

October 31, 2017

Nova Scotia Lands  
45 Wabana Court  
Harbourside Commercial Park  
Sydney, Nova Scotia  
B1P 6H2

ATTENTION: Mr. Frank Potter  
Executive Director

*Long Term Maintenance and Monitoring  
Semi-Annual Surface Water Quality Monitoring Program - August 2017  
Final Report*

Following completion of the Sydney Tar Ponds and Coke Ovens Remediation Project, surface water quality monitoring was implemented as part of the long term maintenance and monitoring (LTMM) program to provide ongoing data and compliance commitments to regulatory agencies and/or stakeholders. Nova Scotia Lands (NS Lands) is a Crown Corporation of the Province of Nova Scotia responsible for the LTMM semi-annual surface water quality program. NS Lands retained Dillon Consulting Limited (Dillon) to conduct the August 2017 LTMM Surface Water Quality Monitoring Program, the details of which are provided herein.

## PROJECT METHODOLOGY

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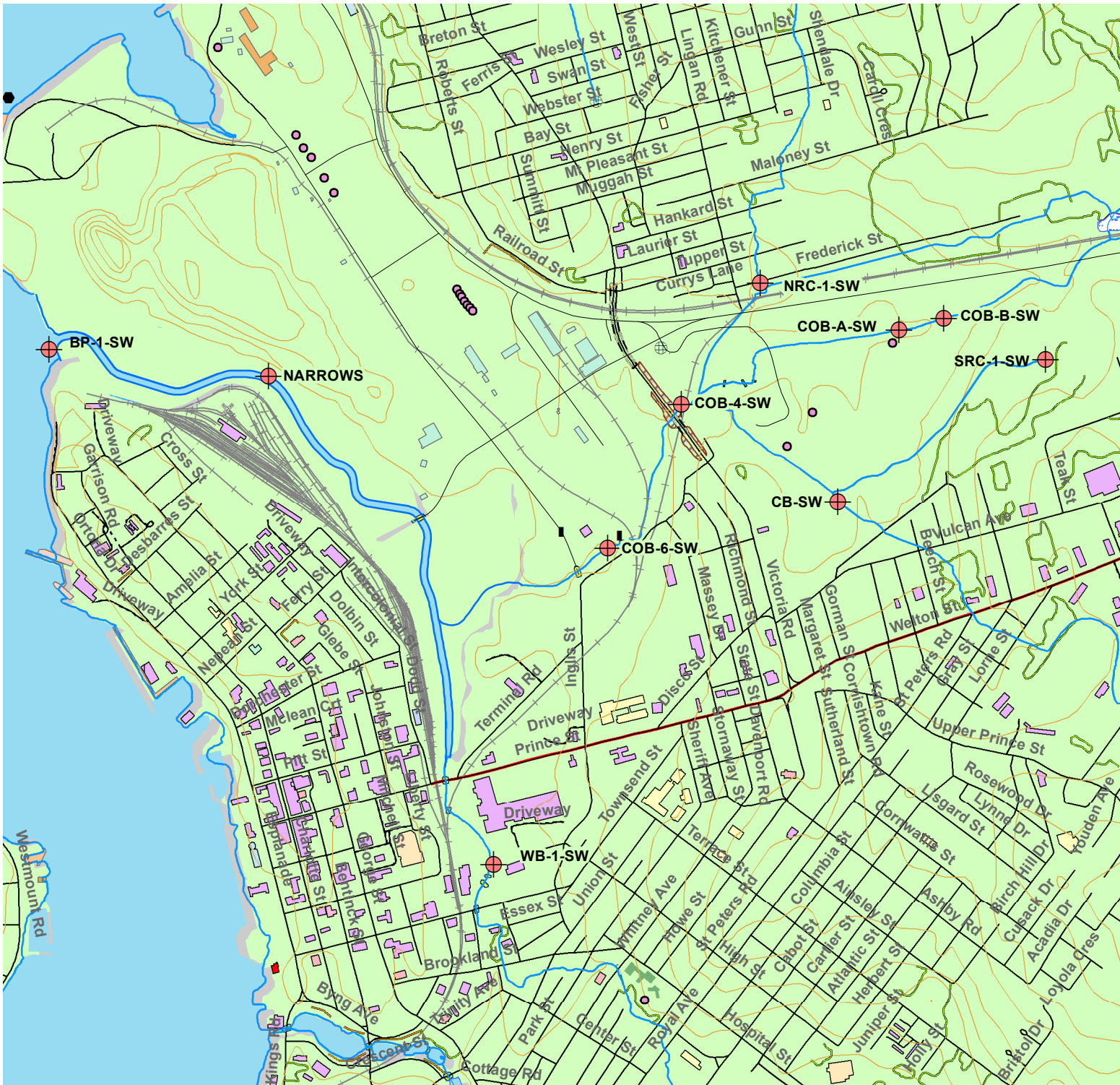
The summer surface water quality monitoring program, which was completed on August 3, 2017, was scheduled to consist of the collection of surface water samples at ten stations (i.e., CB-SW, NRC-1-SW, SRC-1-SW, COB-A-SW, COB-B-SW, COB-4-SW, COB-6-SW, WB-1-SW, Narrows and BP-1-SW) (Figure 1). A GPS unit was used to confirm that the monitoring locations sampled as part of the LTMM surface water quality monitoring program were the same as those used during historical surface water monitoring events (e.g., the Environmental Effects Monitoring and Surface Water Monitoring (EEMSWM) Program associated with the Sydney Tar Ponds remediation). Tasks associated with the August 2017 surface water monitoring included:

- Documenting ecological activity in the surface water bodies, if observed;
- Recording of physical conditions and potential contaminants (i.e., debris, precipitate);
- Measurement of field parameters (e.g., pH, conductivity, temperature, salinity and turbidity) with a calibrated Horiba U-52 multi-probe;
- Flow calculation; and,
- Collection of surface water samples for polycyclic aromatic hydrocarbons (PAHs), general chemistry and total metals (including mercury) (RCApMS) analysis. As concentrations of petroleum hydrocarbons (PHC) and polychlorinated biphenyls (PCBs) have remained below laboratory detection limits for the duration of the



275  
Charlotte Street  
Sydney  
Nova Scotia  
Canada  
B1P 1C6

Telephone  
(902) 562-9880  
Fax  
(902) 562-9890



LONG TERM MAINTENANCE  
AND MONITORING  
SURFACE WATER QUALITY MONITORING PROGRAM  
AUGUST 2017

**SURFACE WATER LOCATIONS**  
FIGURE 1

**LEGEND**

 Surface Water Locations



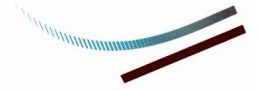
MAP DRAWING INFORMATION:  
Province of Nova Scotia Mapping

MAP CREATED BY: MCL  
MAP CHECKED BY: NJW  
MAP PROJECTION: NAD 1983 UTM Zone 20N

FILE LOCATION: \\DILLON.CA\DILLON\_DFS\SYDNEY  
SYDNEYCAD\GIS\141360



PROJECT: 14-1360  
STATUS: FINAL  
DATE: 08/28/17



LTMM program, the surface water program was modified in July 2016 to consist of PAH and RCapMS analysis only (following approval from Nova Scotia Environment (NSE) and NS Lands).

A summary of the surface water stations included in the August 2017 monitoring program is presented in Table 1.

Table 1 – Surface Water Quality Monitoring Stations

Monitoring Station ID	Water Body	Rationale for Sampling
CB-SW	Cagney Brook	To characterize surface water quality within the urban area of Sydney upstream of CO7/CO8 <sup>1</sup> .
NRC-1-SW	North Realigned Channel	To characterize surface water quality within the urban area of Whitney Pier upstream of CO7/CO8.
SRC-1-SW	South Realigned Channel	To characterize surface water quality related to runoff from the municipal landfill upstream of CO7/CO8.
COB-A-SW	Coke Ovens Brook - concrete riffles upstream of Stable Drive	To characterize surface water quality from runoff and leachate associated with the municipal landfill upstream of CO1 <sup>2</sup> , CO6 <sup>3</sup> and CO7/CO8.
COB-B-SW <sup>4</sup>	Coke Oven Brook along SPAR Road, east of COB-A-SW	To further characterize the potential for impacts from the municipal landfill to COB-A-SW.
COB-4-SW	COB-A-SW	To characterize surface water quality from the upstream areas of CO1, CO6 and CO7/CO8. This sampling location is also upstream of TP6B <sup>5</sup> .
COB-6-SW	Coke Ovens Brook	To further characterize surface water quality from the upstream areas of CO1, CO6 and CO7/CO8. This sampling location is also upstream of TP6B.
WB-1-SW	Coke Ovens Brook	To characterize surface water quality within the urban area of Sydney upstream of TP6B and TP7 <sup>6</sup> .
NARROWS	Wash Brook	To characterize surface water quality downgradient of the majority of the remediation sites.
BP-1-SW <sup>7</sup>	North Channel, Open Hearth Park	To further characterize surface water quality downgradient of the remediation sites and as it discharges to Sydney Harbour.

Notes:

1 CO7/CO8: Collection System (CO7)/Water Treatment Plant (CO8).

2 CO1: Coke Oven Brook.

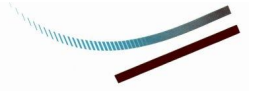
3 CO6: Surface Cap.

4 Upstream monitoring station COB-B-SW was added to the monitoring program in 2015 to further characterize the potential for impacts from the municipal landfill to COB-A-SW.

5 TP6B: Solidification/Stabilization/Channel.

6 TP7: Tar Ponds Cap.

7 The LTMM location of surface water station BP-1-SW is similar to the location used during Pre-Construction activities associated with the EEM Program and is approximately 40 meters upstream from the collection point utilized during the Construction period of the EEM Program.



Field data was recorded on site specific data sheets. Stream flow measurements were calculated by measuring the width of the stream at the sampling location and by measuring the depth of the stream at  $\frac{1}{4}$ ,  $\frac{1}{2}$  and  $\frac{3}{4}$  width intervals. The stream flow velocity was also measured at  $\frac{1}{4}$ ,  $\frac{1}{2}$  and  $\frac{3}{4}$  intervals. Using a spreadsheet formula, the approximate stream flow was calculated for each monitoring station. Due to the depth of surface water station BP-1-SW, it was not possible to obtain field measurements across the entire stream width. Dillon personnel collected as much field data at this deeper location as safely possible (i.e., from the stream banks/shoreline). Stream flow velocity for this location was calculated using the Muggah Creek North Channel Survey (CBCL Limited, October 2014) provided by NS Lands.

Sample containers were pre-labelled by the laboratory with the sample identification, analysis required and the project number. The date and time of sample collection were noted on the sample containers in the field at the time of collection. New nitrile gloves were worn by field staff for each sample to avoid cross-contamination between sampling stations. Samples were collected by opening the container facing upstream. Where samples were collected directly into the sample bottles containing preservative, the container was not fully submerged during sampling to avoid washing the preservative out of the container. Metals sample bottles contained nitric acid preservative to ensure that the metals remained in solution.

## WEATHER CONDITIONS

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Weather information obtained from Environment Canada's climate station at the Sydney Airport indicates that accumulated precipitation for the 30 days preceding the August 2017 surface water monitoring program was approximately 68.4 millimeters (mm). No significant rainfall was recorded on the day of, or the five days leading up to, the sampling event.

Tidal information obtained from Meteo365 (<https://www.tide-forecast.com>) for August 3, 2017, indicated a high tide level of 1 meter (m) and a low tide level of 0.41 m.

## FIELD OBSERVATIONS AND MEASUREMENTS

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Observations at the ten surface water stations during the August 2017 monitoring program are summarized in Table 2. Field measurements are summarized in Table 3.

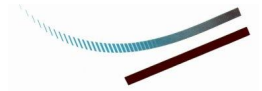


Table 2 – August 2017 Surface Water Quality Monitoring Station Field Observations

Monitoring Station ID	Field Observations	Corresponding Photograph Number
CB-SW	Debris (i.e., plastic and wood) observed in brook.	1
NRC-1-SW	Debris (i.e., Brick and plastic) observed in the channel and on the channel banks. Standing water at culvert only; no flow.	2
SRC-1-SW	Algae observed in the channel. Concrete channel walls had extensive spray painted graffiti visibly dissolving at the high water point. Metal and plastic debris. Small minnows observed.	3
COB-A-SW	Visible orange staining observed on rock lining the brook banks. Standing water; no flow	4
COB-B-SW	Standing water; no flow.	5
COB-4-SW	Debris (i.e., plastic) observed on brook banks.	6
COB-6-SW	Abundant algae growth was observed in the channel and on the rock banks. Stream level was very low. Sampling location moved to near the culvert (see corresponding photograph number 8) where flow movement was apparent and stream level was deeper.	7, 8
WB-1-SW	Debris (i.e., concrete, metal and plastic) observed within the brook and on the brook banks.	9
NARROWS	Algae and snails observed within the channel and on channel rocks.	10
BP-1-SW	Debris (i.e., plastic) observed on the rock banks. Algae, seaweed and snails observed on exposed shoreline rocks. Fish visible in water and seabirds on shoreline.	11

Note:  
 Photographs are presented in Appendix A.

Table 3 – August 2017 Surface Water Quality Monitoring Station Field Measurements

Monitoring Station ID	pH	Turbidity (NTU)	Conductivity (mS/cm)	Salinity (%)	Stream Flow <sup>1</sup> (m3/s)
CB-SW	7.97	3.0	0.379	0	0.021
NRC-1-SW <sup>2</sup>	Dry – No Flow				
SRC-1-SW	Insufficient Water Depth to Submerged Probe Sensors				0.010
COB-A-SW <sup>2</sup>	Dry – No Flow				
COB-B-SW <sup>2</sup>	Dry – No Flow				
COB-4-SW	8.75	0	1.05	0	0.037
COB-6-SW	8.55	0	0.722	0	0.450
WB-1-SW	6.09	0	19.1	1.4	0.033
NARROWS	5.61	0	76.6	1.3-4.0	3.07 <sup>s</sup>

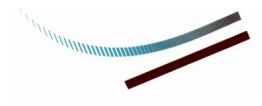


Table 3 – August 2017 Surface Water Quality Monitoring Station Field Measurements

Monitoring Station ID	pH	Turbidity (NTU)	Conductivity (mS/cm)	Salinity (%)	Stream Flow <sup>1</sup> (m3/s)
BP-1-SW <sup>4</sup>	6.33	0	77.8	1.3-4.0	3.63 <sup>3</sup>

Notes:

1 Stream flow is an approximate calculated value.

2 COB-A-SW, COB-B-SW and NRC-1-SW had only standing water on the day of the event. No measurements collected.

3 As surface water stations Narrows and BP-1-SW were monitored at different times of the day, there is some difference in the calculated flow rates due to tidal fluctuation. Both locations were monitored during low tide.

4 Collected during low tide conditions.

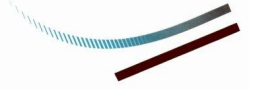
## REGULATORY FRAMEWORK

As specified in Section 4.2, page 21 of the NS Lands LTMM Plan, the remedial criteria used for eight of the ten surface water stations included in the LTMM monitoring program (i.e., CB-SW, NRC-1-SW, SRC-1-SW, COB-A-SW, COB-B-SW, COB-4-SW, COB-6-SW and WB-1-SW) were the Nova Scotia Contaminated Sites Regulations (NS CSRs) Tier I Environmental Quality Standards (EQS) (which came into effect July 6, 2013) for surface water (fresh water) and the Canadian Council of Ministers of the Environment (CCME) for the protection of fresh water aquatic life (FWAL), 2016. Analytical results for the remaining two surface water stations included in the monitoring program (i.e., Narrows and BP-1-SW) were compared to the NS CSRs Tier I EQS for surface water (marine) and the CCME guidelines for the protection of aquatic life (marine).

Additionally, as specified in Section 4.2, page 21 of the NS Lands LTMM Plan, analytical results for surface water samples collected at the upstream sampling stations were compared to previously calculated 95% upper confidence limits (UCL) of available Pre-Construction/Baseline analytical data from the EEMSWCM Program associated with the Sydney Tar Ponds remediation. Furthermore, analytical results for the upstream sampling stations were also compared to calculated 95% UCLs of available historical upstream analytical data (i.e., the Upstream Calculated 95% UCL). Analytical results for the two sampling stations near Sydney Harbour were compared to the calculated 95% UCLs of available Pre-Construction/Baseline analytical data for the Battery Point sampling station.

## SURFACE WATER QUALITY TREND ANALYSIS – MANN KENDALL

Mann-Kendall analysis as a non-parametric statistic test is routinely used to assess the stability of a solute plume (i.e., stable, decreasing, or increasing). At least four independent sampling events are required to evaluate surface water quality trends via Mann-Kendall analysis. The Mann-Kendall test procedure starts by comparing the most recent round of water quality data with the results of earlier rounds. Non-detect data



values are typically assigned a value that is half the laboratory detection limit. The Mann-Kendall test is not designed to account for seasonal variation in data.

Based on a review of the analytical results from the 2017 monitoring events and historical monitoring events, select parameters, with concentrations above (or historically above) applicable guidelines were selected for Mann-Kendall analysis. These include PAH indicator parameters anthracene, pyrene and benzo(a)pyrene and inorganic chemistry indicator parameters boron, cadmium, strontium, sulphate and zinc.

In certain situations, Mann-Kendall analysis results may be biased due to elevated laboratory detection limits. Non-detected data on the Mann-Kendall analysis of indicator parameters was identified and confirmed the influence of non-detected data is minimal.

## SURFACE WATER RESULTS

The surface water quality results for the August 2017 event, and available post-remediation surface water data, are presented in the attached Tables B-1 and B-2 in Appendix B. As stated above, surface water samples were analyzed for PAHs and RCAPMS. Samples were delivered to Maxxam Analytics in Sydney, Nova Scotia (Maxxam) who are contracted directly by NS Lands to conduct the sample analysis. Maxxam is a Canadian Association for Laboratory Accreditation (CALA) certified laboratory for the parameters analyzed. Review of the data indicates:

- PAH results:
  - The fluoranthene concentrations of 0.062 ug/L and 0.044 ug/L in CB-SW and WB-1-SW, respectively exceeded the Tier I EQS and CCME FWAL guideline of 0.04 ug/L; and,
  - The pyrene concentrations of 0.033 ug/L and 0.027 ug/L in CB-SW and WB-1-SW exceeded the Tier I EQS and CCME FWAL guideline of 0.025 ug/L.

The remaining PAH parameters analyzed were below criteria. A summary of concentrations of select organic parameters (i.e., naphthalene and benzo(a)pyrene) at each station recorded during the August 2017 event relative to the calculated 95% UCLs is provided in Table 4.

