Columbia Valley Regional Landfill
2020 Groundwater Monitoring Annual Report

PREPARED FOR: REGIONAL DISTRICT OF EAST KOOTENAY

PREPARED BY: SPERLING HANSEN ASSOCIATES

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PRJ20050

SPERLING HANSEN ASSOCIATES

Regional District of East Kootenay

- Landfill Engineering
- Solid Waste Planning
- Environmental Monitoring
- Landfill Fire Control

1. INTRODUCTION

Sperling Hansen Associates (SHA) was retained by the Regional District of East Kootenay (RDEK) in 2020 to develop an updated Groundwater Monitoring Program (GMP) for seven (7) Solid Waste Management facilities located withing the RDEK. As part of this GMP update, SHA along with Subconsultant Bear Environmental Limited (BEAR), will conduct four (4) groundwater sampling events per year, and provide one interim report per event for each site. The goal of this program is to provide the RDEK with valuable information regarding the groundwater quality at disposal sites and to assist in developing appropriate monitoring and management measures for the next five years.

SHA was awarded this contract with the RDEK in April, 2020. The first two quarterly sampling events were completed by the previous consultant EcoLogic in January and April 2020. As SHA was brought on halfway through the year, the results of the first two sampling events were shared with SHA so that a complete data set for 2020 could be compiled, and that the complete data from all four events could be reviewed and included in this Annual report. The final quarterly water sampling event for the year was completed in October, 2020 over a week period. Samples taken from each site are recorded below, and water quality analysis discussed in Section 4. This report details the sampling notes, lab analysis results, and trends observed at the wells throughout 2020. Section 5 presents recommendations for the next year of monitoring

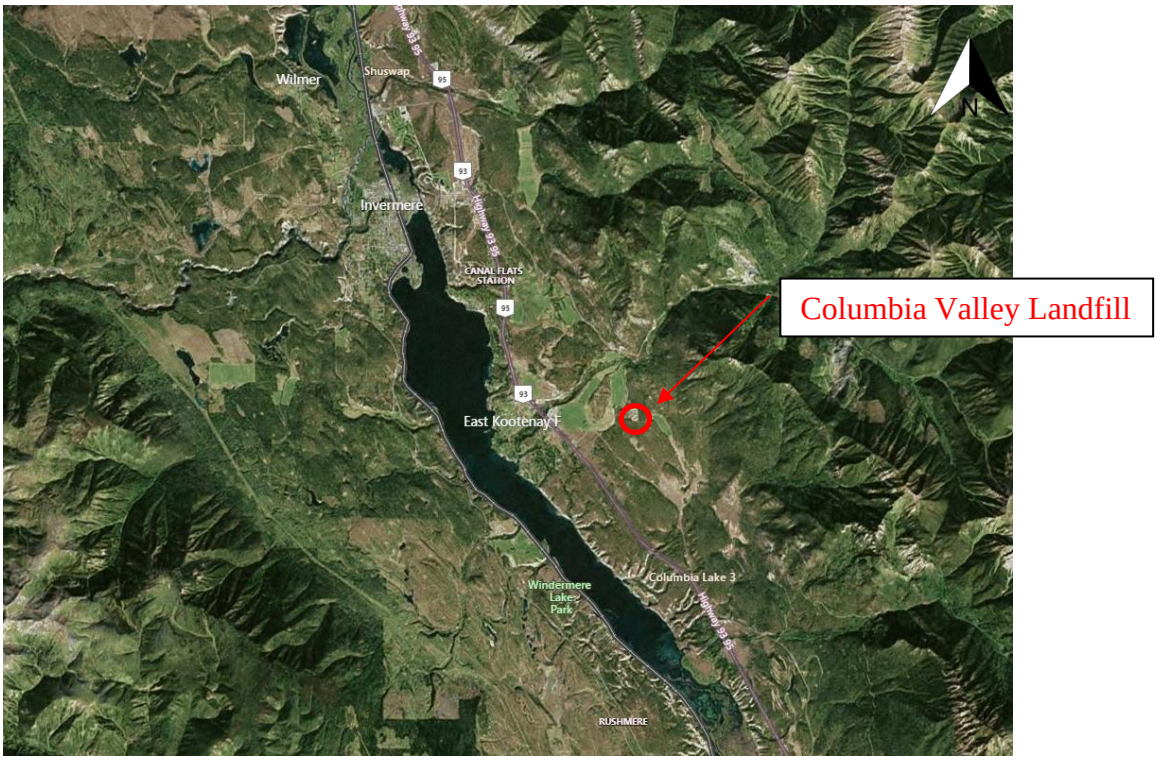


Photo 1-2. Columbia Valley Site Location.

1.1 Location and Setting

The Columbia Valley Landfill is located in the sub-region of Columbia Valley within the RDEK. The site is approximately 1 km from the community of Windermere and 2 km from the municipality of Invermere. The civic address of the site is 1875 Windermere Loop Road. The legal description of the property is Parcel A of Lot 4619, Plan 4386. The longitude and latitude are -115.942831 and 50.465430 respectively.

Photo 1-1. Columbia Valley Landfill Site Layout.

1.2 Site Operations

The landfill operates seven days a week, from 9:00 am to 6:00 pm. The site accepts MSW, recycling, yard and garden waste, and some commercial waste. Due to the nature of waste when it comes into contact with water, it is required to monitor the groundwater on and surrounding the site to observe impacts from the landfill. In compliance with Landfill Criteria for Municipal Solid Waste, Sperling Hansen Associates (SHA) was retained to conduct the groundwater and LFG monitoring. The wells, identified on Figure 1, are sampled quarterly in January, April, July, and October.

The Operational Certificate for the Central Valley Regional Landfill is attached to this report as Appendix A.

2. MONITORING PROGRAM

As per the Columbia Valley Landfill Certificate (OC), the Site monitoring program was required to be developed by a qualified professional to identify potential impacts to the environment and public health and is included in the Site's Design and Operation Plan. Currently, this program includes the quarterly

monitoring of five on-Site wells and three domestic wells. On-Site wells included are E208726, E208720, E265102, E265103, and MW03-5. Domestic wells in the monitoring program include E20778, E207780, and E207782.

Figure 1 outlines the location of wells present in the monitoring program.

Note that in 2020, due to changes in consultants between Q1/Q2 to Q3/Q4, some wells were not sampled in all quarters. Effort was made by SHA to visit the Site twice in Q1 of the new year 2021 to establish visual accounts of all monitoring well locations and to make determinations on specific sampling gear requirements for electrical pump wells.

2.1 Methodology

Ecologic Consultants Ltd. Provided conducted the Site's monitoring program in Q1/Q2 2020. Subsequently, BEAR has conducted field sampling from Q3/Q. Certificates of Analysis were provided to SHA for the year's sampling with the exception of Ecologic's Q2 2020 results..

Each well sampled was tested for a set of parameters. These differ from site to site and some are only tested quarterly while others are only tested annually. Table 2-1 shows which parameters are tested Quarterly and Yearly at the Columbia Valley Landfill.

Table 2-1. Groundwater Monitoring Parameters.

Site	Quarterly and Annual Parameters
Columbia Valley Sub-Region Landfill	Temperature
	Conductivity
	pH
	Nitrite (N)
	Nitrate (N)
	Ammonia Nitrogen (NH3)
	Fluoride (F)
	Sulphate (SO4)
	Chloride (Cl)
	Hardness
	Total Alkalinity
	Total Suspended Solids
	Dissolved Metals
	Total Metals
	Landfill Gas (LEL)

Analysis of the water samples was conducted by ALS Environmental, a CALA accredited laboratory. Certificate of Analysis (COA) are included in Appendix C.

2.2 Groundwater Flow

According to the 2019 DOCP prepared for the site by SHA, the landfill is located atop 30m of dense gravel and silt, underlain by saturated glaciofluvial sand and gravel. The landfill has been developed on a terrace approximately 3.1 km east of Windermere Lake. Based on the regional topography, groundwater is inferred to flow west toward Windermere Lake. Locally, groundwater appears to flow towards the south west under alluvial sands and gravel deposits.

Well details are shown in the Table below. Wells E207780, E207778, and E207882 are off site domestic monitoring locations. E207778 is a well located west of the landfill on the adjacent golf course property. E207780 and E207882 and are sampled from taps at the Leverkus farm residence and C.L.I.B. office, and therefore do not have a measurable water level. All three domestic wells are considered downgradient of the landfill.

Table 2-2. Well Details and Water Level

Well ID	Well Construction	Water Elevation (m)
E265103	2" PVC	883.7
E265102	2" PVC	877.6
E208720	-	878.1
E207780	sink tap	876.0
E207782	outside hydrant tap	859.3
E208726	-	877.8
E207778	-	878.0
03-5	-	878.1

2.3 Nomenclature

The reporting of monitoring wells at the East Kootenay sites has previously been a combination of Environmental Monitoring System Numbers (EMSN, e.g. E207780) and site number names that are the more common naming convention (e.g. MW-1). The majority of sites have both, but some wells only have the E number. To avoid confusion and the potential of double counting the wells, SHA has decided to use the E numbers when referring to them. This way reports and analyses can be consistent, and can be traced to the OC or Permit for the site. The site maps attached to these Annual Reports as Figure 1 have been updated to reflect this change and now have the EMSN numbers labelled.

2.4 Regulatory Criteria

The 2011 OC for the landfill requires the following:

- **Section 2.6 Groundwater Impacts**
  - The landfill shall be operated in a manner such that ground or surface water quality does not decrease beyond that specified by the British Columbia Water Quality Guidelines, or other appropriate criteria as may be specified by the Director, at or beyond the landfill property boundary.
  - If exceedances to the specified water quality criteria occur as a result of landfill operations, the Director may require that leachate management control measures or works be undertaken. Terms of reference for any leachate management study and/or design work shall be submitted to the Director for review prior to conducting the work.

The Criteria recommends the following performance criteria for groundwater and surface water quality:

- After considering the identified uses of groundwater and surface water, a QP must recommend the appropriate water quality criteria, compliance locations, and provide related rationale and justification.
- The appropriate water quality criteria must be satisfied at and beyond the landfill site boundary, or 150 m from the landfill footprint, whichever is closer.
- Any discharges to surface water considered as potential fish habitat must also comply with the requirements of the federal Fisheries Act.

Recent standards and guidelines have been applied by SHA to include:

- The Schedule 3.2 of the BC CSR with consideration to Aquatic Life (AW) and Drinking Water (DW);
- Ministry of Environment and Climate Change Strategy (BC ENV) Source Drinking Water Quality Guidelines (BC SDWQG) to assess neighboring domestic well water quality.

These standards and guidelines published by BC ENV are the most recent used to assess groundwater at contaminated sites and the quality of drinking water.

3. RESULTS

Parameters tested in this event included:

- pH, temperature, conductivity, total suspended solids (TSS), chloride, fluoride, sulphate, bromide, alkalinity (total CaCo3), alkalinity (PP as CaCO3), bicarbonate (HCO3), carbonate (CO3), hydroxide (OH), and the lower explosive limit of landfill gas (LEL).

In Appendix B, Table B-1 provides the water quality analysis alongside the applicable water standards.

All parameters tested were below applicable standards and guidelines with the exception of one parameter:

- Lithium

Details are provided in the Sections below.

3.1 Exceedances

Table 4-1 below outline the parameters exceeded by the wells monitored. Lithium was slightly above the CSR-DW limit at E265102 (MW0-02) for the four quarterly monitoring events.

Table 3-1. Maximum Parameter Concentrations Above BC CSR DW Standards

Parameter	BC CSR DW Standard	Maximum Concentration (mg/L)	Well Name
Lithium (Li)	0.008 mg/L	**0.0085**	E265102

Note: concentrations listed in the table are all above applicable DW standards. Maximum concentrations are shown in **bold.**

3.2 Notes on Regional Background Concentrations

As per the British Columbia Contaminated Sites Regulation (CSR) Schedule 3.2, 2019, the drinking water limit for Lithium (Li) is 8 µg/L or 0.008 mg/L. Many regions in B.C. have background concentrations of lithium that exceed this limit, which poses a complication for monitored sites that are required under Operation Certificates or Permits to avoid exceedances of harmful parameters. In response, the B.C. Ministry of Environment and Climate Change (BC ENV) published a document in 2018 qualifying the limit and providing background concentrations for three regions in the province for five metals, including lithium. The limits published in the *Technical Bulletin 3: Regional Background Concentrations for Select Inorganic Substances in Groundwater* account for naturally occurring levels of the five metals, and are therefore higher than the limit within the CSR currently.

However, these three regions only comprise the Lower Mainland, South Vancouver Island, and Thompson-Okanagan. SHA believes the exceedances in lithium observed at the RDEK sites may be attributable to natural background concentrations that are not accounted for in the CSR Schedule 3.2 or *Technical Bulletin 3*. It should be noted that Eco/Logic did not have a limit for lithium, which explains the discrepancy in exceedances despite there being little difference between 2019 and 2020 results.

Note that Thompson-Okanagan, the nearest region to the RDEK with a back ground concentration qualifier for lithium, has a qualified concentration in the Bulletin of 96 µg/L, or 0.096 mg/L . SHA does

not believe the RD needs to look into remediation measures at this point, but recommends the RD flag this exceedance history in the case that the Ministry publishes a background concentration for the Kootenay region. SHA recommends that future sampling at the Site be conducted utilizing low flow sampling methods to minimize the re-suspension of colloidal materials that can be caused during sampling with bailers and/or Waterra inertia pumps.

3.3 Landfill Gas

The Columbia Valley Landfill has five (5) Landfill Gas monitoring wells, primarily located on the northwest area of the site. These probes were installed in 2004, and are recommended to be monitored as per the DOCP SHA prepared for the site in 2004. LFG monitoring was completed by BEAR at the same time as water sampling.

The landfill criteria stipulate that soil gas concentrations at the landfill site boundary must not exceed the lower explosive limit of methane (5% by volume) at any time. This is particularly important for the Columbia Valley site as there are private residences close to the site. In order to ensure that this requirement is met, SHA installed five (5) nested (one shallow and one deep) probes along the north and west side of the site in 2004. The locations of the probes can be seen in Figure 1. As part of the quarterly monitoring program, a Landtec GEM 2000 Plus landfill gas analyzer was used for the monitoring. Each measurement consisted of reading relative pressure in the probe, and purging the probe until stable readings has been established.

The results from the four monitoring events are presented in Table B-2, presented in Appendix B. As can be seen in the table, all readings were well below the landfill criteria. This is consistent with the monitoring events that took place in 2019. Given the close proximity to nearby residences, it is recommended landfill gas monitoring continue in its current format. In the event that elevated levels of landfill gas are detected in any of the probes, the District representative must be notified right away as further actions may be required.

4. DISCUSSION

All parameters tested were below applicable standards and guidelines with the exception of the following parameters:

- Lithium

The maximum concentration of lithium was found at E265102 at 0.0085 mg/L versus the BC CSR DW standard of 0.008 mg/L. This maximum is calculated as 1.06 times the applicable standard.

4.1 Trend Analysis

To illustrate the trends observed in key parameters at the wells sampled, SHA has prepared figures that combine the 2020 groundwater results with the applicable criteria limits.

- Figure 2 – Lithium concentrations

- Figure 3 – Sulfate concentrations
- Figure 4 – Sodium concentrations
- Figure 5 – Chloride concentrations
- Figure 6 – Nitrate concentrations
- Figure 7 – Specific conductance (Conductivity)
- Figure 8 – Manganese concentrations

The red line on each figure represents the limit for that parameter according to the criteria, to show if wells are under or exceeding the maximum allowable concentration at the time of each quarterly sampling event.

Lithium is the parameter with an observable consistent trend above the CSR DW limit. Sulfate, sodium, chloride, nitrate, and conductivity are graphed because they are typical landfill indicators. As shown in the graphs, these parameters are below applicable standards and guidelines and show the landfill is not impacting groundwater chemistry beyond regulatory standards.

Please note that the graphs provided are for observing trends, and data less than or equal to the detection limit for a parameter appears on graphs as trace concentrations. If a well shows to have no data on the graph, please refer to the master data table for the exact parameter concentration.

4.2 Sampling Concerns

Currently, E207780 (Leverkus Farm) and E207782 (C.L.I.B. Office) are being sampled to capture domestic well water quality. During BEAR's most recent sampling event, in January 2021, the field technician met John Nicholas, a public works manager for the local Aksiqnuk First Nation. He informed BEAR that the tap that had been previously sampled from during Q3 and Q4 was incorrect, and that the appropriate sampling location is in a locked shed near the C.L.I.B. Office. The tap previously sampled has been treated and therefore is not an accurate representation of groundwater quality for this area off site, at least in comparison to data from previous years. This error may discount the Q3 and Q4 data from comparison with previous sampling data. Q3 and Q4 data for E207782 are included in this report but shouldn't be considered a true representation of E207782 water quality.

Bear noticed that several of the monitoring wells around the Columbia Valley landfill have wiring and electrical outlets for some kind of water pump. These include E207778 and E208726, as well as E208720 and MW03-5 which are suspected to be similar based on the mounted box on the exterior of the well. These are suspected to be fire suppression wells, but SHA will confirm with the Regional District how best to sample from these kind of wells.

In addition, SHA believes several wells on the Columbia Valley site plan from both the 2011 and 2014 Design, Operations, and Closure Plans may be inaccurately placed on the map or mislabelled. E207778 (Raven) is located on next to E207780 (Leverkus) on the map, when according to EcoLogic and Bear's sampling, E207778 is next to the golf course and approximately 5 m from the Windermere Loop Rd., facing north. E208726 is located on the map to the north west, when it is really on the north side of the berm and just outside the landfill fence. MW03-5 also is placed on the map within the landfill itself, in

the gravel pit. However, SHA believes its location is really on the east side if the landfill, near the transfer station and green waste pile, approximately 5 m from the fence. Bear used a GPS to obtain coordinates for these wells and SHA has updated Figure 1, the well location map, to more accurately show where the wells are. If the RD has any questions or comments about these observations, please let us know.

5. CONCLUSIONS AND RECOMMENDATIONS

In 2020, quarterly and annual sampling at the Site occurred in accordance with the OC and most recent DOCP. Note that due to changes in consultants between Q1/Q2 to Q3/Q4, some wells were not sampled in all quarters. Effort was made by SHA to visit the Site twice in Q1 of the new year 2021 to establish visual accounts of all monitoring well locations and to make determinations on specific sampling gear requirements for electrical pump wells.

All parameters generally associated with landfill leachate including, but not limited to, chloride, nitrate, and sulfate where below applicable standards and guidelines. However, one metals parameter, lithiumwas detected slightly above applicable criteria.

SHA recommends the following:

Slight metals parameter concentrations of lithium above applicable standards were detected in landfill well E265102, although, this was not accompanied with other elevated landfill contaminants such as chloride, sulfate, nitrate. SHA recommends that a future groundwater sampling events be conducted using a low flow method to minimize the re-suspension of colloidal materials that can be caused during sampling with bailers and/or Waterra inertia pumps. If this sampling method is effective in providing a more accurate interpretation of groundwater data and able to show the groundwater exceedances are a result of suspended materials from bailer sampling, then SHA could make a recommendation to the Regional District to implement this sampling method for the monitoring going forward.

The next sampling event is scheduled in Q2 in April 2021 and will also be the annual sampling and analysis event. This is in line with the same schedule of 2020 that EcoLogic followed. SHA will utilize this event to further establish visual accounts of Site monitoring wells, reference field accounts to published maps, and determine appropriate sampling methods . This spring sampling event is the most likely time of year that all wells are accessible and have adequate water flow.

6. STATEMENT OF LIMITATIONS

This report has been prepared by Sperling Hansen Associates. (SHA) on behalf of the Regional District of East Kootenay (RDEK) in accordance with generally accepted engineering practices to a level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions in British Columbia.

The report is based on site visits, project experience, and analysis by SHA staff of data compiled during the preparation of this report from a number of sources. Except where specifically stated to the contrary, the information on which this study is based has been obtained from external sources. This external information has not been independently verified or otherwise examined by SHA to determine its accuracy and completeness. SHA has relied in good faith on this information and does not accept responsibility of any deficiency, misstatements or inaccuracies contained in the reports as a result of omissions, misinterpretation and/or fraudulent acts of the persons interviewed or contacted, or errors or omissions in the reviewed documentation.

The report is intended solely for the use of the RDEK. Any use which other parties makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such other parties. SHA does not accept any responsibility for other uses of the material contained herein nor for damages, if any, suffered by any third party because of decisions made or actions based on this report. Copying of this intellectual property for other purposes is not permitted.
The findings and conclusions of this report are valid only as of the date of this report. The interpretations presented in this report and the conclusions and recommendations that are drawn are based on information that was made available to SHA during the course of this project. Should additional new data become available in the future, SHA should be requested to re-evaluate the findings of this report and modify the conclusions and recommendations drawn, as required.

Should you have any questions on this report or require further assistance or information, please feel free to contact the undersigned at 778-471-7088 or 604-986-7723.

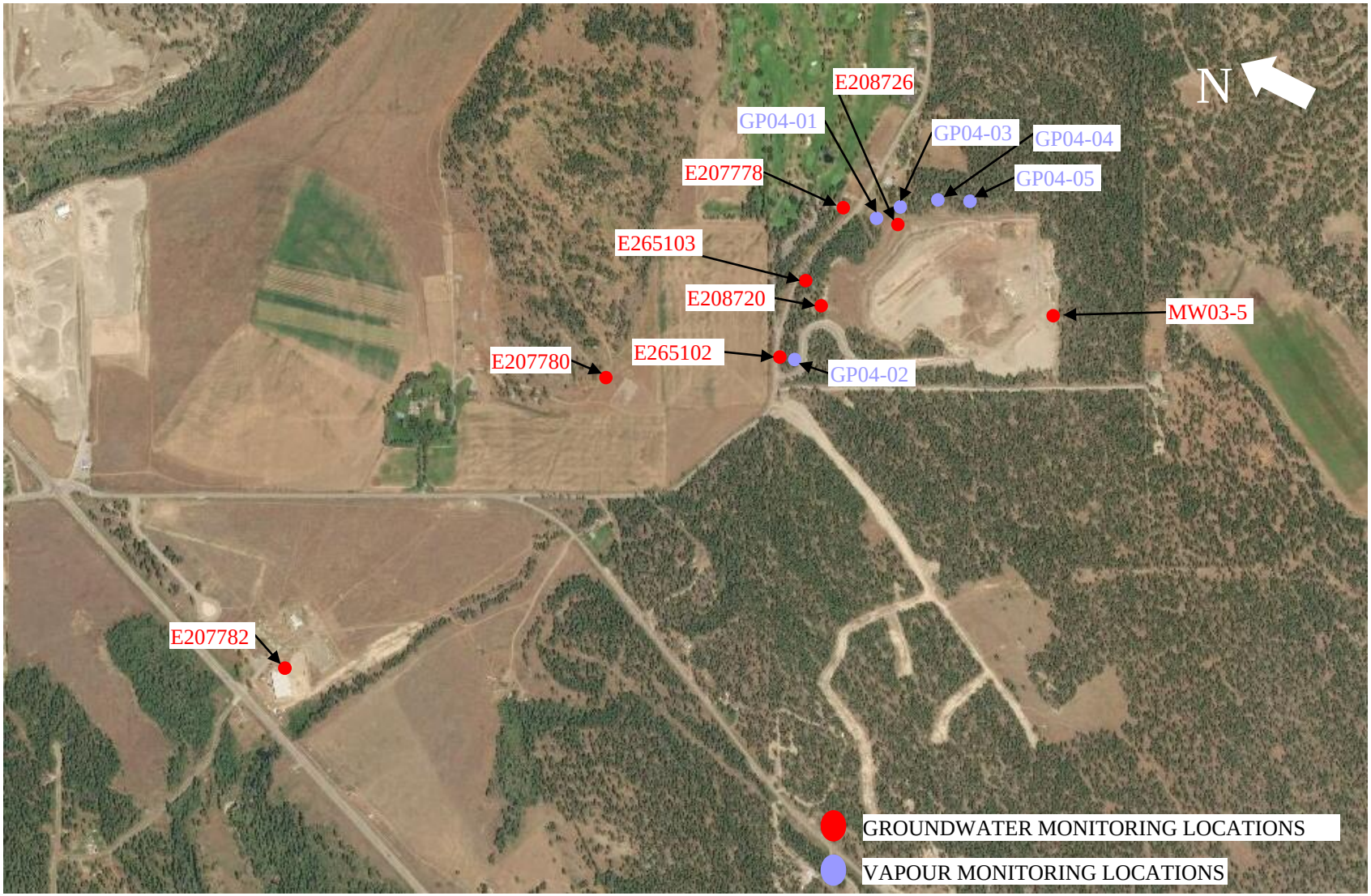
DRAFT Report prepared by:

Chloe Hetherington
Environmental Analyst Assistant

Rahim Gaidhar
GIT, Project Geoscientist

DRAFT Report reviewed by:

Scott Garthwaite
Sr. Civil Technologist



SPERLING HANSEN ASSOCIATES

Regional District of East Kootenay

PROJECT:

SOLID WASTE FACILITY MONITORING PROGRAM 2020-2025

TITLE:

COLUMBIA VALLEY LANDFILL MONITORING LOCATIONS

SCALE:	DATE:	PROJECT NO:
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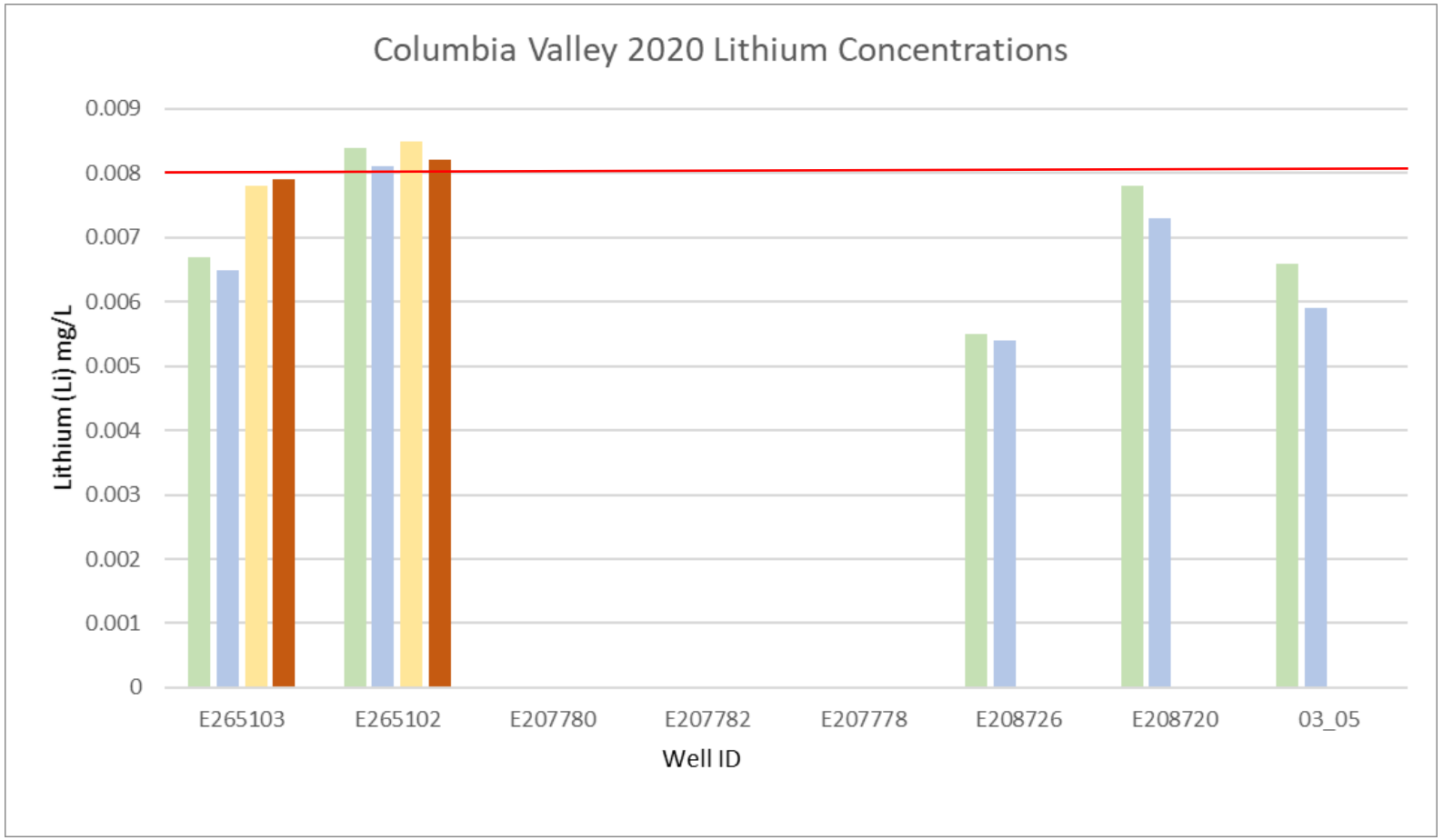
DESIGNED	-	DRAWING NO:
DRAWN	CH	**Figure 1**
CHECKED		



