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**UPDATED HYDROGEOLOGICAL CHARACTERIZATION AND IMPACT
ASSESSMENT
SECHELT LANDFILL
SECHELT, BRITISH COLUMBIA**

Prepared for:

SUNSHINE COAST REGIONAL DISTRICT (SCRD)
1975 Field Road
Sechelt, British Columbia
V0N 3A1

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1. INTRODUCTION

1.1 Purpose and Use

XCG Consulting Limited (XCG) was retained by the Sunshine Coast Regional District (SCRD) to prepare an Updated Hydrogeological Characterization and Impact Assessment report for the Sechelt Landfill (Site). The objective of this task was to update the July 2015 Hydrogeological Characterization and Impact Assessment report, to ensure this updated assessment meets the content requirements provided in the British Columbia Ministry of the Environment (BC MOE) Landfill Criteria for Municipal Solid Waste (2016) Hydrogeology and Hydrology Characterization Report (2016 Landfill Criteria).

The 2016 Landfill Criteria States that the minimum requirements of a Hydrogeology and Hydrology Characterization Report are:

1. Map and Cross-sections – A geologic map and geologic cross-section of the landfill site showing lithology and structural features. Cross-sections shall be referenced to the geologic map and shall be located to best portray geologic features relevant to the landfill site.
2. Geologic Structure – A description of the natural geologic structure of materials underlying and adjacent to the landfill site.
3. Hydraulic Conductivity –The in-situ hydraulic conductivity of soils immediately underlying the landfill footprint including:
 - a. Hydraulic conductivity data, in tabular form, for selected locations within the landfill footprint.
 - b. A map of the landfill site showing test locations where these hydraulic conductivity data were obtained.
 - c. An evaluation of the test procedures and rationale used to obtain the hydraulic conductivity data.
4. Groundwater Flow Direction – the perennial direction(s) of ground water movement beneath and adjacent to the landfill site.
5. Groundwater Flux - the groundwater flux within the aquifer(s) beneath the landfill site.
6. Springs/Groundwater Discharge – A map showing the location of all springs and groundwater discharge locations within 1 km of the landfill footprint.
7. Surface Hydrology – A review of water and contaminant transport over the earth's surface, and through near-surface soils within 1 km of the landfill footprint.
8. Water Quality – An evaluation, supported by available water quality analytical results, of the baseline water quality within 1 km of the landfill footprint.
9. Background – A tabulation of available background water quality for all applicable monitoring parameters and indicator parameters identified in the environmental monitoring program.



10. Land and Water Use

- a. Well Map – a map showing the locations of all wells including water supply monitoring, oil and gas wells, geothermal, etc. within 1 km of the landfill footprint.
- b. Well Information – well information, where available, for each water well indicated on the well map including, but not limited to:
 - Total well depth.
 - Diameter of casing at ground surface and at total depth.
 - Type of well construction (cable-tool, rotary, etc.).
 - Depth and type of perforations.
 - Name and address of well driller.
 - Year of well construction.
 - Use of well (drinking, irrigation, livestock watering, etc.).
 - Depth and type of seals.
 - Lithologic, geophysical, and other types of well logs, if available.
 - Water levels, pump tests, water quality, and other well data, if available.
- c. Land Use – Current and allowed land uses within 1 km of the landfill footprint including:
 - Types of land use (residential, commercial, industrial, agricultural, recreational, etc.).
 - Types of crops.
 - Types of livestock.
 - Number and location of dwelling units.

11. Groundwater and Surface Water Uses – Current and planned future uses of groundwater and surface water within 1 km of the landfill footprint including types of water use (drinking, aquatic life, irrigation, and livestock watering, etc.)

The scope of this report is limited to the matters expressly covered. This report has been prepared for the sole benefit of Sunshine Coast Regional District and may not be relied upon by any other person or entity without the written authorization of XCG Consulting Limited. Any use or reuse of this document (or the findings and conclusions represented herein), by parties other than those listed above, is at the sole risk of those parties.

1.2 Site Description

The Site is located at 4901 Dusty Road in Sechelt, British Columbia approximately 6.5 kilometres northeast of the District of Sechelt (Figure 1). The Site is located on Crown Land under License of Occupation No. 237204. The legal description of the Site is Block C, District Lot 7613, Group 1, New Westminster District.



The Site property is bounded to the north, east, and west by Crown Land (DL 7613), and to the south by Northcote Properties (DL 2464). The landfill encompasses an area of approximately 7 hectares, within an overall Site area of approximately 9.5 hectares. A site location map is shown on Figure 1.

Lehigh Hanson Materials Limited owns the mineral rights and currently operates its Sechelt Mine on the land south and west of the Site, with future expansion options for the Crown Land east and north of the Site.

The Site operates under Operational Certificate No. 106060 and comprises a non-hazardous solid waste landfill that accepts municipal solid waste from the District of Sechelt, Town of Gibsons, Sechelt Indian Government District, and all of the electoral areas in the SCRD. In addition, as of July 20, 2015, waste received at the Pender Harbour Transfer Station is landfilled at the Site.

A fish composting operation was formerly located immediately east of the landfill, and it was in operation until 1992.

Existing facilities located at the Site include the following, as shown on Figure 2:

- Scale house and weigh scale;
- Office trailer;
- Power shed;
- Special waste storage building;
- Recycling area;
- Contact water pond;
- Share shed;
- Public tipping area; and
- Maintenance shed.

A copy of Operation Certificate No. 106060 is included as Appendix A.



2. SETTING

2.1 Topography and Drainage

The Site is located in the physiographic region referred to as the Georgia Lowlands, which comprises the west coast of mainland British Columbia (Holland, 1976). The Site is located approximately 3 kilometres east of the Salish Sea and Sechelt Inlet.

The Site is located on the north edge of a plateau at an approximate elevation of 200 metres above mean sea level (amsl). The majority of the plateau is used for aggregate extraction. From the plateau, the topography slopes steeply upward to the east toward the Coast Mountains.

The plateau is located on the drainage divide between the Irgens Creek watershed to the north and the Chapman Creek watershed to the south. As shown on Figure 1, the Site is located primarily within the Irgens Creek watershed.

Stormwater runoff from areas of the Site completed with final cover and interim final cover, as shown on Figure 2, is routed to the north and west by a series of ditches, pipes, and culverts which discharge directly to the Dusty Road roadside ditch, which conveys water westward eventually draining into Irgens Creek. Irgens Creek runs in a westerly direction, eventually discharging to Porpoise Bay.

Stormwater run-off from active areas of the landfill is routed to the contact water pond, which is allowed to infiltrate.

2.2 Geology

The Georgia Lowlands is underlain by granitic rocks as well as by inliers of older formations (Holland, 1976). Geologic mapping indicates that locally the Site is underlain by a granodiorite intrusive rock (BCGS, 2013).

According to the Geological Survey of Canada Surficial Materials of Canada Map 1880A, the Site is located on the boundary between surficial deposits consisting of till veneer (thin and discontinuous till, may include extensive areas of rock outcrop) to the north, and lag (sand, gravel, and pockets of finer sediment) to the south (Fulton, 1995).

Greater detail is provided by “Surficial Geology and Sand and Gravel Deposits of Sunshine Coast, Powell River, and Campbell River Areas, Bulletin 65” which indicates that:

- Surficial deposits on and south of the Site are comprised of cobbles, gravel, sand, and silt (Capilano Sediments fluvial deltaic fan and channel deposits). The Capilano deposits are the sites of most of the aggregate pits in the area;
- Surficial deposits on and north of the Site are comprised of till which extends for approximately 1,000 metres (Vachon Drift ground moraine deposits); and
- Surficial deposits north of the till consist of bare rock with thin patches of overburden (McCammon, 1977).



Records for water wells nearest the Site indicate that overburden, consisting of sand and gravel with cobbles, with a layer of till or compact to dense silt (at various depths), extends to a depth of 60 to 120 metres below ground surface (bgs).

A map of surficial geological is provided on Figure 3a, and the bedrock geology is shown on Figure 3b.

A geologic cross-section through the Site, based on the logs for approximately 20 boreholes advanced to facilitate construction of groundwater monitoring wells, is shown on Figure B1 in Appendix B. Historic cross-sections are also included in Appendix B, as part of monitoring well installation reports.

As shown on the geologic cross-section on Figure B1, the overburden at the Site is comprised of silty sand and gravel to a maximum confirmed depth of 32 metres bgs. A dense silt and boulder till layer of varying thickness is present in the majority of deep boreholes from approximately 14 to 23 metres bgs. The dense silt till layer was not present, or was not noted, at deep boreholes MW99-9, MW13-01, and MW9 located in the southeast portion of the Site (XCG, 2015a).

2.3 Hydrogeology

Regionally, the Site is located within an area that has not been mapped or classified in the British Columbia aquifer classification system. This is likely due to the low population/low usage of groundwater for potable purposes, and the large area being used for aggregate mining, .

The area approximately 2 kilometres northwest of the Site is a classified aquifer. The aquifer is #566 and is classified as IIIA (lightly developed, high vulnerability) and ranked for hydrogeologic and water use as a 9 in a range of 1 to 25.

According to British Columbia water wells records obtained from iMapBC database, the nearest water wells to the Site are located approximately 1.7 kilometres west of, and cross-gradient to, the Site. The locations of water wells near the Site are shown on Figure 5. The records for water wells near the Site indicate that the wells are completed in overburden at a depth ranging from approximately 20 to 100 metres bgs, and groundwater is located at a depth of approximately 30 metres bgs (Table 1).

A search of the Oil and Gas Commission records available through the iMapBC database found no petroleum-related wells within 1 km of the Site boundaries.

Groundwater levels in the on-site monitoring wells are being monitored on a quarterly basis as part of the Site Environmental Monitoring Program to determine the depth to the water table/water table elevation, and the approximate direction of groundwater flow. Historic groundwater elevations are provided in Appendix C and on the groundwater hydrograph on Figure C1.

Based on the Site geology and the observed groundwater levels, perched groundwater appears to be present at the Site on top of the dense silt till layer from a depth of approximately 1 to 14 metres bgs (Piteau, 1999). The perched groundwater is reflected in the water levels for monitoring wells where a confining layer is present, or monitoring wells instrumented above the confining layer. The elevation of the perched



groundwater ranges from approximately 211 metres amsl at the north end of the Site, to approximately 200 metres amsl at the south end of the Site.

Deep overburden monitoring wells MW13-01 and MW13-02 are screened in the deep gravelly sediments which are interpreted to be hydraulically connected to underlying bedrock aquifer. The bedrock hydraulic conditions are reflected in the water levels for these deep monitoring wells where the confining layer is not present, or monitoring wells are instrumented below the confining layer. The interpreted bedrock groundwater elevation at the Site ranges from approximately 186 to 200 metres amsl.

As illustrated on the groundwater hydrograph on Figure C1, historic groundwater elevations indicate seasonal fluctuations which are more pronounced in monitoring wells instrumented in the perched aquifer.

Groundwater levels measured as part of the monitoring program indicate that the perched groundwater beneath the Site flows in a dominantly south to south-westerly direction. It is anticipated that as perched groundwater migrates to the south it will percolate down to the deep overburden and bedrock aquifer.

Historical measurements of leachate levels in landfill gas extraction wells EX1 and EX2 (Figure 2) indicated that leachate was located from 10 to 12 metres below the landfill surface and was mounded approximately 10 metres above the prevailing ground surface and approximately 15 metres above the perched groundwater (XCG, 2015).

2.4 Receptors

Receptors are generally defined and grouped based upon risk type. The primary environmental receptors include potential downstream users of either surface water or groundwater, and the on-Site buildings and adjacent property owners with respect to landfill gas.

2.4.1 Surface Water

As noted previously, surface watercourses located down-gradient of the Site include:

- Chapman Creek, located approximately 550 metres south of the Site, which drains into Trail Bay; and
- Irgens Creek, located approximately 100 metres north of the Site, which drains into Porpoise Bay.

According to the District of Sechelt Official Community Plan (SCRD, 2009), both Chapman Creek and Irgens Creek provide habitat for fish populations. Moreover, Chapman Creek is known to provide the majority of the water for the SCR D water supply system (Appendix D). Water intake locations along Chapman Creek are indicated on Figure 4. A number of other water intake licenses exist for Chapman Creek and Irgens Creek. Summaries of these licenses are provided in Table 2 and 3, respectively.

According to the BC Water Resources Atlas, Sechelt Spring is located north of the Site. A surface water intake license (C007970) from 1925 exists for irrigation and domestic purposes along Sechelt Spring under licensee name “Sechelt Indian Band”



and appears to supply water to a series of buildings in the southwest part of the town of Sechelt on the Sechelt Band Lands. However, the SCR D reviewed the properties in this area and they appear to be using SCR D water services. The BC Water Resources Atlas also shows some line work running the southwest through the Sechelt Landfill towards the town of Sechelt, which would have had to be abandoned or decommissioned at some point due to landfill development. On March 14, 2019 the SCR D conducted reconnaissance on the Sechelt Spring. The Sechelt Spring appears to be part of Irgens Creek which is intermittent at this point. The SCR D was able to locate what appeared to be an old man-made conveyance ditch that would have diverted water from the Sechelt Spring/Irgens Creek. This ditch originates at Irgens Creek and ends at Dusty Road, just east of groundwater monitoring wells MW4 and MW4A (Figure 2). Water was present in the first half (northern portion) of the conveyance ditch but was dry farther south, likely due to the increase in ground elevation and the natural topography in the area sloping back toward Irgens Creek. This intake license (which is suspected to be inactive) is located up-gradient of the Site and therefore is not considered a potential receptor.

