

# University Endowment Lands Water Quality and Benthic Sampling

University Endowment Lands

Project number: 60639142-301

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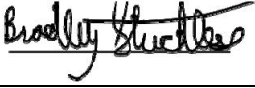
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## 1. Introduction

### 1.1 Overview

The University Endowment Lands (UEL) is not a member municipality of the Greater Vancouver Sewerage & Drainage District but fulfills the requirements of the Greater Vancouver Sewerage & Drainage District Act like the municipality members. Under Metro Vancouver's Integrated Liquid Waste and Resource Management Plan (Metro Vancouver 2010), the University Endowment Lands (UEL) was required to develop and implement an Integrated Stormwater Management Plan (ISMP). The regulatory requirements of the ISMP include a variety of planning, engineering and environmental components, which is reflective of the multi-disciplinary nature of integrated stormwater management planning.

The provincial *Environmental Management Act* is the primary regulatory instrument of environmental protection in British Columbia. The Act allows municipalities to develop community specific solutions to manage the environmental risks of liquid waste streams such as sanitary sewage and stormwater runoff. Metro Vancouver has delegated the responsibility of managing environmental risks of stormwater runoff to its member municipalities, including the UEL. Metro Vancouver's Integrated Liquid Waste and Resource Management Plan require member municipalities to manage these risks through the development and implementation of ISMPs for the watersheds within their jurisdiction. An ISMP is an over-arching, long-term strategy that focuses on the protection and enhancement of watershed health. ISMPs combine concepts of urban planning, stormwater management and environmental management to facilitate sustainable development within a watershed.

The UEL retained AECOM to develop the University Endowment Lands ISMP in line with the requirements of the Metro Vancouver Integrated Liquid Waste and Resource Management Plan and the *Environmental Management Act*. Condition 7 of the BC Minister of Environment's approval of the Integrated Liquid Waste Resource Management Plan requires that municipalities, with the coordination of Metro Vancouver, develop a monitoring and adaptive management framework for assessing watershed health and the effectiveness of ISMPs. To meet this requirement, Metro Vancouver prepared the Monitoring and Adaptive Management Framework (MAMF; Metro Vancouver 2014) for monitoring stormwater, assessing the effectiveness of ISMPs, and recommending adaptive management practices.

As part of the ISMP, AECOM conducted benthic macroinvertebrate and water quality studies for the UEL in 2015 (wet and dry period sampling). The sampling programs were conducted while the implementation of the ISMP for the watersheds was being undertaken. The objective was to collect data representative of existing conditions to be used to monitor temporal changes (both impacts and improvements) in the UEL study area, identify factors potentially impacting environmental health, and to determine the overall health of the watercourses. Baseline conditions were established through sampling that included water quality and benthic macroinvertebrates during different seasons.

The MAMF and the UEL's ISMP recommend water quality monitoring and benthic macroinvertebrate sampling every five years. AECOM conducted a second program of benthic macroinvertebrate and water quality studies for the UEL in 2020 (wet and dry period sampling).

This report describes the studies conducted in 2020 and comparisons to the 2015 program in UEL watercourses including Spanish Bank Creek, Canyon Creek, Salish Creek, and a ponded area along Spanish Trail in Pacific Spirit Park (Figure 1-1).

### 1.2 Study Area

The Study Area includes three streams, Spanish Bank Creek, Canyon Creek, and Salish Creek, which flow into the Burrard Inlet. Sampling sites were selected to collect baseline information for each of the stream systems; in addition, an upstream ponded area of Salish Creek and a site downstream of the UEL works yard were included. The UEL consists of approximately 1,200 hectares of land between the City of Vancouver and the University of British Columbia. The majority of the land, approximately 920 ha (77%), is forested with the remaining 280 ha (23%) is developed for residential, commercial, and institutional land uses. The developed community within the UEL is commonly referred to as University Hill. The ISMP study area consists of UEL and the drainage channels into which the stormwater infrastructure discharges. UEL is divided into four areas (Figure 1-2):

- Area A: bordered by Chancellor Boulevard, Acadia Road, University Boulevard, and Wesbrook Mall;
- Area B: between Chancellor Boulevard and NW Marine Drive;
- Area C: between Blanca St., 6th Ave, Tasmania Crescent and College Highroad; and,
- Area D: between University Boulevard, Agronomy Road, Toronto Road, and Wesbrook Mall; and includes Block F.



Basemapping from Government of BC, Natural Resources Canada, Metro Vancouver and AECOM 2016.

0 50 100 150 200  
Metres  
1:10,000  
NAD 1983 UTM Zone 10N

- Legend**
- Water Quality Sampling Location
  - Water Quality and Benthic Sampling Location
  - Watercourse



University Endowment Lands  
 Water Quality and Benthic Sampling  
 Location: University Endowment Lands

**University Endowment  
 Lands Sampling  
 Locations**

19 January 2021

**AECOM** Figure 1-1



The population of the UEL is estimated at 3,116 residents according to the 2016 Canadian Census with a total of 1,502 private dwellings (Government of BC, 2019). An Area 'D' Plan has been created that may lead to redevelopment and increased density through rezoning. The Province of British Columbia transferred the land of Block F to the Musqueam First Nation, currently proceeding with the Ieləm' development with a future population estimated at 2,300. Further densification of existing developments in UEL is not expected at this time.

The ISMP study area contains a number of high-volume roads that serve as transportation corridors between the City of Vancouver and the University of British Columbia, including Chancellor Boulevard, University Boulevard, and West 16<sup>th</sup> Avenue. There are no current significant projects proposed within the study area that influence the ISMP.

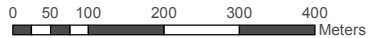
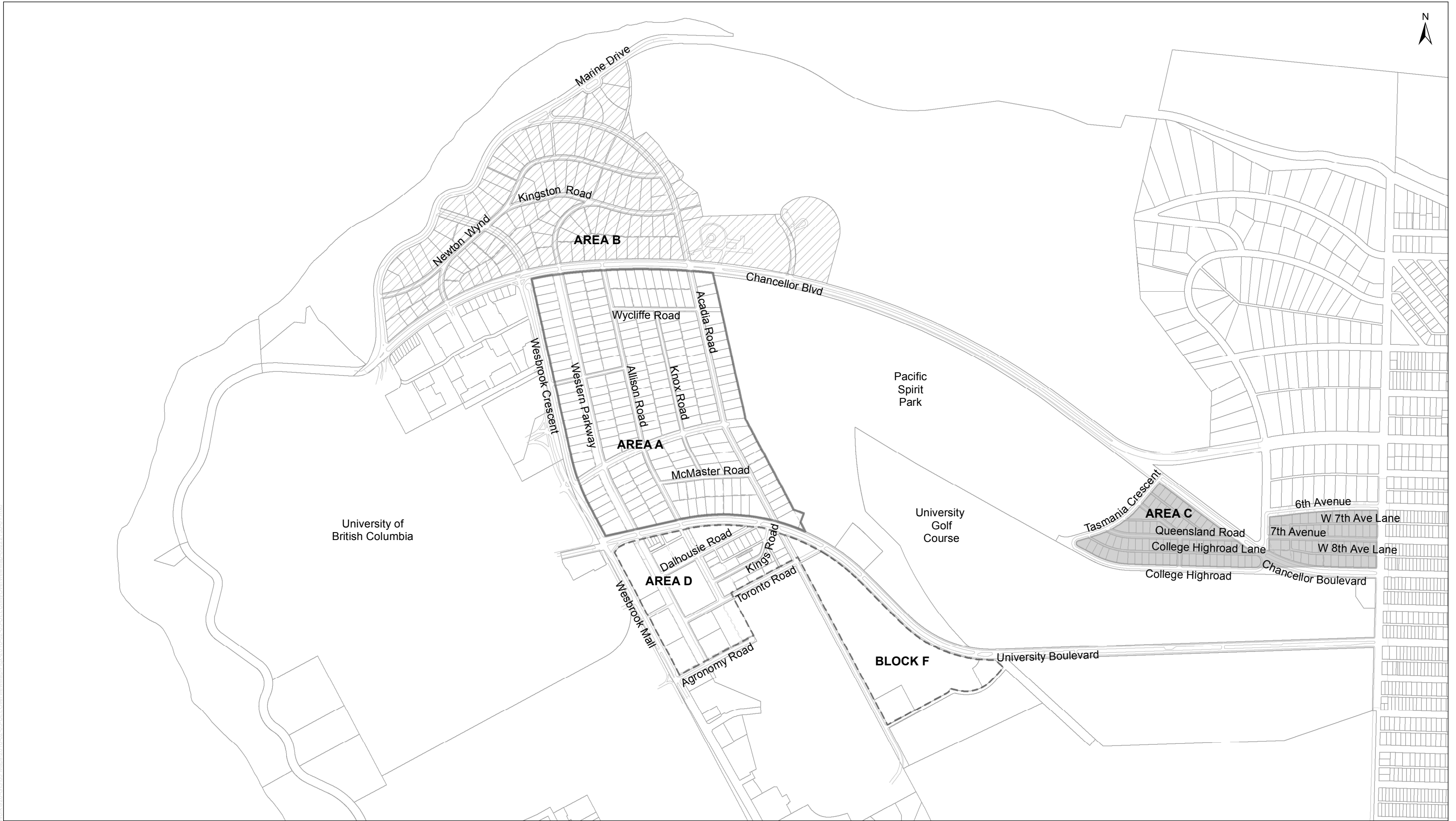
The study area is divided into seven main catchments (4 UEL development areas contained within these catchments), all of which discharge to English Bay via various creeks and ravines. The elevation varies from a high of approximately 90 m to a low of 10 m. The topography of the study area generally slopes northwards towards English Bay. The slope is steepest north of Chancellor Boulevard at a grade of approximately 9% and more gradual south of Chancellor Boulevard with slopes of less than 3%. There are localized high points near the intersections of College Highroad and Western Parkway, as well as Toronto Road and Acadia Road (highest point in the area).

### 1.3 Study Objectives

The overall objective of the 2020 water quality and benthic invertebrate study was to collect data that will characterize conditions in the UEL and compare to baseline data collected in 2015.

The MAMF outlines a framework to enable municipalities to track changes occurring within watersheds. Based on the stream types identified within the watershed, the MAMF recommends collecting a combination of water quality and benthic invertebrate data. The specific scope of work for the 2020 water quality and benthic studies included the following:

- Conduct sampling at the four locations sampled in 2015 within the UEL;
- Add a fifth site as recommended in the 2015 study to capture potential effects that the UEL works yard may have on water quality in Salish Creek;
- Undertake benthic macroinvertebrate sampling to track long terms trends using the Benthic Index of Biotic Integrity (B-IBI) baseline that was reported in 2015 report;
- Conduct water quality sampling according to the following:
  - From each of the five sites, collect five water samples during the dry season (August-September) approximately weekly within a 30 day period; and,
  - From each of the five sites, collect five water samples during the wet season (November-December) approximately weekly within a 30 day period.



#	Revision Description	Date
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**Legend**

	Parcel Lot		Area D
	Area A		Area C
	Area B		

## University Endowment Lands Overview of Utility System

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## 2. Methods

### 2.1 Dates and Locations of Water Quality and Benthic Studies

Sample sites were located in three high gradient stream reaches and two low gradient stream reach (Table 2-1; Figure 1-1). The system type was classified according to criteria outlined in the MAMF. Sample sites were selected to provide an accurate representation of the stream. Sampling for benthic macroinvertebrates was conducted on 16 September 2020; however, samples were not obtained from site UEL-002 because stream flows were too low to allow adequate flow through the surber sampler and UEL-004 and UEL-005 were not sampled due to the low gradient of the stream at these sites which are not recommended for sampling in the MAMF.

Water quality samples were collected weekly for five weeks in September for the dry season and November / December for the wet season. Sampling dates are provided in Table 2-1.

Generally, all 10 weeks of water quality sampling occurred at the same location depicted in Figure 1-1, in order to allow for comparisons between water quality and benthic invertebrate data. Table 2-1 provides the coordinates of the aquatic sampling locations. Appendix D contains site photos of all the water quality sampling locations and site photos taken during benthic invertebrate sampling are provided in Appendix E.

**Table 2-1. List of UEL Watercourse Sampling Stations**

Station ID	Location	UTM Coordinates	System Type	Parameters	Rationale
UEL-001	Lower Spanish Bank Creek	483665 5458256	High Gradient	Water Quality, Benthos	Potentially affected by residential and road development in the area (Area D).
UEL-002	Lower Canyon Creek	483228 5458375	High Gradient	Water Quality	Reflects the impact of roads within the area.
UEL-003	Lower Salish Creek	482214 5458531	High Gradient	Water Quality, Benthos	Potentially affected by residential and institutional development (i.e. school, trail, works yard) in the area (Area B).
UEL-004	Upper Salish Creek	482941 5457461	Low Gradient	Water Quality	Captures potential effects from the golf course.
UEL-005	Salish Creek	482627 5458007	Low Gradient	Water Quality	Captures potential effects from the UEL works yard stormwater outfall.

Notes: \*UTM= Universal Transverse Mercator coordinate system; NAD83 = North American Datum of 1983; Zone = 10U

**Table 2-2. Water Quality Sampling Dates at UEL Watercourses, 2020**

Sampling Periods	Week	Date
Dry	1	02-September-2020
	2	08-September-2020
	3	16-September-2020
	4	25-September-2020
	5	30-September-2020
Wet	1	16-November-2020
	2	23-November-2020
	3	02-December-2020
	4	09-December-2020
	5	16-December-2020

## 2.2 Sample Collection and Data Analysis

### 2.2.1 Water Quality

All surface water samples taken from the watercourses were grab samples, collected in mid-stream below the surface with the bottle mouths facing upstream. All bottles, preservatives, and materials were provided by the laboratory. All samples were kept on ice in a cooler but not allowed to freeze and transported to ALS Laboratories in Burnaby, BC, immediately following sample collection. ALS Laboratories is accredited by the Canadian Association for Environmental Analytical Laboratories. Chain of Custody forms accompanied all samples.

The minimum required water quality parameter list outlined in the MAMF was used, and included nitrate, *E. coli*, fecal coliforms and total metals. Detection limits for each of the parameters is provided in Table 2-3. For metals analysis, it was assumed that high level metal analysis would be sufficient based on the expected urban stream profile.

*In situ* data was obtained using a YSI Pro Plus metre or equivalent for dissolved oxygen (DO), temperature, pH, and conductivity, and turbidity was collected with a Lamotte metre. Samples for general parameters were collected in a plastic bottle. Samples for analysis of total metals only were collected and placed in acid-washed plastic bottles and preserved in the field with nitric acid. A separate glass vial preserved with hydrochloric acid was required for mercury analysis. Microbiological parameters were collected in sterile plastic bottles that contained laboratory preserved sodium thiosulfate.

For the purpose of this report, the reportable detection limits (RDL) as provided by the laboratory were used in the analysis and values below the RDL used the RDL as the values for calculations. Mean values for the dry and wet sampling periods were calculated and compared for all water quality parameters for each site sampled (Appendix A, Table A-1 to A-5). For *E. coli* and fecal coliforms geometric means were calculated instead of the mean as per guideline comparison requirements.

**Table 2-3. Water Quality Parameter and Detections Limits, 2020**

Parameter	Units	RDL	Parameter	Units	RDL
<b>General Parameters</b>			<b>Total Metals Cont'd</b>		
Conductivity	µS/cm	2.0	Copper	µg/L	0.50
pH	pH units	0.10	Iron	µg/L	10
Total Hardness	mg/L CaCO <sub>3</sub>	0.6	Lead	µg/L	0.050
Nutrients			Lithium	µg/L	1.0
Nitrate	mg/L	0.0050	Magnesium	µg/L	5.0
<b>Anions</b>			Manganese	µg/L	0.10
Nitrite (N)	mg/L	0.0010	Mercury	µg/L	0.0050

Parameter	Units	RDL	Parameter	Units	RDL
<b>Nutrients</b>			Molybdenum	µg/L	0.050
Nitrate plus Nitrite (N)	mg/L	0.0050	Nickel	µg/L	0.50
<b>Microbiological Parameters</b>			Potassium	µg/L	50
E. Coli	CFU/100 mL	1	Selenium	µg/L	0.050
Fecal Coliforms	CFU/100 mL	1	Silicon	µg/L	100
<b>Total Metals</b>			Silver	µg/L	0.010
Aluminum	µg/L	3.0	Sodium	µg/L	50
Antimony	µg/L	0.10	Strontium	µg/L	0.20
Arsenic	µg/L	0.10	Sulphur	µg/L	500
Barium	µg/L	0.10	Thallium	µg/L	0.010
Beryllium	µg/L	0.100	Tin	µg/L	0.10
Bismuth	µg/L	0.050	Titanium	µg/L	0.30
Boron	µg/L	10	Uranium	µg/L	0.010
Cadmium	µg/L	0.0050	Vanadium	µg/L	0.50
Calcium	µg/L	50	Zinc	µg/L	3.0
Chromium	µg/L	0.10	Zirconium	µg/L	0.20
Cobalt	µg/L	0.10			

Results included comparisons with the 2015 data and the various available water quality guidelines for those parameters with established guidelines. Guidelines used to compare against measure water quality results included:

- BC Approved Water Quality Guidelines
- A Compendium of Working Water Quality Guidelines for British Columbia
- CCME Canadian Environmental Quality Guidelines
- British Columbia Recreational Water Quality Guidelines

To provide context in terms of the amount of precipitation received leading up to the sampling dates, average daily total precipitation for the entire sampling period and daily total precipitation for each sampling date were downloaded from the Environment and Climate Change database for Vancouver International Airport (ECCC, 2021). A comparison of the 2020 data was completed for the dry and wet period months with available data from the previous 7 years using data from the same station.

### 2.2.2 Benthic Invertebrates

Stream benthic invertebrates were collected from sites UEL-001 and UEL-003 in Spanish Bank Creek and Salish Creek respectively in late summer. Sampling was conducted following benthic invertebrate sampling protocols outlined in MAMF. Sampling was conducted in riffle habitat conditions favourable to *Ephemeroptera*, *Plecoptera* and *Trichoptera* (EPT). The EPT taxa are sensitive to environmental stress such as degraded water quality and therefore provide an important measure of stream health. Samples were collected using a surber sampler with 250 µm mesh with substrate cleaning lasting for 3 minutes for each placement. Each placement sampled an area of 0.09 m<sup>2</sup> and each sample was a composite sample from 3 riffle surber placements. Each of the composite samples was filtered through a 250 µm screen and the sampler thoroughly washed. Washed samples were transferred to pre labeled plastic containers and preserved with 80% ethanol.

Benthic invertebrate samples were shipped to Biologica in Victoria, British Columbia. As specified in the MAMF, benthic invertebrates were analyzed to the lowest practical level. Laboratory analysis and QA/QC procedure were in compliance with protocols outlined in the MAMF.

Total density of benthic invertebrates collected by the surber sampler was calculated by dividing the total number of organisms collected from a sample by the total area sampled of 0.27 m<sup>2</sup>.

### 2.2.2.1 Results Assessment

The B-IBI scoring system from the MAMF followed the ten metric B-IBI scoring system, which consisted of the following (Fore *et al.* 1994):

1. Total number of taxa
2. Number of mayfly (*Ephemeroptera*) taxa
3. Number of stonefly (*Plecoptera*) taxa
4. Number of caddisfly (*Trichoptera*) taxa
5. Number of long-lived taxa, defined as living at least 2-3 years in the immature state
6. Number of intolerant taxa
7. Percent of individuals in tolerant taxa
8. Percent of predator individuals
9. Number of clinger taxa
10. Percent dominance: the sum of individuals in the three most abundant taxa, divided by the total number of individuals found in the sample (top 3 taxa)

Each of the above metrics are scored based on range values provided in Table 2-4.

**Table 2-4. B-IBI Metric Guideline Scores Used to Determine Stream Quality**

Metric	Scoring Category		
	1	3	5
<b>Taxa Richness &amp; Composition</b>			
Total number of taxa	0 to <15	15 to <28	≥28
Number of mayfly ( <i>Ephemeroptera</i> ) taxa	0 to <4	4 to 8	>8
Number of stonefly ( <i>Plecoptera</i> ) taxa	0 to 3	>3 to 7	>7
Number of caddisfly ( <i>Trichoptera</i> ) taxa	0 to <5	5 to <10	≥10
Number of long-lived taxa	0 to 2	>2 to 4	>4
<b>Pollution Tolerance</b>			
Number of Intolerant taxa	0 to 2	>2 to 3	>3
Tolerant individuals (%)	≥50	>19 to 50	0 to 19
<b>Feeding Ecology</b>			
Predator individuals (%)	0 to <10	10 to <20	≥20
<b>Population Attributes</b>			
Number of clinger taxa	0 to 8	>8 to 18	>18
Dominance % (3 taxa)	≥80	60 to <80	0 to <60

Source: Page *et al.*, 2008

Each of the scoring categories can be describe as:

- 1: results expected in severely degraded sites
- 3: somewhat degraded sites
- 5: undisturbed sites

Total B-IBI scores were obtained by summing the scoring for each of the ten metric categories from Table 2-4. Interpretation of the total scores are provided in Table 2-5. Some range values contain gaps between each of the categories, allowing for professional judgement to be applied to select the most appropriate category classification.

**Table 2-5. Range B-IBI Scoring Results Interpretation Values**

Metric B-IBI Score Totals	Stream Conditions
46-50	Excellent
38-44	Good
28-36	Fair
18-26	Poor
10-16	Very Poor

Source: Metro Vancouver, 2014

## 2.3 QA/QC

### 2.3.1 Water Quality

#### 2.3.1.1 Field QA/QC

All field equipment was maintained in good working condition and instruments were calibrated prior to use. The pH probe was calibrated prior to each field trip using prepared solutions with pH levels of 4.0, 7.0, and 10.0, the conductivity meter was checked prior to each field trip using the standard 1,413 µS/cm conductivity solution, Redox (ORP) was calibrated using the standard 240.0 mv solution, and dissolved oxygen was calibrated using the 100% saturated condition approach. The Lamotte turbidity meter was calibrated in the field using 0.1, 1.0, and 10.0 NTU standards prior to sampling.

All water samples were collected using industry standard sampling protocols. Appropriate measures were taken to reduce potential for sample contamination. Field staff wore disposable nitrile gloves when sampling and used bottles and preservative supplied by the analytical laboratory. All stream samples were collected with the mouth of the sampling bottle facing upstream and the sampler standing downstream of the sample bottle. Care was taken to ensure that no upstream disturbances occurred within the creek bed prior to sampling.

Water quality samples were collected by a qualified aquatic biologist. As per a recommendation from the 2015 program, five field blanks were collected as part of the 2020 program and are reported in Appendix F. The field blank is a sample of analyte free water poured into the container in the field, preserved, and delivered to the laboratory with field samples. The purpose of the field blank is to ensure that contamination during handling in the field does not occur. The results for all analytes in each of the field blanks were below detection limits.

#### 2.3.1.2 Laboratory QA/QC

A quality check was conducted by the ALS Laboratories, which included using a spiked sample as an estimate of accuracy of analysis. To meet the QA/QC standard, the results from a spiked matrix must be within 80% to 120% of the known concentration. ALS concluded that overall, the quality control results indicated that the analysis met the quality standards. These quality control results are included in the reports provided by the laboratory along with the sample results and are provided in Appendix F.

### 2.3.2 Benthic Invertebrates

Biologica Environmental Services is a full service taxonomy laboratory based in Victoria, British Columbia which provides taxonomic analysis of invertebrate communities, including benthos, zooplankton, and phytoplankton from both marine and freshwater environments. Biologica has expertise in aquatic habitats throughout Western Canada, the Pacific Northwest and the Arctic, and has worked on projects from around the world.

Biologica has a rigorous sorting procedure that guarantees 95% removal of organisms from all debris sorted. For all samples, a spot check of 25% of the samples is completed. The quality assurance (QA) re-sorts are done after internal quality control (QC) and are selected randomly from all the QC samples. Additionally, a reference collection is created for potential third party verification if necessary. For the UEL samples, re-sorting occurred with 10% of the samples with

an overall average of 98.4% efficiency. Additionally, no disagreements were reported from review of referenced specimens (i.e. 100% agreement).

### 3. Results and Discussion

#### 3.1 Water Quality

Appendix A, Table A-1 to A-5 provides the results of all water quality samples taken during the five weeks of dry period sampling and five weeks of wet period sampling from 2 September to 16 December 2020. Appendix tables were grouped according to sample sites and include dry period mean and wet period mean (geometric mean for microbiological parameters). All parameters with higher concentrations than the criteria for the protection of aquatic life have been highlighted in the tables.

#### 3.2 General Water Quality Parameters

##### 3.2.1 Data Analysis

General water quality parameters include temperature, dissolved oxygen (DO), conductivity, total dissolved solids, salinity, pH, turbidity and hardness. Averages for each site during the dry and wet periods are presented in Table 3-1. Generally, differences were noted in the water quality parameters at UEL-004 compared to all other sampling locations. The difference is likely due to the differences in watercourse morphology. Sites at UEL-001 (Appendix D), UEL-002 (Appendix D), and UEL-003 (Appendix D) are high gradient stream systems. While UEL-005 (Appendix D) is low gradient, but still a flowing stream system compared to UEL-004 (Appendix D) which is a low gradient ponded system with some channelized sections.

At all sampling locations pH was around neutral (Table 3-1). UEL-001, UEL-003, and UEL-005 were slightly more acidic, and UEL-002 and UEL-004 were slightly more alkaline. The pH in the dry sampling period was higher than the wet period, which would be expected due to the higher acidic input of rain during the wet sampling period. The lowest mean pH was measured at UEL-004 during both sampling periods, however, UEL-002 had only slightly higher pH levels.

Higher total hardness was observed in the dry season when compared to the wet season (Table 3-1). Site UEL-002 measured lower total hardness overall than the other sites and UEL-004 had the highest hardness during the dry period and decreased to having similar levels to other sites during the wet season. Water hardness in the area is generally considered to be soft.

Conductivity was generally higher at all sites in the dry period compared to the wet period, with the exception of UEL-002 which had a higher conductivity in the wet period (Table 3-1). The lowest conductivity was measured at UEL-002 (61.7  $\mu\text{S}/\text{cm}$ ) and highest at UEL-004 (201.7  $\mu\text{S}/\text{cm}$ ) and UEL-005 (224.2  $\mu\text{S}/\text{cm}$ ). For reference, specific conductivity values of BC Coastal streams are typically in the 100  $\mu\text{S}/\text{cm}$  range.

Mean turbidity in all sites during the sample periods ranged from 0 – 22 NTU (Table 3-1). The turbidity levels in the wet sampling period were higher than the dry period for all sample locations with the exception of UEL-004 which had turbidity levels higher in the dry period. This result is consistent with the results for total dissolved solids (TDS) in which UEL-004 had the highest amount of TDS. In general, turbidity at all sites (except UEL-004) did not exceed 4 NTU.

Dissolved oxygen (DO) was generally lower in the dry period compared to the wet period (Table 3-1). UEL-001 and UEL-003 had the highest DO concentrations and had very similar measurements for both the dry and wet periods. UEL-002 and UEL-005 had DO concentrations that were similar to UEL-001 and UEL-003 in the wet period but were much lower for the dry period. The lowest DO concentrations were found at UEL-004.

Salinity measurements were taken in the wet period only and were highest in UEL-001, UEL-003, and UEL-004 ranging from 0.06-0.07 ppt (Table 3-1). UEL-002 and UEL-005 had the lowest salinity with 0.04 ppt and 0.05 ppt respectively.



**Table 3-1. General Water Quality Parameters for Wet and Dry Periods at UEL Sampling Sites**

Parameter	Units	UEL-001		UEL-002		UEL-003		UEL-004		UEL-005		All Sites	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Dissolved Oxygen	mg/L	12.44	12.29	8.68	12.17	10.01	12.17	3.96	7.26	8.25	11.43	8.70	11.05
Salinity	ppt	-	0.07	-	0.04	-	0.07	-	0.06	-	0.05	-	0.06
Turbidity	NTU	0.9	2.7	1.3	1.8	0.7	3.7	22.2	4.1	2.2	2.5	5.4	3.0
Total Dissolved Solids	g/L	0.122	0.092	0.043	0.052	0.108	0.248	0.255	0.087	0.186	0.071	0.143	0.111
Conductivity	µS/cm	190.2	145.2	61.7	82.2	165.8	144.0	201.7	134.0	224.2	110.0	173.2	123.1
pH	pH	7.74	7.53	7.33	6.70	7.87	7.69	7.25	7.09	7.74	7.40	7.59	7.28
Total Hardness (CaCO <sub>3</sub> )	mg/L	62.08	41.74	19.12	14.76	55.32	43.84	81.12	46.44	73.72	33.84	58.27	36.12

Note: Data are presented as means.

“-“ = no data collected

### 3.2.2 Comparison with Water Quality Guidelines

General water quality parameters in all systems were within the water quality guidelines including dissolved oxygen thresholds for aquatic life.

### 3.2.3 Comparison with the 2015 Program

General water Quality parameters were found to follow similar trends to the 2015 sampling program, with the exception of DO at UEL-004 (Appendix A, Table A-6). DO in 2015 during the dry period at UEL-004 was very low (0.82 mg/L) compared to the dry period in 2020 (3.96 mg/L).

## 3.3 Nutrients

### 3.3.1 Data Analysis

Nutrient levels are represented by the concentration of nitrogen compounds. The nutrient parameters consisted of nitrite, nitrate, and nitrate plus nitrite, which were the parameters recommended in the MAMF document.

During the 2020 sampling program UEL-001, UEL-002, and UEL-004 had nitrate levels that were higher in the wet period compared to the dry period. However, UEL-003 and UEL-005 nitrate levels were higher during the dry period. Overall, the highest nitrate levels were measured in the wet period at UEL-002 and in the dry period at UEL-005 with measurements of 2.7740 mg/L and 1.6948 mg/L respectively. The lowest nitrate levels observed were during the dry period at UEL-002 and UEL-004 averaging 0.55 mg/L and 0.14 mg/L respectively. Nitrite, however, did not follow the same trend. The highest level was measured in UEL-001 during the wet period (0.0063 mg/L) and UEL-005 during the dry period (0.0078 mg/L). For nitrite UEL-002, UEL-003 and UEL-004 had similar levels between the dry and wet period.

### 3.3.2 Comparison with Water Quality Guidelines

Nutrient concentrations in all systems were within the water quality guidelines.

### 3.3.3 Comparison with the 2015 Program

In general, the 2015 sampling program had similar trends for nitrate except at UEL-003 where levels were higher in the wet period for 2015 (1.2858 mg/L) but higher in the dry period for 2020 (1.3302 mg/L). The most notable changes between 2015 and 2020 for nitrite were that levels decreased at UEL-002, UEL-003 and UEL-004 for both dry and wet periods (Appendix A, Table A-6).

### 3.4 Microbiological Indicators

#### 3.4.1 Data Analysis

Microbiological parameters obtained during the course of the wet and dry sampling periods included fecal coliforms and E.coli. Sampling for the parameters occurred at each of the five sampling locations and data are presented as geometric means in Table 3-2.

Fecal coliforms are common bacteria found in the intestinal tracts of both human and warm-blooded animals and are an indicator of human and animal waste inputs to watercourses. In this case, park users and their dogs are a potential source of fecal coliforms. Levels of fecal coliform varied depending on the site. UEL-001 and UEL-004 had higher fecal coliform levels during the wet period, whereas UEL-002, UEL-003, and UEL-005 had higher levels during the dry period. Mean fecal coliform levels at UEL-001 was the highest during the wet period compared to the other sites during the wet period. During the dry period, the mean fecal coliform levels at UEL-005 were the highest compared to the other sites.

Similar to fecal coliforms, E. coli concentrations varied depending on the site. Both UEL-001 and UEL-003 had higher E. coli levels during the wet period, whereas UEL-002, UEL-004 and UEL-005 had higher levels during the dry period. Levels of E. coli were highest at UEL-001 during the wet period. The lowest means for E.coli and fecal coliforms were observed at UEL-002 during the wet period.

**Table 3-2. Microbiological Concentrations for Wet and Dry Periods at the UEL Sampling Sites**

Site Name		UEL-001		UEL-002		UEL-003		UEL-004		UEL-005		
Parameter	Units	30-day Guideline	Dry	<b>Wet</b>	Dry	<b>Wet</b>	Dry	<b>Wet</b>	Dry	<b>Wet</b>	Dry	<b>Wet</b>
E. coli	CFU/100mL	200	68	<b>391</b>	56	9	77	85	22	20	158	19
Fecal Coliforms	CFU/100mL	-	82	405	76	15	116	103	23	29	206	25

*Note: Data are presented as geometric means.*

*“-“ = no guideline*

*Bolded mean values represent exceedances*

#### 3.4.2 Comparison with Water Quality Guidelines

Various microbiological indicator guidelines exist for E. coli parameters with guideline values being dependent on the use of the water being sampled. Fecal coliforms were removed as the preferred bacterial indicator for microbial water quality analysis and the guidelines were archived; therefore, E. Coli is the only parameter presented here (BCMOE, 2017). The most appropriate guidelines for comparisons are the 30-day mean (200 CFU/100 mL) and single day maximum (400 CFU/100 mL) in the BC Water Quality Recreational Primary Contact derived from the Health Canada Guidelines for Canadian Recreational Water Quality (2012).

E. coli levels at UEL-002, UEL-003, UEL-004, and UEL-005 remained below guidelines for recreational primary contact use during both the wet and dry period. The BC Water Quality 30-day Guideline for E.coli was exceeded during the wet season at UEL-001 (391 CFU/100 mL) by almost double the guideline.

Additional single day maximum guidelines were exceeded at UEL-003, UEL-004, and UEL-005 during one of the sampling events in the dry period. E. Coli levels at UEL-001 exceeded single day maximum guidelines during one sampling event in the wet period.

#### 3.4.3 Comparison with the 2015 Program

For both fecal coliforms and E. coli, there has been a reduction from the 2015 program for all sites in both dry and wet periods, with the exception of UEL-002 and UEL-004 which saw a slight increase in the wet season (Appendix A, Table A-6).

At UEL-001 there are still 30-day mean guideline exceedances, however, E. Coli levels have dropped from 1236 CFU/100 mL to 391 CFU/100 mL for the wet season from 2015 to 2020. At UEL-003, E. coli decreased in the dry season to below guidelines. All other sites that had exceedances have not changed from 2015 to 2020.

## 3.5 Metals

### 3.5.1 Data Analysis

The concentrations of total metals in the samples were variable between wet and dry sampling periods and sampling locations. Generally, higher total metal concentrations were measured in the wet period when compared to the dry period levels. Approximately a third of total metal parameters measured were below RDL levels during both the wet and dry sampling periods at all sites. Key metal parameters identified in the MAMF guidance document are iron, cadmium, copper, lead, and zinc. Of these key parameters, all but iron are highest during the wet season compared to the dry season and are high at sampling sites UEL-001 and UEL-003 compared to the other sites. For both wet and dry periods iron levels are highest at UEL-004 and are higher in the dry period than in the wet period.

### 3.5.2 Comparison with Water Quality Guidelines

Aluminum, copper and iron were reported to exceed either one or all of the CCME and BC Water Quality Guidelines (acute 24 hour guideline and/or chronic 30-day guideline) at all the water quality sampling locations. Additionally, UEL-003 and UEL-004 had exceedances of manganese and the 30-day guideline for zinc during the dry sampling period respectively. Table 3-3 to Table 3-5 below outline the values obtained at each of the sites and the samples that exceeded criteria are displayed in bold. Sample criteria exceedances apply to any available guidelines, for details on which specific guideline is being exceeded, refer to Appendix A, Table A-1 to A-5. Total copper and manganese guideline values are dependent on total hardness, which varies between each sample.

Elevated water quality concentrations in relation to established guidelines were reported for the following parameters:

**Aluminum:** Total aluminum values exceeded CCME guidelines at all sites. A higher proportion of exceedances were recorded in the wet season samples with the highest overall exceedances occurring at sites UEL-001 and UEL-002 (Table 3-3). Aluminum is not considered a serious threat to public health as it can precipitate out of solution but is important for areas with acidic inputs since it can cause deformation of embryos at low pH (RISC 1998).

**Table 3-3. Total Aluminum (µg/L) Concentration at UEL Sampling Locations, 2020.**

Sample Period	Sample Date	Sample Location				
		UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Dry	September 2, 2020	59.2	81.9	25.9	28.5	21.6
	September 8, 2020	38.2	<b>118.0</b>	21.7	49.2	12.2
	September 16, 2020	35.4	<b>334.0</b>	29.5	21.4	29.3
	September 25, 2020	<b>478.0</b>	<b>209.0</b>	<b>226.0</b>	<b>254.0</b>	147.0
	September 30, 2020	52.4	74.3	33.4	<b>105.0</b>	58.2
Wet	November 16, 2020	<b>162.0</b>	<b>141.0</b>	88.9	88.7	96.6
	November 23, 2020	<b>338.0</b>	<b>317.0</b>	<b>142.0</b>	<b>351.0</b>	<b>122.0</b>
	December 2, 2020	<b>235.0</b>	<b>207.0</b>	<b>153.0</b>	<b>147.0</b>	<b>228.0</b>
	December 9, 2020	<b>320.0</b>	<b>371.0</b>	<b>602.0</b>	98.3	<b>149.0</b>
	December 16, 2020	<b>323.0</b>	<b>366.0</b>	<b>236.0</b>	84.8	<b>128.0</b>

Note: Bolded values represent the CCME guidelines exceedance (100 µg/L).

**Copper:** Guideline exceedances for copper concentrations were present at all sample sites during at least one sampling event and up to all 5 during each sampling period. The highest overall sampling exceedances occurred on September 25, 2020 in UEL-001, UEL-003, and UEL-004. The maximum CCME guideline for copper was exceeded for all sampling sites (Table 3-4). Additionally, UEL-001 during the wet period, UEL-003 and UEL-004 during both the wet and dry period, and UEL-005 during the dry period exceeded the BC Water Quality 30-day average guideline. Copper is essential for all plant and animal nutrition; however, copper is acutely toxic to most forms of aquatic life at relatively low concentrations (RISC 1998). It should be noted that total copper includes a large fraction that may be in forms that are biologically unavailable, and therefore total copper may overestimate toxicity.

**Table 3-4. Total Copper ( $\mu\text{g/L}$ ) Concentration at UEL Sampling Locations, 2020.**

Sample Period	Sample Date	Sample Location				
		UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Dry	September 2, 2020	1.08	1.38	<b>2.80</b>	0.50	<b>2.48</b>
	September 8, 2020	0.72	1.45	1.77	0.50	<i>1.14</i>
	September 16, 2020	0.78	<b>2.16</b>	<b>3.84</b>	0.73	<b>3.80</b>
	September 25, 2020	<b>9.00</b>	<b>3.01</b>	<b>8.20</b>	<b>8.21</b>	<b>3.74</b>
	September 30, 2020	1.62	1.48	<b>2.87</b>	1.73	1.93
Wet	November 16, 2020	<b>2.42</b>	0.96	<b>2.78</b>	1.27	1.47
	November 23, 2020	<b>4.69</b>	1.83	<b>4.00</b>	<b>4.97</b>	1.80
	December 2, 2020	<b>5.59</b>	1.41	<b>5.61</b>	1.71	<b>2.01</b>
	December 9, 2020	<b>3.51</b>	1.59	<b>5.74</b>	1.97	1.96
	December 16, 2020	<b>6.88</b>	<b>2.32</b>	<b>5.44</b>	1.81	1.70

Note: Bolded values represent samples with CCME guideline exceedance ( $2 \mu\text{g/L}$ ) and/or BC guidelines exceedance ( $3.3\text{-}7.26 \mu\text{g/L}$ ). Italicized values represent the values used to determine the 30-day mean for exceedance ( $2 \mu\text{g/L}$ ).

**Iron:** CCME Guideline exceedances for iron concentrations were present in all sites and varied between sites during the wet and dry periods. A higher proportion of exceedances occurred at UEL-004, which also exceeded BC Water Quality Guidelines of  $1000 \mu\text{g/L}$  (Table 3-5). One sampling event at UEL-003 and two sampling events at UEL-005 during the dry period also exceeded the BC Water Quality Guideline for Iron. In certain circumstance, total iron concentration in water may exceed the recommended guideline of  $1.0 \text{ mg/L}$  due to natural cases, which is often caused by high load of suspended material in water during high flow conditions and the association of total iron content with the suspended materials (MOE 2008). The suspended material may be the reason for the iron concentration exceedances, particularly during the wet period exceedances. UEL-002 had exceedances during the dry period only and the other sites had exceedance during both wet and dry periods.

**Table 3-5. Total Iron ( $\mu\text{g/L}$ ) Concentration at UEL Sampling Locations, 2020.**

Sample Period	Sample Date	Sample Location				
		UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Dry	September 2, 2020	282	<b>376</b>	128	<b>5520</b>	<b>374</b>
	September 8, 2020	203	<b>388</b>	107	<b>6570</b>	194
	September 16, 2020	237	<b>916</b>	151	<b>4060</b>	283
	September 25, 2020	<b>545</b>	<b>390</b>	<b>1110</b>	<b>1940</b>	<b>1920</b>
	September 30, 2020	180	<b>309</b>	159	<b>5300</b>	<b>1500</b>
Wet	November 16, 2020	184	88	<b>348</b>	<b>1360</b>	<b>645</b>
	November 23, 2020	<b>382</b>	192	<b>482</b>	<b>1280</b>	<b>631</b>
	December 2, 2020	<b>410</b>	143	<b>407</b>	<b>1940</b>	<b>926</b>
	December 9, 2020	<b>302</b>	232	<b>910</b>	<b>1260</b>	<b>810</b>
	December 16, 2020	<b>370</b>	252	<b>521</b>	<b>1250</b>	<b>741</b>

Note: Bolded values represent samples with CCME guidelines exceedance ( $300 \mu\text{g/L}$ ) and/or BC exceedance ( $1000 \mu\text{g/L}$ ).

**Manganese:** Total Manganese exceeded both CCME ( $25\text{-}66.14 \mu\text{g/L}$ ) and BC Water Quality Guidelines ( $692\text{-}1157 \mu\text{g/L}$ ) at UEL-004 for three sampling events (02 September to 16 September 2020) and exceeded the 30-Day Maximum BC Water Quality Guideline for the dry period.

**Zinc:** The total zinc 30-day average guideline value of  $7.5 \mu\text{g/L}$  was exceeded at UEL-003 during the wet sampling period (mean of  $9.6 \mu\text{g/L}$ ). This exceedance was primarily due to the levels measured during the November 23 to December 16, 2020 sampling events. Zinc is relatively non-toxic to terrestrial organisms but is acutely and chronically toxic to aquatic organisms, particularly fish. Zinc toxicity decreases with increasing hardness and temperature and increases with decreasing dissolved oxygen (RISC 1998).

### 3.5.3 Comparison with the 2015 Program

For the above metal analytes, trends between the 2015 and 2020 programs are relatively similar (Appendix A, Table A-6). However, all metals at UEL-004 have decreased since 2015. Aluminum, iron and copper have increased slightly at UEL-001, UEL-002 and UEL-003, and zinc has stayed the same. Exceedance of guidelines remained relatively similar to the 2015 program.

## 3.6 Water Quality Assessment Approach for Adaptive Management

The MAMF includes a water quality assessment approach that provides municipalities with a simplified screening system to identify where water quality conditions are good and where there may be concerns with water quality. This includes an assessment of stream health in watersheds that are potentially at risk from urban land use and non-point source pollution. When evaluating UEL watercourses utilizing the adaptive management system, all sites individual sampling results were pooled to provide a single wet and dry period mean. The MAMF provides a simplified approach to water quality assessment by allowing each parameter to be classified into categories for each parameter by season. This tool provides a generalized approach to water quality assessment and Appendix A, Table A-1 to A-5 should be referenced to evaluate water quality parameters in more detail for each site.

The MAMF rating system using UEL water quality data is presented in Table 3-6. To provide a simplified approach, the water quality assessment table allows each parameter to be classified into three categories based on the average water quality for each parameter by season. This summary system does not account for site specific conditions (e.g. total hardness) and represents an average stream health assessment. Values in the table were calculated using means for each of the season, with exception to bacteriological parameters, which used a geometric mean.

Overall, at sites UEL-002 (Lower Canyon Creek), UEL-003 (Lower Salish Creek), and UEL-005 (Salish Creek) the MAMF rankings were either Good or Satisfactory for all parameters. At site UEL-001 (Lower Spanish Bank Creek) the key parameter that was in the Need Attention category was E.coli (wet period only). At Site UEL-004 (Upper Salish Creek), the key parameters ranked as Need Attention include dissolved oxygen and conductivity (dry period only). At UEL-005 (Salish Creek), the key parameter that was ranked as Need Attention was conductivity (dry period only).

### 3.6.1 Comparison with the 2015 Program

The following key parameters ranked as Needs Attention in the 2015 program and are now in the Satisfactory category: fecal coliform, iron, dissolved oxygen (wet period), and conductivity (wet period). However, turbidity at UEL-004 is now in the Needs Attention category during the dry period, where in 2015 it was ranked as Satisfactory.

**Table 3-6. Adaptive Framework Management Rating System for Key Water Quality Parameters in UEL Sample Creeks**

Parameter	Units	AMF Ranking	UEL-001			UEL-002			UEL-003			UEL-004			UEL-005		
			AMF Ranking	Wet Mean	Dry Mean	AMF Ranking	Wet Mean	Dry Mean	AMF Ranking	Wet Mean	Dry Mean	AMF Ranking	Wet Mean	Dry Mean	AMF Ranking	Wet Mean	Dry Mean
Dissolved Oxygen (DO)	mg/L	11 = Good	Good	12.29	12.44	Good (wet); Satisfactory (dry)	12.17	8.68	Good (wet); Satisfactory (dry)	12.17	10.01	Satisfactory (wet); Need Attention (dry)	7.26	3.96	Good (wet); Satisfactory (dry)	11.43	8.25
		6.5 to 11 = Satisfactory															
		<6.5 = Need Attention															
pH	pH units	6.5-9.0 = Good	Good	7.53	7.74	Good	6.70	7.33	Good	7.69	7.87	Good	6.98	7.25	Good	7.40	7.74
		<6.5 to 6.0 or >9.0 to 9.5 = Satisfactory															
		<6.0 or >9.5 = Need Attention															
Temperature	°C	<16 (Dry) or 7-12 (wet) = Good	Good	8.44	13.36	Good	7.69	14.00	Good	8.07	14.06	Good	7.34	14.40	Good	7.07	15.24
		16-18 (Dry) or 5-7 (wet) or 12-14 (wet) = Satisfactory															
		>18 (dry) or <5 or >14 (wet)= Need Attention															
Conductivity	µS/cm	<50 = Good	Satisfactory	145.2	190.2	Satisfactory	82.2	61.7	Satisfactory	144.0	165.8	Satisfactory (wet); Need Attention (dry)	134.0	201.7	Satisfactory (wet); Need Attention (dry)	110.0	224.2
		50-200 = Satisfactory															
		>200 = Need Attention															
Turbidity	NTU	0-5 = Good	Good	2.6	0.9	Good	1.8	1.3	Good	3.7	0.68	Good (wet); Satisfactory (dry)	4.1	22.2	Good	2.5	2.2
		5-25 = Satisfactory															
		>25 = Need Attention															
Nitrate	mg/L	<2 = Good	Good	1.5880	1.4240	Satisfactory (wet); Good (dry)	2.7740	0.5510	Good	0.8006	1.3302	Good	0.9992	0.1391	Good	0.5648	1.6948
		2-5 = Satisfactory															
		>5 = Need Attention															
Fecal Coliform	CFU/100 ml	<200 = Good	Good (wet); Satisfactory (dry)	405	153	Good	15	76	Good	103	116	Good	29	23	Good (wet); Satisfactory (dry)	25	206
		201-1000 = Satisfactory															
		>1000 = Need Attention															
E. coli	CFU/100 ml	<77 = Good	Need Attention (wet); Good (dry)	391	68	Good	9	56	Satisfactory (wet); Good (dry)	85	77	Good	20	22	Good (wet); Satisfactory (dry)	19	158
		78-386 = Satisfactory															
		>385 = Need Attention															
Iron (total)	µg/L	<800 = Good	Good	330	289	Good	181	476	Good	534	331	Satisfactory	1418	4678		751	854

Parameter	Units	AMF Ranking	UEL-001			UEL-002			UEL-003			UEL-004			UEL-005		
			AMF Ranking	Wet Mean	Dry Mean	AMF Ranking	Wet Mean	Dry Mean	AMF Ranking	Wet Mean	Dry Mean	AMF Ranking	Wet Mean	Dry Mean	AMF Ranking	Wet Mean	Dry Mean
		800-5000 = Satisfactory															
		>5000 = Need Attention															
Cadmium (total)	µg/L	<0.06 = Good	Good	0.0257	0.0160	Good	0.0239	0.0141	Good	0.0161	0.0130	Good	0.0191	0.0120	Good	0.0108	0.0089
		0.06-0.34 = Satisfactory															
		>0.34 = Need Attention															
Copper (total)	µg/L	<3 = Good	Satisfactory (wet); Good (dry)	4.62	2.64	Good	1.62	1.90	Satisfactory	4.71	3.90	Good	2.35	2.33	Good	1.79	2.62
		3-11 = Satisfactory															
		>11 = Need Attention															
Lead (total)	µg/L	<5 = Good	Good	0.398	0.292	Good	0.240	0.227	Good	0.356	0.144	Good	0.268	0.208	Good	0.231	0.143
		5-30 = Satisfactory															
		>30 = Need Attention															
Zinc (total)	µg/L	<6 = Good	Satisfactory (wet); Good (dry)	6.8	5.1	Satisfactory (wet); Good (dry)	6.2	3.3	Satisfactory	9.6	6.2	Good	4.5	4.6	Good	3.9	4.0
		6-40 = Satisfactory															
		>40 = Need Attention															

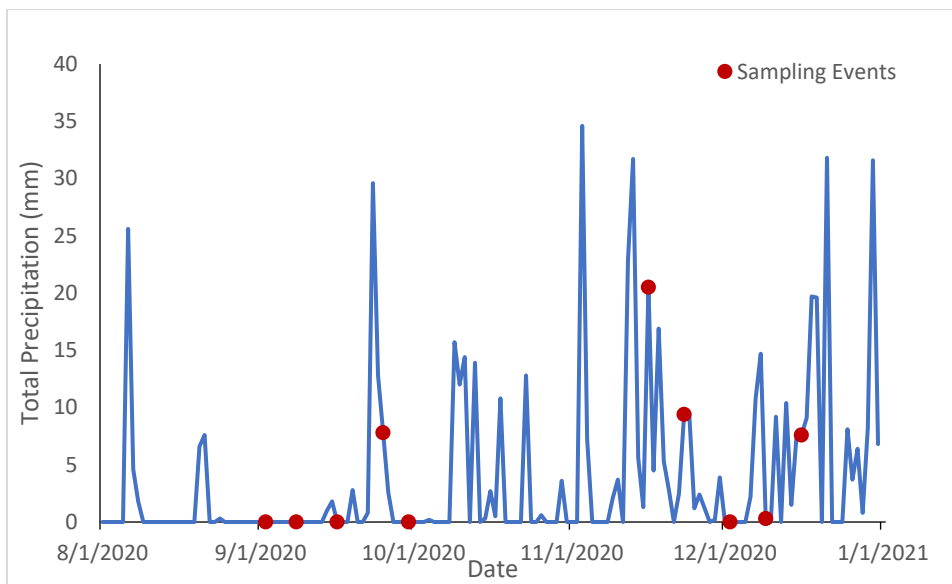
### 3.7 Regional Precipitation

Precipitation data was obtained through Environment and Climate Change Canada database for Vancouver International Airport and was available for the previous 7 years (ECCC, 2021). Precipitation data for the wet and dry period in relation to the sampling days are presented in Figure 3-1 for August to December 2020. For the Dry Period, low flows occurred during most sampling periods, with the exception of week 4 having some precipitation (under 10 mm).

The precipitation that occurred on September 23 was a 2-year rain event. The increase in some parameters and subsequent exceedances observed on September 25 could be a result of this. The following parameters increased from below guidelines on September 16 to above guidelines on September 25:

- UEL-001: Aluminum, copper, and iron
- UEL-003: E. coli, aluminum, copper and iron
- UEL-004: E. coli, aluminum and copper
- UEL-005: Iron

For the Wet Period, all the sampling dates occurred during or immediately following rain events.



**Figure 3-1. Regional Precipitation during both Wet and Dry Period, UEL 2020. (ECCC, 2021)**

The 7-year average downloaded from the ECCC database (ECCC, 2021) for the months of September, November and December from 2013 to 2019 are compared to the 2020 average daily precipitation data from the corresponding sampling months in Figure 3-2 to Figure 3-4. From the previous 7 years, the average daily precipitation for September was below average and above average for November and December.



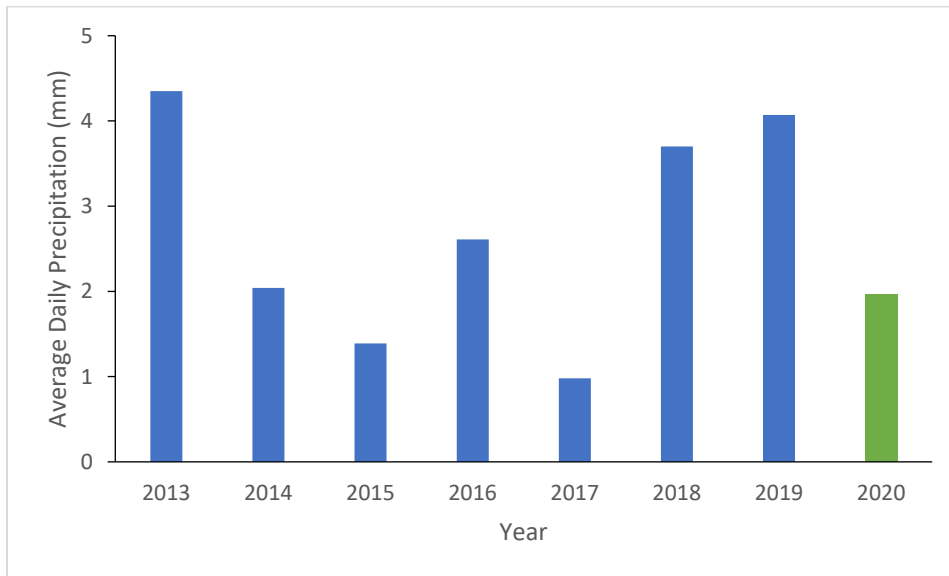


Figure 3-2. Regional Precipitation during Sampling in September, in Relation to Climate Normal near UEL. (ECCC, 2021)

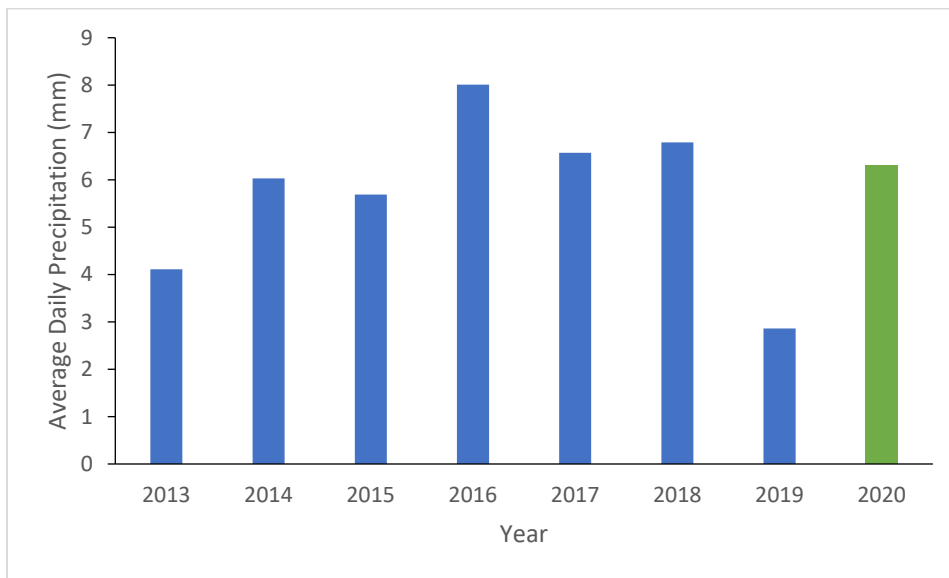


Figure 3-3. Regional Precipitation during Sampling in November, in Relation to Climate Normal near UEL. (ECCC, 2021)

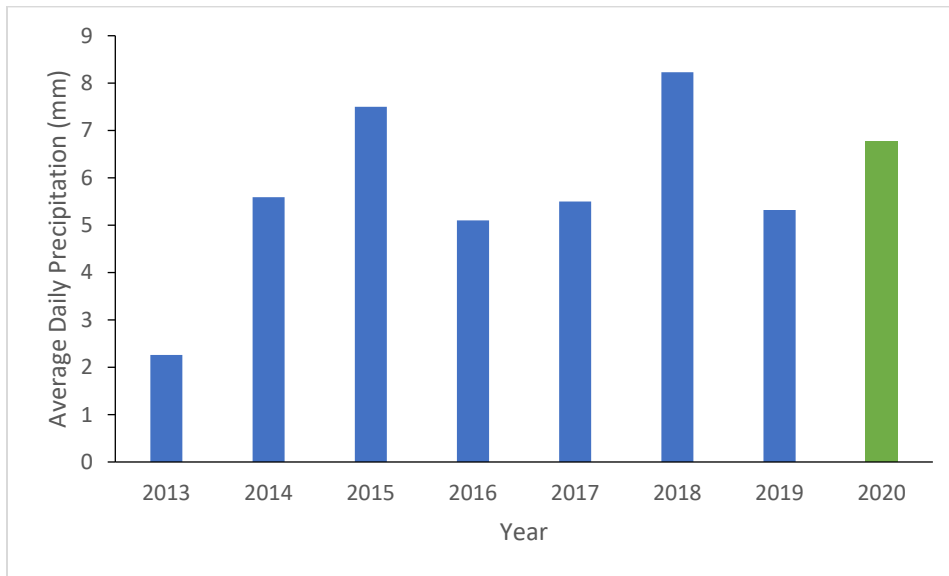


Figure 3-4. Regional Precipitation during Sampling in December, in Relation to Climate Normal near UEL. (ECCC, 2021)

### 3.8 Sampling Site Substrate Condition

For each site, the substrate was visually assessed for dominant and sub-dominant substrate type. Supplementary photographs are presented in Appendix D. UEL-001 and UEL-002 was dominated by gravel with subdominant cobble and sand. UEL-003 was dominated by boulders with subdominant sand and gravel. Due to the low gradient of UEL-004, the substrate was dominated by fines. UEL-005 was dominated by cobbles with subdominant sand.

### 3.9 Benthic Invertebrates

#### 3.9.1 Benthic Invertebrate Metrics

The total number of benthic invertebrate taxa for the UEL watercourse sampling sites in 2020 are provided in Appendix B, Table B-1. Total benthic invertebrate density per square meter (Figure 3-5) and total taxon richness (Figure 3-6) are higher at site UEL-001 compared to UEL-003. Percentages of benthic invertebrate community taxon groups are presented in Table 3-7. The percentage of *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies) and *Trichoptera* (caddisflies; EPT) was higher and is the dominant taxon group at site UEL-001 (average 31.3%) compared to site UEL-003 (average 11.8%) which is the least dominant taxon group. At UEL-003 the dominant group of benthic invertebrates are *Chironomidae* (average 43.4%). The lower density, richness and percentage of EPT and high percentage of *Chironomidae* at UEL-003 suggests that the water quality is poor.

