix Spike		Total Organic Carbon	MS-B	L2140599-1, -2, -3, -4, -5
Qualifiers for Individual	Parameters	Listed:		
Qualifier Descript	ion			
MS-B Matrix Si	pike recoverv	could not be accurately calculated due	e to high analvte	background in sample.
			3 , .	
est Method Reference				
ALS Test Code	Matrix	Test Description		Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration		APHA 2320 Alkalinity
				otal alkalinity is determined by potentiometric titration to a hthalein alkalinity and total alkalinity values.
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculatio		EPA 300.0
		d parameter. Nitrate and Nitrite (as N) :	,	
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)		EPA 300.1 (mod)
Inorganic anions are anal	yzed by Ion C	Chromatography with conductivity and/o	or UV detection.	
CARBONS-DOC-VA	Water	Dissolved organic carbon by combu	stion	APHA 5310B
	ut using proce	edures adapted from APHA Method 53	10 "Total Organic	c Carbon (TOC)". Dissolved carbon (DOC) fractions are
determined by filtering the	e sample thro	ugh a 0.45 micron membrane filter pric	or to analysis.	
CARBONS-TOC-VA	Water	Total organic carbon by combustion		APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried ou	ut using proce	edures adapted from APHA Method 53	10 "Total Organic	c Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC		EPA 300.1 (mod)
Inorganic anions are anal	yzed by Ion C	Chromatography with conductivity and/c	or UV detection.	
	Matan			
				BCMOE Colour Single Wavelength anual "Colour- Single Wavelength." Colour (True Colour) s of the filtrate using the platinum-cobalt colourimetric
method.		-		sived (at time of testing), without pH adjustment.
Concurrent measurement	of sample pl	H is recommended.		
EC-PCT-VA	Water	Conductivity (Automated)		APHA 2510 Auto. Conduc.
This analysis is carried ou electrode.	ut using proce	edures adapted from APHA Method 25	10 "Conductivity"	. Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use C	only)	APHA 2510
	nductivity whe	ere required during preparation of other	57	, metals, etc.
	Matan			
-IC-N-VA	Water	Fluoride in Water by IC Chromatography with conductivity and/c	vr LIV dotaction	EPA 300.1 (mod)
morganic amons are ana			or detection.	
N-T-COL-VA	Water	Total Nitrogen in water by Colour		APHA4500-P(J)/NEMI9171/USGS03-4174
		edures adapted from APHA Method 45 National Environmental Methods Index		hate Method for Simultaneous Determination of Total 735.
NH3-F-VA	Water	Ammonia in Water by Fluorescence	•	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
				m J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society e levels of ammonium in seawater", Roslyn J. Waston et
	Water	Nitrite in Water by IC (Low Level)		EPA 300.1 (mod)
NO2-L-IC-N-VA			vr LIV dotaction	
	yzed by Ion C	Chromatography with conductivity and/o	or ov detection.	
Inorganic anions are anal				EPA 300 1 (mod)
Inorganic anions are anal	Water	Nitrate in Water by IC (Low Level)		EPA 300.1 (mod)
Inorganic anions are anal	Water			EPA 300.1 (mod)

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are

available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. P-TD-COL-VA Water Total Dissolved P in Water by Colour APHA 4500-P Phosphorous This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorus is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field. PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E. This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Sulfate in Water by IC SO4-IC-N-VA Water EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius. **TKN-F-VA** Water TKN in Water by Fluorescence APHA 4500-NORG D. This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. Turbidity by Meter APHA 2130 Turbidity TURBIDITY-VA Water This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

after persulphate digestion of the sample.

GLOSSARY OF REPORT TERMS

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mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

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Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received:02-AUG-18Report Date:14-AUG-18 17:46 (MT)Version:FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2140393 Project P.O. #: NOT SUBMIT

Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW003060-02.002

Brent Mack, B.Sc. Account Manager

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	De Samp Samp	ample ID L2140393-9 scription WATER bled Date 01-AUG-18 bled Time 19:00 Client ID FIELD		
Grouping	Analyte			
FILTER				
Plant Pigments	Chlorophyll a (ug/L)	<0.010		

L2140393 CONTD.... PAGE 3 of 7 14-AUG-18 17:46 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2140393-1 WATER 01-AUG-18 10:23 PEACE AT BEATTON (PD2)	L2140393-2 WATER 01-AUG-18 11:05 BEATTON RIVER (BEATTON)	L2140393-3 WATER 01-AUG-18 12:25 PEACE AT KISKATINAW (PD3)	L2140393-4 WATER 01-AUG-18 12:47 KISKATINAW RIVER (KR)	L2140393-5 WATER 01-AUG-18 13:22 PEACE AT POUCE COUPE (PD4)
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	17.7	160	18.3	78.3	19.4
	Conductivity (uS/cm)	236	239	228	287	223
	рН (рН)	8.29	8.14	8.28	8.37	8.18
	Total Suspended Solids (mg/L)	80.6	28.4	82.4	754	85.8
	Total Dissolved Solids (mg/L)	171	225	151	361	143
	Turbidity (NTU)	50.6	59.5	47.8	985	57.2
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	111	84.1	109	160	102
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	4.8	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	111	84.1	109	164	102
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	0.0493	0.0060
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	0.98	<0.50	1.24	<0.50
	Fluoride (F) (mg/L)	0.062	0.110	0.060	0.096	0.058
	Nitrate and Nitrite (as N) (mg/L)	0.0579	<0.0051	0.0556	0.0218	0.0540
	Nitrate (as N) (mg/L)	0.0579	<0.0050	0.0556	0.0187	0.0540
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	0.0031	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.249	0.702	0.235	1.53	0.243
	Total Nitrogen (mg/L)	0.235	0.675	0.241	1.31	0.249
	Orthophosphate-Dissolved (as P) (mg/L)	0.0027	0.0049	0.0027	0.0087	0.0029
	Phosphorus (P)-Total Dissolved (mg/L)	0.0048	0.0175	0.0049	0.0153	0.0058
	Phosphorus (P)-Total (mg/L)	0.093	0.0793	0.116	0.584	0.112
	Silicate (as SiO2) (mg/L)	3.82	6.06	4.07	4.78	3.94
	Sulfate (SO4) (mg/L)	18.3	40.5	18.3	15.2	18.8
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.85	22.9	4.13	17.4	4.62
	Total Organic Carbon (mg/L)	5.59	25.3	5.62	30.4	5.92

L2140393 CONTD.... PAGE 4 of 7 14-AUG-18 17:46 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2140393-6 WATER 01-AUG-18 13:54 POUCE COUPE (POUCE)	L2140393-7 WATER 01-AUG-18 15:07 PEACE AT MANY ISLANDS (PD5)	L2140393-8 WATER 01-AUG-18 12:00 DUPLICATE 1 (DUP 1)	L2140393-9 WATER 01-AUG-18 19:00 FIELD	
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	130	27.5	18.5	<5.0	
	Conductivity (uS/cm)	310	238	238	<2.0	
	рН (рН)	7.93	8.21	8.31	5.54	
	Total Suspended Solids (mg/L)	3480	347	86.2	<3.0	
	Total Dissolved Solids (mg/L)	304	202	161	<10	
	Turbidity (NTU)	™V >4000	393	47.5	0.16	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	117	110	109	<1.0	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	2.6	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	117	110	112	<1.0	
	Ammonia, Total (as N) (mg/L)	0.0919	0.0165	<0.0050	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	5.41	0.67	<0.50	<0.50	
	Fluoride (F) (mg/L)	0.169	0.071	0.061	<0.020	
	Nitrate and Nitrite (as N) (mg/L)	0.192	0.0641	0.0576	<0.0051	
	Nitrate (as N) (mg/L)	0.183	0.0631	0.0576	<0.0050	
	Nitrite (as N) (mg/L)	0.0098	0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	1.06	0.618	0.258	<0.050	
	Total Nitrogen (mg/L)	2.65	0.61	0.253	<0.030	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0138	0.0063	0.0026	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0325	0.0094	0.0040	<0.0020	
	Phosphorus (P)-Total (mg/L)	2.04	0.376	0.098	<0.0020	
	Silicate (as SiO2) (mg/L)	5.88	3.90	3.99	<0.50	
	Sulfate (SO4) (mg/L)	66.3	21.5	18.3	<0.30	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	26.7	6.20	4.13	<0.50	
	Total Organic Carbon (mg/L)	85.8	13.6	5.31	<0.50	

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Dissolved Organic Carbon	В	L2140393-1
Matrix Spike	Dissolved Organic Carbon	MS-B	L2140393-2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L2140393-2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L2140393-1
Matrix Spike	Dissolved Organic Carbon	MS-B	L2140393-1
Matrix Spike	Total Organic Carbon	MS-B	L2140393-2, -3, -5, -7, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L2140393-1
Matrix Spike	Total Organic Carbon	MS-B	L2140393-1
Matrix Spike	Phosphorus (P)-Total	MS-B	L2140393-1, -2, -3, -4, -5, -6, -7, -8, -9

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Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
TMV	Turbidity exceeded upper limit of the nephelometric method. Minimum value reported.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**						
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity						
		dures adapted from APHA Method 2320 "Alkalinity". To e and hydroxide alkalinity are calculated from phenolph	tal alkalinity is determined by potentiometric titration to a the transmission that a state of the transmission of transmission of the transmission of						
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0						
Nitrate and Nitrite (as N) is	s a calculated	parameter. Nitrate and Nitrite (as N) = Nitrite (as N) +	Nitrate (as N).						
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)						
Inorganic anions are analy	zed by Ion C	hromatography with conductivity and/or UV detection.							
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B						
	This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.								
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)						
This analysis is carried ou	t using proce	dures adapted from APHA Method 5310 "Total Organic	: Carbon (TOC)".						
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0						
		modified from EPA Method 445.0. Chlorophyll-a is de cidification procedure. This method is not subject to in							
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)						
Inorganic anions are analy	zed by Ion C	hromatography with conductivity and/or UV detection.							
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength						
is determined by filtering a method.	a sample throu n be highly p⊢	ugh a 0.45 micron membrane filter followed by analysis I dependent, and apply to the pH of the sample as rece							
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.						
This analysis is carried ou electrode.	t using proce	dures adapted from APHA Method 2510 "Conductivity"	. Conductivity is determined using a conductivity						
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510						
Qualitative analysis of con	ductivity whe	re required during preparation of other tests - e.g. TDS	, metals, etc.						
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)						
Inorganic anions are analy	zed by Ion C	hromatography with conductivity and/or UV detection.							
	Mator	Total Nitragan in water by Calaur							

		dures adapted from APHA Method 4500-P (J) "Persulph ational Environmental Methods Index - Nemi method 57	
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
			m J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society e levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyz	zed by Ion Cl	hromatography with conductivity and/or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyz	zed by Ion Cl	hromatography with conductivity and/or UV detection.	
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestion	of the sampl solved solids	dures adapted from APHA Method 4500-P "Phosphorus le. ; (i.e. seawaters, brackish waters) may produce a negat	
Arsenic (5+), at elevated le	vels, is a pos	sitive interference on colourimetric phosphate analysis.	
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
colourimetrically after persu	ulphate diges solved solids	dures adapted from APHA Method 4500-P "Phosphorus stion of a sample that has been lab or field filtered throu s (i.e. seawaters, brackish waters) may produce a negat	igh a 0.45 micron membrane filter.
Arsenic (5+), at elevated le	vels, is a pos	sitive interference on colourimetric phosphate analysis.	
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out electrode	using procee	dures adapted from APHA Method 4500-H "pH Value".	The pH is determined in the laboratory using a pH
It is recommended that this	analysis be	conducted in the field.	
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a samp	ole that has b solved solids	dures adapted from APHA Method 4500-P "Phosphorus been lab or field filtered through a 0.45 micron membrar s (i.e. seawaters, brackish waters) may produce a negat	ne filter.
Arsenic (5+), at elevated le	vels, is a pos	sitive interference on colourimetric phosphate analysis.	
SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
This analysis is carried out the molybdosilicate-heterop			a". Silicate (molybdate-reactive silica) is determined by
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyz	zed by Ion Cl	hromatography with conductivity and/or UV detection.	
TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC
			s are determined gravimetrically. Total Dissolved Solids /aporating the filtrate to dryness at 180 degrees celsius.
TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
This analysis is carried out Nitrogen is determined usir	using proceeng block dige	dures adapted from APHA Method 4500-Norg D. "Block stion followed by Flow-injection analysis with fluorescer	Digestion and Flow Injection Analysis". Total Kjeldahl ne detection.
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
Solids (TSS) are determine	ed by filtering gh dissolved		
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out	using proce	dures adapted from APHA Method 2130 "Turbidity". Tu	rbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

VA

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION. Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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	Peace at Beatton (PD2)			JUG	10:23	Water	Ř	R	R	R	R									3
	Beatton River (Beatton)			1	11:05	Water	R	R	R	R	R		1					í	I	38
	Peace at Kiskatinaw (PD3)			2018	12:25	Water	R	R	R	R	R				\square		\square			38
	Kiskatinaw River (KR)			1	12:47	Water	R	R	R	R	R									30
	Peace at Pouce Coupe (PD4)	<u> </u>			13:22	Water	R	R	R	R	R				\square					30
	Pouce Coupe (Pouce)				13:54	Water	R	R	R	R	R				\square					33
	Peace at Many Islands (PD5)				15:07	Water	R	R	R	R	R		+		╂──┦					3
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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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NA-FM-0325e v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy. 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4

Date Received: 11-SEP-18 Report Date: 24-SEP-18 16:41 (MT) Version: FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2162370 Project P.O. #: Job Reference: C of C Numbers:

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Brent Mack, B.Sc. Account Manager

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L2162370 CONTD.... PAGE 2 of 7 24-SEP-18 16:41 (MT) Version: FINAL

0		Sample ID Description Sampled Date Sampled Time Client ID	L2162370-1 Water 11-SEP-18 14:00 WILLISTON SHALLOW (W1- SHALLOW)	L2162370-2 Water 11-SEP-18 14:30 WILLISTON SHALLOW (W1- DEEP)	L2162370-3 Water 11-SEP-18 11:30 DINOSAUR SHALLOW (D1- SHALLOW)	L2162370-4 Water 11-SEP-18 12:00 DINOSAUR DEEP (D1-DEEP)	L2162370-5 Water 11-SEP-18 DUPLICATE 2 (DUP 2)
Grouping FILTER	Analyte						
Plant Pigments	Chlorophyll a (ug/L)		1.61	0.160	1.45	1.32	1.45

L2162370 CONTD.... PAGE 3 of 7 24-SEP-18 16:41 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2162370-1 Water 11-SEP-18 14:00 WILLISTON SHALLOW (W1- SHALLOW)	L2162370-2 Water 11-SEP-18 14:30 WILLISTON SHALLOW (W1- DEEP)	L2162370-3 Water 11-SEP-18 11:30 DINOSAUR SHALLOW (D1- SHALLOW)	L2162370-4 Water 11-SEP-18 12:00 DINOSAUR DEEP (D1-DEEP)	L2162370-5 Water 11-SEP-18 DUPLICATE 2 (DUP 2)
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	5.8	6.6	6.2	8.1	7.2
	Conductivity (uS/cm)	173	175	181	181	182
	рН (рН)	8.20	8.19	8.20	8.20	8.21
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	107	103	107	104	104
	Turbidity (NTU)	0.48	0.49	1.08	1.07	1.21
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	81.8	81.0	83.1	83.3	83.6
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	81.8	81.0	83.1	83.3	83.6
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.035	0.036	0.038	0.036	0.038
	Nitrate and Nitrite (as N) (mg/L)	0.0481	0.0483	0.0607	0.0607	0.0596
	Nitrate (as N) (mg/L)	0.0453	0.0454	0.0595	0.0595	0.0585
	Nitrite (as N) (mg/L)	0.0027	0.0029	0.0012	0.0011	0.0011
	Total Kjeldahl Nitrogen (mg/L)	0.120	0.106	0.103	0.103	0.114
	Total Nitrogen (mg/L)	0.147	0.146	0.146	0.148	0.155
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	0.0010	0.0012	<0.0010	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0022	<0.0020	<0.0020	<0.0020	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0035	0.0035	0.0030	0.0034	0.0049
	Silicate (as SiO2) (mg/L)	4.31	4.11	4.26	4.52	4.27
	Sulfate (SO4) (mg/L)	12.7	12.7	13.7	13.7	13.7
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.91	2.91	2.68	2.88	2.79
	Total Organic Carbon (mg/L)	2.84	3.00	2.87	2.94	2.97

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	Sample ID Description Sampled Date Sampled Time Client ID	L2162370-6 Water 11-SEP-18 10:20 PEACE CANYON (PC1)		
Grouping	Analyte			
WATER				
Physical Tests	Colour, True (CU)	6.1		
	Conductivity (uS/cm)	189		
	рН (рН)	8.21		
	Total Suspended Solids (mg/L)	<3.0		
	Total Dissolved Solids (mg/L)	112		
	Turbidity (NTU)	1.11		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	86.4		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	86.4		
	Ammonia, Total (as N) (mg/L)	<0.0050		
	Bromide (Br) (mg/L)	<0.050		
	Chloride (Cl) (mg/L)	0.50		
	Fluoride (F) (mg/L)	0.038		
	Nitrate and Nitrite (as N) (mg/L)	0.0625		
	Nitrate (as N) (mg/L)	0.0625		
	Nitrite (as N) (mg/L)	<0.0010		
	Total Kjeldahl Nitrogen (mg/L)	0.101		
	Total Nitrogen (mg/L)	0.145		
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010		
	Phosphorus (P)-Total Dissolved (mg/L)	<0.0020		
	Phosphorus (P)-Total (mg/L)	0.0037		
	Silicate (as SiO2) (mg/L)	4.62		
	Sulfate (SO4) (mg/L)	14.0		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.82		
	Total Organic Carbon (mg/L)	2.76		

Qualifier

MS-B

MS-B

Applies to Sample Number(s)

L2162370-1, -2, -3, -4, -5, -6

L2162370-1, -2, -3, -4, -5, -6

Parameter

Dissolved Organic Carbon

Total Organic Carbon

QC Samples with Qualifiers & Comments:

QC Type Description

Matrix Spike

Matrix Spike

Qualifier D	Description		
MS-B N	Aatrix Spike recovery	could not be accurately calculated due to high	analyte background in sample.
est Method Refe	erences:		
ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
			linity". Total alkalinity is determined by potentiometric titration to a phenolphthalein alkalinity and total alkalinity values.
ANIONS-N+N-CAL	C-VA Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite	(as N) is a calculated	d parameter. Nitrate and Nitrite (as N) = Nitrite	(as N) + Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions a	are analyzed by Ion C	Chromatography with conductivity and/or UV de	tection.
CARBONS-DOC-V	A Water	Dissolved organic carbon by combustion	APHA 5310B
This analysis is ca	arried out using proce	c	I Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-V	A Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is ca	arried out using proce	edures adapted from APHA Method 5310 "Tota	I Organic Carbon (TOC)".
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0
This analysis is do analysis by fluoror	one using procedures metry using the non-a	modified from EPA Method 445.0. Chlorophylacidification procedure. This method is not sub	II-a is determined by a routine acetone extraction followed with ject to interferences from chlorophyll b.
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions a	are analyzed by Ion C	Chromatography with conductivity and/or UV de	tection.
COLOUR-TRUE-V	A Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
is determined by f method. Colour measurem	iltering a sample thro	bugh a 0.45 micron membrane filter followed by	nental Manual "Colour- Single Wavelength." Colour (True Colour) analysis of the filtrate using the platinum-cobalt colourimetric e as received (at time of testing), without pH adjustment.
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
	arried out using proce		ductivity". Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analys	is of conductivity whe	ere required during preparation of other tests - e	e.g. TDS, metals, etc.
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
		Chromatography with conductivity and/or UV de	
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
This analysis is ca	arried out using proce	o <i>i</i>	"Persulphate Method for Simultaneous Determination of Total
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
			dified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society in of trace levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Chromatography with conductivity and/or UV de	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
	vvater		

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		in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestion of the	he sample. ed solids (i.e. sea	apted from APHA Method 4500-P "Phosphorus" waters, brackish waters) may produce a negativ	. Total Phosphorus is determined colourimetrically ve bias by this method. Alternate methods are
Arsenic (5+), at elevated levels	, is a positive inte	rference on colourimetric phosphate analysis.	
	•		APHA 4500-P Phosphorous
colourimetrically after persulph	ate digestion of a ed solids (i.e. sea	apted from APHA Method 4500-P "Phosphorus" sample that has been lab or field filtered throug waters, brackish waters) may produce a negativ	h a 0.45 micron membrane filter.
Arsenic (5+), at elevated levels	, is a positive inte	rference on colourimetric phosphate analysis.	
PH-PCT-VA W	ater pH by	Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out usir electrode	ng procedures ad	apted from APHA Method 4500-H "pH Value". T	he pH is determined in the laboratory using a pH
It is recommended that this and	alysis be conduct	ed in the field.	
PO4-DO-COL-VA W	ater Diss. C	Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a sample t	hat has been lab ed solids (i.e. sea	apted from APHA Method 4500-P "Phosphorus" or field filtered through a 0.45 micron membrane waters, brackish waters) may produce a negativ	filter.
Arsenic (5+), at elevated levels	, is a positive inte	rference on colourimetric phosphate analysis.	
SILICATE-COL-VA W	ater Silicate	e by Colourimetric analysis	APHA 4500-SiO2 E.
This analysis is carried out usir the molybdosilicate-heteropoly			'. Silicate (molybdate-reactive silica) is determined by
SO4-IC-N-VA W	ater Sulfate	in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed	by Ion Chromatog	graphy with conductivity and/or UV detection.	
TDS-VA W	ater Total D	Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC
			are determined gravimetrically. Total Dissolved Solids porating the filtrate to dryness at 180 degrees celsius.
TKN-F-VA W	ater TKN in	Water by Fluorescence	APHA 4500-NORG D.
		apted from APHA Method 4500-Norg D. "Block I owed by Flow-injection analysis with fluorescend	Digestion and Flow Injection Analysis". Total Kjeldahl ce detection.
TSS-VA W	ater Total S	suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
Solids (TSS) are determined by	y filtering a sampl dissolved solid co	e through a glass fibre filter, TSS is determined ntent (i.e. seawaters, brackish waters) may proc	are determined gravimetrically. Total Suspended by drying the filter at 104 degrees celsius. luce a positive bias by this method. Alternate analysis
TURBIDITY-VA W	ater Turbidi	ty by Meter	APHA 2130 Turbidity
This analysis is carried out usir	ng procedures ad	apted from APHA Method 2130 "Turbidity". Turb	idity is determined by the nephelometric method.
** ALS test methods may incorpo	rate modifications	from specified reference methods to improve p	erformance.
The last two letters of the above	test code(s) indic	cate the laboratory that performed analytical ana	lysis for that test. Refer to the list below:
Laboratory Definition Code	Laboratory Loc	cation	
VA	ALS ENVIRON	MENTAL - VANCOUVER, BRITISH COLUMBIA	, CANADA
Chain of Custody Numbers:			

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. *mg/kg* - *milligrams per kilogram based on dry weight of sample.*

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Short Holding Tim 5

Rush Processing

neatreasta an



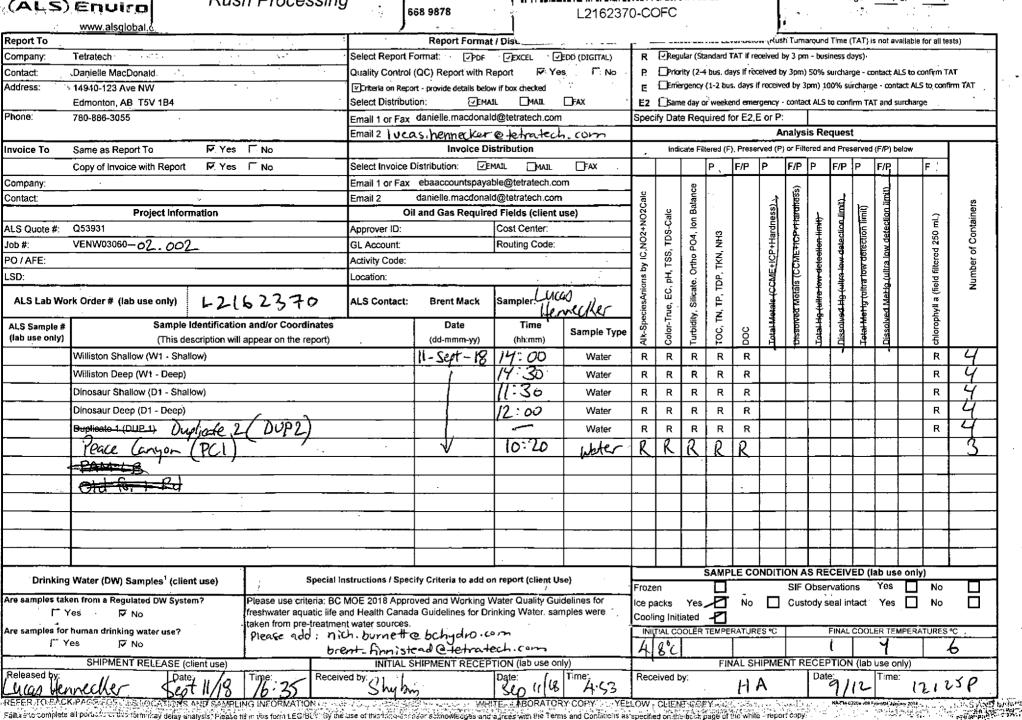


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Page

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1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received:13-SEP-18Report Date:24-SEP-18 16:49 (MT)Version:FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2163952 Project P.O. #: NOT SUBMIT

Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW03060-02.002

Brent Mack, B.Sc. Account Manager

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		Sample ID Description Sampled Date Sampled Time Client ID	L2163952-5 Water 13-SEP-18 11:00 FIELD BLANK		
Grouping	Analyte				
FILTER					
Plant Pigments	Chlorophyll a (ug/L)		<0.010		

L2163952 CONTD.... PAGE 3 of 12 24-SEP-18 16:49 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2163952-1 Water 13-SEP-18 08:36 HALFWAY RIVER - DOWNSTREAM (HD)	L2163952-2 Water 13-SEP-18 08:58 MIDDLE SITE C RESERVOIR (PR2)	L2163952-3 Water 13-SEP-18 10:11 UPPER SITE C RESERVOIR (PR1)	L2163952-4 Water 13-SEP-18 DUPLICATE 1 (DUP 1)	L2163952-5 Water 13-SEP-18 11:00 FIELD BLANK
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	10.9	6.7	6.2	6.2	<5.0
	Conductivity (uS/cm)	432	184	181	184	<2.0
	Hardness (as CaCO3) (mg/L)	230	91.9	90.6	92.1	<0.50
	рН (рН)	8.46	8.18	8.20	8.21	5.41
	Total Suspended Solids (mg/L)	33.0	<3.0	<3.0	<3.0	<3.0
	TDS (Calculated) (mg/L)	258	100	99.2	100	<1.0
	Turbidity (NTU)	22.2	1.07	0.57	1.14	0.17
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	181	84.3	84.5	84.3	<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	11.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	192	84.3	84.5	84.3	<1.0
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (CI) (mg/L)	0.52	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.109	0.038	0.037	0.038	<0.020
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0577	0.0635	0.0635	<0.0051
	Nitrate (as N) (mg/L)	<0.0050	нтр 0.0577	0.0635	0.0635	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.172	0.091	0.084	0.095	<0.050
	Total Nitrogen (mg/L)	0.137	0.143	0.147	0.147	<0.030
	Orthophosphate-Dissolved (as P) (mg/L)	0.0028	0.0013	0.0013	0.0013	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0046	0.0034	0.0031	0.0030	<0.0020
	Phosphorus (P)-Total (mg/L)	0.0418	0.0053	0.0036	0.0038	RRV 0.0068
	Silicate (as SiO2) (mg/L)	3.80	4.19	4.41	4.44	<0.50
	Sulfate (SO4) (mg/L)	54.3	13.6	13.4	13.6	<0.30
	Anion Sum (meq/L)	4.99	1.97	1.97	1.97	<0.10
	Cation Sum (meq/L)	4.79	1.84	1.81	1.84	<0.10
	Cation - Anion Balance (%)	-2.1	-3.6	-4.3	-3.4	0.0
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.53	2.77	2.59	2.54	<0.50
	Total Organic Carbon (mg/L)	3.64	3.15	2.51	2.85	<0.50
Bacteriological Tests	E. coli (MPN/100mL)	10	1	<1	3	<1
	HPC (CFU/1mL)	73	8	9	28	12
	Coliform Bacteria - Total (MPN/100mL)	317	101	35	70	<1
Total Metals	Aluminum (Al)-Total (mg/L)	0.678	0.0429	0.0246	0.0480	<0.0050
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	0.00062	<0.00050	<0.00050	<0.00050	<0.00050

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	Sample ID Description Sampled Date Sampled Time Client ID	L2163952-6 Water 13-SEP-18 TRIP BLANK		
Grouping	Analyte			
WATER				
Physical Tests	Colour, True (CU)	<5.0		
	Conductivity (uS/cm)	<2.0		
	Hardness (as CaCO3) (mg/L)	нтс <0.50		
	рН (рН)	5.34		
	Total Suspended Solids (mg/L)	<3.0		
	TDS (Calculated) (mg/L)	<1.0		
	Turbidity (NTU)	<0.10		
Anions and	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0		
Nutrients	Alkalinity, Carbonate (as CaCO3) (mg/L)			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0		
	Ammonia, Total (as N) (mg/L)	<1.0		
	Bromide (Br) (mg/L)	<0.0050		
	Chloride (Cl) (mg/L)	<0.050		
	Fluoride (F) (mg/L)	<0.50		
	Nitrate and Nitrite (as N) (mg/L)	<0.020		
	Nitrate (as N) (mg/L)	<0.0051		
	Nitrite (as N) (mg/L)	<0.0050		
	Total Kjeldahl Nitrogen (mg/L)	<0.0010		
	Total Nitrogen (mg/L)	<0.050		
	Orthophosphate-Dissolved (as P) (mg/L)	<0.030 <0.0010		
	Phosphorus (P)-Total Dissolved (mg/L)			
	Phosphorus (P)-Total (mg/L)	<0.0020		
	Silicate (as SiO2) (mg/L)	<0.0020 <0.50		
	Sulfate (SO4) (mg/L)	<0.30		
	Anion Sum (meq/L)	<0.30		
	Cation Sum (meq/L)	<0.10		
	Cation - Anion Balance (%)	0.0		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	0.0		
	Total Organic Carbon (mg/L)	<0.50		
Bacteriological Tests	E. coli (MPN/100mL)	<1		
	HPC (CFU/1mL)	<1		
	Coliform Bacteria - Total (MPN/100mL)	<1		
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0050		
	Antimony (Sb)-Total (mg/L)	<0.00050		
	Arsenic (As)-Total (mg/L)	<0.00050		

L2163952 CONTD.... PAGE 5 of 12 24-SEP-18 16:49 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2163952-1 Water 13-SEP-18 08:36 HALFWAY RIVER - DOWNSTREAM (HD)	L2163952-2 Water 13-SEP-18 08:58 MIDDLE SITE C RESERVOIR (PR2)	L2163952-3 Water 13-SEP-18 10:11 UPPER SITE C RESERVOIR (PR1)	L2163952-4 Water 13-SEP-18 DUPLICATE 1 (DUP 1)	L2163952-5 Water 13-SEP-18 11:00 FIELD BLANK
Grouping	Analyte					
WATER						
Total Metals	Barium (Ba)-Total (mg/L)	0.115	0.033	0.031	0.034	<0.020
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.0000777	0.0000210	0.0000182	0.0000171	<0.0000050
	Calcium (Ca)-Total (mg/L)	60.6	26.5	25.8	26.1	<0.10
	Chromium (Cr)-Total (mg/L)	0.0013	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Total (mg/L)	0.00059	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Total (mg/L)	0.0017	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Total (mg/L)	1.01	0.051	0.031	0.055	<0.030
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Total (mg/L)	0.0082	0.0012	0.0011	0.0012	<0.0010
	Magnesium (Mg)-Total (mg/L)	17.8	6.19	6.14	6.13	<0.10
	Manganese (Mn)-Total (mg/L)	0.0254	0.00190	0.00159	0.00198	0.00021
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.0038	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	0.0035	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	0.00124	0.000245	0.000260	0.000258	<0.000050
	Silicon (Si)-Total (mg/L)	2.84	2.10	2.08	2.16	<0.10
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Total (mg/L)	3.6	<2.0	<2.0	<2.0	<2.0
	Strontium (Sr)-Total (mg/L)	0.322	0.103	0.102	0.103	<0.0050
	Thallium (TI)-Total (mg/L)	0.000027	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	0.011	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total (mg/L)	0.00091	0.00045	0.00046	0.00046	<0.00020
	Vanadium (V)-Total (mg/L)	0.00332	0.00052	<0.00050	0.00052	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0074	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Metals	Dissolved Fe2 Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.205	0.0128	<0.0050	0.0160	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Barium (Ba)-Dissolved (mg/L)	0.109	0.036	0.034	0.036	<0.020

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	Sample ID Description Sampled Date Sampled Time Client ID	L2163952-6 Water 13-SEP-18 TRIP BLANK		
Grouping	Analyte			
WATER				
Total Metals	Barium (Ba)-Total (mg/L)	<0.020		
	Beryllium (Be)-Total (mg/L)	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.20		
	Boron (B)-Total (mg/L)	<0.10		
	Cadmium (Cd)-Total (mg/L)	<0.0000050		
	Calcium (Ca)-Total (mg/L)	<0.10		
	Chromium (Cr)-Total (mg/L)	<0.0010		
	Cobalt (Co)-Total (mg/L)	<0.00030		
	Copper (Cu)-Total (mg/L)	<0.0010		
	Iron (Fe)-Total (mg/L)	<0.030		
	Lead (Pb)-Total (mg/L)	<0.00050		
	Lithium (Li)-Total (mg/L)	<0.0010		
	Magnesium (Mg)-Total (mg/L)	<0.10		
	Manganese (Mn)-Total (mg/L)	<0.00010		
	Mercury (Hg)-Total (mg/L)	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	<0.0010		
	Nickel (Ni)-Total (mg/L)	<0.0010		
	Phosphorus (P)-Total (mg/L)	<0.30		
	Potassium (K)-Total (mg/L)	<2.0		
	Selenium (Se)-Total (mg/L)	<0.000050		
	Silicon (Si)-Total (mg/L)	<0.10		
	Silver (Ag)-Total (mg/L)	<0.000020		
	Sodium (Na)-Total (mg/L)	<2.0		
	Strontium (Sr)-Total (mg/L)	<0.0050		
	Thallium (TI)-Total (mg/L)	<0.000010		
	Tin (Sn)-Total (mg/L)	<0.00050		
	Titanium (Ti)-Total (mg/L)	<0.010		
	Uranium (U)-Total (mg/L)	<0.00020		
	Vanadium (V)-Total (mg/L)	<0.00050		
	Zinc (Zn)-Total (mg/L)	<0.0050		
Dissolved Metals	Dissolved Fe2 Filtration Location			
	Dissolved Mercury Filtration Location			
	Dissolved Metals Filtration Location			
	Aluminum (Al)-Dissolved (mg/L)			
	Antimony (Sb)-Dissolved (mg/L)			
	Arsenic (As)-Dissolved (mg/L)			
	Barium (Ba)-Dissolved (mg/L)			

