

Central Subregion Landfill 2021 Groundwater Monitoring Annual Report



PREPARED FOR: REGIONAL DISTRICT OF EAST KOOTENAY

PREPARED BY: SPERLING HANSEN ASSOCIATES

January, 2022

PRJ21063



**SPERLING
HANSEN
ASSOCIATES**



- 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 within the RDEK. As part of this GMP update SHA, along with 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 until 2025.

In 2021, sampling events occurred in January, April, July, and November over a week period. Typically, the fall event is completed in October, however this year BEAR and SHA encountered delays in equipment availability due to supply shortages. As a result, the fall event in 2021 was completed in early November. Samples taken from each site are recorded below, and water quality analysis discussed in Section 3. This report details the sampling notes, lab analysis results, and trends observed at the wells throughout 2021. Section 5 presents recommendations for the next year of monitoring.

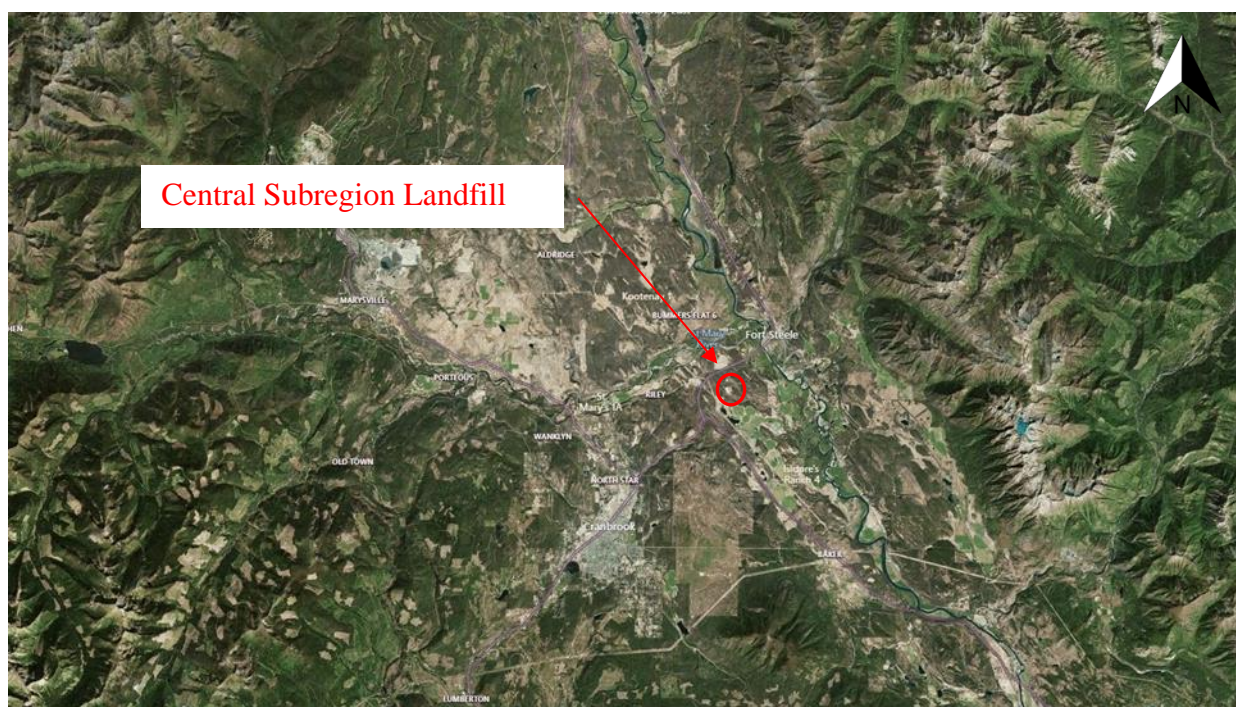


Photo 1-1. Central Subregion Landfill Site Location.

1.1 Location and Setting

The Central Subregion Landfill is located in the sub-region of Central Subregion within the RDEK. The site is approximately 12 km north of Cranbrook at 600 Eager Hill Road, Fort Steele, BC. The legal description of the property is District Lot 11828, Kootenay District. The latitude and longitude are 49.3530 N and 115.4054 W respectively.



Photo 1-2. Central Subregional Landfill Site Layout.

1.2 Site Operations

The landfill has been operating for 21 years since it opened in 2000. The site is approximately 75 hectares in size and services a population of approximately 35,230. The landfill operates Monday to Friday, from 9:00 am to 5:00 pm and Saturday and Sunday from 9:00 am to 4:00 pm. The site accepts MSW, recycling, yard and garden waste, and some commercial waste from municipal and rural transfer stations around Cranbrook, Kimberley, and surrounding areas. The site has been accepting waste from the Elk Valley as well, however this agreement is dependent on the Landfill's DOCP update, which is expected to be complete in early 2022. This waste is brought to the landfill on commercial and contractor vehicles, and the landfill site is not open to the public for drop off.

2. MONITORING PROGRAM

As per the Central Subregion Operational Certificate 15962 (OC), the RDEK is to undertake groundwater monitoring to assess the impact of approved works on groundwater quality and the renovative capacity of the sub surface environment in the area. The routine groundwater program consists of sampling groundwater monitoring wells and two domestic water supply wells in accordance with Tables 1 and 2, Section 5.5.4 of the OC, attached here as Appendix A. The well locations are identified in Figure 1.

2.1 Methodology

BEAR conducts the field sampling at the seven sites. Each well sampled is tested for a set of parameters that are intended to determine landfill impact. Some parameters are tested quarterly while others are only tested annually. Sampling was conducted in accordance with the BC Field Sampling Manual. Table 2-1 shows which wells were sampled during each quarterly event of 2021.

Table 2-1. Well Sampling Frequency, 2021

Event	E238207	E238208	E241355	E231348	E206316	E202404	E238209
January Q1	X	X	X	X	X		O*
April Q2	X	X	X	X	X		O*
July Q3	X	X	X	D*	X	X	O*
November Q4	X	X	X	D*	X		O*

O* - Obstructed at 28.15m

D* - Decommissioned in July, 2021

It was noted by BEAR in July 2020 that the well E238209 was obstructed at 28.15 m. This obstruction has not been resolved, and therefore was not sampled in 2021. According to EcoLogic records, E238209 has not been sampled since January 2020. Location E202404 is only sampled in the summer, when the Fort Steel Campground is open and sampling access is facilitated to the tap.

Analysis of the water samples was conducted by ALS Environmental, a CALA accredited laboratory. Samples were sent to ALS in Calgary via courier by BEAR. Certificate of Analysis (COA) are included in Appendix C. Based on internal laboratory QA/QC, the results are considered reliable. Table 2-2 shows parameters tested Quarterly and Annually at the Central Subregional Landfill.

Table 2-2. Groundwater Monitoring Parameters.

Site	Quarterly Parameters	Yearly Parameters
Central Landfill	Temperature	Temperature
	Conductivity	Conductivity
	pH	pH
	Nitrite (N)	Nitrite (N)
	Nitrate (N)	Nitrate (N)
	Fluoride (F)	Fluoride (F)
	Sulphate (SO ₄)	Sulphate (SO ₄)
	Chloride (Cl)	Chloride (Cl)
	Hardness	Hardness
	Total Alkalinity	Total Alkalinity
	Total Suspended Solids	Total Suspended Solids
	Turbidity	Turbidity
	Dissolved Metals	Dissolved Metals (ICP)
	Ammonia (as N)	Ammonia (as N)
		BTEX
		EPH/VPH

2.2 Sampling Methods

Wells E238208 and E238207 were sampled with Waterra tubing, left inside the well casing. Before being decommissioned, E231348 was also sampled with Waterra tubing. Well, E241355 was sampled with a bailer. The two offsite wells, E202404 and E206316 at the Fort Steele and Heather Farm respectively, were sampled from the taps present at the two locations.

2.3 Groundwater Flow

The landfill has been developed on a terrace adjacent to the Kootenay River and is located on a surficial deposit >30 meters thick consisting mainly of silt to clay-silt. The Kootenay River is located approximately 2km east of the Site. The nearest natural water body to the landfill is a small ‘turtle’ pond located 400 meters south of the Site. There appears to be no surface discharge from the site or this body of water.

Per the BC Water Resource Atlas, there is no mapped aquifer beneath the Site. Based on the regional topography, groundwater is inferred to flow east to the Kootenay River. Locally, groundwater appears to flow towards the southeast towards Turtle Pond. Well details and depth to water (water level) are shown in Table 2-3 below.

Table 2-3. Well Details and Water Level**On Site Wells**

Well ID	Well Construction	Q1 Water Level (m)	Q2 Water Level (m)	Q3 Depth to Water BGS (m)	Q4 Depth to Water BGS (m)
E241348	2" PVC	27.585	27.525	-	-
E238208	6" Steel	50.300	50.100	50.235	50.130
E238209	2" PVC	-	-	obstructed	obstructed
E238207	6" Steel	68.605	68.635	68.650	68.615
E241355	2" PVC	8.165	8.090	8.145	8.165

Domestic Wells

Well ID	Well Construction	Water Level
E202404	outside hydrant tap	n/a
E206316	outside hose tap	n/a

2.4 Nomenclature

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

2.5 Regulatory Criteria

Per the OC published in 1998, ground and surface water quality should be assessed using the most recent Approved and Working Criteria for Water Quality prepared by the Water Management Division of the Ministry of Environment, Lands, and Parks at or beyond the landfill property boundary.

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 are the most recent published by BC ENV used to assess groundwater at contaminated sites and the quality of drinking water. These standards are also the most recent iteration of the criteria to be used for the Central site as per Section 10.2 of the 2013 DOCP for the site.

3. RESULTS

Per the OC Section 5.5.4, parameters tested in 2021 included:

- Routine sampling parameters - pH, conductivity, alkalinity, hardness, total suspended solids, turbidity, anions and nutrients, total metals at domestic wells and dissolved metals at monitoring wells.
- Annual parameters - benzene, toluene, ethylbenzene, and xylene (BTEX), volatile petroleum hydrocarbons, (VPH), and extractable petroleum hydrocarbons (EPH)

Results for the annual parameter testing are attached in Appendix B, Table B-1. Laboratory Certificates are shown in Appendix C.

In 2021, several exceedances of the applicable guidelines were noted, and are explained in order of observance by month below.

January, 2021 – In January, E238207, E241348, and E241355 exhibited elevated concentrations of dissolved lithium. E206316 showed higher concentrations of total lithium. Additionally, E238207 showed to have an elevated ammonia concentration.

April, 2021 (annual event) – In April, E206316 showed elevated total lithium, while E238207, E241348, and E241355 displayed elevated levels of dissolved lithium.

July, 2021 – In July, E206316 showed high elevations of total lithium, while E238207 and E241355 displayed high dissolved lithium.

November, 2021 – In November, E206316 showed high elevations of total lithium, while E238207 and E241355 showed high concentrations of dissolved lithium.

It should be noted that E241348 was decommissioned by SHA in July, 2021, prior to the Q3 sampling event. In addition, E202404 was only sampled in July, due to the campground location being closed between May and October every year.

Details on exceedances are provided in the Sections below.

3.1 Exceedances

Table 3-1 below shows exceedances observed in 2021 by analyte.

Table 3-1. Exceedances by Analyte

	E206316	E238207	E241348	E241355
Lab Results				
Dissolved Metals				
Lithium (dissolved)		X	X	X
General and Inorganic Parameters				
Ammonia (total, as N)		X		
Total Metals				
Lithium (total)	X			

Table 3-2. Maximum Parameter Concentrations Above BC CSR DW Standards

Parameter	BC CSR DW Standard	Maximum Concentration (µg/L)	Well Name
Lithium (Li) Total	8 µg/L	18.3	E206316*
Lithium (Li) Dissolved	8 µg/L	39.7	E241348

Table 3-3. Maximum Parameter Concentrations Above BC CSR AW Standards

Parameter	BC CSR AW Standard	Maximum Concentration (µg/L)	Well Name
Ammonia (total, as N)	3,700 µg/L (Calculated ^a)	16,800	E238207

^a = Standard varies with pH and temperature

* = Domestic well

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

In addition, it should be noted that turbidity at offsite wells E202404 (Fort Steele Campground) and E206316 (Heather Farm) was above ≤1 NTU, which is the recommended standard for raw drinking water without treatment. At E202404, turbidity was recorded to be 1.02 NTU, and at E206316 the maximum recorded concentration was 25.2 NTU in July. However, the guideline states that if natural background turbidity levels are > 50 NTU, then the change from background must not exceed 10% of the background turbidity. E238207 represents background water quality at the site, and its highest recorded turbidity was

261 NTU. Therefore, the level observed at the two offsite wells are not considered to be caused by landfill impact.

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 could 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 EcoLogic did not have a limit for lithium, which explains why no exceedances were reported despite there being little difference between 2019 and 2020 results.

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. None of the wells monitored in October, 2021 would exceed a limit of 0.096 mg/L, so SHA recommends keeping a note of this and a close eye on this parameter in ongoing monitoring. SHA does not believe the RDEK needs to look into remediation measures at this point, but recommends they flag this exceedance history in the case that the Ministry publishes a background concentration for the East Kootenay region.

Domestic well E206316 exhibited concentrations of lithium that exceeded the CSR DW standard in January and July of 2021. Since this well is located locally upgradient but regionally downgradient of the landfill, it's difficult to assess if the region has an existing elevated lithium concentration present. E202404, the other monitored domestic well, had a lithium concentration of 0.0059 mg/L in July 2021.

Due to E202404's location at the Fort Steele Campground, its monitoring is limited to spring and summer, which limits the background water quality data for comparison. It would be beneficial to monitor another domestic well nearby to have reliable data to observe if there are naturally elevated parameters present in the area which could affect how the groundwater results are interpreted.

4. DISCUSSION

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

- Lithium (dissolved and total)
- Ammonia

The maximum concentration of dissolved lithium was found at E241348 at 39.7 µg/L versus the BC CSR DW standard of 8 µg/L. The highest concentration of total lithium was found at E206316 at 18.3 µg/L. The maximum concentration of ammonia was found at E238207 at 16,800 µg/L versus the BC CSR AW standard of 3,700 µg/L. These maximums are calculated as 5-, 2.3-, and 4.5-times respective standards.

The results for lithium and turbidity are consistent with 2020's annual monitoring report. However, the ammonia exceedance at E238207 in January 2021 appears to be an anomaly and should be monitored to see if a pattern forms that would indicate this was not a one-time occurrence.

4.1 Chloride as the Contaminant of Concern

As per Section 3.2, SHA believes the observed lithium exceedances at the Central Landfill are at least in part due to the lowered limit for lithium in the CSR Schedule 3.2, and naturally elevated background concentrations. Lithium is the most frequently observed exceedance across several wells on and offsite, however, the contaminant of concern is chloride. This is because chloride is a common landfill-impact indicator, and is a conservative ion, meaning it does not attenuate through groundwater. Chloride is the contaminant of concern at many MSW landfills in BC, and at Central it is the parameter with which to determine the contaminating lifespan of the site.

4.2 Trend Analysis

To illustrate the trends observed in key parameters at the wells sampled, SHA has prepared figures that combine the 2021 groundwater results with the applicable criteria limits. These figures are attached to this report as Appendix D.

- Figure 2 – Dissolved Lithium concentrations
- Figure 3 – Total Lithium concentrations
- Figure 4 – Manganese concentrations
- Figure 5 – Sulfate concentrations
- Figure 6 – Sodium concentrations
- Figure 7 – Chloride concentrations
- Figure 8 – Nitrate Concentrations
- Figure 9 – Specific Conductance (Conductivity)
- Figure 10 – Turbidity (domestic wells only)

Lithium is the parameter with an observable consistent trend above the CSR DW limit. Sulfate, sodium, chloride, nitrate, manganese, 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.

4.3 Onsite Wells

E231348 has shown to be the most impacted well, which is in line with its location in the center of a natural attenuation landfill. Figure 1 shows the location of the well, which is central in the landfill footprint. As shown in the attached figures, water quality at E231348 has been consistent over the past year and the exceedances observed form a trend that demonstrates the landfill causing some impact to groundwater at this well location. Other landfill impact indicators graphed, such as ammonia, nitrate, chloride, etc. are not exceeding guidelines. E238207 showed one exceedance in 2021, with elevated ammonia over the BC CSR AW guideline limit. This is the first exceedance of this analyte at this well location.

E238209 was not sampled due to an obstruction at 28 m.

4.4 Offsite Wells

Wells E206316 and E202404 are domestic wells at the residence of Heather Farm and Bob and Ronda Young at the Fort Steel Campground. These wells are included in the routine groundwater program as per section 5.5.2 of the OC, and are intended to provide an idea of offsite water quality for the area, however in accordance with the inferred groundwater flow, these two wells are downgradient of the Landfill. Overall, in 2021 only E206316 is reported to have exceedances; consisting of total lithium above the CSR DW standard.

E202404 is not sampled in the winter during Q1, Q2, or Q4 due to the campground being closed for the winter season.

5. CONCLUSIONS AND RECOMMENDATIONS

In 2021, routine and annual sampling at the Site occurred in accordance with the OC. All parameters generally associated with landfill leachate including, but not limited to, chloride, nitrate, and sulfate were below applicable standards and guidelines. However, some metals parameters, lithium (dissolved and total) were detected slightly above applicable criteria.

In conducting analyses for seven different sites within the RDEK with similar exceedances of lithium under the CSR DW limit, SHA believes these elevated concentrations are a region-wide occurrence caused by existing background concentrations rather than impacts caused by activities at the solid waste sites.

SHA recommends the following:

Parameter concentrations of dissolved metals slightly above applicable standards were detected in the Site groundwater monitoring wells. Based on surrounding land use, and relatively low impact to the immediate environment, SHA does not envision a change to the sampling method is warranted at this time. However, if exceeding parameters begin to form a consistently increasing trend, the RDEK may consider groundwater sampling methods using a low flow technique, where possible, 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.

Currently, E202404 (Fort Steele Campground) and E206316 (Heather Farm) are being sampled to capture domestic well water quality. However, because E202404 is inaccessible in the winter due to the campground being closed, SHA recommends that another sampling site from Section 5.5.4 Table 1 of the OC should be sampled instead to avoid the gap in data where E202404 is not sampled in Q4, Q2, and Q1.

It was found in July 2020 that monitoring well E238209 was obstructed, which prevented sample collection in 2021. If the obstruction cannot be remedied, SHA recommends the consideration of another well to represent that location, and to explore whether this would benefit the monitoring program.

The next sampling event is scheduled for early January 2022.

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.

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Environmental Analyst Assistant

Report reviewed by:



Scott Garthwaite
Sr. Civil Technologist / Office Manager

7. REFERENCES

Eco/Logic Environmental, Central Landfill Groundwater Monitoring 2019, prepared for the Regional District of East Kootenay.

BC Contaminated Sites Regulation (CSR) Schedule 3.2, Environmental Management Act, 2019.
https://www.bclaws.gov.bc.ca/civix/document/id/lc/statreg/375_96_08

Bing Maps <https://www.bing.com/maps>

Guidelines for Canadian Drinking Water Quality, Summary Table. Health Canada September 2021.
https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2021-02-11.pdf

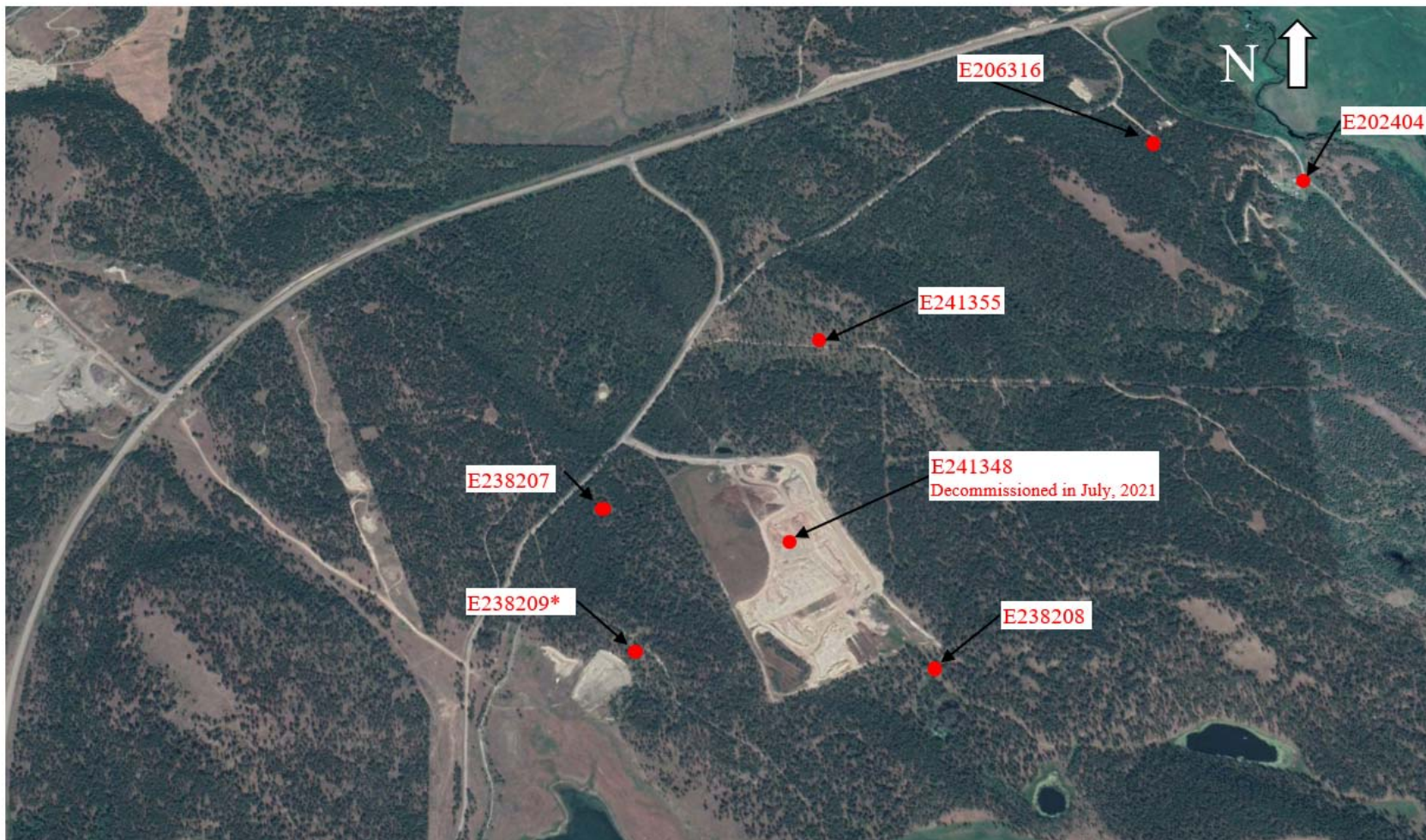
Oram, Brian (n.d.). Lithium in Drinking Water, Water Research Center.
<https://water-research.net/index.php/lithium>

RDEK Public Web Map 2021, retrieved from <https://www.rdek.bc.ca/departments/mapping>

SHA 2013. Central Subregional Landfill Design, Operations and Closure Plan. Sperling Hansen Associates.

Source Drinking Water Quality Guidelines, Ministry of Environment and Climate Change Strategy, 2021.
https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/drinking-water-and-recreation/source_drinking_water_quality_guidelines_bcenv.pdf

Technical Bulletin 3 For Contaminated Sites, Regional Background Concentrations for Select Inorganic Substances in Groundwater. Ministry of Environment and Climate Change Strategy, 2018.
https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/bulletins/tb-3/tb3-regional_background_groundwater_concentrations.pdf



● GROUNDWATER MONITORING LOCATIONS
 * Obstructed well, cannot sample



PROJECT:

**SOLID WASTE FACILITY
MONITORING
PROGRAM 2020-2025**

TITLE:

**CENTRAL SUBREGION
LANDFILL
MONITORING LOCATIONS**

SCALE:
N/A

DATE:
2022/01/10
yyyy/mm/dd

PROJECT NO:
21063

DESIGNED

DRAWING NO:

DRAWN

CH

CHECKED

Figure 1

APPENDICES

APPENDIX A
Operational Certificate



MINISTRY OF ENVIRONMENT,
LANDS AND PARKS

OPERATIONAL CERTIFICATE

MR-15962

*Under the Provisions of the Waste Management Act and in accordance with the
approved part*

*of the Regional District of East Kootenay Solid Waste Management Plan
dated October 5, 1998*

the

REGIONAL DISTRICT OF EAST KOOTENAY

19 - 24 TH AVENUE SOUTH

CRANBROOK, BRITISH COLUMBIA

V1C 3H8

is authorized to store or treat reusable/recyclable material, operate a landfill and discharge municipal solid waste subject to the conditions listed below, on the land or to the ground located north-east of the City of Cranbrook's spray irrigation waste water storage ponds. The reusable/recyclable material or municipal solid waste must originate from the City of Cranbrook, the City of Kimberley or the Regional District of East Kootenay Electoral Areas B, C and E.

This Operational Certificate is issued in accordance with the approved part of the Regional District of East Kootenay Solid Waste Management Plan dated October 5, 1998. If there is a substantive conflict between this Operational Certificate and the approved part of the Solid Waste Management Plan the provisions of the approved part of the Solid Waste Management Plan apply.

Amendment of this Operational Certificate will be in accordance with the Waste Management Act.

Contravention of any of the conditions of this Operational Certificate is a violation of the Waste Management Act and may result in prosecution.

Definitions from the Waste Management Act and the appropriate regulations issued under the Waste Management Act apply except where expressly defined in this Operational Certificate or the context indicates otherwise.

Date Issued: August 9, 2000

A handwritten signature in black ink, appearing to read 'Barry Wood', written over a horizontal line.

Barry Wood, P.Eng.

Assistant Regional Waste Manager

1. AUTHORIZED MUNICIPAL SOLID WASTE MANAGEMENT FACILITIES

1.1. Municipal Solid Waste Facilities

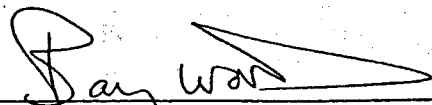
This subsection applies to the operation of a landfill and the discharge of municipal solid waste that is landfilled on site. The authorization is restricted to residual municipal solid waste originating from the City of Cranbrook, the City of Kimberley or the Regional District of East Kootenay Electoral Areas B, C and E. The site reference number for this discharge is E237091.

