GAMETI WTP

Water Supply Facilities Characterization and Testing Plan

10338-PR-RPT-001

Project No: 10338

Ultra-Filtration Potable Water Plant

0	11/05/2020	ISSUED FOR INFORMATION	SB	JP	GNWT
Rev	**Date**	**Rev Description**	**Originator**	**Checker**	**Approver**

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1. Water Characterization Sampling Plan

The Gameti Water Treatment Plant (WTP) is a turnkey membrane ultrafiltration system, with sodium hypochlorite (chlorine) disinfection, installed within a skid-mounted building. The raw water source for the new WTP is Rae Lake (1.5 km east of the community).

1.1. Water quality sampling

Gameti drinking WTP was commissioned in the month of October, 2019. After successful plant start-up and commissioning, water samples were collected for laboratory testing from all points in the WTP where liquid was either entering or being discharged. This enabled all interfaces with the surrounding infrastructure and environment. Testing was carried out which included routine water analysis, organics, metals, and bacterial coliform tests (refer to Table 1 all the interfaces). It is to be noted that clean-in-place (CIP) water is generated only when a CIP is conducted, which will not occur until the WTP has been in full operation for a few months. CIP water sampling would be conducted in the coming site visit to the community with performance of the first CIP. This would be shortly as soon as travel restriction eases due to COVID – 19 pandemic.

Table 1: Gameti WTP Commissioning Test Plan.

Interface	Sample Location	Commissioning Test (CT) Frequency	Parameters
Raw Water	Inlet Sample HV-025	1 x CT	Full set
Backwash Water	Overland discharge pipe	1 x CT	Full set
Wastewater Discharge	Wastewater Tank – HV-133	1 x CT	Full set
Treated water	Truck fill line SV-071	1 x CT	Full set
Membrane Startup Water	Permeate Sample SV-209	1 x CT	Full set
CIP water	Wastewater Tank – HV-133	None (during operation at first CIP)	Full set

1.2. Water quality test results

The table below (Table 2) highlights some results from testing for raw water, backwash water, and the wastewater tank of the samples collected during commissioning of Gameti WTP. Raw water is shown for a background reference. Backwash water, which is discharged overland, is compared to the current municipal water licence lagoon discharge criteria at SNP 003-2 and SNP 003-3. Water quality from the wastewater tank, which is pumped out and hauled to municipal sewage lagoon for treatment, is compared to Schedule I: Standards for Process Effluent Discharged to Municipal Sewage Systems in the Government of the Northwest Territories Department of Environment and Natural Resources 2004 Guideline for Industrial Waste Discharges in the NWT.

Samples were rushed to Yellowknife, NT (within 24 hours) and tested at ALS Laboratory. Treated water was checked for pathogens (i.e., E. coli and total coliforms) in 24 hours and 48 hours duration of WTP operation. Separately, GNWT also conducted treated water sampling for E. coli and total coliform which were tested in Stanton Territorial Hospital Laboratory in Yellowknife. The complete lab reports are included in the appendices.

Table 2: Gameti WTP Commissioning Test Plan.

Raw Water (Inlet Sample HV-025)			
Parameters	**Units**	**Test Results**	
Color	TCU	<5.0	
Iron (total)	mg/L	<0.010	
Manganese (total)	mg/L	0.002	
pH	-	8.18	
Total Dissolved Solids	mg/L	215	
Total Organic Carbon	mg/L	5.07	
Hardness (as $CaCO_3$)	mg/L	153	
Turbidity	NTU	0.33	
Backwash Water (Overland discharge pipe)			
Parameters	**Units**	**Test Results**	**SNP 003-2/3**

Total Suspended Solids	mg/L	46.9	240/25
Oil and Grease	mg/L	<5.0	5/5
CBOD	mg/L	4 (BOD)	235/25
Faecal Coliforms	CFU/100 mL	n/a	$1 \times 10^6/1 \times 10^6$
pH	-	8.81	6 - 9

Wastewater Discharge (Wastewater Tank – HV-133)

Parameters	Units	Test Results	Industrial Waste Discharge Guidelines
Aluminum	mg/L	0.0933	50
Arsenic	mg/L	0.00034	1
Barium	mg/L	0.0237	5
Biochemical oxygen demand	mg/L	<2.0	500
Cadmium	mg/L	0.0000262	2
Chlorides	mg/L	72.9	1500
Chromium	mg/L	0.00576	5
Copper	mg/L	0.0299	5
Cyanide	mg/L	<0.0050	2
Fluoride	mg/L	<0.10	10
Lead	mg/L	0.000637	5
Iron	mg/L	0.144	50
Mercury	mg/L	<0.0000050	0.1
Nickel	mg/L	0.00303	5
Oil & Grease	mg/L	<5.0	150
pH	-	8.09	6.5 - 10.5
Phenolic compounds	mg/L	<0.0010	1

Phosphorus	mg/L	0.612	100
Silver	mg/L	0.000033	5
Sulphates	mg/L	50.9	1500
Sulphides	mg/l	not sampled	2
Suspended solids	mg/l	<3.0	600
Tin	- mg/L	0.00077	5
Zinc	- mg/L	0.0456	5
Color	- TCU	<5.0	15

2. Long Term Water Quality Test Plan

Current sampling programs at the Gameti WTP include:

- continuous online measurements of turbidity in the raw water, filtered water, and treated water storage;
- continuous online measurements of free chlorine in CT tank and treated water tank;
- thrice daily in-plant grab testing of the treated water for chlorine and turbidity
- weekly bacteriological sampling for total coliforms and e.coli;
- annual chemical analysis of both the raw and treated water of the 29 parameters identified in the Water Supply Regulations;

The above sample results are reviewed by the local operator and the Regional Environmental Health Officer to ensure the Community of Gameti continues to receive high-quality, safe drinking water. They provide meaningful results in which an operator can immediate action to protect the quality of water, i.e. increase chlorine does or perform a membrane repair.

Operators also perform in-plant testing of the post CIP water for chlorine and pH to ensure water has been fully de-chlorinated and are of a neutral pH before sending it to the wastewater holding tank, which ultimate gets pumped out to the sewage lagoon for further treatment.

Grab samples of the backwash water and wastewater tank water taken during commissioning are provided for reference. These parameters are not expected to experience significant fluctuation. No chemical addition, other than post-filter chlorination, is completed in this process. Filtered water used in the backwash is not chlorinated. Additional long term sampling of the backwash water and the wastewater tank would not provide any information to the operator in which they can take corrective measures. Therefore, an onerous long-term sampling program on backwash water and wastewater tank would not provide information of practical value to the operations and is not recommended.

Also, the research team at Dalhousie University have been engaged by MACA, ENR and MVLWB to study impacts of WTP residuals and waste to the environment across NWT. The initial report is expected by end of the summer, 2020. The study will be outlining recommendations on best practices and whether there would be value in additional long-term sampling.

APPENDICES

24 Hours after super chlorination

Date: 31-OCT-19
PO No.:
WO No.: L2368840
Project Ref: 10338-G
Sample ID: TREATED WATER - 24HRS
Sampled By:
Date Collected: 20-OCT-19
Lab Sample ID: L2368840-1
Matrix: WATER

AWC SOLUTIONS
9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Alkalinity Species by Titration						
Alkalinity Species by Titration						
Alkalinity, Bicarbonate (as CaCO3)	117		mg/L			24-OCT-19
Alkalinity, Carbonate (as CaCO3)	<1.0		mg/L			24-OCT-19
Alkalinity, Hydroxide (as CaCO3)	<1.0		mg/L			24-OCT-19
Alkalinity, Total (as CaCO3)	117		mg/L			24-OCT-19
Anions by Ion Chromatography						
Sulfate in Water by IC						
Sulfate (SO4)	50.1		mg/L		500	24-OCT-19
Nitrite in Water by IC (Low Level)						
*Nitrite (as N)	<0.0010		mg/L	1		24-OCT-19
Nitrate in Water by IC (Low Level)						
*Nitrate (as N)	0.0090		mg/L	10		24-OCT-19
Fluoride in Water by IC						
Fluoride (F)	0.149		mg/L	1.5		24-OCT-19
Chloride in Water by IC						
Chloride (Cl)	13.4		mg/L		250	24-OCT-19
Bromide in Water by IC (Low Level)						
Bromide (Br)	<0.050		mg/L			24-OCT-19
Biochemical Oxygen Demand	<2.0		mg/L			23-OCT-19
COD	<20		mg/L			28-OCT-19
Colour, True	<5.0		CU		15	24-OCT-19
Dissolved Organic Carbon	5.68		mg/L			24-OCT-19
Hardness (as CaCO3)	154	HTC	mg/L		500	24-OCT-19
Oil and Grease	<5.0		mg/L			25-OCT-19
Phenols (4AAP)	<0.0010		mg/L			24-OCT-19
MPN-Fecal Coliform	<1		MPN/100mL			21-OCT-19
Cyanide, Total	<0.0050		mg/L	0.2		24-OCT-19
Total Dissolved Solids	217		mg/L		500	24-OCT-19
Mercury (Hg)-Total	<0.0000050		mg/L	0.001		26-OCT-19
Total Suspended Solids	<3.0		mg/L			24-OCT-19
Total Organic Carbon	6.32		mg/L			24-OCT-19
*Turbidity	0.17		NTU			24-OCT-19