2.4.2 Groundwater

The details of the nearby down-gradient water wells are summarized in Table 1. As indicated in Table 1, the majority of the nearby, off-site groundwater wells are owned by Construction Aggregates Ltd. and are located on the Lehigh Hanson Materials Ltd. mine property west of the Site. Several down-gradient water wells are completed in the bedrock aquifer. According to Sylvis Environmental Services, quarterly surface and groundwater quality monitoring has been ongoing at the mine since 1999. The monitoring program has reportedly demonstrated that surface and groundwater quality have remained consistent since the inception of the monitoring program.

Based on the foregoing, it is apparent that the primary receptor for the Site is the bedrock aquifer. As indicated above, the shallow perched groundwater is believed to flow in a dominantly south to south-westerly direction, and percolate down to the deep overburden and ultimately to the bedrock aquifer. Groundwater in the bedrock aquifer is anticipated to flow in the direction of the bedrock surface gradient. For this reason, any monitoring wells completed in the deep overburden (bedrock) aquifer along the southern property boundary of the Site are considered to represent compliance monitoring locations.

2.4.3 Potential Use of Groundwater for Municipal Water Supplies

As part of a multi-phase regional groundwater investigation implemented by the SCR D, in October 2018, Associated Environmental Consultants Inc.(Associated) conducted a pumping test evaluation on a test production well (WIN54929) located approximately 2 kilometers west of the Site, as shown on Figure 5.

This test production well, referred to as the Dusty Road Well, was reportedly installed to a depth of 83.5 metres bgs in an unconfined sand and gravel unit.

Associated issued the summary report to the SCR D in January 2019, and the reported pumping test analysis indicated the Dusty Road Well had a high sustainable yield of



approximately 300 gallons per minute. However, due to its unconfined aquifer setting, the proximity of the adjacent quarry and the resultant low source protection score, the SCRD determined that the Dusty Road site would not be developed for municipal water supplies at that time. These findings were outlined in the SCRD Infrastructure Committee Meeting of January 24, 2019.

2.4.4 Landfill Gas

With respect to landfill gas these risks can broadly be categorized as: exposure to combustible gases, asphyxiation potential, and ecotoxicity. The on-site buildings were the only receptor type identified which could potentially be adversely impacted by landfill gas migration.

There are currently several buildings located at the Site. These include the scale house, office trailer, power shed, share shed, special waste storage building, and maintenance shed.

The landfill site's neighbouring properties to the north, east, and west are currently forested areas (crown lands). There is also an aggregate mine south of the Site. There are no structures within the immediate vicinity (i.e. within 300 metres) of the Site on the surrounding properties.



3. ENVIRONMENTAL MONITORING PROGRAM

The results of the ongoing environmental monitoring are reported annually in March of the following year. The most recent Annual Report was issued by XCG on March 11, 2020, and reported groundwater, surface water and landfill, gas monitoring results for the period January 1, 2019 to December 31, 2019.

The results of the environmental monitoring being undertaken in 2020 will be reported in March 2021, and have not been included in this assessment.

3.1 Historical Environmental Monitoring Programs

The following outlines a history of environmental monitoring at the Sechelt Landfill (Piteau Associates Engineering Ltd., 2012):

1993

- Semi-annual monitoring program commences with monitoring wells MW-1 through MW6.

1996

- Piteau Associates Engineering Ltd. installed monitoring wells MW-7, MW-8, and MW-9, and added these wells to the monitoring program.

1999

- Piteau Associates Engineering Ltd. installed monitoring wells MW99-7, MW99-8, and MW99-9, and added these wells to the monitoring program. These wells were installed to replace monitoring wells MW-7, MW-8, and MW-9, which were destroyed shortly after their construction.

2002

- Groundwater samples from two monitoring wells (WP5 and the Sound Berm Well) at the Lehigh Materials facility were submitted for chemical analyses of basic parameters six times between 2002 and 2011. Well WP5 and the Sound Berm Well are situated approximately 2.2 kilometres west and 2.5 kilometres west-southwest of the Site, respectively.

2013

- XCG decommissioned monitoring wells MW99-7, MW99-8, and MW99-9 as part of the Phase 1 Final Closure project and replaced them with monitoring wells MW13-3, MW13-2, and MW13-1, respectively. In addition, background monitoring wells MW13-4 and MW13-5 were installed on the north side of Dusty Road to characterize shallow and deep up-gradient groundwater quality, as recommended in the “2012 Environmental Monitoring Report” (XCG, November 2013).
- Two soil gas probes, GP13-01 and GP13-02, were installed near the share shed and scale house, respectively, as recommended in the “Draft Environmental Monitoring Plan” (XCG, March 2013).



2017

- XCG decommissioned monitoring wells MW13-5 and MW-5. XCG installed monitoring well MW17-01 to monitor groundwater east of the landfill and to replace monitoring well MW-5 which was located off-site in a wet area. XCG installed MW17-02 to replace MW13-5, as MW13-5 had historically been dry. These locations were added to the monitoring program.
- XCG installed an additional soil gas probe GP17-01 near the maintenance shed, as recommended in the “Draft Environmental Monitoring Plan” (XCG, March 2013).
- A landfill gas monitoring program was implemented at the Site using soil gas probes GP13-01 and GP13-02 installed in 2013 and GP17-01 installed in 2017.

2018

- Indoor air monitoring of six on-site buildings commenced as recommended in the 2017 Annual Report (XCG, March 2018).

2019

- Monitoring well MW-1A was removed from the monitoring program. It was installed in 1993 and has never been sampled due to insufficient water. This well has also been damaged for several years. It was therefore recommended that this well be removed from the monitoring program. Monitoring well MW-1 provides sufficient groundwater quality data in this area of the Site.

3.2 Groundwater Monitoring

The groundwater sampling events were completed at the Site in April, November, and December of 2019, and involved monitoring and sampling 12 on-Site monitoring wells.

Collection of groundwater samples was undertaken by SCRD staff for all monitoring events. It is noted that the summer monitoring event was not conducted in 2019 due to change in staffing at the SCRD.

It is noted that groundwater samples were not collected from the following monitoring wells due to insufficient water column in the well at the time of sampling:

- April monitoring event: MW-4A, MW17-01, and MW17-02;
- November monitoring event: MW-4A, MW17-01, and MW17-02; and
- December monitoring event: MW17-01, and MW17-02.

A summary of the on-Site wells and completion details is presented in Table 4. Groundwater monitoring well locations are illustrated on Figure 2. Stratigraphic logs are provided in Appendix B.

The groundwater monitoring program included hydraulic (water level) monitoring, field parameter monitoring (pH, conductivity, temperature, dissolved oxygen, and redox potential), and the collection and laboratory analyses of groundwater samples for the following chemical parameters:

- pH;



- Electrical conductivity;
- Hardness;
- Chemical oxygen demand (COD);
- Dissolved organic carbon (DOC);
- Alkalinity, bicarbonate, carbonate, and hydroxide;
- Turbidity;
- Ammonia;
- Nitrate;
- Nitrite;
- Nitrate plus nitrite;
- Total phosphorous;
- Total nitrogen;
- Total Kjeldahl Nitrogen (TKN);
- Dissolved chloride;
- Dissolved sulfate;
- Detailed dissolved metals scan; and
- Volatile organic compounds.

3.2.1 **Groundwater Monitoring Protocols**

In order to ensure that representative groundwater samples were obtained from the monitoring wells and that no contamination of the recovered samples occurred, the following protocols were implemented during sampling activities:

- Prior to groundwater sample collection, each well was purged of stagnant water. The objective of purging is to pump groundwater from the well until a representative sample of the formation groundwater is obtained. This is generally achieved by the removal of three to five volumes of standing water in the well. In general, purging is considered complete once sediment-free groundwater is obtained.
- Groundwater samples were collected using plastic disposable bailers in the appropriate laboratory-supplied sample containers and preserved as required. Groundwater samples designated for dissolved metals analysis were lab filtered. All samples were packaged in a cooler, stored at a temperature of approximately 4°C and delivered to the laboratory within a 24-hour period.
- Groundwater samples were submitted, under chain-of-custody protocol, to Caro Analytical Services in Richmond, British Columbia, or to Element Materials Technology Canada in Surrey, British Columbia for analysis.

During each monitoring event, the following field data was recorded:



- Water level;
- Purge volumes; and
- Field measured parameters (pH, conductivity, temperature, dissolved oxygen, and redox potential).

3.2.2 Groundwater Elevations

Groundwater levels were measured in April, November, and December 2019 to determine the depth to the water table, water table elevation, and the approximate direction of groundwater flow. Table 5 provides a summary of the groundwater elevations measured at the Site. Table 5 also includes water levels collected XCG in July 2020. Historic groundwater elevations are provided in Appendix C.

As illustrated on the groundwater hydrograph on Figure C1, historic groundwater elevations indicate seasonal fluctuations, with overall groundwater elevations remaining relatively consistent at each monitoring location.

3.2.3 Regulatory Criteria

The groundwater quality laboratory analytical data was assessed with respect to the British Columbia Approved and Working Water Quality Guidelines, 2019 and 2017 Editions respectively, for drinking water and freshwater aquatic life (hereinafter collectively referred to as Criteria). The freshwater aquatic life (FWAL) criteria are deemed most applicable due to the presence of Irgens Creek north of the landfill and Chapman Creek south-west of the Site, which are the most likely receptors for groundwater. The drinking water quality (DWQ) criteria are also applicable due to the water intakes along Chapman Creek, supplying drinking water to the residents of the SCRDC, and water licenses along Irgens Creek.

As presented above, the monitoring wells completed in the deep overburden aquifer along the southern property boundary of the Site are considered to represent compliance monitoring locations, as they are interpreted to be hydraulically connected to the bedrock aquifer. Site compliance is established by comparing analytical results from these monitoring wells to the DWQ criteria. FWAL criteria are not deemed applicable at these groundwater monitoring locations as groundwater is anticipated to discharge to surface water but much farther downstream (towards Chapman Creek located approximately 550 metres south of the Site), hence the FWAL criteria are applicable for comparison purposes but not for determining compliance at the property boundary.

It is noted that groundwater samples were not compared to the FWAL criteria for turbidity as it is not deemed to be applicable for groundwater, as the criteria applies to high flows or turbid waters. It is noted that groundwater samples were not compared to the FWAL criteria for dissolved oxygen and temperature as they are not deemed to be applicable for groundwater as the criteria applies to water bodies.

As per the Environmental Monitoring Plan (XCG, April 2018a), groundwater samples from the monitoring wells are analyzed for dissolved metals concentrations. It is noted that both the DWQ and FWAL criteria for metals are stated in terms of total concentrations, with the exception of the FWAL criteria for aluminum and iron, which



are for dissolved concentrations. For comparison purposes, the results for the dissolved metals analysis are still assessed with regards to the DWQ and the FWAL criteria for total metals. The analytical results are further compared to historical and background results to form an opinion regarding Site compliance and attenuation.

3.2.4 Leachate Indicator Parameters

3.2.4.1 General

The objective of considering leachate indicator parameters is to assist with differentiating landfill impacts from other, non-landfill derived potential impacts. Indications of impact from the landfill is used to determine the performance of the landfill and the need for additional monitoring and/or remedial measures.

The primary consideration in determining leachate indicator parameters is that the concentration of the key leachate indicator parameters must be significantly higher in concentration in comparison to either background or native groundwater quality.

Typically, chloride is a key parameter in determining landfill impacts to groundwater. Chloride is considered a conservative ion, as it does not enter into reactions, adsorb significantly onto mineral surfaces, form complexes with other ions, or undergo transformations that remove the ions from solution. Conservative ions, such as chloride, are the first parameters to break through when a contaminant plume moves through a porous medium and so should be the first to be detected at the leading edge of the moving plume.

In contrast, other, non-conservative parameters, such as nitrate, sulfate, bicarbonate, phosphate, ammonium, calcium, magnesium, and potassium undergo chemical reactions in solutions and are adsorbed onto the aquifer material or are biologically transformed. The non-conservative parameters move slower than the conservative parameters and are usually found/arrive at the monitoring location at a later time (after the conservative parameters), or are only found closer to the pollution source.

In addition, manganese and iron can be good leachate indicator parameters. Manganese and iron are common elements in soil that occur in an oxidized form and are used as indicators of landfill leachate-related impacts. Increased concentration of dissolved manganese and iron in groundwater are an indicator of anaerobic conditions. In anaerobic or anoxic conditions, organic carbon in leachate can be oxidized by groundwater bacteria, which will increase the consumption of available electron acceptors used for respiration. Groundwater bacteria will preferentially respire and chemically reduce dissolved oxygen, nitrate, geologic manganese and iron oxide minerals, sulfate, and carbon in that order. Once the dissolved oxygen and nitrate are depleted, the reduction of manganese and iron oxides in the soil releases soluble metal ions into the groundwater increasing the concentration of dissolved iron and manganese.

Ammonia and other forms of nitrogen in water, principally nitrate, can also be good indicators of man-made effects from landfill leachate, sewage, fertilizer, nitrogenous aerosols, plastics, and drugs. Since conditions within a landfill are typically anaerobic, the concentration of ammonia is high and the concentration of nitrite and nitrate are



typically low. Ammonia and organic nitrogen, collectively detected as TKN, represent a high percentage of the total soluble nitrogen compounds in leachate. Accordingly, high concentrations of TKN can be used as an indicator of leachate impact, while high concentrations of nitrate and nitrite are typically indicative of other anthropogenic impacts.