1.1.1. The maximum authorized rate of discharge is 25,000 tonnes annually. The maximum authorized rate of discharge shall be reviewed by the Regional District of East Kootenay as part of the annual review required by Section 5.11 of this Operational Certificate. The review of the rate of discharge may form the basis of an application to amend the annual rate of discharge.

1.1.2. The characteristics of the discharge shall be typical municipal solid waste but excluding:

- Special Wastes other than those specifically authorized in the Special Waste Regulation or authorized by the Regional Waste Manager. See sub-section 1.1.3. regarding the disposal of asbestos.
- Waste oils.
- Automobiles.
- Automobile batteries.
- Appliances containing ozone depleting substances.
- Animal carcasses except as noted below.*
- Slaughter house or fish hatchery wastes and by-products.
- Bulk liquids and semisolid sludges that contain free liquid including septic tank effluent, septage, black water, holding tank effluent and sewage treatment biosolids.
- Human anatomical and animal waste components of biomedical waste and the untreated non-anatomical waste component of biomedical waste.

Date Issued: August 9, 2000



Barry Wood, P.Eng.
Assistant Regional Waste Manager

- Hog fuel, log yard debris, chipped wood waste and sawdust from industrial sources**.

* The discharge of animal 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 Regional Waste Manager that the carcass(es) cannot be disposed of in accordance with the Agricultural Waste Control Regulation under the Waste Management Act (B.C. Reg. 131/92, O.C. 557/92). Carcasses shall be set aside and temporarily covered then buried at the end of the operational day when daily cover is applied. Large carcasses (over 200 kg) shall be deposited in a separate slit trench and covered immediately.

** Industrial sources means pulp mills, sawmills, planer mills, wood preserving operations, bush mills, pole or post peeling operations and other wood processing operations as specified in writing by the Regional Waste Manager.

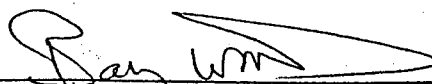
- 1.1.3. The disposal of waste asbestos in compliance with the requirements of the Special Waste Regulation under the Waste Management Act (B.C. Reg. 63/88, O.C. 268/88) is authorized.
- 1.1.4. The authorized works are a natural control sanitary landfill, weigh scale, electric fence around the entire perimeter of the landfill for predator control, run-off control works, run-on control works and other related appurtenances as shown approximately on attached Site Plan B.
- 1.1.5. The works authorized by this section must be complete and in operation on or before the issue date of this Operational Certificate.
- 1.1.6. The location of the authorized works for the storage or treatment of reusable/recyclable material or the discharge of municipal solid waste to which this Operational Certificate is applicable is described as those parts of District Lots 11828, 11827, 424 and 421, Kootenay District, more particularly shown outlined on the attached Site Plan A and B and containing 74.63 hectares more or less.

1.2. Reusable/Recyclable Facilities

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

- 1.2.1. Reusable material means a product or substance that has been diverted from disposal and has reuse value in its present form.

Date Issued: August 9, 2000



Barry Wood, P.Eng.
Assistant Regional Waste Manager

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

- is organic material that has been diverted from residential, commercial or institutional sources and is capable of being composted, or is being composted ***, at the authorized facility;
- is managed as a marketable commodity by the owner or operator of the authorized facility;
- 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;
- has been identified as a recyclable material in the Regional District of East Kootenay solid waste management plan.

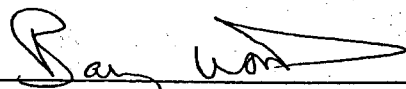
1.2.3. The reusable/recyclable materials presently authorized for on-site storage or treatment includes:

- Tires
- Automobile batteries****
- Glass containers
- Ferrous and non-ferrous metals including white goods in accordance with Ozone Depleting Substance Regulation.
- Paper
- Cardboard
- Plastics
- Compostable material***

*** Compostable material shall be composted in accordance with the Production and Use of Compost Regulation (B.C. Reg. 334/93, O.C. 1295/93).

**** Batteries shall be stored in accordance with the Special Waste Regulation (B.C. Reg. 63/88, O.C. 268/88).

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- 1.2.4. Reusable/recyclable materials stored on site and listed under sub-section 1.2.3 shall not be landfilled without the written approval of the Regional Waste Manager.
- 1.2.5. The works authorized by this section are reusable/recyclable storage area and other related appurtenances as shown approximately on attached Site Plan B.
- 1.2.6. The works authorized by this section shall be complete and in operation on or before the issue date of this Operational Certificate.

2. SANITARY LANDFILL DESIGN REQUIREMENTS

2.1. Design, Operational and Closure Plan

A design, operational and closure plan shall be prepared in accordance with the Regional District of East Kootenay approved part of the Solid Waste Management Plan, this Operational Certificate, the most recent version of the Landfill Criteria for Municipal Solid Waste and the Guidelines for Environmental Monitoring at Municipal Waste Landfills dated January, 1996.

The design, operational and closure plan for the landfill shall be submitted to the Regional Waste Manager for approval on or before November 30, 2000. The design, operational and closure plan shall contain the following outstanding information:


- identification of the direction of groundwater flow.
- landfill cross-sections showing maximum and minimum elevations for the landfill
- a detailed fire response plan
- ongoing visual impact mitigation program
- the name/names of the certified operator(s) (see Section 3.3)

Once approved in writing, the design, operational and closure plan shall form part of this Operational Certificate. Any conflict between the approved design, operational and closure plan and this Operational Certificate shall be resolved in favour of this Operational Certificate.

2.2. Septage Treatment and Disposal

The Regional District of East Kootenay shall undertake a study of the options for septage treatment and disposal and shall submit a report to the Regional Waste

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Manager on or before January 31, 2000. The terms of reference for the study shall be submitted to the Regional Waste Manager for review and comment prior to commencement of the study.

2.3. Woodwaste Treatment and Disposal

The Regional District of East Kootenay shall undertake a study of the options for woodwaste treatment and disposal and shall submit a report to the Regional Waste Manager on or before November 30, 2000. The terms of reference for the study shall be submitted to the Regional Waste Manager for review and comment prior to commencement of the study.

3. SANITARY LANDFILL OPERATIONAL REQUIREMENTS

3.1. Landfill Operation

The Regional District of East Kootenay shall maintain the landfill authorized in Section 1. as a Natural Control Sanitary Landfill in accordance with the most recent version of the Landfill Criteria for Municipal Solid Waste except as specified in this Operational Certificate. Any conflict between this Operational Certificate and the Landfill Criteria for Municipal Solid Waste shall be resolved in favour of this Operational Certificate.

3.2. Access Hours and Landfill Operation Hours

The landfill shall be open from 9:00 AM to 6:00 PM seven days per week except Christmas Day and New Years Day. The access hours may be varied by written approval of the Regional Waste Manager. The Regional District of East Kootenay will review the landfill hours of operation and provide the details of that review to the Regional Waste Manager as part of the annual review required by Section 5.11 of this Operational Certificate.

Landfill operation hours may extend beyond access hours provided all operations cease by 7:00PM and operation beyond access hours is minimized except in emergency conditions or when approved by the Regional Waste Manager in writing.

3.3. Operator Certification

The works authorized by this operational certificate shall be operated and maintained by persons who are qualified in the safe and proper operation of the landfill for the protection of the environment. The landfill operators shall be certified or be required to be certified by an appropriate organization offering certification in landfill operations as approved by the Regional Waste Manager (See Section 2.2).

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3.4. Landfill Site Development

Discharge of municipal solid waste into water is prohibited. The Regional District of East Kootenay shall construct surface water diversion works to minimize surface water run-on and collect run-off in accordance with the approved Operational Plan.

The landfill is to be developed using primarily the area fill method and constructed in accordance with the approved design, operations and closure plan.

If wet soils, saturated soils, sand deposits, gravel deposits, fractured conditions or other high permeability conditions are encountered during the excavation of the landfill area the Regional District of East Kootenay will notify the Regional Waste Manager as soon as possible and provide a report to the satisfaction of the Regional Waste Manager.

3.5. Perimeter Buffer Zone

The Regional District of East Kootenay shall maintain a buffer around the perimeter of the property of 50 metres and maintain natural vegetation in the buffer zone except at the point of access and the stormwater retention pond. No municipal solid waste shall be deposited within the buffer zone.

3.6. Buffer Zone to Private Property

A private property buffer zone between the landfill and private property shall be developed. The private property buffer zone will be established by an Order in Council reserve on the land around the landfill. When complete the Order in Council for the private property buffer zone will be appended to this Operational Certificate as Appendix A for reference only.

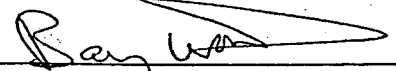
3.7. Waste Deposition and Compaction

The area of the active working face shall be minimized as much as possible. Waste shall be spread in thin layers 0.6 metres in thickness or less on the working face and compacted to at least 590 kg/m³. The working face area should not exceed a vertical height of 3.0 metres and should be maintained at a slope of between 25 and 30 degrees.

3.8. Daily Cover

Suitable soil cover material shall be applied to a compacted depth of at least 0.15 metres on all exposed solid waste at the end of each day that municipal solid waste is discharged to the landfill site. The Regional Waste Manager may approve alternative cover if requested in writing and accompanied by supporting technical documentation.

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3.9. Intermediate Cover

An intermediate cover of 0.30 metres of compacted soils shall be applied on any areas of the active landfill site to which waste will not be discharged for a period of 30 days or more.

3.10. Final Cover

Final cover shall consist of a minimum of 1 metre of low hydraulic conductivity ($<1 \times 10^{-5}$ cm/s) compacted soil or equivalent, plus a minimum of 0.15 metre of topsoil or topsoil equivalent as approved by the Regional Waste Manager and include the establishment of approved vegetation. Final cover is to be constructed with slopes between 4% and 33% with appropriate run-on/run-off drainage controls and erosion controls. Final cover shall be installed within 90 days of cell completion or on any formerly active area that will not receive additional refuse within the next year. Completed portions of the landfill are to progressively receive final cover during the active life of the landfill.

The Regional Waste Manager may approve alternate final cover material(s) if supported by technical data and environmental assessment to the satisfaction of the Regional Waste Manager.

3.11. Cover During Extreme Weather Conditions

During periods of extreme weather conditions, such as those that cause the ground to freeze, the Regional Waste Manager in writing may approve an exemption to the daily cover requirement.

3.12. Public Health, Safety and Nuisance

This landfill shall be operated in a manner such that it will not become a significant threat to public health or safety, or that a public nuisance is not created with respect to, unauthorized access, roads, traffic, odour, noise, bears, birds or other scavenging animals.

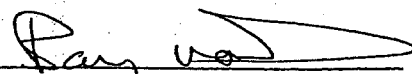
Fire fighting / fire protection equipment will be provided on site to the satisfaction of the Regional Waste Manager. Any fires at the landfill will be fought aggressively until extinguished to the satisfaction of the Regional Waste Manager.

There shall be no burning of municipal solid waste at the landfill site.

Site night time lighting shall be minimized.

The decibel level on back up alarms will be kept to a minimum and satisfy the Workers' Compensation Board requirements.

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3.13. Vector and Wildlife Control

Vectors (carriers capable of transmitting a pathogen from one organism to another including, but not limited to flies and other insects, rodents, and birds) shall be controlled by the application of cover material at the required frequency or by such additional methods as specified by the Regional Waste Manager after consultation with the Fish and Wildlife Program, the Conservation Officer Service local business and local residents.

This landfill shall be operated to minimize the attraction of wildlife such as bears and birds by applying cover at required frequencies and instituting a good housekeeping program. Access to bears is to be prevented through the use of an electrified fence around the entire perimeter of the landfill. The electrified fence shall be maintained and operated annually, March 1 through November 30. The Regional Waste Manager may vary the March 1 and November 30 dates to meet specific weather and wildlife conditions. The electric fence minimum voltage shall be maintained at 5000 volts during the operating period.

3.14. Dust Control

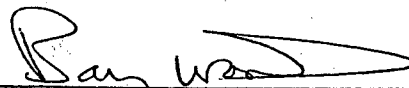
Dust created within the landfill property shall be controlled, using methods and materials acceptable to the Regional Waste Manager, such that it does not cause a public nuisance.

3.15. Litter Control

Litter from the landfill shall be controlled by compacting the waste, minimizing the working face area, applying cover at the required frequencies, providing litter control fences and instituting a once per month litter pickup on lands within the private property buffer zone. Litter on private property adjacent to the private property buffer shall be cleaned up if the litter can be attributed to the landfill. Any enforcement action regarding litter on private property shall be done in co-operation with the Ministry of Environment. In general the Regional District of East Kootenay shall practice good housekeeping or carry out additional litter control measures as specified by the Regional Waste Manager.

Litter accumulated along highway 3/93/95 (i.e. the section of highway between Cranbrook and the landfill site) shall be removed at least once per month and more often to the satisfaction of the Regional Waste Manager during the spring, summer and fall and during the winter when practical to ensure that litter has a minimal impact on aesthetics of the area as it relates to tourism and the local residents.

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3.16. Restricted Access at the Landfill Site

The Regional District of East Kootenay shall discourage and restrict public access to the landfill site.

All waste to be discharged at this site shall be screened by recording the vehicle license number or vehicle unit number, the time, the date, the type of waste and the weight of the waste. In addition, all waste discharged shall be screened visually at the tipping face prior to being compacted to ensure compliance with the terms and conditions of this Operational Certificate.

3.17. Site Access

Appropriately constructed and maintained access roads capable of supporting all vehicles hauling waste are required during the operating life of the landfill.

3.18. Scavenging and Salvaging

Uncontrolled scavenging of waste is prohibited. The controlled salvaging of waste by the landfill operator or persons authorized by the Regional District of East Kootenay is encouraged.

3.19. Site Information

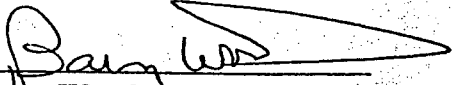
A sign shall be posted at each entrance gate with the following current information:

- Site name.
- Owner
- Contact phone number and address for owner.
- Phone number in case of emergency such as fire and the Ministry of Environment Lands and Parks phone number.
- Hours of operation.
- Public access is restricted

A sign shall be posted at the weigh scales with the following information:

- user fees
- banned materials

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There shall be no landfill signs posted at the junction of the landfill access road and highway 93/95.

3.20. Site Security

Locking gates shall be installed at all access routes into the landfill site. Gates, perimeter fencing and/or barriers shall be installed where necessary to prevent unauthorized access to the site by vehicles. Gates shall be locked during non-access hours.

A site attendant shall be present when the gates are open.

4. SANITARY LANDFILL PERFORMANCE REQUIREMENTS

4.1. Ground and Surface Water Quality Impairment

The authorized landfill shall be operated in such a manner that ground or surface water quality in existing or potential future water supply aquifers or surface waters, does not decrease beyond that allowed by the most recent Approved and Working Criteria for Water Quality prepared by the Water Management Division of the Ministry of Environment, Lands and Parks at or beyond the landfill property boundary

5. MONITORING AND REPORTING REQUIREMENTS

5.1. Environmental Impact

The Pollution Prevention Program of the Ministry of Environment will carry out inspections of the landfill, as part of the routine inspection procedure. Based on these inspections and any other information available to the Regional Waste Manager 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.

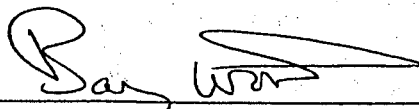
5.2. Process Monitoring

5.2.1. Measurements of Refuse and Recyclables

The quantity of all wastes entering the landfill shall be measured using methods approved by the Regional Waste Manager.

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

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5.2.2. Reporting

Permanent records of the quantity of wastes entering the landfill shall be suitably tabulated and be made available to the Regional Waste Manager upon request.

5.3. Monitoring of the Receiving Environment

The Regional District of East Kootenay shall monitor the receiving water quality and carry out chemical, physical and biological studies on the receiving environment as required by the Regional Waste Manager. Surface water runoff from the active landfill area shall be contained on site and only discharged into the environment after written approval from the Regional Waste Manager has been obtained.

The Regional Waste Manager may require landfill gas monitoring.

The Regional Waste Manager may amend the monitoring program.

5.4. Surface Water Monitoring

The Regional District of East Kootenay shall undertake a baseline surface water monitoring program to establish the water quality of the Turtle Ponds and monitor the runoff control pond(s) water quality prior to discharge. See attached site plans B and C for approximate location of Turtle Ponds and runoff control pond(s).

The Turtle Ponds shall be sampled for at least one year in January, immediately after ice break up, in July and in October. The Turtle Ponds shall be sampled in accordance with baseline requirements listed in Tables 1 and 2, Section 5.5.4. plus total phosphorus but excluding water elevation.

The runoff control ponds shall be sampled in accordance with the requirements listed in Tables 1 and 2, Section 5.5.4. except water elevation.

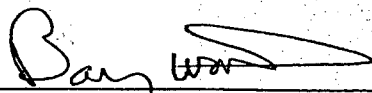
5.5. Groundwater Monitoring

The Regional District of East Kootenay shall undertake a groundwater monitoring program that is designed to assess and identify:

- the impact of the approved works on groundwater quality.
- the renovative capacity of the sub surface environment in the area.

The Regional District of East Kootenay shall undertake a baseline groundwater monitoring program, a routine groundwater monitoring program and a lysimeter vadose zone monitoring program.

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5.5.1. Baseline Groundwater Program

The baseline monitoring program shall consist of sampling groundwater monitoring wells and domestic water supplies in accordance with the baseline requirements listed in Tables 1 and 2, Section 5.5.4. quarterly for one year in January, April, July and October.

5.5.2. Routine Groundwater Program

The routine monitoring program shall consist of sampling the groundwater monitoring wells and two domestic water supplies in accordance with the routine requirements listed in Tables 1 and 2, Section 5.5.4. Sampling will continue on a quarterly basis in January, April, July and October for at least one year following completion of the baseline-monitoring program.

5.5.3. Lysimeter Monitoring Program

The lysimeter monitoring program shall consist of at least two shallow lysimeters installed beneath the first phase of the landfill to monitor groundwater quality in the vadose zone immediately beneath the landfill. The lysimeters shall be sampled in accordance with Tables 1 and 2, Section 5.5.4. quarterly in January, April, July and October for at least two years.

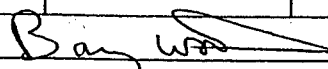
On or before September 30, 2000 the Regional District of East Kootenay will provide installation details for the lysimeters for approval by the Regional Waste Manager.

5.5.4. Sampling Locations and Monitoring Parameters

Table 1 - Summary of Sampling Sites
(See attached Site Plans for Approximate Locations)

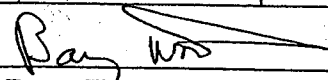
	Sampling Sites ²	Baseline (Quarterly for one Year)	Routine (Quarterly for at least one Year after Baseline Program)
<u>Surface Water</u>			
	Turtle Pond 1 (E241343)	√	
	Turtle Pond 2 (E241344)	√	
	Surface Water Runoff Control Pond(s) (E241356)		As needed

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Sampling Sites ²		Baseline (Quarterly for one Year)	Routine (Quarterly for at least one Year after Baseline Program)
<u>Vadose Zone</u> <u>Lysimeters</u>			
	Lysimeter 1 (E241352) (1 metre deep) (To be installed on or before September 30, 2000)	√	√
	Lysimeter 2 (E241353) (2 metres deep) (To be installed on or before September 30, 2000.)	√	√
<u>Groundwater</u> <u>Monitoring Wells</u>			
	RDEK No. 97-1 (E241345)	√	Water Level Only
	RDEK No. 97-2 (E241346) - Dry Well	√ ¹	√ ¹
	RDEK No. 97-3 (E241347) - Dry Well	√ ¹	√ ¹
	RDEK No. 97-4 (E241348) - Dry Well	√ ¹	√ ¹
	RDEK No. 97-5-1 (E241349) - Dry Well	√ ¹	√ ¹
	RDEK No. 97-5-2 (E241350) - Dry Well	√ ¹	√ ¹
	RDEK No. 97-6 (E241351) - Dry Well	√ ¹	√ ¹
	RDEK No. 97-7 (E238207)	√	√
	RDEK No. 97-8 (E238208)	√	√
	RDEK No. 97-9 (E238209)	√	√
	New Leachate Monitoring Well (E241354) ² - This well is located within the landfill site and is to be installed on or before September 30, 2000	√	√
	New Well (E241355) - The new well is located east of 97-6 and is to be installed to ground water on or before September 30, 2000.	√	√
<u>Domestic Water</u> <u>Wells³</u>			
	Cranbrook and District Rod and Gun Club (E241357)	√	
	Mobile Home near Cranbrook and District Rod and Gun Club (E207079)	√	
	Bull River Shooters Association (E241358)	√	
	Blair Jestin (E238198)	√	
	Rob Paulson (E238199)	√	

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Sampling Sites ²		Baseline (Quarterly for one Year)	Routine (Quarterly for at least one Year after Baseline Program)
	Tom Quirk (E238200)	√	
	Arlene Ridge (E238201)	√	
	Joanne and John Soles (E238202)	√	
	Don and Carol Barr (E238203)	√	
	Charlie Campsall (E238204)	√	
	Hank Campsall (E238205)	√	
	John and Donna Campsall (E238206)	√	
	Heather Farmer (E206316)	√	√
	Margaret Miller, Bob and Ronda Young (202404) (Fort Steele Campground)	√	√(during camping season only)
	Joe and Sue Masi (202402) (Kootenay River Ranch)	√	
	Rocky View Ranch (202403)	√	

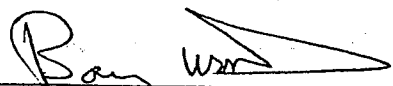
- Existing dry monitoring wells are to be inspected when sampling other wells and if there is sufficient water recharged after purging these wells they shall be sampled for routine parameters. Water level measurements must be taken prior to purging.
- On or before September 30, 2000 the Regional District of East Kootenay will provide installation details for the leachate well for approval by the Regional Waste Manager.
- Domestic well water samples will be obtained from the water supply systems as close to the well as possible and before any filtering or water softening equipment.

See attached site plans B and C for approximate location of groundwater monitoring wells and domestic water wells.

(E.....) or (#.....) Computer data base number used by Ministry of Environment Environmental Monitoring System.

QA/QC Field Blanks and Blind Duplicates will be collected and submitted as part of each monitoring event (see clause 5.6.).

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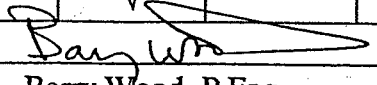


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Table 2 - Summary of Monitoring Parameters

	<u>Parameters</u>	<u>Baseline</u>	<u>Routine</u>	<u>Lysimeter</u>
<u>Field Monitoring Parameters</u>				
	Groundwater Elevation (to be obtained prior to purging and sampling)	√	√	
	pH	√	√	√
	Specific Conductance	√	√	√
	Temperature	√	√	√
<u>Laboratory Analysis</u>				
	<u>General Chemistry</u>			
	Alkalinity	√	√	(√)
	Hardness	√	√	(√)
	Non-Filterable Residues (Total Suspended Solids - TSS)	√	√	(√)
	pH	√	√	√
	Specific Conductance	√	√	√
	Turbidity	√	√	(√)
	<u>Inorganic - Major Ions and Metals¹</u>			
	Aluminum	√		(√)
	Ammonia (as Nitrogen)	√	√	√
	Antimony	√		(√)
	Arsenic	√		(√)
	Barium	√		(√)
	Beryllium	√		(√)
	Boron	√		(√)
	Cadmium	√		(√)
	Calcium	√		√
	Chloride	√	√	√
	Chromium	√		(√)
	Cobalt	√		(√)
	Copper	√		(√)
	Cyanide (Strong Acid Dissociable)	√		
	Fluoride	√	√	√
	Iron	√	√	√
	Lead	√		(√)

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<u>Parameters</u>	<u>Baseline</u>	<u>Routine</u>	<u>Lysimeter</u>
Magnesium	√	√	√
Manganese	√	√	√
Mercury	√		
Molybdenum	√		(√)
Nickel	√		(√)
Nitrate (as Nitrogen)	√	√	√
Nitrite (as Nitrogen)	√	√	√
Phosphorus (total)	Turtle Ponds Only		
Potassium	√	√	√
Selenium	√		
Silicon	√		(√)
Silver	√		(√)
Sodium	√	√	√
Sulphate	√	√	√
Thallium	√		(√)
Uranium	√		
Vanadium	√		(√)
Zinc	√		(√)
<u>Hydrocarbons</u>			
Benzene, Toluene, Ethylbenzene and Xylene (BTEX)	√	√	√
Volatile Petroleum Hydrocarbons - C5 - C9 (VPH)	√	√	√
Extractable Petroleum Hydrocarbons - C10-18 & C19-C32 (EPH)	√	√	

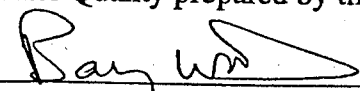
1. Metals analysis shall be for total metals at all domestic wells and surface waters and for dissolved metals at all lysimeters and Regional District of East Kootenay monitoring wells.

(√) Means secondary parameter, to be included provided sufficient sample is practically available.

The need for continued sampling on a quarterly basis will depend on the annual data review and any other relevant information.

Where applicable, minimum analytical detection limits for each parameter listed above shall be at least 1/10th of the drinking water standard listed in the most recent Approved and Working Criteria for Water Quality prepared by the Water

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Management Division of the Ministry of Environment, Lands and Parks so that analytical error is relatively small compared to the result.

Analysis for the above parameters shall be in accordance with procedures described in the "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials, (Current Permittee Edition)" or by suitable alternative procedures as authorized in writing by the Regional Waste Manager.

A copy of the above manual may be purchased from the Queen's Printer Publication Center, P.O. Box 9452, Stn. Prov. Govt., Victoria, British Columbia, V8W 9V7 (1-800-663-6105 or (250) 387-6409). A copy of the manual is also available for inspection at all Pollution Prevention offices.

Monitoring data required by this Operational Certificate must be submitted in accordance with the Environmental Data Quality Assurance Regulation (B.C. Reg. 301/90, m188/90).

