XCG
Environmental Engineers & Scientists

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March 3, 2021 **XCG File No. 4-2111-05-05**

Mr. Arun Kumar
Manager, Solid Waste Operations
Sunshine Coast Regional District
1975 Field Road
Sechelt, British Columbia V0N 3A1

Re: 2019 Environmental Monitoring Results Review Letter – Gibsons Landfill

Dear Mr. Kumar:

XCG Consulting Limited (XCG) is pleased to provide the following summary of results for the 2019 environmental monitoring undertaken at the Gibsons Landfill (Site). Surface water monitoring was undertaken by Sunshine Coast Regional District (SCRD) staff as part of the bi-annual (twice annually) environmental monitoring program for the closed landfill. The SCRD has retained XCG to provide an opinion on whether landfill impacts are evident near the Site based on the results of the 2019 surface water monitoring.

BACKGROUND

As per the Gibsons Landfill Closure Plan (Dayton & Knight Ltd., 1996), the SCRD has collected surface water samples biannually from four locations on-site since 1995. Monitoring locations are illustrated on Figure 2 from the Closure Plan (included as Attachment A) and are described as follows:

- Site 1 (G1 on Attachment A, Figure 2) – Upstream in the north diversion ditch, northwest of the landfill.
- Site 2 (G2 on Attachment A, Figure 2) – Downstream in the north diversion ditch, northeast of the landfill.
- Site 3 (G3 on Attachment A, Figure 2) – Downstream in the drainage course, southeast of the landfill.
- Site 4 (G4 on Appendix A, Figure 2) – Upstream in the drainage course, northeast of the landfill.

Historic surface water quality monitoring results for Sites 1, 2, 3, and 4 are included in Tables 2, 3, 4, and 5, respectively.

As per recommendations from the Environmental Monitoring Review completed by XCG dated July 29, 2016, the on-going bi-annual sampling of the surface water diversion ditch and the unnamed drainage course is to be continued for a period of three years following a rehabilitation of the landfill closure. If monitoring results remain consistent with historic concentrations, the surface water sampling is to be discontinued. The monitoring program will include annual inspections of the closure and surrounding site to ensure that the cover and associated works are in good condition and do not require any repairs. If deficiencies are noted, the SCRD is to undertake steps to rehabilitate the final closure works.

Rehabilitation of the closure works was completed at the landfill during the summer and fall of 2017 to repair damages created by the Sprockids Park bike skills area. The rehabilitation included importing agricultural cover soil from a development site. The soil was spread 2 to 5 metres deep over the affected areas of the landfill. In the fall of 2017 drought tolerant grass was planted in the covered area.

Based on the above, the SCRD is undertaking biannual surface water sampling at the Site until 2020 to confirm that surface water quality is consistent with historic concentrations. Annual inspections of the cover system and closure works are ongoing to ensure that no further rehabilitation activities are required in the future.

ANNUAL COVER INSPECTION

A brief inspection of the landfill cover was conducted by the SCRD on December 12, 2019. During the inspection no significant areas of erosion were observed. The cover was noted to be stabilizing well with dense patches of grass growing along the top of slope and less thickly on slope sides.

SURFACE WATER MONITORING RESULTS

The SCRD undertook one surface water monitoring events in 2019, in December. It is noted that the spring monitoring event was not conducted due to change in staffing at the SCRD; however, as noted in previous reports, the surface water monitoring locations are typically dry during the spring monitoring event.

All four monitoring locations (Site 1, Site 2, Site 3, and Site 4) were sampled during the December 12, 2019 monitoring event. The monitoring included the measurement of field parameters, including pH, conductivity, temperature, turbidity, oxidation reduction potential, total dissolved solids, and dissolved oxygen. The 2019 analytical results are presented in Table 1, and the laboratory certificates of analysis are included as Attachment B.

The following provides a summary of the monitoring results from the December 2019 monitoring event. Results were compared to the Drinking Water Quality (DWQ) criteria and the Fresh Water Aquatic Life (FWAL) criteria from the documents entitled “British Columbia Approved Water Quality Guidelines” (August 2019) and “British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture” (June 2017) prepared by the Ministry of Environment and Climate Change Strategy. Results from the December 2019 monitoring event were also compared to historic concentrations to ensure the consistency of surface water quality at the Site.

- Site 1 is a surface water monitoring location in the north surface water diversion ditch, northwest (upstream) of the landfill, and is considered to represent background surface water quality.

  Analytical results for Site 1 indicated no exceedances. Site 1 analytical results were consistent with historical concentrations.

- Site 2 is a surface water monitoring location in the north surface water diversion ditch, located northeast (downstream) of the landfill. Analytical results for Site 2 indicated the following:

– Field turbidity exceeded the DWQ maximum acceptable increase from background and the FWAL maximum acceptable increase from background during the December 2019 monitoring event with a recorded value of 53.5 NTU.

Turbidity is indicative of the presence of suspended sediment in the sample, which was collected from a drainage water course, and is not believed to be indicative of landfill impacts. Thus, the exceedance for turbidity are not considered to be landfill derived.

Site 2 analytical results were consistent with historical concentrations.

- Site 4 is a surface water monitoring location in the unnamed drainage course, northeast (upstream) of the landfill, and is considered to represent background surface water quality. Analytical results for Site 4 indicated the following:

  – Field pH was outside of the FWAL desired range (6.5-9.0) with a recorded value of 6.42.

  As indicated above, Site 4 is considered an upstream monitoring location therefore the reported field pH which was below the desired pH range is not considered to be landfill derived.

  Site 4 analytical results were consistent with historical concentrations.

- Site 3 is a surface water monitoring location in the unnamed drainage course, located southeast (downstream) of the landfill.

  Analytical results for Site 3 indicated the following no exceedances. Site 3 analytical results were consistent with historical concentrations.