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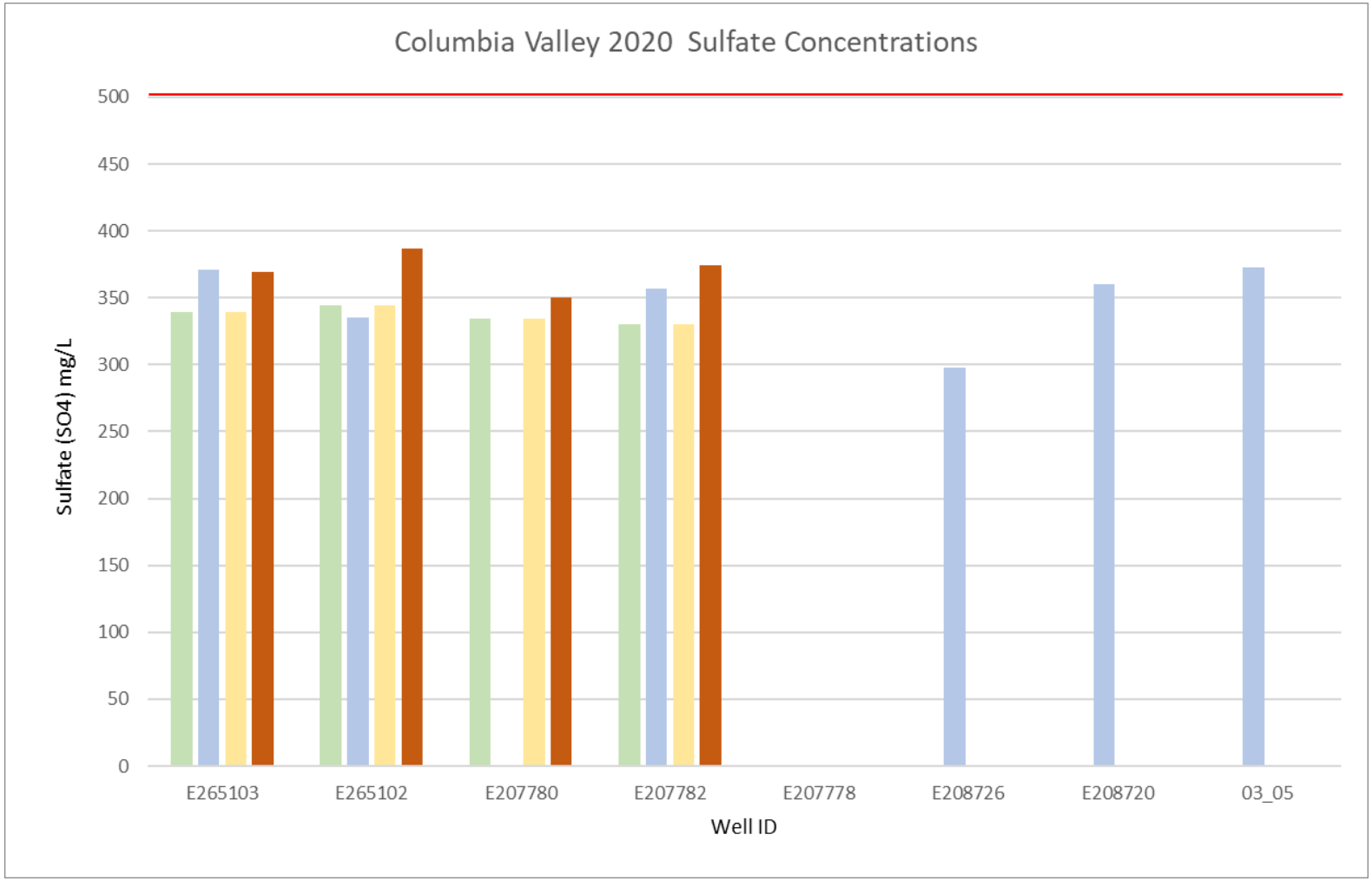

Sperling Hansen Associates

Regional District of East Kootenay

PROJECT:
SOLID WASTE FACILITY MONITORING PROGRAM 2020-2025

TITLE:
2020 Sulfate Concentrations

SCALE:	DATE:	PROJECT NO:
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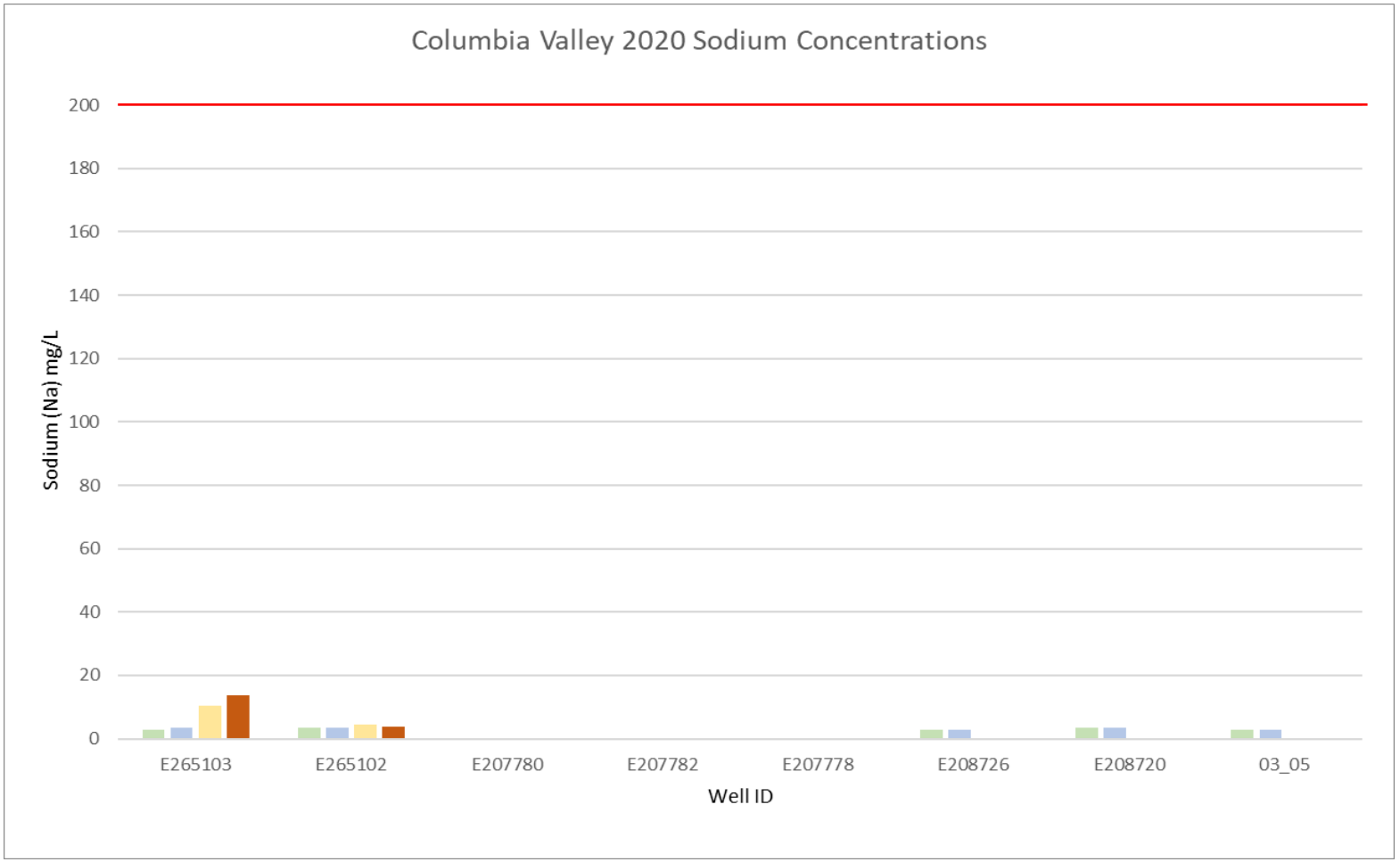
CHECKED	SG	



CSR DW Limit (200 mg/L)

Sperling Hansen Associates	Regional District of East Kootenay	PROJECT: SOLID WASTE FACILITY MONITORING PROGRAM 2020-2025	TITLE: 2020 Sodium Concentrations	SCALE: N/A	DATE: 28/01/2021 yyyy/mm/dd
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				DESIGNED	
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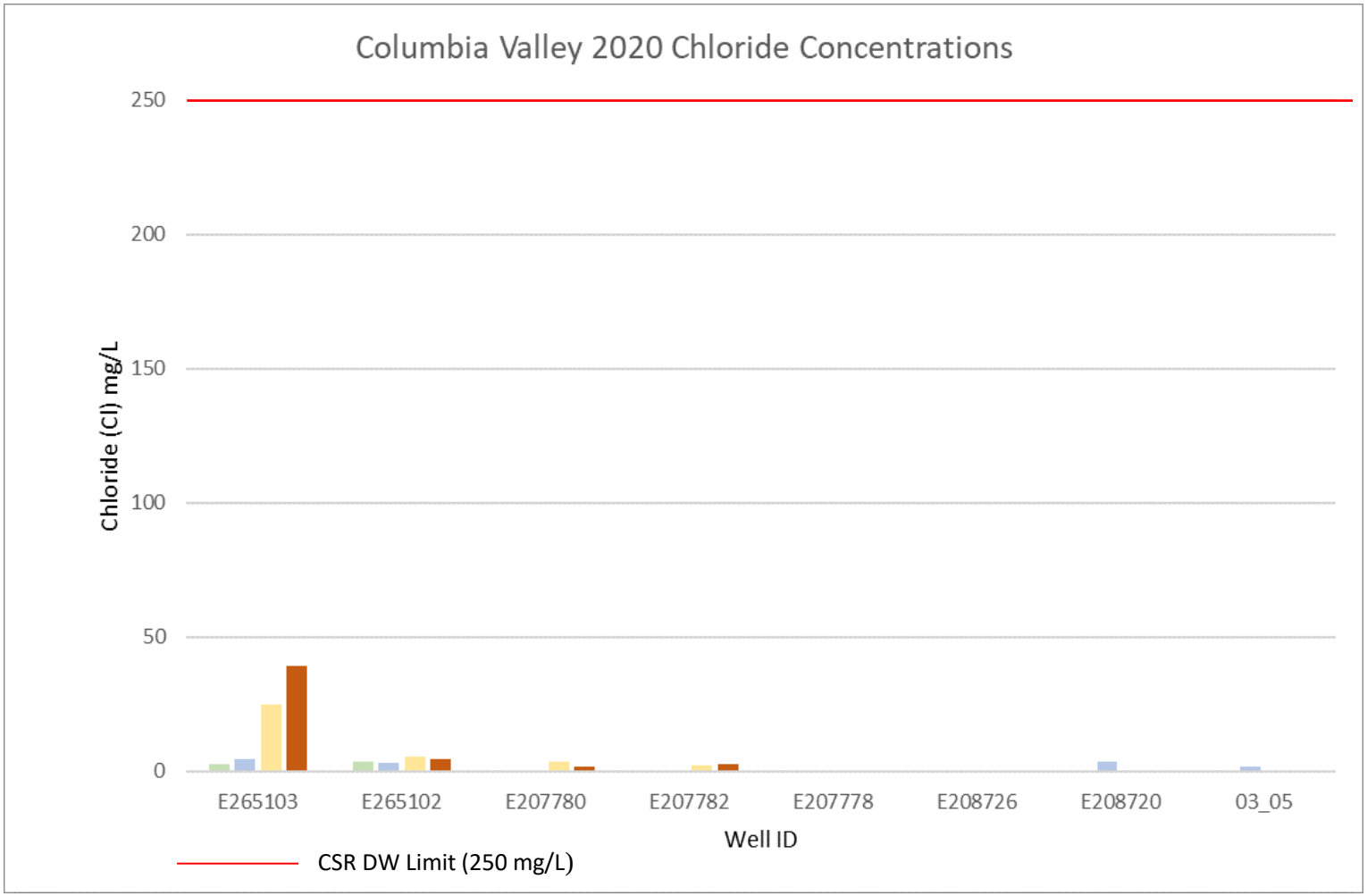

Sperling Hansen Associates	Regional District of East Kootenay	PROJECT: SOLID WASTE FACILITY MONITORING PROGRAM 2020-2025	TITLE: 2020 Chloride Concentrations

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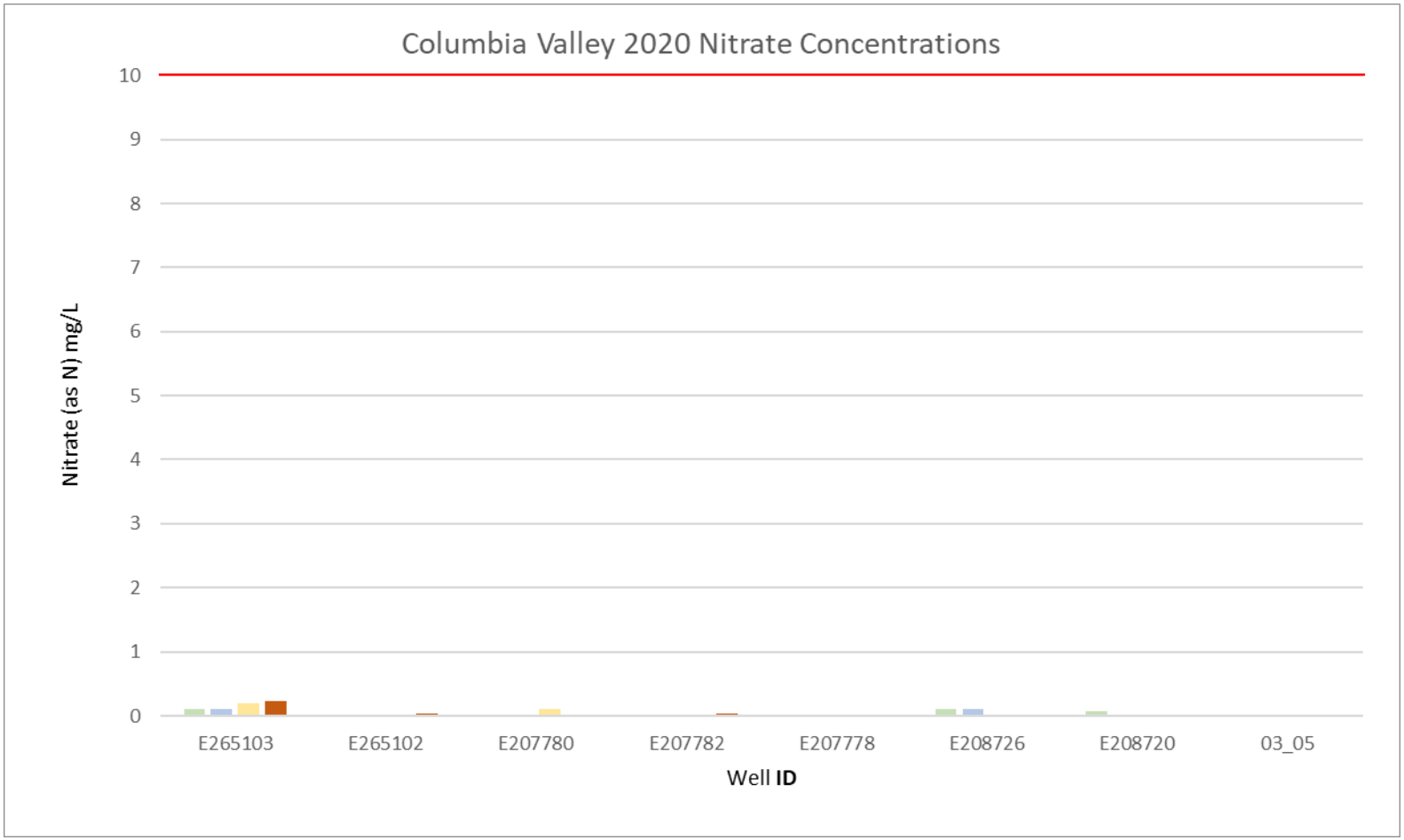

Sperling Hansen Associates	Regional District of East Kootenay	PROJECT: SOLID WASTE FACILITY MONITORING PROGRAM 2020-2025	TITLE: 2020 Nitrate Concentrations

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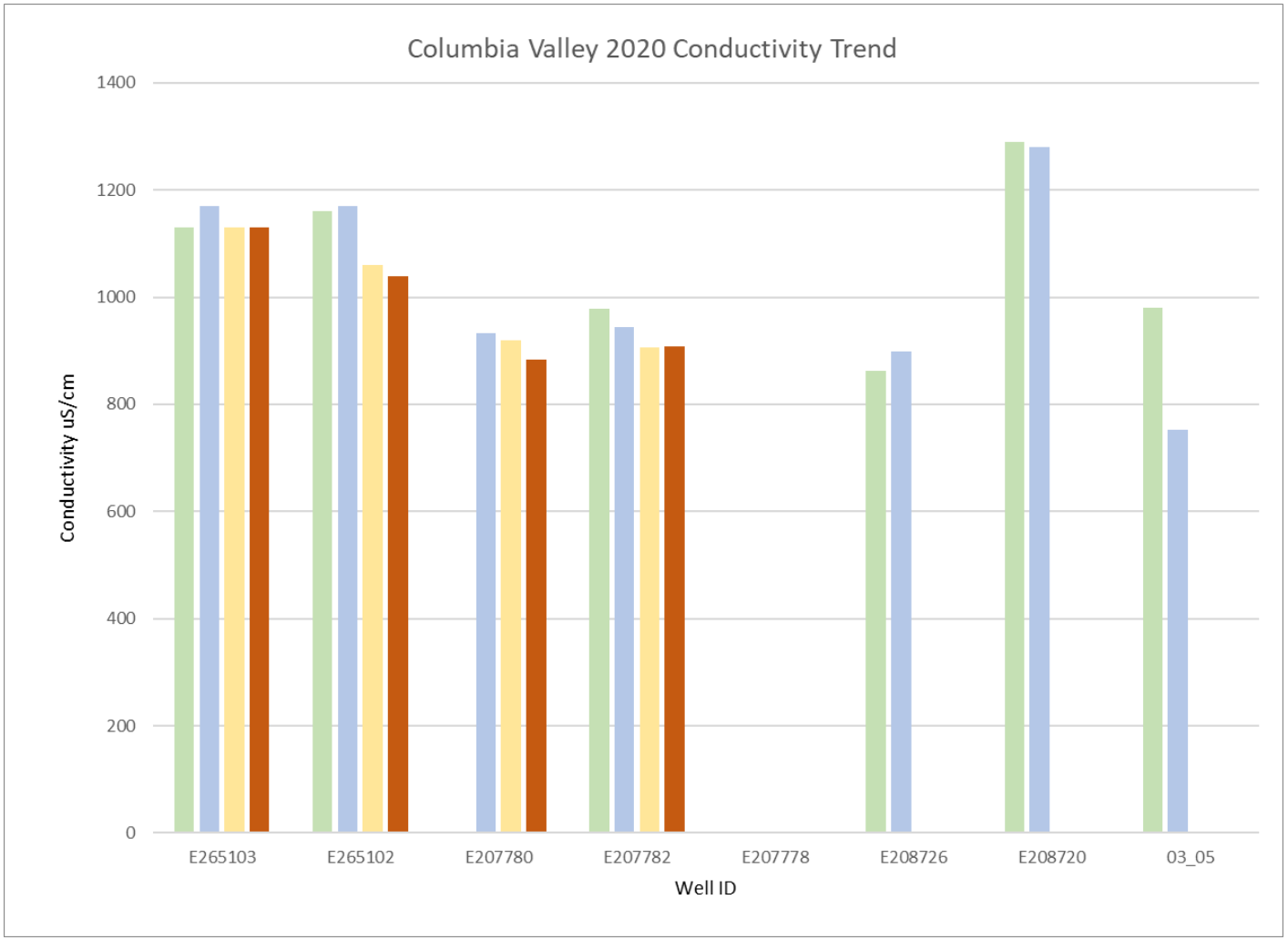

SPERLING HANSEN ASSOCIATES	Regional District of East Kootenay	PROJECT: SOLID WASTE FACILITY MONITORING PROGRAM 2020-2025	TITLE: 2020 Conductivity Trend

SCALE: N/A	DATE: 28/01/2021 yyyy/mm/dd	PROJECT NO: 20050	
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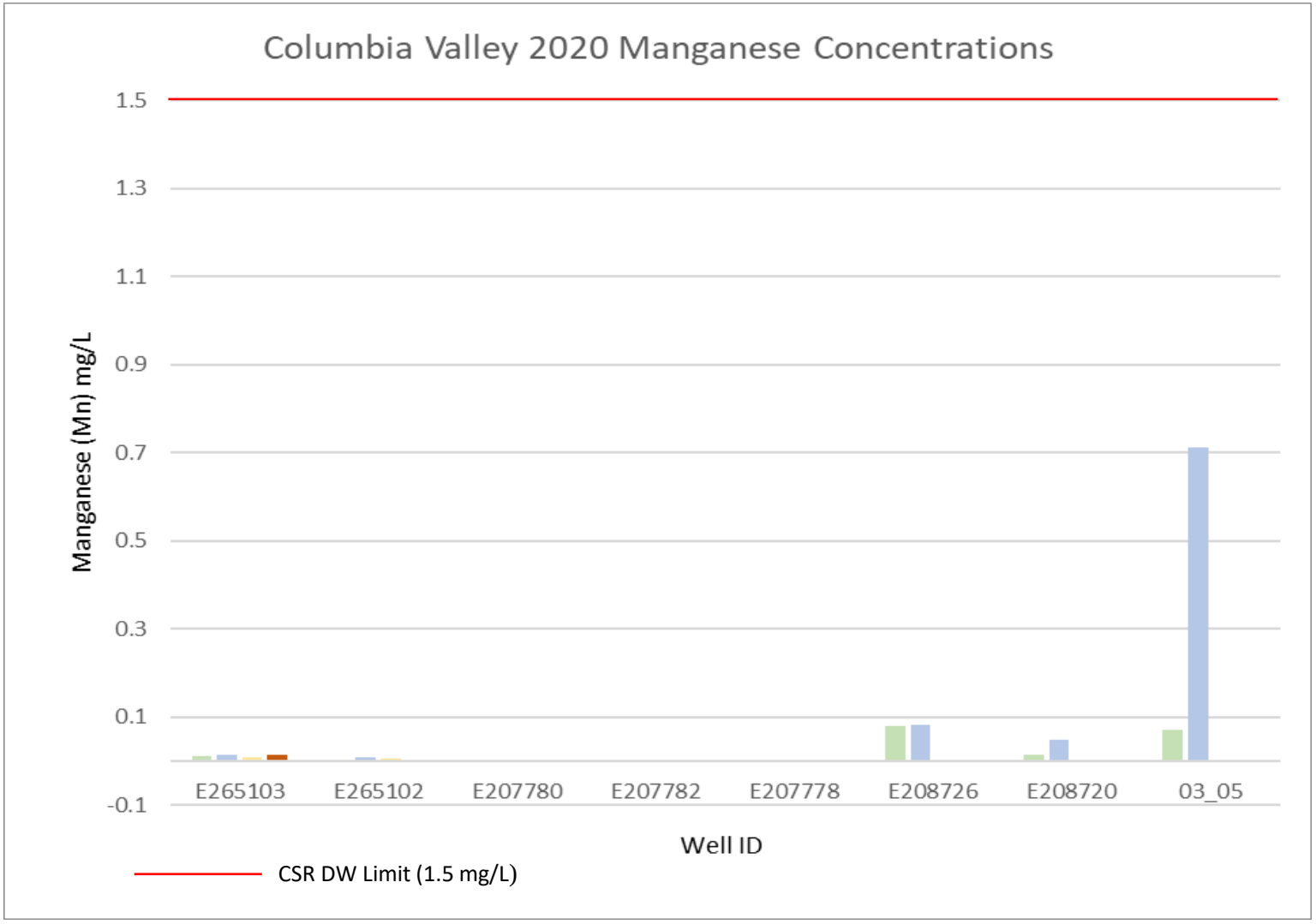

Sperling Hansen Associates	PROJECT: SOLID WASTE FACILITY MONITORING PROGRAM 2020-2025	TITLE: 2020 Manganese Concentrations	SCALE: N/A; DATE: 28/01/2021 yyyy/mm/dd; PROJECT NO: 20050
Regional District of East Kootenay			DESIGNED; DRAWN: CH; CHECKED: SG; DRAWING NO: Figure 8