Table 4 - Summary of Organic Surface Water Indicator Parameter Concentrations relative to Calculated 95% (ug/L)

Parameter	Pre-Construction/ Baseline Calculated 95% UCL <sup>1</sup>	Date	Sample Location										
			CB-SW	NRC-1-SW	SRC-1-SW	COB-A-SW	COB-B-SW <sup>2</sup>	COB-4-SW	COB-6-SW	WB-1-SW	NARROWS	BP-1-SW	
Naphthalene	1.8	12/22/2014	<0.20	<0.20	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20	0.22	<0.20
		7/27/2015	<0.20	<0.20	<0.20	Dry	Dry	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
		11/18/2015	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
		7/22/2016	<0.20	<0.20	<0.20	Dry	Dry	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
		12/8/2016	<0.20	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.38	<0.20	0.21	<0.20
		8/3/2017	<0.20	Dry	<0.20	Dry	Dry	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Benzo(a)pyrene	0.05	12/22/2014	<0.010	<0.010	<0.010	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
		7/27/2015	<0.010	<0.010	<0.010	Dry	Dry	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
		11/18/2015	<0.010	<b>0.068</b>	<0.010	<0.010	<0.010	<b>0.39</b>	0.015	<0.010	<0.010	<0.010	<0.010
		7/22/2016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.025	<0.010	<0.010	<0.010
		12/8/2016	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	0.028	0.027	<0.010	<0.010	<0.010
		8/3/2017	<0.010	Dry	<0.010	Dry	Dry	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010

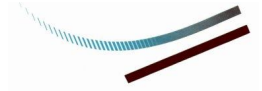
Notes:

<sup>1</sup>Pre-Construction/Baseline Calculated 95% UCL are from the EEMSWCM Program

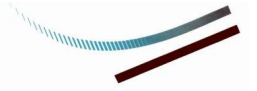
<sup>2</sup>Added to the program in July 2015

**Bold** indicates the concentration exceeds the Pre-Construction/Baseline Calculated 95% UCL





- General chemistry and metals results:
  - Concentrations of aluminum ranging from 14 ug/L to 150 ug/L exceeded the Tier I EQS (fresh water) standard of 5 ug/L in CB-SW, SRC-1-SW, COB-4-SW, the field duplicate sample of COB-4-SW, COB-6-SW and WB-1-SW. The aluminum concentration of 150 ug/L at CB-SW also exceeded the CCME FWAL guideline of 100 ug/L;
  - The arsenic concentration of 1.8 ug/L exceeded the Upstream Calculated 95% UCL of 1.6 ug/L at SRC-1-SW;
  - The boron concentrations of 3600 ug/L at both BP-1-SW and the Narrows exceeded the NSE Tier 1 EQS (marine water) standard of 1200 ug/L;
  - The cadmium concentrations of 0.011 ug/L at both COB-4-SW and COB-6-SW and 0.027 ug/L concentration at WB-1-SW exceeded the Tier I EQS (fresh water) standard of 0.01 ug/L. The cadmium concentration in the field duplicate sample collected at COB-4-SW did not exceed the Tier I EQS;
  - The chloride concentrations of 130 mg/L and 1600 mg/L at COB-6-SW and WB-1-SW, respectively exceeded the CCME (FWAL) guideline of 120 mg/L;
  - Iron concentrations of 750 ug/L and 680 ug/L in CB-SW 680 ug/L and WB-1-SW, respectively exceeded the Tier I EQS (fresh water) and CCME FWAL concentration of 300 ug/L.
  - The manganese concentration of 110 ug/L for both BP-1-SW and the Narrows were above the Battery Point/Narrows Calculated 95% UCL of 70 ug/L;
  - Concentrations of strontium ranging from 190 ug/L to 940 ug/L were above the Upstream 95% UCL of 132 ug/L at CB-SW, SRC-1-SW, COB-4-SW, the field duplicate sample of COB-4-SW, COB-6-SW and WB-1-SW. The strontium concentrations in CB-SW, COB-4-SW, the field duplicate sample of COB-4-SW, COB-6-SW and WB-1-SW also exceed the Pre-Construction/Baseline 95% UCL of 210 ug/L;
  - The sulphate concentration of 54 mg/L at SRC-1-SW exceeded the Upstream Calculated 95% UCL of 26 mg/L. The sulphate concentrations of 110 mg/L at COB-4-SW, the field duplicate sample of COB-4-SW and COB-6-SW, and the concentration of 230 mg/L for WB-1-SW exceeded the Upstream Calculated 95% UCL of 26 mg/L and the Pre-Construction/Baseline Calculated 95% UCL of 84 mg/L; and,
  - The laboratory detection limits for chromium, cobalt, copper, iron, lead, nickel, selenium and zinc at BP-1-SW and the Narrows were elevated above the applicable criteria;



The remaining general chemistry parameters were below applicable criteria. Table 5 provides a summary of concentrations for select inorganic parameters from the August 2017 sampling event relative to the calculated 95% UCLs.

## TREND ANALYSIS

The groundwater quality trend analysis for the 2017 monitoring event was based on the available analytical results (i.e., four rounds of sampling events are required) for select parameters, including PAH indicator parameters anthracene, pyrene and benzo(a)pyrene and inorganic chemistry indicator parameters boron, cadmium, strontium, sulphate and zinc. Concentrations of pyrene at CB-SW showed a generally increasing trend. Trend analysis results for the remaining parameters and surface water stations indicated fluctuations with no trend or a generally declining trend.

## QUALITY CONTROL PROCESS

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The laboratory analytical certificates have been reviewed for quality assurance/quality control purposes. The laboratory completed quality control analysis including duplicates, blanks, spikes, surrogate recoveries and spiked blanks to assess accuracy and precision as well as the potential for bias, contamination and degradation or matrix effects. Review of the laboratory report indicated a poor RCap ion balance due to sample matrix was reported for CB-SW, SRC-1-SW, BP-1-SW and the Narrows and elevated report limits for trace metals due to sample matrix in BP-1-SW and the Narrows.

One field duplicate of sample, COB-4-SW, and one trip blank were collected during the August 2017 monitoring event. The relative percent difference (RPD) was calculated between the sample and associated field duplicate results. The RPD was not calculated for those parameters where one or both of the results associated with the original and/or field duplicate sample exhibited concentrations less than five times the laboratory reportable detection limit (RDL). The calculated RPDs were within established limit (i.e., less than 30% RPD) for each parameter with the exception of nitrogen, carbonate alkalinity, %ion balance and langelier index at 4 degrees Celsius. Both the original sample and field duplicate concentrations for each of the calculated RPDs above 30% did not exceed applicable guidelines. It is further noted that the cadmium concentration in the original sample exceeded the Tier I EQS for fresh water; however, the concentration in the field duplicate did not. As the remainder of analyzed parameters were within the calculated RPD established limit, and no other criteria exceedance discrepancies were identified, the data quality is considered acceptable and the results representative with no identification of significant quality issues requiring further investigation or resampling.

PAH compounds were not detected in the trip blank. There were no holding time exceedances.

Table 5 – Summary of Inorganic Surface Water Indicator Parameter Concentrations relative to Calculated 95% UCLs												
Sample Location	Date	SO4 (mg/L)	Al	As	Cd	Cr	Co	Fe	Pb	Mn	Se	Sr
		Units	(ug/L)									
Upstream Calculated 95% UCL <sup>1</sup>		26	220	1.6	0.1	8.3	-	3,318	1.2	583	1.9	132
Pre-Construction/Baseline Calculated 95% UCL <sup>1</sup>		84	-	1.98	-	-	1.3	1,900	-	800	-	210
CB-SW	12/22/2014	26	110	<1.0	0.018	<1.0	<0.40	290	<0.50	190	<1.0	130
	7/27/2015	16	28	<1.0	<0.010	<1.0	<0.40	260	<0.50	61	<1.0	<b>320</b>
	11/18/2015	24	130	<1.0	0.011	<1.0	<0.40	280	<0.50	140	<1.0	<b>140</b>
	7/22/2016	10	55	1.4	<0.010	<1.0	<0.40	640	<0.50	71	<1.0	<b>160</b>
	12/8/2016	23	84	<1.0	0.017	<1.0	<0.40	330	<0.50	310	<1.0	110
	8/3/2017	12	150	1.4	<0.010	1.0	<0.40	750	0.61	380	<1.0	<b>340</b>
NRC-1-SW	12/22/2014	20	58	<1.0	0.022	<1.0	<0.40	150	<0.50	85	<1.0	32
	7/27/2015	22	45	<1.0	0.019	<1.0	<0.40	1,300	<0.50	75	<1.0	54
	11/18/2015	15	<b>1,500</b>	<b>3.5</b>	<b>0.14</b>	1.9	<u>1.5</u>	<b>3,800</b>	<b>9.5</b>	<b>1,100</b>	<1.0	36
	7/22/2016	15	31	<1.0	0.016	<1.0	<0.40	970	0.61	47	<1.0	52
	12/8/2016	16	110	<1.0	0.025	<1.0	<0.40	360	0.8	200	<1.0	34
	8/3/2017	Dry										
SRC-1-SW	12/22/2014	<b>54</b>	<b>290</b>	<1.0	0.035	<1.0	<0.40	340	1.2	190	<1.0	<b>150</b>
	7/27/2015	<b>47</b>	51	1.0	0.013	<1.0	<0.40	210	1.1	260	<1.0	<b>150</b>
	11/18/2015	<b>43</b>	<b>240</b>	<1.0	0.023	1.2	<0.40	310	0.75	230	<1.0	<b>150</b>
	7/22/2016	<b>51</b>	50	<b>1.9</b>	0.018	<1.0	<0.40	350	<0.50	350	<1.0	<b>170</b>
	12/8/2016	<b>42</b>	<b>300</b>	<1.0	0.039	1.0	<0.40	400	<b>1.6</b>	200	<1.0	<b>140</b>
	8/3/2017	<b>54</b>	24	<b>1.8</b>	<0.010	<1.0	<0.40	150	<0.50	91	<1.0	<b>190</b>
COB-A-SW	12/22/2014	<b>160</b>	16	<1.0	<0.010	<1.0	<0.40	51	<0.50	25	<1.0	<b>260</b>
	7/27/2015	Dry										
	11/18/2015	<b>170</b>	5.1	<1.0	<0.010	<1.0	<0.40	82	<0.50	74	<1.0	<b>260</b>
	7/22/2016	Dry										
COB-B-SW <sup>2</sup>	12/8/2016	<b>150</b>	8.5	<1.0	<0.010	<1.0	<0.40	68	<0.50	92	<1.0	<b>250</b>
	8/3/2017	Dry										
	7/27/2015	Dry										
	11/18/2015	<b>190</b>	7.9	<1.0	<0.010	<1.0	<0.40	<50	<0.50	21	<1.0	<b>250</b>
COB-4-SW	7/22/2016	Dry										
	12/8/2016	<b>440</b>	13	<1.0	0.027	<1.0	0.90	130	<0.50	<b>1,400</b>	<1.0	<b>480</b>
	8/3/2017	Dry										
	12/22/2014	<b>47</b>	82	<1.0	0.014	<1.0	<0.40	210	<0.50	95	<1.0	<b>140</b>
	7/27/2015	<b>100</b>	51	<1.0	<0.010	<1.0	<0.40	460	<0.50	110	<1.0	<b>250</b>
	11/18/2015	<b>41</b>	<b>7,100</b>	<b>13</b>	<b>0.29</b>	8.0	<u>4.6</u>	<b>14,000</b>	<b>37</b>	<b>1,500</b>	<1.0	<b>150</b>
COB-6-SW	7/22/2016	<b>74</b>	28	<1.0	<0.010	<1.0	<0.40	300	<0.50	140	<1.0	<b>270</b>
	12/8/2016	<b>39</b>	120	<1.0	0.014	<1.0	<0.40	390	0.99	180	<1.0	110
	8/3/2017	<b>110</b>	14	<1.0	<b>0.011</b>	<1.0	<0.40	83	<0.50	130	<1.0	<b>450</b>
	12/22/2014	<b>56</b>	61	<1.0	0.01	<1.0	<0.40	170	<0.50	56	<1.0	<b>180</b>
	7/27/2015	<b>21</b>	39	<1.0	<0.010	<1.0	<0.40	160	<0.50	23	<1.0	<b>300</b>
	11/18/2015	<b>44</b>	220	<1.0	0.018	<1.0	<0.40	490	<b>1.5</b>	79	<1.0	<b>180</b>
WB-1-SW	7/22/2016	<b>64</b>	46	1.0	<0.010	<1.0	<0.40	180	<0.50	37	<1.0	<b>300</b>
	12/8/2016	<b>41</b>	200	<1.0	0.015	<1.0	<0.40	360	1.0	110	<1.0	<b>160</b>
	8/3/2017	<b>110</b>	42	1.3	0.011	<1.0	<0.40	<50	<0.50	35	<1.0	<b>500</b>
	12/22/2014	7.9	160	<1.0	0.038	<1.0	<0.40	270	0.71	95	<1.0	53
	7/27/2015	10	89	<1.0	0.012	<1.0	<0.40	480	<0.50	41	<1.0	100
	11/18/2015	8.3	63	<1.0	<0.010	<1.0	<0.40	200	<0.50	43	<1.0	73
Battery Point/ Narrows Calculated 95% UCL <sup>1</sup>	7/22/2016	<b>410</b>	87	<1.0	0.035	<1.0	<0.40	590	0.56	160	<1.0	<b>1300</b>
	12/8/2016	8.4	100	<1.0	0.026	<1.0	<0.40	220	<0.50	100	<1.0	61
	8/3/2017	<b>230</b>	28	1.0	0.027	<1.0	<0.40	680	<0.50	450	<1.0	<b>940</b>
	12/22/2014	<b>2,180</b>	-	-	-	-	<b>0.9</b>	<b>190</b>	-	<b>70</b>	-	<b>7,000</b>
	7/27/2015	270	110	<1.0	0.027	<1.0	<0.40	<b>250</b>	<0.50	63	<1.0	610
	11/18/2015	1,500	86	<1.0	<0.10	<1.0	<4.0	<500	<5.0	<b>100</b>	<1.0	5,400
NARROWS	7/22/2016	110	76	<1.0	0.012	<1.0	<0.40	<b>320</b>	<0.50	45	<1.0	370
	12/8/2016	1,400	51	<1.0	<0.10	<1.0	<4.0	<500	<5.0	<b>120</b>	<1.0	5,400
	8/3/2017	270	75	<1.0	0.029	<1.0	<0.40	<b>250</b>	<0.50	<b>110</b>	<1.0	890
	12/22/2014	2,000	<50	<1.0	<0.10	<1.0	<4.0	<500	<5.0	<b>110</b>	<1.0	6,100
	7/27/2015	170	110	<1.0	0.028	<1.0	<0.40	<b>240</b>	<0.50	61	<1.0	950
	11/18/2015	1,300	140	<1.0	<0.10	<1.0	<4.0	<500	<5.0	59	<1.0	5,300
BP-1-SW	7/22/2016	190	140	<1.0	0.014	<1.0	<0.40	<b>410</b>	<0.50	57	<1.0	580
	12/8/2016	1,600	63	<1.0	<0.10	<1.0	<4.0	<500	<5.0	<b>71</b>	<1.0	5,500
	8/3/2017	290	86	<1.0	0.025	<1.0	<0.40	<b>280</b>	<0.50	<b>100</b>	<1.0	1,000
	8/3/2017	2,000	<50	<1.0	<0.10	<1.0	<4.0	<500	<5.0	<b>110</b>	<1.0	6,100

Notes:

<sup>1</sup>Upstream, Pre-Construction/Baseline and Battery Point/Narrows Calculated 95% UCLs are from the EEMSWCM Program

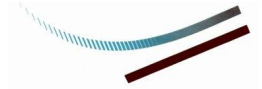
<sup>2</sup>Added to the program in July 2015

**Bold** indicates the concentration exceeds the Upstream Calculated 95% UCL

Underline indicates exceedance of the Pre-Construction/Baseline Calculated 95% UCL

**Italics Bold** indicates exceedance of the Battery Point/Narrows Calculated 95% UCL

*Italics* indicates that the laboratory detection limit is greater than the comparison criteria



## SUMMARY

Analytical results of the August 2017 surface water monitoring program indicate that concentrations of the majority of the analyzed parameters are below the applicable criteria and respective 95% UCLs. Criteria and 95% UCL exceedances are summarized in Table 6.

Table 6 Summary of Surface Water Station Criteria and 95 % UCL Exceedances  
 August 2017

Parameter	Location (Criteria and/or 95% UCL Exceedance)
Fluoranthene	<ul style="list-style-type: none"> <li>• CB-SW (Tier I EQS (fresh water) and CCME FWAL)</li> <li>• WB-1-SW (Tier I EQS (fresh water) and CCME FWAL)</li> </ul>
Pyrene	<ul style="list-style-type: none"> <li>• CB-SW (Tier I EQS (fresh water) and CCME FWAL)</li> <li>• WB-1-SW (Tier I EQS (fresh water) and CCME FWAL)</li> </ul>
Aluminum	<ul style="list-style-type: none"> <li>• CB-SW (Tier I EQS (fresh water) and CCME FWAL)</li> <li>• SRC-1-SW (Tier I EQS (fresh water))</li> <li>• COB-4-SW and the Field Duplicate Sample of COB-4-SW (Tier I EQS (fresh water))</li> <li>• COB-6-SW (Tier I EQS (fresh water))</li> <li>• WB-1-SW (Tier I EQS (fresh water))</li> </ul>
Arsenic	<ul style="list-style-type: none"> <li>• SRC-1-SW (Upstream Calculated 95% UCL)</li> </ul>
Boron	<ul style="list-style-type: none"> <li>• BP-1-SW (Tier 1 EQS (marine water))</li> <li>• Narrows (Tier 1 EQS (marine water))</li> </ul>
Cadmium	<ul style="list-style-type: none"> <li>• COB-4-SW<sup>1</sup> (Tier I EQS (fresh water))</li> <li>• COB-6-SW (Tier I EQS (fresh water))</li> <li>• WB-1-SW (Tier I EQS (fresh water))</li> </ul>
Chloride	<ul style="list-style-type: none"> <li>• COB-6-SW (CCME FWAL)</li> <li>• WB-1-SW (CCME FWAL)</li> </ul>
Iron	<ul style="list-style-type: none"> <li>• CB-SW (Tier I EQS (fresh water) and CCME FWAL)</li> <li>• WB-1-SW (Tier I EQS (fresh water) and CCME FWAL)</li> </ul>
Manganese	<ul style="list-style-type: none"> <li>• BP-1-SW (Battery Point/Narrows Calculated 95%)</li> <li>• Narrows (Battery Point/Narrows Calculated 95%)</li> </ul>
Strontium	<ul style="list-style-type: none"> <li>• CB-SW (Upstream Calculated 95% UCL and Pre-Construction/Baseline 95% UCL)</li> <li>• SRC-1-SW (Upstream Calculated 95% UCL)</li> <li>• COB-4-SW and the Field Duplicate Sample of COB-4-SW (Upstream Calculated 95% UCL and Pre-Construction/Baseline 95% UCL)</li> </ul>

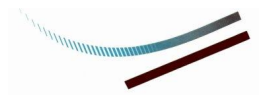


Table 6 Summary of Surface Water Station Criteria and 95 % UCL Exceedances  
 August 2017

Parameter	Location (Criteria and/or 95% UCL Exceedance)
Strontium	<ul style="list-style-type: none"> <li>• COB-6-SW (Upstream Calculated 95% UCL and Pre-Construction/ Baseline 95% UCL)</li> <li>• WB-1-SW (Upstream Calculated 95% UCL and Pre-Construction/ Baseline 95% UCL)</li> </ul>
Sulphate	<ul style="list-style-type: none"> <li>• SRC-1-SW (Upstream 95% UCL)</li> <li>• COB-4-SW and the Field Duplicate Sample of COB-4-SW (Upstream Calculated 95% UCL and Pre-Construction/Baseline Calculated 95% UCL)</li> <li>• COB-6-SW (Upstream Calculated 95% UCL and Pre-Construction/ Baseline Calculated 95% UCL)</li> <li>• WB-1-SW (Upstream Calculated 95% UCL and Pre-Construction/ Baseline Calculated 95% UCL)</li> </ul>

Note:

1. Field duplicate sample of COB-4-SW did not exceed.

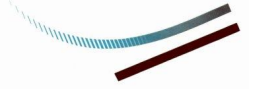
Concentrations of fluoranthene and pyrene exceeded the Tier I EQS and CCME FWAL at CB-SW and WB-1-SW. This was the first event during the LTMM program to observe an exceedance of fluoranthene and pyrene at CB-SW and the second time at WB-1-SW (the first occurrence at WB-1-SW was in July 2016).