CONCLUSIONS

The 2019 environmental monitoring results indicate that the landfill is not impacting the surface water sampling locations. Current monitoring results are consistent with historic surface water quality.

RECOMMENDATIONS

It is recommended that the on-going bi-annual sampling of the surface water diversion ditch and the unnamed drainage course be continued until the fall of 2020 to provide three years of monitoring data following the rehabilitation of the landfill closure. If monitoring results remain consistent with historic concentrations, it is recommended that the surface water sampling be discontinued.

It is further recommended that the SCRD continue to undertake annual inspections of the cover system and closure works at the Site, to ensure that future rehabilitation activities are not required.

CLOSURE

Should you have any questions or require additional information, please do not hesitate to contact us.

Yours very truly,

XCG CONSULTING LIMITED

Trevor Mahoney, B.S.E.
Project Manager

Attachments: Tables 1- 5
Attachment A – Monitoring Locations Figure
Attachment B – Certificates of Analysis

TABLES

Table 1 Surface Water Quality Results

Sample Location:	Method Detection Limit	Units	BC MOE Criteria[1]		Site 1	Site 2	Site 2	Site 3	Site 4
Sample Date:					Dec-19	Dec-19	Dec-19	Dec-19	Dec-19
Parameters:			DWQ	FWAL					
Lab Sample ID:					6906717	6906718	6906721	6906719	6906720
							Duplicate		
Field Parameters									
pH	-	s.u.	---	6.5-9.0	7.17	6.7	-	6.57	**6.42**
Conductivity	-	µS/cm	---	---	110	32	-	0.032	0.022
Temp	-	Deg. C	15 (AO)	19	7.17	7.49	-	7.11	6.77
Turbidity	-	NTU	(a)	(a)	30.5	**53.5**	-	2.6	1.3
Redox Potential	-	mV	---	---	304	303	-	307	314
Total Dissolved Solids	-	mg/L	---	---	0.017	0.021	-	0.021	0.014
Dissolved Oxygen	-	mg/L	---	>5	11.06	10.41	-	9.24	9.86
Physical Parameters									
Conductivity, Electrical	2.0	µS/cm	---	---	28	26	26	28	17
pH	0.1	s.u.	---	6.5-9.0	-	-	-	-	-
Inorganics									
Chemical Oxygen Demand (COD)	10	mg/L	---	---	30	350	10	ND (10)	ND (10)
Nutrients									
Total Ammonia (N)	0.020	mg/L	---	0.681-28.7[b]	0.02	0.02	0.02	0.02	ND (0.01)
Dissolved Nitrate (N)	0.020	mg/L	10	32.8	-	-	-	-	-
Dissolved Nitrite (N)	0.0050	mg/L	1	0.06-0.6[c]	-	-	-	-	-
Nitrate plus Nitrite (N)	0.020	mg/L	10	---	-	-	-	-	-
Dissolved Anions									
Chloride	1.0	mg/L	250 (AO)	600	1.76	2.04	1.69	1.15	1.53
Dissolved Metals									
Iron	0.0050	mg/L	0.3 (AO)	0.35	0.026	0.021	0.024	ND (0.002)	0.01

Notes:

1. Values reported from BC MOE - British Columbia Approved Water Quality Guidelines, 2019 Edition, unless otherwise stated.

0.500 - Exceeds Drinking Water Criteria (DWQ)

0.500 - Exceeds Freshwater Aquatic Life Criteria (FWAL)

0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria

a. Turbidity: BC MOE Approved Water Quality Guidelines, Summary Report Table 44. BC MOE Source Drinking Water Quality Guidelines, Guidelines Summary Table 2. Decreases compared to background concentrations are not interpreted as exceedances.

b. Ammonia-N: BC MOE Approved Water Quality Guidelines, Summary Report Table 26D. Temperature and pH dependent.

c. Nitrite: BC MOE Approved Water Quality Guidelines. Chloride dependent.

AO - DWQ Aesthetic Objective

- No data available

--- Currently no Standard/Criteria

Table 2 Historic Surface Water Quality Results - Site 1

Sample Date: / Parameters:	Units	Method Detection Limit	Nov-95	Dec-95	Apr-97	Dec-98	Dec-01	Dec-01	Mar-03	Mar-03	Mar-04	Feb-06	Nov-06	Apr-07	Nov-07	July-08	Dec-08	Dec-09	May-10	Dec-10
								Duplicate		*Duplicate*						*No Water*	*No Water*	*No Water*	*No Water*	*No Water*
Field Parameters																				
pH	s.u.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Temp	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	ppt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Physical Parameters																				
Conductivity, Electrical	µS/cm	1 - 2.0	14	6	20	17	16	16	31	20	24	21	26	22	29	-	-	-	-	-
pH	s.u.	0.1	5.7	5.9	5.8	5.8	5.9	5.8	6.4	5.5	6.3	6.9	6.3	6.3	6.3	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inorganics																				
Dissolved Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Alkalinity	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	mg/L	10	43	ND	ND	ND	ND	ND	16	ND	ND	35	ND	ND	ND	-	-	-	-	-
Alkalinity (PP as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicarbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nutrients																				
Ammonia	mg/L	0.005 to 0.02	-	-	0.038	-	0.005	0.013	0.009	ND	0.017	0.019	ND	ND	0.015	-	-	-	-	-
Dissolved Nitrate (N)	mg/L	0.02	0.05	0.08	0.06	0.34	0.49	0.49	0.77	0.44	0.22	0.26	0.78	0.04	0.18	-	-	-	-	-
Dissolved Nitrite (N)	mg/L	0.005	ND	0.006	ND	ND	ND	ND	ND	0.005	ND	ND	ND	ND	ND	-	-	-	-	-
Nitrate plus Nitrite (N)	mg/L	0.02	0.05	0.09	0.06	0.34	0.49	0.49	0.77	0.45	0.22	0.26	0.78	0.04	0.18	-	-	-	-	-
Total Nitrogen (N)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Anions																				
Chloride	mg/L	1.0	1.9	1.1	1.4	2.3	ND	1.1	20.8	30.7	2.3	2	1.4	2	37.9	-	-	-	-	-
Sulphate	mg/L	0.5	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Metals																				
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	0.005	0.114	0.095	0.124	0.044	0.081	0.058	0.023	ND	0.025	0.065	0.007	0.0008	0.011	-	-	-	-	-
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																				
Iron	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