24 Hours after super chlorination

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Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
pH	8.19		pH		7-10.5	24-OCT-19
Total Metals in Water by CRC ICPMS						
Aluminum (Al)-Total	0.0281		mg/L		0.1	24-OCT-19
Antimony (Sb)-Total	<0.00010		mg/L	0.006		24-OCT-19
Arsenic (As)-Total	0.00033		mg/L	0.01		24-OCT-19
Barium (Ba)-Total	0.0227		mg/L	1		24-OCT-19
Beryllium (Be)-Total	<0.00010		mg/L			24-OCT-19
Bismuth (Bi)-Total	<0.000050		mg/L			24-OCT-19
Boron (B)-Total	0.022		mg/L	5		24-OCT-19
Cadmium (Cd)-Total	0.0000079		mg/L	0.005		24-OCT-19
Calcium (Ca)-Total	35.9		mg/L			24-OCT-19
Cesium (Cs)-Total	<0.000010		mg/L			24-OCT-19
Chromium (Cr)-Total	0.00050		mg/L	0.05		24-OCT-19
Cobalt (Co)-Total	0.00023		mg/L			24-OCT-19
Copper (Cu)-Total	0.00545		mg/L	2.0	1.0	24-OCT-19
Iron (Fe)-Total	0.049		mg/L		0.3	24-OCT-19
Lead (Pb)-Total	0.000376		mg/L	0.005		24-OCT-19
Lithium (Li)-Total	0.0043		mg/L			24-OCT-19
Magnesium (Mg)-Total	15.6		mg/L			24-OCT-19
Manganese (Mn)-Total	0.00151		mg/L	0.12	0.02	24-OCT-19
Molybdenum (Mo)-Total	0.000406		mg/L			24-OCT-19
Nickel (Ni)-Total	0.00132		mg/L			24-OCT-19
Phosphorus (P)-Total	<0.050		mg/L			24-OCT-19
Potassium (K)-Total	1.87		mg/L			24-OCT-19
Rubidium (Rb)-Total	0.00138		mg/L			24-OCT-19
Selenium (Se)-Total	<0.000050		mg/L	0.05		24-OCT-19
Silicon (Si)-Total	1.38		mg/L			24-OCT-19
Silver (Ag)-Total	<0.000010		mg/L			24-OCT-19
Sodium (Na)-Total	19.4		mg/L		200	24-OCT-19
Strontium (Sr)-Total	0.194		mg/L	7		24-OCT-19
Sulfur (S)-Total	17.7		mg/L			24-OCT-19
Tellurium (Te)-Total	<0.00020		mg/L			24-OCT-19
Thallium (Tl)-Total	<0.000010		mg/L			24-OCT-19
Thorium (Th)-Total	<0.00010		mg/L			24-OCT-19
Tin (Sn)-Total	0.00030		mg/L			24-OCT-19
Titanium (Ti)-Total	<0.00030		mg/L			24-OCT-19
Tungsten (W)-Total	<0.00010		mg/L			24-OCT-19
Uranium (U)-Total	0.00133		mg/L	0.02		24-OCT-19
Vanadium (V)-Total	<0.00050		mg/L			24-OCT-19
Zinc (Zn)-Total	0.0969		mg/L		5.0	24-OCT-19
Zirconium (Zr)-Total	<0.00020		mg/L			24-OCT-19
Total Coliform and E.coli						
Total Coliforms	<1		MPN/100mL	0		21-OCT-19
Escherichia Coli	<1		MPN/100mL	0		21-OCT-19

24 Hours after super chlorination

Date: 31-OCT-19
PO No.:
WO No.: L2368840
Project Ref: 10338-G
Sample ID: TREATED WATER - 24HRS
Sampled By:
Date Collected: 20-OCT-19
Lab Sample ID: L2368840-1
Matrix: WATER

AWC SOLUTIONS
9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
CDWQG = Health Canada Guideline Limits updated	**JUNE 2019**					

* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit.
* Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality
- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Oliver Gregg
Account Manager

AWC SOLUTIONS
9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Date: 31-OCT-19
PO No.:
WO No.: L2368840
Project Ref: 10338-G
Sample ID: BACKWASH SEV3
Sampled By:
Date Collected: 20-OCT-19
Lab Sample ID: L2368840-2
Matrix: WATER

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Alkalinity Species by Titration						
Alkalinity Species by Titration						
Alkalinity, Bicarbonate (as CaCO3)	233		mg/L			24-OCT-19
Alkalinity, Carbonate (as CaCO3)	24.8		mg/L			24-OCT-19
Alkalinity, Hydroxide (as CaCO3)	<1.0		mg/L			24-OCT-19
Alkalinity, Total (as CaCO3)	258		mg/L			24-OCT-19
Anions by Ion Chromatography						
Sulfate in Water by IC						
Sulfate (SO4)	294		mg/L		500	24-OCT-19
Nitrite in Water by IC (Low Level)						
*Nitrite (as N)	0.0097		mg/L	1		24-OCT-19
Nitrate in Water by IC (Low Level)						
*Nitrate (as N)	0.029		mg/L	10		24-OCT-19
Fluoride in Water by IC						
Fluoride (F)	0.27		mg/L	1.5		24-OCT-19
Chloride in Water by IC						
Chloride (Cl)	8.5		mg/L		250	24-OCT-19
Bromide in Water by IC (Low Level)						
Bromide (Br)	<0.25	DLDS	mg/L			24-OCT-19
Biochemical Oxygen Demand	4.0		mg/L			23-OCT-19
COD	115		mg/L			30-OCT-19
Colour, True	<5.0		CU		15	24-OCT-19
Dissolved Organic Carbon	8.81		mg/L			24-OCT-19
Hardness (as CaCO3)	180	HTC	mg/L		500	24-OCT-19
Oil and Grease	<5.0		mg/L			30-OCT-19
Phenols (4AAP)	0.0031		mg/L			29-OCT-19
Cyanide, Total	<0.0050		mg/L	0.2		28-OCT-19
Total Dissolved Solids	864		mg/L		500	24-OCT-19
Mercury (Hg)-Total	<0.0000050		mg/L	0.001		26-OCT-19
Total Suspended Solids	46.9		mg/L			24-OCT-19
Total Organic Carbon	9.77		mg/L			24-OCT-19
*Turbidity	11.5		NTU			24-OCT-19
pH	8.81		pH		7-10.5	24-OCT-19

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9087A 198 Street,
Langley BC V1M 3B1
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Date: 31-OCT-19
PO No.:
WO No.: L2368840
Project Ref: 10338-G
Sample ID: BACKWASH SEV3
Sampled By:
Date Collected: 20-OCT-19
Lab Sample ID: L2368840-2
Matrix: WATER