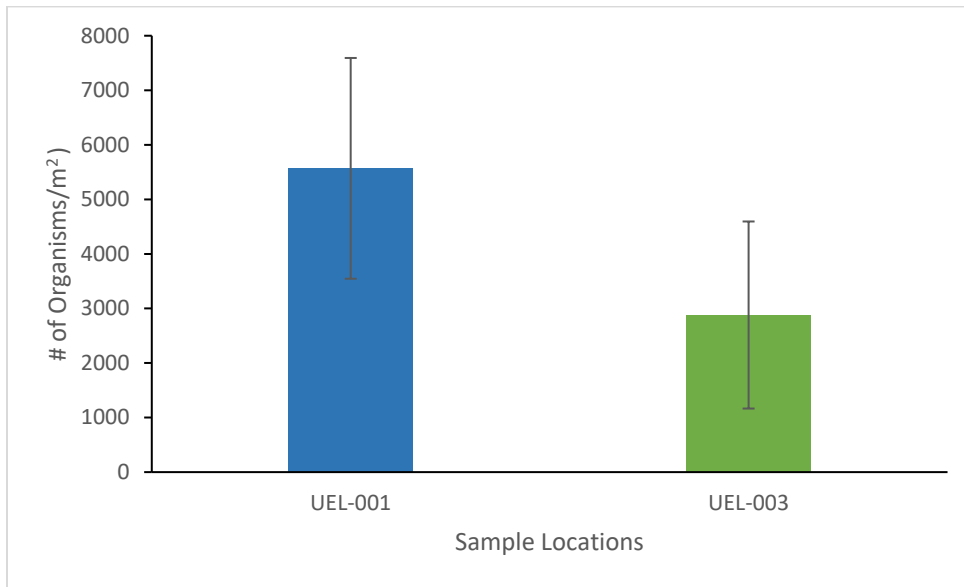


Figure 3-5. Mean Density of Benthic Invertebrates, UEL, September 2020.

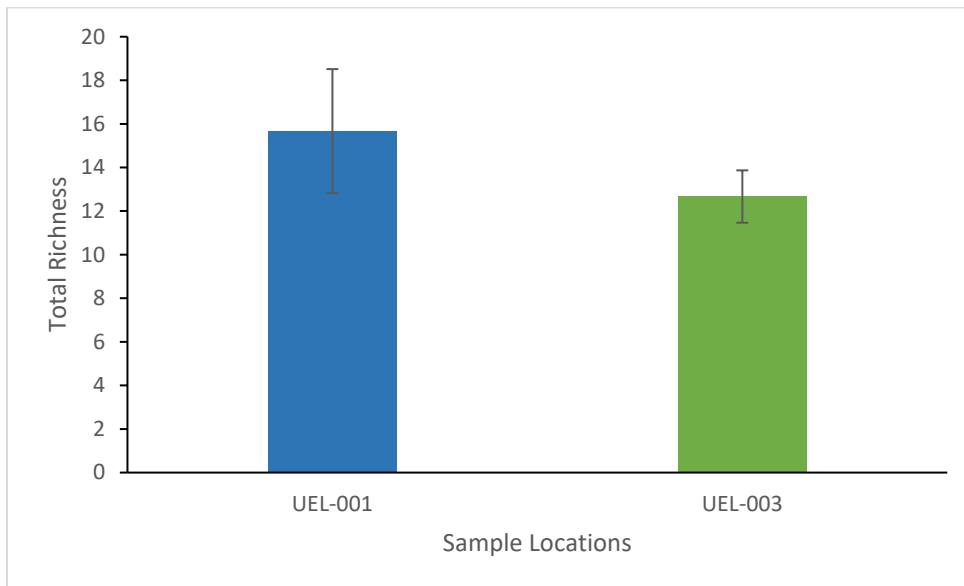


Figure 3-6. Species Richness of Benthic Invertebrates, UEL, September 2020.

Table 3-7. Percentage Composition of Benthic Invertebrate Communities, UEL, September 2020.

Taxa	UEL-001 Average	UEL-003 Average
% EPT	<b>31.3</b>	11.8
% Chironomidae	23.5	<b>43.4</b>
% Oligochaetes	7.5	24.0

Note: Bolded mean values=dominant taxa

### 3.9.2 Benthic Index of Biological Integrity (B-IBI)

Details for the B-IBI scoring for the samples obtained at the UEL sampling locations are found in Appendix C, Table C-1. The results of the B-IBI presented in Table 3-8 rank conditions in UEL-001 and UEL-003 as poor and very poor, respectively. Prior to the 2015 program, the Spanish Bank streamkeepers conducted benthic invertebrate sampling and found that Spanish Banks was within the marginal and acceptable ratings of the protocols they used (Spanish Banks

Streamkeepers, 2010) suggesting that since 2010 there has been a degradation of habitat conditions affecting benthic invertebrate communities.

**Table 3-8. B-IBI Range Scores Obtained for the UEL Project Sampling Program, 2020.**

Metric Scores	UEL-001	UEL-003
Metric Scores	18	16
Stream Condition Rating	Poor	Very Poor

### 3.9.3 Comparison with 2015 Program

Since 2015 the mean density of benthic invertebrates has halved at UEL-001 and quartered at UEL-003. However, the taxon richness has increased slightly at each site. At both sites there was an increase in Chironomid percentage from 2015 to 2020. There was also a decrease in EPT percentage at UEL-003 from 21.3% to 11.8%. The B-IBI range score for UEL-003 has stayed the same since 2015 and improved at UEL-001 from a score of 16 (very poor) to 18 (poor). Although the B-IBI range score showed an improvement at UEL-003, the decrease in EPT could be linked to flash floods in Salish Creek during construction works at the UEL (2017-2019) or to the erosion issues at the existing UEL storm outfall, both leading to the mobilization of sediments and a decrease in water quality.

## 4. Summary

The information presented below is a summary of observations in the watersheds and seasonal differences from the results measured during the water quality and benthic invertebrate sampling program conducted between September to December 2020 for UEL water quality and benthic sampling program.

- This sampling program was completed according to the methodology outline in the Monitoring and Adaptive Management Framework for Stormwater (Metro Vancouver 2014).
- Aluminum, copper, iron, manganese and zinc exceeded either one or all of the CCME and BC Water Quality Guidelines (maximum and/or 30-day) at the UEL watercourse water quality sampling locations. These parameters also exceeded guidelines in 2015.
- The MAMF water quality screening system was applied and determined that the overall water quality in the watershed was rated to be in satisfactory to good condition. E. coli (wet period) was identified as the only parameter at UEL-001 in the Need Attention category. At UEL-004 conductivity and DO in the dry period were identified in the Need Attention category. At UEL-005 conductivity in the dry period was identified in the Need Attention category.
- Benthic macro-invertebrate density and taxon richness was highest at UEL-001, but had decreased for both sites since 2015. The percentage of EPT was higher at UEL-001 compared to UEL-003 in 2020 and there was a reduction in EPT% at UEL-003 from 2015 to 2020.
- Benthic macro-invertebrate B-IBI scoring provided an overall rating of poor and very poor stream conditions for UEL-001 and UEL-003, respectively. Since 2015 the conditions at UEL-001 have improved from a rating of very poor to poor.
- Bacteriological analyses were based on BC guidelines for recreational primary contact levels. E.coli exceeded guidelines during the wet season at UEL-001. Additional daily maximum guidelines were exceeded at UEL-003, UEL-004, and UEL-005 during one of the sampling events in the dry period. E. Coli levels at UEL-001 exceeded single day maximum guidelines during one sampling event in the wet period.
- The 2-year rain event on September 23, 2020 could have resulted in some exceedances seen during the September 25, 2020 sampling event (**Section 3.7**).

### 4.1 Recommendations

The following recommendation is presented for consideration for future water quality sampling occurring within UEL.

- Investigating potential point sources which may involve additional water sampling.

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- Spanish Banks Streamkeepers. 2010. Spanish Bank Creek Invertebrate Surveys. <https://spanishbankstreamkeepers.wordpress.com/>

## Appendix A Water Quality Data

**Table A-1: Water Quality Data from UEL-001**

Table A-1: Water Quality Data from UEL-001

RESULTS OF CHEMICAL ANALYSES OF WATER															BC or CCME 30 Day Water Guidelines	Dry Mean	Wet Mean
Parameter Name	Units	RDL	CCME <sup>a</sup>	BC Water Guidelines	Sampling Period					Wet Sampling							
					Dry Sampling					Wet Sampling							
					2-Sep-20	8-Sep-20	16-Sep-20	25-Sep-20	30-Sep-20	16-Nov-20	23-Nov-20	30-Nov-20	9-Dec-20	16-Dec-20			
					UEL-001	UEL-001	UEL-001	UEL-001	UEL-001	UEL-001	UEL-001	UEL-001	UEL-001	UEL-001			
<b>In Situ</b>																	
Temperature	°C	-			14.1	13.6	12.4	14.4	12.3	8.9	8.0	8.4	8.8	8.2			
Dissolved Oxygen (%)	%	-			89.3	89.0	94.5	96.7	97.1	104.2	112.0	111.0	96.6	101.1			
Dissolved Oxygen (mg/L)	mg/L	-			9.20	18.00	10.12			12.11	13.26	12.98	11.24	11.87			
Specific Conductivity	uS/cm	-			202.9	214.1	199.9	125.3	199.0	165.0	118.0	142.0	136.0	138.0			
Conductivity	uS/cm	-					100.0	150.0	114.0	80.0	97.0	93.0	94.0				
Total Dissolved Solids	g/L	-			0.132	0.139	0.130	0.081	0.129	0.107	0.077	0.095	0.091	0.090			
Salinity	ppt	-								0.08	0.06	0.07	0.06	0.07			
pH	pH	-	6.5 - 9.0	6.5 - 9.0	7.50	7.66	8.00	7.34	7.38	6.75	7.19	6.92	7.48	7.37			
Turbidity	NTU	-			0.48	0.74	0.85	1.40	0.79	2.11	2.78	2.49	2.17	3.69			
<b>Physical Properties</b>																	
Conductivity	uS/cm	2.0			212.0	209.0	209.0	121.0	200.0	177.0	122.0	147.0	140.0	140.0			
pH	pH	0.10	6.5 - 9.0	6.5 - 9.0	7.75	7.84	7.86	7.40	7.86	7.60	7.46	7.63	7.45	7.53			
<b>Anions</b>																	
Nitrite (N)	mg/L	0.0010	0.06		0.0014	0.0014	<0.0010	0.0047	<0.0010	0.0072	0.0034	0.0065	0.0067	0.0076			
<b>Calculated Parameters</b>																	
Nitrate (N)	mg/L	0.0050	550 Acute; 13 Chronic <sup>c</sup>	32.8	1.2600	1.2700	1.2300	2.0000	1.3600	2.1200	1.3100	1.2300	1.7900	1.4900			
Total Hardness (CaCO <sub>3</sub> )	mg/L	0.6			75.6	79.5	73.7	13.5	68.1	50.2	36.4	42.8	38.5	40.8			
<b>Nutrients</b>																	
Nitrate plus Nitrite (N)	mg/L	0.0050			1.2600	1.2800	1.2400	2.0000	1.3600	2.1300	1.3100	1.2300	1.7900	1.5000			
<b>Microbiological Param.</b>																	
E. coli	CFU/100mL	1		400	28	52	160	340	18	260	200	330	2040	260			
Fecal Coliforms	CFU/100mL	1			44	52	170	390	24	260	240	330	2040	260			
<b>Total Metals by ICPMS</b>																	
Total Aluminum (Al)	ug/L	3.0	100		59.2	38.2	35.4	478.0	52.4	162.0	338	235.0	320	323			
Total Antimony (Sb)	ug/L	0.10			<0.10	<0.10	<0.10	0.50	0.20	0.24	0.24	0.22	0.24	0.27			
Total Arsenic (As)	ug/L	0.10	5	5	0.62	0.60	0.60	1.10	0.56	0.59	0.63	0.78	0.56	0.65			
Total Barium (Ba)	ug/L	0.10			13.10	12.2	13.0	19.2	15.4	22.20	19.20	19.80	20.30	22.20			
Total Beryllium (Be)	ug/L	0.100			<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100			
Total Bismuth (Bi)	ug/L	0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.087			
Total Boron (B)	ug/L	10	29000(Acute); 1500 (Chronic)	1200	19	14	14	12	12	11	<10	<10	<10	11			
Total Cadmium (Cd)	ug/L	0.0050	0.28-1.16 <sup>e</sup>		0.0069	0.0076	0.0099	0.0452	0.0194	0.0195	0.0320	0.0264	0.0251	0.0253			
Total Calcium (Ca)	ug/L	50			17300	17900	17900	11000	16700	15000	10900	12500	11500	12200			
Total Chromium (Cr)	ug/L	0.10			0.23	0.25	0.25	0.99	0.30	0.31	0.56	0.60	0.46	0.63			
Total Cobalt (Co)	ug/L	0.10			<0.10	<0.10	<0.10	0.31	<0.10	<0.10	0.20	0.16	0.16	0.17			
Total Copper (Cu)	ug/L	0.50	2 <sup>e</sup>	3.3-7.26 <sup>d</sup>	1.08	0.72	0.78	9.00	1.62	2.42	4.69	5.59	3.51	6.88			
Total Iron (Fe)	ug/L	10	300	1000	282	203	237	545	180	184	382	410	302	370			
Total Lead (Pb)	ug/L	0.050	1 - 1.72 <sup>f</sup>	20.8-53.2 <sup>f</sup>	0.141	0.152	0.087	0.992	0.090	0.201	0.532	0.452	0.403	0.404			
Total Lithium (Li)	ug/L	1.0			1.8	1.8	2.0	<1.0	1.4	<1.0	<1.0	<1.0	<1.0	<1.0			
Total Magnesium (Mg)	ug/L	5.0			7870.0	8460.0	7060.0	2500.0	6380.0	3110.0	2260.0	2800.0	2360.0	2480.0			
Total Manganese (Mn)	ug/L	0.10	25-66.14	692-1157 <sup>g</sup>	15.30	13.6	14.2	22.0	13.0	7.99	17.6	16.6	16.6	18.8			
Total Mercury (Hg)	ug/L	0.0050	0.026 (inorganic)		<0.0050	<0.0050	<0.0050	0.0126	<0.0050	<0.0050	0.0124	0.0055	0.0076	0.0053			
Total Molybdenum (Mo)	ug/L	0.050	73	2000	0.245	0.251	0.266	0.295	0.303	0.362	0.263	0.292	0.334	0.363			
Total Nickel (Ni)	ug/L	0.50	25 - 74 <sup>g</sup>	25 - 74 <sup>g</sup>	<0.50	<0.50	<0.50	2.28	<0.50	0.70	1.51	1.03	1.07	0.88			
Total Potassium (K)	ug/L	50			3590	3520	3540	3450	3480	2360	2370	2210	2120	1970			
Total Selenium (Se)	ug/L	0.050	1		0.081	0.074	0.061	0.095	0.063	<0.100	0.076	0.088	0.086	0.064			
Total Silicon (Si)	ug/L	100			21000	21900	19200	6130	17300	8860	6020	7600	6810	6940			
Total Silver (Ag)	ug/L	0.010	0.3	0.1 <sup>h</sup>	<0.010	<0.010	<0.010	0.022	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			
Total Sodium (Na)	ug/L	50			10200	10700	9660	8160	11000	11800	8230	10800	10600	10500			
Total Strontium (Sr)	ug/L	0.20			136.00	141.00	149.00	73.10	132.00	106.00	67.1	78.30	72.1	80.7			
Total Sulphur (S)	ug/L	500			6960	6540	6900	4010	6290	4790	3120	3280	3390	3500			
Total Thallium (Tl)	ug/L	0.010	0.8		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			
Total Tin (Sn)	ug/L	0.10			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10			
Total Titanium (Ti)	ug/L	0.30			1.39	0.92	0.77	13.0	1.19	2.73	<7.50	6.13	5.52	9.40			
Total Uranium (U)	ug/L	0.010	33 (Acute); 15 (Chronic)		0.308	0.320	0.268	13.100	0.227	0.108	0.072	0.091	0.081	0.077			
Total Vanadium (V)	ug/L	0.50			4.31	4.38	4.12	13.20	3.44	1.94	1.90	2.10	1.91	2.40			
Total Zinc (Zn)	ug/L	3.0	30	33 <sup>i</sup>	3.1	<3.0	<3.0	13.3	3.2	5.2	8.2	6.4	7.2	7.1			
Total Zirconium (Zr)	ug/L	0.20			<0.20	<0.20	<0.20	13.40	<0.20	0.24	0.22	0.23	0.28	0.36			

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 2007. [http://www.ccme.ca/publications/ceqg\\_rceq.html](http://www.ccme.ca/publications/ceqg_rceq.html)

b) Guideline based on range from field pH and temperature; CCME guideline converted to mg/L total ammonia-N by multiplying value by 0.08224.

c) 0.11 µg/L at hardness <5.3 mg/L; calculated as 10<sup>(1.016(log[hardness]) - 1.71)</sup> at hardness ≥5.3 mg/L to ≤360 mg/L; 7.7 µg/L at hardness >360 mg/L.



- d) Guideline values represent concentrations of the chloride ion for CCME standards and NaCl chloride for BC WQ Guidelines
- e) 2 µg/L at hardness <82 mg/L; calculated as  $e^{(0.8545(\ln(\text{hardness}))-1.465)} \times 0.2$  at hardness ≥82 mg/L to ≤180 mg/L; 4 µg/L at hardness >180 mg/L
- f) 1 µg/L at hardness <60 mg/L; calculated as  $e^{(1.273(\ln(\text{hardness}))-4.705)}$  at hardness >60 mg/L to ≤180 mg/L; 7 µg/L at hardness >180 mg/L
- g) 25 µg/L at hardness ≤60 mg/L; calculated as  $e^{(0.769(\ln(\text{hardness}))+1.09)}$  at hardness >60 mg/L to ≤180 mg/L; 150 µg/L at hardness >180 mg/L
- h) Guideline values represent concentrations of the nitrate in ion form, must multiply cc
- i) Clear flow: Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when > 80 NTUs.
- j) Guideline is short term maximum of 100 µg/L at pH ≥6.5 and long term average of 50 µg/L
- k) 0.4 mg/L at hardness 10mg/L; calculate  $-51.73+92.57\log_{10}(\text{hardness}) \times 0.01$
- l) 3 ug/L at hardness ≤ 8 mg/L;  $e^{(1.273 \ln(\text{hardness}))-1.460}$  at hardness > 8 mg/L; expressed as total hardness of samples; 30 day guideline  $(3.31+e^{(1.273 \ln(\text{mean hardness}))-4.704})$
- m) Clear flow: Maximum increase of 25mg/L from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from for a longer term exposure (e.g., 30-d period).  
High flow: Maximum increase of 25 mg/L from background levels at any one time when background levels are between 25 and 250 mg/L. Should not increase more than 10% of background levels when ≥250 mg/L.
- n) Instantaneous maximum calculated from  $0.01102(\text{hardness}) + 0.54$ ; expressed using total hardness of samples; 30 day guideline calculated from  $0.0044(\text{hardness})+0.605$
- o) CCME Longterm - 0.04 µg/L at hardness >0 to 17 mg/L; calculated as  $10^{(0.83(\log(\text{hardness}))-2.48)}$  at hardness ≥17 mg/L to ≤280 mg/L; 0.37 µg/L at hardness >280 mg/L
- p) 0.1 ug/L at hardness ≤ 100mg/L; 3 ug/L at hardness >100mg/L; 30-d mean guideline 0.05 ug/L at hardness ≤ 100mg/L; 1.5 ug/L at hardness >100mg/L
- q) Guideline for total sulphate; 128 mg/L at hardness 0-30 mg/L; 218 mg/L at hardness 31-75 mg/L; 309 mg/L at hardness 76-180; 429 at hardness 181-250 mg/L
- r) Clear flow: Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum change of 5 NTUs from background levels at any one time when background levels are between 8 and 50 NTUs. Should not change more than 10% of background levels when > 50 NTUs.
- s) Clear flow: Maximum increase of 25mg/L from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum increase of 10 mg/L from background at any one time when background levels are between 25 and 100 mg/L. Should not increase more than 10% of background levels when ≥100 mg/L.
- t) 33 ug/L at hardness of ≤90 mg/L (Acute); and  $33+0.75(\text{hardness mg/L}-90)$  for hardness that exceeds 90 mg/L; 30 day guideline 7.5 ug/L at hardness <90 mg/L and  $7.5+0.75(\text{hardness mg/L}-90)$  for hardness that exceeds 90 mg/L
- u) calculated as  $0.094 (\text{hardness}) +2$ ; expressed using total hardness of samples; 30 day is 2 ug/L for hardness <50 mg/L and 0.04(avg hardness) for hardness >50 mg/L
- v) A compendium of working water quality guidelines for British Columbia, 2006. <http://www.env.gov.bc.ca/wat/wq/BCguidelines/working.html>
- w) Calculated as  $e[1.03 \ln(\text{hardness})-5.274]$  short term and  $e[0.736 \ln(\text{hardness})-4.943]$  long term; expressed using total hardness of samples
- x) Guidelines represent total chloride concentrations; 150 mg/L long term average; 600 mg/L short term maximum
- y) Geometric Mean reported here

<=	Less than detection limit.
0.125	Value exceeds CCME guideline.
0.125	Value exceeds BC WQ guidelines
0.125	Value exceeds both CCME and BC WQ guidelines
0.125	Value exceeds BC 30 Day WQ guidelines

RDL = Reportable Detection Limit

**Table A-2: Water Quality Data from UEL-002**

Table A-2: Water Quality Data from UEL-002

RESULTS OF CHEMICAL ANALYSES OF WATER															BC 30 Day Water Guidelines	Dry Mean	Wet Mean	
Parameter Name	Units	RDL	CCME <sup>a</sup>	BC Water Guidelines	Dry Sampling					Wet Sampling								
					2-Sep-20	8-Sep-20	16-Sep-20	25-Sep-20	30-Sep-20	16-Nov-20	23-Nov-20	30-Nov-20	9-Dec-20	16-Dec-20				
Sampling Date	UEL-002	UEL-002	UEL-002	UEL-002	UEL-002	UEL-002	UEL-002	UEL-002	UEL-002	UEL-002	UEL-002	UEL-002	UEL-002	UEL-002				
<b>In Situ</b>																		
Temperature	°C	-			15.5	14.1	13.8	13.8	12.8	7.9	7.5	7.5	8.1	7.5		14.0	7.7	
Dissolved Oxygen (%)	%	-			87.2	86.9	80.3	95.6	89.1	106.3	106.7	104.5	96.9	95.2		87.8	101.9	
Dissolved Oxygen (mg/L)	mg/L	-			8.69	9.02	8.33	51.9	68.0	12.66	12.78	12.55	11.46	11.41		8.68	12.17	
Specific Conductivity	uS/cm	-			66.2	74.2	69.1	51.9	68.0	77.0	68.0	98.0	81.0	74.0		65.9	79.6	
Conductivity	uS/cm	-						40.8	52.0	52.0	45.0	65.0	51.0	50.0		46.4	52.6	
Total Dissolved Solids	g/L	-			0.043	0.048	0.045	0.034	0.045	0.050	0.044	0.062	0.053	0.049		0.043	0.052	
Salinity	ppt	-								0.04	0.03	0.05	0.04	0.03			0.038	
pH	pH	-	6.5 - 9.0	6.5 - 9.0	7.22	7.29	8.68	6.92	7.46	6.67	6.74	6.96	6.66	6.82		7.51	6.77	
Turbidity	NTU	-			1.12	1.17	2.05	1.12	1.16	1.46	1.54		1.51	2.84		1.32	1.84	
<b>Physical Properties</b>																		
Conductivity	uS/cm	2.0			67.6	65.0	71.3	46.3	67.7	84.4	69.5	101.0	80.5	75.8		61.7	82.2	
pH	pH	0.10	6.5 - 9.0	6.5 - 9.0	7.29	7.38	7.44	7.14	7.42	6.74	6.63	6.81	6.63	6.69		7.33	6.70	
<b>Anions</b>																		
Nitrite (N)	mg/L	0.0010	0.06		<0.0010	0.0016	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0025		0.0012	0.0013	
<b>Calculated Parameters</b>																		
Nitrate (N)	mg/L	0.0050	550 Acute; 13 Chronic <sup>b</sup>	32.8	0.3730	0.3870	0.3290	1.1100	0.5560	3.4800	2.8100	2.4300	2.7200	2.4300		3.0	0.5510	2.7740
Total Hardness (CaCO <sub>3</sub> )	mg/L	0.6			19.7	20.7	21.7	13.5	20.0	16.7	14.4	14.0	14.9	13.8		19.1	14.8	
<b>Nutrients</b>																		
Nitrate plus Nitrite (N)	mg/L	0.0050			0.3740	0.3890	0.3290	1.1100	0.5560	3.4800	2.8100	2.4300	2.7200	2.4300		0.5516	2.7740	
<b>Microbiological Param.</b>																		
E. coli	CFU/100mL	1		400	130	78	17	310	10	1	20	8	7	53		200	56 <sup>v</sup>	9 <sup>v</sup>
Fecal Coliforms	CFU/100mL	1			150	107	21	350	22	1	150	10	9	53			76 <sup>v</sup>	15 <sup>v</sup>
<b>Total Metals by ICPMS</b>																		
Total Aluminum (Al)	ug/L	3.0	100		81.9	118.0	334	209	74.3	141	317	207	371	366			163.4	280.4
Total Antimony (Sb)	ug/L	0.10			<0.10	<0.10	0.14	0.24	0.10	0.10	0.11	0.12	0.12	0.19		9 <sup>v</sup>	0.14	0.13
Total Arsenic (As)	ug/L	0.10	5	5	0.26	0.30	0.38	0.28	0.24	0.14	0.15	0.12	0.16	0.24			0.29	0.16
Total Barium (Ba)	ug/L	0.10			15.80	15.2	21.0	13.9	16.2	25.50	28.10	28.80	29.60	31.10		1000 <sup>v</sup>	16.42	28.62
Total Beryllium (Be)	ug/L	0.100			<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100		0.13 <sup>v</sup>	0.100	0.100
Total Bismuth (Bi)	ug/L	0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			0.050	0.050
Total Boron (B)	ug/L	10	29000(Acute); 1500 (Chronic)	1200	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10			10	10
Total Cadmium (Cd)	ug/L	0.0050	0.28-1.16 <sup>c</sup>		0.0089	0.0105	0.0243	0.0182	0.0084	0.0130	0.0316	0.0201	0.0272	0.0274		0.08 <sup>o</sup>	0.0141	0.0239
Total Calcium (Ca)	ug/L	50			4900	5200	5570	3590	5070	4690	3940	3790	4130	3750			4866	4060
Total Chromium (Cr)	ug/L	0.10			0.35	0.35	0.64	1.44	0.43	0.15	0.39	0.30	0.32	0.53			0.64	0.34
Total Cobalt (Co)	ug/L	0.10		110	0.21	0.19	0.48	0.27	0.16	<0.10	0.26	0.15	0.26	0.30		4	0.26	0.21
Total Copper (Cu)	ug/L	0.50	2 <sup>e</sup>	3.3-7.26 <sup>u</sup>	1.38	1.45	2.16	3.01	1.48	0.96	1.83	1.41	1.59	2.32		2 <sup>e</sup>	1.90	1.62
Total Iron (Fe)	ug/L	10	300	1000	376	388	916	390	309	88	192	143	232	252			476	181
Total Lead (Pb)	ug/L	0.050	1 - 1.72 <sup>f</sup>	20.8-53.2 <sup>f</sup>	0.098	0.148	0.461	0.326	0.102	0.086	0.240	0.149	0.345	0.379		3.7-5.75 <sup>f</sup>	0.227	0.240
Total Lithium (Li)	ug/L	1.0			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			1.0	1.0
Total Magnesium (Mg)	ug/L	5.0			1800.0	1860	1900	1110	1790	1200	1120	1090	1110	1070			1692.0	1118.0
Total Manganese (Mn)	ug/L	0.10	25-66.14	692-1157 <sup>n</sup>	32.90	31.8	70.3	38.4	25.0	10.6	26.9	16.5	25.8	28.0		670-809 <sup>o</sup>	39.68	21.56
Total Mercury (Hg)	ug/L	0.0050	0.026 (inorganic)		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			0.0050	0.0050
Total Molybdenum (Mo)	ug/L	0.050	73	2000	0.223	0.233	0.245	0.158	0.216	<0.050	<0.050	0.065	0.054	0.108		1000	0.215	0.065
Total Nickel (Ni)	ug/L	0.50	25 - 74 <sup>g</sup>	25 - 74 <sup>v</sup>	0.61	0.57	0.82	0.71	0.55	0.60	0.91	0.73	0.86	0.90			0.65	0.80
Total Potassium (K)	ug/L	50			1660	1640	1810	1540	1670	781	804	779	754	695			1664	763
Total Selenium (Se)	ug/L	0.050	1		<0.050	0.068	<0.050	0.056	<0.050	<0.100	<0.050	<0.050	<0.050	<0.050		2	0.055	0.060
Total Silicon (Si)	ug/L	100			16800	16900	16800	6540	16100	6730	5990	5760	5870	5640			14628	5998
Total Silver (Ag)	ug/L	0.010	0.3	0.1 <sup>p</sup>	<0.010	0.032	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		0.05 <sup>p</sup>	0.014	0.010
Total Sodium (Na)	ug/L	50			5210	5690	5110	3540	5100	7250	6370	11800	8170	7840			4930	8286
Total Strontium (Sr)	ug/L	0.20			55.60	60.4	69.0	39.5	57.4	56.1	44.9	44.7	47.4	46.5			56.38	47.92
Total Sulphur (S)	ug/L	500			1050	950	1050	570	1070	1700	1440	1230	1650	1820			938	1568
Total Thallium (Tl)	ug/L	0.010	0.8		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			0.010	0.010
Total Tin (Sn)	ug/L	0.10			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10			0.10	0.11
Total Titanium (Ti)	ug/L	0.30			2.02	3.44	9.11	5.88	2.29	1.08	3.79	2.66	6.77	8.62			4.55	4.58
Total Uranium (U)	ug/L	0.010	33 (Acute); 15 (Chronic)		<0.010	0.011	0.013	0.024	0.010	<0.010	<0.010	<0.010	<0.010	<0.010		8.5 <sup>v</sup>	0.014	0.010
Total Vanadium (V)	ug/L	0.50			2.56	2.75	3.88	2.13	2.11	0.51	0.84	0.70	0.96	1.40			2.69	0.88
Total Zinc (Zn)	ug/L	3.0	30	33 <sup>t</sup>	<3.0	<3.0	3.9	3.4	<3.0	4.4	6.8	5.8	6.4	7.8		7.5 <sup>t</sup>	3.3	6.2
Total Zirconium (Zr)	ug/L	0.20			0.23	0.26	0.29	<0.20	0.22	<0.20	<0.20	<0.20	<0.20	<0.20			0.24	0.20

- a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 2007. [http://www.ccme.ca/publications/ceqg\\_rcqe.html](http://www.ccme.ca/publications/ceqg_rcqe.html)
- b) Guideline based on range from field pH and temperature; CCME guideline converted to mg/L total ammonia-N by multiplying value by 0.08224.
- c) 0.11 µg/L at hardness <5.3 mg/L; calculated as  $10^{(1.016(\log(\text{hardness}]) - 1.71)}$  at hardness ≥5.3 mg/L to ≤360 mg/L; 7.7 µg/L at hardness >360 mg/L
- d) Guideline values represent concentrations of the chloride ion for CCME standards and NaCl chloride for BC WQ Guidelines
- e) 2 µg/L at hardness <82 mg/L; calculated as  $e^{(0.8545(\ln(\text{hardness}]) - 1.465)} \times 0.2$  at hardness ≥82 mg/L to ≤180 mg/L; 4 µg/L at hardness >180 mg/L
- f) 1 µg/L at hardness <60 mg/L; calculated as  $e^{1.273(\ln(\text{hardness}]) - 4.705}$  at hardness >60 mg/L to ≤180 mg/L; 7 µg/L at hardness >180 mg/L
- g) 25 µg/L at hardness ≤60 mg/L; calculated as  $e^{(0.76(\ln(\text{hardness}]) + 1.06)}$  at hardness >60 mg/L to ≤180 mg/L; 150 µg/L at hardness >180 mg/L
- h) Guideline values represent concentrations of the nitrate in ion form,
- i) Clear flow: Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when > 80 NTUs.
- j) Guideline is short term maximum of 100 µg/L at pH ≥6.5 and long term average of 50 µg/L
- k) 0.4 mg/L at hardness 10mg/L; calculate  $-51.73 + 92.57 \log_{10}(\text{hardness}) \times 0.01$
- l) 3 ug/L at hardness ≤ 8 mg/L;  $e^{(1.273 \ln(\text{hardness}]) - 1.460}$  at hardness > 8 mg/L; expressed as total hardness of samples; 30 day guideline  $(3.31 + e^{(1.273 \ln(\text{hardness}]) - 4.704})$
- m) Clear flow: Maximum increase of 25mg/L from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from for a longer term exposure (e.g., 30-d period).  
High flow: Maximum increase of 25 mg/L from background levels at any one time when background levels are between 25 and 250 mg/L. Should not increase more than 10% of background levels when ≥250 mg/L.
- n) Instantaneous maximum calculated from  $0.01102(\text{hardness}) + 0.54$ ; expressed using total hardness of samples; 30 day guideline calculated from  $0.0044(\text{hardness}) + 0.605$
- o) CCME Longterm - 0.04 µg/L at hardness >0 to 17 mg/L; calculated as  $10^{(0.83(\log(\text{hardness}]) - 2.46)}$  at hardness ≥17 mg/L to ≤280 mg/L; 0.37 µg/L at hardness >280 mg/L
- p) 0.1 ug/L at hardness ≤ 100mg/L; 3 ug/L at hardness >100mg/L; 30-d mean guideline 0.05 ug/L at hardness ≤ 100mg/L; 1.5 ug/L at hardness >100mg/L
- q) Guideline for total sulphate; 128 mg/L at hardness 0-30 mg/L; 218 mg/L at hardness 31-75 mg/L; 309 mg/L at hardness 76-180; 429 at hardness 181-250 mg/L
- r) Clear flow: Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum change of 5 NTUs from background levels at any one time when background levels are between 8 and 50 NTUs. Should not change more than 10% of background levels when > 50 NTUs.
- s) Clear flow: Maximum increase of 25mg/L from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum increase of 10 mg/L from background at any one time when background levels are between 25 and 100 mg/L. Should not increase more than 10% of background levels when ≥100 mg/L.
- t) 33 ug/L at hardness of ≤90 mg/L (Acute); and  $33 + 0.75(\text{hardness mg/L} - 90)$  for hardness that exceeds 90 mg/L; 30 day guideline 7.5 ug/L at hardness <90 mg/L and  $7.5 + 0.75(\text{hardness mg/L} - 90)$  for hardness that exceeds 90 mg/L
- u) calculated as  $0.094(\text{hardness}) + 2$ ; expressed using total hardness of samples; 30 day is 2 ug/L for hardness <50 mg/L and 0.04(avg hardness) for hardness >50 mg/L
- v) A compendium of working water quality guidelines for British Columbia, 2006. <http://www.env.gov.bc.ca/wat/wq/BCguidelines/working.html>
- w) Calculated as  $e[1.03 \ln(\text{hardness}) - 5.274]$  short term and  $e[0.736 \ln(\text{hardness}) - 4.943]$  long term; expressed using total hardness of samples
- x) Guidelines represent total chloride concentrations; 150 mg/L long term average; 600 mg/L short term maximum
- y) Geometric Mean reported here

<math>\leq</math>	Less than detection limit.
0.125	Value exceeds CCME guideline.
0.125	Value exceeds BC WQ guidelines
0.125	Value exceeds both CCME and BC WQ guidelines
0.125	Value exceeds BC 30 Day WQ guidelines

RDL = Reportable Detection Limit

**Table A-3: Water Quality Data from UEL-003**

Table A-3: Water Quality Data from UEL-003

RESULTS OF CHEMICAL ANALYSES OF WATER															BC 30 Day Water Guidelines	Dry Mean	Wet Mean	
Parameter Name	Units	RDL	CCME <sup>a</sup>	BC Water Guidelines	Dry Sampling					Wet Sampling								
					2-Sep-20	8-Sep-20	16-Sep-20	25-Sep-20	30-Sep-20	16-Nov-20	23-Nov-20	30-Nov-20	9-Dec-20	16-Dec-20				
Sampling Date	UEL-003	UEL-003	UEL-003	UEL-003	UEL-003	UEL-003	UEL-003	UEL-003	UEL-003	UEL-003	UEL-003	UEL-003	UEL-003	UEL-003				
<b>In Situ</b>																		
Temperature	°C	-			14.4	13.9	13.7	15.0	13.3	8.3	7.4	8.1	8.7	7.9			14.1	8.1
Dissolved Oxygen (%)	%	-			99.4	99.4	91.3	102.3	103.3	104.2	109.3	106.1	96.8	97.9			99.1	102.9
Dissolved Oxygen (mg/L)	mg/L	-			10.16	10.39	9.49	11.6	11.6	12.28	13.16	12.48	11.29	11.63			10.01	12.17
Specific Conductivity	uS/cm	-			154.6	157.4	145.6	199.6	173.0	153.0	118.0	140.0	146.0	132.0			166.0	137.8
Conductivity	uS/cm	-						161.4	134.0	105.0	79.0	90.0	102.0	89.0			147.7	93.0
Total Dissolved Solids	g/L	-			0.101	0.102	0.095	0.130	0.112	0.099	0.077	0.080	0.096	0.086			0.108	0.248
Salinity	ppt	-								0.07	0.06	0.07	0.07	0.06				0.07
pH	pH	-	6.5 - 9.0	6.5 - 9.0	7.33	7.91	8.28	7.95	7.99	7.14	7.15	7.73	7.85	7.63			7.89	7.50
Turbidity	NTU	-			0.51	0.68	0.54	0.79	0.87	2.15	2.07	2.48	7.78	4.23			0.68	3.74
<b>Physical Properties</b>																		
Conductivity	uS/cm	2.0			160.0	152.0	152.0	190.0	175.0	165.0	124.0	146.0	152.0	133.0			165.8	144.0
pH	pH	0.10	6.5 - 9.0	6.5 - 9.0	7.82	7.95	7.87	7.80	7.92	7.74	7.62	7.72	7.69	7.66			7.87	7.69
<b>Anions</b>																		
Nitrite (N)	mg/L	0.0010	0.06		0.0014	0.0016	0.0014	0.0103	0.0019	0.0037	0.0025	0.0045	0.0034	0.0053			0.0033	0.0039
<b>Calculated Parameters</b>																		
Nitrate (N)	mg/L	0.0050	550 Acute; 13 Chronic <sup>b</sup>	32.8	1.0600	0.9970	0.9340	2.6400	1.0200	1.0100	0.7090	0.6730	0.8300	0.7810		3.0	1.3302	0.8006
Total Hardness (CaCO <sub>3</sub> )	mg/L	0.6			51.1	49.6	49.2	71.9	54.8	50.3	40.9	42.0	45.4	40.6			55.3	43.8
<b>Nutrients</b>																		
Nitrate plus Nitrite (N)	mg/L	0.0050			1.0500	0.9990	0.9360	2.6600	1.0300	1.0100	0.7120	0.6780	0.8340	0.7860			1.3350	0.8040
<b>Microbiological Param.</b>																		
E. coli	CFU/100mL	1		400	19	72	80	420	58	21	40	240	170	131		200	77 <sup>c</sup>	85 <sup>c</sup>
Fecal Coliforms	CFU/100mL	1			32	72	190	580	84	21	80	310	174	131			116 <sup>c</sup>	104 <sup>c</sup>
<b>Total Metals by ICPMS</b>																		
Total Aluminum (Al)	ug/L	3.0	100		25.9	21.7	29.5	226	33.4	88.9	142	153	602	236			67.3	244.4
Total Antimony (Sb)	ug/L	0.10			0.16	0.16	0.17	0.42	0.19	0.22	0.19	0.22	0.24	0.23		g <sup>e</sup>	0.22	0.22
Total Arsenic (As)	ug/L	0.10	5	5	1.22	1.06	1.58	2.63	1.06	0.72	1.31	2.20	1.02	1.71			1.51	1.39
Total Barium (Ba)	ug/L	0.10			9.77	8.58	9.63	20.20	11.1	14.50	14.80	15.20	20.10	16.10		1000 <sup>d</sup>	11.86	16.14
Total Beryllium (Be)	ug/L	0.100			<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100		0.13 <sup>e</sup>	0.100	0.100
Total Bismuth (Bi)	ug/L	0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.063	0.073			0.050	0.057
Total Boron (B)	ug/L	10	29000(Acute); 1500(Chronic)	1200	21	15	18	27	17	17	11	11	14	13			20	13
Total Cadmium (Cd)	ug/L	0.0050	0.28-1.16 <sup>c</sup>		0.0081	0.0060	0.0056	0.0350	0.0102	0.0094	0.0208	0.0152	0.0191	0.0162		0.08 <sup>e</sup>	0.0130	0.0161
Total Calcium (Ca)	ug/L	50			13500	12800	13500	22300	15200	15700	12700	13000	14000	12600			15460	13600
Total Chromium (Cr)	ug/L	0.10			0.26	0.24	0.68	1.23	0.31	0.31	0.56	0.93	0.82	0.85			0.54	0.69
Total Cobalt (Co)	ug/L	0.10		110	<0.10	<0.10	<0.10	0.18	<0.10	<0.10	0.10	<0.10	0.21	0.13		4	0.12	0.13
Total Copper (Cu)	ug/L	0.50	2 <sup>a</sup>	3.3-7.26 <sup>a</sup>	2.80	1.77	3.84	8.20	2.87	2.78	4.00	5.61	5.74	5.44		2 <sup>a</sup>	3.90	4.71
Total Iron (Fe)	ug/L	10	300	1000	128	107	151	1110	159	348	482	407	910	521			331	534
Total Lead (Pb)	ug/L	0.050	1 - 1.72 <sup>d</sup>	20.8-53.2 <sup>d</sup>	<0.050	<0.050	0.074	0.470	0.078	0.168	0.256	0.346	0.458	0.553		3.7-5.75 <sup>d</sup>	0.144	0.356
Total Lithium (Li)	ug/L	1.0			<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			1.0	1.0
Total Magnesium (Mg)	ug/L	5.0			4220.0	4280	3760	3950	4100	2660	2250	2300	2510	2260			4062.0	2396.0
Total Manganese (Mn)	ug/L	0.10	25-66.14	692-1157 <sup>d</sup>	9.13	9.06	8.56	22.60	7.00	6.78	12.7	11.3	17.1	12.6		670-809 <sup>d</sup>	11.27	12.10
Total Mercury (Hg)	ug/L	0.0050	0.026 (inorganic)		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0052	<0.0050			0.0050	0.0050
Total Molybdenum (Mo)	ug/L	0.050	73	2000	0.435	0.387	0.428	0.614	0.406	0.310	0.195	0.292	0.337	0.334		1000	0.454	0.294
Total Nickel (Ni)	ug/L	0.50	25 - 74 <sup>a</sup>	25 - 74 <sup>a</sup>	<0.50	<0.50	<0.50	1.39	<0.50	0.51	0.79	0.57	1.13	0.66			0.68	0.73
Total Potassium (K)	ug/L	50			51	2640	2630	3960	2820	2170	2020	1860	2210	1840			2420	2020
Total Selenium (Se)	ug/L	0.050	1		0.051	<0.050	0.076	0.103	0.073	<0.150	0.053	0.062	0.064	0.066		2	0.071	0.079
Total Silicon (Si)	ug/L	100			17600	18000	16300	6640	15600	7040	5500	5400	6310	5580			14828	5966
Total Silver (Ag)	ug/L	0.010	0.3	0.1 <sup>p</sup>	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		0.05 <sup>e</sup>	0.010	0.010
Total Sodium (Na)	ug/L	50			10500	11200	9240	10200	10900	10500	7280	10700	10500	9040			10408	9604
Total Strontium (Sr)	ug/L	0.20			103.00	100.00	99.60	127.00	106.00	102.00	77.40	79.5	88.1	81.9			107.12	85.78
Total Sulphur (S)	ug/L	500			3090	2890	3150	4140	3080	3660	2500	2220	2290	2590			3270	2652
Total Thallium (Tl)	ug/L	0.010	0.8		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			0.010	0.010
Total Tin (Sn)	ug/L	0.10			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10			0.10	0.10
Total Titanium (Ti)	ug/L	0.30			0.57	0.54	0.82	6.87	0.96	2.60	4.09	5.45	22.6	8.74			1.95	8.70
Total Uranium (U)	ug/L	0.010	33 (Acute); 15 (Chronic)		0.047	0.043	0.038	0.095	0.053	0.047	0.031	0.032	0.050	0.035		8.5 <sup>e</sup>	0.055	0.039
Total Vanadium (V)	ug/L	0.50			1.94	2.14	2.06	1.42	1.53	0.80	0.84	0.94	1.63	1.53			1.82	1.15
Total Zinc (Zn)	ug/L	3.0	30	33 <sup>1</sup>	3.9	3.1	3.7	16.0	4.3	5.2	10.4	11.3	10.7	10.6		7.5 <sup>1</sup>	6.2	9.6
Total Zirconium (Zr)	ug/L	0.20			<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	<0.20	0.49	0.20			0.20	0.26

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 2007. [http://www.ccmce.ca/publications/ceqg\\_rqce.html](http://www.ccmce.ca/publications/ceqg_rqce.html)

b) Guideline based on range from field pH and temperature; CCME guideline converted to mg/L total ammonia-N by multiplying value by 0.08224.

c) 0.11 µg/L at hardness <5.3 mg/L; calculated as  $10^{(1.016(\log(\text{hardness}) - 1.71))}$  at hardness ≥5.3 mg/L to ≤360 mg/L; 7.7 µg/L at hardness >360 mg/L

d) Guideline values represent concentrations of the chloride ion for CCME standards and NaCl chloride for BC WQ Guidelines

e) 2 µg/L at hardness <82 mg/L; calculated as  $e^{(0.08545(\ln(\text{hardness}) - 1.465))} \times 0.2$  at hardness ≥82 mg/L to ≤180 mg/L; 4 µg/L at hardness >180 mg/L

- f) 1 µg/L at hardness <60 mg/L; calculated as  $e^{1.273[\ln(\text{hardness})]-4.709}$  at hardness >60 mg/L to ≤180 mg/L; 7 µg/L at hardness >180 mg/L
- g) 25 µg/L at hardness ≤60 mg/L; calculated as  $e^{0.76[\ln(\text{hardness})]+1.06}$  at hardness >60 mg/L to ≤180 mg/L; 150 µg/L at hardness >180 mg/L
- h) Guideline values represent concentrations of the nitrate in ion form, must r
- i) Clear flow: Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when > 80 NTUs.
- j) Guideline is short term maximum of 100 µg/L at pH ≥6.5 and long term average of 50 µg/L
- k) 0.4 mg/L at hardness 10mg/L; calculate  $-51.73+92.57\log_{10}(\text{hardness}) \times 0.01$
- l) 3 ug/L at hardness ≤ 8 mg/L;  $e^{1.273 \cdot \ln(\text{hardness})-1.469}$  at hardness > 8 mg/L; expressed as total hardness of samples; 30 day guideline  $(3.31+e^{(1.273 \cdot \ln(\text{hardness})-4.704)})$
- m) Clear flow: Maximum increase of 25mg/L from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from for a longer term exposure (e.g., 30-d period).  
High flow: Maximum increase of 25 mg/L from background levels at any one time when background levels are between 25 and 250 mg/L. Should not increase more than 10% of background levels when ≥250 mg/L.
- n) Instantaneous maximum calculated from  $0.01102(\text{hardness}) + 0.54$ ; expressed using total hardness of samples; 30 day guideline calculated from  $0.0044(\text{hardness})+0.605$
- o) CCME Longterm - 0.04 µg/L at hardness >0 to 17 mg/L; calculated as  $10^{(0.83(\log(\text{hardness})) - 2.46)}$  at hardness ≥17 mg/L to ≤280 mg/L; 0.37 µg/L at hardness >280 mg/L
- p) 0.1 ug/L at hardness ≤ 100mg/L; 3 ug/L at hardness >100mg/L; 30-d mean guideline 0.05 ug/L at hardness ≤ 100mg/L; 1.5 ug/L at hardness >100mg/L
- q) Guideline for total sulphate; 128 mg/L at hardness 0-30 mg/L; 218 mg/L at hardness 31-75 mg/L; 309 mg/L at hardness 76-180; 429 at hardness 181-250 mg/L
- r) Clear flow: Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum change of 5 NTUs from background levels at any one time when background levels are between 8 and 50 NTUs. Should not change more than 10% of background levels when > 50 NTUs.
- s) Clear flow: Maximum increase of 25mg/L from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum increase of 10 mg/L from background at any one time when background levels are between 25 and 100 mg/L. Should not increase more than 10% of background levels when ≥100 mg/L.
- t) 33 ug/L at hardness of ≤90 mg/L (Acute); and  $33+0.75(\text{hardness mg/L}-90)$  for hardness that exceeds 90 mg/L; 30 day guideline 7.5 ug/L at hardness <90 mg/L and  $7.5+0.75(\text{hardness mg/L}-90)$  for hardness that exceeds 90 mg/L
- u) calculated as  $0.094(\text{hardness}) + 2$ ; expressed using total hardness of samples; 30 day is 2 ug/L for hardness <50 mg/L and  $0.04(\text{avg hardness})$  for hardness >50 mg/L
- v) A compendium of working water quality guidelines for British Columbia, 2006. <http://www.env.gov.bc.ca/wat/wq/BCguidelines/working.html>
- w) Calculated as  $e^{1.03 \cdot \ln(\text{hardness})-5.274}$  short term and  $e^{0.736 \cdot \ln(\text{hardness})-4.943}$  long term; expressed using total hardness of samples
- x) Guidelines represent total chloride concentrations; 150 mg/L long term average; 600 mg/L short term maximum
- y) Geometric Mean reported here

"<"	Less than detection limit.
0.125	Value exceeds CCME guideline.
0.125	Value exceeds BC WQ guidelines
0.125	Value exceeds both CCME and BC WQ guidelines
0.125	Value exceeds BC 30 Day WQ guidelines

RDL = Reportable Detection Limit

(1) RDL raised due to sample matrix interference.

**Table A-4: Water Quality Data from UEL-004**



Table A-4: Water Quality Data from UEL-004

RESULTS OF CHEMICAL ANALYSES OF WATER															BC 30 Day Water Guidelines	Dry Mean	Wet Mean
Parameter Name	Units	RDL	CCME <sup>a</sup>	BC Water Guidelines	Dry Sampling					Wet Sampling							
					2-Sep-20	8-Sep-20	16-Sep-20	25-Sep-20	30-Sep-20	16-Nov-20	23-Nov-20	30-Nov-20	9-Dec-20	16-Dec-20			
<b>In Situ</b>																	
Temperature	°C	-			16.0	15.3	14.4	13.0	13.3	7.1	7.2	7.2	8.1	7.1		14.4	7.3
Dissolved Oxygen (%)	%	-					22.4	54.7	10.6	48.3	81.6	60.4	57.1	54.4		29.2	60.4
Dissolved Oxygen (mg/L)	mg/L	-			1.12	8.50	2.27			5.86	9.84	7.28	6.74	6.59		3.96	7.26
Specific Conductivity	uS/cm	-			227.4	256.3	238.3	105.8	194.0	125.0	102.0	161.0	141.0	89.0		202.4	123.6
Conductivity	uS/cm	-						85.4	142.0	82.0	66.0	104.0	94.0	88.0		113.7	86.8
Total Dissolved Solids	g/L	-			0.148	0.166	0.155	0.689	0.120	0.080	0.066	0.107	0.091	0.089		0.255	0.087
Salinity	ppt	-								0.06	0.05	0.08	0.07	0.06			0.06
pH	pH	-	6.5 - 9.0	6.5 - 9.0	6.54	7.16	9.07	6.54	6.79	6.52	6.59	6.88	7.12	6.52		7.22	6.73
Turbidity	NTU	-			33.00	34.10	26.60	1.49	15.80	3.83	7.16	4.15	2.73	2.85		22.20	4.14
<b>Physical Properties</b>																	
Conductivity	uS/cm	2.0			231.0	245.0	249.0	99.7	184.0	131.0	105.0	157.0	143.0	134.0		201.7	134.0
pH	pH	0.10	6.5 - 9.0	6.5 - 9.0	7.17	7.39	7.48	6.81	7.38	6.98	7.00	7.28	7.03	7.18		7.25	7.09
<b>Anions</b>																	
Nitrite (N)	mg/L	0.0010	0.06		<0.0010	0.0010	<0.0010	0.0091	0.0114	0.0067	0.0033	0.0047	0.0029	0.0035		0.0047	0.0042
<b>Calculated Parameters</b>																	
Nitrate (N)	mg/L	0.0050	550 Acute; 13 Chronic <sup>b</sup>	32.8	0.0062	<0.0050	<0.0050	0.6200	0.0594	1.3900	0.6990	0.8370	1.0200	1.0500	3.0	0.1391	0.9992
Total Hardness (CaCO <sub>3</sub> )	mg/L	0.6			91.2	107.0	101.0	39.1	67.3	44.1	38.4	56.0	46.8	46.9		81.1	46.4
<b>Nutrients</b>																	
Nitrate plus Nitrite (N)	mg/L	0.0050			0.0065	<0.0051	0.0052	0.6290	0.0708	1.4000	0.7020	0.8420	1.0200	1.0500		0.1779	1.0028
<b>Microbiological Param.</b>																	
E. coli	CFU/100mL	1		400	9	2	13	430	50	6	120	218	10	2	200	22 <sup>y</sup>	20 <sup>y</sup>
Fecal Coliforms	CFU/100mL	1			9	2	13	530	52	6	150	218	50	2		23 <sup>y</sup>	29 <sup>y</sup>
<b>Total Metals by ICPMS</b>																	
Total Aluminum (Al)	ug/L	3.0	100		28.5	49.2	21.4	254	105	88.7	351	147	98.3	84.8		91.6	154.0
Total Antimony (Sb)	ug/L	0.10			<0.10	<0.10	<0.10	0.25	0.11	0.12	0.18	<0.10	0.16	0.12	9 <sup>y</sup>	0.13	0.14
Total Arsenic (As)	ug/L	0.10	5	5	0.55	0.62	0.53	0.47	0.54	0.25	0.33	0.27	0.22	0.30		0.54	0.27
Total Barium (Ba)	ug/L	0.10			50.30	58.3	54.1	23.3	35.2	27.00	24.60	32.20	29.70	32.60	1000 <sup>y</sup>	44.24	29.22
Total Beryllium (Be)	ug/L	0.100			<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	0.13 <sup>y</sup>	0.100	0.100
Total Bismuth (Bi)	ug/L	0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		0.050	0.050
Total Boron (B)	ug/L	10	29000(Acute); 1500 (Chronic)	1200	15	15	15	13	13	10	<10	10	11	11		14	10
Total Cadmium (Cd)	ug/L	0.0050	0.28-1.16 <sup>c</sup>		<0.0050	<0.0050	<0.0050	0.0368	0.0084	0.0108	0.0312	0.0196	0.0190	0.0151	0.08 <sup>o</sup>	0.0120	0.0191
Total Calcium (Ca)	ug/L	50			25200	31000	29200	11800	19700	13900	12000	17000	14600	14400		23380	14380
Total Chromium (Cr)	ug/L	0.10			0.19	0.22	0.17	0.48	0.28	0.18	0.52	0.25	0.24	0.23		0.27	0.28
Total Cobalt (Co)	ug/L	0.10		110	1.04	1.42	1.05	0.37	0.63	0.23	0.30	0.37	0.28	0.26	4	0.90	0.29
Total Copper (Cu)	ug/L	0.50	2 <sup>p</sup>	3.3-7.26 <sup>u</sup>	<0.50	<0.50	0.73	8.21	1.73	1.27	4.97	1.71	1.97	1.81	2 <sup>y</sup>	2.33	2.35
Total Iron (Fe)	ug/L	10	300	1000	5520	6570	4060	1940	5300	1360	1280	1940	1260	1250		4678	1418
Total Lead (Pb)	ug/L	0.050	1 - 1.72 <sup>i</sup>	20.8-53.2 <sup>j</sup>	0.068	0.127	0.062	0.477	0.307	0.143	0.666	0.267	0.142	0.121	3.7-5.75 <sup>l</sup>	0.208	0.268
Total Lithium (Li)	ug/L	1.0			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		1.0	1.0
Total Magnesium (Mg)	ug/L	5.0			6870.0	7290	6920	2350	4410	2260	2070	3260	2510	2660		5568.0	2552.0
Total Manganese (Mn)	ug/L	0.10	25-66.14	692-1157 <sup>n</sup>	1640.00	2510.00	1700.00	222.00	687.00	176.00	148.00	337.00	184.00	180.00	670-809 <sup>n</sup>	1351.80	205.00
Total Mercury (Hg)	ug/L	0.0050	0.026 (inorganic)		<0.0050	<0.0050	<0.0050	0.0130	<0.0050	<0.0050	0.0100	<0.0050	0.0058	<0.0050		0.0066	0.0062
Total Molybdenum (Mo)	ug/L	0.050	73	2000	0.256	0.356	0.496	0.202	0.194	0.114	0.156	0.117	0.166	0.137	1000	0.301	0.138
Total Nickel (Ni)	ug/L	0.50	25 - 74 <sup>d</sup>	25 - 74 <sup>t</sup>	0.78	0.74	0.61	1.48	0.80	0.55	1.03	0.69	0.74	0.74		0.88	0.75
Total Potassium (K)	ug/L	50			3560	3810	4200	3680	3030	1950	2400	2080	2600	2320		3656	2270
Total Selenium (Se)	ug/L	0.050	1		0.087	0.154	0.169	0.083	0.088	<0.100	<0.050	<0.050	<0.050	0.062	2	0.116	0.062
Total Silicon (Si)	ug/L	100			5450	5820	5320	3520	5720	5880	4040	5710	5000	5260		5166	5178
Total Silver (Ag)	ug/L	0.010	0.3	0.1 <sup>p</sup>	<0.010	<0.010	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.05 <sup>p</sup>	0.011	0.010
Total Sodium (Na)	ug/L	50			8080	8800	8410	3620	7690	5980	4500	7870	7750	6960		7320	6612
Total Strontium (Sr)	ug/L	0.20			216.00	245	256	74.0	159	96.1	72.1	109	88.7	93.3		190.00	91.84
Total Sulphur (S)	ug/L	500			<500	<500	<500	3140	2360	2760	2220	2010	2970	2990		1400	2590
Total Thallium (Tl)	ug/L	0.010	0.8		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		0.010	0.010
Total Tin (Sn)	ug/L	0.10			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		0.10	0.10
Total Titanium (Ti)	ug/L	0.30			0.71	1.28	0.58	7.95	2.88	1.86	13.10	4.23	2.67	2.15		2.68	4.80
Total Uranium (U)	ug/L	0.010	33 (Acute); 15 (Chronic)		0.019	0.026	0.023	0.030	0.015	<0.010	0.021	0.011	0.013	0.011	8.5 <sup>y</sup>	0.023	0.013
Total Vanadium (V)	ug/L	0.50			<0.50	<0.50	<0.50	0.81	0.70	<0.50	1.00	0.56	<0.50	0.88		0.60	0.89
Total Zinc (Zn)	ug/L	3.0	30	33 <sup>t</sup>	4.8	4.7	<3.0	7.7	<3.0	3.8	6.8	4.1	4.0	3.8	7.5 <sup>i</sup>	4.6	4.5
Total Zirconium (Zr)	ug/L	0.20			<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20		0.20	0.20

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 2007. [http://www.cme.ca/publications/ceqg\\_rqce.html](http://www.cme.ca/publications/ceqg_rqce.html)

- b) Guideline based on range from field pH and temperature; CCME guideline converted to mg/L total ammonia-N by multiplying value by 0.08224.
- c) 0.11 µg/L at hardness <5.3 mg/L; calculated as  $10^{(1.016(\log(\text{hardness})) - 1.71)}$  at hardness ≥5.3 mg/L to ≤360 mg/L; 7.7 µg/L at hardness >360 mg/L
- d) Guideline values represent concentrations of the chloride ion for CCME standards and NaCl chloride for BC WQ Guidelines
- e) 2 µg/L at hardness <82 mg/L; calculated as  $e^{(0.8543(\ln(\text{hardness})) - 1.465)}$ ; 0.2 at hardness ≥82 mg/L to ≤180 mg/L; 4 µg/L at hardness >180 mg/L
- f) 1 µg/L at hardness <60 mg/L; calculated as  $e^{(1.273(\ln(\text{hardness})) - 4.705)}$  at hardness >60 mg/L to ≤180 mg/L; 7 µg/L at hardness >180 mg/L
- g) 25 µg/L at hardness ≤60 mg/L; calculated as  $e^{(0.76(\ln(\text{hardness})) + 1.06)}$  at hardness >60 mg/L to ≤180 mg/L; 150 µg/L at hardness >180 mg/L
- h) Guideline values represent concentrations of the nitrate in Less than detection limit.
- i) Clear flow: Maximum increase of 8 NTUs from background Value exceeds CCME guideline.  
High flow or turbid waters: Maximum increase of 8 NTUs Value exceeds BC WQ guidelines
- j) Guideline is short term maximum of 100 µg/L at pH ≥6.5 a Value exceeds both CCME and BC WQ guidelines
- k) 0.4 mg/L at hardness 10mg/L; calculate  $-51.73 + 92.57 \log$  Value exceeds BC 30 Day WQ guidelines
- l) 3 ug/L at hardness ≤ 8 mg/L;  $e^{(1.273 \ln(\text{hardness}) - 1.460)}$  at harc Value exceeds BC 30 Day WQ guidelines and CCME guidelines
- m) Clear flow: Maximum increase of 25mg/L from backgrou Value exceeds BC 30 Day WQ guidelines and BC WQ guidelines  
High flow: Maximum increase of 25 mg/L from background levels at any one time when background levels are between 25 and 250 mg/L. Should not increase more than 10% of background levels when ≥250 mg/L.
- n) Instantaneous maximum calculated from  $0.01102(\text{hardness}) + 0.54$ ; expressed using total hardness of samples; 30 day guideline calculated from  $0.0044(\text{hardness}) + 0.605$
- o) CCME Longterm - 0.04 µg/L at hardness >0 to 17 mg/L; calculated as  $10^{(0.83(\log(\text{hardness})) - 2.46)}$  at hardness ≥17 mg/L to ≤280 mg/L; 0.37 µg/L at hardness >280 mg/L
- p) 0.1 ug/L at hardness ≤ 100mg/L; 3 ug/L at hardness >100mg/L; 30-d mean guideline 0.05 ug/L at hardness ≤ 100mg/L; 1.5 ug/L at hardness >100mg/L
- q) Guideline for total sulphate; 128 mg/L at hardness 0-30 mg/L; 218 mg/L at hardness 31-75 mg/L; 309 mg/L at hardness 76-180; 429 at hardness 181-250 mg/L
- r) Clear flow: Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum change of 5 NTUs from background levels at any one time when background levels are between 8 and 50 NTUs. Should not change more than 10% of background levels when > 50 NTUs.
- s) Clear flow: Maximum increase of 25mg/L from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum increase of 10 mg/L from background at any one time when background levels are between 25 and 100 mg/L. Should not increase more than 10% of background levels when ≥100 mg/L.
- t) 33 ug/L at hardness of ≤90 mg/L (Acute); and  $33 + 0.75(\text{hardness mg/L} - 90)$  for hardness that exceeds 90 mg/L; 30 day guideline 7.5 ug/L at hardness <90 mg/L and  $7.5 + 0.75(\text{hardness mg/L} - 90)$  for hardness that exceeds 90 mg/L
- u) calculated as  $0.094 (\text{hardness}) + 2$ ; expressed using total hardness of samples; 30 day is 2 ug/L for hardness <50 mg/L and 0.04(avg hardness) for hardness >50 mg/L
- v) A compendium of working water quality guidelines for British Columbia, 2006. <http://www.env.gov.bc.ca/wat/wq/BCguidelines/working.html>
- w) Calculated as  $e^{(1.03 \ln(\text{hardness}) - 5.274)}$  short term and  $e^{(0.736 \ln(\text{hardness}) - 4.943)}$  long term; expressed using total hardness of samples
- x) Guidelines represent total chloride concentrations; 150 mg/L long term average; 600 mg/L short term maximum
- y) Geometric Mean reported here

"<"	Less than detection limit.
0.125	Value exceeds CCME guideline.
0.125	Value exceeds BC WQ guidelines
0.125	Value exceeds both CCME and BC WQ guidelines
0.125	Value exceeds BC 30 Day WQ guidelines

RDL = Reportable Detection Limit

(1) RDL raised due to sample matrix interference.