Table B-1 2020 EcoLogic and Sperling Hansen Data

					Q1 (EcoLogic)								Q2 (EcoLogic)								Q3							Q4				
					Jan-20								Apr-20								Jul-20							Oct-20				
		CSR-AW 2019 (2)	CSR-DW 2019 (2)	BC SDWQG 2020	E265103	E265102	E207780	E207782	E207778	E208726	E208720	03_05	E265103	E265102	E207780	E207782	E207778	E208726	E208720	03_05	E265103	E265102	E207780	E207782	E207778	E208726	E208720	03_05	E265103	E265102	E207780	E207782	E207778	E208726	E208720	03_05
					VA20A0161-005	VA20A0161-004	-	VA20A0161-001	-	VA20A0161-002	VA20A0161-003	VA20A0161-006	-	-	-	-	-	-	-	-	L2477031-1	L2477031-2	L2477031-3	L2477031-4	-	-	-	-	L2518964-3	L2518964-4	L2518964-2	L2518964-1	-	-	-	-
Analyte	**Units**				6-Jan-20	6-Jan-20	7-Jan-20	6-Jan-20	6-Jan-20	6-Jan-20	6-Jan-20	6-Jan-20	1-Apr-20	1-Apr-20	1-Apr-20	1-Apr-20	2-Apr-20	1-Apr-20	1-Apr-20	1-Apr-20	7/19/2020	7/19/2020	7/19/2020	7/19/2020	7/19/2020	7/19/2020	7/19/2020	7/19/2020	18/10/2020	18/10/2020	18/10/2020	18/10/2020	18/10/2020	18/10/2020	18/10/2020	18/10/2020
Site					Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V		Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V	Columbia V
Hardness (as CaCO3)	mg/L	-	-	-	644	645	-	-	-	450	745	538	734	724	-	-	-	527	809	407	715	746	580 *	550 *	-	-	-	-	758	734	552	553	-	-	-	-
Total Suspended Solids	mg/L	-	-	-	38.4	3	-	<3.0	-	45.4	18.4	26.8	13.7	7.9	<3.0	<3.0	-	49.9	32.3	47.9	9810 *	156	<1.0	<1.0	-	-	-	-	5150	138	3.1	<1.0	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	-	313	374	-	223	-	206	446	223	350	391	203	211	-	197	461	84.9	1180	381	237	210	-	-	-	-	379	285	195	212	-	-	-	-
Ammonia as N [1.3-18.4 (a)]	mg/L	1.31-18.4			<0.0050	0.0143	-	<0.0050	-	0.0114	<0.0050	<0.0050	<0.0050	0.0156	<0.0050	<0.0050	-	0.006	<0.0050	<0.0050	0.0266	0.0257	0.0429	0.0149	-	-	-	-	0.0131	0.0168	<0.0050	<0.0050	-	-	-	-
Bicarbonate (HCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1440	465	289	256	-	-	-	-	462	348	231	258	-	-	-	-
Carbonate (CO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5.0	<5.0	<5.0	<5.0	-	-	-	-	<5.0	<5.0	<5.0	<5.0	-	-	-	-
Chloride (Cl)	mg/L	1,500	250	250 AO	2.65	3.44	-	<2.50	-	<2.50	<5.00	<2.50	4.27	3.04	<2.50	<2.50	-	<2.50	3.48	1.89	24.90	5.21	3.33	2.37	-	-	-	-	39.2	4.67	1.67	2.85	-	-	-	-
Conductivity (EC)	uS/cm	-	-	-	1130	1160	-	979	-	862	1290	981	1170	1170	932	944	-	898	1280	752	1130	1060	919	906	-	-	-	-	1130	1040	883	908	-	-	-	-
Cyanide (f) [2.2-23.0 (e)]	mg/L	2.0-3.0	1.5	0.177	0.162	-	0.236	-	0.255	<0.200	0.21	0.123	0.114	-	0.181	0.184	-	0.202	<0.100	0.04	0.12	0.14	0.13	0.169	-	-	-	-	0.26	0.31	0.220	0.19	-	-	-	-
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5.0	<5.0	<5.0	<5.0	-	-	-	-	<5.0	<5.0	<5.0	<5.0	-	-	-	-
Nitrate and Nitrite (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.199	<0.025	0.13	0.0191	-	-	-	-	0.238	0.028	<0.0051	0.043	-	-	-	-
Nitrate (as N)	mg/L	400	10	10 MAC	0.11	<0.0250	-	<0.0250	-	0.0975	0.0739	<0.0250	0.103	<0.0250	<0.0250	<0.0250	-	0.111	<0.0250	0.0191	0.199	<0.025	0.103	0.0191	-	-	-	-	0.238	0.028	<0.0050	0.043	-	-	-	-
Nitrite (as N) [0.2-2.0 (h)]	mg/L	0.2-2	1	1 MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0050	<0.0050	0.0266	<0.0010	-	-	-	-	<0.0050	<0.0050	<0.0010	<0.0050	-	-	-	-
pH	pH	-	-	6.5-8.5 AC	7.78	8.03	-	8.17	-	8	7.81	8.03	7.82	7.72	8.01	7.95	-	7.86	7.58	7.26	7.14	7.38	7.72	7.69	-	-	-	-	7.67	7.68	8.33	8.16	-	-	-	-
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0015	<0.0010	<0.0010	<0.0010	-	-	-	-	-	-	-	-	-	-	-	-
Phosphorus (P)-Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.85	0.0781	<0.0020	<0.0020	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate (SO4) [1,280-4,290]	mg/L	1,280-4,290	500	500 AO	371	335	-	357	-	298	360	373	355	319	330	338	-	318	344	301	339	344	334	330	-	-	-	-	369	387	350	374	-	-	-	-
Total Organic Carbon	mg/L	-	-	4 (source water)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	-	-	≤1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biochemical Oxygen Demand	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MPN - E. Coli	MPN/100mL	-	-	≤10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coliform Bacteria - Fecal	CFU/100mL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MPN - Total Coliforms	MPN/100mL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																																				
Aluminum (Al)-Total	mg/L	-	-	9.5 MAC	-	-	-	<0.0030	-	-	-	-	-	-	<0.0030	<0.0030	-	-	-	-	-	-	<0.0030	<0.0030	-	-	-	-	-	-	<0.0030	<0.0030	-	-	-	-
Antimony (Sb)-Total	mg/L	-	-	0.006 MAC	-	-	-	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-
Arsenic (As)-Total	mg/L	-	-	0.01 MAC	-	-	-	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-	0.00013	0.00012	-	-	-	-
Barium (Ba)-Total	mg/L	-	-	-	-	-	-	0.0112	-	-	-	-	-	-	0.00913	0.00975	-	-	-	-	-	-	0.0111	0.0104	-	-	-	-	-	-	0.00972	0.0104	-	-	-	-
Beryllium (Be)-Total	mg/L	-	-	-	-	-	-	<0.000100	-	-	-	-	-	-	<0.000100	<0.000100	-	-	-	-	-	-	<0.000020	<0.000020	-	-	-	-	-	-	<0.000020	<0.000020	-	-	-	-
Bismuth (Bi)-Total	mg/L	-	-	-	-	-	-	<0.000050	-	-	-	-	-	-	<0.000050	<0.000050	-	-	-	-	-	-	<0.000050	<0.000050	-	-	-	-	-	-	<0.000050	<0.000050	-	-	-	-
Boron (B)-Total	mg/L	-	-	5 MAC	-	-	-	0.033	-	-	-	-	-	-	0.028	0.029	-	-	-	-	-	-	0.033	0.028	-	-	-	-	-	-	0.029	0.031	-	-	-	-
Cadmium (Cd)-Total	mg/L	-	-	0.005 MAC	-	-	-	0.0000118	-	-	-	-	-	-	0.0000307	<0.0000050	-	-	-	-	-	-	0.000014	0.0000053	-	-	-	-	-	-	0.0000073	0.0000055	-	-	-	-
Calcium (Ca)-Total	mg/L	-	-	-	-	-	-	156	-	-	-	-	-	-	138	135	-	-	-	-	-	-	161	142	-	-	-	-	-	-	147	141	-	-	-	-
Chromium (Cr)-Total	mg/L	-	-	0.05 MAC	-	-	-	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-
Cobalt (Co)-Total	mg/L	-	-	0.001 MAC	-	-	-	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-
Copper (Cu)-Total	mg/L	-	-	2.0 MAC	-	-	-	0.00087	-	-	-	-	-	-	<0.00050	<0.00050	-	-	-	-	-	-	<0.00050	0.00243	-	-	-	-	-	-	0.00098	0.00625	-	-	-	-
Iron (Fe)-Total	mg/L	-	-	0.3 AO	-	-	-	0.099	-	-	-	-	-	-	0.118	0.054	-	-	-	-	-	-	0.067	<0.010	-	-	-	-	-	-	0.437	0.069	-	-	-	-
Lead (Pb)-Total	mg/L	-	-	0.005	-	-	-	<0.000050	-	-	-	-	-	-	0.000078	<0.000050	-	-	-	-	-	-	<0.000050	0.000076	-	-	-	-	-	-	<0.000129	0.00143	-	-	-	-
Lithium (Li)-Total	mg/L	-	-	-	-	-	-	0.0086	-	-	-	-	-	-	0.007	0.0084	-	-	-	-	-	-	0.0077	0.0093	-	-	-	-	-	-	0.0070	0.0085	-	-	-	-
Magnesium (Mg)-Total	mg/L	-	-	-	-	-	-	47.9	-	-	-	-	-	-	43	46.6	-	-	-	-	-	-	43.3	47.2	-	-	-	-	-	-	44.8	49.1	-	-	-	-
Manganese (Mn)-Total	mg/L	-	-	0.12 MAC	-	-	-	0.00304	-	-	-	-	-	-	0.00314	0.0021	-	-	-	-	-	-	0.00236	0.000597	-	-	-	-	-	-	0.00218	0.00258	-	-	-	-
Mercury (Hg)-Total	mg/L	-	-	0.001 MAC	-	-	-	<0.0000050	-	-	-	-	-	-	<0.0000050	<0.0000050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000050	<0.0000050	-	-	-	-
Molybdenum (Mo)-Total	mg/L	-	-	0.088 MAC	-	-	-	0.000601	-	-	-	-	-	-	0.000703	0.000655	-	-	-	-	-	-	0.00071	0.000643	-	-	-	-	-	-	0.000768	0.000892	-	-	-	-
Nickel (Ni)-Total	mg/L	-	-	0.08 MAC	-	-	-	<0.00050	-	-	-	-	-	-	<0.00050	<0.00050	-	-	-	-	-	-	<0.00050	<0.00050	-	-	-	-	-	-	<0.00050	<0.00050	-	-	-	-
Phosphorus (P)-Total	mg/L	-	-	-	-	-	-	<0.050	-	-	-	-	-	-	<0.050	<0.050	-	-	-	-	-	-	<0.050	<0.050	-	-	-	-	-	-	<0.050	<0.050	-	-	-	-
Potassium (K)-Total	mg/L	-	-	-	-	-	-	1.16	-	-	-	-	-	-	1.02	1.13	-	-	-	-	-	-	1.06	1.05	-	-	-	-	-	-	1.02	1.15	-	-	-	-
Selenium (Se)-Total	mg/L	-	-	0.01 MAC	-	-	-	<0.000050	-	-	-	-	-	-	<0.000050	<0.000050	-	-	-	-	-	-	<0.000050	<0.000050	-	-	-	-	-	-	0.000051	0.000074	-	-	-	-
Silicon (Si)-Total	mg/L	-	-	-	-	-	-	3.96	-	-	-	-	-	-	3.54	3.91	-	-	-	-	-	-	3.89	3.67	-	-	-	-	-	-	3.89	4.08	-	-	-	-
Silver (Ag)-Total	mg/L	-	-	-	-	-	-	<0.000010	-	-	-	-	-	-	<0.000010	<0.000010	-	-	-	-	-	-	<0.000010	<0.000010	-	-	-	-	-	-	<0.000010	<0.000010	-	-	-	-
Sodium (Na)-Total	mg/L	-	-	-	-	-	-	6.83	-	-	-	-	-	-	2.94	6.96	-	-	-	-	-	-	3.57	8.21	-	-	-	-	-	-	2.98	7.15	-	-	-	-
Strontium (Sr)-Total	mg/L	-	-	7.0 MAC	-	-	-	1.74	-	-	-	-	-	-	1.68	1.7	-	-	-	-	-	-	1.90 *	1.84 *	-	-	-	-	-	-	1.81	1.83	-	-	-	-
Sulfur (S)-Total	mg/L	-	-	-	-	-	-	125	-	-	-	-	-	-	126	128	-	-	-	-	-	-	119	117	-	-	-	-	-	-	122	122	-	-	-	-
Thallium (Ti)-Total	mg/L	-	-	-	-	-	-	<0.000010	-	-	-	-	-	-	<0.000010	<0.000010	-	-	-	-	-	-	<0.000010	<0.000010	-	-	-	-	-	-	<0.000010	<0.000010	-	-	-	-
Tin (Sn)-Total	mg/L	-	-	-	-	-	-	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-	<0.00010	0.00101	-	-	-	-
Titanium (Ti)-Total	mg/L	-	-	-	-	-	-	<0.00030	-	-	-	-	-	-	<0.00030	<0.00030	-	-	-	-	-	-	<0.00030	<0.00030	-	-	-	-	-	-	<0.00030	<0.00030	-	-	-	-
Uranium (U)-Total	mg/L	-	-	0.02 MAC	-	-	-	0.00158	-	-	-	-	-	-	0.0012	0.00148	-	-	-	-	-	-	0.00168	0.00168	-	-	-	-	-	-	0.00145	0.00168	-	-	-	-
Vanadium (V)-Total	mg/L	-	-	-	-	-	-	<0.00050	-	-	-	-	-	-	<0.00050	<0.00050	-	-	-	-	-	-	<0.00050	<0.00050	-	-	-	-	-	-	<0.00050	<0.00050	-	-	-	-
Zinc (Zn)-Total	mg/L	-	-	3.0 MAC	-	-	-	0.0078	-	-	-	-	-	-	0.0703	0.0034	-	-	-	-	-	-	0.0493	0.0158	-	-	-	-	-	-	0.0492	0.0452	-	-	-	-
Zirconium (Zr)-Total	mg/L	-	-	-	-	-	-	<0.00020	-	-	-	-	-	-	<0.00020	<0.00020	-	-	-	-	-	-	<0.00030	<0.00030	-	-	-	-	-	-	<0.00030	<0.00030	-	-	-	-
Dissolved Metals																																				
Aluminum (Al)-Dissolved	mg/L	-	9.5	9.5 MAC	0.0011	0.0016	-	-	-	<0.0010	<0.0010	<0.0010	0.0215	0.007	-	-	-	0.12	0.0098	0.001	0.0261	0.0039	-	-	-	-	-	-	<0.0010	0.0028	-	-	-	-	-	-
Antimony (Sb)-Dissolved	mg/L	0.09	0.006	0.006 MAC	<0.00010	0.00015	-	<0.00010	-	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	-	-	-	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-
Arsenic (As)-Dissolved	mg/L	0.05	0.01	0.01 MAC	<0.00010	<0.00010	-	<0.00010	-	<0.00010	<0.00010	<0.00010	<0.00010	0.00019	-	-	-	0.0302	0.00017	<0.00010	0.00012	0.00011	-	-	-	-	-	-	0.00015	0.00014	-	-	-	-	-	-
Barium (Ba)-Dissolved	mg/L	10	1	-	0.0153	0.0139	-	-	-	0.00936	0.0149	0.0116	0.0164	0.0147	-	-	-	0.0132	0.0167	0.00508	0.0248	0.0189	-	-	-	-	-	-	0.0244	0.0148	-	-	-	-	-	-
Beryllium (Be)-Dissolved	mg/L	0.0015	0.008	-	<0.000100	<0.000100	-	-	-	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	-	-	-	<0.000100	<0.000100	<0.000100	<0.000020	<0.000020	-	-	-	-	-	-	<0.000020	<0.000020	-	-	-	-	-	-
Bismuth (Bi)-Dissolved	mg/L	-	-	-	<0.000050	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	-	-	-	-	-	<0.000050	<0.000050	-	-	-	-	-	-
Boron (B)-Dissolved	mg/L	12	5	5 MAC	0.044	0.046	-	-	-	0.042	0.046	0.045	0.04	0.043	-	-	-	0.041	0.042	0.04	0.036	0.04	-	-	-	-	-	-	0.039	0.041	-	-	-	-	-	-
Cadmium (Cd)-Dissolved	mg/L	0.0005-0.004	0.005	0.005 MAC	0.0000614	0.0000913	-	-	-	0.0000054	<0.0000050	<0.0000050	0.0000944	0.0000603	-	-	-	0.0000071	0.0000246	0.000279	0.000022	0.0000126	-	-	-	-	-	-	0.0000072	0.0000118	-	-	-	-	-	-
Calcium (Ca)-Dissolved	mg/L	-	-	-	192	192	-	125	-	227	156	158	221	218	-	-	-	148	246	99.2	213	224	-	-	-	-	-	-	210	215	-	-	-	-	-	-
Chromium (Cr)-Dissolved [0.05-6.0]	mg/L	0.01-0.09	0.05-6.0	0.05 MAC	<0.00010	<0.00010	-	<0.00010	-	<0.00010	<0.00010	<0.00010	0.0004	0.00156	-	-	-	0.00055	0.00022	<0.00010	0.00011	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-
Cobalt (Co)-Dissolved	mg/L	0.04	0.001	0.001 MAC	<0.00010	<0.00010	-	<0.00010	-	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	-	-	-	0.00021	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	-	-	<0.00010	<0.00010	-	-	-	-	-	-
Copper (Cu)-Dissolved [0.02-0.09 (d,f)]	mg/L	0.02-0.09	1.5	2.0 MAC	0.00535	0.00696	-	<0.00020	-	<0.00020	0.0003	<0.00020	0.00282	0.0144	-	-	-	0.00228	0.0125	0.00147	0.00101	0.00473	-	-	-	-	-	-	0.00027	0.00081	-	-	-	-	-	-
Iron (Fe)-Dissolved	mg/L	-	6.5	0.3 AO	<0.010	<0.010	-	<0.010	-	<0.010	<0.010	<0.010	0.042	0.425	-	-	-	8.54	3.95	24	0.021	0.063	-	-	-	-	-	-	<0.010	<0.010	-	-	-	-	-	-
Lead (Pb)-Dissolved [0.04-0.16 (d,f)]	mg/L	0.04-0.16	0.01	0.005	0.000098	0.000146	-	<0.000050	-	<0.000050	<0.000050	<0.000050	0.00027	0.00048	-	-	-	0.000552	0.00751	0.000123	0.00012	0.000119	-	-	-	-	-	-	<0.000050	0.000064	-	-	-	-	-	-
Lithium (Li)-Dissolved	mg/L	-	0.008	-	0.0067	0.0084	-	0.0055	-	0.0078	0.0066	0.0065	0.0065	0.0081	-	-	-	0.0054	0.0073	0.0059	0.0078	0.0085	-	-	-	-	-	-	0.0079	0.0082	-	-	-	-	-	-
Magnesium (Mg)-Dissolved	mg/L	-	-	-	39.8	40	-	34.6	-	43.2	35.9	44.4	43.5	-	38	47.6	38.7	44.5	45.7	-	-	-	-	-	-	-	-	-	56.5	47.8	-	-	-	-	-	-
Manganese (Mn)-Dissolved	mg/L	-	1.5	0.12 MAC	0.0102	0.00298	-	0.0781	-	0.0133	0.0698	0.0134	0.00347	-	-	-	0.0817	0.0468	0.713	0.00943	0.0053	-	-	-	-	-	-	-	0.0125	0.00373	-	-	-	-	-	-
Mercury (Hg)-Dissolved	mg/L	0.00025	0.001	0.001 MAC	<0.0000050	<0.0000050	-	<0.0000050	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	-	-	<0.0000050	<0.0000050	<0.0000050	-	-	-	-	-	-	-	-	<0.0000050	<0.0000050	-	-	-	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	10	0.25	0.088 MAC	0.00058	0.000557	-	0.000799	-	0.000509	0.000706	0.000579	0.000603	-	-	-	0.00104	0.000738	<0.000050	0.00058	0.000647	-	-	-	-	-	-	-	0.000614	0.000563	-	-	-	-	-	-
Nickel (Ni)-Dissolved [0.25-1.5 (d,f)]	mg/L	0.25-1.5	0.08	0.08 MAC	0.00096	0.00102	-	0.00057	-	0.00026	0.00052	0.00089	0.00283	-	-	-	0.00083	0.00304	<0.00050	0.00073	0.00143	-	-	-	-	-	-	-	0.00089	0.00080	-	-	-	-	-	-
Phosphorus (P)-Dissolved	mg/L	-	-	-	<0.050	<0.050	-	<0.050	-	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	-	-	-	<0.050	<0.050	-	-	-	-	-	-
Potassium (K)-Dissolved	mg/L	-	-	-	1.1	1.39	-	0.929	-	1.25	1.05	1.1	1.31	-	-	-	0.933	1.24	0.986	1.15	1.54	-	-	-	-	-	-	-	1.35	1.39	-	-	-	-	-	-
Selenium (Se)-Dissolved	mg/L	0.02	0.01	0.01 MAC	<0.000050	0.000051	-	0.000141	-	0.000068	0.000051	0.000053	<0.000050	-	-	-	0.000055	0.000053	<0.000050	<0.000050	<0.000050	-	-	-	-	-	-	-	<0.000050	<0.000050	-	-	-	-	-	-
Silicon (Si)-Dissolved	mg/L	-	-	-	4.14	5.08	-	2.57	-	4.82	3.5	3.92	4.91	-	-	-	3.18	4.62	2.02	4.41	4.85	-	-	-	-	-	-	-	4.32	4.72	-	-	-	-	-	-
Silver (Ag)-Dissolved [0.0005-0.015 (d)]	mg/L	0.0005-0.015	0.02	-	<0.000010	<0.000010	-	<0.000010	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	<0.000010	<0.000010	<0.000010	0.000013	<0.000010	-	-	-	-	-	-	<0.000010	<0.000010	-	-	-	-	-	-
Sodium (Na)-Dissolved	mg/L	-	200	-	2.96	3.54	-	2.78	-	3.48	2.72	3.42	3.61	-	-	-	2.69	3.43	2.72	10.4	4.44	-	-	-	-	-	-	-	13.7	3.75	-	-	-	-	-	-
Strontium (Sr)-Dissolved	mg/L	-	-	7.0 MAC	1.71	1.95	-	1.31	-	1.76	1.61	1.74	2.06	-	-	-	1.51	1.73	0.582	1.83 *	2.11 *	-	-	-	-	-	-	-	1.80	1.97	-	-	-	-	-	-
Sulfur (S)-Dissolved	mg/L	-	-	-	126	117	-	102	-	124	129	130	118	-	-	-	116	122	111	123	128	-	-	-	-	-	-	-	119	124	-	-	-	-	-	-
Thallium (Ti)-Dissolved	mg/L	0.003	-	-	<0.000010	<0.000010	-	<0.000010	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	<0.000010	0.000013	<0.000010	<0.000010	<0.000010	-	-	-	-	-	-	<0.000010	<0.000010	-	-	-	-	-	-
Tin (Sn)-Dissolved	mg/L	-	2.5	-	0.00024	0.00041	-	<0.00010	-	<0.00010	<0.00010	0.00032	0.00054	-	-	-	<0.00010	0.00011	<0.00010	<0.00010	0.0003	-	-	-	-	-	-	-	0.00011	0.00026	-	-	-	-	-	-
Titanium (Ti)-Dissolved	mg/L	1	-	-	<0.00030	<0.00030	-	<0.00030	-	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	-	-	-	<0.00420	<0.00030	<0.00030	0.00052	<0.00030	-	-	-	-	-	-	-	<0.00030	<0.00030	-	-	-	-	-	-
Uranium (U)-Dissolved	mg/L	0.085	0.02	0.02 MAC	0.00151	0.00181	-	0.000753	-	0.00168	0.00121	0.00149	0.00173	-	-	-	0.00101	0.00158	0.00002	0.00145	0.00172	-	-	-	-	-	-	-	0.00160	0.00183	-	-	-	-	-	-
Vanadium (V)-Dissolved	mg/L	-	0.02	0.02 MAC	<0.00050	<0.00050	-	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-	-	-	-	<0.00050	<0.00050	-	-	-	-	-	-
Zinc (Zn)-Dissolved [0.075-2.4 (d)]	mg/L	0.075-2.4	3.0	3.0 MAC	0.0071	0.0177	-	0.0012	-	0.0024	<0.0010	0.0033	0.0134	-	-	-	0.0101	0.0065	0.0022	0.0018	0.0209	-	-	-	-	-	-	-	0.0023	0.0318	-	-	-	-	-	-
Zirconium (Zr)-Dissolved	mg/L	-	-	-	<0.00020	<0.00020	-	<0.00020	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-	-	-	<0.00020	<0.00020	<0.00020	<0.00030	<0.00030	-	-	-	-	-	-	<0.00030	<0.00030	-	-	-	-	-	-

NOTES

(1) BC Contaminated Sites Regulation (CSR) for Protection of Aquatic Life (AW) - January 2019 Update, Schedule 3.2
(2) BC Contaminated Sites Regulation (CSR) for protection of Drinking Water (DW) - January 2019 Update, Schedule 3.2
(3) BC Source Drinking Water Quality Guidelines, 2020
(4) All criteria limits for Drinking Quality Guidelines based on Total Metal Concentration
(5) BC Source Water Quality Guidelines apply to total metals but are inlcuded to be compared with disscolved metals parameters where total metals data is unavailable
(a) Range based on max pH 8.5 to min pH 6.5 at temperature of 10.0 °C.
(b) Limit dependent upon hardness.
MAC = Maximum Acceptable Concentration
AO = Aesthetic Objective

CSR-AW	*BC Contaminated Sites Regulation Water Quality Guidelines for Protection of Aquatic Life (2019)*
CSR-DW	*BC Contaminated Sites Regulation Water Quality Guidelines for Drinking Water (2019)*
BCSDWQG	*BC ENV Source Drinking Water Quality Guidelines for Drinking Water (2020)*
BCWQG-AW	*BC ENV Approved and Working Water Quality Guidelines for Protection of Aquatic Life (2019)*
	Exceeds More Than One Guideline

Table B-2. 2020 Landfill Gas Monitoring Results

		Q1 January 2020		Q2 April 2020		Q3 July 2020										Q4 October 2020										
Well ID	Depth (m)	Combustible Gas % LEL	Methane Conversion % LEL	Combustible Gas % LEL	Methane Conversion % LEL	CH_4 (%)	CO_2 (%)	O_2 (%)	BAL (%)	H_2 (low/high)	CO (ppm)	H_2S (ppm)	LEL (%)	Relative Pressure	Barometric Presure	GPS Point	CH_4 (%)	CO_2 (%)	O_2 (%)	BAL (%)	H_2 (ppm)	CO (ppm)	H_2S (ppm)	LEL (%)	Relative Pressure	Barometric Presure	GPS Point
GP04-5-D	10.2	trace	ND	trace	trace	0	0.1	19.7	80.2	low	0	0	0	-0.65	26.97	558	0.3	0.3	21	78.4	low	0	0	7	0	26.88	620
GP04-5-S	5.4	ND	ND	trace	trace	0	0.2	19.4	80.4	low	0	0	1%	-0.65	26.97	558	0.3	0.1	21.3	78.2	low	0	0	7	0	26.88	620
GP04-4-D	7.2	trace	trace	trace	trace	0.1	0.4	19.3	80.2	low	0	0	2%	-0.65	26.97	559	0.4	0.4	19.9	79.3	low	0	0	7	0	26.88	621
GP04-4-S	4.9	trace	trace	trace	trace	0.1	0.2	19.5	80.2	low	0	0	2%	-0.65	26.97	559	0.4	0.1	21	78.5	low	0	0	7	0	26.88	621
GP04-3-D	9.1	trace	trace	trace	trace	0.1	0.3	19.3	80.3	low	0	0	3%	-0.65	26.97	560	0.3	0.1	21.1	78.5	low	0	0	7	0	26.88	622
GP04-3-S	4.8	trace	trace	trace	trace	0.1	0.4	19.2	80.4	low	0	0	3%	-0.65	26.97	560	0.3	0.3	20.8	78.6	low	0	0	7	0	26.88	622
GP04-01-D	8.5	trace	trace	trace	trace	0.2	0.2	19.1	80.6	low	0	0	4%	-0.65	26.97	561	0.4	2.2	18.6	78.5	low	0	0	7	0	26.88	619
GP04-01-S	5.2	trace	ND	5%	2.10%	0.2	1.1	13.5	85.2	low	0	0	4%	-0.65	26.97	561	0.4	4.6	18.1	76.9	low	0	0	7	0	26.88	619
GP04-02-D	9.9	ND	ND	3.20%	trace	0.3	2.6	17.0	80.1	low	0	0	6%	-	26.93	564	0.4	2.5	18.2	78.9	low	0	0	7	0	26.92	616
GP04-02-S	5.3	trace	trace	trace	trace	0.3	1.4	18.1	80.2	low	0	0	6%	-	26.93	564	0.4	0.7	19.9	78.9	low	0	0	8	0	26.92	616

LEL - Lower Explosive Limit
trace - less than 2% LEL
ND - Not Detectable
Instrument u:Landtec GEM 2000 Plus

APPENDICES

APPENDIX A
Columbia Valley Landfill Operational Certificate

BRITISH COLUMBIA
The Best Place on Earth

March 1, 2011

Tracking Number: 5004
Authorization Number: 100134

REGISTERED MAIL

RECEIVED

MAR 0 8 2011

Regional District of East Kootenay

Regional District of East Kootenay
19-24 Ave S
Cranbrook BC V1C 3H8

Dear Operational Certificate Holder:

Enclosed is Operational Certificate 100134 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate.

