Groundwater Science Corp.

Unit 2, 465 Kingscourt Drive,
Waterloo, ON N2K 3R5
Phone: (519) 746-6916
groundwaterscience.ca

Technical Memo

To :	Mal Wensierski	Date :	March 18, 2019
	Lafarge Canada Inc.	Re. :	2018 Monitoring Summary
	6509 Airport Road,	Project:	Oro Pit
	Mississauga, ON L4V 1S7	From :	Andrew Pentney

As requested we are providing a summary of the 2018 groundwater monitoring program results for the Oro Pit for your records. Previous memos outlined the complete monitoring program requirements in detail and summarized available monitoring results, including private well surveys in the area of the pit.

Extraction activities began at the Oro Pit in January 2015. The adjacent Greek Pit is well established and extraction has occurred at that site for a number of years.

The current monitoring program requirements for the Oro Pit include quarterly water level measurements and annual water quality sampling.

We note that bi-monthly water level measurements to establish baseline seasonal water table fluctuations at the site were only required during the first operational year (2015). However, the bi-monthly frequency was maintained by Lafarge from 2013 to 2016 in order to ensure a robust baseline data set.

Monitoring Program

The monitoring completed in 2018 constitutes the fourth year of measurements during Oro Pit extraction operations.

The site location and monitoring network is shown in **Figure 1** (attached). Existing Oro Pit monitors include locations M6, DC-1, DC-2, DC-4 and DC-5. In addition monitor OW1, at the Greek Pit, is included in the program.

Based on the water table configuration, groundwater flows from the area of DC-1, and moves radially north, northeast and east across the site (north to DC-2; northeast to Greek Pit OW1; and, east to the Roehner Pit). The current extraction area is immediately north of M6, therefore locations M6 and DC-4 are upgradient of the current extraction area. Location OW1 is downgradient of the current extraction area.

Monitoring completed in 2018 at the Oro Pit included 4 seasonal (quarterly) water level measurements at monitoring wells M6, DC-1, DC-2, DC-4, DC-5 and OW1. Water quality samples were obtained at M6, DC-4 and OW1 in November 2018.

Monitoring Results Summary

The 2018 water level monitoring results at on-site wells are summarized in the attached table and hydrograph. As shown, water level elevations and overall water table fluctuations are consistent from 2013 to 2018, and are comparable to historical (1991) results. No water quantity concerns are noted and no impacts due to the Oro Pit operations are noted.

The 2018 water quality results are attached for reference. Based on the water quality sampling results to date, no significant water quality concerns are noted, and no impacts due to Oro Pit or Greek Pit