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	Sample ID Description Sampled Date Sampled Time Client ID	L2163952-1 Water 13-SEP-18 08:36 HALFWAY RIVER - DOWNSTREAM (HD)	L2163952-2 Water 13-SEP-18 08:58 MIDDLE SITE C RESERVOIR (PR2)	L2163952-3 Water 13-SEP-18 10:11 UPPER SITE C RESERVOIR (PR1)	L2163952-4 Water 13-SEP-18 DUPLICATE 1 (DUP 1)	L2163952-5 Water 13-SEP-18 11:00 FIELD BLANK
Grouping	Analyte					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	0.0000428	0.0000132	0.0000117	0.0000127	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	62.4	26.5	26.1	26.6	<0.10
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	0.00034	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Dissolved (mg/L)	0.0012	<0.0010	<0.0010	0.0014	<0.0010
	Iron (Fe)-Dissolved (mg/L)	0.266	<0.030	<0.030	<0.030	<0.030
	Ferrous Iron, Dissolved (mg/L)	0.085	<0.020	<0.020	<0.020	<0.020
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	0.0077	0.0011	0.0011	0.0012	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	17.9	6.22	6.15	6.26	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.0163	0.00090	0.00064	0.00095	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.0038	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Dissolved (mg/L)	0.0024	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	< 0.30
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Dissolved (mg/L)	0.00114	0.000280	0.000229	0.000253	<0.000050
	Silicon (Si)-Dissolved (mg/L)	1.94	1.90	1.90	1.96	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Dissolved (mg/L)	3.7	<2.0	<2.0	<2.0	<2.0
	Strontium (Sr)-Dissolved (mg/L)	0.322	0.102	0.102	0.103	<0.0050
	Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00020	<0.00020
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00088	0.00045	0.00045	0.00044	<0.00020
	Vanadium (V)-Dissolved (mg/L)	0.00100	<0.00050	< 0.00050	< 0.00050	<0.00020
	Zinc (Zn)-Dissolved (mg/L)	< 0.0050	<0.0050	<0.0050	<0.0050	< 0.0050

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Grouping	Sampled Date Sampled Time Client ID Analyte	13-SEP-18 TRIP BLANK		
WATER	Analyte			
	Popullium (Po) Dissolved (mg/L)			
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)			
	Bismuth (Bi)-Dissolved (mg/L)			
	Boron (B)-Dissolved (mg/L)			
	Cadmium (Cd)-Dissolved (mg/L)			
	Calcium (Ca)-Dissolved (mg/L)			
	Chromium (Cr)-Dissolved (mg/L)			
	Cobalt (Co)-Dissolved (mg/L)			
	Copper (Cu)-Dissolved (mg/L)			
	Iron (Fe)-Dissolved (mg/L)			
	Ferrous Iron, Dissolved (mg/L)			
	Lead (Pb)-Dissolved (mg/L)			
	Lithium (Li)-Dissolved (mg/L)			
	Magnesium (Mg)-Dissolved (mg/L)			
	Manganese (Mn)-Dissolved (mg/L)			
	Mercury (Hg)-Dissolved (mg/L)			
	Molybdenum (Mo)-Dissolved (mg/L)			
	Nickel (Ni)-Dissolved (mg/L)			
	Phosphorus (P)-Dissolved (mg/L)			
	Potassium (K)-Dissolved (mg/L)			
	Selenium (Se)-Dissolved (mg/L)			
	Silicon (Si)-Dissolved (mg/L)			
	Silver (Ag)-Dissolved (mg/L)			
	Sodium (Na)-Dissolved (mg/L)			
	Strontium (Sr)-Dissolved (mg/L)			
	Thallium (TI)-Dissolved (mg/L)			
	Tin (Sn)-Dissolved (mg/L)			
	Titanium (Ti)-Dissolved (mg/L)			
	Uranium (U)-Dissolved (mg/L)			
	Vanadium (V)-Dissolved (mg/L)			
	Zinc (Zn)-Dissolved (mg/L)			

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QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Dissolved Organic Carbon	MS-B	L2163952-1, -2, -3, -4, -5
Matrix Spike	Dissolved Organic Carbon	MS-B	L2163952-1, -2, -3, -4, -5
Matrix Spike	Total Organic Carbon	MS-B	L2163952-1, -2, -3
Matrix Spike	Total Organic Carbon	MS-B	L2163952-4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2163952-1, -2, -3, -4, -5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2163952-1, -2, -3, -4, -5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2163952-5
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2163952-1, -2, -3, -4, -5
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2163952-5
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2163952-1, -2, -3, -4, -5
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2163952-5
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2163952-1, -2, -3, -4, -5
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2163952-1, -2, -3, -4, -5
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2163952-5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2163952-1, -2, -3, -4, -5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2163952-5
Matrix Spike	Boron (B)-Total	MS-B	L2163952-1, -2, -3, -4, -5, -6
Matrix Spike	Copper (Cu)-Total	MS-B	L2163952-1, -2, -3, -4, -5, -6
Matrix Spike	Silicon (Si)-Total	MS-B	L2163952-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Total	MS-B	L2163952-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

method.

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
		edures adapted from APHA Method 2320 "Alkalinity te and hydroxide alkalinity are calculated from phene	". Total alkalinity is determined by potentiometric titration to a nolphthalein alkalinity and total alkalinity values.
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) i	s a calculated	d parameter. Nitrate and Nitrite (as N) = Nitrite (as	N) + Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy	yzed by Ion C	Chromatography with conductivity and/or UV detect	ion.
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B
5	01	edures adapted from APHA Method 5310 "Total Orgunation of the second state of the seco	ganic Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried ou	ut using proce	edures adapted from APHA Method 5310 "Total Org	ganic Carbon (TOC)".
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0
	0.	modified from EPA Method 445.0. Chlorophyll-a i acidification procedure. This method is not subject	is determined by a routine acetone extraction followed with to interferences from chlorophyll b.
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	yzed by Ion C	Chromatography with conductivity and/or UV detect	ion.
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
,	01	•	al Manual "Colour- Single Wavelength." Colour (True Colour) alysis of the filtrate using the platinum-cobalt colourimetric

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Colour measurements can Concurrent measurement c		dependent, and apply to the pH of the sample as receivis is recommended.	ved (at time of testing), without pH adjustment.
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out electrode.	using proced	lures adapted from APHA Method 2510 "Conductivity".	Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conc	luctivity where	e required during preparation of other tests - e.g. TDS,	metals, etc.
ECOLI-COLI-ENV-VA	Water	E.coli by Colilert	APHA METHOD 9223
determined simultaneously	. The sample s and then th	lures adapted from APHA Method 9223 "Enzyme Subst is mixed with a mixture hydrolyzable substrates and the e number of wells exhibiting a positive response are co	en sealed in a multi-well packet. The packet is
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyz	zed by Ion Ch	romatography with conductivity and/or UV detection.	
FE2-D-COL-VA	Water	Diss. Ferrous Iron in Water by Colour	APHA 3500-Fe B/James Ball et al (1999)
	Waters" pub	lures adapted from APHA 3500-Fe B and "A New Metho lished by James W. Ball et al (1999). The procedure inv imetric method.	
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
		s) is calculated from the sum of Calcium and Magnesiu centrations are preferentially used for the hardness calc	
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered with stannous chloride, and		eserved with hydrochloric acid, then undergo a cold-oxi CVAAS or CVAFS.	dation using bromine monochloride prior to reduction
HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a o	cold-oxidation	using bromine monochloride prior to reduction with sta	annous chloride, and analyzed by CVAAS or CVAFS.
HPC-PP-ENV-VA	Water	HPC by pour plate	APHA METHOD 9215
	s determined	lures adapted from APHA Method 9215 "Heterotropic P by culturing and colony counting using the pour plate n pic bacteria.	
IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E
		ce (as % difference) are calculated based on guidance f queous solutions are electrically neutral, the calculated	
Cation and Anion Sums are included where data is pres		q/L concentration of major cations and anions. Dissolv ance is calculated as:	ed species are used where available. Minor ions are
Ion Balance (%) = [Cation S	Sum-Anion S	um] / [Cation Sum+Anion Sum]	
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered	(0.45 um), pr	eserved with nitric acid, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulfu	ur): Sulfide ar	nd volatile sulfur species may not be recovered by this n	nethod.
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digeste	d with nitric a	nd hydrochloric acids, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulfu	ur): Sulfide ar	nd volatile sulfur species may not be recovered by this n	nethod.
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
		lures adapted from APHA Method 4500-P (J) "Persulph ational Environmental Methods Index - Nemi method 57	
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
			n J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyz	ed by Ion Ch	romatography with conductivity and/or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyz	ed by Ion Ch	romatography with conductivity and/or UV detection.	
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestion	of the sample solved solids	ures adapted from APHA Method 4500-P "Phosphorus" e. (i.e. seawaters, brackish waters) may produce a negati	
Arsenic (5+), at elevated lev	vels, is a posi	tive interference on colourimetric phosphate analysis.	
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
colourimetrically after persu	Iphate digest solved solids	ures adapted from APHA Method 4500-P "Phosphorus ion of a sample that has been lab or field filtered throug (i.e. seawaters, brackish waters) may produce a negati	gh a 0.45 micron membrane filter.
Arsenic (5+), at elevated lev	vels, is a posi	tive interference on colourimetric phosphate analysis.	
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out electrode	using proced	ures adapted from APHA Method 4500-H "pH Value". 1	Γhe pH is determined in the laboratory using a pH
It is recommended that this	analysis be o	conducted in the field.	
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a samp	le that has be solved solids	ures adapted from APHA Method 4500-P "Phosphorus een lab or field filtered through a 0.45 micron membrand (i.e. seawaters, brackish waters) may produce a negati	e filter.
Arsenic (5+), at elevated lev	vels, is a posi	tive interference on colourimetric phosphate analysis.	
SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
This analysis is carried out the molybdosilicate-heterop		ures adapted from APHA Method 4500-SiO2 E. "Silica urimetric method.	". Silicate (molybdate-reactive silica) is determined by
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyz	ed by Ion Ch	romatography with conductivity and/or UV detection.	
TCOLI-COLI-ENV-VA	Water	Total coliform by Colilert	APHA METHOD 9223
determined simultaneously.	The sample s and then the	ures adapted from APHA Method 9223 "Enzyme Subst is mixed with a mixture hydrolyzable substrates and the e number of wells exhibiting a positive response are co bable number).	en sealed in a multi-well packet. The packet is
TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)
		ures adapted from APHA 1030E "Checking Correctnes ulated from measured concentrations of anions and cat	
TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
		ures adapted from APHA Method 4500-Norg D. "Block tion followed by Flow-injection analysis with fluorescen	
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
Solids (TSS) are determine	d by filtering a gh dissolved s	ures adapted from APHA Method 2540 "Solids". Solids a sample through a glass fibre filter, TSS is determined solid content (i.e. seawaters, brackish waters) may pro- samples.	by drying the filter at 104 degrees celsius.
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out	using proced	ures adapted from APHA Method 2130 "Turbidity". Turb	bidity is determined by the nephelometric method.
* ALS test methods may inco	rporate modif	fications from specified reference methods to improve p	performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code Laboratory Location

VA

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

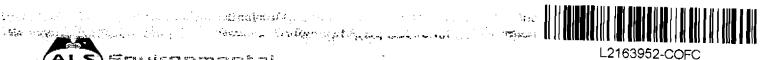
mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION. Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



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(ALS) Environmental

Canada Toll Free: 1 800 668 9879

Report To	www.alsglobal.com			Banart Format	- Distribution	· · · ·	T ···					(D)			Ti (*		A		<u>.</u>
	Tetratech	• <i></i>	Colort Depart /	Report Format			Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)												
	Tetratech					R Regular (Standard TAT if received by 3 pm - business days)													
Contact:	Danielle MacDonald						P Priority (2-4 bus, days if received by 3pm) 50% surcharge - contact ALS to confirm TAT												
Address:	14940-123 Ave NW	• •		rt - provide détails belo			E Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge												
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Contact:			Email 2	danielle.macdonal				-	Balance			& Hg	Jess		<u></u>				es es
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	Halfway River - Downstream (HD)			13-Set-18	08:36	Water	R	R	R	R	R	Ŕ	Ī	l	R		2	ĪĀ	10
	Middle Site C Reservoir (PR2)	_	·····	Y - Y	08:58	Water	R	R	R	R	R	R	IL.	0	R		l	R	1
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<u>. </u>	Upper Site C Reservoir (PR1)				10:11	Water	R	R	R	R	R	R	R	R	R	11	ß	R	9
	Duplicate # (DUP #)					Water	R	R	R	R	R	R	R	R	R		R	LR	9
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Drinking	Water (DW) Samples ⁺ (client use)	Sp	ecial Instructions / Spe	cify Criteria to add o	en report (client U	8e)	Froze	en			LECO	NDIT		-	CEIVE	_	use o es	niy) Nó	
Are samples tak	ten from a Regulated DW System? (es IV No		ia: BC MOE 2018 Appr ic life and Health Canad				Ice p	acks			No		Cust	ody s	eal int	act Y	es [] No	
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Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received:10-SEP-18Report Date:19-SEP-18 13:57 (MT)Version:FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2161498 Project P.O. #: NOT SUBMIT

Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW03058-02A.002

Brent Mack, B.Sc. Account Manager

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L2161498 CONTD.... PAGE 2 of 8 19-SEP-18 13:57 (MT) Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2161498-1 Water 10-SEP-18 16:25 MOVERLY RIVER - DOWNSTREAM (MD)	L2161498-2 Water 10-SEP-18 15:50 LOWER SITE C RESERVOIR (PR3)	L2161498-3 Water 10-SEP-18 15:00 PEACE AT PINE (PD1)	L2161498-4 Water 10-SEP-18 14:22 PINE RIVER (PINE)	
Grouping	Analyte		Water 10-SEP-18 16:25 DOWENLY RIVER- (MD) Water 10-SEP-18 15:50 Water 10-SEP-18 15:00 Water 10-SEP-18 15:00 Water 10-SEP-18 15:00 Water 10-SEP-18 15:00 24.9 5.8 6.1 7.4 268 214 217 348 139 108 114 185 8.30 8.21 8.22 8.41 88.6 9.4 12.8 289 160 120 123 216 126 7.25 9.18 235 136 97.9 98.5 163 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.0 <1.10 <1.0 <1.0			
WATER						
Physical Tests	Colour, True (CU)	24.9	5.8	6.1	7.4	
	Conductivity (uS/cm)	268	214	217	348	
	Hardness (as CaCO3) (mg/L)	139	108	114	185	
	рН (рН)	8.30	8.21	8.22	8.41	
	Total Suspended Solids (mg/L)	88.6	9.4	12.8	289	
	TDS (Calculated) (mg/L)	160	120	123	216	
	Turbidity (NTU)	126	7.25	9.18	235	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	136	97.9	98.5	163	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	7.8	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	136	97.9	98.5	171	
	Ammonia, Total (as N) (mg/L)	0.0073	0.0079	0.0050	0.0103	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	1.27	
	Fluoride (F) (mg/L)	0.088	0.047	0.047	0.097	
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0557	0.0467	0.0663	
	Nitrate (as N) (mg/L)	<0.0050	0.0541	0.0467	0.0663	
	Nitrite (as N) (mg/L)	<0.0010	0.0016	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)		0.099	0.118		
	Total Nitrogen (mg/L)		0.136	0.143	0.340	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0038	0.0013	0.0013	0.0026	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0058	<0.0020	<0.0020	0.0024	
	Phosphorus (P)-Total (mg/L)	0.138	0.0119	0.0167	0.314	
	Silicate (as SiO2) (mg/L)	3.38	4.35	4.16	3.09	
	Sulfate (SO4) (mg/L)	16.5	19.3	19.9	34.2	
	Anion Sum (meq/L)	3.06	2.37	2.39	4.17	
	Cation Sum (meq/L)	2.93	2.17	2.27	3.92	
	Cation - Anion Balance (%)	-2.1	-4.4	-2.5	-3.0	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	6.95	3.03	3.01	3.32	
	Total Organic Carbon (mg/L)	9.62	3.15	3.36	8.14	
Bacteriological Tests	E. coli (MPN/100mL)	55	6	3	59	
	HPC (CFU/1mL)	272	23	92	440	
	Coliform Bacteria - Total (MPN/100mL)	1410	147	179	1410	
Total Metals	Aluminum (Al)-Total (mg/L)	2.61	0.248	0.293	5.02	
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Total (mg/L)	0.00205	<0.00050	<0.00050	0.00406	

L2161498 CONTD.... PAGE 3 of 8 19-SEP-18 13:57 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2161498-1 Water 10-SEP-18 16:25 MOVERLY RIVER - DOWNSTREAM (MD)	L2161498-2 Water 10-SEP-18 15:50 LOWER SITE C RESERVOIR (PR3)	L2161498-3 Water 10-SEP-18 15:00 PEACE AT PINE (PD1)	L2161498-4 Water 10-SEP-18 14:22 PINE RIVER (PINE)	
Grouping	Analyte					
WATER						
Total Metals	Barium (Ba)-Total (mg/L)	0.202	0.045	0.050	0.261	
	Beryllium (Be)-Total (mg/L)	0.00015	<0.00010	<0.00010	0.00034	
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Total (mg/L)	0.000185	0.0000348	0.0000364	0.000376	
	Calcium (Ca)-Total (mg/L)	40.1	29.4	30.1	56.4	
	Chromium (Cr)-Total (mg/L)	0.0045	<0.0010	<0.0010	0.0086	
	Cobalt (Co)-Total (mg/L)	0.00218	<0.00030	<0.00030	0.00457	
	Copper (Cu)-Total (mg/L)	0.0065	<0.0010	0.0011	0.0118	
	Iron (Fe)-Total (mg/L)	4.70	0.291	0.390	10.6	
	Lead (Pb)-Total (mg/L)	0.00240	<0.00050	<0.00050	0.00563	
	Lithium (Li)-Total (mg/L)	0.0077	0.0023	0.0025	0.0161	
	Magnesium (Mg)-Total (mg/L)	11.4	7.45	7.58	15.8	
	Manganese (Mn)-Total (mg/L)	0.0866	0.00758	0.00942	0.149	
	Mercury (Hg)-Total (mg/L)	olimeter de la constante de la	<0.0000050	<0.0000050	olum <0.00010	
	Molybdenum (Mo)-Total (mg/L)	<0.0010	0.0011	0.0011	0.0013	
	Nickel (Ni)-Total (mg/L)	0.0092	0.0014	0.0016	0.0164	
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	0.31	
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	2.4	
	Selenium (Se)-Total (mg/L)	0.000355	0.000386	0.000375	0.000877	
	Silicon (Si)-Total (mg/L)	5.47	2.39	2.48	8.49	
	Silver (Ag)-Total (mg/L)	0.000045	<0.000020	<0.000020	0.000106	
	Sodium (Na)-Total (mg/L)	3.1	<2.0	<2.0	5.0	
	Strontium (Sr)-Total (mg/L)	0.106	0.122	0.124	0.194	
	Thallium (TI)-Total (mg/L)	0.000074	<0.000010	0.000011	0.000150	
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Total (mg/L)	0.025	<0.010	<0.010	0.031	
	Uranium (U)-Total (mg/L)	0.00063	0.00056	0.00055	0.00098	
	Vanadium (V)-Total (mg/L)	0.00967	0.00122	0.00141	0.0178	
	Zinc (Zn)-Total (mg/L)	0.0240	<0.0050	<0.0050	0.0557	
Dissolved Metals	Dissolved Fe2 Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0347	0.0748	0.0130	0.0307	
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Barium (Ba)-Dissolved (mg/L)	0.134	0.043	0.042	0.100	

L2161498 CONTD.... PAGE 4 of 8 19-SEP-18 13:57 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2161498-1 Water 10-SEP-18 16:25 MOVERLY RIVER - DOWNSTREAM (MD)	L2161498-2 Water 10-SEP-18 15:50 LOWER SITE C RESERVOIR (PR3)	L2161498-3 Water 10-SEP-18 15:00 PEACE AT PINE (PD1)	L2161498-4 Water 10-SEP-18 14:22 PINE RIVER (PINE)
Grouping	Analyte				
WATER					
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	0.0000135	0.0000145	0.0000107	0.0000103
	Calcium (Ca)-Dissolved (mg/L)	37.7	30.3	31.5	49.5
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Dissolved (mg/L)	0.0017	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Dissolved (mg/L)	0.046	0.044	<0.030	<0.030
	Ferrous Iron, Dissolved (mg/L)	0.022	<0.020	<0.020	<0.020
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	0.0045	0.0022	0.0023	0.0091
	Magnesium (Mg)-Dissolved (mg/L)	10.9	7.81	8.46	15.0
	Manganese (Mn)-Dissolved (mg/L)	0.0175	0.00372	0.00290	0.00639
	Mercury (Hg)-Dissolved (mg/L)	<0.000050	0.0000051	<0.0000050	<0.000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	0.0011	0.0011	0.0011
	Nickel (Ni)-Dissolved (mg/L)	0.0028	0.0011	0.0011	0.0018
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Dissolved (mg/L)	0.000173	0.000348	0.000315	0.000532
	Silicon (Si)-Dissolved (mg/L)	1.61	2.06	1.93	1.40
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Dissolved (mg/L)	3.4	<2.0	<2.0	5.1
	Strontium (Sr)-Dissolved (mg/L)	0.106	0.132	0.130	0.186
	Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00039	0.00048	0.00048	0.00054
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050

QC Samples with Qualifiers & Comments:

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Matrix Spike Matrix Spike Strontum (Gr-)Disaclved MS-B L2161498-1, 2, 3, 4 Matrix Spike Strontum (Gr-)Disaclved MS-B L2161498-1, 2, 3, 4 Matrix Spike Calcium (Ca)-Total MS-B L2161498-1, 2, 3, 4 Matrix Spike Calcium (Ca)-Total MS-B L2161498-1, 2, 3, 4 Matrix Spike Strontum (Gy)-Total MS-B L2161498-1, 2, 3, 4 Matrix Spike Strontum (Gy)-Total MS-B L2161498-1, 2, 3, 4 Matrix Spike Strontum (Gy)-Total MS-B L2161498-1, 2, 3, 4 Matrix Spike Narate (as N) MS-B L2161498-1, 2, 3, 4 Matrix Spike Narate (as N) MS-B L2161498-1, 2, 3, 4 Matrix Spike Narate (as N) MS-B L2161498-1, 2, 3, 4 Matrix Spike Narate (as N) MS-B L2161498-1, 2, 3, 4 Matrix Spike Narate (as N) MS-B L2161498-1, 2, 3, 4 Matrix Spike Represeurce Narate (as N) MS-B Matrix Spike Represeurce Represeurce Narate (as N) MS-B <td>QC Type Desc</td> <td>cription</td> <td></td> <td>Parameter</td> <td>Qualifier</td> <td>Applies to Sample Number(s)</td>	QC Type Desc	cription		Parameter	Qualifier	Applies to Sample Number(s)	
Matrix Spike Sincitum (Sh)-Disolwid MS-B L2161498-1, -2, -3, -4 Matrix Spike Calcium (Ca)-Total MS-B L2161498-1, -2, -3, -4 Matrix Spike Magnesium (Mg)-Total MS-B L2161498-1, -2, -3, -4 Matrix Spike Sodium (Mg)-Total MS-B L2161498-1, -2, -3, -4 Matrix Spike Sodium (Mg)-Total MS-B L2161498-1, -2, -3, -4 Matrix Spike Sodium (Mg)-Total MS-B L2161498-1, -2, -3, -4 Matrix Spike Storutum (S)-Total MS-B L2161498-1, -2, -3, -4 Matrix Spike Storutum (S)-Total MS-B L2161498-1, -2, -3, -4 Matrix Spike Storutum (S)-Total MS-B L2161498-1, -2, -3, -4 Matrix Spike Storutum (S)-Total MS-B L2161498-1, -2, -3, -4 Matrix Spike recovery could not be asomple matrix effects (e.g. chemical interference, colour, turbidity). MS-B L2161498-1, -2, -3, -4 Mitrix Spike recovery could not be accurately calculated due to high analyte background in sample. RRV Reported Recut Verified Sy Repeat Analysis East Model Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. RRV MS and Spike recoverited actualing	Matrix Spike			Calcium (Ca)-Dissolved	MS-B	L2161498-1, -2, -3, -4	
Marris Spike Barring Ga)_Total MS-B L2161498-1, -2, -3, -4 Marris Spike Sodium (Na)_Total MS-B L2161498-1, -2, -3, -4 Marris Spike Sodium (Na)_Total MS-B L2161498-1, -2, -3, -4 Marris Spike Strontim (G)_Total MS-B L2161498-1, -2, -3, -4 Marris Spike Ntrate (as N) MS-B L2161498-1, -2, -3, -4 Qualifier Description MS-B L2161498-1, -2, -3, -4 Qualifier Description MS-B L2161498-1, -2, -3, -4 Qualifier Description Marris Spike recovery could not be accurately calculated due to high analyte background in sample. MK-TR TR-V Marris Spike recovery could not be accurately calculated due to high analyte background in sample. MK-TR TR-V MK-TR TR-V Marris Spike recovery could not be accurately calculated due to high analyte background in sample. MC-TR TR T	Matrix Spike			Magnesium (Mg)-Dissolved	MS-B	L2161498-1, -2, -3, -4	
Matrix Spike Calcium (Ca)-Total MS-B L2161438-1, -2, -3, -4 Matrix Spike Sodium (Na)-Total MS-B L2161438-1, -2, -3, -4 Matrix Spike Stornium (Na)-Total MS-B L2161438-1, -2, -3, -4 Matrix Spike Nitrate (as N) MS-B L2161438-1, -2, -3, -4 Gualifier for Individual Parameters Listed: E Calcium (Ca)-Total MS-B L2161438-1, -2, -3, -4 Gualifier for Individual Parameters Listed: E Calcium (Ca)-Total MS-B L2161438-1, -2, -3, -4 Gualifier for Individual Parameters Listed: E E Calcium (Ca)-Total MS-B L2161438-1, -2, -3, -4 Gualifier for Individual Parameters Listed: E E Calcium (Ca)-Total MS-B L2161438-1, -2, -3, -4 Gualifier for Individual Parameters Listed: E E Calcium (Ca)-Total MS-B L2161438-1, -2, -3, -4 Gualifier for Individual Parameters Listed: E E Calcium (Ca)-Total MS-B L2161438-1, -2, -3, -4 Gualifier for Individual Parameters Listed: Matrix Spike recovery could not be accurately concluduated tore theackinty is analysis is carined out using procedures a	Matrix Spike			Strontium (Sr)-Dissolved	MS-B	L2161498-1, -2, -3, -4	
Matrix Spike Magnesium (Mg)-Total MS-B L2161438-1, -2, -3, -4 Matrix Spike Storotium (Na)-Total MS-B L2161438-1, -2, -3, -4 Matrix Spike Nitrate (as N) MS-B L2161438-1, -2, -3, -4 Qualifier Description Earlier Qualifier Description Earlier DLM Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity). MS-B Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. RFV Reported Result Varified By Ropeat Analysis Start Method Reference: Latity Spaces by Titration Method Reference'' LKTRFV X Water Matrix Spike in third (as N) a calculated from APHA Method 2320 'Alkalinity to tal alkalinity is determined by potentiomatric titration to pH 4.5 endpoint. Bicatronate, carbonate and hydroxide alkalinity are calculated from phenophythaleni alkalinity and total alkalinit	Matrix Spike			Barium (Ba)-Total	MS-B	L2161498-1, -2, -3, -4	
Matrix Spike Solution (Na)-Total MS-B L2161438-1, -2, -3, -4 Matrix Spike Nitrate (a N) MS-B L2161438-1, -2, -3, -4 Outalitiers for Individual Parameters Listed: L2161438-1, -2, -3, -4 Outalitiers for Individual Parameters Listed: Data Individual Parameters Listed: Data Individual Parameters Listed: Data Individual Parameters Parameters Listed: East Eddeed Matrix Test analysis Reported Result Verified Strates In Natrix Individual Parameters Natrix Strates Individual Parameters Natrix Strates Individual Parameters Natrix Individual Paramet	Matrix Spike			Calcium (Ca)-Total	MS-B	L2161498-1, -2, -3, -4	
Matrix Spike Strontium (Sr)-Total Matrix 4 (as N) MS-B MS-B MS-B MS-B MS-B MS-B MS-B MS-B	Matrix Spike			Magnesium (Mg)-Total	MS-B	L2161498-1, -2, -3, -4	
Matrix Spike Nitrate (as N) MS-B L2161498-1, -2, -3, -4 Qualifier Description	Matrix Spike			Sodium (Na)-Total	MS-B	L2161498-1, -2, -3, -4	
Qualifier for Individual Parameters Listed: Qualifier Description DLM Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity). MS-B Matrix Spike recovery could not be accurately calculated due to high analyte background in sample. RRV Reported Result Verified By Repeat Analysis Est Method References: LLS Test Code Matrix Test Description Method References: Method Reference** LLKTIR-VA Water Nins analysis is carried out using procedures adapted from APHA Method 2320 "Alkalnity". Total atalkalinity is determined by potentiometric titration to pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalnity are calculated from phenotphthalein alkalnity and total alkalinity aruse. NINOS-N+-CALC-VA Water Bromide in Water by IC (Low Level) EPA 300.0 Nirrate and Nirtite (as N) + Sitratia (as N). EPA 300.0 Nirrate and Nirtite (as N) + Nirrate (as N). Nartae and Nirtite (as Companic Carbon by combustion APHA 5310B This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis. ARBONS-TOC-VA Water Chiorde in Water by IC EPA 300	Matrix Spike			Strontium (Sr)-Total	MS-B	L2161498-1, -2, -3, -4	
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<th number="" of="" service="" td="" the="" the<=""><td>MS-B</td><td>Matrix Spi</td><td>ike recovery</td><td>could not be accurately calculated due</td><td>to high analyte</td><td>background in sample.</td></th>	<td>MS-B</td> <td>Matrix Spi</td> <td>ike recovery</td> <td>could not be accurately calculated due</td> <td>to high analyte</td> <td>background in sample.</td>	MS-B	Matrix Spi	ike recovery	could not be accurately calculated due	to high analyte	background in sample.
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Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. ARBONS-DOC-VA Water Dissolved organic carbon by combustion APHA 5310B This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis. ARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC) This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". LI-CN-VA Water Chloride in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. OLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength. This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity. Colour measurement of sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colour/interic method. Colour measurement of sample pH is recommended. C-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conducc. This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity erequired during preparation of other tests - e.g. TDS, metals, etc. COLI-COLI-ENV-VA Water Conductivity Screen (Internal Use Only) APHA 2510 Qualitative analysis of a ortal out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then hen exaled is an util: well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table. IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by	Nitrate and Ni	itrite (as N) is	a calculated	parameter. Nitrate and Nitrite (as N) =	= Nitrite (as N) +	Nitrate (as N).	
ARBONS-DOC-VA Water Dissolved organic carbon by combustion APHA 5310B This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis. ARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC) This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Image: Carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC) This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Image: Carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC) OLOUR-TRUE-VA Water Chloride in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by lon Chromatography with conductivity and/or UV detection. BCMOE Colour Single Wavelength This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour frue colour metacrement of sample pH is recommended. Concurrent measurement of sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour (True Colour (True Colour (True Colour) is determined by filtering a sample through a 0.45 micron method for the sample as received (at time of testing), without pH adjustment. Conourent measurement	R-L-IC-N-VA		Water	Bromide in Water by IC (Low Level)		EPA 300.1 (mod)	
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis. CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC) This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". EPA 300.1 (mod) Inorganic anions are analyzed by lon Chromatography with conductivity and/or UV detection. EPA 300.1 (mod) COLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour-Single Wavelength." Colour (True Colour fire determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended. EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc. This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode. EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510 Qualitati	Inorganic anic	ons are analyz	zed by Ion C	hromatography with conductivity and/o	or UV detection.		
determined by filtering the sample through a 0.45 micron membrane filter prior to analysis. ARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC) This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". ELIC-N-VA Water Chloride in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. EVOLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended. C-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc. This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode. C-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510 Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc. COLI-COLI-ENV-VA Water E.coli by Coliert APHA METHOD 9223 This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table. -IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	ARBONS-DO	C-VA	Water	Dissolved organic carbon by combu	stion	APHA 5310B	
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Inorganic anions are analyzed by lon Chromatography with conductivity and/or UV detection. SOLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength This analysis is carried out using procedures adapted from British Collumbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended. C:PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc. This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode. C-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510 Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc. Coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrate Soliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.	This analysis	is carried out	using proce	dures adapted from APHA Method 531	10 "Total Organic	c Carbon (TOC)".	
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. SOLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength This analysis is carried out using procedures adapted from British Collumbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended. C-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc. This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode. Conductivity Screen (Internal Use Only) APHA 2510 Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc. COLI-COLI-ENV-VA Water E.coli by Colilert APHA METHOD 9223 This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a proba	L-IC-N-VA		Water	Chloride in Water by IC		EPA 300.1 (mod)	
This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour, is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended. C-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc. This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode. C-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510 Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc. COLI-COLI-ENV-VA Water E.coli by Colilert APHA METHOD 9223 This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table. -IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity a	Inorganic anic	ons are analyz	zed by Ion C	,	or UV detection.		
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This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table. -IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	Qualitative an	alysis of cond	ductivity whe	re required during preparation of other	tests - e.g. TDS	, metals, etc.	
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Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.						EPA 300.1 (mod)	
E2-D-COL-VA Water Diss. Ferrous Iron in Water by Colour APHA 3500-Fe B/James Ball et al (1999)	-	ons are analyz		•	or UV detection.		
	-		•			APHA 3500-Fe B/James Ball et al (1999)	