5.6. Quality Assurance

As a minimum the Regional District of East Kootenay shall use blind duplicate samples to check combined sampling and analytical precision and field blank samples to check for contamination. One blind duplicate and one field blank shall be submitted with each sample event.

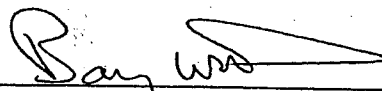
"blind duplicate samples" means identical field samples submitted under different sample identities to test for precision of the sampling and analytical procedure.

"field blank sample" is high purity deionized water in place of a sample carried through the sample collection and handling procedure (including preservation) to check for contamination, purity of preservatives and other systematic errors.

5.7. Monitoring Wells

Monitoring wells, shall be installed, maintained and monitored in accordance with the most recent version of the Ministry of Environment Lands and Parks, "Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills" and the applicable portions 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 alternate procedures approved in writing by the Regional Waste Manager. Monitoring data shall be reported in accordance with the guideline (see Section 5.9).

Date Issued: August 9, 2000



Barry Wood, P.Eng.
Assistant Regional Waste Manager

5.8. Reporting

Maintain data of analyses for inspection and submit the data, suitably tabulated, to the Regional Waste Manager for the previous quarter. All reports shall be submitted within 31 days of the end of the quarter.

5.9. Record Keeping

The Regional District of East Kootenay shall record and maintain the following information both on-site and at their legal address.

- a copy of the operational certificate.
- inspection records for inspections conducted by staff and regulatory agencies for the previous twelve months.
- operational plan, contingency plan and notification procedures.
- closure and post closure care plans.
- a record of all complaints received by the Regional District of East Kootenay, the landfill operator or the Ministry of Environment, Lands and Parks.

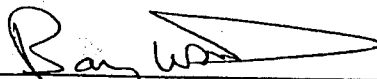
Data generated from the groundwater monitoring program shall be stored in chronological files (see Section 5.7). Data shall be stored in computerized data bases that have the facilities for performing statistical analysis of the data, and for creating time base plots of selected data.

5.10. Annual Report

The Regional District of East Kootenay shall submit the data, suitably tabulated, to the Regional Waste Manager for the previous year. All reports shall be submitted within 120 days of the end of the year. The annual report shall contain:

- Total tonnage of waste discharged into the landfill for the year as well as the calculated per capita waste generation rate.
- Approved design volume
- Remaining site life and capacity.
- Operational Plan for the next 12 months.
- Operational and maintenance expenditures.

Date Issued: August 9, 2000



Barry Wood, P.Eng.
Assistant Regional Waste Manager

- Groundwater quality monitoring data.
- Calculated non-methane organic compound (NMOC) emission rate.
- A summary of all complaints received and the action taken on each complaint.

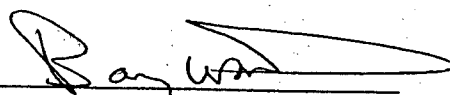
The Operational Certificate holder shall prepare and submit an annual report that shall include a compendium of all the required groundwater monitoring data. The annual report must document any effect of the discharge on the quality of the receiving environment using appropriate statistical and graphical analysis (see Section 5.7). The report must also present any trends in environmental quality in the receiving environment by the discharge using all the years of record in which the discharge has taken place.

All reports must be submitted, suitably formatted and tabulated on a computer storage media, or by prior arrangement, electronically transmitted directly to the B.C. Environment central computer system. If a website is available the Regional District of East Kootenay will make data available on the website.

5.11. Annual Review of Operational Certificate Conditions

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, 2001. The need for increased or decreased monitoring or the need to upgrade existing works will be based in part on this review.

Date Issued: August 9, 2000



Barry Wood, P.Eng.
Assistant Regional Waste Manager

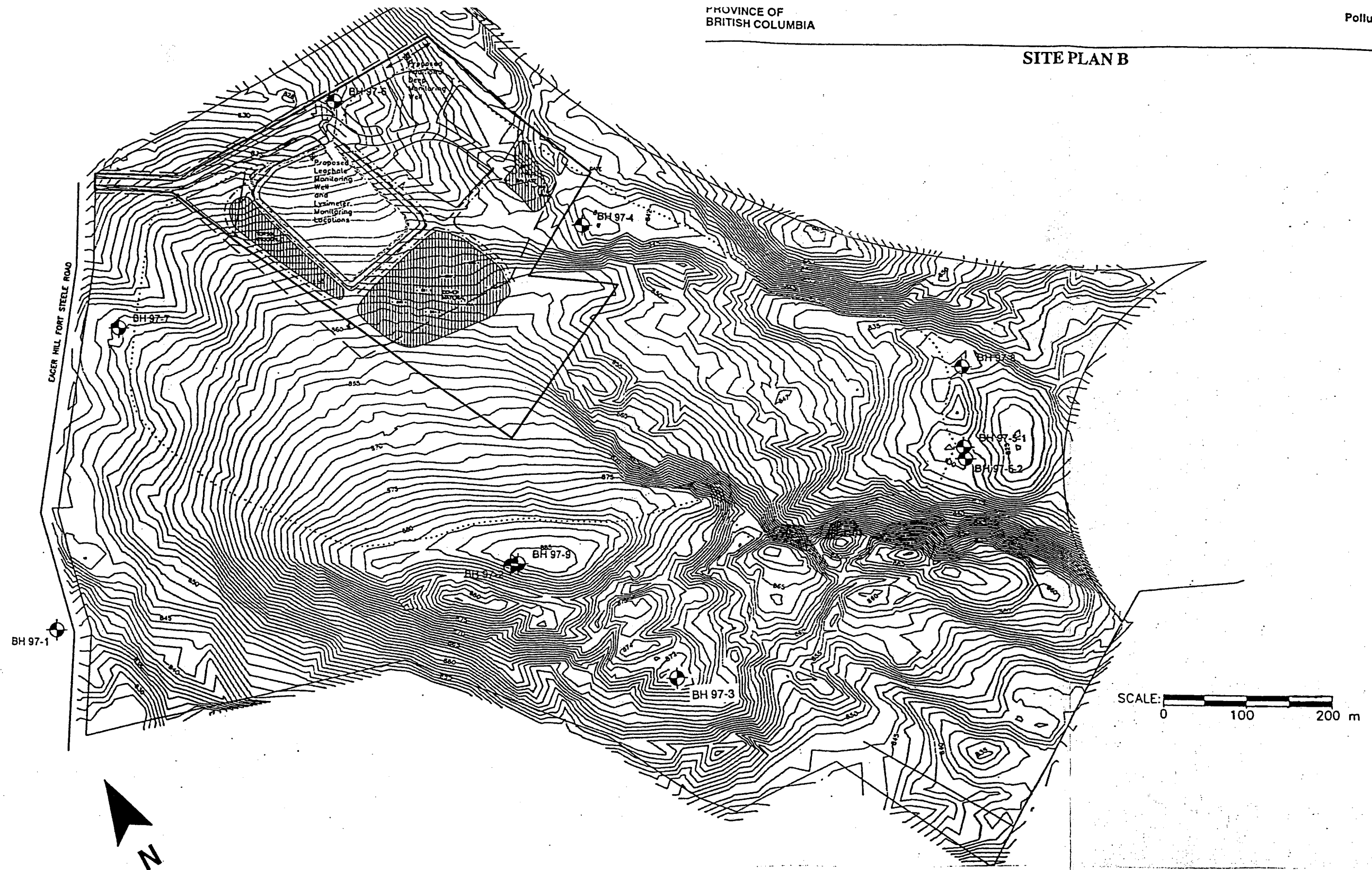
Operational Certificate No. MR15962

Assistant Regional Waste Manager:

Barry Wood, P.Eng.

Name of Certificate Holder: Regional District of East Kootenay

SITE PLAN B



Wells

Note: Existing Monitoring Well Locations Approximate Only.

LEGAL DESCRIPTION: Those parts of District Lots 11828, 11827, 424 and 421, Kootenay District, more particularly shown above and containing 74.63 hectares, more or less.

Date Issued: Aug. 9, 2008

Date Amended:
(most recent)

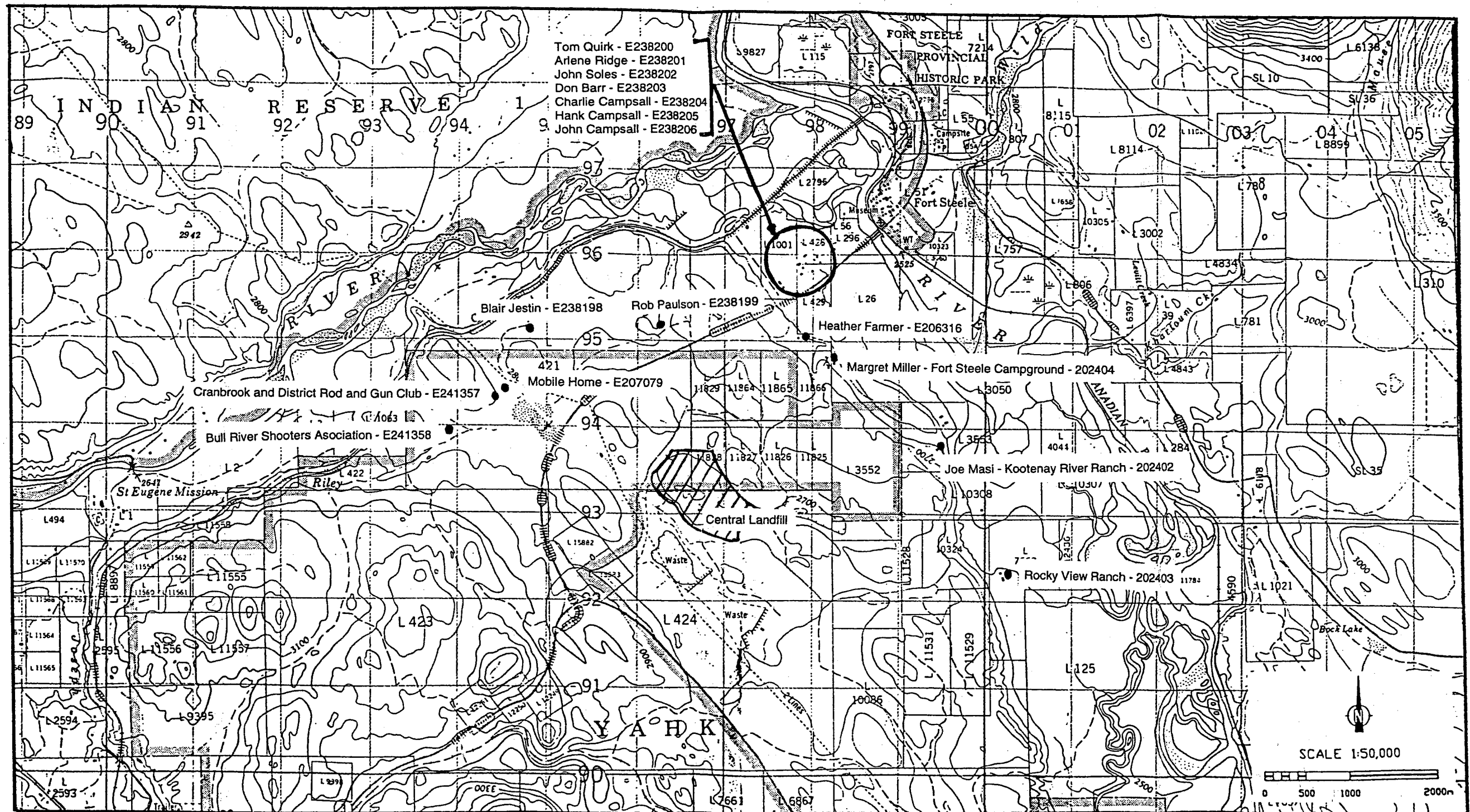
Name of Certificate Holder: Regional District of East Kootenay

Operational Certificate No. MR15962

Assistant Regional Waste Manager:

Barry Wood
Barry Wood, P.Eng.

SITE PLAN C



LEGAL DESCRIPTION: Those parts of District Lots 11828, 11827, 424 and 421, Kootenay District, more particularly shown above and containing 74.63 hectares, more or less.	
Date Issued: <u>Aug 9, 2010</u>	Operational Certificate No. <u>MR15962</u>
Date Amended: (most recent)	Assistant Regional Waste Manager: <u>Barry Wood</u> Barry Wood, P. Eng.
Name of Certificate Holder: <u>Regional District of East Kootenay</u>	

APPENDIX B
Water Quality Results

Central Subregion Landfill
Water Quality Results

Table B-1 Water Quality Analysis

Sampling Location					E202404	E206316	E206316	E206316	E206316	E238207	E238207	E238207	E238207	E238208	E238208	E238208	E238208	E241348	E241348	E241355	E241355	E241355	E241355	
Date Sampled					28-Jul-21	12-Jan-21	27-Apr-21	28-Jul-21	06-Nov-21	12-Jan-21	27-Apr-21	28-Jul-21	06-Nov-21	12-Jan-21	27-Apr-21	28-Jul-21	06-Nov-21	12-Jan-21	27-Apr-21	12-Jan-21	27-Apr-21	28-Jul-21	06-Nov-21	
Lab Sample ID					L2621308-5	L2548136-5	L2581851-5	L2621308-4	L2660638-4	L2548136-1	L2581851-1	L2621308-1	L2660638-1	L2548136-2	L2581851-2	L2621308-2	L2660638-2	L2548136-3	L2581851-3	L2548136-4	L2581851-4	L2621308-3	L2660638-3	
Sample Type																								
Analyte	Unit	Guideline																						
		CSR AW	CSR DW	BC SDWQG MAC																				
Table B-1 Water Quality Analysis																								
Lab Results																								
Anions and Cations in meq/L unit																								
Aluminum (meq/L) (calculated)	meq/L	NG	NG	NG						0.00037	0.0002	0.00021	<0.00011	0.00018	0.00022	0.00021	0.00019	0.00037	0.00044	0.00031	0.00017	0.00016	0.00031	
Barium (meq/L) (calculated)	meq/L	NG	NG	NG						0.000139	0.000147	0.0000371	0.000014	0.000202	0.000186	0.000181	0.000175	0.00149	0.00137	0.000779	0.000745	0.00092	0.000799	
Bicarbonate (HCO3) (meq/L) (calculated)	meq/L	NG	NG	NG	4.72	7.67	7.83	7.87	7.06	5.85	6.21	5.38	4.26	1.77	2.02	2.18	1.34	10	9.42	6.15	6.15	6.42	5.57	
Boron (meq/L) (calculated)	meq/L	NG	NG	NG						0.0067	0.0078	0.005	0.0047	0.012	0.013	0.012	0.012	0.0061	0.0069	0.005	0.0047	0.005	0.005	
Calcium (meq/L) (calculated)	meq/L	NG	NG	NG						0.451	0.714	0.337	0.304	0.0614	0.0669	0.0604	0.0639	1.39	1.42	2.19	2.41	2.08	2.04	
Calcium (total, meq/L) (calculated)	meq/L	NG	NG	NG	1.5	1.94	2.17	2.82	2.05															
Carbonate (CO3) (meq/L) (calculated)	meq/L	NG	NG	NG	<0.17	0.3	0.363	0.377	<0.17	0.22	0.44	0.33	0.753	1.71	1.5	1.4	3.53	0.31	0.537	<0.17	<0.17	<0.17	<0.17	
Chloride (meq/L) (calculated)	meq/L	NG	NG	NG	0.138	0.141	0.121	0.15	0.136	0.108	0.0891	0.0976	0.105	0.209	0.189	0.208	0.21	0.728	0.632	0.14	0.14	0.142	0.143	
Chromium (meq/L) (calculated)	meq/L	NG	NG	NG						0.000019	<0.0000058	0.000017	<0.0000058	0.0000069	0.0000069	0.000039	<0.0000058	0.000031	<0.0000058	<0.0000058	<0.0000058	<0.0000058	<0.0000058	
Copper (meq/L) (calculated)	meq/L	NG	NG	NG						<0.0000063	<0.0000063	<0.0000063	0.0000085	<0.0000063	<0.0000063	0.0000076	0.0000082	0.000021	0.000017	0.000019	0.0000076	0.00003	0.00021	
Fluoride (meq/L) (calculated)	meq/L	NG	NG	NG	0.0131	<0.0053	0.0051	<0.0053	0.0063	0.0035	0.0032	0.0015	0.0038	0.0252	0.0228	0.0313	0.0263	<0.0053	0.00621	0.00637	0.0046	0.0022	0.00653	
Hydroxide (OH) (meq/L) (calculated)	meq/L	NG	NG	NG	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	
Lead (meq/L) (calculated)	meq/L	NG	NG	NG						<0.00000048	<0.00000048	<0.00000048	<0.00000048	<0.00000048	<0.00000048	<0.00000048	<0.00000048	0.00000084	<0.00000048	<0.00000048	<0.00000048	<0.00000048	0.0000007	
Lithium (meq/L) (calculated)	meq/L	NG	NG	NG						0.00154	0.00195	0.0014	0.0014	0.00055	0.00066	0.00055	0.00053	0.00529	0.00572	0.0012	0.00146	0.0014	0.0013	
Magnesium (meq/L) (calculated)	meq/L	NG	NG	NG						4.95	5.55	3.97	3.84	0.131	0.133	0.138	0.131	7.26	7.94	4.21	4.49	4.23	4.11	
Magnesium (total, meq/L) (calculated)	meq/L	NG	NG	NG	3.42	10.4	10.3	10.4	9.71															
Potassium (meq/L) (calculated)	meq/L	NG	NG	NG						0.0737	0.0757	0.0785	0.0778	0.011	0.012	0.011	0.011	0.125	0.125	0.0765	0.0824	0.0775	0.077	
Potassium (total, meq/L) (calculated)	meq/L	NG	NG	NG	0.0417	0.0778	0.076	0.0829	0.0747															
Sodium (meq/L) (calculated)	meq/L	NG	NG	NG						1.3	1.41	1.33	1.34	3.92	3.97	3.92	3.8	4.7	4.87	0.935	0.961	0.94	0.927	
Sodium (total, meq/L) (calculated)	meq/L	NG	NG	NG	2.87	1.78	1.87	2.11	1.82															
Strontium (meq/L) (calculated)	meq/L	NG	NG	NG						0.0021	0.00315	0.00135	0.00117	0.00204	0.00212	0.00213	0.00204	0.01	0.0149	0.0117	0.0124	0.0127	0.0119	
Sulfate (meq/L) (calculated)	meq/L	NG	NG	NG	2.62	6.08	5.89	5.89	6.04	0.56	0.65	0.383	0.408	0.356	0.339	0.341	0.383	2.89	2.64	1.21	1.21	1.18	1.27	
Zinc (meq/L) (calculated)	meq/L	NG	NG	NG						<0.000031	<0.000031	<0.000031	<0.000031	<0.000031	<0.000031	<0.000031	<0.000031	0.00011	0.000315	0.00022	0.000095	0.00011	0.000309	
Dissolved Metals																								
Aluminum (dissolved)	µg/L	NG	9500 ^{2,1}	9500						3.3	1.8	1.9	<1.0	1.6	2	1.9	1.7	3.3	4	2.8	1.5	1.4	2.8	
Antimony (dissolved)	µg/L	90	6	6						<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.25	0.25	<0.10	<0.10	<0.10	<0.10	
Arsenic (dissolved)	µg/L	50	10	10						<0.10	<0.10	<0.10	<0.10	0.13	0.12	0.11	1	0.44	0.49	1.13	1.25	0.57	0.74	
Barium (dissolved)	µg/L	10000	1000	NG						9.52	10.1	2.55	0.97	13.9	12.8	12.4	12	102	94.2	53.5	51.2	63.2	54.9	
Beryllium (dissolved)	µg/L	1.5	8	NG						<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	
Bismuth (dissolved)	µg/L	NG	NG	NG						<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	
Boron (dissolved)	µg/L	12000	5000	5000						24	28	18	17	44	47	43	44	22	25	18	17	18	18	
Cadmium (dissolved)	mg/L	Calc ^{1,1}	0.005	0.005						<0.0000050	<0.0000050	0.0000051	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000172	0.0000198	0.0000074	0.0000068	0.0000284	0.0000242	
Calcium (dissolved)	µg/L	NG	NG	NG						9030	14300	6750	6090	1230	1340	1210	1280	27800	28400	43800	48300	41700	40900	
Chromium (dissolved)	µg/L	10 ^{1,2}	50 ^{2,2}	50						0.33	<0.10	0.3	<0.10	0.12	0.12	0.67	<0.10	0.54	<0.10	<0.10	<0.10	<0.10	<0.10	
Cobalt (dissolved)	µg/L	40	20 ^{2,3}	1						0.11	0.17	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	0.47	0.74	0.41	0.4	<0.10	0.21	
Copper (dissolved)	µg/L																							

Sampling Location					E202404	E206316	E206316	E206316	E206316	E238207	E238207	E238207	E238207	E238207	E238208	E238208	E238208	E238208	E241348	E241348	E241355	E241355	E241355	E241355	
Date Sampled					28-Jul-21	12-Jan-21	27-Apr-21	28-Jul-21	06-Nov-21	12-Jan-21	27-Apr-21	28-Jul-21	06-Nov-21	12-Jan-21	27-Apr-21	28-Jul-21	06-Nov-21	12-Jan-21	27-Apr-21	12-Jan-21	27-Apr-21	28-Jul-21	06-Nov-21		
Lab Sample ID					L2621308-5	L2548136-5	L2581851-5	L2621308-4	L2660638-4	L2548136-1	L2581851-1	L2621308-1	L2660638-1	L2548136-2	L2581851-2	L2621308-2	L2660638-2	L2548136-3	L2581851-3	L2548136-4	L2581851-4	L2548136-4	L2581851-4	L2621308-3	L2660638-3
Sample Type																									
Analyte	Unit	Guideline																							
		CSR AW	CSR DW	BC SDWQG MAC																					
Nitrate + Nitrite (as N) (calculated)	mg/L	400 ^{1.12}	10 ^{2.12}	NG	0.0582	<0.025	<0.0051	<0.025	<0.025		<0.0051	<0.0051	<0.0051	<0.0051	0.0138	0.0137	0.0136		0.041		<0.0051	0.122	0.0386		
Nitrite (as N)	µg/L	Calc ^{1.13}	1000	1000	10	<5.0	<1.0	<5.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4.3	<1.0	<5.0	1.5	1.6	<1.0	<1.0	18.2		
pH		NG	NG	NG	8.27	8.4	8.38	8.39	8.2	8.47	8.48	8.45	8.62	9.83	9.61	9.53	9.92	8.41	8.44	8.27	8.3	8			
Sulphate	mg/L	Calc ^{1.14}	500 ^{2.13}	NG	126	292	283	283	290	26.9	31.2	18.4	19.6	17.1	16.3	16.4	18.4	139	127	58.1	58.3	56.6	60.8		
Temperature when received by lab	°C	NG	NG	NG	20.2		19.6	20.2	20.1		19.7	20.2	20.2		19.5	20.1	20.1		19.3		19.4	20.2	20.1		
Total suspended solids	mg/L	NG	NG	NG	<1.0	<1.0	3.8	2.9	1.6	946	65.9	135	15.1	4.7	9.3	4.8	9	66.3	34.4	5.8	30.1	26.6	10.9		
Turbidity	NTU	NG	NG	N ^{3.2}	1.02		9.86	25.2	8.1		195	261	29.9		21.6	9	15.3		29		18.9	10.4	9.87		
Petroleum Hydrocarbons																									
Benzene	µg/L	400	5	5							<0.50														
Ethylbenzene	µg/L	2000	140 ^{2.14}	140							<0.50														
Methyl tert-butyl ether (MTBE)	µg/L	34000	95 ^{2.15}	NG							<0.50														
Toluene	µg/L	5	60 ^{2.16}	60							<0.50														
VHwG-10	µg/L	15000 ^{1.15}	15000 ^{2.17}	NG							<100														
VPHw	µg/L	1500 ^{1.16}	NG	NG							<100														
m,p-Xylene	µg/L	NG	NG	NG							<0.50														
o-Xylene	µg/L	NG	NG	NG							<0.50														
Xylenes (total)	µg/L	300	90	90							<0.71														
Total Metals																									
Aluminum (total)	µg/L	NG	9500 ^{2.18}	9500	3.1	<3.0	3.3	11.7	<3.0																
Antimony (total)	µg/L	90	6	6	<0.10	<0.10	<0.10	<0.10	<0.10																
Arsenic (total)	µg/L	50	10	10	1.82	4.38	4.63	5.59	4.63																
Barium (total)	µg/L	10000	1000	NG	27.9	8.75	9.63	14	9.69																
Beryllium (total)	µg/L	1.5	8	NG	<0.020	<0.020	<0.020	<0.020	<0.020																
Bismuth (total)	µg/L	NG	NG	NG	<0.050	<0.050	<0.050	<0.050	<0.050																
Boron (total)	µg/L	12000	5000	5000	107	127	139	168	132																
Cadmium (total)	µg/L	Calc ^{1.17}	5	5	0.0076	<0.0050	<0.0050	0.0089	<0.0050																
Calcium (total)	mg/L	NG	NG	NG	30.1	38.9	43.4	56.5	41																
Chromium (total)	µg/L	10 ^{1.18}	50 ^{2.19}	50	<0.10	<0.10	<0.10	0.11	<0.10																
Cobalt (total)	µg/L	40	20 ^{2.20}	1	<0.10	<0.10	<0.10	<0.10	<0.10																
Copper (total)	µg/L	Calc ^{1.19}	1500 ^{2.21}	2000 ^{3.3}	0.85	3.34	0.55	86.3	14.2																
Hardness, Total (total as CaCO3)	mg/L	NG	NG	NG	246	616	622	660	590																
Iron (total)	µg/L	NG	6500 ^{2.22}	NG	113	1310	1760	2690	1540																
Lead (total)	µg/L	Calc ^{1.20}	10	5	0.077	0.075	<0.050	4.74	0.745																
Lithium (total)	µg/L	NG	8	NG	5.6	16.6	18.3	14.8	16.6																
Magnesium (total)	mg/L	NG	NG	NG	41.5	126	125	126	118																
Manganese (total)	µg/L	NG	1500 ^{2.23}	120	68.6	64.6	64.8	51.9	63.8																
Mercury (total)	µg/L	0.25	1	1	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050																
Molybdenum (total)	µg/L	10000	250	88	4.59	1.03	1.12	1.57	1.08																
Nickel (total)	µg/L	Calc ^{1.21}	80	80	<0.50	<0.50	0.96	30.3	3.68																
Phosphorus (total, by ICPMS/ICPOES)	µg/L	NG	NG	NG	<50	<50	<50	<50	<50																
Phosphorus (total, APHA 4500-P)	µg/L	NG	NG	NG	<2.0		3.3	10.6	3.5	12.6	32	3.4		32.5	40.1	48.4		33.1		17.2	37.4	26.5			
Potassium (total)	µg/L	NG	NG	NG	1630	3040	2970	3240	2920																
Selenium (total)	µg/L	20	10	10	<0.050	<0.050	<0.050	<0.050	<0.050																
Silicon (total, as Si)	µg/L	NG	NG	NG	5460	6570	6390	7100	6240																
Silver (total)	µg/L	Calc ^{1.22}	20	NG	<0.010	<0.010	<0.010	0.019	<0.010																
Sodium (total)	mg/L	NG	200 ^{2.24}	NG	66	40.9	42.9	48.4	41.9																
Strontium (total)	µg/L	NG	2500	7000	541	852	969	1390	971																
Sulphur (total)	µg/L	NG	NG	NG	47900	108000	113000	87300	103000																
Thallium (total)	µg/L	3	NG	NG	<0.010	<0.010	<0.010	<0.010	<0.010																
Tin (total)	µg/L	NG	2500	NG	<0.10	<0.10	<0.10	0.37	<0.10																
Titanium (total)	µg/L	1000	NG	NG	<0.30	<0.30	<0.30	0.31	<0.30																
Uranium (total)	µg/L	85	20	20	1.77	3	3.18	4.47	3.07																
Vanadium (total)	µg/L	NG	20	NG	0.93	<0.50	<0.50	0.54	<0.50																
Zinc (total)	µg/L	Calc ^{1.23}	3000 ^{2.25}	3000	29.9	7.5	3.1	70.8	46.6																
Zirconium (total)	µg/L	NG	NG	NG	<0.30	<0.30	<0.30	<0.30	<0.30																
Volatile Organic Compounds																									
Styrene	µg/L	720	800	NG							<0.50														