The amount of organic material in groundwater can also be a good indicator of anthropogenic impacts. The content of organic material in groundwater is measured through one or a combination of biological oxygen demand (BOD), COD, total organic carbon (TOC), or DOC.

3.2.4.2 Site

Comparison of the historic data from monitoring wells MW-4, MW-4A, MW13-04, and MW13-05 (background water quality), and MW-3 (closest approximation of leachate quality at the landfill) indicate that the primary leachate indicator parameters for the Site include: chloride, COD, DOC, ammonia, and TKN. As indicated above, chloride is a key parameter in determining landfill impact, including impact migration and attenuation capacity. The nitrogen compounds (ammonia, nitrate, nitrite, and TKN) and COD are toxic to aquatic life, and important indicators of contaminant attenuation down-gradient of the Site and potential risk to Chapman Creek and Irgens Creek.

The concentrations of cadmium and manganese regularly exceed the FWAL criteria at background groundwater monitoring locations MW-4 and MW-4A, and upstream surface water monitoring location Upper Chapman Creek (Site A). As such, the high concentrations of cadmium and manganese detected at other monitoring locations are believed to be naturally occurring in the area.

The results for dissolved metals indicate multiple exceedances of the DWQ and FWAL criteria during the reporting period. These exceedances may be the result of suspended sediment in the water samples. The presence of particulate matter in the water samples is evidenced by high turbidity results and by the variability of iron concentrations. It is recommended that the monitoring of dissolved metals be continued, with special consideration to monitoring protocols and minimizing particulate matter in the water samples..

3.2.5 Groundwater Quality Results

Water quality analytical results for the 2019 reporting period are presented in Tables 6 to 16. Historic water quality data are included as Appendix E. Concentration versus time graphs were prepared using the historic monitoring data for key leachate indicator parameters including chloride, COD, and ammonia and are included in Appendix E. Laboratory certificates of analyses are included as Appendix F.

It is noted that field pH is outside of the FWAL acceptance range for the majority of monitoring events at all of the sampling locations, which is inconsistent with the pH recorded by the laboratory. The pH in water is dependent on a variety of factors (carbon dioxide, dissolved minerals, temperature) and can change over time, and the difference between the field and laboratory pH is likely due to one or more of these factors.



3.2.5.1 Shallow Groundwater

On-Site wells that monitor shallow groundwater quality include MW-1, MW-2, MW-2A, MW-3, MW-4, MW-4A, MW17-01 (Dry), and MW17-02 (Dry). These wells are located up-gradient and cross-gradient from the landfill near the property boundary, in order to detect landfill impacts as they migrate from leachate down to groundwater.

Background Water Quality

Monitoring wells MW-4, MW-4A, and MW17-02 located north (up-gradient) of the landfill, are considered to represent background quality for shallow groundwater. However, these monitoring wells are located within 20 metres of the landfill (limit of waste), and as a result these wells may not be truly representative of background groundwater conditions. This will be of greater importance as the landfill increases in elevation and the potential for radial flow of leachate increases due to the increasing leachate head within the landfill.

Although, historic monitoring results for background wells MW-4 and MW-4A indicate that these wells have not been significantly impacted by the landfill, a new shallow background monitoring well, MW13-05, was installed north of Dusty Road in August of 2013. However, MW13-05 was typically dry and, as such, in August 2017, MW13-05 was decommissioned and a new well, MW17-02, was installed in its place.

It is noted that groundwater analytical data is not available for monitoring well MW-4A for the April and November monitoring events and monitoring well MW17-02 during the all monitoring events due to insufficient water being present in these wells.

Monitoring Well MW-4

Monitoring well MW-4 analytical data for the reporting period indicated the following:

- Laboratory-measured pH of 6.4 was outside of the FWAL accepted range of 6.5 - 9.0 during the December monitoring event;
- Total phosphorous exceeded the DWQ aesthetic objective (0.01 mg/L) during the April and November monitoring events with concentrations of 0.0233 mg/L and 0.015 mg/L, respectively;
- Manganese exceeded the DWQ aesthetic objective (0.05 mg/L) during the all monitoring events with concentrations ranging from 1.28 mg/L to 3.48 mg/L. Manganese also exceeded the FWAL hardness-dependent maximum acceptable concentration during the April monitoring event; and
- Toluene exceeded the FWAL maximum acceptable concentration (0.0005 mg/L) during the November and December monitoring events with concentrations of 0.0016 mg/L and 0.0017 mg/L, respectively.

As indicated above, the concentrations of manganese detected at the up-gradient monitoring locations are believed to be caused by manganese naturally occurring in the area.



The concentration versus time graphs for monitoring well MW-4 indicated the following:

- Chloride concentration was relatively constant at approximately 2 mg/L until 2006 when it spiked to 32 mg/L. Subsequently, chloride concentration increased to approximately 15 mg/L in 2010. Chloride concentrations have remained below 10 mg/L since 2011.
- COD concentration has been variable, from below detection limits to 48 mg/L.
- Ammonia concentration has been variable, from below detection limits to 0.15 mg/L, with spikes in 2006 (4.66 mg/L), 2014 (0.46 mg/L and 1.6 mg/L), and 2017 (0.31 mg/L).

Based on the change in chloride concentrations, it appears that monitoring well MW-4 has been slightly impacted by the landfill, likely due to the close proximity to the limit of waste and the radial flow from mounded leachate.

Monitoring Well MW-4A

Monitoring well MW-4A analytical data for the reporting period indicated the following:

- Laboratory-measured pH of 5.9 was outside of the FWAL accepted range of 6.5 - 9.0 during the December monitoring event;
- Total phosphorous exceeded the DWQ aesthetic objective (0.01 mg/L) during the December monitoring event with a concentration of 0.032 mg/L; and
- Manganese exceeded the DWQ aesthetic objective (0.05 mg/L) during the December monitoring event with a concentration of 1.25 mg/L.

As indicated above, the concentrations of manganese detected at the up-gradient monitoring locations are believed to be caused by manganese naturally occurring in the area.

The concentration versus time graphs for monitoring well MW-4A indicated the following:

- Chloride concentration has been relatively constant at approximately 2 mg/L, with the exception of two spikes in 2007 (15.8 mg/L) and 2010 (9.7 mg/L). Since 2013, concentrations have fluctuated between 1.5 mg/L and 6.3 mg/L.
- COD concentration has been variable, from below detection limits to approximately 70 mg/L. A spike in concentration was seen in December 2017 (84 mg/L).
- Ammonia concentration has been variable, from below detection limits to 0.91 mg/L.

Based on the change in chloride and COD concentrations, it appears that monitoring well MW-4A has been slightly impacted by the landfill, likely due to the close proximity to the limit of waste and radial flow from mounded leachate.

*Monitoring Well MW17-02*

As indicated above, there are no results for monitoring well MW17-02 for the reporting period.

It is noted that there is insufficient historical data to analyse the concentration versus time graphs for monitoring well MW17-02.

Cross-gradient Monitoring Wells

Monitoring wells MW-1, MW-2, MW-2A, MW-3, and MW17-01 are located cross-gradient of the landfill.

It is noted that groundwater analytical data is not available for monitoring well MW17-01 during all monitoring events due to insufficient water.

Monitoring Well MW-1

Monitoring well MW-1 is located at the northwestern corner of the landfill, near the former gypsum waste disposal area and current public tipping area. Gypsum is a high sulfate content waste which can result in the production of hydrogen sulfide gas.

Monitoring well MW-1 analytical data for the reporting period indicated the following:

- Turbidity exceeded the DWQ maximum acceptable increase from background during the April and November monitoring events with recorded values of 180 NTU, and 31.7 NTU, respectively;
- Total phosphorous exceeded the DWQ aesthetic objective (0.01 mg/L) during the all monitoring events with concentrations ranging from 0.075 mg/L to 0.182 mg/L; and
- Manganese exceeded the DWQ aesthetic objective (0.05 mg/L) during the April monitoring event with a concentration of 0.056 mg/L.

As indicated above, elevated concentrations of manganese are believed to be caused by manganese naturally occurring in the area. Elevated concentrations of total phosphorous were also recorded at up-gradient monitoring wells MW-4 and MW-4A.

The concentration versus time graphs for monitoring well MW-1 indicated the following:

- Chloride concentrations are exhibiting an increasing trend, with a maximum peak recorded in 2016 (80 mg/L).
- COD concentration was variable, from below detection limits to 34 mg/L until 2012. Since then, COD concentrations have been variable, with a maximum concentration of 45 mg/L recorded in 2017.
- Ammonia concentration has been variable, from below detection limits to 4.4 mg/L. No trends are apparent.

Elevated concentrations of chloride (above background levels) could potentially be attributed to the application of road salt along Dusty Road or in the public tipping area. Conversely, these impacts could be the result of historic waste operations in the



vicinity of monitoring well MW-1, or radial flow of impacted water from the contact water pond.

Monitoring Well MW-2

Monitoring well MW-2 is located along the western property boundary, west of the stockpile area.

Monitoring well MW-2 analytical data for the reporting period indicated the following:

- Total phosphorous exceeded the DWQ aesthetic objective (0.01 mg/L) during all monitoring events with concentrations ranging from 0.023 mg/L to 0.0517 mg/L;
- Iron exceeded the FWAL maximum acceptable concentration (0.35 mg/L) and the DWQ aesthetic objective (0.3 mg/L) during the December monitoring event with a concentration of 1.66 mg/L; and
- Manganese exceeded the DWQ aesthetic objective (0.05 mg/L) and the FWAL hardness dependent maximum acceptable concentration during all monitoring events with concentrations ranging from 6.83 mg/L to 14.6 mg/L.

As indicated above, elevated concentrations of manganese are believed to be caused by manganese naturally occurring in the area. Elevated concentrations of phosphorous were also recorded at up-gradient monitoring wells MW-4 and MW-4A.

The concentration versus time graphs for monitoring well MW-2 indicated the following:

- Chloride concentrations exhibited an increasing trend until 2010, when a peak of 190 mg/L was recorded. Since then, concentrations have been variable, from 24 mg/L to 210 mg/L.
- COD concentration has been variable, from below detection limits to 32 mg/L. Since 2015, a number of spikes have been recorded, with a maximum of 113 mg/L in 2018.
- Ammonia concentration had remained fairly consistent, below approximately 0.05 mg/L until 2016. Since then, a number of spikes have been recorded, with maximums in 2016 (0.36 mg/L) and 2018 (0.24 mg/L).

Elevated concentrations of chloride (above background levels) could potentially be attributed to the application of road salt in the public tipping area. Conversely, these impacts could be the result of historic waste operations in the vicinity of monitoring well MW-2, or radial flow of impacted water from the contact water pond.

Monitoring Well MW-2A

Monitoring well MW-2A is located along the western property boundary, west of the contact water pond.

Monitoring well MW-2A analytical data for the reporting period indicated the following:



- Turbidity exceeded the DWQ maximum acceptable increase from background during the April and November monitoring events with recorded values of 28.1 NTU (18.0 NTU for the duplicate sample) and 77.3 NTU, respectively;
- Total phosphorous exceeded the DWQ aesthetic objective (0.01 mg/L) during the all monitoring events with concentrations ranging from 0.273 mg/L and 0.8 mg/L, respectively;
- Iron exceeded the DWQ aesthetic objective (0.3 mg/L) during the April monitoring event with a concentration of 0.338 mg/L (0.386 mg/L for the duplicate sample). Iron also exceeded the FWAL maximum acceptable concentration (0.35 mg/L) during the April monitoring event for the duplicate sample with a concentration of 0.386 mg/L (original sample did not exceed);
- Manganese exceeded the DWQ aesthetic objective (0.05 mg/L) during the all monitoring events with concentrations ranging from 1.28 mg/L and 1.77 mg/L; and
- Toluene exceeded the FWAL maximum acceptable concentration (0.0005 mg/L), during all monitoring events with concentrations ranging from 0.0007 mg/L to 0.544 mg/L. Toluene also exceeded the DWQ aesthetic objective (0.024 mg/L), and the DWQ maximum acceptable concentration (0.06 mg/L) during the April monitoring event.

As indicated above, elevated concentrations of manganese are believed to be caused by manganese naturally occurring in the area. Elevated concentrations of phosphorous were also recorded at up-gradient monitoring wells MW-4 and MW-4A.

The concentration versus time graphs for monitoring well MW-2A indicated the following:

- Chloride concentration exhibited an increasing trend with a peak of 76 mg/L in 2013. Since then, concentrations drastically dropped, but have increased with a new peak of 89.8 mg/L in 2019.
- COD concentration were variable, from below detection limits to 30 mg/L until 2013. Since 2013, COD has demonstrated an increasing trend, with a maximum in 2018 of 687 mg/L.
- Ammonia concentration remained below 0.077 mg/L until 2008. Since 2008, it has demonstrated an increasing trend, with a maximum of 11.1 mg/L recorded in 2019.

Based on a comparison of the aforementioned leachate indicator parameters at monitoring well MW-2A, particularly chloride, COD, DOC, ammonia, and TKN, with the concentrations of these parameters at monitoring well MW-3 (closest approximation of leachate quality at the Site), this monitoring location has been moderately impacted by the landfill. These impacts could be the result of historic waste operations in the vicinity of monitoring well MW-2A, or radial flow of impacted water from the contact water pond.