Both aluminum and strontium concentrations at surface water locations CB-SW, SRC-SW, COB-4-SW, the field duplicate sample of COB-4-SW, COB-6-SW and WB-1-SW had exceedances above applicable guidelines. Aluminum concentrations at each of these locations exceeded the Tier 1 EQS for fresh water and at CB-SW, COB-4-SW and the field duplicate sample of COB-4-SW, the CCME FWAL also exceeded. The strontium exceedances were of the Upstream Calculated 95% UCL and the Pre-Construction/  
Baseline Calculated 95% UCL, with the exception of SRC-1-SW, which only exceeded the Upstream Calculated 95% UCL. Both parameters have historically exceeded applicable guidelines.

Iron concentrations at CB-SW and WB-1-SW exceeded the Tier 1 EQS for fresh water and CCME FWAL guidelines. Previous summer sampling events (July 2013, July 2015 and July 2016) have reported exceedances of iron in WB-1-SW and during several summer and winter monitoring events CB-SW exceeded these guidelines.

Chloride exceeded CCME FWAL in COB-6-SW and WB-1-SW. This was the first event for COB-6-SW to report an exceedance for chloride, while exceedances during previous summer sampling events (July 2013 and July 2016) have been reported in WB-1-SW.

One arsenic exceedance of the Upstream Calculated 95% UCL was observed at SRC-1-SW. An arsenic exceedance was previously reported at this location in July 2016.



The two surface water locations, BP-1-SW and the Narrows, downgradient of the remediation sites, had boron concentrations that exceeded the Tier 1 EQS for marine water and manganese concentrations that exceeded the Battery Point/Narrows Calculated 95% UCL. Boron has exceeded the noted guidelines during each summer event since 2013. Manganese has exceeded the noted guidelines during both summer and winter sampling events. Boron and manganese are the two parameters exceeding applicable guidelines from these two locations downgradient of the remediation site during the August 2017 surface water sampling program.

Exceedances noted above that have not been historically observed may be attributed to the summer 2017 sampling event being conducted in August 2017, whereas historical summer events have been conducted in July. Based on the timing of the 2017 sampling event, site conditions may have been at a lower level than historical events.

## RECOMMENDATIONS

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The next surface water monitoring event will be conducted in the fall (e.g., November 2017). It is recommended that fall 2017 sampling program include the collection of surface water samples at ten stations (i.e., CB-SW, NRC-1-SW, SRC-1-SW, COB-A-SW, COB-B-SW, COB-4-SW, COB-6-SW, WB-1-SW, Narrows and BP-1-SW) for PAH and RCAPMS analysis.

## DISCLAIMER

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This report was prepared exclusively for the purposes, project and site location outlined in the report. The report is based on information provided to, or obtained by Dillon Consulting Limited ("Dillon") as indicated in the report, and applies solely to site conditions existing at the time of the site investigation. Although a reasonable investigation was conducted by Dillon, Dillon's investigation was by no means exhaustive and cannot be construed as a certification of the absence of any contaminants from the site. Rather, Dillon's report represents a reasonable review of available information within an agreed work scope, schedule and budget. It is therefore possible that currently unrecognized contamination or potentially hazardous materials may exist at the site, and that the levels of contamination or hazardous materials may vary across the site. Further review and updating of the report may be required as local and site conditions, and the regulatory and planning frameworks, change over time.



**CLOSING**

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We trust this information is adequate for your needs. Please, however, contact the undersigned if you have any comments or questions regarding the content of this report.

Yours truly,

DILLON CONSULTING LIMITED

Nadine J. Wambolt, B. Tech., CET  
Project Manager

NJW:kme

Our File: 14-1360-1400

APPENDIX A  
SITE PHOTOGRAPHS





PHOTO 1: View of CB-SW looking northwest



PHOTO 2: View of NRC-1-SW looking southeast.



PHOTO 3: View of SRC-1-SW looking northeast.



PHOTO 4: View of COB-A-SW looking west.



PHOTO 5: View of COB-B-SW looking southwest.



PHOTO 6: View of COB-4-SW looking northeast.



PHOTO 7: View of COB-6-SW looking northwest.



PHOTO 8: View of location where COB-6-SW sample was collected near culvert looking north.



PHOTO 9: View of WB-1-SW looking south.



PHOTO 10: View of NARROWS looking west.



PHOTO 11: View of BP-1-SW looking east.

APPENDIX B  
TABLES

TABLE B-1  
 SURFACE WATER ANALYTICAL RESULTS - PAHs  
 LTMM SURFACE WATER QUALITY MONITORING PROGRAM - AUGUST 2017

Sample Location	Sample Date	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(j)fluoranthene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	1-Methylnaphthalene	2-Methylnaphthalene	Naphthalene	Perylene	Phenanthrene	Pyrene	
Units		µg/L																				
NSE Tier 1 EQS Fresh Water <sup>1</sup>		5.8	4.6	0.012	0.018	0.015	0.48 <sup>3</sup>	0.17	0.48 <sup>3</sup>	0.48 <sup>3</sup>	1.4	0.26	0.04	3	0.21	2	2	1.1	-	0.4	0.025	
CCME FWAL <sup>2</sup>		5.8	-	0.012	0.018	0.015	-	-	-	-	-	-	0.04	3	-	-	-	1.1	-	0.4	0.025	
Upstream Calculated 95% UCL		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Pre-Construction/Baseline Calculated 95% UCL		-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	
CB-SW	07/23/13	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	NM	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.20	<0.050	<0.05	<0.010	<0.010	<0.010	
	12/22/14	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	0.028	<0.010	<0.050	<0.050	<0.20	<0.010	0.017	0.012	
	07/27/15	0.066	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	0.039	<0.010	<0.050	<0.050	<0.20	<0.010	0.017	0.016	
	11/18/15	0.049	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.025	0.027	<0.010	<0.050	<0.050	<0.20	<0.010	0.026	0.019	
	07/22/16	0.11	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.025	0.051	<0.010	<0.050	<0.050	<0.20	<0.010	0.05	0.017	
	12/8/16	0.056	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	0.028	<0.010	<0.050	<0.050	<0.20	<0.010	0.028	0.014	
	8/3/17	0.071	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.062	0.048	<0.010	<0.050	<0.050	<0.20	<0.010	0.037	0.033
NRC-1-SW	07/23/13	0.022	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	NM	<0.010	<0.010	<0.010	0.025	0.015	<0.010	<0.20	<0.050	<0.05	<0.010	0.025	0.019	
	12/22/14	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010	
	07/27/15	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	0.011	<0.010	
	11/18/15	0.022	<0.010	0.037	0.075	0.068	0.068	0.039	0.038	0.032	0.091	0.017	0.18	0.021	0.041	<0.050	<0.050	<0.20	0.017	0.13	0.14	
	07/22/16	0.028	<0.010	0.021	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	<0.010	<0.050	<0.050	<0.20	<0.010	0.018	<0.010	
	12/8/16	0.059	<0.010	0.010	0.011	0.011	0.011	<0.010	<0.010	<0.010	0.016	<0.010	0.03	0.036	<0.010	<0.050	0.056	0.20	<0.010	0.066	0.027	
	8/3/17	DRY - NO SAMPLE																				
SRC-1-SW	07/23/13	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	NM	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.20	<0.050	<0.05	<0.010	<0.010	<0.010	
	12/22/14 <sup>FD</sup>	<0.010	<0.010	<0.010	<0.010	0.013	0.013	0.010	<0.010	<0.010	0.011	<0.010	0.021	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	0.012	0.018	
	12/22/14	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010	
	07/27/15 <sup>FD</sup>	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010	
	07/27/15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010	
	11/18/15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010	
	07/22/16	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010	
	12/8/16	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	0.013	0.011	
8/3/17	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010		
COB-A-SW	07/23/13	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	NM	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.20	<0.050	<0.05	<0.010	<0.010	<0.010	
	12/22/14	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	0.01	
	07/27/15	DRY - NO SAMPLE																				
	11/18/15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010	
	07/22/16	DRY - NO SAMPLE																				
	12/8/16	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	8/3/17	DRY - NO SAMPLE																				

TABLE B-1  
 SURFACE WATER ANALYTICAL RESULTS - PAHs  
 LTMM SURFACE WATER QUALITY MONITORING PROGRAM - AUGUST 2017

Sample Location	Sample Date	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(j)fluoranthene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	1-Methylnaphthalene	2-Methylnaphthalene	Naphthalene	Perylene	Phenanthrene	Pyrene
Units		µg/L																			
NSE Tier 1 EQS Fresh Water <sup>1</sup>		5.8	4.6	0.012	0.018	0.015	0.48 <sup>3</sup>	0.17	0.48 <sup>3</sup>	0.48 <sup>3</sup>	1.4	0.26	0.04	3	0.21	2	2	1.1	-	0.4	0.025
CCME FWAL <sup>2</sup>		5.8	-	0.012	0.018	0.015	-	-	-	-	-	-	0.04	3	-	-	-	1.1	-	0.4	0.025
Upstream Calculated 95% UCL		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pre-Construction/Baseline Calculated 95% UCL		-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-
COB-B-SW	07/27/15	DRY - NO SAMPLE																			
	11/18/15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	07/22/16	DRY - NO SAMPLE																			
	12/8/16	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	8/3/17	DRY - NO SAMPLE																			
COB-4-SW	12/22/14	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	07/27/15	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	0.010	0.012
	11/18/15	0.14	0.027	<b>0.12</b>	<b>0.43</b>	<b>0.39</b>	0.33	<b>0.24</b>	0.20	0.19	0.48	0.073	<b>0.88</b>	0.078	<b>0.22</b>	<0.050	<0.050	<0.20	0.10	<b>0.48</b>	<b>0.74</b>
	07/22/16	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	07/22/16 <sup>FD</sup>	0.018	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	12/8/16	0.059	<0.010	<b>0.013</b>	<b>0.021</b>	<b>0.028</b>	0.026	0.018	0.017	0.014	0.031	<0.010	<b>0.043</b>	0.036	0.013	<0.050	<0.050	<0.20	<0.010	0.065	<b>0.04</b>
	8/3/17	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
8/3/17 <sup>FD</sup>	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010	
COB-6-SW	07/23/13	0.073	0.025	<b>0.015</b>	<0.010	<0.010	<0.010	<0.010	NM	<0.010	<0.010	<0.010	0.034	0.034	<0.010	<0.20	<0.050	<0.05	<0.010	0.048	<b>0.026</b>
	12/22/14	0.089	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.02	0.026	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	0.013
	07/27/15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	11/18/15	0.016	<0.010	<0.010	0.015	0.015	0.016	0.019	<0.010	<0.010	0.018	<0.010	0.030	<0.010	0.016	<0.050	<0.050	<0.20	<0.010	0.014	<b>0.030</b>
	07/22/16	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	12/8/16	0.11	0.012	0.01	0.018	<b>0.027</b>	0.025	0.019	0.016	0.013	0.029	<0.010	<b>0.043</b>	0.052	0.013	0.083	<0.050	0.38	0.011	0.049	0.038
	8/3/17	0.052	0.030	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.036	0.024	<0.010	<0.050	<0.050	<0.20	<0.010	0.018	0.017
WB-1-SW	07/23/13	0.11	0.021	<0.010	<0.010	<0.010	<0.010	<0.010	NM	<0.010	<0.010	<0.010	0.018	0.054	<0.010	<0.20	<0.050	<0.05	<0.010	0.066	<0.010
	12/22/14	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	0.011	<0.010
	07/27/15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	11/18/15 <sup>FD</sup>	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	11/18/15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	07/22/16	0.019	<0.010	<0.010	<0.010	<b>0.025</b>	0.029	0.012	0.013	0.017	0.15	<0.010	<b>0.16</b>	0.011	0.011	<0.050	<0.050	<0.20	<0.010	0.07	<b>0.092</b>
	12/8/16 <sup>FD</sup>	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
	12/8/16	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
8/3/17	0.029	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	<0.010	<b>0.044</b>	0.016	<0.010	<0.050	<0.050	<0.20	<0.010	0.035	<b>0.027</b>	

TABLE B-1  
 SURFACE WATER ANALYTICAL RESULTS - PAHs  
 LTMM SURFACE WATER QUALITY MONITORING PROGRAM - AUGUST 2017

Sample Location	Sample Date	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(j)fluoranthene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	1-Methylnaphthalene	2-Methylnaphthalene	Naphthalene	Perylene	Phenanthrene	Pyrene
Units		µg/L																			
NSE Tier 1 EQS Marine Water <sup>1</sup>		6	6	-	-	0.01	-	-	-	-	0.1	-	11	12	-	1	2	1.4	-	4.6	0.02
CCME MAL <sup>2</sup>		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-
Battery Point/Narrows Calculated 95% UCL		-	-	-	-	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BP-1-SW	07/23/13	0.02	<0.03	<0.010	<0.010	<0.010	<0.010	<0.010	NM	<0.010	<0.010	<0.010	0.012	0.025	<0.010	<0.20	<0.050	<0.05	<0.03	0.034	0.01
	12/22/14	0.069	0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.041	0.083	<0.010	0.094	<0.050	<0.20	<0.010	0.065	<u>0.036</u>
	07/27/15	0.014	0.018	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	<0.010	<0.050	<0.050	<0.20	<0.010	0.015	<0.010
	11/18/15	0.052	0.067	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.018	0.058	<0.010	0.057	<0.050	<0.20	<0.010	0.042	<u>0.022</u>
	07/22/16	0.014	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	<0.010	<0.050	<0.050	<0.20	<0.010	0.012	<0.010
	12/8/16	0.059	0.055	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	0.046	<0.010	0.072	<0.050	<0.20	<0.010	0.03	0.016
	8/3/17	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010
NARROWS	12/22/14	0.10	0.11	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.033	0.089	<0.010	0.013	<0.050	0.22	<0.51	0.065	<u>0.030</u>
	07/27/15	0.035	0.037	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.016	0.033	<0.010	<0.050	<0.050	<0.20	<0.010	0.026	0.014
	11/18/15	0.074	0.099	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.023	0.071	<0.010	0.068	<0.050	<0.20	<0.010	0.041	0.019
	07/22/16	0.024	0.02	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	0.021	<0.010	<0.050	<0.050	<0.20	<0.010	0.016	<0.010
	12/8/16	0.078	0.058	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	0.049	<0.010	0.069	<0.050	0.21	<0.010	0.031	0.016
	8/3/17	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	<0.050	<0.050	<0.20	<0.010	<0.010	<0.010

NOTES:

FD - Field Duplicate

NM - Not Measured or not analyzed

mg/L - milligrams per liter

UCL - Upper Concentration Limit

- No applicable guideline criteria

1 - Nova Scotia Environment Tier I Environmental Quality Standards (EQS) for surface water (freshwater and marine) 2013

2 - Canadian Council of Ministers of the Environment (CCME) for the protection of aquatic life (freshwater and marine) 2014

3 - Guideline values for benzo(b)fluoranthene, benzo(j)fluoranthene and benzo(k)fluoranthene are to be compared to the sum of the parameters

**Bold** Concentration exceeds Tier I EQS for surface water (freshwater)

Underline Concentration exceeds Tier I EQS for surface water (marine)

Shading Concentration exceeds CCME FWAL

Shading Concentration exceeds CCME MAL

Double Underline Concentration exceeds Upstream Calculated 95% Upper Concentration Limit

Dashed Border Concentration exceeds Battery Point/Narrows Calculated 95% Upper Concentration Limit

**Red** Concentration exceeds Pre-Construction/Baseline Calculated 95% Upper Concentration Limit

This summary is to be used in conjunction with, not as a replacement of, the Laboratory Certificates of Analysis





TABLE B-2  
SURFACE WATER ANALYTICAL RESULTS - GENERAL CHEMISTRY AND TOTAL METALS  
LTMM SURFACE WATER QUALITY MONITORING PROGRAM - AUGUST 2017

