

REPORT

BC Ministry of Environment

South Shawnigan Creek Water Quality Study Quarterly Summary Report #2



January 2017

ISO 9001 and 14001 Certified | An Associated Engineering Company

Cover photo taken by N. Basaraba on Shawnigan Creek downstream of Van Horne Creek confluence (S-6), November 16, 2016.

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1 Introduction

Associated Environmental Consultants Inc. (Associated) was retained by the Ministry of Environment (MOE) to provide an independent Water Quality Study in the mainstem and selected tributaries of South Shawnigan Creek, including in the vicinity of Stebbings Road Lot 23 (the Cobble Hill Holdings [CHH] contaminated soil treatment facility and contaminated soil landfill) and Stebbings Road Lot 21. The Water Quality Study is being conducted to address the concerns of residents, First Nations, local politicians, and other interested parties in the area about water quality in South Shawnigan Creek in relation to development around this key inflow to Shawnigan Lake. Concerns include the health of the aquatic habitat and the water quality in the lake, which is used as a drinking water source.

The water monitoring project calls for data to be summarized in three quarterly reports and a final report in July 2017. The first quarterly report was issued in October, and included data collected between July and September (the dry season) (Associated 2016a). This report is the second quarterly report, and includes data for five dates during the fall rainy season (October 31 to November 29) plus the December monthly sample.

1.1 BACKGROUND INFORMATION

In July 2016, Brenda Miskimmin of Associated finalized a Study Design report to monitor water quality over a period of one year along South Shawnigan Creek (including areas around Lots 21 and 23 on Stebbings Road and key tributaries) (Associated 2016b). The report outlined the proposed sampling program and was developed in consultation with the group (including methods, sites, parameters to test, and frequency of sampling).

The monitoring program that included monthly sampling of eight sites for one year beginning mid-July, as well as weekly sampling in late summer (August – September low flows) and during fall rains (October - November), is now in progress. The more frequent sampling events represent five consecutive weekly samples in 30 days (“5-in-30”). Data collected at this frequency represents the long-term average or aquatic life chronic effect level (i.e., growth and reproduction), as required for certain water quality guideline parameters and captures the consistency of exposure to contaminants over a month’s time.

1.2 OVERALL STUDY OBJECTIVES

Data collected for this Water Quality Study will add to existing data collected under the Shawnigan Lake Water Quality Objectives (WQO) attainment monitoring program (BC MOE 2016b) and other studies. The Water Quality Study data can be used to:

- Establish current water quality at the monitoring sites;
- Assess water quality along South Shawnigan Creek – in particular, determine if surface water quality degrades at any point in South Shawnigan Creek and compare surface water quality to BC water quality guidelines;
- Help determine if existing permitted activities on Stebbings Road at Lot 23 and/or historical activities on Lot 21 are impacting downstream water quality;

- Help determine if other activities in the South Shawnigan Creek watershed are impacting water quality in South Shawnigan Creek;
- Supplement any other data already being collected by the MOE and the Permittee at Lot 23 to assess the effectiveness of *Environmental Management Act* (EMA) Permit 105809; and
- Recommend future studies for South Shawnigan Creek, and inform updates (if necessary) to the Water Quality Objectives for Shawnigan Lake (MOE 2007).

2 Methodology

2.1 SAMPLING SITES

The sampling sites include those identified in the Study Design report, and represent locations upstream and downstream of the Lot 21 seepage and the ephemeral creek downstream of Lot 23 (Associated 2016b). Table 2-1 lists the eight sites that were included in the Water Quality Study. Figure 2-1 show the locations of the sites.

Table 2-1
List of sampling sites and Environmental Monitoring Site identification numbers

Site Number	EMS ID ¹	Description of sample location
S-1	E294426	South Shawnigan Creek upstream of Lots 21 and 23 (control sample, far upstream) – downstream of Elkington Forest
S-2	E306323	South Shawnigan Creek upstream of Lots 21 and 23
S-3	E306324	Ephemeral creek downstream of Lot 23, near water treatment facility discharge, ¹ upstream of the confluence with South Shawnigan Creek
S-4	E294425	South Shawnigan Creek downstream of Lot 21 and upstream of the Lot 23 ephemeral creek inflow
S-5	E306325	South Shawnigan Creek downstream of the confluence with ephemeral creek and upstream of Van Horne Creek confluence
S-6	E306326	South Shawnigan Creek downstream of Van Horne Creek
S-7	E306327	South Shawnigan Creek at Sooke Lake Road (upstream of disturbed area)
S-8	1199906	South Shawnigan Creek as near as possible to the inflow to Shawnigan Lake (downstream of all other sites).

Note:

¹EMS = Environmental Monitoring Site

South Shawnigan Creek flows from S-1 and S-2 (both of which are upstream of Lots 21 and 23) towards S-4, which is immediately downstream of the soil treatment facility and landfill (Figure 2-1). Site S-5 is downstream of S-4 on South Shawnigan Creek and downstream of the small inflowing tributary (“ephemeral creek”) that flows near Lot 23 (S-3). Site S-6 is downstream of S-5 and below the confluence with Van

¹ Discharge from the containment/settling pond is intermittent based on storm event and other inflows.

Horne Creek, and usually receives flows from both creeks. Sites S-7 and S-8 are in the lower reach of South Shawnigan Creek and receive water from all upstream locations.

Site S-3 is the only site not on South Shawnigan Creek. It is located on the ephemeral creek downstream of Lot 23, near the water treatment facility discharge. Field observations indicate that S-3 receives a combination of water from the discharge pipe from the settling pond treatment facility at Lot 23 and from groundwater seepage.

Photographs of each sampling site are included in Appendix A.

2.2 CHALLENGES ASSOCIATED WITH SITES

Every effort was made to sample all proposed sites during each sampling event. In some cases, samples could not be collected due to lack of sufficient water depth or access issues (due to snow on access routes). Table 2-2 summarizes the sites sampled during each event, and issues encountered in the field that prevented sample collection at some sites.

Table 2-2
Summary of sites sampled during each event

Site Number	EMS ID	31-Oct-16	9-Nov-16	16-Nov-16	23-Nov-16	29-Nov-16	12-Dec-16
S-1	E294426	samp/fl	samp/fl	samp/fl	samp/fl	samp/fl	samp/fl
S-2	E306323	ns (too shallow)	ns (too shallow)	samp/fl	samp/fl	samp/fl	samp/fl
S-3	E306324	samp/fl	samp/fl	samp/fl	samp/fl	samp/pool	samp/fl
S-4	E294425	samp/fl	samp/fl	samp/fl	samp/fl	samp/fl	no access/ns
S-5	E306325	samp/fl	samp/fl	samp/fl	samp/fl	samp/fl	no access/ns
S-6	E306326	samp/fl	samp/fl	samp/fl	samp/fl	samp/fl	no access/ns
S-7	E306327	samp/fl	samp/fl	samp/fl	samp/fl	samp/fl	samp/fl
S-8	1199906	samp/fl	samp/fl	samp/fl	samp/fl	samp/fl	samp/fl

Notes:

EMS = Environmental Monitoring Site
 samp/fl = sample collected from flowing water
 ns (too shallow) = no sample due to insufficient water (< 25 cm)
 samp/pool = sample collected from pooled water
 no access/ns = no sample due to excess snow on access route.

Unlike the first quarterly sampling, most sites had flowing water during the sampling events. As expected, more precipitation occurred during the second quarterly period, which was timed to coincide with fall rains. Daily total precipitation data from the Malahat climate station (ID 1014820), which is approximately 7 km southeast of the southern tip of Shawnigan Lake, indicates that there was 259.6 mm total precipitation

between October 28 and December 3² (Environment Canada 2016). By comparison, during the first quarterly period, there was 37.8 mm of precipitation over a similar time period.

² Precipitation data after December 3 was only available for a few days, and was therefore not included in the calculations.

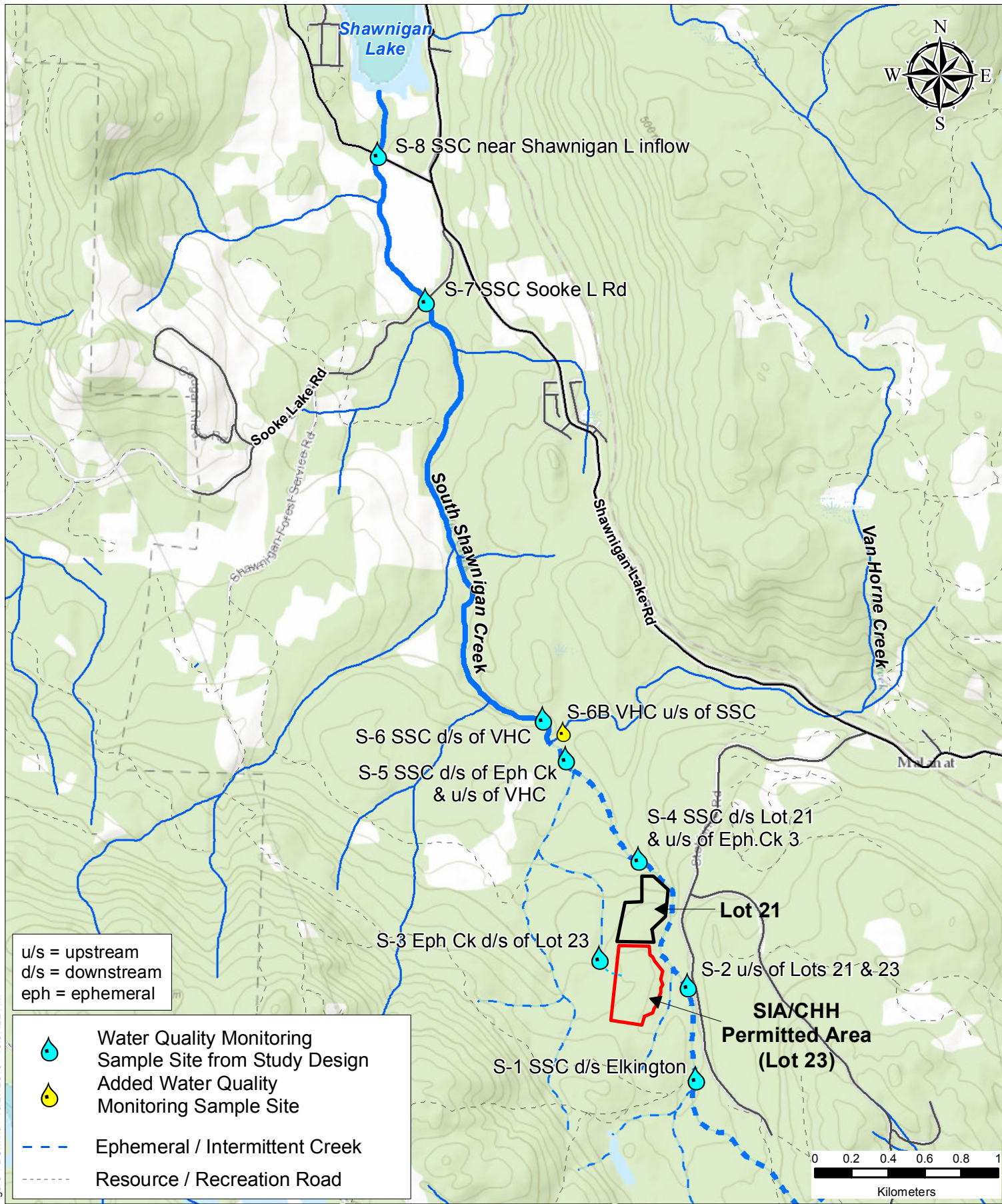


Figure 1 BC.mxd / 10/27/2016 / 10:57:22 AM

2.3 SAMPLING PROTOCOL

Water samples were collected from the shore near the surface at a consistent location in the cross-section, in accordance with the BC water quality sampling protocols (MWLAP 2013). Wherever it was safe and practical to do so, samples were collected at mid-stream. All samples were collected in laboratory-supplied bottles, and were filtered and preserved in the field (as necessary). A field form was filled out for each site to record site conditions, weather conditions, water temperature and other relevant comments (e.g. access or safety issues).



All samples were stored in coolers with ice and delivered following chain-of-custody protocol to an ALS Depot in Victoria, and then shipped by courier to ALS Burnaby for analysis of the following parameters, according to the Study Design report:

- routine water chemistry (including pH, conductivity, turbidity, total suspended solids, hardness, sodium, chloride, and sulphate);
- nutrients (ammonia-N, nitrate-N, nitrite-N, total Kjeldahl nitrogen, organic nitrogen, total nitrogen, total phosphorus, and dissolved ortho-phosphate);
- total and dissolved organic carbon (TOC, DOC);
- total and dissolved metals; and
- organic contaminants (polycyclic aromatic hydrocarbons [PAHs] and light and heavy extractable petroleum hydrocarbons [LEPH/HEPH]).

2.4 QUALITY ASSURANCE AND QUALITY CONTROL

To assess the quality of the sampling and analytical results, two randomly selected sets of duplicate samples were collected at two sites during each sampling event. Collection and analysis of duplicate samples provides information on the combined (field and analytical) precision of the sampling and analytical program. The individual analytical results for each analyte in each sample of the duplicate pair were compared, and the relative percent difference (RPD) was calculated for each analyte. The RPD limits may vary somewhat depending on natural variability, the analysis involved and the concentration of the analyte. The RPD tends to increase at low levels approaching laboratory the detection limit (MWLAP 2013).

In addition to the collection of duplicate samples, the quality assurance and quality control program included collection of trip blank and field blank samples. Trip blanks are sealed water samples of known quality (i.e., deionized water) that are taken from the laboratory to the sampling site and transported back to the laboratory without being exposed to sampling procedures. Their purpose is to detect any widespread contamination resulting from the container or preservative during transport and storage.

Field blanks are samples of deionized water that are poured into the laboratory bottles in the field, then preserved and shipped to the laboratory along with the field samples. They are exposed to the sampling

environment at the sample site and handled in the same manner as the real sample (e.g., preserved, filtered); therefore, they provide information on contamination resulting from handling techniques and from exposure to the atmosphere.

2.5 WATER QUALITY GUIDELINES

All water quality data were tabulated and compared with BC guidelines for the protection of aquatic life and with Health Canada drinking water guidelines. The aquatic life guidelines applied were the BC Approved and Working Water Quality Guidelines (MOE 2015a, 2016). For some parameters, the two guidelines are listed: the long-term average (i.e., chronic) guidelines, which are intended to protect the most sensitive species and life-stage to long-term exposure, and the short-term maximum (i.e., acute) guidelines, which are set to protect against severe effects such as lethality to the most sensitive species and life stage over a defined short-term exposure period (e.g., 96 hours). Compliance with the chronic guidelines is assessed by calculating the average concentration from five weekly samples collected in a period of 30 days (5-in-30).

For screening purposes, all results were first compared with the most stringent (lowest) aquatic life guideline, including chronic guidelines where available. Where results were found to exceed the chronic guidelines, the result was further assessed by calculating the 5-in-30 average concentration and comparing that result with the chronic guideline. Exceedances of acute or chronic guidelines are highlighted in the data tables.

Results were compared with the Guidelines for Canadian Drinking Water Quality (Health Canada 2014), because Shawnigan Lake is used as a drinking water source. This comparison is conservative because it assumes that the lake water is consumed without treatment.

3 Results and Discussion

3.1 OVERVIEW OF FLOW CONDITIONS

Water monitoring during this quarterly period represents the fall rainy season (late October – late November) and early winter (December). As a result of increased precipitation, flowing water was observed in South Shawnigan Creek at all sites during most sampling events. Therefore, the sites were considered connected, and comparisons of water quality upstream and downstream can be made. This differed from the summer dry season, where there was a lack of flowing water upstream of the confluence with Van Horne Creek.

3.2 OVERVIEW OF WATER QUALITY RESULTS

In general, the findings from the October to December results indicate that many parameters increased from upstream to downstream on South Shawnigan Creek. Examples of parameters that increased include turbidity, chloride, sulphate, nitrate, arsenic, sodium, cadmium, copper, chromium, nickel, and iron. Increases in many parameters from upstream to downstream locations can be expected in rivers where

water flows from less developed headwater areas, and as more water is contributed through disturbed parts of the watershed (Miller et al. 2007).

The following sections discuss the noted differences in water quality between sites (Section 3.3) and the parameters that were found to exceed either aquatic life or drinking water guidelines (Section 3.4).

3.3 COMPARISON OF WATER QUALITY BETWEEN SITES

Figures 3-1 to 3-12 depict the average concentrations of key detected parameters from upstream to downstream sites. Concentrations shown are the average concentrations based on all collected data from October 31 to December 12³. The figures are intended to show patterns of water quality change in South Shawnigan Creek from upstream to downstream locations. Because S-3 is not on South Shawnigan Creek and has markedly different chemistry, it is not shown on the figures, but the average concentrations in S-3 are listed on each graph.

3.3.1 General Parameters

The average water temperature was similar across all sites, with a trend to moderately warmer temperatures from upstream to downstream (Figure 3-1). In the sites on South Shawnigan Creek, the average temperature ranged from 5.5°C (S-2) to 7.6°C (lower sites). The average temperature in S-3 was warmer (8.6°) than the other sites, and usually exhibited the warmest temperature on each date. During the November 16, 23, 29, and December 12 sampling events, S-3 was about 2°C higher than the sites on the mainstem South Shawnigan Creek. This is likely a result of groundwater contributing to the flow in S-3. Groundwater temperatures are more consistent over time, and are typically warmer than weather-influenced surface water during colder months.

Average turbidity (Figure 3-2) was generally lower (less than 0.60 NTU) at sites upstream of the confluence with Van Horne Creek (S-1, S-2, S-4, and S-5) than further downstream (greater than 1.5 NTU at S-6, S-7, and S-8). All of the turbidity levels are considered low.

With the exception of S-3, which had an average chloride concentration of 57.4 mg/L, average chloride levels were very low (less than 4 mg/L) at all sites (Figure 3-3). All concentrations were well below the most stringent guideline (150 mg/L). Dissolved and total sodium (Figure 3-4) showed a similar pattern to chloride: higher levels in S-3 (at approximately 27 mg/L total sodium) relative to the other sites, which averaged less than 3 mg/L; but all concentrations were below the most stringent guideline of 200 mg/L.

During the fall rainy period, S-3 was noted to be a mixture of CHH's settling pond discharge and groundwater flow. Parameters like conductivity, total nitrogen, nitrate, sodium, chloride, sulphate, hardness, calcium and magnesium in S-3 samples were about half or less of the concentrations found on the dry September 2016 date. For example, the finding of an average hardness of 184 mg/L from October 31-

³ Duplicates at a site on the same date were averaged so there was only one value used per sampling date.