Monitoring Well MW-3

Monitoring well MW-3 is located at the southwestern corner of the landfill, near the former sludge disposal pits. Monitoring well MW-3 is considered to represent leachate quality at the Site, as it is the most down-gradient shallow well.

Monitoring well MW-3 analytical data for the reporting period indicated the following:

- Turbidity exceeded the DWQ maximum acceptable increase from background during the April and November monitoring events with recorded values of 20 NTU and 82.2 NTU, respectively;
- Ammonia exceeded the FWAL pH and temperature dependant maximum acceptable concentration during all monitoring events with concentrations ranging from 13.0 mg/L to 20.8 mg/L;
- Total phosphorous exceeded the DWQ aesthetic objective (0.01 mg/L) during all monitoring events with concentrations ranging from 0.024 mg/L to 0.0833 mg/L; and
- Manganese exceeded the DWQ aesthetic objective (0.05 mg/L) during all monitoring events with concentrations ranging from 0.779 mg/L and 1.26 mg/L.

As indicated above, elevated concentrations of manganese are believed to be caused by manganese naturally occurring in the area. Elevated concentrations of phosphorous were also recorded at up-gradient monitoring wells MW-4 and MW-4A.

The concentration versus time graphs for monitoring well MW-3 indicated the following:

- Chloride concentrations exhibited an increasing trend, peaking in 2012 with a concentration of 210 mg/L. Since 2014 concentrations have varied from approximately 25 mg/L to approximately 110 mg/L.
- COD concentration has remained relatively consistent, averaging approximately 30 mg/L, with the exception of two spikes in 2008 (187 mg/L) and 2010 (241 mg/L).
- Ammonia concentration exhibited a decreasing trend until 2004, from 40.9 mg/L to below 3.29 mg/L. A slower increasing trend continued until 2010, with a peak of 21 mg/L. Concentrations have been gradually increasing overall since 2016 with a peak of 20.8 mg/L in 2019.

Based on a comparison of the aforementioned leachate indicator parameters at monitoring well MW-3, particularly chloride, COD, DOC, ammonia, and TKN, with the concentrations of these parameters in background monitoring wells, monitoring well MW-3 has been impacted by the landfill.

3.2.5.2 Deep Groundwater

On-Site monitoring wells that monitor quality of deep groundwater include MW13-01, MW13-02, MW13-03, and MW13-04. It is noted that monitoring wells MW13-01 and MW13-02 are installed in the deep overburden and are interpreted to



be hydraulically connected to the bedrock aquifer, while monitoring wells MW13-03 and MW13-04 are shallower and are interpreted to be screened near the base of the perched groundwater zone.

Background Groundwater Quality

Monitoring well MW13-04 located north (up-gradient) of the landfill, is considered to represent background groundwater quality.

Monitoring Well MW13-04

Monitoring well MW13-04 analytical data for the reporting period indicated the following:

- Alkalinity exceeded the FWAL dissolved calcium dependant working water quality guideline concentration (10 to 20 mg/L) during all monitoring events with concentrations ranging from 22.4 mg/L to 26 mg/L; and
- Total phosphorous exceeded the DWQ aesthetic objective (0.01 mg/L) during all monitoring events with concentrations ranging from 0.039 mg/L to 0.116 mg/L.

The concentration versus time graphs for monitoring well MW13-4 indicated the following:

- Chloride concentrations have been consistently below 4 mg/L since 2013 where a peak of 7.8 mg/L was observed.
- COD concentration has exhibited an overall decreasing trend since 2013, indicating the groundwater quality at this location is stabilizing over time.
- Ammonia concentration has been variable, ranging from under the laboratory detection limit to 0.31 mg/L.

Down-gradient Monitoring Wells

Monitoring Well MW13-01

Monitoring well MW13-01 is located at the east end of the southern landfill boundary. This well was installed in August of 2013 to replace monitoring well MW99-9.

It is noted that laboratory analytical results for MW13-01 were mislabelled as “MW13-3” in the laboratory certificate of analysis (Element Lot ID: 1397808) for December.

Monitoring well MW13-01 analytical data for the reporting period indicated the following:

- Turbidity exceeded the DWQ maximum acceptable increase from background during all monitoring events with recorded values ranging from 81.8 NTU to 101 NTU;
- Ammonia exceeded the FWAL pH and temperature dependent maximum acceptable concentration during all monitoring events with concentrations ranging from 52.7 mg/L to 72.7 mg/L;



- Total phosphorous exceeded the DWQ aesthetic objective (0.01 mg/L) during all monitoring events with concentrations ranging from 0.131 mg/L to 0.254 mg/L; and
- Manganese exceeded the DWQ aesthetic objective (0.05 mg/L) and the FWAL hardness dependent maximum acceptable concentration during all monitoring events with concentrations ranging from 4.03 mg/L to 6.21 mg/L.

Turbidity results have been variable at the Site including at the background monitoring well. It is believed that high turbidity values are indicative of suspended sediment in the monitoring wells, possibly due to the mobilization of fines during the purging and sampling activities.

Metals exceedances are possibly indicative of the presence of suspended sediment in the groundwater samples, further evidenced by elevated turbidity results.

Total phosphorus values measured are within the historic range of the background monitoring well.

It is noted that exceedances of the DWQ criteria for total phosphorus and manganese are for the aesthetic objectives and not health-based criteria. Water quality should improve as the monitoring well continues to be developed and eventually stabilizes.

The concentration versus time graphs for monitoring well MW13-01 (MW99-9) indicated the following:

- Chloride concentrations have exhibited a decreasing trend since 2000, stabilizing at approximately 20 mg/L since 2014.
- COD concentration has remained relatively consistent at approximately 50 mg/L, with the exception of a spike of 216 mg/L in 2007. The elevated COD concentrations recorded in 2013 (254 mg/L) and 2014 (164 mg/L and 157 mg/L) were likely a result of the new well installation (MW13-1) not yet having stabilized. COD concentrations since 2014 have returned to approximately 50 mg/L or less.
- Ammonia concentration had remained relatively consistent at approximately 100 mg/L until 2014, with the exception of a spike in 2006 of 763 mg/L. After 2014, ammonia concentration reduced to approximately 60 mg/L.

Based on a comparison of the aforementioned leachate indicator parameters at monitoring well MW13-01, particularly chloride, COD, DOC, ammonia, and TKN, with the concentrations of these parameters in background monitoring well MW13-04, it appears that monitoring well MW13-04 has been moderately impacted by the landfill as well as the historic fish composting operation. The historic fish composting operation was located immediately east of the landfill, and was operated until 1992.

Based on the concentration versus time graph for chloride, it appears that these impacts are decreasing with time.

It is important to note that the recent construction of final cover and interim cover over the east end of the landfill, along with surface water controls along the south side of



the Site, will continue to improve groundwater quality in the vicinity of MW13-01 by reducing infiltration and leachate generation.

Monitoring Well MW13-02

Monitoring well MW13-02 is located at the centre of the southern landfill boundary and replaced monitoring well MW99-8 in August of 2013.

Monitoring well MW13-02 analytical data for the reporting period indicated the following:

- Turbidity exceeded the DWQ maximum acceptable increase from background during the April and December monitoring events with recorded values of 801 NTU and 89.1 NTU (190 NTU for duplicate sample), respectively;
- Total phosphorous exceeded the DWQ aesthetic objective (0.01 mg/L) during all monitoring events with concentrations ranging from 0.214 mg/L to 0.76 mg/L; and
- Manganese exceeded the DWQ aesthetic objective (0.05 mg/L) and the FWAL hardness-dependent maximum acceptable concentration during all monitoring events with concentrations ranging from 6.44 mg/L to 7.4 mg/L.

Turbidity results have been variable at the Site including at the background monitoring well. It is believed that high turbidity values are indicative of suspended sediment in the monitoring wells, possibly due to the mobilization of fines during the purging and sampling activities.

Metals exceedances are possibly indicative of the presence of suspended sediment in the monitoring well, further evidenced by elevated turbidity results.

Total phosphorus values measured are within the historic range of the background monitoring well.

It is noted that the DWQ exceedances for total phosphorus and manganese are for the aesthetic objectives and not health-based criteria. Water quality should improve as the monitoring well continues to be developed and the groundwater quality eventually stabilizes.

The concentration versus time graphs for monitoring well MW13-02 (MW99-8) indicated the following:

- Chloride concentrations have exhibited an overall decreasing trend since 2000, with a minimum concentration of 3.8 mg/L in 2019.
- COD concentration was variable, ranging from non-detect to 71 mg/L until 2013. The elevated COD concentrations recorded in 2013 (127 mg/L) and 2014 (174 mg/L) were likely a result of the new well installation (MW13-2) not yet having stabilized. COD concentration since 2014 has remained consistent at approximately 50 mg/L with the exception of a spike of 154 mg/L in 2018.
- Ammonia concentration has been exhibiting a general increasing trend since 2000, with a maximum concentration of 24 mg/L in 2016.

Based on a comparison of the aforementioned leachate indicator parameters at monitoring well MW13-2, particularly DOC, ammonia, and TKN, with the



concentrations of these parameters at background monitoring well MW13-04, it appears that monitoring well MW13-2 has been slightly impacted by the landfill.

Based on the concentration versus time graph for chloride, it appears that these impacts are decreasing with time; however, ammonia concentrations have been generally increasing with time.

It is important to note that the recent construction of surface water controls along the south side of the Site will continue to improve groundwater quality in the vicinity of MW13-2 by reducing infiltration and leachate generation.

Monitoring Well MW13-03

Monitoring well MW13-03 is located at the west end of the southern landfill boundary and replaced monitoring well MW99-7 in August of 2013.

It is noted that laboratory analytical results for MW13-3 were mislabelled as "MW13-1" in the laboratory certificate of analysis (Element Lot ID: 1397808) for December.

Monitoring well MW13-03 analytical data for the reporting period indicated the following:

- Turbidity exceeded the DWQ maximum acceptable increase from background during all monitoring events with recorded values ranging from 80.4 NTU to 1180 NTU, respectively;
- Total phosphorous exceeded the DWQ aesthetic objective (0.01 mg/L) during all monitoring events with concentrations ranging from 0.229 mg/L to 1.15 mg/L;
- Iron exceeded the FWAL maximum acceptable concentration (0.35 mg/L) and the DWQ aesthetic objective (0.3 mg/L) during the November and December monitoring events with concentrations of 3.99 and 10.3, respectively; and
- Manganese exceeded the DWQ aesthetic objective (0.05 mg/L) and the FWAL hardness dependent maximum acceptable concentration during all monitoring events with concentrations ranging from 8.51 mg/L to 8.6 mg/L.

Turbidity results have been variable at the Site including at the background monitoring well. It is believed that high turbidity values are indicative of suspended sediment in the monitoring wells, possibly due to the mobilization of fines during the purging and sampling activities.

Metals exceedances are possibly indicative of the presence of suspended sediment in the monitoring well, further evidenced by elevated turbidity results and variability of iron concentrations.

Total phosphorus values measured are within the historic range of the background monitoring well.

It is noted that the DWQ exceedances for total phosphorus, iron and manganese are for the aesthetic objectives and not health-based criteria. Water quality should improve as the monitoring well continues to be developed.



The concentration versus time graphs for monitoring well MW13-03 (MW99-7) indicated the following:

- Chloride concentration has exhibited a decreasing trend since 2000, with a minimum concentration of 8.5 mg/L in 2014.
- COD concentration has been variable, but generally less than 150 mg/L with peaks in 2013 and 2015 (294 mg/L and 627 mg/L).
- Ammonia concentration was fairly consistent at less than 3.0 mg/L until 2017, with a spike in 2003 of 13.4 mg/L. The elevated ammonia concentration recorded in 2014 (21 mg/L) is likely a result of the well not yet having stabilized. Since 2017, ammonia concentrations have varied from approximately 2.5 mg/L to 7 mg/L.

Based on a comparison of the aforementioned leachate indicator parameters at monitoring well MW13-03, particularly chloride, COD, DOC, ammonia, and TKN, with the concentrations of these parameters at background monitoring well MW13-04, it appears that monitoring well MW13-03 has been slightly impacted by the landfill.

Based on the concentration versus time graph for chloride, it appears that these impacts are decreasing with time.

It is important to note that the recent construction of surface water controls along the south side of the Site are expected to continue to improve groundwater quality in the vicinity of MW13-03 by reducing infiltration and leachate generation.

3.2.6 Summary

Varying degrees of impact, most likely attributable to the landfill and contact water pond, have been observed at all cross-gradient monitoring wells which are completed in the perched aquifer.

Monitoring wells MW-1 and MW-2 both exhibit impacts that may potentially be due to, or exacerbated by, the application of road salt to Dusty Road or to the public tipping area.

Monitoring well MW13-01 (MW99-9) exhibits impacts from the fish composting operation that historically took place at the Site. These impacts appear to be decreasing with time.

Slight to moderate landfill related impacts have been observed at all down-gradient monitoring wells completed in the deep overburden (bedrock) aquifer. These impacts have shown a marked decrease over time with the exception of ammonia at MW13-02 and are expected to continue to decrease as a result of the recent construction of final cover, interim cover, and surface water management controls at the Site.

3.3 Surface Water Monitoring

The surface water sampling events were completed in April, November, and December of 2019. Collection of surface water samples was completed by SCRD staff.