Sample Location	Sample Date	Units																										
		Al	Sb	As	Ba	Be	Bi	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	Ag	Sr	Tl	Sr	Tl	U	V	Zn	
NSE Tier 1 EQS Fresh Water <sup>1</sup>		5	20	5.0	1000	5.3	-	1200	0.01	-	10	2	300	1	820	0.026	73	25	1.0	0.1	21000	0.8	-	-	300	6	30	
CCME FWAL <sup>2</sup>		100 <sup>5</sup>	-	5	-	-	-	1500	0.09	1 <sup>4</sup>	-	2 <sup>6</sup>	300	1 <sup>7</sup>	-	0.026	73	25 <sup>8</sup>	1	0.25	-	0.8	-	-	15	-	30	
Upstream Calculated 95% UCL		220	-	1.6	-	-	-	-	0.1	8.3	-	-	3318	1.2	583	-	-	-	1.9	-	132	-	-	-	-	-	-	
Pre-Construction/Baseline Calculated 95% UCL		-	-	1.98	-	-	-	-	-	-	1.3	-	1900	-	800	-	-	-	-	-	-	210	-	-	-	-	-	-
CB-SW	07/23/13	28.5	<1.0	1.4	61.9	<1.0	<2.0	<50	0.016	1.3	<0.40	2.0	454	<0.50	3690	NM	<2.0	<2.0	<1.0	<0.10	196	<0.10	<2.0	<2.0	0.37	<2.0	<5	
	12/22/14	110	<1.0	<1.0	27	<1.0	<2.0	<50	0.018	<1.0	<0.40	<2.0	290	<0.50	190	<0.013	<2.0	<2.0	<1.0	<0.10	130	<0.10	<2.0	3.5	0.17	<2.0	6.0	
	07/27/15	28	<1.0	<1.0	52	<1.0	<2.0	<50	<0.010	<1.0	<0.40	<2.0	260	<0.50	61	<0.013	<2.0	<2.0	<1.0	<0.10	320	<0.10	<2.0	<2.0	<0.10	<2.0	9.0	
	11/18/15	130	<1.0	<1.0	29	<1.0	<2.0	<50	0.011	<1.0	<0.40	<2.0	280	<0.50	140	<0.013	<2.0	<2.0	<1.0	<0.10	140	<0.10	<2.0	4.3	0.12	<2.0	6.1	
	07/22/16	55	<1.0	1.4	30	<1.0	<2.0	<50	<0.010	<1.0	<0.40	<2.0	640	<0.50	71	<0.013	<2.0	<2.0	<1.0	<0.10	160	<0.10	<2.0	5.6	<0.10	<2.0	<5.0	
	12/8/16	84	<1.0	<1.0	25	<1.0	<2.0	<50	0.017	<1.0	<0.40	<2.0	330	<0.50	310	<0.013	<2.0	<2.0	<1.0	<0.10	110	<0.10	<2.0	<2.0	0.14	<2.0	<5.0	
	8/3/17	150	<1.0	1.4	87	<1.0	<2.0	<50	<0.010	1.0	<0.40	<2.0	750	0.61	380	<0.013	<2.0	<2.0	<1.0	<0.10	340	<0.10	<2.0	2.9	<0.10	2.6	<5.0	
NRC-1-SW	07/23/13	131	<1.0	1.4	11.8	<1.0	<2.0	<50	0.021	<1.0	<0.40	3.1	148	1.53	69.1	NM	<2.0	<2.0	<1.0	<0.10	64.7	<0.10	<2.0	2.4	0.21	2.2	5.3	
	12/22/14	58	<1.0	<1.0	12	<1.0	<2.0	<50	0.022	<1.0	<0.40	<2.0	150	<0.50	85	<0.013	<2.0	<2.0	<1.0	<0.10	32	<0.10	<2.0	<2.0	<0.10	<2.0	9.1	
	07/27/15	45	<1.0	<1.0	11	<1.0	<2.0	<50	0.019	<1.0	<0.40	<2.0	1300	<0.50	75	<0.013	<2.0	<2.0	<1.0	<0.10	54	<0.10	<2.0	<2.0	<0.10	<2.0	11	
	11/18/15	1500	<1.0	3.5	29	<1.0	<2.0	<50	0.14	1.9	1.5	5	3800	9.5	1100	<0.013	<2.0	3.3	<1.0	<0.10	36	<0.10	<2.0	34	0.14	3	27	
	07/22/16	31	<1.0	<1.0	10	<1.0	<2.0	<50	0.016	<1.0	<0.40	<2.0	970	0.61	47	<0.013	<2.0	<2.0	<1.0	<0.10	52	<0.10	<2.0	<2.0	<0.10	<2.0	<5.0	
	12/8/16	110	<1.0	<1.0	19	<1.0	<2.0	<50	0.025	<1.0	<0.40	<2.0	360	0.8	200	<0.013	<2.0	<2.0	<1.0	<0.10	34	<0.10	<2.0	<2.0	<0.10	<2.0	<5.0	
	8/3/17	DRY - NO SAMPLE																										
SRC-1-SW	07/23/13	29	<1.0	1.2	10.2	<1.0	<2.0	57	<0.01	<1.0	<0.40	<2	69	<0.50	41.4	NM	<2.0	<2.0	<1.0	<0.10	174	<0.10	<2.0	<2.0	0.38	<2.0	<5	
	12/22/14 <sup>FD</sup>	350	<1.0	<1.0	17	<1.0	<2.0	110	0.042	<1.0	<0.40	2.8	350	1.2	200	<0.013	<2.0	<2.0	<1.0	<0.10	150	<0.10	<2.0	6.8	0.40	<2.0	7.0	
	12/22/14	290	<1.0	<1.0	17	<1.0	<2.0	110	0.035	<1.0	<0.40	2.6	340	1.2	190	<0.013	<2.0	<2.0	<1.0	<0.10	150	<0.10	<2.0	6.6	0.40	<2.0	6.9	
	07/27/15 <sup>FD</sup>	51	<1.0	1.0	17	<1.0	<2.0	64	0.015	1.5	<0.40	<2.0	190	<0.50	260	<0.013	<2.0	<2.0	<1.0	<0.10	150	<0.10	<2.0	<2.0	0.32	<2.0	8.4	
	07/27/15	51	<1.0	1.0	16	<1.0	<2.0	63	0.013	<1.0	<0.40	24	210	1.1	260	<0.013	<2.0	<2.0	<1.0	<0.10	150	<0.10	<2.0	2.4	0.29	<2.0	9.5	
	11/18/15	240	<1.0	<1.0	16	<1.0	<2.0	57	0.023	1.2	<0.40	2.2	310	0.75	230	<0.013	<2.0	<2.0	<1.0	<0.10	150	<0.10	<2.0	5.3	0.33	<2.0	<5.0	
	07/22/16	50	<1.0	1.9	11	<1.0	<2.0	91	0.018	<1.0	<0.40	<2.0	350	<0.50	350	<0.013	<2.0	<2.0	<1.0	<0.10	170	<0.10	<2.0	2.1	0.38	<2.0	<5.0	
	12/8/16	300	<1.0	<1.0	18	<1.0	<2.0	54	0.039	1.0	<0.40	2.7	400	1.6	200	<0.013	<2.0	<2.0	<1.0	<0.10	140	<0.10	<2.0	13	0.35	<2.0	5.7	
	8/3/17	24	<1.0	1.8	19	<1.0	<2.0	130	<0.010	<1.0	<0.40	<2.0	150	<0.50	91	<0.013	<2.0	<2.0	<1.0	<0.10	190	<0.10	<2.0	<2.0	0.40	<2.0	<5.0	
COB-A-SW	07/23/13	17.2	<1.0	<1.0	56.2	<1.0	<2.0	415	0.015	<1.0	<0.40	<2.0	56	<0.50	27.9	NM	<2.0	<2.0	<1.0	<0.10	671	<0.10	<2.0	<2.0	2.14	<2.0	<5	
	12/22/14	16	<1.0	<1.0	14	<1.0	<2.0	<50	<0.010	<1.0	<0.40	<2.0	51	<0.50	25	<0.013	<2.0	<2.0	<1.0	<0.10	260	<0.10	<2.0	<2.0	0.38	<2.0	<5.0	
	07/27/15	DRY - NO SAMPLE																										
	11/18/15	5.1	<1.0	<1.0	15	<1.0	<2.0	<50	<0.010	<1.0	<0.40	<2.0	82	<0.50	74	<0.013	<2.0	<2.0	<1.0	<0.10	260	<0.10	<2.0	<2.0	0.42	<2.0	<5.0	
	07/22/16	DRY - NO SAMPLE																										
	12/8/16	8.5	<1.0	<1.0	12	<1.0	<2.0	85	<0.010	<1.0	<0.40	<2.0	68	<0.50	92	<0.013	<2.0	<2.0	<1.0	<0.10	250	<0.10	<2.0	<2.0	0.32	<2.0	<5.0	
	8/3/17	DRY - NO SAMPLE																										
COB-B-SW	07/27/15	DRY - NO SAMPLE																										
	11/18/15	7.9	<1.0	<1.0	18	<1.0	<2.0	<50	<0.010	<1.0	<0.40	<2.0	<50	<0.50	21	<0.013	<2.0	<2.0	<1.0	<0.10	250	<0.10	<2.0	<2.0	0.42	<2.0	<5.0	
	07/22/16	DRY - NO SAMPLE																										
	12/8/16	13	<1.0	<1.0	52	<1.0	<2.0	540	0.027	<1.0	0.90	<2.0	130	<0.50	1400	<0.013	<2.0	2.8	<1.0	<0.10	480	<0.10	<2.0	<2.0	0.68	<2.0	<5.0	
	8/3/17	DRY - NO SAMPLE																										

TABLE B-2  
 SURFACE WATER ANALYTICAL RESULTS - GENERAL CHEMISTRY AND TOTAL METALS  
 LTM SURFACE WATER QUALITY MONITORING PROGRAM - AUGUST 2017

Sample Location	Sample Date	Units	Na	K	Ca	Mg	ALK	SO4	Cl	SiO2	PO4	P	NO3	NO2	NO2-NO3	NH3	Colour	TOC	TURBIDITY	CONDUCTIVITY	pH	HARDNESS	BICARB ALKALINITY	CARB ALKALINITY	TDS	Anion Sum	Ion Balance	Langelier Index (@20C)	Langelier Index (@4C)	Sat_PH (@20C)	Sat_PH (@4C)
	NSE Tier 1 EQS Fresh Water <sup>1</sup>		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CCME FWAL <sup>2</sup>		-	-	-	-	-	-	120	-	-	-	13	0.6	-	1 <sup>3</sup>	-	-	-	-	6.5-9.0	-	-	-	-	-	-	-	-	-	-
	Upstream Calculated 95% UCL		-	-	-	-	-	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pre-Construction/Baseline Calculated 95% UCL		-	-	-	-	-	84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COB-4-SW	12/22/14		20000	1600	34000	3600	53	47	31	7.4	<0.010	<100	0.26	<0.010	0.26	0.057	12	3	1.5	300	7.70	99	52	<1.0	180	2.92	0.17	-0.431	-0.681	8.13	8.38
	07/27/15		37000	2900	60000	6300	94	100	58	8.5	<0.010	<100	0.31	0.013	0.33	<0.050	11	4.1	1.8	530	7.72	180	93	<1.0	330	5.65	4.15	0.036	-0.213	7.68	7.93
	11/18/15		21000	2800	33000	4600	58	41	33	7.5	0.012	390	0.18	<0.010	0.18	<0.050	14	9.3	140	310	7.56	100	58	<1.0	190	2.96	8.50	-0.540	-0.790	8.10	8.35
	07/22/16		34000	2400	55000	5300	98	74	54	9.2	0.015	<100	0.15	<0.010	0.15	<0.050	19	5.2	1.3	460	7.91	160	98	<1.0	300	5.06	3.27	0.223	-0.026	7.69	7.94
	07/22/16 <sup>FD</sup>		36000	2500	55000	5700	99	72	49	9.1	0.016	<100	0.15	<0.010	0.15	<0.050	18	4.8	1.2	460	7.85	160	99	<1.0	290	4.89	0.31	0.169	-0.081	7.68	7.93
	12/8/16		19000	1300	28000	2900	49	39	34	7.4	0.012	<100	0.27	<0.010	0.27	0.083	8.8	2.6	2.7	270	7.76	81	49	<1.0	160	2.79	5.08	-0.477	-0.727	8.24	8.49
	8/3/17		44000	3300	78000	7600	130	110	72	11	<0.010	<100	<0.010	0.12	0.12	0.061	<5.0	2.6	0.46	690	7.98	230	130	1.2	410	6.98	3.41	0.543	0.295	7.44	7.68
8/3/17 <sup>FD</sup>		46000	3500	81000	7700	140	110	71	11	<0.010	<100	<0.010	0.10	0.10	0.11	<5.0	2.5	0.34	700	8.15	230	130	1.8	410	6.98	1.45	0.730	0.482	7.42	7.67	
COB-6-SW	07/23/13		69200	5110	98900	9820	81	170	110	11	<0.010	<100	0.35	<0.010	0.35	<0.05	7.2	2.4	0.38	890	8.36	290	79	1.7	520	8.18	4.1	0.78	0.532	7.58	7.83
	12/22/14		22000	1800	39000	3800	58	56	35	8.3	<0.010	<100	0.28	0.011	0.29	0.1	11	2.6	0.87	340	7.86	110	57	<1.0	200	3.33	0.76	-0.173	-0.423	8.04	8.29
	07/27/15		39000	2600	57000	5000	93	91	61	8.4	<0.010	<100	0.18	0.015	0.19	<0.050	10	3.7	0.98	520	8.46	160	91	2.5	320	5.5	4.46	0.75	0.501	7.71	7.96
	11/18/15		27000	2100	37000	3700	70	44	42	7.6	0.012	<100	0.16	<0.010	0.16	<0.050	10	3.7	4.9	360	7.96	110	69	<1.0	210	3.51	1.89	-0.023	-0.273	7.98	8.23
	07/22/16		40000	2400	55000	4700	99	64	67	8.2	0.015	<100	0.081	<0.010	0.081	<0.050	23	5.3	1	490	8.05	160	98	1	300	5.21	2.46	0.365	0.116	7.69	7.94
	12/8/16		26000	1700	34000	3400	60	41	53	7.9	0.014	<100	0.27	0.01	0.28	<0.050	12	2.9	3.4	340	7.87	100	60	<1.0	210	3.56	5.33	-0.203	-0.453	8.08	8.33
8/3/17		74000	3300	61000	5300	72	110	130	9.9	<0.010	<100	<0.010	0.082	0.082	0.093	6.3	3.1	0.29	760	8.83	170	67	4.3	430	7.29	3.70	0.989	0.740	7.84	8.09	
WB-1-SW	07/23/13		5750000	210000	323000	667000	83	1500	11000	2	<0.010	<1000	0.051	<0.010	0.051	0.2	9.6	<5	6	31000	7.65	3600	82	<1.0	19000	330	0.43	0.178	-0.059	7.47	7.71
	12/22/14		12000	700	7500	1400	17	7.9	21	3.4	0.011	<100	0.14	<0.010	0.14	0.12	32	3.7	0.83	120	7.19	25	17	<1.0	65	1.1	2.33	-2.04	-2.29	9.23	9.48
	07/27/15		19000	860	12000	2200	28	10	32	3.6	0.023	<100	0.16	0.016	0.18	0.18	51	6.3	0.82	170	7.44	39	28	<1.0	98	1.68	0.00	-1.37	-1.62	8.82	9.07
	11/18/15 <sup>FD</sup>		14000	760	9200	1600	23	8.3	26	3.9	0.012	<100	0.098	<0.010	0.098	<0.050	30	4.5	0.18	140	7.42	29	23	<1.0	77	1.36	6.25	-1.59	-1.84	9.01	9.26
	11/18/15		14000	760	9600	1600	23	8.3	24	3.9	0.012	<100	0.11	<0.010	0.11	<0.050	30	4.3	0.67	140	7.45	31	23	<1.0	77	1.32	3.13	-1.54	-1.79	8.99	9.24
	07/22/16		1600000	54000	79000	190000	62	410	2900	4.2	0.024	<100	0.22	0.021	0.24	0.084	37	16	2.2	8500	7.52	980	62	<1.0	5300	92.8	2.21	-0.583	-0.823	8.11	8.35
	12/8/16 <sup>FD</sup>		14000	770	9400	1700	22	8.5	24	3.7	0.03	<100	0.15	<0.010	0.15	0.13	26	3.7	1.1	140	7.29	30	22	<1.0	76	1.3	1.56	-1.71	-1.97	9.01	9.26
	12/8/16		14000	800	9700	1600	22	8.4	25	3.8	0.03	<100	0.15	<0.010	0.15	0.14	27	3.6	1.2	140	7.46	31	22	<1.0	77	1.33	3.1	-1.54	-1.79	9	9.25
8/3/17		940000	35000	82000	110000	97	230	1600	5.2	<0.010	<100	<0.010	0.055	0.055	0.075	9.0	2.6	1.8	5900	7.73	660	96	<1.0	3100	52.0	2.70	-0.0880	-0.330	7.81	8.06	

TABLE B-2  
 SURFACE WATER ANALYTICAL RESULTS - GENERAL CHEMISTRY AND TOTAL METALS  
 LTMM SURFACE WATER QUALITY MONITORING PROGRAM - AUGUST 2017