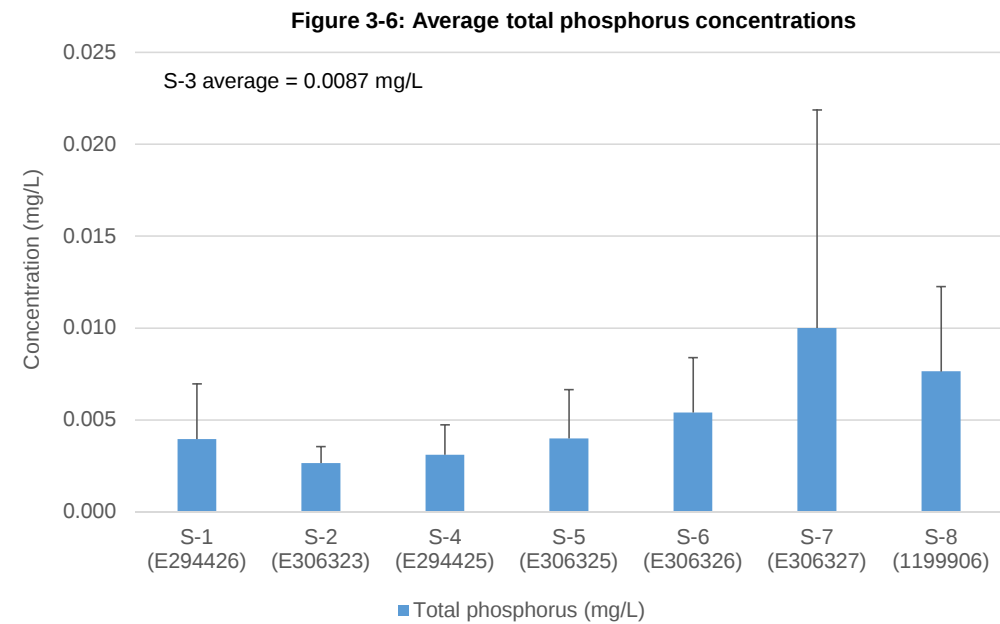
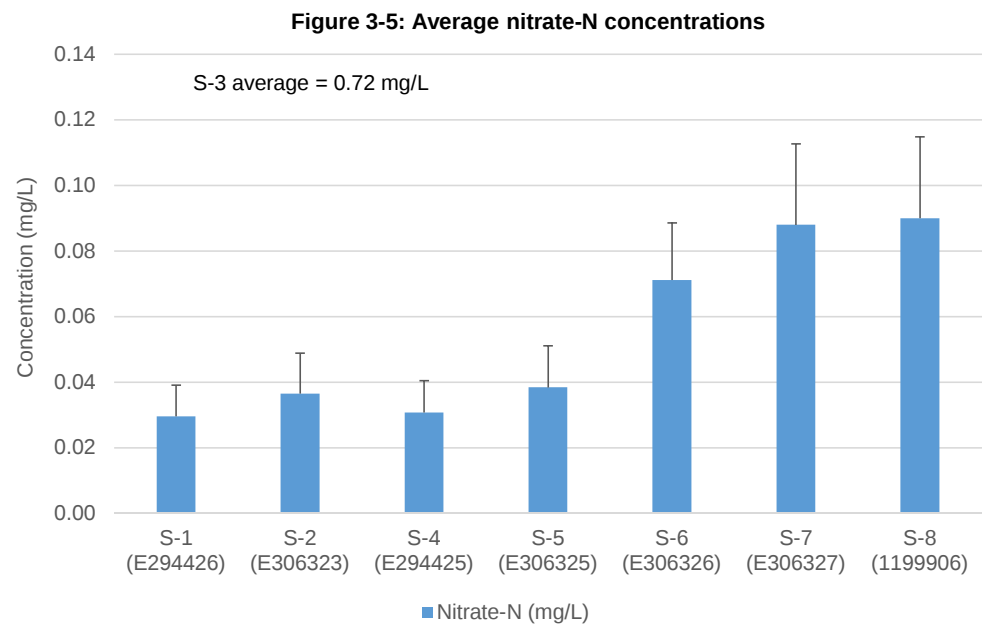
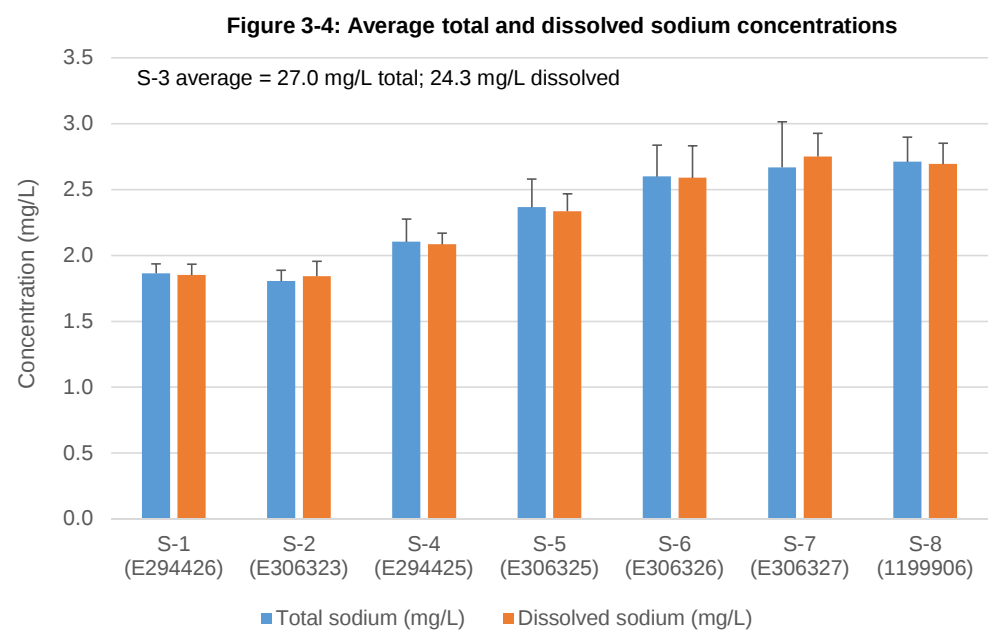
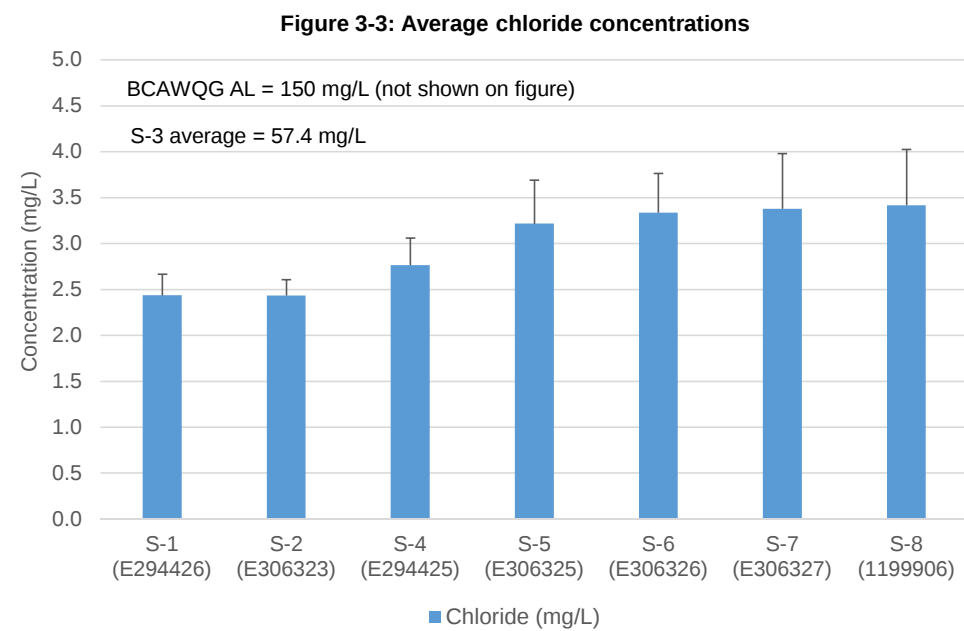
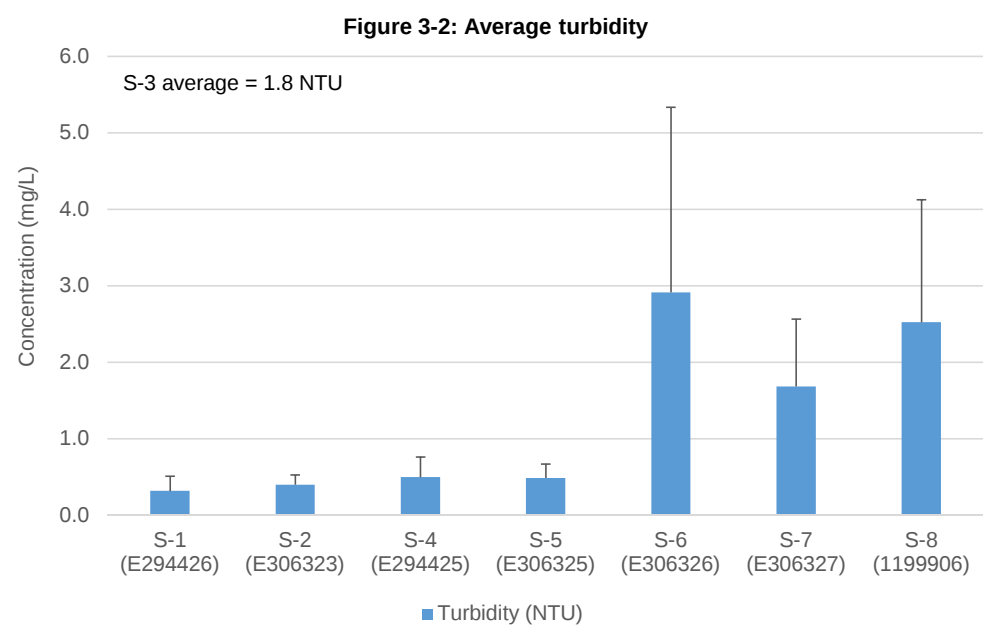
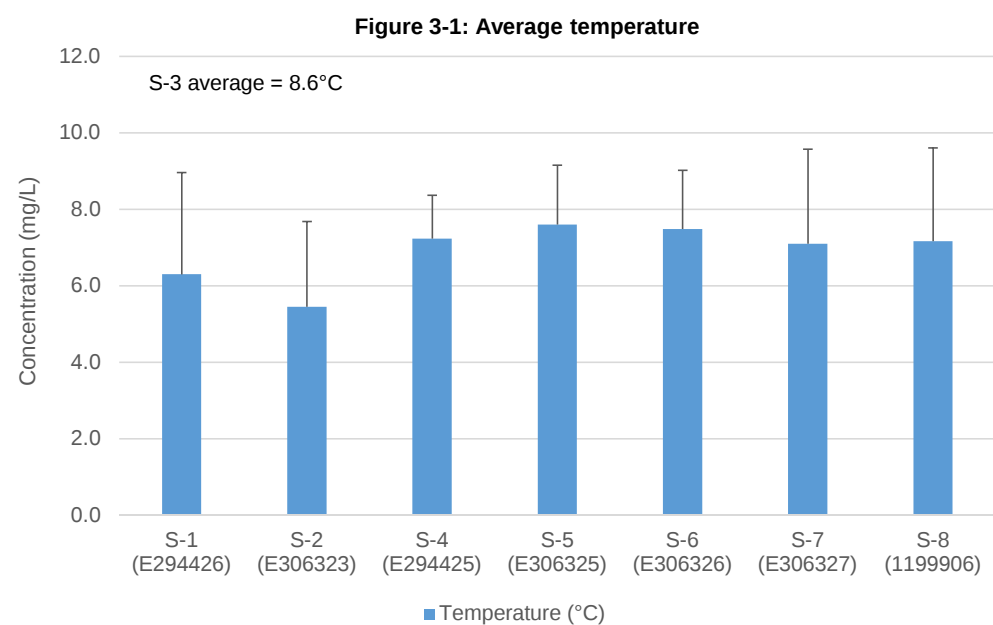
December 12 was less than half of the hardness level recorded from sampling in September 2016 (414 mg/L) at a time when the settling pond was not discharging.

While it is not unusual for groundwater concentrations of a range of variables to be higher than surface water, it is unclear at this time if the groundwater “mix” collected in samples from S-3 are representative of groundwater quality upgradient from the CHH site. It would be useful to have data for other groundwater wells in the area for comparison. However, compared to the next nearest site downstream of this ephemeral tributary of South Shawnigan Creek (S-5), the concentrations at S-3 were higher but no guidelines were exceeded (to be discussed further in S. 3-4).

3.3.2 Nutrients

Nitrate was relatively low at all sites (Figure 3-5) and in most cases, ammonia and nitrite were not detected. The highest and lowest average nitrate-N concentrations were at S-3 (0.72 mg/L) and S-1 (0.030 mg/L), respectively. Average nitrate-N concentrations along South Shawnigan Creek were lower (all less than 0.1 mg/L) than those at S-3. Within South Shawnigan Creek, average concentrations were higher at sites downstream of the confluence with Van Horne Creek. All nitrate-N concentrations were below the most stringent guideline of 3 mg/L.

Total phosphorus (Figure 3-6) concentrations were not elevated at any sites. The highest and lowest average total phosphorus concentrations were at S-7 (0.010 mg/L) and S-2 (0.003 mg/L), respectively. Average concentrations at all sites were at or below 0.010 mg/L, and would be considered within the oligotrophic (low productivity) range. Orthophosphate (dissolved P) was below detection (<0.001 mg/L) at S-1, S-2, S-4, S-5, or S-6 but was detected occasionally at S-7 and S-8 at moderate levels from 0.0011 mg/L to 0.0013 mg/L. At S-3, orthophosphate was detected during all sampling events and ranged from 0.0024 mg/L to 0.0036 mg/L. There are no applicable guidelines for orthophosphate, but this form of phosphorus is readily available to primary producers like algae.



Notes:

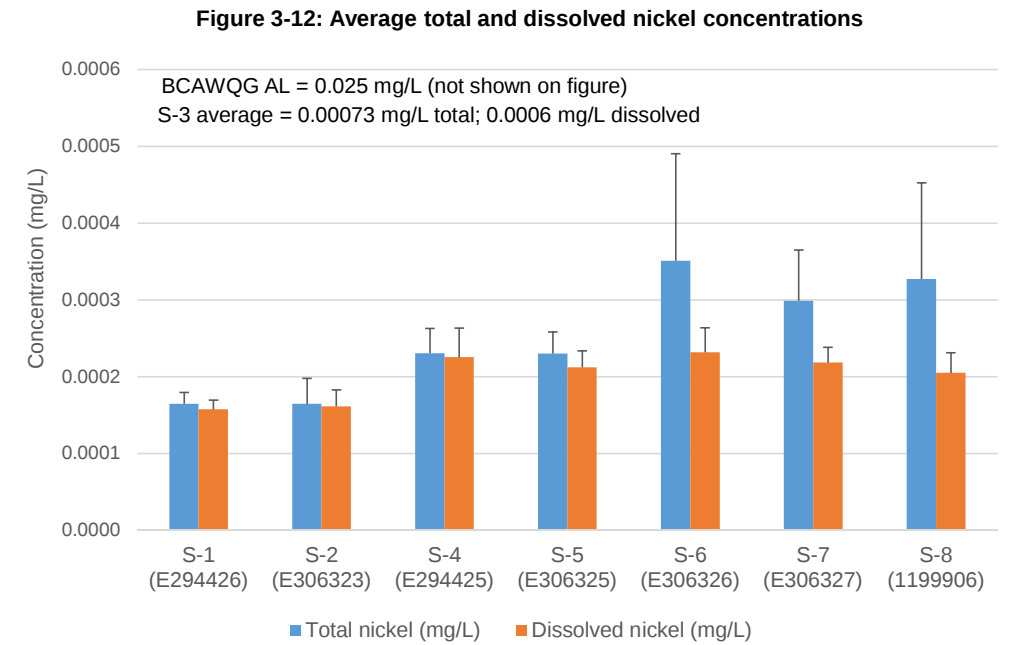
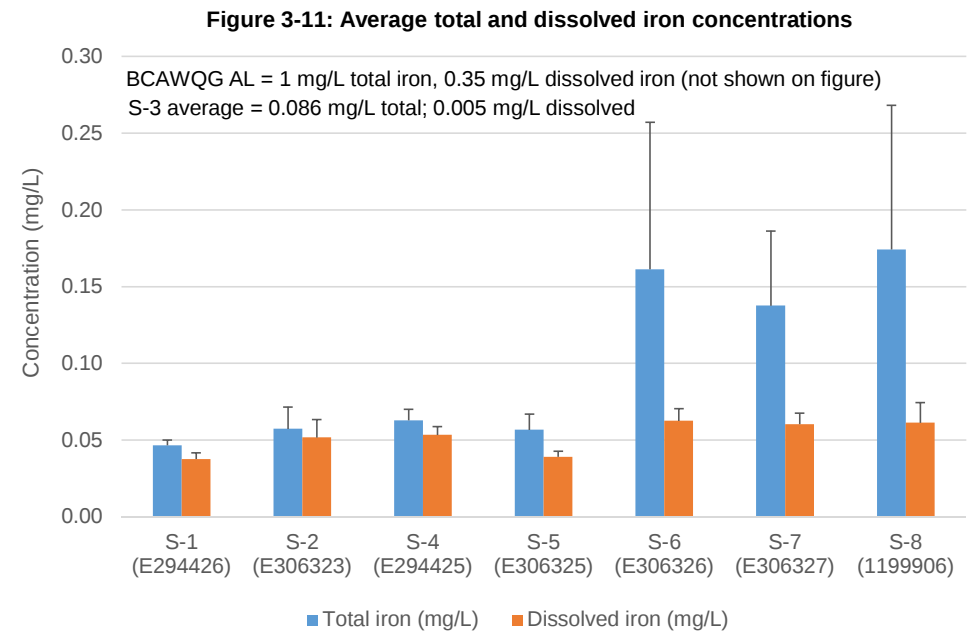
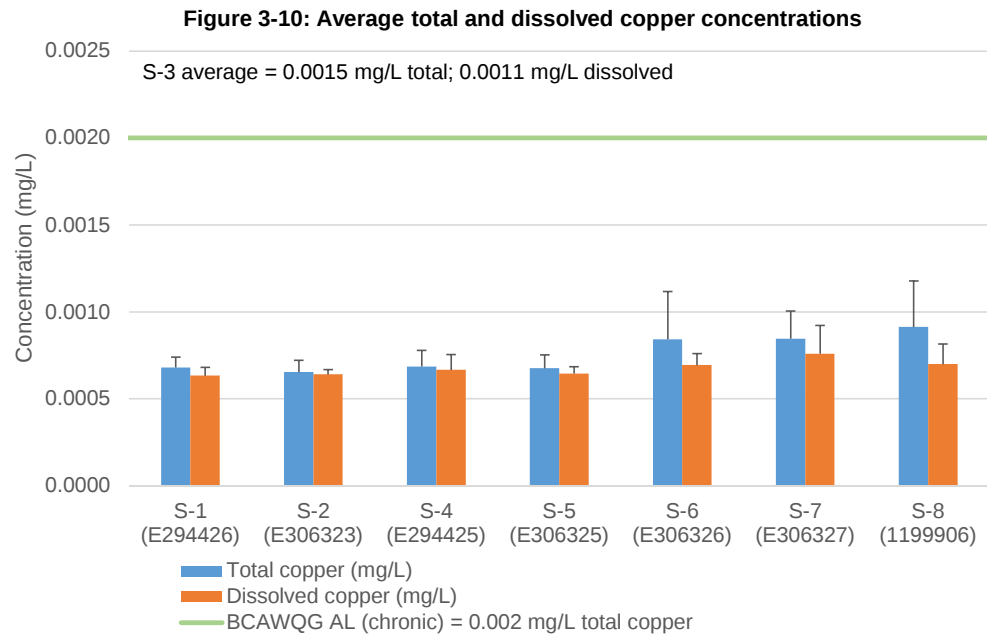
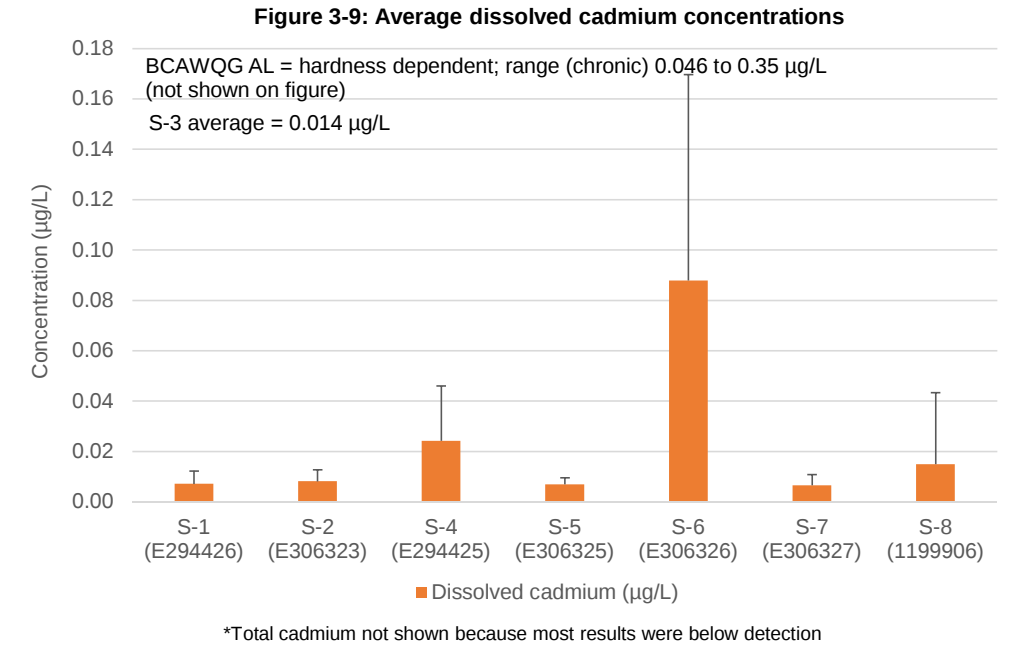
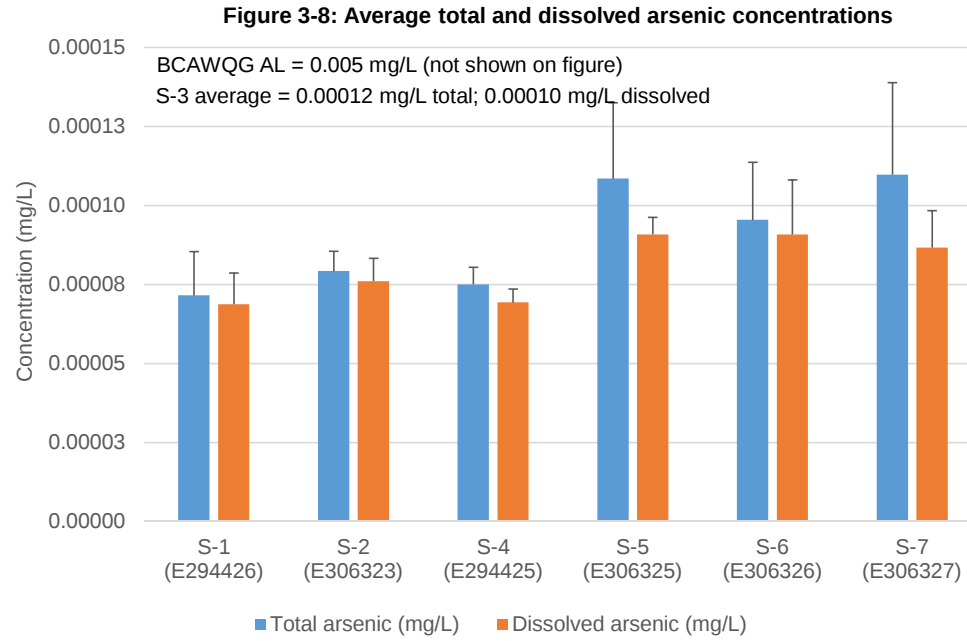
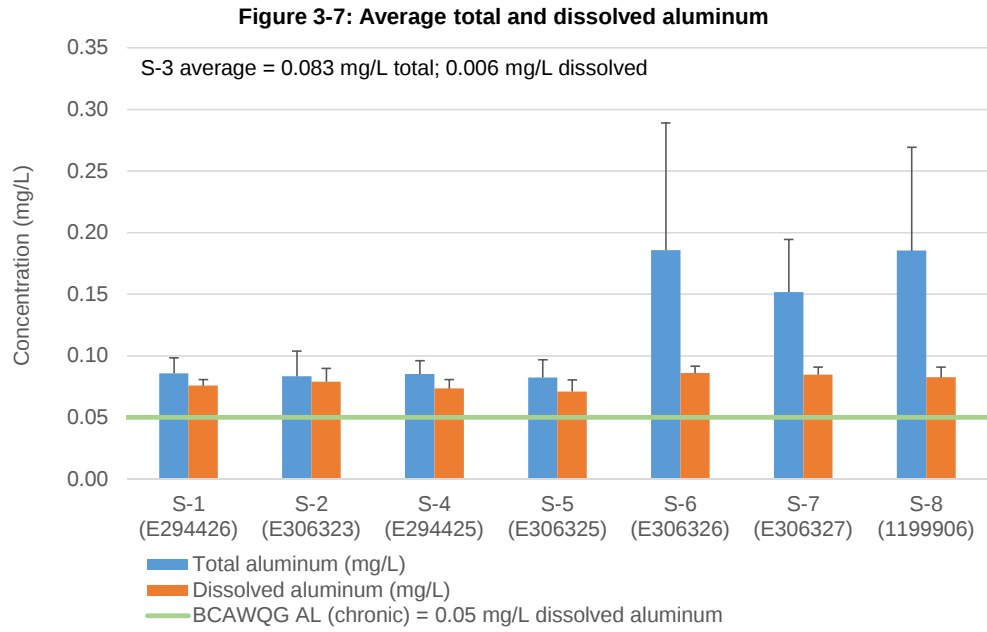
Graphs show average concentrations of parameters measured on South Shawnigan Creek between October 31 and December 12, 2016. For duplicate samples, the average of the two concentrations was used for the calculations. Error bars show standard deviation.