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Concentration in Acid Mine Waters" published by James W. Ball et al (1999). The procedure involves preliminary sample filtration, and ferrous iron is determined using the "FerroZine" colourimetric method. APHA 2340B HARDNESS-CALC-VA Water Hardness Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

This analysis is carried out using procedures adapted from APHA 3500-Fe B and "A New Method for the Direct Determination of Dissolved Iron

HG-D-CVAA-VA Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod) Water Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HPC-PP-ENV-VA Water HPC by pour plate

This analysis is carried out using procedures adapted from APHA Method 9215 "Heterotropic Plate Count". Heterotropic plate count (standard plate count or total plate count) is determined by culturing and colony counting using the pour plate method with a 48 hour incubation period. The test measures colonies formed by heterotropic bacteria. APHA 1030E

APHA METHOD 9215

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Water Ion Balance Calculation **IONBALANCE-VA**

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor jons are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

14/-----

MET-D-CCMS-VA Dissolved Metals in Water by CRC ICPMS Water APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod) Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

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Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
		dures adapted from APHA Method 4500-P (J) "Persulpl ational Environmental Methods Index - Nemi method 57	
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
			m J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society e levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy:	zed by Ion Cl	hromatography with conductivity and/or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		hromatography with conductivity and/or UV detection.	
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestion	of the samples of the	dures adapted from APHA Method 4500-P "Phosphorus le. s (i.e. seawaters, brackish waters) may produce a negat	
Arsenic (5+), at elevated le	evels, is a pos	sitive interference on colourimetric phosphate analysis.	
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
2	0.	dures adapted from APHA Method 4500-P "Phosphorus stion of a sample that has been lab or field filtered throu	•

Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are

available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA APHA 4500-H pH Value Water pH by Meter (Automated) This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field. PO4-DO-COL-VA Water Diss. Orthophosphate in Water by Colour APHA 4500-P Phosphorus This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples. Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis. SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E. This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. **TCOLI-COLI-ENV-VA** Total coliform by Colilert APHA METHOD 9223 Water This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test", E, coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is guantified by a statistical estimation of bacteria density (most probable number). **TDS-CALC-VA** Water TDS (Calculated) APHA 1030E (20TH EDITION) This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses". The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample. **TKN-F-VA** Water TKN in Water by Fluorescence APHA 4500-NORG D. This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC TSS-VA This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples. **TURBIDITY-VA** Water Turbidity by Meter APHA 2130 Turbidity This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method. ** ALS test methods may incorporate modifications from specified reference methods to improve performance. The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below: Laboratory Definition Code Laboratory Location VA ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

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GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



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S) Environmental Canada Toll Free: 1 800 668 9878



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1. If any water samples are taken from a Regulated Drinking Water (DW). System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. ATTN: Danielle MacDonald 14940 - 123 Avenue, NW Edmonton AB T5V 1B4 Date Received:13-SEP-18Report Date:27-SEP-18 17:36 (MT)Version:FINAL

Client Phone: 780-886-3055

Certificate of Analysis

Lab Work Order #: L2163509 Project P.O. #: NOT SUBMIT

Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED VENW003060-02-002

Brent Mack, B.Sc. Account Manager

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L2163509 CONTD.... PAGE 2 of 6 27-SEP-18 17:36 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2163509-1 Water 12-SEP-18 11:07 PEACE AT BEATTON (PD2)	L2163509-2 Water 12-SEP-18 11:33 BEATTON RIVER (BEATTON)	L2163509-3 Water 12-SEP-18 12:05 PEACE AT KISKATINAW (PD3)	L2163509-4 Water 12-SEP-18 12:21 KISKATINAW RIVER (KR)	L2163509-5 Water 12-SEP-18 13:14 PEACE AT POUCE COUPE (PD4)
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	7.1	106	9.2	13.8	<5.0
	Conductivity (uS/cm)	199	374	214	504	215
	рН (рН)	8.22	8.34	8.27	8.57	8.26
	Total Suspended Solids (mg/L)	21.4	35.8	35.8	347	55.4
	Total Dissolved Solids (mg/L)	128	315	140	381	138
	Turbidity (NTU)	13.3	72.6	23.3	280	27.8
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	93.1	127	98.1	227	99.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	3.8	<1.0	20.4	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	93.1	131	98.1	247	99.0
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0310	<0.0050	0.0300	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	3.04	<0.50	1.75	<0.50
	Fluoride (F) (mg/L)	0.044	0.131	0.048	0.107	0.046
	Nitrate and Nitrite (as N) (mg/L)	0.0570	0.0961	0.0581	0.118	0.0560
	Nitrate (as N) (mg/L)	0.0570	0.0922	0.0581	0.115	0.0560
	Nitrite (as N) (mg/L)	<0.0010	0.0039	<0.0010	0.0024	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.128	0.704	0.152	0.962	0.173
	Total Nitrogen (mg/L)	0.180	0.746	0.173	0.541	0.177
	Orthophosphate-Dissolved (as P) (mg/L)	0.0020	0.0071	0.0016	0.0039	0.0020
	Phosphorus (P)-Total Dissolved (mg/L)	0.0026	0.0167	0.0023	0.0061	0.0027
	Phosphorus (P)-Total (mg/L)	0.0215	0.0656	0.0392	0.182	0.0456
	Silicate (as SiO2) (mg/L)	4.28	4.21	4.09	4.86	4.35
	Sulfate (SO4) (mg/L)	15.8	64.2	17.1	47.1	17.1
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.80	19.5	2.87	7.84	3.21
	Total Organic Carbon (mg/L)	3.01	21.4	3.61	12.3	4.28

L2163509 CONTD.... PAGE 3 of 6 27-SEP-18 17:36 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2163509-6 Water 12-SEP-18 14:45 POUCE COUPE (POUCE)	L2163509-7 Water 12-SEP-18 16:15 PEACE AT MANY ISLANDS (PD5)		
Grouping	Analyte				
WATER					
Physical Tests	Colour, True (CU)	30.3	5.6		
-	Conductivity (uS/cm)	991	222		
	рН (рН)	8.50	8.28		
	Total Suspended Solids (mg/L)	27.8	42.6		
	Total Dissolved Solids (mg/L)	716	141		
	Turbidity (NTU)	47.3	36.7		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	195	104		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	15.6	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	211	104		
	Ammonia, Total (as N) (mg/L)	0.0371	0.0058		
	Bromide (Br) (mg/L)	old States = 0.25	<0.050		
	Chloride (Cl) (mg/L)	10.2	<0.50		
	Fluoride (F) (mg/L)	0.29	0.050		
	Nitrate and Nitrite (as N) (mg/L)	0.202	0.0572		
	Nitrate (as N) (mg/L)	0.192	0.0572		
	Nitrite (as N) (mg/L)	0.0105	<0.0010		
	Total Kjeldahl Nitrogen (mg/L)	0.838	0.181		
	Total Nitrogen (mg/L)	1.01	0.202		
	Orthophosphate-Dissolved (as P) (mg/L)	0.0020	0.0022		
	Phosphorus (P)-Total Dissolved (mg/L)	0.0066	0.0033		
	Phosphorus (P)-Total (mg/L)	0.0531	0.0449		
	Silicate (as SiO2) (mg/L)	1.18	4.02		
	Sulfate (SO4) (mg/L)	321	18.8		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L) Total Organic Carbon (mg/L)	15.6	3.12		
		17.2	3.93		

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)	
Method Blank	Phosphorus (P)-Total	В	L2163509-1, -2, -3, -4, -5, -6, -7	
Method Blank	Phosphorus (P)-Total Dissolved	В	L2163509-2	
Matrix Spike	Dissolved Organic Carbon	MS-B	L2163509-1, -2, -3, -4, -5, -6, -7	
Matrix Spike	Dissolved Organic Carbon	MS-B	L2163509-1, -2, -3, -4, -5, -6, -7	
Matrix Spike	Total Organic Carbon	MS-B	L2163509-1, -2, -3, -4, -5, -6, -7	

В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
		dures adapted from APHA Method 2320 "Alkalinity". To e and hydroxide alkalinity are calculated from phenolph	otal alkalinity is determined by potentiometric titration to a hthalein alkalinity and total alkalinity values.
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is	a calculated	parameter. Nitrate and Nitrite (as N) = Nitrite (as N) +	Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion C	hromatography with conductivity and/or UV detection.	
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B
		dures adapted from APHA Method 5310 "Total Organic Igh a 0.45 micron membrane filter prior to analysis.	c Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out	t using proce	dures adapted from APHA Method 5310 "Total Organic	c Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion C	hromatography with conductivity and/or UV detection.	
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
is determined by filtering a method.	sample throu	ugh a 0.45 micron membrane filter followed by analysis I dependent, and apply to the pH of the sample as rece	
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out electrode.	t using proce	dures adapted from APHA Method 2510 "Conductivity"	. Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of con-	ductivity whe	re required during preparation of other tests - e.g. TDS	, metals, etc.
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion C	hromatography with conductivity and/or UV detection.	
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
This analysis is carried out Nitrogen and Total Phosph	t using proceen norus" and N	dures adapted from APHA Method 4500-P (J) "Persulp ational Environmental Methods Index - Nemi method 5	hate Method for Simultaneous Determination of Total
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
			om J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society e levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analy	yzed by Ion (Chromatography with conductivity and/or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy	yzed by Ion (Chromatography with conductivity and/or UV detection.	
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
		edures adapted from APHA Method 4500-P "Phosphor	us". Total Phosphorus is determined colourimetrically
after persulphate digestion Samples with very high di available for these types o	ssolved solid	ple. Is (i.e. seawaters, brackish waters) may produce a neg	ative bias by this method. Alternate methods are
Arsenic (5+), at elevated I	evels, is a po	ositive interference on colourimetric phosphate analysis	S.
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
colourimetrically after pers	sulphate dige ssolved solic	edures adapted from APHA Method 4500-P "Phosphor estion of a sample that has been lab or field filtered thro ds (i.e. seawaters, brackish waters) may produce a neg	ough a 0.45 micron membrane filter.
Arsenic (5+), at elevated I	evels, is a po	ositive interference on colourimetric phosphate analysis	S.
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried ou electrode	It using proce	edures adapted from APHA Method 4500-H "pH Value'	". The pH is determined in the laboratory using a pH
It is recommended that th	is analysis b	e conducted in the field.	
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a sam	ple that has solved solic	edures adapted from APHA Method 4500-P "Phosphor been lab or field filtered through a 0.45 micron membra ds (i.e. seawaters, brackish waters) may produce a neg	ane filter.
Arsenic (5+), at elevated I	evels, is a po	ositive interference on colourimetric phosphate analysis	S.
SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
This analysis is carried ou the molybdosilicate-hetero			ica". Silicate (molybdate-reactive silica) is determined by
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	yzed by Ion (Chromatography with conductivity and/or UV detection.	
TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC
			ids are determined gravimetrically. Total Dissolved Solids evaporating the filtrate to dryness at 180 degrees celsius.
TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
This analysis is carried ou Nitrogen is determined us	it using proce	edures adapted from APHA Method 4500-Norg D. "Blo jestion followed by Flow-injection analysis with fluoresc	ck Digestion and Flow Injection Analysis". Total Kjeldahl ence detection.
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
Solids (TSS) are determin	ied by filterin high dissolve		5 , 1
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried ou	it using proce	edures adapted from APHA Method 2130 "Turbidity". T	urbidity is determined by the nephelometric method.
** ALS test methods may inc	corporate mo	difications from specified reference methods to improv	e performance.
The last two letters of the a	bove test co	de(s) indicate the laboratory that performed analytical a	analysis for that test. Refer to the list below:
Laboratory Definition Cod	le Labo	ratory Location	
VA	ALS E	ENVIRONMENTAL - VANCOUVER, BRITISH COLUME	BIA, CANADA
Chain of Custody Numbers	5:		

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. *mg/kg* - *milligrams per kilogram based on dry weight of sample.*

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Tetra Tech Canada Inc. **ATTN: Lucas Hennecker** 1000-885 Dunsmuir Street, 10th Floor Vancouver BC V6E 1N5

Date Received: 19-OCT-18 Report Date: 29-OCT-18 16:26 (MT) Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2184476 Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

NOT SUBMITTED VENW03060 TASK 002

Brent Mack, B.Sc. Account Manager

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L2184476 CONTD.... PAGE 2 of 12 29-OCT-18 16:26 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2184476-1 Water 19-OCT-18 09:30 WILLISTON SHALLOW (W1- SHALLOW)	L2184476-2 Water 19-OCT-18 09:45 WILLISTON DEEP (W1-DEEP)	L2184476-3 Water 19-OCT-18 12:45 DINOSAUR SHALLOW (D1- SHALLOW)	L2184476-4 Water 19-OCT-18 12:30 DINOSAUR DEEP (D1-DEEP)	L2184476-5 Water 19-OCT-18 12:45 DUPLICATE 2 (DUP 2)
Grouping	Analyte						
FILTER Plant Pigments	Chlorophyll a (ug/L)		1.60	1.50	1.24	1.81	1.48

L2184476 CONTD.... PAGE 3 of 12 29-OCT-18 16:26 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2184476-1 Water 19-OCT-18 09:30 WILLISTON SHALLOW (W1- SHALLOW)	L2184476-2 Water 19-OCT-18 09:45 WILLISTON DEEP (W1-DEEP)	L2184476-3 Water 19-OCT-18 12:45 DINOSAUR SHALLOW (D1- SHALLOW)	L2184476-4 Water 19-OCT-18 12:30 DINOSAUR DEEP (D1-DEEP)	L2184476-5 Water 19-OCT-18 12:45 DUPLICATE 2 (DUP 2)
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	6.7	5.8	5.7	6.2	6.7
	Conductivity (uS/cm)	184	186	185	186	187
	Hardness (as CaCO3) (mg/L)	90.1	89.6	86.7	91.4	91.0
	рН (рН)	8.11	8.09	8.09	8.11	8.10
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	TDS (Calculated) (mg/L)	98.4	97.9	96.7	98.3	97.0
	Turbidity (NTU)	0.36	0.38	0.57	0.64	0.51
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	82.7	82.4	81.3	81.8	80.2
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	82.7	82.4	81.3	81.8	80.2
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.038	0.038	0.038	0.038	0.038
	Nitrate and Nitrite (as N) (mg/L)	0.0582	0.0598	0.0583	0.0579	0.0596
	Nitrate (as N) (mg/L)	0.0582	0.0598	0.0583	0.0579	0.0596
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.101	0.089	0.080	0.066	0.086
	Total Nitrogen (mg/L)	0.134	0.142	0.129	0.136	0.130
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	0.0010	0.0011	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0036	0.0023	0.0032	0.0030	0.0030
	Phosphorus (P)-Total (mg/L)	0.0029	0.0030	0.0028	0.0038	0.0042
	Silicate (as SiO2) (mg/L)	4.53	4.31	4.46	4.25	4.46
	Sulfate (SO4) (mg/L)	13.9	13.9	13.8	13.8	13.8
	Anion Sum (meq/L)	1.95	1.94	1.92	1.93	1.90
	Cation Sum (meq/L)	1.80	1.79	1.73	1.83	1.82
	Cation - Anion Balance (%)	-3.9	-4.1	-5.1	-2.7	-2.1
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.60	2.38	2.44	2.60	2.50
	Total Organic Carbon (mg/L)	2.57	2.45	2.65	2.67	2.44
Total Metals	Aluminum (Al)-Total (mg/L)	0.0137	0.0137	0.0188	0.0237	0.0168
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Barium (Ba)-Total (mg/L)	0.030	0.030	0.031	0.031	0.031
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

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	Sample ID Description Sampled Date Sampled Time Client ID	L2184476-6 Water 19-OCT-18 15:05 PEACE CANYON (PC1)	L2184476-7 Water 19-OCT-18 15:56 UPPER SITE C RESERVOIR (PR1)		
Grouping	Analyte				
WATER					
Physical Tests	Colour, True (CU)	8.2	6.8		
	Conductivity (uS/cm)	187	185		
	Hardness (as CaCO3) (mg/L)	89.1	90.2		
	рН (рН)	8.12	8.10		
	Total Suspended Solids (mg/L)	<3.0	<3.0		
	TDS (Calculated) (mg/L)	98.5	97.8		
	Turbidity (NTU)	0.59	0.65		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	83.9	81.9		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	83.9	81.9		
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050		
	Bromide (Br) (mg/L)	<0.050	<0.050		
	Chloride (Cl) (mg/L)	<0.50	<0.50		
	Fluoride (F) (mg/L)	0.038	0.038		
	Nitrate and Nitrite (as N) (mg/L)	0.0576	0.0577		
	Nitrate (as N) (mg/L)	0.0576	0.0577		
	Nitrite (as N) (mg/L)	<0.0010	<0.0010		
	Total Kjeldahl Nitrogen (mg/L)	0.073	0.082		
	Total Nitrogen (mg/L)	0.135	0.137		
	Orthophosphate-Dissolved (as P) (mg/L)	0.0012	<0.0010		
	Phosphorus (P)-Total Dissolved (mg/L)	0.0030	0.0029		
	Phosphorus (P)-Total (mg/L)	0.0040	0.0040		
	Silicate (as SiO2) (mg/L)	4.24	4.41		
	Sulfate (SO4) (mg/L)	13.8	13.8		
	Anion Sum (meq/L)	1.97	1.93		
	Cation Sum (meq/L)	1.78	1.80		
	Cation - Anion Balance (%)	-5.0	-3.4		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.51	2.41		
	Total Organic Carbon (mg/L)	2.54	2.60		
Total Metals	Aluminum (Al)-Total (mg/L)	0.0196	0.0248		
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050		
	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050		
	Barium (Ba)-Total (mg/L)	0.031	0.031		
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20		

L2184476 CONTD.... PAGE 5 of 12 29-OCT-18 16:26 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2184476-1 Water 19-OCT-18 09:30 WILLISTON SHALLOW (W1- SHALLOW)	L2184476-2 Water 19-OCT-18 09:45 WILLISTON DEEP (W1-DEEP)	L2184476-3 Water 19-OCT-18 12:45 DINOSAUR SHALLOW (D1- SHALLOW)	L2184476-4 Water 19-OCT-18 12:30 DINOSAUR DEEP (D1-DEEP)	L2184476-5 Water 19-OCT-18 12:45 DUPLICATE 2 (DUP 2)
Grouping	Analyte					
WATER						
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.0000146	0.0000128	0.0000149	0.0000172	0.0000139
	Calcium (Ca)-Total (mg/L)	26.9	25.8	26.7	26.6	26.6
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Total (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Total (mg/L)	0.0010	0.0010	0.0011	0.0011	0.0011
	Magnesium (Mg)-Total (mg/L)	6.35	6.28	6.25	6.46	6.33
	Manganese (Mn)-Total (mg/L)	0.00109	0.00110	0.00132	0.00149	0.00132
	Mercury (Hg)-Total (ug/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	0.000224	0.000278	0.000298	0.000222	0.000270
	Silicon (Si)-Total (mg/L)	2.07	2.10	2.09	2.08	2.07
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Strontium (Sr)-Total (mg/L)	0.109	0.108	0.104	0.104	0.105
	Thallium (TI)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total (mg/L)	0.00045	0.00045	0.00043	0.00045	0.00045
	Vanadium (V)-Total (mg/L)	< 0.00050	< 0.00050	< 0.00050	<0.00050	< 0.00050
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050	< 0.0050	<0.0050	<0.0050
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (AI)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	< 0.00050
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Barium (Ba)-Dissolved (mg/L)	0.030	0.031	0.032	0.031	0.031
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.002	<0.00010	< 0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

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	Sample ID Description Sampled Date Sampled Time Client ID	L2184476-6 Water 19-OCT-18 15:05 PEACE CANYON (PC1)	L2184476-7 Water 19-OCT-18 15:56 UPPER SITE C RESERVOIR (PR1)		
Grouping	Analyte				
WATER					
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	0.0000144	0.0000165		
	Calcium (Ca)-Total (mg/L)	25.9	26.5		
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010		
	Cobalt (Co)-Total (mg/L)	<0.00030	<0.00030		
	Copper (Cu)-Total (mg/L)	<0.0010	<0.0010		
	Iron (Fe)-Total (mg/L)	<0.030	0.031		
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050		
	Lithium (Li)-Total (mg/L)	0.0011	0.0011		
	Magnesium (Mg)-Total (mg/L)	6.27	6.48		
	Manganese (Mn)-Total (mg/L)	0.00145	0.00154		
	Mercury (Hg)-Total (ug/L)	<0.00050	<0.00050		
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010		
	Nickel (Ni)-Total (mg/L)	<0.0010	<0.0010		
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30		
	Potassium (K)-Total (mg/L)	<2.0	<2.0		
	Selenium (Se)-Total (mg/L)	0.000268	0.000284		
	Silicon (Si)-Total (mg/L)	2.07	2.10		
	Silver (Ag)-Total (mg/L)	<0.000020	<0.00020		
	Sodium (Na)-Total (mg/L)	<2.0	<2.0		
	Strontium (Sr)-Total (mg/L)	0.105	0.105		
	Thallium (TI)-Total (mg/L)	<0.000010	<0.000010		
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050		
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010		
	Uranium (U)-Total (mg/L)	0.00045	0.00044		
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050		
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050		
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD		
	Dissolved Mercury Filtration Location	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	<0.0050	<0.0050		
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050		
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050		
	Barium (Ba)-Dissolved (mg/L)	0.031	0.032		
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010		
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20		
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10		

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	Sample ID Description Sampled Date Sampled Time Client ID	L2184476-1 Water 19-OCT-18 09:30 WILLISTON SHALLOW (W1- SHALLOW)	L2184476-2 Water 19-OCT-18 09:45 WILLISTON DEEP (W1-DEEP)	L2184476-3 Water 19-OCT-18 12:45 DINOSAUR SHALLOW (D1- SHALLOW)	L2184476-4 Water 19-OCT-18 12:30 DINOSAUR DEEP (D1-DEEP)	L2184476-5 Water 19-OCT-18 12:45 DUPLICATE 2 (DUP 2)
Grouping	Analyte					
WATER						
Dissolved Metals	Cadmium (Cd)-Dissolved (mg/L)	0.0000104	0.0000102	0.0000104	0.000086	0.0000087
	Calcium (Ca)-Dissolved (mg/L)	25.8	25.6	25.7	26.1	25.9
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	0.0017	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	0.0010	0.0010	0.0010	0.0010	0.0010
	Magnesium (Mg)-Dissolved (mg/L)	6.24	6.24	5.46	6.34	6.37
	Manganese (Mn)-Dissolved (mg/L)	0.00020	0.00022	0.00042	0.00111	0.00033
	Mercury (Hg)-Dissolved (ug/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0012
	Nickel (Ni)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	DTMF 0.0048	<0.0010
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Dissolved (mg/L)	0.000257	0.000259	0.000225	0.000292	0.000259
	Silicon (Si)-Dissolved (mg/L)	2.02	2.02	1.88	2.00	1.98
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Strontium (Sr)-Dissolved (mg/L)	0.104	0.103	0.102	0.104	0.104
	Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00042	0.00042	0.00047	0.00042	0.00042
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	0.000026	0.000023	0.000046	0.000028	0.000028
	Methylmercury (as MeHg)-Total (ug/L)	0.000024	<0.000020	<0.000020	<0.000020	<0.000020

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WATER 0.0000079 0.0000104 Dissolved Metals Cadmium (Cd)-Dissolved (mg/L) 25.2 25.7 Chromium (Cr)-Dissolved (mg/L) <0.0010 <0.0010 Cobalt (Co)-Dissolved (mg/L) <0.00030 <0.00030 Copper (Cu)-Dissolved (mg/L) <0.0010 <0.0010 Iron (Fe)-Dissolved (mg/L) <0.00050 <0.00050 Lead (Pb)-Dissolved (mg/L) <0.0010 0.0010 Magnesium (Mg)-Dissolved (mg/L) <0.00050 <0.00050 Lithium (Li)-Dissolved (mg/L) 0.0010 0.0010 Magnesium (Mg)-Dissolved (mg/L) <0.00050 <0.00050 Manganese (Mn)-Dissolved (mg/L) <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0010 <0.0010 Phosphorus (P)-Dissolved (mg/L) <0.0010 <0.0010 Phosphorus (P)-Dissolved (mg/L) <0.00020 <0.00020 Silicon (Si)-Dissolved (mg/L) <0.00020 <0.00020 Silitor (Si)-Dissolved (mg/L)		Sample ID Description Sampled Date Sampled Time Client ID	L2184476-6 Water 19-OCT-18 15:05 PEACE CANYON (PC1)	L2184476-7 Water 19-OCT-18 15:56 UPPER SITE C RESERVOIR (PR1)
Dissolved Metals Cadmium (Cd)-Dissolved (mg/L) 0.0000079 0.0000104 Calcium (Ca)-Dissolved (mg/L) 25.2 25.7 Chromium (Cr)-Dissolved (mg/L) <0.0010 <0.0010 Cobalt (Co)-Dissolved (mg/L) <0.00030 <0.00030 Copper (Cu)-Dissolved (mg/L) <0.0010 <0.0010 Iron (Fe)-Dissolved (mg/L) <0.030 <0.030 Lead (Pb)-Dissolved (mg/L) <0.0000 <0.00050 Lithium (Li)-Dissolved (mg/L) <0.00010 0.0010 Magnesium (Mg)-Dissolved (mg/L) <0.00031 0.00028 Mercury (Hg)-Dissolved (mg/L) <0.0010 <0.0100 Nickel (Ni)-Dissolved (mg/L) <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0010 <0.0010 Phosphorus (P)-Dissolved (mg/L) <0.00020 <0.00020 Selenium (Se)-Dissolved (mg/L) <0.00020 <0.00020 Silicon (Si)-Dissolved (mg/L) <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) <0.00020 <0.000020 Silicon (Si)-D	Grouping	Analyte		
Calcium (Ca)-Dissolved (mg/L) 25.2 25.7 Chromium (Cr)-Dissolved (mg/L) <0.0010 <0.0010 Cobalt (Co)-Dissolved (mg/L) <0.0030 <0.0030 Copper (Cu)-Dissolved (mg/L) <0.0010 <0.0010 Iron (Fe)-Dissolved (mg/L) <0.0030 <0.0030 Lead (Pb)-Dissolved (mg/L) <0.0010 <0.0010 Iron (Fe)-Dissolved (mg/L) <0.00050 <0.00050 Lithium (Li)-Dissolved (mg/L) <0.0010 0.0010 Magnesium (Mg)-Dissolved (mg/L) <0.00031 0.00028 Mercury (Hg)-Dissolved (mg/L) <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0010 <0.0010 Potassium (K)-Dissolved (mg/L) <0.00026 <0.00020 Selenium (Se)-Dissolved (mg/L) <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) <0.00020 <th>WATER</th> <th></th> <th></th> <th></th>	WATER			
Calcium (Ca)-Dissolved (mg/L) 25.2 25.7 Chromium (Cr)-Dissolved (mg/L) <0.0010	Dissolved Metals	Cadmium (Cd)-Dissolved (mg/L)	0.0000079	0.0000104
Chromium (Cr)-Dissolved (mg/L) <0.0010 <0.0010 Cobalt (Co)-Dissolved (mg/L) <0.00030		Calcium (Ca)-Dissolved (mg/L)		
Cobalt (Co)-Dissolved (mg/L) <0.00030		Chromium (Cr)-Dissolved (mg/L)		
Iron (Fe)-Dissolved (mg/L) c0.0010 c0.0010 Lead (Pb)-Dissolved (mg/L) <0.030		Cobalt (Co)-Dissolved (mg/L)	<0.00030	
Lead (Pb)-Dissolved (mg/L) <0.00050		Copper (Cu)-Dissolved (mg/L)		
Lithium (Li)-Dissolved (mg/L) 0.0010 0.0010 Magnesium (Mg)-Dissolved (mg/L) 6.33 6.32 Manganese (Mn)-Dissolved (mg/L) 0.00031 0.00028 Mercury (Hg)-Dissolved (mg/L) 0.0010 <0.0010		Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030
Magnesium (Mg)-Dissolved (mg/L) 6.33 6.32 Manganese (Mn)-Dissolved (mg/L) 0.00031 0.00028 Mercury (Hg)-Dissolved (ug/L) 0.00050 <0.00050		Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050
Manganese (Mn)-Dissolved (mg/L) 0.00031 0.00028 Mercury (Hg)-Dissolved (ug/L) <0.00050		Lithium (Li)-Dissolved (mg/L)	0.0010	0.0010
Mercury (Hg)-Dissolved (ug/L) <0.00050 <0.00050 Mercury (Hg)-Dissolved (ug/L) <0.00050		Magnesium (Mg)-Dissolved (mg/L)	6.33	6.32
Molybdenum (Mo)-Dissolved (mg/L) <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0010		Manganese (Mn)-Dissolved (mg/L)	0.00031	0.00028
Nickel (Ni)-Dissolved (mg/L) <0.0010 <0.0010 Phosphorus (P)-Dissolved (mg/L) <0.30		Mercury (Hg)-Dissolved (ug/L)	<0.00050	<0.00050
Phosphorus (P)-Dissolved (mg/L) <0.30 <0.30 Potassium (K)-Dissolved (mg/L) <2.0		Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010
Potassium (K)-Dissolved (mg/L) <2.0 <2.0 Selenium (Se)-Dissolved (mg/L) 0.000268 0.000306 Silicon (Si)-Dissolved (mg/L) 2.01 1.97 Silver (Ag)-Dissolved (mg/L) <0.000200		Nickel (Ni)-Dissolved (mg/L)	<0.0010	<0.0010
Selenium (Se)-Dissolved (mg/L) 0.000268 0.000306 Silicon (Si)-Dissolved (mg/L) 2.01 1.97 Silver (Ag)-Dissolved (mg/L) <0.000200		Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30
Silicon (Si)-Dissolved (mg/L) 2.01 1.97 Silver (Ag)-Dissolved (mg/L) <0.000020		Potassium (K)-Dissolved (mg/L)	<2.0	<2.0
Silver (Ag)-Dissolved (mg/L) <0.000020 <0.000020 Sodium (Na)-Dissolved (mg/L) <2.0		Selenium (Se)-Dissolved (mg/L)	0.000268	0.000306
Sodium (Na)-Dissolved (mg/L) <2.0		Silicon (Si)-Dissolved (mg/L)	2.01	1.97
Strontium (Sr)-Dissolved (mg/L) 0.102 0.103 Thallium (TI)-Dissolved (mg/L) <0.00020		Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020
Thallium (TI)-Dissolved (mg/L) <0.102 0.102 Tin (Sn)-Dissolved (mg/L) <0.00020		Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0
Tin (Sn)-Dissolved (mg/L) <0.00050 <0.00050 Titanium (Ti)-Dissolved (mg/L) <0.010		Strontium (Sr)-Dissolved (mg/L)	0.102	0.103
Titanium (Ti)-Dissolved (mg/L) <0.010		Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020
Uranium (U)-Dissolved (mg/L) 0.00041 0.00040 Vanadium (V)-Dissolved (mg/L) <0.00050		Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050
Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 Zinc (Zn)-Dissolved (mg/L) <0.0050		Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010
Zinc (Zn)-Dissolved (mg/L) <0.0050 <0.0050 Speciated Metals Methylmercury (as MeHg)-Dissolved (ug/L) 0.000029 0.000033			0.00041	0.00040
Speciated Metals Methylmercury (as MeHg)-Dissolved (ug/L) 0.000029 0.000033		Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050
Mathula annu (ag Malla) Tatal (ug/l.)		Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050
Methylmercury (as MeHg)-Total (ug/L) 0.000088 <0.000020	Speciated Metals		0.000029	0.000033
		Methylmercury (as MeHg)-Total (ug/L)	0.000088	<0.000020

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Organic Carbon	MS-B	L2184476-4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2184476-1, -2, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2184476-3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2184476-1, -2, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2184476-3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2184476-1, -2, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2184476-3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2184476-1, -2, -4, -5, -6, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2184476-3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2184476-1, -2, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2184476-3
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2184476-3
Matrix Spike	Barium (Ba)-Total	MS-B	L2184476-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Total	MS-B	L2184476-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2184476-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Manganese (Mn)-Total	MS-B	L2184476-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Potassium (K)-Total	MS-B	L2184476-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sodium (Na)-Total	MS-B	L2184476-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Total	MS-B	L2184476-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Total Nitrogen	MS-B	L2184476-1, -2, -3, -4, -5, -6, -7
	Phosphorus (P)-Total	MS-B	L2184476-1, -2, -3, -4, -5, -6, -7

 Qualifier
 Description

 DTMF
 Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.

 MS-B
 Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
		edures adapted from APHA Method 2320 "Alkalinity ate and hydroxide alkalinity are calculated from phe	y". Total alkalinity is determined by potentiometric titration to a nolphthalein alkalinity and total alkalinity values.
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is	s a calculate	d parameter. Nitrate and Nitrite (as N) = Nitrite (as	N) + Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy	yzed by Ion (Chromatography with conductivity and/or UV detect	ion.
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B
		edures adapted from APHA Method 5310 "Total Or ugh a 0.45 micron membrane filter prior to analysis	ganic Carbon (TOC)". Dissolved carbon (DOC) fractions are s.
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried ou	it using proce	edures adapted from APHA Method 5310 "Total Or	ganic Carbon (TOC)".
CHLOROA-F-VA	Filter	Chlorophyll a by Fluorometer (Filter)	EPA 445.0
		s modified from EPA Method 445.0. Chlorophyll-a acidification procedure. This method is not subject	is determined by a routine acetone extraction followed with to interferences from chlorophyll b.
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	yzed by Ion (Chromatography with conductivity and/or UV detect	ion.
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
	01		tal Manual "Colour- Single Wavelength." Colour (True Colour) alysis of the filtrate using the platinum-cobalt colourimetric

Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment.

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Concurrent measurement of sample pH is recommended.