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Total Metals in Water by CRC ICPMS						
Aluminum (Al)-Total	0.127		mg/L		0.1	24-OCT-19
Antimony (Sb)-Total	<0.00010		mg/L	0.006		24-OCT-19
Arsenic (As)-Total	0.00032		mg/L	0.01		24-OCT-19
Barium (Ba)-Total	0.0223		mg/L	1		24-OCT-19
Beryllium (Be)-Total	<0.00010		mg/L			24-OCT-19
Bismuth (Bi)-Total	<0.000050		mg/L			24-OCT-19
Boron (B)-Total	0.024		mg/L	5		24-OCT-19
Cadmium (Cd)-Total	0.0000354		mg/L	0.005		24-OCT-19
Calcium (Ca)-Total	37.1		mg/L			24-OCT-19
Cesium (Cs)-Total	0.000033		mg/L			24-OCT-19
Chromium (Cr)-Total	0.00039		mg/L	0.05		24-OCT-19
Cobalt (Co)-Total	<0.00010		mg/L			24-OCT-19
Copper (Cu)-Total	0.00213		mg/L	2.0	1.0	24-OCT-19
Iron (Fe)-Total	0.090		mg/L		0.3	24-OCT-19
Lead (Pb)-Total	0.000156		mg/L	0.005		24-OCT-19
Lithium (Li)-Total	0.0046		mg/L			24-OCT-19
Magnesium (Mg)-Total	21.2		mg/L			24-OCT-19
Manganese (Mn)-Total	0.00670		mg/L	0.12	0.02	24-OCT-19
Molybdenum (Mo)-Total	0.000491		mg/L			24-OCT-19
Nickel (Ni)-Total	<0.00050		mg/L			24-OCT-19
Phosphorus (P)-Total	<0.050		mg/L			24-OCT-19
Potassium (K)-Total	2.10		mg/L			24-OCT-19
Rubidium (Rb)-Total	0.00161		mg/L			24-OCT-19
Selenium (Se)-Total	<0.000050		mg/L	0.05		24-OCT-19
Silicon (Si)-Total	1.42		mg/L			24-OCT-19
Silver (Ag)-Total	<0.000010		mg/L			24-OCT-19
Sodium (Na)-Total	300		mg/L		200	24-OCT-19
Strontium (Sr)-Total	0.192		mg/L	7		24-OCT-19
Sulfur (S)-Total	184		mg/L			24-OCT-19
Tellurium (Te)-Total	<0.00020		mg/L			24-OCT-19
Thallium (Tl)-Total	<0.000010		mg/L			24-OCT-19
Thorium (Th)-Total	<0.00010		mg/L			24-OCT-19
Tin (Sn)-Total	0.00021		mg/L			24-OCT-19
Titanium (Ti)-Total	<0.00030		mg/L			24-OCT-19
Tungsten (W)-Total	<0.00010		mg/L			24-OCT-19
Uranium (U)-Total	0.00128		mg/L	0.02		24-OCT-19
Vanadium (V)-Total	<0.00050		mg/L			24-OCT-19
Zinc (Zn)-Total	0.0030		mg/L		5.0	24-OCT-19
Zirconium (Zr)-Total	<0.00020		mg/L			24-OCT-19

Date: 31-OCT-19
PO No.:
WO No.: L2368840
Project Ref: 10338-G
Sample ID: BACKWASH SEV3
Sampled By:
Date Collected: 20-OCT-19
Lab Sample ID: L2368840-2
Matrix: WATER

AWC SOLUTIONS
9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
CDWQG = Health Canada Guideline Limits updated	**JUNE 2019**					

* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit.
* Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality
- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by _____
Oliver Gregg
Account Manager

AWC SOLUTIONS
9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Date: 31-OCT-19
PO No.:
WO No.: L2368840
Project Ref: 10338-G
Sample ID: RAW WATER
Sampled By:
Date Collected: 20-OCT-19
Lab Sample ID: L2368840-3
Matrix: WATER

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Alkalinity Species by Titration						
Alkalinity Species by Titration						
Alkalinity, Bicarbonate (as CaCO3)	114		mg/L			24-OCT-19
Alkalinity, Carbonate (as CaCO3)	<1.0		mg/L			24-OCT-19
Alkalinity, Hydroxide (as CaCO3)	<1.0		mg/L			24-OCT-19
Alkalinity, Total (as CaCO3)	114		mg/L			24-OCT-19
Anions by Ion Chromatography						
Sulfate in Water by IC						
Sulfate (SO4)	50.0		mg/L		500	24-OCT-19
Nitrite in Water by IC (Low Level)						
*Nitrite (as N)	<0.0010		mg/L	1		24-OCT-19
Nitrate in Water by IC (Low Level)						
*Nitrate (as N)	<0.0050		mg/L	10		24-OCT-19
Fluoride in Water by IC						
Fluoride (F)	0.153		mg/L	1.5		24-OCT-19
Chloride in Water by IC						
Chloride (Cl)	6.78		mg/L		250	24-OCT-19
Bromide in Water by IC (Low Level)						
Bromide (Br)	<0.050		mg/L			24-OCT-19
Biochemical Oxygen Demand	<2.0		mg/L			23-OCT-19
COD	<20		mg/L			30-OCT-19
Colour, True	<5.0		CU		15	24-OCT-19
Dissolved Organic Carbon	4.47		mg/L			24-OCT-19
Hardness (as CaCO3)	153	HTC	mg/L		500	24-OCT-19
Oil and Grease	<5.0		mg/L			30-OCT-19
Phenols (4AAP)	<0.0010		mg/L			28-OCT-19
Cyanide, Total	<0.0050		mg/L	0.2		28-OCT-19
Total Dissolved Solids	215		mg/L		500	24-OCT-19
Mercury (Hg)-Total	<0.0000050		mg/L	0.001		26-OCT-19
Total Suspended Solids	<3.0		mg/L			24-OCT-19
Total Organic Carbon	5.07		mg/L			24-OCT-19
*Turbidity	0.33		NTU			24-OCT-19
pH	8.18		pH		7-10.5	24-OCT-19

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Date: 31-OCT-19
PO No.:
WO No.: L2368840
Project Ref: 10338-G
Sample ID: RAW WATER
Sampled By:
Date Collected: 20-OCT-19
Lab Sample ID: L2368840-3
Matrix: WATER

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Total Metals in Water by CRC ICPMS						
Aluminum (Al)-Total	0.0034		mg/L		0.1	24-OCT-19
Antimony (Sb)-Total	<0.00010		mg/L	0.006		24-OCT-19
Arsenic (As)-Total	0.00031		mg/L	0.01		24-OCT-19
Barium (Ba)-Total	0.0219		mg/L	1		24-OCT-19
Beryllium (Be)-Total	<0.00010		mg/L			24-OCT-19
Bismuth (Bi)-Total	<0.000050		mg/L			24-OCT-19
Boron (B)-Total	0.022		mg/L	5		24-OCT-19
Cadmium (Cd)-Total	<0.0000050		mg/L	0.005		24-OCT-19
Calcium (Ca)-Total	36.3		mg/L			24-OCT-19
Cesium (Cs)-Total	<0.000010		mg/L			24-OCT-19
Chromium (Cr)-Total	<0.00010		mg/L	0.05		24-OCT-19
Cobalt (Co)-Total	<0.00010		mg/L			24-OCT-19
Copper (Cu)-Total	0.00188		mg/L	2.0	1.0	24-OCT-19
Iron (Fe)-Total	<0.010		mg/L		0.3	24-OCT-19
Lead (Pb)-Total	0.000872		mg/L	0.005		24-OCT-19
Lithium (Li)-Total	0.0042		mg/L			24-OCT-19
Magnesium (Mg)-Total	15.2		mg/L			24-OCT-19
Manganese (Mn)-Total	0.00186		mg/L	0.12	0.02	24-OCT-19
Molybdenum (Mo)-Total	0.000379		mg/L			24-OCT-19
Nickel (Ni)-Total	<0.00050		mg/L			24-OCT-19
Phosphorus (P)-Total	<0.050		mg/L			24-OCT-19
Potassium (K)-Total	1.80		mg/L			24-OCT-19
Rubidium (Rb)-Total	0.00140		mg/L			24-OCT-19
Selenium (Se)-Total	<0.000050		mg/L	0.05		24-OCT-19
Silicon (Si)-Total	1.37		mg/L			24-OCT-19
Silver (Ag)-Total	<0.000010		mg/L			24-OCT-19
Sodium (Na)-Total	5.08		mg/L		200	24-OCT-19
Strontium (Sr)-Total	0.191		mg/L	7		24-OCT-19
Sulfur (S)-Total	17.6		mg/L			24-OCT-19
Tellurium (Te)-Total	<0.00020		mg/L			24-OCT-19
Thallium (Tl)-Total	<0.000010		mg/L			24-OCT-19
Thorium (Th)-Total	<0.00010		mg/L			24-OCT-19
Tin (Sn)-Total	<0.00010		mg/L			24-OCT-19
Titanium (Ti)-Total	<0.00030		mg/L			24-OCT-19
Tungsten (W)-Total	<0.00010		mg/L			24-OCT-19
Uranium (U)-Total	0.00129		mg/L	0.02		24-OCT-19
Vanadium (V)-Total	<0.00050		mg/L			24-OCT-19
Zinc (Zn)-Total	0.0033		mg/L		5.0	24-OCT-19
Zirconium (Zr)-Total	<0.00020		mg/L			24-OCT-19

AWC SOLUTIONS
9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Date: 31-OCT-19
PO No.:
WO No.: L2368840
Project Ref: 10338-G
Sample ID: RAW WATER
Sampled By:
Date Collected: 20-OCT-19
Lab Sample ID: L2368840-3
Matrix: WATER

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
CDWQG = Health Canada Guideline Limits updated	**JUNE 2019**					

* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit.
* Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality
- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Oliver Gregg
Account Manager

Guidelines & Objectives

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).