**Table A-5: Water Quality Data from UEL-005**

Table A-5: Water Quality Data from UEL-005

RESULTS OF CHEMICAL ANALYSES OF WATER					Sampling Period										BC 30 Day Water Guidelines	Dry Mean	Wet Mean	
Parameter Name	Units	RDL	CCME <sup>a</sup>	BC Water Guidelines	Dry Sampling					Wet Sampling								
					2-Sep-20	8-Sep-20	16-Sep-20	25-Sep-20	30-Sep-20	16-Nov-20	23-Nov-20	30-Nov-20	9-Dec-20	16-Dec-20				
<b>In Situ</b>																		
Temperature	°C	-			15.8	14.9	15.6	14.9	15.0	7.2		6.8	7.9	6.5			15.2	7.1
Dissolved Oxygen (%)	%	-			92.5	66.0	73.0	81.1	77.0	92.2	39.4	97.5	93.0	89.5			77.9	82.3
Dissolved Oxygen (mg/L)	mg/L	-			9.26		7.23			11.80	1.10	11.87	11.05	10.99			8.25	9.36
Specific Conductivity	uS/cm	-			206.5	315.9	194.1	212.5	175.0	111.0	30.0	107.0	77.0	105.0			220.8	86.0
Conductivity	uS/cm	-								74.0	66.0	71.0	75.0	68.0			156.75	70.8
Total Dissolved Solids	g/L	-			0.345	0.205	0.126	0.139	0.114	0.073	0.020	0.068	0.072	0.069			0.186	0.060
Salinity	ppt	-								0.05	0.01	0.05	0.05	0.05				0.042
pH	pH	-	6.5 - 9.0	6.5 - 9.0	7.04	7.65	8.56	7.48	7.56	6.73	6.88	6.99	7.39	6.93			7.66	6.98
Turbidity	NTU	-			2.64	1.06	1.97	0.99	4.19	2.81	1.77	3.71	2.35	2.00			2.17	2.53
<b>Physical Properties</b>																		
Conductivity	uS/cm	2.0			214.0	309.0	202.0	211.0	185.0	116.0	104.0	108.0	116.0	106.0			224.2	110.0
pH	pH	0.10	6.5 - 9.0	6.5 - 9.0	7.73	7.67	7.78	7.52	7.78	7.50	7.27	7.52	7.30	7.40			7.74	7.40
<b>Anions</b>																		
Nitrite (N)	mg/L	0.0010	0.06		0.0062	0.0114	0.0083	0.0071	0.0058	0.0027	0.0024	0.0021	0.0017	0.0026			0.0078	0.0023
<b>Calculated Parameters</b>																		
Nitrate (N)	mg/L	0.0050	550 Acute; 13 Chronic <sup>b</sup>	32.8	0.3410	0.440	0.5030	6.7200	0.4700	0.6390	0.5810	0.4690	0.5240	0.6110	3.0		1.6948	0.5648
Total Hardness (CaCO <sub>3</sub> )	mg/L	0.6			65.7	97.9	67.5	76.2	61.3	34.6	33.4	34.3	33.7	33.2			73.7	33.8
<b>Nutrients</b>																		
Nitrate plus Nitrite (N)	mg/L	0.0050			0.3480	0.4510	0.5110	6.7300	0.4760	0.6420	0.5830	0.4710	0.5260	0.6140			1.7032	0.5672
<b>Microbiological Param.</b>																		
E. coli	CFU/100mL	1		400	120	900	110	240	34	7	13	8	82	40	200		157.5 <sup>y</sup>	18.9 <sup>y</sup>
Fecal Coliforms	CFU/100mL	1			170	900	140	320	54	7	16	16	138	40			205.9 <sup>y</sup>	25.1 <sup>y</sup>
<b>Total Metals by ICPMS</b>																		
Total Aluminum (Al)	ug/L	3.0	100		21.6	12.2	29.3	147	58.2	96.6	122	228	149	128			53.7	144.7
Total Antimony (Sb)	ug/L	0.10			0.16	0.12	0.22	0.21	0.15	0.12	0.10	0.11	0.11	<0.10	g <sup>r</sup>		0.17	0.11
Total Arsenic (As)	ug/L	0.10	5	5	0.30	0.28	0.31	0.43	0.40	0.25	0.26	0.35	0.25	0.28			0.34	0.28
Total Barium (Ba)	ug/L	0.10			19.20	22.9	20.0	33.9	25.2	17.10	17.30	19.20	18.80	18.30	1000 <sup>y</sup>		24.24	18.14
Total Beryllium (Be)	ug/L	0.100			<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	0.13 <sup>y</sup>		0.100	0.100
Total Bismuth (Bi)	ug/L	0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			0.050	0.050
Total Boron (B)	ug/L	10	2900(Acute); 1500 (Chronic)	1200	17	18	18	19	15	<10	<10	<10	<10	<10			17	10
Total Cadmium (Cd)	ug/L	0.0050	0.28-1.16 <sup>c</sup>		<0.0050	<0.0050	<0.0050	0.0219	0.0078	0.0069	0.0104	0.0153	0.0094	0.0119	0.08 <sup>o</sup>		0.0089	0.0108
Total Calcium (Ca)	ug/L	50			21100	31300	22200	23200	18200	10700	10100	10200	10100	9980			23200	10216
Total Chromium (Cr)	ug/L	0.10			0.14	0.12	0.28	0.46	0.26	0.20	0.23	0.34	0.25	0.25			0.25	0.25
Total Cobalt (Co)	ug/L	0.10		110	<0.10	0.11	<0.10	0.28	0.16	0.15	0.14	0.39	0.16	0.16	4		0.15	0.20
Total Copper (Cu)	ug/L	0.50	2 <sup>p</sup>	3.3-7.26 <sup>u</sup>	2.48	1.14	3.80	3.74	1.93	1.47	1.80	2.01	1.96	1.70	2 <sup>u</sup>		2.62	1.79
Total Iron (Fe)	ug/L	10	300	1000	374	194	283	1920	1500	645	631	926	810	741			854	751
Total Lead (Pb)	ug/L	0.050	1 - 1.72 <sup>j</sup>	20.8-53.2 <sup>j</sup>	0.057	<0.050	0.087	0.364	0.158	0.164	0.177	0.372	0.248	0.196	3.7-5.75 <sup>l</sup>		0.143	0.231
Total Lithium (Li)	ug/L	1.0			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			1.0	1.0
Total Magnesium (Mg)	ug/L	5.0			3180	4780	2890	4400	3830	1920	1980	2150	2060	2020			3816.0	2026.0
Total Manganese (Mn)	ug/L	0.10	25-66.14	692-1157 <sup>n</sup>	51.4	115	52.8	121	117	48.2	35.4	78.4	49.3	44.0	670-809 <sup>n</sup>		91.44	51.06
Total Mercury (Hg)	ug/L	0.0050	0.026 (inorganic)		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0060	<0.0050	0.0051			0.0050	0.0052
Total Molybdenum (Mo)	ug/L	0.050	73	2000	0.367	0.323	0.372	0.138	0.157	0.079	0.067	0.095	0.091	0.080	1000		0.271	0.082
Total Nickel (Ni)	ug/L	0.50	25 - 74 <sup>d</sup>	25 - 74 <sup>t</sup>	<0.50	<0.50	<0.50	1.71	0.53	<0.50	0.57	0.70	0.65	0.56			0.75	0.60
Total Potassium (K)	ug/L	50			1950	2530	2110	5390	2780	1740	1940	1860	1980	1730			2952	1850
Total Selenium (Se)	ug/L	0.050	1		0.052	0.061	<0.050	0.128	0.075	<0.100	<0.050	0.097	0.081	<0.050	2		0.073	0.076
Total Silicon (Si)	ug/L	100			5400	6060	5150	3620	4620	4750	4570	4610	4040	4580			4970	4510
Total Silver (Ag)	ug/L	0.010	0.3	0.1 <sup>p</sup>	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.05 <sup>p</sup>		0.010	0.010
Total Sodium (Na)	ug/L	50			15700	27000	12500	8000	13000	8310	6260	7020	8070	7540			15240	7440
Total Strontium (Sr)	ug/L	0.20			131	183	143	141	136	79.4	69.9	72.9	73.4	75.4			146.80	74.20
Total Sulphur (S)	ug/L	500			1680	1680	1860	2260	2000	2120	1780	1730	1140	1880			1896	1730
Total Thallium (Tl)	ug/L	0.010	0.8		<0.010	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			0.010	0.010
Total Tin (Sn)	ug/L	0.10			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10			0.10	0.10
Total Titanium (Ti)	ug/L	0.30			0.71	0.31	<1.20	4.75	1.76	2.62	2.86	<9.00	4.08	3.41			1.75	4.39
Total Uranium (U)	ug/L	0.010	33 (Acute); 15 (Chronic)		0.019	0.024	0.015	0.014	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	8.5 <sup>v</sup>		0.017	0.010
Total Vanadium (V)	ug/L	0.50			<0.50	<0.50	<0.50	0.73	0.58	<0.50	0.54	0.76	0.55	0.76			0.56	0.62
Total Zinc (Zn)	ug/L	3.0	30	33 <sup>t</sup>	<3.0	<3.0	<3.0	7.5	3.5	3.3	3.3	5.1	3.8	4.0	7.5 <sup>s</sup>		4.0	3.9
Total Zirconium (Zr)	ug/L	0.20			<0.20	<0.20	<0.20	0.30	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20			0.22	0.20

a) Canadian water quality guidelines for the protection of aquatic life, Council of Ministers of the Environment, 2007. [http://www.cme.ca/publications/ceqg\\_rqce.html](http://www.cme.ca/publications/ceqg_rqce.html)

- b) Guideline based on range from field pH and temperature; CCME guideline converted to mg/L total ammonia-N by multiplying value by 0.08224.
- c) 0.11 µg/L at hardness <5.3 mg/L; calculated as  $10^{(1.016(\log(\text{hardness})) - 1.71)}$  at hardness ≥5.3 mg/L to ≤360 mg/L; 7.7 µg/L at hardness >360 mg/L
- d) Guideline values represent concentrations of the chloride ion for CCME standards and NaCl chloride for BC WQ Guidelines
- e) 2 µg/L at hardness <82 mg/L; calculated as  $e^{(0.8543(\ln(\text{hardness})) - 1.465)}$ ; 0.2 at hardness ≥82 mg/L to ≤180 mg/L; 4 µg/L at hardness >180 mg/L
- f) 1 µg/L at hardness <60 mg/L; calculated as  $e^{(1.273(\ln(\text{hardness})) - 4.705)}$  at hardness >60 mg/L to ≤180 mg/L; 7 µg/L at hardness >180 mg/L
- g) 25 µg/L at hardness ≤60 mg/L; calculated as  $e^{(0.76(\ln(\text{hardness})) + 1.06)}$  at hardness >60 mg/L to ≤180 mg/L; 150 µg/L at hardness >180 mg/L
- h) Guideline values represent concentrations of the nitrate in ion form, must multiply con
- i) Clear flow: Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when > 80 NTUs.
- j) Guideline is short term maximum of 100 µg/L at pH ≥6.5 and long term average of 50 µg/L
- k) 0.4 mg/L at hardness 10mg/L; calculate  $-51.73 + 92.57 \log_{10}(\text{hardness}) \times 0.01$
- l) 3 ug/L at hardness ≤ 8 mg/L;  $e^{(1.273 \ln(\text{hardness}) - 1.460)}$  at hardness > 8 mg/L; expressed as total hardness of samples; 30 day guideline  $(3.31 + e^{(1.273 \ln(\text{mean hardness}) - 4.704)})$
- m) Clear flow: Maximum increase of 25mg/L from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from for a longer term exposure (e.g., 30-d period).  
High flow: Maximum increase of 25 mg/L from background levels at any one time when background levels are between 25 and 250 mg/L. Should not increase more than 10% of background levels when ≥250 mg/L.
- n) Instantaneous maximum calculated from  $0.01102(\text{hardness}) + 0.54$ ; expressed using total hardness of samples; 30 day guideline calculated from  $0.0044(\text{hardness}) + 0.605$
- o) CCME Longterm - 0.04 µg/L at hardness >0 to 17 mg/L; calculated as  $10^{(0.83(\log(\text{hardness})) - 2.46)}$  at hardness ≥17 mg/L to ≤280 mg/L; 0.37 µg/L at hardness >280 mg/L
- p) 0.1 ug/L at hardness ≤ 100mg/L; 3 ug/L at hardness >100mg/L; 30-d mean guideline 0.05 ug/L at hardness ≤ 100mg/L; 1.5 ug/L at hardness >100mg/L
- q) Guideline for total sulphate; 128 mg/L at hardness 0-30 mg/L; 218 mg/L at hardness 31-75 mg/L; 309 mg/L at hardness 76-180; 429 at hardness 181-250 mg/L
- r) Clear flow: Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum change of 5 NTUs from background levels at any one time when background levels are between 8 and 50 NTUs. Should not change more than 10% of background levels when > 50 NTUs.
- s) Clear flow: Maximum increase of 25mg/L from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from for a longer term exposure (e.g., 30-d period).  
High flow or turbid waters: Maximum increase of 10 mg/L from background at any one time when background levels are between 25 and 100 mg/L. Should not increase more than 10% of background levels when ≥100 mg/L.
- t) 33 ug/L at hardness of ≤90 mg/L (Acute); and  $33 + 0.75(\text{hardness mg/L} - 90)$  for hardness that exceeds 90 mg/L; 30 day guideline 7.5 ug/L at hardness <90 mg/L and  $7.5 + 0.75(\text{hardness mg/L} - 90)$  for hardness that exceeds 90 mg/L
- u) calculated as  $0.094 (\text{hardness}) + 2$ ; expressed using total hardness of samples; 30 day is 2 ug/L for hardness <50 mg/L and 0.04(avg hardness) for hardness >50 mg/L
- v) A compendium of working water quality guidelines for British Columbia, 2006. <http://www.env.gov.bc.ca/wat/wq/BCguidelines/working.html>
- w) Calculated as  $e^{(1.03 \ln(\text{hardness}) - 5.274)}$  short term and  $e^{(0.736 \ln(\text{hardness}) - 4.943)}$  long term; expressed using total hardness of samples
- x) Guidelines represent total chloride concentrations; 150 mg/L long term average; 600 mg/L short term maximum
- y) Geometric Mean reported here

"<"	Less than detection limit.
0.125	Value exceeds CCME guideline.
0.125	Value exceeds BC WQ guidelines
0.125	Value exceeds both CCME and BC WQ guidelines
0.125	Value exceeds BC 30 Day WQ guidelines

RDL = Reportable Detection Limit

(1) RDL raised due to sample matrix interference.

**Table A-6: Water Quality Parameter Means for the 2015 and 2020 Sampling Programs**



## Appendix B Benthic Invertebrate Data



**Table B-1: Benthic Invertebrate Enumeration Data**

Site		UEL Project											
Station		UEL-001						UEL-003					
Client Sample #		UEL-001-1	UEL-001-2	UEL-001-3	UEL-003-1	UEL-003-2	UEL-003-3						
Family	Taxon	Voltnism	Tol/Intol	Clinger	Feeding	Count	Count	Count	Count	Count	Count	Count	Count
	Oligochaeta indet.	Uv-Sv	0	no	CG	18	23	68	53	60	147		
	Acari indet.	Mv	0	no	PR	11	9	1	59	23	22		
Anisogammaridae	Ramellogammarus sp.	Uv	T	no	CG	2		1			1		
Crangonyctidae	Crangonyx sp.	Uv	T	no	CG						2		
	Amphipoda indet.	Uv	T	no	CG	1		1	6	1	3		
	Isopoda indet.	Uv	0	no	CG			1					
Elmidae	Lara sp.	LL	0	yes	SH	1	5	2			1		5
Chironomidae	Chironomidae indet.	Uv-Mv	0	no	CG	113	108	96	159	103	212		
Dixidae	Dixa sp.	Uv	0	no	CG	1		3	1				
Empididae	Neoplasta sp.	Uv	0	yes	PR	2			1				1
Simuliidae	Simuliidae indet.	Uv	0	yes	CF	107	203	146	54	18	17		
Stratiomyidae	Stratiomyidae indet.	Uv	T	no	CG					1			
Tipulidae	Dicranota sp.	Uv	0	no	PR	2		1					
Tipulidae	Eloeophila sp.	Uv	0	no	PR	4		3					
Tipulidae	Tipula sp.	LL	0	no	OM						1		
	Diptera indet.	Uv	0	no	UN						1		1
Baetidae	Baetidae indet.	Uv-Mv	0	yes	CG	61	42	116	25	3			
Baetidae	Baetis sp.	Uv-Mv	0	yes	CG	8	5	5	19	4	3		3
Heptageniidae	Cinygma sp.	Uv	I	yes	SC	2		5	1				
Heptageniidae	Heptageniidae indet.	Uv	0	yes	SC	18	7	14	2				
Leptophlebiidae	Leptophlebiidae indet.	Uv	0	no	CG	1		2	2				
Leptophlebiidae	Paraleptophlebia sp.	Uv	0	no	CG	1		1					
	Ephemeroptera indet.	UN	0	no	UN	4	5	9					1
Nemouridae	Zapada cinctipes	LL	0	no	SH	13	15	38	3				
Glossosomatidae	Glossosomatidae indet.	Uv	0	yes	SC	7		4					
Hydropsychidae	Hydropsychidae indet.	Uv-Mv	0	yes	CF	22	8	2	32	11	18		
Hydropsychidae	Parapsyche sp.	Uv-Mv	0	yes	CF	4	11	2	4	2			
Limnephilidae	Limnephilidae indet.	Uv	0	no	SH		1	1					
Rhyacophilidae	Rhyacophila grandis group	Uv	I	yes	PR			1					
	Trichoptera indet.	Uv	0	no	UN								4
Pisidiidae	Pisidiidae indet.	LL	0	no	CG	2							
Lymnaeidae	Galba sp.	Uv	T	no	CG				1				
Physidae	Physidae indet.	Uv	T	no	CG			1		2			
Planorbidae	Planorbidae indet.	Uv	T	no	SC			1		1			
	Platyhelminthes indet.	Mv	0	no	PR	1			1				1
<b>Subsample Total</b>						<b>406</b>	<b>442</b>	<b>524</b>	<b>424</b>	<b>232</b>	<b>438</b>		
<b>Total Abundance Extrapolated for whole sample*</b>						<b>1218</b>	<b>2652</b>	<b>786</b>	<b>424</b>	<b>232</b>	<b>1752</b>		
<b>Densities</b>						<b>4370</b>	<b>9516</b>	<b>2820</b>	<b>1521</b>	<b>832</b>	<b>6286</b>		

\*UEL-001-1 split 1/3, UEL-001-2 split 4/24, UEL-001-3 split 2/3, UEL-003-1 split whole, UEL-003-2 split whole, UEL-003-3 split 24/48

Source: Biologica Raw Data

Voltnism Refers to length of life cycle (generation). Can vary by region for any given taxon.

Uv = univoltine, one generation/year

Mv = multivoltine, numerous generations/year

Sv = Semivoltine, generation takes more than one year

LL = long lived (semivoltine in region of interest)

Tol/Intol Tolerance to pollution

I - Intolerant

T - Tolerant

0 - neither tolerant or intolerant

Clinger Macroinvertebrates that cling to substrates, **yes/no**

Feeding **CG** - Collector-Gatherer

**PR** - Predator

**CF** - Collector-Filterer

**PA** - Parasite

**SC** - Scraper

**SH** - Shredder

**OM** - omnivore

## Appendix C B-IBI Data

**Table C-1: B-IBI Data**

Site	UEL Project							
Station	UEL-001				UEL-003			
Client Sample #	UEL-001-1	UEL-001-2	UEL-001-3	UEL-001-Average	UEL-003-1	UEL-003-2	UEL-003-3	UEL-003-Average
Metrics								
Taxon Richness	18	10	19	15.67	15	12	11	12.67
E richness	3	2	3	2.67	3	1	1	1.67
P richness	1	1	1	1.00	1	0	0	0.33
T richness	2	2	3	2.33	2	1	1	1.33
Intolerant Richness	1	0	2	1.00	1	0	0	0.33
Clinger Richness	7	5	7	6.33	5	4	5	4.67
Long-Lived Richness	3	2	2	2.33	1	2	1	1.33
% Tolerant	0.74	0.00	0.76	0.50	1.65	2.16	1.37	1.73
% Predator	4.93	2.04	1.15	2.70	14.39	9.91	5.48	9.93
%Dominance (3)	69.21	79.86	68.32	72.47	64.15	80.17	86.99	77.10
B-IBI Values								
Taxon Richness	3	1	3	3	3	1	1	1
E richness	1	1	1	1	1	1	1	1
P richness	1	1	1	1	1	1	1	1
T richness	1	1	1	1	1	1	1	1
Intolerant Richness	1	1	1	1	1	1	1	1
Clinger Richness	1	1	1	1	1	1	1	1
Long-Lived Richness	3	1	1	1	1	1	1	1
% Tolerant	5	5	5	5	5	5	5	5
% Predator	1	1	1	1	3	1	1	1
%Dominance (3)	3	3	3	3	3	1	1	3
<b>B-IBI Sample Score</b>	20	16	18		20	14	14	
<b>B-IBI Site Score</b>				<b>18</b>				<b>16</b>
<b>B-IBI Site Category</b>				<b>Poor</b>				<b>Very Poor</b>
Community Composition								
%EPT	34.73	21.27	37.98	31.32	20.99	8.62	5.94	11.85
%Chironomidae	27.83	24.43	18.32	23.53	37.50	44.40	48.40	43.43
%Oligochaetes	4.43	5.20	12.98	7.54	12.50	25.86	33.56	23.97

Source: Biologica Raw Data

## Appendix D Water Quality Sampling Photolog



Photograph 1. ↑  
UEL-001 looking upstream during the dry sampling period, September 2, 2020.



Photograph 2. ↑  
UEL-001 looking upstream during the wet sampling period, November 23, 2020.



Photograph 3. ↑  
UEL-002 looking upstream during the dry sampling period, September 2, 2020.



Photograph 4. ↑  
UEL-002 looking upstream during the wet sampling period, November 23, 2020.



Photograph 5. ↑  
UEL-003 looking upstream during the dry sampling period, September 2, 2020.



Photograph 6. ↑  
UEL-003 looking upstream during the wet sampling period, November 23, 2020.



Photograph 7. ↑  
UEL-004 looking upstream during the dry sampling period, September 2, 2020.



Photograph 8. ↑  
UEL-004 looking upstream during the wet sampling period, November 23, 2020.



Photograph 9. ↑  
UEL-005 looking upstream during the dry sampling period, September 2, 2020.



Photograph 10. ↑  
UEL-005 looking upstream during the wet sampling period, November 23, 2020.



Photograph 11. ↑  
Substrate at UEL-001.



Photograph 12. ↑  
Substrate at UEL-002.





Photograph 13. ↑  
Substrate at UEL-003.



Photograph 14. ↑  
Substrate at UEL-004.



Photograph 15. ↑  
Substrate at UEL-005.

## Appendix E Benthic Invertebrate Sampling Photolog



**Photograph 1.**

Benthic invertebrate sampling at UEL-001, September 16, 2020.



**Photograph 2.**

Surber sampler method for sampling benthic invertebrates in the  
UEL watercourses, September 16, 2020.



**Photograph 3.**

Benthic invertebrate sampling at UEL-003, September 16, 2020.

## Appendix F Lab Reports



CERTIFICATE OF ANALYSIS

Work Order : **VA20B4249**  
Client : **AECOM Canada Ltd.**  
Contact : Nadia Baker  
Address : 3292 Production Way  
Burnaby BC Canada V5A 4R4  
Telephone : ----  
Project : 60639142  
PO : ----  
C-O-C number : 17-859803  
Sampler : ----  
Site : ----  
Quote number : VA20-AECO100-0004  
No. of samples received : 5  
No. of samples analysed : 5

Page : 1 of 4  
Laboratory : Vancouver - Environmental  
Account Manager : Dean Watt  
Address : 8081 Lougheed Highway  
Burnaby BC Canada V5A 1W9  
Telephone : +1 604 253 4188  
Date Samples Received : 02-Sep-2020 18:00  
Date Analysis Commenced : 03-Sep-2020  
Issue Date : 10-Sep-2020 18:41

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

**Signatories**

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Nicole Briceelion	Analyst	Microbiology, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior 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.

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
MBER	<i>Estimated Result (Microbiological test). Colony count outside ideal range. Result calculated from most nearly acceptable value.</i>



## Analytical Results

Sub-Matrix: Water					Client sample ID	UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
(Matrix: Water)					Client sampling date / time	02-Sep-2020 15:45	02-Sep-2020 15:05	02-Sep-2020 14:30	02-Sep-2020 13:10	02-Sep-2020 11:55
Analyte	CAS Number	Method	LOR	Unit	VA20B4249-001	VA20B4249-002	VA20B4249-003	VA20B4249-004	VA20B4249-005	
					Result	Result	Result	Result	Result	
<b>Physical Tests</b>										
conductivity	----	E100	2.0	µS/cm	212	67.6	160	231	214	
hardness (as CaCO3), from total Ca/Mg	----	EC100A	600	µg/L	75600	19700	51100	91200	65700	
pH	----	E108	0.10	pH units	7.75	7.29	7.82	7.17	7.73	
<b>Anions and Nutrients</b>										
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	1.26	0.373	1.06	0.0062	0.341	
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	1.26	0.374	1.06	0.0065	0.348	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0014	<0.0010	0.0014	<0.0010	0.0062	
<b>Bacteriological Tests</b>										
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	28	130 <sup>MBER</sup>	19	9	120 <sup>MBER</sup>	
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	44	150 <sup>MBER</sup>	32	9	170 <sup>MBER</sup>	
<b>Total Metals</b>										
aluminum, total	7429-90-5	E420	3.0	µg/L	59.2	81.9	25.9	28.5	21.6	
antimony, total	7440-36-0	E420	0.10	µg/L	<0.10	<0.10	0.16	<0.10	0.16	
arsenic, total	7440-38-2	E420	0.10	µg/L	0.62	0.26	1.22	0.55	0.30	
barium, total	7440-39-3	E420	0.10	µg/L	13.1	15.8	9.77	50.3	19.2	
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100	
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	
boron, total	7440-42-8	E420	10	µg/L	19	<10	21	15	17	
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0069	0.0089	0.0081	<0.0050	<0.0050	
calcium, total	7440-70-2	E420	50	µg/L	17300	4900	13500	25200	21100	
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	<0.010	<0.010	0.027	<0.010	
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	0.23	0.35	0.26	0.19	0.14	
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	0.21	<0.10	1.04	<0.10	
copper, total	7440-50-8	E420	0.50	µg/L	1.08	1.38	2.80	<0.50	2.48	
iron, total	7439-89-6	E420	10	µg/L	282	376	128	5520	374	
lead, total	7439-92-1	E420	0.050	µg/L	0.141	0.098	<0.050	0.068	0.057	
lithium, total	7439-93-2	E420	1.0	µg/L	1.8	<1.0	<1.0	<1.0	<1.0	
magnesium, total	7439-95-4	E420	5.0	µg/L	7870	1800	4220	6870	3180	
manganese, total	7439-96-5	E420	0.10	µg/L	15.3	32.9	9.13	1640	51.4	
mercury, total	7439-97-6	E508	0.0050	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	



## Analytical Results

Sub-Matrix: Water					Client sample ID	UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
(Matrix: Water)										
Client sampling date / time					02-Sep-2020 15:45	02-Sep-2020 15:05	02-Sep-2020 14:30	02-Sep-2020 13:10	02-Sep-2020 11:55	
Analyte	CAS Number	Method	LOR	Unit	VA20B4249-001	VA20B4249-002	VA20B4249-003	VA20B4249-004	VA20B4249-005	
					Result	Result	Result	Result	Result	
<b>Total Metals</b>										
molybdenum, total	7439-98-7	E420	0.050	µg/L	0.245	0.223	0.435	0.256	0.367	
nickel, total	7440-02-0	E420	0.50	µg/L	<0.50	0.61	<0.50	0.78	<0.50	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	<50	51	<50	<50	
potassium, total	7440-09-7	E420	50	µg/L	3590	1660	2770	3560	1950	
rubidium, total	7440-17-7	E420	0.20	µg/L	0.80	1.72	1.57	4.34	1.72	
selenium, total	7782-49-2	E420	0.050	µg/L	0.081	<0.050	0.051	0.087	0.052	
silicon, total	7440-21-3	E420	100	µg/L	21000	16800	17600	5450	5400	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
sodium, total	7440-23-5	E420	50	µg/L	10200	5210	10500	8080	15700	
strontium, total	7440-24-6	E420	0.20	µg/L	136	55.6	103	216	131	
sulfur, total	7704-34-9	E420	500	µg/L	6960	1050	3090	<500	1680	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
titanium, total	7440-32-6	E420	0.30	µg/L	1.39	2.02	0.57	0.71	0.71	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
uranium, total	7440-61-1	E420	0.010	µg/L	0.308	<0.010	0.047	0.019	0.019	
vanadium, total	7440-62-2	E420	0.50	µg/L	4.31	2.56	1.94	<0.50	<0.50	
zinc, total	7440-66-6	E420	3.0	µg/L	3.1	<3.0	3.9	4.8	<3.0	
zirconium, total	7440-67-7	E420	0.20	µg/L	<0.20	0.23	<0.20	<0.20	<0.20	

Please refer to the General Comments section for an explanation of any qualifiers detected.



## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA20B4249</b>	Page	: 1 of 11
Client	: <b>AECOM Canada Ltd.</b>	Laboratory	: Vancouver - Environmental
Contact	: Nadia Baker	Account Manager	: Dean Watt
Address	: 3292 Production Way Burnaby BC Canada V5A 4R4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 60639142	Date Samples Received	: 02-Sep-2020 18:00
PO	: ----	Issue Date	: 10-Sep-2020 18:41
C-O-C number	: 17-859803		
Sampler	: ----		
Site	: ----		
Quote number	: VA20-AECO100-0004		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

- Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.  
**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.  
**DQO:** Data Quality Objective.  
**LOR:** Limit of Reporting (detection limit).  
**RPD:** Relative Percent Difference.

## Summary of Outliers

### **Outliers : Quality Control Samples**

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

### **Outliers : Frequency of Quality Control Samples**

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

RIGHT SOLUTIONS | RIGHT PARTNER



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-001	E235.NO3-L	02-Sep-2020	----	----	----		03-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO3-L	02-Sep-2020	----	----	----		03-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-003	E235.NO3-L	02-Sep-2020	----	----	----		03-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-004	E235.NO3-L	02-Sep-2020	----	----	----		03-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-005	E235.NO3-L	02-Sep-2020	----	----	----		03-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-001	E235.NO2-L	02-Sep-2020	----	----	----		03-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO2-L	02-Sep-2020	----	----	----		03-Sep-2020	3 days	0 days	✓



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-003	E235.NO2-L	02-Sep-2020	----	----	----		03-Sep-2020	3 days	0 days		✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-004	E235.NO2-L	02-Sep-2020	----	----	----		03-Sep-2020	3 days	0 days		✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-005	E235.NO2-L	02-Sep-2020	----	----	----		03-Sep-2020	3 days	0 days		✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.EC	02-Sep-2020	----	----	----		03-Sep-2020	48 hrs	16 hrs		✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.EC	02-Sep-2020	----	----	----		03-Sep-2020	48 hrs	16 hrs		✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.EC	02-Sep-2020	----	----	----		03-Sep-2020	48 hrs	17 hrs		✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.EC	02-Sep-2020	----	----	----		03-Sep-2020	48 hrs	18 hrs		✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.EC	02-Sep-2020	----	----	----		03-Sep-2020	48 hrs	20 hrs		✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.FC	02-Sep-2020	----	----	----		03-Sep-2020	30 hrs	16 hrs		✓



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.FC	02-Sep-2020	----	----	----		03-Sep-2020	30 hrs	16 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.FC	02-Sep-2020	----	----	----		03-Sep-2020	30 hrs	17 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.FC	02-Sep-2020	----	----	----		03-Sep-2020	30 hrs	18 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.FC	02-Sep-2020	----	----	----		03-Sep-2020	30 hrs	20 hrs	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-001	E100	02-Sep-2020	----	----	----		03-Sep-2020	28 days	0 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-002	E100	02-Sep-2020	----	----	----		03-Sep-2020	28 days	0 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-003	E100	02-Sep-2020	----	----	----		03-Sep-2020	28 days	0 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-004	E100	02-Sep-2020	----	----	----		03-Sep-2020	28 days	1 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-005	E100	02-Sep-2020	----	----	----		03-Sep-2020	28 days	1 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-001	E108	02-Sep-2020	----	----	----		03-Sep-2020	0.25 hrs	22 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-002	E108	02-Sep-2020	----	----	----		03-Sep-2020	0.25 hrs	23 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-003	E108	02-Sep-2020	----	----	----		03-Sep-2020	0.25 hrs	23 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-004	E108	02-Sep-2020	----	----	----		03-Sep-2020	0.25 hrs	25 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-005	E108	02-Sep-2020	----	----	----		03-Sep-2020	0.25 hrs	26 hrs	*	EHTR-FM
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-001	E420.Cr-L	02-Sep-2020	----	----	----		07-Sep-2020	180 days	4 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-002	E420.Cr-L	02-Sep-2020	----	----	----		07-Sep-2020	180 days	4 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-003	E420.Cr-L	02-Sep-2020	----	----	----		07-Sep-2020	180 days	5 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-004	E420.Cr-L	02-Sep-2020	----	----	----		07-Sep-2020	180 days	5 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE - total (lab preserved)</b> UEL-005	E420.Cr-L	02-Sep-2020	----	----	----		07-Sep-2020	180 days	5 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-001	E508	02-Sep-2020	----	----	----		04-Sep-2020	28 days	1 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-002	E508	02-Sep-2020	----	----	----		04-Sep-2020	28 days	1 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-003	E508	02-Sep-2020	----	----	----		04-Sep-2020	28 days	1 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-004	E508	02-Sep-2020	----	----	----		04-Sep-2020	28 days	1 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-005	E508	02-Sep-2020	----	----	----		04-Sep-2020	28 days	2 days	✓	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-001	E420	02-Sep-2020	----	----	----		07-Sep-2020	180 days	4 days	✓	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-002	E420	02-Sep-2020	----	----	----		07-Sep-2020	180 days	4 days	✓	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-003	E420	02-Sep-2020	----	----	----		07-Sep-2020	180 days	5 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-004	E420	02-Sep-2020	----	----	----		07-Sep-2020	180 days	5 days	✓
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-005	E420	02-Sep-2020	----	----	----		07-Sep-2020	180 days	5 days	✓

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 Rec. HT: ALS recommended hold time (see units).





## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Conductivity in Water	E100	80833	1	19	5.2	5.0	✔
E. coli (MF-NA-MUG)	E012.EC	81368	0	5	0.0	10.0	✖
Nitrate in Water by IC (Low Level)	E235.NO3-L	80838	1	20	5.0	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	80839	1	19	5.2	5.0	✔
pH by Meter	E108	80832	1	20	5.0	5.0	✔
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	81369	1	10	10.0	10.0	✔
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	81994	1	18	5.5	5.0	✔
Total Mercury in Water by CVAAS	E508	81700	1	20	5.0	5.0	✔
Total Metals in Water by CRC ICPMS	E420	81993	1	20	5.0	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
Conductivity in Water	E100	80833	1	19	5.2	5.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	80838	1	20	5.0	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	80839	1	19	5.2	5.0	✔
pH by Meter	E108	80832	1	20	5.0	5.0	✔
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	81994	1	18	5.5	5.0	✔
Total Mercury in Water by CVAAS	E508	81700	1	20	5.0	5.0	✔
Total Metals in Water by CRC ICPMS	E420	81993	1	20	5.0	5.0	✔
<b>Method Blanks (MB)</b>							
Conductivity in Water	E100	80833	1	19	5.2	5.0	✔
E. coli (MF-NA-MUG)	E012.EC	81368	1	5	20.0	10.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	80838	1	20	5.0	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	80839	1	19	5.2	5.0	✔
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	81369	1	10	10.0	10.0	✔
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	81994	1	18	5.5	5.0	✔
Total Mercury in Water by CVAAS	E508	81700	1	20	5.0	5.0	✔
Total Metals in Water by CRC ICPMS	E420	81993	1	20	5.0	5.0	✔
<b>Matrix Spikes (MS)</b>							
Nitrate in Water by IC (Low Level)	E235.NO3-L	80838	1	20	5.0	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	80839	1	19	5.2	5.0	✔
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	81994	1	18	5.5	5.0	✔
Total Mercury in Water by CVAAS	E508	81700	1	20	5.0	5.0	✔
Total Metals in Water by CRC ICPMS	E420	81993	1	20	5.0	5.0	✔



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-NA-MUG)	E012.EC  Vancouver - Environmental	Water	APHA 9222I (mod)	Positive Total or Thermotolerant Coliform filters are transferred to NA-MUG and incubated at 35.0 ±0.5°C for 4 hours. Colonies exhibiting fluorescence are enumerated.
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC  Vancouver - Environmental	Water	APHA 9222 D (mod)	Following filtration (0.45 µm), and incubation at 45.5 ±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
Conductivity in Water	E100  Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108  Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Nitrite in Water by IC (Low Level)	E235.NO2-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS



<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N  Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).



QUALITY CONTROL REPORT

Work Order : VA20B4249

Page : 1 of 10

Client : AECOM Canada Ltd.
Contact : Nadia Baker
Address : 3292 Production Way
Burnaby BC Canada V5A 4R4
Telephone : ----
Project : 60639142
PO : ----
C-O-C number : 17-859803
Sampler : ----
Site : ----
Quote number : VA20-AECO100-0004
No. of samples received : 5
No. of samples analysed : 5

Laboratory : Vancouver - Environmental
Account Manager : Dean Watt
Address : 8081 Lougheed Highway
Burnaby, British Columbia Canada V5A 1W9
Telephone : +1 604 253 4188
Date Samples Received : 02-Sep-2020 18:00
Date Analysis Commenced : 03-Sep-2020
Issue Date : 10-Sep-2020 18:41

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
● Matrix Spike (MS) Report; Recovery and Acceptance Limits
● Reference Material (RM) Report; Recovery and Acceptance Limits
● Method Blank (MB) Report; Recovery and Acceptance Limits
● Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Table with 3 columns: Signatories, Position, Laboratory Department. Rows include Kim Jensen (Department Manager - Metals), Lindsay Gung (Supervisor - Water Chemistry), Nicole Briceelion (Analyst), and Shaneel Dayal (Analyst).



## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.



### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 80832)</b>											
WR2000784-003	Anonymous	pH	----	E108	0.10	pH units	4.80	4.80	0	Diff <2x LOR	----
<b>Physical Tests (QC Lot: 80833)</b>											
WR2000784-003	Anonymous	conductivity	----	E100	2.0	µS/cm	9020	8780	2.70%	10%	----
<b>Anions and Nutrients (QC Lot: 80838)</b>											
VA20B4244-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 80839)</b>											
VA20B4244-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 81369)</b>											
VA20B4285-001	Anonymous	coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 81700)</b>											
KS2001411-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 81993)</b>											
VA20B4249-002	UEL-002	aluminum, total	7429-90-5	E420	3.00	mg/L	81.9 µg/L	0.0790	3.63%	20%	----
		antimony, total	7440-36-0	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.100	mg/L	0.26 µg/L	0.00026	0.000001	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.100	mg/L	15.8 µg/L	0.0160	1.17%	20%	----
		beryllium, total	7440-41-7	E420	0.100	mg/L	<0.100 µg/L	<0.000100	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.0500	mg/L	<0.050 µg/L	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	10.0	mg/L	<10 µg/L	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.00500	mg/L	0.0089 µg/L	0.0000126	0.0000038	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	50.0	mg/L	4900 µg/L	5.03	2.57%	20%	----
		cesium, total	7440-46-2	E420	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.100	mg/L	0.21 µg/L	0.00019	0.00002	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.500	mg/L	1.38 µg/L	0.00141	0.00004	Diff <2x LOR	----
		iron, total	7439-89-6	E420	10.0	mg/L	376 µg/L	0.376	0.0192%	20%	----
		lead, total	7439-92-1	E420	0.0500	mg/L	0.098 µg/L	0.000100	0.000002	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	1.00	mg/L	<1.0 µg/L	<0.0010	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	5.00	mg/L	1800 µg/L	1.79	0.946%	20%	----
		manganese, total	7439-96-5	E420	0.100	mg/L	32.9 µg/L	0.0326	0.769%	20%	----
		molybdenum, total	7439-98-7	E420	0.0500	mg/L	0.223 µg/L	0.000230	0.000007	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.500	mg/L	0.61 µg/L	0.00060	0.000009	Diff <2x LOR	----



Sub-Matrix: **Water** *Laboratory Duplicate (DUP) Report*

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 81993) - continued</b>											
VA20B4249-002	UEL-002	phosphorus, total	7723-14-0	E420	50.0	mg/L	<50 µg/L	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	50.0	mg/L	1660 µg/L	1.65	0.388%	20%	----
		rubidium, total	7440-17-7	E420	0.200	mg/L	1.72 µg/L	0.00167	0.00005	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.0500	mg/L	<0.050 µg/L	0.000074	0.000024	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	100	mg/L	16800 µg/L	16.7	0.916%	20%	----
		silver, total	7440-22-4	E420	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	50.0	mg/L	5210 µg/L	5.16	0.969%	20%	----
		strontium, total	7440-24-6	E420	0.200	mg/L	55.6 µg/L	0.0548	1.39%	20%	----
		sulfur, total	7704-34-9	E420	500	mg/L	1050 µg/L	1.18	0.13	Diff <2x LOR	----
		tellurium, total	13494-80-9	E420	0.200	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.300	mg/L	2.02 µg/L	0.00192	0.00009	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.500	mg/L	2.56 µg/L	0.00250	0.00007	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	3.00	mg/L	<3.0 µg/L	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.200	mg/L	0.23 µg/L	0.00022	0.000006	Diff <2x LOR	----
<b>Total Metals (QC Lot: 81994)</b>											
VA20B4249-002	UEL-002	chromium, total	7440-47-3	E420.Cr-L	0.100	mg/L	0.35 µg/L	0.00036	0.000006	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 80833)</b>						
conductivity	----	E100	1	µS/cm	<1.0	----
<b>Anions and Nutrients (QCLot: 80838)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 80839)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Bacteriological Tests (QCLot: 81368)</b>						
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 81369)</b>						
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----
<b>Total Metals (QCLot: 81700)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
<b>Total Metals (QCLot: 81993)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----





Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 81993) - continued</b>						
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 81994)</b>						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 80832)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 80833)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	104	90.0	110	----
<b>Anions and Nutrients (QCLot: 80838)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
<b>Anions and Nutrients (QCLot: 80839)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	101	90.0	110	----
<b>Total Metals (QCLot: 81700)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	93.6	80.0	120	----
<b>Total Metals (QCLot: 81993)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	104	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	99.1	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	101	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	106	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	104	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	100	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	106	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	99.1	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	103	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	106	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	105	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	99.8	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	103	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	101	80.0	120	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 81993) - continued</b>									
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	96.3	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	105	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	101	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	107	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	92.0	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	94.6	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	106	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	99.0	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	98.4	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	97.3	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	101	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	101	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	98.6	80.0	120	----
<b>Total Metals (QCLot: 81994)</b>									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	105	80.0	120	----



### Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level  $\geq 1 \times$  spike level.

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	Target	MS	Low	High	
<b>Anions and Nutrients (QCLot: 80838)</b>										
VA20B4244-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.55 mg/L	2.5 mg/L	102	75.0	125	----
<b>Anions and Nutrients (QCLot: 80839)</b>										
VA20B4244-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.507 mg/L	0.5 mg/L	101	75.0	125	----
<b>Total Metals (QCLot: 81700)</b>										
KS2001411-002	Anonymous	mercury, total	7439-97-6	E508	0.0000901 mg/L	0.0001 mg/L	90.1	70.0	130	----
<b>Total Metals (QCLot: 81993)</b>										
VA20B4249-003	UEL-003	aluminum, total	7429-90-5	E420	0.193 mg/L	0.2 mg/L	96.7	70.0	130	----
		antimony, total	7440-36-0	E420	0.0189 mg/L	0.02 mg/L	94.3	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		barium, total	7440-39-3	E420	0.0197 mg/L	0.02 mg/L	98.4	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0396 mg/L	0.04 mg/L	99.0	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00949 mg/L	0.01 mg/L	94.9	70.0	130	----
		boron, total	7440-42-8	E420	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00388 mg/L	0.004 mg/L	97.0	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00946 mg/L	0.01 mg/L	94.6	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0193 mg/L	0.02 mg/L	96.7	70.0	130	----
		copper, total	7440-50-8	E420	0.0191 mg/L	0.02 mg/L	95.6	70.0	130	----
		iron, total	7439-89-6	E420	1.93 mg/L	2 mg/L	96.7	70.0	130	----
		lead, total	7439-92-1	E420	0.0193 mg/L	0.02 mg/L	96.4	70.0	130	----
		lithium, total	7439-93-2	E420	0.0998 mg/L	0.1 mg/L	99.8	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0194 mg/L	0.02 mg/L	97.2	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0192 mg/L	0.02 mg/L	95.9	70.0	130	----
		nickel, total	7440-02-0	E420	0.0396 mg/L	0.04 mg/L	99.0	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.38 mg/L	10 mg/L	93.8	70.0	130	----
		potassium, total	7440-09-7	E420	3.77 mg/L	4 mg/L	94.4	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0201 mg/L	0.02 mg/L	101	70.0	130	----
		selenium, total	7782-49-2	E420	0.0386 mg/L	0.04 mg/L	96.6	70.0	130	----
		silicon, total	7440-21-3	E420	ND mg/L	10 mg/L	ND	70.0	130	----
		silver, total	7440-22-4	E420	0.00379 mg/L	0.004 mg/L	94.8	70.0	130	----



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
<b>Total Metals (QCLot: 81993) - continued</b>										
VA20B4249-003	UEL-003	sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	20.0 mg/L	20 mg/L	99.9	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0368 mg/L	0.04 mg/L	91.9	70.0	130	----
		thallium, total	7440-28-0	E420	0.00373 mg/L	0.004 mg/L	93.3	70.0	130	----
		thorium, total	7440-29-1	E420	0.0205 mg/L	0.02 mg/L	103	70.0	130	----
		tin, total	7440-31-5	E420	0.0186 mg/L	0.02 mg/L	93.0	70.0	130	----
		titanium, total	7440-32-6	E420	0.0386 mg/L	0.04 mg/L	96.6	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0189 mg/L	0.02 mg/L	94.4	70.0	130	----
		uranium, total	7440-61-1	E420	0.00393 mg/L	0.004 mg/L	98.3	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0985 mg/L	0.1 mg/L	98.5	70.0	130	----
		zinc, total	7440-66-6	E420	0.387 mg/L	0.4 mg/L	96.8	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0398 mg/L	0.04 mg/L	99.5	70.0	130	----
<b>Total Metals (QCLot: 81994)</b>										
VA20B4249-003	UEL-003	chromium, total	7440-47-3	E420.Cr-L	0.0403 mg/L	0.04 mg/L	101	70.0	130	----

<b>Report To</b> Contact and company name below will appear on the final report		<b>Report Format / Distribution</b> Select Report Format: <input type="checkbox"/> PDF <input type="checkbox"/> EXCEL <input type="checkbox"/> EDD (ORIGINAL) Quality Control (QC) Report with Report: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Compare Results to Criteria on Report - provide details below if box checked Selected Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																			
Company: <b>AECOM</b>		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																			
Contact: <b>Nadia Baker</b>		Email 1 or Fax: <b>bruce.ford@aecom.com</b>																			
Phone: <b>604-347-8244</b>		Email 2: <b>nadia.baker@aecom.com</b>																			
Company address below will appear on the final report		Email 3: <b>bruce.ford@aecom.com</b>																			
Street: <b>3292 Production Way</b>		City/Province: <b>Burnaby BC</b>																			
Postal Code: <b>V5A 4R4</b>		Invoices To: <input type="checkbox"/> Same as Report To <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO																			
Company: <b>AECOM</b>		Copy of Invoice with Report: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO																			
Contact: <b>Bruce Ford</b>		Selected Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																			
Project Information ALS Account # / Quote #: <b>ALS V420-AECCO100-0004</b>																					
Job #: <b>60639142</b>		Major/Minor Code: _____																			
PO / A/E: _____		Requisition #: _____																			
LSD: _____		Location: _____																			
ALS Lab Work Order # (lab use only): _____		ALS Contact: _____																			
ALS Sample # (lab use only): _____		Sample Identification and/or Coordinates (This description will appear on the report)																			
UFL-001		Date: 02-Sep-20 Time: 15:45 Sample Type: WATER																			
UFL-002		Date: 02-Sep-20 Time: 15:05 Sample Type: WATER																			
UFL-003		Date: 02-Sep-20 Time: 14:30 Sample Type: WATER																			
UFL-004		Date: 02-Sep-20 Time: 13:10 Sample Type: WATER																			
UFL-005		Date: 02-Sep-20 Time: 11:55 Sample Type: WATER																			
<p>Environmental Division Vancouver Work Order Reference <b>VA20B4249</b> Telephone: 1 604 253 4188</p>		<table border="1"> <thead> <tr> <th colspan="2">NUMBER OF CONTAINERS</th> </tr> </thead> <tbody> <tr><td>Total Metals</td><td>4</td></tr> <tr><td>Fecal Coliform</td><td>4</td></tr> <tr><td>E. Coli</td><td>4</td></tr> <tr><td>pH</td><td>4</td></tr> <tr><td>Conductivity</td><td>4</td></tr> <tr><td>Nitrate</td><td>4</td></tr> <tr><td>Nitrite</td><td>4</td></tr> <tr><td>Nitrate + Nitrite (N)</td><td>4</td></tr> </tbody> </table>		NUMBER OF CONTAINERS		Total Metals	4	Fecal Coliform	4	E. Coli	4	pH	4	Conductivity	4	Nitrate	4	Nitrite	4	Nitrate + Nitrite (N)	4
NUMBER OF CONTAINERS																					
Total Metals	4																				
Fecal Coliform	4																				
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pH	4																				
Conductivity	4																				
Nitrate	4																				
Nitrite	4																				
Nitrate + Nitrite (N)	4																				
Drinking Water (DW) Samples (client use) <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)																			
SHIPMENT RELEASE (client use) Released by: <b>Nadia Baker</b> Date: <b>Sept 2, 2020</b>		INITIAL SHIPMENT RECEPTION (lab use only) Received by: _____ Date: _____																			
FINAL SHIPMENT RECEPTION (lab use only) Received by: <b>Te</b> Date: <b>Sept 2</b>		FINAL SHIPMENT RECEPTION (lab use only) Received by: _____ Date: _____																			
SAMPLE CONDITION AS RECEIVED (lab use only) Frozen <input type="checkbox"/> Ice Packs <input checked="" type="checkbox"/> Cooling Initiated <input type="checkbox"/> Ice Cubes <input type="checkbox"/> SIF Observations <input type="checkbox"/> Custy seal intact <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>		FINAL COOLER TEMPERATURES °C INITIAL COOLER TEMPERATURES °C: _____ FINAL COOLER TEMPERATURES °C: _____																			

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



**CERTIFICATE OF ANALYSIS**

**Work Order** : **VA20B4642**  
**Client** : **AECOM Canada Ltd.**  
**Contact** : Nadia Baker  
**Address** : 3292 Production Way  
Burnaby BC Canada V5A 4R4  
**Telephone** : ----  
**Project** : 60639142  
**PO** : ----  
**C-O-C number** : 17-859804  
**Sampler** : Nadia Baker  
**Site** : ----  
**Quote number** : VA20-AECO100-0004  
**No. of samples received** : 6  
**No. of samples analysed** : 6

**Page** : 1 of 6  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Dean Watt  
**Address** : 8081 Lougheed Highway  
Burnaby BC Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 08-Sep-2020 16:50  
**Date Analysis Commenced** : 09-Sep-2020  
**Issue Date** : 15-Sep-2020 17:23

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

**Signatories**

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Microbiology, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior 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.