- No data available

Table 2 Historic Surface Water Quality Results - Site 1

Sample Date: / Parameters:	Units	Method Detection Limit	Aug-11	Nov-11	Dec-11	Apr-12	Dec-12	Apr-13	Nov-13	Dec-14	Jun-17	Dec-17	Dec-17	Jun-18	Dec-18	Dec-18
			No Water	*No Water*	*No Water*	*No Water*	*No Water*	*No Water*	*No Water*		*No Water*		*Duplicate*	*No Water*		*Duplicate*
Field Parameters																
pH	s.u.	-	-	-	-	-	-	-	-	4.92	-	4.58	4.58	-	5.98	5.98
Conductivity	µS/cm	-	-	-	-	-	-	-	-	30	-	23	23	-	31	31
Temp	C	-	-	-	-	-	-	-	-	7.24	-	8.56	8.56	-	8.55	8.55
Turbidity	ppt	-	-	-	-	-	-	-	-	7.97	-	1.9	1.9	-	0	0
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	292	292	-	291	291
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	0.018	0.018	-	0.2	0.2
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	5.81	5.81	-	19.75	19.75
Physical Parameters																
Conductivity, Electrical	µS/cm	1 - 2.0	-	-	-	-	-	-	-	23.1	-	26.5	21.9	-	18.1	18.8
pH	s.u.	0.1	-	-	-	-	-	-	-	6.44	-	6.62	6.26	-	6.37	6.60
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inorganics																
Dissolved Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Alkalinity	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	mg/L	10	-	-	-	-	-	-	-	126	-	12	16	-	ND	26
Alkalinity (PP as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicarbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nutrients																
Ammonia	mg/L	0.005 to 0.02	-	-	-	-	-	-	-	0.060	-	ND	0.19	-	0.035	ND
Dissolved Nitrate (N)	mg/L	0.02	-	-	-	-	-	-	-	0.202	-	0.885	0.886	-	0.571	0.564
Dissolved Nitrite (N)	mg/L	0.005	-	-	-	-	-	-	-	ND	-	ND	ND	-	ND	ND
Nitrate plus Nitrite (N)	mg/L	0.02	-	-	-	-	-	-	-	0.202	-	0.885	0.886	-	0.571	0.564
Total Nitrogen (N)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Anions																
Chloride	mg/L	1.0	-	-	-	-	-	-	-	2	-	1.7	1.7	-	ND	1.0
Sulphate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Metals																
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	0.005	-	-	-	-	-	-	-	-	-	0.102	0.0728	-	0.0418	0.0399
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																
Iron	mg/L	0.01	-	-	-	-	-	-	-	2.46	-	-	-	-	-	-

Notes:

- No data available

Table 3 Historic Surface Water Quality Results - Site 2

Sample Date: / Parameters:	Units	Method Detection Limit	Nov-95	Dec-95	Apr-97	Oct-97	Dec-98	Apr-99	Jun-00	Apr-01	Dec-01	Mar-03	Mar-04	Mar-04	Feb-06	Nov-06	Apr-07	Nov-07	July-08	Dec-08	Dec-09
														Duplicate					*No Water*	*No Water*	
Field Parameters																					
pH	s.u.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.66
Conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Temp	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.2
Turbidity	ppt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Physical Parameters																					
Conductivity, Electrical	µS/cm	1 - 2.0	23	15	15	30	24	22	33	29	16	30	23	23	22	26	20	27	-	-	25
pH	s.u.	0.1	5.7	5.9	5.4	5.9	5.9	6.1	5.9	6.2	5.9	6.5	6.5	6.5	6.3	6.4	6.6	6.7	-	-	6.2
Turbidity	NTU	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inorganics																					
Dissolved Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Alkalinity	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	mg/L	10	23	55	ND	21	ND	ND	ND	ND	17	12	ND	ND	39	ND	ND	ND			ND
Alkalinity (PP as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicarbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nutrients																					
Ammonia	mg/L	0.005 to 0.02	-	-	ND	0.008			0.007	0.011	0.017	ND	0.010	0.010	0.024	0.051	0.021	0.016	-	-	0.021
Dissolved Nitrate (N)	mg/L	0.02	0.35	0.31	0.16	0.39	0.47	0.14	0.63	0.44	0.51	0.86	0.28	0.28	0.22	0.78	0.06	0.17	-	-	0.41
Dissolved Nitrite (N)	mg/L	0.005	ND	0.005	ND	ND	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	ND
Nitrate plus Nitrite (N)	mg/L	0.02	0.35	0.31	0.16	0.39	0.48	0.14	0.63	0.44	0.51	0.86	0.28	0.28	0.22	0.78	0.06	0.17	-	-	0.41
Total Nitrogen (N)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Anions																					
Chloride	mg/L	1.0	1.6	1.4	1.2	1.2	2	2.5	1.4	1.5	ND	4.9	2.1	2.1	2.2	1.6	17.9	5.3	-	-	2
Sulphate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Metals																					
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	0.005	0.038	0.084	ND	0.034	0.026	0.101	ND	0.022	0.079	0.012	0.031	0.031	0.021	0.02	ND	0.007	-	-	0.026
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																					
Iron	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
- No data available