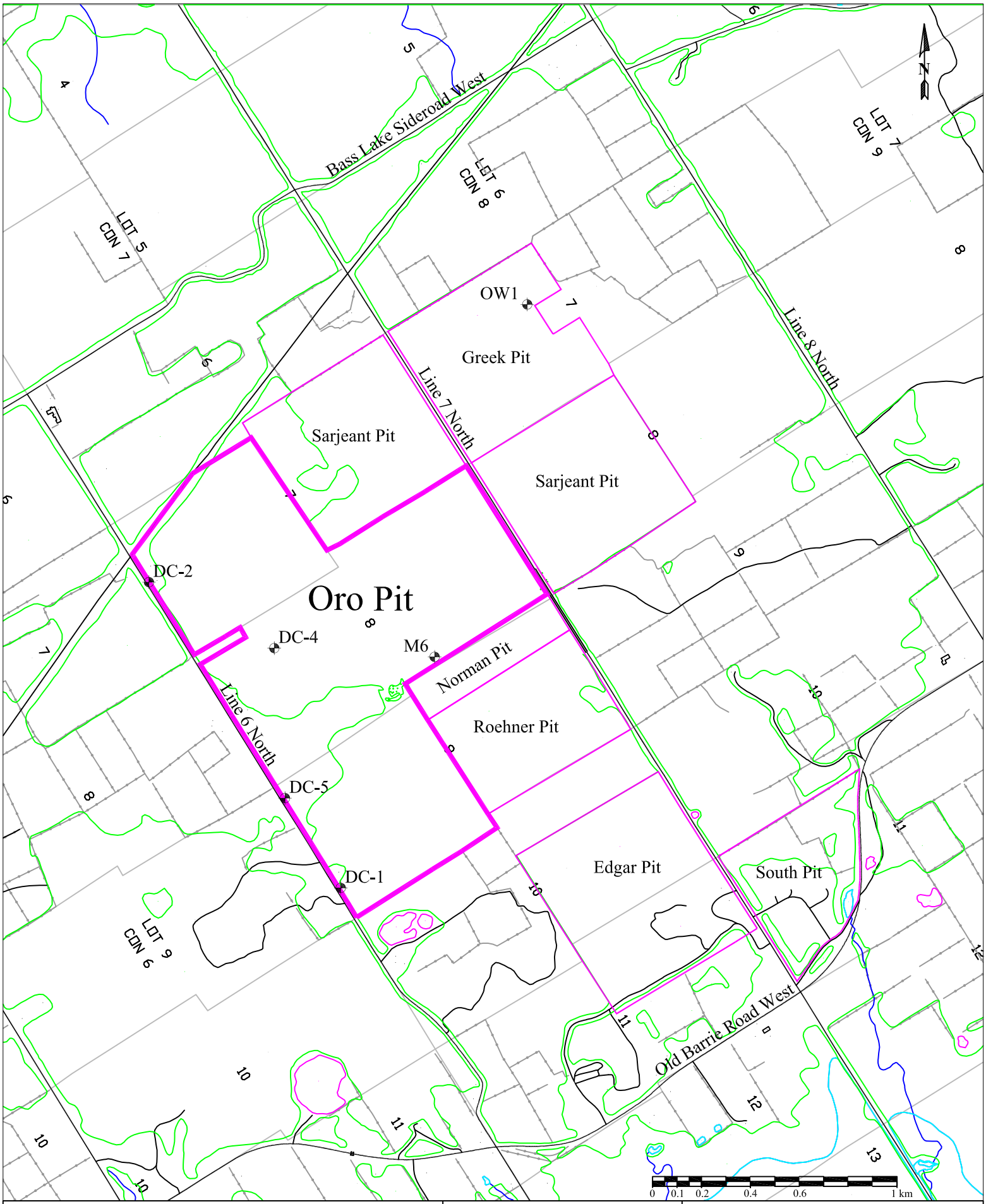
operations are apparent. The results indicate that the groundwater quality within the water table system at the Oro and Greek pit sites meets MECP drinking water health related guidelines.

Chloride concentrations at all three sampled locations can be considered to be within natural (background) ranges for groundwater in southern Ontario and remain well below suggested drinking water criteria related to aesthetics and health. Based on the sampling results to date both at the site and in the surrounding area, there is no evidence that extraction activities at the Oro Pit have affected chloride concentrations in the local groundwater system.

Continued quarterly water level monitoring and annual water quality sampling is recommended, and will occur as part of the stipulated monitoring program.

Attached:

Figure 1: Site Location
Water Level Summary Table
Water Level Hydrograph
Water Quality Sampling Analysis Laboratory Report



Pit licence boundary (approx)
river, stream, pond
treeline
monitoring well location

modified from: OBM mapping, Site Plan
UNDER LICENSE, WITHOUT PREJUDICE OR ENDORSEMENT, FROM THE QUEEN'S PRINTER OF ONTARIO, 2005