3.3.3 Dissolved and Total Metals

There were some notable similarities and differences in average concentrations of metals between sites, as follows:

- Average dissolved aluminum concentrations were consistent (ranging from 0.071 mg/L to 0.086 mg/L) between upstream and downstream sites on South Shawnigan Creek (Figure 3-7). In S-3, the average dissolved aluminum concentration was much lower (0.006 mg/L). Total aluminum showed greater variation between sites: average concentrations were higher downstream of the confluence with Van Horne Creek than they were upstream, and likely relates to the higher turbidity also noted at these downstream sites. Note that total aluminum values at S-8 (EMS 1199906) during the fall of 2013 were found to be about half of the levels found in the fall of 2016 (BC MOE 2016b). Aluminum is discussed relative to aquatic life guidelines in Section 3.3.1.
- Average dissolved arsenic concentrations (Figure 3-8) were relatively consistent and low (less than 0.00010 mg/L) at all sites. Total arsenic was also low (less than 0.00011 mg/L), but was slightly higher in sites downstream of the confluence with Van Horne Creek. All concentrations met the lowest applicable aquatic life guideline for arsenic, which is 0.005 mg/L.
- Total cadmium was detected occasionally: once in S-3, S-5, and S-6 and twice in S-4, S-7, and S-8. The highest average dissolved cadmium concentration⁴ by far was found at S-6, the site immediately downstream of the confluence with Van Horne Creek (0.088 µg/L; Figure 3-9). At the other sites (including S-3), the average dissolved cadmium was at or below 0.015 µg/L. Cadmium is discussed relative to aquatic life guidelines in Section 3.4.2.
- Average concentrations of total and dissolved copper were relatively consistent across the sites and remained below 0.0015 mg/L (Figure 3-10). Essentially all copper was found in the dissolved phase. All concentrations met the lowest applicable aquatic life guideline for total copper, which is 0.002 mg/L.
- Similar to some other metals (and turbidity), average total iron levels were notably higher (greater than 0.14 mg/L) at sites downstream of the confluence with Van Horne Creek than at upstream sites (less than 0.07 mg/L; Figure 3-11). The average dissolved iron levels were more consistent across the South Shawnigan Creek sites, ranging from 0.038 mg/L (S-1) to 0.063 mg/L (S-6), comprising about half of total iron levels at S-6 through S-8. The average total and dissolved iron at S-3 was 0.086 and 0.005 mg/L, respectively. Iron is discussed relative to drinking water guidelines in Section 3.4.
- Average concentrations of total nickel ranged from 0.00016 at upstream sites S-1 and S-2 to about 0.0003 mg/L downstream of Van Horne Creek (Figure 3-12). All concentrations met the lowest applicable aquatic life guideline for nickel, which is 0.025 mg/L.

⁴ See Section 3.5 for a discussion on dissolved metals exceeding total metals in some samples.



Notes:

Graphs show average concentrations of parameters measured on South Shawnigan Creek between October 31 and December 12, 2016. For duplicate samples, the average of the two concentrations was used for the calculations. Error bars show standard deviation.

3.4 EXCEEDANCES OF WATER QUALITY GUIDELINES

The parameters found to exceed the aquatic life guidelines included dissolved aluminum, dissolved cadmium, benzo[a]pyrene, and pyrene as follows:

- Dissolved aluminum 5-in-30 guideline exceedances at all sites except S-3;
- Dissolved cadmium 5-in-30 guideline exceedance at S-6;
- Dissolved cadmium acute aquatic life guideline exceedances on three consecutive dates in November at S-6;
- Benzo[a]pyrene aquatic life guideline exceedance on 23 November only at S-8;
- Pyrene aquatic life guideline exceedance on 23 November only at S-8.

Drinking water quality guidelines for total iron and benzo[a]pyrene were exceeded on 23 November only at S-8.

Tables 3-1 to 3-4 show the measured concentrations of key detected parameters at each site, with results exceeding the aquatic life or drinking water guidelines (Section 3.4) highlighted. Further discussion of guideline exceedances is found following the tabulated key data.

All tabulated water quality data, including all tested parameters that were undetectable, are provided in Appendix B.

Table 3-1
Concentrations of key detected parameters at S-1 and S-2

Analyte	Units	Guideline			S-1 (EMS E294426)						S-2 (EMS E306323)				
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16	9-Nov-16	16-Nov-16	23-Nov-16	29-Nov-16	12-Dec-16	16-Nov-16		23-Nov-16	29-Nov-16	12-Dec-16
General Parameters															
Temperature	°C					9.5	7.3	6.7	5.8	2.2	7.0	7.0	6.8	5.8	2.2
Conductivity	uS/cm	-	-	-	33.2	33.7	33.1	34.5	30.2	29.9	36.5	34.5	35.8	32.8	31
Hardness (as CaCO3)	mg/L	-	-	-	13.5	11.9	13.3	14.1	11.4	9.68	14.3	14.3	13	12.3	9.79
pH	pH	6.5 - 9	6.5 - 8.5	-	7.06	7.16	7.03	7.35	7.16	7.07	6.94	6.9	7.37	7.15	7.07
Total Suspended Solids	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	-	-	-	0.71	0.21	0.25	0.23	0.24	0.25	0.32	0.27	0.41	0.31	0.57
Chloride (Cl)	mg/L	150	250	-	2.85	2.4	2.51	2.38	2.18	2.29	2.65	2.64	2.48	2.23	2.38
Sulfate (SO4)	mg/L	128	500	-	1.49	1.4	1.4	1.37	1.37	1.42	1.43	1.42	1.39	1.38	1.44
Nutrients															
Ammonia, Total (as N)	mg/L	0.102	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate (as N)	mg/L	3	-	10	0.0279	0.0175	0.0243	0.0375	0.0265	0.044	0.025	0.0249	0.0415	0.028	0.0516
Total Nitrogen	mg/L	-	-	-	0.157	0.126	0.121	0.134	0.141	0.128	0.122	0.124	0.137	0.138	0.16
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	mg/L	-	-	-	0.003	0.0031	0.0021	<0.010	0.0021	0.0034	<0.0020	<0.0020	0.0027	<0.0020	0.0039
Organic Carbon															
Dissolved Organic Carbon	mg/L	-	-	-	4.37	3.84	3.76	3.65	4.95	4.3	3.81	3.95	3.81	3.93	4.7
Total Organic Carbon	mg/L	-	-	-	4.49	4.05	3.8	3.77	4.37	3.69	3.88	3.89	3.9	4.18	4.11
Total Metals															
Aluminum (Al)-Total	mg/L	-	0.1	-	0.0714	0.0821	0.0775	0.0826	0.107	0.0936	0.1	0.0915	0.054	0.0849	0.099
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.000074	0.000069	0.000073	0.000067	0.000074	0.000063	0.000073	0.000067	0.000089	0.000072	0.000055
Cadmium (Cd)-Total	µg/L	-	-	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Copper (Cu)-Total	mg/L	0.00148	1	-	0.000724	0.000671	0.000628	0.00065	0.000777	0.000629	0.000686	0.000779	0.000678	0.000572	0.000631
Iron (Fe)-Total	mg/L	1	0.3	-	0.0475	0.041	0.0464	0.0474	0.0517	0.0447	0.0778	0.0749	0.0519	0.0425	0.0582
Lead (Pb)-Total	mg/L	0.003	-	0.01	0.000254	0.0000166	0.0000137	0.0000139	0.0000232	0.0000189	0.0000344	0.0000236	0.0000164	0.0000218	0.0000256
Magnesium (Mg)-Total	mg/L	-	-	-	0.704	0.723	0.7	0.716	0.743	0.671	0.735	0.748	0.508	0.642	0.651
Manganese (Mn)-Total	mg/L	0.768	0.05	-	0.00308	0.00275	0.00276	0.00331	0.00295	0.00231	0.0216	0.0161	0.00459	0.004	0.00655
Nickel (Ni)-Total	mg/L	0.025	-	-	0.000165	0.000167	0.000168	0.00016	0.000187	0.000141	0.000181	0.000219	0.000183	0.000126	0.000149
Sodium (Na)-Total	mg/L	-	200	-	1.83	1.91	1.82	1.91	1.76	1.95	1.87	1.84	1.89	1.71	1.76
Zinc (Zn)-Total	mg/L	0.0075	5	-	0.00063	0.00043	0.00052	0.0003	0.00039	0.00057	0.00057	0.00046	0.00043	0.00033	0.00055
Dissolved Metals															
Aluminum (Al)-Dissolved	mg/L	0.05	0.1	-	0.0695	0.0722	0.0774	0.0745	0.0841	0.0766	0.081	0.0778	0.0641	0.0896	0.0827
Arsenic (As)-Dissolved	mg/L	0.005	-	0.01	0.00007	0.000063	0.000071	0.000074	0.000069	0.000057	0.000076	0.00008	0.000066	0.000075	0.000056
Cadmium (Cd)-Dissolved	µg/L	Calculated	-	5	<0.0050	0.0176	<0.0050	<0.0050	0.0051	<0.0050	<0.0050	<0.0050	0.0149	0.0075	<0.0050
Copper (Cu)-Dissolved	mg/L	Calculated	1	-	0.000699	0.000645	0.000635	0.000635	0.000634	0.00055	0.000655	0.000633	0.000608	0.000679	0.000626
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0413	0.0328	0.0405	0.0385	0.0401	0.0319	0.0563	0.0689	0.0461	0.049	0.0378
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.000018	0.0000133	0.0000108	0.0000094	0.000184	0.0000124	0.000012	0.0000117	0.0000159	0.0000243	0.0000115
Magnesium (Mg)-Dissolved	mg/L	-	-	-	0.719	0.67	0.711	0.729	0.634	0.594	0.784	0.766	0.741	0.675	0.637
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.0021	0.00164	0.00214	0.00182	0.00142	0.00132	0.00852	0.0074	0.00479	0.00943	0.00387
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.000176	0.00015	0.000166	0.000153	0.000158	0.000141	0.000185	0.000174	0.000151	0.000167	0.00013
Sodium (Na)-Dissolved	mg/L	-	200	-	1.94	1.77	1.88	1.95	1.78	1.78	1.97	1.96	1.78	1.74	1.76
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00045	0.00053	0.00055	0.00029	0.00059	0.00073	0.00153	0.00048	0.00123	0.00074	0.00041
Hydrocarbons															
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TEH10-30	mg/L	-	-	-	-	<0.10	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	mg/L	0.00001	-	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Pyrene	mg/L	0.00002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

BCAWQG/BCWWQG AL = BC Approved/Working Water Quality Guidelines for Freshwater Aquatic Life
GCDWQ AO = Guidelines for Canadian Drinking Water Quality Aesthetic Objectives
GCDWQ MAC = Guidelines for Canadian Drinking Water Quality Maximum Acceptable Concentration
Result exceeds the acute BCAWQG/BCWWQG AL
5-in-30 day average concentration exceeds the chronic BCAWQG AL
Result exceeds the GCDWQ
Result exceeds both the BCAWQG AL and the GCDWQ

Table 3-2
Concentrations of key detected parameters at S-3 and S-4

Analyte	Units	Guideline			S-3 (EMS E306324)								S-4 (EMS E294425)							
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16	9-Nov-16		16-Nov-16	23-Nov-16	29-Nov-16		12-Dec-16		31-Oct-16		9-Nov-16	16-Nov-16	23-Nov-16		29-Nov-16
General Parameters																				
Temperature	°C				9.9	10.0	10.0	9.7	8.6	7.2	7.2	4.5	4.5	8.5	8.5		6.9	6.3	6.3	
Conductivity	uS/cm	-	-	-	740	522	545	566	566	418	416	333	334	43.7	42	40.7	39.6	41.3	41	35.3
Hardness (as CaCO3)	mg/L	-	-	-	257	182	195	202	197	155	136	108	104	16	15.9	15.7	16	16.1	16.6	13
pH	pH	6.5 - 9	6.5 - 8.5	-	7.73	7.77	7.76	7.51	8.05	7.78	7.81	7.76	7.77	7.38	7.35	7.35	7.32	7.4	7.34	7.28
Total Suspended Solids	mg/L	-	-	-	<1.0	3.5	1.8	<1.0	3.4	1.7	1.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	-	-	-	1.03	3.43	3.24	0.32	1.68	1.17	0.8	2.21	2.13	0.78	1.15	0.42	0.34	0.36	0.44	0.35
Chloride (Cl)	mg/L	150	250	-	98.1	56.9	56.7	61.8	59.6	40	40	28.7	28.7	3.2	3.2	2.78	2.78	2.69	2.69	2.37
Sulfate (SO4)	mg/L	128	500	-	162	109	109	111	101	76.2	76.3	60.8	60.9	2.43	2.42	2.29	1.98	2.17	2.18	1.79
Nutrients																				
Ammonia, Total (as N)	mg/L	0.102	-	-	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate (as N)	mg/L	3	-	10	1.07	0.72	0.728	0.699	0.716	0.572	0.575	0.503	0.503	0.0267	0.0276	0.0212	0.0278	0.0469	0.0471	0.0308
Total Nitrogen	mg/L	-	-	-	1.11	0.822	0.797	0.757	0.783	0.634	0.63	0.544	0.559	0.158	0.156	0.127	0.131	0.149	0.147	0.141
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	0.0031	0.0036	0.0034	0.0033	0.0032	0.0032	0.0031	0.0024	0.0026	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	mg/L	-	-	-	0.0048	0.0133	0.0152	0.0093	0.0048	0.0037	<0.010	0.0064	0.006	0.0041	0.0033	0.0057	<0.0020	<0.0020	0.0022	<0.0020
Organic Carbon																				
Dissolved Organic Carbon	mg/L	-	-	-	1.69	2.54	1.4	1.56	1.48	0.91	1.22	1.14	1	4.75	4.46	4.45	3.86	3.76	4.02	3.82
Total Organic Carbon	mg/L	-	-	-	1.79	1.59	1.77	1.59	1.46	1.03	1.24	1.16	1.13	4.76	4.8	4.61	4.11	4.07	3.98	4.41
Total Metals																				
Aluminum (Al)-Total	mg/L	-	0.1	-	0.0397	0.147	0.143	0.0233	0.0828	0.0999	0.0369	0.0749	0.0776	0.0951	0.0919	0.0969	0.0748	0.0881	0.0883	0.0728
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.000125	0.000152	0.000141	0.000107	0.000125	0.000112	0.000099	0.000077	0.000085	0.000083	0.000091	0.000085	0.000075	0.000075	0.000077	0.000073
Cadmium (Cd)-Total	µg/L	-	-	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0146	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0137	<0.0050	<0.0050	<0.0050	0.0124
Copper (Cu)-Total	mg/L	0.00148	1	-	0.0016	0.00173	0.00173	0.00121	0.00143	0.00155	0.00124	0.00108	0.0011	0.000781	0.000715	0.000793	0.000652	0.000666	0.000704	0.000549
Iron (Fe)-Total	mg/L	1	0.3	-	0.0451	0.159	0.158	0.0212	0.0837	0.0956	0.0383	0.0677	0.0688	0.0727	0.0719	0.0649	0.0558	0.0675	0.0643	0.0549
Lead (Pb)-Total	mg/L	0.003	-	0.01	0.0000435	0.000155	0.00015	0.0000204	0.0000801	0.000135	0.0000405	0.0000942	0.0000914	0.0000504	0.0000411	0.0000247	0.0000113	0.0000196	0.0000213	0.0000252
Magnesium (Mg)-Total	mg/L	-	-	-	14.6	10.2	10.2	10.4	10.2	9.08	7.86	5.96	6.04	1.02	1.01	1.03	0.912	1.09	1.1	0.841
Manganese (Mn)-Total	mg/L	0.768	0.05	-	0.0119	0.0144	0.0152	0.0062	0.0117	0.0421	0.006	0.00334	0.00332	0.00451	0.00459	0.00568	0.00372	0.00626	0.00623	0.00514
Nickel (Ni)-Total	mg/L	0.025	-	-	0.000934	0.000838	0.000889	0.00056	0.000744	0.000718	0.000601	0.00052	0.000543	0.000282	0.000254	0.00025	0.000209	0.000234	0.000242	0.000187
Sodium (Na)-Total	mg/L	-	200	-	41.4	29.4	29.9	29.5	26.6	18.4	19.1	13.3	13.2	2.12	2.23	2.27	1.95	2.28	2.18	1.89
Zinc (Zn)-Total	mg/L	0.0075	5	-	0.00175	0.00072	0.00073	0.00028	0.00038	0.00068	0.00027	0.00045	0.00036	0.00072	0.00053	0.00048	0.00038	0.0004	0.00037	0.00027
Dissolved Metals																				
Aluminum (Al)-Dissolved	mg/L	0.05	0.1	-	0.00644	0.00575	0.00579	0.00372	0.00357	0.00395	0.0129	0.00497	0.00469	0.0723	0.0713	0.0817	0.0786	0.0693	0.0759	0.0624
Arsenic (As)-Dissolved	mg/L	0.005	-	0.01	0.00012	0.000113	0.000117	0.000103	0.000098	0.000099	0.000092	0.000072	0.000069	0.00009	0.000084	0.000074	0.000074	0.000066	0.000068	0.000078
Cadmium (Cd)-Dissolved	µg/L	Calculated	-	5	<0.0050	0.0489	<0.0050	0.0163	0.0122	0.0225	0.006	<0.0050	<0.0050	<0.0050	<0.0050	0.0326	0.035	0.0238	0.0064	0.0618
Copper (Cu)-Dissolved	mg/L	Calculated	1	-	0.00144	0.00119	0.0016	0.00125	0.00109	0.000975	0.0011	0.000803	0.000834	0.000776	0.000704	0.000713	0.000707	0.000617	0.000639	0.000503
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0034	0.0033	0.0042	0.0017	0.0019	0.002	0.0156	0.0044	0.0064	0.0511	0.051	0.0647	0.0555	0.0481	0.052	0.0508
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.0000123	0.0000094	0.000016	0.000008	0.0000122	0.0000437	0.0000261	0.0000118	0.0000273	0.0000214	0.0000216	0.0000174	0.0000139	0.0000455	0.000024	0.0000233
Magnesium (Mg)-Dissolved	mg/L	-	-	-	14.4	9.3	9.98	10.6	9.83	8.07	6.64	5.98	5.72	1.02	1.02	0.991	1	0.984	1.03	0.816
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.00453	0.00213	0.00217	0.00145	0.00399	0.000888	0.000898	0.00114	0.00113	0.00318	0.00327	0.00357	0.00332	0.00349	0.00361	0.00428
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.000867	0.000632	0.000625	0.000552	0.000599	0.000441	0.000391	0.000543	0.000435	0.000248	0.000257	0.000271	0.000231	0.000196	0.000212	0.000162
Sodium (Na)-Dissolved	mg/L	-	200	-	40.4	27.4	28.3	29	26.2	22.4	19	13.1	12.5	2.09	2.11	2.11	2.18	2.05	2.13	1.91
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00109	0.00061	0.00054	0.00047	0.00037	0.00044	0.00042	0.00022	0.00019	0.00083	0.00066	0.00113	0.0004	0.00053	0.00049	0.00089
Hydrocarbons																				
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TEH10-30	mg/L	-	-	-	-	<0.10	<0.10	-	-	-	-	-	-	-	-	<0.10	-	-	-	-
Benzo(a)pyrene	mg/L	0.00001	-	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Pyrene	mg/L	0.00002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