Health Canada MAC Health Related Criteria Limits

Nitrate/Nitrite-N*	Criteria limit is 10 mg/L (1.0 mg/L if present as all Nitrite-N). High concentrations may contribute to blue baby syndrome in infants.
Lead*	A cumulative body poison, uncommon in naturally occurring hard waters.
Fluoride*	Present in fluoridated water supplies at 0.8 mg/L to reduce dental caries. Elevated levels causes fluorosis (mottling of teeth).
Total Coliforms*	Criteria is 0 CFU/100mL. Adverse health effects.
E. Coli*	Criteria is 0 CFU/100 mL. Certain E. Coli bacteria can be life threatening.
Manganese*	Criteria limit is 0.12 mg/L. Possible neurological effects in infants.

*Health Canada Canadian Drinking Water Quality Guidelines (MAC limit)

Aesthetic Objective Concentration Levels

Alkalinity	Acid neutralizing capacity. Usually a measure of carbonate and bicarbonates and calculated and reported as calcium carbonate.
Balance	Quality control parameter ratioing cations to anions
Bicarbonate	See Alkalinity. Report as the anion HCO3-1
Carbonate	See Alkalinity. Reported at the anion CO3-2
Calcium	See Hardness. Common major cation of water chemistry.
Chloride	Common major anion of water chemistry.
Conductance	Physical test measuring water salinity (dissolved ions or solids)
Hardness	Classical measure or capacity of water to precipitate soap (chiefly calcium and magnesium ions). Causes scaling tendency in water if carbonates/bicarbonates are present (if >200 mg/L). For drinking water purposes waters with results <200 mg/L are considered acceptable, results >200 mg/L are considered poor but can be tolerated. Results >500 mg/L are unacceptable.
Hydroxide	See alkalinity
Magnesium	See hardness. Common major cation of water chemistry. Elevated levels (>125 mg/L) may exert a cathartic or diuretic action.
pH	Measure of water acidity/alkalinity. Normal range is 7.0-8.5.
Potassium	Common major cation of water chemistry.
Sodium	Common major cation of water chemistry. Measure of salinity (saltiness).The aesthetic objective (not related to health) for sodium in drinking water is 200 mg/L. However, where sodium concentration of the drinking water exceeds 20 mg/L, it is recommended that any person on a sodium restricted diet consult with his/her physician or Medical Officer of Health concerning the use of that water.
Sulphate	Common major anion of water chemistry. Elevated levels may exert a cathartic or diuretic action.
Total Dissolved Solids	A measure of water salinity.
Iron	Causes staining to laundry and porcelain and astringent taste. Oxidizes to red-brown precipitate on exposure to air.
Heterotrophic Plate Count	Criteria is 500 cfu/mL Measure of heterotrophic bacteria present.

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2368840-COFC

COC Number: 17 - 817853

Page of

Report To	Contact and company name below will appear on the final report	Report Format	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	AWC solutions	Select Report Format: [X] PDF [X] EXCEL [ ] EDD (DIGITAL)	Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Jainish Patel	Quality Control (QC) Report with Report [ ] YES [ ] NO	PRIORITY (Business Days): 4 day [P4-20%] [ ] / 3 day [P3-25%] [ ] / 2 day [P2-50%] [ ]
Phone:	604 364 9546	[ ] Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E - 100%] [X] / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] [ ]
	Company address below will appear on the final report	Select Distribution: [X] EMAIL [ ] MAIL [ ] FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	9087A 198 St Fraser	Email 1 or Fax: jainish@awcwater.com	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	Surrey BC	Email 2: Curtisb@awcsolutions.com	
Postal Code:	V4N 3B1	Email 3:	
Invoice To	Same as Report To [✓] YES [ ] NO	**Invoice Distribution**	
	Copy of Invoice with Report [✓] YES [ ] NO	Select Invoice Distribution: [X] EMAIL [ ] MAIL [ ] FAX	
Company:	AWC Solutions	Email 1 or Fax: jainish@awcwater.com	
Contact:		Email 2:	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q76748	AFE/Cost Center:	PO#:
Job #:	10338-05	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	L2368840	ALS Contact:	Sampler:

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Bacti Regular	Bacti RUSH	Metals	Cyanide	Mercury	BOD	COD	General	Oil + Grease	Nutrients	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	Treated water - 24hrs	20-10-19	16:00		10		X	X	X	X	X	X	X	X	X		
	Backwash Set 3	20-10-19	16:00		8			X	X	X	X	X	X	X	X		
	Raw water	20-10-19	16:00		8			X	X	X	X	X	X	X	X		
					26												

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

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] SIF Observations Yes [ ] No [ ]

Ice Packs [ ] Ice Cubes [ ] Custody seal intact Yes [ ] No [ ]

Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
13.7	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
JH	Oct 20/19	16:00	M.Khan	Oct 21/19	16:00			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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

GENERAL TERMS AND CONDITIONS:

These terms and conditions are incorporated in and form part of the Agreement between ALS Group's Environmental Division and the party named in the Offer (the "Client").