March 2019
Scale: as shown

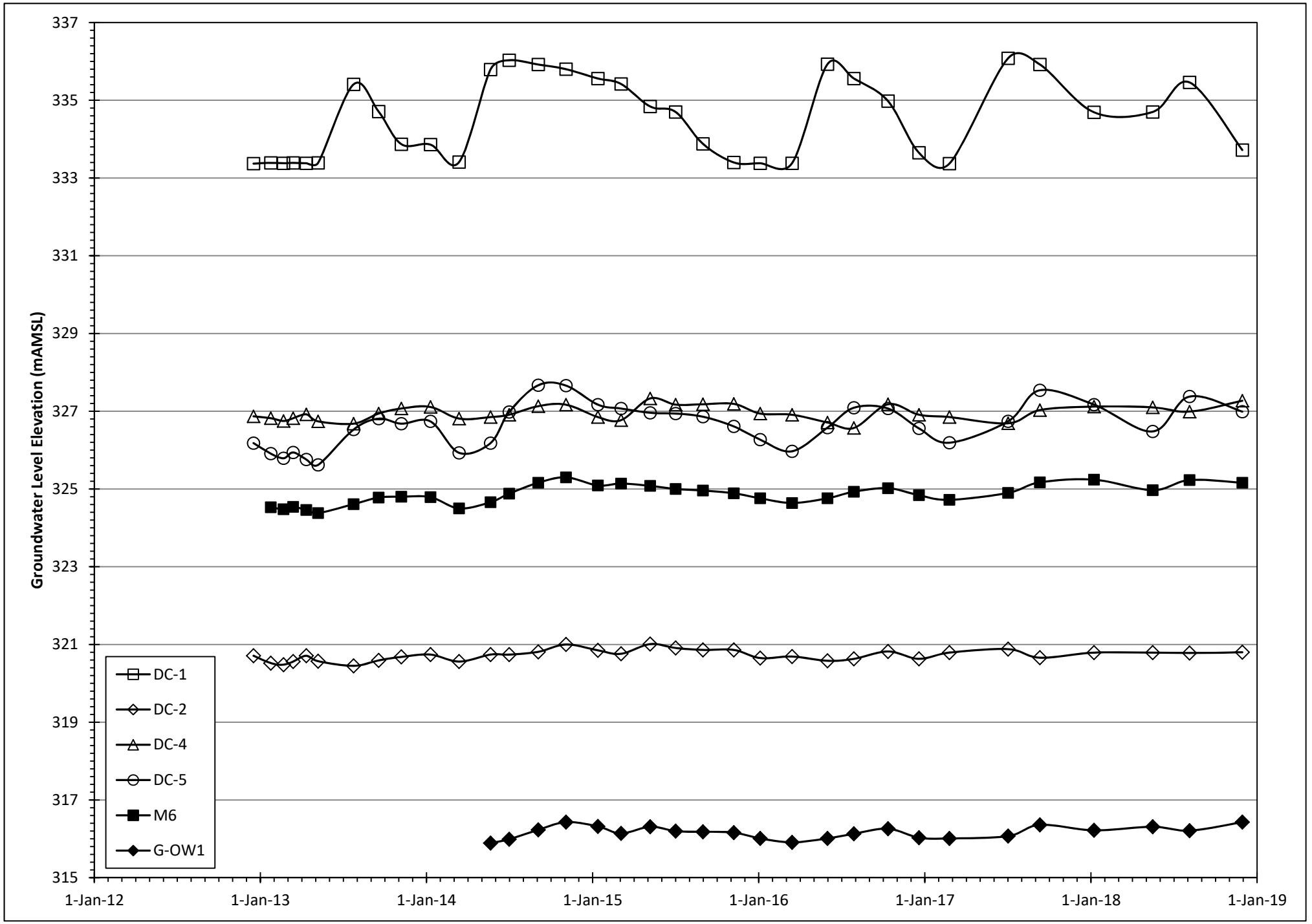
Groundwater Science Corp.

Figure 1: Site Location

Lafarge Canada Inc.
Oro Pit Monitoring Program

Reported Installation Elevations and Details						
Monitor:	**DC-1**	**DC-2**	**DC-4**	**DC-5**	**M6**	**G-OW1**
GS (mASL):	366.7	354.07	354.62	352.05	352.305	343.22
TOC (mASL):	367.45	354.57	355.66	352.64	352.95	343.63
TD (mBTOC):	34.12	36.64	30.48	30.15	31.8	33.88
SU (m):	0.75	0.5	1.04	0.59	0.645	0.41
GS = ground surface		TOC = Top of Casing		TD = total depth	SU = stick-up	