Sample Location	Sample Date	Units	Al	Sb	As	Ba	Be	Bi	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	Ag	Sr	Tl	Sn	Ti	U	V	Zn
NSE Tier 1 EQS Fresh Water <sup>1</sup>			5	20	5.0	1000	5.3	-	1200	0.01	-	10	2	300	1	820	0.026	73	25	1.0	0.1	21000	0.8	-	-	300	6	30
CCME FWAL <sup>2</sup>			100 <sup>5</sup>	-	5	-	-	-	1500	0.09	1 <sup>4</sup>	-	2 <sup>6</sup>	300	1 <sup>7</sup>	-	0.026	73	25 <sup>8</sup>	1	0.25	-	0.8	-	-	15	-	30
Upstream Calculated 95% UCL			220	-	1.6	-	-	-	-	0.1	8.3	-	-	3318	1.2	583	-	-	-	1.9	-	132	-	-	-	-	-	-
Pre-Construction/Baseline Calculated 95% UCL			-	-	1.98	-	-	-	-	-	-	1.3	-	1900	-	800	-	-	-	-	-	-	210	-	-	-	-	-
COB-4-SW	12/22/14		82	<1.0	<1.0	20	<1.0	<2.0	<50	0.014	<1.0	<0.40	<2.0	210	<0.50	95	<0.013	<2.0	<2.0	<1.0	<0.10	140	<0.10	<2.0	3.2	0.18	<2.0	7.2
	07/27/15		51	<1.0	<1.0	32	<1.0	<2.0	60	<0.010	<1.0	<0.40	<2.0	460	<0.50	110	<0.013	<2.0	<2.0	<1.0	<0.10	250	<0.10	<2.0	2.1	0.35	<2.0	10
	11/18/15		7100	<1.0	13	77	<1.0	<2.0	<50	0.29	8.0	4.6	17	14000	37	1500	0.082	<2.0	9.5	<1.0	<0.10	150	0.18	<2.0	200	0.53	14	96
	07/22/16		28	<1.0	<1.0	24	<1.0	<2.0	<50	<0.010	<1.0	<0.40	<2.0	300	<0.50	140	<0.013	<2.0	<2.0	<1.0	<0.10	270	<0.10	<2.0	<2.0	0.32	<2.0	<5.0
	07/22/16 <sup>FD</sup>		42	<1.0	<1.0	26	<1.0	<2.0	<50	<0.010	<1.0	<0.40	2	310	<0.50	140	<0.013	<2.0	<2.0	<1.0	<0.10	280	<0.10	<2.0	<2.0	0.33	<2.0	<5.0
	12/8/16		120	<1.0	<1.0	19	<1.0	<2.0	<50	0.014	<1.0	<0.40	<2.0	390	0.99	180	<0.013	<2.0	<2.0	<1.0	<0.10	110	<0.10	<2.0	<2.0	0.18	<2.0	<5.0
	8/3/17		13	<1.0	<1.0	36	<1.0	<2.0	58	0.011	<1.0	<0.40	<2.0	83	<0.50	120	<0.013	<2.0	<2.0	<1.0	<0.10	440	<0.10	<2.0	<2.0	0.50	<2.0	<5.0
	8/3/17 <sup>FD</sup>		14	<1.0	<1.0	37	<1.0	<2.0	63	<0.010	<1.0	<0.40	<2.0	83	<0.50	130	<0.013	<2.0	<2.0	<1.0	<0.10	450	<0.10	<2.0	<2.0	0.54	<2.0	<5.0
COB-6-SW	07/23/13		65.7	<1.0	1.0	66.6	<1.0	<2.0	66	<0.01	<1.0	<0.40	<2.0	61	<0.50	30.3	NM	<2.0	<2.0	<1.0	<0.10	645	<0.10	<2.0	<2.0	0.68	<2.0	<5
	12/22/14		61	<1.0	<1.0	22	<1.0	<2.0	<50	0.01	<1.0	<0.40	<2.0	170	<0.50	56	<0.013	<2.0	<2.0	<1.0	<0.10	180	<0.10	<2.0	<2.0	0.22	<2.0	6.0
	07/27/15		39	<1.0	<1.0	29	<1.0	<2.0	52	<0.010	<1.0	<0.40	2.2	160	<0.50	23	<0.013	<2.0	<2.0	<1.0	<0.10	300	<0.10	<2.0	<2.0	0.34	<2.0	7.4
	11/18/15		220	<1.0	<1.0	21	<1.0	<2.0	<50	0.018	<1.0	<0.40	<2.0	490	1.5	79	<0.013	<2.0	<2.0	<1.0	<0.10	180	<0.10	<2.0	4	0.22	<2.0	<5.0
	07/22/16		46	<1.0	1	26	<1.0	<2.0	<50	<0.010	<1.0	<0.40	<2.0	180	<0.50	37	<0.013	<2.0	<2.0	<1.0	<0.10	300	<0.10	<2.0	<2.0	0.3	<2.0	<5.0
	12/8/16		200	<1.0	<1.0	21	<1.0	<2.0	<50	0.015	<1.0	<0.40	<2.0	360	1.0	110	<0.013	<2.0	<2.0	<1.0	<0.10	160	<0.10	<2.0	3	0.23	<2.0	<5.0
8/3/17		42	<1.0	1.3	38	<1.0	<2.0	59	0.011	<1.0	<0.40	<2.0	<50	<0.50	35	<0.013	<2.0	<2.0	<1.0	<0.10	500	<0.10	<2.0	<2.0	0.43	<2.0	<5.0	
WB-1-SW	07/23/13		<50	<10	<10	280	<10	<20	2470	0.6	<10	<4.0	<20	936	<5	1920	NM	<20	<20	<10	<1.0	4660	<1	<20	<20	1.6	<20	<50
	12/22/14		180	<1.0	<1.0	15	<1.0	<2.0	<50	0.038	<1.0	<0.40	<2.0	270	0.71	95	<0.013	<2.0	<2.0	<1.0	<0.10	53	<0.10	<2.0	4.6	<0.10	<2.0	10
	07/27/15		89	<1.0	<1.0	18	<1.0	<2.0	<50	0.012	<1.0	<0.40	<2.0	480	<0.50	41	<0.013	<2.0	<2.0	<1.0	<0.10	100	<0.10	<2.0	<2.0	<0.10	<2.0	7.9
	11/18/15 <sup>FD</sup>		63	<1.0	<1.0	15	<1.0	<2.0	<50	<0.010	<1.0	<0.40	<2.0	200	<0.50	41	<0.013	<2.0	<2.0	<1.0	<0.10	70	<0.10	<2.0	<2.0	<0.10	<2.0	<5.0
	11/18/15		63	<1.0	<1.0	15	<1.0	<2.0	<50	<0.010	<1.0	<0.40	<2.0	200	<0.50	43	<0.013	<2.0	<2.0	<1.0	<0.10	73	<0.10	<2.0	<2.0	<0.10	<2.0	<5.0
	07/22/16		87	<1.0	<1.0	39	<1.0	<2.0	690	0.035	<1.0	<0.40	<2.0	590	0.56	160	<0.013	<2.0	<2.0	<1.0	<0.10	1300	<0.10	<2.0	<2.0	0.47	<2.0	11
	12/8/16 <sup>FD</sup>		140	<1.0	<1.0	15	<1.0	<2.0	<50	0.025	<1.0	<0.40	<2.0	220	<0.50	98	<0.013	<2.0	<2.0	<1.0	<0.10	59	<0.10	<2.0	<2.0	<0.10	<2.0	<5.0
	12/8/16		100	<1.0	<1.0	16	<1.0	<2.0	<50	0.026	<1.0	<0.40	<2.0	220	<0.50	100	<0.013	<2.0	<2.0	<1.0	<0.10	61	<0.10	<2.0	<2.0	<0.10	<2.0	<5.0
8/3/17		28	<1.0	1.0	73	<1.0	<2.0	430	0.027	<1.0	<0.40	<2.0	680	<0.50	450	<0.013	<2.0	<2.0	<1.0	<0.10	940	<0.10	<2.0	<2.0	0.43	<2.0	<5.0	

TABLE B-2  
 SURFACE WATER ANALYTICAL RESULTS - GENERAL CHEMISTRY AND TOTAL METALS  
 LTMM SURFACE WATER QUALITY MONITORING PROGRAM - AUGUST 2017

Sample Location	Sample Date	Na	K	Ca	Mg	ALK	SO4	Cl	SiO2	PO4	P	NO3	NO2	NO2-NO3	NH3	Colour	TOC	TURBIDITY	CONDUCTIVITY	pH	HARDNESS	BICARB ALKALINITY	CARB ALKALINITY	TDS	Anion Sum	Ion Balance	Langelier Index (@20C)	Langelier Index (@4C)	Sat_PH (@20C)	Sat_PH (@4C)
	Units	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	mg/L	mg/L	mg/L	mg/L	TCU	mg/L	NTU	µS/cm	pH	mg/L	mg/L	mg/L	mg/L	me/L	%	unitless	unitless	unitless	unitless
	NSE Tier 1 EQS Fresh Water <sup>1</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CCME FWAL <sup>2</sup>	-	-	-	-	-	-	120	-	-	-	13	0.6	-	1 <sup>3</sup>	-	-	-	-	6.5-9.0	-	-	-	-	-	-	-	-	-	-
	Upstream Calculated 95% UCL	-	-	-	-	-	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pre-Construction/Baseline Calculated 95% UCL	-	-	-	-	-	84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	NSE Tier 1 EQS Marine Water <sup>1</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CCME MAL <sup>2</sup>	-	-	-	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	7.0-8.7	-	-	-	-	-	-	-	-	-	-
	Battery Point/Narrows Calculated 95% UCL	-	-	-	-	-	2180	-	-	-	-	-	-	-	-	-	-	88	-	-	-	-	-	-	-	-	-	-	-	-
BP-1-SW	07/23/13	8480000	304000	343000	1000000	84	2000	14000	<0.5	<0.010	<1000	<0.05	<0.010	<0.05	<0.05	<5	<5	7.2	41000	8.07	5000	83	<1.0	26000	434	4.66	0.664	0.425	7.41	7.65
	12/22/14	1000000	38000	68000	120000	56	270	1900	5.5	0.012	<100	0.19	0.019	0.21	0.11	18	2.3	1.1	6300	8.42	680	54	1.3	3500	60.8	1.58	0.248	0.007	8.17	8.41
	07/27/15	7100000	260000	300000	870000	88	1500	13000	1.1	0.018	<1000	0.11	0.011	0.12	0.05	6.8	<5.0	0.6	37000	7.83	4300	87	<1.0	23000	393	0.97	0.369	0.131	7.46	7.7
	11/18/15	6500000	27000	52000	71000	58	190	1200	5.4	0.015	<100	0.14	<0.010	0.14	0.064	25	3.3	1.0	4200	8.00	420	57	<1.0	2200	38.8	1.80	-0.189	-0.432	8.19	8.44
	07/22/16	7500000	280000	300000	910000	92	1600	13000	1	0.026	<1000	0.092	0.01	0.1	0.088	8.3	<5.0	1.2	36000	7.99	4500	91	<1.0	24000	411	1.77	0.559	0.321	7.43	7.67
	12/8/16	1200000	45000	70000	150000	52	290	2300	4.8	0.015	<100	0.21	<0.010	0.21	0.088	20	<5.0	2.1	7000	7.56	780	52	<1.0	4100	72.9	3.02	-0.642	-0.883	8.2	8.44
8/3/17	8400000	300000	340000	1000000	98	2000	13000	0.78	0.010	<1000	<0.010	0.057	0.057	0.13	<5.0	<5.0	1.5	40000	8.05	5000	97	1.0	25000	405	7.68	0.698	0.460	7.35	7.59	
NARROWS	12/22/14	600000	24000	58000	74000	57	170	1100	5.6	0.013	<100	0.22	0.016	0.24	0.11	16	2	1	3900	8.56	450	55	1.9	2100	36	0.1	0.403	0.16	8.15	8.4
	07/27/15	7200000	270000	300000	900000	91	1300	13000	1.2	<0.010	<1000	0.067	<0.010	0.067	0.067	7.4	<5.0	0.36	37000	7.96	4400	90	<1.0	23000	383	3.36	0.502	0.265	7.45	7.69
	11/18/15	330000	15000	38000	36000	55	110	640	5.8	0.016	<100	0.15	<0.010	0.15	0.053	21	3.7	1.7	2400	7.86	240	55	<1.0	1200	21.6	4.13	-0.398	-0.643	8.26	8.50
	07/22/16	7500000	270000	300000	900000	93	1400	12000	1.3	0.017	<1000	0.05	0.01	0.06	0.08	9.9	2.3	1.2	36000	7.97	4400	92	<1.0	23000	378	5.2	0.533	0.295	7.44	7.68
	12/8/16	1000000	38000	72000	130000	61	270	1900	6.1	0.016	<100	0.21	<0.010	0.21	0.082	21	<5.0	1.2	6200	7.67	700	61	<1.0	3500	60.8	0.65	-0.418	-0.66	8.09	8.33
8/3/17	8300000	300000	340000	990000	97	2000	12000	1.1	0.016	<1000	<0.010	0.077	0.077	0.21	<5.0	<5.0	1.4	40000	7.80	4900	97	<1.0	24000	392	8.83	0.450	0.213	7.36	7.59	

TABLE B-2  
 SURFACE WATER ANALYTICAL RESULTS - GENERAL CHEMISTRY AND TOTAL METALS  
 LTMM SURFACE WATER QUALITY MONITORING PROGRAM - AUGUST 2017

Sample Location	Sample Date	Units																									
		Al	Sb	As	Ba	Be	Bi	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	Ag	Sr	Tl	Sn	Ti	U	V	Zn
NSE Tier 1 EQS Fresh Water <sup>1</sup>		5	20	5.0	1000	5.3	-	1200	0.01	-	10	2	300	1	820	0.026	73	25	1.0	0.1	21000	0.8	-	-	300	6	30
CCME FWAL <sup>2</sup>		100 <sup>5</sup>	-	5	-	-	-	1500	0.09	1 <sup>4</sup>	-	2 <sup>6</sup>	300	1 <sup>7</sup>	-	0.026	73	25 <sup>8</sup>	1	0.25	-	0.8	-	-	15	-	30
Upstream Calculated 95% UCL		220	-	1.6	-	-	-	-	0.1	8.3	-	-	3318	1.2	583	-	-	-	1.9	-	132	-	-	-	-	-	-
Pre-Construction/Baseline Calculated 95% UCL		-	-	1.98	-	-	-	-	-	-	1.3	-	1900	-	800	-	-	-	-	-	210	-	-	-	-	-	-
NSE Tier 1 EQS Marine Water <sup>1</sup>		-	500	12.5	500	100	-	1200	0.12	-	-	2	-	2	-	0.016	-	8.3	2	1.5	-	21.3	-	-	100	50	10
CCME MAL <sup>2</sup>		-	-	12.5	-	-	-	-	0.12	1.5 <sup>5</sup>	-	-	-	-	-	0.016	-	-	-	-	-	-	-	-	-	-	-
Battery Point/Narrows Calculated 95% UCL		-	-	-	-	-	-	-	-	-	0.9	-	190	-	70	0.189	-	-	-	-	7000	-	-	-	-	-	-
BP-1-SW	07/23/13	168	<10	<10	41	<10	<20	<u>3700</u>	<u>0.14</u>	<10	<4.0	<20	1990	<5	109	<0.013	<20	<20	<10	<1.0	6130	<1	<20	<20	2.6	<20	<50
	12/22/14	110	<1.0	<1.0	19	<1.0	<2.0	480	0.028	<1.0	<0.40	<2.0	240	<0.50	61	<0.013	<2.0	<2.0	<1.0	<0.10	950	<0.10	<2.0	<2.0	0.41	<2.0	7.2
	07/27/15	86	<10	<10	19	<10	<20	<u>2900</u>	<0.10	<10	<4.0	<20	<500	<5.0	59	<0.013	<20	<20	<10	<1.0	5300	<1.0	<20	<20	2.1	<20	<50
	11/18/15	140	<1.0	<1.0	16	<1.0	<2.0	330	0.014	<1.0	<0.40	<2.0	410	<0.50	57	0.070	<2.0	<2.0	<1.0	<0.10	580	<0.10	<2.0	<2.0	0.29	<2.0	<u>41</u>
	07/22/16	63	<10	<10	23	<10	<20	<u>3600</u>	<0.10	<10	<4.0	<20	<500	<5.0	71	<0.013	<20	<20	<10	<1.0	5500	<1.0	<20	<20	2.4	<20	<50
	12/8/16	86	<1.0	<1.0	20	<1.0	<2.0	520	0.025	<1.0	<0.40	<2.0	280	<0.50	100	<0.013	<2.0	<2.0	<1.0	<0.10	1000	<0.10	<2.0	<2.0	0.48	<2.0	<5.0
	8/3/17	<50	<10	<10	25	<10	<20	<u>3600</u>	<0.10	<10	<4.0	<20	<500	<5.0	110	<0.013	<20	<20	<10	<1.0	6100	<1.0	<20	<20	2.5	<20	<50
NARROWS	12/22/14	110	<1.0	<1.0	19	<1.0	<2.0	300	0.027	<1.0	<0.40	<2.0	250	<0.50	63	<0.013	<2.0	<2.0	<1.0	<0.10	610	<0.10	<2.0	2.4	0.32	<2.0	7.3
	07/27/15	140	<10	<10	21	<10	<20	<u>3100</u>	<0.10	<10	<4.0	<20	<500	<5.0	100	<0.013	<20	<20	<10	<1.0	5400	<1.0	<20	<20	2.2	<20	<50
	11/18/15	76	1.8	<1.0	15	<1.0	<2.0	180	0.012	<1.0	<0.40	<2.0	320	<0.50	45	<0.013	<2.0	<2.0	<1.0	<0.10	370	<0.10	<2.0	<2.0	0.22	<2.0	<u>63</u>
	07/22/16	51	<10	<10	28	<10	<20	<u>3500</u>	<0.10	<10	<4.0	<20	<500	<5.0	120	<0.013	<20	<20	<10	<1.0	5400	<1.0	<20	<20	2.1	<20	<50
	12/8/16	75	<1.0	<1.0	20	<1.0	<2.0	460	0.029	<1.0	<0.40	<2.0	250	<0.50	110	<0.013	<2.0	<2.0	<1.0	<0.10	890	<0.10	<2.0	<2.0	0.58	<2.0	<u>15</u>
8/3/17	<50	<10	<10	26	<10	<20	<u>3600</u>	<0.10	<10	<4.0	<20	<500	<5.0	110	<0.013	<20	<20	<10	<1.0	6100	<1.0	<20	<20	2.4	<20	<50	

**NOTES:**  
 FD - Field Duplicate  
 N/A - Not Measured or not analyzed  
 mg/L - milligrams per liter  
 UCL - Upper Concentration Limit  
 - No applicable guideline criteria

<sup>1</sup> - Nova Scotia Environment Tier 1 Environmental Quality Standards (EQS) for surface water (freshwater and marine) 2013  
<sup>2</sup> - Canadian Council of Ministers of the Environment (CCME) for the protection of aquatic life (freshwater and marine) 2014  
<sup>3</sup> - Guideline value for NH<sub>3</sub> is based on a pH value of 8 and a temperature of 10 °C  
<sup>4</sup> - Guideline for chromium is based on Cr(VI)  
<sup>5</sup> - Guideline value for aluminum based on a pH of 8.5  
<sup>6</sup> - CCME FWAL guideline value for copper is based on a hardness value. If value is unknown, the guideline is 2µg/L.  
<sup>7</sup> - CCME FWAL guideline value for lead is based on a hardness value. If value is unknown, the guideline is 1µg/L.  
<sup>8</sup> - CCME FWAL guideline value for lead is based on a hardness value. If value is unknown, the guideline is 25µg/L.