This operational certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the operational certificate holder. It is also the responsibility of the operational certificate holder to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Administration of this operational certificate will be carried out by staff from the Kootenay-Okanagan Region. Plans, data and reports pertinent to the operational certificate are to be submitted to the Regional Manager, Environmental Protection Division, Ministry of Environment, 401 - 333 Victoria St., Nelson, BC V1L 4K3.

Yours truly,

Chris Stroich, M.Sc., P.Ag.
for Director, *Environmental Management Act*
Kootenay-Okanagan Region

Enclosure

cc: Environment Canada

Ministry of Environment
Environmental Protection Division
401 - 333 Victoria St.
Nelson, BC V1L 4K3
Kootenay Region
Telephone: (250) 354-6333
Facsimile: (250) 354-6332

BRITISH COLUMBIA
The Best Place on Earth

MINISTRY OF ENVIRONMENT

OPERATIONAL CERTIFICATE

100134

Under the Provisions of the Environmental Management Act,

and in accordance with the approved

Regional District of East Kootenay Solid Waste Management Plan, the

REGIONAL DISTRICT OF EAST KOOTENAY

19 - 24 AVE S
CRANBROOK, BC V1C 3H8

is authorized to manage municipal solid waste and recyclable material from the Regional District of East Kootenay and environs at the Columbia Valley Subregional landfill located near Windermere, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may result in prosecution.

The Operational Certificate supersedes all previous versions of Permit PR-01475 issued under the authority of the *Waste Management Act.*

1. AUTHORIZED DISCHARGES

1.1 Authorized Source

This authorization applies to the discharge of municipal solid waste to a sanitary landfill known as the Columbia Valley Subregional landfill. The site reference number for this discharge is E210127.

1.1.1 The authorized works are a sanitary landfill and related appurtenances located approximately as shown on Site Plan.

1.1.2 The maximum quantity of waste discharged shall not exceed the design capacity of the landfill as specified in the Columbia Valley Subregional Landfill - Design and Operations Plan Update (2006).

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Chris Stroich, M.Sc., P.Ag.
for Director, *Environmental Management Act*
Kootenay Region

1.1.3 The characteristics of the landfilled wastes shall be typical residential, commercial, institutional and light industrial waste.

1.1.4 The location of the facilities from which the discharge originates and the point of discharge is Lot 1 of Lot 4619, Plan 8066, Parcel A of Lot 4619, Plan 4386, and an unsurveyed portion of Lot 4619, Kootenay District, as shown on attached Site Plan.

1.2 Prohibited Wastes

The disposal of the following types of wastes is prohibited unless approved by the Director in writing:

a. Hazardous Wastes other than those specifically approved for disposal to authorized landfills in the Hazardous Waste Regulation under the *Environmental Management Act*;
b. Biomedical wastes as defined in the Guidelines for the Management of Biomedical Wastes in Canada (Canadian Council of Ministers of the Environment, February 1992);
c. Bulk liquids and semi-solid sludges which contain free liquid, as determined by US EPA Method 9095A Paint Filter Liquids Test, Test Methods for Evaluating Solid Wastes-Physical /Chemical Methods (EPA Publication No. SW-846);
d. Septic tank effluent, septage black water, holding tank effluent and sewage treatment biosolids;
e. Discharge of carcasses shall be limited to those of a domestic source, animal road kills, or animals killed as part of the animal control activities of the Conservation Officer Service. Mortalities from agricultural operations may be discharged where the generator has demonstrated to the satisfaction of the Director that the carcasses cannot be disposed of in accordance with the Agricultural Waste Control Regulation under the *Environmental Management Act*. The disposal of solid waste from slaughterhouses and poultry processing is allowed subject to the waste being certified in writing as being free of Specified Risk Materials (SRM) by the Canadian Food Inspection Agency (CFIA) on each occasion that such waste is received at the site. A copy of the document issued by the CFIA certifying that the waste is SRM free must be retained at the site office and made available to the Director upon request. Waste from slaughterhouses and poultry processing must be immediately covered with a minimum of 1.0 m of low permeable soil. Large carcasses (over 200 kg) shall be deposited in a

separate slit trench and covered immediately.

1.3 Waste Asbestos

The disposal of waste asbestos must be in compliance with the requirements of Section 40 of the Hazardous Waste Regulation under the *Environmental Management Act.*

1.4 Contaminated Soil

Soil that contains contaminants in concentrations less than "hazardous waste" as defined by the Hazardous Waste Regulation may be disposed at the landfill site. Disposal includes monofilling, co-disposal with other wastes, and use as daily or intermediate cover material. Disposal does not include use as final cover material.

1.5 Ozone Depleting Substances

Release of ozone depleting substances from the storage, handling and disposal of used appliances, equipment, or any material containing ozone depleting substances is prohibited in accordance with the requirements of the Ozone Depleting Substances and other Halocarbons Regulation.

1.6 Diverted Waste

This subsection applies to the recovery and storage of reusable/recyclable material.

Reusable material is defined as a product or substance that has been diverted from disposal and has reuse value in its present form.

Recyclable material is defined as a product or substance that has been diverted from disposal, has no reuse value in its present form and satisfies at least one of the following criteria:

a. is organic material that has been diverted from residential, commercial or institutional sources and is capable of being composted, or is being composted on-site;
b. is managed as a marketable commodity by the owner or operator of the site;
c. is being used in the manufacture of a new product that has an established market or is being processed as an intermediate stage of an existing manufacturing process; and

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for Director, *Environmental Management Act*
Kootenay Region

d. has been identified as a recyclable material in the Regional District of East Kootenay Solid Waste Management Plan.

2. DESIGN AND PERFORMANCE REQUIREMENTS

2.1 Design and Operations Plan

The Operational Certificate holder shall prepare and maintain a current Design and Operations Plan. The Plan shall be developed by a qualified professional and reviewed and updated as needed and at least once every five years. The Plan must address, but not be limited to, each of the subsections in the Landfill criteria for Municipal Solid Waste including performance, siting, design, operational, closure and post-closure criteria. The facilities must be developed, operated and closed in accordance with the Plan. Should there be any inconsistency between the Operational Certificate and the Plan, the Operational Certificate shall take precedence. The Columbia Valley Subregional Landfill – Design and Operations Plan prepared by Sperling Hansen Associates, dated November, 2006 is hereby approved.

Written authorization from the Director shall be obtained prior to implementing any changes to the approved plans. Based on any information obtained in connection with this facility, the Director may require revision of, or addition to the design, operating and closure plans.

2.2 Maintenance of Works and Emergency Procedures

The Operational Certificate holder shall inspect the landfill, any related pollution prevention works and designated areas for managing recyclable or reusable materials regularly and maintain them in good working order.

In the event of an emergency or condition which prevents continuing operation of the authorized works and/or the continued performance of the prescribed methods of operation, the Operational Certificate holder shall immediately notify the Director and take appropriate remedial action.

The Director may reduce or suspend operations to protect the environment until the authorized works has been restored, and / or corrective steps taken to prevent unauthorized discharges.

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for Director, *Environmental Management Act*
Kootenay Region

Any activity or construction on the disposal site must be carried out in a manner that protects the integrity of the areas under final cover and without compromising landfill stability or without damage to the authorized works and related appurtenances.

Any settlement of areas under final cover that prevents the authorized works and appurtenances mentioned in Section 1 from functioning as intended in the Design & Operations Plan must be addressed /remedied accordingly to the satisfaction of the Director.

All access roads, within the landfill boundary, used for transporting waste to the landfill for disposal shall be improved and maintained as necessary to assure safe and reliable all-weather access to the tipping face.

2.3 Additional Facilities or Works

The Director may require investigations, surveys, and the construction of additional facilities or works related to the landfill operation. The Director may also revise the requirements of any of the information required by this Operational Certificate including plans, programs, assessments and reports.

2.4 Public Health, Safety and Nuisance

Operation of the landfill shall be carried out in a manner that ensures that the facility does not pose a threat to public health or safety. The potential for creation of public nuisance should be minimized. Restricting unauthorized access, internal access road maintenance, traffic control measures, noise reduction measures, dust suppression, vector control, wildlife attraction reduction measures and other measures should be undertaken as applicable to ensure the same. There shall be no burning of municipal solid waste at the landfill. Site night time lighting shall be minimized. The decibel level on back-up alarms will be kept to a minimum and also satisfy the Worksafe BC requirements.

2.5 Surface Water Diversion

Discharge of municipal solid waste into water is prohibited. The Operational Certificate holder shall construct adequate surface water and groundwater diversion works to minimize surface water run-off and groundwater seepage

from entering the landfill.

2.6 Groundwater Impacts

The landfill shall be operated in a manner such that ground or surface water quality does not decrease beyond that specified by the British Columbia Water Quality Guidelines, or other appropriate criteria as may be specified by the Director, at or beyond the landfill property boundary. If exceedances to the specified water quality criteria occur as a result of landfill operations, the Director may require that leachate management control measures or works be undertaken. Terms of reference for any leachate management study and/or design work shall be submitted to the Director for review prior to conducting the work.

2.7 Landfill Gas Management

The landfill shall be operated such that combustible gas concentrations do not exceed the lower explosive limit in soils at the property boundary or 25% of the lower explosive limit in any on-site or off-site structure or facility.

2.8 Property Boundary

A 50 metre property boundary setback for the deposit of municipal soil waste shall be maintained around the perimeter of the landfill property. Natural vegetation shall be maintained in the buffer zone except at the point of access and at the storm water retention pond.

3. OPERATIONAL REQUIREMENTS

3.1 Authorized Operations

The Regional District of East Kootenay shall maintain the landfill authorized in Section 1 as a Sanitary Landfill operation in accordance with the BC Landfill Criteria and the Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills.

Date issued: March 1, 2011

Chris Stroich, M.Sc., P.Ag.
for Director, *Environmental Management Act*
Kootenay Region

3.2 Inspections of Authorized Works

The Operational Certificate holder shall inspect the authorized works to ensure compliance with this Operational Certificate and the BC Landfill Criteria. A record of the inspections and actions recommended or action items shall be maintained in the operating record at the site office and made available to the Director upon request.

The Operational Certificate holder shall inspect the property boundaries regularly and notify the Director of any visual evidence of environmental impacts including significant litter beyond the property boundary.

3.3 Waste Deposition and Compaction

The Operational Certificate holder shall compact and contour the refuse daily. The Operational Certificate holder shall ensure that waste deposition and compaction meets or exceeds the requirements of the BC Landfill Criteria or its most current version. Control must be exercised to ensure keeping freshly deposited refuse in a well defined and small /manageable working face.

3.3.1 Daily Cover

Application of daily cover shall be in accordance with requirements of the BC Landfill Criteria or its most current version. The use of other alternative cover material may be approved by the Director upon written request.

3.3.2 Intermediate Cover

The frequency and application of intermediate cover shall be in accordance with requirements of the BC Landfill Criteria or its most current version. The use of functionally equivalent, intermediate cover material may be approved by the Director upon written request.

For areas that have received intermediate cover, the Operational Certificate holder shall maintain the integrity of the cover, identify any breaches in the cover, and repair such breaches in an acceptable manner. The Operational Certificate holder shall address any leachate breaks on the advice of a Qualified Professional.

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Kootenay Region

3.3.3 Final Cover

Completed portions of the landfill are to progressively receive final cover during the active life of the landfill in accordance with the Design and Operations Plan and the most recent version of the BC Landfill Criteria or its most current version.

Final cover shall be installed in accordance with the requirements of the BC Landfill Criteria or its most recent version. Completed portions of the landfill are to progressively receive final cover during the active life of the landfill as specified in the Design & Operational Plan.

For areas that have received final cover, the Operational Certificate holder shall maintain the integrity of the final cover, identify any breaches in the cover, and repair such breaches in an acceptable manner. Soil erosion and standing water should be prevented to the maximum extent practicable. Erosion damage must be repaired and revegetated if applicable to ensure that all waste remains covered. All areas that have settled or where water ponds, must be refilled with soil, graded and seeded. Areas where vegetation has not been fully established must be fertilized, re-seeded, and maintained.

The Operational Certificate holder must record any post-closure repairs performed in the site operating log/records and also report the same to the Director in the Annual Report for the site.

3.4 Wildlife and Vector Control

The Operational Certificate holder shall exercise caution/due diligence to ensure that vectors and wildlife attractants are reduced/minimized as a result of routine landfilling operations. Such measures include but are not limited to –

a. Application of cover material in a timely and consistent manner in compliance with the requirements of the BC Landfill Criteria or by such additional methods as approved by the Director.
b. Installation of electrified wildlife control fencing around the perimeter of the landfill site and shall be electrified for at least the period of March 15 through November 30 of each year.
c. Ensuring that the public drop off area is used in a manner that does not contribute to wildlife attraction.

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Kootenay Region

d. Preparation of a separate bear management strategy if deemed necessary by the Director.

For the purpose of this section, a "vector" is defined as an organism or carrier capable of transmitting a pathogen from one organism to another including, but not limited to flies and other insects, rodents and birds.

For the purpose of this section, an "attractant" is defined as waste, municipal solid waste, refuse, organic matter, compost, garbage, food or food waste that attracts bears or wildlife.

3.5 Site Access and Supervision

The site should be secured to prevent unauthorized access and use. Security procedures shall be implemented that provide for an effective means of controlling entry and exit at all times. Lockable gates shall be installed at all access routes to the landfill property. Gates, perimeter fencing and/or barriers shall be installed and maintained where necessary to prevent unauthorized access to the Landfill property by vehicles. Gates shall be closed to restrict access during non-operating hours or when supervision is not available.

Where feasible, use of the site by waste haulers must occur during site operational hours. Waste haulers having access after hours must be informed in writing regarding landfill procedures and specifically designated areas for depositing waste.

The Operational Certificate holder shall ensure that the site is assigned sufficient staff to ensure proper, orderly, and safe operation of all materials handling equipment, access control, and, to ensure public safety. Staff shall be present at all times during operating hours.

The Operational Certificate holder shall ensure that any person(s) authorized to work within the landfill boundary is fully cognizant with the requirements of this Operational Certificate and the specifications of the Design and Operations Plan.

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for Director, *Environmental Management Act*
Kootenay Region

3.6 Litter Control

Litter shall be controlled and minimized by compacting the waste, minimizing the work face area, applying cover at the required frequencies and good housekeeping practices. A regular litter pick-up program to target windblown litter must be established as part of routine site operations. Litter prevention measures including provision of litter control fences must be undertaken, if necessary. Controls shall prevent the accumulation, or off-site migration, of litter in quantities that create a nuisance or cause other problems.

3.7 Waste Reduction and Alternate Disposal

The Operational Certificate holder is encouraged to segregate for recycling and reuse, where possible, materials destined for disposal at this site.

In certain landfill environments, some construction and demolition debris or other wastes may create specific air and water quality concerns. If problems arise at this site that are attributable to these specific wastes, the Director may require that alternate disposal/storage procedures be implemented.

3.8 Operator Requirements

The Operational Certificate holder shall ensure that any person(s) designated as a landfill operator is adequately trained. The Operational Certificate holder shall ensure that all landfill operators complete the training program specified within six months of their employment.

For the purpose of this Operational Certificate, "adequately trained" refers to being knowledgeable as a result of completing an industry recognized landfill operator training program such as the BC Qualified Landfill Operator (BCQLO) training program.

Training records for staff shall be maintained and made available to the Director upon request.

3.9 Scavenging and Salvaging

Uncontrolled scavenging of waste is prohibited. The controlled separation of salvageable waste stream components by persons authorized by the Operational Certificate holder is allowed in areas designated for separation and storage of these materials.

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Kootenay Region

3.10 Sign Requirements

A sign shall be posted at each entrance gate with the following current information;

a. Site name;
b. Contact phone number and address for owner;
c. Phone number in case of emergency;
d. Hours and days of operation;
e. Materials/waste accepted for landfill; and
f. Tipping fees.

Additional signs which clearly indicate the directions to the active tipping face, public disposal area, recycling and waste separation areas, etc. should also be displayed within the landfill site as deemed necessary.

4. MONITORING AND REPORTING REQUIREMENTS

4.1 Environmental Monitoring Program

A monitoring program shall be developed by a qualified professional to identify potential impacts to the environment and public health from the facility. The monitoring program shall be submitted as part of the Design and Operations Plan and shall address, but not be limited to, subsections 4.1, 4.2, 4.3 and 7.15 of the Landfill Criteria for Municipal Solid Waste and the Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills. Any changes to the Environmental Monitoring Program must be approved in writing by the Director.

Based on the information submitted in the annual report or any other information relevant to the site, the Director may vary the frequency, location and analyses of environmental monitoring as warranted.

The Operational Certificate holder shall ensure that environmental monitoring devices are adequately secured and maintained, including provisions to ensure protection from damage due to vehicles or vandalism.

The Operational Certificate holder shall maintain records of all monitoring program data and analyses and submit them quarterly to the Regional Waste Manager.

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Kootenay Region

4.2 **Waste Quantity**

The quantity of waste entering the landfill shall be measured using a weigh scale or appropriate volume measurements.

The quantity of waste material diverted and removed from the waste stream shall be measured using methods approved by the Director.

Records of the quantities of waste entering the landfill, quantities of waste landfilled and diverted from landfilling shall be made available to the Director upon request.

4.3 **Sampling Techniques**

Sampling shall be carried out in accordance with the procedures described in the most recent edition of the "British Columbia Field Sampling Manual for Continuous Monitoring Plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment and Biological Samples", or by suitable alternative procedures as authorized by the Director.

A copy of the above manual may be purchased from the Queen's Printer Publications Centre, P.O. Box 9452, Stn. Prov. Gov't. Victoria, British Columbia, V8W 9V7 (1-800-663-6105) or (250) 387-6409).

Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination and breakage.

4.4 **Analyses**

Analyses are to be carried out in accordance with procedures described in the most recent edition of the "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials", or by suitable alternative procedures as authorized by the Director.

A copy of the above manual may be purchased from the Queen's Printer Publication Centre, P.O. Box 9452, Stn. Prov. Gov't. Victoria, British Columbia, V8W 9V7 (1-800-663-6105 or (250) 387-6409).

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Kootenay Region

4.5 Quality Assurance

Where applicable, appropriate minimum analytical detection limits for each parameter listed shall be at the limit of quantitation, which must be at least 1/10th of the DW standard listed in the most recent Approved and Working Water Quality Guidelines prepared by the Water Stewardship Division of the Ministry of Environment, so that analytical error is relatively small compared to the result.

The Operational Certificate holder shall obtain from the analytical laboratory their precision, accuracy and blank data for each sample set submitted as well as an evaluation of the data acceptability, based on the criteria set by the laboratory.

A duplicate sample shall be prepared and submitted for analysis for each parameter sampled at each monitoring site and each monitoring period.

The analytical laboratory shall be registered in accordance with CAEAL (Canadian Association of Environmental Analytical Laboratories) unless otherwise instructed by the Director.

Data generated from the groundwater monitoring program shall be stored in computerized data bases that have the facilities for performing statistical analysis of the data, and for creating time base plots of selected data.

Monitoring data required by the Operational Certificate must be submitted in accordance with the Environmental Data Quality Assurance Regulation.

4.6 Non Compliance Reporting

The Operational Certificate holder shall notify the Director by facsimile or email of any non-compliance with the requirements of this Operational Certificate. The Operational Certificate holder shall identify the non-compliance, the cause of non-compliance, and any remedial action to address the non-compliance.

4.7 Quarterly Reporting

The Operational Certificate holder shall submit to the Regional Waste Manager a quarterly report within 30 days of each quarter, each year. This report shall detail any exceedences to the landfill criteria for surface and ground water and operational certificate requirements.

Date issued: March 1, 2011

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for Director, *Environmental Management Act*
Kootenay Region

4.8 Annual Reporting

The Operational Certificate holder shall submit to the Regional Waste Manager an annual report by April 30 each year for the previous calendar year. This report shall be carried out by a qualified professional and it shall include but not be limited to:

a. an executive summary;
b. the type and tonnage of waste received, recycled and landfilled for the year;
c. a current topographic map or aerial photograph showing airspace consumption, on-site borrow pit changes and future developments;
d. updated estimates for the remaining capacity, site life, closure date for the current phase and closure date for the current landfill footprint;
e. any proposed changes from the Design and Operations Plan and the environmental monitoring program, with rationale for the changes;
f. an operations update which summarizes landfill development work completed in the subject reporting year and work planned for the subsequent year;
g. occurrences or observations of wildlife (medium and large carnivores) at the facility;
h. a statement regarding the facility's progress in reducing the regional solid waste stream, in accordance with the hierarchy of reduce, reuse and recycle principles;
i. the results of all monitoring programs as specified in this Operational Certificate. Data interpretation and comparison to the performance criteria in the Landfill Criteria for Municipal Solid Waste and the Guidelines for Environmental Monitoring and Municipal Waste Landfills. Trend analyses, as well as an evaluation of the impacts of the discharges on the receiving environment in the previous year shall be carried out by a qualified professional.
j. approved design volume;
k. remaining site life and capacity;
l. an update of the status of the closure fund and any progressive closure work that was performed for the previous year; calculated non-methane organic compound (NMOC) emission rate; and
m. any additional information requested by the Director.

All reports must be submitted, suitably formatted and tabulated on a computer storage media, or by prior arrangement, directly to the Ministry of Environment central computer system.

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for Director, *Environmental Management Act*
Kootenay Region

The conditions of this Operational Certificate are to be reviewed annually by the Regional District of East Kootenay on or before April 30 each year, with the first review to take place on or before April 30, 2011. The need for increased or decreased monitoring or the need to upgrade existing works will be based in part on this review.

4.9 Inspections

The Environmental Protection Program of the Ministry of Environment will carry out inspections of the landfill, as part of routine inspection procedure. Based on these inspections and any other information available to the Director on the effect of the operation on the receiving environment, the Regional District of East Kootenay may be required to undertake additional monitoring and/or install additional pollution abatement works.

5. CLOSURE AND POST-CLOSURE REQUIREMENTS

5.1 Closure Plan

Columbia Valley Subregional Landfill - Design and Operations Plan Update (2006), contains sufficient closure planning information for Ministry purposes at this time. A more detailed Closure Plan, that satisfies the information requirements outlined in Section 8.1 of the Landfill Criteria for Municipal Solid Waste, shall be submitted to the Director at least 1 year prior to the anticipated closure date. Based on waste disposal and population growth rate estimates, landfill site closure is currently forecast for 2033.

5.2 Declaration of Landfill

Landfills sited on titled land must register a covenant that the property was used for the purpose of waste disposal as a charge against the title to the property as provided for under Section 215.1 of the *Land Title Act*. Landfills located on Crown land are to have a "notation on file" registered that the property was used for the purpose of waste disposal.

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Kootenay Region

5.3 Buildings and Structures

The construction of buildings and other structures on landfills containing putrescible wastes is not recommended for a minimum period of 25 years after closure due to concerns about combustible gas and excessive settlement. Such activity will only be considered and/or authorized after an investigation and report by qualified persons. The report is to be submitted for authorization to the Director prior to initiating construction activities.

5.4 Site Decommissioning

In accordance with Section 40 of the *Environmental Management Act* and Part 2 of the Contaminated Sites Regulation, the Operational Certificate holder shall submit a site profile to the Regional Waste Manager at least 10 days prior to decommissioning the facilities authorized in Section 1.

5.5 Closure Fund

The Operational Certificate holder shall provide for the funding of progressive closure operations, final closure and beyond closure by maintaining a closure fund. The value of the closure fund shall meet or exceed the estimated closure and post-closure costs as established in the approved Design and Operations Plan and updated in the annual report, plus a reasonable contingency for any remediation which may be required.

The Operational Certificate holder shall determine and ensure that the closure fund is adequate by preparing annually a financial statement of the fund which shall be made available to the Director upon request. The financial statement shall report the accrued capital, interest and additions to the fund for the previous year and review the sufficiency of the fund and the rate of accrual in consideration of the projected costs of closure and post-closure obligations.