1. Definitions. Capitalized Terms not defined in these Terms and Conditions have the definitions set out in the other Agreement documents.
2. The Services. ALS will provide the Services to the Client as described in the Offer and in any chain of custody form provided with any sample.
3. Prices. ALS may review and change all prices, fees, surcharges or other charges set out in the Agreement if there are changes to ALS's cost beyond ALS's control, including changes in legislative requirements, Client variations of sample numbers and Client requests for changes to standard reporting requirements. Notwithstanding Condition 3, all quotations expire after three years.
4. Payment Terms. The Client shall pay ALS within 30 days of the invoice date OAC. ALS may, for reasonable business reasons, require the Client to arrange for payment in advance.
5. Quotation Numbers. The Client shall provide the quotation number to ALS (where applicable) to ensure correct pricing.
6. Taxes. Applicable taxes are not included in prices. Applicable surcharges and additional fees will be added at the time of invoicing.
7. Quality Control. ALS has an extensive QA/QC program. Clients' samples are analyzed using approved, referenced procedures followed by thorough data validation prior to reporting of the analytical results.
8. Test Results. Results are obtained from analytical measurements that are subject to inherent variability. Measurement results reflect characteristics of submitted test samples at time of analysis. The Client is responsible for informing itself on the limitation of test results and acknowledges that test results are not guaranteed. When statements of conformity are requested on test reports (e.g. within Criteria Reports), measurement uncertainty is not applied to test results prior to the evaluation.
9. Standard of Care. ALS will use reasonable care and diligence as required by the laws of the province or territory where the sample is tested.
10. Storage. Where possible, ALS will store soil and water samples for 45 days from date of receipt, tissue/biota samples for 6 months from date of receipt, air samples or re-usable media for 14 days from date of receipt, and microbiological samples for 3 days from date of receipt.
11. Holds. If the Client requests a sample to be placed on hold, ALS will store the samples according to paragraph 10, after which ALS will invoice the Client and discard the sample. Each sample is subject to a minimum $5.00 hold fee. Longer hold periods are available upon request. See paragraph 12.
12. Archives. If the Client requests a sample be archived, ALS will invoice in advance and store the sample for the period requested, after which ALS may discard the sample.
13. Legal Sample Handling Protocol. Legal sample handling protocol must be arranged before samples are collected. ALS charges a surcharge on the list price plus the hourly technologist or chemist rates for legal sample protocol. Additional charges will apply for samples that require storage by ALS.
14. Samples. The quality, condition, content and source of samples stored and tested are not known to ALS except as declared and described on the chain of custody form completed and submitted by the Client and accompanying the sample.
15. Risk of Loss. ALS will use reasonable care to protect samples during storage, however all samples are stored at the Client's risk and the Client is responsible for obtaining appropriate insurance, if desired. The Client acknowledges that during the performance of the Services samples may be altered, lost, damaged, or destroyed and the Client releases ALS from any claim the Client may have for any loss or damage to the sample.
16. Environmental Risk. Client must comply with all applicable environment legislation, including labeling all hazardous samples to comply with GHS and TDG regulations, and must provide appropriate Safety Data that include the nature of the hazard and a contact name and phone number to call for information. The Client will indemnify ALS for all loss or damages, including any fine or cost of complying with an order of any government authority, resulting from the Client's breach of this paragraph.
17. Hazardous Materials Disposal. ALS may return, at the Client's cost, hazardous material to the Client for disposal.
18. Hazardous Materials Surcharge. ALS may apply an additional surcharge for handling of hazardous samples or samples with Naturally Occurring Radioactive Materials (NORM), H2S, CN, etc.
19. Sample Containers. ALS may ship sample containers to the Client's location by the most cost effective means using ALS preferred courier suppliers, within the specified project timeline.
20. Additional Charges. ALS may charge the Client (a) its cost for emergency bottle shipments and shipments to and from a remote site, and (b) where pick up and delivery services are provided, subject in each instance to a minimum charge of $25.00.
21. Re-Tests. ALS reserves the right to re-test any samples that remain in its possession. Re-tests requested by the Client may be subject to charges.
22. Waiver. The Client is responsible for making any assessment regarding the suitability of the Services and the intended results for the Client's purposes and waives any claims against ALS it may have as a result of the interpretation of the results. The Client shall indemnify ALS for all claims made by any third party against ALS in respect of all losses however arising from the performance of the Services or the use of any report provided in the performance of the Services.
23. Limitation of Liability. In no event shall ALS be liable for any consequential, indirect, incidental, special, exemplary, or punitive damages, whether foreseeable or unforeseeable (including claims for loss of profits or revenue or losses caused by stoppage of other work or impairment of other assets), incurred by the Client arising out of breach or failure of express or implied warranty, breach of contract, breach of warranty, misrepresentation, negligence, strict liability in tort or otherwise. In any event, the liability of ALS to the Client shall be limited to the cost of testing the sample as requested in the chain of custody form under which the sample was originally deposited. For the purposes of this paragraph and paragraphs 8, 15, 16, 22 and 24, as applicable, "ALS" includes without limitations its directors, officers, employees and affiliates and the "Client" includes without limitation any third party that may have a claim against ALS through the Client.
24. Notice of Liability. Notwithstanding paragraph 23, ALS shall not be liable to the Client unless the Client provides notice in writing to ALS of such loss or damage, together with full particulars thereof, within 30 days of the Client's receipt of the report of the analysis of the sample giving rise to such liability. The provisions of this paragraph allocate the risk under the Agreement between the Client and ALS, and the fees to be paid by the Client to ALS reflect this allocation of risks and the limitations of liability in this Agreement.
25. Third Party Service Provider Indemnity. For testing not performed at ALS, and where the Client requires ALS to forward samples to a third party service provider, the Client indemnifies ALS against any breach of this Agreement, all liabilities or losses incurred in connection with the third party service provider, including but not limited to courier services, testing turn-around time, and any additional costs associated with such third party.
26. Third Party Service Provider Indemnity. If ALS is required to engage a third party service provider for whatever reason, the Client indemnifies ALS against any breach of this Agreement, liabilities, or losses incurred in connection with the third party service provider, including but not limited to courier services, testing turn-around time, and any additional costs associated with such third party.
27. Entire Agreement. The Agreement is the entire agreement between the parties and supersedes and takes precedence over any terms and conditions contained in any documentation provided by the Client. ALS's execution of any subsequent documentation from the Client only acknowledges receipt and not acceptance of any terms or conditions therein. If there is a conflict between these terms and conditions and any other Agreement document, these terms and conditions prevail.
28. Term. Providing the first batch of samples to which this tender refers is submitted within three months of the starting date of this quotation, the following prices, terms and conditions will remain firm until the closing date. This offer, and its terms and conditions will automatically lapse if the offer has not been accepted and samples not delivered to ALS by the Closing Date.
29. Termination. (a) either party may terminate this Agreement for any reason by giving the other party thirty (30) days written notice (Notice Period). (b) if the Agreement is terminated pursuant to clause (a), then the Client must pay ALS for all Services performed up to the expiry of the Notice Period.

Lab Sink: Waste Water

Date: 31-OCT-19
PO No.:
WO No.: L2368827
Project Ref: 10338G
Sample ID: WASTE WATER
Sampled By:
Date Collected: 21-OCT-19
Lab Sample ID: L2368827-1
Matrix: WATER

AWC SOLUTIONS
9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Alkalinity Species by Titration						
Alkalinity Species by Titration						
Alkalinity, Bicarbonate (as CaCO3)	136		mg/L			24-OCT-19
Alkalinity, Carbonate (as CaCO3)	<1.0		mg/L			24-OCT-19
Alkalinity, Hydroxide (as CaCO3)	<1.0		mg/L			24-OCT-19
Alkalinity, Total (as CaCO3)	136		mg/L			24-OCT-19
Anions by Ion Chromatography						
Sulfate in Water by IC						
Sulfate (SO4)	50.9		mg/L		500	24-OCT-19
Nitrite in Water by IC (Low Level)						
*Nitrite (as N)	0.0010		mg/L	1		24-OCT-19
Nitrate in Water by IC (Low Level)						
*Nitrate (as N)	0.0910		mg/L	10		24-OCT-19
Fluoride in Water by IC						
Fluoride (F)	<0.10	DLCI	mg/L	1.5		24-OCT-19
Chloride in Water by IC						
Chloride (Cl)	72.9		mg/L		250	24-OCT-19
Bromide in Water by IC (Low Level)						
Bromide (Br)	<0.050		mg/L			24-OCT-19
Biochemical Oxygen Demand	<2.0		mg/L			23-OCT-19
COD	41		mg/L			30-OCT-19
Colour, True	<5.0		CU		15	24-OCT-19
Dissolved Organic Carbon	15.5		mg/L			24-OCT-19
Hardness (as CaCO3)	155	HTC	mg/L		500	24-OCT-19
Oil and Grease	<5.0		mg/L			30-OCT-19
Phenols (4AAP)	<0.0010		mg/L			28-OCT-19
Cyanide, Total	<0.0050		mg/L	0.2		28-OCT-19
Total Dissolved Solids	339		mg/L		500	25-OCT-19
Mercury (Hg)-Total	<0.0000050		mg/L	0.001		26-OCT-19
Total Suspended Solids	<3.0		mg/L			24-OCT-19
Total Organic Carbon	16.2		mg/L			24-OCT-19
*Turbidity	1.05		NTU			24-OCT-19
pH	8.09		pH		7-10.5	24-OCT-19

AWC SOLUTIONS
9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Date: 31-OCT-19
PO No.:
WO No.: L2368827
Project Ref: 10338G
Sample ID: WASTE WATER
Sampled By:
Date Collected: 21-OCT-19
Lab Sample ID: L2368827-1
Matrix: WATER