BCAWQG/BCWWQG AL = BC Approved/Working Water Quality Guidelines for Freshwater Aquatic Life
GCDWQ AO = Guidelines for Canadian Drinking Water Quality Aesthetic Objectives
GCDWQ MAC = Guidelines for Canadian Drinking Water Quality Maximum Acceptable Concentration
Result exceeds the acute BCAWQG/BCWWQG AL
5-in-30 day average concentration exceeds the chronic BCAWQG AL
Result exceeds the GCDWQ
Result exceeds both the BCAWQG AL and the GCDWQ

Table 3-3
Concentrations of key detected parameters at S-5 and S-6

Analyte	Units	Guideline			S-5 (EMS E306325)						S-6 (EMS E306326)						
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16		9-Nov-16	16-Nov-16	23-Nov-16	29-Nov-16		31-Oct-16	9-Nov-16	16-Nov-16	23-Nov-16		29-Nov-16
General Parameters																	
Temperature	°C				8.7	8.7	9.7	7.0	6.7	5.9	5.9	8.8	9.9	7.0	6.7	6.7	5.8
Conductivity	uS/cm	-	-	-	48	47.1	43.9	43.4	47.5	38.2	37.6	49.4	45.3	45.5	49.5	49.2	40.8
Hardness (as CaCO3)	mg/L	-	-	-	18.7	18.2	17.1	18	17.8	15.8	14.2	18.2	17.8	18	18.1	16.7	13.7
pH	pH	6.5 - 9	6.5 - 8.5	-	7.41	7.34	7.25	7.2	7.38	7.24	7.27	7.34	7.27	7.29	7.38	7.39	7.26
Total Suspended Solids	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1	<1.0	1.1	<1.0	2.7	2.4	1.1
Turbidity	NTU	-	-	-	0.63	0.69	0.64	0.2	0.48	0.41	0.46	1.27	2.52	0.36	5.68	6.13	1.52
Chloride (Cl)	mg/L	150	250	-	3.9	3.89	3.17	3.17	3.28	2.56	2.56	4.01	3.28	3.24	3.41	3.4	2.68
Sulfate (SO4)	mg/L	128	500	-	3.76	3.77	3.13	2.84	3.31	2.3	2.3	4.11	3.58	3.31	3.77	3.77	2.99
Nutrients																	
Ammonia, Total (as N)	mg/L	0.102	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0065	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate (as N)	mg/L	3	-	10	0.0343	0.0345	0.0259	0.0355	0.0598	0.0363	0.0368	0.0577	0.053	0.0585	0.0922	0.0912	0.0744
Total Nitrogen	mg/L	-	-	-	0.154	0.145	0.136	0.132	0.156	0.137	0.152	0.212	0.186	0.174	0.215	0.214	0.203
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	mg/L	-	-	-	0.0029	0.0026	0.0048	0.0083	<0.0020	<0.0020	0.0022	0.003	0.0105	0.0065	0.0053	0.0051	0.002
Organic Carbon																	
Dissolved Organic Carbon	mg/L	-	-	-	4.01	3.83	4.27	3.54	3.73	3.8	4.08	4.62	5.24	3.88	4.29	4.36	4.16
Total Organic Carbon	mg/L	-	-	-	4.09	3.98	4.36	3.72	3.84	4.21	4.67	4.87	4.98	4.1	4.39	4.49	4.61
Total Metals																	
Aluminum (Al)-Total	mg/L	-	0.1	-	0.0768	0.0773	0.106	0.0673	0.0781	0.083	0.084	0.121	0.178	0.103	0.316	0.31	0.086
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.000077	0.00008	0.000081	0.000067	0.000076	0.000063	0.000082	0.000105	0.000119	0.000066	0.000133	0.000126	0.000102
Cadmium (Cd)-Total	µg/L	-	-	0.005	<0.0050	<0.0050	<0.0050	<0.0050	0.0927	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0133
Copper (Cu)-Total	mg/L	0.00148	1	-	0.000686	0.000674	0.000798	0.000596	0.000677	0.00064	0.000605	0.000803	0.00101	0.000455	0.00109	0.00111	0.000582
Iron (Fe)-Total	mg/L	1	0.3	-	0.0545	0.0675	0.072	0.045	0.0542	0.0512	0.05	0.0954	0.151	0.072	0.288	0.272	0.0888
Lead (Pb)-Total	mg/L	0.003	-	0.01	0.0000274	0.0000288	0.0000296	0.0000134	0.000184	0.0000217	0.0000155	0.0000465	0.0000807	0.0000273	0.000119	0.000119	0.0000443
Magnesium (Mg)-Total	mg/L	-	-	-	1.13	1.14	1.18	0.994	1.18	0.919	0.883	1.2	1.2	0.968	1.28	1.28	-
Manganese (Mn)-Total	mg/L	0.768	0.05	-	0.00209	0.00213	0.00309	0.00186	0.00324	0.00255	0.00236	0.00384	0.00597	0.00325	0.00783	0.00779	0.0045
Nickel (Ni)-Total	mg/L	0.025	-	-	0.000234	0.00026	0.00027	0.000199	0.000222	0.000223	0.000201	0.000279	0.000352	0.000245	0.000548	0.000485	0.000197
Sodium (Na)-Total	mg/L	-	200	-	2.53	2.46	2.52	2.22	2.53	2.01	2.11	2.76	2.8	2.33	2.7	2.74	2.26
Zinc (Zn)-Total	mg/L	0.0075	5	-	0.00029	0.00028	0.00045	0.00025	0.00047	0.00022	0.00029	0.00058	0.00096	0.00039	0.00114	0.00123	0.00045
Dissolved Metals																	
Aluminum (Al)-Dissolved	mg/L	0.05	0.1	-	0.0602	0.0593	0.0732	0.0786	0.062	0.0808	0.0815	0.0804	0.0917	0.0839	0.0926	0.0877	0.0789
Arsenic (As)-Dissolved	mg/L	0.005	-	0.01	0.000072	0.000077	0.000071	0.00007	0.000068	0.000072	0.000054	0.000093	0.000091	0.000087	0.000092	0.000083	0.000099
Cadmium (Cd)-Dissolved	µg/L	Calculated	-	5	0.0078	<0.0050	<0.0050	0.0117	0.0059	<0.0050	0.008	<0.0050	0.016	0.143	0.0774	0.0647	0.221
Copper (Cu)-Dissolved	mg/L	Calculated	1	-	0.000624	0.000669	0.000689	0.000667	0.000568	0.000655	0.000641	0.000722	0.000775	0.000642	0.000742	0.000683	0.000599
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0354	0.0367	0.0418	0.0348	0.0374	0.0434	0.0435	0.0589	0.062	0.0608	0.073	0.0693	0.0509
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.0000142	0.0000143	0.000021	0.0000112	0.0000105	0.0000158	0.0000309	0.0000253	0.0000313	0.000018	0.0000661	0.0000323	0.000175
Magnesium (Mg)-Dissolved	mg/L	-	-	-	1.13	1.13	1.08	1.01	1.05	0.957	0.922	1.18	1.15	1.12	1.26	1.14	0.949
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.00109	0.0011	0.00144	0.0012	0.00145	0.00196	0.00197	0.00192	0.00239	0.00238	0.00278	0.00227	0.00235
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.000229	0.000213	0.000218	0.00024	0.000179	0.000217	0.000189	0.00027	0.000261	0.000212	0.000246	0.000213	0.000188
Sodium (Na)-Dissolved	mg/L	-	200	-	2.51	2.36	2.33	2.36	2.4	2.31	2.07	2.69	2.69	2.66	2.75	2.64	2.1
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00066	0.00031	0.00063	0.00073	0.00033	0.00046	0.00035	0.0008	0.00088	0.00087	0.00057	0.00061	0.00097
Hydrocarbons																	
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TEH10-30	mg/L	-	-	-	-	-	<0.10	-	-	-	-	-	<0.10	-	-	-	-
Benzo(a)pyrene	mg/L	0.00001	-	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Pyrene	mg/L	0.00002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

BCAWQG/BCWWQG AL = BC Approved/Working Water Quality Guidelines for Freshwater Aquatic Life
GCDWQ AO = Guidelines for Canadian Drinking Water Quality Aesthetic Objectives
GCDWQ MAC = Guidelines for Canadian Drinking Water Quality Maximum Acceptable Concentration
Result exceeds the acute BCAWQG/BCWWQG AL
5-in-30 day average concentration exceeds the chronic BCAWQG AL
Result exceeds the GCDWQ
Result exceeds both the BCAWQG AL and the GCDWQ

Table 3-4
Concentrations of key detected parameters at S-7 and S-8

Analyte	Units	Guideline			S-7 (EMS E306327)							S-8 (EMS 1199906)							
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16	9-Nov-16		16-Nov-16	23-Nov-16	29-Nov-16	12-Dec-16	31-Oct-16	9-Nov-16	16-Nov-16		23-Nov-16	29-Nov-16	12-Dec-16	
General Parameters																			
Temperature	°C				9.3	10.1	10.1	7.2	6.9	5.9	3.2	9.3	10.1	7.3	7.3	6.9	6.2	3.2	3.2
Conductivity	uS/cm	-	-	-	49.1	46.5	46.9	45.9	47.9	41.5	46.3	50.2	48.7	47	47	48.9	42.3	47.5	47
Hardness (as CaCO3)	mg/L	-	-	-	18.6	18.3	18.4	19	17.3	15.9	16.4	19.2	18.8	19.2	18.9	17.7	14.9	15.3	14.5
pH	pH	6.5 - 9	6.5 - 8.5	-	7.36	7.32	7.33	7.3	7.37	7.29	7.19	7.33	7.35	7.3	7.29	7.33	7.3	7.18	7.19
Total Suspended Solids	mg/L	-	-	-	<1.0	2.2	2.5	<1.0	1.9	9.9	1.1	1.7	4.9	<1.0	<1.0	6.2	2.4	2.3	2.6
Turbidity	NTU	-	-	-	1.5	2.27	2.33	0.51	3.06	1.42	1.3	2.54	4.23	0.89	1.1	4.71	1.32	1.43	1.24
Chloride (Cl)	mg/L	150	250	-	3.86	3.17	3.17	3.11	3.15	2.65	4.32	3.9	3.22	3.14	3.15	3.17	2.68	4.38	4.37
Sulfate (SO4)	mg/L	128	500	-	3.89	3.31	3.31	3.14	3.36	2.85	2.87	3.84	3.3	3.12	3.12	3.35	2.82	2.86	2.85
Nutrients																			
Ammonia, Total (as N)	mg/L	0.102	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0058	<0.0050	<0.0050	<0.0050
Nitrate (as N)	mg/L	3	-	10	0.0654	0.0663	0.0658	0.0731	0.102	0.0934	0.128	0.0639	0.0728	0.074	0.0741	0.102	0.0962	0.131	0.131
Total Nitrogen	mg/L	-	-	-	0.221	0.214	0.211	0.193	0.229	0.278	0.238	0.214	0.224	0.196	0.206	0.521	0.236	0.24	0.234
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	<0.0010	0.0012	0.0012	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	mg/L	-	-	-	0.0052	0.008	0.0083	0.034	0.0037	0.0034	0.0055	0.0064	0.0104	<0.0020	0.0082	0.0153	0.002	0.0069	0.0063
Organic Carbon																			
Dissolved Organic Carbon	mg/L	-	-	-	4.65	4.73	4.81	3.97	4.4	4.12	4.07	4.77	5.25	4.3	4.15	4.57	4.4	4.41	4.17
Total Organic Carbon	mg/L	-	-	-	4.68	5.29	5.36	4.08	4.45	5.51	4.16	4.86	5.27	4.29	4.67	4.95	4.53	4.57	4.41
Total Metals																			
Aluminum (Al)-Total	mg/L	-	0.1	-	0.152	0.166	0.2	0.0973	0.193	0.183	0.102	0.16	0.262	0.107	0.105	0.31	0.17	0.104	0.104
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.00012	0.000107	0.000114	0.000087	0.000093	0.000094	0.000068	0.000113	0.000134	0.000088	0.000086	0.00015	0.000103	0.000071	0.000072
Cadmium (Cd)-Total	µg/L	-	-	0.005	0.0292	<0.0050	<0.0050	<0.0050	<0.0050	0.0051	<0.0050	0.0346	<0.0050	<0.0050	<0.0050	0.0082	<0.0050	<0.0050	<0.0050
Copper (Cu)-Total	mg/L	0.00148	1	-	0.000955	0.000956	0.000981	0.000674	0.000965	0.000896	0.000616	0.000928	0.0012	0.000701	0.00072	0.00126	0.00075	0.000603	0.000654
Iron (Fe)-Total	mg/L	1	0.3	-	0.131	0.154	0.184	0.0818	0.196	0.168	0.0796	0.156	0.279	0.0918	0.0913	0.301	0.135	0.0848	0.0796
Lead (Pb)-Total	mg/L	0.003	-	0.01	0.0000646	0.0000867	0.0000811	0.0000326	0.000108	0.000118	0.0000509	0.0000996	0.000151	0.0000356	0.0000365	0.000171	0.0000949	0.00005	0.000052
Magnesium (Mg)-Total	mg/L	-	-	-	1.39	1.27	1.33	1.13	1.32	1.07	1.02	1.3	1.33	1.19	1.16	1.32	0.959	1.02	1.02
Manganese (Mn)-Total	mg/L	0.768	0.05	-	0.00502	0.00663	0.00752	0.00393	0.00888	0.0124	0.0047	0.00521	0.00887	0.00446	0.00429	0.0124	0.0107	0.00502	0.00451
Nickel (Ni)-Total	mg/L	0.025	-	-	0.000323	0.000318	0.000339	0.000219	0.000391	0.000306	0.000225	0.000339	0.000468	0.000224	0.0002	0.000486	0.000247	0.000212	0.00021
Sodium (Na)-Total	mg/L	-	200	-	3.16	2.88	2.93	2.6	2.37	2.22	2.75	2.66	2.97	2.67	2.63	2.86	2.43	2.66	2.71
Zinc (Zn)-Total	mg/L	0.0075	5	-	0.00194	0.00118	0.00132	0.00064	0.00103	0.0015	0.00081	0.00091	0.00178	0.00069	0.0007	0.00205	0.00102	0.00085	0.00094
Dissolved Metals																			
Aluminum (Al)-Dissolved	mg/L	0.05	0.1	-	0.0767	0.0872	0.0814	0.0788	0.0885	0.0932	0.0866	0.0789	0.0925	0.0772	0.0792	0.0935	0.0751	0.0779	0.0758
Arsenic (As)-Dissolved	mg/L	0.005	-	0.01	0.000093	0.000097	0.000093	0.000077	0.000087	0.000121	0.000072	0.000088	0.000101	0.000081	0.000082	0.00009	0.000093	0.000065	0.000068
Cadmium (Cd)-Dissolved	µg/L	Calculated	-	5	0.0156	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0135	<0.0050	<0.0050	<0.0050	0.0759	<0.0050	<0.0050	<0.0050
Copper (Cu)-Dissolved	mg/L	Calculated	1	-	0.00076	0.00111	0.000741	0.000645	0.000672	0.000753	0.000628	0.000807	0.000795	0.000669	0.00066	0.000807	0.000779	0.000553	0.000521
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0614	0.0633	0.0619	0.0607	0.0711	0.0564	0.0471	0.0669	0.07	0.0618	0.0633	0.0828	0.0569	0.0449	0.0428
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.0000349	0.0000417	0.0000352	0.0000192	0.0000294	0.000018	0.0000331	0.0000379	0.0000367	0.0000211	0.0000194	0.0000421	0.0000272	0.0000203	0.0000206
Magnesium (Mg)-Dissolved	mg/L	-	-	-	1.22	1.2	1.14	1.17	1.19	1.08	1.15	1.29	1.26	1.21	1.24	1.19	0.883	1.06	1.01
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.00221	0.00269	0.00252	0.00249	0.00234	0.0022	0.00272	0.00253	0.00312	0.00276	0.00283	0.00474	0.00267	0.00272	0.00265
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.00024	0.000234	0.000227	0.000189	0.000202	0.000233	0.000202	0.000245	0.000238	0.000197	0.000203	0.000217	0.000175	0.000181	0.000183
Sodium (Na)-Dissolved	mg/L	-	200	-	2.78	2.72	2.73	2.72	2.65	2.54	3.11	2.73	2.76	2.73	2.75	2.53	2.38	2.87	2.79
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00086	0.0013	0.001	0.00075	0.00061	0.00101	0.00098	0.00182	0.00118	0.00087	0.00061	0.00128	0.00126	0.00097	0.00109
Hydrocarbons																			
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TEH10-30	mg/L	-	-	-	-	<0.10	<0.10	-	-	-	-	-	<0.10	-	-	-	-	-	-
Benzo(a)pyrene	mg/L	0.00001	-	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000171	<0.0000050	<0.0000050	<0.0000050
Pyrene	mg/L	0.00002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000044	<0.000010	<0.000010	<0.000010

BCAWQG/BCWWQG AL = BC Approved/Working Water Quality Guidelines for Freshwater Aquatic Life
GCDWQ AO = Guidelines for Canadian Drinking Water Quality Aesthetic Objectives
GCDWQ MAC = Guidelines for Canadian Drinking Water Quality Maximum Acceptable Concentration
Result exceeds the acute BCAWQG/BCWWQG AL
5-in-30 day average concentration exceeds the chronic BCAWQG AL
Result exceeds the GCDWQ
Result exceeds both the BCAWQG AL and the GCDWQ

3.4.1 Dissolved Aluminum

The aquatic life guideline for dissolved aluminum is based on the water pH. When the pH is greater than 6.5, which was the case for all sites during all sample events, the acute guideline is 0.1 mg/L and the chronic guideline is 0.05 mg/L (MOE 2001). None of the measured concentrations exceeded the acute guideline, but the 5-in-30 average concentrations at most sites exceeded the chronic guideline. Table 3-5 provides a comparison of the results with the pH-based acute and chronic guidelines.

Table 3-5
Dissolved aluminum aquatic life guideline comparison

Site	Acute			Chronic	
	Acute guideline (mg/L) ¹	Highest measured concentration (mg/L)	Date of highest concentration	Chronic guideline (mg/L) ¹	5-in-30 average concentration (mg/L) ²
S-1	0.1	0.0841	29-Nov	0.05	0.0755
S-2 ³		0.0896	29-Nov		0.0794
S-3		0.0129	29-Nov		0.0065
S-4		0.0817	9-Nov		0.0742
S-5		0.0815	29-Nov		0.0711
S-6		0.0926	23-Nov		0.0855
S-7		0.0932	29-Nov		0.0849
S-8		0.0935	23-Nov		0.0838

Notes:

Bolded concentrations exceed the guideline.

¹ Applies when the pH is greater than 6.5, which was the case for all samples on all dates.

² Average is calculated from the 5-in-30 samples, including October 31 and November 9, 16, 23, and 29 data. For sites where duplicate samples were collected, the higher concentration was used for the average calculations.

³ Average does not represent 5-in-30 because S-2 was not sampled Oct 31 or Nov 9. The average shown here was calculated using all available data (November 16, 23, and 29 and December 12).

All sites on South Shawnigan Creek had 5-in-30 average dissolved aluminum concentrations above the chronic guideline, including upstream sites S-1 (control) and S-2. The average concentrations at S-1 and S-2 were slightly higher than at downstream site S-4. Site S-3 (near Lot 23), was the only site with an average aluminum concentration below the chronic guideline. These factors suggest either that the dissolved aluminum is naturally occurring or is widespread in the watershed for other reasons.

3.4.2 Dissolved Cadmium

The acute and chronic aquatic life guidelines for dissolved cadmium were calculated for each site using a formula that incorporates water hardness (MOE 2015b). As water hardness increases, the guideline also increases because hardness protects against toxicity. Table 3-6 provides a comparison of the results with the calculated guidelines. One site (S-6) had concentrations of dissolved cadmium that not only exceeded the chronic guideline, but also exceeded the acute guideline on three consecutive occasions (Table 3-6). This represents a relatively long exposure to the higher concentration.

At all other sites, dissolved cadmium concentrations were below the acute and chronic guidelines; although, the highest measured dissolved cadmium concentrations at S-4 and S-8 approached the acute guideline on two separate dates (Table 3-6).