Water Level Elevation - mASL						
Date	**DC-1**	**DC-2**	**DC-4**	**DC-5**	**M6**	**G-OW1**
3-May-91	334.56	320.22	326.22	325.94	323.81	#N/A
13-May-91	335.58	320.3	326.3	326.19	323.89	#N/A
22-Jul-91	335.72	320.26	326.46	327.22	324.22	#N/A
1-Oct-91	335.39	320.52	326.91	327.17	324.45	#N/A
14-Nov-91	#N/A	#N/A	#N/A	#N/A	#N/A	315.20
11-Dec-91	#N/A	#N/A	#N/A	#N/A	#N/A	315.00
17-Dec-12	333.37 *	320.71	326.87	326.18	#N/A	#N/A
24-Jan-13	333.39 *	320.52	326.82	325.91	324.53	#N/A
21-Feb-13	333.38 *	320.48	326.75	325.79	324.48	#N/A
14-Mar-13	333.39 *	320.56	326.82	325.94	324.54	#N/A
12-Apr-13	333.38 *	320.71	326.92	325.76	324.46	#N/A
8-May-13	333.39 *	320.57	326.74	325.62	324.38	#N/A
25-Jul-13	335.41	320.45	326.68	326.53	324.61	#N/A
18-Sep-13	334.71	320.59	326.94	326.81	324.78	#N/A
7-Nov-13	333.87	320.68	327.07	326.68	324.80	#N/A
10-Jan-14	333.86	320.74	327.11	326.74	324.79	#N/A
14-Mar-14	333.41 *	320.56	326.81	325.93	324.50	#N/A
22-May-14	335.79	320.74	326.85	326.18	324.66	315.89
2-Jul-14	336.03	320.74	326.91	326.98	324.88	315.99
4-Sep-14	335.92	320.81	327.13	327.67	325.16	316.23
4-Nov-14	335.80	321.00	327.17	327.66	325.30	316.43
13-Jan-15	335.56	320.85	326.85	327.17	325.09	316.32
5-Mar-15	335.42	320.76	326.77	327.07	325.14	316.14
8-May-15	334.84	321.01	327.33	326.96	325.08	316.31
3-Jul-15	334.70	320.91	327.17	326.94	325.00	316.20
1-Sep-15	333.88	320.86	327.18	326.86	324.96	316.18
8-Nov-15	333.40 *	320.86	327.19	326.61	324.89	316.16
5-Jan-16	333.38 *	320.65	326.94	326.27	324.76	316.01
15-Mar-16	333.38 *	320.69	326.91	325.97	324.64	315.91
1-Jun-16	335.93	320.58	326.71	326.58	324.76	316.01
29-Jul-16	335.56	320.63	326.57	327.09	324.93	316.13
12-Oct-16	334.98	320.82	327.18	327.07	325.02	316.26
19-Dec-16	333.65	320.63	326.91	326.56	324.84	316.03
24-Feb-17	333.37 *	320.79	326.85	326.19	324.72	316.01
3-Jul-17	336.08	320.88	326.69	326.74	324.90	316.07
11-Sep-17	335.92	320.66	327.03	327.54	325.17	316.36
8-Jan-18	334.69	320.79	327.12	327.17	325.24	316.22
17-May-18	334.70	320.79	327.10	326.48	324.97	316.31
6-Aug-18	335.46	320.78	326.99	327.38	325.23	316.21
30-Nov-18	333.72	320.80	327.27	326.99	325.16	316.43
mASL = metres above sea level				#N/A = not available		
* = likely dry (<10 cm of water column)						



Lafarge Canada Inc.
Oro Pit and Greek Pit

Water level Hydrograph

Groundwater Science Corp.
Monitoring Program

GROUNDWATER SCIENCE CORP. (Waterloo)
ATTN: ANDREW PENTNEY
465 Kingscourt Drive
UNIT 2
WATERLOO ON N2K 3R5

Date Received: 30-NOV-18
Report Date: 10-DEC-18 14:09 (MT)
Version: FINAL

Client Phone: 519-746-6916

Certificate of Analysis

Lab Work Order #: L2204200

Project P.O. #: NOT SUBMITTED
Job Reference: ORO PIT
C of C Numbers: 17-728454
Legal Site Desc:

Nellie Gudzak
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2204200-1 M6 Sampled By: DN on 30-NOV-18 @ 10:00 Matrix: WATER							
Physical Tests							
Colour, Apparent	171		2.0	CU		01-DEC-18	R4375351
Conductivity	352		3.0	umhos/cm		02-DEC-18	R4375388
pH	8.29		0.10	pH units		02-DEC-18	R4375388
pH	8.29		0.10	pH units		02-DEC-18	R4375388
Total Dissolved Solids	224	DLDS	20	mg/L		04-DEC-18	R4374746
Turbidity	554		0.10	NTU		30-NOV-18	R4367058
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	179		10	mg/L		03-DEC-18	R4368189
Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L		03-DEC-18	R4368189
Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L		03-DEC-18	R4368189
Alkalinity, Total (as CaCO3)	179		10	mg/L		03-DEC-18	R4368189
Ammonia, Total (as N)	0.115		0.020	mg/L		04-DEC-18	R4371647
Bromide (Br)	<0.10		0.10	mg/L		04-DEC-18	R4374968
Chloride (Cl)	0.59		0.50	mg/L		04-DEC-18	R4374968
Fluoride (F)	0.034		0.020	mg/L		04-DEC-18	R4374968
Nitrate (as N)	1.33		0.020	mg/L		04-DEC-18	R4374968
Nitrite (as N)	<0.010		0.010	mg/L		04-DEC-18	R4374968
Orthophosphate-Dissolved (as P)	0.0081		0.0030	mg/L		03-DEC-18	R4367870
Sulfate (SO4)	8.02		0.30	mg/L		04-DEC-18	R4374968
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD					03-DEC-18	R4367471
Aluminum (Al)-Dissolved	0.0167		0.0050	mg/L	03-DEC-18	03-DEC-18	R4370849
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Arsenic (As)-Dissolved	0.00014		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Barium (Ba)-Dissolved	0.0644		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Boron (B)-Dissolved	<0.010		0.010	mg/L	03-DEC-18	03-DEC-18	R4370849
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Calcium (Ca)-Dissolved	47.4		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	03-DEC-18	03-DEC-18	R4370849
Chromium (Cr)-Dissolved	0.00118		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Copper (Cu)-Dissolved	0.00180		0.00020	mg/L	03-DEC-18	03-DEC-18	R4370849
Iron (Fe)-Dissolved	0.044		0.010	mg/L	03-DEC-18	03-DEC-18	R4370849
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Lithium (Li)-Dissolved	0.0016		0.0010	mg/L	03-DEC-18	03-DEC-18	R4370849
Magnesium (Mg)-Dissolved	14.5		0.0050	mg/L	03-DEC-18	03-DEC-18	R4370849
Manganese (Mn)-Dissolved	0.00300		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849
Molybdenum (Mo)-Dissolved	0.000147		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2204200-1 M6 Sampled By: DN on 30-NOV-18 @ 10:00 Matrix: WATER							
Dissolved Metals							
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Potassium (K)-Dissolved	1.10		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Rubidium (Rb)-Dissolved	0.00095		0.00020	mg/L	03-DEC-18	03-DEC-18	R4370849
Selenium (Se)-Dissolved	0.000114		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Silicon (Si)-Dissolved	5.49		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Sodium (Na)-Dissolved	2.11		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Strontium (Sr)-Dissolved	0.121		0.0010	mg/L	03-DEC-18	03-DEC-18	R4370849
Sulfur (S)-Dissolved	2.64		0.50	mg/L	03-DEC-18	03-DEC-18	R4370849
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	03-DEC-18	03-DEC-18	R4370849
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	03-DEC-18	03-DEC-18	R4370849
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Titanium (Ti)-Dissolved	0.00154		0.00030	mg/L	03-DEC-18	03-DEC-18	R4370849
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Uranium (U)-Dissolved	0.000336		0.000010	mg/L	03-DEC-18	03-DEC-18	R4370849
Vanadium (V)-Dissolved	0.00111		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849
Zinc (Zn)-Dissolved	0.0049		0.0010	mg/L	03-DEC-18	03-DEC-18	R4370849
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	03-DEC-18	03-DEC-18	R4370849
Aggregate Organics							
Phenols (4AAP)	<0.0010		0.0010	mg/L		03-DEC-18	R4371030
L2204200-2 DC-4 Sampled By: DN on 30-NOV-18 @ 11:00 Matrix: WATER							
Physical Tests							
Colour, Apparent	123		2.0	CU		01-DEC-18	R4375351
Conductivity	369		3.0	umhos/cm		02-DEC-18	R4375388
pH	8.33		0.10	pH units		02-DEC-18	R4375388
pH	8.33		0.10	pH units		02-DEC-18	R4375388
Total Dissolved Solids	222	DLDS	20	mg/L		04-DEC-18	R4374746
Turbidity	236		0.10	NTU		30-NOV-18	R4367058
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	196		10	mg/L		07-DEC-18	R4383255
Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L		07-DEC-18	R4383255
Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L		07-DEC-18	R4383255
Alkalinity, Total (as CaCO3)	196		10	mg/L		07-DEC-18	R4383255
Ammonia, Total (as N)	0.039		0.020	mg/L		04-DEC-18	R4371647
Bromide (Br)	<0.10		0.10	mg/L		04-DEC-18	R4374968
Chloride (Cl)	0.63		0.50	mg/L		04-DEC-18	R4374968
Fluoride (F)	0.031		0.020	mg/L		04-DEC-18	R4374968
Nitrate (as N)	0.574		0.020	mg/L		04-DEC-18	R4374968
Nitrite (as N)	<0.010		0.010	mg/L		04-DEC-18	R4374968