Table 3 Historic Surface Water Quality Results - Site 2

Sample Date: / Parameters:	Units	Method Detection Limit	May-10	Dec-11	Aug-11	Nov-11	Dec-11	Dec-12	Apr-13	Nov-13	May-14	Dec-14	Mar-16	Jun-17	Dec-17	Jun-18	Dec-18
				No Water	*No Water*	*No Water*	*No Water*			*No Water*				*No Water*		*No Water*	
Field Parameters																	
pH	s.u.	-	6.67	-	-	-	-	-	-	-	5.12	4.61	-	-	4.41	-	5.25
Conductivity	µS/cm	-	2470	-	-	-	-	-	-	-	154	86	-	-	210	-	23
Temp	C	-	10.7	-	-	-	-	-	-	-	12.7	7.51	-	-	9.48	-	8.1
Turbidity	ppt	-	1.9	-	-	-	-	-	-	-	-	9.4	-	-	0.8	-	0.2
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	283	-	303
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.137	-	0.015
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-	7.34
Physical Parameters																	
Conductivity, Electrical	µS/cm	1 - 2.0	28	-	-	-	-	24.8	21.5	-	22.1	21.7	19	-	21.4	-	19.0
pH	s.u.	0.1	7	-	-	-	-	6.86	6.45	-	6.57	6.48	6.26	-	6.33	-	6.50
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inorganics																	
Dissolved Hardness	mg/L	-	-	-	-	-	-	-	-	-	5.84	-	-	-	-	-	-
Total Alkalinity	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	mg/L	10	959	-	-	-	-	19	ND	-	14	12	ND	-	15	-	ND
Alkalinity (PP as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicarbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nutrients																	
Ammonia	mg/L	0.005 to 0.02	0.21	-	-	-	-	0.043	0.028	-	0.050	0.050	0.032	-	ND	-	0.023
Dissolved Nitrate (N)	mg/L	0.02	0.1	-	-	-	-	0.586	0.127	-	0.114	0.255	0.076	-	0.903	-	0.579
Dissolved Nitrite (N)	mg/L	0.005	ND	-	-	-	-	ND	ND	-	ND	ND	ND	-	ND	-	ND
Nitrate plus Nitrite (N)	mg/L	0.02	0.1	-	-	-	-	0.586	0.127	-	0.114	0.255	0.076	-	0.903	-	0.579
Total Nitrogen (N)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Anions																	
Chloride	mg/L	1.0	2.4	-	-	-	-	2.1	2.2	-	2.2	2	2.3	-	1.7	-	1.2
Sulphate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Metals																	
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	0.005	0.079	-	-	-	-	0.0295	0.0505	-	0.121	-	0.0256	-	0.0742	-	0.0401
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																	
Iron	mg/L	0.01	-	-	-	-	-	-	-	-	-	1.59	-	-	-	-	-

Notes:
- No data available

Table 4 Historic Surface Water Quality Results - Site 3

Sample Date: / Parameters:	Units	Method Detection Limit	Nov-95	Dec-95	Apr-97	Oct-97	Nov-98	Dec-98	Apr-99	Jun-00	Dec-00	Apr-01	Dec-01	Mar-03	Mar-04	Dec-04	Feb-06	Nov-06	Apr-07	Nov-07	July-08	Dec-08
																					No Water	
Field Parameters																						
pH	s.u.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.24
Conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Temp	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6
Turbidity	ppt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Physical Parameters																						
Conductivity, Electrical	µS/cm	1 - 2.0	18	16	18	23	51	19	21	16	26	19	20	23	20	22	19	18	21	20	-	18
pH	s.u.	0.1	5.4	5.6	5.7	5.7	5.2	5.5	5.9	6.3	5.8	5.9	5.7	6.0	6.1	5.9	6	6	6.4	6.1	-	5.7
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inorganics																						
Dissolved Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.3
Total Alkalinity	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Chemical Oxygen Demand (COD)	mg/L	10	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16	12	ND	ND	ND	-	ND
Alkalinity (PP as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Bicarbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Carbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Hydroxide	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Nutrients																						
Ammonia	mg/L	0.005 to 0.02	-	-	ND	0.006				0.007	0.009	ND	0.010	0.007	ND	ND	ND	ND	ND	ND	-	ND
Dissolved Nitrate (N)	mg/L	0.02	0.58	0.3	0.26	1.05	4.70	0.39	0.35	0.52	1.29	0.46	0.67	0.78	0.44	0.61	0.3	0.23	0.2	0.35	-	0.4
Dissolved Nitrite (N)	mg/L	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
Nitrate plus Nitrite (N)	mg/L	0.02	0.58	0.3	0.26	1.05	4.70	0.39	0.35	0.52	1.29	0.46	0.67	0.78	0.44	0.61	0.3	0.23	0.2	0.35	-	0.4
Total Nitrogen (N)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.42
Total Kjeldahl Nitrogen (TKN)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03
Dissolved Anions																						
Chloride	mg/L	1.0	2.0	2.2	1.2	2.0	1.9	2.3	2.1	1.6	1.8	1.6	1.9	2.7	1.8	1.9	1.9	2.3	1.1	2.2	-	9.3
Sulphate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Dissolved Metals																						
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.064
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00007
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0003
Iron	mg/L	0.005	0.009	0.008	0.028	0.010	0.003	ND	0.023	ND	0.008	ND	0.014	0.013	0.033	0.026	0.023	ND	0.019	0.017	-	ND
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.26
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.004
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.11
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.16
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.31
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.012
Sulfur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Thallium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.008
Zirconium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Total Metals																						
Iron	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