Table 3-6
Dissolved cadmium aquatic life guideline comparison

Site	Acute			Chronic	
	Acute guideline (µg/L) ¹	Highest measured concentration(s) (µg/L)	Date of highest concentration	Chronic guideline (µg/L) ²	5-in-30 average concentration (µg/L) ³
S-1	0.053	0.0176	Nov 9	0.047	< ⁴
S-2	0.054	0.0149	Nov 23	0.046	< ⁴
S-3	0.610	0.0489	Nov 9	0.350	0.021
S-4	0.072	0.0618	Nov 29	0.053	0.032
S-5	0.079	0.0117	Nov 16	0.058	0.008
S-6	0.076	0.143, 0.0774, 0.221	Nov 16, 23, 29	0.057	0.092
S-7	0.089	0.0156	Oct 31	0.059	< ⁴
S-8	0.080	0.0759	Nov 23	0.060	< ⁴

Notes:

Bolded concentrations exceed the guideline.

¹ Calculated according to the formula $e^{[1.03 \cdot \ln(\text{hardness}) - 5.274]}$, using the lowest measured hardness at each site, which is considered a conservative approach because the guideline increases as the hardness increases. At all sites, hardness remained below 455 mg/L, which is the upper bound for the acute equation (MOE 2015b).

² Calculated according to the formula $e^{[0.736 \cdot \ln(\text{hardness}) - 4.943]}$, using the 5-in-30 day average hardness. At all sites, hardness remained below 285 mg/L, which is the upper bound for the chronic equation (MOE 2015b).

³ Calculated from the 5-in-30 samples, including October 31 and November 9, 16, 23, and 29 data. For sites where duplicate samples were collected, the higher concentration was used for the average calculations.

⁴ Average was not calculated because more than 50% of samples were below detection.

It appears from the data that the source of much of the cadmium contamination is from the Van Horne Creek watershed. The 5-in-30 chronic guideline and acute guideline exceedances at S-6 may warrant further investigation of land use around the creek. Certainly there is recent logging, roadways and other disturbances in the area that may contribute to contaminated runoff.

3.4.3 Hydrocarbons

On November 23, benzo[a]pyrene (0.0000171 mg/L) and pyrene (0.000044 mg/L) at S-8 exceeded the aquatic life guidelines of 0.00001 mg/L and 0.00002 mg/L, respectively. The guideline for benzo[a]pyrene is considered a chronic guideline, and this parameter was not detected at S-8 during the other sampling events. The guideline for pyrene is based on phototoxic effects, meaning that sunlight increases pyrene toxicity. Benzo[a]pyrene is among the other polycyclic hydrocarbons (PAHs) also known to be influenced by phototoxicity (Lyons et al. 2002).

Other PAHs detected at S-8 during the November 23 sampling event included benz[a]anthracene, benzo[b]fluoranthene, benzo[g,h,i]perylene, chrysene, fluoranthene, and indeno[1,2,3-c,d]pyrene; but all

either met guidelines or do not have a guideline. Nevertheless, these are usually not naturally-occurring compounds. Sources include industrial activities, forest fires, fossil-fuel combustion (including emissions from vehicles), and waste incineration (CCME 1999).

During all other sampling events and at all other sites (including S-7), hydrocarbons were not detected.⁵ Therefore, the source of the hydrocarbons at S-8 is likely either runoff from Sooke Lake Road, West Shawnigan Lake Road (bridge crossings) or various unidentified land uses between S-7 and S-8 (Figure 3-13).



Figure 3-13
Land use near South Shawnigan Creek between Sites S-7 and S-8 (Google Earth image, 8/18/2016)

⁵ These substances are more likely to be associated with sediments as they are not very water soluble.

3.4.4 Exceedances of Drinking Water Maximum Acceptable Concentration and Aesthetic Objective

The results at all sites generally met the drinking water guidelines, with the exception of total iron and benzo[a]pyrene at S-8 on November 23. The measured concentration of total iron (0.301 mg/L) is equivalent to the drinking water guideline of 0.3 mg/L. The guideline level for iron is based on *aesthetic concerns* (i.e., staining of plumbing fixtures) and not on health-based concerns (Health Canada 2014).

The measured concentration of benzo[a]pyrene (0.0000171 mg/L) exceeded the health-based guideline of 0.00001 mg/L, which is founded on health concerns. We understand that South Shawnigan Creek is not a direct drinking water source, but flows into Shawnigan Lake, which is used as a drinking water source. Neither iron nor benzo[a]pyrene exceeded the drinking water guidelines at the other sites. Therefore, it is possible the exceedances in S-8 are attributed to roadways and/or land use between S-7 and S-8, as discussed above.

3.5 QUALITY ASSURANCE AND QUALITY CONTROL

The average RPD, based on 12 duplicate sample pairs, was 8%, which is reasonable agreement between sample analyses. Higher variability than this can sometimes occur with surface water, given the variability that occurs within a flowing stream.

A number of parameters were detected in both the field and trip blanks (see Appendix B for a summary). Results for detected parameters were discussed with the laboratory, and compared with the concentrations detected in the samples and with guideline levels. For the most part, the detected concentrations are attributed to analytical variability, as most of the concentrations are close to their detection limits. Other possible sources include the bottles (for trip or field blanks) or the field filters (for dissolved metals in field blanks).

In several cases, the reported concentrations of dissolved metals in the actual site samples were higher than the concentration of *total* metals for the same parameter in the same sample. In theory, this should not occur and therefore the laboratory flags the data and confirms the result. The cause is likely the same as the reason metals were detected in the blank samples (analytical variability or field filters), or may be a result of actual sample differences because samples for dissolved metals are collected in different bottles than the samples for total metals. Samples are collected simultaneously, but small differences in water chemistry can be expected due to the nature of flowing water.

Overall, the data are considered reliable because the levels at which QA/QC parameters were detected are much lower than what was detected in the samples. The only exceptions are dissolved and total zinc, which were found in the trip and field blanks at levels similar to those found in the samples. This suggests that at least some of the detected zinc in the samples may not actually be present in the water. However, this would cause the concentrations to be higher, and all results were below the most stringent guidelines.

4 Conclusions and Next Steps

4.1 CONCLUSIONS AND KEY FINDINGS

The second quarterly water quality sampling was designed to capture results from the rainy season. Given the high levels of precipitation during this period, flowing water was consistently found (unlike during the dry season). This allowed for good comparisons between upstream and downstream conditions.

Between October 31 and December 12, 2016, six sets of water quality samples were collected for the South Shawnigan Creek Water Quality Study. Key findings were as follows:

- With a few notable exceptions, the water quality overall was relatively good considering the many anthropogenic disturbances in the watershed.
- Concentrations of many parameters increased from upstream to downstream locations, and often the greatest increases occurred downstream of Van Horne Creek.
- Levels of some parameters were higher at S-3, the ephemeral creek fed by groundwater and the discharge from CHH, but guidelines were not exceeded here. More information is needed about upgradient groundwater quality to make further conclusions about whether the concentrations at this site are normal for the area or not. There was no evidence that the next nearest site downstream on South Shawnigan Creek (S-5) was influenced by the levels found at S-3.
- The water quality guideline exceedances included the following:
 - **Dissolved aluminum:** The 5-in-30 average concentration of dissolved aluminum exceeded the chronic aquatic life guideline at all sites except S-3. None of the individual results exceeded the acute guidelines. The fact that dissolved aluminum was also found at similar levels in the upstream control sites (S-1 and S-2) suggests that the dissolved aluminum may be either naturally occurring or is widespread in the watershed for other reasons.
 - **Dissolved cadmium:** At site S-6, the 5-in-30 average concentration of dissolved cadmium exceeded the chronic aquatic life guideline, and the concentrations on three consecutive dates exceeded the acute guideline.
 - **Polycyclic aromatic hydrocarbons:** Benzo[a]pyrene and pyrene in S-8 exceeded aquatic life guidelines during one sampling event (November 23). During that sampling event, other hydrocarbons were also detected at S-8 but did not exceed guidelines. During all other events and at all other sites, hydrocarbons were not detected. The detected concentrations could be from roadways and/or land uses between S-7 and S-8.
 - **Total iron:** At S-8 on November 23, the concentration of total iron slightly exceeded the drinking water aesthetic objective.
- **Van Horne Creek** may be a source of contamination near the confluence with South Shawnigan Creek, but the many diverse land disturbances throughout the watersheds also likely contribute.

4.2 NEXT STEPS

The 5-in-30 sampling sessions are now complete, and data have been obtained for both the dry and rainy seasons. Monthly sampling will occur from January to June, 2017. One more brief quarterly report will be provided after the results for March are received, with the final report following receipt of the June results.

Results described in this report will be presented and discussed at the upcoming meeting of interested parties on February 1st, 2017.

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Appendix A – Photographs

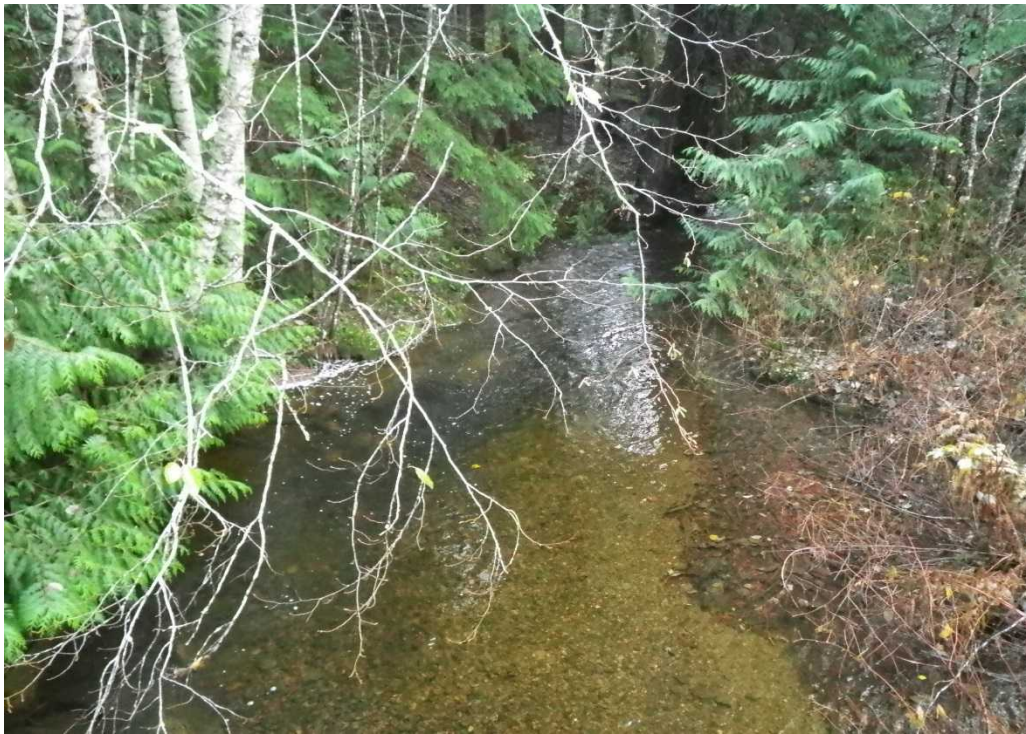


Figure A-1: Site S-1 - South Shawnigan Creek downstream of Elkington Forest on November 9, 2016



Figure A-2: Site S-2 - South Shawnigan Creek upstream of Lots 21 and 23, on November 16, 2016



Figure A-3: Site S-3 - Ephemeral creek downstream of Lot 23 and upstream of the confluence with South Shawnigan Creek on December 12, 2016



Figure A-4: Site S-3 - Discharge pipe below the settling pond at Lot 23 (upstream of site S-3) on December 12, 2016

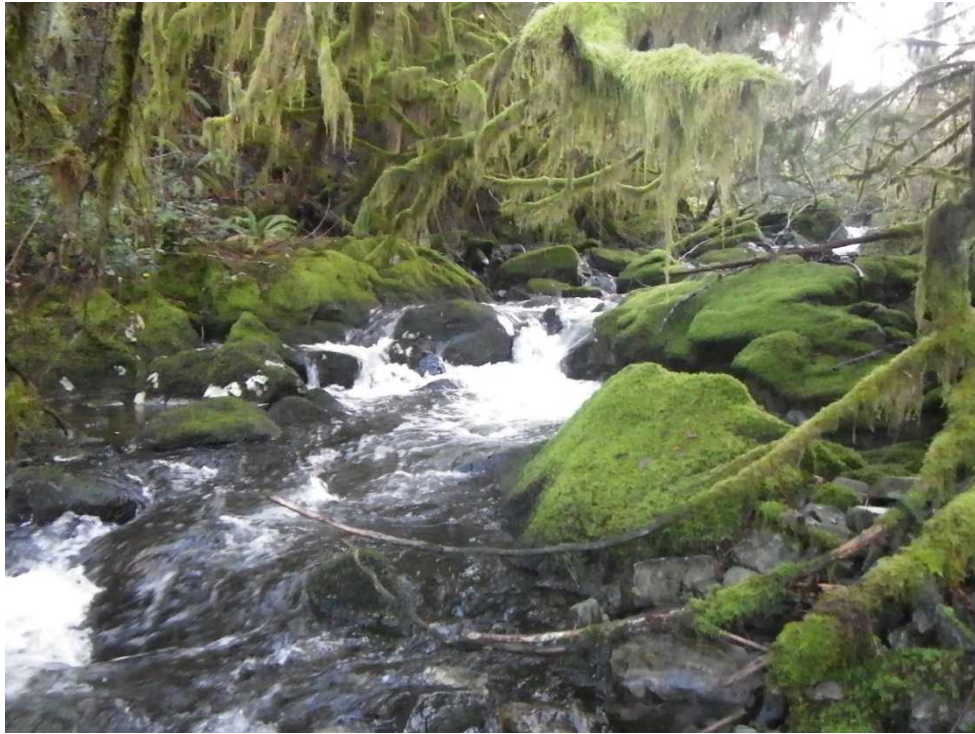


Figure A-5: Site S-4 - South Shawnigan Creek downstream of Lot 21 and upstream of the Lot 23 ephemeral creek inflow on November 16, 2016



Figure A-6: Site S-5 - South Shawnigan Creek downstream of the confluence with the ephemeral creek and upstream of the confluence with Van Horne Creek on November 16, 2016

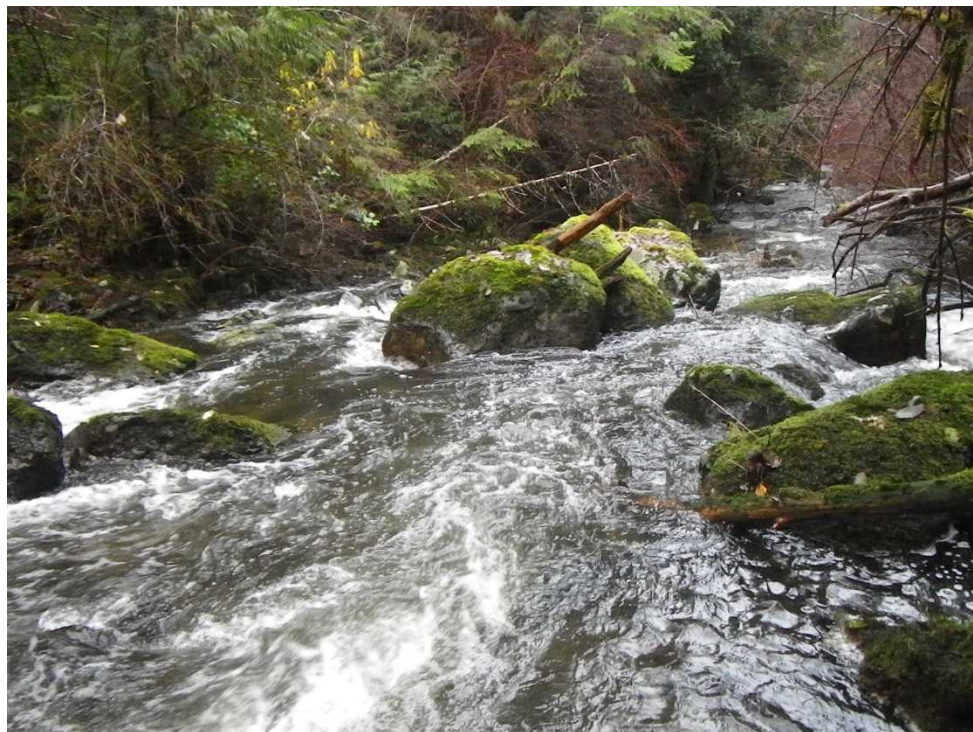


Figure A-7: Site S-6 - South Shawnigan Creek downstream of Van Horne Creek on November 16, 2016

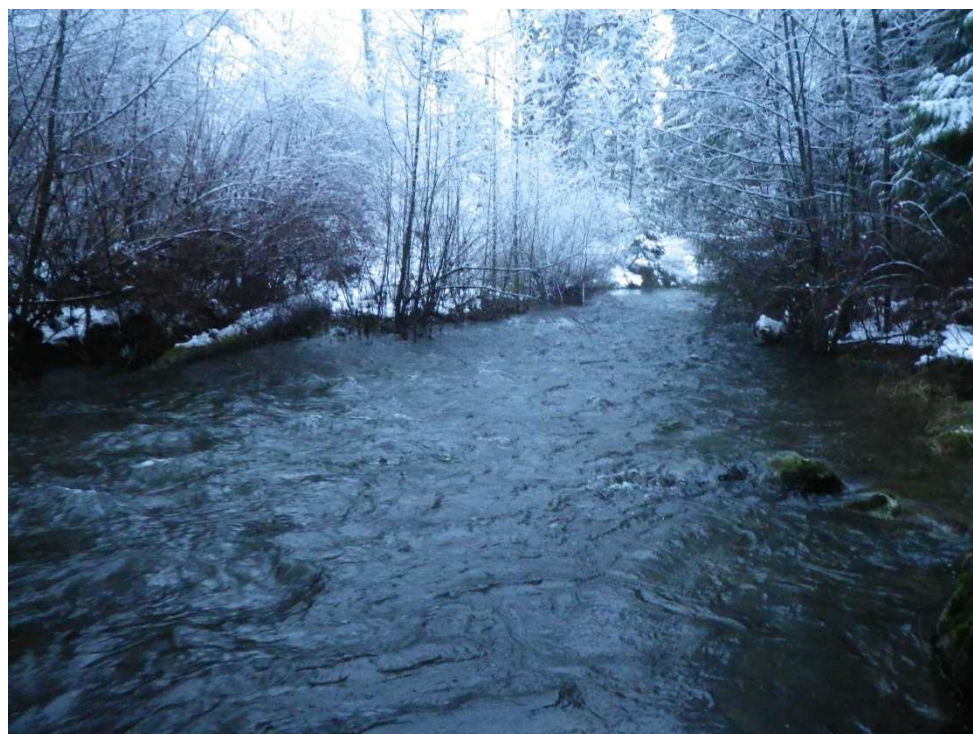


Figure A-8: Site S-7 - South Shawnigan Creek at Sooke Lake Road on December 12, 2016



Figure A-9: Site S-8 - South Shawnigan Creek as near as possible to the inflow to Shawnigan Lake (downstream of all other sites) on December 12, 2016

Appendix B – Water Quality Data: October to December 2016

Quarterly Summary Report #2
Water Quality Results (all sites)