Concurrent measurement of	or sample pri	is recommended.	
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out electrode.	using proced	lures adapted from APHA Method 2510 "Conductivity".	Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of cond	ductivity wher	e required during preparation of other tests - e.g. TDS,	metals, etc.
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyz	zed by Ion Ch	nromatography with conductivity and/or UV detection.	
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
		s) is calculated from the sum of Calcium and Magnesic centrations are preferentially used for the hardness calc	
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra)	APHA 3030 B / EPA 1631 REV. E
American Public Health As (EPA). The procedure may	sociation, and y involve preli r to a purge a	minary sample treatment by filtration (APHA 3030B) ar and trap concentration step and final reduction of the sa	ation of Water and Wastewater" published by the by the United States Environmental Protection Agency and involves a cold-oxidation of the acidified sample using ample with stannous chloride. Instrumental analysis is
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra)	EPA 1631 REV. E
procedure involves a cold-	oxidation of th	lures adapted from Method 1631 Rev. E. by the United the acidified sample using bromine monochloride prior to hloride. Instrumental analysis is by cold vapour atomic	a purge and trap concentration step and final
IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E
		ce (as % difference) are calculated based on guidance queous solutions are electrically neutral, the calculated	
included where data is pres	sent. Ion Bala		ved species are used where available. Minor ions are
		um] / [Cation Sum+Anion Sum]	
MEHG-D-GCAF-VA	Water	Diss. Methylmercury in Water by GCAFS	EPA 1630
interferences. The distillate	is analyzed l	US EPA. Samples are distilled under an inert gas flow by aqueous phase ethylation, purge and trap, desorptic I by cold vapour atomic flourescence spectroscopy. Re	n and GC separation. The separated species are then
MEHG-T-GCAF-VA	Water	Total Methylmercury in Water by GCAFS	EPA 1630
interferences. The distillate	is analyzed I	US EPA. Samples are distilled under an inert gas flow by aqueous phase ethylation, purge and trap, desorptic by cold vapour atomic flourescence spectroscopy. Re	n and GC separation. The separated species are then
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered	(0.45 um), pr	reserved with nitric acid, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulf	ur): Sulfide ar	nd volatile sulfur species may not be recovered by this	method.
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		and hydrochloric acids, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulf	ur): Sulfide ar	nd volatile sulfur species may not be recovered by this	method.
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
This analysis is carried out Nitrogen and Total Phosph	using proced orus" and Na	lures adapted from APHA Method 4500-P (J) "Persulph ational Environmental Methods Index - Nemi method 57	nate Method for Simultaneous Determination of Total 735.
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out	, on sulfuric a	icid preserved samples, using procedures modified fror	n J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are anal	yzed by Ion (Chromatography with conductivity and/or UV dete	ection.
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are anal	yzed by Ion (Chromatography with conductivity and/or UV dete	ection.
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestio	n of the sam issolved solid	ple.	osphorus". Total Phosphorus is determined colourimetrically a negative bias by this method. Alternate methods are
		acitiva interference on colourimetric phoephote o	nalvaia
P-TD-COL-VA	Water	ositive interference on colourimetric phosphate a Total Dissolved P in Water by Colour	-
		,	APHA 4500-P Phosphorous osphorus". Total Dissolved Phosphorus is determined
colourimetrically after per	sulphate dige issolved solid	estion of a sample that has been lab or field filter	
Arsenic (5+), at elevated	levels, is a p	ositive interference on colourimetric phosphate a	nalysis.
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried ou electrode	ut using proc	edures adapted from APHA Method 4500-H "pH	Value". The pH is determined in the laboratory using a pH
It is recommended that th	nis analysis b	e conducted in the field.	
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a san	nple that has issolved solic	been lab or field filtered through a 0.45 micron n	osphorus". Dissolved Orthophosphate is determined nembrane filter. a negative bias by this method. Alternate methods are
Arsenic (5+), at elevated	levels, is a p	ositive interference on colourimetric phosphate a	nalysis.
SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
		edures adapted from APHA Method 4500-SiO2 E lourimetric method. Arsenic (5+) above 100 mg/	E. "Silica". Silicate (molybdate-reactive silica) is determined by L is a negative interference on this test.
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are anal	yzed by Ion (Chromatography with conductivity and/or UV dete	ection.
TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)
		edures adapted from APHA 1030E "Checking Co Iculated from measured concentrations of anion	
TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
		edures adapted from APHA Method 4500-Norg I lestion followed by Flow-injection analysis with flu	D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl uorescence detection.
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
Solids (TSS) are determir	ned by filterin high dissolve	g a sample through a glass fibre filter, TSS is de d solid content (i.e. seawaters, brackish waters)	s". Solids are determined gravimetrically. Total Suspended etermined by drying the filter at 104 degrees celsius. may produce a positive bias by this method. Alternate analysis
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried ou	ut using proc	edures adapted from APHA Method 2130 "Turbio	dity". Turbidity is determined by the nephelometric method.
** ALS test methods may inc	corporate mo	difications from specified reference methods to i	improve performance.
The last two letters of the a	above test co	de(s) indicate the laboratory that performed anal	lytical analysis for that test. Refer to the list below:
Laboratory Definition Co	de Labo	ratory Location	
VA	ALS E	ENVIRONMENTAL - VANCOUVER, BRITISH CO	DLUMBIA, CANADA
Chain of Custody Number	s:		

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. *mg/kg* - *milligrams per kilogram based on dry weight of sample.*

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

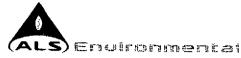
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Chain of Custody (COC) / Analytical

Request Form



COC Number: 14 -

Page <u>1</u> of <u>1</u>

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Canada Toll Free: 1 800 668 9878

Report To				Report Forma	t / Distribution		1	Se	lect Sei	vice Le	vel Bek	w (Bus	sh Turn	around	Time (TAT\ ie	not avai	ilobla (iar all ta	
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Contact:	Lucas Hennecker		Quality Control	(QC) Report with F		- ,	 R ☑ Regular (Standard TAT if received by 3 pm - business days) P ☑ Priority (2-4 bus, days if received by 3pm) 50% surcharge - contact ALS to confirm TAT 													
Address:	Suite 1000, 10th Floor, 885	Dunsmuir Street,		ort - provide details belo			E D Emergency (1-2 bus, days if received by 3pm) 100% surcharge - contact ALS to confirm TAT						arm TAT							
	Vancouver, BC V6C 1N5		Select Distribut			🗖 FAX											T and su			
Phone:	1 (604) 313-9067		Email 1 or Fax	Lucas.Hennecker	@tetratech.com (see notes)					for E2,									
			Email 2	Brent.Finnestad@	tetratech.com				_	•			_	is Rec	Juest					
Invoice To	Same as Report To	I Yes Γ No		Invoice Di	stribution			Ind	icate Fil	terec (F), Prese						(F/P) bet	low	<u> </u>	
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Contact:			Email 2	Lucas.Hennecker	@tetratech.com (see notes)	1 👰		Balance			\$	less		_ ۵		limit)			
	Project Info	rmation	Oi	and Gas Require	d Fields (client i	use)	IC,NO2+NO2Calc	alc	Ba			ess)	ardr		detection limit)	Ê		<u>-</u>		ners
ALS Quote #:	Q53931		Approver ID:		Cost Center:		5 L	TDS-Calc	₽			- PE	Ŧ	Ē	tion	ii	fect	Ē		ntari
Job #:	VENW03060 task 002		GL Account:		Routing Code:	i	2		ğ	Ξ		ļŢ	⊡ ÷	l lo	etec	ecti	× de	125		ວິ
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LSD:			Location:					pH, TSS,	Ō	L L		Me.	Δ	j ŏ ≯	la k	No.	(uttr	dfit		Number of Containers
ALS Lab Wo	ork Order # (lab use only)	12184475	ALS Contact;	Brent Mack	Sampler:	Englie	Alk-SpeciesAnions	្អ	, Silicate.	, TP, TDP, TKN, NH3		fotal Metals (CCME+ICP+Hardness)	Dissolved Metals (CCME+ICP+Hardness	rotal Hg (uttra low	Dissolved Hg (ultra low	Total MeHg (ultra low detection limit)	Dissolved MeHg (ultra low detection	chlorophyll a (field filtered 250 mL)		Ñ
ALS Sample #	Sample	Identification and/or Coordina	tes	Date	Time		bec	Color-True,	Turbidity,	N.		Me	pher	문	Aver	Me	lvec	, Hq		
(lab use only)	(This d	escription will appear on the repo	rt)	(dd-mmm-yy)	(hh:mm)	Sample Type	-¥	1 8	P2	8	8	otal	lisse	otal	jssi	otal	lisso	티머		
	Williston Shallow (W1 - Sha	allow)		A-01-18	9:30	Water	R	Ť		0	7	12	R	V	7	7	71 1-	R	\rightarrow	10
	Williston Deep (W1 - Deep)		· · · ·	1	9:45	Water	R	12	Ŕ	12	12	12	15		5	5	4	B		10
	Dinosaur Shallow (D1 - Sha	illow)		- /	12:45	Water	R	R	Ŕ	K	Ŕ	K	R	Ŕ	H	F I	->-+	R	-+	10
	Dinosaur Deep (D1 - Deep)	· · · · · · · · · · · · · · · · · · ·			12:30	Water	R	R	R	1	R	P	R	e	Þ	'è l'	·	R		10
	Duplicate 1 (DUP 1)					-Water -	- R	<u> </u>		-			·~-			~		-R-	-	_/0
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	Delicate 2 (D	UP2)			12:45	Wate-	R	R	R	R	R	R	R	R	12	7	0	D	\rightarrow	\$10
	Place Canyon	n (PCI)	· · · · · · ·		15:05	With	P	R	12	12	R	12	Ŕ	\vec{n}	A	2	'n	4		3
		Reservoir (PRI)			15:56	libter	17	12	5	10	0	n	12	12	₩+	6	ົ≁	\rightarrow	+	-á
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									 					┝─┤	\rightarrow	\rightarrow				
Drinking	Drinking Water (DW) Samples ¹ (client use) Special Instructions / Specify Criteria to add on report (client Use) SAMPLE CONDITION AS RECEIVED (lab use only) Frozen SIF Observations Yes No. F																			
Are samples taken from a Regulated DW System? Please use criteria: BC MOE 2018 Approved and Working Water Qual				Vater Quality Gui	idelines for	-		v	닕	NI-					-	Yes	H	No		
[Г ^т Ү	IT Yes IV No freshwater aquatic life and Heal			a Guidelines for Dr	inking Water, sar	nples were		acks ing Initi	Yes		No	Ļ	Cust	ody se	al inte	ict	Yes		No	
Are samples for	Are samples for human drinking water use? Itaken from pre-treatment water s			Please add nich.bu	imett@bchydro.c	om to					RATUR									
L L A		distribution list for	results					9								UULEI	R TEMP	T	JRES 1	<u>.</u>
	SHIPMENT RELEASE (client use)	INITIALS	HIPMENT RECEP	TION (lab use on			7	ł	CIA						11+1-	ise only			
Released by			na ali sa di basi		Date: , /	Time:	Rece	eived b	y:	1.11	AL SP	II ME		Date:			ise only Time:	<u>y)</u>	<u>*.</u>	
	mecher 01	I. 14/18 18:25		Geoff	100 (1/18	18:25										[
REFER TO BACK	EFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY																			

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.
1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. **ATTN: Lucas Hennecker** 1000-885 Dunsmuir Street, 10th Floor Vancouver BC V6E 1N5

Date Received: 20-OCT-18 Report Date: 02-NOV-18 15:11 (MT) Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2184609 Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

NOT SUBMITTED VENW03060 TASK 002

Brent Mack, B.Sc. Account Manager

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L2184609 CONTD.... PAGE 2 of 8 02-NOV-18 15:11 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2184609-1 Water 20-OCT-18 09:15 HALFWAY RIVER - DOWNSTREAM (HD)	L2184609-2 Water 20-OCT-18 08:36 MIDDLE SITE C RESERVOIR (PR2)	L2184609-3 Water 20-OCT-18 10:06 FIELD BLANK	L2184609-4 Water 20-OCT-18 TRIP BLANK	
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	14.3	7.7	<5.0	<5.0	
	Conductivity (uS/cm)	420	184	<2.0	<2.0	
	Hardness (as CaCO3) (mg/L)	216	90.8	<0.50	нтс <0.50	
	рН (рН)	8.37	8.15	5.44	5.40	
	Total Suspended Solids (mg/L)	18.3	3.3	<3.0	<3.0	
	TDS (Calculated) (mg/L)	248	99.8	<1.0	<1.0	
	Turbidity (NTU)	22.0	1.44	<0.10	<0.10	
Anions and	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	179	84.4	<1.0	<1.0	
Nutrients	Alkolinity Corborate (as Cacca) (===/()					
	Alkalinity, Carbonate (as CaCO3) (mg/L)	6.6	<1.0	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	186	84.4	<1.0	<1.0	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	0.64	<0.50	<0.50	<0.50	
	Fluoride (F) (mg/L)	0.099	0.037	<0.020	<0.020	
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0601	<0.0051	<0.0051	
	Nitrate (as N) (mg/L)	<0.0050	0.0601	<0.0050	<0.0050	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.155	0.068	<0.050	<0.050	
	Total Nitrogen (mg/L)	0.149	0.150	<0.030	<0.030	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0021	0.0014	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0034	0.0023	<0.0020	<0.0020	
	Phosphorus (P)-Total (mg/L)	0.0290	0.0047	<0.0020	<0.0020	
	Silicate (as SiO2) (mg/L)	3.58	4.22	<0.50	<0.50	
	Sulfate (SO4) (mg/L)	52.5	13.9	<0.30	<0.30	
	Anion Sum (meq/L)	4.83	1.98	<0.10	<0.10	
	Cation Sum (meq/L)	4.48	1.81	<0.10	<0.10	
	Cation - Anion Balance (%)	-3.7	-4.4	0.0	0.0	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	3.80	2.67	<0.50		
	Total Organic Carbon (mg/L)	4.17	2.65	<0.50	<0.50	
Total Metals	Aluminum (Al)-Total (mg/L)	0.553	0.0506	<0.0050	<0.0050	
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Barium (Ba)-Total (mg/L)	0.110	0.032	<0.020	<0.020	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	

L2184609 CONTD.... PAGE 3 of 8 02-NOV-18 15:11 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2184609-1 Water 20-OCT-18 09:15 HALFWAY RIVER - DOWNSTREAM (HD)	L2184609-2 Water 20-OCT-18 08:36 MIDLE SITE C RESERVOIR (PR2)	L2184609-3 Water 20-OCT-18 10:06 FIELD BLANK	L2184609-4 Water 20-OCT-18 TRIP BLANK
Grouping	Analyte				
WATER					
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.0000551	0.0000165	<0.0000050	<0.000050
	Calcium (Ca)-Total (mg/L)	58.6	26.6	<0.10	<0.10
	Chromium (Cr)-Total (mg/L)	0.0011	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Total (mg/L)	0.00036	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Total (mg/L)	0.0014	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Total (mg/L)	0.798	0.060	<0.030	<0.030
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Total (mg/L)	0.0075	0.0012	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	17.0	6.13	<0.10	<0.10
	Manganese (Mn)-Total (mg/L)	0.0179	0.00217	0.00011	<0.00010
	Mercury (Hg)-Total (ug/L)	0.00241	0.00100	<0.00050	<0.00050
	Molybdenum (Mo)-Total (mg/L)	0.0034	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	0.0026	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	0.00127	0.000281	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	2.65	2.15	<0.10	<0.10
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Total (mg/L)	3.5	<2.0	<2.0	<2.0
	Strontium (Sr)-Total (mg/L)	0.306	0.103	<0.0050	<0.0050
	Thallium (TI)-Total (mg/L)	0.000019	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total (mg/L)	0.00080	0.00043	<0.00020	<0.00020
	Vanadium (V)-Total (mg/L)	0.00263	0.00056	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0050	<0.0050	<0.0050	<0.0050
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0077	0.0065	<0.0050	
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	
	Barium (Ba)-Dissolved (mg/L)	0.098	0.033	<0.020	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	

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GroupingAnalyteImage: Comparison of the comparison	GroupingAnalyseIntermIn		Sample ID Description Sampled Date Sampled Time Client ID	L2184609-1 Water 20-OCT-18 09:15 HALFWAY RIVER - DOWNSTREAM (HD)	L2184609-2 Water 20-OCT-18 08:36 MIDDLE SITE C RESERVOIR (PR2)	L2184609-3 Water 20-OCT-18 10:06 FIELD BLANK	L2184609-4 Water 20-OCT-18 TRIP BLANK	
Dissolved Metals Cadmium (Cd)-Dissolved (mg/L) Calcium (Ca)-Dissolved (mg/L) 0.0000118 58.5 0.0000118 26.1 <0.0000050	Dissolved Metals Cadmium (Cd)-Dissolved (mg/L) 0.0000138 0.0000118 c0.0000050 Calcium (Ca)-Dissolved (mg/L) 58.5 26.1 c0.10 Cobalt (Co)-Dissolved (mg/L) c0.0010 c0.0010 c0.0010 Cobalt (Co)-Dissolved (mg/L) c0.0010 c0.0010 c0.0010 Copper (Cu)-Dissolved (mg/L) c0.0010 c0.0010 c0.0010 Lead (Pb)-Dissolved (mg/L) c0.00050 c0.00050 c0.00050 Lithium (Li)-Dissolved (mg/L) c0.0073 0.0012 c0.0010 Magnesium (Mg)-Dissolved (mg/L) 0.00746 0.00050 c0.00050 Manganese (Mn)-Dissolved (mg/L) 0.00746 0.0010 c0.0010 Metury (Hg)-Dissolved (mg/L) 0.0016 c0.0010 c0.0010 Molybdenum (Mo)-Dissolved (mg/L) 0.0012 c0.00050 c0.0050 Molybdenum (Mp-Dissolved (mg/L) 0.0016 c0.0010 c0.0010 Nickel (Ni)-Dissolved (mg/L) c0.0012 c0.00050 c0.0050 Silicon (Si)-Dissolved (mg/L) c0.0012 c0.00020 c0.00020 Silicon (Si)	Grouping	Analyte					
Calcium (Ca)-Dissolved (mg/L) 58.5 26.1 <0.10 Chromium (Cr)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Cobalt (Co)-Dissolved (mg/L) <0.0010 <0.0030 <0.0030 Copper (Cu)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Iron (Fe)-Dissolved (mg/L) <0.0030 <0.00050 <0.00050 Lead (Pb)-Dissolved (mg/L) <0.0073 0.0012 <0.0010 Magnesium (Mg)-Dissolved (mg/L) 0.00746 0.00050 <0.00050 Magnesium (Mg)-Dissolved (mg/L) 0.00746 0.00050 <0.00010 Marganese (Mn)-Dissolved (mg/L) 0.00746 0.00010 <0.0010 Mercury (Hg)-Dissolved (mg/L) 0.0073 <0.0010 <0.0010 Molybdenum (Mo)-Dissolved (mg/L) 0.0033 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0016 <0.0010 <0.0010 Potassium (K)-Dissolved (mg/L) <2.0 <2.0 <2.0 Selenium (Se)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Silver (Ag)-Dissolved (mg/L) <0.0020 <0.00020 <0.00020 Solum (Na)-Dissolved (mg/L) </th <th>Calcium (Ca)-Dissolved (mg/L) 50.000110 60.00010 60.0010 Chromium (Cr)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Cabatt (Co)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Cabatt (Co)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Capper (Cu)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Itom (Fe)-Dissolved (mg/L) <0.0073 <0.00050 <0.00050 Lead (Pb)-Dissolved (mg/L) <0.0073 <0.0012 <0.0010 Magnesium (Mg)-Dissolved (mg/L) 0.00746 0.00051 <0.00010 Marganese (Mn)-Dissolved (mg/L) 0.0073 <0.0010 <0.0010 Mercury (Hg)-Dissolved (mg/L) 0.0073 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) 0.0033 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0016 <0.0010 <0.0010 Potassium (K)-Dissolved (mg/L) <0.30 <0.30 <0.30 Silicon (Si)-Dissolved (mg/L) <0.00122 <0.00020 <0.00020 Silicon (Si)-Dissolved (mg/L) <0.0010</th> <th>WATER</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>	Calcium (Ca)-Dissolved (mg/L) 50.000110 60.00010 60.0010 Chromium (Cr)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Cabatt (Co)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Cabatt (Co)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Capper (Cu)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Itom (Fe)-Dissolved (mg/L) <0.0073 <0.00050 <0.00050 Lead (Pb)-Dissolved (mg/L) <0.0073 <0.0012 <0.0010 Magnesium (Mg)-Dissolved (mg/L) 0.00746 0.00051 <0.00010 Marganese (Mn)-Dissolved (mg/L) 0.0073 <0.0010 <0.0010 Mercury (Hg)-Dissolved (mg/L) 0.0073 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) 0.0033 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0016 <0.0010 <0.0010 Potassium (K)-Dissolved (mg/L) <0.30 <0.30 <0.30 Silicon (Si)-Dissolved (mg/L) <0.00122 <0.00020 <0.00020 Silicon (Si)-Dissolved (mg/L) <0.0010	WATER						
Chromium (Cr)-Dissolved (mg/L) <0.001 <0.0010 <0.0010 Cobalt (Co)-Dissolved (mg/L) <0.0010	Chromium (Cr)-Dissolved (mg/L) c0.0010 c0.0010 c0.0010 Cobalt (Co)-Dissolved (mg/L) c0.00300 c0.00300 c0.00300 Copper (Cu)-Dissolved (mg/L) c0.0010 c0.0010 c0.0010 Itom (Fe)-Dissolved (mg/L) c0.00300 c0.00300 c0.00300 Lead (Pb)-Dissolved (mg/L) c0.0050 c0.00050 c0.00050 Lithium (Li)-Dissolved (mg/L) 0.0073 0.0012 c0.0010 Magnesium (Mg)-Dissolved (mg/L) 0.00746 0.00051 c0.00010 Marganese (Mn)-Dissolved (mg/L) 0.00746 0.00051 c0.00010 Mercury (Hg)-Dissolved (mg/L) 0.0076 c0.0010 c0.0010 Nickel (Ni)-Dissolved (mg/L) 0.0033 c0.0010 c0.0010 Nickel (Ni)-Dissolved (mg/L) 0.0016 c0.0010 c0.0010 Potassium (Sr)-Dissolved (mg/L) c0.0020 c0.00020 c0.00020 Silicon (Si)-Dissolved (mg/L) c1.69 c2.0 c2.0 Silicon (Si)-Dissolved (mg/L) c0.00020 c0.00020 c0.00020 Silicon (Si)-Dissolved (mg/L) c0.	Dissolved Metals	Cadmium (Cd)-Dissolved (mg/L)	0.0000138	0.0000118	<0.0000050		
Cobalt (Co)-Dissolved (mg/L) c0.00030 c0.00030 c0.00030 Copper (Cu)-Dissolved (mg/L) c0.00030 c0.00030 c0.00030 Iron (Fe)-Dissolved (mg/L) c0.0010 c0.0010 c0.0010 Iron (Fe)-Dissolved (mg/L) c0.00050 c0.00050 c0.00050 Lead (Pb)-Dissolved (mg/L) c0.0073 0.0012 c0.0010 Magnesium (Mg)-Dissolved (mg/L) 17.1 6.21 c0.101 Magnese (Mn)-Dissolved (mg/L) 0.0073 c0.0010 c0.00050 Molybdenum (Mo)-Dissolved (mg/L) 0.0073 c0.0010 c0.0010 Mercury (Hg)-Dissolved (mg/L) 0.0016 c0.0010 c0.0010 Nickel (Ni)-Dissolved (mg/L) c0.30 c0.30 c0.300 Phosphorus (P)-Dissolved (mg/L) c0.0016 c0.0010 c0.0010 Nickel (Ni)-Dissolved (mg/L) c2.0 c2.0 c2.0 Selenium (Se)-Dissolved (mg/L) c3.37 c2.0 c2.0 Silicon (Si)-Dissolved (mg/L) 3.77 c2.0 c2.0 Silver (Ag)-Dissolved (mg/L) c0.00020 c0.00020	Cobalt (Co)-Dissolved (mg/L) Count of consistent (Co)-Dissolved (mg/L) Count of count of count (Co)-Dissolved (mg/L) Count of count of count (Co)-Dissolved (mg/L) Count of count (Co)-Dissolve		Calcium (Ca)-Dissolved (mg/L)	58.5	26.1	<0.10		
Copper (Cu)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Iron (Fe)-Dissolved (mg/L) <0.000	Copper (Cu)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Iron (Fe)-Dissolved (mg/L) <0.030		Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
Inon (Fe)-Dissolved (mg/L) K00000 K00000 K00000 Lead (Pb)-Dissolved (mg/L) <0.030	Iton (Fe)-Dissolved (mg/L) Co.0010 Co.0030 Lead (Pb)-Dissolved (mg/L) <0.030		Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
Lead (Pb)-Dissolved (mg/L) C0.000 C0.00050 C0.00050 Lithium (Li)-Dissolved (mg/L) 0.0073 0.0012 <0.00010	Lead (Pb)-Dissolved (mg/L) Co.00050 Co.00050 Co.00050 Lithium (Li)-Dissolved (mg/L) 0.0073 0.0012 <0.0010		Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
Lithium (Li)-Dissolved (mg/L) 0.0073 0.0012 <0.0010	Lithium (Li)-Dissolved (mg/L) 0.0073 0.0012 <0.0010 Magnesium (Mg)-Dissolved (mg/L) 17.1 6.21 <0.10		Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030		
Magnesium (Mg)-Dissolved (mg/L) 17.1 6.21 <0.0010 Manganese (Mn)-Dissolved (mg/L) 0.00746 0.00051 <0.00010	Magnesium (Mg)-Dissolved (mg/L) 17.1 6.21 <0.10 Magnesium (Mg)-Dissolved (mg/L) 0.00746 0.00051 <0.00010		Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
Manganese (Mn)-Dissolved (mg/L) 0.00746 0.00051 <0.00010	Manganese (Mn)-Dissolved (mg/L) 0.00746 0.00051 <0.00010 Mercury (Hg)-Dissolved (ug/L) 0.00079 <0.00050		Lithium (Li)-Dissolved (mg/L)	0.0073	0.0012	<0.0010		
Mercury (Hg)-Dissolved (ug/L) 0.00079 <0.00050 <0.00050 Molybdenum (Mo)-Dissolved (mg/L) 0.0033 <0.0010	Mercury (Hg)-Dissolved (ug/L) 0.00079 <0.00050 <0.00050 Mercury (Hg)-Dissolved (ug/L) 0.00079 <0.00050		Magnesium (Mg)-Dissolved (mg/L)	17.1	6.21	<0.10		
Molybdenum (Mo)-Dissolved (mg/L) 0.0033 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) 0.0016 <0.0010	Molybdenum (Mo)-Dissolved (mg/L) 0.0033 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) 0.0016 <0.0010		Manganese (Mn)-Dissolved (mg/L)	0.00746	0.00051	<0.00010		
Nickel (Ni)-Dissolved (mg/L) 0.0016 <0.0010	Nickel (Ni)-Dissolved (mg/L) 0.00016 <0.0010 <0.0010 Phosphorus (P)-Dissolved (mg/L) <0.30		Mercury (Hg)-Dissolved (ug/L)	0.00079	<0.00050	<0.00050		
Phosphorus (P)-Dissolved (mg/L) <0.30 <0.30 <0.30 <0.30 Potassium (K)-Dissolved (mg/L) <2.0	Phosphorus (P)-Dissolved (mg/L) <0.30 <0.30 <0.30 Potassium (K)-Dissolved (mg/L) <2.0		Molybdenum (Mo)-Dissolved (mg/L)	0.0033	<0.0010	<0.0010		
Potassium (K)-Dissolved (mg/L) <2.0	Potassium (K)-Dissolved (mg/L) <2.0 <2.0 <2.0 Selenium (Se)-Dissolved (mg/L) 0.00122 0.000266 <0.000050		Nickel (Ni)-Dissolved (mg/L)	0.0016	<0.0010	<0.0010		
Selenium (Se)-Dissolved (mg/L) 0.00122 0.000266 <0.000050 Silicon (Si)-Dissolved (mg/L) 1.69 2.03 <0.050	Selenium (Se)-Dissolved (mg/L) 0.00122 0.000266 <0.000050 Silicon (Si)-Dissolved (mg/L) 1.69 2.03 <0.050		Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30		
Silicon (Si)-Dissolved (mg/L) 1.69 2.03 <0.050	Silicon (Si)-Dissolved (mg/L) 1.69 2.03 <0.050020		Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0		
Silver (Ag)-Dissolved (mg/L) <0.000020	Silver (Ag)-Dissolved (mg/L) <0.000020		Selenium (Se)-Dissolved (mg/L)	0.00122	0.000266	<0.000050		
Sodium (Na)-Dissolved (mg/L) 3.7 <2.0	Sodium (Na)-Dissolved (mg/L) 3.7 <2.0 <2.0 Strontium (Sr)-Dissolved (mg/L) 0.294 0.100 <0.0050		Silicon (Si)-Dissolved (mg/L)	1.69	2.03	<0.050		
Strontium (Sr)-Dissolved (mg/L) 0.294 0.100 <0.0050	Strontium (Sr)-Dissolved (mg/L) 0.294 0.100 <0.0050 Thallium (TI)-Dissolved (mg/L) <0.00020		Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020		
Thallium (TI)-Dissolved (mg/L) <0.00020	Thallium (TI)-Dissolved (mg/L) <0.00020		Sodium (Na)-Dissolved (mg/L)	3.7	<2.0	<2.0		
Tin (Sn)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Titanium (Ti)-Dissolved (mg/L) <0.010	Tin (Sn)-Dissolved (mg/L) <0.00050		Strontium (Sr)-Dissolved (mg/L)	0.294	0.100	<0.0050		
Titanium (Ti)-Dissolved (mg/L) <0.010	Titanium (Ti)-Dissolved (mg/L) <0.010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) 0.00084 0.00045 <0.00020		Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
Uranium (U)-Dissolved (mg/L) 0.00084 0.00045 <0.00020	Uranium (U)-Dissolved (mg/L) 0.00084 0.00045 <0.00020		Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Zinc (Zn)-Dissolved (mg/L) <0.0050		Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050	Zinc (Zn)-Dissolved (mg/L) <0.0050 <0.0050 <0.0050 Speciated Metals Methylmercury (as MeHg)-Dissolved (ug/L) 0.000041 0.000031 0.000071		Uranium (U)-Dissolved (mg/L)	0.00084	0.00045	<0.00020		
	Speciated Metals Methylmercury (as MeHg)-Dissolved (ug/L) 0.000041 0.000031 0.000071		Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Speciated Metals Methylmercury (as MeHg)-Dissolved (ug/L) 0.000041 0.000031 0.000071		Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050			
	Methylmercury (as MeHg)-Total (ug/L) 0.000026 <0.000020 <0.000020 <0.000020	Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	0.000041	0.000031			
Methylmercury (as MeHg)-Total (ug/L) 0.000026 <0.000020 <0.000020 <0.000020			Methylmercury (as MeHg)-Total (ug/L)	0.000026	<0.000020	<0.000020	<0.000020	

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QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Total Nitrogen	В	L2184609-1, -2, -3
Method Blank	Methylmercury (as MeHg)-Total	MB-LOR	L2184609-2, -3
Matrix Spike	Dissolved Organic Carbon	MS-B	L2184609-1, -2, -3
Matrix Spike	Total Organic Carbon	MS-B	L2184609-4
Matrix Spike	Total Organic Carbon	MS-B	L2184609-1, -2, -3
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2184609-3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2184609-1, -2, -3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2184609-3
Matrix Spike	Cobalt (Co)-Dissolved	MS-B	L2184609-1, -2, -3
Matrix Spike	Lithium (Li)-Dissolved	MS-B	L2184609-1, -2, -3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2184609-1, -2, -3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2184609-3
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2184609-1, -2, -3
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2184609-3
Matrix Spike	Nickel (Ni)-Dissolved	MS-B	L2184609-1, -2, -3
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2184609-1, -2, -3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2184609-1, -2, -3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2184609-3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2184609-1, -2, -3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2184609-3
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2184609-1, -2, -3
Matrix Spike	Copper (Cu)-Total	MS-B	L2184609-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Total	MS-B	L2184609-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Total	MS-B	L2184609-1, -2, -3, -4
Matrix Spike	Nitrate (as N)	MS-B	L2184609-1, -2, -3, -4
Matrix Spike	Silicate (as SiO2)	MS-B	L2184609-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**			
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity			
,	01	edures adapted from APHA Method 2320 "Alkalinity te and hydroxide alkalinity are calculated from pher	". Total alkalinity is determined by potentiometric titration to a nolphthalein alkalinity and total alkalinity values.			
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0			
Nitrate and Nitrite (as N)	is a calculate	d parameter. Nitrate and Nitrite (as N) = Nitrite (as I	N) + Nitrate (as N).			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)			
Inorganic anions are anal	yzed by Ion (Chromatography with conductivity and/or UV detecti	ion.			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B			
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.						
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)			
This analysis is carried or	ut using proce	edures adapted from APHA Method 5310 "Total Org	ganic Carbon (TOC)".			
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)			

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. COLOUR-TRUE-VA Water Colour (True) by Spectrometer **BCMOE Colour Single Wavelength** This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended. **EC-PCT-VA** Water Conductivity (Automated) APHA 2510 Auto. Conduc. This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode. **EC-SCREEN-VA** Conductivity Screen (Internal Use Only) Water APHA 2510 Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc. F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. HARDNESS-CALC-VA APHA 2340B Water Hardness Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents, Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation. HG-D-U-CVAF-VA Water Diss. Mercury in Water by CVAFS (Ultra) APHA 3030 B / EPA 1631 REV. E This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry. HG-T-U-CVAF-VA Water Total Mercury in Water by CVAFS (Ultra) EPA 1631 REV. E This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry. **IONBALANCE-VA** Water Ion Balance Calculation **APHA 1030F** Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero. Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as: Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum] MEHG-D-GCAF-VA Diss. Methylmercury in Water by GCAFS EPA 1630 Water This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg". **MEHG-T-GCAF-VA** Water Total Methylmercury in Water by GCAFS EPA 1630 This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg". Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod) MET-D-CCMS-VA Water Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod) Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. N-T-COL-VA Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174 Water