**Bold** Concentration exceeds Tier 1 EQS for surface water (freshwater)  
**Underline** Concentration exceeds Tier 1 EQS for surface water (marine)  
**Shading** Concentration exceeds CCME FWAL  
**Shading** Concentration exceeds CCME MAL  
**Shading/Underline** Concentration exceeds Upstream Calculated 95% UCL  
**Dashed Border** Concentration exceeds Battery Point/Narrows Calculated 95% Upper Concentration Limit  
**Red** Concentration exceeds Pre-Construction/Baseline Calculated 95% Upper Concentration Limit  
**Blue** Laboratory detection limit is higher than guideline criteria

This summary is to be used in conjunction with, not as a replacement of, the Laboratory Certificate of Analysis

APPENDIX C  
LABORATORY CERTIFICATES

Your Project #: 14-1360  
 Site#: NS LANDS SW PROGRAM  
 Site Location: NS LANDS SW PROGRAM  
 Your C.O.C. #: 621478

**Attention:Nadine Wambolt**

Dillon Consulting Limited  
 275 Charlotte St  
 Sydney, NS  
 B1P 1C6

**Report Date: 2017/08/14**  
 Report #: R4650935  
 Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B7G6919**

**Received: 2017/08/03, 16:10**

Sample Matrix: Water  
 # Samples Received: 9

<b>Analyses</b>	<b>Quantity</b>	<b>Date Extracted</b>	<b>Date Analyzed</b>	<b>Laboratory Method</b>	<b>Reference</b>
Carbonate, Bicarbonate and Hydroxide (1)	8	N/A	2017/08/11	N/A	SM 22 4500-CO2 D
Alkalinity (1)	4	N/A	2017/08/10	ATL SOP 00013	EPA 310.2 R1974 m
Alkalinity (1)	4	N/A	2017/08/11	ATL SOP 00013	EPA 310.2 R1974 m
Benzo(b/j)fluoranthene Sum (water) (1)	1	N/A	2017/08/11	N/A	Auto Calc.
Benzo(b/j)fluoranthene Sum (water) (1)	8	N/A	2017/08/14	N/A	Auto Calc.
Chloride (1)	8	N/A	2017/08/11	ATL SOP 00014	SM 22 4500-Cl- E m
Colour (1)	8	N/A	2017/08/10	ATL SOP 00020	SM 22 2120C m
Conductance - water (1)	8	N/A	2017/08/10	ATL SOP 00004	SM 22 2510B m
Hardness (calculated as CaCO3) (1)	5	N/A	2017/08/11	ATL SOP 00048	SM 22 2340 B
Hardness (calculated as CaCO3) (1)	3	N/A	2017/08/14	ATL SOP 00048	SM 22 2340 B
Mercury - Total (CVAA,LL) (1)	8	2017/08/10	2017/08/11	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Total MS (1)	5	2017/08/10	2017/08/10	ATL SOP 00058	EPA 6020A R1 m
Metals Water Total MS (1)	3	2017/08/10	2017/08/11	ATL SOP 00058	EPA 6020A R1 m
Ion Balance (% Difference) (1)	5	N/A	2017/08/11	N/A	Auto Calc.
Ion Balance (% Difference) (1)	3	N/A	2017/08/14	N/A	Auto Calc.
Anion and Cation Sum (1)	5	N/A	2017/08/11	N/A	Auto Calc.
Anion and Cation Sum (1)	3	N/A	2017/08/14	N/A	Auto Calc.
Nitrogen Ammonia - water (1)	8	N/A	2017/08/10	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite (1)	8	N/A	2017/08/10	ATL SOP 00016	USGS SOPINCF0452.2 m
Nitrogen - Nitrite (1)	8	N/A	2017/08/10	ATL SOP 00017	SM 22 4500-NO2- B m
Nitrogen - Nitrate (as N) (1)	8	N/A	2017/08/11	ATL SOP 00018	ASTM D3867-16
PAH in Water by GC/MS (SIM) (1)	4	2017/08/10	2017/08/11	ATL SOP 00103	EPA 8270D 2007 m
PAH in Water by GC/MS (SIM) (1)	5	2017/08/10	2017/08/12	ATL SOP 00103	EPA 8270D 2007 m
pH (1, 2)	8	N/A	2017/08/10	ATL SOP 00003	SM 22 4500-H+ B m
Phosphorus - ortho (1)	8	N/A	2017/08/10	ATL SOP 00021	SM 4500-Pe m
Sat. pH and Langelier Index (@ 20C) (1)	5	N/A	2017/08/11	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 20C) (1)	3	N/A	2017/08/14	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C) (1)	5	N/A	2017/08/11	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C) (1)	3	N/A	2017/08/14	ATL SOP 00049	Auto Calc.
Reactive Silica (1)	8	N/A	2017/08/10	ATL SOP 00022	EPA 366.0 m

Your Project #: 14-1360  
 Site#: NS LANDS SW PROGRAM  
 Site Location: NS LANDS SW PROGRAM  
 Your C.O.C. #: 621478

**Attention:Nadine Wambolt**

Dillon Consulting Limited  
 275 Charlotte St  
 Sydney, NS  
 B1P 1C6

**Report Date: 2017/08/14**

Report #: R4650935

Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B7G6919**

**Received: 2017/08/03, 16:10**

Sample Matrix: Water  
 # Samples Received: 9

Analyses	Date		Laboratory Method	Reference
	Quantity	Extracted		
Sulphate (1)	8	N/A	2017/08/11 ATL SOP 00023	ASTMD516-11 m
Total Dissolved Solids (TDS calc) (1)	5	N/A	2017/08/11 N/A	Auto Calc.
Total Dissolved Solids (TDS calc) (1)	3	N/A	2017/08/14 N/A	Auto Calc.
Organic carbon - Total (TOC) (1, 3)	8	N/A	2017/08/10 ATL SOP 00037	SM 22 5310C m
Turbidity (1)	8	N/A	2017/08/11 ATL SOP 00011	EPA 180.1 R2 m

**Remarks:**

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Bedford

(2) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.

(3) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.



Your Project #: 14-1360  
Site#: NS LANDS SW PROGRAM  
Site Location: NS LANDS SW PROGRAM  
Your C.O.C. #: 621478

**Attention:Nadine Wambolt**

Dillon Consulting Limited  
275 Charlotte St  
Sydney, NS  
B1P 1C6

**Report Date: 2017/08/14**  
Report #: R4650935  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B7G6919**  
**Received: 2017/08/03, 16:10**

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.  
Natalie MacAskill, Sr. Project Manager  
Email: NMacAskill@maxxam.ca  
Phone# (902)567-1255 Ext:17

=====  
This report has been generated and distributed using a secure automated process.  
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

### RESULTS OF ANALYSES OF WATER

Maxxam ID		EWN983		EWO006		EWO007			EWO008		
Sampling Date		2017/08/03		2017/08/03		2017/08/03			2017/08/03		
COC Number		621478		621478		621478			621478		
	UNITS	CB-SW	RDL	SRC-1-SW	QC Batch	COB-4-SW	RDL	QC Batch	COB-6-SW	RDL	QC Batch

#### Calculated Parameters

Anion Sum	me/L	3.76	N/A	5.83	5105540	6.98	N/A	5105540	7.29	N/A	5105540
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	96	1.0	110	5105536	130	1.0	5105536	67	1.0	5105536
Calculated TDS	mg/L	210	1.0	330	5105545	410	1.0	5105545	430	1.0	5105545
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	1.5	5105536	1.2	1.0	5105536	4.3	1.0	5105536
Cation Sum	me/L	3.34	N/A	5.23	5105540	6.52	N/A	5105540	6.77	N/A	5105540
Hardness (CaCO3)	mg/L	92	1.0	150	5105538	230	1.0	5105538	170	1.0	5105538
Ion Balance (% Difference)	%	5.92	N/A	5.42	5105539	3.41	N/A	5105539	3.70	N/A	5105539
Langelier Index (@ 20C)	N/A	0.0650		0.492	5105543	0.543		5105543	0.989		5105543
Langelier Index (@ 4C)	N/A	-0.185		0.243	5105544	0.295		5105544	0.740		5105544
Nitrate (N)	mg/L	0.060	0.050	<0.050	5105541	0.12	0.050	5105541	0.082	0.050	5105541
Saturation pH (@ 20C)	N/A	7.93		7.66	5105543	7.44		5105543	7.84		5105543
Saturation pH (@ 4C)	N/A	8.18		7.91	5105544	7.68		5105544	8.09		5105544

#### Inorganics

Total Alkalinity (Total as CaCO3)	mg/L	97	10	120	5110513	130	25	5110513	72	5.0	5110513
Dissolved Chloride (Cl)	mg/L	56	1.0	85	5110516	72	1.0	5110516	130	1.0	5110516
Colour	TCU	<5.0	5.0	14	5110529	<5.0	5.0	5110529	6.3	5.0	5110529
Nitrate + Nitrite (N)	mg/L	0.060	0.050	0.055	5110533	0.12	0.050	5110533	0.082	0.050	5110533
Nitrite (N)	mg/L	<0.010	0.010	0.014	5110534	<0.010	0.010	5110534	<0.010	0.010	5110534
Nitrogen (Ammonia Nitrogen)	mg/L	0.071	0.050	0.073	5111041	0.061	0.050	5111041	0.093	0.050	5111048
Total Organic Carbon (C)	mg/L	1.9	0.50	5.7	5112549	2.6	0.50	5112549	3.1	0.50	5112549
Orthophosphate (P)	mg/L	0.15	0.010	<0.010	5110532	<0.010	0.010	5110532	<0.010	0.010	5110532
pH	pH	7.99	N/A	8.15	5112582	7.98	N/A	5112590	8.83	N/A	5112582
Reactive Silica (SiO2)	mg/L	10	0.50	10	5110521	11	0.50	5110521	9.9	0.50	5110521
Dissolved Sulphate (SO4)	mg/L	12	2.0	54	5110519	110	10	5110519	110	10	5110519
Turbidity	NTU	0.88	0.10	1.2	5114420	0.46	0.10	5114420	0.29	0.10	5114422
Conductivity	uS/cm	370	1.0	580	5112585	690	1.0	5112594	760	1.0	5112585

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

N/A = Not Applicable

**RESULTS OF ANALYSES OF WATER**

Maxxam ID		EWO009		EWO010		EWO011			EWO012		
Sampling Date		2017/08/03		2017/08/03		2017/08/03			2017/08/03		
COC Number		621478		621478		621478			621478		
	UNITS	WB-1-SW	RDL	NARROWS	QC Batch	BP-1-SW	RDL	QC Batch	FD-01	RDL	QC Batch
<b>Calculated Parameters</b>											
Anion Sum	me/L	52.0	N/A	392	5105540	405	N/A	5105540	6.98	N/A	5105540
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	96	1.0	97	5105536	97	1.0	5105536	130	1.0	5105536
Calculated TDS	mg/L	3100	1.0	24000	5105545	25000	1.0	5105545	410	1.0	5105545
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	<1.0	5105536	1.0	1.0	5105536	1.8	1.0	5105536
Cation Sum	me/L	54.8	N/A	468	5105540	473	N/A	5105540	6.78	N/A	5105540
Hardness (CaCO3)	mg/L	660	1.0	4900	5105538	5000	1.0	5105538	230	1.0	5105538
Ion Balance (% Difference)	%	2.70	N/A	8.83	5105539	7.68	N/A	5105539	1.45	N/A	5105539
Langelier Index (@ 20C)	N/A	-0.0880		0.450	5105543	0.698		5105543	0.730		5105543
Langelier Index (@ 4C)	N/A	-0.330		0.213	5105544	0.460		5105544	0.482		5105544
Nitrate (N)	mg/L	0.055	0.050	0.077	5105541	0.057	0.050	5105541	0.10	0.050	5105541
Saturation pH (@ 20C)	N/A	7.81		7.36	5105543	7.35		5105543	7.42		5105543
Saturation pH (@ 4C)	N/A	8.06		7.59	5105544	7.59		5105544	7.67		5105544
<b>Inorganics</b>											
Total Alkalinity (Total as CaCO3)	mg/L	97	5.0	97	5110513	98	5.0	5110513	140	25	5110513
Dissolved Chloride (Cl)	mg/L	1600	30	12000	5110516	13000	120	5110516	71	1.0	5110516
Colour	TCU	9.0	5.0	<5.0	5110529	<5.0	5.0	5110529	<5.0	5.0	5110529
Nitrate + Nitrite (N)	mg/L	0.055	0.050	0.077	5110533	0.057	0.050	5110533	0.10	0.050	5110533
Nitrite (N)	mg/L	<0.010	0.010	<0.010	5110534	<0.010	0.010	5110534	<0.010	0.010	5110534
Nitrogen (Ammonia Nitrogen)	mg/L	0.075	0.050	0.21	5111048	0.13	0.050	5111048	0.11	0.050	5111048
Total Organic Carbon (C)	mg/L	2.6	0.50	<5.0 (1)	5112549	<5.0 (1)	5.0	5112549	2.5	0.50	5112549
Orthophosphate (P)	mg/L	<0.010	0.010	0.016	5110532	0.010	0.010	5110532	<0.010	0.010	5110532
pH	pH	7.73	N/A	7.80	5112582	8.05	N/A	5112577	8.15	N/A	5112582
Reactive Silica (SiO2)	mg/L	5.2	0.50	1.1	5110521	0.78	0.50	5110521	11	0.50	5110521
Dissolved Sulphate (SO4)	mg/L	230	40	2000	5110519	2000	200	5110519	110	10	5110519
Turbidity	NTU	1.8	0.10	1.4	5114422	1.5	0.10	5114421	0.34	0.10	5114422
Conductivity	uS/cm	5900	1.0	40000	5112585	40000	1.0	5112579	700	1.0	5112585
RDL = Reportable Detection Limit											
QC Batch = Quality Control Batch											
N/A = Not Applicable											
(1) Elevated reporting limit due to sample matrix.											

**MERCURY BY COLD VAPOUR AA (WATER)**

<b>Maxxam ID</b>		EWN983	EWO006	EWO007	EWO008	EWO009	EWO010	EWO011		
<b>Sampling Date</b>		2017/08/03	2017/08/03	2017/08/03	2017/08/03	2017/08/03	2017/08/03	2017/08/03		
<b>COC Number</b>		621478	621478	621478	621478	621478	621478	621478		
	<b>UNITS</b>	<b>CB-SW</b>	<b>SRC-1-SW</b>	<b>COB-4-SW</b>	<b>COB-6-SW</b>	<b>WB-1-SW</b>	<b>NARROWS</b>	<b>BP-1-SW</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Metals</b>										
Total Mercury (Hg)	ug/L	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	0.013	5112445

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch

<b>Maxxam ID</b>		EWO012		
<b>Sampling Date</b>		2017/08/03		
<b>COC Number</b>		621478		
	<b>UNITS</b>	<b>FD-01</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Metals</b>				
Total Mercury (Hg)	ug/L	<0.013	0.013	5112445

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch

**ELEMENTS BY ICP/MS (WATER)**

Maxxam ID		EWN983	EWO006		EWO007	EWO008	EWO009		
Sampling Date		2017/08/03	2017/08/03		2017/08/03	2017/08/03	2017/08/03		
COC Number		621478	621478		621478	621478	621478		
	UNITS	CB-SW	SRC-1-SW	QC Batch	COB-4-SW	COB-6-SW	WB-1-SW	RDL	QC Batch
<b>Metals</b>									
Total Aluminum (Al)	ug/L	150	24	5112322	13	42	28	5.0	5112318
Total Antimony (Sb)	ug/L	<1.0	<1.0	5112322	<1.0	<1.0	<1.0	1.0	5112318
Total Arsenic (As)	ug/L	1.4	1.8	5112322	<1.0	1.3	1.0	1.0	5112318
Total Barium (Ba)	ug/L	87	19	5112322	36	38	73	1.0	5112318
Total Beryllium (Be)	ug/L	<1.0	<1.0	5112322	<1.0	<1.0	<1.0	1.0	5112318
Total Bismuth (Bi)	ug/L	<2.0	<2.0	5112322	<2.0	<2.0	<2.0	2.0	5112318
Total Boron (B)	ug/L	<50	130	5112322	58	59	430	50	5112318
Total Cadmium (Cd)	ug/L	<0.010	<0.010	5112322	0.011	0.011	0.027	0.010	5112318
Total Calcium (Ca)	ug/L	30000	51000	5112322	78000	61000	82000	100	5112318
Total Chromium (Cr)	ug/L	1.0	<1.0	5112322	<1.0	<1.0	<1.0	1.0	5112318
Total Cobalt (Co)	ug/L	<0.40	<0.40	5112322	<0.40	<0.40	<0.40	0.40	5112318
Total Copper (Cu)	ug/L	<2.0	<2.0	5112322	<2.0	<2.0	<2.0	2.0	5112318
Total Iron (Fe)	ug/L	750	150	5112322	83	<50	680	50	5112318
Total Lead (Pb)	ug/L	0.61	<0.50	5112322	<0.50	<0.50	<0.50	0.50	5112318
Total Magnesium (Mg)	ug/L	3900	5400	5112322	7600	5300	110000	100	5112318
Total Manganese (Mn)	ug/L	380	91	5112322	120	35	450	2.0	5112318
Total Molybdenum (Mo)	ug/L	<2.0	<2.0	5112322	<2.0	<2.0	<2.0	2.0	5112318
Total Nickel (Ni)	ug/L	<2.0	<2.0	5112322	<2.0	<2.0	<2.0	2.0	5112318
Total Phosphorus (P)	ug/L	330	<100	5112322	<100	<100	<100	100	5112318
Total Potassium (K)	ug/L	2200	2800	5112322	3300	3300	35000	100	5112318
Total Selenium (Se)	ug/L	<1.0	<1.0	5112322	<1.0	<1.0	<1.0	1.0	5112318
Total Silver (Ag)	ug/L	<0.10	<0.10	5112322	<0.10	<0.10	<0.10	0.10	5112318
Total Sodium (Na)	ug/L	33000	50000	5112322	44000	74000	940000	100	5112318
Total Strontium (Sr)	ug/L	340	190	5112322	440	500	940	2.0	5112318
Total Thallium (Tl)	ug/L	<0.10	<0.10	5112322	<0.10	<0.10	<0.10	0.10	5112318
Total Tin (Sn)	ug/L	<2.0	<2.0	5112322	<2.0	<2.0	<2.0	2.0	5112318
Total Titanium (Ti)	ug/L	2.9	<2.0	5112322	<2.0	<2.0	<2.0	2.0	5112318
Total Uranium (U)	ug/L	<0.10	0.40	5112322	0.50	0.43	0.43	0.10	5112318
Total Vanadium (V)	ug/L	2.6	<2.0	5112322	<2.0	<2.0	<2.0	2.0	5112318
Total Zinc (Zn)	ug/L	<5.0	<5.0	5112322	<5.0	<5.0	<5.0	5.0	5112318

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch

**ELEMENTS BY ICP/MS (WATER)**

Maxxam ID		EWO010	EWO011		EWO012		
Sampling Date		2017/08/03	2017/08/03		2017/08/03		
COC Number		621478	621478		621478		
	UNITS	NARROWS	BP-1-SW	RDL	FD-01	RDL	QC Batch
<b>Metals</b>							
Total Aluminum (Al)	ug/L	<50	<50	50	14	5.0	5112318
Total Antimony (Sb)	ug/L	<10	<10	10	<1.0	1.0	5112318
Total Arsenic (As)	ug/L	<10	<10	10	<1.0	1.0	5112318
Total Barium (Ba)	ug/L	26	25	10	37	1.0	5112318
Total Beryllium (Be)	ug/L	<10	<10	10	<1.0	1.0	5112318
Total Bismuth (Bi)	ug/L	<20	<20	20	<2.0	2.0	5112318
Total Boron (B)	ug/L	3600	3600	500	63	50	5112318
Total Cadmium (Cd)	ug/L	<0.10	<0.10	0.10	<0.010	0.010	5112318
Total Calcium (Ca)	ug/L	340000	340000	1000	81000	100	5112318
Total Chromium (Cr)	ug/L	<10	<10	10	<1.0	1.0	5112318
Total Cobalt (Co)	ug/L	<4.0	<4.0	4.0	<0.40	0.40	5112318
Total Copper (Cu)	ug/L	<20	<20	20	<2.0	2.0	5112318
Total Iron (Fe)	ug/L	<500	<500	500	83	50	5112318
Total Lead (Pb)	ug/L	<5.0	<5.0	5.0	<0.50	0.50	5112318
Total Magnesium (Mg)	ug/L	990000	1000000	1000	7700	100	5112318
Total Manganese (Mn)	ug/L	110	110	20	130	2.0	5112318
Total Molybdenum (Mo)	ug/L	<20	<20	20	<2.0	2.0	5112318
Total Nickel (Ni)	ug/L	<20	<20	20	<2.0	2.0	5112318
Total Phosphorus (P)	ug/L	<1000	<1000	1000	<100	100	5112318
Total Potassium (K)	ug/L	300000	300000	1000	3500	100	5112318
Total Selenium (Se)	ug/L	<10	<10	10	<1.0	1.0	5112318
Total Silver (Ag)	ug/L	<1.0	<1.0	1.0	<0.10	0.10	5112318
Total Sodium (Na)	ug/L	8300000	8400000	1000	46000	100	5112318
Total Strontium (Sr)	ug/L	6100	6100	20	450	2.0	5112318
Total Thallium (Tl)	ug/L	<1.0	<1.0	1.0	<0.10	0.10	5112318
Total Tin (Sn)	ug/L	<20	<20	20	<2.0	2.0	5112318
Total Titanium (Ti)	ug/L	<20	<20	20	<2.0	2.0	5112318
Total Uranium (U)	ug/L	2.4	2.5	1.0	0.54	0.10	5112318
Total Vanadium (V)	ug/L	<20	<20	20	<2.0	2.0	5112318
Total Zinc (Zn)	ug/L	<50	<50	50	<5.0	5.0	5112318
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							