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2204200-2 DC-4 Sampled By: DN on 30-NOV-18 @ 11:00 Matrix: WATER							
Anions and Nutrients							
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		03-DEC-18	R4367870
Sulfate (SO4)	11.1		0.30	mg/L		04-DEC-18	R4374968
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD					03-DEC-18	R4367471
Aluminum (Al)-Dissolved	0.0081		0.0050	mg/L	03-DEC-18	03-DEC-18	R4370849
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Arsenic (As)-Dissolved	0.00016		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Barium (Ba)-Dissolved	0.0466		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Boron (B)-Dissolved	<0.010		0.010	mg/L	03-DEC-18	03-DEC-18	R4370849
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Calcium (Ca)-Dissolved	49.7		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	03-DEC-18	03-DEC-18	R4370849
Chromium (Cr)-Dissolved	0.00080		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Copper (Cu)-Dissolved	0.00058		0.00020	mg/L	03-DEC-18	03-DEC-18	R4370849
Iron (Fe)-Dissolved	0.016		0.010	mg/L	03-DEC-18	03-DEC-18	R4370849
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Lithium (Li)-Dissolved	0.0017		0.0010	mg/L	03-DEC-18	03-DEC-18	R4370849
Magnesium (Mg)-Dissolved	17.2		0.0050	mg/L	03-DEC-18	03-DEC-18	R4370849
Manganese (Mn)-Dissolved	0.00085		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849
Molybdenum (Mo)-Dissolved	0.000305		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Potassium (K)-Dissolved	1.18		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Rubidium (Rb)-Dissolved	0.00041		0.00020	mg/L	03-DEC-18	03-DEC-18	R4370849
Selenium (Se)-Dissolved	0.000073		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Silicon (Si)-Dissolved	5.46		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Sodium (Na)-Dissolved	2.33		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Strontium (Sr)-Dissolved	0.121		0.0010	mg/L	03-DEC-18	03-DEC-18	R4370849
Sulfur (S)-Dissolved	3.94		0.50	mg/L	03-DEC-18	03-DEC-18	R4370849
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	03-DEC-18	03-DEC-18	R4370849
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	03-DEC-18	03-DEC-18	R4370849
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Titanium (Ti)-Dissolved	0.00071		0.00030	mg/L	03-DEC-18	03-DEC-18	R4370849
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Uranium (U)-Dissolved	0.000367		0.000010	mg/L	03-DEC-18	03-DEC-18	R4370849
Vanadium (V)-Dissolved	0.00079		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2204200-2 DC-4 Sampled By: DN on 30-NOV-18 @ 11:00 Matrix: WATER							
Dissolved Metals							
Zinc (Zn)-Dissolved	0.0016		0.0010	mg/L	03-DEC-18	03-DEC-18	R4370849
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	03-DEC-18	03-DEC-18	R4370849
Aggregate Organics							
Phenols (4AAP)	<0.0010		0.0010	mg/L		03-DEC-18	R4371030
L2204200-3 GREEK DW1 Sampled By: DN on 30-NOV-18 @ 12:00 Matrix: WATER							
Physical Tests							
Colour, Apparent	215		2.0	CU		01-DEC-18	R4375351
Conductivity	398		3.0	umhos/cm		02-DEC-18	R4375388
pH	7.96		0.10	pH units		02-DEC-18	R4375388
pH	7.96		0.10	pH units		02-DEC-18	R4375388
Total Dissolved Solids	288	DLDS	20	mg/L		04-DEC-18	R4374746
Turbidity	374		0.10	NTU		30-NOV-18	R4367058
Anions and Nutrients							
Alkalinity, Bicarbonate (as CaCO3)	205		10	mg/L		03-DEC-18	R4368189
Alkalinity, Carbonate (as CaCO3)	<10		10	mg/L		03-DEC-18	R4368189
Alkalinity, Hydroxide (as CaCO3)	<10		10	mg/L		03-DEC-18	R4368189
Alkalinity, Total (as CaCO3)	205		10	mg/L		03-DEC-18	R4368189
Ammonia, Total (as N)	0.047		0.020	mg/L		04-DEC-18	R4371647
Bromide (Br)	<0.10		0.10	mg/L		04-DEC-18	R4374968
Chloride (Cl)	6.28		0.50	mg/L		04-DEC-18	R4374968
Fluoride (F)	0.025		0.020	mg/L		04-DEC-18	R4374968
Nitrate (as N)	2.36		0.020	mg/L		04-DEC-18	R4374968
Nitrite (as N)	<0.010		0.010	mg/L		04-DEC-18	R4374968
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		03-DEC-18	R4367870
Sulfate (SO4)	7.03		0.30	mg/L		04-DEC-18	R4374968
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD					03-DEC-18	R4367471
Aluminum (Al)-Dissolved	<0.0050		0.0050	mg/L	03-DEC-18	03-DEC-18	R4370849
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Barium (Ba)-Dissolved	0.0463		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Beryllium (Be)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Boron (B)-Dissolved	<0.010		0.010	mg/L	03-DEC-18	03-DEC-18	R4370849
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Calcium (Ca)-Dissolved	62.3		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Cesium (Cs)-Dissolved	<0.000010		0.000010	mg/L	03-DEC-18	03-DEC-18	R4370849
Chromium (Cr)-Dissolved	0.00102		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Copper (Cu)-Dissolved	<0.00020		0.00020	mg/L	03-DEC-18	03-DEC-18	R4370849