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

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NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
			n J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society e levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion Cl	nromatography with conductivity and/or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion Cl	nromatography with conductivity and/or UV detection.	
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestion	of the sampl solved solids	dures adapted from APHA Method 4500-P "Phosphorus e. · (i.e. seawaters, brackish waters) may produce a negat	
Arsenic (5+), at elevated le	evels, is a pos	sitive interference on colourimetric phosphate analysis.	
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
colourimetrically after pers	ulphate diges solved solids	dures adapted from APHA Method 4500-P "Phosphorus tion of a sample that has been lab or field filtered throu (i.e. seawaters, brackish waters) may produce a negat	gh a 0.45 micron membrane filter.
Arsenic (5+), at elevated le	vels, is a pos	sitive interference on colourimetric phosphate analysis.	
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out electrode	using procee	dures adapted from APHA Method 4500-H "pH Value".	The pH is determined in the laboratory using a pH
It is recommended that this	s analysis be	conducted in the field.	
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a samples with very high dis available for these types of	ole that has b solved solids samples.	dures adapted from APHA Method 4500-P "Phosphorus een lab or field filtered through a 0.45 micron membrar (i.e. seawaters, brackish waters) may produce a negat	ne filter.
		sitive interference on colourimetric phosphate analysis.	
SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
		dures adapted from APHA Method 4500-SiO2 E. "Silica purimetric method. Arsenic (5+) above 100 mg/L is a ne	
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion Cl	nromatography with conductivity and/or UV detection.	
TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)
		dures adapted from APHA 1030E "Checking Correctnes culated from measured concentrations of anions and ca	
TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
		dures adapted from APHA Method 4500-Norg D. "Block stion followed by Flow-injection analysis with fluorescer	
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
Solids (TSS) are determine	ed by filtering igh dissolved		
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out	using procee	dures adapted from APHA Method 2130 "Turbidity". Tur	rbidity is determined by the nephelometric method.
** ALS test methods may inco	orporate mod	ifications from specified reference methods to improve	performance.
The last two letters of the al	ove test cod	e(s) indicate the laboratory that performed analytical an	alysis for that test. Refer to the list below:

VA

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

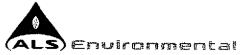
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. mg/kg - milligrams per kilogram based on dry weight of sample. mg/kg wwt - milligrams per kilogram based on wet weight of sample. mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample. mg/L - milligrams per litre. < - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION. Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Chain of Custody (COC) / Analytical Request Form



COC Number: 14 -

Page <u>1</u> of <u>1</u>

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Canada Toll Free: 1 800 668 9878

Report To					Report Format	t/Disti.		_						h Turna	around	Time (1	TAT) is	not ava	ilable fo	r all test	s}
Company:	Tetratech			Select Report Format: 🗹 PDF 🗹 EXCEL 🗹 EDD (DIGITAL)				R I Regular (Standard TAT if received by 3 pm - business days)									<u> </u>				
Contact:	Lucas Hennecker	••		Quality Control	(QC) Report with R	leport 🛛 🖓 Yes	s ∏No	P	🔲 Prio									tact ALS	5 to con	irm TAT	
Address:	Suite 1000, 10th Floor, 885	Dunsmuir Str	eet,	Criteria on Repo	t · provide details below	v if box checked		E Emergency (1-2 bus, days if received by 3pm) 100% surcharge - contact ALS to confirm TAT								TAT					
	Vancouver, BC V6C 1N5			Select Distribut	on: 🗹 EMA		🗆 FAX	E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge													
Phone:	1 (604) 313-9067			Email 1 or Fax	Lucas.Hennecker	etetratech.com (see notes)	Spec	ify Dat	e Req	uired f	or E2,	E or P:								••••
				Email 2	Brent.Finnestad@	tetratech.com							A	nalys	is Re	quest	2				
Invoice To	Same as Report To	🖓 Yes			Invoice Di	stribution			Inc	licate Fi	iltered (f	⁼), Prese	erved (P) or Filt	ered ar	d Prese	erved (l	F/P) bel	ow		
	Copy of Invoice with Report	🗹 Yes	l ⁺ No	Select Invoice Distribution: 🕢 EMAIL 🔲 MAIL 🔲 FAX							Р	F/P	Р	F/P		F	P	F/P	P	F/P	
Company:				Email 1 or Fax	ebaaccountspaya	ble@tetratech.co	m			an a			4	ľ							
Contact:				Email 2	Lucas.Hennecker	@tetratech.com (see notes)	<u>ੂ</u>		Balance				ess)				Ê			ø
	Project Infor	mation		Oi	and Gas Require	d Fields (client u	150)	IC,NO2+NO2Calc	्र २	Bal			sss).	ardn		detection limit)	ŧ	i≣ B			iner
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Job #:	VENW03060 task 002		GL Account:		Routing Code:] ĝ	6	Po Lo	Ξ		ļ Ŧ	10 F	5	stec	ectic	P A	g	1	õ	
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LSD:	SD;			Location:					pH, TSS,	ک ا	L L		Ŭ.	ğ	8	tra lo	No	<u></u>	3	f	Number of Containers
ALS Lab Wo	rk Order # (lab use only)	L218	34609	ALS Contact:	Brent Mack	Sampler UC	Romedher	kk-SpeciesAnions	ЦÜ	. Silicate.	1, TP, TDP, TKN, NH3		Total Metals (CCME+ICP+Hardness)-	Dissolved Metals (CCME+ICP+Hardness)	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low	Total MeHg (ultra low detection limit)	Dissolved MeHg (uttra low detection limit)	Hom: E	<u> </u>	Ž.
ALS Sample #	Sample	Identification	and/or Coordinates	es Date Time Sample Type 4			Ē	Turbidity,	, TN,		l ¥	e ve	臣	olve	Me	olvei	Ē	Ε.			
(lab use only)	(This de	escription will	appear on the report)		(dd-mmm-yy)	(hh:mm)	Sample Type	¥k.	8	11	T0C,	Doc	Tota	l isi	Tota	Diss	Lota	Diss	E I	Diss.	
	Halfway River - Downstream	ו (HD)					Water	R	R	R	R	R	R	R	R	R	R	R			9
	Middle Site C Reservoir (PR	12)					Water	R	0	R	P	R	R	R	R	R	Ŕ	2			9
-	Peace Canyon (PC I)	· · · · ·					-Water					1		- r~	v	<u> </u>	~ ~				/
	Upper Site & Reservoir (PR	1)	<u> </u>				Water	R	†						<u> </u>						
	Duplicato 2 (DUP 2)						Water	R				<u> </u>		-				-			
	Field Blank		<u> </u>				Water	R	2	0	R	R	2	R	Ö	R	R	R			9
	Trip Blank		· · · · ·				Water	R	n	5	0	5	12	15	15	12		2			-{
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Drinking	g Water (DW) Samples ¹ (cile	nt use)	Specie	I Instructions / Spec	ify Criteria to add o	n report (client Use	a)	Froz				LE CO	NUIT			CEIVE vation		buse Yes	only)	No	
Are samples take	an from a Regulated DW System	n?	Please use criteria: B	C MOE 2018 Appro	ved and Working V	Water Quality Gui	delines for			Yes	凶	No						Yes		No	
ΓY	′es i≆ No		freshwater aquatic life	and Health Canad	a Guidelines for Dr	inking Water, sar	nples were		aurs ing Initi		X	140		Just	ouy s		051	185	ب	UNU	
Are samples for	human drinking water use?		taken from pre-treatm distribution list for rest		Please addand nic	h.burnett@bchyd	ro.com to		ITIAL CO			RATURE	s℃	1		FINAL	COOLI	ER TEÑ	PERAT	URES *	3
Г ^т Ү	es I ^T No		also botton list for rest	ла				<u> </u>	3	· · ·											
	SHIPMENT RELEASE (0	lient use)	·	INITIAL S	HIPMENT RECEP	TION (lab use on	V)	+			Fit	I IAL SH	HPMF	NT B	ÊCEF	TION	(labi	ise on	itv)		
Released by:	1 Date	e: .	Time: Rece	Second Inc.	eoff	Date:	Time:	Rec	eived b	y:					Date		,. <u>_</u>	Time:	**		
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REFER TO BACK	PAGE FOR ALS LOCATIONS A	AND SAMPLING	S INFORMATION		WHI	TE - LABORATOR	V COPY VELL	<u> W.</u>	LIENT	COPY						MJ. Cal. Con	SCA 100 Cu	ont/04 Janua			

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.
1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. **ATTN: Lucas Hennecker** 1000-885 Dunsmuir Street, 10th Floor Vancouver BC V6E 1N5

Date Received: 17-OCT-18 Report Date: 29-OCT-18 13:45 (MT) Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2182905 Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

NOT SUBMITTED VENW03060 TASK 002

Brent Mack, B.Sc. Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700 ALS CANADA LTD Part of the ALS Group An ALS Limited Company

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L2182905 CONTD.... PAGE 2 of 7 29-OCT-18 13:45 (MT) Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2182905-1 Water 17-OCT-18 14:02 MOBERLY RIVER - DOWNSTREAM (MD)	L2182905-2 Water 17-OCT-18 13:07 LOWER SITE C RESERVOIR (PR3)	L2182905-3 Water 12-OCT-18 11:41 PEACE AT PINE (PD1)	L2182905-4 Water 17-OCT-18 10:13 PINE RIVER (PINE)	
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	27.6	6.6	7.2	9.4	
	Conductivity (uS/cm)	265	183	185	333	
	Hardness (as CaCO3) (mg/L)	141	94.5	96.9	181	
	рН (рН)	8.29	8.16	8.16	8.38	
	Total Suspended Solids (mg/L)	24.0	6.4	5.4	20.0	
	TDS (Calculated) (mg/L)	158	102	104	201	
	Turbidity (NTU)	43.7	3.69	2.76	33.0	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	137	85.6	86.2	156	
Nutrento	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	5.8	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	137	85.6	86.2	162	
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	< 0.0050	<0.0050	
	Bromide (Br) (mg/L)	<0.050	<0.050	< 0.050	<0.050	
	Chloride (Cl) (mg/L)	0.71	<0.50	<0.50	1.43	
	Fluoride (F) (mg/L)	0.084	0.041	0.041	0.082	
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0549	0.0537	0.0633	
	Nitrate (as N) (mg/L)	<0.0050	0.0549	0.0537	0.0623	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.296	0.097	0.083	0.177	
	Total Nitrogen (mg/L)	0.245	0.128	0.133	0.185	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0019	<0.0010	<0.0010	<0.0010	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0061	0.0021	0.0028	0.0033	
	Phosphorus (P)-Total (mg/L)	0.0442	0.0076	0.0072	0.0338	
	Silicate (as SiO2) (mg/L)	3.38	4.42	4.39	3.00	
	Sulfate (SO4) (mg/L)	13.5	14.4	14.9	29.9	
	Anion Sum (meq/L)	3.04	2.02	2.04	3.91	
	Cation Sum (meq/L)	2.96	1.89	1.94	3.84	
	Cation - Anion Balance (%)	-1.3	-3.2	-2.6	-0.9	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	7.27	2.68	2.79	3.36	
	Total Organic Carbon (mg/L)	8.88	2.66	2.67	3.87	
Total Metals	Aluminum (Al)-Total (mg/L)	0.807	0.0678	0.0857	0.679	
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Total (mg/L)	0.00076	<0.00050	<0.00050	<0.00050	
	Barium (Ba)-Total (mg/L)	0.176	0.034	0.037	0.139	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	

L2182905 CONTD.... PAGE 3 of 7 29-OCT-18 13:45 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2182905-1 Water 17-OCT-18 14:02 MOBERLY RIVER - DOWNSTREAM (MD)	L2182905-2 Water 17-OCT-18 13:07 LOWER SITE C RESERVOIR (PR3)	L2182905-3 Water 12-OCT-18 11:41 PEACE AT PINE (PD1)	L2182905-4 Water 17-OCT-18 10:13 PINE RIVER (PINE)	
Grouping	Analyte					
WATER						
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Total (mg/L)	0.0000555	0.0000214	0.0000278	0.0000456	
	Calcium (Ca)-Total (mg/L)	41.8	28.1	28.1	50.3	
	Chromium (Cr)-Total (mg/L)	0.0014	<0.0010	<0.0010	0.0012	
	Cobalt (Co)-Total (mg/L)	0.00065	<0.00030	<0.00030	0.00049	
	Copper (Cu)-Total (mg/L)	0.0025	<0.0010	<0.0010	0.0015	
	Iron (Fe)-Total (mg/L)	1.36	0.083	0.117	0.944	
	Lead (Pb)-Total (mg/L)	0.00072	<0.00050	<0.00050	0.00052	
	Lithium (Li)-Total (mg/L)	0.0049	0.0013	0.0014	0.0080	
	Magnesium (Mg)-Total (mg/L)	11.6	6.54	7.05	14.5	
	Manganese (Mn)-Total (mg/L)	0.0330	0.00349	0.00413	0.0189	
	Mercury (Hg)-Total (ug/L)	0.00335	0.00063	0.00071	0.00285	
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Nickel (Ni)-Total (mg/L)	0.0035	<0.0010	<0.0010	0.0023	
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Total (mg/L)	0.000212	0.000286	0.000303	0.000558	
	Silicon (Si)-Total (mg/L)	2.63	2.07	2.12	2.43	
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Sodium (Na)-Total (mg/L)	3.3	<2.0	<2.0	4.3	
	Strontium (Sr)-Total (mg/L)	0.0977	0.106	0.103	0.182	
	Thallium (TI)-Total (mg/L)	0.000024	<0.000010	<0.000010	0.000019	
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Uranium (U)-Total (mg/L)	0.00041	0.00047	0.00046	0.00049	
	Vanadium (V)-Total (mg/L)	0.00313	0.00055	0.00065	0.00249	
	Zinc (Zn)-Total (mg/L)	0.0072	0.0090	<0.0050	0.0054	
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (AI)-Dissolved (mg/L)	0.0367	0.0055	<0.0050	0.189	
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Barium (Ba)-Dissolved (mg/L)	0.146	0.031	0.033	0.126	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	

L2182905 CONTD.... PAGE 4 of 7 29-OCT-18 13:45 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2182905-1 Water 17-OCT-18 14:02 MOBERLY RIVER - DOWNSTREAM (MD)	L2182905-2 Water 17-OCT-18 13:07 LOWER SITE C RESERVOIR (PR3)	L2182905-3 Water 12-OCT-18 11:41 PEACE AT PINE (PD1)	L2182905-4 Water 17-OCT-18 10:13 PINE RIVER (PINE)	
Grouping	Analyte					
WATER						
Dissolved Metals	Cadmium (Cd)-Dissolved (mg/L)	0.000098	0.000093	0.0000068	0.0000182	
	Calcium (Ca)-Dissolved (mg/L)	39.0	27.4	28.1	50.6	
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Copper (Cu)-Dissolved (mg/L)	0.0011	<0.0010	<0.0010	<0.0010	
	Iron (Fe)-Dissolved (mg/L)	0.106	<0.030	<0.030	0.174	
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Lithium (Li)-Dissolved (mg/L)	0.0036	0.0012	0.0013	0.0076	
	Magnesium (Mg)-Dissolved (mg/L)	10.5	6.36	6.50	13.3	
	Manganese (Mn)-Dissolved (mg/L)	0.0133	0.00105	0.00063	0.00766	
	Mercury (Hg)-Dissolved (ug/L)	0.00098	<0.00050	<0.00050	0.00140	
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Nickel (Ni)-Dissolved (mg/L)	0.0018	<0.0010	<0.0010	0.0013	
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Dissolved (mg/L)	0.000151	0.000273	0.000264	0.000576	
	Silicon (Si)-Dissolved (mg/L)	1.55	1.89	1.94	1.66	
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Sodium (Na)-Dissolved (mg/L)	3.2	<2.0	<2.0	4.4	
	Strontium (Sr)-Dissolved (mg/L)	0.0986	0.103	0.104	0.175	
	Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Uranium (U)-Dissolved (mg/L)	0.00037	0.00047	0.00048	0.00050	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.00064	
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	0.000038	0.000021	<0.000020	0.000021	
	Methylmercury (as MeHg)-Total (ug/L)	0.000047	<0.000020	<0.000020	0.000023	

L2182905 CONTD.... PAGE 5 of 7 29-OCT-18 13:45 (MT) Version: FINAL

QC Samples with Qualif	iers & Comme	nts:		
QC Type Description		Parameter	Qualifier	Applies to Sample Number(s)
Test Method Referenc	es:			
ALS Test Code	Matrix	Test Description		Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration		APHA 2320 Alkalinity
				al alkalinity is determined by potentiometric titration to a halein alkalinity and total alkalinity values.
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)		EPA 300.0
Nitrate and Nitrite (as N)	is a calculated	parameter. Nitrate and Nitrite (as N) = Nitr	rite (as N) + N	litrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)		EPA 300.1 (mod)
Inorganic anions are and	alyzed by Ion Cł	romatography with conductivity and/or UV	detection.	
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	n	APHA 5310B
		lures adapted from APHA Method 5310 "T gh a 0.45 micron membrane filter prior to a		Carbon (TOC)". Dissolved carbon (DOC) fractions are
CARBONS-TOC-VA	Water	Total organic carbon by combustion		APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried of	out using procee	lures adapted from APHA Method 5310 "T	otal Organic	Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC		EPA 300.1 (mod)
Inorganic anions are ana	alyzed by lon Ch	promatography with conductivity and/or UV	detection.	
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer		BCMOE Colour Single Wavelength
is determined by filtering		lures adapted from British Columbia Enviro		nual "Colour- Single Wavelength." Colour (True Colour) of the filtrate using the platinum-cobalt colourimetric
method. Colour measurements c Concurrent measurement			nple as receiv	ved (at time of testing), without pH adjustment.
EC-PCT-VA	Water	Conductivity (Automated)		APHA 2510 Auto. Conduc.
This analysis is carried of electrode.	out using proced	lures adapted from APHA Method 2510 "C	Conductivity".	Conductivity is determined using a conductivity
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)		APHA 2510
Qualitative analysis of co	onductivity wher	e required during preparation of other test	s - e.g. TDS, ı	metals, etc.
F-IC-N-VA	Water	Fluoride in Water by IC		EPA 300.1 (mod)
Inorganic anions are ana	alyzed by Ion Ch	romatography with conductivity and/or UV	detection.	
HARDNESS-CALC-VA	Water	Hardness		APHA 2340B
		s) is calculated from the sum of Calcium a centrations are preferentially used for the I		Im concentrations, expressed in CaCO3 equivalents. culation.
HG-D-U-CVAF-VA	Water	Diss. Mercury in Water by CVAFS (Ultra	a)	APHA 3030 B / EPA 1631 REV. E
American Public Health (EPA). The procedure n	Association, an nay involve prel rior to a purge a	d with procedures adapted from Method 1 iminary sample treatment by filtration (APH and trap concentration step and final reduc	631 Rev. E. b IA 3030B) an	tion of Water and Wastewater" published by the by the United States Environmental Protection Agency d involves a cold-oxidation of the acidified sample using ample with stannous chloride. Instrumental analysis is
HG-T-U-CVAF-VA	Water	Total Mercury in Water by CVAFS (Ultra	a)	EPA 1631 REV. E
procedure involves a col	ld-oxidation of th		noride prior to	States Environmental Protection Agency (EPA). The a purge and trap concentration step and final fluorescence spectrophotometry.
IONBALANCE-VA	Water	Ion Balance Calculation		APHA 1030E
				from APHA Standard Methods (1030E Checking ion balance (% difference of cations minus anions)
Cation and Anion Sums included where data is p			ions. Dissolv	ed species are used where available. Minor ions are

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MEHG-D-GCAF-VA Water Diss. Methylmercury in Water by GCAFS EPA 1630

interferences. The distillate	e is analyzed	US EPA. Samples are distilled under an inert gas flov by aqueous phase ethylation, purge and trap, desorptic d by cold vapour atomic flourescence spectroscopy. Re	on and GC separation. The separated species are then
MEHG-T-GCAF-VA	Water	Total Methylmercury in Water by GCAFS	EPA 1630
interferences. The distillate	e is analyzed	e US EPA. Samples are distilled under an inert gas flow by aqueous phase ethylation, purge and trap, desorption d by cold vapour atomic flourescence spectroscopy. Re	on and GC separation. The separated species are then
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered	(0.45 um), p	reserved with nitric acid, and analyzed by CRC ICPMS	
Method Limitation (re: Sulf	ur): Sulfide ar	nd volatile sulfur species may not be recovered by this	method.
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digeste	ed with nitric a	and hydrochloric acids, and analyzed by CRC ICPMS.	
Method Limitation (re: Sulf	ur): Sulfide ai	nd volatile sulfur species may not be recovered by this	method.
N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174
		dures adapted from APHA Method 4500-P (J) "Persulp ational Environmental Methods Index - Nemi method 5	
NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
			m J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society e levels of ammonium in seawater", Roslyn J. Waston et
NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion Cł	nromatography with conductivity and/or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy	zed by Ion Cł	nromatography with conductivity and/or UV detection.	
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestion	of the sampl	dures adapted from APHA Method 4500-P "Phosphoru: e. ; (i.e. seawaters, brackish waters) may produce a nega	
Arsenic (5+), at elevated le	evels, is a pos	sitive interference on colourimetric phosphate analysis.	
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
colourimetrically after pers	ulphate diges	dures adapted from APHA Method 4500-P "Phosphorus tion of a sample that has been lab or field filtered throu (i.e. seawaters, brackish waters) may produce a nega	ugh a 0.45 micron membrane filter.
Arsenic (5+), at elevated le	evels, is a pos	sitive interference on colourimetric phosphate analysis.	
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out electrode	using proced	dures adapted from APHA Method 4500-H "pH Value".	The pH is determined in the laboratory using a pH
It is recommended that this	s analysis be	conducted in the field.	
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a sam	ple that has b solved solids	dures adapted from APHA Method 4500-P "Phosphorus een lab or field filtered through a 0.45 micron membrar (i.e. seawaters, brackish waters) may produce a nega	ne filter.
Arsenic (5+), at elevated le	evels, is a pos	sitive interference on colourimetric phosphate analysis.	
SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
		dures adapted from APHA Method 4500-SiO2 E. "Silic purimetric method. Arsenic (5+) above 100 mg/L is a ne	a". Silicate (molybdate-reactive silica) is determined by egative interference on this test.
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)
		dures adapted from APHA 1030E "Che culated from measured concentrations	
TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
		dures adapted from APHA Method 450 stion followed by Flow-injection analys	0-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl is with fluorescence detection.
TSS-VA	Water	Total Suspended Solids by Gravime	tric APHA 2540 D - GRAVIMETRIC
Solids (TSS) are determined	d by filtering h dissolved	a sample through a glass fibre filter, T solid content (i.e. seawaters, brackish	0 "Solids". Solids are determined gravimetrically. Total Suspended SS is determined by drying the filter at 104 degrees celsius. waters) may produce a positive bias by this method. Alternate analysis
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out u	using proced	dures adapted from APHA Method 213	0 "Turbidity". Turbidity is determined by the nephelometric method.
** ALS test methods may inco	porate mod	ifications from specified reference met	nods to improve performance.
The last two letters of the ab	ove test cod	le(s) indicate the laboratory that perfo	med analytical analysis for that test. Refer to the list below:
Laboratory Definition Code	e Labora	atory Location	
VA	ALS E	NVIRONMENTAL - VANCOUVER, BR	ITISH COLUMBIA, CANADA
Chain of Custody Numbers:			

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Chain of Custody (COC) / Analytical **Request Form**



COC Number: 14 -

Page <u>1</u> of <u>1</u>

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Contact:				Email 2		Lucas.Hennecker@	etetratech.com (see notes)	alc		ance			8-HD	ess				mit)			S
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ALS Lab Wo	ALS Lab Work Order # (lab use only)				tact:	Brent Mack	Sampler: Luc	kmeither	Alk-SpeciesAnior	Color-True, EC, pH, TSS, TDS-Calc	y, Silicate. Ortho	TN, TP, TI		Fotal Metals (CCME+ICP+Hardness)	Dissolved Metals (CCME+ICP+Hardness)/#H	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit)	Fotal MeHg (ultra low detection limit)	Dissolved MeHg (ultra low detection limit)	Total Coliform, E.	Dissolved Ferrous Iron	z
ALS Sample #	Sample	Identification	and/or Coordinat	tes		Date	Time	Commis Trees	Spe	L-10	Turbidity,	F 0	0	M	solve	ΠΗ	solve	Ň	solve	al C	solve	
(lab use only)	(This d	escription will a	appear on the repo	rt)		(dd-mmm-yy)	(hh:mm)	Sample Type	Ak .	Col	Turt	TOC,	DOC	Tota	Dise	Tota	Dist	Tota	Dis	Tot	Dis	
	Moberly River - Downstrear	n (MD)				17-04-18	14:02	Water	R	R	R	R	R	R	R	R	R	R	R			9
	Lower Site C Reservoir (PR	(3)	· · · · · · · · · · · · · · · · · · ·	-		A-at-18	13:07	Water	R	i v	R	R	R	R	R	R	R	R	P			9
	Peace at Pine (PD1)	•				17-125-13	11:41	Water	R	Ŕ	R	$\dot{1}$	R	Ŕ	12	2	R	$\overline{\mathcal{R}}$	R			9
·	Pine River (Pine)		••	-0		12-0-6-112	10:13	Water	R	12	ΗQ	5	0	12	12	0	0	0	0	-		á
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Drinking	g Water (DW) Samples ¹ (clie	ent use)	Spo	ecial Instructions	/ Spec	ify Criteria to add or	n report (client Use	e)	Froz	en							vatior		Yes		No	
Are samples tak	ten from a Regulated DW System Yes IV No			life and Health C	Canad	a Guidelines for Dr	inking Water. sa	mples were	lce p	acks ing Ini		<u> </u>	No		Cust	ody s	eal in	tact	Yes		No	Ō
Are samples for	human drinking water use?		taken from pre-trea distribution list for		urces.	Please and nich.bu	irnett@bchydro.c	com to	IN	ITIAL C	OOLER		RATURE	ES °C			FINAL	COOL	ER TEN	PERAT	URES	°C
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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. **ATTN: Lucas Hennecker** 1000-885 Dunsmuir Street, 10th Floor Vancouver BC V6E 1N5

Date Received: 18-OCT-18 Report Date: 01-NOV-18 18:35 (MT) Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2183715 Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

NOT SUBMITTED VENW03060 TASK 002

Brent Mack, B.Sc. Account Manager

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L2183715 CONTD.... PAGE 2 of 11 01-NOV-18 18:35 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2183715-1 Water 18-OCT-18 08:10 PEACE AT BEATTON (PD2)	L2183715-2 Water 18-OCT-18 08:55 BEATTON RIVER (BEA)	L2183715-3 Water 18-OCT-18 09:44 PEACE AT KISKATINAW (PD3)	L2183715-4 Water 18-OCT-18 10:13 KISKATINAW RIVER (KR)	L2183715-5 Water 18-OCT-18 11:18 PEACE AT POUCE COUPE (PD4)
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	7.9	164	7.7	24.0	8.3
	Conductivity (uS/cm)	211	354	206	429	207
	Hardness (as CaCO3) (mg/L)	101	132	103	223	103
	pH (pH)	8.20	8.23	8.21	8.53	8.21
	Total Suspended Solids (mg/L)	11.2	7.0	11.2	63.6	12.6
	TDS (Calculated) (mg/L)	113	235	113	261	114
	Turbidity (NTU)	6.80	26.6	6.06	119	8.02
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	94.7	117	94.1	214	94.9
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	15.8	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	94.7	117	94.1	230	94.9
	Ammonia, Total (as N) (mg/L)	0.0051	0.0095	0.0110	0.0179	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	3.09	<0.50	1.74	<0.50
	Fluoride (F) (mg/L)	0.046	0.122	0.044	0.087	0.044
	Nitrate and Nitrite (as N) (mg/L)	0.0554	0.0166	0.0532	0.0150	0.0533
	Nitrate (as N) (mg/L)	0.0554	0.0151	0.0532	0.0138	0.0533
	Nitrite (as N) (mg/L)	<0.0010	0.0015	<0.0010	0.0012	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.092	0.649	0.101	0.536	0.105
	Total Nitrogen (mg/L)	0.151	0.605	0.163	0.427	0.155
	Orthophosphate-Dissolved (as P) (mg/L)	0.0028	0.0121	<0.0010	0.0029	<0.0010
	Phosphorus (P)-Total Dissolved (mg/L)	0.0030	0.0241	0.0027	0.0050	0.0025
	Phosphorus (P)-Total (mg/L)	0.0133	0.0626	0.0171	0.109	0.0147
	Silicate (as SiO2) (mg/L)	4.03	2.22	4.26	4.58	4.23
	Sulfate (SO4) (mg/L)	16.6	64.3	16.2	19.7	16.4
	Anion Sum (meq/L)	2.25	3.78	2.22	5.05	2.24
	Cation Sum (meq/L)	2.02	3.91	2.08	4.94	2.06
	Cation - Anion Balance (%)	-5.2	1.7	-3.4	-1.2	-4.3
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.90	21.6	3.14	10.1	3.05
	Total Organic Carbon (mg/L)	3.12	22.0	3.25	12.1	3.38
Total Metals	Aluminum (Al)-Total (mg/L)	0.208	0.929	0.188	2.32	0.198
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	<0.00050	0.00127	<0.00050	0.00190	<0.00050
	Barium (Ba)-Total (mg/L)	0.049	0.088	0.047	0.215	0.048
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00013	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

L2183715 CONTD.... PAGE 3 of 11 01-NOV-18 18:35 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2183715-6 Water 18-OCT-18 11:51 POUCE COUPE (POUCE)	L2183715-7 Water 18-OCT-18 13:29 PEACE AT MANY ISLANDS (PD5)	L2183715-8 Water 18-OCT-18 13:29 DUP1	
Grouping	Analyte				
WATER					
Physical Tests	Colour, True (CU)	43.5	7.7	8.1	
	Conductivity (uS/cm)	882	210	210	
	Hardness (as CaCO3) (mg/L)	364	103	102	
	рН (рН)	8.43	8.22	8.22	
	Total Suspended Solids (mg/L)	7.2	9.2	9.4	
	TDS (Calculated) (mg/L)	582	114	113	
	Turbidity (NTU)	22.1	7.57	6.61	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	199	95.0	93.6	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	10.4	<1.0	<1.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	
	Alkalinity, Total (as CaCO3) (mg/L)	209	95.0	93.6	
	Ammonia, Total (as N) (mg/L)	0.0247	<0.0050	<0.0050	
	Bromide (Br) (mg/L)	DLDS <0.25	<0.050	<0.050	
	Chloride (Cl) (mg/L)	19.1	<0.50	<0.50	
	Fluoride (F) (mg/L)	0.15	0.044	0.045	
	Nitrate and Nitrite (as N) (mg/L)	0.148	0.0520	0.0517	
	Nitrate (as N) (mg/L)	0.148	0.0520	0.0517	
	Nitrite (as N) (mg/L)	DLDS <0.0050	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.812	0.098	0.086	
	Total Nitrogen (mg/L)	0.858	0.144	0.151	
	Orthophosphate-Dissolved (as P) (mg/L)	0.0048	0.0023	0.0019	
	Phosphorus (P)-Total Dissolved (mg/L)	0.0139	0.0092	0.0021	
	Phosphorus (P)-Total (mg/L)	0.0451	0.0197	0.0151	
	Silicate (as SiO2) (mg/L)	<0.50	4.21	4.03	
	Sulfate (SO4) (mg/L)	232	16.9	17.0	
	Anion Sum (meq/L)	9.57	2.26	2.23	
	Cation Sum (meq/L)	9.75	2.06	2.05	
	Cation - Anion Balance (%)	0.9	-4.5	-4.3	
Organic / Inorganic Carbon		19.1	3.22	3.14	
	Total Organic Carbon (mg/L)	19.3	3.24	3.17	
Total Metals	Aluminum (Al)-Total (mg/L)	0.290	0.200	0.199	
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Total (mg/L)	0.00104	<0.00050	<0.00050	
	Barium (Ba)-Total (mg/L)	0.064	0.048	0.049	
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	

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	Sample ID Description Sampled Date Sampled Time Client ID	L2183715-1 Water 18-OCT-18 08:10 PEACE AT BEATTON (PD2)	L2183715-2 Water 18-OCT-18 08:55 BEATTON RIVER (BEA)	L2183715-3 Water 18-OCT-18 09:44 PEACE AT KISKATINAW (PD3)	L2183715-4 Water 18-OCT-18 10:13 KISKATINAW RIVER (KR)	L2183715-5 Water 18-OCT-18 11:18 PEACE AT POUCE COUPE (PD4)
Grouping	Analyte					
WATER						
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.0000299	0.0000570	0.0000320	0.000113	0.0000265
	Calcium (Ca)-Total (mg/L)	28.4	33.6	29.7	60.7	29.2
	Chromium (Cr)-Total (mg/L)	<0.0010	0.0017	<0.0010	0.0036	<0.0010
	Cobalt (Co)-Total (mg/L)	<0.00030	0.00056	<0.00030	0.00158	<0.00030
	Copper (Cu)-Total (mg/L)	<0.0010	0.0027	<0.0010	0.0052	<0.0010
	Iron (Fe)-Total (mg/L)	0.299	2.63	0.258	3.75	0.272
	Lead (Pb)-Total (mg/L)	<0.00050	0.00072	<0.00050	0.00199	<0.00050
	Lithium (Li)-Total (mg/L)	0.0019	0.0081	0.0018	0.0053	0.0018
	Magnesium (Mg)-Total (mg/L)	7.47	10.8	7.34	17.5	7.28
	Manganese (Mn)-Total (mg/L)	0.00647	0.0522	0.00640	0.0685	0.00708
	Mercury (Hg)-Total (ug/L)	0.00118	0.00428	0.00104	0.00720	0.00113
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	0.0010	0.0051	<0.0010	0.0064	0.0011
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	0.000354	0.000244	0.000341	0.000292	0.000335
	Silicon (Si)-Total (mg/L)	2.29	2.92	2.23	5.65	2.18
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	0.000036	<0.000020
	Sodium (Na)-Total (mg/L)	<2.0	26.5	<2.0	9.5	<2.0
	Strontium (Sr)-Total (mg/L)	0.121	0.140	0.114	0.256	0.118
	Thallium (TI)-Total (mg/L)	<0.000010	0.000022	<0.000010	0.000061	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	<0.010	0.026	<0.010	0.021	<0.010
	Uranium (U)-Total (mg/L)	0.00048	0.00095	0.00048	0.00078	0.00049
	Vanadium (V)-Total (mg/L)	0.00106	0.00405	0.00099	0.00882	0.00103
	Zinc (Zn)-Total (mg/L)	<0.0050	0.0070	<0.0050	0.0185	<0.0050
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (AI)-Dissolved (mg/L)	0.0095	0.106	0.0525	0.226	0.0061
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	< 0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	< 0.00050	0.00064	<0.00050	0.00060	<0.00050
	Barium (Ba)-Dissolved (mg/L)	0.043	0.060	0.042	0.170	0.041
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.20	<0.10	<0.10	<0.10	<0.10