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for Director, *Environmental Management Act*
Kootenay Region

Location Map

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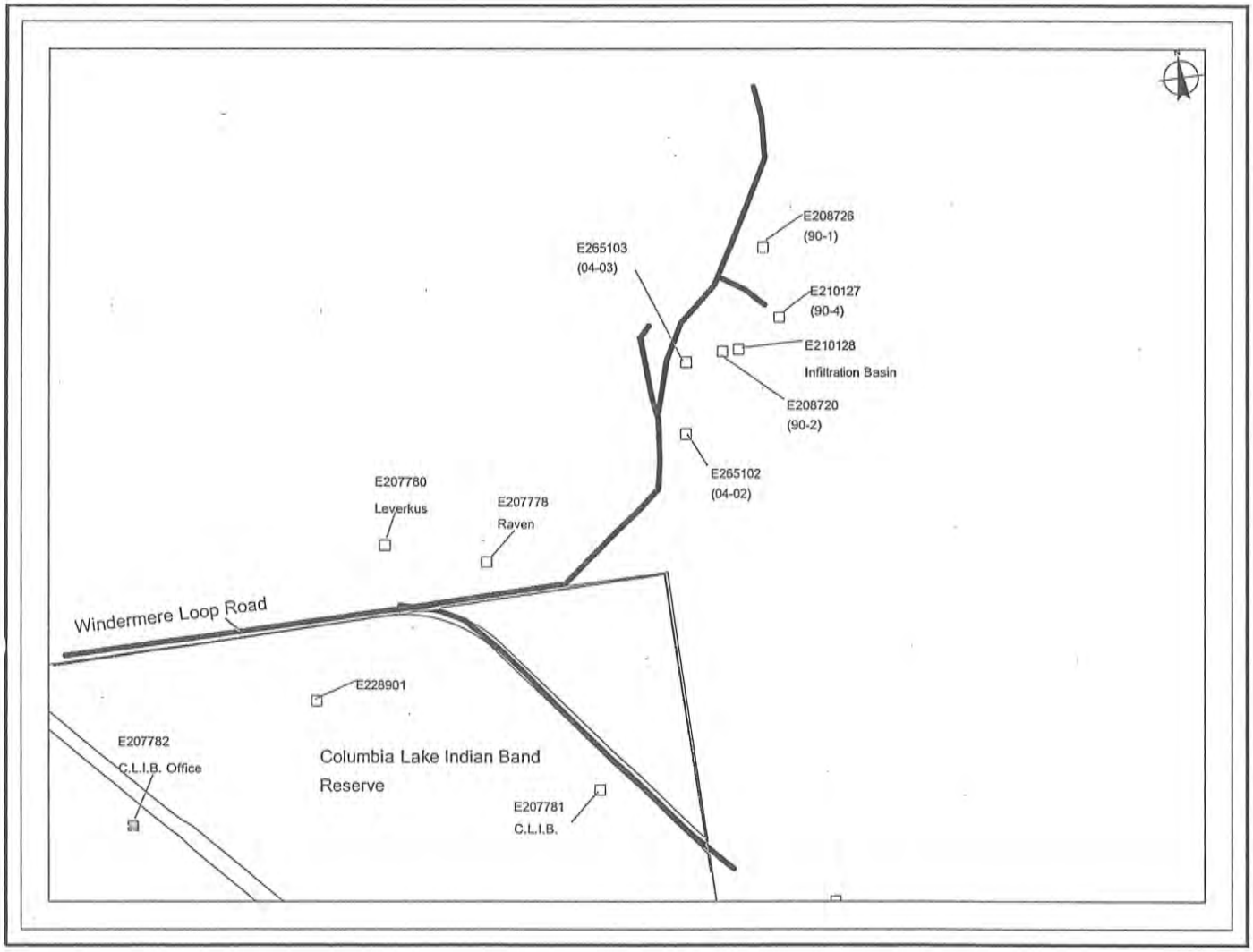
Kootenay Region

Site Plan



Date issued: March 1, 2011

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for Director, *Environmental Management Act*
Kootenay Region

APPENDIX B
Water Quality Analysis

Results Summary VA20A0161

Project Columbia Valley

Report To Ron Mickel, Eco/Logic Environmental

Client Sample ID		BCE STANDARDS		E207782	E208726	E208720	E265102	E265103	03_05
Date Sampled		DRINKING	AQUATIC	6-Jan-20	6-Jan-20	6-Jan-20	6-Jan-20	6-Jan-20	6-Jan-20
Time Sampled				00:00	00:00	00:00	00:00	00:00	00:00
ALS Sample ID				VA20A0161-001	VA20A0161-002	VA20A0161-003	VA20A0161-004	VA20A0161-005	VA20A0161-006
Physical Tests (Matrix: Water)									
alkalinity, total (as CaCO3)	mg/L	*na*	*na*	223	206	446	374	313	223
conductivity	µS/cm	*700*	*na*	979	862	1290	1160	1130	981
hardness (as CaCO3), diss	mg/L	*500*	*na*		455	745	645	644	538
hardness (as CaCO3), Tot	mg/L	*500*	*na*	587					
pH	pH units	*6.5-8.5*	*6.5-9*	8.17	8.00	7.81	8.03	7.78	8.03
solids, total suspended [TSS]	mg/L	*na*	*na*	<3.0	45.4	18.4	3.0	38.4	26.8
Anions and Nutrients (Matrix: Water)									
ammonia, total (as N)	mg/L	*na*	*0.75-27.7*	<0.0050	0.0114	<0.0050	0.0143	<0.0050	<0.0050
chloride	mg/L	*250*	*na*	<2.50	<2.50	<5.00	3.44	2.65	<2.50
fluoride	mg/L	*1.5*	*na*	0.236	0.255	<0.200	0.162	0.177	0.210
nitrate (as N)	mg/L	*10*	*200*	<0.0250	0.0975	0.0739	<0.0250	0.110	<0.0250
sulfate (as SO4)	mg/L	*500*	*100*	357	298	360	335	371	373

Total Metals (Matrix: Water)		DRINKING	AQUATIC	E207782	E208726	E208720	E265102	E265103	03_05
aluminum, total	mg/L	*0.2*	*0.1*	<0.0030					
antimony, total	mg/L	*0.006*	*na*	<0.00010					
arsenic, total	mg/L	*0.025*	*0.005*	<0.00010					
barium, total	mg/L	*1*	*na*	0.0112					
beryllium, total	mg/L	*na*	*na*	<0.000100					
bismuth, total	mg/L	*na*	*na*	<0.000050					
boron, total	mg/L	*5*	*0.12*	0.033					
cadmium, total	mg/L	*0.005*	*0.2*	0.0000118					
calcium, total	mg/L	*na*	*na*	156					
cesium, total	mg/L	*na*	*na*	<0.000010					
chromium, total	mg/L	*na*	*1*	<0.00010					
cobalt, total	mg/L	*na*	*na*	<0.00010					
copper, total	mg/L	*5*	*0.09*	0.00087					
iron, total	mg/L	*0.03*	*na*	0.099					
lead, total	mg/L	*0.01*	*3*	<0.000050					
lithium, total	mg/L	*na*	*na*	0.0086					
magnesium, total	mg/L	*na*	*na*	47.9					
manganese, total	mg/L	*0.05*	*na*	0.00304					
mercury, total	mg/L	0.001	0.0006	<0.0000050					
molybdenum, total	mg/L	*0.25*	*2*	0.000601					
nickel, total	mg/L	*0.025*	*na*	<0.00050					
phosphorus, total	mg/L	*na*	*na*	<0.050					
potassium, total	mg/L	*na*	*na*	1.16					
rubidium, total	mg/L	*na*	*na*	0.00074					
selenium, total	mg/L	*0.01*	*na*	<0.000050					
silicon, total	mg/L	*na*	*na*	3.96					
silver, total	mg/L	*na*	*na*	<0.000010					
sodium, total	mg/L	*200*	*na*	6.83					
strontium, total	mg/L	*na*	*na*	1.74					
sulfur, total	mg/L	*500*	*na*	125					
tellurium, total	mg/L	*na*	*na*	<0.00020					
thallium, total	mg/L	*na*	*na*	<0.000010					
thorium, total	mg/L	*na*	*na*	<0.00010					
tin, total	mg/L	*na*	*na*	<0.00010					
titanium, total	mg/L	*na*	*na*	<0.00030					
tungsten, total	mg/L	*na*	*na*	<0.00010					
uranium, total	mg/L	0.015	*na*	0.00158					
vanadium, total	mg/L	*na*	*na*	<0.00050					
zinc, total	mg/L	*na*	*0.03*	0.0078					
zirconium, total	mg/L	*na*	*na*	<0.00020					

Dissolved Metals (Matrix: Water)		DRINKING	AQUATIC	E207782	E208726	E208720	E265102	E265103	03_05
aluminum, dissolved	mg/L	*0.2*	*0.1*		<0.0010	<0.0010	0.0016	0.0011	<0.0010
antimony, dissolved	mg/L	*0.006*	*na*		<0.00010	<0.00010	0.00015	<0.00010	<0.00010
arsenic, dissolved	mg/L	*0.025*	*0.005*		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
barium, dissolved	mg/L	*1*	*na*		0.00936	0.0149	0.0139	0.0153	0.0116
beryllium, dissolved	mg/L	*na*	*na*		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, dissolved	mg/L	*na*	*na*		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	mg/L	*5*	*0.12*		0.042	0.046	0.046	0.044	0.045
cadmium, dissolved	mg/L	*0.005*	*0.2*		0.0000054	<0.0000050	0.0000913	0.0000614	<0.0000050
calcium, dissolved	mg/L	*na*	*na*		125	227	192	192	156
cesium, dissolved	mg/L	*na*	*na*		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
chromium, dissolved	mg/L	*na*	*1*		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	mg/L	*na*	*na*		0.00017	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	mg/L	*5*	*0.09*		<0.00020	0.00030	0.00696	0.00535	<0.00020
iron, dissolved	mg/L	*0.03*	*na*		<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	mg/L	*0.01*	*3*		<0.000050	<0.000050	0.000146	0.000098	<0.000050
lithium, dissolved	mg/L	*na*	*na*		0.0055	0.0078	0.0084	0.0067	0.0066
magnesium, dissolved	mg/L	*na*	*na*		34.6	43.2	40.0	39.8	35.9
manganese, dissolved	mg/L	*0.05*	*na*		0.0781	0.0133	0.00298	0.0102	0.0698
mercury, dissolved	mg/L	0.001	0.0006		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	mg/L	*0.25*	*2*		0.000799	0.000509	0.000557	0.000580	0.000706
nickel, dissolved	mg/L	*0.025*	*na*		0.00057	0.00326	0.00102	0.00096	0.00052
phosphorus, dissolved	mg/L	*na*	*na*		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	mg/L	*na*	*na*		0.929	1.25	1.39	1.10	1.05
rubidium, dissolved	mg/L	*na*	*na*		0.00073	0.00081	0.00075	0.00078	0.00068
selenium, dissolved	mg/L	*0.01*	*na*		0.000141	0.000068	0.000051	<0.000050	0.000051
silicon, dissolved	mg/L	*na*	*na*		2.57	4.82	5.08	4.14	3.50
silver, dissolved	mg/L	*na*	*na*		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	mg/L	*200*	*na*		2.78	3.48	3.54	2.96	2.72
strontium, dissolved	mg/L	*na*	*na*		1.31	1.76	1.95	1.71	1.61
sulfur, dissolved	mg/L	*500*	*na*		102	124	117	126	129
tellurium, dissolved	mg/L	*na*	*na*		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, dissolved	mg/L	*na*	*na*		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
thorium, dissolved	mg/L	*na*	*na*		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, dissolved	mg/L	*na*	*na*		<0.00010	<0.00010	0.00041	0.00024	<0.00010
titanium, dissolved	mg/L	*na*	*na*		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
tungsten, dissolved	mg/L	*na*	*na*		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, dissolved	mg/L	0.015	*na*		0.000753	0.00168	0.00181	0.00151	0.00121
vanadium, dissolved	mg/L	*na*	*na*		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	mg/L	*na*	*0.03*		0.0012	0.0024	0.0177	0.0071	<0.0010
zirconium, dissolved	mg/L	*na*	*na*		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

Qualifier Legend

DLDS Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.

Results Summary VA20A4365

Project Columbia Valley
Report To Ron Mickel, Eco/Logic Environmental
Date Received 03-Apr-2020 08:30

Client Sample ID			BCE STANDARDS		E207780	E207782	E208726	E208720	E265102	E265103	03_05	FIELD BLANK
Date Sampled			DRINKING	AQUATIC	1-Apr-20	1-Apr-20	1-Apr-20	1-Apr-20	1-Apr-20	1-Apr-20	1-Apr-20	1-Apr-20
Time Sampled					00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
Physical Tests	LDL	Units										
alkalinity, total (as CaCO3)	1.0	mg/L	*na*	*na*	203	211	197	461	391	350	84.9	1.2
conductivity	2.0	µS/cm	700	*na*	932	944	898	1280	1170	1170	752	<2.0
hardness (as CaCO3), diss	0.60	mg/L	*500*	*na*			527	809	724	734	407	<0.60
hardness (as CaCO3),	0.60	mg/L	*500*	*na*	523	529						
pH	0.10	pH units	*6.5-8.5*	*6.5-9*	8.01	7.95	7.86	7.58	7.72	7.82	7.26	5.24
solids, total suspended	3.0	mg/L	*na*	*na*	<3.0	<3.0	49.9	32.3	7.9	13.7	47.9	<3.0
Anions and Nutrients												
ammonia, total (as N)	0.0050	mg/L	*na*	*0.75-27.7*	<0.0050	<0.0050	0.0060	<0.0050	0.0156	<0.0050	<0.0050	<0.0050
chloride	0.50	mg/L	*250*	*na*	<2.50	<2.50	<2.50	3.48	3.04	4.27	1.89	<0.50
fluoride	0.020	mg/L	*1.5*	*na*	0.181	0.184	0.202	<0.100	0.114	0.123	0.040	<0.020
nitrate (as N)	0.0050	mg/L	*10*	*200*	<0.0250	<0.0250	0.111	<0.0250	<0.0250	0.103	0.0191	<0.0050
sulfate (as SO4)	0.30	mg/L	*500*	*100*	330	338	318	344	319	355	301	<0.30

Total Metals (Matrix: Water)			DRINKING	AQUATIC	E207780	E207782	E208726	E208720	E265102	E265103	03_05	FIELD BLANK
aluminum, total	0.0030	mg/L	*0.2*	*0.1*	<0.0030	<0.0030						
antimony, total	0.00010	mg/L	*0.006*	*na*	<0.00010	<0.00010						
arsenic, total	0.00010	mg/L	*0.025*	*0.005*	<0.00010	<0.00010						
barium, total	0.00010	mg/L	*1*	*na*	0.00913	0.00975						
beryllium, total	0.000100	mg/L	*na*	*na*	<0.000100	<0.000100						
bismuth, total	0.000050	mg/L	*na*	*na*	<0.000050	<0.000050						
boron, total	0.010	mg/L	*5*	*0.12*	0.028	0.029						
cadmium, total	0.0000050	mg/L	*0.005*	*0.2*	0.0000307	<0.0000050						
calcium, total	0.050	mg/L	*na*	*na*	138	135						
cesium, total	0.000010	mg/L	*na*	*na*	<0.000010	<0.000010						
chromium, total	0.00010	mg/L	*na*	*1*	<0.00010	<0.00010						
cobalt, total	0.00010	mg/L	*na*	*na*	<0.00010	<0.00010						
copper, total	0.00050	mg/L	*5*	*0.09*	<0.00050	<0.00050						
iron, total	0.010	mg/L	*0.03*	*na*	0.118	0.054						
lead, total	0.000050	mg/L	*0.01*	*3*	0.000078	<0.000050						
lithium, total	0.0010	mg/L	*na*	*na*	0.0070	0.0084						
magnesium, total	0.0050	mg/L	*na*	*na*	43.0	46.6						
manganese, total	0.00010	mg/L	*0.05*	*na*	0.00314	0.00210						
mercury, total	0.0000050	mg/L	0.001	0.0006	<0.0000050	<0.0000050						
molybdenum, total	0.000050	mg/L	*0.25*	*2*	0.000703	0.000655						
nickel, total	0.00050	mg/L	*0.025*	*na*	<0.00050	<0.00050						
phosphorus, total	0.050	mg/L	*na*	*na*	<0.050	<0.050						
potassium, total	0.050	mg/L	*na*	*na*	1.02	1.13						
rubidium, total	0.00020	mg/L	*na*	*na*	0.00046	0.00056						
selenium, total	0.000050	mg/L	*0.01*	*na*	<0.000050	<0.000050						
silicon, total	0.10	mg/L	*na*	*na*	3.54	3.91						
silver, total	0.000010	mg/L	*na*	*na*	<0.000010	<0.000010						
sodium, total	0.050	mg/L	*200*	*na*	2.94	6.96						
strontium, total	0.00020	mg/L	*na*	*na*	1.68	1.70						
sulfur, total	0.50	mg/L	*500*	*na*	126	128						
tellurium, total	0.00020	mg/L	*na*	*na*	0.00023	0.00027						
thallium, total	0.000010	mg/L	*na*	*na*	<0.000010	<0.000010						
thorium, total	0.00010	mg/L	*na*	*na*	<0.00010	<0.00010						
tin, total	0.00010	mg/L	*na*	*na*	<0.00010	<0.00010						
titanium, total	0.00030	mg/L	*na*	*na*	<0.00030	<0.00030						
tungsten, total	0.00010	mg/L	*na*	*na*	<0.00010	<0.00010						
uranium, total	0.000010	mg/L	0.015	*na*	0.00120	0.00148						
vanadium, total	0.00050	mg/L	*na*	*na*	<0.00050	<0.00050						
zinc, total	0.0030	mg/L	*na*	*0.03*	0.0703	0.0034						
zirconium, total	0.00020	mg/L	*na*	*na*	<0.00020	<0.00020						

Dissolved Metals (Matrix: Water)			DRINKING	AQUATIC	E207780	E207782	E208726	E208720	E265102	E265103	03_05	FIELD BLANK
aluminum, dissolved	0.0010	mg/L	*0.2*	*0.1*			0.120	0.0098	0.0070	0.0215	0.0010	<0.0010
antimony, dissolved	0.00010	mg/L	*0.006*	*na*			<0.00010	0.00011	0.00012	<0.00010	<0.00010	<0.00010
arsenic, dissolved	0.00010	mg/L	*0.025*	*0.005*			0.00020	0.00017	0.00019	<0.00010	<0.00010	<0.00010
barium, dissolved	0.00010	mg/L	*1*	*na*			0.0132	0.0167	0.0147	0.0164	0.00508	<0.00010
beryllium, dissolved	0.000100	mg/L	*na*	*na*			<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, dissolved	0.000050	mg/L	*na*	*na*			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	0.010	mg/L	*5*	*0.12*			0.041	0.042	0.043	0.040	0.040	<0.010
cadmium, dissolved	0.0000050	mg/L	*0.005*	*0.2*			0.0000071	0.0000246	0.0000603	0.0000844	0.000279	<0.0000050
calcium, dissolved	0.050	mg/L	*na*	*na*			148	246	218	221	99.2	<0.050
cesium, dissolved	0.000010	mg/L	*na*	*na*			0.000019	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
chromium, dissolved	0.00010	mg/L	*na*	*1*			0.00055	0.00022	0.00156	0.00040	<0.00010	<0.00010
cobalt, dissolved	0.00010	mg/L	*na*	*na*			0.00021	<0.00010	0.00012	<0.00010	<0.00010	<0.00010
copper, dissolved	0.00020	mg/L	*5*	*0.09*			0.00228	0.0125	0.0144	0.00282	0.00147	<0.00020
iron, dissolved	0.010	mg/L	*0.03*	*na*			8.54	3.95	0.425	0.042	24.0	<0.010
lead, dissolved	0.000050	mg/L	*0.01*	*3*			0.000552	0.00751	0.000480	0.000270	0.000123	<0.000050
lithium, dissolved	0.0010	mg/L	*na*	*na*			0.0054	0.0073	0.0081	0.0065	0.0059	<0.0010
magnesium, dissolved	0.0050	mg/L	*na*	*na*			38.0	47.6	43.5	44.4	38.7	<0.0050
manganese, dissolved	0.00010	mg/L	*0.05*	*na*			0.0817	0.0468	0.00847	0.0134	0.713	<0.00010
mercury, dissolved	0.0000050	mg/L	0.001	0.0006			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	0.000050	mg/L	*0.25*	*2*			0.00104	0.000738	0.000603	0.000579	<0.000050	<0.000050
nickel, dissolved	0.00050	mg/L	*0.025*	*na*			0.00083	0.00304	0.00283	0.00089	<0.00050	<0.00050
phosphorus, dissolved	0.050	mg/L	*na*	*na*			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	0.050	mg/L	*na*	*na*			0.933	1.24	1.31	1.10	0.986	<0.050
rubidium, dissolved	0.00020	mg/L	*na*	*na*			0.00091	0.00092	0.00074	0.00077	0.00071	<0.00020
selenium, dissolved	0.000050	mg/L	*0.01*	*na*			0.000055	0.000053	<0.000050	0.000053	<0.000050	<0.000050
silicon, dissolved	0.050	mg/L	*na*	*na*			3.18	4.62	4.91	3.92	2.02	<0.050
silver, dissolved	0.000010	mg/L	*na*	*na*			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	0.050	mg/L	*200*	*na*			2.69	3.43	3.61	3.42	2.72	<0.050
strontium, dissolved	0.00020	mg/L	*na*	*na*			1.51	1.73	2.06	1.74	0.582	<0.00020
sulfur, dissolved	0.50	mg/L	*500*	*na*			116	122	118	130	111	<0.50
tellurium, dissolved	0.00020	mg/L	*na*	*na*			<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, dissolved	0.000010	mg/L	*na*	*na*			<0.000010	0.000013	<0.000010	<0.000010	<0.000010	<0.000010
thorium, dissolved	0.00010	mg/L	*na*	*na*			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, dissolved	0.00010	mg/L	*na*	*na*			<0.00010	0.00011	0.00054	0.00032	<0.00010	<0.00010
titanium, dissolved	0.00030	mg/L	*na*	*na*			<0.00420	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
tungsten, dissolved	0.00010	mg/L	*na*	*na*			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, dissolved	0.000010	mg/L	0.015	*na*			0.00101	0.00158	0.00173	0.00149	0.000020	<0.000010
vanadium, dissolved	0.00050	mg/L	*na*	*na*			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	0.0010	mg/L	*na*	*0.03*			0.0101	0.0065	0.0134	0.0033	0.0022	<0.0010
zirconium, dissolved	0.00020	mg/L	*na*	*na*			<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

Qualifier Legend

DLDS Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.

DLM Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Results Summary L2477031

Job Reference
Report To David Kvick, Sperling Hansen Associates Inc.
Date Received 21-Jul-2020 8:50
Report Date 22-Jul-2020 16:59
Report Version 1

Client Sample ID			MW04-A	MW04-02	E207780	E207782	E29730	E297151	E297152
Date Sampled			19-Jul-2020	19-Jul-2020	19-Jul-2020	19-Jul-2020	20-Jul-2020	20-Jul-2020	20-Jul-2020
Time Sampled			10:00	10:00	10:00	10:00	10:00	10:00	10:00
ALS Sample ID			L2477031-1	L2477031-2	L2477031-3	L2477031-4	L2477031-7	L2477031-8	L2477031-9
Parameter	Lowest Detection Limit	Units	Water	Water	Water	Water	Water	Water	Water
Physical Tests (Water)									
Hardness (as CaCO3)	0.50	mg/L	715	746	580	550	494	497	592
Total Suspended Solids	1.0	mg/L	9810	156	<1.0	<1.0	5610	228	343
Anions and Nutrients (Water)									
Alkalinity, Total (as CaCO3)	2.0	mg/L	1180	381	237	210	671	446	518
Ammonia as N	0.0050	mg/L	0.0266	0.0257	0.0429	0.0149	0.269	0.0108	0.0226
Bicarbonate (HCO3)	5.0	mg/L	1440	465	289	256	819	544	631
Carbonate (CO3)	5.0	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride (Cl)	0.10	mg/L	24.9	5.21	3.33	2.37	2.35	13.5	42.2
Conductivity (EC)	2.0	uS/cm	1130	1060	919	906	537	906	1090
Fluoride (F)	0.020	mg/L	0.12	0.14	0.13	0.169	0.075	<0.10	<0.10
Hydroxide (OH)	5.0	mg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Nitrate and Nitrite (as N)	0.0051	mg/L	0.199	<0.025	0.13	0.0191	0.174	9.2	16.1
Nitrate (as N)	0.0050	mg/L	0.199	<0.025	0.103	0.0191	0.0860	9.20	16.1
Nitrite (as N)	0.0010	mg/L	<0.0050	<0.0050	0.0266	<0.0010	0.0878	<0.0050	<0.0050
pH	0.10	pH	7.14	7.35	7.72	7.69	7.89	7.81	7.83
Orthophosphate-Dissolved (as P)	0.0010	mg/L	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	0.0020	mg/L	4.85	0.0781	<0.0020	<0.0020	2.29	0.0956	0.0646
Sulfate (SO4)	0.050	mg/L	339	344	334	330	6.52	85.6	43.2
Bacteriological Tests (Water)									
MPN - E. Coli	1	MPN/100mL					<1	<1	<1
Coliform Bacteria - Fecal	2	CFU/100mL					6000	<2	<2
MPN - Total Coliforms	1	MPN/100mL					>2419.6	<1	9
Total Metals (Water)									
Aluminum (Al)-Total	0.0030	mg/L			<0.0030	<0.0030			
Antimony (Sb)-Total	0.00010	mg/L			<0.00010	<0.00010			
Arsenic (As)-Total	0.00010	mg/L			<0.00010	<0.00010			
Barium (Ba)-Total	0.00010	mg/L			0.0111	0.0104			
Beryllium (Be)-Total	0.000020	mg/L			<0.000020	<0.000020			
Bismuth (Bi)-Total	0.000050	mg/L			<0.000050	<0.000050			
Boron (B)-Total	0.010	mg/L			0.033	0.028			
Cadmium (Cd)-Total	0.0000050	mg/L			0.0000140	0.0000053			
Calcium (Ca)-Total	0.050	mg/L			161	142			
Chromium (Cr)-Total	0.00010	mg/L			<0.00010	<0.00010			
Cobalt (Co)-Total	0.00010	mg/L			<0.00010	<0.00010			
Copper (Cu)-Total	0.00050	mg/L			<0.00050	0.00243			
Iron (Fe)-Total	0.010	mg/L			0.067	<0.010			
Lead (Pb)-Total	0.000050	mg/L			<0.000050	0.000076			
Lithium (Li)-Total	0.0010	mg/L			0.0077	0.0093			
Magnesium (Mg)-Total	0.0050	mg/L			43.3	47.2			
Manganese (Mn)-Total	0.00010	mg/L			0.00236	0.00097			
Molybdenum (Mo)-Total	0.000050	mg/L			0.000710	0.000643			
Nickel (Ni)-Total	0.00050	mg/L			<0.00050	<0.00050			
Phosphorus (P)-Total	0.050	mg/L			<0.050	<0.050			
Potassium (K)-Total	0.10	mg/L			1.05	1.05			
Selenium (Se)-Total	0.000050	mg/L			<0.000050	<0.000050			
Silicon (Si)-Total	0.050	mg/L			3.89	3.67			
Silver (Ag)-Total	0.000010	mg/L			<0.000010	<0.000010			
Sodium (Na)-Total	0.050	mg/L			3.57	8.21			
Strontium (Sr)-Total	0.00020	mg/L			1.90	1.84			
Sulfur (S)-Total	0.50	mg/L			119	117			
Thallium (Tl)-Total	0.000010	mg/L			<0.000010	<0.000010			
Tin (Sn)-Total	0.00010	mg/L			<0.00010	<0.00010			
Titanium (Ti)-Total	0.00030	mg/L			<0.00030	<0.00030			
Uranium (U)-Total	0.000010	mg/L			0.00168	0.00168			
Vanadium (V)-Total	0.00050	mg/L			<0.00050	<0.00050			
Zinc (Zn)-Total	0.0030	mg/L			0.0493	0.0158			
Zirconium (Zr)-Total	0.00030	mg/L			<0.00030	<0.00030			
Dissolved Metals (Water)									
Dissolved Metals Filtration Location		-	FIELD	FIELD			FIELD	FIELD	FIELD
Dissolved Metals Filtration Location		-	FIELD	FIELD			FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved	0.0010	mg/L	0.0261	0.0039			1.49	0.0020	0.0056
Antimony (Sb)-Dissolved	0.00010	mg/L	<0.00010	<0.00010			<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	0.00010	mg/L	0.00012	0.00011			0.00355	0.00014	0.00013
Barium (Ba)-Dissolved	0.00010	mg/L	0.0248	0.0169			0.418	0.0415	0.100
Beryllium (Be)-Dissolved	0.000020	mg/L	<0.000020	<0.000020			0.000186	<0.000020	<0.000020
Bismuth (Bi)-Dissolved	0.000050	mg/L	<0.000050	<0.000050			<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	0.010	mg/L	0.036	0.040			0.012	0.026	0.015
Cadmium (Cd)-Dissolved	0.0000050	mg/L	0.0000220	0.000126			0.000229	0.0000053	0.0000072
Calcium (Ca)-Dissolved	0.050	mg/L	213	224			92.1	55.0	45.8
Chromium (Cr)-Dissolved	0.00010	mg/L	0.00011	<0.00010			0.00181	0.00061	0.00070
Cobalt (Co)-Dissolved	0.00010	mg/L	<0.00010	<0.00010			0.00384	<0.00010	<0.00010
Copper (Cu)-Dissolved	0.00020	mg/L	0.00101	0.00473			0.0297	0.00181	0.00089
Iron (Fe)-Dissolved	0.010	mg/L	0.021	0.063			2.79	<0.010	<0.010
Lead (Pb)-Dissolved	0.000050	mg/L	0.000120	0.000119			0.0283	0.000058	0.000084
Lithium (Li)-Dissolved	0.0010	mg/L	0.0078	0.0085			0.0108	0.0043	0.0149
Magnesium (Mg)-Dissolved	0.0050	mg/L	44.5	45.7			64.0	87.4	116
Manganese (Mn)-Dissolved	0.00010	mg/L	0.00943	0.00530			0.354	0.00022	0.00134
Molybdenum (Mo)-Dissolved	0.000050	mg/L	0.000580	0.000647			0.000347	0.000172	0.000178
Nickel (Ni)-Dissolved	0.00050	mg/L	0.00073	0.00143			0.00421	<0.00050	0.00078
Phosphorus (P)-Dissolved	0.050	mg/L	<0.050	<0.050			0.270	<0.050	<0.050
Potassium (K)-Dissolved	0.10	mg/L	1.15	1.54			1.83	2.22	2.35
Selenium (Se)-Dissolved	0.000050	mg/L	<0.000050	<0.000050			<0.000050	0.000170	0.000694
Silicon (Si)-Dissolved	0.050	mg/L	4.41	4.85			7.83	8.16	7.96
Silver (Ag)-Dissolved	0.000010	mg/L	0.000013	<0.000010			<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	0.050	mg/L	10.4	4.44			17.1	15.8	30.8
Strontium (Sr)-Dissolved	0.00020	mg/L	1.83	2.11			0.746	0.353	0.519
Sulfur (S)-Dissolved	0.50	mg/L	123	128			4.85	35.4	19.4
Thallium (Tl)-Dissolved	0.000010	mg/L	<0.000010	<0.000010			0.000037	<0.000010	<0.000010
Tin (Sn)-Dissolved	0.00010	mg/L	<0.00010	0.00030			0.00052	<0.00010	<0.00010
Titanium (Ti)-Dissolved	0.00030	mg/L	0.00052	<0.00030			0.0254	<0.00030	<0.00030
Uranium (U)-Dissolved	0.000010	mg/L	0.00145	0.00172			0.00411	0.00494	0.00599
Vanadium (V)-Dissolved	0.00050	mg/L	<0.00050	<0.00050			0.00319	<0.00050	<0.00050
Zinc (Zn)-Dissolved	0.0010	mg/L	0.0018	0.0209			0.0273	0.0015	0.0030
Zirconium (Zr)-Dissolved	0.00030	mg/L	<0.00030	<0.00030			<0.00030	<0.00030	<0.00030