**SEMI-VOLATILE ORGANICS BY GC-MS (WATER)**

Maxxam ID		EWN983	EWO006	EWO007	EWO008	EWO009	EWO010	EWO011		
Sampling Date		2017/08/03	2017/08/03	2017/08/03	2017/08/03	2017/08/03	2017/08/03	2017/08/03		
COC Number		621478	621478	621478	621478	621478	621478	621478		
	UNITS	CB-SW	SRC-1-SW	COB-4-SW	COB-6-SW	WB-1-SW	NARROWS	BP-1-SW	RDL	QC Batch

Polyaromatic Hydrocarbons										
1-Methylnaphthalene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5110040
2-Methylnaphthalene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5110040
Acenaphthene	ug/L	0.071	<0.010	<0.010	0.052	0.029	<0.010	0.014	0.010	5110040
Acenaphthylene	ug/L	<0.010	<0.010	<0.010	0.030	<0.010	<0.010	<0.010	0.010	5110040
Anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5110040
Benzo(a)anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5110040
Benzo(a)pyrene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5110040
Benzo(b)fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5110040
Benzo(b,j)fluoranthene	ug/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	5108636
Benzo(g,h,i)perylene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5110040
Benzo(j)fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5110040
Benzo(k)fluoranthene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5110040
Chrysene	ug/L	<0.010	<0.010	<0.010	<0.010	0.017	<0.010	<0.010	0.010	5110040
Dibenz(a,h)anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5110040
Fluoranthene	ug/L	0.062	<0.010	<0.010	0.036	0.044	0.014	<0.010	0.010	5110040
Fluorene	ug/L	0.048	<0.010	<0.010	0.024	0.016	<0.010	0.011	0.010	5110040
Indeno(1,2,3-cd)pyrene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5110040
Naphthalene	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	5110040
Perylene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	5110040
Phenanthrene	ug/L	0.037	<0.010	<0.010	0.018	0.035	<0.010	<0.010	0.010	5110040
Pyrene	ug/L	0.033	<0.010	<0.010	0.017	0.027	<0.010	<0.010	0.010	5110040

Surrogate Recovery (%)										
D10-Anthracene	%	99	81	81	80	81	80	76		5110040
D14-Terphenyl	%	108	88	87	88	87	87	82		5110040
D8-Acenaphthylene	%	99	83	74	80	75	74	77		5110040

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch

**SEMI-VOLATILE ORGANICS BY GC-MS (WATER)**

Maxxam ID		EWO012	EWO014		
Sampling Date		2017/08/03	2017/08/03		
COC Number		621478	621478		
	UNITS	FD-01	TB-01	RDL	QC Batch
<b>Polyaromatic Hydrocarbons</b>					
1-Methylnaphthalene	ug/L	<0.050	<0.050	0.050	5110040
2-Methylnaphthalene	ug/L	<0.050	<0.050	0.050	5110040
Acenaphthene	ug/L	<0.010	<0.010	0.010	5110040
Acenaphthylene	ug/L	<0.010	<0.010	0.010	5110040
Anthracene	ug/L	<0.010	<0.010	0.010	5110040
Benzo(a)anthracene	ug/L	<0.010	<0.010	0.010	5110040
Benzo(a)pyrene	ug/L	<0.010	<0.010	0.010	5110040
Benzo(b)fluoranthene	ug/L	<0.010	<0.010	0.010	5110040
Benzo(b/j)fluoranthene	ug/L	<0.020	<0.020	0.020	5108636
Benzo(g,h,i)perylene	ug/L	<0.010	<0.010	0.010	5110040
Benzo(j)fluoranthene	ug/L	<0.010	<0.010	0.010	5110040
Benzo(k)fluoranthene	ug/L	<0.010	<0.010	0.010	5110040
Chrysene	ug/L	<0.010	<0.010	0.010	5110040
Dibenz(a,h)anthracene	ug/L	<0.010	<0.010	0.010	5110040
Fluoranthene	ug/L	<0.010	<0.010	0.010	5110040
Fluorene	ug/L	<0.010	<0.010	0.010	5110040
Indeno(1,2,3-cd)pyrene	ug/L	<0.010	<0.010	0.010	5110040
Naphthalene	ug/L	<0.20	<0.20	0.20	5110040
Perylene	ug/L	<0.010	<0.010	0.010	5110040
Phenanthrene	ug/L	<0.010	<0.010	0.010	5110040
Pyrene	ug/L	<0.010	<0.010	0.010	5110040
<b>Surrogate Recovery (%)</b>					
D10-Anthracene	%	78	97		5110040
D14-Terphenyl	%	84	101		5110040
D8-Acenaphthylene	%	79	93		5110040
RDL = Reportable Detection Limit					
QC Batch = Quality Control Batch					



### GENERAL COMMENTS

Sample EWN983 [CB-SW] : Poor RCap Ion Balance due to sample matrix.

Sample EWO006 [SRC-1-SW] : Poor RCap Ion Balance due to sample matrix.

Sample EWO010 [NARROWS] : Elevated reporting limits for trace metals due to sample matrix.

Poor RCap Ion Balance due to sample matrix.

Sample EWO011 [BP-1-SW] : Elevated reporting limits for trace metals due to sample matrix.

Poor RCap Ion Balance due to sample matrix.

**Results relate only to the items tested.**

**QUALITY ASSURANCE REPORT**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5110040	GTH	Matrix Spike [EWN983-05]	D10-Anthracene	2017/08/11		96	%	50 - 130
			D14-Terphenyl	2017/08/11		103	%	50 - 130
			D8-Acenaphthylene	2017/08/11		97	%	50 - 130
			1-Methylnaphthalene	2017/08/11		89	%	30 - 130
			2-Methylnaphthalene	2017/08/11		90	%	30 - 130
			Acenaphthene	2017/08/11		95	%	30 - 130
			Acenaphthylene	2017/08/11		107	%	30 - 130
			Anthracene	2017/08/11		87	%	30 - 130
			Benzo(a)anthracene	2017/08/11		112	%	30 - 130
			Benzo(a)pyrene	2017/08/11		98	%	30 - 130
			Benzo(b)fluoranthene	2017/08/11		98	%	30 - 130
			Benzo(g,h,i)perylene	2017/08/11		105	%	30 - 130
			Benzo(j)fluoranthene	2017/08/11		102	%	30 - 130
			Benzo(k)fluoranthene	2017/08/11		96	%	30 - 130
			Chrysene	2017/08/11		106	%	30 - 130
			Dibenz(a,h)anthracene	2017/08/11		103	%	30 - 130
			Fluoranthene	2017/08/11		106	%	30 - 130
			Fluorene	2017/08/11		101	%	30 - 130
			Indeno(1,2,3-cd)pyrene	2017/08/11		101	%	30 - 130
			Naphthalene	2017/08/11		88	%	30 - 130
			Perylene	2017/08/11		98	%	30 - 130
			Phenanthrene	2017/08/11		111	%	30 - 130
			Pyrene	2017/08/11		100	%	30 - 130
			5110040	GTH	Spiked Blank	D10-Anthracene	2017/08/11	
D14-Terphenyl	2017/08/11					102	%	50 - 130
D8-Acenaphthylene	2017/08/11					92	%	50 - 130
1-Methylnaphthalene	2017/08/11					86	%	30 - 130
2-Methylnaphthalene	2017/08/11					88	%	30 - 130
Acenaphthene	2017/08/11					92	%	30 - 130
Acenaphthylene	2017/08/11					108	%	30 - 130
Anthracene	2017/08/11					119	%	30 - 130
Benzo(a)anthracene	2017/08/11					103	%	30 - 130
Benzo(a)pyrene	2017/08/11					96	%	30 - 130
Benzo(b)fluoranthene	2017/08/11					92	%	30 - 130
Benzo(g,h,i)perylene	2017/08/11					100	%	30 - 130
Benzo(j)fluoranthene	2017/08/11					101	%	30 - 130
Benzo(k)fluoranthene	2017/08/11					95	%	30 - 130
Chrysene	2017/08/11					97	%	30 - 130
Dibenz(a,h)anthracene	2017/08/11					97	%	30 - 130
Fluoranthene	2017/08/11					103	%	30 - 130
Fluorene	2017/08/11					99	%	30 - 130
Indeno(1,2,3-cd)pyrene	2017/08/11					98	%	30 - 130
Naphthalene	2017/08/11					84	%	30 - 130
Perylene	2017/08/11					95	%	30 - 130
Phenanthrene	2017/08/11					109	%	30 - 130
Pyrene	2017/08/11					100	%	30 - 130
5110040	GTH	Method Blank				D10-Anthracene	2017/08/11	
			D14-Terphenyl	2017/08/11		104	%	50 - 130
			D8-Acenaphthylene	2017/08/11		97	%	50 - 130
			1-Methylnaphthalene	2017/08/11	<0.050		ug/L	
			2-Methylnaphthalene	2017/08/11	<0.050		ug/L	
Acenaphthene	2017/08/11	<0.010		ug/L				

**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acenaphthylene	2017/08/11	<0.010		ug/L	
			Anthracene	2017/08/11	<0.010		ug/L	
			Benzo(a)anthracene	2017/08/11	<0.010		ug/L	
			Benzo(a)pyrene	2017/08/11	<0.010		ug/L	
			Benzo(b)fluoranthene	2017/08/11	<0.010		ug/L	
			Benzo(g,h,i)perylene	2017/08/11	<0.010		ug/L	
			Benzo(j)fluoranthene	2017/08/11	<0.010		ug/L	
			Benzo(k)fluoranthene	2017/08/11	<0.010		ug/L	
			Chrysene	2017/08/11	<0.010		ug/L	
			Dibenz(a,h)anthracene	2017/08/11	<0.010		ug/L	
			Fluoranthene	2017/08/11	<0.010		ug/L	
			Fluorene	2017/08/11	<0.010		ug/L	
			Indeno(1,2,3-cd)pyrene	2017/08/11	<0.010		ug/L	
			Naphthalene	2017/08/11	<0.20		ug/L	
			Perylene	2017/08/11	<0.010		ug/L	
			Phenanthrene	2017/08/11	<0.010		ug/L	
			Pyrene	2017/08/11	<0.010		ug/L	
5110040	GTH	RPD	1-Methylnaphthalene	2017/08/11	NC		%	40
			2-Methylnaphthalene	2017/08/11	NC		%	40
			Acenaphthene	2017/08/11	NC		%	40
			Acenaphthylene	2017/08/11	NC		%	40
			Anthracene	2017/08/11	NC		%	40
			Benzo(a)anthracene	2017/08/11	NC		%	40
			Benzo(a)pyrene	2017/08/11	NC		%	40
			Benzo(b)fluoranthene	2017/08/11	NC		%	40
			Benzo(g,h,i)perylene	2017/08/11	NC		%	40
			Benzo(j)fluoranthene	2017/08/11	NC		%	40
			Benzo(k)fluoranthene	2017/08/11	NC		%	40
			Chrysene	2017/08/11	NC		%	40
			Dibenz(a,h)anthracene	2017/08/11	NC		%	40
			Fluoranthene	2017/08/11	NC		%	40
			Fluorene	2017/08/11	NC		%	40
			Indeno(1,2,3-cd)pyrene	2017/08/11	NC		%	40
			Naphthalene	2017/08/11	NC		%	40
			Perylene	2017/08/11	NC		%	40
			Phenanthrene	2017/08/11	18		%	40
			Pyrene	2017/08/11	NC		%	40
5110513	MCN	Matrix Spike	Total Alkalinity (Total as CaCO3)	2017/08/10		94	%	80 - 120
5110513	MCN	Spiked Blank	Total Alkalinity (Total as CaCO3)	2017/08/10		111	%	80 - 120
5110513	MCN	Method Blank	Total Alkalinity (Total as CaCO3)	2017/08/10	<5.0		mg/L	
5110513	MCN	RPD	Total Alkalinity (Total as CaCO3)	2017/08/10	1.3		%	25
5110516	MCN	Matrix Spike	Dissolved Chloride (Cl)	2017/08/11		103	%	80 - 120
5110516	MCN	QC Standard	Dissolved Chloride (Cl)	2017/08/11		108	%	80 - 120
5110516	MCN	Spiked Blank	Dissolved Chloride (Cl)	2017/08/11		105	%	80 - 120
5110516	MCN	Method Blank	Dissolved Chloride (Cl)	2017/08/11	<1.0		mg/L	
5110516	MCN	RPD	Dissolved Chloride (Cl)	2017/08/11	0.12		%	25
5110519	MCN	Matrix Spike	Dissolved Sulphate (SO4)	2017/08/11		NC	%	80 - 120
5110519	MCN	Spiked Blank	Dissolved Sulphate (SO4)	2017/08/11		102	%	80 - 120
5110519	MCN	Method Blank	Dissolved Sulphate (SO4)	2017/08/11	<2.0		mg/L	
5110519	MCN	RPD	Dissolved Sulphate (SO4)	2017/08/11	0.33		%	25
5110521	MCN	Matrix Spike	Reactive Silica (SiO2)	2017/08/10		NC	%	80 - 120
5110521	MCN	Spiked Blank	Reactive Silica (SiO2)	2017/08/10		100	%	80 - 120
5110521	MCN	Method Blank	Reactive Silica (SiO2)	2017/08/10	<0.50		mg/L	

**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5110521	MCN	RPD	Reactive Silica (SiO <sub>2</sub> )	2017/08/10	0.18		%	25
5110529	MCN	Spiked Blank	Colour	2017/08/10		101	%	80 - 120
5110529	MCN	Method Blank	Colour	2017/08/10	<5.0		TCU	
5110529	MCN	RPD	Colour	2017/08/10	3.3		%	20
5110532	KBT	Matrix Spike	Orthophosphate (P)	2017/08/10		94	%	80 - 120
5110532	KBT	Spiked Blank	Orthophosphate (P)	2017/08/10		98	%	80 - 120
5110532	KBT	Method Blank	Orthophosphate (P)	2017/08/10	<0.010		mg/L	
5110532	KBT	RPD	Orthophosphate (P)	2017/08/10	NC		%	25
5110533	MCN	Matrix Spike	Nitrate + Nitrite (N)	2017/08/10		101	%	80 - 120
5110533	MCN	Spiked Blank	Nitrate + Nitrite (N)	2017/08/10		101	%	80 - 120
5110533	MCN	Method Blank	Nitrate + Nitrite (N)	2017/08/10	<0.050		mg/L	
5110533	MCN	RPD	Nitrate + Nitrite (N)	2017/08/10	0.78		%	25
5110534	KBT	Matrix Spike	Nitrite (N)	2017/08/10		95	%	80 - 120
5110534	KBT	Spiked Blank	Nitrite (N)	2017/08/10		100	%	80 - 120
5110534	KBT	Method Blank	Nitrite (N)	2017/08/10	<0.010		mg/L	
5110534	KBT	RPD	Nitrite (N)	2017/08/10	NC		%	25
5111041	NRG	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2017/08/10		NC	%	80 - 120
5111041	NRG	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2017/08/10		105	%	80 - 120
5111041	NRG	Method Blank	Nitrogen (Ammonia Nitrogen)	2017/08/10	<0.050		mg/L	
5111041	NRG	RPD	Nitrogen (Ammonia Nitrogen)	2017/08/10	5.0		%	20
5111048	NRG	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2017/08/10		103	%	80 - 120
5111048	NRG	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2017/08/10		104	%	80 - 120
5111048	NRG	Method Blank	Nitrogen (Ammonia Nitrogen)	2017/08/10	<0.050		mg/L	
5111048	NRG	RPD	Nitrogen (Ammonia Nitrogen)	2017/08/10	13		%	20
5112318	BAN	Matrix Spike	Total Aluminum (Al)	2017/08/10		93	%	80 - 120
			Total Antimony (Sb)	2017/08/10		104	%	80 - 120
			Total Arsenic (As)	2017/08/10		98	%	80 - 120
			Total Barium (Ba)	2017/08/10		105	%	80 - 120
			Total Beryllium (Be)	2017/08/10		103	%	80 - 120
			Total Bismuth (Bi)	2017/08/10		103	%	80 - 120
			Total Boron (B)	2017/08/10		98	%	80 - 120
			Total Cadmium (Cd)	2017/08/10		104	%	80 - 120
			Total Calcium (Ca)	2017/08/10		103	%	80 - 120
			Total Chromium (Cr)	2017/08/10		98	%	80 - 120
			Total Cobalt (Co)	2017/08/10		100	%	80 - 120
			Total Copper (Cu)	2017/08/10		97	%	80 - 120
			Total Iron (Fe)	2017/08/10		101	%	80 - 120
			Total Lead (Pb)	2017/08/10		105	%	80 - 120
			Total Magnesium (Mg)	2017/08/10		98	%	80 - 120
			Total Manganese (Mn)	2017/08/10		100	%	80 - 120
			Total Molybdenum (Mo)	2017/08/10		101	%	80 - 120
			Total Nickel (Ni)	2017/08/10		99	%	80 - 120
			Total Phosphorus (P)	2017/08/10		103	%	80 - 120
			Total Potassium (K)	2017/08/10		104	%	80 - 120
			Total Selenium (Se)	2017/08/10		100	%	80 - 120
			Total Silver (Ag)	2017/08/10		101	%	80 - 120
			Total Sodium (Na)	2017/08/10		93	%	80 - 120
			Total Strontium (Sr)	2017/08/10		105	%	80 - 120
			Total Thallium (Tl)	2017/08/10		102	%	80 - 120
			Total Tin (Sn)	2017/08/10		105	%	80 - 120
			Total Titanium (Ti)	2017/08/10		99	%	80 - 120
			Total Uranium (U)	2017/08/10		109	%	80 - 120
			Total Vanadium (V)	2017/08/10		100	%	80 - 120