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
MBER	<i>Estimated Result (Microbiological test). Colony count outside ideal range. Result calculated from most nearly acceptable value.</i>





## Analytical Results

Sub-Matrix: Water					Client sample ID	UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
(Matrix: Water)					Client sampling date / time	08-Sep-2020 14:25	08-Sep-2020 13:45	08-Sep-2020 13:08	08-Sep-2020 11:05	08-Sep-2020 12:15
Analyte	CAS Number	Method	LOR	Unit	VA20B4642-001	VA20B4642-002	VA20B4642-003	VA20B4642-004	VA20B4642-005	
					Result	Result	Result	Result	Result	
<b>Physical Tests</b>										
conductivity	----	E100	2.0	µS/cm	209	65.0	152	245	309	
hardness (as CaCO3), from total Ca/Mg	----	EC100A	600	µg/L	79500	20700	49600	107000	97900	
pH	----	E108	0.10	pH units	7.84	7.38	7.95	7.39	7.87	
<b>Anions and Nutrients</b>										
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	1.27	0.387	0.997	<0.0050	0.440	
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	1.28	0.389	0.999	<0.0051	0.451	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0014	0.0016	0.0016	0.0010	0.0114	
<b>Bacteriological Tests</b>										
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	52	78	72	2	900 <sup>MBER</sup>	
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	52	107	72	2	900 <sup>MBER</sup>	
<b>Total Metals</b>										
aluminum, total	7429-90-5	E420	3.0	µg/L	38.2	118	21.7	49.2	12.2	
antimony, total	7440-36-0	E420	0.10	µg/L	<0.10	<0.10	0.16	<0.10	0.12	
arsenic, total	7440-38-2	E420	0.10	µg/L	0.62	0.30	1.06	0.62	0.28	
barium, total	7440-39-3	E420	0.10	µg/L	12.2	15.2	8.58	58.3	22.9	
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100	
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	
boron, total	7440-42-8	E420	10	µg/L	14	<10	15	15	18	
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0076	0.0105	0.0060	<0.0050	<0.0050	
calcium, total	7440-70-2	E420	50	µg/L	17900	5200	12800	31000	31300	
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	<0.010	<0.010	0.033	0.013	
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	0.25	0.35	0.24	0.22	0.12	
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	0.19	<0.10	1.42	0.11	
copper, total	7440-50-8	E420	0.50	µg/L	0.72	1.45	1.77	<0.50	1.14	
iron, total	7439-89-6	E420	10	µg/L	203	388	107	6570	194	
lead, total	7439-92-1	E420	0.050	µg/L	0.152	0.148	<0.050	0.127	<0.050	
lithium, total	7439-93-2	E420	1.0	µg/L	1.8	<1.0	<1.0	<1.0	<1.0	
magnesium, total	7439-95-4	E420	5.0	µg/L	8460	1860	4280	7290	4780	
manganese, total	7439-96-5	E420	0.10	µg/L	13.6	31.8	9.06	2510	115	
mercury, total	7439-97-6	E508	0.0050	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	



## Analytical Results

Sub-Matrix: Water

(Matrix: Water)

					Client sample ID	UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
					Client sampling date / time	08-Sep-2020 14:25	08-Sep-2020 13:45	08-Sep-2020 13:08	08-Sep-2020 11:05	08-Sep-2020 12:15
Analyte	CAS Number	Method	LOR	Unit	VA20B4642-001	VA20B4642-002	VA20B4642-003	VA20B4642-004	VA20B4642-005	
					Result	Result	Result	Result	Result	
<b>Total Metals</b>										
molybdenum, total	7439-98-7	E420	0.050	µg/L	0.251	0.233	0.387	0.356	0.323	
nickel, total	7440-02-0	E420	0.50	µg/L	<0.50	0.57	<0.50	0.74	<0.50	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	<50	75	<50	<50	
potassium, total	7440-09-7	E420	50	µg/L	3520	1640	2640	3810	2530	
rubidium, total	7440-17-7	E420	0.20	µg/L	0.64	1.71	1.37	4.76	2.42	
selenium, total	7782-49-2	E420	0.050	µg/L	0.074	0.068	<0.050	0.154	0.061	
silicon, total	7440-21-3	E420	100	µg/L	21900	16900	18000	5820	6060	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	0.032	<0.010	<0.010	<0.010	
sodium, total	7440-23-5	E420	50	µg/L	10700	5690	11200	8800	27000	
strontium, total	7440-24-6	E420	0.20	µg/L	141	60.4	100	245	183	
sulfur, total	7704-34-9	E420	500	µg/L	6540	950	2890	<500	1680	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
titanium, total	7440-32-6	E420	0.30	µg/L	0.92	3.44	0.54	1.28	0.31	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
uranium, total	7440-61-1	E420	0.010	µg/L	0.320	0.011	0.043	0.026	0.024	
vanadium, total	7440-62-2	E420	0.50	µg/L	4.38	2.75	2.14	<0.50	<0.50	
zinc, total	7440-66-6	E420	3.0	µg/L	<3.0	<3.0	3.1	4.7	<3.0	
zirconium, total	7440-67-7	E420	0.20	µg/L	<0.20	0.26	<0.20	<0.20	<0.20	

Please refer to the General Comments section for an explanation of any qualifiers detected.



## Analytical Results

Sub-Matrix: Water					Client sample ID	Field Blank	---	---	---	---
(Matrix: Water)					Client sampling date / time	08-Sep-2020	---	---	---	---
Analyte	CAS Number	Method	LOR	Unit	VA20B4642-006	-----	-----	-----	-----	-----
					Result	---	---	---	---	---
<b>Physical Tests</b>										
conductivity	---	E100	2.0	µS/cm	<2.0	---	---	---	---	---
hardness (as CaCO3), from total Ca/Mg	---	EC100A	600	µg/L	<600	---	---	---	---	---
pH	---	E108	0.10	pH units	5.99	---	---	---	---	---
<b>Anions and Nutrients</b>										
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	---	---	---	---	---
nitrate + nitrite (as N)	---	EC235.N+N	0.0050	mg/L	<0.0051	---	---	---	---	---
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	---	---	---	---	---
<b>Bacteriological Tests</b>										
coliforms, Escherichia coli [E. coli]	---	E012.EC	1	CFU/100mL	<1	---	---	---	---	---
coliforms, thermotolerant [fecal]	---	E012.FC	1	CFU/100mL	<1	---	---	---	---	---
<b>Total Metals</b>										
aluminum, total	7429-90-5	E420	3.0	µg/L	<3.0	---	---	---	---	---
antimony, total	7440-36-0	E420	0.10	µg/L	<0.10	---	---	---	---	---
arsenic, total	7440-38-2	E420	0.10	µg/L	<0.10	---	---	---	---	---
barium, total	7440-39-3	E420	0.10	µg/L	<0.10	---	---	---	---	---
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	---	---	---	---	---
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	---	---	---	---	---
boron, total	7440-42-8	E420	10	µg/L	<10	---	---	---	---	---
cadmium, total	7440-43-9	E420	0.0050	µg/L	<0.0050	---	---	---	---	---
calcium, total	7440-70-2	E420	50	µg/L	<50	---	---	---	---	---
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	---	---	---	---	---
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	<0.10	---	---	---	---	---
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	---	---	---	---	---
copper, total	7440-50-8	E420	0.50	µg/L	<0.50	---	---	---	---	---
iron, total	7439-89-6	E420	10	µg/L	<10	---	---	---	---	---
lead, total	7439-92-1	E420	0.050	µg/L	<0.050	---	---	---	---	---
lithium, total	7439-93-2	E420	1.0	µg/L	<1.0	---	---	---	---	---
magnesium, total	7439-95-4	E420	5.0	µg/L	<5.0	---	---	---	---	---
manganese, total	7439-96-5	E420	0.10	µg/L	<0.10	---	---	---	---	---
mercury, total	7439-97-6	E508	0.0050	µg/L	<0.0050	---	---	---	---	---
molybdenum, total	7439-98-7	E420	0.050	µg/L	<0.050	---	---	---	---	---
nickel, total	7440-02-0	E420	0.50	µg/L	<0.50	---	---	---	---	---



## Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					Field Blank	----	----	----	----
					08-Sep-2020	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20B4642-006	-----	-----	-----	-----
					Result	---	---	---	---
<b>Total Metals</b>									
phosphorus, total	7723-14-0	E420	50	µg/L	<50	----	----	----	----
potassium, total	7440-09-7	E420	50	µg/L	<50	----	----	----	----
rubidium, total	7440-17-7	E420	0.20	µg/L	<0.20	----	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L	<0.050	----	----	----	----
silicon, total	7440-21-3	E420	100	µg/L	<100	----	----	----	----
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	----	----	----	----
sodium, total	7440-23-5	E420	50	µg/L	<50	----	----	----	----
strontium, total	7440-24-6	E420	0.20	µg/L	<0.20	----	----	----	----
sulfur, total	7704-34-9	E420	500	µg/L	<500	----	----	----	----
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	----	----	----	----
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	----	----	----	----
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	----	----	----	----
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	----	----	----	----
titanium, total	7440-32-6	E420	0.30	µg/L	<0.30	----	----	----	----
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	----	----	----	----
uranium, total	7440-61-1	E420	0.010	µg/L	<0.010	----	----	----	----
vanadium, total	7440-62-2	E420	0.50	µg/L	<0.50	----	----	----	----
zinc, total	7440-66-6	E420	3.0	µg/L	<3.0	----	----	----	----
zirconium, total	7440-67-7	E420	0.20	µg/L	<0.20	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA20B4642</b>	Page	: 1 of 13
Client	: <b>AECOM Canada Ltd.</b>	Laboratory	: Vancouver - Environmental
Contact	: Nadia Baker	Account Manager	: Dean Watt
Address	: 3292 Production Way Burnaby BC Canada V5A 4R4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 60639142	Date Samples Received	: 08-Sep-2020 16:50
PO	: ----	Issue Date	: 15-Sep-2020 17:23
C-O-C number	: 17-859804		
Sampler	: Nadia Baker		
Site	: ----		
Quote number	: VA20-AECO100-0004		
No. of samples received	: 6		
No. of samples analysed	: 6		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

## Summary of Outliers

### **Outliers : Quality Control Samples**

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

### **Outliers : Frequency of Quality Control Samples**

- No Quality Control Sample Frequency Outliers occur.





**Outliers : Quality Control Samples**

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
<b>Laboratory Control Sample (LCS) Recoveries</b>								
Total Metals	QC-MRG2-8414000 2	----	bismuth, total	7440-69-9	E420	123 % <sup>MES</sup>	80.0-120%	Recovery greater than upper control limit

**Result Qualifiers**

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE Field Blank	E235.NO3-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-001	E235.NO3-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO3-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-003	E235.NO3-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-004	E235.NO3-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-005	E235.NO3-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE Field Blank	E235.NO2-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✓





Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-001	E235.NO2-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-002	E235.NO2-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-003	E235.NO2-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-004	E235.NO2-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-005	E235.NO2-L	08-Sep-2020	----	----	----		09-Sep-2020	3 days	0 days	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> Field Blank	E012.EC	08-Sep-2020	----	----	----		09-Sep-2020	48 hrs	19 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.EC	08-Sep-2020	----	----	----		09-Sep-2020	48 hrs	20 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.EC	08-Sep-2020	----	----	----		09-Sep-2020	48 hrs	20 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.EC	08-Sep-2020	----	----	----		09-Sep-2020	48 hrs	21 hrs	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.EC	08-Sep-2020	----	----	----		09-Sep-2020	48 hrs	22 hrs	✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.EC	08-Sep-2020	----	----	----		09-Sep-2020	48 hrs	23 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> Field Blank	E012.FC	08-Sep-2020	----	----	----		09-Sep-2020	30 hrs	19 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.FC	08-Sep-2020	----	----	----		09-Sep-2020	30 hrs	20 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.FC	08-Sep-2020	----	----	----		09-Sep-2020	30 hrs	20 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.FC	08-Sep-2020	----	----	----		09-Sep-2020	30 hrs	21 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.FC	08-Sep-2020	----	----	----		09-Sep-2020	30 hrs	22 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.FC	08-Sep-2020	----	----	----		09-Sep-2020	30 hrs	23 hrs	✓
<b>Physical Tests : Conductivity in Water</b>										
<b>HDPE</b> Field Blank	E100	08-Sep-2020	----	----	----		09-Sep-2020	28 days	0 days	✓



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-001	E100	08-Sep-2020	----	----	----		09-Sep-2020	28 days	0 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-002	E100	08-Sep-2020	----	----	----		09-Sep-2020	28 days	0 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-003	E100	08-Sep-2020	----	----	----		09-Sep-2020	28 days	0 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-004	E100	08-Sep-2020	----	----	----		09-Sep-2020	28 days	0 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-005	E100	08-Sep-2020	----	----	----		09-Sep-2020	28 days	0 days	✓
<b>Physical Tests : pH by Meter</b>										
HDPE Field Blank	E108	08-Sep-2020	----	----	----		09-Sep-2020	0.25 hrs	18 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-001	E108	08-Sep-2020	----	----	----		09-Sep-2020	0.25 hrs	18 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-002	E108	08-Sep-2020	----	----	----		09-Sep-2020	0.25 hrs	19 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-003	E108	08-Sep-2020	----	----	----		09-Sep-2020	0.25 hrs	20 hrs	* EHTR-FM



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : pH by Meter</b>											
<b>HDPE</b> UEL-005	E108	08-Sep-2020	----	----	----		09-Sep-2020	0.25 hrs	20 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
<b>HDPE</b> UEL-004	E108	08-Sep-2020	----	----	----		09-Sep-2020	0.25 hrs	22 hrs	*	EHTR-FM
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE - total (lab preserved)</b> Field Blank	E420.Cr-L	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE - total (lab preserved)</b> UEL-001	E420.Cr-L	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE - total (lab preserved)</b> UEL-002	E420.Cr-L	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE - total (lab preserved)</b> UEL-003	E420.Cr-L	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE - total (lab preserved)</b> UEL-004	E420.Cr-L	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE - total (lab preserved)</b> UEL-005	E420.Cr-L	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> Field Blank	E508	08-Sep-2020	----	----	----		14-Sep-2020	28 days	5 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-001	E508	08-Sep-2020	----	----	----		14-Sep-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-002	E508	08-Sep-2020	----	----	----		14-Sep-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-003	E508	08-Sep-2020	----	----	----		14-Sep-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-004	E508	08-Sep-2020	----	----	----		14-Sep-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-005	E508	08-Sep-2020	----	----	----		14-Sep-2020	28 days	5 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> Field Blank	E420	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-001	E420	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-002	E420	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-003	E420	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-004	E420	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-005	E420	08-Sep-2020	----	----	----		11-Sep-2020	180 days	2 days	✔

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Conductivity in Water	E100	83200	1	6	16.6	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	83706	1	6	16.6	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	83162	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	83163	1	16	6.2	5.0	✓
pH by Meter	E108	83199	1	16	6.2	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	83705	1	7	14.2	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	84140	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	85390	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	84141	1	17	5.8	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Conductivity in Water	E100	83200	1	6	16.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	83162	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	83163	1	16	6.2	5.0	✓
pH by Meter	E108	83199	1	16	6.2	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	84140	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	85390	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	84141	1	17	5.8	5.0	✓
<b>Method Blanks (MB)</b>							
Conductivity in Water	E100	83200	1	6	16.6	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	83706	1	6	16.6	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	83162	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	83163	1	16	6.2	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	83705	1	7	14.2	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	84140	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	85390	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	84141	1	17	5.8	5.0	✓
<b>Matrix Spikes (MS)</b>							
Nitrate in Water by IC (Low Level)	E235.NO3-L	83162	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	83163	1	16	6.2	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	84140	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	85390	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	84141	1	17	5.8	5.0	✓



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-NA-MUG)	E012.EC  Vancouver - Environmental	Water	APHA 9222I (mod)	Positive Total or Thermotolerant Coliform filters are transferred to NA-MUG and incubated at 35.0 ±0.5°C for 4 hours. Colonies exhibiting fluorescence are enumerated.
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC  Vancouver - Environmental	Water	APHA 9222 D (mod)	Following filtration (0.45 µm), and incubation at 45.5 ±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
Conductivity in Water	E100  Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108  Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Nitrite in Water by IC (Low Level)	E235.NO2-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS





<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N  Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

## QUALITY CONTROL REPORT

**Work Order** : **VA20B4642**

**Page** : 1 of 10

**Client** : AECOM Canada Ltd.  
**Contact** : Nadia Baker  
**Address** : 3292 Production Way  
 Burnaby BC Canada V5A 4R4  
**Telephone** : ----  
**Project** : 60639142  
**PO** : ----  
**C-O-C number** : 17-859804  
**Sampler** : Nadia Baker  
**Site** : ----  
**Quote number** : VA20-AECO100-0004  
**No. of samples received** : 6  
**No. of samples analysed** : 6

**Laboratory** : Vancouver - Environmental  
**Account Manager** : Dean Watt  
**Address** : 8081 Lougheed Highway  
 Burnaby, British Columbia Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 08-Sep-2020 16:50  
**Date Analysis Commenced** : 09-Sep-2020  
**Issue Date** : 15-Sep-2020 17:23

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Microbiology, Burnaby, British Columbia
Cristina Alexandre	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

Page : 2 of 10  
Work Order : VA20B4642  
Client : AECOM Canada Ltd.  
Project : 60639142

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## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.



### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 83199)</b>											
VA20B4642-001	UEL-001	pH	----	E108	0.10	pH units	7.84	7.88	0.509%	4%	----
<b>Physical Tests (QC Lot: 83200)</b>											
VA20B4642-001	UEL-001	conductivity	----	E100	2.0	µS/cm	209	213	1.90%	10%	----
<b>Anions and Nutrients (QC Lot: 83162)</b>											
VA20B4656-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0561	0.0498	0.0063	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 83163)</b>											
VA20B4656-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0032	<0.0050	0.0018	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 83705)</b>											
VA20B4642-006	Field Blank	coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 83706)</b>											
VA20B4642-006	Field Blank	coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 84140)</b>											
VA20B4442-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00027	0.00026	0.000009	Diff <2x LOR	----
<b>Total Metals (QC Lot: 84141)</b>											
VA20B4442-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0471	0.0470	0.300%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00024	0.00023	0.00001	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00027	0.00027	0.000005	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0139	0.0137	1.56%	20%	----
		beryllium, total	7440-41-7	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000080	<0.0000050	0.0000030	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	42.2	42.8	1.46%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	0.000191	0.000199	4.23%	20%	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00011	<0.00010	0.000006	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.860	0.845	1.83%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000110	0.000109	0.000002	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0021	0.0021	0.000007	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	17.5	17.9	2.17%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0290	0.0300	3.27%	20%	----



Sub-Matrix: **Water**

*Laboratory Duplicate (DUP) Report*

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 84141) - continued</b>											
VA20B4442-001	Anonymous	molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000185	0.000184	0.0000009	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00081	0.00087	0.00006	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.80	1.80	0.225%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00355	0.00371	4.26%	20%	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	<0.000050	0.000063	0.000013	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	4.77	4.91	2.83%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	0.000013	0.000015	0.000002	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	30.6	30.2	1.02%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	3.12	3.10	0.743%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	51.4	50.9	0.855%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	0.00060	0.00045	0.00015	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	0.00093	0.00092	0.00001	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00175	0.00165	0.00010	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	0.00060	0.00058	0.00003	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00674	0.00658	2.37%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00070	0.00071	0.000009	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.192	0.194	0.630%	20%	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 85390)</b>											
KS2001663-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 83200)</b>						
conductivity	----	E100	1	µS/cm	<1.0	----
<b>Anions and Nutrients (QCLot: 83162)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 83163)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Bacteriological Tests (QCLot: 83705)</b>						
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 83706)</b>						
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----
<b>Total Metals (QCLot: 84140)</b>						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
<b>Total Metals (QCLot: 84141)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 84141) - continued</b>						
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	MBRR
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 85390)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----

**Qualifiers**

Qualifier	Description
MBRR	Initial MB for this submission had positive results for flagged analyte (data not shown). Low level samples were repeated with new QC (2nd MB results shown). High level results (>5x initial MB level) and non-detect results were reported and are defensible



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Physical Tests (QCLot: 83199)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 83200)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.9	90.0	110	----
<b>Anions and Nutrients (QCLot: 83162)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 83163)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	98.7	90.0	110	----
<b>Total Metals (QCLot: 84140)</b>									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
<b>Total Metals (QCLot: 84141)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	99.5	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	99.0	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	95.5	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	97.4	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	# 123	80.0	120	MES
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	93.6	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	99.2	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	98.4	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	97.6	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	98.4	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	109	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	99.2	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	93.8	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	105	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	97.1	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	94.7	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	112	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	96.8	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	92.7	80.0	120	----





Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 84141) - continued</b>									
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	105	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	106	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	98.3	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	108	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	97.2	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	93.5	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	103	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	98.6	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	96.4	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	97.5	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	99.1	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	101	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	97.6	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	98.7	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	100	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	90.1	80.0	120	----
<b>Total Metals (QCLot: 85390)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	99.2	80.0	120	----

### Qualifiers

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).



### Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 83162)</b>										
VA20B4656-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.66 mg/L	2.5 mg/L	106	75.0	125	----
<b>Anions and Nutrients (QCLot: 83163)</b>										
VA20B4656-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.517 mg/L	0.5 mg/L	103	75.0	125	----
<b>Total Metals (QCLot: 84140)</b>										
VA20B4442-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0394 mg/L	0.04 mg/L	98.6	70.0	130	----
<b>Total Metals (QCLot: 84141)</b>										
VA20B4442-002	Anonymous	aluminum, total	7429-90-5	E420	ND mg/L	0.2 mg/L	ND	70.0	130	----
		antimony, total	7440-36-0	E420	0.0196 mg/L	0.02 mg/L	98.0	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0195 mg/L	0.02 mg/L	97.6	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0398 mg/L	0.04 mg/L	99.6	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0101 mg/L	0.01 mg/L	101	70.0	130	----
		boron, total	7440-42-8	E420	0.095 mg/L	0.1 mg/L	95.2	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00385 mg/L	0.004 mg/L	96.3	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00965 mg/L	0.01 mg/L	96.5	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		copper, total	7440-50-8	E420	0.0185 mg/L	0.02 mg/L	92.4	70.0	130	----
		iron, total	7439-89-6	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	0.0193 mg/L	0.02 mg/L	96.7	70.0	130	----
		lithium, total	7439-93-2	E420	0.0996 mg/L	0.1 mg/L	99.6	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0191 mg/L	0.02 mg/L	95.5	70.0	130	----
		nickel, total	7440-02-0	E420	0.0368 mg/L	0.04 mg/L	91.9	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.0 mg/L	10 mg/L	100	70.0	130	----
		potassium, total	7440-09-7	E420	3.79 mg/L	4 mg/L	94.8	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		selenium, total	7782-49-2	E420	0.0421 mg/L	0.04 mg/L	105	70.0	130	----
		silicon, total	7440-21-3	E420	9.74 mg/L	10 mg/L	97.4	70.0	130	----
		silver, total	7440-22-4	E420	0.00385 mg/L	0.004 mg/L	96.3	70.0	130	----



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
<b>Total Metals (QCLot: 84141) - continued</b>										
VA20B4442-002	Anonymous	sodium, total	7440-23-5	E420	2.17 mg/L	2 mg/L	108	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	20.3 mg/L	20 mg/L	102	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0371 mg/L	0.04 mg/L	92.7	70.0	130	----
		thallium, total	7440-28-0	E420	0.00385 mg/L	0.004 mg/L	96.2	70.0	130	----
		thorium, total	7440-29-1	E420	0.0238 mg/L	0.02 mg/L	119	70.0	130	----
		tin, total	7440-31-5	E420	0.0189 mg/L	0.02 mg/L	94.5	70.0	130	----
		titanium, total	7440-32-6	E420	0.0379 mg/L	0.04 mg/L	94.8	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		uranium, total	7440-61-1	E420	0.00392 mg/L	0.004 mg/L	98.1	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0971 mg/L	0.1 mg/L	97.1	70.0	130	----
		zinc, total	7440-66-6	E420	ND mg/L	0.4 mg/L	ND	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0367 mg/L	0.04 mg/L	91.7	70.0	130	----
<b>Total Metals (QCLot: 85390)</b>										
KS2001667-001	Anonymous	mercury, total	7439-97-6	E508	0.0000994 mg/L	0.0001 mg/L	99.4	70.0	130	----



ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - 859804

Page of

Contact and company name below will appear on the final report

Report Format / Distribution

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Company: **AECOM**  
 Contact: **NADIA BAKER**  
 Phone: **604-341-8242**  
 Company address below will appear on the final report  
 Street: **3292 Prud'homme Way 4th floor**  
 City/Province: **Burnaby**  
 Postal Code: **V5A 4R4**  
 Invoice To:  YES  NO  
 Same as Report To:  YES  NO  
 Copy of Invoice with Report:  YES  NO  
 Company: **AECOM**  
 Contact: **Bruce Ford**  
 Project Information  
 ALS Account # / Quote #: **VA20-AEC0100-0004**  
 Job #: **60639142**  
 PO/A/E: \_\_\_\_\_  
 Location: \_\_\_\_\_

Select Report Format:  PDF  EXCEL  EDD (DIGITAL)  
 Quality Control (QC) Report with Report:  YES  NO  
 Compare Results to Criteria on Report - provide details below if box checked  
 Select Distribution:  EMAIL  MAIL  FAX  
 Email 1 or Fax: **Nadia.baker@aecom.com**  
 Email 2: **bruce.ford@aecom.com**  
 Email 3: \_\_\_\_\_  
 Invoice Distribution:  EMAIL  MAIL  FAX  
 Select Invoice Distribution:  EMAIL  MAIL  FAX  
 Email 1 or Fax: **bruce.ford@aecom.com**  
 Email 2: **nadia.baker@aecom.com**  
 Oil and Gas Required Fields (client use)  
 A/E/Cost Center: \_\_\_\_\_ PO#: \_\_\_\_\_  
 Major/Minor Code: \_\_\_\_\_ Routing Code: \_\_\_\_\_  
 Requisitioner: \_\_\_\_\_  
 Location: \_\_\_\_\_

ALS Lab Work Order # (lab use only): \_\_\_\_\_  
 ALS Sample # (lab use only): \_\_\_\_\_  
 Sample Identification and/or Coordinates (This description will appear on the report)  
 DEL-001  
 DEL-002  
 DEL-003  
 DEL-004  
 UEL-005  
 Field blank

ALS Sample # (lab use only)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	ALS Contact:	Sampler:
DEL-001	08/09/20	14:25	Water	Johnson	Nadia Baker
DEL-002	08/09/20	13:45	"	Katana	Nadia Baker
DEL-003	08/09/20	13:58	"		
DEL-004	08/09/20	11:03	"		
UEL-005	08/09/20	12:15	"		
Field blank	08/09/20		"		

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)  
 Drinking Water (DW) Samples (client use)  
 Are samples taken from a Regulated DW System?  YES  NO  
 Are samples for human consumption/user?  YES  NO  
 SHIPMENT RELEASE (client use)  
 Released by: **Nadia Baker** Date: **Sept 8/2020** Time: **16:45**  
 INITIAL SHIPMENT RECEPTION (lab use only)  
 Received by: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

NUMBER OF CONTAINERS  
 Total Metals + Hg  
 Fecal Coliforms  
 E. Coli  
 pH by meter  
 Conductivity  
 Nitrate  
 Nitrite  
 Nitrite + Nitrate  
 SAMPLE CONDITION AS RECEIVED (lab use only)  
 Frozen   
 Ice Packs   
 Ice Cubes   
 Cooling Initiated   
 SIF Observations: Yes  No   
 Custody seal intact: Yes  No   
 INITIAL COOLER TEMPERATURES °C: \_\_\_\_\_  
 FINAL COOLER TEMPERATURES °C: \_\_\_\_\_  
 FINAL SHIPMENT RECEPTION (lab use only)  
 Received by: **Seif** Date: **Sept 8** Time: **4:50**

Environmental Division  
 Vancouver  
 Work Order Reference  
**VA20B4642**  
 Telephone: +1 804 253 4188

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



**CERTIFICATE OF ANALYSIS**

**Work Order** : **VA20B5383**  
**Client** : **AECOM Canada Ltd.**  
**Contact** : Nadia Baker  
**Address** : 3292 Production Way  
 Burnaby BC Canada V5A 4R4  
**Telephone** : ----  
**Project** : 60639142  
**PO** : ----  
**C-O-C number** : 17-860896  
**Sampler** : Nadia Baker  
**Site** : ----  
**Quote number** : VA20-AECO100-0004  
**No. of samples received** : 5  
**No. of samples analysed** : 5

**Page** : 1 of 4  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Dean Watt  
**Address** : 8081 Lougheed Highway  
 Burnaby BC Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 16-Sep-2020 15:40  
**Date Analysis Commenced** : 17-Sep-2020  
**Issue Date** : 23-Sep-2020 14:20

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

**Signatories**

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Microbiology, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior 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.

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MBEB	Estimated Result (Microbiology test). Presence of many non-coliform colonies in the sample prevented an accurate count of target coliform colonies.
MBER	Estimated Result (Microbiological test). Colony count outside ideal range. Result calculated from most nearly acceptable value.



## Analytical Results

Sub-Matrix: Water					Client sample ID				
(Matrix: Water)					UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Client sampling date / time					16-Sep-2020 09:50	16-Sep-2020 11:47	16-Sep-2020 11:00	16-Sep-2020 12:43	16-Sep-2020 13:30
Analyte	CAS Number	Method	LOR	Unit	VA20B5383-001	VA20B5383-002	VA20B5383-003	VA20B5383-004	VA20B5383-005
					Result	Result	Result	Result	Result
<b>Physical Tests</b>									
conductivity	----	E100	2.0	µS/cm	209	71.3	152	249	202
hardness (as CaCO <sub>3</sub> ), from total Ca/Mg	----	EC100A	600	µg/L	73700	21700	49200	101000	67500
pH	----	E108	0.10	pH units	7.86	7.44	7.87	7.48	7.78
<b>Anions and Nutrients</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	1.23	0.329	0.934	<0.0050	0.503
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	1.24	0.329	0.936	0.0052	0.511
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0.0014	<0.0010	0.0083
<b>Bacteriological Tests</b>									
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	160 <sup>MBER</sup>	17	80 <sup>MBEB</sup>	13	110 <sup>MBEB</sup>
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	170 <sup>MBER</sup>	21	190 <sup>MBER</sup>	13	140 <sup>MBEB</sup>
<b>Total Metals</b>									
aluminum, total	7429-90-5	E420	3.0	µg/L	35.4	334	29.5	21.4	29.3
antimony, total	7440-36-0	E420	0.10	µg/L	<0.10	0.14	0.17	<0.10	0.22
arsenic, total	7440-38-2	E420	0.10	µg/L	0.58	0.38	1.58	0.53	0.31
barium, total	7440-39-3	E420	0.10	µg/L	13.0	21.0	9.63	54.1	20.0
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050
boron, total	7440-42-8	E420	10	µg/L	14	<10	18	15	18
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0099	0.0243	0.0056	<0.0050	<0.0050
calcium, total	7440-70-2	E420	50	µg/L	17900	5570	13500	29200	22200
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	0.012	<0.010	0.038	0.012
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	0.25	0.64	0.68	0.17	0.28
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	0.48	<0.10	1.05	<0.10
copper, total	7440-50-8	E420	0.50	µg/L	0.78	2.16	3.84	0.73	3.80
iron, total	7439-89-6	E420	10	µg/L	237	916	151	4060	283
lead, total	7439-92-1	E420	0.050	µg/L	0.087	0.461	0.074	0.062	0.087
lithium, total	7439-93-2	E420	1.0	µg/L	2.0	<1.0	1.1	<1.0	<1.0
magnesium, total	7439-95-4	E420	5.0	µg/L	7060	1900	3760	6920	2890
manganese, total	7439-96-5	E420	0.10	µg/L	14.2	70.3	8.56	1700	52.8
mercury, total	7439-97-6	E508	0.0050	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050



## Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Client sampling date / time					16-Sep-2020 09:50	16-Sep-2020 11:47	16-Sep-2020 11:00	16-Sep-2020 12:43	16-Sep-2020 13:30	
Analyte	CAS Number	Method	LOR	Unit	VA20B5383-001	VA20B5383-002	VA20B5383-003	VA20B5383-004	VA20B5383-005	
					Result	Result	Result	Result	Result	
<b>Total Metals</b>										
molybdenum, total	7439-98-7	E420	0.050	µg/L	0.266	0.245	0.428	0.496	0.372	
nickel, total	7440-02-0	E420	0.50	µg/L	<0.50	0.82	<0.50	0.61	<0.50	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	<50	69	53	<50	
potassium, total	7440-09-7	E420	50	µg/L	3540	1810	2630	4200	2110	
rubidium, total	7440-17-7	E420	0.20	µg/L	0.81	1.80	1.57	5.34	1.82	
selenium, total	7782-49-2	E420	0.050	µg/L	0.061	<0.050	0.076	0.169	<0.050	
silicon, total	7440-21-3	E420	100	µg/L	19200	16800	16300	5320	5150	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
sodium, total	7440-23-5	E420	50	µg/L	9660	5110	9240	8410	12500	
strontium, total	7440-24-6	E420	0.20	µg/L	149	69.0	99.6	256	143	
sulfur, total	7704-34-9	E420	500	µg/L	6900	1050	3150	<500	1860	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
titanium, total	7440-32-6	E420	0.30	µg/L	0.77	9.11	0.82	0.58	<1.20 <sup>DLM</sup>	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
uranium, total	7440-61-1	E420	0.010	µg/L	0.268	0.013	0.038	0.023	0.015	
vanadium, total	7440-62-2	E420	0.50	µg/L	4.12	3.88	2.06	<0.50	<0.50	
zinc, total	7440-66-6	E420	3.0	µg/L	<3.0	3.9	3.7	<3.0	<3.0	
zirconium, total	7440-67-7	E420	0.20	µg/L	<0.20	0.29	<0.20	<0.20	<0.20	

Please refer to the General Comments section for an explanation of any qualifiers detected.



## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA20B5383</b>	Page	: 1 of 11
Client	: <b>AECOM Canada Ltd.</b>	Laboratory	: Vancouver - Environmental
Contact	: Nadia Baker	Account Manager	: Dean Watt
Address	: 3292 Production Way Burnaby BC Canada V5A 4R4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 60639142	Date Samples Received	: 16-Sep-2020 15:40
PO	: ----	Issue Date	: 23-Sep-2020 14:20
C-O-C number	: 17-860896		
Sampler	: Nadia Baker		
Site	: ----		
Quote number	: VA20-AECO100-0004		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

## Summary of Outliers

### **Outliers : Quality Control Samples**

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

### **Outliers : Frequency of Quality Control Samples**

- No Quality Control Sample Frequency Outliers occur.

RIGHT SOLUTIONS | RIGHT PARTNER



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-001	E235.NO3-L	16-Sep-2020	----	----	----		17-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO3-L	16-Sep-2020	----	----	----		17-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-003	E235.NO3-L	16-Sep-2020	----	----	----		17-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-004	E235.NO3-L	16-Sep-2020	----	----	----		17-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-005	E235.NO3-L	16-Sep-2020	----	----	----		17-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-001	E235.NO2-L	16-Sep-2020	----	----	----		17-Sep-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO2-L	16-Sep-2020	----	----	----		17-Sep-2020	3 days	0 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-003	E235.NO2-L	16-Sep-2020	----	----	----		17-Sep-2020	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-004	E235.NO2-L	16-Sep-2020	----	----	----		17-Sep-2020	3 days	0 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-005	E235.NO2-L	16-Sep-2020	----	----	----		17-Sep-2020	3 days	0 days	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.EC	16-Sep-2020	----	----	----		17-Sep-2020	48 hrs	23 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.EC	16-Sep-2020	----	----	----		17-Sep-2020	48 hrs	24 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.EC	16-Sep-2020	----	----	----		17-Sep-2020	48 hrs	25 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.EC	16-Sep-2020	----	----	----		17-Sep-2020	48 hrs	26 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.EC	16-Sep-2020	----	----	----		17-Sep-2020	48 hrs	27 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.FC	16-Sep-2020	----	----	----		17-Sep-2020	30 hrs	23 hrs	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.FC	16-Sep-2020	----	----	----		17-Sep-2020	30 hrs	24 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.FC	16-Sep-2020	----	----	----		17-Sep-2020	30 hrs	25 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.FC	16-Sep-2020	----	----	----		17-Sep-2020	30 hrs	26 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.FC	16-Sep-2020	----	----	----		17-Sep-2020	30 hrs	27 hrs	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-001	E100	16-Sep-2020	----	----	----		17-Sep-2020	28 days	1 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-002	E100	16-Sep-2020	----	----	----		17-Sep-2020	28 days	1 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-003	E100	16-Sep-2020	----	----	----		17-Sep-2020	28 days	1 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-004	E100	16-Sep-2020	----	----	----		17-Sep-2020	28 days	1 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-005	E100	16-Sep-2020	----	----	----		17-Sep-2020	28 days	1 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-004	E108	16-Sep-2020	----	----	----		17-Sep-2020	0.25 hrs	26 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-005	E108	16-Sep-2020	----	----	----		17-Sep-2020	0.25 hrs	26 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-002	E108	16-Sep-2020	----	----	----		17-Sep-2020	0.25 hrs	27 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-003	E108	16-Sep-2020	----	----	----		17-Sep-2020	0.25 hrs	28 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-001	E108	16-Sep-2020	----	----	----		17-Sep-2020	0.25 hrs	29 hrs	*	EHTR-FM
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-001	E420.Cr-L	16-Sep-2020	----	----	----		23-Sep-2020	180 days	6 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-002	E420.Cr-L	16-Sep-2020	----	----	----		23-Sep-2020	180 days	6 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-003	E420.Cr-L	16-Sep-2020	----	----	----		23-Sep-2020	180 days	6 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-004	E420.Cr-L	16-Sep-2020	----	----	----		23-Sep-2020	180 days	6 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE - total (lab preserved)</b> UEL-005	E420.Cr-L	16-Sep-2020	----	----	----		23-Sep-2020	180 days	6 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-001	E508	16-Sep-2020	----	----	----		22-Sep-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-002	E508	16-Sep-2020	----	----	----		22-Sep-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-003	E508	16-Sep-2020	----	----	----		22-Sep-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-004	E508	16-Sep-2020	----	----	----		22-Sep-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-005	E508	16-Sep-2020	----	----	----		22-Sep-2020	28 days	5 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-001	E420	16-Sep-2020	----	----	----		23-Sep-2020	180 days	6 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-002	E420	16-Sep-2020	----	----	----		23-Sep-2020	180 days	6 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-003	E420	16-Sep-2020	----	----	----		23-Sep-2020	180 days	6 days	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-004	E420	16-Sep-2020	----	----	----		23-Sep-2020	180 days	6 days	✓
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-005	E420	16-Sep-2020	----	----	----		23-Sep-2020	180 days	6 days	✓

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 Rec. HT: ALS recommended hold time (see units).





## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Conductivity in Water	E100	87052	1	15	6.6	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	87646	1	5	20.0	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	87057	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	87058	1	15	6.6	5.0	✓
pH by Meter	E108	87053	1	15	6.6	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	87645	1	7	14.2	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	87771	1	10	10.0	5.0	✓
Total Mercury in Water by CVAAS	E508	89677	2	25	8.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	87772	1	20	5.0	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Conductivity in Water	E100	87052	1	15	6.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	87057	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	87058	1	15	6.6	5.0	✓
pH by Meter	E108	87053	1	15	6.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	87771	1	10	10.0	5.0	✓
Total Mercury in Water by CVAAS	E508	89677	2	25	8.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	87772	1	20	5.0	5.0	✓
<b>Method Blanks (MB)</b>							
Conductivity in Water	E100	87052	1	15	6.6	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	87646	1	5	20.0	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	87057	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	87058	1	15	6.6	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	87645	1	7	14.2	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	87771	1	10	10.0	5.0	✓
Total Mercury in Water by CVAAS	E508	89677	2	25	8.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	87772	1	20	5.0	5.0	✓
<b>Matrix Spikes (MS)</b>							
Nitrate in Water by IC (Low Level)	E235.NO3-L	87057	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	87058	1	15	6.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	87771	1	10	10.0	5.0	✓
Total Mercury in Water by CVAAS	E508	89677	2	25	8.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	87772	1	20	5.0	5.0	✓



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-NA-MUG)	E012.EC  Vancouver - Environmental	Water	APHA 9222I (mod)	Positive Total or Thermotolerant Coliform filters are transferred to NA-MUG and incubated at 35.0 ±0.5°C for 4 hours. Colonies exhibiting fluorescence are enumerated.
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC  Vancouver - Environmental	Water	APHA 9222 D (mod)	Following filtration (0.45 µm), and incubation at 45.5 ±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
Conductivity in Water	E100  Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108  Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Nitrite in Water by IC (Low Level)	E235.NO2-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS



<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N  Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).



QUALITY CONTROL REPORT

Work Order : VA20B5383

Page : 1 of 10

Client : AECOM Canada Ltd.
Contact : Nadia Baker
Address : 3292 Production Way
Burnaby BC Canada V5A 4R4
Telephone : ----
Project : 60639142
PO : ----
C-O-C number : 17-860896
Sampler : Nadia Baker
Site : ----
Quote number : VA20-AECO100-0004
No. of samples received : 5
No. of samples analysed : 5

Laboratory : Vancouver - Environmental
Account Manager : Dean Watt
Address : 8081 Lougheed Highway
Burnaby, British Columbia Canada V5A 1W9
Telephone : +1 604 253 4188
Date Samples Received : 16-Sep-2020 15:40
Date Analysis Commenced : 17-Sep-2020
Issue Date : 23-Sep-2020 14:20

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
● Matrix Spike (MS) Report; Recovery and Acceptance Limits
● Reference Material (RM) Report; Recovery and Acceptance Limits
● Method Blank (MB) Report; Recovery and Acceptance Limits
● Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Table with 3 columns: Signatories, Position, Laboratory Department. Rows include Dee Lee (Analyst, Metals), Kim Jensen (Department Manager - Metals, Metals), Lindsay Gung (Supervisor - Water Chemistry, Inorganics), and Lindsay Gung (Supervisor - Water Chemistry, Microbiology).



## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.



### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 87052)</b>											
VA20B5312-001	Anonymous	conductivity	----	E100	2.0	µS/cm	300	298	0.669%	10%	----
<b>Physical Tests (QC Lot: 87053)</b>											
VA20B5312-001	Anonymous	pH	----	E108	0.10	pH units	8.23	8.24	0.121%	4%	----
<b>Anions and Nutrients (QC Lot: 87057)</b>											
KS2001749-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 87058)</b>											
KS2001749-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 87645)</b>											
VA20B5383-004	UEL-004	coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	13	12	8.00%	65%	----
<b>Bacteriological Tests (QC Lot: 87646)</b>											
VA20B5383-004	UEL-004	coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	13	12	8.00%	65%	----
<b>Total Metals (QC Lot: 87771)</b>											
VA20B5272-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 87772)</b>											
VA20B5272-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00015	0.00015	0.000003	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00015	0.00014	0.00001	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0392	0.0393	0.352%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	0.0000053	0.0000003	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	51.7	52.5	1.55%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00059	0.00055	0.00004	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0011	0.0010	0.00004	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	23.4	23.0	1.51%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00021	0.00020	0.000010	Diff <2x LOR	----



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 87772) - continued</b>											
VA20B5272-001	Anonymous	molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000474	0.000463	0.000012	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	0.370	0.364	0.006	Diff <2x LOR	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00032	0.00027	0.00004	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000334	0.000365	0.000031	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	2.13	2.14	0.380%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	1.21	1.18	2.89%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.206	0.199	3.52%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	6.90	7.11	3.01%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000098	0.000102	3.78%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 89676)</b>											
VA20B5335-021	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 89677)</b>											
VA20B5383-003	UEL-003	mercury, total	7439-97-6	E508	0.00500	mg/L	<0.0050 µg/L	<0.0000050	0	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 87052)</b>						
conductivity	----	E100	1	µS/cm	<1.0	----
<b>Anions and Nutrients (QCLot: 87057)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 87058)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Bacteriological Tests (QCLot: 87645)</b>						
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 87646)</b>						
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----
<b>Total Metals (QCLot: 87771)</b>						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
<b>Total Metals (QCLot: 87772)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----





Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 87772) - continued</b>						
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 89676)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
<b>Total Metals (QCLot: 89677)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 87052)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
<b>Physical Tests (QCLot: 87053)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Anions and Nutrients (QCLot: 87057)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
<b>Anions and Nutrients (QCLot: 87058)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	98.0	90.0	110	----
<b>Total Metals (QCLot: 87771)</b>									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
<b>Total Metals (QCLot: 87772)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	99.6	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	115	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	101	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	110	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	98.2	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	104	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	93.6	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	98.9	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	102	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	97.6	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	97.3	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	91.6	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	99.3	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	99.3	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	97.9	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	104	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	98.4	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	107	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	100	80.0	120	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 87772) - continued</b>									
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	99.4	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	100	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	103	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	107	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	101	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	94.9	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	105	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	88.5	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	95.6	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	96.7	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	92.2	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	103	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	103	80.0	120	----
<b>Total Metals (QCLot: 89676)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	99.9	80.0	120	----
<b>Total Metals (QCLot: 89677)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	97.4	80.0	120	----



### Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 87057)</b>										
KS2001756-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	12.4 mg/L	12.5 mg/L	99.0	75.0	125	----
<b>Anions and Nutrients (QCLot: 87058)</b>										
KS2001756-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	2.31 mg/L	2.5 mg/L	92.5	75.0	125	----
<b>Total Metals (QCLot: 87771)</b>										
VA20B5272-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0394 mg/L	0.04 mg/L	98.5	70.0	130	----
<b>Total Metals (QCLot: 87772)</b>										
VA20B5272-002	Anonymous	aluminum, total	7429-90-5	E420	0.194 mg/L	0.2 mg/L	97.0	70.0	130	----
		antimony, total	7440-36-0	E420	0.0219 mg/L	0.02 mg/L	110	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0197 mg/L	0.02 mg/L	98.7	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0417 mg/L	0.04 mg/L	104	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00940 mg/L	0.01 mg/L	94.0	70.0	130	----
		boron, total	7440-42-8	E420	0.099 mg/L	0.1 mg/L	98.9	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00384 mg/L	0.004 mg/L	96.0	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.0108 mg/L	0.01 mg/L	108	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0188 mg/L	0.02 mg/L	93.8	70.0	130	----
		copper, total	7440-50-8	E420	0.0184 mg/L	0.02 mg/L	92.2	70.0	130	----
		iron, total	7439-89-6	E420	2.00 mg/L	2 mg/L	100	70.0	130	----
		lead, total	7439-92-1	E420	0.0184 mg/L	0.02 mg/L	92.1	70.0	130	----
		lithium, total	7439-93-2	E420	0.104 mg/L	0.1 mg/L	104	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0196 mg/L	0.02 mg/L	98.0	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0221 mg/L	0.02 mg/L	110	70.0	130	----
		nickel, total	7440-02-0	E420	0.0377 mg/L	0.04 mg/L	94.2	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.6 mg/L	10 mg/L	106	70.0	130	----
		potassium, total	7440-09-7	E420	3.92 mg/L	4 mg/L	97.9	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		selenium, total	7782-49-2	E420	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, total	7440-21-3	E420	9.03 mg/L	10 mg/L	90.3	70.0	130	----
		silver, total	7440-22-4	E420	0.00428 mg/L	0.004 mg/L	107	70.0	130	----



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
<b>Total Metals (QCLot: 87772) - continued</b>										
VA20B5272-002	Anonymous	sodium, total	7440-23-5	E420	1.83 mg/L	2 mg/L	91.4	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	21.7 mg/L	20 mg/L	108	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0416 mg/L	0.04 mg/L	104	70.0	130	----
		thallium, total	7440-28-0	E420	0.00383 mg/L	0.004 mg/L	95.7	70.0	130	----
		thorium, total	7440-29-1	E420	0.0197 mg/L	0.02 mg/L	98.6	70.0	130	----
		tin, total	7440-31-5	E420	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		titanium, total	7440-32-6	E420	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0195 mg/L	0.02 mg/L	97.6	70.0	130	----
		uranium, total	7440-61-1	E420	0.00363 mg/L	0.004 mg/L	90.7	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0997 mg/L	0.1 mg/L	99.7	70.0	130	----
		zinc, total	7440-66-6	E420	0.382 mg/L	0.4 mg/L	95.6	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0471 mg/L	0.04 mg/L	118	70.0	130	----
<b>Total Metals (QCLot: 89676)</b>										
VA20B5335-022	Anonymous	mercury, total	7439-97-6	E508	0.0000960 mg/L	0.0001 mg/L	96.0	70.0	130	----
<b>Total Metals (QCLot: 89677)</b>										
VA20B5383-004	UEL-004	mercury, total	7439-97-6	E508	0.0000960 mg/L	0.0001 mg/L	96.0	70.0	130	----



ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Affix ALS barcode label here (lab use only)

Canada Toll Free: 1 800 668 9878

COC Number: 17 - 860896

Page 1 of 1

Contact and company name below will appear on the final report

Report Format / Distribution

Select Service Level Below - Contact your AM to confirm all E&P T&Ts (surcharges may apply)

Company: AECOM Canada  
Contact: Nadia Baker

Select Report Format: PDF  EXCEL  EOD (DIGITAL)  
Quality Control (QC) Report with Report  YES  NO

Regular R1  Standard T&T if received by 3 pm - business days - no surcharges apply  
4 day [P4-20%]   
3 day [P3-25%]   
2 day [P2-50%]   
EMERGENCY  Same Day, Weekend or Statutory holiday [E2-200% (laboratory opening fees may apply)]

Phone: Company address below will appear on the final report

Select Distribution:  EMAIL  MAIL  FAX

Date and Time Required for all E&P T&Ts: dd-mm-yy hh:mm

Street: 3292 PRODUCTION Way, 5th Floor

Email 1 or Fax: nadia.baker@aecom.com

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

City/Province: Burnaby BC

Email 2: bruce.ford@aecom.com

Analysis Request

Postal Code: V5A 4R5

Email 3

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

Invoice To: Same as Report To

Invoice Distribution:  EMAIL  MAIL  FAX

Number of Containers

Copy of Invoice with Report:  YES  NO

Select Invoice Distribution:  EMAIL  MAIL  FAX

Regular R1

Company: AECOM Canada

Email 1 or Fax: CANSSCOFF-billing@aecom.com

Standard T&T

Contact: Bruce Ford

Email 2: bruce.ford@aecom.com

1 Business day [E - 100%]

Project Information

Oil and Gas Required Fields (client use)

Same Day, Weekend or Statutory holiday [E2-200% (laboratory opening fees may apply)]

ALS Account # / Quote #: VA300-AECCOIDD-004

AFECost Center: PO#

Fecal Coliforms

Job #: 60039142

Major/Minor Code: Routing Code:

E. coli

PO / AFE:

Requisitioner: Location:

SAMPLES ON HOLD

LSD:

ALS contact: Dean Watt, Jasmeen Datta

SUSPECTED HAZARD (see Special Instructions)

ALS Lab Work Order # (lab use only):

ALS Sample # (lab use only):

Sample Identification and/or Coordinates (This description will appear on the report)

Sample # UEL-001

Date: 16/09/20

Time: 09:50

Sample # UEL-002

Date: 11:47

Time: 11:00

Sample # UEL-003

Date: 12:47

Time: 13:30

Sample # UEL-004

Date: 13:30

Time: 13:30

Sample # UEL-005

Date: 13:30

Time: 13:30

Environmental Division  
Vancouver  
Work Order Reference  
VA20B5383  
Telephone: +1 604 253 4189

Drinking Water (DW) Samples (client use)

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

Are samples taken from a Regulated DW System?  YES  NO  
Are samples for human consumption?  YES  NO

SHIPMENT RELEASE (client use)

INITIAL SHIPMENT RECEPTION (lab use only)

FINAL SHIPMENT RECEPTION (lab use only)

Processed by: N. Baker  
Date: Sept 16/2020  
Time: 15:35  
Received by: [Signature]  
Date: [Signature]  
Time: 9:16  
Time: 5:49

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

WHITE - LABORATORY COPY YELLOW - CLIENT COPY



CERTIFICATE OF ANALYSIS

Work Order : **VA20B6358**  
Client : **AECOM Canada Ltd.**  
Contact : Nadia Baker  
Address : 3292 Production Way  
Burnaby BC Canada V5A 4R4  
Telephone : ----  
Project : 60639142-301  
PO : ----  
C-O-C number : 17-858414  
Sampler : M. Heppner  
Site : ----  
Quote number : VA20-AECO100-0004  
No. of samples received : 5  
No. of samples analysed : 5

Page : 1 of 4  
Laboratory : Vancouver - Environmental  
Account Manager : Dean Watt  
Address : 8081 Lougheed Highway  
Burnaby BC Canada V5A 1W9  
Telephone : +1 604 253 4188  
Date Samples Received : 25-Sep-2020 15:14  
Date Analysis Commenced : 25-Sep-2020  
Issue Date : 06-Oct-2020 18:43

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

**Signatories**

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Microbiology, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics - Water Quality, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior 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.

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
MBEB	<i>Estimated Result (Microbiology test). Presence of many non-coliform colonies in the sample prevented an accurate count of target coliform colonies.</i>





## Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Client sampling date / time					25-Sep-2020 10:15	25-Sep-2020 11:00	25-Sep-2020 11:30	25-Sep-2020 12:45	25-Sep-2020 09:30
Analyte	CAS Number	Method	LOR	Unit	VA20B6358-001	VA20B6358-002	VA20B6358-003	VA20B6358-004	VA20B6358-005
					Result	Result	Result	Result	Result
<b>Physical Tests</b>									
conductivity	----	E100	2.0	µS/cm	121	46.3	190	99.7	211
hardness (as CaCO <sub>3</sub> ), from total Ca/Mg	----	EC100A	600	µg/L	37700	13500	71900	39100	76200
pH	----	E108	0.10	pH units	7.40	7.14	7.80	6.81	7.52
<b>Anions and Nutrients</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	2.00	1.11	2.64	0.620	6.72
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	2.00	1.11	2.66	0.629	6.73
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0047	0.0013	0.0103	0.0091	0.0071
<b>Bacteriological Tests</b>									
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	340 <sup>MBEB</sup>	310	420	430	240
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	390 <sup>MBEB</sup>	350	580	530	320
<b>Total Metals</b>									
aluminum, total	7429-90-5	E420	3.0	µg/L	478	209	226	254	147
antimony, total	7440-36-0	E420	0.10	µg/L	0.46	0.24	0.42	0.25	0.21
arsenic, total	7440-38-2	E420	0.10	µg/L	1.13	0.28	2.63	0.47	0.43
barium, total	7440-39-3	E420	0.10	µg/L	19.2	13.9	20.2	23.3	33.9
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050
boron, total	7440-42-8	E420	10	µg/L	12	<10	27	13	19
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0452	0.0182	0.0350	0.0368	0.0219
calcium, total	7440-70-2	E420	50	µg/L	11000	3590	22300	11800	23200
cesium, total	7440-46-2	E420	0.010	µg/L	0.014	<0.010	0.013	0.013	0.014
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	0.99	1.44	1.23	0.48	0.46
cobalt, total	7440-48-4	E420	0.10	µg/L	0.31	0.27	0.18	0.37	0.28
copper, total	7440-50-8	E420	0.50	µg/L	9.00	3.01	8.20	8.21	3.74
iron, total	7439-89-6	E420	10	µg/L	545	390	1110	1940	1920
lead, total	7439-92-1	E420	0.050	µg/L	0.992	0.326	0.470	0.477	0.364
lithium, total	7439-93-2	E420	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
magnesium, total	7439-95-4	E420	5.0	µg/L	2500	1110	3950	2350	4400
manganese, total	7439-96-5	E420	0.10	µg/L	22.6	38.4	22.6	222	121
mercury, total	7439-97-6	E508	0.0050	µg/L	0.0126	<0.0050	<0.0050	0.0130	<0.0050



## Analytical Results

Sub-Matrix: Water					Client sample ID	UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
(Matrix: Water)										
Client sampling date / time					25-Sep-2020 10:15	25-Sep-2020 11:00	25-Sep-2020 11:30	25-Sep-2020 12:45	25-Sep-2020 09:30	
Analyte	CAS Number	Method	LOR	Unit	VA20B6358-001	VA20B6358-002	VA20B6358-003	VA20B6358-004	VA20B6358-005	
					Result	Result	Result	Result	Result	
<b>Total Metals</b>										
molybdenum, total	7439-98-7	E420	0.050	µg/L	0.295	0.158	0.614	0.202	0.138	
nickel, total	7440-02-0	E420	0.50	µg/L	2.28	0.71	1.39	1.48	1.71	
phosphorus, total	7723-14-0	E420	50	µg/L	95	<50	56	<50	<50	
potassium, total	7440-09-7	E420	50	µg/L	3450	1540	3960	3680	5390	
rubidium, total	7440-17-7	E420	0.20	µg/L	1.73	1.73	2.26	2.24	3.06	
selenium, total	7782-49-2	E420	0.050	µg/L	0.095	0.056	0.103	0.083	0.128	
silicon, total	7440-21-3	E420	100	µg/L	6130	6540	6640	3520	3620	
silver, total	7440-22-4	E420	0.010	µg/L	0.022	<0.010	<0.010	0.016	<0.010	
sodium, total	17341-25-2	E420	50	µg/L	8160	3540	10200	3620	8000	
strontium, total	7440-24-6	E420	0.20	µg/L	73.1	39.5	127	74.0	141	
sulfur, total	7704-34-9	E420	500	µg/L	4010	570	4140	3140	2260	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	0.012	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
titanium, total	7440-32-6	E420	0.30	µg/L	13.0	5.88	6.87	7.95	4.75	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
uranium, total	7440-61-1	E420	0.010	µg/L	0.100	0.024	0.095	0.030	0.014	
vanadium, total	7440-62-2	E420	0.50	µg/L	2.76	2.13	1.42	0.81	0.73	
zinc, total	7440-66-6	E420	3.0	µg/L	13.2	3.4	16.0	7.7	7.5	
zirconium, total	7440-67-7	E420	0.20	µg/L	0.23	<0.20	<0.20	<0.20	0.30	

Please refer to the General Comments section for an explanation of any qualifiers detected.

## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA20B6358</b>	Page	: 1 of 11
Client	: <b>AECOM Canada Ltd.</b>	Laboratory	: Vancouver - Environmental
Contact	: Nadia Baker	Account Manager	: Dean Watt
Address	: 3292 Production Way Burnaby BC Canada V5A 4R4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 60639142-301	Date Samples Received	: 25-Sep-2020 15:14
PO	: ----	Issue Date	: 06-Oct-2020 18:43
C-O-C number	: 17-858414		
Sampler	: M. Heppner		
Site	: ----		
Quote number	: VA20-AECO100-0004		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

## Summary of Outliers

### **Outliers : Quality Control Samples**

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

### **Outliers : Frequency of Quality Control Samples**

- No Quality Control Sample Frequency Outliers occur.