APPENDIX C
Certificates of Analysis



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

Date Received: 14-JAN-21
Report Date: 20-JAN-21 16:55 (MT)
Version: FINAL

Client Phone: 604-986-7723

Certificate of Analysis

Lab Work Order #: L2548136
Project P.O. #: NOT SUBMITTED
Job Reference: 20050 CENTRAL SUBREGIONAL
C of C Numbers:
Legal Site Desc:

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

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2548136-1 GROUNDWATER 12-JAN-21 E238207	L2548136-2 GROUNDWATER 12-JAN-21 E238208	L2548136-3 GROUNDWATER 12-JAN-21 E231348	L2548136-4 GROUNDWATER 12-JAN-21 E241355	L2548136-5 GROUNDWATER 12-JAN-21 E206316
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO ₃) (mg/L)	270	9.63	432	320	616 ^{HTC}
	Total Suspended Solids (mg/L)	946 ^{DLHC}	4.7	66.3	5.8	<1.0
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)	303	174	516	307	397
	Ammonia as N (mg/L)	16.8 ^{DLM}	0.0258	0.0449	0.134	0.255
	Bicarbonate (HCO ₃) (mg/L)	357	108	610	375	468
	Carbonate (CO ₃) (mg/L)	6.5	51.4	9.4	<5.0	8.0
	Chloride (Cl) (mg/L)	3.84	7.42	25.8 ^{DLHC}	4.90	4.99 ^{DLHC}
	Conductivity (EC) (uS/cm)	542	390	1080	617	1080
	Fluoride (F) (mg/L)	0.066	0.478	<0.10 ^{DLHC}	0.121	<0.10 ^{DLHC}
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Nitrate and Nitrite (as N) (mg/L)	0.105	<0.0051	0.122	<0.0051	<0.025
	Nitrate (as N) (mg/L)	0.105	<0.0050	0.122 ^{DLHC}	<0.0050	<0.025 ^{DLHC}
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0050 ^{DLHC}	0.0016	<0.0050 ^{DLHC}
	pH (pH)	8.47	9.83	8.41	8.27	8.40
	Sulfate (SO ₄) (mg/L)	26.9	17.1	139 ^{DLHC}	58.1	292 ^{DLHC}
Total Metals	Aluminum (Al)-Total (mg/L)					<0.0030
	Antimony (Sb)-Total (mg/L)					<0.00010
	Arsenic (As)-Total (mg/L)					0.00438
	Barium (Ba)-Total (mg/L)					0.00875
	Beryllium (Be)-Total (mg/L)					<0.000020
	Bismuth (Bi)-Total (mg/L)					<0.000050
	Boron (B)-Total (mg/L)					0.127
	Cadmium (Cd)-Total (mg/L)					<0.0000050
	Calcium (Ca)-Total (mg/L)					38.9
	Chromium (Cr)-Total (mg/L)					<0.00010
	Cobalt (Co)-Total (mg/L)					<0.00010
	Copper (Cu)-Total (mg/L)					0.00334
	Iron (Fe)-Total (mg/L)					1.31
	Lead (Pb)-Total (mg/L)					0.000075
	Lithium (Li)-Total (mg/L)					0.0166
	Magnesium (Mg)-Total (mg/L)					126
	Manganese (Mn)-Total (mg/L)					0.0646
	Mercury (Hg)-Total (mg/L)					<0.0000050
	Molybdenum (Mo)-Total (mg/L)					0.00103
	Nickel (Ni)-Total (mg/L)					<0.00050
	Phosphorus (P)-Total (mg/L)					<0.050
	Potassium (K)-Total (mg/L)					3.04

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2548136-1 GROUNDWATER 12-JAN-21 E238207	L2548136-2 GROUNDWATER 12-JAN-21 E238208	L2548136-3 GROUNDWATER 12-JAN-21 E231348	L2548136-4 GROUNDWATER 12-JAN-21 E241355	L2548136-5 GROUNDWATER 12-JAN-21 E206316
Grouping	Analyte					
WATER						
Total Metals	Selenium (Se)-Total (mg/L)					<0.000050
	Silicon (Si)-Total (mg/L)					6.57
	Silver (Ag)-Total (mg/L)					<0.000010
	Sodium (Na)-Total (mg/L)					40.9
	Strontium (Sr)-Total (mg/L)					0.852
	Sulfur (S)-Total (mg/L)					108
	Thallium (Tl)-Total (mg/L)					<0.000010
	Tin (Sn)-Total (mg/L)					<0.00010
	Titanium (Ti)-Total (mg/L)					<0.00030
	Uranium (U)-Total (mg/L)					0.00300
	Vanadium (V)-Total (mg/L)					<0.00050
	Zinc (Zn)-Total (mg/L)					0.0075
	Zirconium (Zr)-Total (mg/L)					<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0033	0.0016	0.0033	0.0028	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00025	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	<0.00010	0.00013	0.00044	0.00113	
	Barium (Ba)-Dissolved (mg/L)	0.00952	0.0139	0.102	0.0535	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	0.024	0.044	0.022	0.018	
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	0.0000172	0.0000074	
	Calcium (Ca)-Dissolved (mg/L)	9.03	1.23	27.8	43.8	
	Chromium (Cr)-Dissolved (mg/L)	0.00033	0.00012	0.00054	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	0.00011	<0.00010	0.00047	0.00041	
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	0.00066	0.00061	
	Iron (Fe)-Dissolved (mg/L)	0.317	<0.010	0.020	0.148	
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Dissolved (mg/L)	0.0107	0.0038	0.0367	0.0085	
	Magnesium (Mg)-Dissolved (mg/L)	60.1	1.59	88.2	51.2	
	Manganese (Mn)-Dissolved (mg/L)	0.0669	0.00330	0.230	0.0755	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	0.00626	0.00741	0.00534	0.00305	
	Nickel (Ni)-Dissolved (mg/L)	0.00241	<0.00050	0.00343	<0.00050	
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	2.88	0.43	4.87	2.99	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2548136-1 GROUNDWATER 12-JAN-21 E238207	L2548136-2 GROUNDWATER 12-JAN-21 E238208	L2548136-3 GROUNDWATER 12-JAN-21 E231348	L2548136-4 GROUNDWATER 12-JAN-21 E241355	L2548136-5 GROUNDWATER 12-JAN-21 E206316
Grouping	Analyte					
WATER						
Dissolved Metals	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	0.000163	<0.000050	
	Silicon (Si)-Dissolved (mg/L)	3.08	0.230	4.64	6.28	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	31.0	90.2	108	21.5	
	Strontium (Sr)-Dissolved (mg/L)	0.0922	0.0892	0.600	0.513	
	Sulfur (S)-Dissolved (mg/L)	10.1	6.20	49.1	21.4	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000056	<0.000010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00030	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)	0.000434	<0.000010	0.0124	0.00904	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0036	0.0071	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<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	Barium (Ba)-Dissolved	MS-B	L2548136-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2548136-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2548136-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L2548136-5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2548136-5
Matrix Spike	Sodium (Na)-Total	MS-B	L2548136-5
Matrix Spike	Strontium (Sr)-Total	MS-B	L2548136-5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
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.

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 CaCO ₃ 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.			
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. Weston 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.			
		Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Reference Information

NO3-L-IC-N-CL

Water

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
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CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA
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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 ww - 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: L2548136

Report Date: 20-JAN-21

Page 1 of 8

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	R5349898							
WG3474441-2 LCS		TMRM						
Beryllium (Be)-Dissolved			99.2		%		80-120	16-JAN-21
WG3474441-1 MB								
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	16-JAN-21
BE-T-L-CCMS-CL Water								
Batch	R5348576							
WG3474029-2 LCS		TMRM						
Beryllium (Be)-Total			92.6		%		80-120	15-JAN-21
WG3474029-1 MB								
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	15-JAN-21
CL-L-IC-N-CL Water								
Batch	R5347978							
WG3473949-10 LCS								
Chloride (Cl)			104.6		%		85-115	14-JAN-21
WG3473949-9 MB								
Chloride (Cl)			<0.10		mg/L		0.1	14-JAN-21
F-L-IC-CL Water								
Batch	R5347978							
WG3473949-10 LCS								
Fluoride (F)			99.0		%		85-115	14-JAN-21
WG3473949-9 MB								
Fluoride (F)			<0.020		mg/L		0.02	14-JAN-21
HG-D-CVAA-CL Water								
Batch	R5353916							
WG3475612-2 LCS								
Mercury (Hg)-Dissolved			101.0		%		80-120	19-JAN-21
WG3475612-6 LCS								
Mercury (Hg)-Dissolved			99.1		%		80-120	19-JAN-21
WG3475612-1 MB								
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	19-JAN-21
WG3475612-5 MB								
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	19-JAN-21
HG-T-CVAA-CL Water								
Batch	R5353916							
WG3475615-2 LCS								
Mercury (Hg)-Total			108.0		%		80-120	19-JAN-21
WG3475615-6 LCS								

Quality Control Report

Workorder: L2548136

Report Date: 20-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-CL								
Water								
Batch R5353916								
WG3475615-6 LCS								
Mercury (Hg)-Total			106.0		%		80-120	19-JAN-21
WG3475615-1 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	19-JAN-21
WG3475615-5 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	19-JAN-21
MET-D-CCMS-CL								
Water								
Batch R5349898								
WG3474441-2 LCS								
Aluminum (Al)-Dissolved		TMRM	102.3		%		80-120	16-JAN-21
Antimony (Sb)-Dissolved			98.7		%		80-120	16-JAN-21
Arsenic (As)-Dissolved			101.2		%		80-120	16-JAN-21
Barium (Ba)-Dissolved			101.5		%		80-120	16-JAN-21
Bismuth (Bi)-Dissolved			97.1		%		80-120	16-JAN-21
Boron (B)-Dissolved			99.3		%		80-120	16-JAN-21
Cadmium (Cd)-Dissolved			101.6		%		80-120	16-JAN-21
Calcium (Ca)-Dissolved			98.6		%		80-120	16-JAN-21
Chromium (Cr)-Dissolved			102.7		%		80-120	16-JAN-21
Cobalt (Co)-Dissolved			101.3		%		80-120	16-JAN-21
Copper (Cu)-Dissolved			98.9		%		80-120	16-JAN-21
Iron (Fe)-Dissolved			96.7		%		80-120	16-JAN-21
Lead (Pb)-Dissolved			99.7		%		80-120	16-JAN-21
Lithium (Li)-Dissolved			101.1		%		80-120	16-JAN-21
Magnesium (Mg)-Dissolved			107.6		%		80-120	16-JAN-21
Manganese (Mn)-Dissolved			103.0		%		80-120	16-JAN-21
Molybdenum (Mo)-Dissolved			101.6		%		80-120	16-JAN-21
Nickel (Ni)-Dissolved			101.2		%		80-120	16-JAN-21
Phosphorus (P)-Dissolved			104.6		%		70-130	16-JAN-21
Potassium (K)-Dissolved			103.4		%		80-120	16-JAN-21
Selenium (Se)-Dissolved			100.3		%		80-120	16-JAN-21
Silicon (Si)-Dissolved			101.7		%		60-140	16-JAN-21
Silver (Ag)-Dissolved			98.0		%		80-120	16-JAN-21
Sodium (Na)-Dissolved			105.0		%		80-120	16-JAN-21
Strontium (Sr)-Dissolved			102.9		%		80-120	16-JAN-21
Sulfur (S)-Dissolved			99.0		%		80-120	16-JAN-21
Thallium (Tl)-Dissolved			98.6		%		80-120	16-JAN-21

Quality Control Report

Workorder: L2548136

Report Date: 20-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch	R5349898							
WG3474441-2	LCS	TMRM						
Tin (Sn)-Dissolved			100.3		%		80-120	16-JAN-21
Titanium (Ti)-Dissolved			95.4		%		80-120	16-JAN-21
Uranium (U)-Dissolved			101.5		%		80-120	16-JAN-21
Vanadium (V)-Dissolved			102.1		%		80-120	16-JAN-21
Zinc (Zn)-Dissolved			98.5		%		80-120	16-JAN-21
Zirconium (Zr)-Dissolved			97.0		%		80-120	16-JAN-21
WG3474441-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	16-JAN-21
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	16-JAN-21
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	16-JAN-21
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	16-JAN-21
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	16-JAN-21
Boron (B)-Dissolved			<0.010		mg/L		0.01	16-JAN-21
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	16-JAN-21
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	16-JAN-21
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	16-JAN-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	16-JAN-21
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	16-JAN-21
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	16-JAN-21
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	16-JAN-21
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	16-JAN-21
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	16-JAN-21
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	16-JAN-21
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	16-JAN-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	16-JAN-21
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	16-JAN-21
Potassium (K)-Dissolved			<0.050		mg/L		0.05	16-JAN-21
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	16-JAN-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	16-JAN-21
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	16-JAN-21
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	16-JAN-21
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	16-JAN-21
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	16-JAN-21
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	16-JAN-21

Quality Control Report

Workorder: L2548136

Report Date: 20-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL		Water						
Batch	R5349898							
WG3474441-1 MB								
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	16-JAN-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	16-JAN-21
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	16-JAN-21
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	16-JAN-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	16-JAN-21
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	16-JAN-21
MET-T-CCMS-CL		Water						
Batch	R5348576							
WG3474029-2 LCS		TMRM						
Aluminum (Al)-Total			94.6		%		80-120	15-JAN-21
Antimony (Sb)-Total			100.7		%		80-120	15-JAN-21
Arsenic (As)-Total			93.8		%		80-120	15-JAN-21
Barium (Ba)-Total			93.3		%		80-120	15-JAN-21
Bismuth (Bi)-Total			94.7		%		80-120	15-JAN-21
Boron (B)-Total			98.9		%		80-120	15-JAN-21
Cadmium (Cd)-Total			99.95		%		80-120	15-JAN-21
Calcium (Ca)-Total			90.3		%		80-120	15-JAN-21
Chromium (Cr)-Total			97.6		%		80-120	15-JAN-21
Cobalt (Co)-Total			97.3		%		80-120	15-JAN-21
Copper (Cu)-Total			96.9		%		80-120	15-JAN-21
Iron (Fe)-Total			95.3		%		80-120	15-JAN-21
Lead (Pb)-Total			95.2		%		80-120	15-JAN-21
Lithium (Li)-Total			98.3		%		80-120	15-JAN-21
Magnesium (Mg)-Total			100.6		%		80-120	15-JAN-21
Manganese (Mn)-Total			97.1		%		80-120	15-JAN-21
Molybdenum (Mo)-Total			94.9		%		80-120	15-JAN-21
Nickel (Ni)-Total			96.0		%		80-120	15-JAN-21
Phosphorus (P)-Total			91.6		%		70-130	15-JAN-21
Potassium (K)-Total			89.1		%		80-120	15-JAN-21
Selenium (Se)-Total			97.4		%		80-120	15-JAN-21
Silicon (Si)-Total			93.3		%		60-140	15-JAN-21
Silver (Ag)-Total			93.4		%		80-120	15-JAN-21
Sodium (Na)-Total			99.0		%		80-120	15-JAN-21
Strontium (Sr)-Total			95.7		%		80-120	15-JAN-21

Quality Control Report

Workorder: L2548136

Report Date: 20-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	Water							
Batch	R5348576							
WG3474029-2	LCS	TMRM						
Sulfur (S)-Total			97.7		%		80-120	15-JAN-21
Thallium (Tl)-Total			93.3		%		80-120	15-JAN-21
Tin (Sn)-Total			97.8		%		80-120	15-JAN-21
Titanium (Ti)-Total			91.4		%		80-120	15-JAN-21
Uranium (U)-Total			95.6		%		80-120	15-JAN-21
Vanadium (V)-Total			96.8		%		80-120	15-JAN-21
Zinc (Zn)-Total			94.9		%		80-120	15-JAN-21
Zirconium (Zr)-Total			89.3		%		80-120	15-JAN-21
WG3474029-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	15-JAN-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	15-JAN-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	15-JAN-21
Barium (Ba)-Total			<0.00010		mg/L		0.0001	15-JAN-21
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	15-JAN-21
Boron (B)-Total			<0.010		mg/L		0.01	15-JAN-21
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	15-JAN-21
Calcium (Ca)-Total			<0.050		mg/L		0.05	15-JAN-21
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	15-JAN-21
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	15-JAN-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	15-JAN-21
Iron (Fe)-Total			<0.010		mg/L		0.01	15-JAN-21
Lead (Pb)-Total			<0.000050		mg/L		0.00005	15-JAN-21
Lithium (Li)-Total			<0.0010		mg/L		0.001	15-JAN-21
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	15-JAN-21
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	15-JAN-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	15-JAN-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	15-JAN-21
Phosphorus (P)-Total			<0.050		mg/L		0.05	15-JAN-21
Potassium (K)-Total			<0.050		mg/L		0.05	15-JAN-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	15-JAN-21
Silicon (Si)-Total			<0.050		mg/L		0.05	15-JAN-21
Silver (Ag)-Total			<0.000010		mg/L		0.00001	15-JAN-21
Sodium (Na)-Total			<0.050		mg/L		0.05	15-JAN-21
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	15-JAN-21

Quality Control Report

Workorder: L2548136

Report Date: 20-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	Water							
Batch R5348576								
WG3474029-1 MB								
Sulfur (S)-Total			<0.50		mg/L		0.5	15-JAN-21
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	15-JAN-21
Tin (Sn)-Total			<0.00010		mg/L		0.0001	15-JAN-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	15-JAN-21
Uranium (U)-Total			<0.000010		mg/L		0.00001	15-JAN-21
Vanadium (V)-Total			<0.00050		mg/L		0.0005	15-JAN-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	15-JAN-21
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	15-JAN-21
NH3-L-F-CL	Water							
Batch R5350127								
WG3474466-14 LCS								
Ammonia as N			106.0		%		85-115	16-JAN-21
WG3474466-13 MB								
Ammonia as N			<0.0050		mg/L		0.005	16-JAN-21
NO2-L-IC-N-CL	Water							
Batch R5347978								
WG3473949-10 LCS								
Nitrite (as N)			101.5		%		90-110	14-JAN-21
WG3473949-9 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	14-JAN-21
NO3-L-IC-N-CL	Water							
Batch R5347978								
WG3473949-10 LCS								
Nitrate (as N)			105.8		%		90-110	14-JAN-21
WG3473949-9 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	14-JAN-21
PH/EC/ALK-CL	Water							
Batch R5348677								
WG3474168-8 LCS								
Conductivity (EC)			99.2		%		90-110	14-JAN-21
Alkalinity, Total (as CaCO3)			102.1		%		85-115	14-JAN-21
WG3474168-7 MB								
Conductivity (EC)			<2.0		uS/cm		2	14-JAN-21
Bicarbonate (HCO3)			<5.0		mg/L		5	14-JAN-21
Carbonate (CO3)			<5.0		mg/L		5	14-JAN-21

Quality Control Report

Workorder: L2548136

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-CL	Water							
Batch	R5348677							
WG3474168-7 MB								
Hydroxide (OH)			<5.0		mg/L		5	14-JAN-21
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-JAN-21
SO4-L-IC-N-CL	Water							
Batch	R5347978							
WG3473949-10 LCS								
Sulfate (SO4)			101.0		%		85-115	14-JAN-21
WG3473949-9 MB								
Sulfate (SO4)			<0.050		mg/L		0.05	14-JAN-21
TSS-L-CL	Water							
Batch	R5353016							
WG3474759-6 LCS								
Total Suspended Solids			106.0		%		85-115	18-JAN-21
WG3474759-5 MB								
Total Suspended Solids			<1.0		mg/L		1	18-JAN-21

Quality Control Report

Workorder: L2548136

Report Date: 20-JAN-21

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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
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.



COC Number: 20 -

Canada Toll Free: 1 800 668 9878

Page of

Report To Contact and company name below will appear on the final report		Reports / Recipients		Turnaround Time (TAT) Requested	
Company:	Sperling Hansen Associates Inc.	Select Report Format:	<input type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)	<input checked="" type="checkbox"/> Routine [R] if received by 3pm M-F - no	
Contact:	Scott Garthwaite	Merge QC/QCI Reports with COA	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20	
Phone:	778-471-7088	<input checked="" type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked		<input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 21	
Company address below will appear on the final report		Select Distribution:	<input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX	<input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 51	
Street:	1225 East Keith Road	Email 1 or Fax	sgarthwaite@sperlinghansen.com	<input type="checkbox"/> 1 day [E] if received by 3pm M-F - 101	
City/Province:	North Vancouver, B.C.	Email 2	chetherington@sperlinghansen.com	<input type="checkbox"/> Same day [E2] if received by 10am M-F	
Postal Code:	V7J 1J3	Email 3		<input type="checkbox"/> fees may apply to rush requests on wee. routine tests	
Invoice To	Same as Report To <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> NO	Invoice Recipients		Date and Time Required for all E&P TATs: dd-mm-yy hh:mm am/pm	
	Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Select Invoice Distribution:	<input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX	For all tests with rush TATs requested, please contact your AM to confirm availability.	
Company:		Email 1 or Fax	rhajjafari@sperlinghansen.com	Analysis Request	
Contact:		Email 2		Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below	
Project Information		Oil and Gas Required Fields (client use)		NUMBER OF CONTAINERS	
ALS Account # / Quote #:		AFE/Cost Center:	PO#		
Job #:	20050 Central Subregional	Major/Minor Code:	Routing Code:		
PO / AFE:		Requisitioner:			
LSD:		Location:			
ALS Lab Work Order # (ALS use only):		ALS Contact:	Dean Watt	Sampler: <i>Tim McBride</i>	
ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	
	E238207	12-01-21		Groundwater	4
	E238208	12-01-21		"	4
	E241340 E231348	12-01-21		"	4
	E241355	12-01-21		"	4
	E206316	12-01-21		"	4
	E202404				
Drinking Water (DW) Samples ¹ (client use)		Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)		SAMPLE RECEIPT DETAILS (ALS use only)	
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	British Columbia Contaminated Sites Regulation Stage 10 Amendment (NOV, 2017)		Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED		
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)		Submission Comments identified on Sample Receipt Notification: <input type="checkbox"/> YES <input type="checkbox"/> NO		
				Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A	
				INITIAL COOLER TEMPERATURES °C	
				FINAL COOLER TEMPERATURES °C	
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (ALS use only)		FINAL SHIPMENT RECEPTION (ALS use only)	
Released by: <i>Tim McBride</i>	Date: 13-01-21	Time:	Received by: <i>AL</i>	Date: 1/14	Time: 7:50

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

ALY3 2020 FROM

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: 29-APR-21
Report Date: 10-MAY-21 10:02 (MT)
Version: FINAL

Client Phone: 604-986-7723

Certificate of Analysis

Lab Work Order #: L2581851
Project P.O. #: NOT SUBMITTED
Job Reference: 20050 CENTRAL SUBREGIONAL
C of C Numbers:
Legal Site Desc:

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

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ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298
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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2581851-1 WATER 27-APR-21 08:00 E238207	L2581851-2 WATER 27-APR-21 08:00 E238208	L2581851-3 WATER 27-APR-21 08:00 E241348	L2581851-4 WATER 27-APR-21 08:00 E241355	L2581851-5 WATER 27-APR-21 08:00 E206316
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO ₃) (mg/L)	313	10.0	468	345	622 ^{HTC}
	Temperature (Degree C)	19.7	19.5	19.3	19.4	19.6
	Total Suspended Solids (mg/L)	65.9	9.3	34.4	30.1	3.8
	Turbidity (NTU)	195	21.6	29.0	18.9	9.86
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)	333	176	498	307	410
	Bicarbonate (HCO ₃) (mg/L)	379	123	575	375	478
	Carbonate (CO ₃) (mg/L)	13.2	44.9	16.1	<5.0	10.9
	Chloride (Cl) (mg/L)	3.16	6.69	22.4	4.95	4.29
	Conductivity (EC) (uS/cm)	603	389	1070	624	1110
	Fluoride (F) (mg/L)	0.060	0.434	0.118	0.087	0.096
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Nitrate (as N) (mg/L)	<0.0050	0.0138	0.0395	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0015	<0.0010	<0.0010
	pH (pH)	8.48	9.61	8.44	8.27	8.38
	Phosphorus (P)-Total (mg/L)	0.0126	0.0325	0.0331	0.0172	0.0033
	Sulfate (SO ₄) (mg/L)	31.2	16.3	127	58.3	283
Total Metals	Aluminum (Al)-Total (mg/L)					0.0033
	Antimony (Sb)-Total (mg/L)					<0.00010
	Arsenic (As)-Total (mg/L)					0.00463
	Barium (Ba)-Total (mg/L)					0.00963
	Beryllium (Be)-Total (mg/L)					<0.000020
	Bismuth (Bi)-Total (mg/L)					<0.000050
	Boron (B)-Total (mg/L)					0.139
	Cadmium (Cd)-Total (mg/L)					<0.0000050
	Calcium (Ca)-Total (mg/L)					43.4
	Chromium (Cr)-Total (mg/L)					<0.00010
	Cobalt (Co)-Total (mg/L)					<0.00010
	Copper (Cu)-Total (mg/L)					0.00055
	Iron (Fe)-Total (mg/L)					1.76
	Lead (Pb)-Total (mg/L)					<0.000050
	Lithium (Li)-Total (mg/L)					0.0183
	Magnesium (Mg)-Total (mg/L)					125
	Manganese (Mn)-Total (mg/L)					0.0648
	Mercury (Hg)-Total (mg/L)					<0.0000050
	Molybdenum (Mo)-Total (mg/L)					0.00112
	Nickel (Ni)-Total (mg/L)					0.00096
	Phosphorus (P)-Total (mg/L)					<0.050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2581851-1 WATER 27-APR-21 08:00 E238207	L2581851-2 WATER 27-APR-21 08:00 E238208	L2581851-3 WATER 27-APR-21 08:00 E241348	L2581851-4 WATER 27-APR-21 08:00 E241355	L2581851-5 WATER 27-APR-21 08:00 E206316
Grouping	Analyte					
WATER						
Total Metals	Potassium (K)-Total (mg/L)					2.97
	Selenium (Se)-Total (mg/L)					<0.000050
	Silicon (Si)-Total (mg/L)					6.39
	Silver (Ag)-Total (mg/L)					<0.000010
	Sodium (Na)-Total (mg/L)					42.9
	Strontium (Sr)-Total (mg/L)					0.969
	Sulfur (S)-Total (mg/L)					113
	Thallium (Tl)-Total (mg/L)					<0.000010
	Tin (Sn)-Total (mg/L)					<0.00010
	Titanium (Ti)-Total (mg/L)					<0.00030
	Uranium (U)-Total (mg/L)					0.00318
	Vanadium (V)-Total (mg/L)					<0.00050
	Zinc (Zn)-Total (mg/L)					0.0031
	Zirconium (Zr)-Total (mg/L)					<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0018	0.0020	0.0040	0.0015	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00025	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	<0.00010	0.00012	0.00049	0.00125	
	Barium (Ba)-Dissolved (mg/L)	0.0101	0.0128	0.0942	0.0512	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	0.028	0.047	0.025	0.017	
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	0.0000198	0.0000068	
	Calcium (Ca)-Dissolved (mg/L)	14.3	1.34	28.4	48.3	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00012	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	0.00017	<0.00010	0.00074	0.00040	
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	0.00054	0.00024	
	Iron (Fe)-Dissolved (mg/L)	0.084	<0.010	0.028	0.133	
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000087	<0.000050	
	Lithium (Li)-Dissolved (mg/L)	0.0135	0.0046	0.0397	0.0101	
	Magnesium (Mg)-Dissolved (mg/L)	67.4	1.62	96.5	54.6	
	Manganese (Mn)-Dissolved (mg/L)	0.0470	0.00267	0.212	0.0738	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	0.00413	0.00772	0.00661	0.00323	
	Nickel (Ni)-Dissolved (mg/L)	0.00269	<0.00050	0.00880	0.00062	
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2581851-1 WATER 27-APR-21 08:00 E238207	L2581851-2 WATER 27-APR-21 08:00 E238208	L2581851-3 WATER 27-APR-21 08:00 E241348	L2581851-4 WATER 27-APR-21 08:00 E241355	L2581851-5 WATER 27-APR-21 08:00 E206316
Grouping	Analyte					
WATER						
Dissolved Metals	Potassium (K)-Dissolved (mg/L)	2.96	0.45	4.90	3.22	
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	0.000082	<0.000050	
	Silicon (Si)-Dissolved (mg/L)	4.67	0.232	5.07	6.37	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	32.3	91.2	112	22.1	
	Strontium (Sr)-Dissolved (mg/L)	0.138	0.0927	0.653	0.545	
	Sulfur (S)-Dissolved (mg/L)	17.5	6.90	53.9	24.0	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000025	<0.000010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00013	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)	0.000903	<0.000010	0.0116	0.00941	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0103	0.0031	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
Aggregate Organics	Biochemical Oxygen Demand (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Chemical Oxygen Demand (mg/L)	<10	<10	14	<10	<10
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				
	Ethylbenzene (mg/L)	<0.00050				
	Methyl-tert-Butyl Ether (mg/L)	<0.00050				
	Styrene (mg/L)	<0.00050				
	Toluene (mg/L)	<0.00050				
	o-Xylene (mg/L)	<0.00050				
	m+p-Xylene (mg/L)	<0.00050				
	Xylenes (mg/L)	<0.00071				
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10				
	Surrogate: 4-Bromofluorobenzene (%)	105.8				
	Surrogate: 3,4-Dichlorotoluene (%)	79.6				
	Surrogate: 1,4-Difluorobenzene (%)	95.2				
Hydrocarbons	VPH (C6-C10) (mg/L)	<0.10				

* 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	Magnesium (Mg)-Dissolved	MS-B	L2581851-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2581851-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
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.			
BOD-BC-CL	Water	Biochemical Oxygen Demand (BOD)	APHA 5210 B-5 day Incub.-O2 electrode
This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
BTEXSM-HS-MS-CL	Water	BTEX, Styrene and MTBE	EPA 8260C/5021A
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. BTEX Target compound concentrations are measured using mass spectrometry detection.			
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.			
COD-T-COL-CL	Water	Chemical Oxygen Demand (COD)	APHA 5220 D Colorimetry
Samples are analyzed using the closed reflux colourimetric method			
EPH-L-ME-FID-CL	Water	EPH (C10-C19) & EPH (C19-C32)	BC Lab manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
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.			
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.			
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.			

Reference Information

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.			
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			
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.			
TEMP-CL	Water	Temperature	APHA 2550-Thermometer
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.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			
VH-HS-FID-CL	Water	VHs	BC Env. Lab Manual (VH in Water)
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.			
VPH-CALC-CL	Water	VPH Calculation	BC MOE LABORATORY MANUAL (2005)
These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water" (Version 2.1, July 20, 1999). According to this method, the concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10). Analysis of Volatile Hydrocarbons adheres to all prescribed elements of BCMELP method "Volatile Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).			
XYLENES-CALC-CL	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Calculation of Total Xylenes			
Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.			

** 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 ww - 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: L2581851

Report Date: 10-MAY-21

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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	R5450760							
WG3529562-7 DUP		L2581851-1						
Beryllium (Be)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	05-MAY-21
WG3529562-6 LCS		TMRM						
Beryllium (Be)-Dissolved			102.5		%		80-120	05-MAY-21
WG3529562-5 MB								
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	05-MAY-21
WG3529562-8 MS		L2581851-1						
Beryllium (Be)-Dissolved			109.1		%		70-130	05-MAY-21
BE-T-L-CCMS-CL		Water						
Batch	R5450760							
WG3527021-2 LCS		TMRM						
Beryllium (Be)-Total			108.9		%		80-120	05-MAY-21
WG3527021-1 MB								
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	05-MAY-21
BOD-BC-CL		Water						
Batch	R5448677							
WG3528907-2 LCS								
Biochemical Oxygen Demand			98.9		%		85-115	29-APR-21
WG3528907-1 MB								
Biochemical Oxygen Demand			<2.0		mg/L		2	29-APR-21
BTXSM-HS-MS-CL		Water						
Batch	R5452336							
WG3530033-2 LCS								
Benzene			104.0		%		70-130	04-MAY-21
Ethylbenzene			92.2		%		70-130	04-MAY-21
Methyl-tert-Butyl Ether			95.2		%		70-130	04-MAY-21
o-Xylene			98.2		%		70-130	04-MAY-21
m+p-Xylene			98.1		%		70-130	04-MAY-21
Styrene			91.9		%		70-130	04-MAY-21
Toluene			94.3		%		70-130	04-MAY-21
WG3530033-1 MB								
Benzene			<0.00050		mg/L		0.0005	04-MAY-21
Ethylbenzene			<0.00050		mg/L		0.0005	04-MAY-21
Methyl-tert-Butyl Ether			<0.00050		mg/L		0.0005	04-MAY-21
o-Xylene			<0.00050		mg/L		0.0005	04-MAY-21
m+p-Xylene			<0.00050		mg/L		0.0005	04-MAY-21
Styrene			<0.00050		mg/L		0.0005	04-MAY-21

Quality Control Report

Workorder: L2581851

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXSM-HS-MS-CL Water								
Batch	R5452336							
WG3530033-1	MB							
Toluene			<0.00050		mg/L		0.0005	04-MAY-21
Surrogate: 4-Bromofluorobenzene			105.6		%		70-130	04-MAY-21
Surrogate: 1,4-Difluorobenzene			97.7		%		70-130	04-MAY-21
CL-L-IC-N-CL Water								
Batch	R5443764							
WG3527135-3	DUP	L2581851-1						
Chloride (Cl)		3.16	3.16		mg/L	0.1	20	29-APR-21
WG3527135-2	LCS							
Chloride (Cl)			98.1		%		85-115	29-APR-21
WG3527135-6	LCS							
Chloride (Cl)			101.0		%		85-115	29-APR-21
WG3527135-1	MB							
Chloride (Cl)			<0.10		mg/L		0.1	29-APR-21
WG3527135-5	MB							
Chloride (Cl)			<0.10		mg/L		0.1	29-APR-21
WG3527135-4	MS	L2581851-1						
Chloride (Cl)			100.3		%		75-125	29-APR-21
COD-T-COL-CL Water								
Batch	R5443995							
WG3527340-6	LCS							
Chemical Oxygen Demand			97.0		%		85-115	30-APR-21
WG3527340-5	MB							
Chemical Oxygen Demand			<10		mg/L		10	30-APR-21
F-L-IC-CL Water								
Batch	R5443764							
WG3527135-3	DUP	L2581851-1						
Fluoride (F)		0.060	0.060		mg/L	0.3	20	29-APR-21
WG3527135-2	LCS							
Fluoride (F)			93.5		%		85-115	29-APR-21
WG3527135-6	LCS							
Fluoride (F)			97.2		%		85-115	29-APR-21
WG3527135-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	29-APR-21
WG3527135-5	MB							
Fluoride (F)			<0.020		mg/L		0.02	29-APR-21
WG3527135-4	MS	L2581851-1						
Fluoride (F)			87.4		%		75-125	29-APR-21

Quality Control Report

Workorder: L2581851

Report Date: 10-MAY-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-CL Water								
Batch	R5452466							
WG3529545-10 LCS								
Mercury (Hg)-Dissolved			104.0		%		80-120	05-MAY-21
WG3529545-9 MB								
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	05-MAY-21
HG-T-CVAA-CL Water								
Batch	R5452466							
WG3529542-3 DUP		L2581851-5						
Mercury (Hg)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	05-MAY-21
WG3529542-2 LCS								
Mercury (Hg)-Total			107.0		%		80-120	05-MAY-21
WG3529542-1 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	05-MAY-21
WG3529542-4 MS		L2581851-5						
Mercury (Hg)-Total			113.0		%		70-130	05-MAY-21
MET-D-CCMS-CL Water								
Batch	R5450760							
WG3529562-7 DUP		L2581851-1						
Aluminum (Al)-Dissolved		0.0018	0.0011	J	mg/L	0.0006	0.002	05-MAY-21
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	05-MAY-21
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	05-MAY-21
Barium (Ba)-Dissolved		0.0101	0.0103		mg/L	2.4	20	05-MAY-21
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	05-MAY-21
Boron (B)-Dissolved		0.028	0.027		mg/L	0.8	20	05-MAY-21
Cadmium (Cd)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	05-MAY-21
Calcium (Ca)-Dissolved		14.3	14.4		mg/L	0.8	20	05-MAY-21
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	05-MAY-21
Cobalt (Co)-Dissolved		0.00017	0.00015		mg/L	10	20	05-MAY-21
Copper (Cu)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	05-MAY-21
Iron (Fe)-Dissolved		0.084	0.072		mg/L	15	20	05-MAY-21
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	05-MAY-21
Lithium (Li)-Dissolved		0.0135	0.0138		mg/L	2.6	20	05-MAY-21
Magnesium (Mg)-Dissolved		67.4	67.8		mg/L	0.5	20	05-MAY-21
Manganese (Mn)-Dissolved		0.0470	0.0471		mg/L	0.1	20	05-MAY-21
Molybdenum (Mo)-Dissolved		0.00413	0.00427		mg/L	3.2	20	05-MAY-21
Nickel (Ni)-Dissolved		0.00269	0.00198	J	mg/L	0.00071	0.001	05-MAY-21
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	05-MAY-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL		Water						
Batch	R5450760							
WG3529562-7 DUP		L2581851-1						
Potassium (K)-Dissolved		2.96	2.94		mg/L	0.9	20	05-MAY-21
Selenium (Se)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	05-MAY-21
Silicon (Si)-Dissolved		4.67	4.65		mg/L	0.4	20	05-MAY-21
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	05-MAY-21
Sodium (Na)-Dissolved		32.3	31.9		mg/L	1.0	20	05-MAY-21
Strontium (Sr)-Dissolved		0.138	0.142		mg/L	2.9	20	05-MAY-21
Sulfur (S)-Dissolved		17.5	17.5		mg/L	0.2	20	05-MAY-21
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	05-MAY-21
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	05-MAY-21
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	05-MAY-21
Uranium (U)-Dissolved		0.000903	0.000912		mg/L	1.0	20	05-MAY-21
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	05-MAY-21
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	05-MAY-21
Zirconium (Zr)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	05-MAY-21
WG3529562-6 LCS		TMRM						
Aluminum (Al)-Dissolved			98.0		%		80-120	05-MAY-21
Antimony (Sb)-Dissolved			99.8		%		80-120	05-MAY-21
Arsenic (As)-Dissolved			93.8		%		80-120	05-MAY-21
Barium (Ba)-Dissolved			95.4		%		80-120	05-MAY-21
Bismuth (Bi)-Dissolved			96.3		%		80-120	05-MAY-21
Boron (B)-Dissolved			97.6		%		80-120	05-MAY-21
Cadmium (Cd)-Dissolved			93.5		%		80-120	05-MAY-21
Calcium (Ca)-Dissolved			92.5		%		80-120	05-MAY-21
Chromium (Cr)-Dissolved			93.9		%		80-120	05-MAY-21
Cobalt (Co)-Dissolved			95.0		%		80-120	05-MAY-21
Copper (Cu)-Dissolved			95.0		%		80-120	05-MAY-21
Iron (Fe)-Dissolved			102.6		%		80-120	05-MAY-21
Lead (Pb)-Dissolved			93.5		%		80-120	05-MAY-21
Lithium (Li)-Dissolved			108.7		%		80-120	05-MAY-21
Magnesium (Mg)-Dissolved			99.7		%		80-120	05-MAY-21
Manganese (Mn)-Dissolved			96.2		%		80-120	05-MAY-21
Molybdenum (Mo)-Dissolved			94.9		%		80-120	05-MAY-21
Nickel (Ni)-Dissolved			87.0		%		80-120	05-MAY-21
Phosphorus (P)-Dissolved			98.2		%		70-130	05-MAY-21

Quality Control Report

Workorder: L2581851

Report Date: 10-MAY-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch	R5450760							
WG3529562-6	LCS	TMRM						
Potassium (K)-Dissolved			93.7		%		80-120	05-MAY-21
Selenium (Se)-Dissolved			87.7		%		80-120	05-MAY-21
Silicon (Si)-Dissolved			97.4		%		60-140	05-MAY-21
Silver (Ag)-Dissolved			96.3		%		80-120	05-MAY-21
Sodium (Na)-Dissolved			97.1		%		80-120	05-MAY-21
Strontium (Sr)-Dissolved			98.3		%		80-120	05-MAY-21
Sulfur (S)-Dissolved			97.4		%		80-120	05-MAY-21
Thallium (Tl)-Dissolved			96.2		%		80-120	05-MAY-21
Tin (Sn)-Dissolved			92.1		%		80-120	05-MAY-21
Titanium (Ti)-Dissolved			92.7		%		80-120	05-MAY-21
Uranium (U)-Dissolved			96.9		%		80-120	05-MAY-21
Vanadium (V)-Dissolved			95.4		%		80-120	05-MAY-21
Zinc (Zn)-Dissolved			94.7		%		80-120	05-MAY-21
Zirconium (Zr)-Dissolved			94.7		%		80-120	05-MAY-21
WG3529562-5	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	05-MAY-21
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	05-MAY-21
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	05-MAY-21
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	05-MAY-21
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	05-MAY-21
Boron (B)-Dissolved			<0.010		mg/L		0.01	05-MAY-21
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	05-MAY-21
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	05-MAY-21
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	05-MAY-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	05-MAY-21
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	05-MAY-21
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	05-MAY-21
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	05-MAY-21
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	05-MAY-21
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	05-MAY-21
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	05-MAY-21
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	05-MAY-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	05-MAY-21
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	05-MAY-21

Quality Control Report

Workorder: L2581851

Report Date: 10-MAY-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch	R5450760							
WG3529562-5 MB								
Potassium (K)-Dissolved			<0.050		mg/L		0.05	05-MAY-21
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	05-MAY-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	05-MAY-21
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	05-MAY-21
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	05-MAY-21
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	05-MAY-21
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	05-MAY-21
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	05-MAY-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	05-MAY-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	05-MAY-21
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	05-MAY-21
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	05-MAY-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	05-MAY-21
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	05-MAY-21
WG3529562-8 MS		L2581851-1						
Aluminum (Al)-Dissolved			101.3		%		70-130	05-MAY-21
Antimony (Sb)-Dissolved			103.3		%		70-130	05-MAY-21
Arsenic (As)-Dissolved			99.5		%		70-130	05-MAY-21
Barium (Ba)-Dissolved			97.0		%		70-130	05-MAY-21
Bismuth (Bi)-Dissolved			100.9		%		70-130	05-MAY-21
Boron (B)-Dissolved			105.9		%		70-130	05-MAY-21
Cadmium (Cd)-Dissolved			99.0		%		70-130	05-MAY-21
Calcium (Ca)-Dissolved			95.2		%		70-130	05-MAY-21
Chromium (Cr)-Dissolved			92.7		%		70-130	05-MAY-21
Cobalt (Co)-Dissolved			98.9		%		70-130	05-MAY-21
Copper (Cu)-Dissolved			100.2		%		70-130	05-MAY-21
Iron (Fe)-Dissolved			97.3		%		70-130	05-MAY-21
Lead (Pb)-Dissolved			99.3		%		70-130	05-MAY-21
Lithium (Li)-Dissolved			114.3		%		70-130	05-MAY-21
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	05-MAY-21
Manganese (Mn)-Dissolved			97.0		%		70-130	05-MAY-21
Molybdenum (Mo)-Dissolved			103.3		%		70-130	05-MAY-21
Nickel (Ni)-Dissolved			91.3		%		70-130	05-MAY-21
Phosphorus (P)-Dissolved			104.3		%		70-130	05-MAY-21

Quality Control Report

Workorder: L2581851

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL								
Water								
Batch	R5450760							
WG3529562-8 MS		L2581851-1						
Potassium (K)-Dissolved			97.5		%		70-130	05-MAY-21
Selenium (Se)-Dissolved			95.4		%		70-130	05-MAY-21
Silicon (Si)-Dissolved			102.9		%		70-130	05-MAY-21
Silver (Ag)-Dissolved			92.2		%		70-130	05-MAY-21
Sodium (Na)-Dissolved			N/A	MS-B	%		-	05-MAY-21
Strontium (Sr)-Dissolved			100.2		%		70-130	05-MAY-21
Thallium (Tl)-Dissolved			100.0		%		70-130	05-MAY-21
Tin (Sn)-Dissolved			100.3		%		70-130	05-MAY-21
Titanium (Ti)-Dissolved			127.8		%		70-130	05-MAY-21
Uranium (U)-Dissolved			101.7		%		70-130	05-MAY-21
Vanadium (V)-Dissolved			99.0		%		70-130	05-MAY-21
Zinc (Zn)-Dissolved			101.0		%		70-130	05-MAY-21
Zirconium (Zr)-Dissolved			105.6		%		70-130	05-MAY-21
MET-T-CCMS-CL								
Water								
Batch	R5450760							
WG3527021-2 LCS		TMRM						
Aluminum (Al)-Total			104.9		%		80-120	05-MAY-21
Antimony (Sb)-Total			107.7		%		80-120	05-MAY-21
Arsenic (As)-Total			99.6		%		80-120	05-MAY-21
Barium (Ba)-Total			103.0		%		80-120	05-MAY-21
Bismuth (Bi)-Total			101.2		%		80-120	05-MAY-21
Boron (B)-Total			110.0		%		80-120	05-MAY-21
Cadmium (Cd)-Total			100.4		%		80-120	05-MAY-21
Calcium (Ca)-Total			101.6		%		80-120	05-MAY-21
Chromium (Cr)-Total			102.0		%		80-120	05-MAY-21
Cobalt (Co)-Total			103.7		%		80-120	05-MAY-21
Copper (Cu)-Total			100.9		%		80-120	05-MAY-21
Iron (Fe)-Total			101.2		%		80-120	05-MAY-21
Lead (Pb)-Total			102.1		%		80-120	05-MAY-21
Lithium (Li)-Total			110.5		%		80-120	05-MAY-21
Magnesium (Mg)-Total			108.0		%		80-120	05-MAY-21
Manganese (Mn)-Total			103.0		%		80-120	05-MAY-21
Molybdenum (Mo)-Total			106.5		%		80-120	05-MAY-21
Nickel (Ni)-Total			101.5		%		80-120	05-MAY-21

Quality Control Report

Workorder: L2581851

Report Date: 10-MAY-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	Water							
Batch	R5450760							
WG3527021-2 LCS		TMRM						
Phosphorus (P)-Total			110.1		%		70-130	05-MAY-21
Potassium (K)-Total			103.7		%		80-120	05-MAY-21
Selenium (Se)-Total			96.3		%		80-120	05-MAY-21
Silicon (Si)-Total			105.7		%		60-140	05-MAY-21
Silver (Ag)-Total			107.4		%		80-120	05-MAY-21
Sodium (Na)-Total			104.5		%		80-120	05-MAY-21
Strontium (Sr)-Total			107.8		%		80-120	05-MAY-21
Sulfur (S)-Total			103.9		%		80-120	05-MAY-21
Thallium (Tl)-Total			100.3		%		80-120	05-MAY-21
Tin (Sn)-Total			102.4		%		80-120	05-MAY-21
Titanium (Ti)-Total			99.9		%		80-120	05-MAY-21
Uranium (U)-Total			101.2		%		80-120	05-MAY-21
Vanadium (V)-Total			103.3		%		80-120	05-MAY-21
Zinc (Zn)-Total			100.8		%		80-120	05-MAY-21
Zirconium (Zr)-Total			102.9		%		80-120	05-MAY-21
WG3527021-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	05-MAY-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	05-MAY-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	05-MAY-21
Barium (Ba)-Total			<0.00010		mg/L		0.0001	05-MAY-21
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	05-MAY-21
Boron (B)-Total			<0.010		mg/L		0.01	05-MAY-21
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	05-MAY-21
Calcium (Ca)-Total			<0.050		mg/L		0.05	05-MAY-21
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	05-MAY-21
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	05-MAY-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	05-MAY-21
Iron (Fe)-Total			<0.010		mg/L		0.01	05-MAY-21
Lead (Pb)-Total			<0.000050		mg/L		0.00005	05-MAY-21
Lithium (Li)-Total			<0.0010		mg/L		0.001	05-MAY-21
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	05-MAY-21
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	05-MAY-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	05-MAY-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	05-MAY-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL		Water						
Batch R5450760								
WG3527021-1 MB								
Phosphorus (P)-Total			<0.050		mg/L		0.05	05-MAY-21
Potassium (K)-Total			<0.050		mg/L		0.05	05-MAY-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	05-MAY-21
Silicon (Si)-Total			<0.050		mg/L		0.05	05-MAY-21
Silver (Ag)-Total			<0.000010		mg/L		0.00001	05-MAY-21
Sodium (Na)-Total			<0.050		mg/L		0.05	05-MAY-21
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	05-MAY-21
Sulfur (S)-Total			<0.50		mg/L		0.5	05-MAY-21
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	05-MAY-21
Tin (Sn)-Total			<0.00010		mg/L		0.0001	05-MAY-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	05-MAY-21
Uranium (U)-Total			<0.000010		mg/L		0.00001	05-MAY-21
Vanadium (V)-Total			<0.00050		mg/L		0.0005	05-MAY-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	05-MAY-21
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	05-MAY-21
NO2-L-IC-N-CL		Water						
Batch R5443764								
WG3527135-3 DUP		L2581851-1						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	29-APR-21
WG3527135-2 LCS								
Nitrite (as N)			99.9		%		90-110	29-APR-21
WG3527135-6 LCS								
Nitrite (as N)			105.1		%		90-110	29-APR-21
WG3527135-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	29-APR-21
WG3527135-5 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	29-APR-21
WG3527135-4 MS		L2581851-1						
Nitrite (as N)			104.7		%		75-125	29-APR-21
NO3-L-IC-N-CL		Water						
Batch R5443764								
WG3527135-3 DUP		L2581851-1						
Nitrate (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	29-APR-21
WG3527135-2 LCS								
Nitrate (as N)			98.8		%		90-110	29-APR-21
WG3527135-6 LCS								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-L-IC-N-CL	Water							
Batch	R5443764							
WG3527135-5 MB								
Sulfate (SO4)			<0.050		mg/L		0.05	29-APR-21
WG3527135-4 MS		L2581851-1						
Sulfate (SO4)			101.2		%		75-125	29-APR-21
TSS-L-CL	Water							
Batch	R5447581							
WG3528101-2 LCS								
Total Suspended Solids			89.0		%		85-115	03-MAY-21
WG3528101-1 MB								
Total Suspended Solids			<1.0		mg/L		1	03-MAY-21
TURBIDITY-CL	Water							
Batch	R5444060							
WG3527067-2 LCS								
Turbidity			99.5		%		85-115	30-APR-21
WG3527067-5 LCS								
Turbidity			99.0		%		85-115	30-APR-21
WG3527067-1 MB								
Turbidity			<0.10		NTU		0.1	30-APR-21
WG3527067-4 MB								
Turbidity			<0.10		NTU		0.1	30-APR-21
VH-HS-FID-CL	Water							
Batch	R5452338							
WG3530035-2 LCS								
Volatile Hydrocarbons (VH6-10)			110.7		%		70-130	04-MAY-21
WG3530035-1 MB								
Volatile Hydrocarbons (VH6-10)			<0.10		mg/L		0.1	04-MAY-21
Surrogate: 3,4-Dichlorotoluene			86.3		%		70-130	04-MAY-21

Quality Control Report

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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.