Analyte	Units	Guideline			S-1 (EMS E294426)						S-2 (EMS E306323)				
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16	9-Nov-16	16-Nov-16	23-Nov-16	29-Nov-16	12-Dec-16	16-Nov-16		23-Nov-16	29-Nov-16	12-Dec-16
General Parameters															
Temperature	°C					9.5	7.3	6.7	5.8	2.2	7.0	7.0	6.8	5.8	2.2
Conductivity	uS/cm	-	-	-	33.2	33.7	33.1	34.5	30.2	29.9	36.5	34.5	35.8	32.8	31
Hardness (as CaCO3)	mg/L	-	-	-	13.5	11.9	13.3	14.1	11.4	9.68	14.3	14.3	13	12.3	9.79
pH	pH	6.5 - 9	6.5 - 8.5	-	7.06	7.16	7.03	7.35	7.16	7.07	6.94	6.9	7.37	7.15	7.07
Total Suspended Solids	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	-	-	-	0.71	0.21	0.25	0.23	0.24	0.25	0.32	0.27	0.41	0.31	0.57
Chloride (Cl)	mg/L	150	250	-	2.85	2.4	2.51	2.38	2.18	2.29	2.65	2.64	2.48	2.23	2.38
Sulfate (SO4)	mg/L	128	500	-	1.49	1.4	1.4	1.37	1.37	1.42	1.43	1.42	1.39	1.38	1.44
Nutrients															
Ammonia, Total (as N)	mg/L	0.102	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L	-	-	10	0.0279	0.0175	0.0243	0.0375	0.0265	0.044	0.025	0.0249	0.0415	0.028	0.0516
Nitrate (as N)	mg/L	3	-	10	0.0279	0.0175	0.0243	0.0375	0.0265	0.044	0.025	0.0249	0.0415	0.028	0.0516
Nitrite (as N)	mg/L	0.02	-	1	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	-	-	-	0.129	0.108	0.096	0.096	0.115	0.084	0.097	0.099	0.095	0.11	0.109
Total Nitrogen	mg/L	-	-	-	0.157	0.126	0.121	0.134	0.141	0.128	0.122	0.124	0.137	0.138	0.16
Total Organic Nitrogen	mg/L	-	-	-	0.13	0.107	0.095	0.093	0.114	0.082	0.096	0.098	0.091	0.108	0.106
Dissolved Kjeldahl Nitrogen	mg/L	-	-	-	0.148	0.097	0.1	0.098	0.106	0.09	0.105	0.098	0.1	0.098	0.09
Total Dissolved Nitrogen	mg/L	-	-	-	0.176	0.115	0.124	0.135	0.132	0.134	0.13	0.123	0.142	0.126	0.142
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	mg/L	-	-	-	0.003	0.0031	0.0021	<0.010	0.0021	0.0034	<0.0020	<0.0020	0.0027	<0.0020	0.0039
Organic Carbon															
Dissolved Organic Carbon	mg/L	-	-	-	4.37	3.84	3.76	3.65	4.95	4.3	3.81	3.95	3.81	3.93	4.7
Total Organic Carbon	mg/L	-	-	-	4.49	4.05	3.8	3.77	4.37	3.69	3.88	3.89	3.9	4.18	4.11
Total Metals															
Mercury (Hg)-Total	mg/L	0.00001	-	0.001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-
Aluminum (Al)-Total	mg/L	-	0.1	-	0.0714	0.0821	0.0775	0.0826	0.107	0.0936	0.1	0.0915	0.054	0.0849	0.099
Antimony (Sb)-Total	mg/L	-	-	0.006	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.000074	0.000069	0.000073	0.000067	0.000074	0.000063	0.000073	0.000067	0.000089	0.000072	0.000055
Barium (Ba)-Total	mg/L	1	-	1	0.00325	0.00294	0.00281	0.00309	0.00325	0.00292	0.0031	0.00305	0.0029	0.00302	0.00274
Beryllium (Be)-Total	mg/L	0.00013	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi)-Total	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B)-Total	mg/L	1.2	-	5	0.0055	0.0059	<0.0050	<0.0050	<0.0050	<0.0050	0.0057	<0.0050	<0.0050	0.0066	<0.0050
Cadmium (Cd)-Total	µg/L	-	-	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Calcium (Ca)-Total	mg/L	-	-	-	3.95	3.86	3.94	4.38	3.32	3.29	4.28	4.2	4.16	3.39	2.82
Chromium (Cr)-Total	mg/L	0.001	-	0.05	0.00012	0.00014	0.00013	0.00013	0.00015	0.00015	0.00014	0.00014	0.00012	0.00013	0.00016
Cobalt (Co)-Total	mg/L	0.004	-	-	0.0000566	0.0000526	0.0000561	0.0000568	0.0000634	0.0000457	0.00018	0.000145	0.0000706	0.0000661	0.0000828
Copper (Cu)-Total	mg/L	0.00148	1	-	0.000724	0.000671	0.000628	0.00065	0.000777	0.000629	0.000686	0.000779	0.000678	0.000572	0.000631
Iron (Fe)-Total	mg/L	1	0.3	-	0.0475	0.041	0.0464	0.0474	0.0517	0.0447	0.0778	0.0749	0.0519	0.0425	0.0582
Lead (Pb)-Total	mg/L	0.003	-	0.01	0.000254	0.0000166	0.0000137	0.0000139	0.0000232	0.0000189	0.0000344	0.0000236	0.0000164	0.0000218	0.0000256
Lithium (Li)-Total	mg/L	0.014	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	-	0.704	0.723	0.7	0.716	0.743	0.671	0.735	0.748	0.508	0.642	0.651
Manganese (Mn)-Total	mg/L	0.768	0.05	-	0.00308	0.00275	0.00276	0.00331	0.00295	0.00231	0.0216	0.0161	0.00459	0.004	0.00655
Molybdenum (Mo)-Total	mg/L	1	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000051	<0.000050
Nickel (Ni)-Total	mg/L	0.025	-	-	0.000165	0.000167	0.000168	0.00016	0.000187	0.000141	0.000181	0.000219	0.000183	0.000126	0.000149
Potassium (K)-Total	mg/L	373	-	-	0.156	0.129	0.109	0.112	0.116	0.136	0.115	0.11	0.112	0.117	0.13
Selenium (Se)-Total	mg/L	0.001	-	0.05	0.000044	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	0.00004	<0.000040	0.000051	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	-	-	-	2.79	3.25	3.02	3.2	3.57	3.64	3.15	3.19	2.83	3.06	3.26
Silver (Ag)-Total	mg/L	0.00005	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Total	mg/L	-	200	-	1.83	1.91	1.82	1.91	1.76	1.95	1.87	1.84	1.89	1.71	1.76
Strontium (Sr)-Total	mg/L	-	-	-	0.0158	0.0158	0.0156	0.0172	0.0128	0.0136	0.0167	0.0164	0.0205	0.0131	0.0122
Thallium (Tl)-Total	mg/L	0.0008	-	-	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000035	<0.0000020	<0.0000020	<0.0000020	0.0000025	0.0000037
Tin (Sn)-Total	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Total	mg/L	0.0085	-	0.02	0.000009	0.00001	0.0000094	0.0000114	0.0000079	0.0000098	0.0000143	0.0000128	0.0000117	0.0000084	0.0000091
Vanadium (V)-Total	mg/L	0.006	-	-	<0.00020	0.00022	<0.00020	<0.00020	<0.00020	<0.00020	0.00025	0.00028	0.00021	<0.00020	0.00022
Zinc (Zn)-Total	mg/L	0.0075	5	-	0.00063	0.00043	0.00052	0.0003	0.00039	0.00057	0.00057	0.00046	0.00043	0.00033	0.00055
Dissolved Metals															
Aluminum (Al)-Dissolved	mg/L	0.05	0.1	-	0.0695	0.0722	0.0774	0.0745	0.0841	0.0766	0.081	0.0778	0.0641	0.0896	0.0827
Antimony (Sb)-Dissolved	mg/L	-	-	0.006	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Arsenic (As)-Dissolved	mg/L	0.005	-	0.01	0.00007	0.000063	0.000071	0.000074	0.000069	0.000057	0.000076	0.00008	0.000066	0.000075	0.000056
Barium (Ba)-Dissolved	mg/L	1	-	1	0.00311	0.00278	0.00278	0.00304	0.00244	0.00262	0.00299	0.00289	0.00303	0.0032	0.00252
Beryllium (Be)-Dissolved	mg/L	0.00013	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi)-Dissolved	mg/L	-	-	-	<0.0000050	<0.0000									

Quarterly Summary Report #2
Water Quality Results (all sites)

Analyte	Units	Guideline			S-1 (EMS E294426)						S-2 (EMS E306323)				
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16	9-Nov-16	16-Nov-16	23-Nov-16	29-Nov-16	12-Dec-16	16-Nov-16		23-Nov-16	29-Nov-16	12-Dec-16
Cadmium (Cd)-Dissolved	µg/L	Calculated	-	5	<0.0050	0.0176	<0.0050	<0.0050	0.0051	<0.0050	<0.0050	<0.0050	0.0149	0.0075	<0.0050
Calcium (Ca)-Dissolved	mg/L	4	-	-	4.21	3.68	4.16	4.43	3.52	2.9	4.45	4.48	3.97	3.79	2.87
Chromium (Cr)-Dissolved	mg/L	0.001	-	0.05	0.00013	0.00013	0.00013	0.00014	0.00018	0.00012	0.00015	0.00014	0.00013	0.00015	0.00014
Cobalt (Co)-Dissolved	mg/L	0.004	-	-	0.0000508	0.000043	0.000049	0.0000449	0.0000429	0.0000356	0.0000858	0.0000797	0.0000615	0.0000657	0.000046
Copper (Cu)-Dissolved	mg/L	Calculated	1	-	0.000699	0.000645	0.000635	0.000635	0.000634	0.00055	0.000655	0.000633	0.000608	0.000679	0.000626
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0413	0.0328	0.0405	0.0385	0.0401	0.0319	0.0563	0.0689	0.0461	0.049	0.0378
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.000018	0.0000133	0.0000108	0.0000094	0.000184	0.0000124	0.000012	0.0000117	0.0000159	0.0000243	0.0000115
Lithium (Li)-Dissolved	mg/L	0.014	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium (Mg)-Dissolved	mg/L	-	-	-	0.719	0.67	0.711	0.729	0.634	0.594	0.784	0.766	0.741	0.675	0.637
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.0021	0.00164	0.00214	0.00182	0.00142	0.00132	0.00852	0.0074	0.00479	0.00943	0.00387
Molybdenum (Mo)-Dissolved	mg/L	1	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.000176	0.00015	0.000166	0.000153	0.000158	0.000141	0.000185	0.000174	0.000151	0.000167	0.00013
Potassium (K)-Dissolved	mg/L	373	-	-	0.16	0.123	0.116	0.111	0.121	0.122	0.119	0.118	0.106	0.123	0.13
Selenium (Se)-Dissolved	mg/L	0.001	-	0.05	0.000045	<0.000040	0.000042	<0.000040	0.000052	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Dissolved	mg/L	-	-	-	2.88	3.1	3.14	3.14	2.87	3.18	3.27	3.27	2.97	2.9	3.1
Silver (Ag)-Dissolved	mg/L	0.00005	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Dissolved	mg/L	-	200	-	1.94	1.77	1.88	1.95	1.78	1.78	1.97	1.96	1.78	1.74	1.76
Strontium (Sr)-Dissolved	mg/L	-	-	-	0.0155	0.0153	0.0161	0.0166	0.0124	0.0125	0.0162	0.0161	0.0163	0.0146	0.0121
Thallium (Tl)-Dissolved	mg/L	0.0008	-	-	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000029	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000031
Tin (Sn)-Dissolved	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Dissolved	mg/L	0.0085	-	0.02	0.0000092	0.0000087	0.0000094	0.0000107	0.0000091	0.0000079	0.0000092	0.0000089	0.0000102	0.0000085	0.0000078
Vanadium (V)-Dissolved	mg/L	0.006	-	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00023	0.00022	<0.00020	<0.00020	<0.00020
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00045	0.00053	0.00055	0.00029	0.00059	0.00073	0.00153	0.00048	0.00123	0.00074	0.00041
Hydrocarbons															
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TEH10-30	mg/L	-	-	-	-	<0.10	-	-	-	-	-	-	-	-	-
2-Bromobenzotrifluoride	%	-	-	-	92.5	98.7	89.8	116	100.4	94.7	97.1	92.7	110.3	101.5	104.9
Acenaphthene	mg/L	0.006	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine	mg/L	0.00005	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L	0.0001	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L	0.0001	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(a)pyrene	mg/L	0.00001	-	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Benzo(b)fluoranthene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(k)fluoranthene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chrysene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dibenz(a,h)anthracene	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Fluoranthene	mg/L	0.0002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Fluorene	mg/L	0.012	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Naphthalene	mg/L	0.001	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Phenanthrene	mg/L	0.0003	-	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Pyrene	mg/L	0.00002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Quinoline	mg/L	0.0034	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Acridine d9	%	-	-	-	90.7	86.4	93.1	83	66.8	112.5	103.2	96.1	99.6	74.9	90.2
Chrysene d12	%	-	-	-	87.2	101.4	81.8	60.7	78.4	118.9	92.9	84.2	63.7	79.3	100.7
Naphthalene d8	%	-	-	-	104.6	109.8	90.8	99.2	79.4	123.3	94.5	92.3	107.7	78.8	105.8
Phenanthrene d10	%	-	-	-	104.3	109.6	102.9	97.3	79	120.4	109	104.3	100.5	79.9	108.8

BCAWQG/BCWWQG AL = BC Approved/Working Water Quality Guidelines for Freshwater Aquatic Life
GCDWQ AO = Guidelines for Canadian Drinking Water Quality Aesthetic Objectives
GCDWQ MAC = Guidelines for Canadian Drinking Water Quality Maximum Acceptable Concentration
Result exceeds the acute BCAWQG/BCWWQG AL
5-in-30 day average concentration exceeds the chronic BCAWQG AL
Result exceeds the GCDWQ
Result exceeds both the BCAWQG AL and the GCDWQ

Quarterly Summary Report #2 Water Quality Results (all sites)																				
Analyte	Units	Guideline			S-3 (EMS E306324)								S-4 (EMS E294425)							
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16	9-Nov-16		16-Nov-16	23-Nov-16	29-Nov-16		12-Dec-16		31-Oct-16		9-Nov-16	16-Nov-16	23-Nov-16		29-Nov-16
General Parameters																				
Temperature	°C				9.9	10.0	10.0	9.7	8.6	7.2	7.2	4.5	4.5	8.5	8.5		6.9	6.3	6.3	
Conductivity	uS/cm	-	-	-	740	522	545	566	566	418	416	333	334	43.7	42	40.7	39.6	41.3	41	35.3
Hardness (as CaCO3)	mg/L	-	-	-	257	182	195	202	197	155	136	108	104	16	15.9	15.7	16	16.1	16.6	13
pH	pH	6.5 - 9	6.5 - 8.5	-	7.73	7.77	7.76	7.51	8.05	7.78	7.81	7.76	7.77	7.38	7.35	7.35	7.32	7.4	7.34	7.28
Total Suspended Solids	mg/L	-	-	-	<1.0	3.5	1.8	<1.0	3.4	1.7	1.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	-	-	-	1.03	3.43	3.24	0.32	1.68	1.17	0.8	2.21	2.13	0.78	1.15	0.42	0.34	0.36	0.44	0.35
Chloride (Cl)	mg/L	150	250	-	98.1	56.9	56.7	61.8	59.6	40	40	28.7	28.7	3.2	3.2	2.78	2.78	2.69	2.69	2.37
Sulfate (SO4)	mg/L	128	500	-	162	109	109	111	101	76.2	76.3	60.8	60.9	2.43	2.42	2.29	1.98	2.17	2.18	1.79
Nutrients																				
Ammonia, Total (as N)	mg/L	0.102	-	-	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L	-	-	10	1.07	0.72	0.728	0.699	0.716	0.572	0.575	0.503	0.505	0.0267	0.0276	0.0212	0.0278	0.0469	0.0471	0.0308
Nitrate (as N)	mg/L	3	-	10	1.07	0.72	0.728	0.699	0.716	0.572	0.575	0.503	0.503	0.0267	0.0276	0.0212	0.0278	0.0469	0.0471	0.0308
Nitrite (as N)	mg/L	0.02	-	1	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	-	-	-	<0.11	0.102	<0.080	<0.076	<0.078	<0.063	<0.063	<0.054	<0.056	0.131	0.129	0.106	0.103	0.103	0.1	0.11
Total Nitrogen	mg/L	-	-	-	1.11	0.822	0.797	0.757	0.783	0.634	0.63	0.544	0.559	0.158	0.156	0.127	0.131	0.149	0.147	0.141
Total Organic Nitrogen	mg/L	-	-	-	<0.22	<0.16	<0.16	<0.15	<0.16	<0.13	<0.13	<0.11	<0.11	0.129	0.127	0.105	0.101	0.1	0.096	0.109
Dissolved Kjeldahl Nitrogen	mg/L	-	-	-	<0.050	<0.078	0.093	<0.077	<0.079	<0.061	<0.061	<0.055	<0.054	0.14	0.124	0.119	0.106	0.101	0.105	0.102
Total Dissolved Nitrogen	mg/L	-	-	-	0.189	0.779	0.82	0.773	0.788	0.607	0.607	0.552	0.54	0.166	0.152	0.14	0.133	0.147	0.153	0.132
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	0.0031	0.0036	0.0034	0.0033	0.0032	0.0032	0.0031	0.0024	0.0026	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	mg/L	-	-	-	0.0048	0.0133	0.0152	0.0093	0.0048	0.0037	<0.010	0.0064	0.006	0.0041	0.0033	0.0057	<0.0020	<0.0020	0.0022	<0.0020
Organic Carbon																				
Dissolved Organic Carbon	mg/L	-	-	-	1.69	2.54	1.4	1.56	1.48	0.91	1.22	1.14	1	4.75	4.46	4.45	3.86	3.76	4.02	3.82
Total Organic Carbon	mg/L	-	-	-	1.79	1.59	1.77	1.59	1.46	1.03	1.24	1.16	1.13	4.76	4.8	4.61	4.11	4.07	3.98	4.41
Total Metals																				
Mercury (Hg)-Total	mg/L	0.00001	-	0.001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Aluminum (Al)-Total	mg/L	-	0.1	-	0.0397	0.147	0.143	0.0233	0.0828	0.0999	0.0369	0.0749	0.0776	0.0951	0.0919	0.0969	0.0748	0.0881	0.0883	0.0728
Antimony (Sb)-Total	mg/L	-	-	0.006	0.000367	0.000302	0.000297	0.000295	0.000269	0.000252	0.000269	0.000182	0.000178	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.000125	0.000152	0.000141	0.000107	0.000125	0.000112	0.000099	0.000077	0.000085	0.000083	0.000091	0.000085	0.000075	0.000075	0.000077	0.000073
Barium (Ba)-Total	mg/L	1	-	1	0.0257	0.0165	0.0172	0.0171	0.0167	0.0108	0.0107	0.00799	0.00797	0.00372	0.00381	0.00354	0.00386	0.00355	0.00356	0.00265
Beryllium (Be)-Total	mg/L	0.00013	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi)-Total	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B)-Total	mg/L	1.2	-	5	0.0385	0.0307	0.0297	0.0277	0.0258	0.0218	0.0174	0.0174	0.018	0.0054	0.0056	0.0062	0.0052	<0.0050	0.0051	<0.0050
Cadmium (Cd)-Total	µg/L	-	-	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0146	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0137	<0.0050	<0.0050	<0.0050	0.0124
Calcium (Ca)-Total	mg/L	-	-	-	80.1	63.2	65.3	65.5	63.3	45.4	43	33.6	33.4	4.84	5.08	5.1	4.55	5.22	4.97	3.69
Chromium (Cr)-Total	mg/L	0.001	-	0.05	0.00016	0.0003	0.00032	0.00011	0.0002	0.00019	0.00014	0.00017	0.00018	0.00015	0.00018	0.00016	0.00014	0.00015	0.00015	

Quarterly Summary Report #2 Water Quality Results (all sites)																				
Analyte	Units	Guideline			S-3 (EMS E306324)								S-4 (EMS E294425)							
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16	9-Nov-16		16-Nov-16	23-Nov-16	29-Nov-16		12-Dec-16		31-Oct-16		9-Nov-16	16-Nov-16	23-Nov-16		29-Nov-16
Cadmium (Cd)-Dissolved	µg/L	Calculated	-	5	<0.0050	0.0489	<0.0050	0.0163	0.0122	0.0225	0.006	<0.0050	<0.0050	<0.0050	<0.0050	0.0326	0.035	0.0238	0.0064	0.0618
Calcium (Ca)-Dissolved	mg/L	4	-	-	79.1	57.6	61.6	63.6	62.9	48.9	43.6	33.4	32.1	4.74	4.68	4.65	4.76	4.81	4.95	3.85
Chromium (Cr)-Dissolved	mg/L	0.001	-	0.05	<0.00010	<0.00010	0.00013	<0.00010	<0.00010	<0.00010	0.0001	<0.00010	0.00029	0.00015	0.00013	0.00015	0.00014	0.00013	0.00013	0.00016
Cobalt (Co)-Dissolved	mg/L	0.004	-	-	0.0000826	0.0000533	0.0000538	0.0000547	0.0000661	0.0000403	0.0000392	0.0000395	0.0000353	0.0000534	0.0000531	0.0000556	0.0000586	0.0000487	0.000051	0.000045
Copper (Cu)-Dissolved	mg/L	Calculated	1	-	0.00144	0.00119	0.0016	0.00125	0.00109	0.000975	0.0011	0.000803	0.000834	0.000776	0.000704	0.000713	0.000707	0.000617	0.000639	0.000503
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0034	0.0033	0.0042	0.0017	0.0019	0.002	0.0156	0.0044	0.0064	0.0511	0.051	0.0647	0.0555	0.0481	0.052	0.0508
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.0000123	0.0000094	0.000016	0.000008	0.0000122	0.0000437	0.0000261	0.0000118	0.0000273	0.0000214	0.0000216	0.0000174	0.0000139	0.0000455	0.000024	0.0000233
Lithium (Li)-Dissolved	mg/L	0.014	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium (Mg)-Dissolved	mg/L	-	-	-	14.4	9.3	9.98	10.6	9.83	8.07	6.64	5.98	5.72	1.02	1.02	0.991	1	0.984	1.03	0.816
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.00453	0.00213	0.00217	0.00145	0.00399	0.000888	0.000898	0.00114	0.00113	0.00318	0.00327	0.00357	0.00332	0.00349	0.00361	0.00428
Molybdenum (Mo)-Dissolved	mg/L	1	-	-	0.0015	0.00134	0.00136	0.00133	0.00121	0.001	0.00104	0.000735	0.000766	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.000867	0.000632	0.000625	0.000552	0.000599	0.000441	0.000391	0.000543	0.000435	0.000248	0.000257	0.000271	0.000231	0.000196	0.000212	0.000162
Potassium (K)-Dissolved	mg/L	373	-	-	2.09	1.48	1.61	1.53	1.4	1.17	1.09	0.873	0.824	0.187	0.186	0.172	0.141	0.129	0.137	0.139
Selenium (Se)-Dissolved	mg/L	0.001	-	0.05	0.000429	0.000347	0.000342	0.000351	0.000324	0.00031	0.000277	0.00023	0.000219	0.000049	0.000054	<0.000040	0.000044	<0.000040	<0.000040	<0.000040
Silicon (Si)-Dissolved	mg/L	-	-	-	4.82	3.9	4.64	4.46	4.12	4.1	3.66	4.26	4.09	2.97	2.95	3.22	3.37	2.98	3.09	2.24
Silver (Ag)-Dissolved	mg/L	0.00005	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Dissolved	mg/L	-	200	-	40.4	27.4	28.3	29	26.2	22.4	19	13.1	12.5	2.09	2.11	2.11	2.18	2.05	2.13	1.91
Strontium (Sr)-Dissolved	mg/L	-	-	-	0.283	0.177	0.223	0.241	0.226	0.116	0.123	0.115	0.111	0.0188	0.0191	0.0181	0.0178	0.0186	0.0198	0.0168
Thallium (Tl)-Dissolved	mg/L	0.0008	-	-	0.0000061	0.000003	0.0000029	0.0000029	0.0000026	0.0000023	0.0000023	0.0000026	0.0000029	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Tin (Sn)-Dissolved	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Dissolved	mg/L	0.0085	-	0.02	0.00108	0.000799	0.000794	0.000821	0.000855	0.000549	0.000534	0.000383	0.000371	0.0000091	0.0000089	0.0000086	0.0000091	0.00001	0.00001	0.0000054
Vanadium (V)-Dissolved	mg/L	0.006	-	-	0.00094	0.00085	0.00087	0.00089	0.00074	0.0007	0.00064	0.00051	0.00049	0.00023	0.00023	0.00023	0.00022	<0.00020	0.0002	<0.00020
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00109	0.00061	0.00054	0.00047	0.00037	0.00044	0.00042	0.00022	0.00019	0.00083	0.00066	0.00113	0.0004	0.00053	0.00049	0.00089
Hydrocarbons																				
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TEH10-30	mg/L	-	-	-	-	<0.10	<0.10	-	-	-	-	-	-	-	-	<0.10	-	-	-	-
2-Bromobenzotrifluoride	%	-	-	-	94.3	89.1	83.3	82.2	90	106.3	113.1	107	88.7	88.9	99	85.7	86.5	114.3	117.4	96.2
Acenaphthene	mg/L	0.006	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine	mg/L	0.00005	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L	0.0001	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L	0.0001	-	-	<0.000010															