Lab Sink: Waste Water

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Total Metals in Water by CRC ICPMS						
Aluminum (Al)-Total	0.0933		mg/L		0.1	24-OCT-19
Antimony (Sb)-Total	0.00022		mg/L	0.006		24-OCT-19
Arsenic (As)-Total	0.00034		mg/L	0.01		24-OCT-19
Barium (Ba)-Total	0.0237		mg/L	1		24-OCT-19
Beryllium (Be)-Total	<0.00010		mg/L			24-OCT-19
Bismuth (Bi)-Total	0.000412		mg/L			24-OCT-19
Boron (B)-Total	0.024		mg/L	5		24-OCT-19
Cadmium (Cd)-Total	0.0000262		mg/L	0.005		24-OCT-19
Calcium (Ca)-Total	36.9		mg/L			24-OCT-19
Cesium (Cs)-Total	<0.000010		mg/L			24-OCT-19
Chromium (Cr)-Total	0.00576		mg/L	0.05		24-OCT-19
Cobalt (Co)-Total	0.00022		mg/L			24-OCT-19
Copper (Cu)-Total	0.0299		mg/L	2.0	1.0	24-OCT-19
Iron (Fe)-Total	0.144		mg/L		0.3	24-OCT-19
Lead (Pb)-Total	0.000637		mg/L	0.005		24-OCT-19
Lithium (Li)-Total	0.0043		mg/L			24-OCT-19
Magnesium (Mg)-Total	15.3		mg/L			24-OCT-19
Manganese (Mn)-Total	0.00700		mg/L	0.12	0.02	24-OCT-19
Molybdenum (Mo)-Total	0.000673		mg/L			24-OCT-19
Nickel (Ni)-Total	0.00303		mg/L			24-OCT-19
Phosphorus (P)-Total	0.612		mg/L			24-OCT-19
Potassium (K)-Total	3.30		mg/L			24-OCT-19
Rubidium (Rb)-Total	0.00197		mg/L			24-OCT-19
Selenium (Se)-Total	0.000064		mg/L	0.05		24-OCT-19
Silicon (Si)-Total	1.39		mg/L			24-OCT-19
Silver (Ag)-Total	0.000033		mg/L			24-OCT-19
Sodium (Na)-Total	62.4		mg/L		200	24-OCT-19
Strontium (Sr)-Total	0.196		mg/L	7		24-OCT-19
Sulfur (S)-Total	18.0		mg/L			24-OCT-19
Tellurium (Te)-Total	<0.00020		mg/L			24-OCT-19
Thallium (Tl)-Total	<0.000010		mg/L			24-OCT-19
Thorium (Th)-Total	<0.00010		mg/L			24-OCT-19
Tin (Sn)-Total	0.00077		mg/L			24-OCT-19
Titanium (Ti)-Total	0.00188		mg/L			24-OCT-19
Tungsten (W)-Total	0.00013		mg/L			24-OCT-19
Uranium (U)-Total	0.00139		mg/L	0.02		24-OCT-19
Vanadium (V)-Total	<0.00050		mg/L			24-OCT-19
Zinc (Zn)-Total	0.0456		mg/L		5.0	24-OCT-19
Zirconium (Zr)-Total	<0.00020		mg/L			24-OCT-19

AWC SOLUTIONS
9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Date: 31-OCT-19
PO No.:
WO No.: L2368827
Project Ref: 10338G
Sample ID: WASTE WATER
Sampled By:
Date Collected: 21-OCT-19
Lab Sample ID: L2368827-1
Matrix: WATER

Lab Sink: Waste Water

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
CDWQG = Health Canada Guideline Limits updated	**JUNE 2019**					

* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit.
* Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality
- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by _____
Oliver Gregg
Account Manager

48 Hours after super chlorination

Date: 31-OCT-19
PO No.:
WO No.: L2368827
Project Ref: 10338G
Sample ID: TREATED WATER
Sampled By:
Date Collected: 21-OCT-19
Lab Sample ID: L2368827-2
Matrix: WATER

AWC SOLUTIONS
9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
MPN-Fecal Coliform	<1		MPN/100mL			21-OCT-19
Total Coliform and E.coli						
Total Coliforms	<1		MPN/100mL	0		21-OCT-19
Escherichia Coli	<1		MPN/100mL	0		21-OCT-19

CDWQG = Health Canada Guideline Limits updated **JUNE 2019**

* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit.
* Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality
- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by _____
Oliver Gregg
Account Manager

Guidelines & Objectives

Sample Parameter Qualifier key listed:

Qualifier	Description
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).

Health Canada MAC Health Related Criteria Limits

Nitrate/Nitrite-N*	Criteria limit is 10 mg/L (1.0 mg/L if present as all Nitrite-N). High concentrations may contribute to blue baby syndrome in infants.
Lead*	A cumulative body poison, uncommon in naturally occurring hard waters.
Fluoride*	Present in fluoridated water supplies at 0.8 mg/L to reduce dental caries. Elevated levels causes fluorosis (mottling of teeth).
Total Coliforms*	Criteria is 0 CFU/100mL. Adverse health effects.
E. Coli*	Criteria is 0 CFU/100 mL. Certain E. Coli bacteria can be life threatening.
Manganese*	Criteria limit is 0.12 mg/L. Possible neurological effects in infants.

*Health Canada Canadian Drinking Water Quality Guidelines (MAC limit)

Aesthetic Objective Concentration Levels

Alkalinity	Acid neutralizing capacity. Usually a measure of carbonate and bicarbonates and calculated and reported as calcium carbonate.
Balance	Quality control parameter ratioing cations to anions
Bicarbonate	See Alkalinity. Report as the anion HCO3-1
Carbonate	See Alkalinity. Reported at the anion CO3-2
Calcium	See Hardness. Common major cation of water chemistry.
Chloride	Common major anion of water chemistry.
Conductance	Physical test measuring water salinity (dissolved ions or solids)
Hardness	Classical measure or capacity of water to precipitate soap (chiefly calcium and magnesium ions). Causes scaling tendency in water if carbonates/bicarbonates are present (if >200 mg/L). For drinking water purposes waters with results <200 mg/L are considered acceptable, results >200 mg/L are considered poor but can be tolerated. Results >500 mg/L are unacceptable.
Hydroxide	See alkalinity
Magnesium	See hardness. Common major cation of water chemistry. Elevated levels (>125 mg/L) may exert a cathartic or diuretic action.
pH	Measure of water acidity/alkalinity. Normal range is 7.0-8.5.
Potassium	Common major cation of water chemistry.
Sodium	Common major cation of water chemistry. Measure of salinity (saltiness).The aesthetic objective (not related to health) for sodium in drinking water is 200 mg/L. However, where sodium concentration of the drinking water exceeds 20 mg/L, it is recommended that any person on a sodium restricted diet consult with his/her physician or Medical Officer of Health concerning the use of that water.
Sulphate	Common major anion of water chemistry. Elevated levels may exert a cathartic or diuretic action.
Total Dissolved Solids	A measure of water salinity.
Iron	Causes staining to laundry and porcelain and astringent taste. Oxidizes to red-brown precipitate on exposure to air.
Heterotrophic Plate Count	Criteria is 500 cfu/mL Measure of heterotrophic bacteria present.

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

ALS Environmental
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 - 817854

Page of

Report To	Contact and company name below will appear on the final report
Company:	AWC Water Solutions.
Contact:	Jainish Patel
Phone:	
	Company address below will appear on the final report
Street:	9087A 198 ST
City/Province:	Langley BC
Postal Code:	V1M 3B1
Invoice To	Same as Report To [X] YES [ ] NO
	Copy of Invoice with Report [ ] YES [ ] NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: [X] PDF [X] 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: [X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax: Jainish@awcwater.com
Email 2: Curtis@awcSolutions.com
Email 3:

Invoice Distribution

Select Invoice Distribution: [X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax:
Email 2:

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

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

PRIORITY (Business Days): 4 day [P4-20%] [ ] | 3 day [P3-25%] [ ] | 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E - 100%] [X] | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] [ ]

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

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

Project Information	Oil and Gas Required Fields (client use)
ALS Account # / Quote #:	AFE/Cost Center: PO#:
Job #: 103384	Major/Minor Code: Routing Code:
PO / AFE:	Requisitioner:
LSD:	Location:
ALS Lab Work Order # (lab use only): L2368827	ALS Contact: Sampler:

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	BOD	COD	Cyanide	Mercury	Coliforms	Oil & Grease	Nutrients	Bacteria* (Rush)	Bacteria* Each	Metals	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	Waste Water	21-Oct-19	11:00	Waste		X	X	X	X	X	X	X	X		X		
	Treated water (RUSH)	21-Oct-19	13:30	~~Bact~~									X				

L2368827-COFC

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

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] SIF Observations Yes [ ] No [ ]
Ice Packs [ ] Ice Cubes [ ] Custody seal intact Yes [ ] No [ ]
Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
15.1	15.8						

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	21-Oct-19	14:00	M. Khan	Oct 21/19	16:00			

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**

GENERAL TERMS AND CONDITIONS:

These terms and conditions are incorporated in and form part of the Agreement between ALS Group's Environmental Division and the party named in the Offer (the "Client").