It is noted that the summer monitoring event was not conducted due to change in staffing at the SCRD.

Surface water monitoring locations are presented on Figure 4.

The 2019 surface water monitoring program consisted of field parameter monitoring (pH, conductivity, temperature, dissolved oxygen, and redox potential) and the collection and laboratory analyses of water samples for the following chemical parameters:

- pH;
- Electrical conductivity;
- Hardness;
- COD;
- DOC;
- Ammonia;
- Nitrate;
- Nitrite;
- Nitrate plus nitrite;
- Total nitrogen;
- TKN;
- Dissolved chloride; and
- Detailed total metals scan.

It is noted that total nitrogen and nitrate plus nitrite were not analyzed during the April monitoring event.

3.3.1 Surface Water Monitoring Protocols

In order to ensure that representative water quality samples were obtained from the watercourse and that no contamination of the collected samples occurred, the following sampling protocols were adhered to during the monitoring event:

- Surface water samples were collected in areas of the surface water body that were representative of the surface water body conditions;
- Samples were collected approximately 15 centimetres below the surface with the sample bottle completely submerged to prevent floating debris from entering the sample bottles;
- Surface water samples were collected in the appropriate laboratory-supplied sample containers and preserved as required; and
- Surface water samples were submitted under chain-of-custody protocol, to Maxxam Analytics in Burnaby, British Columbia for analysis.

During each monitoring event, the following field data was recorded:



- Field-measured parameters (pH, conductivity, temperature, dissolved oxygen, and redox potential).

3.3.2 Regulatory Criteria

The surface water quality laboratory analytical data was assessed with respect to the Criteria, as defined in Section 3.2.3.

3.3.3 Surface Water Quality Results

Surface water quality analytical results for the reporting period are presented in Tables 6, and 17 to 20. Historic surface water quality data is included as Appendix E. Based on a review of historic monitoring data, concentration versus time graphs were prepared for key leachate indicator parameters including chloride, COD, and ammonia and are included in Appendix E. Laboratory certificates of analyses are included as Appendix F.

The concentrations of cadmium regularly exceed the FWAL criterion at upstream surface water monitoring location Upper Chapman Creek (Site A). As such, the high concentrations of cadmium detected at other monitoring locations are not considered to be due to leachate but are believed to be caused by other, possibly natural source(s) up-stream of the Site.

3.3.3.1 Chapman Creek

Chapman Creek is located approximately 550 metres south of the Site and flows southwest to eventually discharge into Trail Bay.

Site A – Upper Chapman Creek

The upper Chapman Creek sampling location is located approximately 500 metres southeast (up-stream) of the landfill and is considered to represent background surface water quality location.

Site A analytical data for the reporting period indicated the following:

- Laboratory-measured pH was outside of the FWAL accepted range of 6.5 - 9.0 during the April and December monitoring events with recorded values of 5.99 (5.88 for the duplicate sample) and 6.49, respectively;
- Cadmium exceeded the FWAL hardness dependent maximum acceptable concentration during the April and November monitoring events with concentrations of 0.000054 mg/L (0.00003 mg/L for the duplicate sample) and 0.00006 mg/L, respectively; and
- Copper exceeded the calculated FWAL acute guideline during the April monitoring event with a concentration of 0.00054 mg/L (0.00059 mg/L for the duplicate sample).

As indicated above, elevated cadmium concentrations do not appear to be related to the Site.

The concentration versus time graphs for Site A indicated the following:



- Chloride concentrations exhibited a decreasing trend from a maximum of 140 mg/L in 2000 to 0.77 mg/L in 2012. Since then, concentrations have remained below 2 mg/L.
- COD concentration was relatively consistent at approximately 10 mg/L until a spike in 2007 of 215 mg/L. Since that time, COD has returned to historic concentrations.
- Ammonia concentration has been variable, from below detection limits to 0.079 mg/L, with a spike of 0.24 mg/L in 2014.

Site B – Lower Chapman Creek

The lower Chapman Creek sampling location is approximately 2.5 kilometres downstream of the upper Chapman Creek sampling location.

Site B analytical data for the reporting period indicated the following:

- Laboratory-measured pH was outside of the FWAL accepted range of 6.5 - 9.0 during the April monitoring event with a recorded value of 5.94.

pH values are similar to those measured at upstream location Site A and are therefore not considered to be landfill derived.

The concentration versus time graphs for Site B indicated the following:

- Chloride concentrations have remained consistently low, at less than 1.6 mg/L until 2013. Concentrations increased slightly in 2015, with a peak of 6.9 mg/L. Since then, chloride has returned to average historical concentrations.
- COD concentration has been relatively consistent, varying from below detection limits to 42 mg/L.
- Ammonia concentration has been variable, from below detection limits to 0.057 mg/L, with a spike of 0.17 mg/L in 2014. It is noted that this spike was repeated at the upper Chapman Creek (Site A) surface water monitoring location.

Based on an analysis of the aforementioned leachate indicator parameters, Lower Chapman Creek does not appear to be impacted by the landfill.

Irgens Creek

Irgens Creek is located approximately 100 metres north of the Site and flows west to eventually discharge into Porpoise Bay.

Site E – Upper Irgens Creek

The upper Irgens Creek sampling location is located approximately 200 metres northeast (up-stream) of the landfill and is considered to represent background surface water quality location.

Site E analytical data for the reporting period indicated the following:

- Laboratory-measured pH was outside of the FWAL accepted range of 6.5 - 9.0 during the November and December monitoring events with recorded values of 6.4 and 6.29, respectively;



- Cadmium exceeded the FWAL hardness dependent maximum acceptable concentration during the December monitoring event with a concentration of 0.00012 mg/L; and
- Copper exceeded the calculated FWAL acute guideline during the April monitoring event with a concentration of 0.00076 mg/L.

As indicated above, elevated cadmium concentrations appeared to be naturally occurring in the area.

The concentration versus time graphs for Site E indicated the following:

- Chloride concentrations remained consistently low, at less than 1.9 mg/L.
- COD concentration has been relatively consistent, varying from below detection limits to 15 mg/L.
- Ammonia concentration has been variable, from less than the detection limits to 0.037 mg/L, with a spike of 0.21 mg/L in 2014.

Site C – Lower Irgens Creek

The lower Irgens Creek sampling location is located approximately 2 kilometres downstream of the upper Irgens Creek sampling location.

Site C analytical data for the reporting period indicated no exceedances.

The concentration versus time graphs for Site C indicated the following:

- Chloride concentration has been relatively consistent at less than 10 mg/L.
- COD concentration has been relatively consistent, varying from below detection limits to 42 mg/L.
- Ammonia concentration has been variable, from below detection limits to 0.116 mg/L, with a spike of 0.24 mg/L in 2014 and a spike of 0.56 in 2019. It is noted that the 2014 spike was repeated at the Upper Irgens Creek (Site E) surface water monitoring location. It is noted that the 2019 spike was not mimicked in the duplicate sample which had a concentration of less than the detection limit of 0.01 mg/L.

Based on an analysis of the aforementioned leachate indicator parameters, lower Irgens Creek does not appear to be impacted by the landfill.

3.3.4 Summary

There is no evidence of landfill impacts at the four surface water monitoring locations.

3.4 Landfill Gas Monitoring

3.4.1 Soil Gas Probes

As recommended in the Environmental Monitoring Plan (EMP)[XCG,2013], soil gas probes were installed at the Site in 2013 and 2017. In 2013, two soil gas probes (GP13-01 and GP13-02) were installed near the share shed and scale house. In 2017, an additional soil gas probe (GP17-01) was installed near the maintenance shed. These



installations were completed to address the risk of landfill gas migration to on-Site receptors. Monitoring of the probes commenced in 2017.

Each of the soil gas monitoring locations consists of a dedicated multi-level probe installation. The depth of each probe depends on depth to groundwater and geological conditions encountered at each borehole. The nested probes allow monitoring of landfill gas migration at multiple depths from surface, down to the seasonal low water table. The probes are screened in areas of higher permeability unsaturated soil (e.g. sand), if present, in the surficial stratigraphy. By locating the screened intervals within specific permeable hydrogeologic units, it is possible to better delineate subsurface gas migration point sources and determine risk to potential receptors in the event that elevated methane concentrations are detected in the soil gas matrix. When possible, the soil gas probes are installed above the water table, as groundwater can inhibit the migration of landfill gas.

Each probe was constructed of an approximate 20-millimetre diameter, Schedule 40 PVC pipe. The lengths of PVC pipe were connected with threaded joints. The perforated pipe sections were backfilled with washed pea gravel and sealed with a concrete/bentonite seal at the ground surface. Each probe was equipped with a slip cap cover (greased with a non-petroleum-based lubricant) and a 6-millimetre PVC labcock valve fitted with a 6-millimetre hose barb and PVC end-cap.

A summary of the on-Site soil gas probes and completion details is presented in Table 22. Soil gas probe locations are illustrated on Figure 2. Stratigraphic logs are provided in Appendix B.

3.4.2 Historical Results

During the initial 2017 monitoring events, the trigger level was exceeded at multiple soil gas probe locations. Contingency measures from Table G15 of the Emergency Response Plan included as part of the Design, Operations, and Closure Plan (XCG, 2017) were implemented as a result. Contingency measures included notifying the BC MOE of regulatory exceedances, additional confirmatory monitoring, assessing the nature and risk of the problem, and identifying appropriate corrective actions.

Confirmatory monitoring of the soil gas probes was completed in February 2018, concentrations of methane gas again remained above the 25% LEL (1.25% gas by volume) limit in monitoring locations GP13-02S, GP17-01S, and GP17-01D. Additionally, as per XCG's recommendation, an RKI Eagle was used inside the on-Site (share shed, office building, scale house, power shed, and maintenance shed) buildings at both ground level and breathing level, to monitor indoor air quality. Methane concentrations measured inside of the on-Site buildings were well below the 10% LEL trigger level (0.5% by volume).

XCG assessed the risk of landfill gas migration into each on-Site building based on the construction and ventilation of each building, the results were included in the 2017 Annual Report (XCG, March 2018). The following was concluded:

- The office trailer and power shed are constructed on raised foundation with a ventilated space between the bottom of the building and the ground surface. As a



result, the potential for landfill gas to enter these buildings is low, as long as continued ventilation is maintained.

- The maintenance shed is a slab on grade with a metal frame and large bay doors. The share shed is also constructed of a slab on grade with metal frame and bay door. There are no utility connections to the maintenance shed or share shed. The slab on grade serves as a barrier; however, there is potential for landfill gas to migrate through cracks in the concrete.
- XCG recommended that the use of personal methane monitors be implemented to ensure safe air quality when opening the maintenance shed and the share shed. This option was selected since a fixed methane monitor would be difficult to implement because the buildings do not have power. During the operational hours of the Site, the bay doors of both buildings are left open which allows for sufficient ventilation of these buildings and reduces the risk of landfill gas accumulation.
- The special waste storage building (storage bunker) is a small concrete building with a slab on-grade foundation, with vents located at the top and the bottom of the front wall with double metal doors. XCG recommended that the use of personal methane monitors be implemented to ensure safe air quality when entering this building.
- The scale house is constructed with a below ground concrete foundation with a crawl space. XCG recommended that a fixed methane monitor be installed in the scale house to ensure staff safety on an ongoing basis. It is noted that caution should be taken when accessing the crawl space under the scale house as this is a confined space where landfill gas may accumulate. The concrete foundation of the scale house serves as a barrier, however there is potential for landfill gas to migrate through cracks in the concrete and accumulate in the crawl space. As the foundation is below ground there is an increased risk of landfill gas migration. The landfill gas could then migrate from the crawl space into the scale house itself. The crawl space should only be accessed by appropriately trained staff wearing a personal gas monitor.
- As is typical at landfill sites, sources of ignition should be reduced and/or mitigated, and a no smoking policy should be enacted. XCG understands that smoking is not permitted at the Site.

Based on the results of the risk assessment, interior building monitoring was added to the monitoring program as a contingency measure as of February 2018.

Historic landfill gas monitoring results are included in Appendix G.

3.4.3 2019 Landfill Gas Monitoring

Landfill gas monitoring was completed at the Site in April, November, and December of 2019, and involved sampling six nested gas probes at three different locations and indoor monitoring in six on-Site buildings. The landfill gas monitoring program for 2019 consisted of hydraulic (water level) monitoring and the measurement of field parameters (pressure, and concentrations of methane, carbon dioxide, and oxygen). Monitoring events were completed by SCRD staff for all monitoring events. It is noted



that the summer monitoring event was not conducted due to change in staffing at the SCRD. It is noted that interior on-Site building monitoring was not conducted during the November 2019 monitoring event due to equipment malfunction.

3.4.4 Soil Gas Monitoring Protocols

The following soil gas monitoring and sampling protocols were adopted to ensure that monitoring data was representative of in-situ soil gas conditions.

- Standpipe wellhead pressure measurements were taken at each probe using a digital manometer;
- Prior to measuring gas composition with field instruments, each probe was purged of the standing volume of gas. The objective of purging is to pump gas from the probe until a representative sample of the soil gas is obtained. This was generally achieved by purging until stable readings were obtained;
- A CES-Landtec GEM 2000/GEM 5000 landfill gas analyzer was used to measure methane, carbon dioxide, and oxygen concentrations in the soil gas. Field measurements were recorded once readings had stabilized;
- Static water levels (below top of casing) were taken for each probe; and
- Sample ports were visually inspected prior to locking the wellhead protective cover to ensure that the sample port valve was in the closed position.