Quarterly Summary Report #2
Water Quality Results (all sites)

Analyte	Units	Guideline			S-5 (EMS E306325)							S-6 (EMS E306326)					
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16		9-Nov-16	16-Nov-16	23-Nov-16	29-Nov-16		31-Oct-16	9-Nov-16	16-Nov-16	23-Nov-16		29-Nov-16
General Parameters																	
Temperature	°C				8.7	8.7	9.7	7.0	6.7	5.9	5.9	8.8	9.9	7.0	6.7	6.7	5.8
Conductivity	uS/cm	-	-	-	48	47.1	43.9	43.4	47.5	38.2	37.6	49.4	45.3	45.5	49.5	49.2	40.8
Hardness (as CaCO3)	mg/L	-	-	-	18.7	18.2	17.1	18	17.8	15.8	14.2	18.2	17.8	18	18.1	16.7	13.7
pH	pH	6.5 - 9	6.5 - 8.5	-	7.41	7.34	7.25	7.2	7.38	7.24	7.27	7.34	7.27	7.29	7.38	7.39	7.26
Total Suspended Solids	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1	<1.0	1.1	<1.0	2.7	2.4	1.1
Turbidity	NTU	-	-	-	0.63	0.69	0.64	0.2	0.48	0.41	0.46	1.27	2.52	0.36	5.68	6.13	1.52
Chloride (Cl)	mg/L	150	250	-	3.9	3.89	3.17	3.17	3.28	2.56	2.56	4.01	3.28	3.24	3.41	3.4	2.68
Sulfate (SO4)	mg/L	128	500	-	3.76	3.77	3.13	2.84	3.31	2.3	2.3	4.11	3.58	3.31	3.77	3.77	2.99
Nutrients																	
Ammonia, Total (as N)	mg/L	0.102	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0065	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L	-	-	10	0.0343	0.0345	0.0259	0.0355	0.0598	0.0363	0.0368	0.0577	0.053	0.0585	0.0922	0.0912	0.0744
Nitrate (as N)	mg/L	3	-	10	0.0343	0.0345	0.0259	0.0355	0.0598	0.0363	0.0368	0.0577	0.053	0.0585	0.0922	0.0912	0.0744
Nitrite (as N)	mg/L	0.02	-	1	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	-	-	-	0.12	0.11	0.11	0.097	0.096	0.101	0.116	0.155	0.133	0.116	0.122	0.123	0.128
Total Nitrogen	mg/L	-	-	-	0.154	0.145	0.136	0.132	0.156	0.137	0.152	0.212	0.186	0.174	0.215	0.214	0.203
Total Organic Nitrogen	mg/L	-	-	-	0.12	0.112	0.109	0.096	0.094	0.101	0.109	0.155	0.131	0.114	0.12	0.12	0.128
Dissolved Kjeldahl Nitrogen	mg/L	-	-	-	0.11	0.116	0.104	0.091	0.096	0.105	0.102	0.144	0.13	0.111	0.124	0.125	0.115
Total Dissolved Nitrogen	mg/L	-	-	-	0.144	0.15	0.13	0.126	0.156	0.141	0.138	0.202	0.183	0.169	0.216	0.216	0.189
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	mg/L	-	-	-	0.0029	0.0026	0.0048	0.0083	<0.0020	<0.0020	0.0022	0.003	0.0105	0.0065	0.0053	0.0051	0.002
Organic Carbon																	
Dissolved Organic Carbon	mg/L	-	-	-	4.01	3.83	4.27	3.54	3.73	3.8	4.08	4.62	5.24	3.88	4.29	4.36	4.16
Total Organic Carbon	mg/L	-	-	-	4.09	3.98	4.36	3.72	3.84	4.21	4.67	4.87	4.98	4.1	4.39	4.49	4.61
Total Metals																	
Mercury (Hg)-Total	mg/L	0.00001	-	0.001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Aluminum (Al)-Total	mg/L	-	0.1	-	0.0768	0.0773	0.106	0.0673	0.0781	0.083	0.084	0.121	0.178	0.103	0.316	0.31	0.086
Antimony (Sb)-Total	mg/L	-	-	0.006	<0.000020	<0.000020	<0.000020	<0.000020	0.000024	<0.000020	<0.000020	0.000023	0.000023	0.000021	0.000024	0.000024	0.000021
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.000077	0.00008	0.000081	0.000067	0.000076	0.000063	0.000082	0.000105	0.000119	0.000066	0.000133	0.000126	0.000102
Barium (Ba)-Total	mg/L	1	-	1	0.00407	0.00425	0.00379	0.00326	0.00392	0.00302	0.00274	0.00466	0.0047	0.00378	0.00596	0.00594	0.00307
Beryllium (Be)-Total	mg/L	0.00013	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi)-Total	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B)-Total	mg/L	1.2	-	5	0.0074	0.007	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0069	0.0055	<0.0050	0.0051	0.0053	<0.0050
Cadmium (Cd)-Total	µg/L	-	-	0.005	<0.0050	<0.0050	<0.0050	<0.0050	0.0927	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0133
Calcium (Ca)-Total	mg/L	-	-	-	5.68	5.46	5.63	4.97	5.59	4.02	4.07	5.37	5.47	5.2	5.11	5.22	4.19
Chromium (Cr)-Total	mg/L	0.001	-	0.05	0.00014	0.00027	0.00017	0.00013	0.00017	0.00033	0.00015	0.00023	0.00028	0.00014	0.00048	0.00042	0.0002
Cobalt (Co)-Total	mg/L	0.004	-	-	0.0000517	0.0000586	0.0000672	0.0000487	0.0000557	0.0000539	0.0000363	0.0000664	0.0000923	0.0000655	0.000157	0.000148	0.0000658
Copper (Cu)-Total	mg/L	0.00148	1	-	0.000686	0.000674	0.000798	0.000596	0.000677	0.00064	0.000605	0.000803	0.00101	0.000455	0.00109	0.00111	0.000582
Iron (Fe)-Total	mg/L	1	0.3	-	0.0545	0.0675	0.072	0.045	0.0542	0.0512	0.05	0.0954	0.151	0.072	0.288	0.272	0.0888
Lead (Pb)-Total	mg/L	0.003	-	0.01	0.0000274	0.0000288	0.0000296	0.0000134	0.000184	0.0000217	0.0000155	0.0000465	0.0000807	0.0000273	0.000119	0.000119	0.0000443
Lithium (Li)-Total	mg/L	0.014	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	-	1.13	1.14	1.18	0.994	1.18	0.919	0.883	1.2	1.2	0.968	1.28	1.28	-
Manganese (Mn)-Total	mg/L	0.768	0.05	-	0.00209	0.00213	0.00309	0.00186	0.00324	0.00255	0.00236	0.00384	0.00597	0.00325	0.00783	0.00779	0.0045
Molybdenum (Mo)-Total	mg/L	1	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.025	-	-	0.0												

Quarterly Summary Report #2
Water Quality Results (all sites)

Analyte	Units	Guideline			S-5 (EMS E306325)							S-6 (EMS E306326)					
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16		9-Nov-16	16-Nov-16	23-Nov-16	29-Nov-16		31-Oct-16	9-Nov-16	16-Nov-16	23-Nov-16		29-Nov-16
Cadmium (Cd)-Dissolved	µg/L	Calculated	-	5	0.0078	<0.0050	<0.0050	0.0117	0.0059	<0.0050	0.008	<0.0050	0.016	0.143	0.0774	0.0647	0.221
Calcium (Ca)-Dissolved	mg/L	4	-	-	5.62	5.42	5.05	5.53	5.39	4.75	4.17	5.35	5.25	5.37	5.17	4.83	3.92
Chromium (Cr)-Dissolved	mg/L	0.001	-	0.05	0.00012	0.00011	0.00017	0.00016	0.00012	0.00016	0.00015	0.00015	0.00019	0.00015	0.00017	0.00016	0.00017
Cobalt (Co)-Dissolved	mg/L	0.004	-	-	0.0000438	0.0000387	0.000046	0.0000455	0.0000369	0.0000453	0.0000461	0.0000504	0.0000516	0.0000486	0.000056	0.0000493	0.0000391
Copper (Cu)-Dissolved	mg/L	Calculated	1	-	0.000624	0.000669	0.000689	0.000667	0.000568	0.000655	0.000641	0.000722	0.000775	0.000642	0.000742	0.000683	0.000599
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0354	0.0367	0.0418	0.0348	0.0374	0.0434	0.0435	0.0589	0.062	0.0608	0.073	0.0693	0.0509
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.0000142	0.0000143	0.000021	0.0000112	0.0000105	0.0000158	0.0000309	0.0000253	0.0000313	0.000018	0.0000661	0.0000323	0.000175
Lithium (Li)-Dissolved	mg/L	0.014	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium (Mg)-Dissolved	mg/L	-	-	-	1.13	1.13	1.08	1.01	1.05	0.957	0.922	1.18	1.15	1.12	1.26	1.14	0.949
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.00109	0.0011	0.00144	0.0012	0.00145	0.00196	0.00197	0.00192	0.00239	0.00238	0.00278	0.00227	0.00235
Molybdenum (Mo)-Dissolved	mg/L	1	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.000229	0.000213	0.000218	0.00024	0.000179	0.000217	0.000189	0.00027	0.000261	0.000212	0.000246	0.000213	0.000188
Potassium (K)-Dissolved	mg/L	373	-	-	0.236	0.225	0.205	0.162	0.152	0.175	0.157	0.344	0.315	0.233	0.272	0.243	0.225
Selenium (Se)-Dissolved	mg/L	0.001	-	0.05	<0.000040	<0.000040	<0.000040	0.000044	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	0.000044	<0.000040	<0.000040	0.000043
Silicon (Si)-Dissolved	mg/L	-	-	-	3.1	3.09	3.33	3.19	3.01	3.27	3.4	3.61	3.84	3.7	3.95	3.63	3.03
Silver (Ag)-Dissolved	mg/L	0.00005	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Dissolved	mg/L	-	200	-	2.51	2.36	2.33	2.36	2.4	2.31	2.07	2.69	2.69	2.66	2.75	2.64	2.1
Strontium (Sr)-Dissolved	mg/L	-	-	-	0.0213	0.0222	0.022	0.0224	0.0218	0.0166	0.0141	0.0208	0.0205	0.0185	0.0213	0.0205	0.0136
Thallium (Tl)-Dissolved	mg/L	0.0008	-	-	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Tin (Sn)-Dissolved	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Dissolved	mg/L	0.0085	-	0.02	0.0000076	0.0000076	0.0000076	0.0000065	0.0000087	0.0000084	0.0000062	0.0000076	0.0000065	0.0000065	0.0000069	0.0000071	0.0000051
Vanadium (V)-Dissolved	mg/L	0.006	-	-	0.00022	0.00022	0.00025	0.00022	<0.00020	0.00021	<0.00020	0.00033	0.00034	0.00031	0.00035	0.00033	0.00027
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00066	0.00031	0.00063	0.00073	0.00033	0.00046	0.00035	0.0008	0.00088	0.00087	0.00057	0.00061	0.00097
Hydrocarbons																	
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TEH10-30	mg/L	-	-	-	-	-	<0.10	-	-	-	-	-	<0.10	-	-	-	-
2-Bromobenzotrifluoride	%	-	-	-	82.9	93	96.1	88.2	102.8	115.7	110	94.3	96.8	89.8	122.2	118.5	99
Acenaphthene	mg/L	0.006	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine	mg/L	0.00005	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L	0.0001	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L	0.0001	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(a)pyrene	mg/L	0.00001	-	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Benzo(b)fluoranthene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(k)fluoranthene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chrysene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dibenz(a,h)anthracene	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Fluoranthene	mg/L	0.0002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Fluorene	mg/L	0.012	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Naphthalene	mg/L	0.001	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Phenanthrene	mg/L	0.0003	-	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Pyrene	mg/L	0.00002															

BCAWQG/BCWWQG AL = BC Approved/Working Water Quality Guidelines for Freshwater Aquatic Life
GCDWQ AO = Guidelines for Canadian Drinking Water Quality Aesthetic Objectives
GCDWQ MAC = Guidelines for Canadian Drinking Water Quality Maximum Acceptable Concentration
Result exceeds the acute BCAWQG/BCWWQG AL
5-in-30 day average concentration exceeds the chronic BCAWQG AL
Result exceeds the GCDWQ
Result exceeds both the BCAWQG AL and the GCDWQ

Quarterly Summary Report #2
Water Quality Results (all sites)

Analyte	Units	Guideline			S-7 (EMS E306327)							S-8 (EMS 1199906)							
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16	9-Nov-16		16-Nov-16	23-Nov-16	29-Nov-16	12-Dec-16	31-Oct-16	9-Nov-16	16-Nov-16		23-Nov-16	29-Nov-16	12-Dec-16	
General Parameters																			
Temperature	°C				9.3	10.1	10.1	7.2	6.9	5.9	3.2	9.3	10.1	7.3	7.3	6.9	6.2	3.2	3.2
Conductivity	uS/cm	-	-	-	49.1	46.5	46.9	45.9	47.9	41.5	46.3	50.2	48.7	47	47	48.9	42.3	47.5	47
Hardness (as CaCO3)	mg/L	-	-	-	18.6	18.3	18.4	19	17.3	15.9	16.4	19.2	18.8	19.2	18.9	17.7	14.9	15.3	14.5
pH	pH	6.5 - 9	6.5 - 8.5	-	7.36	7.32	7.33	7.3	7.37	7.29	7.19	7.33	7.35	7.3	7.29	7.33	7.3	7.18	7.19
Total Suspended Solids	mg/L	-	-	-	<1.0	2.2	2.5	<1.0	1.9	9.9	1.1	1.7	4.9	<1.0	<1.0	6.2	2.4	2.3	2.6
Turbidity	NTU	-	-	-	1.5	2.27	2.33	0.51	3.06	1.42	1.3	2.54	4.23	0.89	1.1	4.71	1.32	1.43	1.24
Chloride (Cl)	mg/L	150	250	-	3.86	3.17	3.17	3.11	3.15	2.65	4.32	3.9	3.22	3.14	3.15	3.17	2.68	4.38	4.37
Sulfate (SO4)	mg/L	128	500	-	3.89	3.31	3.31	3.14	3.36	2.85	2.87	3.84	3.3	3.12	3.12	3.35	2.82	2.86	2.85
Nutrients																			
Ammonia, Total (as N)	mg/L	0.102	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0058	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L	-	-	10	0.0654	0.0663	0.0658	0.0731	0.102	0.0934	0.128	0.0639	0.0728	0.074	0.0741	0.102	0.0962	0.132	0.131
Nitrate (as N)	mg/L	3	-	10	0.0654	0.0663	0.0658	0.0731	0.102	0.0934	0.128	0.0639	0.0728	0.074	0.0741	0.102	0.0962	0.131	0.131
Nitrite (as N)	mg/L	0.02	-	1	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010
Total Kjeldahl Nitrogen	mg/L	-	-	-	0.156	0.148	0.145	0.119	0.127	0.184	0.11	0.15	0.151	0.122	0.132	0.419	0.14	0.108	0.103
Total Nitrogen	mg/L	-	-	-	0.221	0.214	0.211	0.193	0.229	0.278	0.238	0.214	0.224	0.196	0.206	0.521	0.236	0.24	0.234
Total Organic Nitrogen	mg/L	-	-	-	0.156	0.147	0.144	0.118	0.124	0.183	0.107	0.148	0.149	0.12	0.131	0.414	0.138	0.105	0.1
Dissolved Kjeldahl Nitrogen	mg/L	-	-	-	0.153	0.144	0.137	0.129	0.132	0.117	0.097	0.146	0.134	0.117	0.111	0.191	0.117	0.088	0.096
Total Dissolved Nitrogen	mg/L	-	-	-	0.218	0.21	0.203	0.202	0.235	0.211	0.225	0.21	0.207	0.191	0.185	0.293	0.213	0.22	0.227
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	<0.0010	0.0012	0.0012	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	mg/L	-	-	-	0.0052	0.008	0.0083	0.034	0.0037	0.0034	0.0055	0.0064	0.0104	<0.0020	0.0082	0.0153	0.002	0.0069	0.0063
Organic Carbon																			
Dissolved Organic Carbon	mg/L	-	-	-	4.65	4.73	4.81	3.97	4.4	4.12	4.07	4.77	5.25	4.3	4.15	4.57	4.4	4.41	4.17
Total Organic Carbon	mg/L	-	-	-	4.68	5.29	5.36	4.08	4.45	5.51	4.16	4.86	5.27	4.29	4.67	4.95	4.53	4.57	4.41
Total Metals																			
Mercury (Hg)-Total	mg/L	0.00001	-	0.001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	<0.0000050	0.0000057	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	-
Aluminum (Al)-Total	mg/L	-	0.1	-	0.152	0.166	0.2	0.0973	0.193	0.183	0.102	0.16	0.262	0.107	0.105	0.31	0.17	0.104	0.104
Antimony (Sb)-Total	mg/L	-	-	0.006	0.000029	0.000028	0.000027	0.000026	0.000025	0.000025	0.000024	0.00003	0.000031	0.000025	0.000026	0.000028	0.000024	0.000023	0.000023
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.00012	0.000107	0.000114	0.000087	0.000093	0.000094	0.000068	0.000113	0.000134	0.000088	0.000086	0.00015	0.000103	0.000071	0.000072
Barium (Ba)-Total	mg/L	1	-	1	0.0043	0.00418	0.00404	0.00346	0.00501	0.00413	0.00383	0.00466	0.00535	0.00371	0.00368	0.00582	0.00381	0.00382	0.00369
Beryllium (Be)-Total	mg/L	0.00013	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi)-Total	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B)-Total	mg/L	1.2	-	5	0.0068	0.0055	0.0052	<0.0050	0.0056	<0.0050	<0.0050	0.0067	0.0057	<0.0050	<0.0050	0.0056	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	µg/L	-	-	0.005	0.0292	<0.0050	<0.0050	<0.0050	<0.0050	0.0051	<0.0050	0.0346	<0.0050	<0.0050	<0.0050	0.0082	<0.0050	<0.0050	<0.0050
Calcium (Ca)-Total	mg/L	-	-	-	6.35	5.49	5.74	5.28	4.87	4.23	3.89	5.56	6.15	5.71	5.05	5.54	4.58	4.06	3.88
Chromium (Cr)-Total	mg/L	0.001	-	0.05	0.00029	0.00026	0.00034	0.00017	0.00028	0.00029	0.0002	0.00027	0.00043	0.00018	0.00019	0.00046	0.0003	0.00018	0.00023
Cobalt (Co)-Total	mg/L	0.004	-	-	0.0000848	0.0000928	0.000088	0.0000617	0.000132	0.000125	0.0000604	0.0000894	0.000147	0.0000645	0.0000672	0.000177	0.0000968	0.0000632	0.0000621
Copper (Cu)-Total	mg/L	0.00148	1	-	0.000955	0.000956	0.000981	0.000674	0.000965	0.000896	0.000616	0.000928	0.0012	0.000701	0.00072	0.00126	0.00075	0.000603	0.000654
Iron (Fe)-Total	mg/L	1	0.3	-	0.131	0.154	0.184	0.0818	0.196	0.168	0.0796	0.156	0.279	0.0918	0.0913	0.301	0.135	0.0848	0.0796
Lead (Pb)-Total	mg/L	0.003	-	0.01	0.0000646	0.0000867	0.0000811	0.0000326	0.000108	0.000118	0.0000509	0.0000996	0.000151	0.0000356	0.0000365	0.000171	0.0000949	0.00005	0.000052
Lithium (Li)-Total	mg/L	0.014	-	-	0.00187	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	-	1.39	1.27	1.33	1.13	1.32	1.07	1.02	1.3	1.33	1.19	1.16	1.32	0.959	1.02	1.02
Manganese (Mn)-Total	mg/L	0.768	0.05	-	0.00502	0.00663	0.00752	0.00393	0.00888	0.0124	0.0047	0.00521	0.00887	0.00446	0.00429	0.0124	0.0107	0.00502	0.00451
Molybdenum (Mo)-Total	mg/L	1	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.025	-	-	0.000323	0.000318	0.000339	0.000219	0.000391	0.000306	0.000225	0.000339	0.000468	0.000224	0.0002	0.000486	0.000247	0.000212	0.00021
Potassium (K)-Total	mg/L	373	-	-	0.391	0.337	0.356	0.238	0.248	0.254	0.266	0.357	0.357	0.246	0.232	0.32	0.278	0.274	0.268
Selenium (Se)-Total	mg/L	0.001	-	0.05	0.000045	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	0.000044	0.000044	0.00004	<0.000040	0.000041	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	-	-	-	4.53	4.61	5.36	3.93	4.13	4.23	4.02	4.11	4.87	4.11	3.94	4.66	4.1	4.08	4
Silver (Ag)-Total	mg/L	0.00005	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Total	mg/L	-	200	-	3.16	2.88	2.93	2.6	2.37	2.22	2.75	2.66	2.97	2.67	2.63	2.86	2.43	2.66	2.71
Strontium (Sr)-Total	mg/L	-	-	-	0.0216	0.0207	0.0212	0.0203	0.0173	0.0166	0.017	0.0215	0.0226	0.0209	0.021	0.0211	0.015	0.0169	0.0169
Thallium (Tl)-Total	mg/L	0.0008	-	-	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000025	0.0000029	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000027	0.0000034	0.0000031	0.0000035
Tin (Sn)-Total	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Total	mg/L	0.0085	-	0.02	0.0000078	0.0000079	0.0000073	0.0000066	0.0000094	0.0000082	0.0000076	0.0000096	0.0000093	0.0000072	0.000007	0.0000115	0.0000082	0.0000076	0.0000071
Vanadium (V)-Total	mg/L	0.006	-	-	0.00064	0.00067	0.00082	0.00042	0.00066	0.00063	0.00039	0.00064	0.001	0.00047	0.00047	0.00106	0.00064	0.00038	0.00037
Zinc (Zn)-Total	mg/L	0.0075	5	-	0.00194	0.00118	0.00132	0.00064	0.00103	0.0015	0.00081	0.00091	0.00178	0.00069	0.0007	0.00205	0.00102	0.00085	0.00094
Dissolved Metals																			
Aluminum (Al)-Dissolved	mg/L	0.05	0.1	-	0.0767	0.0872	0.0814	0.0788	0.0885	0.0932	0.0866	0.0789	0.0925	0.0772	0.0792	0.0935	0.0751	0.0779	0.0758
Antimony (Sb)-Dissolved	mg/L	-	-	0.006	0.000028	0.000031	0.000031	0.000023	0.000024	0.000023	0.000024	0.000028	0.00003	0.000024	0.000024	0.000023	0.000025		