1. Definitions. Capitalized Terms not defined in these Terms and Conditions have the definitions set out in the other Agreement documents.
2. The Services. ALS will provide the Services to the Client as described in the Offer and in any chain of custody form provided with any sample.
3. Prices. ALS may review and change all prices, fees, surcharges or other charges set out in the Agreement if there are changes to ALS's cost beyond ALS's control, including changes in legislative requirements, Client variations of sample numbers and Client requests for changes to standard reporting requirements. Notwithstanding Condition 3, all quotations expire after three years.
4. Payment Terms. The Client shall pay ALS within 30 days of the invoice date OAC. ALS may, for reasonable business reasons, require the Client to arrange for payment in advance.
5. Quotation Numbers. The Client shall provide the quotation number to ALS (where applicable) to ensure correct pricing.
6. Taxes. Applicable taxes are not included in prices. Applicable surcharges and additional fees will be added at the time of invoicing.
7. Quality Control. ALS has an extensive QA/QC program. Clients' samples are analyzed using approved, referenced procedures followed by thorough data validation prior to reporting of the analytical results.
8. Test Results. Results are obtained from analytical measurements that are subject to inherent variability. Measurement results reflect characteristics of submitted test samples at time of analysis. The Client is responsible for informing itself on the limitation of test results and acknowledges that test results are not guaranteed. When statements of conformity are requested on test reports (e.g. within Criteria Reports), measurement uncertainty is not applied to test results prior to the evaluation.
9. Standard of Care. ALS will use reasonable care and diligence as required by the laws of the province or territory where the sample is tested.
10. Storage. Where possible, ALS will store; soil and water samples for 45 days from date of receipt, tissue/biota samples for 6 months from date of receipt, air samples or re-usable media for 14 days from date of receipt, and microbiological samples for 3 days from date of receipt.
11. Holds. If the Client requests a sample to be placed on hold, ALS will store the samples according to paragraph 10, after which ALS will invoice the Client and discard the sample. Each sample is subject to a minimum $5.00 hold fee. Longer hold periods are available upon request. See paragraph 12.
12. Archives. If the Client requests a sample be archived, ALS will invoice in advance and store the sample for the period requested, after which ALS may discard the sample.
13. Legal Sample Handling Protocol. Legal sample handling protocol must be arranged before samples are collected. ALS charges a surcharge on the list price plus the hourly technologist or chemist rates for legal sample protocol. Additional charges will apply for samples that require storage by ALS.
14. Samples. The quality, condition, content and source of samples stored and tested are not known to ALS except as declared and described on the chain of custody form completed and submitted by the Client and accompanying the sample.
15. Risk of Loss. ALS will use reasonable care to protect samples during storage, however all samples are stored at the Client's risk and the Client is responsible for obtaining appropriate insurance, if desired. The Client acknowledges that during the performance of the Services samples may be altered, lost, damaged, or destroyed and the Client releases ALS from any claim the Client may have for any loss or damage to the sample.
16. Environmental. The Client must comply with all applicable environment legislation, including labeling all hazardous samples to comply with GHS and TDG regulations, and must provide appropriate Safety Data that include the nature of the hazard and a contact name and phone number to call for information. The Client will indemnify ALS for all loss or damages, including any fine or cost of complying with an order of any government authority, resulting from the Client's breach of this paragraph.
17. Hazardous Materials Disposal. ALS may return, at the Client's cost, hazardous material to the Client for disposal.
18. Hazardous Materials Surcharge. ALS may apply an additional surcharge for handling of hazardous samples or samples with Naturally Occurring Radioactive Materials (NORM), H2S, CN, etc.
19. Sample Containers. ALS may ship sample containers to the Client's location by the most cost effective means using ALS preferred courier suppliers, within the specified project timeline.
20. Additional Charges. ALS may charge the Client (a) its cost for emergency bottle shipments and shipments to and from a remote site, and (b) where pick up and delivery services are provided, subject in each instance to a minimum charge of $25.00.
21. Re-Tests. ALS reserves the right to re-test any samples that remain in its possession. Re-tests requested by the Client may be subject to charges.
22. Waiver. The Client is responsible for making any assessment regarding the suitability of the Services and the intended results for the Client's purposes and waives any claims against ALS it may have as a result of the interpretation of the results. The Client shall indemnify ALS for all claims made by any third party against ALS in respect of all losses however arising from the performance of the Services or the use of any report provided in the performance of the Services.
23. Limitation of Liability. In no event shall ALS be liable for any consequential, indirect, incidental, special, exemplary, or punitive damages, whether foreseeable or unforeseeable (including claims for loss of profits or revenue or losses caused by stoppage of other work or impairment of other assets), incurred by the Client arising out of breach or failure of express or implied warranty, breach of contract, breach of warranty, misrepresentation, negligence, strict liability in tort or otherwise. In any event, the liability of ALS to the Client shall be limited to the cost of testing the sample as requested in the chain of custody form under which the sample was originally deposited. For the purposes of this paragraph and paragraphs 8, 15, 16, 22 and 24, as applicable, "ALS" includes without limitations its directors, officers, employees and affiliates and the "Client" includes without limitation any third party that may have a claim against ALS through the Client.
24. Notice of Liability. Notwithstanding paragraph 23, ALS shall not be liable to the Client unless the Client provides notice in writing to ALS of such loss or damage, together with full particulars thereof, within 30 days of the Client's receipt of the report of the analysis of the sample giving rise to such liability. The provisions of this paragraph allocate the risk under the Agreement between the Client and ALS, and the fees to be paid by the Client to ALS reflect this allocation of risks and the limitations of liability in this Agreement.
25. Third Party Service Provider Indemnity. For testing not performed at ALS, and where the Client requires ALS to forward samples to a third party service provider, the Client indemnifies ALS against any breach of this Agreement, all liabilities or losses incurred in connection with the third party service provider, including but not limited to courier services, testing turn-around time, and any additional costs associated with such third party.
26. Third Party Service Provider Indemnity. If ALS is required to engage a third party service provider for whatever reason, the Client indemnifies ALS against any breach of this Agreement, liabilities, or losses incurred in connection with the third party service provider, including but not limited to courier services, testing turn-around time, and any additional costs associated with such third party.
27. Entire Agreement. The Agreement is the entire agreement between the parties and supersedes and takes precedence over any terms and conditions contained in any documentation provided by the Client. ALS's execution of any subsequent documentation from the Client only acknowledges receipt and not acceptance of any terms or conditions therein. If there is a conflict between these terms and conditions and any other Agreement document, these terms and conditions prevail.
28. Term. Providing the first batch of samples to which this tender refers is submitted within three months of the starting date of this quotation, the following prices, terms and conditions will remain firm until the closing date. This offer, and its terms and conditions will automatically lapse if the offer has not been accepted and samples not delivered to ALS by the Closing Date.
29. Termination. (a) Either party may terminate this Agreement for any reason by giving the other party thirty (30) days written notice (Notice Period). (b) If the Agreement is terminated pursuant to clause (a), then the Client must pay ALS for all Services performed up to the expiry of the Notice Period.

Membrane Start Up : backwash Water sample

Date: 31-OCT-19
PO No.:
WO No.: L2366744
Project Ref: AWC 10338-G
Sample ID: BACKWASH
Sampled By: Jainish Patel
Date Collected: 16-OCT-19
Lab Sample ID: L2366744-1
Matrix: WATER

AWC SOLUTIONS
9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Alkalinity Species by Titration						
Alkalinity Species by Titration						
Alkalinity, Bicarbonate (as CaCO3)	113		mg/L			21-OCT-19
Alkalinity, Carbonate (as CaCO3)	<1.0		mg/L			21-OCT-19
Alkalinity, Hydroxide (as CaCO3)	<1.0		mg/L			21-OCT-19
Alkalinity, Total (as CaCO3)	113		mg/L			21-OCT-19
Anions by Ion Chromatography						
Sulfate in Water by IC						
Sulfate (SO4)	50.6		mg/L		500	20-OCT-19
Nitrite in Water by IC (Low Level)						
*Nitrite (as N)	0.0086		mg/L	1		20-OCT-19
Nitrate in Water by IC (Low Level)						
*Nitrate (as N)	0.0372		mg/L	10		20-OCT-19
Fluoride in Water by IC						
Fluoride (F)	0.136		mg/L	1.5		20-OCT-19
Chloride in Water by IC						
Chloride (Cl)	9.84		mg/L		250	20-OCT-19
Bromide in Water by IC (Low Level)						
Bromide (Br)	<0.050		mg/L			20-OCT-19
Biochemical Oxygen Demand	26.0		mg/L			18-OCT-19
COD	701		mg/L			30-OCT-19
Colour, True	<5.0		CU		15	20-OCT-19
Dissolved Organic Carbon	224	HTD	mg/L			23-OCT-19
Hardness (as CaCO3)	163	HTC	mg/L		500	22-OCT-19
Oil and Grease	<5.0		mg/L			28-OCT-19
Phenols (4AAP)	<0.0010		mg/L			23-OCT-19
MPN-Fecal Coliform	<1		MPN/100mL			17-OCT-19
Cyanide, Total	0.0087		mg/L	0.2		21-OCT-19
Total Dissolved Solids	205		mg/L		500	21-OCT-19
Mercury (Hg)-Total	<0.0000050		mg/L	0.001		23-OCT-19
Sulphide as S	<0.018		mg/L		0.05	22-OCT-19
Total Suspended Solids	<3.0		mg/L			22-OCT-19
Total Organic Carbon	236		mg/L			23-OCT-19