During each monitoring event, the following field data was recorded:

- Date of sampling event;
- Probe wellhead pressure;
- Methane, carbon dioxide, and oxygen concentrations; and
- Static water level.

3.4.5 Indoor Building Monitoring Protocols

An RKI Eagle was used inside all on-Site buildings at both ground level and breathing level to monitor indoor air quality.

3.4.6 Trigger Levels and Regulatory Criteria

Landfill gas trigger levels are based on an exceedance of a specified concentration of combustible gas in soil. Typical landfill gas migration triggers or limits are based on the following parameters:

- Concentration of combustible gas at the property boundary;
- Concentration of combustible gas at on-Site buildings; and
- Concentration of combustible gas at off-Site buildings.

Site-specific trigger levels were developed as a component of the current EMP (XCG, April 2018a) as summarized in Table 22. A trigger level concentration of 10% LEL (0.5% gas by volume) was selected for all soil gas probes on Site to reflect trigger values associated with landfill gas migrating to any on-Site structures. A trigger level



concentration of 1% LEL (0.05% gas by volume) was selected for all on-Site buildings. Exceedance of trigger levels will necessitate the implementation of contingency measures. Regulatory criteria associated with landfill gas is also summarized in Table 22.

3.4.7 Soil Gas Field Monitoring Results

Field monitoring results are presented in Table 23. Monitoring program results were assessed with respect to the trigger levels and regulatory criteria presented above. It is noted that interior on-Site building monitoring was not conducted during the November 2019 monitoring event due to equipment malfunction.

Groundwater level measurements for the current and past reporting periods are presented in Table G1 in Appendix G. A groundwater hydrograph for the soil gas probes is provided on Figure G1 in Appendix G. Groundwater levels are important to note as groundwater inhibits the movement of landfill gas and an elevated groundwater table can decrease the overall risk of landfill gas migration at a Site. The groundwater table is interpreted to be just below the deep soil gas probes, therefore the location of the soil gas probes within the stratigraphy are deemed sufficient to assess the landfill gas migration in the surrounding area.

Due to the limited data set, no discussion can be made in regard to groundwater elevation trends in the soil gas probes. Climate data in Table 24 indicates that local precipitation peaks in the months of October through March, while the months of April through September have relatively low precipitation.

As indicated in Table 23, the 2019 groundwater level measurements and field monitoring results indicate the following:

Soil Gas Probe GP13-01S

Soil gas probe GP13-01S was dry during all four monitoring events. This means that groundwater remained below the screened interval (3.0 metres bgs) at this location, allowing landfill gas to freely enter the probe. During all three monitoring events the concentration measured in GP13-01S was equal to or exceeded the methane trigger level concentration of 10% LEL (0.5% gas by volume) with concentrations ranging from 0.5% methane, to 4.1% methane, respectively. The concentrations measured in November and December were also above the 25% LEL limit (1.25% gas by volume) stated in the Operational Certificate.

Soil Gas Probe GP13-01D

Soil gas probe GP13-01D was dry during all four monitoring events. This means that groundwater remained below the screened interval (4.9 metres bgs) at this location, allowing landfill gas to freely enter the probe. During the all three monitoring events the concentration measured in GP13-01D was equal to or exceeded the methane trigger level concentration of 10% LEL (0.5% gas by volume) with concentrations ranging from 0.5% methane to 5.9% methane. The concentrations measured in November and December were also above the 25% LEL limit (1.25% gas by volume) stated in the Operational Certificate.

*Soil Gas Probe GP13-02S*

Soil gas probe GP13-02S was dry during all four monitoring events. This means that groundwater remained below the screened interval (2.70 metres bgs) at this location, allowing landfill gas to freely enter the probe. During all three monitoring events the concentration measured in GP13-02S exceeded the trigger level concentration of 10% LEL (0.5% gas by volume) with concentrations ranging from 11.3% methane to 19.0% methane. This is also above the 25% LEL limit (1.25% gas by volume) stated in the Operational Certificate.

Soil Gas Probe GP13-02D

Soil gas probe GP13-02 was dry during all four monitoring events. This means that groundwater remained below the screened interval (4.60 metres bgs) at this location, allowing landfill gas to freely enter the probe. During all three monitoring events the concentration measured in GP13-02D exceeded the trigger level concentration of 10% LEL (0.5% gas by volume) with concentrations ranging from 8.9% methane to 15.7% methane. This is also above the 25% LEL limit (1.25% gas by volume) stated in the Operational Certificate.

Soil Gas Probe GP17-01S

Soil gas probe GP17-01S was dry during all four monitoring events. This means that groundwater remained below the screened interval (2.7 metres bgs) at this location, allowing landfill gas to freely enter the probe. During all three monitoring events the concentration measured in GP17-01S exceeded the trigger level concentration of 10% LEL (0.5% gas by volume) with concentrations ranging from 61.8% methane to 67.3% methane. This is also above the 25% LEL limit (1.25% gas by volume) stated in the Operational Certificate.

Soil Gas Probe GP17-01D

Soil gas probe GP17-01D was dry during all four monitoring events. This means that groundwater remained below the screened interval (4.6 metres bgs) at this location, allowing landfill gas to freely enter the probe. During all three monitoring events the concentration measured in GP17-01D exceeded the trigger level concentration of 10 % LEL (0.5 % gas by volume) with concentrations ranging from 20.1% methane to 65.5% methane. This is also above the 25 % LEL limit (1.25 % gas by volume) stated in the Operational Certificate.

3.4.8 Interior Building Monitoring Results

Methane concentrations measured inside of the on-Site buildings (share shed, special waste storage building/storage bunker, office building, scale house, power shed, and maintenance shed) during all 2019 monitoring events were well below the 1% LEL trigger level (0.05% by volume). The results from the interior building monitoring from 2019 are included in Table 23.

3.4.9 Summary

Based on the foregoing, all soil gas probes were dry during the monitoring period allowing landfill gas to freely enter all the probes. High concentrations of methane in nested monitoring gas probes GP13-01, GP13-02, and GP17-01 are likely due to their



relative proximity to waste and the highly permeable subsurface soil conditions on-Site (i.e. sand and gravel). It is noted that the highest concentration of methane was observed in GP17-01, which is located within 2 metres of the approximate historical limit of waste. Landfill gas related impacts were not observed in any of the on-Site buildings during the 2019 indoor monitoring.

Landfill gas monitoring will continue to be completed quarterly with the addition of interior methane monitoring in the on-Site buildings.



4. INVESTIGATIONS UNDERTAKEN IN 2020

4.1 Groundwater: Hydraulic Gradients

Based on a review of borehole stratigraphy and water levels, it was determined that the groundwater levels in monitoring wells MW-1, MW-2A, MW-4, and MW13-03 were representative of perched groundwater conditions.

The horizontal hydraulic gradient for the shallow (perched) groundwater unit was calculated using the groundwater elevation contours for water levels collected from wells MW-1, MW-2A, MW-4, and MW13-03 in April, November and December of 2019, and in July of 2020. These water levels are summarized in Table 5, and the perched groundwater elevation contours are presented on Figure 6a (April 2, 2019), Figure 6b (November 4, 2019), Figure 6c (December 10, 2019) and Figure 6d (July 7, 2020). The water levels from 2019 were collected by SRDC staff as part of the ongoing monitoring program, and the water levels on July 2020 were collected by XCG during the in-situ well response testing as described in Section 4.2. The resultant inferred groundwater flow direction is to the south/southwest as shown on Figures 6a-6d.

No horizontal hydraulic gradients were calculated for the deep overburden (bedrock) aquifer because only two deep overburden wells (MW13-01 and MW13-02) are present on the Site, and a minimum of three wells are required to allow for contouring of the groundwater elevation data.

The seasonal horizontal hydraulic gradients in the perched groundwater zone were estimated by dividing the drop in elevation between contours by linear distance measured perpendicular to the contours. The resultant horizontal hydraulic gradients are summarized in the following table:

Horizontal Hydraulic Gradients

Date	Contour Elevations (m)		Linear Distance (m)	Horizontal Hydraulic Gradients
2-Apr-19	210	200	240	0.042
4-Nov-19	211	200	211	0.052
10-Dec-19	211	200	240	0.046
7-Jul-20	210	10	218	0.046

The vertical hydraulic gradient is the change in hydraulic head that occurs over a certain vertical distance. Typically, the vertical hydraulic gradient is calculated to assess the relative permeability of a geologic unit separating the screened intervals of two adjacent (i.e. nested) monitoring wells, or to assess groundwater discharge characteristics. The vertical hydraulic gradients were calculated using seasonal water levels measured at monitoring well pairs MW4/MW4A (north landfill boundary) and MW13-02/MW13-03 (south landfill boundary), and these results are summarized in the table below:

**Vertical Hydraulic Gradients**

Monitoring Well Pairs (shallow/deep)	Surface Elevation (m ASL)	Depth to Top of Well Screen (m bgs)	Screen Length (m)	Depth to Water (m bgs)	Vertical Gradient
MW4A	219.04	2.5	1.5	3.27	1-Apr-19 :0.70 (downward)
MW4	219.04	9.0	2.5	7.79	
MW13-03	213.81	14.0	3.1	14.82	1-Apr-19 :0.97 (downward)
MW13-02	215.23	26.2	6.1	26.66	
MW4A	219.04	2.5	1.5	2.92	4-Nov-19 :0.75 (downward)
MW4	219.04	9.0	2.5	7.79	
MW13-03	213.81	14.0	3.1	14.60	4-Nov-19 :0.92 (downward)
MW13-02	215.23	26.2	6.1	25.90	
MW4A	219.04	2.5	1.5	2.75	11-Dec-19: 0.71 (downward)
MW4	219.04	9.0	2.5	7.39	
MW13-03	213.81	14.0	3.1	14.40	11-Dec-19: 0.94 (downward)
MW13-02	215.23	26.2	6.1	25.92	
MW4A	219.04	2.5	1.5	2.69	7-July-20: 0.99 (downward)
MW4	219.04	9.0	2.5	9.12	
MW13-03	213.81	14.0	3.1	15.20	7-July-20: 1.10 (downward)
MW13-02	215.23	26.2	6.1	28.42	

The resultant vertical hydraulic gradients indicate strong downward gradients are present, as would be expected in a perched groundwater setting.

4.2 Hydraulic Conductivity

On July 7-8, 2020, XCG conducted in-situ hydraulic conductivity testing on six on-Site monitoring wells, including wells in the both the shallow and deeper water-bearing units. This testing consisted of installing electronic pressure transducer dataloggers to record changes in water levels in the monitoring wells and using a bailer to remove a volume of water from the wells.

Following completion of the in-situ hydraulic conductivity testing, the water level recovery data were downloaded from the dataloggers and analyzed using Aquifer Test Pro 9.0 hydrogeologic software to calculate estimates of hydraulic conductivity values at the screened intervals of the tested monitoring wells. The data was analyzed using the Bouwer and Rice (1976) method, which is considered applicable for unconfined conditions and where the wells may be screened across the water table.

The AquiferTest plots and corresponding monitoring well logs are provided in Appendix H and the results are summarized as follows:



Location	Well Depth (mbgs)	Static Water Levels July 7-20 (mbgs)	Screened Geologic Unit	Hydraulic Conductivity (m/s)
MW3	4.3	5.02	Silty Sand	7.5×10^{-6}
MW4	11.5	9.93	Sandy Silt	2.0×10^{-7}
MW4A	4.0	3.44	Silty Sand	2.0×10^{-7}
MW13-01	25.9	21.93	Gravelly Sand	1.9×10^{-4}
MW13-02	32.3	28.42	Silty Sand and Gravel	2.8×10^{-4}
MW13-03	17.1	15.20	Silty Sand with Cobbles	1.1×10^{-4}

The calculated hydraulic conductivities for the monitoring wells generally agree with published values for similar soil types (Table 2.2, Freeze and Cherry, 1979).

4.3 Groundwater Flux

To estimate groundwater flux in the perched groundwater zone, Darcy's Law can be applied. The basic equation to calculate groundwater flux using Darcy's Law (Darcy Flux) is:

$q = -Ki$, where q is the Darcy Flux, K is hydraulic conductivity, and i is the hydraulic gradient.

The Darcy Flux is defined as the flow per unit cross sectional area of the aquifer material.

The following table shows a range Darcy Flux values determined by applying geometric mean of the hydraulic conductivity values described in Section 4.2 (excluding deep overburden monitoring wells MW13-01 and MW13-02) and the range of horizontal hydraulic gradients described in Section 4.1.

Hydraulic Gradient	Geometric Mean Hydraulic Conductivity (m/s)	Darcy Flux (m/s)
0.042	2.4×10^{-6}	1.0×10^{-7}
0.046	2.4×10^{-6}	1.1×10^{-7}
0.052	2.4×10^{-6}	1.2×10^{-7}



5. COMPLIANCE AND IMPACTS TO RECEPTORS

5.1 Compliance and Impact to Receptors

As noted previously, the potential receptors for Site-derived impacts are downstream users of either surface water or groundwater.

Surface watercourses located downstream of the Site include:

- Chapman Creek, located approximately 550 metres south of the Site, which drains into Trail Bay; and
- Irgens Creek, located approximately 100 metres north of the Site, which drains into Porpoise Bay.

Sechelt Spring (which appears to be part of Irgens Creek) is located north of the Site and is interpreted to be located up-gradient of the Site (Figure 3).