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	Sample ID Description Sampled Date Sampled Time Client ID	L2183715-6 Water 18-OCT-18 11:51 POUCE COUPE (POUCE)	L2183715-7 Water 18-OCT-18 13:29 PEACE AT MANY ISLANDS (PD5)	L2183715-8 Water 18-OCT-18 13:29 DUP1	
Grouping	Analyte				
WATER					
Total Metals	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Total (mg/L)	0.0000282	0.0000295	0.0000300	
	Calcium (Ca)-Total (mg/L)	97.2	31.5	29.6	
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	<0.0010	
	Cobalt (Co)-Total (mg/L)	0.00078	<0.00030	<0.00030	
	Copper (Cu)-Total (mg/L)	0.0032	<0.0010	<0.0010	
	Iron (Fe)-Total (mg/L)	0.934	0.304	0.296	
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	
	Lithium (Li)-Total (mg/L)	0.0169	0.0020	0.0020	
	Magnesium (Mg)-Total (mg/L)	31.7	7.41	7.51	
	Manganese (Mn)-Total (mg/L)	0.0385	0.00906	0.00740	
	Mercury (Hg)-Total (ug/L)	0.00296	0.00108	0.00103	
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010	<0.0010	
	Nickel (Ni)-Total (mg/L)	0.0079	0.0012	0.0013	
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	
	Potassium (K)-Total (mg/L)	5.5	<2.0	<2.0	
	Selenium (Se)-Total (mg/L)	0.000357	0.000306	0.000321	
	Silicon (Si)-Total (mg/L)	0.50	2.21	2.22	
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	
	Sodium (Na)-Total (mg/L)	50.6	2.0	2.0	
	Strontium (Sr)-Total (mg/L)	0.355	0.117	0.117	
	Thallium (TI)-Total (mg/L)	0.000014	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010	
	Uranium (U)-Total (mg/L)	0.00225	0.00045	0.00046	
	Vanadium (V)-Total (mg/L)	0.00121	0.00107	0.00111	
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050	<0.0050	
Dissolved Metals	Dissolved MeHg Filtration Location	FIELD	FIELD	FIELD	
	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0840	0.0470	0.0404	
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Dissolved (mg/L)	0.00060	<0.00050	<0.00050	
	Barium (Ba)-Dissolved (mg/L)	0.058	0.043	0.042	
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	

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	Sample ID Description Sampled Date Sampled Time Client ID	L2183715-1 Water 18-OCT-18 08:10 PEACE AT	L2183715-2 Water 18-OCT-18 08:55 BEATTON RIVER	L2183715-3 Water 18-OCT-18 09:44 PEACE AT	L2183715-4 Water 18-OCT-18 10:13 KISKATINAW	L2183715-5 Water 18-OCT-18 11:18 PEACE AT POUCI
0		BEATTON (PD2)	(BEA)	KISKATINAW (PD3)	RIVER (KR)	COUPE (PD4)
Grouping	Analyte					
WATER						
Dissolved Metals	Cadmium (Cd)-Dissolved (mg/L)	0.0000111	0.0000244	0.0000174	0.0000364	0.0000145
	Calcium (Ca)-Dissolved (mg/L)	28.1	34.8	29.5	62.4	29.6
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	0.00040	<0.00030
	Copper (Cu)-Dissolved (mg/L)	<0.0010	0.0015	<0.0010	0.0020	<0.0010
	Iron (Fe)-Dissolved (mg/L)	<0.030	0.903	0.065	0.535	<0.030
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	0.0019	0.0079	0.0018	0.0037	0.0018
	Magnesium (Mg)-Dissolved (mg/L)	7.52	10.9	7.23	16.2	7.06
	Manganese (Mn)-Dissolved (mg/L)	0.00139	0.0300	0.00315	0.0209	0.00104
	Mercury (Hg)-Dissolved (ug/L)	<0.00050	0.00222	0.00064	0.00283	<0.00050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Dissolved (mg/L)	<0.0010	0.0039	<0.0010	0.0024	<0.0010
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Dissolved (mg/L)	0.000327	0.000184	0.000315	0.000141	0.000358
	Silicon (Si)-Dissolved (mg/L)	1.75	1.02	1.79	2.22	1.74
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Dissolved (mg/L)	<2.0	27.9	<2.0	9.9	<2.0
	Strontium (Sr)-Dissolved (mg/L)	0.114	0.132	0.114	0.243	0.116
	Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00046	0.00085	0.00045	0.00070	0.00048
	Vanadium (V)-Dissolved (mg/L)	<0.00040	0.00052	<0.00040	0.00095	<0.00040
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	0.0056	<0.00050
Speciated Metals	Methylmercury (as MeHg)-Dissolved (ug/L)	0.000021	0.000225	0.000022	0.000045	<0.000020
	Methylmercury (as MeHg)-Total (ug/L)	0.000021	0.000223	0.000022	0.000068	<0.000020
	······································	0.000021	0.000251	0.000024	0.00008	<0.000020

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WATER		Sample ID Description Sampled Date Sampled Time Client ID	L2183715-6 Water 18-OCT-18 11:51 POUCE COUPE (POUCE)	L2183715-7 Water 18-OCT-18 13:29 PEACE AT MANY ISLANDS (PD5)	L2183715-8 Water 18-OCT-18 13:29 DUP1	
Dissolved Metals Cadmium (Cd)-Dissolved (mg/L) Calcium (Ca)-Dissolved (mg/L) 0.0000158 94.1 0.0000210 29.2 0.0000221 Chromium (Cr)-Dissolved (mg/L) Cobalt (Co)-Dissolved (mg/L) <0.010 <0.0010 <0.0010 Cobalt (Co)-Dissolved (mg/L) 0.00050 <0.00030 <0.00030 Copper (Cu)-Dissolved (mg/L) 0.004 0.057 0.056 Lead (Pb)-Dissolved (mg/L) 0.0161 0.0018 0.0018 Magnesium (Mg)-Dissolved (mg/L) 0.0161 0.0018 0.00050 Lithium (Li)-Dissolved (mg/L) 0.0161 0.0018 0.00050 Magnesium (Mg)-Dissolved (mg/L) 0.0181 0.0018 0.00050 Magnesium (Mg)-Dissolved (mg/L) 0.0181 0.00050 0.00050 Molybdenum (Mo)-Dissolved (mg/L) 0.018 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) 0.00069 <0.0010 <0.0010 Phosphorus (P)-Dissolved (mg/L) 0.000372 0.000319 0.000322 Silicon (Si)-Dissolved (mg/L) 0.169 1.79 1.82 Silicon (Si)-Dissolved (mg/L) <0.00020 <0.000020 <	Grouping	Analyte				
Calcium (Ca)-Dissolved (mg/L) 94.1 29.2 28.9 Chromium (Cr)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Cobalt (Co)-Dissolved (mg/L) 0.0055 <0.0010 <0.0030 Copper (Cu)-Dissolved (mg/L) 0.0025 <0.0010 <0.0010 Iron (Fe)-Dissolved (mg/L) 0.0025 <0.0010 <0.0010 Iron (Fe)-Dissolved (mg/L) 0.094 0.057 0.056 Lead (Pb)-Dissolved (mg/L) <0.0161 0.0018 0.0018 Magnesium (Mg)-Dissolved (mg/L) 0.1611 0.0018 0.00252 Manganese (Mn)-Dissolved (mg/L) 0.0197 0.00252 0.00246 Mercury (Hg)-Dissolved (mg/L) 0.0114 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) 0.0069 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) 0.0069 <0.0010 <0.0010 Phosphorus (P)-Dissolved (mg/L) 6.2 <2.0 <2.0 Silicon (Si)-Dissolved (mg/L) 0.169 1.79 1.82 Siliver (Ag)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) <0.352 0	WATER					
Calcium (Ca)-Dissolved (mg/L) 94.1 29.2 28.9 Chromium (Cr)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Cobalt (Co)-Dissolved (mg/L) 0.00050 <0.00300 <0.00301 Copper (Cu)-Dissolved (mg/L) 0.0025 <0.0010 <0.0010 Iron (Fe)-Dissolved (mg/L) 0.094 0.057 0.056 Lead (Pb)-Dissolved (mg/L) <0.00161 0.0018 <0.0018 Magnesium (Mg)-Dissolved (mg/L) 31.3 7.25 7.26 Manganese (Mn)-Dissolved (mg/L) 0.0197 0.00252 0.00260 Morcury (Hg)-Dissolved (mg/L) 0.00148 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0014 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Phosphorus (P)-Dissolved (mg/L) <0.00372 0.000319 0.000332 Silicon (Si)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Silicon (Si)-Dissolved (mg/L) <0.352 0.115 0.113 Thallium (Th)-Dissolved (mg/L) <0.00020 <	Dissolved Metals	Cadmium (Cd)-Dissolved (mg/L)	0.0000158	0.0000210	0.0000221	
Chromium (Cr)-Dissolved (mg/L) <0.0010		Calcium (Ca)-Dissolved (mg/L)				
Cobalt (Co)-Dissolved (mg/L) 0.00050 <0.0030		Chromium (Cr)-Dissolved (mg/L)				
Copper (Cu)-Dissolved (mg/L) 0.0025 <0.0010		Cobalt (Co)-Dissolved (mg/L)				
Lead (Pb)-Dissolved (mg/L) c.0.004 0.007 c.0.0050 Lithium (Li)-Dissolved (mg/L) 0.0161 0.0018 0.0018 Magnesium (Mg)-Dissolved (mg/L) 31.3 7.25 7.26 Manganese (Mn)-Dissolved (mg/L) 0.0148 c0.00050 c0.00246 Mercury (Hg)-Dissolved (mg/L) 0.0197 0.00252 0.00246 Mercury (Hg)-Dissolved (mg/L) 0.0010 c0.0010 c0.0010 Nickel (Ni)-Dissolved (mg/L) 0.0069 c0.0010 c0.0010 Nickel (Ni)-Dissolved (mg/L) c0.30 c0.30 c0.30 Potassium (K)-Dissolved (mg/L) c0.000372 0.000319 0.000332 Silicon (Si)-Dissolved (mg/L) c0.00020 c0.00020 c0.00020 Selenium (Se)-Dissolved (mg/L) c0.00020 c0.00020 c0.00020 Sodium (Na)-Dissolved (mg/L) c0.00020 c0.00020 c0.00020 Sodium (Na)-Dissolved (mg/L) c0.00020 c0.00020 c0.00020 Sodium (Na)-Dissolved (mg/L) c0.00050 c0.00050 c0.00050 Thallium (TI)-Dissolved (mg/L) c0.00		Copper (Cu)-Dissolved (mg/L)				
Lithium (Li)-Dissolved (mg/L) 0.0161 0.0018 0.0018 Magnesium (Mg)-Dissolved (mg/L) 31.3 7.25 7.26 Manganese (Mn)-Dissolved (mg/L) 0.0197 0.00252 0.00246 Mercury (Hg)-Dissolved (mg/L) 0.00148 <0.0010 <0.0010 Molybdenum (Mo)-Dissolved (mg/L) 0.00148 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) 0.0069 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0069 <0.0010 <0.0010 Phosphorus (P)-Dissolved (mg/L) <0.000372 0.000319 0.000332 Selenium (Se)-Dissolved (mg/L) <0.169 1.79 1.82 Silicon (Si)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) <53.0 <2.0 <2.0 Soliver (Ag)-Dissolved (mg/L) <0.3022 <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) <3.3 <2.0 <2.0 Strontium (Sr)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) <0.00050 <0.00050 <0.00020 Thallium (Ti)-Dissolved (mg/L)		Iron (Fe)-Dissolved (mg/L)	0.094	0.057	0.056	
Lithium (Li)-Dissolved (mg/L) 0.0161 0.0018 0.0018 Magnesium (Mg)-Dissolved (mg/L) 31.3 7.25 7.26 Manganese (Mn)-Dissolved (mg/L) 0.0197 0.00252 0.00246 Mercury (Hg)-Dissolved (mg/L) 0.00148 <0.0050 0.00050 Molybdenum (Mo)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.30 <0.30 <0.30 Phosphorus (P)-Dissolved (mg/L) <0.00372 0.000319 <0.00032 Silicon (Si)-Dissolved (mg/L) <0.00020 <0.000020 <0.00020 Silicon (Si)-Dissolved (mg/L) <0.352 0.115 0.113 Silicon (Si)-Dissolved (mg/L) <0.352 0.115 0.113 Silicon (Si)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) <0.352 0.115 0.113 Thallium (TI)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Titanium (TI)-Dissolved (mg/L) <0.0010 <0.00050 <0.00050 Titanium (TI)-Dissolved (mg/L) <0.010		Lead (Pb)-Dissolved (mg/L)				
Manganese (Mn)-Dissolved (mg/L) 0.0197 0.00252 0.00246 Mercury (Hg)-Dissolved (ug/L) 0.00148 <0.00050 0.00050 Molybdenum (Mo)-Dissolved (mg/L) <0.0010 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0069 <0.0010 <0.0010 Nickel (Ni)-Dissolved (mg/L) <0.0069 <0.0010 <0.0010 Phosphorus (P)-Dissolved (mg/L) <0.30 <0.30 <0.30 Potassium (K)-Dissolved (mg/L) <0.000372 0.000319 0.000332 Silicon (Si)-Dissolved (mg/L) <0.169 1.79 1.82 Silver (Ag)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) <3.30 <2.0 <2.0 Silver (Ag)-Dissolved (mg/L) <3.0 <2.0 <2.0 Sodium (Na)-Dissolved (mg/L) <3.0 <2.0 <0.00020 Sodium (Na)-Dissolved (mg/L) <3.52 0.115 0.113 Thallium (TI)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Tin (Sn)-Dissolved (mg/L) <0.010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) <0.010		Lithium (Li)-Dissolved (mg/L)		0.0018		
Mercury (Hg)-Dissolved (ug/L) 0.00148 <0.0010		Magnesium (Mg)-Dissolved (mg/L)	31.3	7.25	7.26	
Molybdenum (Mo)-Dissolved (mg/L)		Manganese (Mn)-Dissolved (mg/L)	0.0197	0.00252	0.00246	
Nickel (Ni)-Dissolved (mg/L) 0.0069 <0.0010 <0.0010 Phosphorus (P)-Dissolved (mg/L) <0.30 <0.30 <0.30 Potassium (K)-Dissolved (mg/L) 6.2 <2.0 <2.0 Selenium (Se)-Dissolved (mg/L) 0.000372 0.000319 0.000332 Silicon (Si)-Dissolved (mg/L) 0.169 1.79 1.82 Silver (Ag)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) 53.0 <2.0 <2.0 Strontium (Sr)-Dissolved (mg/L) 0.352 0.115 0.113 Thallium (Tl)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Tin (Sn)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Titanium (Ti)-Dissolved (mg/L) <0.010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) <0.0025 0.00047 0.00048 Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050		Mercury (Hg)-Dissolved (ug/L)	0.00148	<0.00050	0.00050	
Phosphorus (P)-Dissolved (mg/L) <0.30 <0.30 <0.30 Potassium (K)-Dissolved (mg/L) 6.2 <2.0 <2.0 Selenium (Se)-Dissolved (mg/L) 0.000372 0.000319 0.000332 Silicon (Si)-Dissolved (mg/L) 0.169 1.79 1.82 Silver (Ag)-Dissolved (mg/L) <0.00020 <0.000020 <0.000020 Sodium (Na)-Dissolved (mg/L) 53.0 <2.0 <2.0 Strontium (Sr)-Dissolved (mg/L) 0.352 0.115 0.113 Thallium (TI)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Tin (Sn)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Titanium (Ti)-Dissolved (mg/L) <0.010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) <0.0025 0.00047 0.00048 Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050		Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	
Potassium (K)-Dissolved (mg/L) 6.2 <2.0		Nickel (Ni)-Dissolved (mg/L)	0.0069	<0.0010	<0.0010	
Selenium (Se)-Dissolved (mg/L) 0.000372 0.000319 0.000332 Silicon (Si)-Dissolved (mg/L) 0.169 1.79 1.82 Silver (Ag)-Dissolved (mg/L) <0.00020 <0.000020 <0.000020 Sodium (Na)-Dissolved (mg/L) 53.0 <2.0 <2.0 Strontium (Sr)-Dissolved (mg/L) 0.352 0.115 0.113 Thallium (TI)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Tin (Sn)-Dissolved (mg/L) <0.0010 <0.00050 <0.00050 Titanium (Ti)-Dissolved (mg/L) <0.0010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) <0.0025 0.00047 0.00048 Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050		Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	
Silicon (Si)-Dissolved (mg/L) 0.169 1.79 1.82 Silver (Ag)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Sodium (Na)-Dissolved (mg/L) 53.0 <2.0 <2.0 Strontium (Sr)-Dissolved (mg/L) 0.352 0.115 0.113 Thallium (Tl)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Tin (Sn)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Titanium (Ti)-Dissolved (mg/L) <0.010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) <0.0025 0.00047 0.00048 Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050		Potassium (K)-Dissolved (mg/L)	6.2	<2.0	<2.0	
Silver (Ag)-Dissolved (mg/L) <0.000020 <0.000020 <0.000020 Sodium (Na)-Dissolved (mg/L) 53.0 <2.0 <2.0 Strontium (Sr)-Dissolved (mg/L) 0.352 0.115 0.113 Thallium (Tl)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Tin (Sn)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Titanium (Ti)-Dissolved (mg/L) <0.010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) 0.00225 0.00047 0.00048 Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050		Selenium (Se)-Dissolved (mg/L)	0.000372	0.000319	0.000332	
Sodium (Na)-Dissolved (mg/L) 53.0 <2.0 <2.0 Strontium (Sr)-Dissolved (mg/L) 0.352 0.115 0.113 Thallium (Tl)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Tin (Sn)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Titanium (Ti)-Dissolved (mg/L) <0.010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) 0.00225 0.00047 0.00048 Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050		Silicon (Si)-Dissolved (mg/L)	0.169	1.79	1.82	
Strontium (Sr)-Dissolved (mg/L) 0.352 0.115 0.113 Thallium (Tl)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Tin (Sn)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Titanium (Ti)-Dissolved (mg/L) <0.010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) 0.00225 0.00047 0.00048 Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050		Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	
Thallium (TI)-Dissolved (mg/L) <0.00020 <0.00020 <0.00020 Tin (Sn)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Titanium (Ti)-Dissolved (mg/L) <0.010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) 0.00225 0.00047 0.00048 Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050		Sodium (Na)-Dissolved (mg/L)	53.0	<2.0	<2.0	
Tin (Sn)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050 Titanium (Ti)-Dissolved (mg/L) <0.010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) 0.00225 0.00047 0.00048 Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050		Strontium (Sr)-Dissolved (mg/L)	0.352	0.115	0.113	
Titanium (Ti)-Dissolved (mg/L) <0.010 <0.010 <0.010 Uranium (U)-Dissolved (mg/L) 0.00225 0.00047 0.00048 Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050		Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	
Uranium (U)-Dissolved (mg/L) 0.00225 0.00047 0.00048 Vanadium (V)-Dissolved (mg/L) <0.00050 <0.00050 <0.00050		Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	
Vanadium (V)-Dissolved (mg/L) <0.00050		Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	
			0.00225	0.00047	0.00048	
Zinc (Zn)-Dissolved (mg/L) <0.0050 <0.0050 <0.0050			<0.00050	<0.00050	<0.00050	
			<0.0050	<0.0050	<0.0050	
Speciated Metals Methylmercury (as MeHg)-Dissolved (ug/L) 0.000082 <0.000020	Speciated Metals		0.000082	<0.000020	<0.000020	
Methylmercury (as MeHg)-Total (ug/L) 0.000120 <0.000020		Methylmercury (as MeHg)-Total (ug/L)	0.000120	<0.000020	<0.000020	

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QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Methylmercury (as MeHg)-Dissolved	MB-LOR	L2183715-5, -7, -8
Method Blank	Methylmercury (as MeHg)-Total	MB-LOR	L2183715-5, -7, -8
Matrix Spike	Dissolved Organic Carbon	MS-B	L2183715-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Total Organic Carbon	MS-B	L2183715-1, -3, -4, -5, -6, -7, -8
Matrix Spike	Total Organic Carbon	MS-B	L2183715-1, -3, -4, -5, -6, -7, -8
Matrix Spike	Aluminum (AI)-Dissolved	MS-B	L2183715-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2183715-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2183715-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2183715-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2183715-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2183715-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2183715-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Aluminum (AI)-Total	MS-B	L2183715-6, -7, -8
Matrix Spike	Barium (Ba)-Total	MS-B	L2183715-1, -2, -3, -4, -5
Matrix Spike	Barium (Ba)-Total	MS-B	L2183715-6, -7, -8
Matrix Spike	Calcium (Ca)-Total	MS-B	L2183715-1, -2, -3, -4, -5
Matrix Spike	Calcium (Ca)-Total	MS-B	L2183715-6, -7, -8
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2183715-1, -2, -3, -4, -5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2183715-6, -7, -8
Matrix Spike	Manganese (Mn)-Total	MS-B	L2183715-6, -7, -8
Matrix Spike	Potassium (K)-Total	MS-B	L2183715-6, -7, -8
Matrix Spike	Sodium (Na)-Total	MS-B	L2183715-1, -2, -3, -4, -5
Matrix Spike	Sodium (Na)-Total	MS-B	L2183715-6, -7, -8
Matrix Spike	Strontium (Sr)-Total	MS-B	L2183715-1, -2, -3, -4, -5
Matrix Spike	Strontium (Sr)-Total	MS-B	L2183715-6, -7, -8
Matrix Spike	Silicate (as SiO2)	MS-B	L2183715-1, -2, -3, -4, -5, -6, -7, -8

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
		edures adapted from APHA Method 2320 "Alkalinity te and hydroxide alkalinity are calculated from phe	/". Total alkalinity is determined by potentiometric titration to a nolphthalein alkalinity and total alkalinity values.
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) i	s a calculated	d parameter. Nitrate and Nitrite (as N) = Nitrite (as	N) + Nitrate (as N).
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analy	yzed by Ion C	Chromatography with conductivity and/or UV detect	ion.
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B
	01	edures adapted from APHA Method 5310 "Total Or ugh a 0.45 micron membrane filter prior to analysis	ganic Carbon (TOC)". Dissolved carbon (DOC) fractions are s.
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried ou	ut using proce	edures adapted from APHA Method 5310 "Total Or	ganic Carbon (TOC)".
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analy	yzed by Ion C	Chromatography with conductivity and/or UV detect	ion.
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended. APHA 2510 Auto, Conduc, FC-PCT-VA Water Conductivity (Automated) This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode. **EC-SCREEN-VA** Water Conductivity Screen (Internal Use Only) APHA 2510 Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc. Fluoride in Water by IC EPA 300.1 (mod) F-IC-N-VA Water Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection. HARDNESS-CALC-VA Water Hardness **APHA 2340B** Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation. HG-D-U-CVAF-VA Diss. Mercury in Water by CVAFS (Ultra) APHA 3030 B / EPA 1631 REV. E Water This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure may involve preliminary sample treatment by filtration (APHA 3030B) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry. Total Mercury in Water by CVAFS (Ultra) EPA 1631 REV. E HG-T-U-CVAF-VA Water This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry. **IONBALANCE-VA** Water Ion Balance Calculation APHA 1030F Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero. Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as: Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum] Diss. Methylmercury in Water by GCAFS EPA 1630 **MEHG-D-GCAF-VA** Water This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. The separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg". EPA 1630 Total Methylmercury in Water by GCAFS **MEHG-T-GCAF-VA** Water This method follows Method 1630 of the US EPA. Samples are distilled under an inert gas flow to isolate methylmercury and minimize matrix interferences. The distillate is analyzed by aqueous phase ethylation, purge and trap, desorption and GC separation. THe separated species are then pyrolized to elemental Hg and quantified by cold vapour atomic flourescence spectroscopy. Results are reported "as MeHg". Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod) **MET-D-CCMS-VA** Water Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. **MET-T-CCMS-VA** Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod) Water Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method. Total Nitrogen in water by Colour APHA4500-P(J)/NEMI9171/USGS03-4174 N-T-COL-VA Water This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735. NH3-F-VA Ammonia in Water by Fluorescence J. ENVIRON, MONIT., 2005, 7, 37-42, RSC Water This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

al.

	Water	Nitrite in Water by IC (Low Lovel)	EDA 200 1 (mod)
NO2-L-IC-N-VA		Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
morganic anions are analyz	ed by ion Cr	aromatography with conductivity and/or UV detection.	
NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyz	ed by Ion Ch	nromatography with conductivity and/or UV detection.	
P-T-PRES-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorus
after persulphate digestion	of the sampl solved solids	lures adapted from APHA Method 4500-P "Phosphorus e. (i.e. seawaters, brackish waters) may produce a negati	
Arsenic (5+), at elevated lev	vels, is a pos	itive interference on colourimetric phosphate analysis.	
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous
colourimetrically after persu	Iphate diges solved solids	lures adapted from APHA Method 4500-P "Phosphorus tion of a sample that has been lab or field filtered throug (i.e. seawaters, brackish waters) may produce a negati	gh a 0.45 micron membrane filter.
Arsenic (5+), at elevated lev	vels, is a pos	itive interference on colourimetric phosphate analysis.	
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out electrode	using procec	lures adapted from APHA Method 4500-H "pH Value". 1	The pH is determined in the laboratory using a pH
It is recommended that this	analysis be	conducted in the field.	
PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus
colourimetrically on a samp Samples with very high diss available for these types of	le that has b solved solids samples.	lures adapted from APHA Method 4500-P "Phosphorus een lab or field filtered through a 0.45 micron membran (i.e. seawaters, brackish waters) may produce a negati	e filter.
		itive interference on colourimetric phosphate analysis.	
SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SiO2 E.
		lures adapted from APHA Method 4500-SiO2 E. "Silica purimetric method. Arsenic (5+) above 100 mg/L is a neg	
SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyz	ed by Ion Ch	rromatography with conductivity and/or UV detection.	
TDS-CALC-VA	Water	TDS (Calculated)	APHA 1030E (20TH EDITION)
This analysis is carried out The Total Dissolved Solids	using proced result is cald	lures adapted from APHA 1030E "Checking Correctnes ulated from measured concentrations of anions and cat	s of Analyses". tions in the sample.
TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
		lures adapted from APHA Method 4500-Norg D. "Block stion followed by Flow-injection analysis with fluorescen	
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
Solids (TSS) are determine	d by filtering gh dissolved	lures adapted from APHA Method 2540 "Solids". Solids a sample through a glass fibre filter, TSS is determined solid content (i.e. seawaters, brackish waters) may pro- f samples.	by drying the filter at 104 degrees celsius.
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out	using proced	lures adapted from APHA Method 2130 "Turbidity". Turl	bidity is determined by the nephelometric method.
** ALS test methods may inco	rporate mod	fications from specified reference methods to improve p	performance.
The last two letters of the ab	ove test code	e(s) indicate the laboratory that performed analytical and	alysis for that test. Refer to the list below:
Laboratory Definition Code	Labora	tory Location	
VA	ALS EN	IVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA	A, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

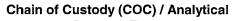
< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION. Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



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Request Form



COC Number: 14 -

Page <u>1</u> of <u>1</u>

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Contact:	Lucas Hennecker		Quality Control	Quality Control (QC) Report with Report 🔽 Yes 🗌 No					P 🛄 Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT										
Address:	Suite 1000, 10th Floor, 885 Dunsmuir Stre	eet,	Criteria on Repo	Criteria on Report - provide details below if box checked				E Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT											
	Vancouver, BC V6C 1N5		Select Distribut	elect Distribution: 🛛 EMAIL 🗍 MAIL 🗍 FAX				E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge											
Phone:	1 (604) 313-9067		Email 1 or Fax	nail 1 or Fax Lucas.Hennecker@tetratech.com (see notes)				cify Date Required for E2,E or P:											
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ALS Lab Wo	rk Order # (lab use only)	5715	ALS Contact:	Brent Mack	Sampler:	ennecther	Alk-SpeciesAnior	Color-True, EC, pH, TSS, TDS-Calc	Silicate.	TP, TDP, TKN, NH3		als (CC	Dissolved Metals (CCME+ICP+Hardness)#	Total Hg (ultra low detection limit)	Dissolved Hg (ultra low detection limit)	Total MeHg (ultra low detection limit)			Ž
ALC Commis #	Sample Identification	-		Date	Time		peci	Ę	Furbidity,	Ľ		Total Metals		ĥ	lved	Met			
ALS Sample # (lab use only)	(This description will		\ \	(dd-mmm-yy)	(hh:mm)	Sample Type	S-X	olor	urbį	о́с	DOC	otal	issc	otal	isso	otal	1		
(Peace at Beatton (PD2)			1.1	8:10	14/-4	∢ R		7	6	R	6		1	8	\vec{R}		+	9
· · · · · ·	Beatton River (BEA)			18-00t-18	8:55	Water Water	R	$\frac{1}{2}$	R	R	R	R	K R	R		RR	-	+	-á
	Peace at Kiskatinaw (PD3)	<u>F</u>			9.44	Water	R	R	R	R	R	R	R	Â	\hat{k}	RA		+	9
	Kiskatinaw River (KR)				10:13	Water	R	R	R	Ŕ	Ŕ	R	R	R	RI	RI		-	9
	Peace at Pouce Coupe (PD4)		r ISS		11:18	Water	R	Ŕ	A	K	R	R	K	Ŕ	K	RK			9
	Pouce Coupe (POUCE)		i Qi -		11:51	Water	R	R	K	R	R	R	R	R	R	R j			9
	Peace at Many Islands (PD5)		ğ		13:29	Water	R	R	R	R	K	R	R	R	R	RIA	2		9
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Drinking) Water (DW) Samples ¹ (client use)	Spr		ify Criteria to add o	n report (client U	ise)	Froz	en						bserva	_	<u>`</u>		No	
Are samples tak	en from a Regulated DW System?	Please use criteria: BC				idelines for	ice p	acks	Yes	\boxtimes	No		Custo	ody sea	al inta	ct Y	es 🗖	No	
	es 🔽 No	freshwater aquatic life.	•		ter. Please add			ing Initi		図		_							
-	human drinking water use?	nich.burnett@bchydro.c	om to distribution	i list for results .			INI	TIAL CO	OLER	TEMPE	RATURE	ES ⁰C		FI	NAL CO	DOLER	TEMPERA	ATURES	.°C
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	K PAGE FOR ALS LOCATIONS AND SAMPLI			<u></u>	TE - LABORATOR	RY COPY YE	low	- CLIÉN	T COF	γ	001		- 201		A-FM-03264	e v09 Front/0-	January 2014	<u> </u>	<u> </u>

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.
1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. **ATTN: Lucas Hennecker** 1000-885 Dunsmuir Street, 10th Floor Vancouver BC V6E 1N5

Date Received: 19-OCT-18 Report Date: 29-OCT-18 13:47 (MT) Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2184475 Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

NOT SUBMITTED VENW03060 TASK 002

Brent Mack, B.Sc. Account Manager

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L2184475 CONTD.... PAGE 2 of 5 29-OCT-18 13:47 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2184475-1 Soil 19-OCT-18 10:00 WILLISTON RESERVOIR (W1)	L2184475-2 Soil 19-OCT-18 13:00 DINOSAUR RESERVOIR (D1)	L2184475-3 Soil 19-OCT-18 10:00 DUPLICATE 2 (DUP 2)	L2184475-4 Soil 19-OCT-18 15:05 PEACE CANYON (PC1)	L2184475-5 Soil 19-OCT-18 15:56 UPPER SITE C RESERVOIR (PR1)
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	8.54	8.14	8.57	8.68	7.75
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	<1.0	<1.0	27.2
	% Sand (2.00mm - 1.00mm) (%)	<1.0	<1.0	<1.0	10.4	6.7
	% Sand (1.00mm - 0.50mm) (%)	<1.0	<1.0	<1.0	11.9	4.4
	% Sand (0.50mm - 0.25mm) (%)	<1.0	<1.0	<1.0	19.0	7.3
	% Sand (0.25mm - 0.125mm) (%)	<1.0	5.1	<1.0	18.8	12.0
	% Sand (0.125mm - 0.063mm) (%)	28.3	13.2	27.1	12.4	9.4
	% Silt (0.063mm - 0.0312mm) (%)	36.0	31.9	36.5	11.0	14.0
	% Silt (0.0312mm - 0.004mm) (%)	32.2	38.8	32.8	11.9	15.9
	% Clay (<4um) (%)	2.5	10.1	2.7	4.6	3.1
	Texture	Silt loam	Silt loam	Silt loam	Loamy sand	Sandy loam
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (%)	0.023	0.104	<0.020	0.073	0.174
Anions and Nutrients	Total Nitrogen by LECO (%)	0.079	0.120	0.030	0.083	0.185
Organic / Inorganic Carbon	Total Organic Carbon (%)	4.2	1.73	1.39	1.30	3.07
Plant Available Nutrients	Available Ammonium-N (mg/kg)	<1.0	1.6	<1.0	2.1	3.7 DLM
	Nitrate+Nitrite-N (mg/kg)	<2.0	<2.0	<2.0	<2.0	3.0 DLM
	Nitrate-N (mg/kg)	<2.0	<2.0	<2.0	<2.0	3.0
	Nitrite-N (mg/kg)	<0.40	<0.40	<0.40	<0.40	<1.2 DLM
	Available Phosphate-P (mg/kg)	<2.0	<2.0	<2.0	<2.0	3.6
Metals	Aluminum (Al) (mg/kg)	5300	7590	5650	7210	6110
	Antimony (Sb) (mg/kg)	0.73	1.10	0.72	0.52	0.70
	Arsenic (As) (mg/kg)	4.39	7.20	4.70	6.15	6.76
	Barium (Ba) (mg/kg)	96.9	461	105	278	169
	Beryllium (Be) (mg/kg)	0.20	0.39	0.19	0.34	0.29
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	<5.0	7.6	<5.0	6.1	6.7
	Cadmium (Cd) (mg/kg)	0.882	0.963	0.888	0.588	0.822
	Calcium (Ca) (mg/kg)	67200	37000	68300	41100	25800
	Chromium (Cr) (mg/kg)	17.1	18.1	18.3	26.4	16.6
	Cobalt (Co) (mg/kg)	5.59	6.98	5.74	6.50	5.60
	Copper (Cu) (mg/kg)	11.8	20.6	11.9	16.9	14.0
	Iron (Fe) (mg/kg)	14600	16400	14600	22000	17400
	Lead (Pb) (mg/kg)	5.88	9.63	5.84	9.07	7.53
	Lithium (Li) (mg/kg)	7.5	9.2	7.6	10.4	7.6
	Magnesium (Mg) (mg/kg)	18300	10700	19700	9300	10300