- No data available

Table 4 Historic Surface Water Quality Results - Site 3

Sample Date: / Parameters:	Units	Method Detection Limit	Dec-09	May-10	Dec-11	Aug-11	Nov-11	Dec-11	Dec-12	Dec-12	Apr-13	Nov-13	May-14	Dec-14	Jun-17	Dec-17	Jun-18	Dec-18
				No Water	*No Water*	*No Water*	*No Water*			*Duplicate*					*No Water*		*No Water*	
Field Parameters																		
pH	s.u.	-	5.57	-	-	-	-	-	-	-	-	-	5.16	5.16	-	4.72	-	5.03
Conductivity	µS/cm	-	370	-	-	-	-	-	-	-	-	-	32	21	-	19	-	19
Temp	C	-	7.1	-	-	-	-	-	-	-	-	-	11.3	7.19	-	7.65	-	7.6
Turbidity	ppt	-	0.02	-	-	-	-	-	-	-	-	-	-	15.7	-	7.9	-	3.6
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	306	-	324
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.013	-	0.013
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.37	-	7.76
Physical Parameters																		
Conductivity, Electrical	µS/cm	1 - 2.0	18	-	-	-	-	31	17.8	18	16.8	22.6	23.3	18.4	-	19.5	-	16.9
pH	s.u.	0.1	6	-	-	-	-	6.9	6.35	6.56	6.13	6.13	6.57	6.46	-	6.27	-	6.82
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inorganics																		
Dissolved Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	6.37	-	-	-	-	-
Total Alkalinity	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Chemical Oxygen Demand (COD)	mg/L	10	11	-	-	-	-	ND	ND	ND	ND	ND	11	ND	-	16	-	19
Alkalinity (PP as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicarbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nutrients																		
Ammonia	mg/L	0.005 to 0.02	0.009	-	-	-	-	ND	0.008	0.025	0.010	0.010	0.014	0.011	-	ND	-	0.021
Dissolved Nitrate (N)	mg/L	0.02	0.17	-	-	-	-	0.14	0.407	0.402	0.253	1.04	0.359	0.314	-	0.405	-	0.133
Dissolved Nitrite (N)	mg/L	0.005	ND	-	-	-	-	ND	ND	ND	ND	ND	ND	ND	-	ND	-	ND
Nitrate plus Nitrite (N)	mg/L	0.02	0.17	-	-	-	-	0.14	0.407	0.402	0.253	1.04	0.359	0.314	-	0.405	-	0.133
Total Nitrogen (N)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Anions																		
Chloride	mg/L	1.0	2.2	-	-	-	-	2.3	1.9	1.7	1.7	1.7	1.7	1.5	-	2.1	-	1.4
Sulphate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Metals																		
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	0.005	ND	-	-	-	-	0.012	0.0117	0.0066	ND	ND	ND	-	-	0.0125	-	ND
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																		
Iron	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-

Notes:

- No data available

Table 5 Historic Surface Water Quality Results - Site 4

Sample Date: / Parameters:	Units	Method Detection Limit	Nov-95	Dec-95	Oct-97	Nov-98	Dec-98	Apr-99	Jun-00	Apr-01	Dec-01	Mar-03	Mar-04	Dec-04	Dec-04	Feb-06	Nov-06	Apr-07	Nov-07	July-08	Dec-08	Dec-08	Dec-09	Dec-09	May-10	May-10
															Duplicate					*No Water*		*Duplicate*		*Duplicate*		*Duplicate*
Field Parameters																										
pH	s.u.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.93	5.93	5.99	5.99	6.16	6.16
Conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	130	130	1179	1179
Temp	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	2.5	6.1	6.1	10.5	10.5
Turbidity	ppt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.09	0.09	0.77	0.77
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Physical Parameters																										
Conductivity, Electrical	µS/cm	1 - 2.0	15	11	19	47	21	18	14	21	18	20	18	19	19	22	19	17	20	-	20	20	20	21	20	19
pH	s.u.	0.1	5.3	5.4	5.5	4.9	5.7	5.5	5.6	5.9	5.4	5.6	5.8	6.2	6.2	6.4	5.9	5.9	6.3	-	5.7	5.7	6	6	6.9	6.6
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.2	-	-	-	-
Inorganics																										
Dissolved Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3.9	-	-	-	-
Total Alkalinity	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Chemical Oxygen Demand (COD)	mg/L	10	20	37	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15	ND	ND	ND	-	ND	12	11	ND	ND	ND
Alkalinity (PP as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Bicarbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Carbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Hydroxide	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Nutrients																										
Ammonia	mg/L	0.005 to 0.02	-	-	ND	-	-	-	0.011	ND	ND	0.010	ND	0.005	0.005	0.005	ND	ND	ND	-	ND	0.040	0.005	ND	0.099	0.150
Dissolved Nitrate (N)	mg/L	0.02	0.25	0.20	0.73	3.94	0.51	0.27	0.47	0.80	0.46	0.41	0.30	0.27	0.27	0.35	0.33	0.12	0.30	-	0.51	0.51	0.20	0.18	0.21	0.20
Dissolved Nitrite (N)	mg/L	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND	ND	ND	ND	ND	ND
Nitrate plus Nitrite (N)	mg/L	0.02	0.25	0.20	0.73	3.94	0.51	0.27	0.47	0.80	0.46	0.41	0.30	0.27	0.27	0.35	0.33	0.12	0.30	-	0.51	0.51	0.20	0.18	0.21	0.20
Total Nitrogen (N)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.78	0.55	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.28	0.04	-	-	-	-
Dissolved Anions																										
Chloride	mg/L	1.0	2.1	1.8	4.4	1.8	2.2	2.4	5.4	1.6	2.1	7.6	1.8	1.8	1.9	1.8	2.3	0.9	1.2	-	5.6	2.1	2.0	1.7	1.3	1.3
Sulphate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Dissolved Metals																										
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.075	0.084	-	-	-	-
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.012	0.012	-	-	-	-
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00004	0.00004	-	-	-	-
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.14	1.12	-	-	-	-
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Iron	mg/L	0.005	ND	ND	ND	0.003	0.009	ND	ND	0.013	ND	ND	0.017	ND	ND	ND	0.02	ND	ND	-	0.019	0.019	0.017	0.017	0.035	0.037
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.27	0.27	-	-	-	-
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.008	0.008	-	-	-	-
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.11	0.11	-	-	-	-
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.23	3.13	-	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.35	1.34	-	-	-	-
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.013	0.013	-	-	-	-
Sulfur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Thallium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.007	0.006	-	-	-	-
Zirconium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-
Total Metals																										
Iron	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