Quarterly Summary Report #2
Water Quality Results (all sites)

Analyte	Units	Guideline			S-7 (EMS E306327)							S-8 (EMS 1199906)							
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	31-Oct-16	9-Nov-16		16-Nov-16	23-Nov-16	29-Nov-16	12-Dec-16	31-Oct-16	9-Nov-16	16-Nov-16		23-Nov-16	29-Nov-16	12-Dec-16	
Cadmium (Cd)-Dissolved	µg/L	Calculated	-	5	0.0156	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0135	<0.0050	<0.0050	<0.0050	0.0759	<0.0050	<0.0050	<0.0050
Calcium (Ca)-Dissolved	mg/L	4	-	-	5.46	5.34	5.48	5.69	4.97	4.59	4.68	5.58	5.44	5.7	5.52	5.13	4.5	4.39	4.14
Chromium (Cr)-Dissolved	mg/L	0.001	-	0.05	0.00017	0.00019	0.00023	0.00016	0.00016	0.00015	0.00018	0.00018	0.00019	0.00016	0.00016	0.00017	0.00019	0.00016	0.00014
Cobalt (Co)-Dissolved	mg/L	0.004	-	-	0.0000446	0.000048	0.0000486	0.0000516	0.0000525	0.0000463	0.000044	0.0000505	0.0000509	0.0000531	0.000053	0.0000675	0.0000486	0.0000404	0.0000407
Copper (Cu)-Dissolved	mg/L	Calculated	1	-	0.00076	0.00111	0.000741	0.000645	0.000672	0.000753	0.000628	0.000807	0.000795	0.000669	0.00066	0.000807	0.000779	0.000553	0.000521
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0614	0.0633	0.0619	0.0607	0.0711	0.0564	0.0471	0.0669	0.07	0.0618	0.0633	0.0828	0.0569	0.0449	0.0428
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.0000349	0.0000417	0.0000352	0.0000192	0.0000294	0.000018	0.0000331	0.0000379	0.0000367	0.0000211	0.0000194	0.0000421	0.0000272	0.0000203	0.0000206
Lithium (Li)-Dissolved	mg/L	0.014	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium (Mg)-Dissolved	mg/L	-	-	-	1.22	1.2	1.14	1.17	1.19	1.08	1.15	1.29	1.26	1.21	1.24	1.19	0.883	1.06	1.01
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.00221	0.00269	0.00252	0.00249	0.00234	0.0022	0.00272	0.00253	0.00312	0.00276	0.00283	0.00474	0.00267	0.00272	0.00265
Molybdenum (Mo)-Dissolved	mg/L	1	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000061	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.00024	0.000234	0.000227	0.000189	0.000202	0.000233	0.000202	0.000245	0.000238	0.000197	0.000203	0.000217	0.000175	0.000181	0.000183
Potassium (K)-Dissolved	mg/L	373	-	-	0.329	0.313	0.298	0.241	0.268	0.285	0.307	0.338	0.316	0.252	0.242	0.268	0.284	0.288	0.276
Selenium (Se)-Dissolved	mg/L	0.001	-	0.05	<0.000040	<0.000040	<0.000040	0.000049	0.000043	0.000062	<0.000040	<0.000040	<0.000040	0.000048	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Dissolved	mg/L	-	-	-	3.87	4.2	4.08	4.06	4.14	3.76	4.49	4.04	4.33	4.08	4.17	4.05	3.5	4.11	3.97
Silver (Ag)-Dissolved	mg/L	0.00005	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Dissolved	mg/L	-	200	-	2.78	2.72	2.73	2.72	2.65	2.54	3.11	2.73	2.76	2.73	2.75	2.53	2.38	2.87	2.79
Strontium (Sr)-Dissolved	mg/L	-	-	-	0.0209	0.0203	0.0202	0.0197	0.0191	0.0179	0.0191	0.0208	0.0206	0.0203	0.0196	0.0208	0.0183	0.017	0.0174
Thallium (Tl)-Dissolved	mg/L	0.0008	-	-	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000022	0.0000021	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.0000021	0.0000026	0.0000033
Tin (Sn)-Dissolved	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Dissolved	mg/L	0.0085	-	0.02	0.0000069	0.0000063	0.0000063	0.0000064	0.0000073	0.0000031	0.000007	0.0000061	0.0000062	0.0000061	0.0000059	0.0000074	0.0000062	0.0000061	0.0000063
Vanadium (V)-Dissolved	mg/L	0.006	-	-	0.00041	0.00044	0.00042	0.00038	0.00039	0.00031	0.0003	0.00043	0.00046	0.0004	0.00042	0.00043	0.00037	0.00029	0.00028
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00086	0.0013	0.001	0.00075	0.00061	0.00101	0.00098	0.00182	0.00118	0.00087	0.00061	0.00128	0.00126	0.00097	0.00109
Hydrocarbons																			
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TEH10-30	mg/L	-	-	-	-	<0.10	<0.10	-	-	-	-	-	<0.10	-	-	-	-	-	-
2-Bromobenzotrifluoride	%	-	-	-	96.2	88.9	95.5	91.9	100.7	98.7	80.1	97.3	94.1	101	93.4	95.8	96.2	89	92.1
Acenaphthene	mg/L	0.006	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine	mg/L	0.00005	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L	0.0001	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L	0.0001	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000027	<0.000010	<0.000010	<0.000010
Benzo(a)pyrene	mg/L	0.00001	-	0.00001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000171	<0.0000050	<0.0000050	<0.0000050
Benzo(b)fluoranthene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000025	<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000013	<0.000010	<0.000010	<0.000010
Benzo(k)fluoranthene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chrysene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000024	<0.000010	<0.000010	<0.000010
Dibenz(a,h)anthracene	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Fluoranthene	mg/L	0.0002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000041	<0.000010	<0.000010	<0.000010
Fluorene	mg/L	0.012	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000013	<0.000010	<0.000010	<0.000010
Naphthalene	mg/L	0.001	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Phenanthrene	mg/L	0.0003	-	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Pyrene	mg/L	0.00002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000044	<0.000010	<0.000010	<0.000010
Quinoline	mg/L	0.0034	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Acridine d9	%	-	-	-	74.7	96.4	95.2	90.2	83.2	72.5	90.4	75.6	91.9	89.8	92.1	99.2	71.4	103.4	84.9
Chrysene d12	%	-	-	-	83.2	96.4	98.1	84.2	60.9	74.6	91.7	82.5	97.4	82.5	86.3	109.2	81.4	105.1	104.1
Naphthalene d8	%	-	-	-	95.8	107.7	107.3	85.8	100.1	73.2	95.1	95.8	105.9	90.2	86.3	100.2	80.4	112.9	103.6
Phen																			

Quarterly Summary Report #2
Blank QA/QC Samples - All Results

Analyte	Sample name		Field Blank						Trip Blank					
	Date sampled		31-Oct-16	9-Nov-16	16-Nov-16	23-Nov-16	29-Nov-16	12-Dec-16	31-Oct-16	9-Nov-16	18-Nov-16	23-Nov-16	29-Nov-16	13-Dec-16
	Units	Detection limit												
General Parameters														
Conductivity	uS/cm	2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Hardness (as CaCO3)	mg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-	-	<0.50	<0.50	-	<0.50
pH	pH	0.1	5.66	5.7	5.67	5.47	5.87	5.46	5.8	5.66	5.91	5.45	5.67	5.38
Total Suspended Solids	mg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	0.1	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride (Cl)	mg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Sulfate (SO4)	mg/L	0.3	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Nutrients														
Ammonia, Total (as N)	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0156	<0.0050	0.0053	0.0144	<0.0050
Nitrate and Nitrite (as N)	mg/L	0.0032	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032	<0.0032
Nitrate (as N)	mg/L	0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Nitrite (as N)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Nitrogen	mg/L	0.03	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Total Organic Nitrogen	mg/L	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Kjeldahl Nitrogen	mg/L	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Dissolved Nitrogen	mg/L	0.03	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Orthophosphate-Dissolved (as P)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	mg/L	0.002	<0.0020	0.0035	0.0099	<0.0020	<0.0020	<0.0020	0.0042	<0.0020	<0.0020	<0.0020	<0.010	<0.0020
Organic Carbon														
Dissolved Organic Carbon	mg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Organic Carbon	mg/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.68	<0.50	<0.50	<0.50	<0.50	<0.50
Total Metals														
Mercury (Hg)-Total	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	-
Aluminum (Al)-Total	mg/L	0.0002	<0.00020	<0.00020	<0.00020	<0.00020	0.00026	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00021	<0.00020
Antimony (Sb)-Total	mg/L	0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.0000050	<0.0000050	<0.000020	<0.000020	<0.0000050	<0.000020
Arsenic (As)-Total	mg/L	0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Barium (Ba)-Total	mg/L	0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Beryllium (Be)-Total	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.0000020	<0.0000020	<0.000010	<0.000010	<0.0000020	<0.000010
Bismuth (Bi)-Total	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000010	<0.0000010	<0.0000050	<0.0000050	<0.0000010	<0.0000050
Boron (B)-Total	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cesium (Cs)-Total	mg/L	0.000005	-	-	-	-	-	-	<0.0000050	<0.0000050	-	-	<0.0000050	-
Chromium (Cr)-Total	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	<0.00010	<0.00010	<0.000050	<0.00010
Cobalt (Co)-Total	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Copper (Cu)-Total	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Gallium (Ga)-Total	mg/L	0.00005	-	-	-	-	-	-	<0.000050	<0.000050	-	-	<0.000050	-
Iron (Fe)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Lanthanum (La)-Total	mg/L	0.00001	-	-	-	-	-	-	<0.000010	<0.000010	-	-	<0.000010	-
Lead (Pb)-Total	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Lithium (Li)-Total	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00020	<0.00020	<0.00050	<0.00050	<0.00020	<0.00050
Magnesium (Mg)-Total	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.010	<0.0010	<0.010
Manganese (Mn)-Total	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.0000050	0.0000079	<0.000050	<0.000050	<0.0000050	<0.000050
Molybdenum (Mo)-Total	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	<0.000050	<0.000050	<0.000010	<0.000050
Nickel (Ni)-Total	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Phosphorus (P)-Total	mg/L	0.002	-	-	-	-	-	-	<0.0020	<0.0020	-	-	<0.0020	-
Potassium (K)-Total	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Rhenium (Re)-Total	mg/L	0.000005	-	-	-	-	-	-	<0.0000050	<0.0000050	-	-	<0.0000050	-
Rubidium (Rb)-Total	mg/L	0.000005	-	-	-	-	-	-	<0.0000050	<0.0000050	-	-	<0.0000050	-
Selenium (Se)-Total	mg/L	0.00004	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (Ag)-Total	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Total	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Strontium (Sr)-Total	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000020	<0.000020	<0.000050	<0.000050	<0.000020	<0.000050
Tellurium (Te)-Total	mg/L	0.00001	-	-	-	-	-	-	<0.000010	<0.000010	-	-	<0.000010	-
Thallium (Tl)-Total	mg/L	0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000010	<0.0000010	<0.0000020	<0.0000020	<0.0000010	<0.0000020
Thorium (Th)-Total	mg/L	0.000005	-	-	-	-	-	-	<0.0000050	<0.0000050	-	-	<0.0000050	-
Tin (Sn)-Total	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Titanium (Ti)-Total	mg/L	0.00005	-	-	-	-	-	-	<0.000050	<0.000050	-	-	<0.000050	-
Tungsten (W)-Total	mg/L	0.00001	-	-	-	-	-	-	<0.000010	<0.000010	-	-	<0.000010	-
Uranium (U)-Total	mg/L	0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000010	<0.0000010	<0.0000020	<0.0000020	<0.0000010	<0.0000020
Vanadium (V)-Total	mg/L	0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.000010	<0.000010	<0.00020	<0.00020	<0.000010	<0.00020
Yttrium (Y)-Total	mg/L	0.000005	-	-	-	-	-	-	<0.0000050	<0.0000050	-	-	<0.0000050	-
Zinc (Zn)-Total	mg/L	0.0001	<0.00010	<0.00010	<0.00010	0.0003	<0.00010	<0.00010	0.00026	0.00014	0.00028	<0.00010	<0.00010	<0.00010

Quarterly Summary Report #2
Blank QA/QC Samples - All Results

Analyte	Sample name		Field Blank						Trip Blank					
	Date sampled		31-Oct-16	9-Nov-16	16-Nov-16	23-Nov-16	29-Nov-16	12-Dec-16	31-Oct-16	9-Nov-16	18-Nov-16	23-Nov-16	29-Nov-16	13-Dec-16
	Units	Detection limit												
Zirconium (Zr)-Total	mg/L	0.00001	-	-	-	-	-	-	<0.000010	<0.000010	-	-	<0.000010	-
Dissolved Metals														
Aluminum (Al)-Dissolved	mg/L	0.0002	<0.00020	0.0007	<0.00020	<0.00020	0.00022	<0.00020	-	-	<0.00020	-	-	-
Antimony (Sb)-Dissolved	mg/L	0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	-	-	<0.000020	-	-	-
Arsenic (As)-Dissolved	mg/L	0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	-	-	<0.000020	-	-	-
Barium (Ba)-Dissolved	mg/L	0.00002	<0.000020	<0.000020	<0.000020	<0.000020	0.0002	<0.000020	-	-	<0.000020	-	-	-
Beryllium (Be)-Dissolved	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-	<0.000010	-	-	-
Bismuth (Bi)-Dissolved	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	-	<0.0000050	-	-	-
Boron (B)-Dissolved	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	-	<0.0050	-	-	-
Cadmium (Cd)-Dissolved	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	-	<0.0000050	-	-	-
Calcium (Ca)-Dissolved	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-	<0.010	-	-	-
Chromium (Cr)-Dissolved	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-	<0.00010	-	-	-
Cobalt (Co)-Dissolved	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	-	<0.0000050	-	-	-
Copper (Cu)-Dissolved	mg/L	0.00005	<0.000050	0.000331	<0.000050	<0.000050	<0.000050	<0.000050	-	-	<0.000050	-	-	-
Iron (Fe)-Dissolved	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	<0.0010	-	-	-
Lead (Pb)-Dissolved	mg/L	0.000005	<0.0000050	0.0000104	<0.0000050	<0.0000050	0.0000076	<0.0000050	-	-	<0.0000050	-	-	-
Lithium (Li)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	<0.00050	-	-	-
Magnesium (Mg)-Dissolved	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-	<0.010	-	-	-
Manganese (Mn)-Dissolved	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	-	<0.000050	-	-	-
Mercury (Hg)-Dissolved	mg/L	0.000005	-	-	-	-	<0.0000050	-	-	-	-	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	-	<0.000050	-	-	-
Nickel (Ni)-Dissolved	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	-	<0.000050	-	-	-
Potassium (K)-Dissolved	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	-	<0.0050	-	-	-
Selenium (Se)-Dissolved	mg/L	0.00004	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	-	-	<0.000040	-	-	-
Silicon (Si)-Dissolved	mg/L	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	<0.050	-	-	-
Silver (Ag)-Dissolved	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	-	<0.0000050	-	-	-
Sodium (Na)-Dissolved	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-	<0.010	-	-	-
Strontium (Sr)-Dissolved	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	-	<0.000050	-	-	-
Thallium (Tl)-Dissolved	mg/L	0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	-	-	<0.0000020	-	-	-
Tin (Sn)-Dissolved	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-	<0.000010	-	-	-
Uranium (U)-Dissolved	mg/L	0.000002	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	-	-	<0.0000020	-	-	-
Vanadium (V)-Dissolved	mg/L	0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-	-	<0.00020	-	-	-
Zinc (Zn)-Dissolved	mg/L	0.0001	0.00032	0.00049	0.00012	0.00016	<0.00010	<0.00010	-	-	0.00015	-	-	-
Hydrocarbons														
BOD	mg/L	2	-	-	-	-	-	-	-	-	-	-	-	-
BOD Carbonaceous	mg/L	2	-	-	-	-	-	-	-	-	-	-	-	-
EPH10-19	mg/L	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
TEH10-30	mg/L	0.1	-	<0.10	-	-	-	-	-	<0.10	-	-	-	-
2-Bromobenzotrifluoride	%	Surrogate	91.2	89.2	83.4	118.2	97.3	97.8	93.9	90.9	84.1	107.5	96.5	100.8
Acenaphthene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(a)pyrene	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Benzo(b)fluoranthene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(k)fluoranthene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chrysene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dibenz(a,h)anthracene	mg/L	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Fluoranthene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Fluorene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Naphthalene	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Phenanthrene	mg/L	0.00002	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Pyrene	mg/L	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Quinoline	mg/L	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Acridine d9	%	Surrogate	79.2	83.4	94.6	69.2	63.9	112.7	75.8	100.3	93.7	79.1	61.1	95.8
Chrysene d12	%	Surrogate	80.6	81.3	83.5	60.1	75.6	95.6	78.3	103.1	83.8	61	77.3	103.8
Naphthalene d8	%	Surrogate	96.2	82.8	91.8	101.8	77.8	106.9	93.3	107.2	91.2	107.7	81.1	107
Phenanthrene d10	%	Surrogate	94.7	88.9	103.6	98.9	76.2	108.8	93	108.5	103.4	97.1	77.8	109.2

Detected concentration