L2184475 CONTD.... PAGE 3 of 5 29-OCT-18 13:47 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2184475-1 Soil 19-OCT-18 10:00 WILLISTON RESERVOIR (W1)	L2184475-2 Soil 19-OCT-18 13:00 DINOSAUR RESERVOIR (D1)	L2184475-3 Soil 19-OCT-18 10:00 DUPLICATE 2 (DUP 2)	L2184475-4 Soil 19-OCT-18 15:05 PEACE CANYON (PC1)	L2184475-5 Soil 19-OCT-18 15:56 UPPER SITE C RESERVOIR (PR1
Grouping	Analyte						
SOIL							
Metals	Manganese (Mn) (mg/kg)		306	312	314	261	259
	Mercury (Hg) (mg/kg)		0.0295	0.0519	0.0181	0.0405	0.0534
	Molybdenum (Mo) (mg/kg)		1.22	1.36	1.15	0.84	1.16
	Nickel (Ni) (mg/kg)		18.1	23.8	18.6	20.8	21.9
	Phosphorus (P) (mg/kg)		894	809	881	781	910
	Potassium (K) (mg/kg)		550	1490	630	1100	1000
	Selenium (Se) (mg/kg)		0.26	0.53	0.20	0.33	0.65
	Silver (Ag) (mg/kg)		<0.10	0.28	<0.10	0.15	0.16
	Sodium (Na) (mg/kg)		91	109	93	112	85
	Strontium (Sr) (mg/kg)		123	84.8	126	119	59.0
	Sulfur (S) (mg/kg)		<1000	<1000	<1000	<1000	<1000
	Thallium (TI) (mg/kg)		0.131	0.202	0.130	0.110	0.146
	Tin (Sn) (mg/kg)		<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)		298	96.7	338	159	133
	Tungsten (W) (mg/kg)		<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)		0.814	0.778	0.853	0.615	0.837
	Vanadium (V) (mg/kg)		36.3	41.1	38.6	52.0	35.9
	Zinc (Zn) (mg/kg)		48.7	77.9	49.6	77.8	66.5
	Zirconium (Zr) (mg/kg)		3.6	1.8	3.7	2.0	<1.0

L2184475 CONTD.... PAGE 4 of 5 29-OCT-18 13:47 (MT) Version: FINAL

QC Samples with Qualifiers & Comments:

Duplicate	tion	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate		Mercury (Hg)	DUP-H	L2184475-1, -2, -3, -4, -5
Qualifiers for Inc	dividual Parameters	s Listed:		
Qualifier	Description			
DLM	Detection Limit Adju	sted due to sample matrix effects (e.g. chemical interfere	nce, colour, turbidity).
DUP-H	Duplicate results out	side ALS DQO, due to sample hete	erogeneity.	
est Method Ref	erences:			
ALS Test Code	Matrix	Test Description		Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil		CSSS (2008) P216-217
		6	in the soil. The pH of	the resulting solution is measured and compared
		o weight of carbonate.		
-TOC-CALC-SK	Soil	Total Organic Carbon Calculati	on	CSSS (2008) 21.2
Total Organic Ca	rbon (TOC) is calcul	ated by the difference between tota	I carbon (TC) and tota	I inorganic carbon. (TIC)
-TOT-LECO-SK	Soil	Total Carbon by combustion m	ethod	CSSS (2008) 21.2
The sample is igr	nited in a combustior	n analyzer where carbon in the redu	ced CO2 gas is deter	mined using a thermal conductivity detector.
IG-200.2-CVAF-V	/A Soil	Mercury in Soil by CVAAS		EPA 200.2/1631E (mod)
			by CVAAS analvsis.	This method is fully compliant with the BC SALM strong
	etals digestion meth		,	
C-CACO3-CALC-	SK Soil	Inorganic Carbon as CaCO3 Ec	quivalent	Calculation
IET-200.2-CCMS		Metals in Soil by CRC ICPMS		EPA 200.2/6020A (mod) e <2mm fraction are solubilized by heated digestion with
), including Al, Ba, Be, Cr, S, Sr, Ti, I2S) may be excluded if lost during		emental Sulfur may be poorly recovered by this method. digestion.
I-TOT-LECO-SK	Soil	Total Nitrogen by combustion n	nethod	CSSS (2008) 22.4
The sample is igr	nited in a combustion	n analyzer where nitrogen in the red	luced nitrous oxide ga	s is determined using a thermal conductivity detector.
I-TOTKJ-COL-SK	K Soil	Total Kjeldahl Nitrogen		CSSS (2008) 22.2.3
	ed with sulfuric acid	in the presence of CuSO4 and K2S	O4 catalysts. Ammon	is in the sail extract is determined colrimetrically at 660
nm. I2/N3-AVAIL-SK	Soil	Nitrate, Nitrite and Nitrate+Nitr	ite-N	APHA 4500 NO3F
I2/N3-AVAIL-SK Available Nitrate passage of the sa sulfanilamide follo measured at colo column.	and Nitrite are extrac ample through a cop owed by coupling wit primetrically at 520nn	cted from the soil using a dilute calc perized cadmium column. The nitr h N-(1-naphthyl) ethylenediamine c n. Nitrite is determined on the same	ium chloride solution. ite (reduced nitrate pl lihydrochloride. The r e extract by following t	
I2/N3-AVAIL-SK Available Nitrate passage of the sa sulfanilamide follo measured at colo column. Reference: Reco	and Nitrite are extract ample through a cop owed by coupling wit primetrically at 520nn mmended Methods of	cted from the soil using a dilute calc perized cadmium column. The nitr h N-(1-naphthyl) ethylenediamine c n. Nitrite is determined on the sam of Soil Analysis for Canadian Prairie	ium chloride solution. ite (reduced nitrate pl lihydrochloride. The r e extract by following t	APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium berta Agriculture (1988) p. 19 and 28
I2/N3-AVAIL-SK Available Nitrate passage of the s sulfanilamide follo measured at colo column. Reference: Reco IH4-AVAIL-SK Ammonium (NH4	and Nitrite are extract ample through a cop owed by coupling wit orimetrically at 520nn mmended Methods of Soil 4-N) is extracted from	cted from the soil using a dilute calc perized cadmium column. The nitr h N-(1-naphthyl) ethylenediamine c n. Nitrite is determined on the sam of Soil Analysis for Canadian Prairie Available Ammonium-N	tium chloride solution. ite (reduced nitrate pl lihydrochloride. The n e extract by following Agricultural Soils. All	APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium
2/N3-AVAIL-SK Available Nitrate passage of the sa sulfanilamide follo measured at colo column. Reference: Reco IH4-AVAIL-SK Ammonium (NH4 blue, which is def	and Nitrite are extract ample through a cop owed by coupling wit orimetrically at 520nn mmended Methods of Soil 4-N) is extracted from	cted from the soil using a dilute calc perized cadmium column. The nitr h N-(1-naphthyl) ethylenediamine c n. Nitrite is determined on the sam of Soil Analysis for Canadian Prairie Available Ammonium-N n the soil using 2 N KCI. Ammonium	tium chloride solution. ite (reduced nitrate pl lihydrochloride. The re- e extract by following re- e Agricultural Soils. All n in the extract is mixe	APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium berta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6)
2/N3-AVAIL-SK Available Nitrate passage of the si sulfanilamide follo measured at colo column. Reference: Reco H4-AVAIL-SK Ammonium (NH4 blue, which is def H-1:2-VA This analysis is c Physical/Inorgani (No. 10 / 2mm) si	and Nitrite are extract ample through a cop owed by coupling wit orimetrically at 520nn mmended Methods of Soil 1-N) is extracted from termined colorimetric Soil carried out in accorda ic and Misc. Constitu	cted from the soil using a dilute calc perized cadmium column. The nitr h N-(1-naphthyl) ethylenediamine o n. Nitrite is determined on the sam of Soil Analysis for Canadian Prairie Available Ammonium-N n the soil using 2 N KCI. Ammonium cally by auto analysis at 660 nm. pH in Soil (1:2 Soil:Water Extra unce with procedures described in the tents, BC Environmental Laboratory	tium chloride solution. ite (reduced nitrate pl lihydrochloride. The re- e extract by following re- e Agricultural Soils. All n in the extract is mixed action) ne pH, Electrometric in Manual 2007. The p	APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium berta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6) d with hypochlorite and salicylate to form indophenol BC WLAP METHOD: PH, ELECTROMETRIC, SOIL n Soil and Sediment method - Section B
I2/N3-AVAIL-SK Available Nitrate passage of the si sulfanilamide follo measured at colo column. Reference: Reco IH4-AVAIL-SK Ammonium (NH4 blue, which is def PH-1:2-VA This analysis is c Physical/Inorgani	and Nitrite are extract ample through a cop owed by coupling wit orimetrically at 520nn mmended Methods of Soil 1-N) is extracted from termined colorimetric Soil carried out in accorda ic and Misc. Constitu	cted from the soil using a dilute calc perized cadmium column. The nitr h N-(1-naphthyl) ethylenediamine o n. Nitrite is determined on the sam of Soil Analysis for Canadian Prairie Available Ammonium-N n the soil using 2 N KCI. Ammonium cally by auto analysis at 660 nm. pH in Soil (1:2 Soil:Water Extra unce with procedures described in the tents, BC Environmental Laboratory	tium chloride solution. ite (reduced nitrate pl lihydrochloride. The re- e extract by following re- e Agricultural Soils. All n in the extract is mixed action) ne pH, Electrometric in Manual 2007. The p	APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium berta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6) d with hypochlorite and salicylate to form indophenol BC WLAP METHOD: PH, ELECTROMETRIC, SOIL n Soil and Sediment method - Section B rocedure involves mixing the dried (at <60°C) and sieved
I2/N3-AVAIL-SK Available Nitrate passage of the sc sulfanilamide follo measured at colo column. Reference: Reco IH4-AVAIL-SK Ammonium (NH4 blue, which is det PH-1:2-VA This analysis is c Physical/Inorgani (No. 10 / 2mm) sc probe. O4-AVAIL-SK	and Nitrite are extract ample through a cop owed by coupling with primetrically at 520nn mmended Methods of Soil 4-N) is extracted from termined colorimetric Soil carried out in accorda ic and Misc. Constitu ample with deionized Soil	cted from the soil using a dilute calc perized cadmium column. The nitr h N-(1-naphthyl) ethylenediamine o n. Nitrite is determined on the sam of Soil Analysis for Canadian Prairie Available Ammonium-N n the soil using 2 N KCI. Ammonium cally by auto analysis at 660 nm. pH in Soil (1:2 Soil:Water Extra nonce with procedures described in the tents, BC Environmental Laboratory d/distilled water at a 1:2 ratio of sed Available Phosphate-P	tium chloride solution. ite (reduced nitrate pl lihydrochloride. The re- e extract by following the Agricultural Soils. All n in the extract is mixed action) he pH, Electrometric in Manual 2007. The p iment to water. The p	APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium berta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6) d with hypochlorite and salicylate to form indophenol BC WLAP METHOD: PH, ELECTROMETRIC, SOIL In Soil and Sediment method - Section B rocedure involves mixing the dried (at <60°C) and sieved H of the solution is then measured using a standard pH
I2/N3-AVAIL-SK Available Nitrate passage of the sa sulfanilamide follo measured at colo column. Reference: Reco IH4-AVAIL-SK Ammonium (NH4 blue, which is det 'H-1:2-VA This analysis is c Physical/Inorgani (No. 10 / 2mm) s probe. 'O4-AVAIL-SK Plant available ph	and Nitrite are extract ample through a cop owed by coupling wit primetrically at 520nn mmended Methods of Soil 4-N) is extracted from termined colorimetric Soil carried out in accorda ic and Misc. Constitu ample with deionized Soil hosphorus is extracted	cted from the soil using a dilute calc perized cadmium column. The nitr h N-(1-naphthyl) ethylenediamine o n. Nitrite is determined on the sam of Soil Analysis for Canadian Prairie Available Ammonium-N n the soil using 2 N KCI. Ammonium cally by auto analysis at 660 nm. pH in Soil (1:2 Soil:Water Extra nonce with procedures described in the tents, BC Environmental Laboratory d/distilled water at a 1:2 ratio of sed Available Phosphate-P	tium chloride solution. ite (reduced nitrate pl lihydrochloride. The r e extract by following f Agricultural Soils. All n in the extract is mixe at in the extract is mixe for the pH, Electrometric in Manual 2007. The p iment to water. The p	APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium berta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6) d with hypochlorite and salicylate to form indophenol BC WLAP METHOD: PH, ELECTROMETRIC, SOIL In Soil and Sediment method - Section B rocedure involves mixing the dried (at <60°C) and sieved H of the solution is then measured using a standard pH Comm. Soil Sci. Plant Anal. 25 (5&6)

Particle size distribution is determined by a combination of techniques. Dry sieving is performed for coarse particles, wet sieving for sand particles and the pipette sedimentation method for clay particles.

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

*1	* AL	S test	metho	ds may	' inco	orpo	rate m	nodi	ficat	ions	s fro	m	spe	cifi	ied re	efer	enc	e me	thods t	to in	npr	ove	per	for	ma	nce	Э.				
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Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

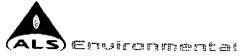
mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION. Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Chain of Custody (COC) / Analytical Request Form



COC Number: 14 -

Page <u>1</u> of <u>1</u>

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Report To				Report Forma	t / Distr								T					_	
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Contact:	Lucas Hennecker			(QC) Report with P						andard TAT									
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-	n from a Regulated DW System?						Froze	en						servatio		Yes		No	
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Failure to complete all portions of this form may delay analysis. Please (III in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the while - report copy.
1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. **ATTN: Lucas Hennecker** 1000-885 Dunsmuir Street, 10th Floor Vancouver BC V6E 1N5

Date Received: 20-OCT-18 Report Date: 30-OCT-18 15:25 (MT) Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2184608 Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

NOT SUBMITTED VENW03060 TASK 002

Brent Mack, B.Sc. Account Manager

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L2184608 CONTD.... PAGE 2 of 5 30-OCT-18 15:25 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2184608-1 Soil 20-OCT-18 09:15 HALFWAY RIVER - DOWNSTREAM (HD)	L2184608-2 Soil 20-OCT-18 08:36 MIDDLE SITE C RESERVOIR (PR2)		
Grouping	Analyte				
SOIL					
Physical Tests	pH (1:2 soil:water) (pH)	8.32	8.20		
Particle Size	% Gravel (>2mm) (%)	1.1	1.7		
	% Sand (2.00mm - 1.00mm) (%)	2.0	<1.0		
	% Sand (1.00mm - 0.50mm) (%)	7.4	<1.0		
	% Sand (0.50mm - 0.25mm) (%)	30.6	2.3		
	% Sand (0.25mm - 0.125mm) (%)	33.8	6.0		
	% Sand (0.125mm - 0.063mm) (%)	5.5	18.3		
	% Silt (0.063mm - 0.0312mm) (%)	5.2	26.6		
	% Silt (0.0312mm - 0.004mm) (%)	9.0	34.5		
	% Clay (<4um) (%)	5.6	9.3		
	Texture	Loamy sand	Silt loam		
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (%)	0.070	0.083		
Anions and Nutrients	Total Nitrogen by LECO (%)	0.108	0.143		
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.73	0.87		
Plant Available Nutrients	Available Ammonium-N (mg/kg)	1.3	1.9		
	Nitrate+Nitrite-N (mg/kg)	<2.0	<2.0		
	Nitrate-N (mg/kg)	<2.0	<2.0		
	Nitrite-N (mg/kg)	<0.40	<0.40		
	Available Phosphate-P (mg/kg)	3.0	<2.0		
Metals	Aluminum (Al) (mg/kg)	6390	8470		
	Antimony (Sb) (mg/kg)	0.72	0.76		
	Arsenic (As) (mg/kg)	9.12	6.39		
	Barium (Ba) (mg/kg)	414	385		
	Beryllium (Be) (mg/kg)	0.47	0.40		
	Bismuth (Bi) (mg/kg)	<0.20	<0.20		
	Boron (B) (mg/kg)	7.8	7.5		
	Cadmium (Cd) (mg/kg)	0.495	0.846		
	Calcium (Ca) (mg/kg)	18100	33200		
	Chromium (Cr) (mg/kg)	11.6	19.0		
	Cobalt (Co) (mg/kg)	7.00	7.64		
	Copper (Cu) (mg/kg)	14.8	19.8		
	Iron (Fe) (mg/kg)	23000	18700		
	Lead (Pb) (mg/kg)	8.39	8.09		
	Lithium (Li) (mg/kg)	9.3	11.2		
	Magnesium (Mg) (mg/kg)	4250	12700		

L2184608 CONTD.... PAGE 3 of 5 30-OCT-18 15:25 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2184608-1 Soil 20-OCT-18 09:15 HALFWAY RIVER - DOWNSTREAM (HD)	L2184608-2 Soil 20-OCT-18 08:36 MIDDLE SITE C RESERVOIR (PR2)		
Grouping	Analyte					
SOIL						
Metals	Manganese (Mn) (mg/kg)		249	302		
	Mercury (Hg) (mg/kg)		0.0412	0.0542		
	Molybdenum (Mo) (mg/kg)		1.85	1.23		
	Nickel (Ni) (mg/kg)		19.5	24.3		
	Phosphorus (P) (mg/kg)		1120	822		
	Potassium (K) (mg/kg)		1370	1400		
	Selenium (Se) (mg/kg)		0.69	0.58		
	Silver (Ag) (mg/kg)		0.15	0.21		
	Sodium (Na) (mg/kg)		86	133		
	Strontium (Sr) (mg/kg)		62.4	72.7		
	Sulfur (S) (mg/kg)		1700	<1000		
	Thallium (TI) (mg/kg)		0.119	0.171		
	Tin (Sn) (mg/kg)		<2.0	<2.0		
	Titanium (Ti) (mg/kg)		<33	169		
	Tungsten (W) (mg/kg)		<0.50	<0.50		
	Uranium (U) (mg/kg)		0.958	0.825		
	Vanadium (V) (mg/kg)		27.0	40.7		
	Zinc (Zn) (mg/kg)		82.6	78.3		
	Zirconium (Zr) (mg/kg)		2.4	2.6		

	Description		
DLM	Detection Limit Adjus	ted due to sample matrix effects (e.g. chemical	interference, colour, turbidity).
est Method R	eferences:		
ALS Test Code	Matrix	Test Description	Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil	CSSS (2008) P216-217
A known quanti against a stand	tity of acetic acid is cons dard curve relating pH to	sumed by reaction with carbonates in the soil. T	he pH of the resulting solution is measured and compared
C-TOC-CALC-S	K Soil	Total Organic Carbon Calculation	CSSS (2008) 21.2
Total Organic C	Carbon (TOC) is calcula	ated by the difference between total carbon (TC)	and total inorganic carbon. (TIC)
C-TOT-LECO-SI	K Soil	Total Carbon by combustion method	CSSS (2008) 21.2
		•	s is determined using a thermal conductivity detector.
HG-200.2-CVAF	-VA Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)
			analysis. This method is fully compliant with the BC SALM strong
	metals digestion metho		
IC-CACO3-CAL	C-SK Soil	Inorganic Carbon as CaCO3 Equivalent	Calculation
MET-200.2-CCM	IS-VA Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)
		and sieved (2 mm). Strong Acid Leachable Me ntal analysis is by Collision / Reaction Cell ICPI	tals in the <2mm fraction are solubilized by heated digestion with MS.
partially recove	ered (matrix dependent)		icate minerals are not solubilized. Some metals may be only d Zr. Elemental Sulfur may be poorly recovered by this method. orage, or digestion.
N-TOT-LECO-SI	K Soil	Total Nitrogen by combustion method	CSSS (2008) 22.4
The sample is i	ignited in a combustion	analyzer where nitrogen in the reduced nitrous	oxide gas is determined using a thermal conductivity detector.
N-TOTKJ-COL-S	SK Soil	Total Kjeldahl Nitrogen	CSSS (2008) 22.2.3
		, ,	Ammonia in the soil extract is determined colrimetrically at 660
0	ested with sulfuric acid in	,	
The soil is dige nm. N2/N3-AVAIL-SI		Nitrate, Nitrite and Nitrate+Nitrite-N	APHA 4500 NO3F
nm. N2/N3-AVAIL-SI Available Nitrat passage of the sulfanilamide for measured at co column.	K Soil te and Nitrite are extrac sample through a copp ollowed by coupling with olorimetrically at 520nm	Nitrate, Nitrite and Nitrate+Nitrite-N ted from the soil using a dilute calcium chloride perized cadmium column. The nitrite (reduced n N-(1-naphthyl) ethylenediamine dihydrochloric	APHA 4500 NO3F solution. Nitrate plus Nitrite is quantitatively reduced to nitrite by nitrate plus original nitrite) is then determined by diazotizing with le. The resulting water soluble dye has a magenta color which is ollowing the same instrumental procedure without a cadmium
nm. N2/N3-AVAIL-SI Available Nitrat passage of the sulfanilamide for measured at co column. Reference: Red	K Soil te and Nitrite are extract sample through a copp ollowed by coupling with olorimetrically at 520nm commended Methods o	Nitrate, Nitrite and Nitrate+Nitrite-N ted from the soil using a dilute calcium chloride perized cadmium column. The nitrite (reduced n N-(1-naphthyl) ethylenediamine dihydrochloric N. Nitrite is determined on the same extract by f of Soil Analysis for Canadian Prairie Agricultural	APHA 4500 NO3F solution. Nitrate plus Nitrite is quantitatively reduced to nitrite by nitrate plus original nitrite) is then determined by diazotizing with le. The resulting water soluble dye has a magenta color which is ollowing the same instrumental procedure without a cadmium Soils. Alberta Agriculture (1988) p. 19 and 28
nm. N2/N3-AVAIL-SI Available Nitrat passage of the sulfanilamide for measured at co column. Reference: Ref	K Soil te and Nitrite are extrac e sample through a copp ollowed by coupling with olorimetrically at 520nm commended Methods o Soil	Nitrate, Nitrite and Nitrate+Nitrite-N ted from the soil using a dilute calcium chloride berized cadmium column. The nitrite (reduced n N-(1-naphthyl) ethylenediamine dihydrochloric b. Nitrite is determined on the same extract by f of Soil Analysis for Canadian Prairie Agricultural Available Ammonium-N	APHA 4500 NO3F solution. Nitrate plus Nitrite is quantitatively reduced to nitrite by nitrate plus original nitrite) is then determined by diazotizing with le. The resulting water soluble dye has a magenta color which is ollowing the same instrumental procedure without a cadmium Soils. Alberta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6)
nm. N2/N3-AVAIL-SI Available Nitrat passage of the sulfanilamide for measured at co column. Reference: Reformation NH4-AVAIL-SK Ammonium (NH	K Soil te and Nitrite are extrac sample through a copp ollowed by coupling with olorimetrically at 520nm commended Methods o Soil H4-N) is extracted from	Nitrate, Nitrite and Nitrate+Nitrite-N ted from the soil using a dilute calcium chloride berized cadmium column. The nitrite (reduced n N-(1-naphthyl) ethylenediamine dihydrochloric b. Nitrite is determined on the same extract by f of Soil Analysis for Canadian Prairie Agricultural Available Ammonium-N	APHA 4500 NO3F solution. Nitrate plus Nitrite is quantitatively reduced to nitrite by nitrate plus original nitrite) is then determined by diazotizing with le. The resulting water soluble dye has a magenta color which is ollowing the same instrumental procedure without a cadmium Soils. Alberta Agriculture (1988) p. 19 and 28
nm. N2/N3-AVAIL-SI Available Nitrat passage of the sulfanilamide for measured at co column. Reference: Reo NH4-AVAIL-SK Ammonium (NH blue, which is co	K Soil te and Nitrite are extrac sample through a copp ollowed by coupling with olorimetrically at 520nm commended Methods o Soil H4-N) is extracted from	Nitrate, Nitrite and Nitrate+Nitrite-N ted from the soil using a dilute calcium chloride berized cadmium column. The nitrite (reduced n N-(1-naphthyl) ethylenediamine dihydrochloric b. Nitrite is determined on the same extract by f of Soil Analysis for Canadian Prairie Agricultural Available Ammonium-N the soil using 2 N KCI. Ammonium in the extract	APHA 4500 NO3F solution. Nitrate plus Nitrite is quantitatively reduced to nitrite by nitrate plus original nitrite) is then determined by diazotizing with le. The resulting water soluble dye has a magenta color which is ollowing the same instrumental procedure without a cadmium Soils. Alberta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6)
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nm. N2/N3-AVAIL-SI Available Nitrat passage of the sulfanilamide for measured at co column. Reference: Red NH4-AVAIL-SK Ammonium (NH blue, which is of PH-1:2-VA This analysis is Physical/Inorga (No. 10 / 2mm) probe. PO4-AVAIL-SK Plant available	K Soil te and Nitrite are extrac sample through a copp ollowed by coupling with olorimetrically at 520nm commended Methods of Soil H4-N) is extracted from determined colorimetric: Soil s carried out in accordaa anic and Misc. Constitue) sample with deionized Soil phosphorus is extracted	Nitrate, Nitrite and Nitrate+Nitrite-N ted from the soil using a dilute calcium chloride perized cadmium column. The nitrite (reduced n N-(1-naphthyl) ethylenediamine dihydrochloric h. Nitrite is determined on the same extract by f of Soil Analysis for Canadian Prairie Agricultural Available Ammonium-N the soil using 2 N KCI. Ammonium in the extract ally by auto analysis at 660 nm. pH in Soil (1:2 Soil:Water Extraction) nce with procedures described in the pH, Electre ents, BC Environmental Laboratory Manual 200 /distilled water at a 1:2 ratio of sediment to wate Available Phosphate-P	APHA 4500 NO3F solution. Nitrate plus Nitrite is quantitatively reduced to nitrite by nitrate plus original nitrite) is then determined by diazotizing with le. The resulting water soluble dye has a magenta color which is ollowing the same instrumental procedure without a cadmium Soils. Alberta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6) ct is mixed with hypochlorite and salicylate to form indophenol BC WLAP METHOD: PH, ELECTROMETRIC, SOIL ometric in Soil and Sediment method - Section B 7. The procedure involves mixing the dried (at <60°C) and siever ar. The pH of the solution is then measured using a standard pH

Reference:

Department of Agriculture Natural Resources Conservation Service.

** ALS test methods may incorpo	prate modifications from specified reference methods to improve performance.
The last two letters of the above	e test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:
Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Chain of Custody (COC) / Analytical Request Form



COC Number: 14 -

Page <u>1</u> of <u>1</u>

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Report To				Report Forma	t / Distriction						•	ah Tu				<u> </u>	<u> </u>	<u> </u>
Company:	Tetratech		Select Report F			EDD (DIGITAL)	+ -			andard TAT						t available	+ for all te	ests)
Contact:	Lucas Hennecker		·	(QC) Report with #														-
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	Vancouver, BC V6C 1N5		Select Distribut			🗆 FAX	1 -			x weekend e								
Phone:	1 (604) 313-9067		Email 1 or Fax	Lucas.Hennecker	@tetratech.com (see notes)			-	uired for 8	_					J SUICINGIN	Je	
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ALS Sample #	Sample	Identification and/or Coo	rdinates	Date	Time	Joiner w	1 F	8	Met							i i		
(lab use only)	(This d	escription will appear on the	e report)	(dd-mmm-yy)	(hh:mm)	Sample Type	D D	Particie	otal									
	Halfway River - Downstrear	n (HD)			· · · · · ·	Soil	B	R	R			+	+	┢━━╋			┽──	3
	Middle Site C Reservoir (PF	32)				Soil	B	R	R				┥—┥		-+		+	
	Peace Conven (PC1)			<u> </u>	<u> </u>	Soil						-	+	┝──┼	<u> </u>		–	3
· · · · · ·	Upper Site C Reservoir (PB	1)	·····	· ·····	-	<u> </u>			R		_		+	<u>↓ ·</u>	\rightarrow		<u> </u>	<u> </u>
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Drinking	y Water (DW) Samples ¹ (clie	nt use)	Special Instructions / Spec	ify Criteria to add o	ri report (client Use	9)				SAMPLE	COND						<u>y)</u>	
Are samples take	on from a Regulated DW Syster	n? Please use o	riteria: BC MOE 2018 Appro				Froze				_		Observ		-	» 🗖		
Г Ү		freshwater a	quatic life and Health Canad	a Guidelines for Dr	rinking Water, san	noles were	· ·	acks	Yes		• L	Cus	tody se	aal inta	ict Y	es 🗖	No	
Are samples for I	human drinking water use?	taken from p	re-treatment water sources.	Please add nich.b	urnett@bchydro.c	om to		ing Initi			IDEC OF			FINAL C		7514959	17.0000	
ΓY	-	distribution li	St for results							EMPERAT	/ncə *L	<u> </u>		FINAL C	JOOLER	TEMPER	ATURES	
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1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Tetra Tech Canada Inc. **ATTN: Lucas Hennecker** 1000-885 Dunsmuir Street, 10th Floor Vancouver BC V6E 1N5

Date Received: 17-OCT-18 Report Date: 29-OCT-18 15:48 (MT) Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2182906 Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

NOT SUBMITTED VENW03060 TASK 002

Brent Mack, B.Sc. Account Manager

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L2182906 CONTD.... PAGE 2 of 5 29-OCT-18 15:48 (MT) Version: FINAL

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2182906-1 Soil 17-OCT-18 14:02 MOBERLY RIVER - DOWNSTREAM (MD)	L2182906-2 Soil 17-OCT-18 13:07 LOWER SITE C RESERVOIR (PR3)	L2182906-3 Soil 17-OCT-18 11:41 PEACE AT PINE (PD1)	L2182906-4 Soil 17-OCT-18 10:13 PINE RIVER (PINE)	
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	8.16	7.74	8.11	8.41	
Particle Size	% Gravel (>2mm) (%)	<1.0	<1.0	<1.0	4.5	
	% Sand (2.00mm - 1.00mm) (%)	<1.0	<1.0	<1.0	<1.0	
	% Sand (1.00mm - 0.50mm) (%)	<1.0	<1.0	<1.0	2.7	
	% Sand (0.50mm - 0.25mm) (%)	14.3	<1.0	<1.0	55.3	
	% Sand (0.25mm - 0.125mm) (%)	38.1	2.5	10.7	23.6	
	% Sand (0.125mm - 0.063mm) (%)	20.8	15.6	32.8	4.7	
	% Silt (0.063mm - 0.0312mm) (%)	9.5	33.2	24.7	3.0	
	% Silt (0.0312mm - 0.004mm) (%)	9.7	38.8	23.8	3.7	
	% Clay (<4um) (%)	7.2	9.4	7.7	2.1	
	Texture	Loamy sand	Silt loam	Sandy loam	Sand	
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (%)	0.086	0.112	0.084	0.045	
Anions and Nutrients	Total Nitrogen by LECO (%)	0.088	0.127	0.095	0.043	
Organic / Inorganic Carbon	Total Organic Carbon (%)	1.30	1.74	1.47	0.62	
Plant Available Nutrients	Available Ammonium-N (mg/kg)	2.1	10.3	6.2	<1.0	
	Nitrate+Nitrite-N (mg/kg)	<2.0	<2.0	<2.0	<2.0	
	Nitrate-N (mg/kg)	<2.0	<2.0	<2.0	<2.0	
	Nitrite-N (mg/kg)	<0.40	0.49	<0.40	<0.40	
	Available Phosphate-P (mg/kg)	<2.0	<2.0	<2.0	<2.0	
Metals	Aluminum (Al) (mg/kg)	5840	5760	5900	3760	
	Antimony (Sb) (mg/kg)	0.63	0.67	0.64	0.67	
	Arsenic (As) (mg/kg)	7.36	6.61	6.63	9.25	
	Barium (Ba) (mg/kg)	265	424	406	240	
	Beryllium (Be) (mg/kg)	0.38	0.42	0.37	0.39	
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	<0.20	
	Boron (B) (mg/kg)	5.5	6.1	6.0	<5.0	
	Cadmium (Cd) (mg/kg)	0.488	0.752	0.649	0.458	
	Calcium (Ca) (mg/kg)	15400	23500	22500	20200	
	Chromium (Cr) (mg/kg)	12.4	13.1	13.3	8.88	
	Cobalt (Co) (mg/kg)	7.31	6.65	6.37	5.46	
	Copper (Cu) (mg/kg)	15.3	15.7	14.1	9.07	
	Iron (Fe) (mg/kg)	17800	16400	16200	29400	
	Lead (Pb) (mg/kg)	7.69	7.83	7.35	6.37	
	Lithium (Li) (mg/kg)	8.0	8.5	8.2	5.7	
	Magnesium (Mg) (mg/kg)	5220	8560	7630	3580	

L2182906 CONTD.... PAGE 3 of 5 29-OCT-18 15:48 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2182906-1 Soil 17-OCT-18 14:02 MOBERLY RIVER - DOWNSTREAM (MD)	L2182906-2 Soil 17-OCT-18 13:07 LOWER SITE C RESERVOIR (PR3)	L2182906-3 Soil 17-OCT-18 11:41 PEACE AT PINE (PD1)	L2182906-4 Soil 17-OCT-18 10:13 PINE RIVER (PINE)	
Grouping	Analyte						
SOIL							
Metals	Manganese (Mn) (mg/kg)		276	242	214	273	
	Mercury (Hg) (mg/kg)		0.0339	0.0520	0.0450	0.0255	
	Molybdenum (Mo) (mg/kg)		1.51	1.55	1.35	1.92	
	Nickel (Ni) (mg/kg)		23.2	21.3	20.5	19.0	
	Phosphorus (P) (mg/kg)		696	838	804	955	
	Potassium (K) (mg/kg)		970	980	1030	740	
	Selenium (Se) (mg/kg)		0.49	0.62	0.67	0.47	
	Silver (Ag) (mg/kg)		0.13	0.18	0.16	0.11	
	Sodium (Na) (mg/kg)		84	81	74	170	
	Strontium (Sr) (mg/kg)		47.2	61.0	61.3	59.4	
	Sulfur (S) (mg/kg)		<1000	1400	1100	1200	
	Thallium (TI) (mg/kg)		0.113	0.155	0.141	0.104	
	Tin (Sn) (mg/kg)		<2.0	<2.0	<2.0	<2.0	
	Titanium (Ti) (mg/kg)		68.0	44.3	54.1	27.4	
	Tungsten (W) (mg/kg)		<0.50	<0.50	<0.50	<0.50	
	Uranium (U) (mg/kg)		0.747	0.843	0.795	0.734	
	Vanadium (V) (mg/kg)		25.4	27.2	28.0	22.1	
	Zinc (Zn) (mg/kg)		68.9	82.9	75.4	73.2	
	Zirconium (Zr) (mg/kg)		2.1	1.5	1.8	1.9	