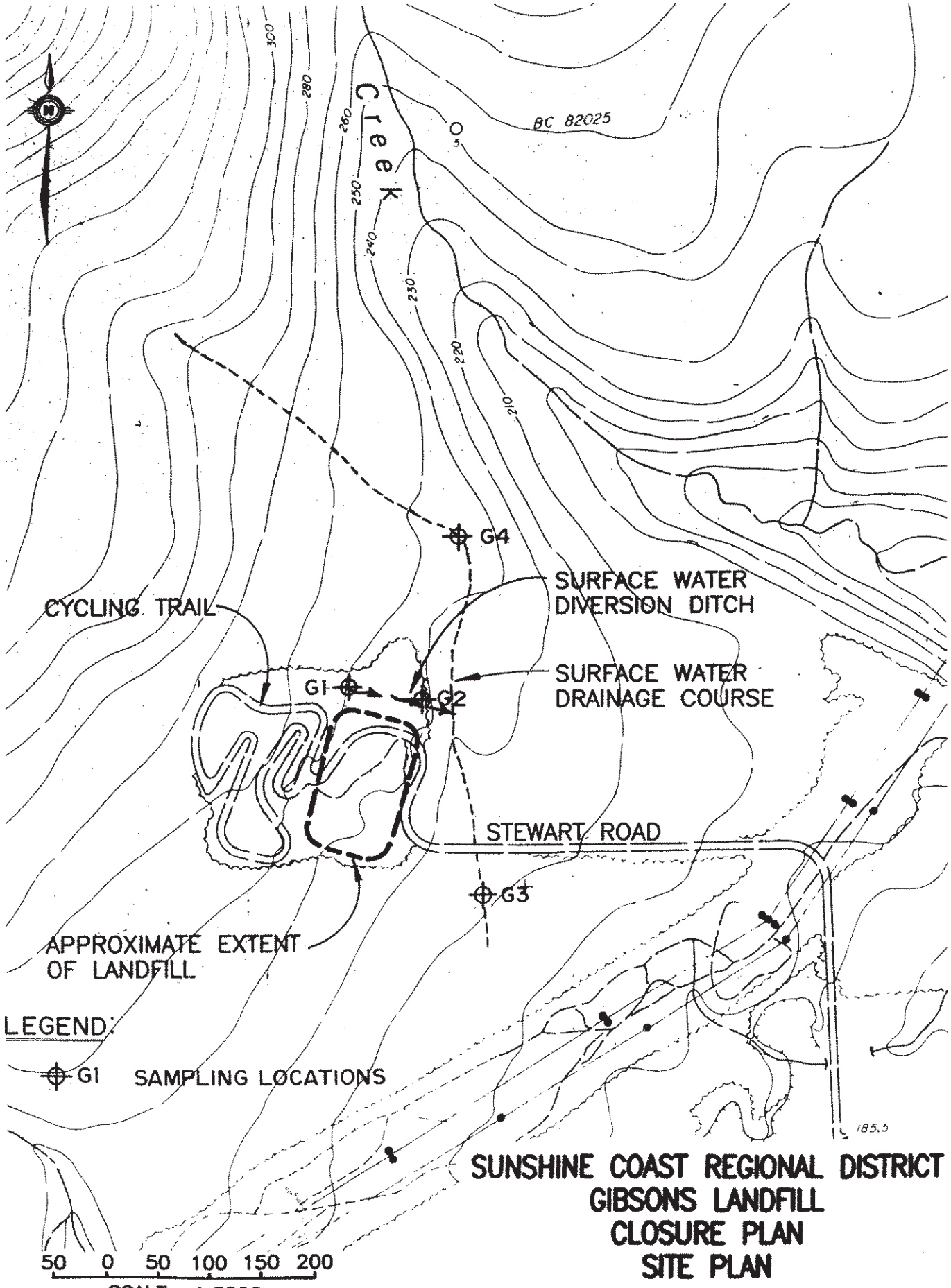
Notes:
- No data available

Table 5 Historic Surface Water Quality Results - Site 4

Sample Date: / Parameters:	Units	Method Detection Limit	Dec-10	Aug-11	Oct-11	Dec-11	Dec-12	Apr-13	Apr-13	Nov-13	Nov-13	May-14	May-14	Dec-14	Dec-15	Mar-16	Mar-16	Jun-17	Jun-17	Dec-17	Jun-18	Dec-18
				No Water	*No Water*				*Duplicate*		*Duplicate*		*Duplicate*				*Duplicate*		*Duplicate*		*No Water*	
Field Parameters																						
pH	s.u.	-	-	-	-	-	-	-	-	-	-	4.99	4.99	5.19	-	-	-	5.35	5.35	4.36	-	4.98
Conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	19	19	9	-	-	-	47	47	20	-	18
Temp	C	-	-	-	-	-	-	-	-	-	-	10.6	10.6	7.27	-	-	-	13.63	13.63	7.01	-	7.48
Turbidity	ppt	-	-	-	-	-	-	-	-	-	-	-	-	6.14	-	-	-	0.2	0.2	1	-	0.1
Redox Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	294	294	337	-	319
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.31	0.31	0.013	-	0.011
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.45	26.45	6.31	-	7.68
Physical Parameters																						
Conductivity, Electrical	µS/cm	1 - 2.0	20	-	-	23.7	20.3	17.9	17.9	21.3	21.5	18.3	17.3	19.3	18.7	17.2	17.3	19.5	19.5	19.1	-	16.5
pH	s.u.	0.1	5.9	-	-	6.06	6.77	6.13	6.14	5.82	6.01	6.35	6.35	6.93	6.38	5.99	6	6.78	6.80	5.84	-	6.73
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inorganics																						
Dissolved Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Alkalinity	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	mg/L	10	ND	-	-	ND	ND	ND	ND	ND	ND	ND	11	ND	ND	ND	ND	ND	ND	ND	-	ND
Alkalinity (PP as CaCO3)	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicarbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nutrients																						
Ammonia	mg/L	0.005 to 0.02	0.120	-	-	ND	0.021	0.011	0.011	ND	0.006	0.015	0.020	ND	0.013	0.028	0.022	0.020	0.043	ND	-	0.021
Dissolved Nitrate (N)	mg/L	0.02	0.35	-	-	0.97	0.49	0.33	0.33	1.06	1.07	0.19	0.19	0.33	0.32	0.196	0.19	0.305	0.306	0.492	-	0.136
Dissolved Nitrite (N)	mg/L	0.005	ND	-	-	0.007	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
Nitrate plus Nitrite (N)	mg/L	0.02	0.35	-	-	0.97	0.49	0.33	0.33	1.06	1.07	0.19	0.18	0.33	0.32	0.196	0.19	0.305	0.306	0.492	-	0.136
Total Nitrogen (N)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Anions																						
Chloride	mg/L	1.0	2.1	-	-	2.6	1.7	1.4	1.3	1.9	1.9	1.6	1.6	1.9	1.7	1.8	1.7	1.1	1.1	2.1	-	1.4
Sulphate	mg/L	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Metals																						
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	0.005	0.026	-	-	0.0285	0.0113	0.0171	0.021	0.0108	0.00608	0.0236	0.0242	-	-	0.0233	0.0224	ND	ND	0.0062	-	ND
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																						
Iron	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	0.027	0.058	-	-	-	-	-	-	-

Notes:
- No data available

ATTACHMENT A
MONITORING LOCATIONS FIGURE



SUNSHINE COAST REGIONAL DISTRICT
GIBSONS LANDFILL
CLOSURE PLAN
SITE PLAN

FIGURE 2

DAYTON & KNIGHT LTD.
Consulting Engineers
DWG. No. 28.158

ATTACHMENT B
CERTIFICATES OF ANALYSIS

Element