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Sample ID: BACKWASH
Sampled By: Jainish Patel
Date Collected: 16-OCT-19
Lab Sample ID: L2366744-1
Matrix: WATER

Membrane Start Up : backwash Water sample

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
*Turbidity	0.14		NTU			20-OCT-19
pH	8.14		pH		7-10.5	21-OCT-19
Total Metals in Water by CRC ICPMS						
Aluminum (Al)-Total	0.0212		mg/L		0.1	22-OCT-19
Antimony (Sb)-Total	<0.00010		mg/L	0.006		22-OCT-19
Arsenic (As)-Total	0.00067		mg/L	0.01		22-OCT-19
Barium (Ba)-Total	0.0215		mg/L	1		22-OCT-19
Beryllium (Be)-Total	<0.00010		mg/L			22-OCT-19
Bismuth (Bi)-Total	<0.000050		mg/L			22-OCT-19
Boron (B)-Total	0.025		mg/L	5		22-OCT-19
Cadmium (Cd)-Total	0.0000076		mg/L	0.005		22-OCT-19
Calcium (Ca)-Total	39.2		mg/L			22-OCT-19
Cesium (Cs)-Total	<0.000010		mg/L			22-OCT-19
Chromium (Cr)-Total	0.00028		mg/L	0.05		22-OCT-19
Cobalt (Co)-Total	<0.00010		mg/L			22-OCT-19
Copper (Cu)-Total	0.00364		mg/L	2.0	1.0	22-OCT-19
Iron (Fe)-Total	<0.010		mg/L		0.3	22-OCT-19
Lead (Pb)-Total	0.000179		mg/L	0.005		22-OCT-19
Lithium (Li)-Total	0.0045		mg/L			22-OCT-19
Magnesium (Mg)-Total	15.9		mg/L			22-OCT-19
Manganese (Mn)-Total	0.00088		mg/L	0.12	0.02	22-OCT-19
Molybdenum (Mo)-Total	0.000410		mg/L			22-OCT-19
Nickel (Ni)-Total	0.00071		mg/L			22-OCT-19
Phosphorus (P)-Total	<0.050		mg/L			22-OCT-19
Potassium (K)-Total	1.90		mg/L			22-OCT-19
Rubidium (Rb)-Total	0.00135		mg/L			22-OCT-19
Selenium (Se)-Total	<0.000050		mg/L	0.05		22-OCT-19
Silicon (Si)-Total	1.27		mg/L			22-OCT-19
Silver (Ag)-Total	<0.000010		mg/L			22-OCT-19
Sodium (Na)-Total	6.97		mg/L		200	22-OCT-19
Strontium (Sr)-Total	0.205		mg/L	7		22-OCT-19
Sulfur (S)-Total	16.9		mg/L			22-OCT-19
Tellurium (Te)-Total	<0.00020		mg/L			22-OCT-19
Thallium (Tl)-Total	<0.000010		mg/L			22-OCT-19
Thorium (Th)-Total	<0.00010		mg/L			22-OCT-19
Tin (Sn)-Total	0.00174		mg/L			22-OCT-19
Titanium (Ti)-Total	<0.00030		mg/L			22-OCT-19
Tungsten (W)-Total	<0.00010		mg/L			22-OCT-19
Uranium (U)-Total	0.00139		mg/L	0.02		22-OCT-19
Vanadium (V)-Total	<0.00050		mg/L			22-OCT-19
Zinc (Zn)-Total	0.0090		mg/L		5.0	22-OCT-19
Zirconium (Zr)-Total	<0.00020		mg/L			22-OCT-19
Total Coliform and E.coli						
			MPN/100mL			

Membrane Start Up : backwash Water sample

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9087A 198 Street,
Langley BC V1M 3B1
ATTN: Jainish Patel

Date: 31-OCT-19
PO No.:
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Project Ref: AWC 10338-G
Sample ID: BACKWASH
Sampled By: Jainish Patel
Date Collected: 16-OCT-19
Lab Sample ID: L2366744-1
Matrix: WATER

Test Description	Result	Qualifier	Units of Measure	CDWQG MAC	Aesthetic Objective	Date Analyzed
Total Coliform and E.coli						
Total Coliforms	<1			0		17-OCT-19
Escherichia Coli	<1		MPN/100mL	0		17-OCT-19

CDWQG = Health Canada Guideline Limits updated **JUNE 2019**

* CDWQG for Nitrate+Nitrite-N is the limit for nitrate only. If present as Nitrate then the limit is 10mg/L < or N.D. = less than detection limit.
* Turbidity guideline based on membrane filtration. For guidelines on conventional treatment and slow sand or diatomaceous earth filtration please see Summary Table of Guidelines for Canadian Drinking Water Quality
- A blank entry designates no known limit.
- A shaded value in the Results column exceeds CDWQG MAC and/ or Aesthetic Objective.

Approved by

Oliver Gregg
Account Manager

Guidelines & Objectives

Sample Parameter Qualifier key listed:

Qualifier	Description
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).

Health Canada MAC Health Related Criteria Limits

Nitrate/Nitrite-N*	Criteria limit is 10 mg/L (1.0 mg/L if present as all Nitrite-N). High concentrations may contribute to blue baby syndrome in infants.
Lead*	A cumulative body poison, uncommon in naturally occurring hard waters.
Fluoride*	Present in fluoridated water supplies at 0.8 mg/L to reduce dental caries. Elevated levels causes fluorosis (mottling of teeth).
Total Coliforms*	Criteria is 0 CFU/100mL. Adverse health effects.
E. Coli*	Criteria is 0 CFU/100 mL. Certain E. Coli bacteria can be life threatening.
Manganese*	Criteria limit is 0.12 mg/L. Possible neurological effects in infants.

*Health Canada Canadian Drinking Water Quality Guidelines (MAC limit)

Aesthetic Objective Concentration Levels

Alkalinity	Acid neutralizing capacity. Usually a measure of carbonate and bicarbonates and calculated and reported as calcium carbonate.
Balance	Quality control parameter ratioing cations to anions
Bicarbonate	See Alkalinity. Report as the anion HCO3-1
Carbonate	See Alkalinity. Reported at the anion CO3-2
Calcium	See Hardness. Common major cation of water chemistry.
Chloride	Common major anion of water chemistry.
Conductance	Physical test measuring water salinity (dissolved ions or solids)
Hardness	Classical measure or capacity of water to precipitate soap (chiefly calcium and magnesium ions). Causes scaling tendency in water if carbonates/bicarbonates are present (if >200 mg/L). For drinking water purposes waters with results <200 mg/L are considered acceptable, results >200 mg/L are considered poor but can be tolerated. Results >500 mg/L are unacceptable.
Hydroxide	See alkalinity
Magnesium	See hardness. Common major cation of water chemistry. Elevated levels (>125 mg/L) may exert a cathartic or diuretic action.
pH	Measure of water acidity/alkalinity. Normal range is 7.0-8.5.
Potassium	Common major cation of water chemistry.
Sodium	Common major cation of water chemistry. Measure of salinity (saltiness).The aesthetic objective (not related to health) for sodium in drinking water is 200 mg/L. However, where sodium concentration of the drinking water exceeds 20 mg/L, it is recommended that any person on a sodium restricted diet consult with his/her physician or Medical Officer of Health concerning the use of that water.
Sulphate	Common major anion of water chemistry. Elevated levels may exert a cathartic or diuretic action.
Total Dissolved Solids	A measure of water salinity.
Iron	Causes staining to laundry and porcelain and astringent taste. Oxidizes to red-brown precipitate on exposure to air.
Heterotrophic Plate Count	Criteria is 500 cfu/mL Measure of heterotrophic bacteria present.

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
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< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
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