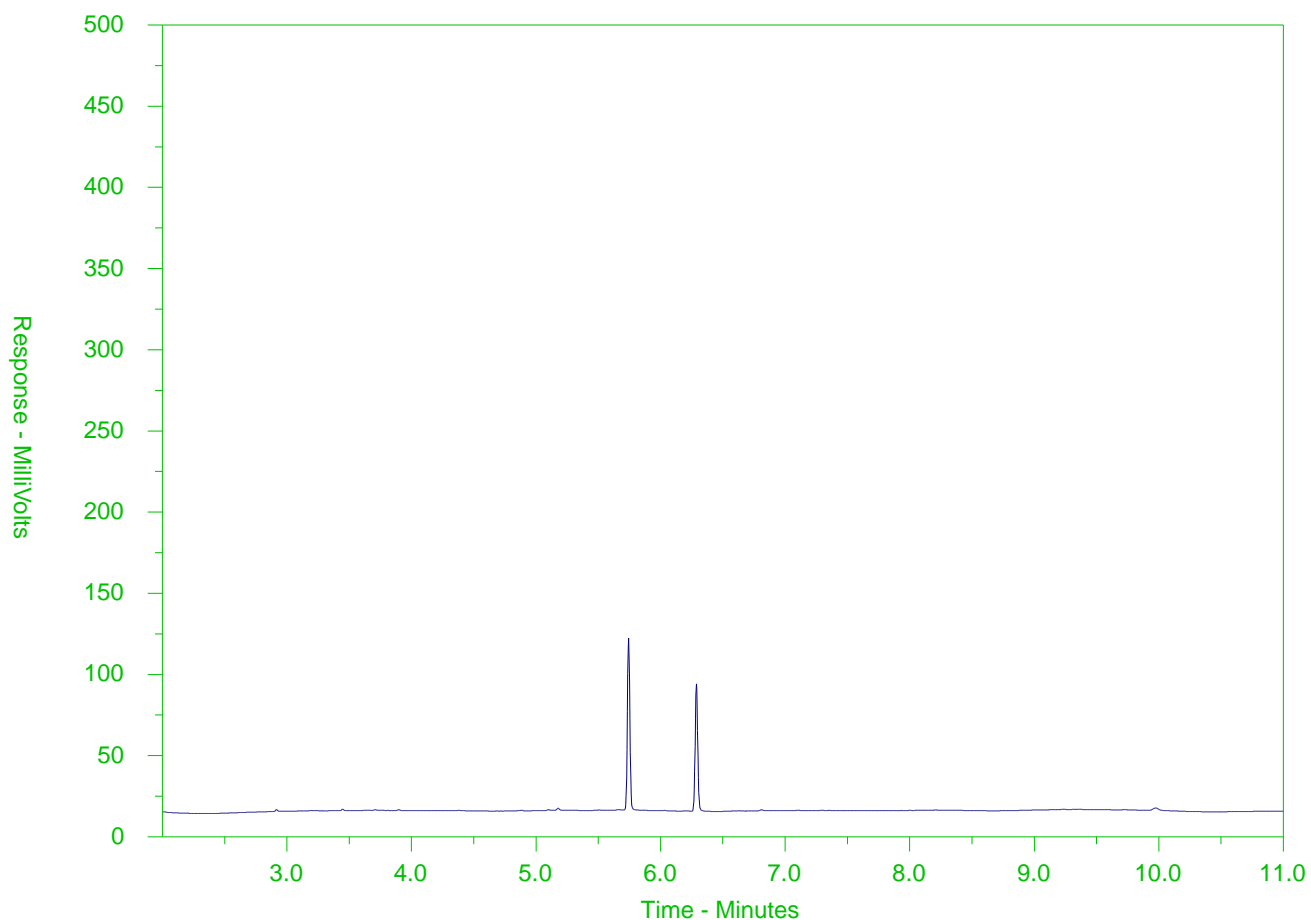
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where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

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2581851-1
Client Sample ID: E238207



← EPH10-19 →		← EPH19-32 →	
nC10	nC19	nC32	
174°C	330°C	467°C	
346°F	626°F	873°F	
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

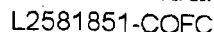
The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.



COC Number: 20 -

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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form I EGBLY. 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.

AUG 2020 FRSN



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

Date Received: 30-JUL-21
Report Date: 11-AUG-21 15:03 (MT)
Version: FINAL

Client Phone: 604-986-7723

Certificate of Analysis

Lab Work Order #: L2621308
Project P.O. #: NOT SUBMITTED
Job Reference: 20050 CENTRAL SUBREGION
C of C Numbers:
Legal Site Desc:

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

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298
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ALS ENVIRONMENTAL ANALYTICAL REPORT

11-AUG-21 15:03 (MT)

Version: FINAL

Sample ID Description Sampled Date Sampled Time Client ID		L2621308-1 Groundwater 28-JUL-21 12:00 E238207	L2621308-2 Groundwater 28-JUL-21 12:00 E238208	L2621308-3 Groundwater 28-JUL-21 12:00 E241355	L2621308-4 Groundwater 28-JUL-21 12:00 E206316	L2621308-5 Groundwater 28-JUL-21 12:00 E202404
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO ₃) (mg/L)	215	9.95	316	660 ^{HTC}	246 ^{HTC}
	Temperature (Degree C)	20.2	20.1	20.2	20.2	20.2
	Total Suspended Solids (mg/L)	135	4.8	26.6	2.9	<1.0
	Turbidity (NTU)	261	9.00	10.4	25.2	1.02
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)	285	179	321	412	236
	Bicarbonate (HCO ₃) (mg/L)	328	133	392	480	288
	Carbonate (CO ₃) (mg/L)	9.8	42.1	<5.0	11.3	<5.0
	Chloride (Cl) (mg/L)	3.46	7.38	5.03	5.30	4.89
	Conductivity (EC) (uS/cm)	471	381	620	1110	644
	Fluoride (F) (mg/L)	0.029	0.595	0.041	<0.10 ^{DLDS}	0.248
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0137	0.122	<0.025 ^{DLDS}	0.0582
	Nitrate (as N) (mg/L)	<0.0050	0.0094	0.122	<0.025 ^{DLDS}	0.0482
	Nitrite (as N) (mg/L)	<0.0010	0.0043	<0.0010	<0.0050 ^{DLDS}	0.0100
	pH (pH)	8.45	9.53	8.30	8.39	8.27
	Phosphorus (P)-Total (mg/L)	0.0320	0.0401	0.0374	0.0106	<0.0020
	Sulfate (SO ₄) (mg/L)	18.4	16.4	56.6	283	126
					0.0117	0.0031
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)				<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)				0.00559	0.00182
	Barium (Ba)-Total (mg/L)				0.0140	0.0279
	Beryllium (Be)-Total (mg/L)				<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)				<0.000050	<0.000050
	Boron (B)-Total (mg/L)				0.168	0.107
	Cadmium (Cd)-Total (mg/L)				0.0000089	0.0000076
	Calcium (Ca)-Total (mg/L)				56.5	30.1
	Chromium (Cr)-Total (mg/L)				0.00011	<0.00010
	Cobalt (Co)-Total (mg/L)				<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)				0.0863	0.00085
	Iron (Fe)-Total (mg/L)				2.69	0.113
	Lead (Pb)-Total (mg/L)				0.00474	0.000077
	Lithium (Li)-Total (mg/L)				0.0148	0.0056
	Magnesium (Mg)-Total (mg/L)				126	41.5
	Manganese (Mn)-Total (mg/L)				0.0519	0.0686
	Mercury (Hg)-Total (mg/L)				<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)				0.00157	0.00459
	Nickel (Ni)-Total (mg/L)				0.0303	<0.00050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2621308-1 Groundwater 28-JUL-21 12:00 E238207	L2621308-2 Groundwater 28-JUL-21 12:00 E238208	L2621308-3 Groundwater 28-JUL-21 12:00 E241355	L2621308-4 Groundwater 28-JUL-21 12:00 E206316	L2621308-5 Groundwater 28-JUL-21 12:00 E202404
Grouping	Analyte					
WATER						
Total Metals	Phosphorus (P)-Total (mg/L)				<0.050	<0.050
	Potassium (K)-Total (mg/L)				3.24	1.63
	Selenium (Se)-Total (mg/L)				<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)				7.10	5.46
	Silver (Ag)-Total (mg/L)				0.000019	<0.000010
	Sodium (Na)-Total (mg/L)				48.4	66.0
	Strontium (Sr)-Total (mg/L)				1.39	0.541
	Sulfur (S)-Total (mg/L)				87.3	47.9
	Thallium (Tl)-Total (mg/L)				<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)				0.00037	<0.00010
	Titanium (Ti)-Total (mg/L)				0.00031	<0.00030
	Uranium (U)-Total (mg/L)				0.00447	0.00177
	Vanadium (V)-Total (mg/L)				0.00054	0.00093
	Zinc (Zn)-Total (mg/L)				0.0708	0.0299
	Zirconium (Zr)-Total (mg/L)				<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0019	0.0019	0.0014		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	<0.00010	0.00011	0.00057		
	Barium (Ba)-Dissolved (mg/L)	0.00255	0.0124	0.0632		
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	0.018	0.043	0.018		
	Cadmium (Cd)-Dissolved (mg/L)	0.0000051	<0.0000050	0.0000284		
	Calcium (Ca)-Dissolved (mg/L)	6.75	1.21	41.7		
	Chromium (Cr)-Dissolved (mg/L)	0.00030	0.00067	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)	0.00012	<0.00010	<0.00010		
	Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00024	0.00095		
	Iron (Fe)-Dissolved (mg/L)	0.036	0.012	<0.010		
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	0.0095	0.0038	0.0094		
	Magnesium (Mg)-Dissolved (mg/L)	48.2	1.68	51.4		
	Manganese (Mn)-Dissolved (mg/L)	0.0171	0.00303	0.0353		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	0.00661	0.00781	0.00313		
	Nickel (Ni)-Dissolved (mg/L)	0.00474	0.00062	<0.00050		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2621308-1 Groundwater 28-JUL-21 12:00 E238207	L2621308-2 Groundwater 28-JUL-21 12:00 E238208	L2621308-3 Groundwater 28-JUL-21 12:00 E241355	L2621308-4 Groundwater 28-JUL-21 12:00 E206316	L2621308-5 Groundwater 28-JUL-21 12:00 E202404
Grouping	Analyte					
WATER						
Dissolved Metals	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	3.07	0.44	3.03		
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Silicon (Si)-Dissolved (mg/L)	0.898	0.225	6.08		
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	30.6	90.2	21.6		
	Strontium (Sr)-Dissolved (mg/L)	0.0591	0.0931	0.557		
	Sulfur (S)-Dissolved (mg/L)	8.51	6.44	21.9		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000027		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00011		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Uranium (U)-Dissolved (mg/L)	0.000158	<0.000010	0.00917		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0036		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
Aggregate Organics	Biochemical Oxygen Demand (mg/L)	<2.0 ^{PHA}	<2.0 ^{PHA}	<2.0	<2.0	<2.0
	Chemical Oxygen Demand (mg/L)	<10	<10	12	<10	<10

* 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)
Qualifiers for Individual Parameters Listed:			
Qualifier	Description		
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.		
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).		
PHA	pH Adjusted Before 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.			
BOD-BC-CL	Water	Biochemical Oxygen Demand (BOD)	APHA 5210 B-5 day Incub.-O2 electrode
This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
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.			
COD-T-COL-CL	Water	Chemical Oxygen Demand (COD)	APHA 5220 D Colorimetry
Samples are analyzed using the closed reflux colourimetric method			
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.			
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
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.			
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.			

Reference Information

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.

TEMP-CL Water Temperature APHA 2550-Thermometer

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.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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

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

Laboratory Definition Code	Laboratory Location
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 ww - 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: L2621308

Report Date: 11-AUG-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-L-IC-CL								
Water								
Batch	R5544557							
WG3590662-2	LCS							
Fluoride (F)			94.0		%		85-115	31-JUL-21
WG3590662-6	LCS							
Fluoride (F)			91.8		%		85-115	31-JUL-21
WG3590662-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	31-JUL-21
WG3590662-5	MB							
Fluoride (F)			<0.020		mg/L		0.02	31-JUL-21
HG-D-CVAA-CL								
Water								
Batch	R5546057							
WG3592354-6	LCS							
Mercury (Hg)-Dissolved			89.1		%		80-120	07-AUG-21
WG3592354-5	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	07-AUG-21
HG-T-CVAA-CL								
Water								
Batch	R5546057							
WG3592358-6	LCS							
Mercury (Hg)-Total			107.0		%		80-120	07-AUG-21
WG3592358-5	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	07-AUG-21
MET-D-CCMS-CL								
Water								
Batch	R5546923							
WG3593345-2	LCS	TMRM						
Aluminum (Al)-Dissolved			100.2		%		80-120	09-AUG-21
Antimony (Sb)-Dissolved			99.6		%		80-120	09-AUG-21
Arsenic (As)-Dissolved			99.4		%		80-120	09-AUG-21
Barium (Ba)-Dissolved			104.2		%		80-120	09-AUG-21
Bismuth (Bi)-Dissolved			100.6		%		80-120	09-AUG-21
Boron (B)-Dissolved			91.4		%		80-120	09-AUG-21
Cadmium (Cd)-Dissolved			97.1		%		80-120	09-AUG-21
Calcium (Ca)-Dissolved			97.5		%		80-120	09-AUG-21
Chromium (Cr)-Dissolved			98.8		%		80-120	09-AUG-21
Cobalt (Co)-Dissolved			97.8		%		80-120	09-AUG-21
Copper (Cu)-Dissolved			95.4		%		80-120	09-AUG-21
Iron (Fe)-Dissolved			101.7		%		80-120	09-AUG-21
Lead (Pb)-Dissolved			99.4		%		80-120	09-AUG-21

Quality Control Report

Workorder: L2621308

Report Date: 11-AUG-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL		Water						
Batch	R5546923							
WG3593345-2	LCS	TMRM						
Lithium (Li)-Dissolved			99.8		%		80-120	09-AUG-21
Magnesium (Mg)-Dissolved			99.1		%		80-120	09-AUG-21
Manganese (Mn)-Dissolved			98.6		%		80-120	09-AUG-21
Molybdenum (Mo)-Dissolved			103.8		%		80-120	09-AUG-21
Nickel (Ni)-Dissolved			96.7		%		80-120	09-AUG-21
Phosphorus (P)-Dissolved			102.6		%		70-130	09-AUG-21
Potassium (K)-Dissolved			98.2		%		80-120	09-AUG-21
Selenium (Se)-Dissolved			95.9		%		80-120	09-AUG-21
Silicon (Si)-Dissolved			102.1		%		60-140	09-AUG-21
Silver (Ag)-Dissolved			98.5		%		80-120	09-AUG-21
Sodium (Na)-Dissolved			97.9		%		80-120	09-AUG-21
Strontium (Sr)-Dissolved			106.8		%		80-120	09-AUG-21
Sulfur (S)-Dissolved			97.0		%		80-120	09-AUG-21
Thallium (Tl)-Dissolved			99.3		%		80-120	09-AUG-21
Tin (Sn)-Dissolved			100.8		%		80-120	09-AUG-21
Titanium (Ti)-Dissolved			95.8		%		80-120	09-AUG-21
Uranium (U)-Dissolved			95.8		%		80-120	09-AUG-21
Vanadium (V)-Dissolved			99.5		%		80-120	09-AUG-21
Zinc (Zn)-Dissolved			97.1		%		80-120	09-AUG-21
Zirconium (Zr)-Dissolved			104.9		%		80-120	09-AUG-21
WG3593345-1	MB							
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	09-AUG-21
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	09-AUG-21
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	09-AUG-21
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	09-AUG-21
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	09-AUG-21
Boron (B)-Dissolved			<0.010		mg/L		0.01	09-AUG-21
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	09-AUG-21
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	09-AUG-21
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	09-AUG-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	09-AUG-21
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	09-AUG-21
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	09-AUG-21
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	09-AUG-21

Quality Control Report

Workorder: L2621308

Report Date: 11-AUG-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL								
Water								
Batch	R5546923							
WG3593345-1	MB							
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	09-AUG-21
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	09-AUG-21
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	09-AUG-21
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	09-AUG-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	09-AUG-21
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	09-AUG-21
Potassium (K)-Dissolved			<0.050		mg/L		0.05	09-AUG-21
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	09-AUG-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	09-AUG-21
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	09-AUG-21
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	09-AUG-21
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	09-AUG-21
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	09-AUG-21
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	09-AUG-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	09-AUG-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	09-AUG-21
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	09-AUG-21
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	09-AUG-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	09-AUG-21
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	09-AUG-21
MET-T-CCMS-CL								
Water								
Batch	R5546923							
WG3590966-2	LCS	TMRM						
Aluminum (Al)-Total			100.9		%		80-120	10-AUG-21
Antimony (Sb)-Total			100.1		%		80-120	10-AUG-21
Arsenic (As)-Total			103.1		%		80-120	10-AUG-21
Barium (Ba)-Total			103.8		%		80-120	10-AUG-21
Bismuth (Bi)-Total			105.1		%		80-120	10-AUG-21
Boron (B)-Total			103.4		%		80-120	10-AUG-21
Cadmium (Cd)-Total			102.1		%		80-120	10-AUG-21
Calcium (Ca)-Total			105.0		%		80-120	10-AUG-21
Chromium (Cr)-Total			104.9		%		80-120	10-AUG-21
Cobalt (Co)-Total			104.4		%		80-120	10-AUG-21
Copper (Cu)-Total			102.1		%		80-120	10-AUG-21

Quality Control Report

Workorder: L2621308

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL		Water						
Batch	R5546923							
WG3590966-2	LCS	TMRM						
Iron (Fe)-Total			108.0		%		80-120	10-AUG-21
Lead (Pb)-Total			105.2		%		80-120	10-AUG-21
Lithium (Li)-Total			106.5		%		80-120	10-AUG-21
Magnesium (Mg)-Total			106.7		%		80-120	10-AUG-21
Manganese (Mn)-Total			104.9		%		80-120	10-AUG-21
Molybdenum (Mo)-Total			104.1		%		80-120	10-AUG-21
Nickel (Ni)-Total			103.6		%		80-120	10-AUG-21
Phosphorus (P)-Total			109.3		%		70-130	10-AUG-21
Potassium (K)-Total			106.0		%		80-120	10-AUG-21
Selenium (Se)-Total			103.0		%		80-120	10-AUG-21
Silicon (Si)-Total			106.6		%		60-140	10-AUG-21
Silver (Ag)-Total			97.4		%		80-120	10-AUG-21
Sodium (Na)-Total			103.8		%		80-120	10-AUG-21
Strontium (Sr)-Total			103.9		%		80-120	10-AUG-21
Sulfur (S)-Total			96.6		%		80-120	10-AUG-21
Thallium (Tl)-Total			104.3		%		80-120	10-AUG-21
Tin (Sn)-Total			106.4		%		80-120	10-AUG-21
Titanium (Ti)-Total			102.2		%		80-120	10-AUG-21
Uranium (U)-Total			99.3		%		80-120	10-AUG-21
Vanadium (V)-Total			101.7		%		80-120	10-AUG-21
Zinc (Zn)-Total			98.1		%		80-120	10-AUG-21
Zirconium (Zr)-Total			103.4		%		80-120	10-AUG-21
WG3590966-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-AUG-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-AUG-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-AUG-21
Barium (Ba)-Total			<0.00010		mg/L		0.0001	10-AUG-21
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	10-AUG-21
Boron (B)-Total			<0.010		mg/L		0.01	10-AUG-21
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	10-AUG-21
Calcium (Ca)-Total			<0.050		mg/L		0.05	10-AUG-21
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-AUG-21
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	10-AUG-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	10-AUG-21



Workorder: L2621308

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NO3-L-IC-N-CL Water

Quality Control Report

Workorder: L2621308

Report Date: 11-AUG-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch	R5544557							
WG3590662-2	LCS							
Nitrate (as N)			98.7		%		90-110	31-JUL-21
WG3590662-6	LCS							
Nitrate (as N)			99.4		%		90-110	31-JUL-21
WG3590662-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	31-JUL-21
WG3590662-5	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	31-JUL-21
P-T-L-COL-CL	Water							
Batch	R5545601							
WG3591896-6	LCS							
Phosphorus (P)-Total			104.8		%		80-120	06-AUG-21
WG3591896-5	MB							
Phosphorus (P)-Total			<0.0020		mg/L		0.002	06-AUG-21
PH/EC/ALK-CL	Water							
Batch	R5546843							
WG3593251-5	LCS							
Conductivity (EC)			102.2		%		90-110	07-AUG-21
Alkalinity, Total (as CaCO3)			103.6		%		85-115	07-AUG-21
WG3593251-4	MB							
Conductivity (EC)			<2.0		uS/cm		2	07-AUG-21
Bicarbonate (HCO3)			<5.0		mg/L		5	07-AUG-21
Carbonate (CO3)			<5.0		mg/L		5	07-AUG-21
Hydroxide (OH)			<5.0		mg/L		5	07-AUG-21
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	07-AUG-21
SO4-L-IC-N-CL	Water							
Batch	R5544557							
WG3590662-2	LCS							
Sulfate (SO4)			99.3		%		85-115	31-JUL-21
WG3590662-6	LCS							
Sulfate (SO4)			98.6		%		85-115	31-JUL-21
WG3590662-1	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	31-JUL-21
WG3590662-5	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	31-JUL-21
TSS-L-CL	Water							

Quality Control Report

Workorder: L2621308

Report Date: 11-AUG-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-L-CL	Water							
Batch	R5544649							
WG3588650-2	LCS							
Total Suspended Solids			97.2		%		85-115	03-AUG-21
WG3588650-1	MB							
Total Suspended Solids			<1.0		mg/L		1	03-AUG-21
TURBIDITY-CL	Water							
Batch	R5537176							
WG3588163-3	DUP	L2621308-1						
Turbidity		261	267		NTU	2.3	15	31-JUL-21
WG3588163-2	LCS							
Turbidity			96.0		%		85-115	31-JUL-21
WG3588163-1	MB							
Turbidity			<0.10		NTU		0.1	31-JUL-21

Quality Control Report

Workorder: L2621308

Report Date: 11-AUG-21

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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
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

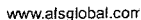
Hold Time Exceedances:

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.