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: info.vancouver@element.com
W: element.com

Report Transmission Cover Page

Bill To: Sunshine Coast Regional District
1975 Field Road
Sechelt, BC, Canada
V0N 3A1
Attn: Accounts Payable
Sampled By: Sandi Bandara
Company: Sunshine Coast Regional District

Project ID: SP100120
Project Name: Gibson Landfill Sampling
Project Location: Gibsons
LSD:
P.O.: SP100120
Proj. Acct. code:

Lot ID: **1397970**
Control Number:
Date Received: Dec 13, 2019
Date Reported: Dec 20, 2019
Report Number: 2476206

Contact	Company	Address
Accounts Payable	**Sunshine Coast Regional District**	1975 Field Road Sechelt, BC V0N 3A1 Phone: (604) 885-6800 Fax: Email: accounts.payable@scrd.ca

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Contact	Company	Address
Anna Agnew	**Sunshine Coast Regional District**	5920 Mason Road Sechelt, BC V0N 3A8 Phone: (604) 885-6800 Fax: Email: anna.agnew@scrd.ca

Delivery	Format	Deliverables
Email - Multiple Reports By Lot	PDF	COC / Test Report
Email - Multiple Reports By Lot	Standard Crosstab without Tabs	Test Report
Email - Single Report	PDF	COA

Contact	Company	Address
Paul Sheridan	**Sunshine Coast Regional District**	5920 Mason Road Sechelt, BC V0N 3A8 Phone: (604) 885-6800 Fax: Email: paul.sheridan@scrd.ca

Delivery	Format	Deliverables
Email - Multiple Reports By Lot	PDF	COC / Test Report
Email - Multiple Reports By Lot	Standard Crosstab without Tabs	Test Report
Email - Single Report	PDF	COA

Contact	Company	Address
Sandi Bandara	**Sunshine Coast Regional District**	1975 Field Road Sechelt, BC V0N 3A1 Phone: (604) 885-6800 Fax: Email: sandi.bandara@scrd.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COA
Email - Single Report	Standard Crosstab without Tabs	Test Report

Notes To Clients:

Element
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1 (604) 514-3322
F: +1 (604) 514-3323
E: info.vancouver@element.com
W: element.com

Analytical Report

Bill To: Sunshine Coast Regional District
1975 Field Road
Sechelt, BC, Canada
V0N 3A1
Attn: Accounts Payable
Sampled By: Sandi Bandara
Company: Sunshine Coast Regional District

Project ID: SP100120
Project Name: Gibson Landfill Sampling
Project Location: Gibsons
LSD:
P.O.: SP100120
Proj. Acct. code:

Lot ID: **1397970**
Control Number:
Date Received: Dec 13, 2019
Date Reported: Dec 20, 2019
Report Number: 2476206

	Reference Number	1397970-1	1397970-2	1397970-3	
	Sample Date	Dec 12, 2019	Dec 12, 2019	Dec 12, 2019	
	Sample Time	09:54	10:10	10:12	
	Sample Location				
	Sample Description	G1	G2	G3	
	Matrix	Water	Water	Water	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Aggregate Organic Constituents						
Chemical Oxygen Demand		mg/L	30	350	<10	10
Inorganic Nonmetallic Parameters						
Ammonia - N		mg/L	0.02	0.02	0.02	0.01
Routine Water						
Electrical Conductivity		µS/cm at 25 °C	28	26	28	1
Chloride	Dissolved	mg/L	1.76	2.04	1.15	0.05
Trace Metals Dissolved						
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	Lab filtered & preserved	
Iron	Dissolved	mg/L	0.026	0.021	<0.002	0.002