**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5112318	BAN	Spiked Blank	Total Zinc (Zn)	2017/08/10		98	%	80 - 120
			Total Aluminum (Al)	2017/08/10		99	%	80 - 120
			Total Antimony (Sb)	2017/08/10		100	%	80 - 120
			Total Arsenic (As)	2017/08/10		96	%	80 - 120
			Total Barium (Ba)	2017/08/10		99	%	80 - 120
			Total Beryllium (Be)	2017/08/10		103	%	80 - 120
			Total Bismuth (Bi)	2017/08/10		100	%	80 - 120
			Total Boron (B)	2017/08/10		104	%	80 - 120
			Total Cadmium (Cd)	2017/08/10		99	%	80 - 120
			Total Calcium (Ca)	2017/08/10		102	%	80 - 120
			Total Chromium (Cr)	2017/08/10		99	%	80 - 120
			Total Cobalt (Co)	2017/08/10		99	%	80 - 120
			Total Copper (Cu)	2017/08/10		98	%	80 - 120
			Total Iron (Fe)	2017/08/10		104	%	80 - 120
			Total Lead (Pb)	2017/08/10		101	%	80 - 120
			Total Magnesium (Mg)	2017/08/10		102	%	80 - 120
			Total Manganese (Mn)	2017/08/10		98	%	80 - 120
			Total Molybdenum (Mo)	2017/08/10		101	%	80 - 120
			Total Nickel (Ni)	2017/08/10		100	%	80 - 120
			Total Phosphorus (P)	2017/08/10		102	%	80 - 120
			Total Potassium (K)	2017/08/10		105	%	80 - 120
			Total Selenium (Se)	2017/08/10		99	%	80 - 120
			Total Silver (Ag)	2017/08/10		97	%	80 - 120
			Total Sodium (Na)	2017/08/10		99	%	80 - 120
			Total Strontium (Sr)	2017/08/10		101	%	80 - 120
			Total Thallium (Tl)	2017/08/10		102	%	80 - 120
			Total Tin (Sn)	2017/08/10		104	%	80 - 120
Total Titanium (Ti)	2017/08/10		96	%	80 - 120			
Total Uranium (U)	2017/08/10		106	%	80 - 120			
Total Vanadium (V)	2017/08/10		100	%	80 - 120			
Total Zinc (Zn)	2017/08/10				97	%	80 - 120	
5112318	BAN	Method Blank	Total Aluminum (Al)	2017/08/10	<5.0		ug/L	
			Total Antimony (Sb)	2017/08/10	<1.0		ug/L	
			Total Arsenic (As)	2017/08/10	<1.0		ug/L	
			Total Barium (Ba)	2017/08/10	<1.0		ug/L	
			Total Beryllium (Be)	2017/08/10	<1.0		ug/L	
			Total Bismuth (Bi)	2017/08/10	<2.0		ug/L	
			Total Boron (B)	2017/08/10	<50		ug/L	
			Total Cadmium (Cd)	2017/08/10	<0.010		ug/L	
			Total Calcium (Ca)	2017/08/10	<100		ug/L	
			Total Chromium (Cr)	2017/08/10	<1.0		ug/L	
			Total Cobalt (Co)	2017/08/10	<0.40		ug/L	
			Total Copper (Cu)	2017/08/10	<2.0		ug/L	
			Total Iron (Fe)	2017/08/10	<50		ug/L	
			Total Lead (Pb)	2017/08/10	<0.50		ug/L	
			Total Magnesium (Mg)	2017/08/10	<100		ug/L	
			Total Manganese (Mn)	2017/08/10	<2.0		ug/L	
			Total Molybdenum (Mo)	2017/08/10	<2.0		ug/L	
			Total Nickel (Ni)	2017/08/10	<2.0		ug/L	
			Total Phosphorus (P)	2017/08/10	<100		ug/L	
			Total Potassium (K)	2017/08/10	<100		ug/L	
Total Selenium (Se)	2017/08/10	<1.0		ug/L				
Total Silver (Ag)	2017/08/10	<0.10		ug/L				

**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Sodium (Na)	2017/08/10	<100		ug/L	
			Total Strontium (Sr)	2017/08/10	<2.0		ug/L	
			Total Thallium (Tl)	2017/08/10	<0.10		ug/L	
			Total Tin (Sn)	2017/08/10	<2.0		ug/L	
			Total Titanium (Ti)	2017/08/10	<2.0		ug/L	
			Total Uranium (U)	2017/08/10	<0.10		ug/L	
			Total Vanadium (V)	2017/08/10	<2.0		ug/L	
			Total Zinc (Zn)	2017/08/10	<5.0		ug/L	
5112318	BAN	RPD	Total Aluminum (Al)	2017/08/10	NC		%	20
			Total Antimony (Sb)	2017/08/10	NC		%	20
			Total Arsenic (As)	2017/08/10	NC		%	20
			Total Barium (Ba)	2017/08/10	1.1		%	20
			Total Beryllium (Be)	2017/08/10	NC		%	20
			Total Bismuth (Bi)	2017/08/10	NC		%	20
			Total Boron (B)	2017/08/10	NC		%	20
			Total Cadmium (Cd)	2017/08/10	NC		%	20
			Total Calcium (Ca)	2017/08/10	1.4		%	20
			Total Chromium (Cr)	2017/08/10	NC		%	20
			Total Cobalt (Co)	2017/08/10	NC		%	20
			Total Copper (Cu)	2017/08/10	0.41		%	20
			Total Iron (Fe)	2017/08/10	NC		%	20
			Total Lead (Pb)	2017/08/10	NC		%	20
			Total Magnesium (Mg)	2017/08/10	1.1		%	20
			Total Manganese (Mn)	2017/08/10	NC		%	20
			Total Molybdenum (Mo)	2017/08/10	NC		%	20
			Total Nickel (Ni)	2017/08/10	NC		%	20
			Total Phosphorus (P)	2017/08/10	NC		%	20
			Total Potassium (K)	2017/08/10	0.68		%	20
			Total Selenium (Se)	2017/08/10	NC		%	20
			Total Silver (Ag)	2017/08/10	NC		%	20
			Total Sodium (Na)	2017/08/10	1.0		%	20
			Total Strontium (Sr)	2017/08/10	2.1		%	20
			Total Thallium (Tl)	2017/08/10	NC		%	20
			Total Tin (Sn)	2017/08/10	NC		%	20
			Total Titanium (Ti)	2017/08/10	NC		%	20
			Total Uranium (U)	2017/08/10	0.23		%	20
			Total Vanadium (V)	2017/08/10	NC		%	20
			Total Zinc (Zn)	2017/08/10	2.0		%	20
5112322	BAN	Matrix Spike	Total Aluminum (Al)	2017/08/10		94	%	80 - 120
			Total Antimony (Sb)	2017/08/10		106	%	80 - 120
			Total Arsenic (As)	2017/08/10		97	%	80 - 120
			Total Barium (Ba)	2017/08/10		101	%	80 - 120
			Total Beryllium (Be)	2017/08/10		102	%	80 - 120
			Total Bismuth (Bi)	2017/08/10		101	%	80 - 120
			Total Boron (B)	2017/08/10		99	%	80 - 120
			Total Cadmium (Cd)	2017/08/10		101	%	80 - 120
			Total Calcium (Ca)	2017/08/10		100	%	80 - 120
			Total Chromium (Cr)	2017/08/10		95	%	80 - 120
			Total Cobalt (Co)	2017/08/10		97	%	80 - 120
			Total Copper (Cu)	2017/08/10		95	%	80 - 120
			Total Iron (Fe)	2017/08/10		97	%	80 - 120
			Total Lead (Pb)	2017/08/10		101	%	80 - 120
			Total Magnesium (Mg)	2017/08/10		97	%	80 - 120

**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Manganese (Mn)	2017/08/10		96	%	80 - 120
			Total Molybdenum (Mo)	2017/08/10		104	%	80 - 120
			Total Nickel (Ni)	2017/08/10		95	%	80 - 120
			Total Phosphorus (P)	2017/08/10		102	%	80 - 120
			Total Potassium (K)	2017/08/10		105	%	80 - 120
			Total Selenium (Se)	2017/08/10		96	%	80 - 120
			Total Silver (Ag)	2017/08/10		98	%	80 - 120
			Total Sodium (Na)	2017/08/10		NC	%	80 - 120
			Total Strontium (Sr)	2017/08/10		100	%	80 - 120
			Total Thallium (Tl)	2017/08/10		102	%	80 - 120
			Total Tin (Sn)	2017/08/10		110	%	80 - 120
			Total Titanium (Ti)	2017/08/10		93	%	80 - 120
			Total Uranium (U)	2017/08/10		108	%	80 - 120
			Total Vanadium (V)	2017/08/10		97	%	80 - 120
			Total Zinc (Zn)	2017/08/10		96	%	80 - 120
5112322	BAN	Spiked Blank	Total Aluminum (Al)	2017/08/10		96	%	80 - 120
			Total Antimony (Sb)	2017/08/10		106	%	80 - 120
			Total Arsenic (As)	2017/08/10		98	%	80 - 120
			Total Barium (Ba)	2017/08/10		102	%	80 - 120
			Total Beryllium (Be)	2017/08/10		103	%	80 - 120
			Total Bismuth (Bi)	2017/08/10		105	%	80 - 120
			Total Boron (B)	2017/08/10		103	%	80 - 120
			Total Cadmium (Cd)	2017/08/10		102	%	80 - 120
			Total Calcium (Ca)	2017/08/10		102	%	80 - 120
			Total Chromium (Cr)	2017/08/10		97	%	80 - 120
			Total Cobalt (Co)	2017/08/10		100	%	80 - 120
			Total Copper (Cu)	2017/08/10		97	%	80 - 120
			Total Iron (Fe)	2017/08/10		102	%	80 - 120
			Total Lead (Pb)	2017/08/10		104	%	80 - 120
			Total Magnesium (Mg)	2017/08/10		98	%	80 - 120
			Total Manganese (Mn)	2017/08/10		100	%	80 - 120
			Total Molybdenum (Mo)	2017/08/10		105	%	80 - 120
			Total Nickel (Ni)	2017/08/10		98	%	80 - 120
			Total Phosphorus (P)	2017/08/10		103	%	80 - 120
			Total Potassium (K)	2017/08/10		105	%	80 - 120
			Total Selenium (Se)	2017/08/10		98	%	80 - 120
			Total Silver (Ag)	2017/08/10		99	%	80 - 120
			Total Sodium (Na)	2017/08/10		93	%	80 - 120
			Total Strontium (Sr)	2017/08/10		104	%	80 - 120
			Total Thallium (Tl)	2017/08/10		104	%	80 - 120
			Total Tin (Sn)	2017/08/10		107	%	80 - 120
			Total Titanium (Ti)	2017/08/10		98	%	80 - 120
			Total Uranium (U)	2017/08/10		108	%	80 - 120
			Total Vanadium (V)	2017/08/10		100	%	80 - 120
			Total Zinc (Zn)	2017/08/10		98	%	80 - 120
5112322	BAN	Method Blank	Total Aluminum (Al)	2017/08/10	<5.0		ug/L	
			Total Antimony (Sb)	2017/08/10	<1.0		ug/L	
			Total Arsenic (As)	2017/08/10	<1.0		ug/L	
			Total Barium (Ba)	2017/08/10	<1.0		ug/L	
			Total Beryllium (Be)	2017/08/10	<1.0		ug/L	
			Total Bismuth (Bi)	2017/08/10	<2.0		ug/L	
			Total Boron (B)	2017/08/10	<50		ug/L	
			Total Cadmium (Cd)	2017/08/10	<0.010		ug/L	

**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Calcium (Ca)	2017/08/10	<100		ug/L	
			Total Chromium (Cr)	2017/08/10	<1.0		ug/L	
			Total Cobalt (Co)	2017/08/10	<0.40		ug/L	
			Total Copper (Cu)	2017/08/10	<2.0		ug/L	
			Total Iron (Fe)	2017/08/10	<50		ug/L	
			Total Lead (Pb)	2017/08/10	<0.50		ug/L	
			Total Magnesium (Mg)	2017/08/10	<100		ug/L	
			Total Manganese (Mn)	2017/08/10	<2.0		ug/L	
			Total Molybdenum (Mo)	2017/08/10	<2.0		ug/L	
			Total Nickel (Ni)	2017/08/10	<2.0		ug/L	
			Total Phosphorus (P)	2017/08/10	<100		ug/L	
			Total Potassium (K)	2017/08/10	<100		ug/L	
			Total Selenium (Se)	2017/08/10	<1.0		ug/L	
			Total Silver (Ag)	2017/08/10	<0.10		ug/L	
			Total Sodium (Na)	2017/08/10	<100		ug/L	
			Total Strontium (Sr)	2017/08/10	<2.0		ug/L	
			Total Thallium (Tl)	2017/08/10	<0.10		ug/L	
			Total Tin (Sn)	2017/08/10	<2.0		ug/L	
			Total Titanium (Ti)	2017/08/10	<2.0		ug/L	
			Total Uranium (U)	2017/08/10	<0.10		ug/L	
			Total Vanadium (V)	2017/08/10	<2.0		ug/L	
			Total Zinc (Zn)	2017/08/10	<5.0		ug/L	
5112322	BAN	RPD	Total Aluminum (Al)	2017/08/10	2.9		%	20
			Total Antimony (Sb)	2017/08/10	NC		%	20
			Total Arsenic (As)	2017/08/10	NC		%	20
			Total Barium (Ba)	2017/08/10	1.4		%	20
			Total Beryllium (Be)	2017/08/10	NC		%	20
			Total Bismuth (Bi)	2017/08/10	NC		%	20
			Total Boron (B)	2017/08/10	0.52		%	20
			Total Cadmium (Cd)	2017/08/10	NC		%	20
			Total Calcium (Ca)	2017/08/10	0.38		%	20
			Total Chromium (Cr)	2017/08/10	0.20		%	20
			Total Cobalt (Co)	2017/08/10	NC		%	20
			Total Copper (Cu)	2017/08/10	NC		%	20
			Total Iron (Fe)	2017/08/10	1.7		%	20
			Total Lead (Pb)	2017/08/10	NC		%	20
			Total Magnesium (Mg)	2017/08/10	3.9		%	20
			Total Manganese (Mn)	2017/08/10	2.9		%	20
			Total Molybdenum (Mo)	2017/08/10	NC		%	20
			Total Nickel (Ni)	2017/08/10	2.0		%	20
			Total Phosphorus (P)	2017/08/10	NC		%	20
			Total Potassium (K)	2017/08/10	1.5		%	20
			Total Selenium (Se)	2017/08/10	NC		%	20
			Total Silver (Ag)	2017/08/10	NC		%	20
			Total Sodium (Na)	2017/08/10	0.99		%	20
			Total Strontium (Sr)	2017/08/10	3.2		%	20
			Total Thallium (Tl)	2017/08/10	NC		%	20
			Total Tin (Sn)	2017/08/10	NC		%	20
			Total Titanium (Ti)	2017/08/10	2.9		%	20
			Total Uranium (U)	2017/08/10	2.2		%	20
			Total Vanadium (V)	2017/08/10	4.0		%	20
			Total Zinc (Zn)	2017/08/10	NC		%	20
5112445	ARS	Matrix Spike	Total Mercury (Hg)	2017/08/11		109	%	80 - 120



### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5112445	ARS	Spiked Blank	Total Mercury (Hg)	2017/08/11		109	%	80 - 120
5112445	ARS	Method Blank	Total Mercury (Hg)	2017/08/11	<0.013		ug/L	
5112445	ARS	RPD	Total Mercury (Hg)	2017/08/11	2.5		%	20
5112549	SMT	Matrix Spike [EWO009-03]	Total Organic Carbon (C)	2017/08/10		88	%	80 - 120
5112549	SMT	Spiked Blank	Total Organic Carbon (C)	2017/08/10		105	%	80 - 120
5112549	SMT	Method Blank	Total Organic Carbon (C)	2017/08/10	<0.50		mg/L	
5112549	SMT	RPD [EWO009-03]	Total Organic Carbon (C)	2017/08/10	4.4		%	20
5112577	JMV	QC Standard	pH	2017/08/10		100	%	97 - 103
5112577	JMV	RPD	pH	2017/08/10	2.0		%	N/A
5112579	JMV	Spiked Blank	Conductivity	2017/08/10		102	%	80 - 120
5112579	JMV	Method Blank	Conductivity	2017/08/10	<1.0		uS/cm	
5112579	JMV	RPD	Conductivity	2017/08/10	0.78		%	25
5112582	JMV	QC Standard	pH	2017/08/10		100	%	97 - 103
5112582	JMV	RPD	pH	2017/08/10	0.75		%	N/A
5112585	JMV	Spiked Blank	Conductivity	2017/08/10		102	%	80 - 120
5112585	JMV	Method Blank	Conductivity	2017/08/10	1.4, RDL=1.0		uS/cm	
5112585	JMV	RPD	Conductivity	2017/08/10	1.1		%	25
5112590	JMV	QC Standard	pH	2017/08/10		100	%	97 - 103
5112590	JMV	RPD	pH	2017/08/10	1.9		%	N/A
5112594	JMV	Spiked Blank	Conductivity	2017/08/10		102	%	80 - 120
5112594	JMV	Method Blank	Conductivity	2017/08/10	1.5, RDL=1.0		uS/cm	
5112594	JMV	RPD	Conductivity	2017/08/10	0.39		%	25
5114420	JMV	QC Standard	Turbidity	2017/08/11		96	%	80 - 120
5114420	JMV	Spiked Blank	Turbidity	2017/08/11		90	%	80 - 120
5114420	JMV	Method Blank	Turbidity	2017/08/11	<0.10		NTU	
5114420	JMV	RPD	Turbidity	2017/08/11	5.8		%	20
5114421	JMV	QC Standard	Turbidity	2017/08/11		95	%	80 - 120
5114421	JMV	Spiked Blank	Turbidity	2017/08/11		90	%	80 - 120
5114421	JMV	Method Blank	Turbidity	2017/08/11	<0.10		NTU	
5114421	JMV	RPD	Turbidity	2017/08/11	15		%	20
5114422	JMV	QC Standard	Turbidity	2017/08/11		94	%	80 - 120
5114422	JMV	Spiked Blank	Turbidity	2017/08/11		90	%	80 - 120
5114422	JMV	Method Blank	Turbidity	2017/08/11	<0.10		NTU	
5114422	JMV	RPD [EWO010-01]	Turbidity	2017/08/11	6.3		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

### VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

*Kevin A. MacDonald*

Kevin MacDonald, Inorganics Supervisor

*Rosemarie MacDonald*

Rosemarie MacDonald, Scientific Specialist (Organics)

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.