Qualifier Legend

DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
RRV	Reported Result Verified By Repeat Analysis
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Results Summary L2518964

Job Reference	20050 COLUMBIA VALLEY
Report To	Scott Garthwaite, Sperling Hansen Associates Inc.
Date Received	20-Oct-2020 8:35
Report Date	27-Oct-2020 16:01
Report Version	1

Client Sample ID			E207782	E207780	E265103	E265102
Date Sampled			18-Oct-2020	18-Oct-2020	18-Oct-2020	18-Oct-2020
Time Sampled			12:00	12:00	12:00	12:00
ALS Sample ID			L2518964-1	L2518964-2	L2518964-3	L2518964-4
Parameter	Lowest Detection Limit	Units	Water	Water	Water	Water
Physical Tests (Water)						
Hardness (as CaCO3)	0.50	mg/L	553	552	758	734
Total Suspended Solids	1.0	mg/L	<1.0	3.1	5150	138
Anions and Nutrients (Water)						
Alkalinity, Total (as CaCO3)	2.0	mg/L	212	195	379	285
Ammonia as N	0.0050	mg/L	<0.0050	<0.0050	0.0131	0.0168
Bicarbonate (HCO3)	5.0	mg/L	258	231	462	348
Carbonate (CO3)	5.0	mg/L	<5.0	<5.0	<5.0	<5.0
Chloride (Cl)	0.10	mg/L	2.85	1.67	39.2	4.67
Conductivity (EC)	2.0	uS/cm	908	883	1130	1040
Fluoride (F)	0.020	mg/L	0.19	0.220	0.26	0.31
Hydroxide (OH)	5.0	mg/L	<5.0	<5.0	<5.0	<5.0
Nitrate and Nitrite (as N)	0.0051	mg/L	0.043	<0.0051	0.238	0.028
Nitrate (as N)	0.0050	mg/L	0.043	<0.0050	0.238	0.028
Nitrite (as N)	0.0010	mg/L	<0.0050	<0.0010	<0.0050	<0.0050
pH	0.10	pH	8.16	8.33	7.67	7.68
Sulfate (SO4)	0.050	mg/L	374	350	369	387
Total Metals (Water)						
Aluminum (Al)-Total	0.0030	mg/L	<0.0030	<0.0030		
Antimony (Sb)-Total	0.00010	mg/L	<0.00010	<0.00010		
Arsenic (As)-Total	0.00010	mg/L	0.00012	0.00013		
Barium (Ba)-Total	0.00010	mg/L	0.0104	0.00972		
Beryllium (Be)-Total	0.000020	mg/L	<0.000020	<0.000020		
Bismuth (Bi)-Total	0.000050	mg/L	<0.000050	<0.000050		
Boron (B)-Total	0.010	mg/L	0.031	0.029		
Cadmium (Cd)-Total	0.0000050	mg/L	0.0000055	0.0000073		
Calcium (Ca)-Total	0.050	mg/L	141	147		
Chromium (Cr)-Total	0.00010	mg/L	<0.00010	<0.00010		
Cobalt (Co)-Total	0.00010	mg/L	<0.00010	<0.00010		
Copper (Cu)-Total	0.00050	mg/L	0.00625	0.00098		
Iron (Fe)-Total	0.010	mg/L	0.069	0.437		
Lead (Pb)-Total	0.000050	mg/L	0.00143	0.000129		
Lithium (Li)-Total	0.0010	mg/L	0.0085	0.0070		
Magnesium (Mg)-Total	0.0050	mg/L	49.1	44.8		
Manganese (Mn)-Total	0.00010	mg/L	0.00258	0.00218		
Mercury (Hg)-Total	0.0000050	mg/L	<0.0000050	<0.0000050		
Molybdenum (Mo)-Total	0.000050	mg/L	0.000892	0.000768		
Nickel (Ni)-Total	0.00050	mg/L	<0.00050	<0.00050		
Phosphorus (P)-Total	0.050	mg/L	<0.050	<0.050		
Potassium (K)-Total	0.10	mg/L	1.15	1.02		
Selenium (Se)-Total	0.000050	mg/L	0.000074	0.000051		
Silicon (Si)-Total	0.050	mg/L	4.08	3.89		
Silver (Ag)-Total	0.000010	mg/L	<0.000010	<0.000010		
Sodium (Na)-Total	0.050	mg/L	7.15	2.98		
Strontium (Sr)-Total	0.00020	mg/L	1.83	1.81		
Sulfur (S)-Total	0.50	mg/L	122	122		
Thallium (Tl)-Total	0.000010	mg/L	<0.000010	<0.000010		
Tin (Sn)-Total	0.00010	mg/L	0.00101	<0.00010		
Titanium (Ti)-Total	0.00030	mg/L	<0.00030	<0.00030		
Uranium (U)-Total	0.000010	mg/L	0.00168	0.00145		
Vanadium (V)-Total	0.00050	mg/L	<0.00050	<0.00050		
Zinc (Zn)-Total	0.0030	mg/L	0.0452	0.0492		
Zirconium (Zr)-Total	0.00030	mg/L	<0.00030	<0.00030		
Dissolved Metals (Water)						
Dissolved Mercury Filtration Location		-			FIELD	FIELD
Dissolved Metals Filtration Location		-			FIELD	FIELD
Dissolved Metals Filtration Location		-			FIELD	FIELD
Aluminum (Al)-Dissolved	0.0010	mg/L			<0.0010	0.0028
Antimony (Sb)-Dissolved	0.00010	mg/L			<0.00010	<0.00010
Arsenic (As)-Dissolved	0.00010	mg/L			0.00015	0.00014
Barium (Ba)-Dissolved	0.00010	mg/L			0.0244	0.0148
Beryllium (Be)-Dissolved	0.000020	mg/L			<0.000020	<0.000020
Bismuth (Bi)-Dissolved	0.000050	mg/L			<0.000050	<0.000050
Boron (B)-Dissolved	0.010	mg/L			0.039	0.041
Cadmium (Cd)-Dissolved	0.0000050	mg/L			0.0000072	0.0000118
Calcium (Ca)-Dissolved	0.050	mg/L			210	215
Chromium (Cr)-Dissolved	0.00010	mg/L			<0.00010	<0.00010
Cobalt (Co)-Dissolved	0.00010	mg/L			<0.00010	<0.00010
Copper (Cu)-Dissolved	0.00020	mg/L			0.00027	0.00081
Iron (Fe)-Dissolved	0.010	mg/L			<0.010	<0.010
Lead (Pb)-Dissolved	0.000050	mg/L			<0.000050	0.000064
Lithium (Li)-Dissolved	0.0010	mg/L			0.0079	0.0082
Magnesium (Mg)-Dissolved	0.0050	mg/L			56.5	47.8
Manganese (Mn)-Dissolved	0.00010	mg/L			0.0125	0.00373
Mercury (Hg)-Dissolved	0.0000050	mg/L			<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	0.000050	mg/L			0.000614	0.000563
Nickel (Ni)-Dissolved	0.00050	mg/L			0.00089	0.00080
Phosphorus (P)-Dissolved	0.050	mg/L			<0.050	<0.050
Potassium (K)-Dissolved	0.10	mg/L			1.35	1.39
Selenium (Se)-Dissolved	0.000050	mg/L			<0.000050	<0.000050
Silicon (Si)-Dissolved	0.050	mg/L			4.32	4.72
Silver (Ag)-Dissolved	0.000010	mg/L			<0.000010	<0.000010
Sodium (Na)-Dissolved	0.050	mg/L			13.7	3.75
Strontium (Sr)-Dissolved	0.00020	mg/L			1.80	1.97
Sulfur (S)-Dissolved	0.50	mg/L			119	124
Thallium (Tl)-Dissolved	0.000010	mg/L			<0.000010	<0.000010
Tin (Sn)-Dissolved	0.00010	mg/L			0.00011	0.00026
Titanium (Ti)-Dissolved	0.00030	mg/L			<0.00030	<0.00030
Uranium (U)-Dissolved	0.000010	mg/L			0.00160	0.00183
Vanadium (V)-Dissolved	0.00050	mg/L			<0.00050	<0.00050
Zinc (Zn)-Dissolved	0.0010	mg/L			0.0023	0.0318
Zirconium (Zr)-Dissolved	0.00030	mg/L			<0.00030	<0.00030

Qualifier Legend

HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

APPENDIX C
Certificate of Analysis

Report To	Ron Mickel, Eco/Logic Environmental	**Date Received**	08-Jan-2020 12:50
	PO Box 1112	**Issue Date**	13-Jan-2020 11:46
		Amendment	0
	Nelson, BC V1L 6H3, Canada	**Version**	FINAL

Client Phone (250) 354-3406

Certificate of Analysis

Lab Work Order #	VA20A0161
Project PO #	
Project	Columbia Valley
Legal Site Description	
C of C Numbers	

Comments

Sample FIEL BLANK not received at lab. Sample will not be reported as such. Please send sample if you would like to have it analyzed

Temperature 4

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Robin	Team Leader - Metals	Inorganics - Water Quality, Burnaby, British Columbia
Evan	Metal Analyst	Metals, Burnaby, British Columbia
Tracy	Supervisor - Water Quality Instrumenta	Inorganics - Water Quality, Burnaby, British Columbia
Kim	Department Manager - Metals	Metals, Burnaby, British Columbia
Ilnaz	Team Leader - Metals preparation	Metals, Burnaby, British Columbia

Results Summary VA20A0161

Project	Columbia Valley
Report To	Ron Mickel, Eco/Logic Environmental
Date Received	08-Jan-2020 12:50
Issue Date	13-Jan-2020 11:46
Amendment	0

Client Sample ID			E207782	E208726	E208720	E265102	E265103	03_05
Date Sampled			06-Jan-2020	06-Jan-2020	06-Jan-2020	06-Jan-2020	06-Jan-2020	06-Jan-2020
Time Sampled			00:00	00:00	00:00	00:00	00:00	00:00
ALS Sample ID			VA20A0161-001	VA20A0161-002	VA20A0161-003	VA20A0161-004	VA20A0161-005	VA20A0161-006
Analyte	Lowest Detection Limit	Units	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water
Physical Tests (Matrix: Water)								
alkalinity, total (as CaCO3)	1.0	mg/L	223	206	446	374	313	223
conductivity	2.0	µS/cm	979	862	1290	1160	1130	981
hardness (as CaCO3), dissolved	0.60	mg/L		455	745	645	644	538
hardness (as CaCO3), from total Ca/Mg	0.60	mg/L	587					
pH	0.10	pH units	8.17	8.00	7.81	8.03	7.78	8.03
solids, total suspended [TSS]	3.0	mg/L	<3.0	45.4	18.4	3.0	38.4	26.8
Anions and Nutrients (Matrix: Water)								
ammonia, total (as N)	0.0050	mg/L	<0.0050	0.0114	<0.0050	0.0143	<0.0050	<0.0050
chloride	0.50	mg/L	<2.50	<2.50	<5.00	3.44	2.65	<2.50
fluoride	0.020	mg/L	0.236	0.255	<0.200	0.162	0.177	0.210
nitrate (as N)	0.0050	mg/L	<0.0250	0.0975	0.0739	<0.0250	0.110	<0.0250
sulfate (as SO4)	0.30	mg/L	357	298	360	335	371	373
Total Metals (Matrix: Water)								
aluminum, total	0.0030	mg/L	<0.0030					
antimony, total	0.00010	mg/L	<0.00010					
arsenic, total	0.00010	mg/L	<0.00010					
barium, total	0.00010	mg/L	0.0112					
beryllium, total	0.000100	mg/L	<0.000100					
bismuth, total	0.000050	mg/L	<0.000050					
boron, total	0.010	mg/L	0.033					
cadmium, total	0.0000050	mg/L	0.0000118					
calcium, total	0.050	mg/L	156					
cesium, total	0.000010	mg/L	<0.000010					
chromium, total	0.00010	mg/L	<0.00010					
cobalt, total	0.00010	mg/L	<0.00010					
copper, total	0.00050	mg/L	0.00087					
iron, total	0.010	mg/L	0.099					
lead, total	0.000050	mg/L	<0.000050					
lithium, total	0.0010	mg/L	0.0086					
magnesium, total	0.0050	mg/L	47.9					
manganese, total	0.00010	mg/L	0.00304					
mercury, total	0.0000050	mg/L	<0.0000050					
molybdenum, total	0.000050	mg/L	0.000601					
nickel, total	0.00050	mg/L	<0.00050					
phosphorus, total	0.050	mg/L	<0.050					
potassium, total	0.050	mg/L	1.16					
rubidium, total	0.00020	mg/L	0.00074					
selenium, total	0.000050	mg/L	<0.000050					
silicon, total	0.10	mg/L	3.96					
silver, total	0.000010	mg/L	<0.000010					
sodium, total	0.050	mg/L	6.83					
strontium, total	0.00020	mg/L	1.74					
sulfur, total	0.50	mg/L	125					
tellurium, total	0.00020	mg/L	<0.00020					
thallium, total	0.000010	mg/L	<0.000010					
thorium, total	0.00010	mg/L	<0.00010					
tin, total	0.00010	mg/L	<0.00010					
titanium, total	0.00030	mg/L	<0.00030					
tungsten, total	0.00010	mg/L	<0.00010					
uranium, total	0.000010	mg/L	0.00158					
vanadium, total	0.00050	mg/L	<0.00050					
zinc, total	0.0030	mg/L	0.0078					
zirconium, total	0.00020	mg/L	<0.00020					
Dissolved Metals (Matrix: Water)								
aluminum, dissolved	0.0010	mg/L		<0.0010	<0.0010	0.0016	0.0011	<0.0010
antimony, dissolved	0.00010	mg/L		<0.00010	<0.00010	0.00015	<0.00010	<0.00010
arsenic, dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
barium, dissolved	0.00010	mg/L		0.00936	0.0149	0.0139	0.0153	0.0116
beryllium, dissolved	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, dissolved	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	0.010	mg/L		0.042	0.046	0.046	0.044	0.045
cadmium, dissolved	0.0000050	mg/L		0.0000054	<0.0000050	0.0000913	0.0000614	<0.0000050
calcium, dissolved	0.050	mg/L		125	227	192	192	156
cesium, dissolved	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
chromium, dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
cobalt, dissolved	0.00010	mg/L		0.00017	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	0.00020	mg/L		<0.00020	0.00030	0.00696	0.00535	<0.00020
dissolved mercury filtration location				Laboratory	Laboratory	Laboratory	Laboratory	Laboratory
dissolved metals filtration location				Laboratory	Laboratory	Laboratory	Laboratory	Laboratory
iron, dissolved	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	0.000050	mg/L		<0.000050	<0.000050	0.000146	0.000098	<0.000050
lithium, dissolved	0.0010	mg/L		0.0055	0.0078	0.0084	0.0067	0.0066
magnesium, dissolved	0.0050	mg/L		34.6	43.2	40.0	39.8	35.9
manganese, dissolved	0.00010	mg/L		0.0781	0.0133	0.00298	0.0102	0.0698
mercury, dissolved	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	0.000050	mg/L		0.000799	0.000509	0.000557	0.000580	0.000706
nickel, dissolved	0.00050	mg/L		0.00057	0.00326	0.00102	0.00096	0.00052
phosphorus, dissolved	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	0.050	mg/L		0.929	1.25	1.39	1.10	1.05
rubidium, dissolved	0.00020	mg/L		0.00073	0.00081	0.00075	0.00078	0.00068
selenium, dissolved	0.000050	mg/L		0.000141	0.000068	0.000051	<0.000050	0.000051
silicon, dissolved	0.050	mg/L		2.57	4.82	5.08	4.14	3.50
silver, dissolved	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	0.050	mg/L		2.78	3.48	3.54	2.96	2.72
strontium, dissolved	0.00020	mg/L		1.31	1.76	1.95	1.71	1.61
sulfur, dissolved	0.50	mg/L		102	124	117	126	129
tellurium, dissolved	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, dissolved	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
thorium, dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, dissolved	0.00010	mg/L		<0.00010	<0.00010	0.00041	0.00024	<0.00010
titanium, dissolved	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
tungsten, dissolved	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, dissolved	0.000010	mg/L		0.000753	0.00168	0.00181	0.00151	0.00121
vanadium, dissolved	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	0.0010	mg/L		0.0012	0.0024	0.0177	0.0071	<0.0010
zirconium, dissolved	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

Qualifier Legend

DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.

Sperling Hansen Associates Inc.
ATTN: David Kvick
#8 - 1225 East Keith Road
North Vancouver BC V7J 1J3

Date Received: 21-JUL-20
Report Date: 22-JUL-20 16:59 (MT)
Version: FINAL

Client Phone: 604-986-7723

Certificate of Analysis

Lab Work Order #: L2477031

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

Patryk Wojciak, B.Sc., P.Chem.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2477031-1	L2477031-2	L2477031-3	L2477031-4	L2477031-7
Description	BAILER	BAILER	BAILER	BAILER	BAILER
Sampled Date	19-JUL-20	19-JUL-20	19-JUL-20	19-JUL-20	20-JUL-20
Sampled Time	10:00	10:00	10:00	10:00	10:00
Client ID	MW04-A	MW04-02	E207780	E207782	E29730
Grouping / **Analyte**					
WATER					
Physical Tests					
Hardness (as CaCO3) (mg/L)	715	746	580 HTC	550 HTC	494
Total Suspended Solids (mg/L)	9810 DLHC	156	<1.0	<1.0	5610 DLHC
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	1180	381	237	210	671
Ammonia as N (mg/L)	0.0266	0.0257	0.0429	0.0149	0.269
Bicarbonate (HCO3) (mg/L)	1440	465	289	256	819
Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
Chloride (Cl) (mg/L)	24.9 DLHC	5.21 DLHC	3.33 DLHC	2.37	2.35
Conductivity (EC) (uS/cm)	1130	1060	919	906	537
Fluoride (F) (mg/L)	0.12 DLHC	0.14 DLHC	0.13 DLHC	0.169	0.075
Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
Nitrate and Nitrite (as N) (mg/L)	0.199	<0.025	0.130	0.0191	0.174
Nitrate (as N) (mg/L)	0.199 DLHC	<0.025 DLHC	0.103 DLHC	0.0191	0.0860
Nitrite (as N) (mg/L)	<0.0050 DLHC	<0.0050 DLHC	0.0266 DLHC	<0.0010	0.0878
pH (pH)	7.14	7.35	7.72	7.69	7.89
Orthophosphate-Dissolved (as P) (mg/L)	0.0015	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total (mg/L)	4.85 DLHC	0.0781 DLHC	<0.0020 DLHC	<0.0020	2.29 DLHC
Sulfate (SO4) (mg/L)	339 DLHC	344 DLHC	334 DLHC	330	6.52
Bacteriological Tests					
MPN - E. Coli (MPN/100mL)					<1
Coliform Bacteria - Fecal (CFU/100mL)					6000 DLA
MPN - Total Coliforms (MPN/100mL)					>2419.6
Total Metals					
Aluminum (Al)-Total (mg/L)			<0.0030	<0.0030	
Antimony (Sb)-Total (mg/L)			<0.00010	<0.00010	
Arsenic (As)-Total (mg/L)			<0.00010	<0.00010	
Barium (Ba)-Total (mg/L)			0.0111	0.0104	
Beryllium (Be)-Total (mg/L)			<0.000020	<0.000020	
Bismuth (Bi)-Total (mg/L)			<0.000050	<0.000050	
Boron (B)-Total (mg/L)			0.033	0.028	
Cadmium (Cd)-Total (mg/L)			0.0000140	0.0000053	
Calcium (Ca)-Total (mg/L)			161	142	
Chromium (Cr)-Total (mg/L)			<0.00010	<0.00010	
Cobalt (Co)-Total (mg/L)			<0.00010	<0.00010	
Copper (Cu)-Total (mg/L)			<0.00050	0.00243	
Iron (Fe)-Total (mg/L)			0.067	<0.010	
Lead (Pb)-Total (mg/L)			<0.000050	0.000076	
Lithium (Li)-Total (mg/L)			0.0077	0.0093	
Magnesium (Mg)-Total (mg/L)			43.3	47.2	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2477031-8	L2477031-9			
	Description	BAILER	BAILER			
	Sampled Date	20-JUL-20	20-JUL-20			
	Sampled Time	10:00	10:00			
	Client ID	E297151	E297152			
Grouping	**Analyte**					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	497	592			
	Total Suspended Solids (mg/L)	228	343			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	446	518			
	Ammonia as N (mg/L)	0.0108	0.0226			
	Bicarbonate (HCO3) (mg/L)	544	631			
	Carbonate (CO3) (mg/L)	<5.0	<5.0			
	Chloride (Cl) (mg/L)	13.5 DLHC	42.2 DLHC			
	Conductivity (EC) (uS/cm)	906	1090			
	Fluoride (F) (mg/L)	<0.10 DLHC	<0.10 DLHC			
	Hydroxide (OH) (mg/L)	<5.0	<5.0			
	Nitrate and Nitrite (as N) (mg/L)	9.20	16.1			
	Nitrate (as N) (mg/L)	9.20 DLHC	16.1 DLHC			
	Nitrite (as N) (mg/L)	<0.0050 DLHC	<0.0050 DLHC			
	pH (pH)	7.81	7.83			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total (mg/L)	0.0956	0.0646			
	Sulfate (SO4) (mg/L)	85.6 DLHC	43.2 DLHC			
Bacteriological Tests	MPN - E. Coli (MPN/100mL)	<1	<1			
	Coliform Bacteria - Fecal (CFU/100mL)	<2 DLM	<2 DLM			
	MPN - Total Coliforms (MPN/100mL)	<1	9			
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2477031-1	L2477031-2	L2477031-3	L2477031-4	L2477031-7
Description	BAILER	BAILER	BAILER	BAILER	BAILER
Sampled Date	19-JUL-20	19-JUL-20	19-JUL-20	19-JUL-20	20-JUL-20
Sampled Time	10:00	10:00	10:00	10:00	10:00
Client ID	MW04-A	MW04-02	E207780	E207782	E29730
Grouping / **Analyte**					
WATER					
Total Metals					
Manganese (Mn)-Total (mg/L)			0.00236	0.00097	
Molybdenum (Mo)-Total (mg/L)			0.000710	0.000643	
Nickel (Ni)-Total (mg/L)			<0.00050	<0.00050	
Phosphorus (P)-Total (mg/L)			<0.050	<0.050	
Potassium (K)-Total (mg/L)			1.05	1.05	
Selenium (Se)-Total (mg/L)			<0.000050	<0.000050	
Silicon (Si)-Total (mg/L)			3.89	3.67	
Silver (Ag)-Total (mg/L)			<0.000010	<0.000010	
Sodium (Na)-Total (mg/L)			3.57	8.21	
Strontium (Sr)-Total (mg/L)			1.90 RRV	1.84 RRV	
Sulfur (S)-Total (mg/L)			119	117	
Thallium (Tl)-Total (mg/L)			<0.000010	<0.000010	
Tin (Sn)-Total (mg/L)			<0.00010	<0.00010	
Titanium (Ti)-Total (mg/L)			<0.00030	<0.00030	
Uranium (U)-Total (mg/L)			0.00168	0.00168	
Vanadium (V)-Total (mg/L)			<0.00050	<0.00050	
Zinc (Zn)-Total (mg/L)			0.0493	0.0158	
Zirconium (Zr)-Total (mg/L)			<0.00030	<0.00030	
Dissolved Metals					
Dissolved Metals Filtration Location	FIELD	FIELD			FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0261	0.0039			1.49
Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			<0.00010
Arsenic (As)-Dissolved (mg/L)	0.00012	0.00011			0.00355
Barium (Ba)-Dissolved (mg/L)	0.0248	0.0169			0.418
Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			0.000186
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			<0.000050
Boron (B)-Dissolved (mg/L)	0.036	0.040			0.012
Cadmium (Cd)-Dissolved (mg/L)	0.0000220	0.000126			0.000229
Calcium (Ca)-Dissolved (mg/L)	213	224			92.1
Chromium (Cr)-Dissolved (mg/L)	0.00011	<0.00010			0.00181
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			0.00384
Copper (Cu)-Dissolved (mg/L)	0.00101	0.00473			0.0297
Iron (Fe)-Dissolved (mg/L)	0.021	0.063			2.79
Lead (Pb)-Dissolved (mg/L)	0.000120	0.000119			0.0283
Lithium (Li)-Dissolved (mg/L)	0.0078	0.0085			0.0108
Magnesium (Mg)-Dissolved (mg/L)	44.5	45.7			64.0
Manganese (Mn)-Dissolved (mg/L)	0.00943	0.00530			0.354
Molybdenum (Mo)-Dissolved (mg/L)	0.000580	0.000647			0.000347

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2477031-8	L2477031-9			
	Description	BAILER	BAILER			
	Sampled Date	20-JUL-20	20-JUL-20			
	Sampled Time	10:00	10:00			
	Client ID	E297151	E297152			
Grouping	**Analyte**					
WATER						
Total Metals	Manganese (Mn)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					
	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Sulfur (S)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
	Zirconium (Zr)-Total (mg/L)					
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0020	0.0056			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00014	0.00013			
	Barium (Ba)-Dissolved (mg/L)	0.0415	0.100			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	0.026	0.015			
	Cadmium (Cd)-Dissolved (mg/L)	0.0000053	0.0000072			
	Calcium (Ca)-Dissolved (mg/L)	55.0	45.8			
	Chromium (Cr)-Dissolved (mg/L)	0.00061	0.00070			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	0.00181	0.00089			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	0.000058	0.000084			
	Lithium (Li)-Dissolved (mg/L)	0.0043	0.0149			
	Magnesium (Mg)-Dissolved (mg/L)	87.4	116			
	Manganese (Mn)-Dissolved (mg/L)	0.00022	0.00134			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000172	0.000178			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2477031-1	L2477031-2	L2477031-3	L2477031-4	L2477031-7
Description	BAILER	BAILER	BAILER	BAILER	BAILER
Sampled Date	19-JUL-20	19-JUL-20	19-JUL-20	19-JUL-20	20-JUL-20
Sampled Time	10:00	10:00	10:00	10:00	10:00
Client ID	MW04-A	MW04-02	E207780	E207782	E29730
Grouping **Analyte**					
WATER					
Dissolved Metals Nickel (Ni)-Dissolved (mg/L)	0.00073	0.00143			0.00421
Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			0.270
Potassium (K)-Dissolved (mg/L)	1.15	1.54			1.83
Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050			<0.000050
Silicon (Si)-Dissolved (mg/L)	4.41	4.85			7.83
Silver (Ag)-Dissolved (mg/L)	0.000013	<0.000010			<0.000010
Sodium (Na)-Dissolved (mg/L)	10.4	4.44			17.1
Strontium (Sr)-Dissolved (mg/L)	1.83 RRV	2.11 RRV			0.746
Sulfur (S)-Dissolved (mg/L)	123	128			4.85
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			0.000037
Tin (Sn)-Dissolved (mg/L)	<0.00010	0.00030			0.00052
Titanium (Ti)-Dissolved (mg/L)	0.00052	<0.00030			0.0254
Uranium (U)-Dissolved (mg/L)	0.00145	0.00172			0.00411
Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			0.00319
Zinc (Zn)-Dissolved (mg/L)	0.0018	0.0209			0.0273
Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2477031-8	L2477031-9			
	Description	BAILER	BAILER			
	Sampled Date	20-JUL-20	20-JUL-20			
	Sampled Time	10:00	10:00			
	Client ID	E297151	E297152			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00078			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	2.22	2.35			
	Selenium (Se)-Dissolved (mg/L)	0.000170	0.000694			
	Silicon (Si)-Dissolved (mg/L)	8.16	7.96			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	15.8	30.8			
	Strontium (Sr)-Dissolved (mg/L)	0.353	0.519			
	Sulfur (S)-Dissolved (mg/L)	35.4	19.4			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.00494	0.00599			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0015	0.0030			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Total	MS-B	L2477031-3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2477031-3, -4
Matrix Spike	Sodium (Na)-Total	MS-B	L2477031-3, -4
Matrix Spike	Sulfate (SO4)	MS-B	L2477031-1, -2, -3, -4, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
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**
BE-D-L-CCMS-CL	Water	Diss. Be (low) in Water by CRC ICPMS	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.