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## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-001	E235.NO3-L	25-Sep-2020	----	----	----		27-Sep-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO3-L	25-Sep-2020	----	----	----		27-Sep-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-005	E235.NO3-L	25-Sep-2020	----	----	----		27-Sep-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-004	E235.NO3-L	25-Sep-2020	----	----	----		28-Sep-2020	3 days	2 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-003	E235.NO3-L	25-Sep-2020	----	----	----		28-Sep-2020	3 days	3 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-001	E235.NO2-L	25-Sep-2020	----	----	----		27-Sep-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO2-L	25-Sep-2020	----	----	----		27-Sep-2020	3 days	1 days	✓



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-005	E235.NO2-L	25-Sep-2020	----	----	----		27-Sep-2020	3 days	1 days	✓	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-004	E235.NO2-L	25-Sep-2020	----	----	----		28-Sep-2020	3 days	2 days	✓	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-003	E235.NO2-L	25-Sep-2020	----	----	----		28-Sep-2020	3 days	3 days	✓	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.EC	25-Sep-2020	----	----	----		25-Sep-2020	48 hrs	4 hrs	✓	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.EC	25-Sep-2020	----	----	----		25-Sep-2020	48 hrs	5 hrs	✓	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.EC	25-Sep-2020	----	----	----		25-Sep-2020	48 hrs	5 hrs	✓	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.EC	25-Sep-2020	----	----	----		25-Sep-2020	48 hrs	6 hrs	✓	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.EC	25-Sep-2020	----	----	----		25-Sep-2020	48 hrs	7 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.FC	25-Sep-2020	----	----	----		25-Sep-2020	30 hrs	4 hrs	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.FC	25-Sep-2020	----	----	----		25-Sep-2020	30 hrs	5 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.FC	25-Sep-2020	----	----	----		25-Sep-2020	30 hrs	5 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.FC	25-Sep-2020	----	----	----		25-Sep-2020	30 hrs	6 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.FC	25-Sep-2020	----	----	----		25-Sep-2020	30 hrs	7 hrs	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-001	E100	25-Sep-2020	----	----	----		27-Sep-2020	28 days	2 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-002	E100	25-Sep-2020	----	----	----		27-Sep-2020	28 days	2 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-005	E100	25-Sep-2020	----	----	----		27-Sep-2020	28 days	2 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-003	E100	25-Sep-2020	----	----	----		28-Sep-2020	28 days	3 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-004	E100	25-Sep-2020	----	----	----		28-Sep-2020	28 days	3 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-001	E108	25-Sep-2020	----	----	----		27-Sep-2020	0.25 hrs	49 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-002	E108	25-Sep-2020	----	----	----		27-Sep-2020	0.25 hrs	49 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-005	E108	25-Sep-2020	----	----	----		27-Sep-2020	0.25 hrs	50 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-004	E108	25-Sep-2020	----	----	----		28-Sep-2020	0.25 hrs	72 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-003	E108	25-Sep-2020	----	----	----		28-Sep-2020	0.25 hrs	73 hrs	*	EHTR-FM
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-001	E420.Cr-L	25-Sep-2020	----	----	----		02-Oct-2020	180 days	7 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-002	E420.Cr-L	25-Sep-2020	----	----	----		02-Oct-2020	180 days	7 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-003	E420.Cr-L	25-Sep-2020	----	----	----		02-Oct-2020	180 days	7 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE - total (lab preserved) UEL-004	E420.Cr-L	25-Sep-2020	----	----	----		02-Oct-2020	180 days	7 days	✓	





Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
<b>HDPE - total (lab preserved)</b> UEL-005	E420.Cr-L	25-Sep-2020	----	----	----		02-Oct-2020	180 days	7 days	✔
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
<b>Glass vial total (hydrochloric acid)</b> UEL-002	E508	25-Sep-2020	----	----	----		02-Oct-2020	28 days	6 days	✔
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
<b>Glass vial total (hydrochloric acid)</b> UEL-003	E508	25-Sep-2020	----	----	----		02-Oct-2020	28 days	6 days	✔
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
<b>Glass vial total (hydrochloric acid)</b> UEL-004	E508	25-Sep-2020	----	----	----		02-Oct-2020	28 days	6 days	✔
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
<b>Glass vial total (hydrochloric acid)</b> UEL-001	E508	25-Sep-2020	----	----	----		02-Oct-2020	28 days	7 days	✔
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
<b>Glass vial total (hydrochloric acid)</b> UEL-005	E508	25-Sep-2020	----	----	----		02-Oct-2020	28 days	7 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-001	E420	25-Sep-2020	----	----	----		02-Oct-2020	180 days	7 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-002	E420	25-Sep-2020	----	----	----		02-Oct-2020	180 days	7 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-003	E420	25-Sep-2020	----	----	----		02-Oct-2020	180 days	7 days	✔



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-004	E420	25-Sep-2020	----	----	----		02-Oct-2020	180 days	7 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-005	E420	25-Sep-2020	----	----	----		02-Oct-2020	180 days	7 days	✔

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Conductivity in Water	E100	92814	2	36	5.5	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	92347	1	5	20.0	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	92788	2	38	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	92789	2	30	6.6	5.0	✓
pH by Meter	E108	92815	2	37	5.4	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	92348	1	10	10.0	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	93257	1	16	6.2	5.0	✓
Total Mercury in Water by CVAAS	E508	95955	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	93258	1	20	5.0	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Conductivity in Water	E100	92814	2	36	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	92788	2	38	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	92789	2	30	6.6	5.0	✓
pH by Meter	E108	92815	2	37	5.4	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	93257	1	16	6.2	5.0	✓
Total Mercury in Water by CVAAS	E508	95955	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	93258	1	20	5.0	5.0	✓
<b>Method Blanks (MB)</b>							
Conductivity in Water	E100	92814	2	36	5.5	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	92347	1	5	20.0	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	92788	2	38	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	92789	2	30	6.6	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	92348	1	10	10.0	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	93257	1	16	6.2	5.0	✓
Total Mercury in Water by CVAAS	E508	95955	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	93258	1	20	5.0	5.0	✓
<b>Matrix Spikes (MS)</b>							
Nitrate in Water by IC (Low Level)	E235.NO3-L	92788	2	38	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	92789	2	30	6.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	93257	1	16	6.2	5.0	✓
Total Mercury in Water by CVAAS	E508	95955	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	93258	1	20	5.0	5.0	✓



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-NA-MUG)	E012.EC  Vancouver - Environmental	Water	APHA 9222I (mod)	Positive Total or Thermotolerant Coliform filters are transferred to NA-MUG and incubated at 35.0 ±0.5°C for 4 hours. Colonies exhibiting fluorescence are enumerated.
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC  Vancouver - Environmental	Water	APHA 9222 D (mod)	Following filtration (0.45 µm), and incubation at 45.5 ±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
Conductivity in Water	E100  Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108  Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Nitrite in Water by IC (Low Level)	E235.NO2-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS



<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N  Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).



QUALITY CONTROL REPORT

Work Order : VA20B6358

Page : 1 of 10

Client : AECOM Canada Ltd.
Contact : Nadia Baker
Address : 3292 Production Way
Burnaby BC Canada V5A 4R4
Telephone : ----
Project : 60639142-301
PO : ----
C-O-C number : 17-858414
Sampler : M. Heppner
Site : ----
Quote number : VA20-AECO100-0004
No. of samples received : 5
No. of samples analysed : 5

Laboratory : Vancouver - Environmental
Account Manager : Dean Watt
Address : 8081 Lougheed Highway
Burnaby, British Columbia Canada V5A 1W9
Telephone : +1 604 253 4188
Date Samples Received : 25-Sep-2020 15:14
Date Analysis Commenced : 25-Sep-2020
Issue Date : 06-Oct-2020 18:43

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
● Matrix Spike (MS) Report; Recovery and Acceptance Limits
● Reference Material (RM) Report; Recovery and Acceptance Limits
● Method Blank (MB) Report; Recovery and Acceptance Limits
● Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Table with 3 columns: Signatories, Position, Laboratory Department. Rows include Dee Lee (Analyst, Metals), Kim Jensen (Department Manager - Metals, Metals), Lindsay Gung (Supervisor - Water Chemistry, Inorganics), Robin Weeks (Team Leader - Metals, Metals), and Tracy Harley (Supervisor - Water Quality Instrumentation, Inorganics).



## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.



### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 92814)</b>											
VA20B6247-002	Anonymous	conductivity	----	E100	2.0	µS/cm	658	658	0.00%	10%	----
<b>Physical Tests (QC Lot: 92815)</b>											
VA20B6247-002	Anonymous	pH	----	E108	0.10	pH units	7.98	7.99	0.125%	4%	----
<b>Physical Tests (QC Lot: 93187)</b>											
WR2000943-001	Anonymous	pH	----	E108	0.10	pH units	6.81	6.68	1.93%	4%	----
<b>Physical Tests (QC Lot: 93188)</b>											
WR2000943-001	Anonymous	conductivity	----	E100	2.0	µS/cm	2250	2320	3.06%	10%	----
<b>Anions and Nutrients (QC Lot: 92788)</b>											
VA20B6247-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0571	0.0630	9.80%	20%	----
<b>Anions and Nutrients (QC Lot: 92789)</b>											
VA20B6247-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 93129)</b>											
VA20B6351-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	2.95	2.95	0.277%	20%	----
<b>Anions and Nutrients (QC Lot: 93133)</b>											
VA20B6351-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.189	0.188	0.176%	20%	----
<b>Bacteriological Tests (QC Lot: 92347)</b>											
VA20B6358-001	UEL-001	coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	340	310	9.23%	65%	----
<b>Bacteriological Tests (QC Lot: 92348)</b>											
VA20B6358-001	UEL-001	coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	390	370	5.26%	65%	----
<b>Total Metals (QC Lot: 93257)</b>											
VA20B6358-001	UEL-001	chromium, total	7440-47-3	E420.Cr-L	0.100	mg/L	0.99 µg/L	0.00098	0.00001	Diff <2x LOR	----
<b>Total Metals (QC Lot: 93258)</b>											
VA20B6358-001	UEL-001	aluminum, total	7429-90-5	E420	3.00	mg/L	478 µg/L	0.481	0.742%	20%	----
		antimony, total	7440-36-0	E420	0.100	mg/L	0.46 µg/L	0.00046	0.000002	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.100	mg/L	1.13 µg/L	0.00117	3.52%	20%	----
		barium, total	7440-39-3	E420	0.100	mg/L	19.2 µg/L	0.0194	0.891%	20%	----
		beryllium, total	7440-41-7	E420	0.100	mg/L	<0.100 µg/L	<0.000100	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.0500	mg/L	<0.050 µg/L	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	10.0	mg/L	12 µg/L	0.012	0.0003	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.00500	mg/L	0.0452 µg/L	0.0000453	0.0000001	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	50.0	mg/L	11000 µg/L	11.0	0.248%	20%	----





Sub-Matrix: **Water** *Laboratory Duplicate (DUP) Report*

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 93258) - continued</b>											
VA20B6358-001	UEL-001	cesium, total	7440-46-2	E420	0.0100	mg/L	0.014 µg/L	0.000013	0.0000005	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.100	mg/L	0.31 µg/L	0.00031	0.000005	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.500	mg/L	9.00 µg/L	0.00913	1.41%	20%	----
		iron, total	7439-89-6	E420	10.0	mg/L	545 µg/L	0.539	1.07%	20%	----
		lead, total	7439-92-1	E420	0.0500	mg/L	0.992 µg/L	0.000988	0.352%	20%	----
		lithium, total	7439-93-2	E420	1.00	mg/L	<1.0 µg/L	<0.0010	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	5.00	mg/L	2500 µg/L	2.46	1.36%	20%	----
		manganese, total	7439-96-5	E420	0.100	mg/L	22.6 µg/L	0.0225	0.297%	20%	----
		molybdenum, total	7439-98-7	E420	0.0500	mg/L	0.295 µg/L	0.000314	0.000018	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.500	mg/L	2.28 µg/L	0.00231	0.00002	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	50.0	mg/L	95 µg/L	0.082	0.012	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	50.0	mg/L	3450 µg/L	3.51	1.87%	20%	----
		rubidium, total	7440-17-7	E420	0.200	mg/L	1.73 µg/L	0.00177	0.00004	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.0500	mg/L	0.095 µg/L	0.000072	0.000022	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	100	mg/L	6130 µg/L	6.03	1.65%	20%	----
		silver, total	7440-22-4	E420	0.0100	mg/L	0.022 µg/L	0.000019	0.000003	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	50.0	mg/L	8160 µg/L	8.01	1.85%	20%	----
		strontium, total	7440-24-6	E420	0.200	mg/L	73.1 µg/L	0.0722	1.22%	20%	----
		sulfur, total	7704-34-9	E420	500	mg/L	4010 µg/L	4.20	0.18	Diff <2x LOR	----
		tellurium, total	13494-80-9	E420	0.200	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.300	mg/L	13.0 µg/L	0.0123	5.85%	20%	----
		tungsten, total	7440-33-7	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.0100	mg/L	0.100 µg/L	0.000099	0.000002	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.500	mg/L	2.76 µg/L	0.00281	0.00004	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	3.00	mg/L	13.2 µg/L	0.0134	0.0002	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.200	mg/L	0.23 µg/L	0.00022	0.00002	Diff <2x LOR	----
<b>Total Metals (QC Lot: 95955)</b>											
VA20B6349-003	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

### Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 92814)</b>						
conductivity	----	E100	1	µS/cm	<1.0	----
<b>Physical Tests (QCLot: 93188)</b>						
conductivity	----	E100	1	µS/cm	<1.0	----
<b>Anions and Nutrients (QCLot: 92788)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 92789)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 93129)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 93133)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Bacteriological Tests (QCLot: 92347)</b>						
coliforms, Escherichia coli [E. coli]	---	E012.EC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 92348)</b>						
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----
<b>Total Metals (QCLot: 93257)</b>						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
<b>Total Metals (QCLot: 93258)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 93258) - continued</b>						
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 95955)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 92814)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.8	90.0	110	----
<b>Physical Tests (QCLot: 92815)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 93187)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 93188)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 92788)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 92789)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.6	90.0	110	----
<b>Anions and Nutrients (QCLot: 93129)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	100	90.0	110	----
<b>Anions and Nutrients (QCLot: 93133)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	98.7	90.0	110	----
<b>Total Metals (QCLot: 93257)</b>									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
<b>Total Metals (QCLot: 93258)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	102	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	105	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	101	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	98.5	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	106	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	97.0	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	102	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	102	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	111	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	109	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	98.6	80.0	120	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 93258) - continued</b>									
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	104	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	104	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	100	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	108	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	100	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	104	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	107	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	106	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	106	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	99.4	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	100	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	96.2	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	96.9	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	99.9	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	99.8	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	98.4	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	98.0	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	102	80.0	120	----
<b>Total Metals (QCLot: 95955)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	96.3	80.0	120	----



### Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level  $\geq 1 \times$  spike level.

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	Target	MS	Low	High	
<b>Anions and Nutrients (QCLot: 92788)</b>										
VA20B6384-009	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.40 mg/L	2.5 mg/L	96.0	75.0	125	----
<b>Anions and Nutrients (QCLot: 92789)</b>										
VA20B6268-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	4.98 mg/L	5 mg/L	99.6	75.0	125	----
<b>Anions and Nutrients (QCLot: 93129)</b>										
VA20B6384-006	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.59 mg/L	2.5 mg/L	103	75.0	125	----
<b>Anions and Nutrients (QCLot: 93133)</b>										
VA20B6384-006	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.492 mg/L	0.5 mg/L	98.3	75.0	125	----
<b>Total Metals (QCLot: 93257)</b>										
VA20B6358-002	UEL-002	chromium, total	7440-47-3	E420.Cr-L	0.0413 mg/L	0.04 mg/L	103	70.0	130	----
<b>Total Metals (QCLot: 93258)</b>										
VA20B6358-002	UEL-002	aluminum, total	7429-90-5	E420	ND mg/L	0.2 mg/L	ND	70.0	130	----
		antimony, total	7440-36-0	E420	0.0211 mg/L	0.02 mg/L	106	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0199 mg/L	0.02 mg/L	99.3	70.0	130	----
		barium, total	7440-39-3	E420	0.0190 mg/L	0.02 mg/L	95.1	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0420 mg/L	0.04 mg/L	105	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0103 mg/L	0.01 mg/L	103	70.0	130	----
		boron, total	7440-42-8	E420	0.100 mg/L	0.1 mg/L	100	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00399 mg/L	0.004 mg/L	99.7	70.0	130	----
		calcium, total	7440-70-2	E420	4.13 mg/L	4 mg/L	103	70.0	130	----
		cesium, total	7440-46-2	E420	0.0114 mg/L	0.01 mg/L	114	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0209 mg/L	0.02 mg/L	104	70.0	130	----
		copper, total	7440-50-8	E420	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		iron, total	7439-89-6	E420	2.04 mg/L	2 mg/L	102	70.0	130	----
		lead, total	7439-92-1	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		lithium, total	7439-93-2	E420	0.104 mg/L	0.1 mg/L	104	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0213 mg/L	0.02 mg/L	107	70.0	130	----
		nickel, total	7440-02-0	E420	0.0416 mg/L	0.04 mg/L	104	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.49 mg/L	10 mg/L	94.9	70.0	130	----



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
<b>Total Metals (QCLot: 93258) - continued</b>										
VA20B6358-002	UEL-002	potassium, total	7440-09-7	E420	4.28 mg/L	4 mg/L	107	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		selenium, total	7782-49-2	E420	0.0406 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, total	7440-21-3	E420	9.55 mg/L	10 mg/L	95.5	70.0	130	----
		silver, total	7440-22-4	E420	0.00434 mg/L	0.004 mg/L	109	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	20.7 mg/L	20 mg/L	103	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		thallium, total	7440-28-0	E420	0.00404 mg/L	0.004 mg/L	101	70.0	130	----
		thorium, total	7440-29-1	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		tin, total	7440-31-5	E420	0.0200 mg/L	0.02 mg/L	99.9	70.0	130	----
		titanium, total	7440-32-6	E420	0.0415 mg/L	0.04 mg/L	104	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0199 mg/L	0.02 mg/L	99.4	70.0	130	----
		uranium, total	7440-61-1	E420	0.00486 mg/L	0.004 mg/L	122	70.0	130	----
		vanadium, total	7440-62-2	E420	0.103 mg/L	0.1 mg/L	103	70.0	130	----
		zinc, total	7440-66-6	E420	0.392 mg/L	0.4 mg/L	97.9	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0420 mg/L	0.04 mg/L	105	70.0	130	----
<b>Total Metals (QCLot: 95955)</b>										
VA20B6351-001	Anonymous	mercury, total	7439-97-6	E508	0.0000931 mg/L	0.0001 mg/L	93.1	70.0	130	----



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Chain of Custody (COC) / Analytical Request Form

Affix ALS barcode label here (lab use only)

Canada Toll Free: 1 800 668 9878

COC Number: 17 - 858414

Page of

Contact and company name below will appear on the final report

Report Format / Distribution

Select Service Level Below - Contact your AM to confirm all EAP TATs (surcharges may apply)

Company: **AECOM**  
 Contact: **Nadia Baker**  
 Phone: **604 247 8242**  
 Company address below will appear on the final report  
 Street: **3292 Production Way**  
 City/Province: **Burnaby BC**  
 Postal Code: **V5A 4R4**  
 Invoice To:  YES  NO  
 Copy of Invoice with Report:  YES  NO  
 Company: **AECOM Canada**  
 Contact: **Bruce Ford**  
 Project Information  
 ALS Account # / Quote #: **60639142-301**  
 Job #: **VA20-AEC 0100-004**  
 PO / A/E:  
 Location:  
 Select Report Format:  PDF  EXCEL  EDD (DIGITAL)  
 Quality Control (QC) Report with Report:  YES  NO  
 Complete Results to Criteria on Report - provide details below if box checked  
 Select Distribution:  EMAIL  MAIL  FAX  
 Email 1 or Fax: **Nadia Baker - @aecom.com**  
 Email 2: **Bruce Ford @aecom.com**  
 Email 3:  
 Invoice Distribution:  EMAIL  MAIL  FAX  
 Select Invoice Distribution:  EMAIL  MAIL  FAX  
 Email 1 or Fax: **CAUS-FC-E-billing@**  
 Email 2: **bruce.ford@aecom.com**  
 Email 3:  
 A/E/Cost Center:  
 Major/Minor Codes:  
 Routing Code:  
 Priority (Business Days):  
 Regular (R)  Standard TAT if received by 3 pm - business days - no surcharges apply  
 4 day (P4-20%)   
 3 day (P3-25%)   
 2 day (P2-50%)   
 EMERGENCY   
 Date and Time Required for all EAP TATs: dd-mm-yy hh:mm  
 Same Day, Weekend or Statutory holiday (E2 -200% (Laboratory opening fees may apply))  
 For use that can not be performed according to the service level selected, you will be contacted.  
 Analysis Request

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sampler	Sample Type	NUMBER OF CONTAINERS	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (FP) below	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
UEL-001	Environmental Division Vancouver Work Order Reference VA20B6358	09/20	10:15	M Hepner	Water	5	Total metals + Hg		
UEL-002		"	11:00			5	Conductivity		
UEL-003		"	11:30			5	pH		
UEL-004		"	12:45			5	Nitrite		
UEL-005		"	9:30			5	Nitrate		
						5	Nitrate + Nitrite (As)		
						5	Fecal Coliforms		
						5	E coli		

ALS Lab Work Order # (lab use only):  
 Drinking Water (DW) Samples (client use)  
 Are samples taken from a Regulated DW System?  
 YES  NO  
 Are samples for human consumption/ use?  
 YES  NO  
 Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)  
 Telephone: +1 604 253 4188  
 Barcode  
 SHIPMENT RELEASE (client use)  
 Date: **SEP 24 2026** Time: **2:30**  
 Received by: **Marsa Hepner**  
 INITIAL SHIPMENT RECEPTION (lab use only)  
 Date: **SEP 25** Time: **3:46**  
 Received by: **Marsa Hepner**  
 FINAL SHIPMENT RECEPTION (lab use only)  
 Date: **SEP 25** Time: **3:46**  
 Received by: **Marsa Hepner**  
 SAMPLE CONDITION AS RECEIVED (lab use only)  
 Frozen  SIF Observations Yes  No   
 Ice Packs  Ice Cluses  Custody seal intact Yes  No   
 Cooling Initiated   
 INITIAL COOLER TEMPERATURES °C: **20**  
 FINAL COOLER TEMPERATURES °C: **20**

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.  
 REFER TO BACK PAGE FOR ALLOCATIONS AND SAMPLING INFORMATION  
 WHITE - LABORATORY COPY YELLOW - CLIENT COPY  
 JUNE 2016 PRINT





# BC and YUKON Drinking Water Declaration Form

In British Columbia, the Drinking Water Protection Act requires laboratories to immediately report positive results for Fecal Coliform and Escherichia coli in drinking water samples directly to the Water Supplier, the Drinking Water Officer, and the Medical Health Officer in the region the water samples were taken. Immediate reporting is not required if the sample is water for which a public advisory to boil for drinking water has been issued, or if the sample is not a drinking water.

In Yukon Territories, the Public Health and Safety Act requires the laboratory to immediately report any results that exceeds the acceptable concentration for any health-related parameter set out in the Guidelines for Canadian Drinking Water Quality to Environmental Health Services.

Water Suppliers are required by the Act to ensure the laboratory conducting the testing is aware of the applicable standards.

**Please submit this completed form and an ALS Chain of Custody with your sample.**

1. Are your samples currently used for human consumption in BC or the Yukon?

YES  NO

If you selected YES, proceed to #2. If you selected NO, proceed to #5.

2. Are your samples from a water supply system that either:  
a) serves more than 1 single family residence in BC, or

YES  NO

b) serves more than 15 connections, or is trucked to more than 5 sites in the Yukon Territory

YES  NO

If you selected YES to either a) or b), proceed to #3. If you selected NO, proceed to #5.

3. Is your water supply under a boil water advisory?

YES  NO

If you selected NO, proceed to #4. If you selected YES, proceed to #5.

4. Please indicate (✓) which Health Authority Region your samples were collected in, and provide the contact details for the applicable Drinking Water and Medical Health Officers:

- Northern
- Interior
- Vancouver Island
- Vancouver Coastal
- Fraser
- Yukon

Water Supplier Name	Phone & Email
Drinking Water Officer:	Phone:
Medical Health Officer:	Phone:

5. Name of Sampler: Marissa Heppner

Released by (signature): [Signature]

Phone: 604 353 2974

Date: Sept 24 2020

ALS Vancouver can receive samples Monday to Friday (24 hours) and Saturday and Sunday (8:00am to 4:00pm). Please contact ALS for testing limitations around statutory holidays.



**CERTIFICATE OF ANALYSIS**

**Work Order** : **VA20B6781**  
**Client** : **AECOM Canada Ltd.**  
**Contact** : Nadia Baker  
**Address** : 3292 Production Way  
 Burnaby BC Canada V5A 4R4  
**Telephone** : ----  
**Project** : 60639142-301  
**PO** : ----  
**C-O-C number** : 17-858551  
**Sampler** : M. Heppner  
**Site** : ----  
**Quote number** : VA20-AECO100-0004  
**No. of samples received** : 6  
**No. of samples analysed** : 6

**Page** : 1 of 6  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Dean Watt  
**Address** : 8081 Lougheed Highway  
 Burnaby BC Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 30-Sep-2020 13:25  
**Date Analysis Commenced** : 30-Sep-2020  
**Issue Date** : 14-Oct-2020 17:08

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

**Signatories**

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Caitlin Macey	Team Leader - Inorganics	Microbiology, Burnaby, British Columbia
Erick Magalhaes	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior 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.

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
MBER	<i>Estimated Result (Microbiological test). Colony count outside ideal range. Result calculated from most nearly acceptable value.</i>



## Analytical Results

Sub-Matrix: Water					Client sample ID	UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
(Matrix: Water)					Client sampling date / time	30-Sep-2020 09:15	30-Sep-2020 10:15	30-Sep-2020 10:30	30-Sep-2020 11:00	30-Sep-2020 12:00
Analyte	CAS Number	Method	LOR	Unit	VA20B6781-001	VA20B6781-002	VA20B6781-003	VA20B6781-004	VA20B6781-005	
					Result	Result	Result	Result	Result	
<b>Physical Tests</b>										
conductivity	----	E100	2.0	µS/cm	200	67.7	175	184	185	
hardness (as CaCO3), from total Ca/Mg	----	EC100A	600	µg/L	68100	20000	54800	67300	61300	
pH	----	E108	0.10	pH units	7.86	7.42	7.92	7.38	7.78	
<b>Anions and Nutrients</b>										
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	1.36	0.556	1.02	0.0594	0.470	
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	1.36	0.556	1.03	0.0708	0.476	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0.0019	0.0114	0.0058	
<b>Bacteriological Tests</b>										
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	18 <sup>MBER</sup>	10 <sup>MBER</sup>	58	50	34 <sup>MBER</sup>	
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	24 <sup>MBER</sup>	22 <sup>MBER</sup>	84	52	54	
<b>Total Metals</b>										
aluminum, total	7429-90-5	E420	3.0	µg/L	52.4	74.3	33.4	105	58.2	
antimony, total	7440-36-0	E420	0.10	µg/L	0.16	0.10	0.19	0.11	0.15	
arsenic, total	7440-38-2	E420	0.10	µg/L	0.56	0.24	1.06	0.54	0.40	
barium, total	7440-39-3	E420	0.10	µg/L	15.4	16.2	11.1	35.2	25.2	
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100	
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	
boron, total	7440-42-8	E420	10	µg/L	12	<10	17	13	15	
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0104	0.0084	0.0102	0.0084	0.0078	
calcium, total	7440-70-2	E420	50	µg/L	16700	5070	15200	19700	18200	
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	<0.010	<0.010	0.016	0.013	
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	0.30	0.43	0.31	0.28	0.26	
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	0.16	<0.10	0.63	0.16	
copper, total	7440-50-8	E420	0.50	µg/L	1.62	1.48	2.87	1.73	1.93	
iron, total	7439-89-6	E420	10	µg/L	180	309	159	5300	1500	
lead, total	7439-92-1	E420	0.050	µg/L	0.090	0.102	0.078	0.307	0.158	
lithium, total	7439-93-2	E420	1.0	µg/L	1.4	<1.0	<1.0	<1.0	<1.0	
magnesium, total	7439-95-4	E420	5.0	µg/L	6380	1790	4100	4410	3830	
manganese, total	7439-96-5	E420	0.10	µg/L	13.0	25.0	7.00	687	117	
mercury, total	7439-97-6	E508	0.0050	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	



## Analytical Results

Sub-Matrix: Water					Client sample ID	UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
(Matrix: Water)										
Client sampling date / time					30-Sep-2020 09:15	30-Sep-2020 10:15	30-Sep-2020 10:30	30-Sep-2020 11:00	30-Sep-2020 12:00	
Analyte	CAS Number	Method	LOR	Unit	VA20B6781-001	VA20B6781-002	VA20B6781-003	VA20B6781-004	VA20B6781-005	
					Result	Result	Result	Result	Result	Result
<b>Total Metals</b>										
molybdenum, total	7439-98-7	E420	0.050	µg/L	0.303	0.216	0.406	0.194	0.157	
nickel, total	7440-02-0	E420	0.50	µg/L	<0.50	0.55	<0.50	0.80	0.53	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	<50	<50	<50	<50	
potassium, total	7440-09-7	E420	50	µg/L	3480	1670	2820	3030	2780	
rubidium, total	7440-17-7	E420	0.20	µg/L	1.12	1.72	1.60	2.65	2.54	
selenium, total	7782-49-2	E420	0.050	µg/L	0.063	<0.050	0.073	0.088	0.075	
silicon, total	7440-21-3	E420	100	µg/L	17300	16100	15600	5720	4620	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
sodium, total	17341-25-2	E420	50	µg/L	11000	5100	10900	7690	13000	
strontium, total	7440-24-6	E420	0.20	µg/L	132	57.4	106	159	136	
sulfur, total	7704-34-9	E420	500	µg/L	6290	1070	3080	2360	2000	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
titanium, total	7440-32-6	E420	0.30	µg/L	1.19	2.29	0.96	2.88	1.76	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
uranium, total	7440-61-1	E420	0.010	µg/L	0.227	0.010	0.053	0.015	0.014	
vanadium, total	7440-62-2	E420	0.50	µg/L	3.44	2.11	1.53	0.70	0.58	
zinc, total	7440-66-6	E420	3.0	µg/L	3.2	<3.0	4.3	<3.0	3.5	
zirconium, total	7440-67-7	E420	0.20	µg/L	<0.20	0.22	<0.20	<0.20	<0.20	

Please refer to the General Comments section for an explanation of any qualifiers detected.



## Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					Blank	----	----	----	----
					30-Sep-2020 09:15	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20B6781-006	-----	-----	-----	-----
					Result	---	---	---	---
<b>Physical Tests</b>									
conductivity	----	E100	2.0	µS/cm	<2.0	----	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	600	µg/L	<600	----	----	----	----
pH	----	E108	0.10	pH units	5.79	----	----	----	----
<b>Anions and Nutrients</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	<0.0051	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	----	----	----	----
<b>Bacteriological Tests</b>									
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----	----	----	----
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----	----	----	----
<b>Total Metals</b>									
aluminum, total	7429-90-5	E420	3.0	µg/L	<3.0	----	----	----	----
antimony, total	7440-36-0	E420	0.10	µg/L	<0.10	----	----	----	----
arsenic, total	7440-38-2	E420	0.10	µg/L	<0.10	----	----	----	----
barium, total	7440-39-3	E420	0.10	µg/L	<0.10	----	----	----	----
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	----	----	----	----
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	----	----	----	----
boron, total	7440-42-8	E420	10	µg/L	<10	----	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L	<0.0050	----	----	----	----
calcium, total	7440-70-2	E420	50	µg/L	<50	----	----	----	----
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	<0.10	----	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	----	----	----	----
copper, total	7440-50-8	E420	0.50	µg/L	<0.50	----	----	----	----
iron, total	7439-89-6	E420	10	µg/L	<10	----	----	----	----
lead, total	7439-92-1	E420	0.050	µg/L	<0.050	----	----	----	----
lithium, total	7439-93-2	E420	1.0	µg/L	<1.0	----	----	----	----
magnesium, total	7439-95-4	E420	5.0	µg/L	<5.0	----	----	----	----
manganese, total	7439-96-5	E420	0.10	µg/L	<0.10	----	----	----	----
mercury, total	7439-97-6	E508	0.0050	µg/L	<0.0050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.050	µg/L	<0.050	----	----	----	----



## Analytical Results

Sub-Matrix: Water					Client sample ID	Blank	----	----	----	----
(Matrix: Water)					Client sampling date / time	30-Sep-2020 09:15	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20B6781-006	-----	-----	-----	-----	
					Result	---	---	---	---	
<b>Total Metals</b>										
nickel, total	7440-02-0	E420	0.50	µg/L	<0.50	----	----	----	----	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	----	----	----	----	
potassium, total	7440-09-7	E420	50	µg/L	<50	----	----	----	----	
rubidium, total	7440-17-7	E420	0.20	µg/L	<0.20	----	----	----	----	
selenium, total	7782-49-2	E420	0.050	µg/L	<0.050	----	----	----	----	
silicon, total	7440-21-3	E420	100	µg/L	<100	----	----	----	----	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	----	----	----	----	
sodium, total	17341-25-2	E420	50	µg/L	<50	----	----	----	----	
strontium, total	7440-24-6	E420	0.20	µg/L	<0.20	----	----	----	----	
sulfur, total	7704-34-9	E420	500	µg/L	<500	----	----	----	----	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	----	----	----	----	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	----	----	----	----	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	----	----	----	----	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	----	----	----	----	
titanium, total	7440-32-6	E420	0.30	µg/L	<0.30	----	----	----	----	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	----	----	----	----	
uranium, total	7440-61-1	E420	0.010	µg/L	<0.010	----	----	----	----	
vanadium, total	7440-62-2	E420	0.50	µg/L	<0.50	----	----	----	----	
zinc, total	7440-66-6	E420	3.0	µg/L	<3.0	----	----	----	----	
zirconium, total	7440-67-7	E420	0.20	µg/L	<0.20	----	----	----	----	

Please refer to the General Comments section for an explanation of any qualifiers detected.

## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA20B6781</b>	Page	: 1 of 12
Client	: <b>AECOM Canada Ltd.</b>	Laboratory	: Vancouver - Environmental
Contact	: Nadia Baker	Account Manager	: Dean Watt
Address	: 3292 Production Way Burnaby BC Canada V5A 4R4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 60639142-301	Date Samples Received	: 30-Sep-2020 13:25
PO	: ----	Issue Date	: 14-Oct-2020 17:09
C-O-C number	: 17-858551		
Sampler	: M. Heppner		
Site	: ----		
Quote number	: VA20-AECO100-0004		
No. of samples received	: 6		
No. of samples analysed	: 6		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

## Summary of Outliers

### **Outliers : Quality Control Samples**

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

### **Outliers : Frequency of Quality Control Samples**

- No Quality Control Sample Frequency Outliers occur.



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## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE Blank	E235.NO3-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE UEL-001	E235.NO3-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE UEL-002	E235.NO3-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE UEL-003	E235.NO3-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE UEL-004	E235.NO3-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE UEL-005	E235.NO3-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✓	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE Blank	E235.NO2-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-001	E235.NO2-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-002	E235.NO2-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-003	E235.NO2-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-004	E235.NO2-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-005	E235.NO2-L	30-Sep-2020	----	----	----		03-Oct-2020	3 days	3 days	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.EC	30-Sep-2020	----	----	----		30-Sep-2020	48 hrs	4 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.EC	30-Sep-2020	----	----	----		30-Sep-2020	48 hrs	5 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.EC	30-Sep-2020	----	----	----		30-Sep-2020	48 hrs	6 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.EC	30-Sep-2020	----	----	----		30-Sep-2020	48 hrs	6 hrs	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> Blank	E012.EC	30-Sep-2020	----	----	----		30-Sep-2020	48 hrs	7 hrs	✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.EC	30-Sep-2020	----	----	----		30-Sep-2020	48 hrs	7 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.FC	30-Sep-2020	----	----	----		30-Sep-2020	30 hrs	4 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.FC	30-Sep-2020	----	----	----		30-Sep-2020	30 hrs	5 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.FC	30-Sep-2020	----	----	----		30-Sep-2020	30 hrs	6 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.FC	30-Sep-2020	----	----	----		30-Sep-2020	30 hrs	6 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> Blank	E012.FC	30-Sep-2020	----	----	----		30-Sep-2020	30 hrs	7 hrs	✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.FC	30-Sep-2020	----	----	----		30-Sep-2020	30 hrs	7 hrs	✓
<b>Physical Tests : Conductivity in Water</b>										
<b>HDPE</b> Blank	E100	30-Sep-2020	----	----	----		03-Oct-2020	28 days	3 days	✓



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-001	E100	30-Sep-2020	----	----	----		03-Oct-2020	28 days	3 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-002	E100	30-Sep-2020	----	----	----		03-Oct-2020	28 days	3 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-003	E100	30-Sep-2020	----	----	----		03-Oct-2020	28 days	3 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-004	E100	30-Sep-2020	----	----	----		03-Oct-2020	28 days	3 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-005	E100	30-Sep-2020	----	----	----		03-Oct-2020	28 days	3 days	✓
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-005	E108	30-Sep-2020	----	----	----		03-Oct-2020	0.25 hrs	74 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-004	E108	30-Sep-2020	----	----	----		03-Oct-2020	0.25 hrs	75 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-002	E108	30-Sep-2020	----	----	----		03-Oct-2020	0.25 hrs	76 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-003	E108	30-Sep-2020	----	----	----		03-Oct-2020	0.25 hrs	76 hrs	* EHTR-FM



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Physical Tests : pH by Meter</b>										
HDPE Blank	E108	30-Sep-2020	----	----	----		03-Oct-2020	0.25 hrs	77 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-001	E108	30-Sep-2020	----	----	----		03-Oct-2020	0.25 hrs	77 hrs	* EHTR-FM
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE - total (lab preserved) Blank	E420.Cr-L	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE - total (lab preserved) UEL-001	E420.Cr-L	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE - total (lab preserved) UEL-002	E420.Cr-L	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE - total (lab preserved) UEL-003	E420.Cr-L	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE - total (lab preserved) UEL-004	E420.Cr-L	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE - total (lab preserved) UEL-005	E420.Cr-L	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✓
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
Glass vial total (hydrochloric acid) Blank	E508	30-Sep-2020	----	----	----		06-Oct-2020	28 days	5 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-001	E508	30-Sep-2020	----	----	----		06-Oct-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-002	E508	30-Sep-2020	----	----	----		06-Oct-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-003	E508	30-Sep-2020	----	----	----		06-Oct-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-004	E508	30-Sep-2020	----	----	----		06-Oct-2020	28 days	5 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-005	E508	30-Sep-2020	----	----	----		06-Oct-2020	28 days	5 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> Blank	E420	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-001	E420	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-002	E420	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE - total (lab preserved)</b> UEL-003	E420	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-004	E420	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE - total (lab preserved)</b> UEL-005	E420	30-Sep-2020	----	----	----		07-Oct-2020	180 days	7 days	✔

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 Rec. HT: ALS recommended hold time (see units).





## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Conductivity in Water	E100	96591	2	14	14.2	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	94970	1	6	16.6	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	96524	2	29	6.9	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	96525	2	35	5.7	5.0	✓
pH by Meter	E108	96590	2	20	10.0	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	94969	1	7	14.2	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	97502	1	11	9.0	5.0	✓
Total Mercury in Water by CVAAS	E508	97693	1	15	6.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	97503	2	20	10.0	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Conductivity in Water	E100	96591	2	14	14.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	96524	2	29	6.9	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	96525	2	35	5.7	5.0	✓
pH by Meter	E108	96590	2	20	10.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	97502	1	11	9.0	5.0	✓
Total Mercury in Water by CVAAS	E508	97693	1	15	6.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	97503	1	20	5.0	5.0	✓
<b>Method Blanks (MB)</b>							
Conductivity in Water	E100	96591	2	14	14.2	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	94970	1	6	16.6	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	96524	2	29	6.9	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	96525	2	35	5.7	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	94969	1	7	14.2	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	97502	1	11	9.0	5.0	✓
Total Mercury in Water by CVAAS	E508	97693	1	15	6.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	97503	2	20	10.0	5.0	✓
<b>Matrix Spikes (MS)</b>							
Nitrate in Water by IC (Low Level)	E235.NO3-L	96524	2	29	6.9	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	96525	2	35	5.7	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	97502	1	11	9.0	5.0	✓
Total Mercury in Water by CVAAS	E508	97693	1	15	6.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	97503	2	20	10.0	5.0	✓



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-NA-MUG)	E012.EC  Vancouver - Environmental	Water	APHA 9222I (mod)	Positive Total or Thermotolerant Coliform filters are transferred to NA-MUG and incubated at 35.0 ±0.5°C for 4 hours. Colonies exhibiting fluorescence are enumerated.
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC  Vancouver - Environmental	Water	APHA 9222 D (mod)	Following filtration (0.45 µm), and incubation at 45.5 ±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
Conductivity in Water	E100  Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108  Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Nitrite in Water by IC (Low Level)	E235.NO2-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS



<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N  Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

## QUALITY CONTROL REPORT

**Work Order** : **VA20B6781**

**Page** : 1 of 10

**Client** : AECOM Canada Ltd.  
**Contact** : Nadia Baker  
**Address** : 3292 Production Way  
 Burnaby BC Canada V5A 4R4  
**Telephone** : ----  
**Project** : 60639142-301  
**PO** : ----  
**C-O-C number** : 17-858551  
**Sampler** : M. Heppner  
**Site** : ----  
**Quote number** : VA20-AECO100-0004  
**No. of samples received** : 6  
**No. of samples analysed** : 6

**Laboratory** : Vancouver - Environmental  
**Account Manager** : Dean Watt  
**Address** : 8081 Lougheed Highway  
 Burnaby, British Columbia Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 30-Sep-2020 13:25  
**Date Analysis Commenced** : 30-Sep-2020  
**Issue Date** : 14-Oct-2020 17:09

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Caitlin Macey	Team Leader - Inorganics	Microbiology, Burnaby, British Columbia
Erick Magalhaes	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

Page : 2 of 10  
Work Order : VA20B6781  
Client : AECOM Canada Ltd.  
Project : 60639142-301

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## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.



### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 96590)</b>											
VA20B6781-001	UEL-001	pH	----	E108	0.10	pH units	7.86	7.87	0.127%	4%	----
<b>Physical Tests (QC Lot: 96591)</b>											
VA20B6781-001	UEL-001	conductivity	----	E100	2.0	µS/cm	200	200	0.200%	10%	----
<b>Physical Tests (QC Lot: 96635)</b>											
VA20B6781-002	UEL-002	conductivity	----	E100	2.0	µS/cm	67.7	67.6	0.148%	10%	----
<b>Physical Tests (QC Lot: 96636)</b>											
VA20B6781-002	UEL-002	pH	----	E108	0.10	pH units	7.42	7.42	0.0404%	4%	----
<b>Anions and Nutrients (QC Lot: 96524)</b>											
VA20B6793-003	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0500	mg/L	0.0537	<0.0500	0.0037	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 96525)</b>											
VA20B6793-003	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 96614)</b>											
VA20B6793-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 96615)</b>											
VA20B6793-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0200	mg/L	<0.0200	<0.0200	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 94969)</b>											
VA20B6781-006	Blank	coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 94970)</b>											
VA20B6781-006	Blank	coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 97502)</b>											
VA20B6781-001	UEL-001	chromium, total	7440-47-3	E420.Cr-L	0.100	mg/L	0.30 µg/L	0.00030	0.000008	Diff <2x LOR	----
<b>Total Metals (QC Lot: 97503)</b>											
VA20B6781-001	UEL-001	titanium, total	7440-32-6	E420	0.300	mg/L	1.19 µg/L	0.00122	0.00004	Diff <2x LOR	----
VA20B6781-001	UEL-001	aluminum, total	7429-90-5	E420	3.00	mg/L	52.4 µg/L	0.0524	0.124%	20%	----
		antimony, total	7440-36-0	E420	0.100	mg/L	0.16 µg/L	0.00015	0.000005	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.100	mg/L	0.56 µg/L	0.00060	0.00004	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.100	mg/L	15.4 µg/L	0.0154	0.159%	20%	----
		beryllium, total	7440-41-7	E420	0.100	mg/L	<0.100 µg/L	<0.000100	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.0500	mg/L	<0.050 µg/L	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	10.0	mg/L	12 µg/L	0.013	0.0005	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.00500	mg/L	0.0104 µg/L	0.0000086	0.0000019	Diff <2x LOR	----



Sub-Matrix: **Water** *Laboratory Duplicate (DUP) Report*

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 97503) - continued</b>											
VA20B6781-001	UEL-001	calcium, total	7440-70-2	E420	50.0	mg/L	16700 µg/L	16.7	0.0397%	20%	----
		cesium, total	7440-46-2	E420	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.500	mg/L	1.62 µg/L	0.00154	0.00008	Diff <2x LOR	----
		iron, total	7439-89-6	E420	10.0	mg/L	180 µg/L	0.184	2.40%	20%	----
		lead, total	7439-92-1	E420	0.0500	mg/L	0.090 µg/L	0.000089	0.000001	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	1.00	mg/L	1.4 µg/L	0.0014	0.000004	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	5.00	mg/L	6380 µg/L	6.67	4.34%	20%	----
		manganese, total	7439-96-5	E420	0.100	mg/L	13.0 µg/L	0.0131	1.03%	20%	----
		molybdenum, total	7439-98-7	E420	0.0500	mg/L	0.303 µg/L	0.000309	0.000006	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.500	mg/L	<0.50 µg/L	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	50.0	mg/L	<50 µg/L	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	50.0	mg/L	3480 µg/L	3.51	0.640%	20%	----
		rubidium, total	7440-17-7	E420	0.200	mg/L	1.12 µg/L	0.00106	0.00006	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.0500	mg/L	0.063 µg/L	0.000077	0.000014	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	100	mg/L	17300 µg/L	17.7	2.13%	20%	----
		silver, total	7440-22-4	E420	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	50.0	mg/L	11000 µg/L	10.7	3.08%	20%	----
		strontium, total	7440-24-6	E420	0.200	mg/L	132 µg/L	0.130	1.31%	20%	----
		sulfur, total	7704-34-9	E420	500	mg/L	6290 µg/L	6.87	8.81%	20%	----
		tellurium, total	13494-80-9	E420	0.200	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.0100	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.100	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.0100	mg/L	0.227 µg/L	0.000232	2.20%	20%	----
		vanadium, total	7440-62-2	E420	0.500	mg/L	3.44 µg/L	0.00350	0.00006	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	3.00	mg/L	3.2 µg/L	<0.0030	0.0002	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.200	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 97693)</b>											
VA20B6762-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 96591)</b>						
conductivity	----	E100	1	µS/cm	<1.0	----
<b>Physical Tests (QCLot: 96635)</b>						
conductivity	----	E100	1	µS/cm	1.0	----
<b>Anions and Nutrients (QCLot: 96524)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 96525)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 96614)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 96615)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Bacteriological Tests (QCLot: 94969)</b>						
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 94970)</b>						
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----
<b>Total Metals (QCLot: 97502)</b>						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
<b>Total Metals (QCLot: 97503)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	MBRR
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	MBRR
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----





Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 97503) - continued</b>						
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	MBRR
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	MBRR
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 97693)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----

**Qualifiers**

Qualifier	Description
MBRR	Initial MB for this submission had positive results for flagged analyte (data not shown). Low level samples were repeated with new QC (2nd MB results shown). High level results (>5x initial MB level) and non-detect results were reported and are defensible



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 96590)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 96591)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	102	90.0	110	----
<b>Physical Tests (QCLot: 96635)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.3	90.0	110	----
<b>Physical Tests (QCLot: 96636)</b>									
pH	----	E108	----	pH units	7 pH units	99.9	98.0	102	----
<b>Anions and Nutrients (QCLot: 96524)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	100	90.0	110	----
<b>Anions and Nutrients (QCLot: 96525)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	98.8	90.0	110	----
<b>Anions and Nutrients (QCLot: 96614)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 96615)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	102	90.0	110	----
<b>Total Metals (QCLot: 97502)</b>									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
<b>Total Metals (QCLot: 97503)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	99.3	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	105	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	100	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	98.8	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	98.9	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	94.4	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	98.6	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	102	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	93.9	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	101	80.0	120	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 97503) - continued</b>									
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	96.0	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	100	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	112	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	97.6	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	97.2	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	105	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	103	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	110	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	91.1	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	98.8	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	98.2	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	94.7	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	98.4	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	101	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	100	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	94.8	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	101	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	99.6	80.0	120	----
<b>Total Metals (QCLot: 97693)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	96.1	80.0	120	----



### Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level  $\geq 1 \times$  spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 96524)</b>										
VA20B6793-004	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	23.7 mg/L	25 mg/L	94.9	75.0	125	----
<b>Anions and Nutrients (QCLot: 96525)</b>										
VA20B6793-004	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	4.72 mg/L	5 mg/L	94.3	75.0	125	----
<b>Anions and Nutrients (QCLot: 96614)</b>										
VA20B6793-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	24.4 mg/L	25 mg/L	97.6	75.0	125	----
<b>Anions and Nutrients (QCLot: 96615)</b>										
VA20B6793-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	4.83 mg/L	5 mg/L	96.6	75.0	125	----
<b>Total Metals (QCLot: 97502)</b>										
VA20B6781-002	UEL-002	chromium, total	7440-47-3	E420.Cr-L	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
<b>Total Metals (QCLot: 97503)</b>										
VA20B6781-002	UEL-002	titanium, total	7440-32-6	E420	0.0386 mg/L	0.04 mg/L	96.6	70.0	130	----
VA20B6781-002	UEL-002	aluminum, total	7429-90-5	E420	0.191 mg/L	0.2 mg/L	95.6	70.0	130	----
		antimony, total	7440-36-0	E420	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0197 mg/L	0.02 mg/L	98.7	70.0	130	----
		barium, total	7440-39-3	E420	0.0209 mg/L	0.02 mg/L	105	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0387 mg/L	0.04 mg/L	96.8	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0101 mg/L	0.01 mg/L	101	70.0	130	----
		boron, total	7440-42-8	E420	0.088 mg/L	0.1 mg/L	87.9	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00403 mg/L	0.004 mg/L	101	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.0107 mg/L	0.01 mg/L	107	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		copper, total	7440-50-8	E420	0.0200 mg/L	0.02 mg/L	99.9	70.0	130	----
		iron, total	7439-89-6	E420	2.01 mg/L	2 mg/L	101	70.0	130	----
		lead, total	7439-92-1	E420	0.0196 mg/L	0.02 mg/L	97.8	70.0	130	----
		lithium, total	7439-93-2	E420	0.0931 mg/L	0.1 mg/L	93.1	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0201 mg/L	0.02 mg/L	101	70.0	130	----
		nickel, total	7440-02-0	E420	0.0405 mg/L	0.04 mg/L	101	70.0	130	----



Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Total Metals (QCLot: 97503) - continued</b>										
VA20B6781-002	UEL-002	phosphorus, total	7723-14-0	E420	10.3 mg/L	10 mg/L	103	70.0	130	----
		potassium, total	7440-09-7	E420	4.04 mg/L	4 mg/L	101	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		selenium, total	7782-49-2	E420	0.0392 mg/L	0.04 mg/L	98.0	70.0	130	----
		silicon, total	7440-21-3	E420	ND mg/L	10 mg/L	ND	70.0	130	----
		silver, total	7440-22-4	E420	0.00413 mg/L	0.004 mg/L	103	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	19.8 mg/L	20 mg/L	99.1	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0394 mg/L	0.04 mg/L	98.5	70.0	130	----
		thallium, total	7440-28-0	E420	0.00380 mg/L	0.004 mg/L	94.9	70.0	130	----
		thorium, total	7440-29-1	E420	0.0196 mg/L	0.02 mg/L	98.0	70.0	130	----
		tin, total	7440-31-5	E420	0.0194 mg/L	0.02 mg/L	97.2	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0196 mg/L	0.02 mg/L	97.9	70.0	130	----
		uranium, total	7440-61-1	E420	0.00372 mg/L	0.004 mg/L	93.0	70.0	130	----
		vanadium, total	7440-62-2	E420	0.103 mg/L	0.1 mg/L	103	70.0	130	----
		zinc, total	7440-66-6	E420	0.402 mg/L	0.4 mg/L	100	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0413 mg/L	0.04 mg/L	103	70.0	130	----
<b>Total Metals (QCLot: 97693)</b>										
VA20B6762-002	Anonymous	mercury, total	7439-97-6	E508	0.0000959 mg/L	0.0001 mg/L	95.9	70.0	130	----



**ALS Environmental**

www.alsglobal.com


Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - 858551

Page of

<b>Report To</b> Contact and company name below will appear on the final report Company: <b>AECOM Canada</b> Contact: <b>Nadia Baker</b> Phone: _____ Company address below will appear on the final report		<b>Report Format / Distribution</b> Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL   <input type="checkbox"/> EOD (DISTAL) <input type="checkbox"/> YES <input type="checkbox"/> NO Quality Control (QC) Report with Report <input type="checkbox"/> YES <input type="checkbox"/> NO Compare Results to Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL   <input type="checkbox"/> MAIL   <input type="checkbox"/> FAX	
Street: <b>3292 Production Way</b> City/Province: <b>Burnaby BC</b> Postal Code: <b>V5G 4R4</b>		Email 1 or Fax: <b>Nadia Baker @ aecom.com</b> Email 2: <b>bace, bond @ aecom.com</b> Email 3: _____	
Invoice To: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Same as Report To: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Copy of Invoice with Report: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<b>Invoice Distribution</b> Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: <b>CANISSC.E-billing@aecom.ca</b> Email 2: <b>bace, bond @ aecom.com</b> Oil and Gas Required Fields (client use)	
Company: <b>AECOM Canada</b> Contact: <b>Bruce Ford</b> Project Information		AFE/Cost Center: _____ PO#: _____ Major/Minor Code: _____ Routing Code: _____ Requisitioner: _____ Location: _____ ALS Contact: <b>DEAN WATT</b> <b>SASMEER SHANKAR</b>	
ALS Account # / Quote #: <b>VA 20 - AEC 0100 - 004</b> Job #: <b>60639142-301</b> PO / AFE: _____ LSD: _____ ALS Lab Work Order # (lab use only): _____			
<b>ALS Sample # (lab use only)</b> Sample Identification and/or Coordinates (This description will appear on the report) <b>VEL-001</b> <b>" - 002</b> <b>" - 003</b> <b>" - 004</b> <b>" - 005</b> <b>Blank</b>		<b>Date</b> (dd-mm-yy)   <b>Time</b> (hh:mm)   <b>Sample Type</b> <b>30/09/20</b>   <b>9:15</b>   <b>Water</b> <b>"</b>   <b>10:15</b>   <b>"</b> <b>"</b>   <b>10:30</b>   <b>"</b> <b>"</b>   <b>11:00</b>   <b>"</b> <b>"</b>   <b>12:00</b>   <b>"</b> <b>"</b>   <b>9:15</b>   <b>"</b>	
Drinking Water (DW) Samples (client use) Are samples taken from a Regulated DW System? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Are samples for human consumption use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<b>SPECIAL INSTRUCTIONS / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)</b> Telephone: +1 604 253 4188  <b>Environmental Division</b> <b>Vancouver</b> <b>Work Order Reference</b> <b>VA20B6781</b>	
<b>SHIPPING RELEASE (client use)</b> Released by: _____ Date: _____ <b>Manissa Heenan</b>   <b>Sept 30 2020</b>   <b>11:30</b>		<b>INITIAL SHIPMENT RECEPTION (lab use only)</b> Received by: _____ Date: _____ <b>em</b>   _____   _____	
<b>INITIAL SHIPMENT RECEPTION (lab use only)</b> Received by: _____ Date: _____ <b>em</b>   _____   _____		<b>FINAL SHIPMENT RECEPTION (lab use only)</b> Received by: _____ Date: _____ <b>em</b>   <b>30 Sept. 2020</b>   <b>11:25 AM</b>	
<b>NUMBER OF CONTAINERS</b> Indicate Filled (F), Preserved (P) or Filled and Preserved (FP) below Total metals <del>###</del> + Hg Conductivity PH Nitrite Nitrate Nitrate + Nitrite (AsN) Fecal Coliforms E coli		<b>SAMPLE CONDITION AS RECEIVED (lab use only)</b> Frozen <input checked="" type="checkbox"/> <input type="checkbox"/> Ice Packs <input type="checkbox"/> <input type="checkbox"/> Ice Cubes <input type="checkbox"/> <input type="checkbox"/> Cooling Initiated <input type="checkbox"/> <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/> INITIAL COOLER TEMPERATURES °C: _____ FINAL COOLER TEMPERATURES °C: <b>14.4</b>	
<b>SUSPECTED HAZARD (see Special Instructions)</b>			

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



# BC and YUKON Drinking Water Declaration Form

In British Columbia, the Drinking Water Protection Act requires laboratories to immediately report positive results for Fecal Coliform and Escherichia coli in drinking water samples directly to the Water Supplier, the Drinking Water Officer, and the Medical Health Officer in the region the water samples were taken. Immediate reporting is not required if the sample is water for which a public advisory to boil for drinking water has been issued, or if the sample is not a drinking water.

In Yukon Territories, the Public Health and Safety Act requires the laboratory to immediately report any results that exceeds the acceptable concentration for any health-related parameter set out in the Guidelines for Canadian Drinking Water Quality to Environmental Health Services.

Water Suppliers are required by the Act to ensure the laboratory conducting the testing is aware of the applicable standards.

**Please submit this completed form and an ALS Chain of Custody with your sample.**

1. Are your samples currently used for human consumption in BC or the Yukon?

YES  NO

If you selected YES, proceed to #2. If you selected NO, proceed to #5.

2. Are your samples from a water supply system that either:

a) serves more than 1 single family residence in BC, or

YES  NO

b) serves more than 15 connections, or is trucked to more than 5 sites in the Yukon Territory

YES  NO

If you selected YES to either a) or b), proceed to #3. If you selected NO, proceed to #5.

3. Is your water supply under a boil water advisory?

YES  NO

If you selected NO, proceed to #4. If you selected YES, proceed to #5.

4. Please indicate (✓) which Health Authority Region your samples were collected in, and provide the contact details for the applicable Drinking Water and Medical Health Officers:

- Northern
- Interior
- Vancouver Island
- Vancouver Coastal
- Fraser
- Yukon

Water Supplier Name	Phone & Email
Drinking Water Officer:	Phone:
Medical Health Officer:	Phone:

5. Name of Sampler: Marissa Heppner

Phone: 604 703 9610

Released by (signature): [Signature]

Date: Sept 30 2020

ALS Vancouver can receive samples Monday to Friday (24 hours) and Saturday and Sunday (8:00am to 4:00pm). Please contact ALS for testing limitations around statutory holidays.



**CERTIFICATE OF ANALYSIS**

**Work Order** : **VA20C0890**  
**Client** : **AECOM Canada Ltd.**  
**Contact** : Bruce Ford  
**Address** : 3292 Production Way  
Burnaby BC Canada V5A 4R4  
**Telephone** : ----  
**Project** : 60639142-301  
**PO** : ----  
**C-O-C number** : 17-862792  
**Sampler** : Brad Stuckless, Marissa Heppner  
**Site** : ----  
**Quote number** : VA20-AECO100-0004  
**No. of samples received** : 6  
**No. of samples analysed** : 6

**Page** : 1 of 6  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Dean Watt  
**Address** : 8081 Lougheed Highway  
Burnaby BC Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 16-Nov-2020 14:30  
**Date Analysis Commenced** : 16-Nov-2020  
**Issue Date** : 23-Nov-2020 17:59

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

**Signatories**

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Microbiology, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia





## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior 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.