COC Number: 20 -

Canada Toll Free: 1 800 668 9878

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[illegible]

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

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

AUG 30 2011 FROM



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

Date Received: 09-NOV-21
Report Date: 16-NOV-21 10:35 (MT)
Version: FINAL

Client Phone: 604-986-7723

Certificate of Analysis

Lab Work Order #: L2660638
Project P.O. #: NOT SUBMITTED
Job Reference: 20050 CENTRAL SUBREGION
C of C Numbers:
Legal Site Desc:

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

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

16-NOV-21 10:35 (MT)

Version: FINAL

Sample ID Description Sampled Date Sampled Time Client ID		L2660638-1 GW 06-NOV-21 E238207	L2660638-2 GW 06-NOV-21 E238208	L2660638-3 GW 06-NOV-21 E241355	L2660638-4 GW 06-NOV-21 E206316	
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO ₃) (mg/L)	208	9.76	308	590 ^{HTC}	
	Temperature (Degree C)	20.2	20.1	20.1	20.1	
	Total Suspended Solids (mg/L)	15.1	9.0	10.9	1.6	
	Turbidity (NTU)	29.9	15.3	9.87	8.10	
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)	282	188	340	431	
	Bicarbonate (HCO ₃) (mg/L)	260	81.7	340	431	
	Carbonate (CO ₃) (mg/L)	22.6	106	<5.0	<5.0	
	Chloride (Cl) (mg/L)	3.72	7.44	5.08	4.82	
	Conductivity (EC) (uS/cm)	476	411	648	1130	
	Fluoride (F) (mg/L)	0.072	0.499	0.124	0.12	
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0136	0.0386	<0.025 ^{DLDS}	
	Nitrate (as N) (mg/L)	<0.0050	0.0136	0.0204	<0.025 ^{DLDS}	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0182	<0.0050	
	pH (pH)	8.62	9.92	8.00	8.20	
	Phosphorus (P)-Total (mg/L)	0.0034	0.0484	0.0265	0.0035	
	Sulfate (SO ₄) (mg/L)	19.6	18.4	60.8	290	
Total Metals	Aluminum (Al)-Total (mg/L)				<0.0030	
	Antimony (Sb)-Total (mg/L)				<0.00010	
	Arsenic (As)-Total (mg/L)				0.00463	
	Barium (Ba)-Total (mg/L)				0.00969	
	Beryllium (Be)-Total (mg/L)				<0.000020	
	Bismuth (Bi)-Total (mg/L)				<0.000050	
	Boron (B)-Total (mg/L)				0.132	
	Cadmium (Cd)-Total (mg/L)				<0.0000050	
	Calcium (Ca)-Total (mg/L)				41.0	
	Chromium (Cr)-Total (mg/L)				<0.00010	
	Cobalt (Co)-Total (mg/L)				<0.00010	
	Copper (Cu)-Total (mg/L)				0.0142	
	Iron (Fe)-Total (mg/L)				1.54	
	Lead (Pb)-Total (mg/L)				0.000745	
	Lithium (Li)-Total (mg/L)				0.0166	
	Magnesium (Mg)-Total (mg/L)				118	
	Manganese (Mn)-Total (mg/L)				0.0638	
	Mercury (Hg)-Total (mg/L)				<0.0000050	
	Molybdenum (Mo)-Total (mg/L)				0.00108	
	Nickel (Ni)-Total (mg/L)				0.00368	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L2660638-1 GW 06-NOV-21 E238207	L2660638-2 GW 06-NOV-21 E238208	L2660638-3 GW 06-NOV-21 E241355	L2660638-4 GW 06-NOV-21 E206316	
Grouping	Analyte						
WATER							
Total Metals	Phosphorus (P)-Total (mg/L)					<0.050	
	Potassium (K)-Total (mg/L)					2.92	
	Selenium (Se)-Total (mg/L)					<0.000050	
	Silicon (Si)-Total (mg/L)					6.24	
	Silver (Ag)-Total (mg/L)					<0.000010	
	Sodium (Na)-Total (mg/L)					41.9	
	Strontium (Sr)-Total (mg/L)					0.971	
	Sulfur (S)-Total (mg/L)					103	
	Thallium (Tl)-Total (mg/L)					<0.000010	
	Tin (Sn)-Total (mg/L)					<0.00010	
	Titanium (Ti)-Total (mg/L)					<0.00030	
	Uranium (U)-Total (mg/L)					0.00307	
	Vanadium (V)-Total (mg/L)					<0.00050	
	Zinc (Zn)-Total (mg/L)					0.0466	
	Zirconium (Zr)-Total (mg/L)					<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	0.0017	0.0028			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	<0.00010	0.00100	0.00074			
	Barium (Ba)-Dissolved (mg/L)	0.00097	0.0120	0.0549			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	0.017	0.044	0.018			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	0.0000242			
	Calcium (Ca)-Dissolved (mg/L)	6.09	1.28	40.9			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	0.00021			
	Copper (Cu)-Dissolved (mg/L)	0.00027	0.00026	0.00668			
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.019	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000073			
	Lithium (Li)-Dissolved (mg/L)	0.0095	0.0037	0.0093			
	Magnesium (Mg)-Dissolved (mg/L)	46.7	1.59	49.9			
	Manganese (Mn)-Dissolved (mg/L)	0.0142	0.00269	0.0678			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.00318	0.00705	0.00308			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2660638-1 GW 06-NOV-21 E238207	L2660638-2 GW 06-NOV-21 E238208	L2660638-3 GW 06-NOV-21 E241355	L2660638-4 GW 06-NOV-21 E206316	
Grouping	Analyte					
WATER						
Dissolved Metals	Phosphorus (P)-Dissolved (mg/L)	<0.050	0.054	<0.050		
	Potassium (K)-Dissolved (mg/L)	3.04	0.43	3.01		
	Selenium (Se)-Dissolved (mg/L)	<0.000050	0.000059	<0.000050		
	Silicon (Si)-Dissolved (mg/L)	0.456	0.219	5.93		
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	30.7	87.4	21.3		
	Strontium (Sr)-Dissolved (mg/L)	0.0514	0.0894	0.522		
	Sulfur (S)-Dissolved (mg/L)	7.92	6.29	21.8		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000016		
	Tin (Sn)-Dissolved (mg/L)	0.00015	<0.00010	0.00026		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Uranium (U)-Dissolved (mg/L)	0.000502	<0.000010	0.00813		
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0101		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030 ^{PHA}	<0.00030		
Aggregate Organics	Biochemical Oxygen Demand (mg/L)	<2.0	<2.0 ^{PHA}	<2.0	<2.0	
	Chemical Oxygen Demand (mg/L)	<10	<10	<10	<10	

* 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	Chemical Oxygen Demand	MS-B	L2660638-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2660638-1, -2, -3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2660638-1, -2, -3
Matrix Spike	Calcium (Ca)-Total	MS-B	L2660638-4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2660638-4
Matrix Spike	Sodium (Na)-Total	MS-B	L2660638-4
Matrix Spike	Strontium (Sr)-Total	MS-B	L2660638-4
Matrix Spike	Sulfate (SO4)	MS-B	L2660638-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
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.
PHA	pH Adjusted Before 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.			
BOD-BC-CL	Water	Biochemical Oxygen Demand (BOD)	APHA 5210 B-5 day Incub.-O2 electrode
This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
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.			
COD-T-COL-CL	Water	Chemical Oxygen Demand (COD)	APHA 5220 D Colorimetry
Samples are analyzed using the closed reflux colourimetric method			
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.			
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.			

Reference Information

N2N3-CALC-CL	Water	Nitrate+Nitrite	CALCULATION
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.			
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			
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.			
TEMP-CL	Water	Temperature	APHA 2550-Thermometer
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.			
TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

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

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

Laboratory Definition Code	Laboratory Location
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 ww - 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: L2660638

Report Date: 16-NOV-21

Page 2 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-L-IC-CL	Water							
Batch R5643976								
WG3657216-2 LCS								
Fluoride (F)			101.8		%		85-115	09-NOV-21
WG3657216-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	09-NOV-21
HG-D-CVAA-CL	Water							
Batch R5640916								
WG3656315-6 LCS								
Mercury (Hg)-Dissolved			103.0		%		80-120	10-NOV-21
WG3656315-5 MB								
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	10-NOV-21
HG-T-CVAA-CL	Water							
Batch R5640916								
WG3656318-2 LCS								
Mercury (Hg)-Total			102.0		%		80-120	10-NOV-21
WG3656318-1 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	10-NOV-21
MET-D-CCMS-CL	Water							
Batch R5645697								
WG3657367-3 DUP		L2660638-1						
Aluminum (Al)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	12-NOV-21
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-NOV-21
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-NOV-21
Barium (Ba)-Dissolved		0.00097	0.00096		mg/L	0.9	20	12-NOV-21
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	12-NOV-21
Boron (B)-Dissolved		0.017	0.017		mg/L	2.5	20	12-NOV-21
Cadmium (Cd)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	12-NOV-21
Calcium (Ca)-Dissolved		6.09	6.11		mg/L	0.3	20	12-NOV-21
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-NOV-21
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-NOV-21
Copper (Cu)-Dissolved		0.00027	0.00026		mg/L	4.1	20	12-NOV-21
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	12-NOV-21
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	12-NOV-21
Lithium (Li)-Dissolved		0.0095	0.0094		mg/L	1.0	20	12-NOV-21
Magnesium (Mg)-Dissolved		46.7	46.4		mg/L	0.7	20	12-NOV-21
Manganese (Mn)-Dissolved		0.0142	0.0144		mg/L	1.1	20	12-NOV-21
Molybdenum (Mo)-Dissolved		0.00318	0.00313		mg/L	1.7	20	12-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL		Water						
Batch	R5645697							
WG3657367-3	DUP	L2660638-1						
Nickel (Ni)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	12-NOV-21
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	12-NOV-21
Potassium (K)-Dissolved		3.04	3.08		mg/L	1.0	20	12-NOV-21
Selenium (Se)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	12-NOV-21
Silicon (Si)-Dissolved		0.456	0.461		mg/L	1.1	20	12-NOV-21
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	12-NOV-21
Sodium (Na)-Dissolved		30.7	30.5		mg/L	0.4	20	12-NOV-21
Strontium (Sr)-Dissolved		0.0514	0.0510		mg/L	0.6	20	12-NOV-21
Sulfur (S)-Dissolved		7.92	8.14		mg/L	2.7	20	12-NOV-21
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	12-NOV-21
Tin (Sn)-Dissolved		0.00015	0.00015		mg/L	3.1	20	12-NOV-21
Titanium (Ti)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	12-NOV-21
Uranium (U)-Dissolved		0.000502	0.000499		mg/L	0.8	20	12-NOV-21
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	12-NOV-21
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	12-NOV-21
Zirconium (Zr)-Dissolved		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	12-NOV-21
WG3657367-2	LCS							
Aluminum (Al)-Dissolved			94.5		%		80-120	12-NOV-21
Antimony (Sb)-Dissolved			97.3		%		80-120	12-NOV-21
Arsenic (As)-Dissolved			93.0		%		80-120	12-NOV-21
Barium (Ba)-Dissolved			92.0		%		80-120	12-NOV-21
Bismuth (Bi)-Dissolved			93.9		%		80-120	12-NOV-21
Boron (B)-Dissolved			89.0		%		80-120	12-NOV-21
Cadmium (Cd)-Dissolved			92.0		%		80-120	12-NOV-21
Calcium (Ca)-Dissolved			90.1		%		80-120	12-NOV-21
Chromium (Cr)-Dissolved			92.7		%		80-120	12-NOV-21
Cobalt (Co)-Dissolved			92.8		%		80-120	12-NOV-21
Copper (Cu)-Dissolved			91.2		%		80-120	12-NOV-21
Iron (Fe)-Dissolved			104.9		%		80-120	12-NOV-21
Lead (Pb)-Dissolved			91.7		%		80-120	12-NOV-21
Lithium (Li)-Dissolved			92.8		%		80-120	12-NOV-21
Magnesium (Mg)-Dissolved			93.3		%		80-120	12-NOV-21
Manganese (Mn)-Dissolved			92.8		%		80-120	12-NOV-21
Molybdenum (Mo)-Dissolved			97.6		%		80-120	12-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL		Water						
Batch	R5645697							
WG3657367-2		LCS						
Nickel (Ni)-Dissolved			91.3		%		80-120	12-NOV-21
Phosphorus (P)-Dissolved			96.0		%		70-130	12-NOV-21
Potassium (K)-Dissolved			93.7		%		80-120	12-NOV-21
Selenium (Se)-Dissolved			87.5		%		80-120	12-NOV-21
Silicon (Si)-Dissolved			92.0		%		60-140	12-NOV-21
Silver (Ag)-Dissolved			88.4		%		80-120	12-NOV-21
Sodium (Na)-Dissolved			94.6		%		80-120	12-NOV-21
Strontium (Sr)-Dissolved			94.8		%		80-120	12-NOV-21
Sulfur (S)-Dissolved			91.0		%		80-120	12-NOV-21
Thallium (Tl)-Dissolved			93.9		%		80-120	12-NOV-21
Tin (Sn)-Dissolved			90.3		%		80-120	12-NOV-21
Titanium (Ti)-Dissolved			93.9		%		80-120	12-NOV-21
Uranium (U)-Dissolved			86.3		%		80-120	12-NOV-21
Vanadium (V)-Dissolved			91.6		%		80-120	12-NOV-21
Zinc (Zn)-Dissolved			91.8		%		80-120	12-NOV-21
Zirconium (Zr)-Dissolved			90.1		%		80-120	12-NOV-21
WG3657367-1		MB						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	12-NOV-21
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	12-NOV-21
Boron (B)-Dissolved			<0.010		mg/L		0.01	12-NOV-21
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	12-NOV-21
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	12-NOV-21
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	12-NOV-21
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	12-NOV-21
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	12-NOV-21
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	12-NOV-21
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	12-NOV-21
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	12-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch	R5645697							
WG3657367-1 MB								
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	12-NOV-21
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	12-NOV-21
Potassium (K)-Dissolved			<0.050		mg/L		0.05	12-NOV-21
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	12-NOV-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	12-NOV-21
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	12-NOV-21
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	12-NOV-21
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	12-NOV-21
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	12-NOV-21
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	12-NOV-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	12-NOV-21
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	12-NOV-21
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	12-NOV-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	12-NOV-21
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	12-NOV-21
WG3657367-4 MS		L2660638-1						
Aluminum (Al)-Dissolved			90.2		%		70-130	12-NOV-21
Antimony (Sb)-Dissolved			87.1		%		70-130	12-NOV-21
Arsenic (As)-Dissolved			91.6		%		70-130	12-NOV-21
Barium (Ba)-Dissolved			89.4		%		70-130	12-NOV-21
Bismuth (Bi)-Dissolved			83.4		%		70-130	12-NOV-21
Boron (B)-Dissolved			92.8		%		70-130	12-NOV-21
Cadmium (Cd)-Dissolved			92.5		%		70-130	12-NOV-21
Calcium (Ca)-Dissolved			87.7		%		70-130	12-NOV-21
Chromium (Cr)-Dissolved			91.5		%		70-130	12-NOV-21
Cobalt (Co)-Dissolved			90.8		%		70-130	12-NOV-21
Copper (Cu)-Dissolved			89.6		%		70-130	12-NOV-21
Iron (Fe)-Dissolved			89.0		%		70-130	12-NOV-21
Lead (Pb)-Dissolved			84.1		%		70-130	12-NOV-21
Lithium (Li)-Dissolved			91.4		%		70-130	12-NOV-21
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	12-NOV-21
Manganese (Mn)-Dissolved			92.1		%		70-130	12-NOV-21
Molybdenum (Mo)-Dissolved			92.2		%		70-130	12-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL		Water						
Batch	R5645697							
WG3657367-4 MS		L2660638-1						
Nickel (Ni)-Dissolved			89.6		%		70-130	12-NOV-21
Phosphorus (P)-Dissolved			92.2		%		70-130	12-NOV-21
Potassium (K)-Dissolved			89.0		%		70-130	12-NOV-21
Selenium (Se)-Dissolved			87.7		%		70-130	12-NOV-21
Silicon (Si)-Dissolved			86.1		%		70-130	12-NOV-21
Silver (Ag)-Dissolved			86.6		%		70-130	12-NOV-21
Sodium (Na)-Dissolved			N/A	MS-B	%		-	12-NOV-21
Strontium (Sr)-Dissolved			89.5		%		70-130	12-NOV-21
Thallium (Tl)-Dissolved			82.4		%		70-130	12-NOV-21
Tin (Sn)-Dissolved			86.0		%		70-130	12-NOV-21
Titanium (Ti)-Dissolved			92.9		%		70-130	12-NOV-21
Uranium (U)-Dissolved			83.1		%		70-130	12-NOV-21
Vanadium (V)-Dissolved			88.7		%		70-130	12-NOV-21
Zinc (Zn)-Dissolved			89.9		%		70-130	12-NOV-21
Zirconium (Zr)-Dissolved			90.5		%		70-130	12-NOV-21
MET-T-CCMS-CL		Water						
Batch	R5642878							
WG3655395-3 DUP		L2660638-4						
Aluminum (Al)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	11-NOV-21
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	11-NOV-21
Arsenic (As)-Total		0.00463	0.00470		mg/L	1.5	20	11-NOV-21
Barium (Ba)-Total		0.00969	0.00991		mg/L	2.3	20	11-NOV-21
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	11-NOV-21
Boron (B)-Total		0.132	0.134		mg/L	2.0	20	11-NOV-21
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	11-NOV-21
Calcium (Ca)-Total		41.0	41.6		mg/L	1.4	20	11-NOV-21
Chromium (Cr)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	11-NOV-21
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	11-NOV-21
Copper (Cu)-Total		0.0142	0.0138		mg/L	3.0	20	11-NOV-21
Iron (Fe)-Total		1.54	1.54		mg/L	0.1	20	11-NOV-21
Lead (Pb)-Total		0.000745	0.000748		mg/L	0.3	20	11-NOV-21
Lithium (Li)-Total		0.0166	0.0169		mg/L	1.4	20	11-NOV-21
Magnesium (Mg)-Total		118	121		mg/L	2.3	20	11-NOV-21
Manganese (Mn)-Total		0.0638	0.0651		mg/L	2.1	20	11-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL		Water						
Batch	R5642878							
WG3655395-3	DUP	L2660638-4						
Molybdenum (Mo)-Total		0.00108	0.00107		mg/L	0.2	20	11-NOV-21
Nickel (Ni)-Total		0.00368	0.00383		mg/L	3.8	20	11-NOV-21
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	11-NOV-21
Potassium (K)-Total		2.92	2.96		mg/L	1.5	20	11-NOV-21
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	11-NOV-21
Silicon (Si)-Total		6.24	6.22		mg/L	0.4	20	11-NOV-21
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	11-NOV-21
Sodium (Na)-Total		41.9	42.5		mg/L	1.4	20	11-NOV-21
Strontium (Sr)-Total		0.971	0.983		mg/L	1.2	20	11-NOV-21
Sulfur (S)-Total		103	102		mg/L	1.0	20	11-NOV-21
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	11-NOV-21
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	11-NOV-21
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	11-NOV-21
Uranium (U)-Total		0.00307	0.00310		mg/L	0.8	20	11-NOV-21
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	11-NOV-21
Zinc (Zn)-Total		0.0466	0.0472		mg/L	1.1	20	11-NOV-21
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	11-NOV-21
WG3655395-2	LCS	TMRM						
Aluminum (Al)-Total			93.7		%		80-120	11-NOV-21
Antimony (Sb)-Total			98.0		%		80-120	11-NOV-21
Arsenic (As)-Total			90.8		%		80-120	11-NOV-21
Barium (Ba)-Total			93.5		%		80-120	11-NOV-21
Bismuth (Bi)-Total			92.4		%		80-120	11-NOV-21
Boron (B)-Total			91.4		%		80-120	11-NOV-21
Cadmium (Cd)-Total			91.8		%		80-120	11-NOV-21
Calcium (Ca)-Total			90.7		%		80-120	11-NOV-21
Chromium (Cr)-Total			94.9		%		80-120	11-NOV-21
Cobalt (Co)-Total			93.2		%		80-120	11-NOV-21
Copper (Cu)-Total			91.8		%		80-120	11-NOV-21
Iron (Fe)-Total			104.7		%		80-120	11-NOV-21
Lead (Pb)-Total			93.4		%		80-120	11-NOV-21
Lithium (Li)-Total			93.1		%		80-120	11-NOV-21
Magnesium (Mg)-Total			94.0		%		80-120	11-NOV-21
Manganese (Mn)-Total			94.4		%		80-120	11-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	Water							
Batch	R5642878							
WG3655395-2 LCS		TMRM						
Molybdenum (Mo)-Total			97.0		%		80-120	11-NOV-21
Nickel (Ni)-Total			90.8		%		80-120	11-NOV-21
Phosphorus (P)-Total			99.8		%		70-130	11-NOV-21
Potassium (K)-Total			96.1		%		80-120	11-NOV-21
Selenium (Se)-Total			89.0		%		80-120	11-NOV-21
Silicon (Si)-Total			92.6		%		60-140	11-NOV-21
Silver (Ag)-Total			89.1		%		80-120	11-NOV-21
Sodium (Na)-Total			94.4		%		80-120	11-NOV-21
Strontium (Sr)-Total			96.0		%		80-120	11-NOV-21
Sulfur (S)-Total			89.4		%		80-120	11-NOV-21
Thallium (Tl)-Total			93.6		%		80-120	11-NOV-21
Tin (Sn)-Total			94.4		%		80-120	11-NOV-21
Titanium (Ti)-Total			93.7		%		80-120	11-NOV-21
Uranium (U)-Total			85.8		%		80-120	11-NOV-21
Vanadium (V)-Total			93.9		%		80-120	11-NOV-21
Zinc (Zn)-Total			92.0		%		80-120	11-NOV-21
Zirconium (Zr)-Total			91.1		%		80-120	11-NOV-21
WG3655395-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	11-NOV-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	11-NOV-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	11-NOV-21
Barium (Ba)-Total			<0.00010		mg/L		0.0001	11-NOV-21
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	11-NOV-21
Boron (B)-Total			<0.010		mg/L		0.01	11-NOV-21
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	11-NOV-21
Calcium (Ca)-Total			<0.050		mg/L		0.05	11-NOV-21
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	11-NOV-21
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	11-NOV-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	11-NOV-21
Iron (Fe)-Total			<0.010		mg/L		0.01	11-NOV-21
Lead (Pb)-Total			<0.000050		mg/L		0.00005	11-NOV-21
Lithium (Li)-Total			<0.0010		mg/L		0.001	11-NOV-21
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	11-NOV-21
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	11-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	Water							
Batch	R5642878							
WG3655395-1 MB								
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	11-NOV-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	11-NOV-21
Phosphorus (P)-Total			<0.050		mg/L		0.05	11-NOV-21
Potassium (K)-Total			<0.050		mg/L		0.05	11-NOV-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	11-NOV-21
Silicon (Si)-Total			<0.050		mg/L		0.05	11-NOV-21
Silver (Ag)-Total			<0.000010		mg/L		0.00001	11-NOV-21
Sodium (Na)-Total			<0.050		mg/L		0.05	11-NOV-21
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	11-NOV-21
Sulfur (S)-Total			<0.50		mg/L		0.5	11-NOV-21
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	11-NOV-21
Tin (Sn)-Total			<0.00010		mg/L		0.0001	11-NOV-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	11-NOV-21
Uranium (U)-Total			<0.000010		mg/L		0.00001	11-NOV-21
Vanadium (V)-Total			<0.00050		mg/L		0.0005	11-NOV-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	11-NOV-21
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	11-NOV-21
WG3655395-4 MS		L2660638-4						
Aluminum (Al)-Total			96.1		%		70-130	11-NOV-21
Antimony (Sb)-Total			97.5		%		70-130	11-NOV-21
Arsenic (As)-Total			93.0		%		70-130	11-NOV-21
Barium (Ba)-Total			98.4		%		70-130	11-NOV-21
Bismuth (Bi)-Total			88.0		%		70-130	11-NOV-21
Boron (B)-Total			100.9		%		70-130	11-NOV-21
Cadmium (Cd)-Total			95.0		%		70-130	11-NOV-21
Calcium (Ca)-Total			N/A	MS-B	%		-	11-NOV-21
Chromium (Cr)-Total			96.2		%		70-130	11-NOV-21
Cobalt (Co)-Total			94.8		%		70-130	11-NOV-21
Copper (Cu)-Total			94.8		%		70-130	11-NOV-21
Iron (Fe)-Total			94.5		%		70-130	11-NOV-21
Lead (Pb)-Total			93.1		%		70-130	11-NOV-21
Lithium (Li)-Total			96.9		%		70-130	11-NOV-21
Magnesium (Mg)-Total			N/A	MS-B	%		-	11-NOV-21
Manganese (Mn)-Total			96.2		%		70-130	11-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	Water							
Batch	R5642878							
WG3655395-4 MS		L2660638-4						
Molybdenum (Mo)-Total			101.8		%		70-130	11-NOV-21
Nickel (Ni)-Total			93.2		%		70-130	11-NOV-21
Phosphorus (P)-Total			100.4		%		70-130	11-NOV-21
Potassium (K)-Total			99.3		%		70-130	11-NOV-21
Selenium (Se)-Total			92.9		%		70-130	11-NOV-21
Silicon (Si)-Total			91.9		%		70-130	11-NOV-21
Silver (Ag)-Total			94.1		%		70-130	11-NOV-21
Sodium (Na)-Total			N/A	MS-B	%		-	11-NOV-21
Strontium (Sr)-Total			N/A	MS-B	%		-	11-NOV-21
Thallium (Tl)-Total			87.8		%		70-130	11-NOV-21
Tin (Sn)-Total			94.3		%		70-130	11-NOV-21
Titanium (Ti)-Total			95.3		%		70-130	11-NOV-21
Uranium (U)-Total			87.8		%		70-130	11-NOV-21
Vanadium (V)-Total			96.7		%		70-130	11-NOV-21
Zinc (Zn)-Total			99.0		%		70-130	11-NOV-21
Zirconium (Zr)-Total			102.5		%		70-130	11-NOV-21
NO2-L-IC-N-CL	Water							
Batch	R5643976							
WG3657216-2 LCS								
Nitrite (as N)			103.3		%		90-110	09-NOV-21
WG3657216-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	09-NOV-21
NO3-L-IC-N-CL	Water							
Batch	R5643976							
WG3657216-2 LCS								
Nitrate (as N)			100.7		%		90-110	09-NOV-21
WG3657216-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	09-NOV-21
P-T-L-COL-CL	Water							
Batch	R5644781							
WG3657498-2 LCS								
Phosphorus (P)-Total			97.8		%		80-120	12-NOV-21
WG3657498-1 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	12-NOV-21
PH/EC/ALK-CL	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL		Water						
Batch	R5640257							
WG3656088-3	DUP	L2660638-1						
Turbidity		29.9	30.2		NTU	0.9	15	10-NOV-21
WG3656088-2	LCS							
Turbidity			92.0		%		85-115	10-NOV-21
WG3656088-1	MB							
Turbidity			<0.10		NTU		0.1	10-NOV-21

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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.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity	1	06-NOV-21	10-NOV-21 12:45	3	4	days	EHTL
	2	06-NOV-21	10-NOV-21 12:45	3	4	days	EHTL
	3	06-NOV-21	10-NOV-21 12:45	3	4	days	EHTL
	4	06-NOV-21	10-NOV-21 12:45	3	4	days	EHTL

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

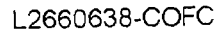
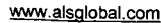
Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2660638 were received on 09-NOV-21 09:12.

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.