BE-T-L-CCMS-CL	Water	Total Be (Low) 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.

CL-L-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)

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

F-L-IC-CL	Water	Fluoride	APHA 4110 B-Ion Chromatography
FCC-MF-CL	Water	Fecal Coliform Count-MF	APHA 9222D

This analysis is carried out using procedures adapted from APHA Method 9222 "Membrane Filter Technique for Members of the Coliform Group". Coliform bacteria is enumerated by culturing and colony counting. A known sample volume is filtered through a 0.45 micron membrane filter. The test involves an initial 24 hour incubation at 44.5 degrees C of the filter with the appropriate growth medium. This method is specific for thermotolerant bacteria (Fecal) and is used for non-turbid water with a low background bacteria level.

HARDNESS-CALC-CL	Water	Hardness	APHA 2340 B

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.

MET-D-CCMS-CL	Water	Dissolved Metals in Water by CRC ICPMS	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-CL	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.

N2N3-CALC-CL	Water	Nitrate+Nitrite	CALCULATION
NH3-L-F-CL	Water	Ammonia, Total (as N)	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-CL	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-CL	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.

Reference Information

P-T-L-COL-CL	Water	Phosphorus (P)-Total	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.

PH/EC/ALK-CL	Water	pH, Conductivity and Total Alkalinity	APHA 4500H,2510,2320

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)
pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode.
Alkalinity measurement is based on the sample's capacity to neutralize acid
Conductivity measurement is based on the sample's capacity to convey an electric current

PO4-DO-L-COL-CL	Water	Orthophosphate-Dissolved (as P)	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.

SO4-L-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)

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

TC-EC-MPN-CL	Water	Total Coliforms and E. Coli by MPN	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.

TSS-L-CL	Water	Total Suspended Solids	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, and by drying the filter at 104 deg. C.

** 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
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, 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.

Quality Control Report

Workorder: L2477031 Report Date: 22-JUL-20

Client: Sperling Hansen Associates Inc.
#8 - 1225 East Keith Road
North Vancouver BC V7J 1J3
Contact: David Kvick

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BE-D-L-CCMS-CL	**Water**							
Batch R5159852								
WG3367106-2 LCS		**TMRM**						
Beryllium (Be)-Dissolved			95.5		%		80-120	21-JUL-20
WG3367106-1 MB								
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	21-JUL-20
BE-T-L-CCMS-CL	**Water**							
Batch R5162023								
WG3367016-2 LCS		**TMRM**						
Beryllium (Be)-Total			101.4		%		80-120	22-JUL-20
WG3367016-1 MB								
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	22-JUL-20
CL-L-IC-N-CL	**Water**							
Batch R5161078								
WG3367859-3 DUP		**L2477031-4**						
Chloride (Cl)		2.37	2.72		mg/L	14	20	21-JUL-20
WG3367859-2 LCS								
Chloride (Cl)			104.7		%		85-115	21-JUL-20
WG3367859-6 LCS								
Chloride (Cl)			104.2		%		85-115	21-JUL-20
WG3367859-1 MB								
Chloride (Cl)			<0.10		mg/L		0.1	21-JUL-20
WG3367859-5 MB								
Chloride (Cl)			<0.10		mg/L		0.1	21-JUL-20
WG3367859-4 MS		**L2477031-4**						
Chloride (Cl)			107.4		%		75-125	21-JUL-20
F-L-IC-CL	**Water**							
Batch R5161078								
WG3367859-3 DUP		**L2477031-4**						
Fluoride (F)		0.169	0.181		mg/L	7.2	20	21-JUL-20
WG3367859-2 LCS								
Fluoride (F)			100.3		%		85-115	21-JUL-20
WG3367859-6 LCS								
Fluoride (F)			99.9		%		85-115	21-JUL-20
WG3367859-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	21-JUL-20
WG3367859-5 MB								
Fluoride (F)			<0.020		mg/L		0.02	21-JUL-20
WG3367859-4 MS		**L2477031-4**						
Fluoride (F)			95.5		%		75-125	21-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
FCC-MF-CL	**Water**							
Batch R5162048								
WG3368157-1 MB								
Coliform Bacteria - Fecal			<1		CFU/100mL		1	21-JUL-20
MET-D-CCMS-CL	**Water**							
Batch R5159852								
WG3367106-2 LCS		**TMRM**						
Aluminum (Al)-Dissolved			104.4		%		80-120	21-JUL-20
Antimony (Sb)-Dissolved			105.1		%		80-120	21-JUL-20
Arsenic (As)-Dissolved			103.8		%		80-120	21-JUL-20
Barium (Ba)-Dissolved			107.2		%		80-120	21-JUL-20
Bismuth (Bi)-Dissolved			103.4		%		80-120	21-JUL-20
Boron (B)-Dissolved			97.9		%		80-120	21-JUL-20
Cadmium (Cd)-Dissolved			102.2		%		80-120	21-JUL-20
Calcium (Ca)-Dissolved			99.3		%		80-120	21-JUL-20
Chromium (Cr)-Dissolved			104.1		%		80-120	21-JUL-20
Cobalt (Co)-Dissolved			102.7		%		80-120	21-JUL-20
Copper (Cu)-Dissolved			105.9		%		80-120	21-JUL-20
Iron (Fe)-Dissolved			96.2		%		80-120	21-JUL-20
Lead (Pb)-Dissolved			102.1		%		80-120	21-JUL-20
Lithium (Li)-Dissolved			98.1		%		80-120	21-JUL-20
Magnesium (Mg)-Dissolved			109.1		%		80-120	21-JUL-20
Manganese (Mn)-Dissolved			105.5		%		80-120	21-JUL-20
Molybdenum (Mo)-Dissolved			101.8		%		80-120	21-JUL-20
Nickel (Ni)-Dissolved			103.1		%		80-120	21-JUL-20
Phosphorus (P)-Dissolved			107.8		%		70-130	21-JUL-20
Potassium (K)-Dissolved			104.7		%		80-120	21-JUL-20
Selenium (Se)-Dissolved			96.9		%		80-120	21-JUL-20
Silicon (Si)-Dissolved			102.1		%		60-140	21-JUL-20
Silver (Ag)-Dissolved			102.4		%		80-120	21-JUL-20
Sodium (Na)-Dissolved			101.6		%		80-120	21-JUL-20
Strontium (Sr)-Dissolved			111.3		%		80-120	21-JUL-20
Sulfur (S)-Dissolved			95.1		%		80-120	21-JUL-20
Thallium (Tl)-Dissolved			105.0		%		80-120	21-JUL-20
Tin (Sn)-Dissolved			100.1		%		80-120	21-JUL-20
Titanium (Ti)-Dissolved			103.6		%		80-120	21-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5159852								
WG3367106-2 LCS		**TMRM**						
Uranium (U)-Dissolved			98.5		%		80-120	21-JUL-20
Vanadium (V)-Dissolved			104.4		%		80-120	21-JUL-20
Zinc (Zn)-Dissolved			101.7		%		80-120	21-JUL-20
Zirconium (Zr)-Dissolved			94.8		%		80-120	21-JUL-20
WG3367106-1 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	21-JUL-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	21-JUL-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	21-JUL-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	21-JUL-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	21-JUL-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	21-JUL-20
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	21-JUL-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	21-JUL-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	21-JUL-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	21-JUL-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	21-JUL-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	21-JUL-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	21-JUL-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	21-JUL-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	21-JUL-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	21-JUL-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	21-JUL-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	21-JUL-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	21-JUL-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	21-JUL-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	21-JUL-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	21-JUL-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	21-JUL-20
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	21-JUL-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	21-JUL-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	21-JUL-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	21-JUL-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	21-JUL-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	21-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5159852								
WG3367106-1 MB								
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	21-JUL-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	21-JUL-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	21-JUL-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	21-JUL-20
MET-T-CCMS-CL	**Water**							
Batch R5162023								
WG3367016-2 LCS		**TMRM**						
Aluminum (Al)-Total			107.8		%		80-120	22-JUL-20
Antimony (Sb)-Total			106.6		%		80-120	22-JUL-20
Arsenic (As)-Total			103.3		%		80-120	22-JUL-20
Barium (Ba)-Total			101.9		%		80-120	22-JUL-20
Bismuth (Bi)-Total			97.7		%		80-120	22-JUL-20
Boron (B)-Total			99.2		%		80-120	22-JUL-20
Cadmium (Cd)-Total			102.6		%		80-120	22-JUL-20
Calcium (Ca)-Total			100.1		%		80-120	22-JUL-20
Chromium (Cr)-Total			105.3		%		80-120	22-JUL-20
Cobalt (Co)-Total			100.8		%		80-120	22-JUL-20
Copper (Cu)-Total			103.9		%		80-120	22-JUL-20
Iron (Fe)-Total			99.1		%		80-120	22-JUL-20
Lead (Pb)-Total			101.5		%		80-120	22-JUL-20
Lithium (Li)-Total			102.1		%		80-120	22-JUL-20
Magnesium (Mg)-Total			113.9		%		80-120	22-JUL-20
Manganese (Mn)-Total			108.6		%		80-120	22-JUL-20
Molybdenum (Mo)-Total			97.2		%		80-120	22-JUL-20
Nickel (Ni)-Total			100.7		%		80-120	22-JUL-20
Phosphorus (P)-Total			107.9		%		70-130	22-JUL-20
Potassium (K)-Total			103.6		%		80-120	22-JUL-20
Selenium (Se)-Total			99.1		%		80-120	22-JUL-20
Silicon (Si)-Total			105.1		%		60-140	22-JUL-20
Silver (Ag)-Total			100.7		%		80-120	22-JUL-20
Sodium (Na)-Total			101.9		%		80-120	22-JUL-20
Strontium (Sr)-Total			103.1		%		80-120	22-JUL-20
Sulfur (S)-Total			101.5		%		80-120	22-JUL-20
Thallium (Tl)-Total			101.3		%		80-120	22-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	**Water**							
Batch R5162023								
WG3367016-2 LCS		**TMRM**						
Tin (Sn)-Total			99.0		%		80-120	22-JUL-20
Titanium (Ti)-Total			100.5		%		80-120	22-JUL-20
Uranium (U)-Total			101.2		%		80-120	22-JUL-20
Vanadium (V)-Total			104.8		%		80-120	22-JUL-20
Zinc (Zn)-Total			95.5		%		80-120	22-JUL-20
Zirconium (Zr)-Total			93.1		%		80-120	22-JUL-20
WG3367016-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	22-JUL-20
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	22-JUL-20
Arsenic (As)-Total			<0.00010		mg/L		0.0001	22-JUL-20
Barium (Ba)-Total			<0.00010		mg/L		0.0001	22-JUL-20
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	22-JUL-20
Boron (B)-Total			<0.010		mg/L		0.01	22-JUL-20
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	22-JUL-20
Calcium (Ca)-Total			<0.050		mg/L		0.05	22-JUL-20
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	22-JUL-20
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	22-JUL-20
Copper (Cu)-Total			<0.00050		mg/L		0.0005	22-JUL-20
Iron (Fe)-Total			<0.010		mg/L		0.01	22-JUL-20
Lead (Pb)-Total			<0.000050		mg/L		0.00005	22-JUL-20
Lithium (Li)-Total			<0.0010		mg/L		0.001	22-JUL-20
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	22-JUL-20
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	22-JUL-20
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	22-JUL-20
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	22-JUL-20
Phosphorus (P)-Total			<0.050		mg/L		0.05	22-JUL-20
Potassium (K)-Total			<0.050		mg/L		0.05	22-JUL-20
Selenium (Se)-Total			<0.000050		mg/L		0.00005	22-JUL-20
Silicon (Si)-Total			<0.050		mg/L		0.05	22-JUL-20
Silver (Ag)-Total			<0.000010		mg/L		0.00001	22-JUL-20
Sodium (Na)-Total			<0.050		mg/L		0.05	22-JUL-20
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	22-JUL-20
Sulfur (S)-Total			<0.50		mg/L		0.5	22-JUL-20
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	22-JUL-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	**Water**							
Batch R5162023								
WG3367016-1 MB								
Tin (Sn)-Total			<0.00010		mg/L		0.0001	22-JUL-20
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	22-JUL-20
Uranium (U)-Total			<0.000010		mg/L		0.00001	22-JUL-20
Vanadium (V)-Total			<0.00050		mg/L		0.0005	22-JUL-20
Zinc (Zn)-Total			<0.0030		mg/L		0.003	22-JUL-20
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	22-JUL-20
NH3-L-F-CL	**Water**							
Batch R5159866								
WG3367138-18 LCS								
Ammonia as N			97.8		%		85-115	21-JUL-20
WG3367138-22 LCS								
Ammonia as N			98.8		%		85-115	21-JUL-20
WG3367138-26 LCS								
Ammonia as N			103.2		%		85-115	21-JUL-20
WG3367138-17 MB								
Ammonia as N			<0.0050		mg/L		0.005	21-JUL-20
WG3367138-21 MB								
Ammonia as N			<0.0050		mg/L		0.005	21-JUL-20
WG3367138-25 MB								
Ammonia as N			<0.0050		mg/L		0.005	21-JUL-20
NO2-L-IC-N-CL	**Water**							
Batch R5161078								
WG3367859-3 DUP		**L2477031-4**						
Nitrite (as N)		<0.0010	0.0020	RPD-NA	mg/L	N/A	20	21-JUL-20
WG3367859-2 LCS								
Nitrite (as N)			105.0		%		90-110	21-JUL-20
WG3367859-6 LCS								
Nitrite (as N)			104.6		%		90-110	21-JUL-20
WG3367859-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	21-JUL-20
WG3367859-5 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	21-JUL-20
WG3367859-4 MS		**L2477031-4**						
Nitrite (as N)			81.9		%		75-125	21-JUL-20
NO3-L-IC-N-CL	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	**Water**							
Batch R5161078								
WG3367859-3 DUP		**L2477031-4**						
Nitrate (as N)		0.0191	0.0190		mg/L	0.5	20	21-JUL-20
WG3367859-2 LCS								
Nitrate (as N)			105.2		%		90-110	21-JUL-20
WG3367859-6 LCS								
Nitrate (as N)			104.9		%		90-110	21-JUL-20
WG3367859-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	21-JUL-20
WG3367859-5 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	21-JUL-20
WG3367859-4 MS		**L2477031-4**						
Nitrate (as N)			112.1		%		75-125	21-JUL-20
P-T-L-COL-CL	**Water**							
Batch R5161978								
WG3367969-30 LCS								
Phosphorus (P)-Total			108.0		%		80-120	22-JUL-20
WG3367969-29 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	22-JUL-20
PH/EC/ALK-CL	**Water**							
Batch R5161418								
WG3367941-3 DUP		**L2477031-9**						
pH		7.83	7.82	J	pH	0.01	0.2	22-JUL-20
Conductivity (EC)		1090	1090		uS/cm	0.0	10	22-JUL-20
Bicarbonate (HCO3)		631	644		mg/L	1.9	20	22-JUL-20
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	20	22-JUL-20
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	20	22-JUL-20
Alkalinity, Total (as CaCO3)		518	528		mg/L	1.9	20	22-JUL-20
WG3367941-2 LCS								
Conductivity (EC)			101.2		%		90-110	22-JUL-20
Alkalinity, Total (as CaCO3)			100.2		%		85-115	22-JUL-20
WG3367941-1 MB								
Conductivity (EC)			<2.0		uS/cm		2	22-JUL-20
Bicarbonate (HCO3)			<5.0		mg/L		5	22-JUL-20
Carbonate (CO3)			<5.0		mg/L		5	22-JUL-20
Hydroxide (OH)			<5.0		mg/L		5	22-JUL-20
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	22-JUL-20
PO4-DO-L-COL-CL	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-L-COL-CL	**Water**							
Batch R5160111								
WG3367235-2 LCS								
Orthophosphate-Dissolved (as P)			99.7		%		80-120	21-JUL-20
WG3367235-6 LCS								
Orthophosphate-Dissolved (as P)			102.0		%		80-120	21-JUL-20
WG3367235-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	21-JUL-20
WG3367235-5 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	21-JUL-20
SO4-L-IC-N-CL	**Water**							
Batch R5161078								
WG3367859-3 DUP		**L2477031-4**						
Sulfate (SO4)		330	332		mg/L	0.6	20	21-JUL-20
WG3367859-2 LCS								
Sulfate (SO4)			104.7		%		85-115	21-JUL-20
WG3367859-6 LCS								
Sulfate (SO4)			102.6		%		85-115	21-JUL-20
WG3367859-1 MB								
Sulfate (SO4)			<0.050		mg/L		0.05	21-JUL-20
WG3367859-5 MB								
Sulfate (SO4)			<0.050		mg/L		0.05	21-JUL-20
WG3367859-4 MS		**L2477031-4**						
Sulfate (SO4)			N/A	MS-B	%		-	21-JUL-20
TC-EC-MPN-CL	**Water**							
Batch R5162027								
WG3368138-1 MB								
MPN - E. Coli			<1		MPN/100mL		1	21-JUL-20
MPN - Total Coliforms			<1		MPN/100mL		1	21-JUL-20
TSS-L-CL	**Water**							
Batch R5162260								
WG3366710-4 LCS								
Total Suspended Solids			97.6		%		85-115	21-JUL-20
WG3366710-3 MB								
Total Suspended Solids			<1.0		mg/L		1	21-JUL-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2477031-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	Sperling Hansen Associates Inc.
Contact:	David Kvick
Phone:	604-813-8476
	Company address below will appear on the final report
Street:	8-1225 East Keith Road
City/Province:	North Vancouver B.C.,
Postal Code:	V7J 1J3
Invoice To	Same as Report To ☑ ☐ NO
	Copy of Invoice with Report ☑ ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax

Email 2

Project Information

ALS Account # / Quote #: Q80923

Job #:

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location: Columbia Valley

ALS Lab Work Order # (lab use only):

ALS Contact: Sampler: J. Solman

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☒ Same Day, Weekend or Statutory holiday [E0] ☒

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	pH	Conductivity	Anions	NH_3	Total Alkalinity	TSS	Metals (F/P)	Metals (P)	Number of Containers
	~~2024~~ MW04 - A	19/07/20		Bailer	X	X	X	X	X	X	X		3
	MW04 - 02	19/07/20		"	X	X	X	X	X	X	X		3
	E207780	19/07/20		"	X	X	X	X	X	X		X	3
	E207782	19/07/20		"	X	X	X	X	X	X		X	3
	~~MW-5~~	~~2~~											
	~~MW-1~~												
	~~E207851~~												

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ ☑ NO

Are samples for human drinking water use? ☐ ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact ☒ Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
4					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: J. Solman	Date: 20 7 2020	Time:	Received by:	Date: 7/21	Time: 8:51	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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**.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2477031-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	Sperling Hansen Associates Inc.
Contact:	David Kvick
Phone:	604-813-8476
	Company address below will appear on the final report
Street:	8-1225 East Keith Road
City/Province:	North Vancouver B.C.,
Postal Code:	V7J 1J3

Report Format / Distribution	
Select Report Format:	☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	
Email 2	
Email 3	

Invoice To		
	Same as Report To	☑ ☐ NO
	Copy of Invoice with Report	☑ ☐ NO
Company:		
Contact:		

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	Q80923
Job #:	
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	Wasa

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler: J. Solman

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4]	☐	1 Business day [E1]	☐
3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	X
2 day [P2]	☐		

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

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	pH	Conductivity	Anions	NH3	Total Alkalinity	TSS	Metals (F/P)	Fecal + total Coliform	Number of Containers
	MW-5	20/7/2020		Water	X	X	X	X	X	X	X	X	4
	MW-1	"		"	X	X	X	X	X	X	X	X	4
	E297130	"		"	X	X	X	X	X	X	X	X	4
	E297151	"		"	X	X	X	X	X	X	X	X	4
	E297152	"		"	X	X	X	X	X	X	X	X	4

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ ☑ NO	
Are samples for human drinking water use? ☐ ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☒ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: J. Solman	Date: 20/7/2020	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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**.

Sperling Hansen Associates Inc.
ATTN: Scott Garthwaite
#8 - 1225 East Keith Road
North Vancouver BC V7J 1J3

Date Received: 20-OCT-20
Report Date: 27-OCT-20 16:01 (MT)
Version: FINAL

Client Phone: 604-986-7723

Certificate of Analysis

Lab Work Order #: L2518964

Project P.O. #: NOT SUBMITTED
Job Reference: 20050 COLUMBIA VALLEY
C of C Numbers:
Legal Site Desc:

Patryk Wojciak, B.Sc., P.Chem.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2518964-1	L2518964-2	L2518964-3	L2518964-4	
	Description	GW	GW	GW	GW	
	Sampled Date	18-OCT-20	18-OCT-20	18-OCT-20	18-OCT-20	
	Sampled Time	12:00	12:00	12:00	12:00	
	Client ID	E207782	E207780	E265103	E265102	
Grouping	**Analyte**					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	553 HTC	552 HTC	758	734	
	Total Suspended Solids (mg/L)	<1.0	3.1	5150 DLHC	138	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	212	195	379	285	
	Ammonia as N (mg/L)	<0.0050	<0.0050	0.0131	0.0168	
	Bicarbonate (HCO3) (mg/L)	258	231	462	348	
	Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	
	Chloride (Cl) (mg/L)	2.85 DLHC	1.67	39.2 DLHC	4.67 DLHC	
	Conductivity (EC) (uS/cm)	908	883	1130	1040	
	Fluoride (F) (mg/L)	0.19 DLHC	0.220	0.26 DLHC	0.31 DLHC	
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	
	Nitrate and Nitrite (as N) (mg/L)	0.043	<0.0051	0.238	0.028	
	Nitrate (as N) (mg/L)	0.043 DLHC	<0.0050	0.238 DLHC	0.028 DLHC	
	Nitrite (as N) (mg/L)	<0.0050 DLHC	<0.0010	<0.0050 DLHC	<0.0050 DLHC	
	pH (pH)	8.16	8.33	7.67	7.68	
	Sulfate (SO4) (mg/L)	374 DLHC	350	369 DLHC	387 DLHC	
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030			
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00012	0.00013			
	Barium (Ba)-Total (mg/L)	0.0104	0.00972			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	0.031	0.029			
	Cadmium (Cd)-Total (mg/L)	0.0000055	0.0000073			
	Calcium (Ca)-Total (mg/L)	141	147			
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	0.00625	0.00098			
	Iron (Fe)-Total (mg/L)	0.069	0.437			
	Lead (Pb)-Total (mg/L)	0.00143	0.000129			
	Lithium (Li)-Total (mg/L)	0.0085	0.0070			
	Magnesium (Mg)-Total (mg/L)	49.1	44.8			
	Manganese (Mn)-Total (mg/L)	0.00258	0.00218			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000892	0.000768			
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	1.15	1.02			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2518964-1	L2518964-2	L2518964-3	L2518964-4	
	Description	GW	GW	GW	GW	
	Sampled Date	18-OCT-20	18-OCT-20	18-OCT-20	18-OCT-20	
	Sampled Time	12:00	12:00	12:00	12:00	
	Client ID	E207782	E207780	E265103	E265102	
Grouping	**Analyte**					
WATER						
Total Metals	Selenium (Se)-Total (mg/L)	0.000074	0.000051			
	Silicon (Si)-Total (mg/L)	4.08	3.89			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	7.15	2.98			
	Strontium (Sr)-Total (mg/L)	1.83	1.81			
	Sulfur (S)-Total (mg/L)	122	122			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	0.00101	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.00168	0.00145			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.0452	0.0492			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location			FIELD	FIELD	
	Dissolved Metals Filtration Location			FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)			<0.0010	0.0028	
	Antimony (Sb)-Dissolved (mg/L)			<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)			0.00015	0.00014	
	Barium (Ba)-Dissolved (mg/L)			0.0244	0.0148	
	Beryllium (Be)-Dissolved (mg/L)			<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)			<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)			0.039	0.041	
	Cadmium (Cd)-Dissolved (mg/L)			0.0000072	0.0000118	
	Calcium (Ca)-Dissolved (mg/L)			210	215	
	Chromium (Cr)-Dissolved (mg/L)			<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)			<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)			0.00027	0.00081	
	Iron (Fe)-Dissolved (mg/L)			<0.010	<0.010	
	Lead (Pb)-Dissolved (mg/L)			<0.000050	0.000064	
	Lithium (Li)-Dissolved (mg/L)			0.0079	0.0082	
	Magnesium (Mg)-Dissolved (mg/L)			56.5	47.8	
	Manganese (Mn)-Dissolved (mg/L)			0.0125	0.00373	
	Mercury (Hg)-Dissolved (mg/L)			<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)			0.000614	0.000563	
	Nickel (Ni)-Dissolved (mg/L)			0.00089	0.00080	
	Phosphorus (P)-Dissolved (mg/L)			<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)			1.35	1.39	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2518964-1	L2518964-2	L2518964-3	L2518964-4	
Description	GW	GW	GW	GW	
Sampled Date	18-OCT-20	18-OCT-20	18-OCT-20	18-OCT-20	
Sampled Time	12:00	12:00	12:00	12:00	
Client ID	E207782	E207780	E265103	E265102	
Grouping **Analyte**					
WATER					
Dissolved Metals Selenium (Se)-Dissolved (mg/L)			<0.000050	<0.000050	
Silicon (Si)-Dissolved (mg/L)			4.32	4.72	
Silver (Ag)-Dissolved (mg/L)			<0.000010	<0.000010	
Sodium (Na)-Dissolved (mg/L)			13.7	3.75	
Strontium (Sr)-Dissolved (mg/L)			1.80	1.97	
Sulfur (S)-Dissolved (mg/L)			119	124	
Thallium (Tl)-Dissolved (mg/L)			<0.000010	<0.000010	
Tin (Sn)-Dissolved (mg/L)			0.00011	0.00026	
Titanium (Ti)-Dissolved (mg/L)			<0.00030	<0.00030	
Uranium (U)-Dissolved (mg/L)			0.00160	0.00183	
Vanadium (V)-Dissolved (mg/L)			<0.00050	<0.00050	
Zinc (Zn)-Dissolved (mg/L)			0.0023	0.0318	
Zirconium (Zr)-Dissolved (mg/L)			<0.00030	<0.00030	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2518964-3, -4
Matrix Spike	Barium (Ba)-Total	MS-B	L2518964-1, -2
Matrix Spike	Calcium (Ca)-Total	MS-B	L2518964-1, -2
Matrix Spike	Calcium (Ca)-Total	MS-B	L2518964-1, -2
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2518964-1, -2
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2518964-1, -2
Matrix Spike	Strontium (Sr)-Total	MS-B	L2518964-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
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**
BE-D-L-CCMS-CL	Water	Diss. Be (low) in Water by CRC ICPMS	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.