Element
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Analytical Report

Bill To: Sunshine Coast Regional District
1975 Field Road
Sechelt, BC, Canada
V0N 3A1
Attn: Accounts Payable
Sampled By: Sandi Bandara
Company: Sunshine Coast Regional District

Project ID: SP100120
Project Name: Gibson Landfill Sampling
Project Location: Gibsons
LSD:
P.O.: SP100120
Proj. Acct. code:

Lot ID: **1397970**
Control Number:
Date Received: Dec 13, 2019
Date Reported: Dec 20, 2019
Report Number: 2476206

Reference Number	1397970-4	1397970-5	1397970-6
Sample Date	Dec 12, 2019	Dec 12, 2019	Dec 12, 2019
Sample Time	10:22	10:05	NA
Sample Location			
Sample Description	G4	G5	Field Blank
Matrix	Water	Water	Water

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Chemical Oxygen Demand		mg/L	<10	10	<10	10
Inorganic Nonmetallic Parameters						
Ammonia - N		mg/L	<0.01	0.02	<0.01	0.01
Routine Water						
Electrical Conductivity		µS/cm at 25 °C	17	26	3	1
Chloride	Dissolved	mg/L	1.53	1.69	<0.05	0.05
Trace Metals Dissolved						
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	Lab filtered & preserved	
Iron	Dissolved	mg/L	0.010	0.024	<0.002	0.002

Approved by:

Matthew Norman, BSc, PChem
Operations Chemist

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Element
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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E: info.vancouver@element.com
W: element.com

Methodology and Notes

Bill To:	Sunshine Coast Regional District 1975 Field Road Sechelt, BC, Canada V0N 3A1	Project ID:	SP100120	Lot ID:	**1397970**
		Project Name:	Gibson Landfill Sampling	Control Number:	
		Project Location:	Gibsons	Date Received:	Dec 13, 2019
		LSD:		Date Reported:	Dec 20, 2019
Attn:	Accounts Payable	P.O.:	SP100120	Report Number:	2476206
Sampled By:	Sandi Bandara	Proj. Acct. code:			
Company:	Sunshine Coast Regional District				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Alk, pH, EC, Turb in water (BC)	APHA	*	Conductivity, 2510 B	Dec 16, 2019	Element Vancouver
Ammonia-N in Water (VAN)	APHA	*	Flow Injection Analysis, 4500-NH3 H	Dec 17, 2019	Element Vancouver
Anions by IEC in water (VAN)	APHA	*	Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Dec 17, 2019	Element Vancouver
Chemical Oxygen Demand (water-VAN)	APHA	*	Closed Reflux, Colorimetric Method, 5220 D	Dec 18, 2019	Element Vancouver
Chemical Oxygen Demand (water-VAN)	APHA	*	Closed Reflux, Colorimetric Method, 5220 D	Dec 20, 2019	Element Vancouver
Trace Metals (dissolved) in Water (VAN)	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Dec 16, 2019	Element Vancouver

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater
US EPA	US Environmental Protection Agency Test Methods

element
www.Element.com

Project Information

Project ID:	SP100120
Project Name:	Gibsons Landfill Sampling
Project Location:	Gibsons
Legal Location:	
PO/AFE#:	SP100120
Proj. Acct. Code:	
Quote #:	

Invoice To

Company:	Sunshine Coast Regional District
Address:	1975 Field Road
	Sechelt, BC
Attention:	Accounts Payable
Phone:	604-885-6800
Cell:	
Fax:	
E-mail:	accounts.payable@scrd.ca
Agreement ID:	113277
Copy of Report:	NO

Report To

Company:	Sunshine Coast Regional District
Address:	1975 Field Road
	Sechelt, BC
Attention:	Sandi Bandara
Phone:	604-885-6800
Cell:	
Fax:	
E-mail 1:	sandi.bandara@scrd.ca
E-mail 2:	
Copy of Invoice:	YES

Additional Reports to

1) Name:
E-mail:
2) Name:
E-mail:

Sample Custody

Sampled by: Sandi Bandara
Company: SCRD

I authorize Element to proceed with the work indicated on this form:

Signature: *Sandi Bandara*
Date/Time: December 13/2019

RUSH Priority

- ☐ Same Day (200%)
- ☐ Next Day/Two Day (100%)
- ☐ Three or Four Days (50%)
- ☐ 5 to 7 Days (Regular TAT)

Date Required _____

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Report Results

- ☑ Email ☐ QA/QC
- ☐ Online ☑ PDF
- ☐ Fax ☑ Excel

Requirements

- ☐ HCDWORG ☐ SPIGEC
- ☐ AB Tier 1 ☐ BCCSR

Other (list below)

Special Instructions/Comments (please include contact information including phone number if different from above).

No Preservatives were added to the dissolved metals container

	Site I.D.	Sample Description	Depth start (cm)	Depth end (m)	Date/Time sampled	Matrix	Sampling method	Number of Containers #	MeOH Field Preserved? ✓	Gibsons Landfill sampling ✓
1	G1	Surface Water			12/12/19, 9:54	Water	Dip	3		✓
2	G2	Surface Water			12/12/19,10:00	Water	Dip	3		✓
3	G3	Surface Water			12/12/19,10:12	Water	Dip	3		✓
4	G4	Surface Water			12/12/19,10:22	Water	Dip	3		✓
5	G5	Surface Water			12/12/19,10:05	Water	Dip	3		✓
6	Field Blank				12/12/2019	Water	Dip	3		✓
7										
8										
9										
10										
11										
12										
13										
14										
15										

Enter tests above (✓ relevant samples below)

Please indicate any potentially hazardous samples

Submission of this form acknowledges acceptance of Element's Standard of terms and conditions (https://www.element.com/terms/terms-and-conditions)

Lot: 1397970 COC

Temp. received: 7.8 °C
Date/Time stamp:
Delivery Method:
Waybill:
Received by:

Control #