COC Number: 20 -

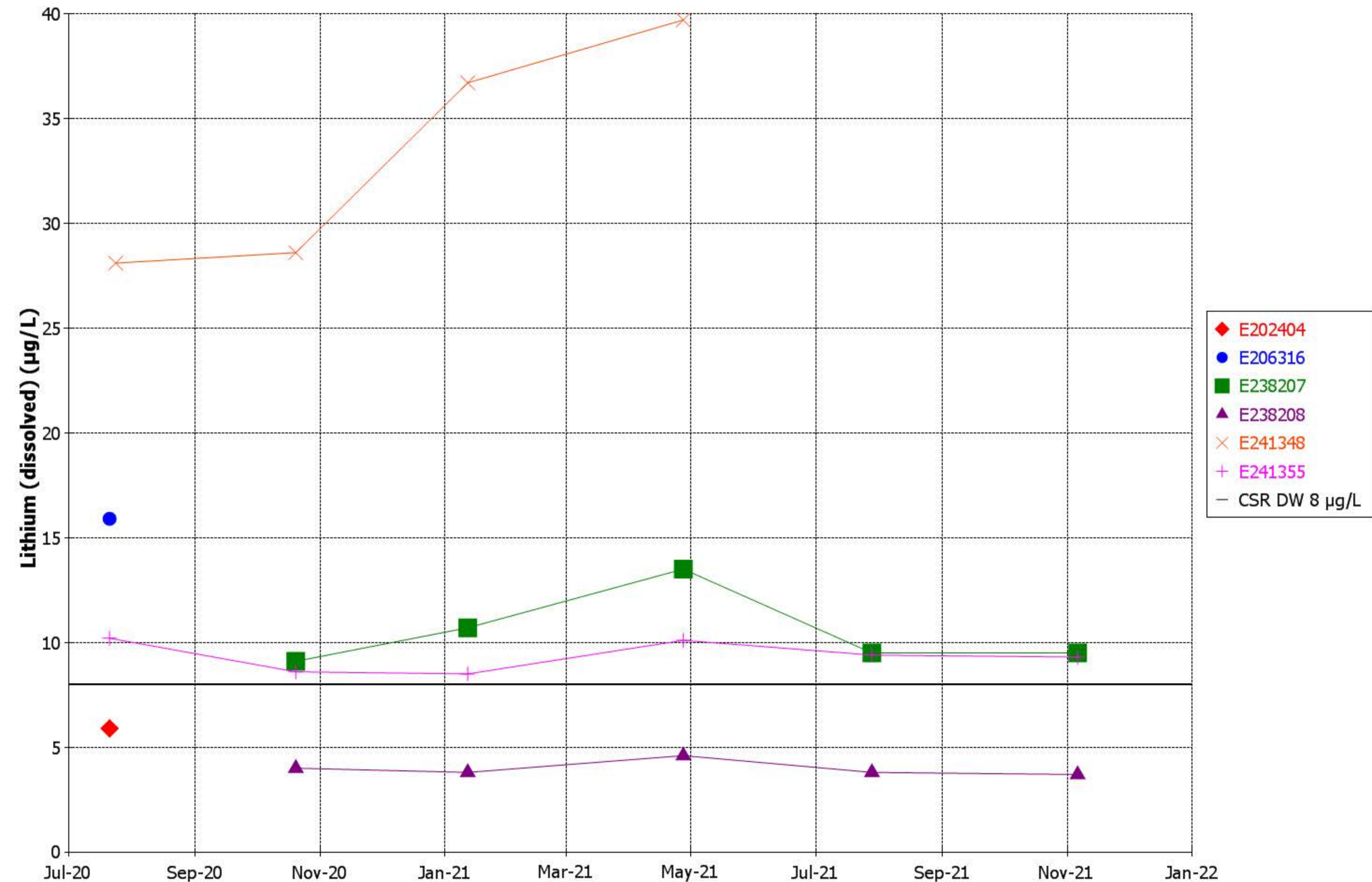
Page of

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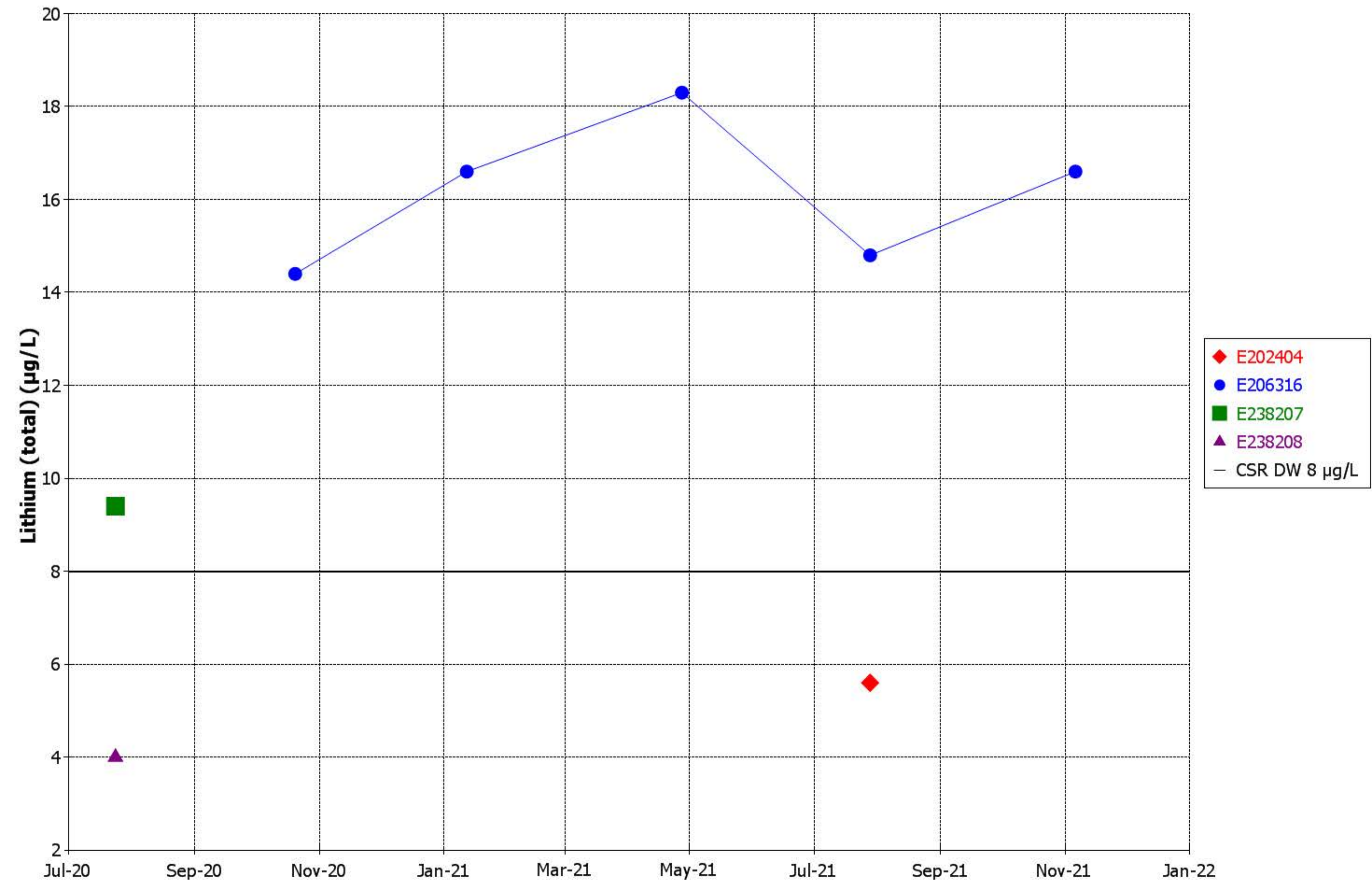
1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

APPENDIX D
Trending Figures

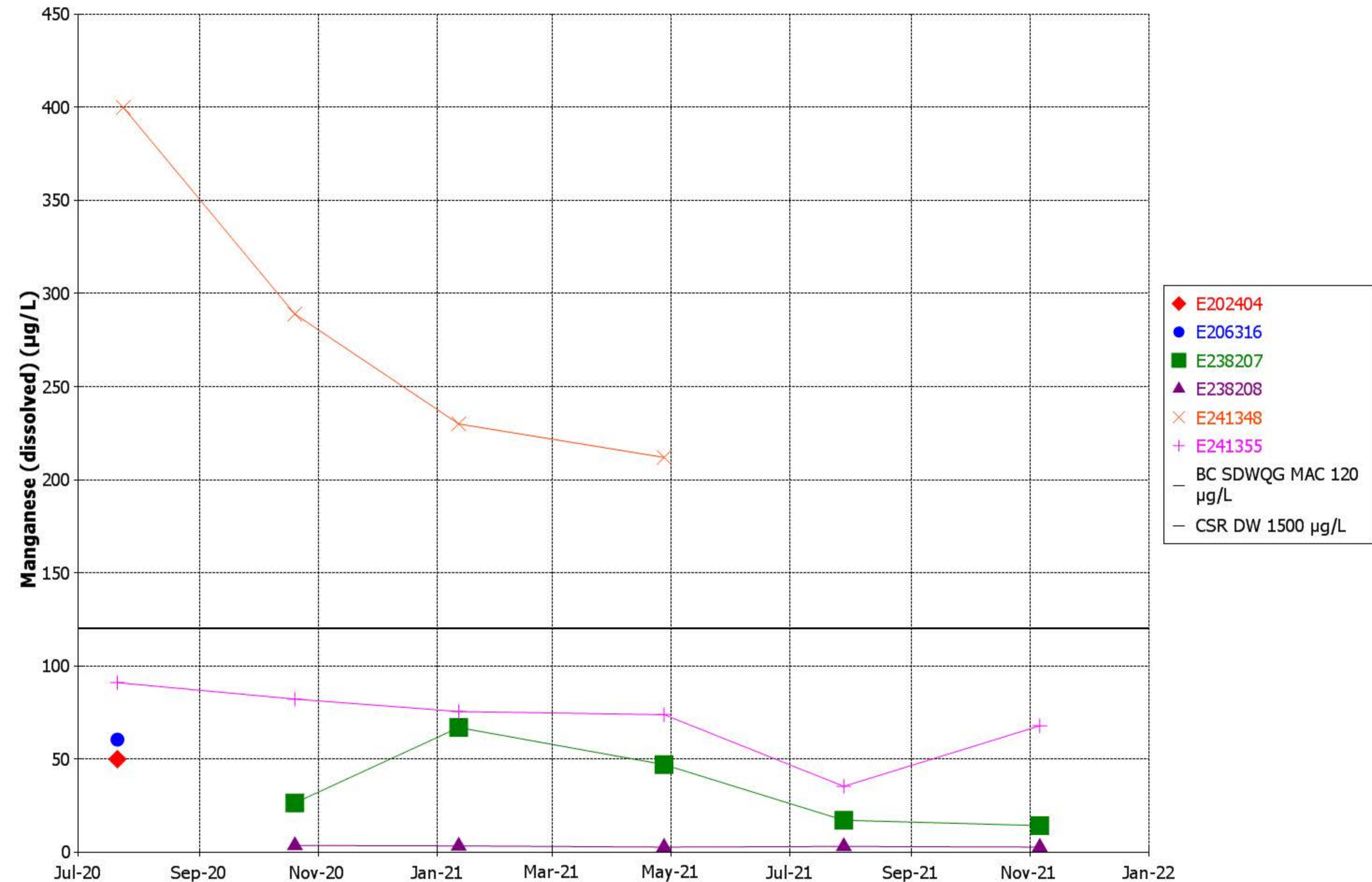
Time Series Plot For Lithium (dissolved) Central Subregion Landfill



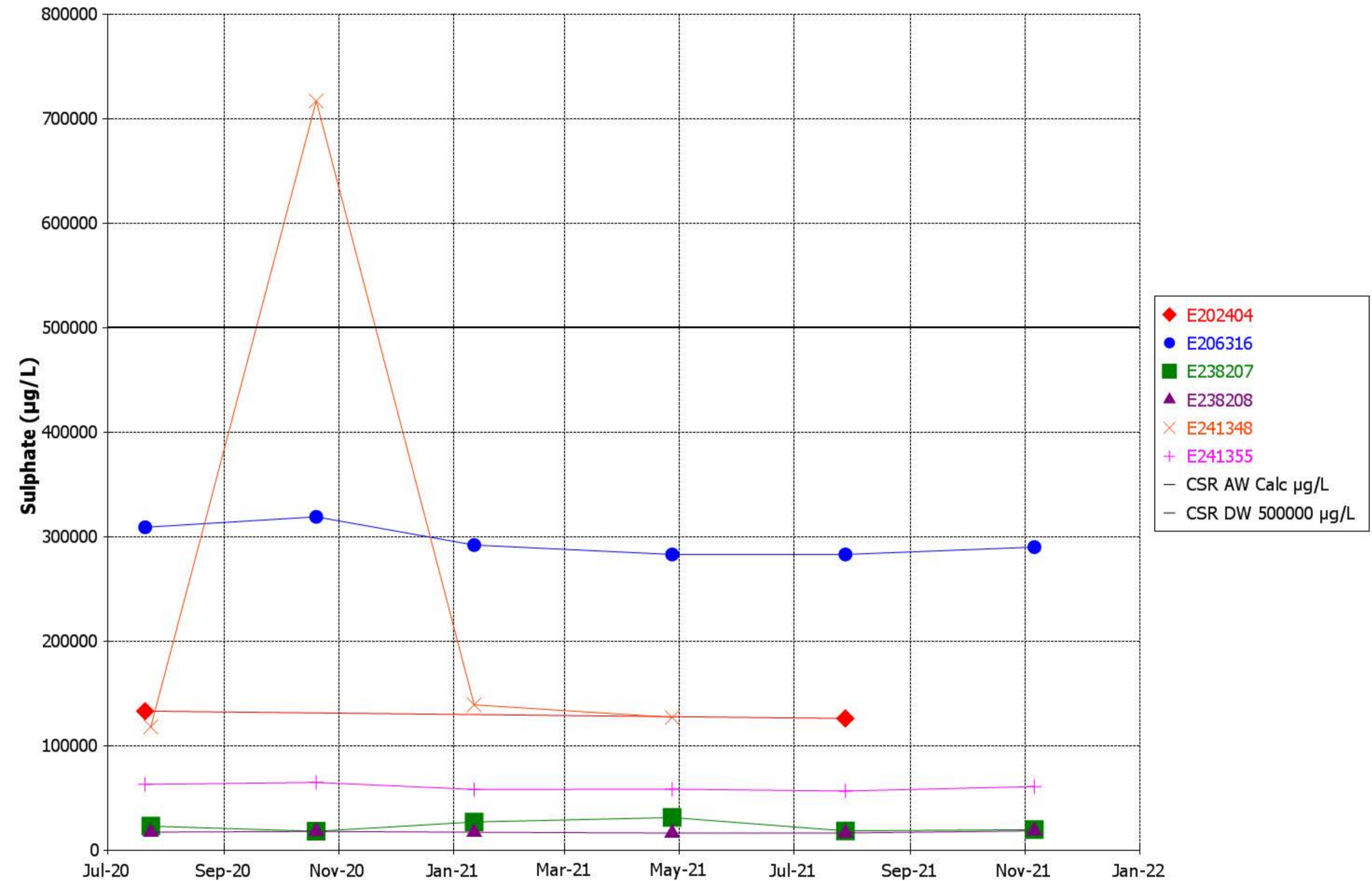
Time Series Plot For Lithium (total) Central Subregion Landfill



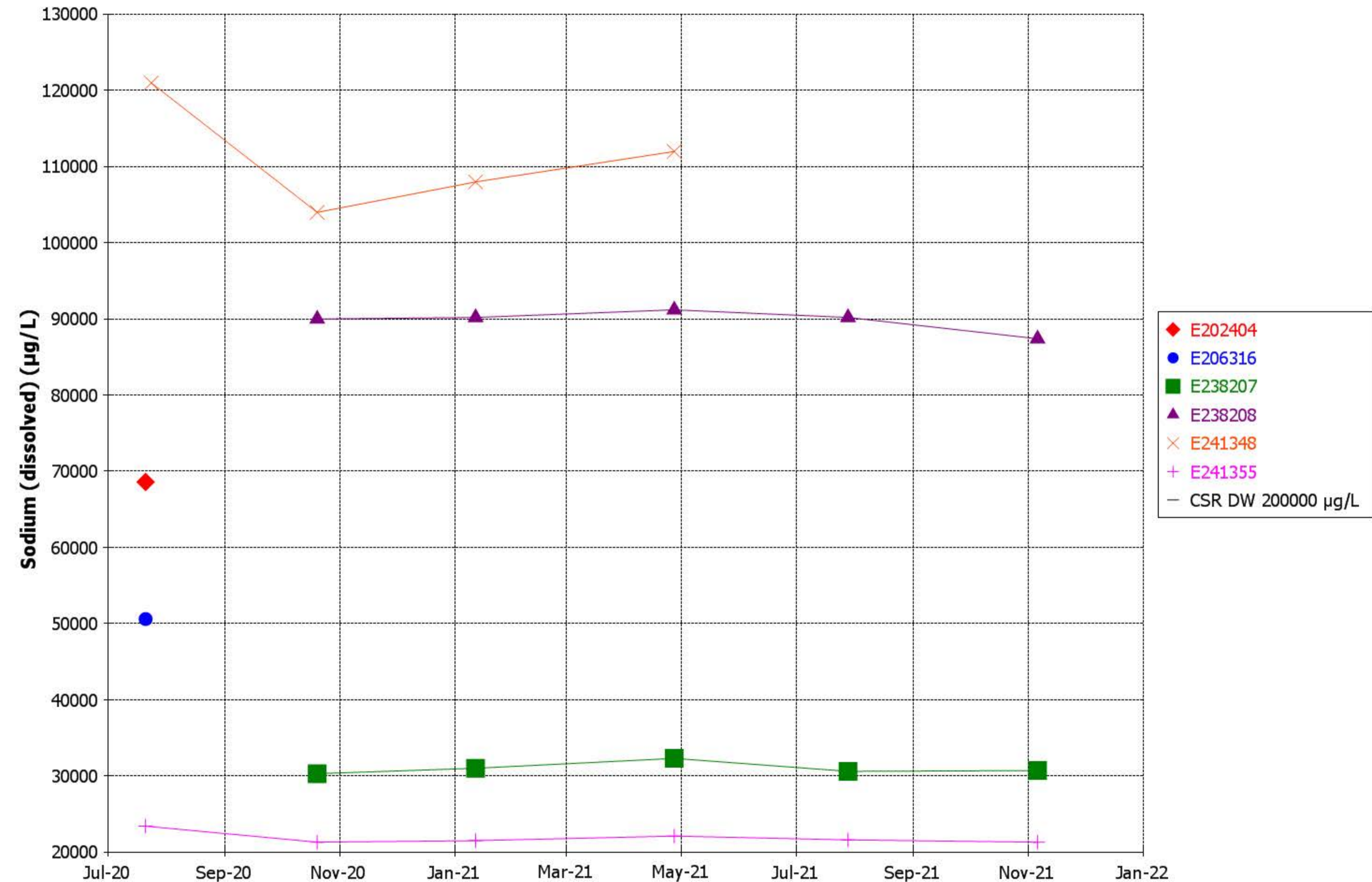
Time Series Plot For Manganese (dissolved) Central Subregion Landfill



Time Series Plot For Sulphate Central Subregion Landfill



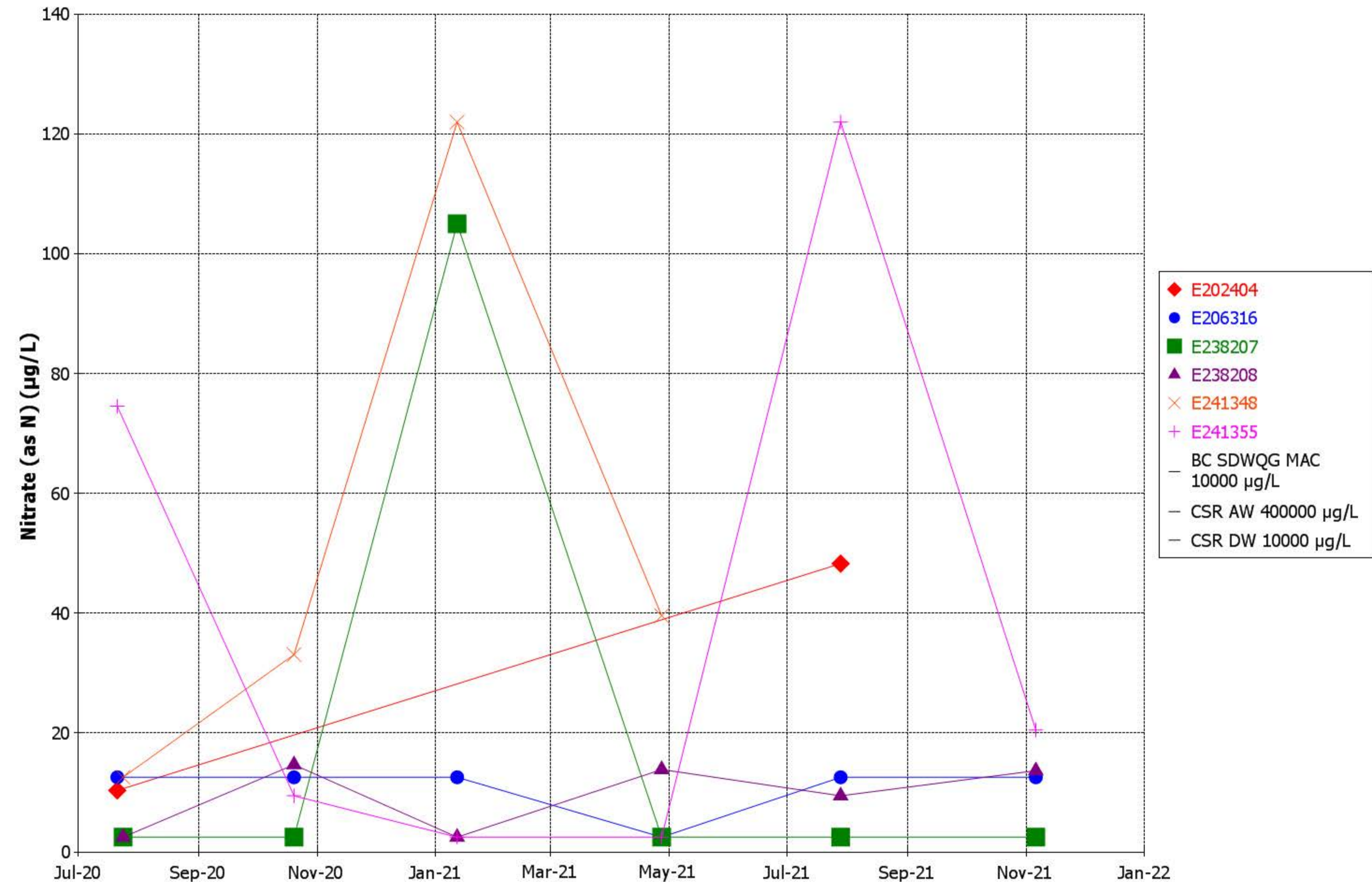
Time Series Plot For Sodium (dissolved) Central Subregion Landfill



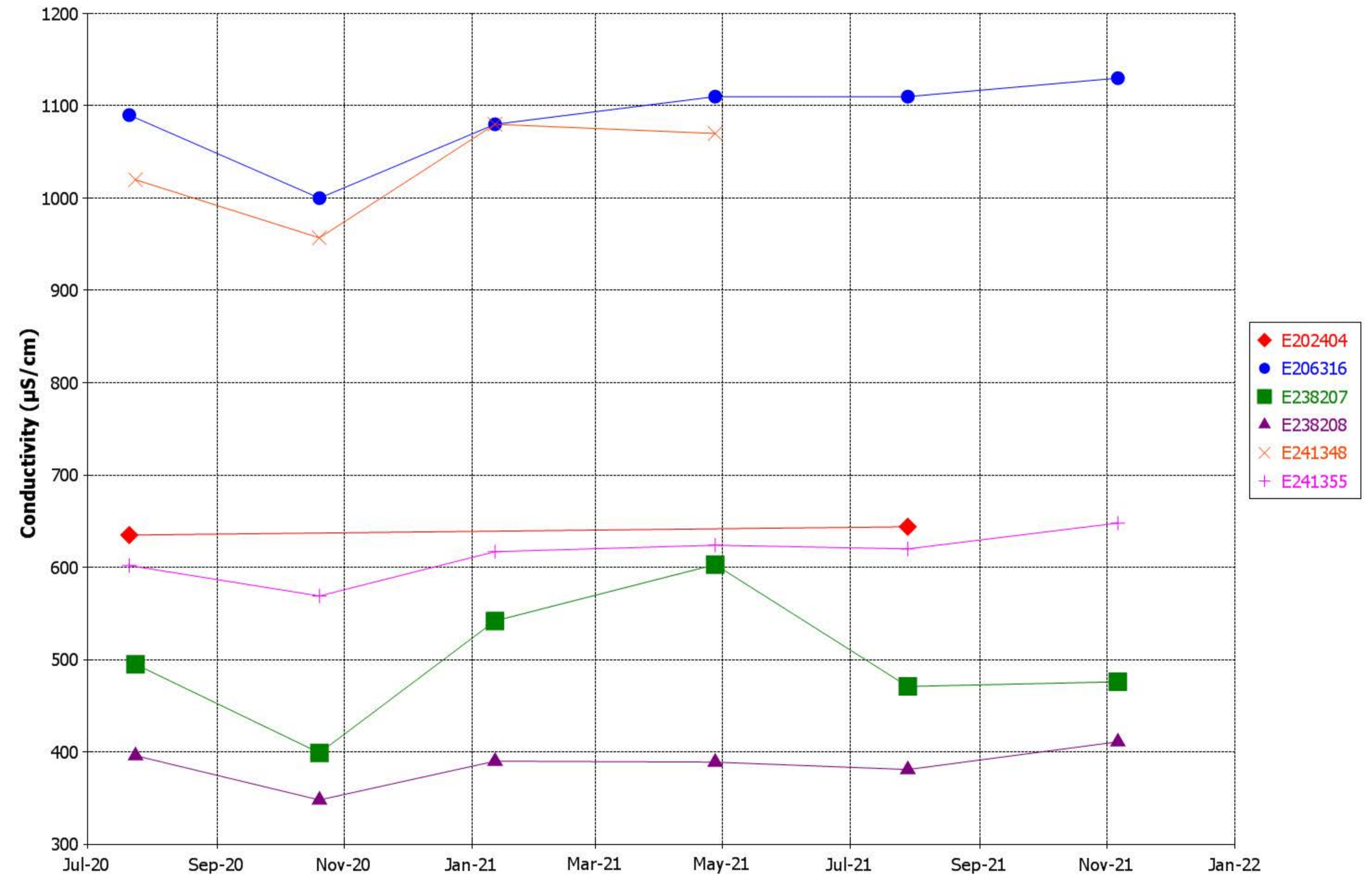
Time Series Plot For Chloride Central Subregion Landfill



Time Series Plot For Nitrate (as N) Central Subregion Landfill



Time Series Plot For Conductivity Central Subregion Landfill



Time Series Plot For Turbidity Central Subregion Landfill