L2182906 CONTD.... PAGE 4 of 5 29-OCT-18 15:48 (MT) Version: FINAL

QC Type Description		Parameter	Qualifier	Applies to Sample Number(s)
est Method References	:			
ALS Test Code	Matrix	Test Description		Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil		CSSS (2008) P216-217
A known quantity of acetic against a standard curve re			I. The pH of t	he resulting solution is measured and compared
C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation		CSSS (2008) 21.2
Total Organic Carbon (TO	C) is calculat	ed by the difference between total carbon (TC) and total	inorganic carbon. (TIC)
C-TOT-LECO-SK	Soil	Total Carbon by combustion method		CSSS (2008) 21.2
The sample is ignited in a o	combustion a	analyzer where carbon in the reduced CO2	gas is determ	ined using a thermal conductivity detector.
HG-200.2-CVAF-VA	Soil	Mercury in Soil by CVAAS		EPA 200.2/1631E (mod)
Soil samples are digested acid leachable metals dige			S analysis. T	his method is fully compliant with the BC SALM strong
IC-CACO3-CALC-SK	Soil	Inorganic Carbon as CaCO3 Equivalent		Calculation
MET-200.2-CCMS-VA	Soil	Metals in Soil by CRC ICPMS		EPA 200.2/6020A (mod)
		nd sieved (2 mm). Strong Acid Leachable tal analysis is by Collision / Reaction Cell IC		<2mm fraction are solubilized by heated digestion with
partially recovered (matrix	dependent),		and Zr. Elen	rals are not solubilized. Some metals may be only nental Sulfur may be poorly recovered by this method. igestion.
N-TOT-LECO-SK	Soil	Total Nitrogen by combustion method		CSSS (2008) 22.4
The sample is ignited in a o	combustion a	analyzer where nitrogen in the reduced nitro	ous oxide gas	is determined using a thermal conductivity detector.
N-TOTKJ-COL-SK	Soil	Total Kjeldahl Nitrogen		CSSS (2008) 22.2.3
The soil is digested with sunnm.	Ilfuric acid in	the presence of CuSO4 and K2SO4 cataly	sts. Ammonia	a in the soil extract is determined colrimetrically at 660
N2/N3-AVAIL-SK	Soil	Nitrate, Nitrite and Nitrate+Nitrite-N		APHA 4500 NO3F
passage of the sample thro sulfanilamide followed by c measured at colorimetrical column.	ough a coppe oupling with ly at 520nm.	erized cadmium column. The nitrite (reduc N-(1-naphthyl) ethylenediamine dihydrochlo Nitrite is determined on the same extract b	ed nitrate plus oride. The res by following th	Nitrate plus Nitrite is quantitatively reduced to nitrite by s original nitrite) is then determined by diazotizing with sulting water soluble dye has a magenta color which is le same instrumental procedure without a cadmium
Reference: Recommended	I Methods of	Soil Analysis for Canadian Prairie Agricultu	Irai Solis. Aldo	erta Agriculture (1988) p. 19 and 28
NH4-AVAIL-SK	Soil	Available Ammonium-N		CSSS Carter 6.2 / Comm Soil Sci 19(6)
		he soil using 2 N KCI. Ammonium in the ex lly by auto analysis at 660 nm.	tract is mixed	with hypochlorite and salicylate to form indophenol
PH-1:2-VA	Soil	pH in Soil (1:2 Soil:Water Extraction)		BC WLAP METHOD: PH, ELECTROMETRIC, SOIL
Physical/Inorganic and Mis	c. Constituer	ce with procedures described in the pH, Ele nts, BC Environmental Laboratory Manual 2 distilled water at a 1:2 ratio of sediment to w	2007. The pro	Soil and Sediment method - Section B peedure involves mixing the dried (at <60°C) and sieved of the solution is then measured using a standard pH
PO4-AVAIL-SK	Soil	Available Phosphate-P		Comm. Soil Sci. Plant Anal. 25 (5&6)
Plant available phosphorus 880 nm.	s is extracted	from the soil using Modified Kelowna solut	tion. Phospho	rous in the soil extract is determined colorimetrically at
PSA-PIPET-DETAIL-SK	Soil	Particle size - Sieve and Pipette		SSIR-51 METHOD 3.2.1
	determined b			

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



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Chain of Custody (COC) / Analytical **Request Form**



COC Number: 14 -

Page 1 of 1

Canada Toll Free: 1 800 668 9878

Report To				Report Format	/ Distribution		Ľ	~				n Tur	naround	Time (T/	AT) is not a	available f	or all tes	ts)
Company:	Tetratech		Select Report F	Select Report Format: 🖸 PDF 🖾 EXCEL 🖾 EDD (DIGITAL)				R 🗹 Regular (Standard TAT if received by 3 pm - business days)										
Contact:	Lucas Hennecker		Quality Control	(QC) Report with R	eport 🛛 🔽 Yes	s TNo	P [] Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT											
Address:	Suite 1000, 10th Floor, 885	Dunsmuir Street,	Criteria on Repo	Criteria on Report - provide details below if box checked				E Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT										
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Phone:	1 (604) 313-9067			Lucas.Hennecker		see notes)	Spec	ify Dat	e Req	uired for	E2,E +							
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LSD:			Location:				TDP,		CM									
ALS Lab Wo	ork Order # (lab use only)	L2182906	ALS Contact:	Brent Mack	Sampler: Lui	ennedly	TN, TP, 1	Size	Total Metals (CCME+ICP+Hardness)									_
ALS Sample #	Sample	Identification and/or Coordinates	s	Date	Time	Sample Type		Particle	M									
(lab use only)	(This de	escription will appear on the report)		(dd-mmm-yy)	(hh:mm)	Sample Type	TOC,	Par	Tot									
	Moberly River - Downstream	(MD)		17-at-18	14:02	Soil	R	R	R									3
	Lower Site C Reservoir (PR	3)		17-0ct-18	13.07	Soil	R	R	R									3
	Peace at Pine (PD1)			17-at-18	11 41	Soil	R	R	R									· 3
	Pine River (Pine)			17-at-12	10:13	Soil	R	R	R									3
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Drinking	g Water (DW) Samples ¹ (clie	nt use) Spec	ial Instructions / Spec	ify Criteria to add or	n report (client Use	e)	Froze	en				SIF	Obse	vations	s Ye		No	
Are samples tak	en from a Regulated DW System ∕es I∕ No		BC MOE 2018 Appro fe and Health Canad					acks		N KI	No	🔲 Cu	stody s	eal inta	act Ye	s 🗖	No	
Are samples for human drinking water use?				Please add nich.bu	irnett@bchydro.c	om to	Cooling Initiated INIITIAL COOLER TEMPERATURES °C				°C	FINAL COOLER TEMPERATURES °C						
			sults	ts				12					1			1	<u>u</u>	
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Released by: LUCGS temecher Date: 70 Time: DUG. 12/10 16:40 Received by: Geoff Date: 01/19 16:40 REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELL						CORV	3			<u></u>		Se v09 Front/04 .		-	• -			

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Tetra Tech Canada Inc. **ATTN: Lucas Hennecker** 1000-885 Dunsmuir Street, 10th Floor Vancouver BC V6E 1N5

Date Received: 18-OCT-18 Report Date: 30-OCT-18 14:22 (MT) Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L2183717 Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc:

NOT SUBMITTED VENW03060 TASK 002

Brent Mack, B.Sc. Account Manager

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L2183717 CONTD.... PAGE 2 of 7 30-OCT-18 14:22 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2183717-1 Soil 18-OCT-18 08:10 PEACE AT BEATTON (PD2)	L2183717-2 Soil 18-OCT-18 08:55 BEATTON RIVER (BEA)	L2183717-3 Soil 18-OCT-18 09:44 PEACE AT KISKATINAW (PD3)	L2183717-4 Soil 18-OCT-18 10:13 KISKATINAW RIVER (KR)	L2183717-5 Soil 18-OCT-18 11:18 PEACE AT POUCE COUPE (PD4)
Grouping	Analyte					
SOIL						
Physical Tests	pH (1:2 soil:water) (pH)	8.31	8.10	8.02	8.26	8.14
Particle Size	% Gravel (>2mm) (%)	19.8	31.3	11.2	17.0	<1.0
	% Sand (2.00mm - 1.00mm) (%)	10.8	<1.0	<1.0	<1.0	<1.0
	% Sand (1.00mm - 0.50mm) (%)	7.4	<1.0	<1.0	<1.0	<1.0
	% Sand (0.50mm - 0.25mm) (%)	7.5	1.2	2.9	1.0	<1.0
	% Sand (0.25mm - 0.125mm) (%)	18.7	13.4	8.4	2.4	7.4
	% Sand (0.125mm - 0.063mm) (%)	19.3	13.3	19.1	2.2	36.4
	% Silt (0.063mm - 0.0312mm) (%)	7.9	16.9	24.5	30.2	26.7
	% Silt (0.0312mm - 0.004mm) (%)	5.8	15.4	22.9	33.5	23.0
	% Clay (<4um) (%)	2.7	6.9	10.0	12.2	6.4
	Texture	Loamy sand	Loam	Silt loam	Silt loam	Sandy loam
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (%)	0.042	0.079	0.092	0.105	0.075
Anions and Nutrients	Total Nitrogen by LECO (%)	0.049	0.082	0.099	0.110	0.079
Organic / Inorganic Carbon	Total Organic Carbon (%)	0.72	0.940	1.24	1.66	1.28
Plant Available Nutrients	Available Ammonium-N (mg/kg)	1.1	1.4	5.4	2.4	3.8
	Nitrate+Nitrite-N (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Nitrate-N (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Nitrite-N (mg/kg)	<0.40	<0.40	<0.40	<0.40	<0.40
	Available Phosphate-P (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
Metals	Aluminum (Al) (mg/kg)	5150	7980	9290	11000	6410
	Antimony (Sb) (mg/kg)	0.67	3.78	0.61	0.76	0.65
	Arsenic (As) (mg/kg)	8.17	23.0	8.39	7.95	7.69
	Barium (Ba) (mg/kg)	367	401	436	421	418
	Beryllium (Be) (mg/kg)	0.37	0.60	0.57	0.73	0.46
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B) (mg/kg)	5.2	7.7	8.3	8.6	6.5
	Cadmium (Cd) (mg/kg)	0.476	0.614	0.492	0.701	0.568
	Calcium (Ca) (mg/kg)	22600	5390	13800	21200	20000
	Chromium (Cr) (mg/kg)	11.1	16.7	19.1	21.6	14.0
	Cobalt (Co) (mg/kg)	6.96	12.8	8.84	9.69	7.36
	Copper (Cu) (mg/kg)	11.3	20.1	19.0	24.6	15.1
	Iron (Fe) (mg/kg)	18500	25000	20300	20800	17400
	Lead (Pb) (mg/kg)	6.89	20.2	10.2	11.7	8.46
	Lithium (Li) (mg/kg)	7.3	11.4	13.8	16.3	9.5
	Magnesium (Mg) (mg/kg)	5120	3660	5560	7720	6480

L2183717 CONTD.... PAGE 3 of 7 30-OCT-18 14:22 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2183717-6 Soil 18-OCT-18 11:51 POUCE COUPE (POUCE)	L2183717-7 Soil 18-OCT-18 13:29 PEACE AT MANY ISLANDS (PD5)	L2183717-8 Soil 18-OCT-18 13:29 DUP1	
Grouping	Analyte				
SOIL					
Physical Tests	pH (1:2 soil:water) (pH)	8.32	8.18	8.13	
Particle Size	% Gravel (>2mm) (%)	37.3	<1.0	<1.0	
	% Sand (2.00mm - 1.00mm) (%)	<1.0	<1.0	<1.0	
	% Sand (1.00mm - 0.50mm) (%)	6.7	<1.0	<1.0	
	% Sand (0.50mm - 0.25mm) (%)	28.1	<1.0	<1.0	
	% Sand (0.25mm - 0.125mm) (%)	6.3	<1.0	<1.0	
	% Sand (0.125mm - 0.063mm) (%)	4.5	30.1	29.2	
	% Silt (0.063mm - 0.0312mm) (%)	5.3	33.9	33.7	
	% Silt (0.0312mm - 0.004mm) (%)	7.1	27.9	28.5	
	% Clay (<4um) (%)	4.4	7.4	8.1	
	Texture	Sandy loam	Silt loam	Silt loam	
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (%)	0.044	0.060	0.059	
Anions and Antrients	Total Nitrogen by LECO (%)	0.045	0.065	0.070	
Drganic / norganic Carbon	Total Organic Carbon (%)	0.661	0.793	0.834	
Plant Available Nutrients	Available Ammonium-N (mg/kg)	1.6	2.7	2.4	
	Nitrate+Nitrite-N (mg/kg)	<2.0	<2.0	<2.0	
	Nitrate-N (mg/kg)	<2.0	<2.0	<2.0	
	Nitrite-N (mg/kg)	<0.40	<0.40	<0.40	
	Available Phosphate-P (mg/kg)	2.5	2.1	<2.0	
Metals	Aluminum (Al) (mg/kg)	5950	7100	7040	
	Antimony (Sb) (mg/kg)	0.51	0.59	0.58	
	Arsenic (As) (mg/kg)	10.9	7.79	7.80	
	Barium (Ba) (mg/kg)	261	398	395	
	Beryllium (Be) (mg/kg)	0.54	0.44	0.44	
	Bismuth (Bi) (mg/kg)	<0.20	<0.20	<0.20	
	Boron (B) (mg/kg)	7.9	6.8	6.7	
	Cadmium (Cd) (mg/kg)	0.276	0.409	0.408	
	Calcium (Ca) (mg/kg)	7990	11200	11400	
	Chromium (Cr) (mg/kg)	12.1	15.0	14.7	
	Cobalt (Co) (mg/kg)	7.40	7.46	7.72	
	Copper (Cu) (mg/kg)	11.4	14.3	14.2	
	Iron (Fe) (mg/kg)	29900	17600	18000	
	Lead (Pb) (mg/kg)	7.21	8.87	8.68	
	Lithium (Li) (mg/kg)	8.6	9.9	10.0	
	Magnesium (Mg) (mg/kg)	3250	4810	4830	

L2183717 CONTD.... PAGE 4 of 7 30-OCT-18 14:22 (MT) Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2183717-1 Soil 18-OCT-18 08:10 PEACE AT BEATTON (PD2)	L2183717-2 Soil 18-OCT-18 08:55 BEATTON RIVER (BEA)	L2183717-3 Soil 18-OCT-18 09:44 PEACE AT KISKATINAW (PD3)	L2183717-4 Soil 18-OCT-18 10:13 KISKATINAW RIVER (KR)	L2183717-5 Soil 18-OCT-18 11:18 PEACE AT POUCI COUPE (PD4)
Grouping	Analyte						
SOIL							
Metals	Manganese (Mn) (mg/kg)		306	328	284	326	271
	Mercury (Hg) (mg/kg)		0.125	0.159	0.0754	0.0902	0.0646
	Molybdenum (Mo) (mg/kg)		1.26	1.93	1.22	1.13	1.28
	Nickel (Ni) (mg/kg)		21.3	44.0	26.1	31.8	22.7
	Phosphorus (P) (mg/kg)		645	682	769	637	799
	Potassium (K) (mg/kg)		860	1350	1540	1690	1100
	Selenium (Se) (mg/kg)		0.56	1.33	0.68	0.92	0.61
	Silver (Ag) (mg/kg)		0.11	0.30	0.17	0.25	0.16
	Sodium (Na) (mg/kg)		61	118	93	111	78
	Strontium (Sr) (mg/kg)		49.5	37.9	51.6	58.5	52.1
	Sulfur (S) (mg/kg)		<1000	2900	<1000	<1000	<1000
	Thallium (TI) (mg/kg)		0.110	0.331	0.167	0.207	0.147
	Tin (Sn) (mg/kg)		<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) (mg/kg)		62.3	49.1	66.0	53.6	<51
	Tungsten (W) (mg/kg)		<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U) (mg/kg)		0.757	0.997	1.01	0.976	0.871
	Vanadium (V) (mg/kg)		24.6	33.3	34.5	39.8	28.3
	Zinc (Zn) (mg/kg)		70.5	103	89.3	104	81.4
	Zirconium (Zr) (mg/kg)		2.2	3.3	3.2	4.1	2.5
			2.2		3.2	4.1	

L2183717 CONTD.... PAGE 5 of 7 30-OCT-18 14:22 (MT) Version: FINAL

	Do Sam	Sample ID escription pled Date pled Time Client ID	L2183717-6 Soil 18-OCT-18 11:51 POUCE COUPE (POUCE)	L2183717-7 Soil 18-OCT-18 13:29 PEACE AT MANY ISLANDS (PD5)	L2183717-8 Soil 18-OCT-18 13:29 DUP1	
Grouping	Analyte					
SOIL						
Metals	Manganese (Mn) (mg/kg)		351	251	252	
	Mercury (Hg) (mg/kg)		0.0380	0.0521	0.0578	
	Molybdenum (Mo) (mg/kg)		1.03	1.08	1.04	
	Nickel (Ni) (mg/kg)		20.5	22.3	22.6	
	Phosphorus (P) (mg/kg)		591	734	699	
	Potassium (K) (mg/kg)		1060	1240	1190	
	Selenium (Se) (mg/kg)		0.46	0.41	0.52	
	Silver (Ag) (mg/kg)		<0.10	0.16	0.15	
	Sodium (Na) (mg/kg)		113	77	81	
	Strontium (Sr) (mg/kg)		33.5	45.5	43.3	
	Sulfur (S) (mg/kg)		<1000	1000	1000	
	Thallium (Tl) (mg/kg)		0.107	0.142	0.135	
	Tin (Sn) (mg/kg)		<2.0	<2.0	<2.0	
	Titanium (Ti) (mg/kg)		55.6	65.9	63.7	
	Tungsten (W) (mg/kg)		<0.50	<0.50	<0.50	
	Uranium (U) (mg/kg)		0.674	1.04	0.973	
	Vanadium (V) (mg/kg)		31.0	29.1	28.8	
	Zinc (Zn) (mg/kg)		70.8	77.0	78.1	
	Zirconium (Zr) (mg/kg)		3.0	3.8	3.7	

QC Samples with Qualifiers & Comments:

Duplicate	ion	Parameter	Qualifier	Applies to Sample Number(s)
		Mercury (Hg)	DUP-H	L2183717-7, -8
Qualifiers for Ind	lividual Parameters	Listed:		
Qualifier D	Description			
DLM D	Detection Limit Adjus	ted due to sample matrix effects (e.g. ch	emical interfere	ence, colour, turbidity).
DUP-H D	Duplicate results outs	ide ALS DQO, due to sample heterogen	eity.	
est Method Refe	erences:			
ALS Test Code	Matrix	Test Description		Method Reference**
C-TIC-PCT-SK	Soil	Total Inorganic Carbon in Soil		CSSS (2008) P216-217
		•	soil. The pH of	the resulting solution is measured and compared
-		weight of carbonate.		
C-TOC-CALC-SK	Soil	Total Organic Carbon Calculation		CSSS (2008) 21.2
Total Organic Car	bon (TOC) is calcula	ted by the difference between total carbo	on (TC) and tota	al inorganic carbon. (TIC)
C-TOT-LECO-SK	Soil	Total Carbon by combustion method		CSSS (2008) 21.2
The sample is ign	ited in a combustion	analyzer where carbon in the reduced C	O2 gas is deter	mined using a thermal conductivity detector.
HG-200.2-CVAF-V	A Soil	Mercury in Soil by CVAAS		EPA 200.2/1631E (mod)
	digested with hot nitri etals digestion metho		/AAS analysis.	This method is fully compliant with the BC SALM strong
C-CACO3-CALC-S	SK Soil	Inorganic Carbon as CaCO3 Equivale	ent	Calculation
MET-200.2-CCMS-	VA Soil	Metals in Soil by CRC ICPMS		EPA 200.2/6020A (mod)
N-TOT-LECO-SK	Soil	Total Nitrogen by combustion method	ł	CSSS (2008) 22.4
The sample is ion	ited in a combustion	analyzer where nitrogen in the reduced	nitrous oxide da	s is determined using a thermal conductivity detector.
			inite de critate ge	
	Soil	Total Kieldahl Nitrogen		· · ·
N-TOTKJ-COL-SK		Total Kjeldahl Nitrogen h the presence of CuSO4 and K2SO4 ca	Ū	CSSS (2008) 22.2.3 nia in the soil extract is determined colrimetrically at 660
N-TOTKJ-COL-SK The soil is digeste nm.	ed with sulfuric acid ir	the presence of CuSO4 and K2SO4 ca	Ū	CSSS (2008) 22.2.3 nia in the soil extract is determined colrimetrically at 660
N-TOTKJ-COL-SK The soil is digeste nm. N2/N3-AVAIL-SK	ed with sulfuric acid ir Soil	the presence of CuSO4 and K2SO4 ca Nitrate, Nitrite and Nitrate+Nitrite-N	talysts. Ammor	CSSS (2008) 22.2.3 nia in the soil extract is determined colrimetrically at 660 APHA 4500 NO3F
N-TOTKJ-COL-SK The soil is digeste nm. N2/N3-AVAIL-SK Available Nitrate a passage of the sa sulfanilamide follo measured at color column.	ed with sulfuric acid in Soil and Nitrite are extract imple through a copp owed by coupling with rimetrically at 520nm	h the presence of CuSO4 and K2SO4 ca Nitrate, Nitrite and Nitrate+Nitrite-N ed from the soil using a dilute calcium c erized cadmium column. The nitrite (re N-(1-naphthyl) ethylenediamine dihydro Nitrite is determined on the same extra	talysts. Ammor hloride solution duced nitrate pl ochloride. The r act by following	CSSS (2008) 22.2.3 iia in the soil extract is determined colrimetrically at 660 APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium
N-TOTKJ-COL-SK The soil is digeste nm. N2/N3-AVAIL-SK Available Nitrate a passage of the sa sulfanilamide follo measured at color column.	ed with sulfuric acid in Soil and Nitrite are extract imple through a copp owed by coupling with rimetrically at 520nm	h the presence of CuSO4 and K2SO4 ca Nitrate, Nitrite and Nitrate+Nitrite-N ed from the soil using a dilute calcium c erized cadmium column. The nitrite (re N-(1-naphthyl) ethylenediamine dihydro	talysts. Ammor hloride solution duced nitrate pl ochloride. The r act by following	CSSS (2008) 22.2.3 iia in the soil extract is determined colrimetrically at 660 APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium
N-TOTKJ-COL-SK The soil is digeste nm. N2/N3-AVAIL-SK Available Nitrate a passage of the sa sulfanilamide follo measured at color column. Reference: Recon	ed with sulfuric acid in Soil and Nitrite are extract imple through a copp owed by coupling with rimetrically at 520nm	h the presence of CuSO4 and K2SO4 ca Nitrate, Nitrite and Nitrate+Nitrite-N ed from the soil using a dilute calcium c erized cadmium column. The nitrite (re N-(1-naphthyl) ethylenediamine dihydro Nitrite is determined on the same extra	talysts. Ammor hloride solution duced nitrate pl ochloride. The r act by following	CSSS (2008) 22.2.3 iia in the soil extract is determined colrimetrically at 660 APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium
N-TOTKJ-COL-SK The soil is digeste nm. N2/N3-AVAIL-SK Available Nitrate a passage of the sa sulfanilamide follo measured at color column. Reference: Recon NH4-AVAIL-SK Ammonium (NH4-	ed with sulfuric acid in Soil and Nitrite are extract imple through a copp wed by coupling with rimetrically at 520nm nmended Methods of Soil	h the presence of CuSO4 and K2SO4 ca Nitrate, Nitrite and Nitrate+Nitrite-N ed from the soil using a dilute calcium c erized cadmium column. The nitrite (re N-(1-naphthyl) ethylenediamine dihydro Nitrite is determined on the same extra Soil Analysis for Canadian Prairie Agric Available Ammonium-N	talysts. Ammor hloride solution duced nitrate pl ochloride. The r act by following cultural Soils. Al	CSSS (2008) 22.2.3 nia in the soil extract is determined colrimetrically at 660 APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium berta Agriculture (1988) p. 19 and 28
N-TOTKJ-COL-SK The soil is digestent. N2/N3-AVAIL-SK Available Nitrate a passage of the sa sulfanilamide follo measured at color column. Reference: Recon NH4-AVAIL-SK Ammonium (NH4- blue, which is dete	ed with sulfuric acid in Soil and Nitrite are extract imple through a copp wed by coupling with rimetrically at 520nm nmended Methods of Soil	h the presence of CuSO4 and K2SO4 ca Nitrate, Nitrite and Nitrate+Nitrite-N ed from the soil using a dilute calcium c erized cadmium column. The nitrite (re N-(1-naphthyl) ethylenediamine dihydro Nitrite is determined on the same extra Soil Analysis for Canadian Prairie Agric Available Ammonium-N the soil using 2 N KCI. Ammonium in the	talysts. Ammor hloride solution duced nitrate pl pchloride. The r act by following cultural Soils. Al	CSSS (2008) 22.2.3 nia in the soil extract is determined colrimetrically at 660 APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium berta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6)
N-TOTKJ-COL-SK The soil is digestent. N2/N3-AVAIL-SK Available Nitrate a passage of the sa sulfanilamide follo measured at color column. Reference: Recon NH4-AVAIL-SK Ammonium (NH4- blue, which is dete PH-1:2-VA This analysis is ca Physical/Inorganic	ed with sulfuric acid in Soil and Nitrite are extract imple through a copp wed by coupling with rimetrically at 520nm nmended Methods of Soil -N) is extracted from ermined colorimetrica Soil arried out in accordar c and Misc. Constitue	n the presence of CuSO4 and K2SO4 ca Nitrate, Nitrite and Nitrate+Nitrite-N ed from the soil using a dilute calcium c erized cadmium column. The nitrite (re N-(1-naphthyl) ethylenediamine dihydro Nitrite is determined on the same extra Soil Analysis for Canadian Prairie Agric Available Ammonium-N the soil using 2 N KCI. Ammonium in the ally by auto analysis at 660 nm. pH in Soil (1:2 Soil:Water Extraction) are with procedures described in the pH ents, BC Environmental Laboratory Manu	talysts. Ammor hloride solution duced nitrate pl ochloride. The r act by following cultural Soils. Al e extract is mixe Electrometric i ual 2007. The p	CSSS (2008) 22.2.3 nia in the soil extract is determined colrimetrically at 660 APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium berta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6) ed with hypochlorite and salicylate to form indophenol BC WLAP METHOD: PH, ELECTROMETRIC, SOIL n Soil and Sediment method - Section B
N-TOTKJ-COL-SK The soil is digesten. N2/N3-AVAIL-SK Available Nitrate a passage of the sa sulfanilamide follo measured at color column. Reference: Recon NH4-AVAIL-SK Ammonium (NH4- blue, which is dete PH-1:2-VA This analysis is ca Physical/Inorganic (No. 10 / 2mm) sa probe.	ed with sulfuric acid in Soil and Nitrite are extract imple through a copp wed by coupling with rimetrically at 520nm nmended Methods of Soil -N) is extracted from ermined colorimetrica Soil arried out in accordar c and Misc. Constitue	n the presence of CuSO4 and K2SO4 ca Nitrate, Nitrite and Nitrate+Nitrite-N ed from the soil using a dilute calcium c erized cadmium column. The nitrite (re N-(1-naphthyl) ethylenediamine dihydro Nitrite is determined on the same extra Soil Analysis for Canadian Prairie Agric Available Ammonium-N the soil using 2 N KCI. Ammonium in the ally by auto analysis at 660 nm. pH in Soil (1:2 Soil:Water Extraction) are with procedures described in the pH ents, BC Environmental Laboratory Manu	talysts. Ammor hloride solution duced nitrate pl ochloride. The r act by following cultural Soils. Al e extract is mixe Electrometric i ual 2007. The p	CSSS (2008) 22.2.3 nia in the soil extract is determined colrimetrically at 660 APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium berta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6) ed with hypochlorite and salicylate to form indophenol BC WLAP METHOD: PH, ELECTROMETRIC, SOIL n Soil and Sediment method - Section B procedure involves mixing the dried (at <60°C) and siever
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N-TOTKJ-COL-SK The soil is digestent. N2/N3-AVAIL-SK Available Nitrate a passage of the sa sulfanilamide follo measured at color column. Reference: Recon NH4-AVAIL-SK Ammonium (NH4- blue, which is dete PH-1:2-VA This analysis is ca Physical/Inorganic (No. 10 / 2mm) sa probe. PO4-AVAIL-SK Plant available ph	ed with sulfuric acid in Soil and Nitrite are extract imple through a copp wed by coupling with rimetrically at 520nm nmended Methods of Soil N) is extracted from ermined colorimetrica Soil arried out in accordar c and Misc. Constitue ample with deionized/ Soil osphorus is extracted	h the presence of CuSO4 and K2SO4 ca Nitrate, Nitrite and Nitrate+Nitrite-N ed from the soil using a dilute calcium c erized cadmium column. The nitrite (re N-(1-naphthyl) ethylenediamine dihydro Nitrite is determined on the same extra Soil Analysis for Canadian Prairie Agric Available Ammonium-N the soil using 2 N KCI. Ammonium in the ally by auto analysis at 660 nm. pH in Soil (1:2 Soil:Water Extraction) nee with procedures described in the pH ents, BC Environmental Laboratory Manu distilled water at a 1:2 ratio of sediment Available Phosphate-P	talysts. Ammor hloride solution duced nitrate pl ochloride. The r act by following cultural Soils. Al e extract is mixe be extr	CSSS (2008) 22.2.3 hia in the soil extract is determined colrimetrically at 660 APHA 4500 NO3F Nitrate plus Nitrite is quantitatively reduced to nitrite by us original nitrite) is then determined by diazotizing with esulting water soluble dye has a magenta color which is the same instrumental procedure without a cadmium berta Agriculture (1988) p. 19 and 28 CSSS Carter 6.2 / Comm Soil Sci 19(6) ed with hypochlorite and salicylate to form indophenol BC WLAP METHOD: PH, ELECTROMETRIC, SOIL n Soil and Sediment method - Section B procedure involves mixing the dried (at <60°C) and sieved of the solution is then measured using a standard pH

Reference:

Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.
The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

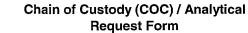
mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION. Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.





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Canada Toll Free: 1 800 668 9878

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Report To	Report Format / Distribution						(urnaround Time (TAT) is not available for all tests)																	
Company:	Select Report Format: 🗹 PDF 🗹 EXCEL 🗹 EDD (DIGITAL)						R I Regular (Standard TAT if received by 3 pm - business days)																	
Contact:	ntact: Lucas Hennecker					Quality Control (QC) Report with Report 🔽 Yes 🗌 No																		
Address: Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC V6C 1N5				Criteria on Report - provide details below if box checked						E Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT														
				Select Distribution: 🛛 EMAIL 🗍 MAIL 🗍 FAX						E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge														
Phone:	Email 1 or Fax Lucas.Hennecker@tetratech.com (see notes)						Specify Date Required for E2,E or P:																	
	Email 2 Brent.Finnestad@tetratech.com						Analysis Request Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																	
Invoice To	Invoice Distribution						Indi	cate Fili	ered (F)	Presen	ved (P) or	Filtered	and Prese	erved (F	F/P) bel	ow								
	Select invoice Distribution: 🗹 EMAIL 🗌 MAIL 🔲 FAX																							
Company:	Email 1 or Fax ebaaccountspayable@tetratech.com							& Hg																
Contact:				Email 2 Lucas.Hennecker@tetratech.com (see notes)							s) &										ស			
Project Information				Oil and Gas Required Fields (client use)							nes										Containers			
ALS Quote #:	Approver ID: Cost Center:					E F E		lard										out						
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ALS Lab Wo	ALS Contact:	Bren	t Mack	Sampler: Luios		TP, TDP,	e	s (C										Z						
ALS Lab WO	ork Order # (lab use only)	L218	7717	ALS CONIACI.	Diei		Sampler. H	enaby	, Ľ	Siz	letal													
ALS Sample #	Sample		Date		Time	Sample Type		Particle Size	Total Metals (CCME+ICP+Hardness)															
(lab use only)		(dd-m	nmm-yy)	(hh:mm)	Sample Type	TOC,	Par																	
	Peace at Beatton (PD2)					rt-18	8:10	Soil	R	R	R										3			
	Beatton River (BEA)			1	8.55	Soil	R	R	R										3					
	Peace at Kiskatinaw (PD3)					9:44	Soil	R	R	R										3				
	Kiskatinaw River (KR)			1	10:13	Soil	R	R	R										3					
	Peace at Pouce Coupe (PD4)						11-18	Soil	R	R	R										3			
	Pouce Coupe (POUCE)			/	11:51	Soil	R	R	R										3					
	Peace at Many Islands (PD	•	<u> </u>		13-29	Soil	R	R	R										3					
	DUPI			-15-00		13:29	Soil	R	P	R										3				
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Drinking	Water (DW) Samples ¹ (clie	structions / Specify Criteria to add on report (client Use)						SAMPLE CONDITION AS RECEIVED (lab use only)																
Are samples tak							Frozen SIF Observations Yes No																	
	MOE 2018 Approved and Working Water Quality Guidelines for Ind Health Canada Guidelines for Drinking Water. samples were						Ice packs Yes 🖾 No 🛄 Custody seal intact Yes 🔲 No 🔲																	
Are samples for	nt water sources. Please add nich.burnett@bchydro.com to																							
Are samples for	S																							
<u>├</u>		INITIAL SHIPMENT RECEPTION (lab use only)						6/7 FINAL SHIPMENT RECEPTION (lab use only)																
Released by:	SHIPMENT RELEASE (c	d by:						Received by:																
Lucas H	mecker a	Geort Det (8/13 17:15						JC nrt 199118 /1-05/42																
REFER TO BACK	LUGS HEMECHER OF 18/18 17:15 GOFF D= + (B/13 17:15) HEFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - (Pγ				NA-FM-03	26e v09 From	n/04 Januar	ry 2014					

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.
1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.