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
DLB	<i>Detection Limit Raised. Analyte detected at comparable level in Method Blank.</i>
MBER	<i>Estimated Result (Microbiological test). Colony count outside ideal range. Result calculated from most nearly acceptable value.</i>



## Analytical Results

Sub-Matrix: Water  
 (Matrix: Water)

Client sample ID

					UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Client sampling date / time					16-Nov-2020 10:40	16-Nov-2020 11:03	16-Nov-2020 11:19	16-Nov-2020 12:12	16-Nov-2020 12:24
Analyte	CAS Number	Method	LOR	Unit	VA20C0890-001	VA20C0890-002	VA20C0890-003	VA20C0890-004	VA20C0890-005
					Result	Result	Result	Result	Result
<b>Physical Tests</b>									
conductivity	----	E100	2.0	µS/cm	177	84.4	165	131	116
hardness (as CaCO <sub>3</sub> ), from total Ca/Mg	----	EC100A	600	µg/L	50200	16700	50300	44100	34600
pH	----	E108	0.10	pH units	7.60	6.74	7.74	6.98	7.50
<b>Anions and Nutrients</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	2.12	3.48	1.01	1.39	0.639
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	2.13	3.48	1.01	1.40	0.642
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0072	<0.0010	0.0037	0.0067	0.0027
<b>Bacteriological Tests</b>									
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	260 <sup>MBER</sup>	1	21	6	7
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	260 <sup>MBER</sup>	1	21	6	7
<b>Total Metals</b>									
aluminum, total	7429-90-5	E420	3.0	µg/L	162	141	88.9	88.7	96.6
antimony, total	7440-36-0	E420	0.10	µg/L	0.24	0.10	0.22	0.12	0.12
arsenic, total	7440-38-2	E420	0.10	µg/L	0.59	0.14	0.72	0.25	0.25
barium, total	7440-39-3	E420	0.10	µg/L	22.2	25.5	14.5	27.0	17.1
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050
boron, total	7440-42-8	E420	10	µg/L	11	<10	17	10	<10
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0195	0.0130	0.0094	0.0108	0.0069
calcium, total	7440-70-2	E420	50	µg/L	15000	4690	15700	13900	10700
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	0.31	0.15	0.31	0.18	0.20
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	<0.10	<0.10	0.23	0.15
copper, total	7440-50-8	E420	0.50	µg/L	2.42	0.96	2.78	1.27	1.47
iron, total	7439-89-6	E420	10	µg/L	184	88	348	1360	645
lead, total	7439-92-1	E420	0.050	µg/L	0.201	0.086	0.168	0.143	0.164
lithium, total	7439-93-2	E420	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
magnesium, total	7439-95-4	E420	5.0	µg/L	3110	1200	2660	2260	1920
manganese, total	7439-96-5	E420	0.10	µg/L	7.99	10.6	6.78	176	48.2
mercury, total	7439-97-6	E508	0.0050	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050



## Analytical Results

Sub-Matrix: Water					Client sample ID	UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
(Matrix: Water)										
Client sampling date / time					16-Nov-2020 10:40	16-Nov-2020 11:03	16-Nov-2020 11:19	16-Nov-2020 12:12	16-Nov-2020 12:24	
Analyte	CAS Number	Method	LOR	Unit	VA20C0890-001	VA20C0890-002	VA20C0890-003	VA20C0890-004	VA20C0890-005	
					Result	Result	Result	Result	Result	
<b>Total Metals</b>										
molybdenum, total	7439-98-7	E420	0.050	µg/L	0.362	<0.050	0.310	0.114	0.079	
nickel, total	7440-02-0	E420	0.50	µg/L	0.70	0.60	0.51	0.55	<0.50	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	<50	<50	<50	<50	
potassium, total	7440-09-7	E420	50	µg/L	2360	781	2170	1950	1740	
rubidium, total	7440-17-7	E420	0.20	µg/L	1.24	0.94	1.50	1.86	1.60	
selenium, total	7782-49-2	E420	0.050	µg/L	<0.100 <sup>DLB</sup>	<0.100 <sup>DLB</sup>	<0.150 <sup>DLB</sup>	<0.100 <sup>DLB</sup>	<0.100 <sup>DLB</sup>	
silicon, total	7440-21-3	E420	100	µg/L	8860	6730	7040	5880	4750	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
sodium, total	17341-25-2	E420	50	µg/L	11800	7250	10500	5980	8310	
strontium, total	7440-24-6	E420	0.20	µg/L	106	56.1	102	96.1	79.4	
sulfur, total	7704-34-9	E420	500	µg/L	4790	1700	3660	2760	2120	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
titanium, total	7440-32-6	E420	0.30	µg/L	2.73	1.08	2.60	1.86	2.62	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
uranium, total	7440-61-1	E420	0.010	µg/L	0.108	<0.010	0.047	<0.010	<0.010	
vanadium, total	7440-62-2	E420	0.50	µg/L	1.94	0.51	0.80	<0.50	<0.50	
zinc, total	7440-66-6	E420	3.0	µg/L	5.2	4.4	5.2	3.8	3.3	
zirconium, total	7440-67-7	E420	0.20	µg/L	0.24	<0.20	<0.20	<0.20	<0.20	

Please refer to the General Comments section for an explanation of any qualifiers detected.



## Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					Blank	----	----	----	----
					16-Nov-2020 10:40	----	---	---	----
Analyte	CAS Number	Method	LOR	Unit	VA20C0890-006	-----	-----	-----	-----
					Result	---	---	---	---
<b>Physical Tests</b>									
conductivity	----	E100	2.0	µS/cm	<2.0	----	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	600	µg/L	<600	----	----	----	----
pH	----	E108	0.10	pH units	5.47	----	----	----	----
<b>Anions and Nutrients</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	<0.0051	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0015	----	----	----	----
<b>Bacteriological Tests</b>									
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----	----	----	----
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----	----	----	----
<b>Total Metals</b>									
aluminum, total	7429-90-5	E420	3.0	µg/L	<3.0	----	----	----	----
antimony, total	7440-36-0	E420	0.10	µg/L	<0.10	----	----	----	----
arsenic, total	7440-38-2	E420	0.10	µg/L	<0.10	----	----	----	----
barium, total	7440-39-3	E420	0.10	µg/L	<0.10	----	----	----	----
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	----	----	----	----
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	----	----	----	----
boron, total	7440-42-8	E420	10	µg/L	<10	----	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L	<0.0050	----	----	----	----
calcium, total	7440-70-2	E420	50	µg/L	<50	----	----	----	----
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	<0.10	----	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	----	----	----	----
copper, total	7440-50-8	E420	0.50	µg/L	<0.50	----	----	----	----
iron, total	7439-89-6	E420	10	µg/L	<10	----	----	----	----
lead, total	7439-92-1	E420	0.050	µg/L	<0.050	----	----	----	----
lithium, total	7439-93-2	E420	1.0	µg/L	<1.0	----	----	----	----
magnesium, total	7439-95-4	E420	5.0	µg/L	<5.0	----	----	----	----
manganese, total	7439-96-5	E420	0.10	µg/L	<0.10	----	----	----	----
mercury, total	7439-97-6	E508	0.0050	µg/L	<0.0050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.050	µg/L	<0.050	----	----	----	----



## Analytical Results

Sub-Matrix: Water					Client sample ID	Blank	----	----	----	----
(Matrix: Water)					Client sampling date / time	16-Nov-2020 10:40	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20C0890-006	-----	-----	-----	-----	
					Result	---	---	---	---	
<b>Total Metals</b>										
nickel, total	7440-02-0	E420	0.50	µg/L	<0.50	----	----	----	----	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	----	----	----	----	
potassium, total	7440-09-7	E420	50	µg/L	<50	----	----	----	----	
rubidium, total	7440-17-7	E420	0.20	µg/L	<0.20	----	----	----	----	
selenium, total	7782-49-2	E420	0.050	µg/L	<0.050	----	----	----	----	
silicon, total	7440-21-3	E420	100	µg/L	<100	----	----	----	----	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	----	----	----	----	
sodium, total	17341-25-2	E420	50	µg/L	<50	----	----	----	----	
strontium, total	7440-24-6	E420	0.20	µg/L	<0.20	----	----	----	----	
sulfur, total	7704-34-9	E420	500	µg/L	<500	----	----	----	----	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	----	----	----	----	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	----	----	----	----	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	----	----	----	----	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	----	----	----	----	
titanium, total	7440-32-6	E420	0.30	µg/L	<0.30	----	----	----	----	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	----	----	----	----	
uranium, total	7440-61-1	E420	0.010	µg/L	<0.010	----	----	----	----	
vanadium, total	7440-62-2	E420	0.50	µg/L	<0.50	----	----	----	----	
zinc, total	7440-66-6	E420	3.0	µg/L	<3.0	----	----	----	----	
zirconium, total	7440-67-7	E420	0.20	µg/L	<0.20	----	----	----	----	

Please refer to the General Comments section for an explanation of any qualifiers detected.

## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA20C0890</b>	Page	: 1 of 13
Client	: <b>AECOM Canada Ltd.</b>	Laboratory	: Vancouver - Environmental
Contact	: Bruce Ford	Account Manager	: Dean Watt
Address	: 3292 Production Way Burnaby BC Canada V5A 4R4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 60639142-301	Date Samples Received	: 16-Nov-2020 14:30
PO	: ----	Issue Date	: 23-Nov-2020 17:59
C-O-C number	: 17-862792		
Sampler	: Brad Stuckless, Marissa Heppner		
Site	: ----		
Quote number	: VA20-AECO100-0004		
No. of samples received	: 6		
No. of samples analysed	: 6		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

## Summary of Outliers

### **Outliers : Quality Control Samples**

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

### **Outliers : Frequency of Quality Control Samples**

- No Quality Control Sample Frequency Outliers occur.





**Outliers : Quality Control Samples**

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
<b>Method Blank (MB) Values</b>								
Total Metals	QC-MRG2-1191020 01	----	selenium, total	7782-49-2	E420	0.000058 <sup>MB-LOR</sup> mg/L	0.00005 mg/L	Blank result exceeds permitted value

**Result Qualifiers**

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.





## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE Blank	E235.NO3-L	16-Nov-2020	----	----	----		17-Nov-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-001	E235.NO3-L	16-Nov-2020	----	----	----		17-Nov-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO3-L	16-Nov-2020	----	----	----		17-Nov-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-003	E235.NO3-L	16-Nov-2020	----	----	----		17-Nov-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-004	E235.NO3-L	16-Nov-2020	----	----	----		17-Nov-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-005	E235.NO3-L	16-Nov-2020	----	----	----		18-Nov-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE Blank	E235.NO2-L	16-Nov-2020	----	----	----		17-Nov-2020	3 days	1 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-001	E235.NO2-L	16-Nov-2020	----	----	----		17-Nov-2020	3 days	1 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-002	E235.NO2-L	16-Nov-2020	----	----	----		17-Nov-2020	3 days	1 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-003	E235.NO2-L	16-Nov-2020	----	----	----		17-Nov-2020	3 days	1 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-004	E235.NO2-L	16-Nov-2020	----	----	----		17-Nov-2020	3 days	1 days	✔	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-005	E235.NO2-L	16-Nov-2020	----	----	----		18-Nov-2020	3 days	1 days	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.EC	16-Nov-2020	----	----	----		16-Nov-2020	48 hrs	5 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.EC	16-Nov-2020	----	----	----		16-Nov-2020	48 hrs	5 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.EC	16-Nov-2020	----	----	----		16-Nov-2020	48 hrs	6 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.EC	16-Nov-2020	----	----	----		16-Nov-2020	48 hrs	6 hrs	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> Blank	E012.EC	16-Nov-2020	----	----	----		16-Nov-2020	48 hrs	7 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.EC	16-Nov-2020	----	----	----		16-Nov-2020	48 hrs	7 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.FC	16-Nov-2020	----	----	----		16-Nov-2020	30 hrs	5 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.FC	16-Nov-2020	----	----	----		16-Nov-2020	30 hrs	5 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.FC	16-Nov-2020	----	----	----		16-Nov-2020	30 hrs	6 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.FC	16-Nov-2020	----	----	----		16-Nov-2020	30 hrs	6 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> Blank	E012.FC	16-Nov-2020	----	----	----		16-Nov-2020	30 hrs	7 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.FC	16-Nov-2020	----	----	----		16-Nov-2020	30 hrs	7 hrs	✔	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> Blank	E100	16-Nov-2020	----	----	----		18-Nov-2020	28 days	1 days	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-001	E100	16-Nov-2020	----	----	----		18-Nov-2020	28 days	1 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-002	E100	16-Nov-2020	----	----	----		18-Nov-2020	28 days	1 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-003	E100	16-Nov-2020	----	----	----		18-Nov-2020	28 days	1 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-004	E100	16-Nov-2020	----	----	----		18-Nov-2020	28 days	1 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-005	E100	16-Nov-2020	----	----	----		18-Nov-2020	28 days	2 days	✓
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-004	E108	16-Nov-2020	----	----	----		18-Nov-2020	0.25 hrs	44 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-002	E108	16-Nov-2020	----	----	----		18-Nov-2020	0.25 hrs	45 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-003	E108	16-Nov-2020	----	----	----		18-Nov-2020	0.25 hrs	45 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE Blank	E108	16-Nov-2020	----	----	----		18-Nov-2020	0.25 hrs	46 hrs	* EHTR-FM



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : pH by Meter</b>											
<b>HDPE</b> UEL-001	E108	16-Nov-2020	----	----	----		18-Nov-2020	0.25 hrs	46 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
<b>HDPE</b> UEL-005	E108	16-Nov-2020	----	----	----		18-Nov-2020	0.25 hrs	50 hrs	*	EHTR-FM
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE total (nitric acid)</b> Blank	E420.Cr-L	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE total (nitric acid)</b> UEL-001	E420.Cr-L	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE total (nitric acid)</b> UEL-002	E420.Cr-L	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE total (nitric acid)</b> UEL-003	E420.Cr-L	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE total (nitric acid)</b> UEL-004	E420.Cr-L	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE total (nitric acid)</b> UEL-005	E420.Cr-L	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> Blank	E508	16-Nov-2020	----	----	----		19-Nov-2020	28 days	3 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-001	E508	16-Nov-2020	----	----	----		19-Nov-2020	28 days	3 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-002	E508	16-Nov-2020	----	----	----		19-Nov-2020	28 days	3 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-003	E508	16-Nov-2020	----	----	----		19-Nov-2020	28 days	3 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-004	E508	16-Nov-2020	----	----	----		19-Nov-2020	28 days	3 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-005	E508	16-Nov-2020	----	----	----		19-Nov-2020	28 days	3 days	✓	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> Blank	E420	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✓	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL-001	E420	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✓	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL-002	E420	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✓	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL-003	E420	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL-004	E420	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL-005	E420	16-Nov-2020	----	----	----		19-Nov-2020	180 days	2 days	✔

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Conductivity in Water	E100	118337	2	22	9.0	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	118004	1	6	16.6	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	118327	2	31	6.4	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	118328	2	31	6.4	5.0	✓
pH by Meter	E108	118336	2	35	5.7	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	118003	1	6	16.6	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	119102	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	119694	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	119103	1	20	5.0	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Conductivity in Water	E100	118337	2	22	9.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	118327	2	31	6.4	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	118328	2	31	6.4	5.0	✓
pH by Meter	E108	118336	2	35	5.7	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	119102	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	119694	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	119103	1	20	5.0	5.0	✓
<b>Method Blanks (MB)</b>							
Conductivity in Water	E100	118337	2	22	9.0	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	118004	1	6	16.6	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	118327	2	31	6.4	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	118328	2	31	6.4	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	118003	1	6	16.6	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	119102	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	119694	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	119103	1	20	5.0	5.0	✓
<b>Matrix Spikes (MS)</b>							
Nitrate in Water by IC (Low Level)	E235.NO3-L	118327	2	31	6.4	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	118328	2	31	6.4	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	119102	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	119694	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	119103	1	20	5.0	5.0	✓





## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-NA-MUG)	E012.EC  Vancouver - Environmental	Water	APHA 9222I (mod)	Positive Total or Thermotolerant Coliform filters are transferred to NA-MUG and incubated at 35.0 ±0.5°C for 4 hours. Colonies exhibiting fluorescence are enumerated.
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC  Vancouver - Environmental	Water	APHA 9222 D (mod)	Following filtration (0.45 µm), and incubation at 45.5 ±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
Conductivity in Water	E100  Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108  Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Nitrite in Water by IC (Low Level)	E235.NO2-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS



<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N  Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

## QUALITY CONTROL REPORT

<b>Work Order</b>	<b>: VA20C0890</b>	<b>Page</b>	: 1 of 10
<b>Client</b>	: AECOM Canada Ltd.	<b>Laboratory</b>	: Vancouver - Environmental
<b>Contact</b>	: Bruce Ford	<b>Account Manager</b>	: Dean Watt
<b>Address</b>	: 3292 Production Way Burnaby BC Canada V5A 4R4	<b>Address</b>	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
<b>Telephone</b>	: ----	<b>Telephone</b>	: +1 604 253 4188
<b>Project</b>	: 60639142-301	<b>Date Samples Received</b>	: 16-Nov-2020 14:30
<b>PO</b>	: ----	<b>Date Analysis Commenced</b>	: 16-Nov-2020
<b>C-O-C number</b>	: 17-862792	<b>Issue Date</b>	: 23-Nov-2020 17:59
<b>Sampler</b>	: Brad Stuckless, Marissa Heppner		
<b>Site</b>	: ----		
<b>Quote number</b>	: VA20-AECO100-0004		
<b>No. of samples received</b>	: 6		
<b>No. of samples analysed</b>	: 6		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

### *Signatories*

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Microbiology, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

Page : 2 of 10  
Work Order : VA20C0890  
Client : AECOM Canada Ltd.  
Project : 60639142-301

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## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.



### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 118336)</b>											
VA20C0918-002	Anonymous	pH	----	E108	0.10	pH units	8.14	8.13	0.123%	4%	----
<b>Physical Tests (QC Lot: 118337)</b>											
VA20C0918-002	Anonymous	conductivity	----	E100	2.0	µS/cm	307	310	0.972%	10%	----
<b>Physical Tests (QC Lot: 118615)</b>											
VA20C0853-001	Anonymous	pH	----	E108	0.10	pH units	8.37	8.37	0.0478%	4%	----
<b>Physical Tests (QC Lot: 118616)</b>											
VA20C0853-001	Anonymous	conductivity	----	E100	2.0	µS/cm	508	507	0.197%	10%	----
<b>Anions and Nutrients (QC Lot: 118327)</b>											
VA20C0901-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 118328)</b>											
VA20C0901-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 118620)</b>											
VA20C0943-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 118621)</b>											
VA20C0943-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0500	mg/L	<0.0500	<0.0500	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 118003)</b>											
VA20C0890-006	Blank	coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 118004)</b>											
VA20C0890-006	Blank	coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 119102)</b>											
VA20C0811-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 119103)</b>											
VA20C0811-001	Anonymous	aluminum, total	7429-90-5	E420	0.0150	mg/L	<0.0150	<0.0150	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00050	mg/L	0.00585	0.00607	3.56%	20%	----
		arsenic, total	7440-38-2	E420	0.00050	mg/L	35.1	34.0	3.07%	20%	----
		barium, total	7440-39-3	E420	0.00050	mg/L	0.0249	0.0250	0.532%	20%	----
		beryllium, total	7440-41-7	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000250	mg/L	<0.000250	<0.000250	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.050	mg/L	0.325	0.320	0.005	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.000200	mg/L	<0.000200	<0.000200	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.250	mg/L	523	501	4.27%	20%	----



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 119103) - continued</b>											
VA20C0811-001	Anonymous	cesium, total	7440-46-2	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00050	mg/L	3.67	3.48	5.37%	20%	----
		copper, total	7440-50-8	E420	0.00250	mg/L	<0.00250	<0.00250	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.050	mg/L	33.9	32.0	5.89%	20%	----
		lead, total	7439-92-1	E420	0.000250	mg/L	<0.000250	<0.000250	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0050	mg/L	0.0288	0.0288	0.00004	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0250	mg/L	55.5	51.8	6.98%	20%	----
		manganese, total	7439-96-5	E420	0.00050	mg/L	1.46	1.40	4.51%	20%	----
		molybdenum, total	7439-98-7	E420	0.000250	mg/L	1.13	1.15	1.75%	20%	----
		nickel, total	7440-02-0	E420	0.00250	mg/L	0.0331	0.0310	6.58%	20%	----
		phosphorus, total	7723-14-0	E420	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.250	mg/L	21.4	20.1	6.02%	20%	----
		rubidium, total	7440-17-7	E420	0.00100	mg/L	0.0102	0.00935	0.00089	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000250	mg/L	0.00523	0.00491	6.38%	20%	----
		silicon, total	7440-21-3	E420	0.50	mg/L	15.1	14.5	4.03%	20%	----
		silver, total	7440-22-4	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.250	mg/L	1030	981	4.60%	20%	----
		strontium, total	7440-24-6	E420	0.00100	mg/L	1.47	1.55	5.17%	20%	----
		sulfur, total	7704-34-9	E420	2.50	mg/L	1390	1370	1.07%	20%	----
		tellurium, total	13494-80-9	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00150	mg/L	<0.00150	<0.00150	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000050	mg/L	0.00453	0.00470	3.63%	20%	----
		vanadium, total	7440-62-2	E420	0.00250	mg/L	<0.00250	<0.00250	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0150	mg/L	0.0175	0.0174	0.0001	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 119694)</b>											
VA20C0834-001	Anonymous	mercury, total	7439-97-6	E508	0.0000500	mg/L	<0.0000500	<0.0000500	0	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 118337)</b>						
conductivity	----	E100	1	µS/cm	<1.0	----
<b>Physical Tests (QCLot: 118616)</b>						
conductivity	----	E100	1	µS/cm	1.4	----
<b>Anions and Nutrients (QCLot: 118327)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 118328)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Anions and Nutrients (QCLot: 118620)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 118621)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Bacteriological Tests (QCLot: 118003)</b>						
coliforms, thermotolerant [fecal]	---	E012.FC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 118004)</b>						
coliforms, Escherichia coli [E. coli]	---	E012.EC	1	CFU/100mL	<1	----
<b>Total Metals (QCLot: 119102)</b>						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
<b>Total Metals (QCLot: 119103)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 119103) - continued</b>						
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	---
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	---
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	---
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	---
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	---
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	---
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	---
selenium, total	7782-49-2	E420	0.00005	mg/L	# 0.000058	MB-LOR
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	---
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	---
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	---
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	---
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	---
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	---
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	---
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	---
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	---
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	---
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	---
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	---
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	---
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	---
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	---
<b>Total Metals (QCLot: 119694)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	---

**Qualifiers**

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.





## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 118336)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 118337)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	102	90.0	110	----
<b>Physical Tests (QCLot: 118615)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 118616)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 118327)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	100.0	90.0	110	----
<b>Anions and Nutrients (QCLot: 118328)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	103	90.0	110	----
<b>Anions and Nutrients (QCLot: 118620)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 118621)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	105	90.0	110	----
<b>Total Metals (QCLot: 119102)</b>									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	99.1	80.0	120	----
<b>Total Metals (QCLot: 119103)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	98.4	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	114	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	94.3	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	95.1	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	106	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	113	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	102	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	98.3	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	106	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	98.3	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	92.8	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	92.0	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	97.1	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	114	80.0	120	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 119103) - continued</b>									
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	104	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	94.8	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	92.5	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	91.7	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	109	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	97.2	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	104	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	112	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	108	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	105	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	106	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	108	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	106	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	109	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	103	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	96.9	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	90.5	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	108	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	109	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	94.8	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	94.9	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	105	80.0	120	----
<b>Total Metals (QCLot: 119694)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	86.2	80.0	120	----



### Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level  $\geq 1 \times$  spike level.


Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 118327)</b>										
VA20C0918-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.43 mg/L	2.5 mg/L	97.3	75.0	125	----
<b>Anions and Nutrients (QCLot: 118328)</b>										
VA20C0918-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.496 mg/L	0.5 mg/L	99.3	75.0	125	----
<b>Anions and Nutrients (QCLot: 118620)</b>										
VA20C0943-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	125 mg/L	125 mg/L	100	75.0	125	----
<b>Anions and Nutrients (QCLot: 118621)</b>										
VA20C0943-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	25.8 mg/L	25 mg/L	103	75.0	125	----
<b>Total Metals (QCLot: 119102)</b>										
VA20C0811-006	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0397 mg/L	0.04 mg/L	99.3	70.0	130	----
<b>Total Metals (QCLot: 119103)</b>										
VA20C0811-006	Anonymous	aluminum, total	7429-90-5	E420	0.193 mg/L	0.2 mg/L	96.7	70.0	130	----
		antimony, total	7440-36-0	E420	0.0209 mg/L	0.02 mg/L	104	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0183 mg/L	0.02 mg/L	91.7	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0101 mg/L	0.01 mg/L	101	70.0	130	----
		boron, total	7440-42-8	E420	0.098 mg/L	0.1 mg/L	98.1	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00404 mg/L	0.004 mg/L	101	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.0100 mg/L	0.01 mg/L	100	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0190 mg/L	0.02 mg/L	95.0	70.0	130	----
		copper, total	7440-50-8	E420	0.0186 mg/L	0.02 mg/L	92.8	70.0	130	----
		iron, total	7439-89-6	E420	2.02 mg/L	2 mg/L	101	70.0	130	----
		lead, total	7439-92-1	E420	0.0207 mg/L	0.02 mg/L	104	70.0	130	----
		lithium, total	7439-93-2	E420	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0186 mg/L	0.02 mg/L	93.1	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		nickel, total	7440-02-0	E420	0.0376 mg/L	0.04 mg/L	93.9	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.61 mg/L	10 mg/L	96.1	70.0	130	----



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
<b>Total Metals (QCLot: 119103) - continued</b>										
VA20C0811-006	Anonymous	potassium, total	7440-09-7	E420	3.88 mg/L	4 mg/L	97.1	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0200 mg/L	0.02 mg/L	99.9	70.0	130	----
		selenium, total	7782-49-2	E420	0.0430 mg/L	0.04 mg/L	107	70.0	130	----
		silicon, total	7440-21-3	E420	9.21 mg/L	10 mg/L	92.1	70.0	130	----
		silver, total	7440-22-4	E420	0.00408 mg/L	0.004 mg/L	102	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	21.3 mg/L	20 mg/L	107	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0409 mg/L	0.04 mg/L	102	70.0	130	----
		thallium, total	7440-28-0	E420	0.00403 mg/L	0.004 mg/L	101	70.0	130	----
		thorium, total	7440-29-1	E420	0.0221 mg/L	0.02 mg/L	110	70.0	130	----
		tin, total	7440-31-5	E420	0.0197 mg/L	0.02 mg/L	98.5	70.0	130	----
		titanium, total	7440-32-6	E420	0.0374 mg/L	0.04 mg/L	93.6	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		uranium, total	7440-61-1	E420	0.00397 mg/L	0.004 mg/L	99.2	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0941 mg/L	0.1 mg/L	94.1	70.0	130	----
		zinc, total	7440-66-6	E420	0.391 mg/L	0.4 mg/L	97.9	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0423 mg/L	0.04 mg/L	106	70.0	130	----
<b>Total Metals (QCLot: 119694)</b>										
VA20C0839-001	Anonymous	mercury, total	7439-97-6	E508	0.0000909 mg/L	0.0001 mg/L	90.9	70.0	130	----

<b>Report To</b> Contact and company name below will appear on the final report		<b>Report Format / Distribution</b>		<b>Select Service Level Below - Contact your AM to confirm all E&amp;P TATs (surcharges may apply)</b>																																																																																																																		
Company: <u>AECOM Canada</u>		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL     EDD (DIGITAL)		Regular [R] <input checked="" type="checkbox"/> Standard TAT if received by 3 pm - business days - no surcharges apply																																																																																																																		
Contact: <u>Marissa Heppner</u>		Quality Control (QC) Report with Report <input type="checkbox"/> YES <input type="checkbox"/> NO		PRIORITY (Business Days)		EMERGENCY																																																																																																																
Phone: <u>604 353 2974</u>		<input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked		4 day [P4-20%] <input type="checkbox"/>		1 Business day [E - 100%] <input type="checkbox"/>																																																																																																																
Company address below will appear on the final report		Select Distribution: <input checked="" type="checkbox"/> EMAIL     MAIL <input type="checkbox"/> FAX		3 day [P3-25%] <input type="checkbox"/>		Same Day, Weekend or Statutory holiday [E2 - 200% (Laboratory opening fees may apply)] <input type="checkbox"/>																																																																																																																
Street: <u>3292 Production Way, 9th floor</u>		Email 1 or Fax: <u>Nadia.baker@aecom.com</u>		Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm																																																																																																																		
City/Province: <u>Burnaby, BC</u>		Email 2: <u>bruce.ford@aecom.com</u>		For tests that can not be performed according to the service level selected, you will be contacted.																																																																																																																		
Postal Code: <u>V5H 4R4</u>		Email 3:		<b>Analysis Request</b>																																																																																																																		
Invoice To: Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<b>Invoice Distribution</b>		Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																																																																																																																		
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		<table border="1"> <tr> <th rowspan="10">NUMBER OF CONTAINERS</th> <th>Total Metals</th> <th>Mg</th> <th>Conductivity</th> <th>pH</th> <th>Nitrite</th> <th>Nitrate (ASD)</th> <th>Nitrate+Nitrite</th> <th>Fecal Coliforms</th> <th>E coli</th> <th rowspan="10">SAMPLES ON HOLD</th> <th rowspan="10">SUSPECTED HAZARD (see Special Instructions)</th> </tr> <tr><td>f</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr> <tr><td>f</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr> <tr><td>f</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr> <tr><td>f</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr> <tr><td>f</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr> <tr><td>f</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr> <tr><td>f</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr> <tr><td>f</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr> <tr><td>f</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr> </table>				NUMBER OF CONTAINERS	Total Metals	Mg	Conductivity	pH	Nitrite	Nitrate (ASD)	Nitrate+Nitrite	Fecal Coliforms	E coli	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)	f	✓	✓	✓	✓	✓	✓	✓	✓			f	✓	✓	✓	✓	✓	✓	✓	✓			f	✓	✓	✓	✓	✓	✓	✓	✓			f	✓	✓	✓	✓	✓	✓	✓	✓			f	✓	✓	✓	✓	✓	✓	✓	✓			f	✓	✓	✓	✓	✓	✓	✓	✓			f	✓	✓	✓	✓	✓	✓	✓	✓			f	✓	✓	✓	✓	✓	✓	✓	✓			f	✓	✓	✓	✓	✓	✓	✓	✓		
NUMBER OF CONTAINERS	Total Metals	Mg	Conductivity						pH	Nitrite	Nitrate (ASD)	Nitrate+Nitrite	Fecal Coliforms	E coli	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)																																																																																																						
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Company: <u>AECOM Canada</u>		Email 1 or Fax: <u>CANSSC.E-billing@aecom.com</u>																																																																																																																				
Contact: <u>Bruce Ford</u>		Email 2: <u>bruce.ford@aecom.com</u>																																																																																																																				
<b>Project Information</b>		<b>Oil and Gas Required Fields (client use)</b>																																																																																																																				
ALS Account # / Quote #: <u>VA20-AEC0100-004</u>		AFE/Cost Center: PO#																																																																																																																				
Job #: <u>60639142-301</u>		Major/Minor Code: Routing Code:																																																																																																																				
PO / AFE:		Requisitioner:																																																																																																																				
LSD:		Location:																																																																																																																				
ALS Lab Work Order # (lab use only):		ALS Contact: <u>Dean Watt</u> <u>Marissa Heppner</u> <u>Jasmeen Jatar</u> <u>Brad Stuckless</u>																																																																																																																				
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type																																																																																																																		
	<p>Environmental Division Vancouver Work Order Reference <b>VA20C0890</b></p>  <p>Telephone: +1 804 253 4186</p>	<u>16/11/20</u>	<u>10:40</u>	<u>Water</u>																																																																																																																		
		<u>VEL-001</u>	<u>16/11/20</u>	<u>11:03</u>	↓																																																																																																																	
		<u>VEL-002</u>		<u>11:19</u>	↓																																																																																																																	
		<u>VEL-003</u>		<u>12:12</u>	↓																																																																																																																	
		<u>VEL-004</u>		<u>12:24</u>	↓																																																																																																																	
		<u>VEL-005</u>		<u>10:40</u>	↓																																																																																																																	
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<b>Drinking Water (DW) Samples (client use)</b>		<b>Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)</b>		<b>SAMPLE CONDITION AS RECEIVED (lab use only)</b>																																																																																																																		
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO				Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>																																																																																																																		
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO				Ice Packs <input checked="" type="checkbox"/> Ice Cubes <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>																																																																																																																		
				Cooling Initiated <input type="checkbox"/>																																																																																																																		
				INITIAL COOLER TEMPERATURES °C: FINAL COOLER TEMPERATURES °C: <u>11.0</u>																																																																																																																		
<b>SHIPMENT RELEASE (client use)</b>		<b>INITIAL SHIPMENT RECEPTION (lab use only)</b>		<b>FINAL SHIPMENT RECEPTION (lab use only)</b>																																																																																																																		
Released by: <u>Marissa Heppner</u> Date: <u>Nov 16/2020</u> Time: <u>16:00</u>		Received by: _____ Date: _____ Time: _____		Received by: <u>MB</u> Date: <u>Nov 16</u> Time: <u>2:30PM</u>																																																																																																																		

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

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



# BC and YUKON Drinking Water Declaration Form

In British Columbia, the Drinking Water Protection Act requires laboratories to immediately report positive results for Fecal Coliform and Escherichia coli in drinking water samples directly to the Water Supplier, the Drinking Water Officer, and the Medical Health Officer in the region the water samples were taken. Immediate reporting is not required if the sample is water for which a public advisory to boil for drinking water has been issued, or if the sample is not a drinking water.

In Yukon Territories, the Public Health and Safety Act requires the laboratory to immediately report any results that exceeds the acceptable concentration for any health-related parameter set out in the Guidelines for Canadian Drinking Water Quality to Environmental Health Services.

Water Suppliers are required by the Act to ensure the laboratory conducting the testing is aware of the applicable standards.

**Please submit this completed form and an ALS Chain of Custody with your sample.**

1. Are your samples currently used for human consumption in BC or the Yukon?

YES

NO

If you selected YES, proceed to #2. If you selected NO, proceed to #5.

2. Are your samples from a water supply system that either:

a) serves more than 1 single family residence in BC, or

YES

NO

b) serves more than 15 connections, or is trucked to more than 5 sites in the Yukon Territory

YES

NO

If you selected YES to either a) or b), proceed to #3. If you selected NO, proceed to #5.

3. Is your water supply under a boil water advisory?

YES

NO

If you selected NO, proceed to #4. If you selected YES, proceed to #5.

4. Please indicate (✓) which Health Authority Region your samples were collected in, and provide the contact details for the applicable Drinking Water and Medical Health Officers:

Northern

Vancouver Coastal

Interior

Fraser

Vancouver Island

Yukon

Water Supplier Name	Phone & Email
Drinking Water Officer:	Phone:
Medical Health Officer:	Phone:

5. Name of Sampler: Marissa Heppner/Brad Studdless Phone: 604 903 9610

Released by (signature): [Signature] Date: Nov 16 2020

ALS Vancouver can receive samples Monday to Friday (24 hours) and Saturday and Sunday (8:00am to 4:00pm). Please contact ALS for testing limitations around statutory holidays.

## CERTIFICATE OF ANALYSIS

**Work Order** : **VA20C1503**  
**Client** : **AECOM Canada Ltd.**  
**Contact** : Bruce Ford  
**Address** : 3292 Production Way  
                   Burnaby BC Canada V5A 4R4  
**Telephone** : ----  
**Project** : 60639142-301  
**PO** : ----  
**C-O-C number** : 17-863507  
**Sampler** : Brad Stuckless  
**Site** : ----  
**Quote number** : VA20-AECO100-0004  
**No. of samples received** : 6  
**No. of samples analysed** : 6

**Page** : 1 of 6  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Dean Watt  
**Address** : 8081 Lougheed Highway  
                   Burnaby BC Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 23-Nov-2020 17:00  
**Date Analysis Commenced** : 24-Nov-2020  
**Issue Date** : 01-Dec-2020 18:11

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Microbiology, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior 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.

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).





## Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Client sampling date / time					23-Nov-2020 13:10	23-Nov-2020 13:32	23-Nov-2020 13:51	23-Nov-2020 14:29	23-Nov-2020 15:02
Analyte	CAS Number	Method	LOR	Unit	VA20C1503-001	VA20C1503-002	VA20C1503-003	VA20C1503-004	VA20C1503-005
					Result	Result	Result	Result	Result
<b>Physical Tests</b>									
conductivity	----	E100	2.0	µS/cm	122	69.5	124	105	104
hardness (as CaCO <sub>3</sub> ), from total Ca/Mg	----	EC100A	600	µg/L	36400	14400	40900	38400	33400
pH	----	E108	0.10	pH units	7.46	6.63	7.62	7.00	7.27
<b>Anions and Nutrients</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	1.31	2.81	0.709	0.699	0.581
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	1.31	2.81	0.712	0.702	0.583
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0034	<0.0010	0.0025	0.0033	0.0024
<b>Bacteriological Tests</b>									
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	200	20	40	120	13
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	240	150	80	150	16
<b>Total Metals</b>									
aluminum, total	7429-90-5	E420	3.0	µg/L	338	317	142	351	122
antimony, total	7440-36-0	E420	0.10	µg/L	0.24	0.11	0.19	0.18	0.10
arsenic, total	7440-38-2	E420	0.10	µg/L	0.63	0.15	1.31	0.33	0.26
barium, total	7440-39-3	E420	0.10	µg/L	19.2	28.1	14.8	24.6	17.3
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050
boron, total	7440-42-8	E420	10	µg/L	<10	<10	11	<10	<10
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0320	0.0316	0.0208	0.0312	0.0104
calcium, total	7440-70-2	E420	50	µg/L	10900	3940	12700	12000	10100
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	<0.010	<0.010	0.015	<0.010
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	0.56	0.39	0.56	0.52	0.23
cobalt, total	7440-48-4	E420	0.10	µg/L	0.20	0.26	0.10	0.30	0.14
copper, total	7440-50-8	E420	0.50	µg/L	4.69	1.83	4.00	4.97	1.80
iron, total	7439-89-6	E420	10	µg/L	382	192	482	1280	631
lead, total	7439-92-1	E420	0.050	µg/L	0.532	0.240	0.256	0.666	0.177
lithium, total	7439-93-2	E420	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
magnesium, total	7439-95-4	E420	5.0	µg/L	2260	1120	2250	2070	1980
manganese, total	7439-96-5	E420	0.10	µg/L	17.6	26.9	12.7	148	35.4
mercury, total	7439-97-6	E508	0.0050	µg/L	0.0124	<0.0050	<0.0050	0.0100	<0.0050



## Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Client sampling date / time					23-Nov-2020 13:10	23-Nov-2020 13:32	23-Nov-2020 13:51	23-Nov-2020 14:29	23-Nov-2020 15:02	
Analyte	CAS Number	Method	LOR	Unit	VA20C1503-001	VA20C1503-002	VA20C1503-003	VA20C1503-004	VA20C1503-005	
					Result	Result	Result	Result	Result	
<b>Total Metals</b>										
molybdenum, total	7439-98-7	E420	0.050	µg/L	0.263	<0.050	0.195	0.156	0.067	
nickel, total	7440-02-0	E420	0.50	µg/L	1.51	0.91	0.79	1.03	0.57	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	<50	<50	<50	<50	
potassium, total	7440-09-7	E420	50	µg/L	2370	804	2020	2400	1940	
rubidium, total	7440-17-7	E420	0.20	µg/L	1.21	1.06	1.66	1.86	1.90	
selenium, total	7782-49-2	E420	0.050	µg/L	0.076	<0.050	0.053	<0.050	<0.050	
silicon, total	7440-21-3	E420	100	µg/L	6020	5990	5500	4040	4570	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
sodium, total	17341-25-2	E420	50	µg/L	8230	6370	7280	4500	6260	
strontium, total	7440-24-6	E420	0.20	µg/L	67.1	44.9	77.4	72.1	69.9	
sulfur, total	7704-34-9	E420	500	µg/L	3120	1440	2500	2220	1780	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
titanium, total	7440-32-6	E420	0.30	µg/L	<7.50 <sup>DLM</sup>	3.79	4.09	13.1	2.86	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
uranium, total	7440-61-1	E420	0.010	µg/L	0.072	<0.010	0.031	0.021	<0.010	
vanadium, total	7440-62-2	E420	0.50	µg/L	1.90	0.84	0.84	1.00	0.54	
zinc, total	7440-66-6	E420	3.0	µg/L	8.2	6.8	10.4	6.8	3.3	
zirconium, total	7440-67-7	E420	0.20	µg/L	0.22	<0.20	0.20	<0.20	<0.20	

Please refer to the General Comments section for an explanation of any qualifiers detected.



## Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					Blank	----	----	----	----
Client sampling date / time					23-Nov-2020 11:44	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20C1503-006	-----	-----	-----	-----
					Result	---	---	---	---
<b>Physical Tests</b>									
conductivity	----	E100	2.0	µS/cm	<2.0	----	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	600	µg/L	<600	----	----	----	----
pH	----	E108	0.10	pH units	5.46	----	----	----	----
<b>Anions and Nutrients</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	----	----	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	<0.0051	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	----	----	----	----
<b>Bacteriological Tests</b>									
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----	----	----	----
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----	----	----	----
<b>Total Metals</b>									
aluminum, total	7429-90-5	E420	3.0	µg/L	<3.0	----	----	----	----
antimony, total	7440-36-0	E420	0.10	µg/L	<0.10	----	----	----	----
arsenic, total	7440-38-2	E420	0.10	µg/L	<0.10	----	----	----	----
barium, total	7440-39-3	E420	0.10	µg/L	<0.10	----	----	----	----
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	----	----	----	----
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	----	----	----	----
boron, total	7440-42-8	E420	10	µg/L	<10	----	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L	<0.0050	----	----	----	----
calcium, total	7440-70-2	E420	50	µg/L	<50	----	----	----	----
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	<0.10	----	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	----	----	----	----
copper, total	7440-50-8	E420	0.50	µg/L	<0.50	----	----	----	----
iron, total	7439-89-6	E420	10	µg/L	<10	----	----	----	----
lead, total	7439-92-1	E420	0.050	µg/L	<0.050	----	----	----	----
lithium, total	7439-93-2	E420	1.0	µg/L	<1.0	----	----	----	----
magnesium, total	7439-95-4	E420	5.0	µg/L	<5.0	----	----	----	----
manganese, total	7439-96-5	E420	0.10	µg/L	<0.10	----	----	----	----
mercury, total	7439-97-6	E508	0.0050	µg/L	<0.0050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.050	µg/L	<0.050	----	----	----	----



## Analytical Results

Sub-Matrix: Water					Client sample ID	Blank	----	----	----	----
(Matrix: Water)					Client sampling date / time	23-Nov-2020 11:44	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20C1503-006	-----	-----	-----	-----	
					Result	---	---	---	---	
<b>Total Metals</b>										
nickel, total	7440-02-0	E420	0.50	µg/L	<0.50	----	----	----	----	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	----	----	----	----	
potassium, total	7440-09-7	E420	50	µg/L	<50	----	----	----	----	
rubidium, total	7440-17-7	E420	0.20	µg/L	<0.20	----	----	----	----	
selenium, total	7782-49-2	E420	0.050	µg/L	<0.050	----	----	----	----	
silicon, total	7440-21-3	E420	100	µg/L	<100	----	----	----	----	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	----	----	----	----	
sodium, total	17341-25-2	E420	50	µg/L	<50	----	----	----	----	
strontium, total	7440-24-6	E420	0.20	µg/L	<0.20	----	----	----	----	
sulfur, total	7704-34-9	E420	500	µg/L	<500	----	----	----	----	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	----	----	----	----	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	----	----	----	----	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	----	----	----	----	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	----	----	----	----	
titanium, total	7440-32-6	E420	0.30	µg/L	<0.30	----	----	----	----	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	----	----	----	----	
uranium, total	7440-61-1	E420	0.010	µg/L	<0.010	----	----	----	----	
vanadium, total	7440-62-2	E420	0.50	µg/L	<0.50	----	----	----	----	
zinc, total	7440-66-6	E420	3.0	µg/L	<3.0	----	----	----	----	
zirconium, total	7440-67-7	E420	0.20	µg/L	<0.20	----	----	----	----	

Please refer to the General Comments section for an explanation of any qualifiers detected.

## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA20C1503</b>	Page	: 1 of 12
Client	: <b>AECOM Canada Ltd.</b>	Laboratory	: Vancouver - Environmental
Contact	: Bruce Ford	Account Manager	: Dean Watt
Address	: 3292 Production Way Burnaby BC Canada V5A 4R4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 60639142-301	Date Samples Received	: 23-Nov-2020 17:00
PO	: ----	Issue Date	: 01-Dec-2020 18:12
C-O-C number	: 17-863507		
Sampler	: Brad Stuckless		
Site	: ----		
Quote number	: VA20-AECO100-0004		
No. of samples received	: 6		
No. of samples analysed	: 6		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

## Summary of Outliers

### **Outliers : Quality Control Samples**

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

### **Outliers : Frequency of Quality Control Samples**

- No Quality Control Sample Frequency Outliers occur.

RIGHT SOLUTIONS | RIGHT PARTNER



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO3-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-003	E235.NO3-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-004	E235.NO3-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-005	E235.NO3-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE Blank	E235.NO3-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-001	E235.NO3-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO2-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	0 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE UEL-003	E235.NO2-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	0 days		✔
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE UEL-004	E235.NO2-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	0 days		✔
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE UEL-005	E235.NO2-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	0 days		✔
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE Blank	E235.NO2-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	1 days		✔
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE UEL-001	E235.NO2-L	23-Nov-2020	----	----	----		24-Nov-2020	3 days	1 days		✔
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
Sterile HDPE (Sodium thiosulphate) UEL-005	E012.EC	23-Nov-2020	----	----	----		24-Nov-2020	48 hrs	20 hrs		✔
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
Sterile HDPE (Sodium thiosulphate) UEL-004	E012.EC	23-Nov-2020	----	----	----		24-Nov-2020	48 hrs	21 hrs		✔
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
Sterile HDPE (Sodium thiosulphate) UEL-001	E012.EC	23-Nov-2020	----	----	----		24-Nov-2020	48 hrs	22 hrs		✔
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
Sterile HDPE (Sodium thiosulphate) UEL-002	E012.EC	23-Nov-2020	----	----	----		24-Nov-2020	48 hrs	22 hrs		✔





Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.EC	23-Nov-2020	----	----	----		24-Nov-2020	48 hrs	22 hrs	✔
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> Blank	E012.EC	23-Nov-2020	----	----	----		24-Nov-2020	48 hrs	24 hrs	✔
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.FC	23-Nov-2020	----	----	----		24-Nov-2020	30 hrs	20 hrs	✔
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.FC	23-Nov-2020	----	----	----		24-Nov-2020	30 hrs	21 hrs	✔
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.FC	23-Nov-2020	----	----	----		24-Nov-2020	30 hrs	22 hrs	✔
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.FC	23-Nov-2020	----	----	----		24-Nov-2020	30 hrs	22 hrs	✔
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.FC	23-Nov-2020	----	----	----		24-Nov-2020	30 hrs	22 hrs	✔
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> Blank	E012.FC	23-Nov-2020	----	----	----		24-Nov-2020	30 hrs	24 hrs	✔
<b>Physical Tests : Conductivity in Water</b>										
<b>HDPE</b> UEL-003	E100	23-Nov-2020	----	----	----		24-Nov-2020	28 days	0 days	✔



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-004	E100	23-Nov-2020	----	----	----		24-Nov-2020	28 days	0 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-005	E100	23-Nov-2020	----	----	----		24-Nov-2020	28 days	0 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE Blank	E100	23-Nov-2020	----	----	----		24-Nov-2020	28 days	1 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-001	E100	23-Nov-2020	----	----	----		24-Nov-2020	28 days	1 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-002	E100	23-Nov-2020	----	----	----		24-Nov-2020	28 days	1 days	✓
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-005	E108	23-Nov-2020	----	----	----		24-Nov-2020	0.25 hrs	22 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-003	E108	23-Nov-2020	----	----	----		24-Nov-2020	0.25 hrs	23 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-004	E108	23-Nov-2020	----	----	----		24-Nov-2020	0.25 hrs	23 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-001	E108	23-Nov-2020	----	----	----		24-Nov-2020	0.25 hrs	24 hrs	* EHTR-FM



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : pH by Meter</b>											
HDPE UEL-002	E108	23-Nov-2020	----	----	----		24-Nov-2020	0.25 hrs	24 hrs	*	EHTR-FM
<b>Physical Tests : pH by Meter</b>											
HDPE Blank	E108	23-Nov-2020	----	----	----		24-Nov-2020	0.25 hrs	26 hrs	*	EHTR-FM
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE total (nitric acid) Blank	E420.Cr-L	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE total (nitric acid) UEL-001	E420.Cr-L	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE total (nitric acid) UEL-002	E420.Cr-L	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE total (nitric acid) UEL-003	E420.Cr-L	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE total (nitric acid) UEL-004	E420.Cr-L	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✓	
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
HDPE total (nitric acid) UEL-005	E420.Cr-L	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✓	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
Glass vial total (hydrochloric acid) UEL-001	E508	23-Nov-2020	----	----	----		27-Nov-2020	28 days	3 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-002	E508	23-Nov-2020	----	----	----		27-Nov-2020	28 days	3 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-005	E508	23-Nov-2020	----	----	----		27-Nov-2020	28 days	3 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> Blank	E508	23-Nov-2020	----	----	----		27-Nov-2020	28 days	4 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-003	E508	23-Nov-2020	----	----	----		27-Nov-2020	28 days	4 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-004	E508	23-Nov-2020	----	----	----		27-Nov-2020	28 days	4 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> Blank	E420	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL-001	E420	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL-002	E420	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL-003	E420	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL-004	E420	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL-005	E420	23-Nov-2020	----	----	----		25-Nov-2020	180 days	1 days	✔

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Conductivity in Water	E100	121396	1	15	6.6	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	121721	1	10	10.0	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	121375	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	121376	1	16	6.2	5.0	✓
pH by Meter	E108	121395	1	16	6.2	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	121722	1	10	10.0	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	121513	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	123230	2	26	7.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	121514	1	20	5.0	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Conductivity in Water	E100	121396	1	15	6.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	121375	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	121376	1	16	6.2	5.0	✓
pH by Meter	E108	121395	1	16	6.2	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	121513	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	123230	2	26	7.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	121514	1	20	5.0	5.0	✓
<b>Method Blanks (MB)</b>							
Conductivity in Water	E100	121396	1	15	6.6	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	121721	1	10	10.0	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	121375	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	121376	1	16	6.2	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	121722	1	10	10.0	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	121513	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	123230	2	26	7.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	121514	1	20	5.0	5.0	✓
<b>Matrix Spikes (MS)</b>							
Nitrate in Water by IC (Low Level)	E235.NO3-L	121375	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	121376	1	16	6.2	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	121513	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	123230	2	26	7.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	121514	1	20	5.0	5.0	✓



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-NA-MUG)	E012.EC  Vancouver - Environmental	Water	APHA 9222I (mod)	Positive Total or Thermotolerant Coliform filters are transferred to NA-MUG and incubated at 35.0 ±0.5°C for 4 hours. Colonies exhibiting fluorescence are enumerated.
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC  Vancouver - Environmental	Water	APHA 9222 D (mod)	Following filtration (0.45 µm), and incubation at 45.5 ±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
Conductivity in Water	E100  Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108  Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Nitrite in Water by IC (Low Level)	E235.NO2-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS



<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N  Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).



## QUALITY CONTROL REPORT

**Work Order** : **VA20C1503**

**Page** : 1 of 10

**Client** : AECOM Canada Ltd.  
**Contact** : Bruce Ford  
**Address** : 3292 Production Way  
 Burnaby BC Canada V5A 4R4  
**Telephone** : ----  
**Project** : 60639142-301  
**PO** : ----  
**C-O-C number** : 17-863507  
**Sampler** : Brad Stuckless  
**Site** : ----  
**Quote number** : VA20-AECO100-0004  
**No. of samples received** : 6  
**No. of samples analysed** : 6

**Laboratory** : Vancouver - Environmental  
**Account Manager** : Dean Watt  
**Address** : 8081 Lougheed Highway  
 Burnaby, British Columbia Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 23-Nov-2020 17:00  
**Date Analysis Commenced** : 24-Nov-2020  
**Issue Date** : 01-Dec-2020 18:12

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Microbiology, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia



## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.



### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 121395)</b>											
VA20C1515-003	Anonymous	pH	----	E108	0.10	pH units	7.62	7.59	0.394%	4%	----
<b>Physical Tests (QC Lot: 121396)</b>											
VA20C1515-003	Anonymous	conductivity	----	E100	2.0	µS/cm	148	147	0.814%	10%	----
<b>Anions and Nutrients (QC Lot: 121375)</b>											
VA20C1515-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0815	0.0812	0.343%	20%	----
<b>Anions and Nutrients (QC Lot: 121376)</b>											
VA20C1515-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 121721)</b>											
VA20C1532-001	Anonymous	coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 121722)</b>											
VA20C1535-001	Anonymous	coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 121513)</b>											
VA20C1414-007	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 121514)</b>											
VA20C1414-007	Anonymous	aluminum, total	7429-90-5	E420	0.0300	mg/L	15.5	15.8	2.16%	20%	----
		antimony, total	7440-36-0	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00100	mg/L	0.00227	0.00226	0.00009	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00100	mg/L	0.00241	0.00247	0.00006	Diff <2x LOR	----
		beryllium, total	7440-41-7	E420	0.000200	mg/L	<0.000200	<0.000200	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000500	mg/L	0.246	0.261	5.98%	20%	----
		calcium, total	7440-70-2	E420	0.500	mg/L	<0.500	<0.500	0	Diff <2x LOR	----
		cesium, total	7440-46-2	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00100	mg/L	0.00709	0.00724	0.00015	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00500	mg/L	0.297	0.305	2.47%	20%	----
		iron, total	7439-89-6	E420	0.100	mg/L	1.80	1.87	3.96%	20%	----
		lead, total	7439-92-1	E420	0.000500	mg/L	0.0292	0.0291	0.362%	20%	----
		lithium, total	7439-93-2	E420	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	1.00	mg/L	<1.00	<1.00	0	Diff <2x LOR	----
		manganese, total	7439-96-5	E420	0.00100	mg/L	0.701	0.713	1.75%	20%	----



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 121514) - continued</b>											
VA20C1414-007	Anonymous	molybdenum, total	7439-98-7	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.500	mg/L	<0.500	<0.500	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	1.00	mg/L	<1.00	<1.00	0	Diff <2x LOR	----
		rubidium, total	7440-17-7	E420	0.00200	mg/L	<0.00200	0.00208	0.00008	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	1.00	mg/L	<1.00	<1.00	0	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000100	mg/L	<0.000100	0.000109	0.000009	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.500	mg/L	<0.500	<0.500	0	Diff <2x LOR	----
		strontium, total	7440-24-6	E420	0.00200	mg/L	0.00368	0.00382	0.00014	Diff <2x LOR	----
		sulfur, total	7704-34-9	E420	5.00	mg/L	49.1	48.8	0.29	Diff <2x LOR	----
		tellurium, total	13494-80-9	E420	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000100	mg/L	0.000204	0.000203	0.0000003	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00100	mg/L	0.00334	0.00334	0.00000005	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00300	mg/L	<0.00300	<0.00300	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000100	mg/L	0.00265	0.00263	0.989%	20%	----
		vanadium, total	7440-62-2	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0300	mg/L	32.3	32.7	1.16%	20%	----
		zirconium, total	7440-67-7	E420	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 123177)</b>											
VA20C1444-004	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 123230)</b>											
VA20C1442-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 121396)</b>						
conductivity	----	E100	1	µS/cm	<1.0	----
<b>Anions and Nutrients (QCLot: 121375)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 121376)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Bacteriological Tests (QCLot: 121721)</b>						
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 121722)</b>						
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----
<b>Total Metals (QCLot: 121513)</b>						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
<b>Total Metals (QCLot: 121514)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 121514) - continued</b>						
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 123177)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
<b>Total Metals (QCLot: 123230)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 121395)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 121396)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 121375)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
<b>Anions and Nutrients (QCLot: 121376)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	101	90.0	110	----
<b>Total Metals (QCLot: 121513)</b>									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	96.2	80.0	120	----
<b>Total Metals (QCLot: 121514)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	101	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	95.6	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	95.8	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	95.7	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	101	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	94.3	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	95.8	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	97.2	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	91.9	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	97.1	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	96.3	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	97.8	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	99.3	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	91.5	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	98.8	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	97.4	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	98.1	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	97.7	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	102	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	94.7	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	100	80.0	120	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 121514) - continued</b>									
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	98.1	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	106	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	92.3	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	106	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	91.7	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	95.8	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	104	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	103	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	89.6	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	96.0	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	98.2	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	94.4	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	95.7	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	97.3	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	95.0	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	90.4	80.0	120	----
<b>Total Metals (QCLot: 123177)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	103	80.0	120	----
<b>Total Metals (QCLot: 123230)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	97.0	80.0	120	----





## Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level  $\geq 1 \times$  spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 121375)</b>										
VA20C1515-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.57 mg/L	2.5 mg/L	103	75.0	125	----
<b>Anions and Nutrients (QCLot: 121376)</b>										
VA20C1515-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.492 mg/L	0.5 mg/L	98.4	75.0	125	----
<b>Total Metals (QCLot: 121513)</b>										
VA20C1414-008	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0374 mg/L	0.04 mg/L	93.6	70.0	130	----
<b>Total Metals (QCLot: 121514)</b>										
VA20C1414-008	Anonymous	aluminum, total	7429-90-5	E420	ND mg/L	0.2 mg/L	ND	70.0	130	----
		antimony, total	7440-36-0	E420	0.0176 mg/L	0.02 mg/L	88.2	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0186 mg/L	0.02 mg/L	92.8	70.0	130	----
		barium, total	7440-39-3	E420	0.0186 mg/L	0.02 mg/L	93.0	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0370 mg/L	0.04 mg/L	92.5	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00945 mg/L	0.01 mg/L	94.5	70.0	130	----
		boron, total	7440-42-8	E420	0.096 mg/L	0.1 mg/L	96.4	70.0	130	----
		cadmium, total	7440-43-9	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		calcium, total	7440-70-2	E420	3.74 mg/L	4 mg/L	93.5	70.0	130	----
		cesium, total	7440-46-2	E420	0.00899 mg/L	0.01 mg/L	89.9	70.0	130	----
		cobalt, total	7440-48-4	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		copper, total	7440-50-8	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		iron, total	7439-89-6	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		lithium, total	7439-93-2	E420	0.0926 mg/L	0.1 mg/L	92.6	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0181 mg/L	0.02 mg/L	90.6	70.0	130	----
		nickel, total	7440-02-0	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.54 mg/L	10 mg/L	95.4	70.0	130	----
		potassium, total	7440-09-7	E420	3.76 mg/L	4 mg/L	93.9	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0192 mg/L	0.02 mg/L	96.1	70.0	130	----
		selenium, total	7782-49-2	E420	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, total	7440-21-3	E420	9.59 mg/L	10 mg/L	95.9	70.0	130	----
		silver, total	7440-22-4	E420	0.00354 mg/L	0.004 mg/L	88.5	70.0	130	----



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
<b>Total Metals (QCLot: 121514) - continued</b>										
VA20C1414-008	Anonymous	sodium, total	17341-25-2	E420	2.02 mg/L	2 mg/L	101	70.0	130	----
		strontium, total	7440-24-6	E420	0.0187 mg/L	0.02 mg/L	93.4	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0387 mg/L	0.04 mg/L	96.7	70.0	130	----
		thallium, total	7440-28-0	E420	0.00364 mg/L	0.004 mg/L	91.1	70.0	130	----
		thorium, total	7440-29-1	E420	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		tin, total	7440-31-5	E420	0.0182 mg/L	0.02 mg/L	91.3	70.0	130	----
		titanium, total	7440-32-6	E420	0.0373 mg/L	0.04 mg/L	93.2	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0183 mg/L	0.02 mg/L	91.7	70.0	130	----
		uranium, total	7440-61-1	E420	0.00365 mg/L	0.004 mg/L	91.2	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0945 mg/L	0.1 mg/L	94.5	70.0	130	----
		zinc, total	7440-66-6	E420	ND mg/L	0.4 mg/L	ND	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0361 mg/L	0.04 mg/L	90.2	70.0	130	----
<b>Total Metals (QCLot: 123177)</b>										
VA20C1444-005	Anonymous	mercury, total	7439-97-6	E508	0.0000938 mg/L	0.0001 mg/L	93.8	70.0	130	----
<b>Total Metals (QCLot: 123230)</b>										
VA20C1442-002	Anonymous	mercury, total	7439-97-6	E508	0.0000970 mg/L	0.0001 mg/L	97.0	70.0	130	----

Report To: **ALCON Canada Ltd.** Contact and company name below will appear on the final report

Company: **ALCON Canada Ltd.**

Contact: **Broad Shuckless**

Phone: **604-347-6802**

Street: **3297 Production Way, 4th Floor**

City/Province: **Burnaby BC**

Postal Code: **V5A 4R14**

Invoice To:  Same as Report To  YES  NO

Company: **ALCON Canada Ltd.**

Contact: **Bruce Ford**

Project Information

ALS Account # / Quote #: **VA20-AELCO100-004**

Job #: **101039157-301**

PO / AFE: \_\_\_\_\_

ALS Lab Work Order # (lab use only): \_\_\_\_\_

Sample Identification and/or Coordinates (This description will appear on the report)

ALS Sample # (lab use only)	Sample Identification and/or Coordinates	Date (dd-mm-yy)	Time (hh:mm)	Sample Type
WE1-001	Environmental Division Vancouver Work Order Reference VA20C1503	23-Nov-20	13:10	Water
WE1-002		13:32		
WE1-003		13:51		
WE1-004		14:29		
WE1-005		15:02		
		13:11:44		

Barcode:

Telephone: +1 604 233 4188

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

Drinking Water (DW) Samples (client use)

Are samples taken from a Regulated DW System?  YES  NO

Are samples for human consumption/ use?  YES  NO

SHIPMENT RELEASE (client use)

Date: **Nov 23/20**

Time: **11:16**

Received by: \_\_\_\_\_

INITIAL SHIPMENT RECEPTION (lab use only)

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Received by: \_\_\_\_\_

NUMBER OF CONTAINERS

Container	Total Metals	Hg	Conductivity	pH	Nitrite	Nitrate	Nitrate/Nitrite (ASV)	Fecal Coliforms	E. Coli
1	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✓	✓	✓	✓	✓

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen  SIF Observations Yes  No

Ice Packs  Ice Cubes  Custody seal intact Yes  No

Cooling Initiated

INITIAL COOLER TEMPERATURES °C \_\_\_\_\_

FINAL COOLER TEMPERATURES °C \_\_\_\_\_

FINAL SHIPMENT RECEPTION (lab use only)

Date: **Nov 23**

Time: **5:15**

Received by: \_\_\_\_\_

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

## CERTIFICATE OF ANALYSIS

**Work Order** : **VA20C2133**  
**Client** : **AECOM Canada Ltd.**  
**Contact** : Bruce Ford  
**Address** : 3292 Production Way  
                   Burnaby BC Canada V5A 4R4  
**Telephone** : ----  
**Project** : 60639142-301  
**PO** : ----  
**C-O-C number** : ----  
**Sampler** : M Heppner  
**Site** : ----  
**Quote number** : VA20-AECO100-0004  
**No. of samples received** : 5  
**No. of samples analysed** : 5

**Page** : 1 of 4  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Dean Watt  
**Address** : 8081 Lougheed Highway  
                   Burnaby BC Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 30-Nov-2020 13:10  
**Date Analysis Commenced** : 30-Nov-2020  
**Issue Date** : 07-Dec-2020 16:38

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Microbiology, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior 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.