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2204200-3 GREEK DW1 Sampled By: DN on 30-NOV-18 @ 12:00 Matrix: WATER							
Dissolved Metals							
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	03-DEC-18	03-DEC-18	R4370849
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	03-DEC-18	03-DEC-18	R4370849
Magnesium (Mg)-Dissolved	13.3		0.0050	mg/L	03-DEC-18	03-DEC-18	R4370849
Manganese (Mn)-Dissolved	<0.00050		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849
Molybdenum (Mo)-Dissolved	0.000070		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Potassium (K)-Dissolved	0.918		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Rubidium (Rb)-Dissolved	0.00096		0.00020	mg/L	03-DEC-18	03-DEC-18	R4370849
Selenium (Se)-Dissolved	0.000190		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Silicon (Si)-Dissolved	5.13		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	03-DEC-18	03-DEC-18	R4370849
Sodium (Na)-Dissolved	2.60		0.050	mg/L	03-DEC-18	03-DEC-18	R4370849
Strontium (Sr)-Dissolved	0.126		0.0010	mg/L	03-DEC-18	03-DEC-18	R4370849
Sulfur (S)-Dissolved	2.39		0.50	mg/L	03-DEC-18	03-DEC-18	R4370849
Tellurium (Te)-Dissolved	<0.00020		0.00020	mg/L	03-DEC-18	03-DEC-18	R4370849
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L	03-DEC-18	03-DEC-18	R4370849
Thorium (Th)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L	03-DEC-18	03-DEC-18	R4370849
Tungsten (W)-Dissolved	<0.00010		0.00010	mg/L	03-DEC-18	03-DEC-18	R4370849
Uranium (U)-Dissolved	0.000286		0.000010	mg/L	03-DEC-18	03-DEC-18	R4370849
Vanadium (V)-Dissolved	0.00076		0.00050	mg/L	03-DEC-18	03-DEC-18	R4370849
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	03-DEC-18	03-DEC-18	R4370849
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L	03-DEC-18	03-DEC-18	R4370849
Aggregate Organics							
Phenols (4AAP)	<0.0010		0.0010	mg/L		03-DEC-18	R4371030

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Boron (B)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Lithium (Li)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2204200-1, -2, -3
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2204200-1, -2, -3

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-AUTO-WT	Water	Automated Speciated Alkalinity	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALK-SPEC-MANUAL-WT	Water	Speciated Alkalinity	APHA 2320B

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ALK-SPECIATED-WT	Water	pH Measurement for Spec. Alk	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

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

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

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

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

COLOUR-APPARENT-WT	Water	Colour	APHA 2120

Apparent Colour is measured spectrophotometrically by comparison to platinum-cobalt standards using the single wavelength method after sample decanting. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

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

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

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

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

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

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NH3-WT	Water	Ammonia, Total as N	EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

Total Ammonia (as N), refers to the

Reference Information

sum of the un-ionized (NH3) and ionized (NH4
+) ammonia species in the sample, expressed in units of milligrams of nitrogen per litre of sample.

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

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

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

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

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

PHENOLS-4AAP-WT	Water	Phenol (4AAP)	EPA 9066

An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.

PO4-DO-COL-WT	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

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

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

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TURBIDITY-WT	Water	Turbidity	APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

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

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

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

17-728454

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 weight of sample
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.