A search using the iMapBC database indicated that the closest off-site groundwater wells are located from 1.6 to 2.5 kilometres west, northwest and southwest of the Site (Figure 5).

As described in previous sections, the primary receptor for the Site is the bedrock aquifer. The main compliance locations are the monitoring wells (MW13-01 and MW13-02) located along the south property boundary that are completed in deep overburden that is interpreted to be hydraulically connected to the bedrock aquifer. Based on the depth and stratigraphy at monitoring well MW13-03, this location interpreted to be influenced by perched groundwater conditions. To establish Site compliance, analytical data from these wells is compared to the DWQ criteria. FWAL criteria are not deemed applicable at these groundwater monitoring locations as groundwater is anticipated to discharge to surface water but much farther downstream (towards Chapman Creek located approximately 550 metres south of the Site), hence the FWAL criteria are used for comparison purposes but not for determining compliance at the property boundary.

5.1.1 Groundwater

Varying degrees of impact, most likely attributable to the landfill and contact water pond, have been observed at all cross-gradient monitoring wells which are completed in the shallow perched water bearing unit.

The geophysical investigation completed at the Site by Worley Parsons Canada in 2011 delineated the attenuation zone for the landfill. It was noted that the attenuation zone may extend beyond the south boundary of the Site in the vicinity of monitoring well MW13-02.

Results from the environmental monitoring program have indicated that the Site is in compliance based on the monitoring data collected from the three compliance wells (MW13-01, MW13-02, and MW13-03) compared to the DWQ (performance criteria), with the exception of the exceedance of turbidity and aesthetic objectives for, total phosphorus, iron and manganese. Turbidity results have been variable at the Site including at the background monitoring well. It is believed that high turbidity values



and metal exceedances are indicative of suspended sediment in the monitoring wells, further evidenced by the variability of iron concentrations.

Total phosphorus values measured at the compliance wells in 2019 are within the historic range of the background monitoring well. It is noted that the exceedances for total phosphorus, iron and manganese are for the aesthetic objectives and not health-based criteria.

It is noted that attenuation appears to be occurring as impacted water from the perched zone migrates down to the deep overburden (bedrock) aquifer. As evident at monitoring wells MW13-01, MW13-02, and MW13-03, groundwater quality at these locations has been improving over time, with the exception of ammonia levels at MW13-02. The water quality in these wells is expected to continue to improve as the SCRD installs final cover, interim cover, and improved surface water management controls at the Site.

Slight to moderate landfill related impacts have been observed at the down-gradient deep monitoring wells MW13-01 and MW13-02. These impacts have shown a marked decrease over time with the exception of ammonia levels at MW13-02 and are expected to continue to decrease due to the recent construction of final cover, interim cover, and surface water management controls at the Site.

It is noted that groundwater monitoring has been undertaken at the wells located at the Lehigh Hanson Materials Ltd. property west of the Site since 1999 (Sylvia Environmental Services). The monitoring program has demonstrated that groundwater quality has remained consistent since the inception of the monitoring program.

Based on the above, risk to off-Site groundwater users is deemed to be low.

5.1.2 Surface Water

Landfill related impacts were not observed at the four surface water monitoring locations. Risk to surface water receptors is deemed to be low.

5.1.3 Landfill Gas

High concentrations (above regulatory criteria) of methane in nested soil gas probes GP13-01, GP13-02, and GP17-01 are likely due to their relative proximity to waste and the highly permeable subsurface soil conditions on-Site (i.e. sand and gravel). The potential for lateral landfill gas migration toward on-Site buildings is deemed moderate to high. Landfill gas related impacts were not observed in any of the on-Site buildings during the 2019 indoor monitoring.

Landfill gas **MONITORING** will continue to be completed quarterly with the addition of interior methane monitoring in the on-Site buildings. The implementation of personal monitors and a fixed gas monitor within the scale house are recommended to aid in mitigating the risk to on-Site staff and the public.



6. SUMMARY AND RECOMMENDATIONS

6.1 Summary

The following provides a summary of the monitoring carried out during the 2019 reporting period, as well as applicable results:

6.1.1 Groundwater

- The 2019 environmental monitoring program included three monitoring events (April, November, and December) monitoring of 12 on-Site monitoring wells;
- The summer monitoring event was not conducted due to change in staffing at the SCRD;
- Three monitoring wells could not be sampled during the reporting period due to insufficient water (see Section 3.2);
- Perched groundwater conditions exist at the Site. Based on groundwater flow mapping, the perched groundwater is interpreted to flow in a dominantly south to south-westerly direction and percolate downward to the deep overburden aquifer. Groundwater is anticipated to flow in the direction of the slope of the bedrock surface;
- Monitoring wells MW13-01 and MW13-02 are completed in the deep overburden along the southern property boundary of the Site and are interpreted to be hydraulically connected to the bedrock aquifer, and are considered to represent compliance monitoring locations;
- Monitoring well MW13-03 is completed in the intermediate depth overburden along the southern property boundary of the Site and is interpreted to represent perched groundwater conditions, and is considered to represent a compliance monitoring location;
- Varying degrees of landfill impacts were observed at all cross-gradient shallow groundwater monitoring wells;
- Downward vertical hydraulic gradients were observed at nested monitoring wells locations at the north and south property limits of the Site;
- Results from the environmental monitoring program have indicated that the Site is in compliance based on the monitoring data collected from the three compliance wells (MW13-01, MW13-02, and MW13-03) compared to the DWQ (performance criteria), with the exception of the exceedance of turbidity and aesthetic objectives for total phosphorus, iron and manganese. Turbidity results have been variable at the Site including at the background monitoring well. It is believed that high turbidity values and metal exceedances are indicative of suspended sediment in the monitoring wells, further evidenced by the variability of iron concentrations. Total phosphorus values measured at the compliance wells in 2019 are within the historic ranges for the background monitoring wells. It is noted that the exceedances for total phosphorus, iron and manganese are for the aesthetic objectives and not health-based criteria.



- It is noted that attenuation appears to be occurring as impacted water from the shallow perched aquifer migrates down to the deep overburden aquifer. As evidenced at monitoring wells MW13-01, MW13-02, and MW13-03, groundwater quality at these locations has been improving over time, with the exception of ammonia levels at MW13-02. Water quality in these wells is expected to continue to improve as the SCRD installs final cover, interim cover, and improves surface water management controls at the Site; and
- Risk to off-Site groundwater users is deemed to be low.

6.1.2 Surface Water

- Four surface water locations were sampled during the April, November, and December monitoring events;
- The summer monitoring event was not conducted due to change in staffing at the SCRD;
- There is no evidence of leachate impacts at any surface water monitoring locations, including the two down-stream from the landfill; and
- Risk to surface water receptors is deemed to be low.

6.1.3 Landfill Gas

- Three nested soil gas probes were monitored during the April, November, and December monitoring events;
- Six on-Site buildings were monitored during the April and December monitoring events, it is noted that interior on-Site building monitoring was not conducted during the November 2019 monitoring event due to equipment malfunction;
- High concentrations (above regulatory criteria) of methane in nested monitoring gas probes GP13-01, GP13-02, and GP17-01 are likely due to their relative proximity to waste and the highly permeable subsurface soil conditions on-Site (i.e. sand and gravel);
- Landfill gas related impacts were not observed in any of the on-Site buildings during the 2019 monitoring.

6.2 Recommendations

The following section presents recommendations for revisions to the ongoing monitoring program for the Sechelt Landfill:

- It is recommended that the SCRD water quality meter be serviced annually and calibrated prior to each environmental monitoring event.
- It is recommended that the monitoring program be continued with special consideration to following prescribed monitoring protocols and minimizing particulate matter in the water samples.
- The installation additional monitoring wells is recommended at the following locations:



- MW17-01/MW17-02: Due to consistent dry conditions at these two locations, install deeper replacement monitoring wells to ensure reliable collection of groundwater quality data, groundwater water levels and groundwater flow mapping.
- MW4/MW4A: At the upgradient (north) Site boundary, install one deep overburden well in a similar depth (stratigraphic) setting as monitoring well MW13-02 to allow for collection of groundwater quality data and groundwater levels, and to refine groundwater flow mapping in the deep overburden zone.
- MW17-01: At the cross gradient (east) Site boundary, install one deep overburden well in a similar depth (stratigraphic) setting as monitoring well MW13-02 to allow for collection of groundwater quality data and groundwater levels, and to refine groundwater flow mapping in the deep overburden zone.
- Landfill gas monitoring should continue to be completed quarterly. The implementation of personal monitors and the fixed gas monitor within the scale house are recommended to aid in mitigating the risk to on-Site staff and public.



7. REFERENCES

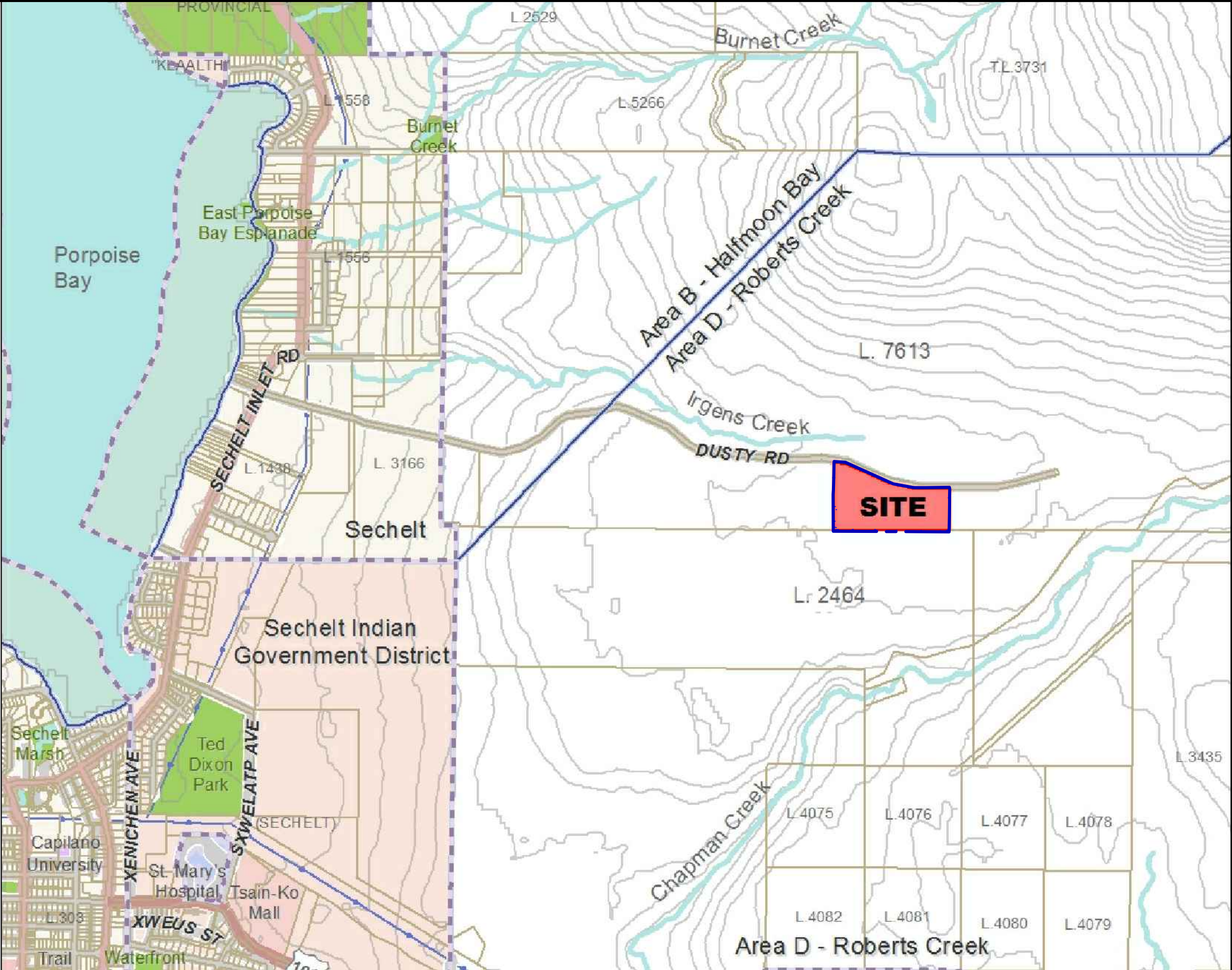
1. Associated Environmental, "Groundwater Investigation Phase 2 Project: Final Report and preliminary Design of Production Wells at Dusty Road, Mahan Road, and Church Rd Well Sites," January 2019.
2. British Columbia Geological Survey. "On-line Geoscience Map," Layer - Bedrock Geology by Lithology & Layer – Bedrock Geology by Age and Rock Class, 2013.
<http://www.empr.gov.bc.ca/Mining/Geoscience/MapPlace/MainMaps/Pages/geology.aspx>
3. British Columbia Ministry of the Environment, "Landfill Criteria for Municipal Solid Waste," June 2016. British Columbia Ministry of the Environment, "Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills," January 1996.
4. British Columbia Ministry of the Environment, "British Columbia Environmental Laboratory Manual," 2015.
5. British Columbia Ministry of the Environment, "British Columbia Field Sampling Manual: 2003 - For Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment and Biological Samples, Last Updated: March 2004, Part E - Water and Wastewater Sampling, Ambient and Fresh Water Effluent Sampling," 1997.
6. British Columbia Ministry of the Environment, "Working Water Quality Guidelines for British Columbia," June 2017.
7. British Columbia Ministry of the Environment, "British Columbia Approved Water Quality Guidelines," August 2019.
8. Dayton & Knight Ltd., "Sechelt Landfill Closure Plan," December 1995.
9. Ecoplans Limited, "Hydrogeological and Environmental Monitoring Review," August 2010.
10. Fulton, R.J., "Surficial Materials of Canada, Map 1880A, 1:5,000,000, Geological Survey of Canada," 1995.
11. Holland, S.S., "Landforms of British Columbia, A Physiographic Outline, Bulletin 48," 1976. The Government of the Province of British Columbia.
12. McCammon, J.W., "Surficial Geology and Sand and Gravel Deposits of Sunshine Coast, Powell River, and Campbell River Areas, Bulletin 65," 1977, Province of British Columbia Ministry of Mines and Petroleum Resources.
13. Piteau Associates Engineering Ltd., "Replacement of Three Monitoring Wells," December 30, 1999.
14. Piteau Associates Engineering Ltd., "2011 Annual Environmental Monitoring Review," November 2012.