BE-T-L-CCMS-CL	Water	Total Be (Low) 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.

CL-L-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)

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

F-L-IC-CL	Water	Fluoride	APHA 4110 B-Ion Chromatography
HARDNESS-CALC-CL	Water	Hardness	APHA 2340 B

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-CL	Water	Dissolved Mercury in Water by CVAAS	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.

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

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

MET-D-CCMS-CL	Water	Dissolved Metals in Water by CRC ICPMS	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.

Reference Information

MET-T-CCMS-CL	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.

N2N3-CALC-CL	Water	Nitrate+Nitrite	CALCULATION
NH3-L-F-CL	Water	Ammonia, Total (as N)	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-CL	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-CL	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.

PH/EC/ALK-CL	Water	pH, Conductivity and Total Alkalinity	APHA 4500H,2510,2320

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)
pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode.
Alkalinity measurement is based on the sample's capacity to neutralize acid
Conductivity measurement is based on the sample's capacity to convey an electric current

SO4-L-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)

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

TSS-L-CL	Water	Total Suspended Solids	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, and by drying the filter at 104 deg. C.

** 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
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, 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.

Quality Control Report

Client: Sperling Hansen Associates Inc.
#8 - 1225 East Keith Road
North Vancouver BC V7J 1J3
Contact: Scott Garthwaite

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BE-D-L-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-10 LCS		**TMRM**						
Beryllium (Be)-Dissolved			102.2		%		80-120	23-OCT-20
WG3431348-14 LCS		**TMRM**						
Beryllium (Be)-Dissolved			103.6		%		80-120	23-OCT-20
WG3431348-18 LCS		**TMRM**						
Beryllium (Be)-Dissolved			105.2		%		80-120	23-OCT-20
WG3431348-2 LCS		**TMRM**						
Beryllium (Be)-Dissolved			106.6		%		80-120	23-OCT-20
WG3431348-6 LCS		**TMRM**						
Beryllium (Be)-Dissolved			101.9		%		80-120	23-OCT-20
WG3431348-1 MB								
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	23-OCT-20
WG3431348-13 MB								
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	23-OCT-20
WG3431348-17 MB								
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	23-OCT-20
WG3431348-5 MB								
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	23-OCT-20
WG3431348-9 MB								
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	23-OCT-20
BE-T-L-CCMS-CL	**Water**							
Batch R5264456								
WG3429385-2 LCS		**TMRM**						
Beryllium (Be)-Total			105.6		%		80-120	22-OCT-20
WG3429385-1 MB								
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	22-OCT-20
CL-L-IC-N-CL	**Water**							
Batch R5261379								
WG3429191-2 LCS								
Chloride (Cl)			104.1		%		85-115	20-OCT-20
WG3429191-1 MB								
Chloride (Cl)			<0.10		mg/L		0.1	20-OCT-20
F-L-IC-CL	**Water**							
Batch R5261379								
WG3429191-2 LCS								
Fluoride (F)			98.8		%		85-115	20-OCT-20
WG3429191-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	20-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-CL	**Water**							
Batch R5269634								
WG3433221-6 LCS								
Mercury (Hg)-Dissolved			94.8		%		80-120	27-OCT-20
WG3433221-5 MB								
Mercury (Hg)-Dissolved			<0.000005(		mg/L		0.000005	27-OCT-20
HG-T-CVAA-CL	**Water**							
Batch R5269634								
WG3433234-2 LCS								
Mercury (Hg)-Total			94.8		%		80-120	27-OCT-20
WG3433234-1 MB								
Mercury (Hg)-Total			<0.000005(		mg/L		0.000005	27-OCT-20
MET-D-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-10 LCS		**TMRM**						
Aluminum (Al)-Dissolved			109.5		%		80-120	23-OCT-20
Antimony (Sb)-Dissolved			99.7		%		80-120	23-OCT-20
Arsenic (As)-Dissolved			104.7		%		80-120	23-OCT-20
Barium (Ba)-Dissolved			106.5		%		80-120	23-OCT-20
Bismuth (Bi)-Dissolved			99.8		%		80-120	23-OCT-20
Boron (B)-Dissolved			93.2		%		80-120	23-OCT-20
Cadmium (Cd)-Dissolved			105.8		%		80-120	23-OCT-20
Calcium (Ca)-Dissolved			101.4		%		80-120	23-OCT-20
Chromium (Cr)-Dissolved			107.0		%		80-120	23-OCT-20
Cobalt (Co)-Dissolved			105.1		%		80-120	23-OCT-20
Copper (Cu)-Dissolved			104.6		%		80-120	23-OCT-20
Iron (Fe)-Dissolved			101.4		%		80-120	23-OCT-20
Lead (Pb)-Dissolved			99.3		%		80-120	23-OCT-20
Lithium (Li)-Dissolved			100.8		%		80-120	23-OCT-20
Magnesium (Mg)-Dissolved			111.4		%		80-120	23-OCT-20
Manganese (Mn)-Dissolved			107.9		%		80-120	23-OCT-20
Molybdenum (Mo)-Dissolved			99.7		%		80-120	23-OCT-20
Nickel (Ni)-Dissolved			105.7		%		80-120	23-OCT-20
Phosphorus (P)-Dissolved			106.0		%		70-130	23-OCT-20
Potassium (K)-Dissolved			108.0		%		80-120	23-OCT-20
Selenium (Se)-Dissolved			98.5		%		80-120	23-OCT-20
Silicon (Si)-Dissolved			101.2		%		60-140	23-OCT-20
Silver (Ag)-Dissolved			100.0		%		80-120	23-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-10 LCS		**TMRM**						
Sodium (Na)-Dissolved			106.8		%		80-120	23-OCT-20
Strontium (Sr)-Dissolved			104.0		%		80-120	23-OCT-20
Sulfur (S)-Dissolved			104.7		%		80-120	23-OCT-20
Thallium (Tl)-Dissolved			99.7		%		80-120	23-OCT-20
Tin (Sn)-Dissolved			100.5		%		80-120	23-OCT-20
Titanium (Ti)-Dissolved			102.0		%		80-120	23-OCT-20
Uranium (U)-Dissolved			99.6		%		80-120	23-OCT-20
Vanadium (V)-Dissolved			107.1		%		80-120	23-OCT-20
Zinc (Zn)-Dissolved			103.2		%		80-120	23-OCT-20
Zirconium (Zr)-Dissolved			96.2		%		80-120	23-OCT-20
WG3431348-14 LCS		**TMRM**						
Aluminum (Al)-Dissolved			113.7		%		80-120	23-OCT-20
Antimony (Sb)-Dissolved			105.4		%		80-120	23-OCT-20
Arsenic (As)-Dissolved			109.7		%		80-120	23-OCT-20
Barium (Ba)-Dissolved			110.4		%		80-120	23-OCT-20
Bismuth (Bi)-Dissolved			102.7		%		80-120	23-OCT-20
Boron (B)-Dissolved			96.1		%		80-120	23-OCT-20
Cadmium (Cd)-Dissolved			112.4		%		80-120	23-OCT-20
Calcium (Ca)-Dissolved			102.8		%		80-120	23-OCT-20
Chromium (Cr)-Dissolved			112.8		%		80-120	23-OCT-20
Cobalt (Co)-Dissolved			109.5		%		80-120	23-OCT-20
Copper (Cu)-Dissolved			109.5		%		80-120	23-OCT-20
Iron (Fe)-Dissolved			105.7		%		80-120	23-OCT-20
Lead (Pb)-Dissolved			102.2		%		80-120	23-OCT-20
Lithium (Li)-Dissolved			103.6		%		80-120	23-OCT-20
Magnesium (Mg)-Dissolved			114.1		%		80-120	23-OCT-20
Manganese (Mn)-Dissolved			111.4		%		80-120	23-OCT-20
Molybdenum (Mo)-Dissolved			104.9		%		80-120	23-OCT-20
Nickel (Ni)-Dissolved			110.5		%		80-120	23-OCT-20
Phosphorus (P)-Dissolved			110.5		%		70-130	23-OCT-20
Potassium (K)-Dissolved			112.9		%		80-120	23-OCT-20
Selenium (Se)-Dissolved			101.2		%		80-120	23-OCT-20
Silicon (Si)-Dissolved			106.4		%		60-140	23-OCT-20
Silver (Ag)-Dissolved			105.4		%		80-120	23-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-14 LCS		**TMRM**						
Sodium (Na)-Dissolved			108.7		%		80-120	23-OCT-20
Strontium (Sr)-Dissolved			108.1		%		80-120	23-OCT-20
Sulfur (S)-Dissolved			106.0		%		80-120	23-OCT-20
Thallium (Tl)-Dissolved			103.7		%		80-120	23-OCT-20
Tin (Sn)-Dissolved			106.1		%		80-120	23-OCT-20
Titanium (Ti)-Dissolved			106.3		%		80-120	23-OCT-20
Uranium (U)-Dissolved			102.9		%		80-120	23-OCT-20
Vanadium (V)-Dissolved			112.2		%		80-120	23-OCT-20
Zinc (Zn)-Dissolved			112.6		%		80-120	23-OCT-20
Zirconium (Zr)-Dissolved			102.6		%		80-120	23-OCT-20
WG3431348-18 LCS		**TMRM**						
Aluminum (Al)-Dissolved			111.5		%		80-120	23-OCT-20
Antimony (Sb)-Dissolved			105.5		%		80-120	23-OCT-20
Arsenic (As)-Dissolved			108.0		%		80-120	23-OCT-20
Barium (Ba)-Dissolved			110.2		%		80-120	23-OCT-20
Bismuth (Bi)-Dissolved			103.1		%		80-120	23-OCT-20
Boron (B)-Dissolved			97.5		%		80-120	23-OCT-20
Cadmium (Cd)-Dissolved			108.3		%		80-120	23-OCT-20
Calcium (Ca)-Dissolved			105.7		%		80-120	23-OCT-20
Chromium (Cr)-Dissolved			110.2		%		80-120	23-OCT-20
Cobalt (Co)-Dissolved			107.7		%		80-120	23-OCT-20
Copper (Cu)-Dissolved			106.5		%		80-120	23-OCT-20
Iron (Fe)-Dissolved			104.1		%		80-120	23-OCT-20
Lead (Pb)-Dissolved			103.3		%		80-120	23-OCT-20
Lithium (Li)-Dissolved			106.6		%		80-120	23-OCT-20
Magnesium (Mg)-Dissolved			112.0		%		80-120	23-OCT-20
Manganese (Mn)-Dissolved			108.6		%		80-120	23-OCT-20
Molybdenum (Mo)-Dissolved			106.1		%		80-120	23-OCT-20
Nickel (Ni)-Dissolved			107.0		%		80-120	23-OCT-20
Phosphorus (P)-Dissolved			108.2		%		70-130	23-OCT-20
Potassium (K)-Dissolved			110.7		%		80-120	23-OCT-20
Selenium (Se)-Dissolved			100.1		%		80-120	23-OCT-20
Silicon (Si)-Dissolved			105.5		%		60-140	23-OCT-20
Silver (Ag)-Dissolved			105.5		%		80-120	23-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-18 LCS		**TMRM**						
Sodium (Na)-Dissolved			108.9		%		80-120	23-OCT-20
Strontium (Sr)-Dissolved			110.9		%		80-120	23-OCT-20
Sulfur (S)-Dissolved			100.4		%		80-120	23-OCT-20
Thallium (Tl)-Dissolved			102.5		%		80-120	23-OCT-20
Tin (Sn)-Dissolved			105.6		%		80-120	23-OCT-20
Titanium (Ti)-Dissolved			98.3		%		80-120	23-OCT-20
Uranium (U)-Dissolved			101.3		%		80-120	23-OCT-20
Vanadium (V)-Dissolved			108.3		%		80-120	23-OCT-20
Zinc (Zn)-Dissolved			106.7		%		80-120	23-OCT-20
Zirconium (Zr)-Dissolved			103.3		%		80-120	23-OCT-20
WG3431348-2 LCS		**TMRM**						
Aluminum (Al)-Dissolved			117.0		%		80-120	23-OCT-20
Antimony (Sb)-Dissolved			105.1		%		80-120	23-OCT-20
Arsenic (As)-Dissolved			113.4		%		80-120	23-OCT-20
Barium (Ba)-Dissolved			112.4		%		80-120	23-OCT-20
Bismuth (Bi)-Dissolved			102.2		%		80-120	23-OCT-20
Boron (B)-Dissolved			101.9		%		80-120	23-OCT-20
Cadmium (Cd)-Dissolved			112.5		%		80-120	23-OCT-20
Calcium (Ca)-Dissolved			106.9		%		80-120	23-OCT-20
Chromium (Cr)-Dissolved			115.1		%		80-120	23-OCT-20
Cobalt (Co)-Dissolved			113.8		%		80-120	23-OCT-20
Copper (Cu)-Dissolved			112.9		%		80-120	23-OCT-20
Iron (Fe)-Dissolved			106.9		%		80-120	23-OCT-20
Lead (Pb)-Dissolved			105.0		%		80-120	23-OCT-20
Lithium (Li)-Dissolved			104.8		%		80-120	23-OCT-20
Magnesium (Mg)-Dissolved			100.3		%		80-120	23-OCT-20
Manganese (Mn)-Dissolved			115.9		%		80-120	23-OCT-20
Molybdenum (Mo)-Dissolved			104.7		%		80-120	23-OCT-20
Nickel (Ni)-Dissolved			113.4		%		80-120	23-OCT-20
Phosphorus (P)-Dissolved			116.1		%		70-130	23-OCT-20
Potassium (K)-Dissolved			118.7		%		80-120	23-OCT-20
Selenium (Se)-Dissolved			102.7		%		80-120	23-OCT-20
Silicon (Si)-Dissolved			108.0		%		60-140	23-OCT-20
Silver (Ag)-Dissolved			105.2		%		80-120	23-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-2 LCS		**TMRM**						
Sodium (Na)-Dissolved			113.1		%		80-120	23-OCT-20
Strontium (Sr)-Dissolved			107.8		%		80-120	23-OCT-20
Sulfur (S)-Dissolved			105.2		%		80-120	23-OCT-20
Thallium (Tl)-Dissolved			104.1		%		80-120	23-OCT-20
Tin (Sn)-Dissolved			104.5		%		80-120	23-OCT-20
Titanium (Ti)-Dissolved			106.1		%		80-120	23-OCT-20
Uranium (U)-Dissolved			104.1		%		80-120	23-OCT-20
Vanadium (V)-Dissolved			114.5		%		80-120	23-OCT-20
Zinc (Zn)-Dissolved			111.9		%		80-120	23-OCT-20
Zirconium (Zr)-Dissolved			102.1		%		80-120	23-OCT-20
WG3431348-6 LCS		**TMRM**						
Aluminum (Al)-Dissolved			107.9		%		80-120	23-OCT-20
Antimony (Sb)-Dissolved			97.1		%		80-120	23-OCT-20
Arsenic (As)-Dissolved			104.9		%		80-120	23-OCT-20
Barium (Ba)-Dissolved			103.3		%		80-120	23-OCT-20
Bismuth (Bi)-Dissolved			97.2		%		80-120	23-OCT-20
Boron (B)-Dissolved			91.3		%		80-120	23-OCT-20
Cadmium (Cd)-Dissolved			105.7		%		80-120	23-OCT-20
Calcium (Ca)-Dissolved			101.4		%		80-120	23-OCT-20
Chromium (Cr)-Dissolved			106.3		%		80-120	23-OCT-20
Cobalt (Co)-Dissolved			105.3		%		80-120	23-OCT-20
Copper (Cu)-Dissolved			105.0		%		80-120	23-OCT-20
Iron (Fe)-Dissolved			99.3		%		80-120	23-OCT-20
Lead (Pb)-Dissolved			98.8		%		80-120	23-OCT-20
Lithium (Li)-Dissolved			99.7		%		80-120	23-OCT-20
Magnesium (Mg)-Dissolved			107.9		%		80-120	23-OCT-20
Manganese (Mn)-Dissolved			107.4		%		80-120	23-OCT-20
Molybdenum (Mo)-Dissolved			98.6		%		80-120	23-OCT-20
Nickel (Ni)-Dissolved			105.7		%		80-120	23-OCT-20
Phosphorus (P)-Dissolved			105.9		%		70-130	23-OCT-20
Potassium (K)-Dissolved			107.9		%		80-120	23-OCT-20
Selenium (Se)-Dissolved			95.5		%		80-120	23-OCT-20
Silicon (Si)-Dissolved			99.5		%		60-140	23-OCT-20
Silver (Ag)-Dissolved			99.4		%		80-120	23-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-6 LCS		**TMRM**						
Sodium (Na)-Dissolved			105.8		%		80-120	23-OCT-20
Strontium (Sr)-Dissolved			103.8		%		80-120	23-OCT-20
Sulfur (S)-Dissolved			102.5		%		80-120	23-OCT-20
Thallium (Tl)-Dissolved			98.6		%		80-120	23-OCT-20
Tin (Sn)-Dissolved			98.7		%		80-120	23-OCT-20
Titanium (Ti)-Dissolved			98.9		%		80-120	23-OCT-20
Uranium (U)-Dissolved			97.8		%		80-120	23-OCT-20
Vanadium (V)-Dissolved			107.4		%		80-120	23-OCT-20
Zinc (Zn)-Dissolved			104.7		%		80-120	23-OCT-20
Zirconium (Zr)-Dissolved			96.9		%		80-120	23-OCT-20
WG3431348-1 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-OCT-20
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	23-OCT-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-OCT-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-OCT-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	23-OCT-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-1 MB								
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	23-OCT-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	23-OCT-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	23-OCT-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
WG3431348-13 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-OCT-20
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	23-OCT-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-OCT-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-OCT-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	23-OCT-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-13 MB								
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	23-OCT-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	23-OCT-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	23-OCT-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
WG3431348-17 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-OCT-20
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	23-OCT-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-OCT-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-OCT-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	23-OCT-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-17 MB								
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	23-OCT-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	23-OCT-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	23-OCT-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
WG3431348-5 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-OCT-20
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	23-OCT-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-OCT-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-OCT-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	23-OCT-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-5 MB								
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	23-OCT-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	23-OCT-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	23-OCT-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
WG3431348-9 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-OCT-20
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	23-OCT-20
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-OCT-20
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-OCT-20
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	23-OCT-20
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	23-OCT-20
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R5267236								
WG3431348-9 MB								
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-OCT-20
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	23-OCT-20
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	23-OCT-20
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	23-OCT-20
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-OCT-20
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	23-OCT-20
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-OCT-20
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	23-OCT-20
MET-T-CCMS-CL	**Water**							
Batch R5261996								
WG3429385-2 LCS		**TMRM**						
Aluminum (Al)-Total			116.7		%		80-120	21-OCT-20
Antimony (Sb)-Total			105.7		%		80-120	21-OCT-20
Arsenic (As)-Total			108.9		%		80-120	21-OCT-20
Barium (Ba)-Total			108.5		%		80-120	21-OCT-20
Bismuth (Bi)-Total			103.6		%		80-120	21-OCT-20
Boron (B)-Total			108.4		%		80-120	21-OCT-20
Cadmium (Cd)-Total			105.8		%		80-120	21-OCT-20
Calcium (Ca)-Total			105.7		%		80-120	21-OCT-20
Chromium (Cr)-Total			110.6		%		80-120	21-OCT-20
Cobalt (Co)-Total			108.5		%		80-120	21-OCT-20
Copper (Cu)-Total			107.4		%		80-120	21-OCT-20
Iron (Fe)-Total			105.9		%		80-120	21-OCT-20
Lead (Pb)-Total			104.2		%		80-120	21-OCT-20
Lithium (Li)-Total			119.2		%		80-120	21-OCT-20
Magnesium (Mg)-Total			111.3		%		80-120	21-OCT-20
Manganese (Mn)-Total			111.1		%		80-120	21-OCT-20
Molybdenum (Mo)-Total			106.3		%		80-120	21-OCT-20
Nickel (Ni)-Total			106.9		%		80-120	21-OCT-20
Phosphorus (P)-Total			108.6		%		70-130	21-OCT-20
Potassium (K)-Total			110.4		%		80-120	21-OCT-20
Selenium (Se)-Total			103.4		%		80-120	21-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	**Water**							
Batch R5261996								
WG3429385-2 LCS		**TMRM**						
Silicon (Si)-Total			115.2		%		60-140	21-OCT-20
Silver (Ag)-Total			105.9		%		80-120	21-OCT-20
Sodium (Na)-Total			110.2		%		80-120	21-OCT-20
Strontium (Sr)-Total			109.8		%		80-120	21-OCT-20
Sulfur (S)-Total			106.8		%		80-120	21-OCT-20
Thallium (Tl)-Total			106.0		%		80-120	21-OCT-20
Tin (Sn)-Total			104.1		%		80-120	21-OCT-20
Titanium (Ti)-Total			109.7		%		80-120	21-OCT-20
Uranium (U)-Total			107.5		%		80-120	21-OCT-20
Vanadium (V)-Total			110.7		%		80-120	21-OCT-20
Zinc (Zn)-Total			102.0		%		80-120	21-OCT-20
Zirconium (Zr)-Total			105.8		%		80-120	21-OCT-20
WG3429385-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	21-OCT-20
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	21-OCT-20
Arsenic (As)-Total			<0.00010		mg/L		0.0001	21-OCT-20
Barium (Ba)-Total			<0.00010		mg/L		0.0001	21-OCT-20
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	21-OCT-20
Boron (B)-Total			<0.010		mg/L		0.01	21-OCT-20
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	21-OCT-20
Calcium (Ca)-Total			<0.050		mg/L		0.05	21-OCT-20
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	21-OCT-20
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	21-OCT-20
Copper (Cu)-Total			<0.00050		mg/L		0.0005	21-OCT-20
Iron (Fe)-Total			<0.010		mg/L		0.01	21-OCT-20
Lead (Pb)-Total			<0.000050		mg/L		0.00005	21-OCT-20
Lithium (Li)-Total			<0.0010		mg/L		0.001	21-OCT-20
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	21-OCT-20
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	21-OCT-20
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	21-OCT-20
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	21-OCT-20
Phosphorus (P)-Total			<0.050		mg/L		0.05	21-OCT-20
Potassium (K)-Total			<0.050		mg/L		0.05	21-OCT-20
Selenium (Se)-Total			<0.000050		mg/L		0.00005	21-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	**Water**							
Batch R5261996								
WG3429385-1 MB								
Silicon (Si)-Total			<0.050		mg/L		0.05	21-OCT-20
Silver (Ag)-Total			<0.000010		mg/L		0.00001	21-OCT-20
Sodium (Na)-Total			<0.050		mg/L		0.05	21-OCT-20
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	21-OCT-20
Sulfur (S)-Total			<0.50		mg/L		0.5	21-OCT-20
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	21-OCT-20
Tin (Sn)-Total			<0.00010		mg/L		0.0001	21-OCT-20
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	21-OCT-20
Uranium (U)-Total			<0.000010		mg/L		0.00001	21-OCT-20
Vanadium (V)-Total			<0.00050		mg/L		0.0005	21-OCT-20
Zinc (Zn)-Total			<0.0030		mg/L		0.003	21-OCT-20
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	21-OCT-20
NH3-L-F-CL	**Water**							
Batch R5269497								
WG3432568-10 LCS								
Ammonia as N			92.5		%		85-115	26-OCT-20
WG3432568-9 MB								
Ammonia as N			<0.0050		mg/L		0.005	26-OCT-20
NO2-L-IC-N-CL	**Water**							
Batch R5261379								
WG3429191-2 LCS								
Nitrite (as N)			105.1		%		90-110	20-OCT-20
WG3429191-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	20-OCT-20
NO3-L-IC-N-CL	**Water**							
Batch R5261379								
WG3429191-2 LCS								
Nitrate (as N)			104.6		%		90-110	20-OCT-20
WG3429191-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	20-OCT-20
PH/EC/ALK-CL	**Water**							
Batch R5263236								
WG3429799-17 LCS								
Conductivity (EC)			96.0		%		90-110	21-OCT-20
Alkalinity, Total (as CaCO3)			100.1		%		85-115	21-OCT-20

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-CL	**Water**							
Batch R5263236								
WG3429799-16 MB								
Conductivity (EC)			<2.0		uS/cm		2	21-OCT-20
Bicarbonate (HCO3)			<5.0		mg/L		5	21-OCT-20
Carbonate (CO3)			<5.0		mg/L		5	21-OCT-20
Hydroxide (OH)			<5.0		mg/L		5	21-OCT-20
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	21-OCT-20
SO4-L-IC-N-CL	**Water**							
Batch R5261379								
WG3429191-2 LCS								
Sulfate (SO4)			102.0		%		85-115	20-OCT-20
WG3429191-1 MB								
Sulfate (SO4)			<0.050		mg/L		0.05	20-OCT-20
TSS-L-CL	**Water**							
Batch R5268009								
WG3429618-19 LCS								
Total Suspended Solids			110.4		%		85-115	22-OCT-20
WG3429618-18 MB								
Total Suspended Solids			<1.0		mg/L		1	22-OCT-20

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 -

L2518964-COFC

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Page of

www.alsglobal.com

Report To	Contact and company name below will appear on the final report
Company:	Sperling Hansen Associates Inc.
Contact:	Scott Garthwaite
Phone:	778-471-7088
	Company address below will appear on the final report
Street:	1225 East Keith Road
City/Province:	North Vancouver, B.C.
Postal Code:	V7J 1J3
Invoice To	Same as Report To ☑ ☑ NO
	Copy of Invoice with Report ☑ ☐ NO
Company:	
Contact:	

Reports / Recipients

Select Report Format: ☐ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: sgarthwaite@sperlinghansen.com

Email 2: chetherington@sperlinghansen.com

Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: rhajjafari@sperlinghansen.com

Email 2:

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm am/pm

For all tests with rush TATs requested, please contact your AM to confirm availability.

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#:
Job #:	20050 Columbia Valley	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (ALS use only):		ALS Contact: Dean Watt	Sampler: Tyler McBride

Analysis Request

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Anions	Total Alkalinity	TSS	Dissolved Metals (F/P)	Total Metals (P)	Ammonia	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
1	E207782	18-10-20		Groundwater	4	x	x	x		x	x			
2	E207780	18-10-20		Groundwater	4	x	x	x		x	x			
3	E265103	18-10-20		Groundwater	4	x	x	x	x		x			
4	E265102	18-10-20		Groundwater	4	x	x	x	x		x			
	E208720	—		Groundwater										
	E208726	—		Groundwater										
	E207778	—		Groundwater										
	03-5	—		Groundwater										

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ ☑ NO

Are samples for human consumption/ use? ☐ ☑ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

British Columbia Contaminated Sites Regulation Stage 10 Amendment (NOV, 2017)

British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☑ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☑ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
10	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Tyler McBride	Oct 19, 2020			10/20	835			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

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.**