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MBER	Estimated Result (Microbiological test). Colony count outside ideal range. Result calculated from most nearly acceptable value.



## Analytical Results

Sub-Matrix: Water					Client sample ID	UEL - 001	UEL - 002	UEL - 003	UEL - 004	UEL - 005
(Matrix: Water)					Client sampling date / time	30-Nov-2020 09:15	30-Nov-2020 10:15	30-Nov-2020 10:45	30-Nov-2020 11:15	30-Nov-2020 11:30
Analyte	CAS Number	Method	LOR	Unit	VA20C2133-001	VA20C2133-002	VA20C2133-003	VA20C2133-004	VA20C2133-005	
					Result	Result	Result	Result	Result	
<b>Physical Tests</b>										
conductivity	----	E100	2.0	µS/cm	147	101	146	157	108	
hardness (as CaCO <sub>3</sub> ), from total Ca/Mg	----	EC100A	600	µg/L	42800	14000	42000	56000	34300	
pH	----	E108	0.10	pH units	7.63	6.81	7.72	7.28	7.52	
<b>Anions and Nutrients</b>										
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	1.23	2.43	0.673	0.837	0.469	
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	1.23	2.43	0.678	0.842	0.471	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0065	<0.0010	0.0045	0.0047	0.0021	
<b>Bacteriological Tests</b>										
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	330	8 <sup>MBER</sup>	240	218 <sup>MBER</sup>	8 <sup>MBER</sup>	
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	330	10 <sup>MBER</sup>	310	218 <sup>MBER</sup>	16 <sup>MBER</sup>	
<b>Total Metals</b>										
aluminum, total	7429-90-5	E420	3.0	µg/L	235	207	153	147	228	
antimony, total	7440-36-0	E420	0.10	µg/L	0.22	0.12	0.22	<0.10	0.11	
arsenic, total	7440-38-2	E420	0.10	µg/L	0.78	0.12	2.20	0.27	0.35	
barium, total	7440-39-3	E420	0.10	µg/L	19.8	28.8	15.2	32.2	19.2	
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100	
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	
boron, total	7440-42-8	E420	10	µg/L	<10	<10	11	10	<10	
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0264	0.0201	0.0152	0.0196	0.0153	
calcium, total	7440-70-2	E420	50	µg/L	12500	3790	13000	17000	10200	
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	<0.010	<0.010	0.012	<0.010	
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	0.60	0.30	0.93	0.25	0.34	
cobalt, total	7440-48-4	E420	0.10	µg/L	0.16	0.15	<0.10	0.37	0.39	
copper, total	7440-50-8	E420	0.50	µg/L	5.59	1.41	5.61	1.71	2.01	
iron, total	7439-89-6	E420	10	µg/L	410	143	407	1940	926	
lead, total	7439-92-1	E420	0.050	µg/L	0.452	0.149	0.346	0.267	0.372	
lithium, total	7439-93-2	E420	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
magnesium, total	7439-95-4	E420	5.0	µg/L	2800	1090	2300	3260	2150	
manganese, total	7439-96-5	E420	0.10	µg/L	16.6	16.5	11.3	337	78.4	
mercury, total	7439-97-6	E508	0.0050	µg/L	0.0055	<0.0050	<0.0050	<0.0050	0.0060	



## Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	UEL - 001	UEL - 002	UEL - 003	UEL - 004	UEL - 005
Client sampling date / time					30-Nov-2020 09:15	30-Nov-2020 10:15	30-Nov-2020 10:45	30-Nov-2020 11:15	30-Nov-2020 11:30	
Analyte	CAS Number	Method	LOR	Unit	VA20C2133-001	VA20C2133-002	VA20C2133-003	VA20C2133-004	VA20C2133-005	
					Result	Result	Result	Result	Result	
<b>Total Metals</b>										
molybdenum, total	7439-98-7	E420	0.050	µg/L	0.292	0.065	0.292	0.117	0.095	
nickel, total	7440-02-0	E420	0.50	µg/L	1.03	0.73	0.57	0.69	0.70	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	<50	<50	<50	<50	
potassium, total	7440-09-7	E420	50	µg/L	2210	779	1860	2080	1860	
rubidium, total	7440-17-7	E420	0.20	µg/L	1.19	1.05	1.42	2.04	2.06	
selenium, total	7782-49-2	E420	0.050	µg/L	0.088	<0.050	0.062	<0.050	0.097	
silicon, total	7440-21-3	E420	100	µg/L	7600	5760	5400	5710	4610	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
sodium, total	17341-25-2	E420	50	µg/L	10800	11800	10700	7870	7020	
strontium, total	7440-24-6	E420	0.20	µg/L	78.3	44.7	79.5	109	72.9	
sulfur, total	7704-34-9	E420	500	µg/L	3280	1230	2220	2010	1730	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
titanium, total	7440-32-6	E420	0.30	µg/L	6.13	2.66	5.45	4.23	<9.00 <sup>DLM</sup>	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
uranium, total	7440-61-1	E420	0.010	µg/L	0.091	<0.010	0.032	0.011	<0.010	
vanadium, total	7440-62-2	E420	0.50	µg/L	2.10	0.70	0.94	0.56	0.76	
zinc, total	7440-66-6	E420	3.0	µg/L	6.4	5.8	11.3	4.1	5.1	
zirconium, total	7440-67-7	E420	0.20	µg/L	0.23	<0.20	<0.20	<0.20	<0.20	

Please refer to the General Comments section for an explanation of any qualifiers detected.

## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA20C2133</b>	Page	: 1 of 11
Client	: <b>AECOM Canada Ltd.</b>	Laboratory	: Vancouver - Environmental
Contact	: Bruce Ford	Account Manager	: Dean Watt
Address	: 3292 Production Way Burnaby BC Canada V5A 4R4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 60639142-301	Date Samples Received	: 30-Nov-2020 13:10
PO	: ----	Issue Date	: 07-Dec-2020 16:38
C-O-C number	: ----		
Sampler	: M Heppner		
Site	: ----		
Quote number	: VA20-AECO100-0004		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

## Summary of Outliers

### **Outliers : Quality Control Samples**

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

### **Outliers : Frequency of Quality Control Samples**

- No Quality Control Sample Frequency Outliers occur.



RIGHT SOLUTIONS | RIGHT PARTNER



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL - 001	E235.NO3-L	30-Nov-2020	----	----	----		01-Dec-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL - 002	E235.NO3-L	30-Nov-2020	----	----	----		01-Dec-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL - 003	E235.NO3-L	30-Nov-2020	----	----	----		01-Dec-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL - 004	E235.NO3-L	30-Nov-2020	----	----	----		01-Dec-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL - 005	E235.NO3-L	30-Nov-2020	----	----	----		01-Dec-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL - 001	E235.NO2-L	30-Nov-2020	----	----	----		01-Dec-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL - 002	E235.NO2-L	30-Nov-2020	----	----	----		01-Dec-2020	3 days	1 days	✓



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL - 003	E235.NO2-L	30-Nov-2020	----	----	----		01-Dec-2020	3 days	1 days		✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL - 004	E235.NO2-L	30-Nov-2020	----	----	----		01-Dec-2020	3 days	1 days		✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL - 005	E235.NO2-L	30-Nov-2020	----	----	----		01-Dec-2020	3 days	1 days		✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL - 004	E012.EC	30-Nov-2020	----	----	----		30-Nov-2020	48 hrs	3 hrs		✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL - 005	E012.EC	30-Nov-2020	----	----	----		30-Nov-2020	48 hrs	3 hrs		✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL - 002	E012.EC	30-Nov-2020	----	----	----		30-Nov-2020	48 hrs	4 hrs		✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL - 003	E012.EC	30-Nov-2020	----	----	----		30-Nov-2020	48 hrs	4 hrs		✓
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL - 001	E012.EC	30-Nov-2020	----	----	----		30-Nov-2020	48 hrs	5 hrs		✓
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL - 004	E012.FC	30-Nov-2020	----	----	----		30-Nov-2020	30 hrs	3 hrs		✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL - 005	E012.FC	30-Nov-2020	----	----	----		30-Nov-2020	30 hrs	3 hrs	✔
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL - 002	E012.FC	30-Nov-2020	----	----	----		30-Nov-2020	30 hrs	4 hrs	✔
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL - 003	E012.FC	30-Nov-2020	----	----	----		30-Nov-2020	30 hrs	4 hrs	✔
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL - 001	E012.FC	30-Nov-2020	----	----	----		30-Nov-2020	30 hrs	5 hrs	✔
<b>Physical Tests : Conductivity in Water</b>										
<b>HDPE</b> UEL - 001	E100	30-Nov-2020	----	----	----		01-Dec-2020	28 days	1 days	✔
<b>Physical Tests : Conductivity in Water</b>										
<b>HDPE</b> UEL - 002	E100	30-Nov-2020	----	----	----		01-Dec-2020	28 days	1 days	✔
<b>Physical Tests : Conductivity in Water</b>										
<b>HDPE</b> UEL - 003	E100	30-Nov-2020	----	----	----		01-Dec-2020	28 days	1 days	✔
<b>Physical Tests : Conductivity in Water</b>										
<b>HDPE</b> UEL - 004	E100	30-Nov-2020	----	----	----		01-Dec-2020	28 days	1 days	✔
<b>Physical Tests : Conductivity in Water</b>										
<b>HDPE</b> UEL - 005	E100	30-Nov-2020	----	----	----		01-Dec-2020	28 days	1 days	✔



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval
<b>Physical Tests : pH by Meter</b>										
HDPE UEL - 004	E108	30-Nov-2020	----	----	----		01-Dec-2020	0.25 hrs	31 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL - 005	E108	30-Nov-2020	----	----	----		01-Dec-2020	0.25 hrs	31 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL - 002	E108	30-Nov-2020	----	----	----		01-Dec-2020	0.25 hrs	32 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL - 003	E108	30-Nov-2020	----	----	----		01-Dec-2020	0.25 hrs	32 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL - 001	E108	30-Nov-2020	----	----	----		01-Dec-2020	0.25 hrs	33 hrs	* EHTR-FM
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL - 001	E420.Cr-L	30-Nov-2020	----	----	----		01-Dec-2020	180 days	1 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL - 002	E420.Cr-L	30-Nov-2020	----	----	----		01-Dec-2020	180 days	1 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL - 003	E420.Cr-L	30-Nov-2020	----	----	----		01-Dec-2020	180 days	1 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL - 004	E420.Cr-L	30-Nov-2020	----	----	----		01-Dec-2020	180 days	1 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE total (nitric acid)</b> UEL - 005	E420.Cr-L	30-Nov-2020	----	----	----		01-Dec-2020	180 days	1 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL - 001	E508	30-Nov-2020	----	----	----		04-Dec-2020	28 days	4 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL - 002	E508	30-Nov-2020	----	----	----		04-Dec-2020	28 days	4 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL - 003	E508	30-Nov-2020	----	----	----		04-Dec-2020	28 days	4 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL - 004	E508	30-Nov-2020	----	----	----		04-Dec-2020	28 days	4 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL - 005	E508	30-Nov-2020	----	----	----		04-Dec-2020	28 days	4 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL - 001	E420	30-Nov-2020	----	----	----		01-Dec-2020	180 days	1 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL - 002	E420	30-Nov-2020	----	----	----		01-Dec-2020	180 days	1 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL - 003	E420	30-Nov-2020	----	----	----		01-Dec-2020	180 days	1 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL - 004	E420	30-Nov-2020	----	----	----		01-Dec-2020	180 days	1 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL - 005	E420	30-Nov-2020	----	----	----		01-Dec-2020	180 days	1 days	✔

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Conductivity in Water	E100	124618	1	16	6.2	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	124282	1	8	12.5	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	124571	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	124572	1	17	5.8	5.0	✓
pH by Meter	E108	124617	1	16	6.2	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	124281	1	9	11.1	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	124334	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	126118	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	124333	1	19	5.2	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Conductivity in Water	E100	124618	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	124571	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	124572	1	17	5.8	5.0	✓
pH by Meter	E108	124617	1	16	6.2	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	124334	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	126118	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	124333	1	19	5.2	5.0	✓
<b>Method Blanks (MB)</b>							
Conductivity in Water	E100	124618	1	16	6.2	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	124282	1	8	12.5	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	124571	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	124572	1	17	5.8	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	124281	1	9	11.1	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	124334	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	126118	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	124333	1	19	5.2	5.0	✓
<b>Matrix Spikes (MS)</b>							
Nitrate in Water by IC (Low Level)	E235.NO3-L	124571	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	124572	1	17	5.8	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	124334	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	126118	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	124333	1	19	5.2	5.0	✓





## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-NA-MUG)	E012.EC  Vancouver - Environmental	Water	APHA 9222I (mod)	Positive Total or Thermotolerant Coliform filters are transferred to NA-MUG and incubated at 35.0 ±0.5°C for 4 hours. Colonies exhibiting fluorescence are enumerated.
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC  Vancouver - Environmental	Water	APHA 9222 D (mod)	Following filtration (0.45 µm), and incubation at 45.5 ±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
Conductivity in Water	E100  Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108  Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Nitrite in Water by IC (Low Level)	E235.NO2-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS



<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N  Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).



## QUALITY CONTROL REPORT

Work Order : **VA20C2133**

Page : 1 of 10

Client : AECOM Canada Ltd.  
 Contact : Bruce Ford  
 Address : 3292 Production Way  
 Burnaby BC Canada V5A 4R4  
 Telephone : ----  
 Project : 60639142-301  
 PO : ----  
 C-O-C number : ----  
 Sampler : M Heppner  
 Site : ----  
 Quote number : VA20-AECO100-0004  
 No. of samples received : 5  
 No. of samples analysed : 5

Laboratory : Vancouver - Environmental  
 Account Manager : Dean Watt  
 Address : 8081 Lougheed Highway  
 Burnaby, British Columbia Canada V5A 1W9  
 Telephone : +1 604 253 4188  
 Date Samples Received : 30-Nov-2020 13:10  
 Date Analysis Commenced : 30-Nov-2020  
 Issue Date : 07-Dec-2020 16:38

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

### Signatories

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

Signatories	Position	Laboratory Department
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Microbiology, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

Page : 2 of 10  
Work Order : VA20C2133  
Client : AECOM Canada Ltd.  
Project : 60639142-301

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## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.



### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 124617)</b>											
VA20C2146-003	Anonymous	pH	----	E108	0.10	pH units	8.24	8.24	0.00%	4%	----
<b>Physical Tests (QC Lot: 124618)</b>											
VA20C2146-003	Anonymous	conductivity	----	E100	2.0	µS/cm	411	411	0.00%	10%	----
<b>Anions and Nutrients (QC Lot: 124571)</b>											
VA20C2146-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0058	0.0052	0.0006	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 124572)</b>											
VA20C2146-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 124281)</b>											
VA20C2133-002	UEL - 002	coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	10	6	50.0%	65%	----
<b>Bacteriological Tests (QC Lot: 124282)</b>											
VA20C2133-002	UEL - 002	coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	8	6	28.6%	65%	----
<b>Total Metals (QC Lot: 124333)</b>											
VA20C2022-001	Anonymous	aluminum, total	7429-90-5	E420	6.00	mg/L	2060 µg/L	2.05	0.434%	20%	----
		antimony, total	7440-36-0	E420	0.200	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.200	mg/L	0.56 µg/L	0.00052	0.00004	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.200	mg/L	11.8 µg/L	0.0118	0.133%	20%	----
		beryllium, total	7440-41-7	E420	0.200	mg/L	<0.200 µg/L	<0.000200	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.100	mg/L	<0.100 µg/L	<0.000100	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	20.0	mg/L	1550 µg/L	1.58	1.56%	20%	----
		cadmium, total	7440-43-9	E420	0.0100	mg/L	0.134 µg/L	0.000117	13.5%	20%	----
		calcium, total	7440-70-2	E420	100	mg/L	20500 µg/L	20.5	0.241%	20%	----
		cesium, total	7440-46-2	E420	0.0200	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.200	mg/L	9.03 µg/L	0.00896	0.757%	20%	----
		copper, total	7440-50-8	E420	1.00	mg/L	59.5 µg/L	0.0593	0.276%	20%	----
		iron, total	7439-89-6	E420	20.0	mg/L	1960 µg/L	1.92	1.90%	20%	----
		lead, total	7439-92-1	E420	0.100	mg/L	0.713 µg/L	0.000726	0.000014	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	2.00	mg/L	3.5 µg/L	0.0035	0.000001	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	10.0	mg/L	6820 µg/L	6.72	1.50%	20%	----
		manganese, total	7439-96-5	E420	0.200	mg/L	35.9 µg/L	0.0354	1.47%	20%	----
		molybdenum, total	7439-98-7	E420	0.100	mg/L	26.2 µg/L	0.0255	2.70%	20%	----
		nickel, total	7440-02-0	E420	1.00	mg/L	186 µg/L	0.183	1.24%	20%	----



Sub-Matrix: **Water** *Laboratory Duplicate (DUP) Report*

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 124333) - continued</b>											
VA20C2022-001	Anonymous	phosphorus, total	7723-14-0	E420	100	mg/L	537 µg/L	0.505	0.032	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	100	mg/L	1850 µg/L	1.85	0.320%	20%	----
		rubidium, total	7440-17-7	E420	0.400	mg/L	0.66 µg/L	0.00068	0.00002	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.100	mg/L	<0.100 µg/L	0.000122	0.000022	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	200	mg/L	6800 µg/L	6.94	2.02%	20%	----
		silver, total	7440-22-4	E420	0.0200	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	100	mg/L	514000 µg/L	508	1.19%	20%	----
		strontium, total	7440-24-6	E420	0.400	mg/L	184 µg/L	0.184	0.108%	20%	----
		sulfur, total	7704-34-9	E420	1000	mg/L	108000 µg/L	109	0.832%	20%	----
		tellurium, total	13494-80-9	E420	0.400	mg/L	<0.40 µg/L	<0.00040	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.0200	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.200	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.200	mg/L	0.42 µg/L	0.00042	0.000001	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.600	mg/L	1.74 µg/L	0.00183	0.00009	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.200	mg/L	1.30 µg/L	0.00132	0.00002	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.0200	mg/L	0.518 µg/L	0.000533	2.84%	20%	----
		vanadium, total	7440-62-2	E420	1.00	mg/L	3.77 µg/L	0.00368	0.00010	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	6.00	mg/L	33.7 µg/L	0.0347	0.0010	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.400	mg/L	<0.40 µg/L	<0.00040	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 124334)</b>											
VA20C2022-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.200	mg/L	389 µg/L	0.368	5.52%	20%	----
<b>Total Metals (QC Lot: 126118)</b>											
VA20C2133-001	UEL - 001	mercury, total	7439-97-6	E508	0.00500	mg/L	0.0055 µg/L	0.0000078	0.0000024	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

### Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 124618)</b>						
conductivity	----	E100	1	µS/cm	1.3	----
<b>Anions and Nutrients (QCLot: 124571)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 124572)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Bacteriological Tests (QCLot: 124281)</b>						
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 124282)</b>						
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----
<b>Total Metals (QCLot: 124333)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 124333) - continued</b>						
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 124334)</b>						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
<b>Total Metals (QCLot: 126118)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----





## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 124617)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 124618)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 124571)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
<b>Anions and Nutrients (QCLot: 124572)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.3	90.0	110	----
<b>Total Metals (QCLot: 124333)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	102	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	99.3	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	100.0	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	101	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	96.8	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	96.4	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	97.9	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	95.8	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	100	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	98.9	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	99.8	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	95.4	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	103	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	101	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	97.0	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	98.0	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	110	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	102	80.0	120	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 124333) - continued</b>									
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	95.2	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	95.9	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	92.4	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	93.7	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	102	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	89.6	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	94.5	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	98.9	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	94.9	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	97.7	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	102	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	94.4	80.0	120	----
<b>Total Metals (QCLot: 124334)</b>									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
<b>Total Metals (QCLot: 126118)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	97.4	80.0	120	----



### Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 124571)</b>										
VA20C2146-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.40 mg/L	2.5 mg/L	96.0	75.0	125	----
<b>Anions and Nutrients (QCLot: 124572)</b>										
VA20C2146-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.463 mg/L	0.5 mg/L	92.5	75.0	125	----
<b>Total Metals (QCLot: 124333)</b>										
VA20C2053-001	Anonymous	aluminum, total	7429-90-5	E420	0.187 mg/L	0.2 mg/L	93.4	70.0	130	----
		antimony, total	7440-36-0	E420	0.0193 mg/L	0.02 mg/L	96.6	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0184 mg/L	0.02 mg/L	91.8	70.0	130	----
		barium, total	7440-39-3	E420	0.0183 mg/L	0.02 mg/L	91.7	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0379 mg/L	0.04 mg/L	94.6	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00871 mg/L	0.01 mg/L	87.1	70.0	130	----
		boron, total	7440-42-8	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00384 mg/L	0.004 mg/L	96.0	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00930 mg/L	0.01 mg/L	93.0	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0189 mg/L	0.02 mg/L	94.5	70.0	130	----
		copper, total	7440-50-8	E420	0.0181 mg/L	0.02 mg/L	90.4	70.0	130	----
		iron, total	7439-89-6	E420	1.88 mg/L	2 mg/L	94.0	70.0	130	----
		lead, total	7439-92-1	E420	0.0177 mg/L	0.02 mg/L	88.4	70.0	130	----
		lithium, total	7439-93-2	E420	0.0898 mg/L	0.1 mg/L	89.8	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0191 mg/L	0.02 mg/L	95.7	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0203 mg/L	0.02 mg/L	101	70.0	130	----
		nickel, total	7440-02-0	E420	0.0373 mg/L	0.04 mg/L	93.4	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.32 mg/L	10 mg/L	93.2	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0191 mg/L	0.02 mg/L	95.3	70.0	130	----
		selenium, total	7782-49-2	E420	0.0396 mg/L	0.04 mg/L	99.0	70.0	130	----
		silicon, total	7440-21-3	E420	9.18 mg/L	10 mg/L	91.8	70.0	130	----
		silver, total	7440-22-4	E420	0.00360 mg/L	0.004 mg/L	90.1	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
<b>Total Metals (QCLot: 124333) - continued</b>										
VA20C2053-001	Anonymous	sulfur, total	7704-34-9	E420	19.3 mg/L	20 mg/L	96.4	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0372 mg/L	0.04 mg/L	92.9	70.0	130	----
		thallium, total	7440-28-0	E420	0.00344 mg/L	0.004 mg/L	86.1	70.0	130	----
		thorium, total	7440-29-1	E420	0.0194 mg/L	0.02 mg/L	97.0	70.0	130	----
		tin, total	7440-31-5	E420	0.0194 mg/L	0.02 mg/L	97.2	70.0	130	----
		titanium, total	7440-32-6	E420	0.0402 mg/L	0.04 mg/L	100	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0187 mg/L	0.02 mg/L	93.6	70.0	130	----
		uranium, total	7440-61-1	E420	0.00365 mg/L	0.004 mg/L	91.2	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0966 mg/L	0.1 mg/L	96.6	70.0	130	----
		zinc, total	7440-66-6	E420	0.387 mg/L	0.4 mg/L	96.9	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0416 mg/L	0.04 mg/L	104	70.0	130	----
<b>Total Metals (QCLot: 124334)</b>										
VA20C2053-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0380 mg/L	0.04 mg/L	95.0	70.0	130	----
<b>Total Metals (QCLot: 126118)</b>										
VA20C2133-002	UEL - 002	mercury, total	7439-97-6	E508	0.0000968 mg/L	0.0001 mg/L	96.8	70.0	130	----

<b>Report To</b> Contact and company name below will appear on the final report Company: <b>AECOM Canada</b> Contact: <b>Marcissa Heppner</b> Phone: _____ Company address below will appear on the final report Street: <b>3892 Production Way</b> City/Province: <b>Burnaby BC</b> Postal Code: <b>V2A 4R4</b>		<b>Report Format / Distribution</b> Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DISTAL) Quality Control (QC) Report with Report <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX	
<b>Invoice To</b> Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Copy of Invoices with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<b>Invoice Distribution</b> Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX	
<b>Company:</b> <b>AECOM Canada</b> <b>Contact:</b> <b>Marcissa Heppner</b>		<b>Email 1 or Fax:</b> <b>marcissa.heppner@aecom.com</b> <b>Email 2:</b> <b>marcissa.heppner@aecom.com</b> <b>Email 3:</b> _____	
<b>ALS Account # / Quote #:</b> <b>VA220 - AECOM - 004</b>		<b>AFECost Center:</b> _____ <b>Region/Inflor Code:</b> _____ <b>Routing Code:</b> _____	
<b>Job #:</b> <b>60639142 - 301</b>		<b>Requestioner:</b> _____ <b>Location:</b> _____	
<b>PO/A/E:</b> _____		<b>ALS Contact:</b> <b>Dean Watt</b> <b>SASMEAN TATANA</b>	
<b>ALS Lab Work Order # (lab use only):</b> _____		<b>Sample Identification and/or Coordinates</b> (This description will appear on the report)	
<b>ALS Sample # (lab use only)</b>		<b>Date</b> (dd-mm-yy)	
<b>Sample Identification and/or Coordinates</b>		<b>Time</b> (hh:mm)	
<b>Sample Type</b>		<b>NUMBER OF CONTAINERS</b>	
<b>VEL-001</b>		<b>9:15</b> <b>Water</b>	
<b>VEL-002</b>		<b>10:15</b>	
<b>VEL-003</b>		<b>10:45</b>	
<b>VEL-004</b>		<b>11:15</b>	
<b>VEL-005</b>		<b>11:30</b>	
<b>VEL-006</b>		<b>11:30</b>	
<b>VEL-007</b>		<b>11:30</b>	
<b>VEL-008</b>		<b>11:30</b>	
<b>VEL-009</b>		<b>11:30</b>	
<b>VEL-010</b>		<b>11:30</b>	
<b>VEL-011</b>		<b>11:30</b>	
<b>VEL-012</b>		<b>11:30</b>	
<b>VEL-013</b>		<b>11:30</b>	
<b>VEL-014</b>		<b>11:30</b>	
<b>VEL-015</b>		<b>11:30</b>	
<b>VEL-016</b>		<b>11:30</b>	
<b>VEL-017</b>		<b>11:30</b>	
<b>VEL-018</b>		<b>11:30</b>	
<b>VEL-019</b>		<b>11:30</b>	
<b>VEL-020</b>		<b>11:30</b>	
<b>VEL-021</b>		<b>11:30</b>	
<b>VEL-022</b>		<b>11:30</b>	
<b>VEL-023</b>		<b>11:30</b>	
<b>VEL-024</b>		<b>11:30</b>	
<b>VEL-025</b>		<b>11:30</b>	
<b>VEL-026</b>		<b>11:30</b>	
<b>VEL-027</b>		<b>11:30</b>	
<b>VEL-028</b>		<b>11:30</b>	
<b>VEL-029</b>		<b>11:30</b>	
<b>VEL-030</b>		<b>11:30</b>	
<b>VEL-031</b>		<b>11:30</b>	
<b>VEL-032</b>		<b>11:30</b>	
<b>VEL-033</b>		<b>11:30</b>	
<b>VEL-034</b>		<b>11:30</b>	
<b>VEL-035</b>		<b>11:30</b>	
<b>VEL-036</b>		<b>11:30</b>	
<b>VEL-037</b>		<b>11:30</b>	
<b>VEL-038</b>		<b>11:30</b>	
<b>VEL-039</b>		<b>11:30</b>	
<b>VEL-040</b>		<b>11:30</b>	
<b>VEL-041</b>		<b>11:30</b>	
<b>VEL-042</b>		<b>11:30</b>	
<b>VEL-043</b>		<b>11:30</b>	
<b>VEL-044</b>		<b>11:30</b>	
<b>VEL-045</b>		<b>11:30</b>	
<b>VEL-046</b>		<b>11:30</b>	
<b>VEL-047</b>		<b>11:30</b>	
<b>VEL-048</b>		<b>11:30</b>	
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<b>VEL-080</b>		<b>11:30</b>	
<b>VEL-081</b>		<b>11:30</b>	
<b>VEL-082</b>		<b>11:30</b>	
<b>VEL-083</b>		<b>11:30</b>	
<b>VEL-084</b>		<b>11:30</b>	
<b>VEL-085</b>		<b>11:30</b>	
<b>VEL-086</b>		<b>11:30</b>	
<b>VEL-087</b>		<b>11:30</b>	
<b>VEL-088</b>		<b>11:30</b>	
<b>VEL-089</b>		<b>11:30</b>	
<b>VEL-090</b>		<b>11:30</b>	
<b>VEL-091</b>		<b>11:30</b>	
<b>VEL-092</b>		<b>11:30</b>	
<b>VEL-093</b>		<b>11:30</b>	
<b>VEL-094</b>		<b>11:30</b>	
<b>VEL-095</b>		<b>11:30</b>	
<b>VEL-096</b>		<b>11:30</b>	
<b>VEL-097</b>		<b>11:30</b>	
<b>VEL-098</b>		<b>11:30</b>	
<b>VEL-099</b>		<b>11:30</b>	
<b>VEL-100</b>		<b>11:30</b>	

Drinking Water (DW) Samples (client use)  
 Are samples taken from a Regulated DW System?  YES  NO  
 Are samples for human consumption/use?  YES  NO

Telephone: +1 604 253 4188

SHIPMENT RELEASE (client use)  
 Released by: **M Heppner** Date: **Nov 30, 2020** Time: **12:30**

INITIAL SHIPMENT RECEPTION (lab use only)  
 Received by: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

FINAL SHIPMENT RECEPTION (lab use only)  
 Received by: **TK** Date: **30/11/20** Time: **010 Am**

WHITE - LABORATORY COPY YELLOW - CLIENT COPY



**SAMPLES ON HOLD**  
 SUSPECTED HAZARD (see Special Instructions)

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



# BC and YUKON Drinking Water Declaration Form

In British Columbia, the Drinking Water Protection Act requires laboratories to immediately report positive results for Fecal Coliform and Escherichia coli in drinking water samples directly to the Water Supplier, the Drinking Water Officer, and the Medical Health Officer in the region the water samples were taken. Immediate reporting is not required if the sample is water for which a public advisory to boil for drinking water has been issued, or if the sample is not a drinking water.

In Yukon Territories, the Public Health and Safety Act requires the laboratory to immediately report any results that exceeds the acceptable concentration for any health-related parameter set out in the Guidelines for Canadian Drinking Water Quality to Environmental Health Services.

Water Suppliers are required by the Act to ensure the laboratory conducting the testing is aware of the applicable standards.

**Please submit this completed form and an ALS Chain of Custody with your sample.**

1. Are your samples currently used for human consumption in BC or the Yukon?

YES  NO

If you selected YES, proceed to #2. If you selected NO, proceed to #5.

2. Are your samples from a water supply system that either:

a) serves more than 1 single family residence in BC, or

YES  NO

b) serves more than 15 connections, or is trucked to more than 5 sites in the Yukon Territory

YES  NO

If you selected YES to either a) or b), proceed to #3. If you selected NO, proceed to #5.

3. Is your water supply under a boil water advisory?

YES  NO

If you selected NO, proceed to #4. If you selected YES, proceed to #5.

4. Please indicate (✓) which Health Authority Region your samples were collected in, and provide the contact details for the applicable Drinking Water and Medical Health Officers:

- Northern
- Interior
- Vancouver Island
- Vancouver Coastal
- Fraser
- Yukon

Water Supplier Name	Phone & Email
Drinking Water Officer:	Phone:
Medical Health Officer:	Phone:

5. Name of Sampler: Marissa Heppner

Phone: 604 353 2974

Released by (signature): [Signature]

Date: Nov 30 2020

ALS Vancouver can receive samples Monday to Friday (24 hours) and Saturday and Sunday (8:00am to 4:00pm). Please contact ALS for testing limitations around statutory holidays.



## CERTIFICATE OF ANALYSIS

**Work Order** : **VA20C2933**  
**Client** : **AECOM Canada Ltd.**  
**Contact** : Bruce Ford  
**Address** : 3292 Production Way  
Burnaby BC Canada V5A 4R4  
**Telephone** : ----  
**Project** : 60639142-301  
**PO** : ----  
**C-O-C number** : 17-862433  
**Sampler** : Brad Stuckless  
**Site** : ----  
**Quote number** : VA20-AECO100-0004  
**No. of samples received** : 6  
**No. of samples analysed** : 6

**Page** : 1 of 6  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Dean Watt  
**Address** : 8081 Lougheed Highway  
Burnaby BC Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 09-Dec-2020 14:50  
**Date Analysis Commenced** : 09-Dec-2020  
**Issue Date** : 16-Dec-2020 17:50

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Caitlin Macey	Team Leader - Inorganics	Microbiology, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior 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.

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).





## Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Client sampling date / time					09-Dec-2020 10:25	09-Dec-2020 10:43	09-Dec-2020 11:07	09-Dec-2020 11:56	09-Dec-2020 12:48
Analyte	CAS Number	Method	LOR	Unit	VA20C2933-001	VA20C2933-002	VA20C2933-003	VA20C2933-004	VA20C2933-005
					Result	Result	Result	Result	Result
<b>Physical Tests</b>									
conductivity	----	E100	2.0	µS/cm	140	80.5	152	143	116
hardness (as CaCO <sub>3</sub> ), from total Ca/Mg	----	EC100A	600	µg/L	38500	14900	45400	46800	33700
pH	----	E108	0.10	pH units	7.45	6.63	7.69	7.03	7.30
<b>Anions and Nutrients</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	1.79	2.72	0.830	1.02	0.524
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	1.79	2.72	0.834	1.02	0.526
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0067	<0.0010	0.0034	0.0029	0.0017
<b>Bacteriological Tests</b>									
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	2040	7	170	10	82
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	2040	9	174	50	138
<b>Total Metals</b>									
aluminum, total	7429-90-5	E420	3.0	µg/L	320	371	602	98.3	149
antimony, total	7440-36-0	E420	0.10	µg/L	0.24	0.12	0.24	0.16	0.11
arsenic, total	7440-38-2	E420	0.10	µg/L	0.56	0.16	1.02	0.22	0.25
barium, total	7440-39-3	E420	0.10	µg/L	20.3	29.6	20.1	29.7	18.8
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	<0.050	0.063	<0.050	<0.050
boron, total	7440-42-8	E420	10	µg/L	<10	<10	14	11	<10
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0251	0.0272	0.0191	0.0190	0.0094
calcium, total	7440-70-2	E420	50	µg/L	11500	4130	14000	14600	10100
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	0.010	0.022	<0.010	<0.010
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	0.46	0.32	0.82	0.24	0.25
cobalt, total	7440-48-4	E420	0.10	µg/L	0.16	0.26	0.21	0.28	0.16
copper, total	7440-50-8	E420	0.50	µg/L	3.51	1.59	5.74	1.97	1.96
iron, total	7439-89-6	E420	10	µg/L	302	232	910	1260	810
lead, total	7439-92-1	E420	0.050	µg/L	0.403	0.345	0.458	0.142	0.248
lithium, total	7439-93-2	E420	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
magnesium, total	7439-95-4	E420	5.0	µg/L	2360	1110	2510	2510	2060
manganese, total	7439-96-5	E420	0.10	µg/L	16.6	25.8	17.1	184	49.3
mercury, total	7439-97-6	E508	0.0050	µg/L	0.0076	<0.0050	0.0052	0.0058	<0.0050



## Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Client sampling date / time					09-Dec-2020 10:25	09-Dec-2020 10:43	09-Dec-2020 11:07	09-Dec-2020 11:56	09-Dec-2020 12:48
Analyte	CAS Number	Method	LOR	Unit	VA20C2933-001	VA20C2933-002	VA20C2933-003	VA20C2933-004	VA20C2933-005
					Result	Result	Result	Result	Result
<b>Total Metals</b>									
molybdenum, total	7439-98-7	E420	0.050	µg/L	0.334	0.054	0.337	0.166	0.091
nickel, total	7440-02-0	E420	0.50	µg/L	1.07	0.86	1.13	0.74	0.65
phosphorus, total	7723-14-0	E420	50	µg/L	<50	<50	<50	<50	<50
potassium, total	7440-09-7	E420	50	µg/L	2120	754	2210	2600	1980
rubidium, total	7440-17-7	E420	0.20	µg/L	1.29	1.16	1.98	2.08	2.01
selenium, total	7782-49-2	E420	0.050	µg/L	0.086	<0.050	0.064	<0.050	0.081
silicon, total	7440-21-3	E420	100	µg/L	6810	5870	6310	5000	4040
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
sodium, total	17341-25-2	E420	50	µg/L	10600	8170	10500	7750	8070
strontium, total	7440-24-6	E420	0.20	µg/L	72.1	47.4	88.1	88.7	73.4
sulfur, total	7704-34-9	E420	500	µg/L	3390	1650	2290	2970	1140
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
titanium, total	7440-32-6	E420	0.30	µg/L	5.52	6.77	22.6	2.67 <sup>DLM</sup>	4.08
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
uranium, total	7440-61-1	E420	0.010	µg/L	0.081	<0.010	0.050	0.013	<0.010
vanadium, total	7440-62-2	E420	0.50	µg/L	1.91	0.96	1.63	<0.50	0.55
zinc, total	7440-66-6	E420	3.0	µg/L	7.2	6.4	10.7	4.0	3.8
zirconium, total	7440-67-7	E420	0.20	µg/L	0.28	<0.20	0.49	<0.20	<0.20

Please refer to the General Comments section for an explanation of any qualifiers detected.



## Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					Blank	----	----	----	----	
					Client sampling date / time	09-Dec-2020 13:09	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20C2933-006	-----	-----	-----	-----	
					Result	---	---	---	---	
<b>Physical Tests</b>										
conductivity	----	E100	2.0	µS/cm	<2.0	----	----	----	----	
hardness (as CaCO3), from total Ca/Mg	----	EC100A	600	µg/L	<600	----	----	----	----	
pH	----	E108	0.10	pH units	5.45	----	----	----	----	
<b>Anions and Nutrients</b>										
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	----	----	----	----	
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	<0.0051	----	----	----	----	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	----	----	----	----	
<b>Bacteriological Tests</b>										
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----	----	----	----	
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----	----	----	----	
<b>Total Metals</b>										
aluminum, total	7429-90-5	E420	3.0	µg/L	<3.0	----	----	----	----	
antimony, total	7440-36-0	E420	0.10	µg/L	<0.10	----	----	----	----	
arsenic, total	7440-38-2	E420	0.10	µg/L	<0.10	----	----	----	----	
barium, total	7440-39-3	E420	0.10	µg/L	<0.10	----	----	----	----	
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	----	----	----	----	
bismuth, total	7440-69-9	E420	0.050	µg/L	<0.050	----	----	----	----	
boron, total	7440-42-8	E420	10	µg/L	<10	----	----	----	----	
cadmium, total	7440-43-9	E420	0.0050	µg/L	<0.0050	----	----	----	----	
calcium, total	7440-70-2	E420	50	µg/L	<50	----	----	----	----	
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	----	----	----	----	
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	<0.10	----	----	----	----	
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	----	----	----	----	
copper, total	7440-50-8	E420	0.50	µg/L	<0.50	----	----	----	----	
iron, total	7439-89-6	E420	10	µg/L	<10	----	----	----	----	
lead, total	7439-92-1	E420	0.050	µg/L	<0.050	----	----	----	----	
lithium, total	7439-93-2	E420	1.0	µg/L	<1.0	----	----	----	----	
magnesium, total	7439-95-4	E420	5.0	µg/L	<5.0	----	----	----	----	
manganese, total	7439-96-5	E420	0.10	µg/L	<0.10	----	----	----	----	
mercury, total	7439-97-6	E508	0.0050	µg/L	<0.0050	----	----	----	----	
molybdenum, total	7439-98-7	E420	0.050	µg/L	<0.050	----	----	----	----	



## Analytical Results

Sub-Matrix: Water					Client sample ID	Blank	----	----	----	----
(Matrix: Water)					Client sampling date / time	09-Dec-2020 13:09	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20C2933-006	-----	-----	-----	-----	
					Result	---	---	---	---	
<b>Total Metals</b>										
nickel, total	7440-02-0	E420	0.50	µg/L	<0.50	----	----	----	----	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	----	----	----	----	
potassium, total	7440-09-7	E420	50	µg/L	<50	----	----	----	----	
rubidium, total	7440-17-7	E420	0.20	µg/L	<0.20	----	----	----	----	
selenium, total	7782-49-2	E420	0.050	µg/L	<0.050	----	----	----	----	
silicon, total	7440-21-3	E420	100	µg/L	<100	----	----	----	----	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	----	----	----	----	
sodium, total	17341-25-2	E420	50	µg/L	<50	----	----	----	----	
strontium, total	7440-24-6	E420	0.20	µg/L	<0.20	----	----	----	----	
sulfur, total	7704-34-9	E420	500	µg/L	<500	----	----	----	----	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	----	----	----	----	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	----	----	----	----	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	----	----	----	----	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	----	----	----	----	
titanium, total	7440-32-6	E420	0.30	µg/L	<0.30	----	----	----	----	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	----	----	----	----	
uranium, total	7440-61-1	E420	0.010	µg/L	<0.010	----	----	----	----	
vanadium, total	7440-62-2	E420	0.50	µg/L	<0.50	----	----	----	----	
zinc, total	7440-66-6	E420	3.0	µg/L	<3.0	----	----	----	----	
zirconium, total	7440-67-7	E420	0.20	µg/L	<0.20	----	----	----	----	

Please refer to the General Comments section for an explanation of any qualifiers detected.

## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA20C2933</b>	Page	: 1 of 13
Client	: <b>AECOM Canada Ltd.</b>	Laboratory	: Vancouver - Environmental
Contact	: Bruce Ford	Account Manager	: Dean Watt
Address	: 3292 Production Way Burnaby BC Canada V5A 4R4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 60639142-301	Date Samples Received	: 09-Dec-2020 14:50
PO	: ----	Issue Date	: 16-Dec-2020 17:50
C-O-C number	: 17-862433		
Sampler	: Brad Stuckless		
Site	: ----		
Quote number	: VA20-AECO100-0004		
No. of samples received	: 6		
No. of samples analysed	: 6		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

## Summary of Outliers

### **Outliers : Quality Control Samples**

- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

### **Outliers : Frequency of Quality Control Samples**

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.





**Outliers : Quality Control Samples**

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
<b>Method Blank (MB) Values</b>								
Total Metals	QC-MRG2-1285180 01	----	magnesium, total	7439-95-4	E420	0.0052 <sup>B</sup> mg/L	0.005 mg/L	Blank result exceeds permitted value

**Result Qualifiers**

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.

<b>Laboratory Control Sample (LCS) Recoveries</b>								
Total Metals	QC-MRG2-1285180 02	----	boron, total	7440-42-8	E420	122 % <sup>MES</sup>	80.0-120%	Recovery greater than upper control limit

**Result Qualifiers**

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE Blank	E235.NO3-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-005	E235.NO3-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	0 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-001	E235.NO3-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO3-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-003	E235.NO3-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>										
HDPE UEL-004	E235.NO3-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	1 days	✓
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE Blank	E235.NO2-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	0 days	✓





Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-005	E235.NO2-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	0 days	✔
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-001	E235.NO2-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	1 days	✔
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-002	E235.NO2-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	1 days	✔
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-003	E235.NO2-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	1 days	✔
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>										
HDPE UEL-004	E235.NO2-L	09-Dec-2020	----	----	----		10-Dec-2020	3 days	1 days	✔
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> Blank	E012.EC	09-Dec-2020	----	----	----		09-Dec-2020	48 hrs	3 hrs	✔
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.EC	09-Dec-2020	----	----	----		09-Dec-2020	48 hrs	3 hrs	✔
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.EC	09-Dec-2020	----	----	----		09-Dec-2020	48 hrs	4 hrs	✔
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>										
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.EC	09-Dec-2020	----	----	----		09-Dec-2020	48 hrs	5 hrs	✔



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.EC	09-Dec-2020	----	----	----		09-Dec-2020	48 hrs	5 hrs	✔	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.EC	09-Dec-2020	----	----	----		09-Dec-2020	48 hrs	6 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> Blank	E012.FC	09-Dec-2020	----	----	----		09-Dec-2020	30 hrs	3 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.FC	09-Dec-2020	----	----	----		09-Dec-2020	30 hrs	3 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.FC	09-Dec-2020	----	----	----		09-Dec-2020	30 hrs	4 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.FC	09-Dec-2020	----	----	----		09-Dec-2020	30 hrs	5 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.FC	09-Dec-2020	----	----	----		09-Dec-2020	30 hrs	5 hrs	✔	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.FC	09-Dec-2020	----	----	----		09-Dec-2020	30 hrs	6 hrs	✔	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> Blank	E100	09-Dec-2020	----	----	----		11-Dec-2020	28 days	1 days	✔	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
Rec	Actual	Rec		Actual						
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-001	E100	09-Dec-2020	----	----	----		11-Dec-2020	28 days	1 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-002	E100	09-Dec-2020	----	----	----		11-Dec-2020	28 days	1 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-003	E100	09-Dec-2020	----	----	----		11-Dec-2020	28 days	1 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-004	E100	09-Dec-2020	----	----	----		11-Dec-2020	28 days	1 days	✓
<b>Physical Tests : Conductivity in Water</b>										
HDPE UEL-005	E100	09-Dec-2020	----	----	----		11-Dec-2020	28 days	1 days	✓
<b>Physical Tests : pH by Meter</b>										
HDPE Blank	E108	09-Dec-2020	----	----	----		11-Dec-2020	0.25 hrs	43 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-005	E108	09-Dec-2020	----	----	----		11-Dec-2020	0.25 hrs	43 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-004	E108	09-Dec-2020	----	----	----		11-Dec-2020	0.25 hrs	44 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-002	E108	09-Dec-2020	----	----	----		11-Dec-2020	0.25 hrs	45 hrs	* EHTR-FM



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-003	E108	09-Dec-2020	----	----	----		11-Dec-2020	0.25 hrs	45 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-001	E108	09-Dec-2020	----	----	----		11-Dec-2020	0.25 hrs	46 hrs	* EHTR-FM
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) Blank	E420.Cr-L	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL-001	E420.Cr-L	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL-002	E420.Cr-L	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL-003	E420.Cr-L	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL-004	E420.Cr-L	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL-005	E420.Cr-L	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✓
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
Glass vial total (hydrochloric acid) Blank	E508	09-Dec-2020	----	----	----		11-Dec-2020	28 days	2 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
<b>Glass vial total (hydrochloric acid)</b> UEL-001	E508	09-Dec-2020	----	----	----		11-Dec-2020	28 days	2 days	✔
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
<b>Glass vial total (hydrochloric acid)</b> UEL-002	E508	09-Dec-2020	----	----	----		11-Dec-2020	28 days	2 days	✔
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
<b>Glass vial total (hydrochloric acid)</b> UEL-003	E508	09-Dec-2020	----	----	----		11-Dec-2020	28 days	2 days	✔
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
<b>Glass vial total (hydrochloric acid)</b> UEL-004	E508	09-Dec-2020	----	----	----		11-Dec-2020	28 days	2 days	✔
<b>Total Metals : Total Mercury in Water by CVAAS</b>										
<b>Glass vial total (hydrochloric acid)</b> UEL-005	E508	09-Dec-2020	----	----	----		11-Dec-2020	28 days	2 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> Blank	E420	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL-001	E420	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL-002	E420	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL-003	E420	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✔



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL-004	E420	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL-005	E420	09-Dec-2020	----	----	----		10-Dec-2020	180 days	1 days	✔

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Conductivity in Water	E100	129041	1	8	12.5	5.0	✔
E. coli (MF-NA-MUG)	E012.EC	128411	2	14	14.2	10.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	128638	1	17	5.8	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	128641	1	9	11.1	5.0	✔
pH by Meter	E108	129040	1	8	12.5	5.0	✔
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	128413	1	14	7.1	10.0	✖
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	128518	1	14	7.1	5.0	✔
Total Mercury in Water by CVAAS	E508	129480	1	20	5.0	5.0	✔
Total Metals in Water by CRC ICPMS	E420	128519	1	20	5.0	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
Conductivity in Water	E100	129041	1	8	12.5	5.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	128638	1	17	5.8	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	128641	1	9	11.1	5.0	✔
pH by Meter	E108	129040	1	8	12.5	5.0	✔
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	128518	1	14	7.1	5.0	✔
Total Mercury in Water by CVAAS	E508	129480	1	20	5.0	5.0	✔
Total Metals in Water by CRC ICPMS	E420	128519	1	20	5.0	5.0	✔
<b>Method Blanks (MB)</b>							
Conductivity in Water	E100	129041	1	8	12.5	5.0	✔
E. coli (MF-NA-MUG)	E012.EC	128411	2	14	14.2	10.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	128638	1	17	5.8	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	128641	1	9	11.1	5.0	✔
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	128413	2	14	14.2	10.0	✔
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	128518	1	14	7.1	5.0	✔
Total Mercury in Water by CVAAS	E508	129480	1	20	5.0	5.0	✔
Total Metals in Water by CRC ICPMS	E420	128519	1	20	5.0	5.0	✔
<b>Matrix Spikes (MS)</b>							
Nitrate in Water by IC (Low Level)	E235.NO3-L	128638	1	17	5.8	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	128641	1	9	11.1	5.0	✔
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	128518	1	14	7.1	5.0	✔
Total Mercury in Water by CVAAS	E508	129480	1	20	5.0	5.0	✔
Total Metals in Water by CRC ICPMS	E420	128519	1	20	5.0	5.0	✔



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-NA-MUG)	E012.EC  Vancouver - Environmental	Water	APHA 9222I (mod)	Positive Total or Thermotolerant Coliform filters are transferred to NA-MUG and incubated at 35.0 ±0.5°C for 4 hours. Colonies exhibiting fluorescence are enumerated.
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC  Vancouver - Environmental	Water	APHA 9222 D (mod)	Following filtration (0.45 µm), and incubation at 45.5 ±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
Conductivity in Water	E100  Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108  Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Nitrite in Water by IC (Low Level)	E235.NO2-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS





<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N  Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

## QUALITY CONTROL REPORT

<b>Work Order</b>	<b>: VA20C2933</b>	<b>Page</b>	<b>: 1 of 10</b>
<b>Client</b>	: AECOM Canada Ltd.	<b>Laboratory</b>	: Vancouver - Environmental
<b>Contact</b>	: Bruce Ford	<b>Account Manager</b>	: Dean Watt
<b>Address</b>	: 3292 Production Way Burnaby BC Canada V5A 4R4	<b>Address</b>	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
<b>Telephone</b>	: ----	<b>Telephone</b>	: +1 604 253 4188
<b>Project</b>	: 60639142-301	<b>Date Samples Received</b>	: 09-Dec-2020 14:50
<b>PO</b>	: ----	<b>Date Analysis Commenced</b>	: 09-Dec-2020
<b>C-O-C number</b>	: 17-862433	<b>Issue Date</b>	: 16-Dec-2020 17:50
<b>Sampler</b>	: Brad Stuckless		
<b>Site</b>	: ----		
<b>Quote number</b>	: VA20-AECO100-0004		
<b>No. of samples received</b>	: 6		
<b>No. of samples analysed</b>	: 6		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

### *Signatories*

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Caitlin Macey	Team Leader - Inorganics	Microbiology, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia

Page : 2 of 10  
Work Order : VA20C2933  
Client : AECOM Canada Ltd.  
Project : 60639142-301

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## **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.



### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 129040)</b>											
VA20C2933-001	UEL-001	pH	----	E108	0.10	pH units	7.45	7.47	0.268%	4%	----
<b>Physical Tests (QC Lot: 129041)</b>											
VA20C2933-001	UEL-001	conductivity	----	E100	2.0	µS/cm	140	142	1.56%	10%	----
<b>Anions and Nutrients (QC Lot: 128638)</b>											
VA20C2893-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 128641)</b>											
VA20C2904-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	10.0	mg/L	291 µg/L	0.290	0.467%	20%	----
<b>Bacteriological Tests (QC Lot: 128411)</b>											
VA20C2883-001	Anonymous	coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	2	1	1	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 128413)</b>											
VA20C2933-006	Blank	coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 128414)</b>											
VA20C2933-006	Blank	coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 128518)</b>											
VA20C2848-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00011	<0.00010	0.00001	Diff <2x LOR	----
<b>Total Metals (QC Lot: 128519)</b>											
VA20C2848-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0124	0.0133	0.0010	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.00294	0.00288	1.82%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	11.4	10.4	9.15%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.075	0.075	0.00004	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 128519) - continued</b>											
VA20C2848-001	Anonymous	magnesium, total	7439-95-4	E420	0.100	mg/L	1.96	1.97	0.725%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0365	0.0368	0.810%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000054	<0.000050	0.000004	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	0.138	0.140	0.001	Diff <2x LOR	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.0500	mg/L	0.058 µg/L	<0.000050	0.000008	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	0.21	0.21	0.003	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	0.748	0.748	0.0969%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.0428	0.0408	4.74%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	6.85	7.02	2.49%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000076	0.000072	0.000004	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0048	0.0048	0.00005	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 129480)</b>											
VA20C2898-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 129041)</b>						
conductivity	----	E100	1	µS/cm	<1.0	----
<b>Anions and Nutrients (QCLot: 128638)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 128641)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Bacteriological Tests (QCLot: 128411)</b>						
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 128412)</b>						
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 128413)</b>						
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 128414)</b>						
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----
<b>Total Metals (QCLot: 128518)</b>						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
<b>Total Metals (QCLot: 128519)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	# 0.0052	B
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 128519) - continued</b>						
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 129480)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----

**Qualifiers**

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 129040)</b>									
pH	----	E108	----	pH units	7 pH units	99.8	98.0	102	----
<b>Physical Tests (QCLot: 129041)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.9	90.0	110	----
<b>Anions and Nutrients (QCLot: 128638)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	104	90.0	110	----
<b>Anions and Nutrients (QCLot: 128641)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.8	90.0	110	----
<b>Total Metals (QCLot: 128518)</b>									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
<b>Total Metals (QCLot: 128519)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	106	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	105	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	97.7	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	95.0	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	108	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	102	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	# 122	80.0	120	MES
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	109	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	101	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	102	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	111	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	101	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	104	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	107	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	111	80.0	120	----





Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 128519) - continued</b>									
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	96.4	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	102	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	105	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	107	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	92.1	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	98.5	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	99.9	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	102	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	99.2	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	100	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	106	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	109	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	98.8	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	102	80.0	120	----
<b>Total Metals (QCLot: 129480)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	93.2	80.0	120	----

### Qualifiers

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).



## Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level  $\geq 1 \times$  spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Anions and Nutrients (QCLot: 128638)</b>										
VA20C2893-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.61 mg/L	2.5 mg/L	104	75.0	125	----
<b>Anions and Nutrients (QCLot: 128641)</b>										
VA20C2930-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	5.06 mg/L	5 mg/L	101	75.0	125	----
<b>Total Metals (QCLot: 128518)</b>										
VA20C2848-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0394 mg/L	0.04 mg/L	98.5	70.0	130	----
<b>Total Metals (QCLot: 128519)</b>										
VA20C2848-002	Anonymous	aluminum, total	7429-90-5	E420	0.214 mg/L	0.2 mg/L	107	70.0	130	----
		antimony, total	7440-36-0	E420	0.0199 mg/L	0.02 mg/L	99.7	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0197 mg/L	0.02 mg/L	98.6	70.0	130	----
		barium, total	7440-39-3	E420	0.0186 mg/L	0.02 mg/L	93.0	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0412 mg/L	0.04 mg/L	103	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00904 mg/L	0.01 mg/L	90.4	70.0	130	----
		boron, total	7440-42-8	E420	0.096 mg/L	0.1 mg/L	95.6	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00365 mg/L	0.004 mg/L	91.2	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.0104 mg/L	0.01 mg/L	104	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0189 mg/L	0.02 mg/L	94.4	70.0	130	----
		copper, total	7440-50-8	E420	0.0178 mg/L	0.02 mg/L	88.9	70.0	130	----
		iron, total	7439-89-6	E420	1.90 mg/L	2 mg/L	95.1	70.0	130	----
		lead, total	7439-92-1	E420	0.0178 mg/L	0.02 mg/L	88.8	70.0	130	----
		lithium, total	7439-93-2	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0196 mg/L	0.02 mg/L	98.0	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0214 mg/L	0.02 mg/L	107	70.0	130	----
		nickel, total	7440-02-0	E420	0.0363 mg/L	0.04 mg/L	90.8	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.9 mg/L	10 mg/L	109	70.0	130	----
		potassium, total	7440-09-7	E420	4.07 mg/L	4 mg/L	102	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0212 mg/L	0.02 mg/L	106	70.0	130	----
		selenium, total	7782-49-2	E420	0.0429 mg/L	0.04 mg/L	107	70.0	130	----
		silicon, total	7440-21-3	E420	9.91 mg/L	10 mg/L	99.1	70.0	130	----
		silver, total	7440-22-4	E420	0.00371 mg/L	0.004 mg/L	92.8	70.0	130	----



Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Total Metals (QCLot: 128519) - continued</b>										
VA20C2848-002	Anonymous	sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0375 mg/L	0.04 mg/L	93.8	70.0	130	----
		thallium, total	7440-28-0	E420	0.00358 mg/L	0.004 mg/L	89.6	70.0	130	----
		thorium, total	7440-29-1	E420	0.0215 mg/L	0.02 mg/L	108	70.0	130	----
		tin, total	7440-31-5	E420	0.0193 mg/L	0.02 mg/L	96.3	70.0	130	----
		titanium, total	7440-32-6	E420	0.0431 mg/L	0.04 mg/L	108	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.104 mg/L	0.1 mg/L	104	70.0	130	----
		zinc, total	7440-66-6	E420	0.340 mg/L	0.4 mg/L	84.9	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0445 mg/L	0.04 mg/L	111	70.0	130	----
<b>Total Metals (QCLot: 129480)</b>										
VA20C2898-002	Anonymous	mercury, total	7439-97-6	E508	0.0000922 mg/L	0.0001 mg/L	92.2	70.0	130	----



Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Affix ALS barcode label here (lab use only)

COC Number: 17 - 862433

Page of

<b>Report To</b> Contact and company name below will appear on the final report Company: <b>AECOM Canada Ltd.</b> Contact: <b>Brad Stuckless</b> Phone: <b>604-347-6802</b> <small>Company address below will appear on the final report</small>		<b>Report Format / Distribution</b> Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL) Quality Control (QC) Report with Report <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		<b>Select Service Level Below - Contact your AM to confirm all E&amp;P TATs (surcharges may apply)</b> Regular [R] <input checked="" type="checkbox"/> Standard TAT if received by 3 pm - business days - no surcharges apply 4 day [P4-20%] <input type="checkbox"/> 3 day [P3-25%] <input type="checkbox"/> 2 day [P2-50%] <input type="checkbox"/> 1 Business day [E - 100%] <input type="checkbox"/> Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] <input type="checkbox"/> Date and Time Required for all E&P TATs: _____ dd-mmm-yy-hh:mm-																																																																															
Street: <b>3292 Production Way, Hth Fr</b> City/Province: <b>Burnaby BC</b> Postal Code: <b>V5A 4R14</b>		Email 1 or Fax: <b>radia.baker@aecom.com</b> Email 2: <b>bruce.ford@aecom.com</b> Email 3:		<b>Analysis Request</b> Indicate Filtered (F), Preserved (P) or Filtered and Preserved (FP) below <table border="1"> <tr> <th rowspan="2">NUMBER OF CONTAINERS</th> <th colspan="10">Analysis Request</th> <th rowspan="2">SAMPLES ON HOLD</th> <th rowspan="2">SUSPECTED HAZARD (see Special Instructions)</th> </tr> <tr> <td>Total Metals</td> <td>Hg</td> <td>Conductivity</td> <td>pH</td> <td>Nitrite</td> <td>Nitrate</td> <td>Nitrite+Nitrate (ASN)</td> <td>Fecal Coliforms</td> <td>E. Coli</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> </table>				NUMBER OF CONTAINERS	Analysis Request										SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)	Total Metals	Hg	Conductivity	pH	Nitrite	Nitrate	Nitrite+Nitrate (ASN)	Fecal Coliforms	E. Coli			4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
NUMBER OF CONTAINERS	Analysis Request										SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)																																																																							
	Total Metals	Hg	Conductivity	pH	Nitrite	Nitrate	Nitrite+Nitrate (ASN)	Fecal Coliforms	E. Coli																																																																										
4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																																																																									
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<b>Invoice To</b> Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<b>Invoice Distribution</b> Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: <b>CANSSC-E-billing@aecom.com</b> Email 2: <b>bruce.ford@aecom.com</b>		<b>Project Information</b> ALS Account # / Quote #: <b>VA20-AEC000-004</b> Job #: <b>60639142-301</b> PO / AFE: LSD:																																																																															
<b>ALS Lab Work Order # (lab use only):</b> <b>ca933</b>		<b>ALS Contact:</b> <b>Dean Watt</b> <b>Jasmeen Jotani</b>		<b>Sampler:</b> <b>Brad Stuckless</b>																																																																															
<b>ALS Sample # (lab use only)</b>		<b>Sample Identification and/or Coordinates</b> <small>(This description will appear on the report)</small>		<b>Date</b> <small>(dd-mmm-yy)</small>		<b>Time</b> <small>(hh:mm)</small>		<b>Sample Type</b>																																																																											
		<b>WEL-001</b>		<b>09-Dec-20</b>		<b>10:25</b>		<b>Water</b>																																																																											
		<b>WEL-002</b>		<b>↓</b>		<b>10:43</b>		<b>↓</b>																																																																											
		<b>WEL-003</b>		<b>↓</b>		<b>11:07</b>		<b>↓</b>																																																																											
		<b>WEL-004</b>		<b>↓</b>		<b>11:56</b>		<b>↓</b>																																																																											
		<b>WEL-005</b>		<b>↓</b>		<b>12:48</b>		<b>↓</b>																																																																											
		<b>Blank</b>		<b>↓</b>		<b>13:09</b>		<b>↓</b>																																																																											
		<b>Blank</b>																																																																																	

Environmental Division  
 Vancouver  
 Work Order Reference  
**VA20C2933**

Telephone: - 1 604 253 4188

<b>Drinking Water (DW) Samples (client use)</b> Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<b>Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)</b>		<b>SAMPLE CONDITION AS RECEIVED (lab use only)</b> Frozen: <input checked="" type="checkbox"/> Ice Packs: <input checked="" type="checkbox"/> Ice Cubes <input type="checkbox"/> Cooling Initiated: <input type="checkbox"/> SIF Observations: Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact: Yes <input type="checkbox"/> No <input type="checkbox"/> INITIAL COOLER TEMPERATURES °C: _____ FINAL COOLER TEMPERATURES °C: <b>130C</b>			
<b>SHIPMENT RELEASE (client use)</b> Released by: <b>Brad Stuckless</b> Date: <b>Dec 9/20</b> Time: <b>14:41</b>		<b>INITIAL SHIPMENT RECEPTION (lab use only)</b> Received by: _____ Date: _____ Time: _____		<b>FINAL SHIPMENT RECEPTION (lab use only)</b> Received by: <b>KS</b> Date: <b>12/9/20</b> Time: <b>2:50</b>			

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



**CERTIFICATE OF ANALYSIS**

**Work Order** : **VA20C3474**  
**Client** : **AECOM Canada Ltd.**  
**Contact** : Bruce Ford  
**Address** : 3292 Production Way  
 Burnaby BC Canada V5A 4R4  
**Telephone** : ----  
**Project** : 60639142-301  
**PO** : ----  
**C-O-C number** : 17-862129  
**Sampler** : Brad Stuckless  
**Site** : ----  
**Quote number** : VA20-AECO100-0004  
**No. of samples received** : 5  
**No. of samples analysed** : 5

**Page** : 1 of 4  
**Laboratory** : Vancouver - Environmental  
**Account Manager** : Dean Watt  
**Address** : 8081 Lougheed Highway  
 Burnaby BC Canada V5A 1W9  
**Telephone** : +1 604 253 4188  
**Date Samples Received** : 16-Dec-2020 13:35  
**Date Analysis Commenced** : 16-Dec-2020  
**Issue Date** : 23-Dec-2020 15:01

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

**Signatories**

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Microbiology, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Woochan Song	Lab Assistant	Metals, Burnaby, British Columbia



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior 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.

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in reports identified as "Preliminary Report" are considered authorized for use.



## Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Client sampling date / time					16-Dec-2020 09:55	16-Dec-2020 10:11	16-Dec-2020 10:30	16-Dec-2020 11:09	16-Dec-2020 12:03
Analyte	CAS Number	Method	LOR	Unit	VA20C3474-001	VA20C3474-002	VA20C3474-003	VA20C3474-004	VA20C3474-005
					Result	Result	Result	Result	Result
<b>Physical Tests</b>									
conductivity	----	E100	2.0	µS/cm	140	75.8	133	134	106
hardness (as CaCO3), from total Ca/Mg	----	EC100A	600	µg/L	40800	13800	40600	46900	33200
pH	----	E108	0.10	pH units	7.53	6.69	7.66	7.18	7.40
<b>Anions and Nutrients</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	1.49	2.43	0.781	1.05	0.611
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L	1.50	2.43	0.786	1.05	0.614
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0076	0.0025	0.0053	0.0035	0.0026
<b>Bacteriological Tests</b>									
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	260	53	131	2	40
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	260	53	131	2	40
<b>Total Metals</b>									
aluminum, total	7429-90-5	E420	3.0	µg/L	323	366	236	84.8	128
antimony, total	7440-36-0	E420	0.10	µg/L	0.27	0.19	0.23	0.12	<0.10
arsenic, total	7440-38-2	E420	0.10	µg/L	0.65	0.24	1.71	0.30	0.28
barium, total	7440-39-3	E420	0.10	µg/L	22.2	31.1	16.1	32.6	18.3
beryllium, total	7440-41-7	E420	0.100	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100
bismuth, total	7440-69-9	E420	0.050	µg/L	0.087	<0.050	0.073	<0.050	<0.050
boron, total	7440-42-8	E420	10	µg/L	11	<10	13	11	<10
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0253	0.0274	0.0162	0.0151	0.0119
calcium, total	7440-70-2	E420	50	µg/L	12200	3750	12600	14400	9980
cesium, total	7440-46-2	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
chromium, total	7440-47-3	E420.Cr-L	0.10	µg/L	0.63	0.53	0.85	0.23	0.25
cobalt, total	7440-48-4	E420	0.10	µg/L	0.17	0.30	0.13	0.26	0.16
copper, total	7440-50-8	E420	0.50	µg/L	6.88	2.32	5.44	1.81	1.70
iron, total	7439-89-6	E420	10	µg/L	370	252	521	1250	741
lead, total	7439-92-1	E420	0.050	µg/L	0.404	0.379	0.553	0.121	0.196
lithium, total	7439-93-2	E420	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
magnesium, total	7439-95-4	E420	5.0	µg/L	2480	1070	2260	2660	2020
manganese, total	7439-96-5	E420	0.10	µg/L	18.8	28.0	12.6	180	44.0
mercury, total	7439-97-6	E508	0.0050	µg/L	0.0053	<0.0050	<0.0050	<0.0050	0.0051



## Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	UEL-001	UEL-002	UEL-003	UEL-004	UEL-005
Client sampling date / time					16-Dec-2020 09:55	16-Dec-2020 10:11	16-Dec-2020 10:30	16-Dec-2020 11:09	16-Dec-2020 12:03	
Analyte	CAS Number	Method	LOR	Unit	VA20C3474-001	VA20C3474-002	VA20C3474-003	VA20C3474-004	VA20C3474-005	
					Result	Result	Result	Result	Result	
<b>Total Metals</b>										
molybdenum, total	7439-98-7	E420	0.050	µg/L	0.363	0.108	0.334	0.137	0.080	
nickel, total	7440-02-0	E420	0.50	µg/L	0.88	0.90	0.66	0.74	0.56	
phosphorus, total	7723-14-0	E420	50	µg/L	<50	<50	<50	<50	<50	
potassium, total	7440-09-7	E420	50	µg/L	1970	695	1840	2320	1730	
rubidium, total	7440-17-7	E420	0.20	µg/L	1.09	1.06	1.48	2.08	1.69	
selenium, total	7782-49-2	E420	0.050	µg/L	0.064	<0.050	0.066	0.062	<0.050	
silicon, total	7440-21-3	E420	100	µg/L	6940	5640	5580	5260	4580	
silver, total	7440-22-4	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
sodium, total	17341-25-2	E420	50	µg/L	10500	7840	9040	6960	7540	
strontium, total	7440-24-6	E420	0.20	µg/L	80.7	46.5	81.9	93.3	75.4	
sulfur, total	7704-34-9	E420	500	µg/L	3500	1820	2590	2990	1880	
tellurium, total	13494-80-9	E420	0.20	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	
thallium, total	7440-28-0	E420	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	
thorium, total	7440-29-1	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
tin, total	7440-31-5	E420	0.10	µg/L	<0.10	0.15	<0.10	<0.10	<0.10	
titanium, total	7440-32-6	E420	0.30	µg/L	9.40	8.62	8.74	2.15	3.41	
tungsten, total	7440-33-7	E420	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	
uranium, total	7440-61-1	E420	0.010	µg/L	0.077	<0.010	0.035	0.011	<0.010	
vanadium, total	7440-62-2	E420	0.50	µg/L	2.40	1.40	1.53	0.88	0.76	
zinc, total	7440-66-6	E420	3.0	µg/L	7.1	7.8	10.6	3.8	4.0	
zirconium, total	7440-67-7	E420	0.20	µg/L	0.36	<0.20	0.20	<0.20	<0.20	

Please refer to the General Comments section for an explanation of any qualifiers detected.



## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: <b>VA20C3474</b>	Page	: 1 of 11
Client	: <b>AECOM Canada Ltd.</b>	Laboratory	: Vancouver - Environmental
Contact	: Bruce Ford	Account Manager	: Dean Watt
Address	: 3292 Production Way Burnaby BC Canada V5A 4R4	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 60639142-301	Date Samples Received	: 16-Dec-2020 13:35
PO	: ----	Issue Date	: 23-Dec-2020 15:02
C-O-C number	: 17-862129		
Sampler	: Brad Stuckless		
Site	: ----		
Quote number	: VA20-AECO100-0004		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

### Key

**Anonymous:** Refers to samples which are not part of this work order, but which formed part of the QC process lot.

**CAS Number:** Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

**DQO:** Data Quality Objective.

**LOR:** Limit of Reporting (detection limit).

**RPD:** Relative Percent Difference.

## Summary of Outliers

### **Outliers : Quality Control Samples**

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

### **Outliers : Analysis Holding Time Compliance (Breaches)**

- Analysis Holding Time Outliers exist - please see following pages for full details.

### **Outliers : Frequency of Quality Control Samples**

- No Quality Control Sample Frequency Outliers occur.

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## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE UEL-001	E235.NO3-L	16-Dec-2020	----	----	----		18-Dec-2020	3 days	1 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE UEL-002	E235.NO3-L	16-Dec-2020	----	----	----		18-Dec-2020	3 days	1 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE UEL-003	E235.NO3-L	16-Dec-2020	----	----	----		18-Dec-2020	3 days	1 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE UEL-004	E235.NO3-L	16-Dec-2020	----	----	----		18-Dec-2020	3 days	1 days	✓	
<b>Anions and Nutrients : Nitrate in Water by IC (Low Level)</b>											
HDPE UEL-005	E235.NO3-L	16-Dec-2020	----	----	----		18-Dec-2020	3 days	1 days	✓	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE UEL-001	E235.NO2-L	16-Dec-2020	----	----	----		18-Dec-2020	3 days	1 days	✓	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
HDPE UEL-002	E235.NO2-L	16-Dec-2020	----	----	----		18-Dec-2020	3 days	1 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-003	E235.NO2-L	16-Dec-2020	----	----	----		18-Dec-2020	3 days	1 days	✓	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-004	E235.NO2-L	16-Dec-2020	----	----	----		18-Dec-2020	3 days	1 days	✓	
<b>Anions and Nutrients : Nitrite in Water by IC (Low Level)</b>											
<b>HDPE</b> UEL-005	E235.NO2-L	16-Dec-2020	----	----	----		18-Dec-2020	3 days	1 days	✓	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.EC	16-Dec-2020	----	----	----		16-Dec-2020	48 hrs	4 hrs	✓	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.EC	16-Dec-2020	----	----	----		16-Dec-2020	48 hrs	5 hrs	✓	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.EC	16-Dec-2020	----	----	----		16-Dec-2020	48 hrs	6 hrs	✓	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.EC	16-Dec-2020	----	----	----		16-Dec-2020	48 hrs	6 hrs	✓	
<b>Bacteriological Tests : E. coli (MF-NA-MUG)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.EC	16-Dec-2020	----	----	----		16-Dec-2020	48 hrs	6 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-005	E012.FC	16-Dec-2020	----	----	----		16-Dec-2020	30 hrs	4 hrs	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-004	E012.FC	16-Dec-2020	----	----	----		16-Dec-2020	30 hrs	5 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-001	E012.FC	16-Dec-2020	----	----	----		16-Dec-2020	30 hrs	6 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-002	E012.FC	16-Dec-2020	----	----	----		16-Dec-2020	30 hrs	6 hrs	✓	
<b>Bacteriological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)</b>											
<b>Sterile HDPE (Sodium thiosulphate)</b> UEL-003	E012.FC	16-Dec-2020	----	----	----		16-Dec-2020	30 hrs	6 hrs	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-005	E100	16-Dec-2020	----	----	----		18-Dec-2020	28 days	1 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-001	E100	16-Dec-2020	----	----	----		18-Dec-2020	28 days	2 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-002	E100	16-Dec-2020	----	----	----		18-Dec-2020	28 days	2 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-003	E100	16-Dec-2020	----	----	----		18-Dec-2020	28 days	2 days	✓	
<b>Physical Tests : Conductivity in Water</b>											
<b>HDPE</b> UEL-004	E100	16-Dec-2020	----	----	----		18-Dec-2020	28 days	2 days	✓	



Matrix: **Water** Evaluation: \* = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-005	E108	16-Dec-2020	----	----	----		18-Dec-2020	0.25 hrs	47 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-004	E108	16-Dec-2020	----	----	----		18-Dec-2020	0.25 hrs	48 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-001	E108	16-Dec-2020	----	----	----		18-Dec-2020	0.25 hrs	49 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-002	E108	16-Dec-2020	----	----	----		18-Dec-2020	0.25 hrs	49 hrs	* EHTR-FM
<b>Physical Tests : pH by Meter</b>										
HDPE UEL-003	E108	16-Dec-2020	----	----	----		18-Dec-2020	0.25 hrs	49 hrs	* EHTR-FM
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL-001	E420.Cr-L	16-Dec-2020	----	----	----		16-Dec-2020	180 days	0 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL-002	E420.Cr-L	16-Dec-2020	----	----	----		16-Dec-2020	180 days	0 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL-003	E420.Cr-L	16-Dec-2020	----	----	----		16-Dec-2020	180 days	0 days	✓
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>										
HDPE total (nitric acid) UEL-004	E420.Cr-L	16-Dec-2020	----	----	----		16-Dec-2020	180 days	0 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)</b>											
<b>HDPE total (nitric acid)</b> UEL-005	E420.Cr-L	16-Dec-2020	----	----	----		16-Dec-2020	180 days	0 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-004	E508	16-Dec-2020	----	----	----		20-Dec-2020	28 days	3 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-005	E508	16-Dec-2020	----	----	----		20-Dec-2020	28 days	3 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-001	E508	16-Dec-2020	----	----	----		20-Dec-2020	28 days	4 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-002	E508	16-Dec-2020	----	----	----		20-Dec-2020	28 days	4 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
<b>Glass vial total (hydrochloric acid)</b> UEL-003	E508	16-Dec-2020	----	----	----		20-Dec-2020	28 days	4 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL-001	E420	16-Dec-2020	----	----	----		16-Dec-2020	180 days	0 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL-002	E420	16-Dec-2020	----	----	----		16-Dec-2020	180 days	0 days	✔	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> UEL-003	E420	16-Dec-2020	----	----	----		16-Dec-2020	180 days	0 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL-004	E420	16-Dec-2020	----	----	----		16-Dec-2020	180 days	0 days	✔
<b>Total Metals : Total Metals in Water by CRC ICPMS</b>										
<b>HDPE total (nitric acid)</b> UEL-005	E420	16-Dec-2020	----	----	----		16-Dec-2020	180 days	0 days	✔

**Legend & Qualifier Definitions**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended  
 Rec. HT: ALS recommended hold time (see units).





## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: \* = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Conductivity in Water	E100	132662	1	15	6.6	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	131918	1	8	12.5	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	132655	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	132656	1	13	7.6	5.0	✓
pH by Meter	E108	132661	1	18	5.5	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	131921	1	5	20.0	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	131798	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	133628	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	131797	1	20	5.0	5.0	✓
<b>Laboratory Control Samples (LCS)</b>							
Conductivity in Water	E100	132662	1	15	6.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	132655	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	132656	1	13	7.6	5.0	✓
pH by Meter	E108	132661	1	18	5.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	131798	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	133628	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	131797	1	20	5.0	5.0	✓
<b>Method Blanks (MB)</b>							
Conductivity in Water	E100	132662	1	15	6.6	5.0	✓
E. coli (MF-NA-MUG)	E012.EC	131918	1	8	12.5	10.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	132655	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	132656	1	13	7.6	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	131921	1	5	20.0	10.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	131798	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	133628	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	131797	1	20	5.0	5.0	✓
<b>Matrix Spikes (MS)</b>							
Nitrate in Water by IC (Low Level)	E235.NO3-L	132655	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	132656	1	13	7.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	131798	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	133628	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	131797	1	20	5.0	5.0	✓



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
E. coli (MF-NA-MUG)	E012.EC  Vancouver - Environmental	Water	APHA 9222I (mod)	Positive Total or Thermotolerant Coliform filters are transferred to NA-MUG and incubated at 35.0 ±0.5°C for 4 hours. Colonies exhibiting fluorescence are enumerated.
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC  Vancouver - Environmental	Water	APHA 9222 D (mod)	Following filtration (0.45 µm), and incubation at 45.5 ±0.2°C for 24 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and confirmed.
Conductivity in Water	E100  Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108  Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Nitrite in Water by IC (Low Level)	E235.NO2-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L  Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Metals in Water by CRC ICPMS	E420  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L  Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Water by CVAAS	E508  Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS



<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A  Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N  Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).



QUALITY CONTROL REPORT

Work Order : VA20C3474

Page : 1 of 10

Client : AECOM Canada Ltd.
Contact : Bruce Ford
Address : 3292 Production Way
Burnaby BC Canada V5A 4R4
Telephone : ----
Project : 60639142-301
PO : ----
C-O-C number : 17-862129
Sampler : Brad Stuckless
Site : ----
Quote number : VA20-AECO100-0004
No. of samples received : 5
No. of samples analysed : 5

Laboratory : Vancouver - Environmental
Account Manager : Dean Watt
Address : 8081 Lougheed Highway
Burnaby, British Columbia Canada V5A 1W9
Telephone : +1 604 253 4188
Date Samples Received : 16-Dec-2020 13:35
Date Analysis Commenced : 16-Dec-2020
Issue Date : 23-Dec-2020 15:01

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
Matrix Spike (MS) Report; Recovery and Acceptance Limits
Reference Material (RM) Report; Recovery and Acceptance Limits
Method Blank (MB) Report; Recovery and Acceptance Limits
Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Table with 3 columns: Signatories, Position, Laboratory Department. Rows include Kim Jensen (Department Manager - Metals), Lindsay Gung (Supervisor - Water Chemistry), Miles Gropen (Department Manager - Inorganics), Robin Weeks (Team Leader - Metals), and Woochan Song (Lab Assistant).



## General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include 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 predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

# = Indicates a QC result that did not meet the ALS DQO.



### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests (QC Lot: 132661)</b>											
VA20C3506-013	Anonymous	pH	----	E108	0.10	pH units	7.64	7.61	0.328%	4%	----
<b>Physical Tests (QC Lot: 132662)</b>											
VA20C3506-013	Anonymous	conductivity	----	E100	2.0	µS/cm	317	319	0.629%	10%	----
<b>Anions and Nutrients (QC Lot: 132655)</b>											
VA20C3506-008	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 132656)</b>											
VA20C3506-008	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 131918)</b>											
VA20C3436-011	Anonymous	coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	<1	0	Diff <2x LOR	----
<b>Bacteriological Tests (QC Lot: 131921)</b>											
VA20C3474-001	UEL-001	coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	260	240	8.00%	65%	----
<b>Total Metals (QC Lot: 131797)</b>											
VA20C3443-001	Anonymous	aluminum, total	7429-90-5	E420	0.0060	mg/L	<0.0060	<0.0060	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00020	mg/L	0.00046	0.00047	0.000009	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00020	mg/L	0.00041	0.00038	0.00003	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00020	mg/L	0.0243	0.0246	1.40%	20%	----
		beryllium, total	7440-41-7	E420	0.000040	mg/L	<0.000040	<0.000040	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000100	mg/L	0.000360	0.000356	1.16%	20%	----
		calcium, total	7440-70-2	E420	0.100	mg/L	314	315	0.500%	20%	----
		cesium, total	7440-46-2	E420	0.000020	mg/L	<0.000020	0.000020	0.0000001	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00100	mg/L	0.00106	<0.00100	0.00006	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0020	mg/L	0.0382	0.0391	2.41%	20%	----
		magnesium, total	7439-95-4	E420	0.200	mg/L	217	217	0.00801%	20%	----
		manganese, total	7439-96-5	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E420	0.000100	mg/L	0.00432	0.00448	3.71%	20%	----
		nickel, total	7440-02-0	E420	0.00100	mg/L	0.0192	0.0195	1.60%	20%	----



Sub-Matrix: **Water**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Total Metals (QC Lot: 131797) - continued</b>											
VA20C3443-001	Anonymous	phosphorus, total	7723-14-0	E420	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.100	mg/L	2.54	2.60	2.08%	20%	----
		rubidium, total	7440-17-7	E420	0.00040	mg/L	0.00204	0.00206	0.00002	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.100	mg/L	433 µg/L	0.433	0.197%	20%	----
		silicon, total	7440-21-3	E420	0.20	mg/L	2.22	2.20	0.914%	20%	----
		silver, total	7440-22-4	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.100	mg/L	2.42	2.44	0.929%	20%	----
		strontium, total	7440-24-6	E420	0.00040	mg/L	0.200	0.212	6.00%	20%	----
		sulfur, total	7704-34-9	E420	1.00	mg/L	407	400	1.87%	20%	----
		tellurium, total	13494-80-9	E420	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000020	mg/L	0.000024	0.000027	0.00003	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.0200	mg/L	<0.0200	<0.0200	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000020	mg/L	0.0192	0.0191	0.332%	20%	----
		vanadium, total	7440-62-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0060	mg/L	0.0120	0.0122	0.0001	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 131798)</b>											
VA20C3443-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 133628)</b>											
FJ2000127-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 132662)</b>						
conductivity	----	E100	1	µS/cm	1.5	----
<b>Anions and Nutrients (QCLot: 132655)</b>						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 132656)</b>						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
<b>Bacteriological Tests (QCLot: 131918)</b>						
coliforms, Escherichia coli [E. coli]	----	E012.EC	1	CFU/100mL	<1	----
<b>Bacteriological Tests (QCLot: 131921)</b>						
coliforms, thermotolerant [fecal]	----	E012.FC	1	CFU/100mL	<1	----
<b>Total Metals (QCLot: 131797)</b>						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----





Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 131797) - continued</b>						
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
<b>Total Metals (QCLot: 131798)</b>						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
<b>Total Metals (QCLot: 133628)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 132661)</b>									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
<b>Physical Tests (QCLot: 132662)</b>									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	103	90.0	110	----
<b>Anions and Nutrients (QCLot: 132655)</b>									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	103	90.0	110	----
<b>Anions and Nutrients (QCLot: 132656)</b>									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	102	90.0	110	----
<b>Total Metals (QCLot: 131797)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	110	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	113	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	108	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	111	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	104	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	112	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	106	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	104	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	104	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	110	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	107	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	104	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	103	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	100	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	111	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	108	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	115	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	107	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	118	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	116	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	101	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	105	80.0	120	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Total Metals (QCLot: 131797) - continued</b>									
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	104	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	119	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	106	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	118	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	111	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	106	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	101	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	106	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	104	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	101	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	108	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	111	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	109	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	104	80.0	120	----
<b>Total Metals (QCLot: 131798)</b>									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	112	80.0	120	----
<b>Total Metals (QCLot: 133628)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	99.9	80.0	120	----



### Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level  $\geq 1 \times$  spike level.

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	Target	MS	Low	High	
<b>Anions and Nutrients (QCLot: 132655)</b>										
VA20C3506-010	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.57 mg/L	2.5 mg/L	103	75.0	125	----
<b>Anions and Nutrients (QCLot: 132656)</b>										
VA20C3506-010	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.502 mg/L	0.5 mg/L	100	75.0	125	----
<b>Total Metals (QCLot: 131797)</b>										
VA20C3443-002	Anonymous	aluminum, total	7429-90-5	E420	0.190 mg/L	0.2 mg/L	95.0	70.0	130	----
		antimony, total	7440-36-0	E420	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0215 mg/L	0.02 mg/L	108	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0452 mg/L	0.04 mg/L	113	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00854 mg/L	0.01 mg/L	85.4	70.0	130	----
		boron, total	7440-42-8	E420	0.113 mg/L	0.1 mg/L	113	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00370 mg/L	0.004 mg/L	92.6	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00974 mg/L	0.01 mg/L	97.4	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0185 mg/L	0.02 mg/L	92.6	70.0	130	----
		copper, total	7440-50-8	E420	0.0181 mg/L	0.02 mg/L	90.5	70.0	130	----
		iron, total	7439-89-6	E420	1.95 mg/L	2 mg/L	97.6	70.0	130	----
		lead, total	7439-92-1	E420	0.0177 mg/L	0.02 mg/L	88.5	70.0	130	----
		lithium, total	7439-93-2	E420	0.107 mg/L	0.1 mg/L	107	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0185 mg/L	0.02 mg/L	92.4	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0212 mg/L	0.02 mg/L	106	70.0	130	----
		nickel, total	7440-02-0	E420	0.0356 mg/L	0.04 mg/L	89.0	70.0	130	----
		phosphorus, total	7723-14-0	E420	11.6 mg/L	10 mg/L	116	70.0	130	----
		potassium, total	7440-09-7	E420	4.08 mg/L	4 mg/L	102	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0200 mg/L	0.02 mg/L	99.8	70.0	130	----
		selenium, total	7782-49-2	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, total	7440-21-3	E420	8.95 mg/L	10 mg/L	89.5	70.0	130	----
		silver, total	7440-22-4	E420	0.00382 mg/L	0.004 mg/L	95.5	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----



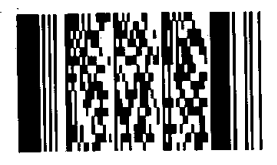
Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
<b>Total Metals (QCLot: 131797) - continued</b>										
VA20C3443-002	Anonymous	sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0398 mg/L	0.04 mg/L	99.5	70.0	130	----
		thallium, total	7440-28-0	E420	0.00344 mg/L	0.004 mg/L	85.9	70.0	130	----
		thorium, total	7440-29-1	E420	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		tin, total	7440-31-5	E420	0.0195 mg/L	0.02 mg/L	97.5	70.0	130	----
		titanium, total	7440-32-6	E420	0.0387 mg/L	0.04 mg/L	96.8	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0181 mg/L	0.02 mg/L	90.4	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.100 mg/L	0.1 mg/L	100	70.0	130	----
		zinc, total	7440-66-6	E420	0.380 mg/L	0.4 mg/L	95.0	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0431 mg/L	0.04 mg/L	108	70.0	130	----
<b>Total Metals (QCLot: 131798)</b>										
VA20C3443-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0392 mg/L	0.04 mg/L	98.0	70.0	130	----
<b>Total Metals (QCLot: 133628)</b>										
FJ2000127-002	Anonymous	mercury, total	7439-97-6	E508	0.0000941 mg/L	0.0001 mg/L	94.1	70.0	130	----

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<b>Report To</b> Contact and company name below will appear on the final report		<b>Report Format / Distribution</b>		<b>Select Service Level Below - Contact your AM to confirm all E&amp;P TATs (surcharges may apply)</b>																																																																																																																																																													
Company: <b>AECOM Canada Ltd.</b>		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL   <input type="checkbox"/> EDD (DIGITAL)		Regular (R) <input checked="" type="checkbox"/> Standard TAT if received by 3 pm - business days - no surcharges apply																																																																																																																																																													
Contact: <b>Brad Stuckless</b>		Quality Control (QC) Report with Report <input type="checkbox"/> YES <input type="checkbox"/> NO		4 day [P4-20%] <input type="checkbox"/>																																																																																																																																																													
Phone: <b>604-347-6802</b>		<input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked		1 Business day [E - 100%] <input type="checkbox"/>																																																																																																																																																													
Company address below will appear on the final report		Select Distribution: <input checked="" type="checkbox"/> EMAIL   <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		2 day [P2-50%] <input type="checkbox"/>																																																																																																																																																													
Street: <b>3292 Production Way</b>		Email 1 or Fax: <b>nadia.baker@aecom.com</b>		Same Day, Weekend or Statutory holiday [E2 - 200% (Laboratory opening fees may apply)] <input type="checkbox"/>																																																																																																																																																													
City/Province: <b>Burnaby, BC</b>		Email 2: <b>Bruce.ford@aecom.com</b>		Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm																																																																																																																																																													
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Company: <b>AECOM Canada Ltd.</b>		Email 1 or Fax: <b>CANSSC_E-billing@aecom.com</b>		<table border="1"> <tr> <td rowspan="10" style="writing-mode: vertical-rl; transform: rotate(180deg);">NUMBER OF CONTAINERS</td> <td>Total Metals</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td rowspan="10" style="writing-mode: vertical-rl; transform: rotate(180deg);">SAMPLES ON HOLD</td> <td rowspan="10" style="writing-mode: vertical-rl; transform: rotate(180deg);">SUSPECTED HAZARD (see Special Instructions)</td> </tr> <tr> <td>Hg</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Conductivity</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>pH</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Nitrite</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Nitrate</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Nitrite + Nitrate (ASN)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Fecal Coliforms</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>E. Coli</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>		NUMBER OF CONTAINERS	Total Metals																	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)	Hg																	Conductivity																	pH																	Nitrite																	Nitrate																	Nitrite + Nitrate (ASN)																	Fecal Coliforms																	E. Coli																
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ALS Account # / Quote #: <b>VA20-AEC0100-004</b>		AFE/Cost Center:		PO#																																																																																																																																																													
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ALS Lab Work Order # (lab use only): <b>3474</b>		ALS Contact: <b>Dean Watt</b>		Sampler: <b>Brad Stuckless</b>																																																																																																																																																													
ALS Sample # (lab use only)		Sample Identification and/or Coordinates (This description will appear on the report)		Date (dd-mmm-yy)		Time (hh:mm)		Sample Type																																																																																																																																																									
1	UFL-001			16-Dec-20		9:55		Water																																																																																																																																																									
2	UFL-002			↓		10:11		↓																																																																																																																																																									
3	UFL-003			↓		10:30		↓																																																																																																																																																									
4	UFL-004			↓		11:09		↓																																																																																																																																																									
5	UFL-005			↓		12:03		↓																																																																																																																																																									

Environmental Division  
Vancouver  
Work Order Reference  
**VA20C3474**



Telephone: +1 604 253 4188

<b>Drinking Water (DW) Samples (client use)</b>		<b>Special Instructions / Specify Criteria to (elec)</b>	
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
<b>SHIPMENT RELEASE (client use)</b>		<b>SAMPLE CONDITION AS RECEIVED (lab use only)</b>	
Released by: <b>Brad Stuckless</b>	Date: <b>Dec 16 / 20</b>	Time: <b>13:30</b>	Received by: <b>RK</b>
INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C	
		<b>7.2°C</b>	
<b>FINAL SHIPMENT RECEPTION (lab use only)</b>		Time: <b>16/12/20</b>	
Time: <b>13:30</b>		Date: <b>16/12/20</b>	



## Abbreviations & Definitions

### Worksheets:

1. Abbreviations & Definitions	Glossary of terms and outline of report.
2. Data-Matrix	Abundance data in matrix format, including total taxa.
3. Data-Long	Abundance data in long format.
4. QC-QA Report	Results of sorting efficiency.
5. MEMO-Incidental	Taxa not included in BIBI calculations.

### Life/Size Stages:

A	Adult
Int	Intermediate - has adult features but not of typical reproductive size
J	Juvenile
L	Larvae
N	Nymph
P	Pupa
Col	Colony
Deut	Deutonymph
Total Number of Taxa	Number of unique taxa (= species richness), not including higher-order taxa for which there exists a lower-order identification (e.g. not including <i>Lumbrineris</i> sp. if there exists <i>Lumbrineris cruzensis</i> in the data)
Total Number of Organisms	Total Abundance, not including incidental taxa

### B-IBI codes:

Voltinism	Refers to the length of a life cycle of an organism.
Univoltine (Uv)	One generation/year
Semivoltine (Ll)	Organism takes more than one year to complete its life cycle (considered Long-lived)
Multivoltine (Mv)	Numerous generations/year

Clingers: Organisms that cling to substrates, yes/no

Tol/Intol: Tolerance of organisms to organic pollution (Tolerance/Intolerance)  
I : Intolerant  
T: Tolerant  
O: No information

Feeding: SC: Scrapers  
SH: Shredders  
PR: Predators  
CG: Collector-Gatherer  
PA: Parasites  
CF: Collector-Filterer

### Major Taxonomic Groups:

EPT Ephemeroptera, Plecoptera, Trichoptera

### Miscellaneous

AMPH	Amphibia
BRYO	Bryozoa
CNHY	Cnidaria Hydrozoa
CNXX	Cnidaria
NTEA	Nemertea
PISC	Pisces
PLTY	Platyhelminthes
PORI	Porifera

ROTI	Rotifera
TARD	Tardigrada
EGGS	Invertebrate eggs
<b>Annelida</b>	
ANHI	Annelida Hirudinea
ANOL	Annelida Oligochaeta
ANXX	Annelida
<b>Arthropoda</b>	
CHAR	Chelicerata Arachnida
CHXX	Chelicerata
CRAM	Crustacea Amphipoda
CRCL	Crustacea Cladocera
CRCO	Crustacea Copepoda
CRCU	Crustacea Cumacea
CRIS	Crustacea Isopoda
CRMY	Crustacea Mysidacea
CROS	Crustacea Ostracoda
CRXX	Crustacea
<b>Insecta</b>	
INCM	Insecta Collembola
INCO	Insecta Coleoptera
INDI	Insecta Diptera
INEP	Insecta Ephemeroptera
INHM	Insecta Hemiptera
INHY	Insecta Hymenoptera
INLE	Insecta Lepidoptera
INMG	Insecta Megaloptera
INOD	Insecta Odonata
INPL	Insecta Plecoptera
INTR	Insecta Tricoptera
INXX	Insecta
<b>Mollusca</b>	
MOBI	Mollusca Bivalvia
MOGA	Mollusca Gastropoda
MOXX	Mollusca





Abundance data in matrix format and BIBI calculations for AECOM Metro Vancouver AMF Streams, 2020. Calculations exclude copepods, ostracods, and nematods.

Client Sample #		UEL-001		UEL-001		UEL-001		UEL-003		UEL-003		UEL-003				
Replicate		1		2		3		1		2		3				
Biological Sample #		20-114-001		20-114-002		20-114-003		20-114-004		20-114-005		20-114-006				
Percent sampled		33.33		16.67		66.67		100.00		100.00		25.00				
Group Code	Family	Taxon	Voltnism	Tol/Intol	Clinger	Feeding	Unique	Count	Unique	Count	Unique	Count	Unique	Count	Unique	Count
ANOL		Oligochaeta indet.	Uv-Sv	0	no	CG	1	18	1	23	1	68	1	53	1	147
CHAR		Acari indet.	Mv	0	no	PR	1	11	1	9	1	1	1	59	1	22
GRAM	Anisogammaridae	Ramellogammarus sp.	Uv	T	no	CG	1	2			1	1			1	1
GRAM	Crangonyctidae	Crangonyx sp.	Uv	T	no	CG									1	2
GRAM		Amphipoda indet.	Uv	T	no	CG		1				1	6	1	1	3
CRIS		Isopoda indet.	Uv	0	no	CG					1	1				
INCO	Elmidae	Lara sp.	LL	0	yes	SH	1	1	1	5	1	2		1	1	5
INDI	Chironomidae	Chironomidae indet.	Uv-Mv	0	no	CG	1	113	1	108	1	96	1	159	1	212
INDI	Dixidae	Dixa sp.	Uv	0	no	CG	1	1			1	3	1	1		
INDI	Empididae	Neoplasma sp.	Uv	0	yes	PR	1	2					1	1	1	1
INDI	Simuliidae	Simuliidae indet.	Uv	0	yes	CF	1	107	1	203	1	146	1	54	1	17
INDI	Stratiomyidae	Stratiomyidae indet.	Uv	T	no	CG								1	1	
INDI	Tipulidae	Dicranota sp.	Uv	0	no	PR	1	2			1	1				
INDI	Tipulidae	Eloeophila sp.	Uv	0	no	PR	1	4			1	3				
INDI	Tipulidae	Tipula sp.	LL	0	no	OM								1	1	
INDI		Diptera indet.	Uv	0	no	UN									1	1
INEP	Baetidae	Baetidae indet.	Uv-Mv	0	yes	CG		61		42		116		25		
INEP	Baetidae	Baetis sp.	Uv-Mv	0	yes	CG	1	8	1	5	1	5	1	19	1	3
INEP	Heptageniidae	Cinygma sp.	Uv	I	yes	SC	1	2			1	5	1	1		
INEP	Heptageniidae	Heptageniidae indet.	Uv	0	yes	SC		18	1	7		14		2		
INEP	Leptophlebiidae	Leptophlebiidae indet.	Uv	0	no	CG		1				2	1	2		
INEP	Leptophlebiidae	Paraleptophlebia sp.	Uv	0	no	CG	1	1			1	1				
INEP		Ephemeroptera indet.	UN	0	no	UN		4		5		9				1
INPL	Nemouridae	Zapada cinctipes	LL	0	no	SH	1	13	1	15	1	38	1	3		
INTR	Glossosomatidae	Glossosomatidae indet.	Uv	0	yes	SC	1	7			1	4				
INTR	Hydropsychidae	Hydropsychidae indet.	Uv-Mv	0	yes	CF		22		8		2		32		11
INTR	Hydropsychidae	Parapsyche sp.	Uv-Mv	0	yes	CF	1	4	1	11	1	2	1	4	1	2
INTR	Limnephilidae	Limnephilidae indet.	Uv	0	no	SH			1	1			1	1		
INTR	Rhyacophilidae	Rhyacophila grandis group	Uv	I	yes	PR					1	1				
INTR		Trichoptera indet.	Uv	0	no	UN										4
MOBI	Pisidiidae	Pisidiidae indet.	LL	0	no	CG	1	2								
MOGA	Lymnaeidae	Galba sp.	Uv	T	no	CG							1	1		
MOGA	Physidae	Physidae indet.	Uv	T	no	CG					1	1				
MOGA	Planorbidae	Planorbidae indet.	Uv	T	no	SC					1	1		1	1	
PLTY		Platyhelminthes indet.	Mv	0	no	PR	1	1					1	1	1	1
<b>Total</b>							<b>406</b>	<b>442</b>	<b>524</b>	<b>424</b>	<b>232</b>	<b>438</b>				
<b>Metrics</b>							<b>Station Average</b>				<b>Station Average</b>					
Taxon Richness							18	10	19	16	15	12	11	13		
E richness							3	2	3	3	3	1	1	2		
P richness							1	1	1	1	1	0	0	0		
T richness							2	2	3	2	2	1	1	1		
Intolerant Richness							1	0	2	1	1	0	0	0		
Clinger Richness							7	5	7	6	5	4	5	5		
Long-Lived Richness							3	2	2	2	1	2	1	1		
% Tolerant							0.74	0.00	0.76	0.50	1.65	2.16	1.37	1.73		
% Predator							4.93	2.04	1.15	2.70	14.39	9.91	5.48	9.93		
% Dominance (3)							69.21	79.86	68.32	72.47	64.15	80.17	86.99	77.10		
<b>10-50 B-IBI Values (Fine Resolution)</b>																
Taxon Richness							3	1	3	3	3	1	1	1		

E richness	1	1	1	1	1	1	1	1
P richness	1	1	1	1	1	1	1	1
T richness	1	1	1	1	1	1	1	1
Intolerant Richness	1	1	1	1	1	1	1	1
Clinger Richness	1	1	1	1	1	1	1	1
Long-Lived Richness	3	1	1	1	1	1	1	1
% Tolerant	5	5	5	5	5	5	5	5
% Predator	1	1	1	1	3	1	1	1
%Dominance (3)	3	3	3	3	3	1	1	3
<b>B-IBI Sample Score</b>	<b>20</b>	<b>16</b>	<b>18</b>		<b>20</b>	<b>14</b>	<b>14</b>	
<b>B-IBI Site Score</b>				<b>18.0</b>				<b>16.0</b>
<b>B-IBI Site Category</b>				<b>Poor</b>				<b>Very Poor</b>
<b>Community Composition</b>								
% EPT	34.7	21.3	38.0		21.0	8.6	5.9	
% Chironomidae	27.8	24.4	18.3		37.5	44.4	48.4	
% Oligochaetes	4.4	5.2	13.0		12.5	25.9	33.6	



Abundance data in long format for AECOM Metro Vancouver AMF Streams, 2020.

Table with 35 columns: Client, Project, Year, Split, Fraction (µm), Biologica Sample ID, Client Sample ID, Replicate, Sample Date, genus, Phylum, Class, Order, Family, Subfamily, Tribe, Taxon, A, J, L, N, P, D, Out, Raw Total, Split Multiplier, Total Abundance, Unique Tax Count, Comments, Vol/Inlet, To/Inlet, Cleaner, Reading. The table contains abundance data for various insect species across different projects and stream samples.



**Table 1. Benthic report of sorting efficiency and taxonomic quality control and quality assurance for AECOM Metro Vancouver AMF Streams, 2020.**

Biologica Sample ID	Client Sample ID	Sorting Efficiency QA: Random whole resorts	Percent taxonomic Agreement (PTA)	Percent similarity in Enumeration (PSE)
20-114-001	UEL-001-1		100.00%	99.75%
20-114-002	UEL-001-2			
20-114-003	UEL-001-3			
20-114-004	UEL-003-1			
20-114-005	UEL-003-2	98.37%		
20-114-006	UEL-003-3			
<b>Average:</b>		<b>98.37%</b>	<b>100.00%</b>	<b>99.75%</b>

**QA/QC:**

Sorting efficiency: [(total count – organisms recovered in spot check and/or re-sort) / total count] x 100%

**Table 2. QA Identification for AECOM Metro Vancouver AMF Streams, 2020.**

Biologica Sample #	Client Sample #	Agreements	Disagreements/ Misidentification	Difference in Resolution	Difference in Enumeration	Total Organisms Found in Original Sample	Total Organisms Found in QA	Percent Taxonomic Agreement (PTA)	Percent Agreement in Enumeration
20-114-001	UEL-001-1	24	0	0	1	406	405	100.00	99.75

**Quality Assurance (QA) Identification Agreement Rate**

Identification Agreement Rate: [(# incorrect identifications/total organisms found in audit) x100%]-100

Enumeration, questionable taxonomic resolution and insufficient taxonomic resolution are not included in the % Agreement Rate



Incidental (memo) taxa not included in B-BI calculations for AECOM Metro Vancouver AMF Streams, 2020.

Client	Project	Year	Split	Fraction (µm)	Biologica Sample ID	Client Sample ID	Replicate	Sample Date	grpcode	Phylum	Class	Order	Family	Subfamily	Tribe	Taxon	A	J	L	N	P	Deut	Raw Total	Split Multiplier	Total Abundance	Comments	
AECOM	Metro Vancouver AMF Streams	2020	1/3	250	20-114-001	UEL-001-1	1	16-Sep-20	CHAR	Arthropoda	Arachnida					Acari indet. (terrestrial)	3						3	3.0	9	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	1/3	250	20-114-001	UEL-001-1	1	16-Sep-20	CRCO	Arthropoda						Copepoda indet.	1						1	3.0	3	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	1/3	250	20-114-001	UEL-001-1	1	16-Sep-20	CRIS	Arthropoda	Malacostraca	Isopoda				Isopoda indet. (terrestrial)	4						4	3.0	12	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	1/3	250	20-114-001	UEL-001-1	1	16-Sep-20	INDI	Arthropoda	Insecta	Diptera	Chironomidae			Chironomidae indet.					1		1	3.0	3	Pupae not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	1/3	250	20-114-001	UEL-001-1	1	16-Sep-20	INDI	Arthropoda	Insecta	Diptera	Simuliidae			Simuliidae indet.					1		1	3.0	3	Pupae not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	1/3	250	20-114-001	UEL-001-1	1	16-Sep-20	MOGA	Mollusca						Gastropoda indet. (terrestrial)			1				1	3.0	3	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	4/24	250	20-114-002	UEL-001-2	2	16-Sep-20	CRIS	Arthropoda	Malacostraca	Isopoda				Isopoda indet. (terrestrial)	1						1	6.0	6	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	4/24	250	20-114-002	UEL-001-2	2	16-Sep-20	INDI	Arthropoda	Insecta	Diptera	Chironomidae			Chironomidae indet.					3		3	6.0	18	Pupae not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	4/24	250	20-114-002	UEL-001-2	2	16-Sep-20	INDI	Arthropoda	Insecta	Diptera	Simuliidae			Simuliidae indet.					12		12	6.0	72	Pupae not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	2/3	250	20-114-003	UEL-001-3	3	16-Sep-20	INCM	Arthropoda	Collembola	Collembola				Collembola indet.	1						1	1.5	1.5	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	2/3	250	20-114-003	UEL-001-3	3	16-Sep-20	INDI	Arthropoda	Insecta	Diptera	Simuliidae			Simuliidae indet.					4		4	1.5	6	Pupae not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	2/3	250	20-114-003	UEL-001-3	3	16-Sep-20	INTR	Arthropoda	Insecta	Trichoptera				Trichoptera indet.					1		1	1.5	1.5	Pupae not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	2/3	250	20-114-003	UEL-001-3	3	16-Sep-20	INXX	Arthropoda	Insecta					Insecta indet. (terrestrial)	1						1	1.5	1.5	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-004	UEL-003-1	1	16-Sep-20	ANOL	Annelida						Oligochaeta indet. (cocoon)	3						3	1.0	3	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-004	UEL-003-1	1	16-Sep-20	CHAR	Arthropoda	Arachnida					Acari indet. (terrestrial)	4						4	1.0	4	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-004	UEL-003-1	1	16-Sep-20	CRCO	Arthropoda						Copepoda indet.	1						1	1.0	1	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-004	UEL-003-1	1	16-Sep-20	CRIS	Arthropoda	Malacostraca	Isopoda				Isopoda indet. (terrestrial)	5						5	1.0	5	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-004	UEL-003-1	1	16-Sep-20	CRIS	Arthropoda	Collembola	Collembola				Ostracoda indet.	1						1	1.0	1	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-004	UEL-003-1	1	16-Sep-20	INDI	Arthropoda	Insecta	Diptera	Chironomidae			Chironomidae indet.					3		3	1.0	3	Pupae not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-004	UEL-003-1	1	16-Sep-20	INDI	Arthropoda	Insecta	Diptera	Simuliidae			Simuliidae indet.					6		6	1.0	6	Pupae not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-004	UEL-003-1	1	16-Sep-20	INLE	Arthropoda	Insecta	Lepidoptera				Lepidoptera indet.					1		1	1.0	1	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-004	UEL-003-1	1	16-Sep-20	INXX	Arthropoda	Insecta					Insecta indet. (terrestrial)	3		1				3	1.0	3	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-005	UEL-003-2	2	16-Sep-20	ANOL	Annelida						Lumbricidae indet. (terrestrial)	2						2	1.0	2	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-005	UEL-003-2	2	16-Sep-20	ANOL	Annelida						Oligochaeta indet. (cocoon)	1						1	1.0	1	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-005	UEL-003-2	2	16-Sep-20	CHAR	Arthropoda	Arachnida					Acari indet. (terrestrial)	2						2	1.0	2	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-005	UEL-003-2	2	16-Sep-20	CRIS	Arthropoda	Malacostraca	Isopoda				Isopoda indet. (terrestrial)	3						3	1.0	3	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-005	UEL-003-2	2	16-Sep-20	INCM	Arthropoda	Collembola	Collembola				Collembola indet.	1						1	1.0	1	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-005	UEL-003-2	2	16-Sep-20	INDI	Arthropoda	Insecta	Diptera	Chironomidae			Chironomidae indet.					1		1	1.0	1	Pupae not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-005	UEL-003-2	2	16-Sep-20	INDI	Arthropoda	Insecta	Diptera	Simuliidae			Simuliidae indet.					1		1	1.0	1	Pupae not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	Whole	250	20-114-005	UEL-003-2	2	16-Sep-20	INLE	Arthropoda	Insecta	Lepidoptera				Lepidoptera indet.					2		2	1.0	2	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	12/48	250	20-114-006	UEL-003-3	3	16-Sep-20	ANOL	Annelida						Lumbricidae indet. (terrestrial)	11						11	4.0	44	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	12/48	250	20-114-006	UEL-003-3	3	16-Sep-20	CHAR	Arthropoda	Arachnida					Acari indet. (terrestrial)	1						1	4.0	4	Not included in BIBI	
AECOM	Metro Vancouver AMF Streams	2020	12/48	250	20-114-006	UEL-003-3	3	16-Sep-20	INDI	Arthropoda	Insecta	Diptera	Simuliidae			Simuliidae indet.						1		1	4.0	4	Pupae not included in BIBI



**Freshwater Benthic Enumeration and Identification Methods**  
**Client: AECOM**  
**Project: Metro Vancouver AMF Streams 2020**  
**Protocol: B-IBI (Metro Vancouver Adaptive Management Framework)**

### Sample Inventory

Sample arrival: 17-Sep-20  
Number of samples: 18-Dec-20  
Number of jars: 6  
Screen size: 250 µm  
Biologica project number: 20-114

The chain of custody documents were checked and approved with the client. Samples were transferred from formalin into 70% ethanol and stained with Rose Bengal to aid in sorting. Each sample was provided a unique identification number and placed in the queue for analysis.

**Table 1.** Summary of benthic samples processed for AECOM Metro Vancouver AMF Streams, 2020.

Client Sample ID	Replicate	Date Sampled	Biologica Sample ID	Sub-sample	Organisms Counted
UEL-001-1	1	16-Sep-20	20-114-001	1/3	406
UEL-001-2	2	16-Sep-20	20-114-002	4/24	442
UEL-001-3	3	16-Sep-20	20-114-003	2/3	524
UEL-003-1	1	16-Sep-20	20-114-004	Whole	424
UEL-003-2	2	16-Sep-20	20-114-005	Whole	232
UEL-003-3	3	16-Sep-20	20-114-006	12/48	438

### Sample Processing

#### Sorting:

Samples were sorted using dissecting microscopes at 10–40x magnification by trained personnel. All debris in each sample was checked microscopically, including leaves, twigs, moss, elutriated gravel, and other large debris, to ensure “clinger taxa” were recovered consistently from the samples.

To minimize potential sorter bias, samples were distributed among technicians such that no one person sorted all the replicates of a given sample or station.

#### Sorting QA/QC:

To ensure sorting efficiency was >95%, whole and/or partial sub-samples were re-sorted. Sorting efficiency was calculated using the following equation (where total count = final total number of organisms in sample):

Sorting efficiency =  $[1 - (\# \text{ of organisms in spotcheck or resort} / \text{total organisms})] \times 100$

\*Total organisms includes the original count and the number found from the resort

Sorting efficiency QA/QC was performed on 67% of samples. 25% of the debris was re-sorted for the selected samples. All samples checked must meet or exceed 95% sorting efficiency. Any samples falling below 95% sorting efficiency were re-sorted in their entirety, and additional checks were undertaken as necessary.

For quality assurance, QA resorts were performed on 10% of samples. One sample was randomly selected and resorted in its entirety. Refer to Table 2 for sorting efficiency results.

**Table 2.** Summary of sorting QA/QC results for AECOM Metro Vancouver AMF Streams, 2020.

Client Sample ID	Biologica Sample ID	Sorting Efficiency QA: Whole Resort
UEL-001-1	20-114-001	
UEL-001-2	20-114-002	
UEL-001-3	20-114-003	
UEL-003-1	20-114-004	
UEL-003-2	20-114-005	98.37%
UEL-003-3	20-114-006	
<b>Average:</b>		<b>98.37%</b>

**Identification:**

All organisms were identified using a combination of dissecting (10–40x) and compound (100–1000x) microscopes and standard taxonomic keys (see methodological and taxonomic references) to the lowest practicable level as specified by Plotnikoff and White (1996). All specimens were archived in air-tight glass vials with glycerin and 70% ethanol for long-term storage. Taxonomic data were recorded in Biologica’s custom database.

Data were compiled in an excel spreadsheet. Incidental organisms (e.g., pupae, Collembola, terrestrial insects) were reported separately. These data were entered into Biologica’s database and completely double-checked for entry errors.

The multi-metric benthic index of biological integrity (B-IBI) was calculated based on the following metrics after Karr and Chu (1999), Morely (2002) and Page et al. (2008):

- Total number of unique taxa
- Total number of unique mayfly (Ephemeroptera) taxa
- Total number of unique stonefly (Plecoptera) taxa
- Total number of unique caddisfly (Trichoptera) taxa
- Number of long lived taxa (organisms living a minimum of 2-3 years in the immature state)
- Number of intolerant taxa
- Percent of predatory individuals
- Number of clinger taxa
- Percent dominance: the percent of individuals in the three most dominant taxa.

Long-lived, predatory, clinger, and tolerant/intolerant taxa were defined consistently with

available species list attributes at pugetsoundstreambenthos.org (files constructed by R.W. Wisseman and L. Fore).

Each metric in each sample was assigned a value (1, 3 or 5) according to the thresholds reported at pugetsoundstreambenthos.org and Page et al. (2008). The sum of these values gave the sample B-IBI.

Any species new to Biologica’s verified reference collections are confirmed by one of Biologica’s secondary certified taxonomists.

**Identification QA/QC:**

For quality assurance of identification, 10% of samples were randomly selected and re-identified by a second trained taxonomist. Refer to Table 3 for QA results. Standard taxonomic effort and a list of Biologica’s taxonomists certified by the Society of Freshwater Science (SFS) are presented in Tables 4 and 5, respectively.

**Table 3.** Summary of taxonomic QA/QC results for AECOM Metro Vancouver AMF Streams, 2020.

Client Sample ID	Biologica Sample ID	% Taxonomic Agreement	% Similarity in Enumeration
UEL-001-1	20-114-001	100.00%	99.75%

**% Identification Agreement:**

100-[(# of disagreements / total # of taxa identified) x 100]

*\*differences in resolution are not considered disagreements*

**% Enumeration Agreement:**

{100 – [(difference in abundance between samples/total abundance of original sample) x 100]}%

**Table 4.** Taxonomists certified by the Society of Freshwater Science (SFS).

Taxonomist	Certification	Date of Certification
Robynn Holma	North American Chironomidae	2022
	Western Arthropods	2022
	Western EPT	2024
	Western Chironomidae	---
	Eastern EPT	2022
Karen Hoban	Eastern Arthropods	2024
	Western EPT	2022
	Western Arthropods	2022
	Eastern EPT	2025
Breanna Bomback	Eastern Arthropods	2025
	North American Chironomidae	2025
Hiroki Tomoe	North American Oligochaeta	2020

**Data**

All data were recorded in Biologica’s custom database. Results were provided to the AECOM project manager in Excel spreadsheets via email.



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