15. Province of British Columbia, Water Resources Atlas, <http://maps.gov.bc.ca/ess/hm/wrbc/>.
16. Sunshine Coast Regional District, “Sechelt Official Community Plan,” February 2009.
17. Waterline Resources Inc., “Report on Groundwater Investigation to Supplement Chapman Creek Water Supply,” October 2017.
18. Worley Parsons Canada, “2011 Geophysical Investigation, Sechelt Landfill,” July 2012.
19. AECOM Canada Ltd, “Solid Waste Management Plan – The Foundation for Zero Waste Plan – Final Draft,” March 2011.
20. XCG Consulting Limited, “Environmental Monitoring Plan,” Sechelt Landfill, Sechelt, British Columbia,” March 2013, Draft.
21. XCG Consulting Limited, “2012 Environmental Monitoring Report, Sechelt Landfill, Sechelt, British Columbia,” November 2013.
22. XCG Consultants Limited, “Hydrogeological Characterization and Impact Assessment, Sechelt Landfill, Sechelt, British Columbia,” July 2015a.
23. XCG Consulting Limited, “Design, Operations, and Closure Plan, Sechelt Landfill, Sechelt, British Columbia,” December 2017.
24. XCG Consultants Limited, “Review of December 2018 Contact Water Pond Analytical Data – Sechelt Landfill,” January 2019.
25. XCG Consultants Limited, “2017 Annual Report, Sechelt Landfill,” March 2018.
26. XCG Consulting Limited, “Environmental Monitoring Plan,” Sechelt Landfill, Sechelt, British Columbia,” April 2018.
27. XCG Consulting Limited, “2019 Annual Report, Sechelt Landfill,” March 2020.

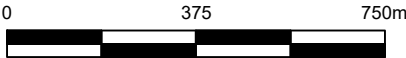


FIGURES



LEGEND:

PROPERTY BOUNDARY



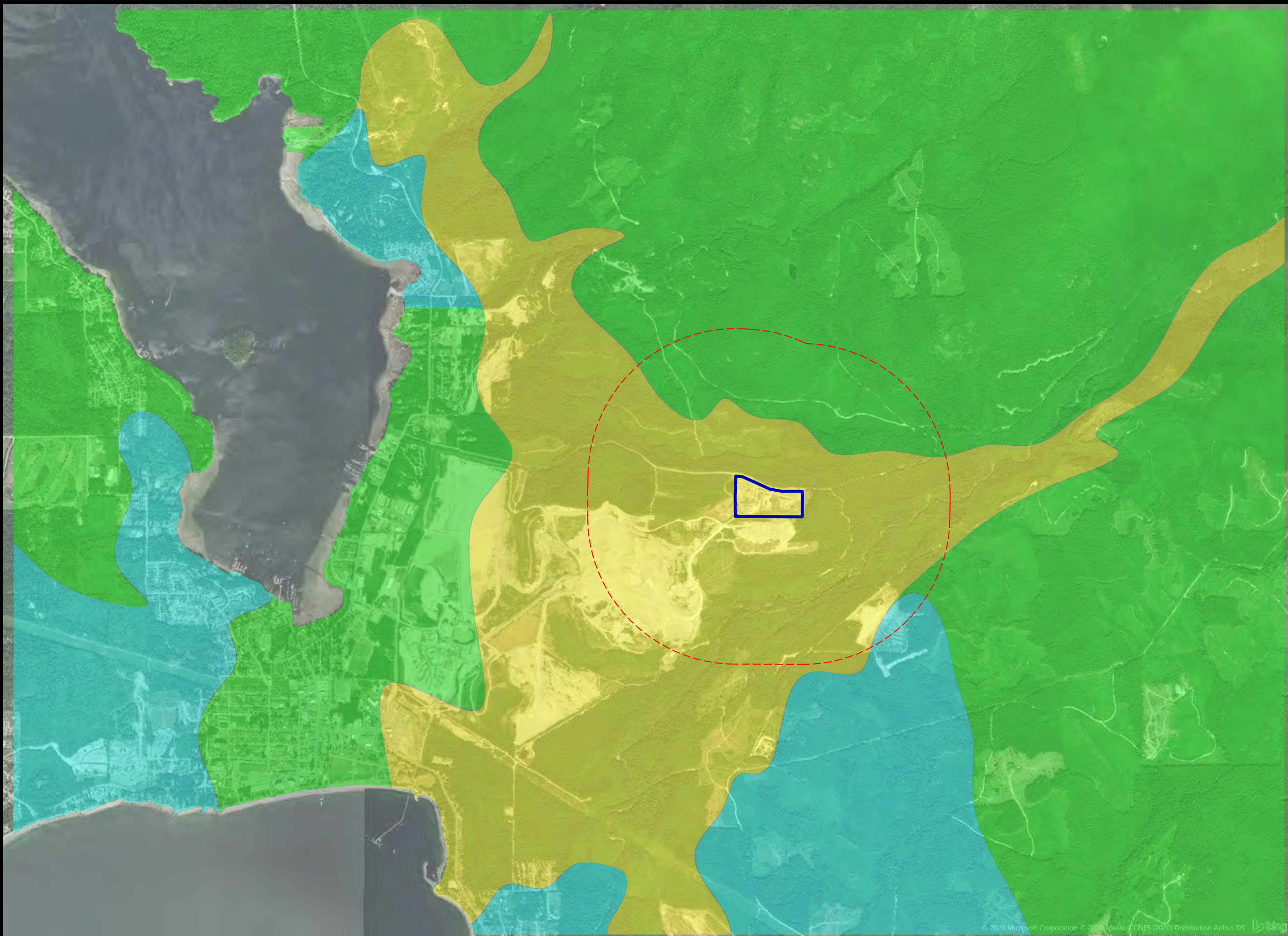
SITE LOCATION MAP

SECHULT LANDFILL
SUNSHITE COAST REGIONAL DISTRICT

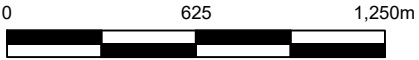


DATE	JOB NO.	FIGURE NO.
AUG. 2020	4-2111-01-65	1

DRAWING REFERENCE: Figure based on data supplied by the client and XCG field notes.
NOTE: Location of building, underground utilities, etc. are for reference only and should not be relied upon for detailed design, renovation, or construction purposes. Property boundary and building locations shown may not represent actual surveyed boundaries.



- LEGEND:**
- PROPERTY BOUNDARY
 - 1,000m BUFFER ON PROPERTY BOUNDARY
 - MORAINAL MATERIAL (TILL)
 - FLUVIAL MATERIAL
 - MARINE MATERIAL



SURFICIAL GEOLOGY

SECHULT LANDFILL
SUNSHITE COAST REGIONAL DISTRICT

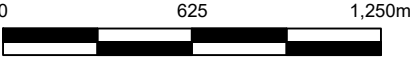


DATE	JOB NO.	FIGURE NO.
AUG. 2020	4-2111-01-65	3A

DRAWING REFERENCE: Figure based on data supplied by the client, British Columbia online well mapping and XCG field notes.
NOTE: Location of building, underground utilities, etc. are for reference only and should not be relied upon for detailed design, renovation, or construction purposes. Property boundary and building locations shown may not represent actual surveyed boundaries.



- LEGEND:
- PROPERTY BOUNDARY
 - 1,000m BUFFER ON PROPERTY BOUNDARY
 - JURASSIC
 - CRETACEOUS



BEDROCK GEOLOGY

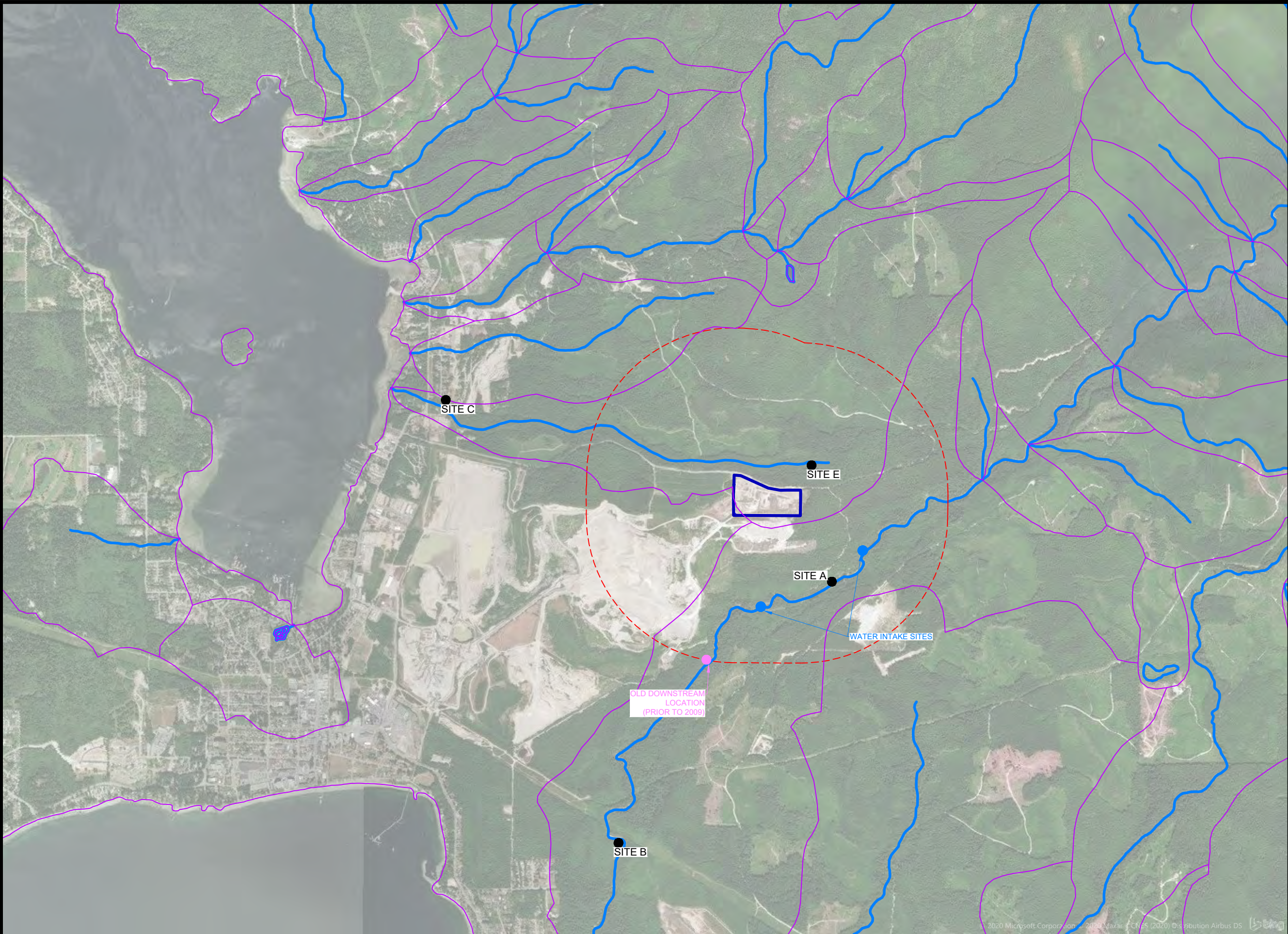
SECHULT LANDFILL
SUNSHITE COAST REGIONAL DISTRICT



DATE	JOB NO.	FIGURE NO.
AUG. 2020	4-2111-01-65	3B

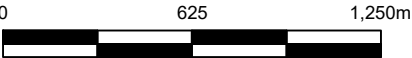
DRAWING REFERENCE: Figure based on data supplied by the client, British Columbia online well mapping and XCG field notes.
NOTE: Location of building, underground utilities, etc. are for reference only and should not be relied upon for detailed design, renovation, or construction purposes. Property boundary and building locations shown may not represent actual surveyed boundaries.

SHEET: R421110165001FIG03B.pdf
FILE: R421110165001.dwg



LEGEND:

- PROPERTY BOUNDARY
- 1,000m BUFFER ON PROPERTY BOUNDARY
- WATERSHED BOUNDARIES
- WATERCOURSE
- WATER INTAKE SITES
- SURFACE WATER SAMPLING LOCATION
- HISTORIC SURFACE WATER SAMPLING LOCATION



SURFACE WATER SAMPLING LOCATIONS

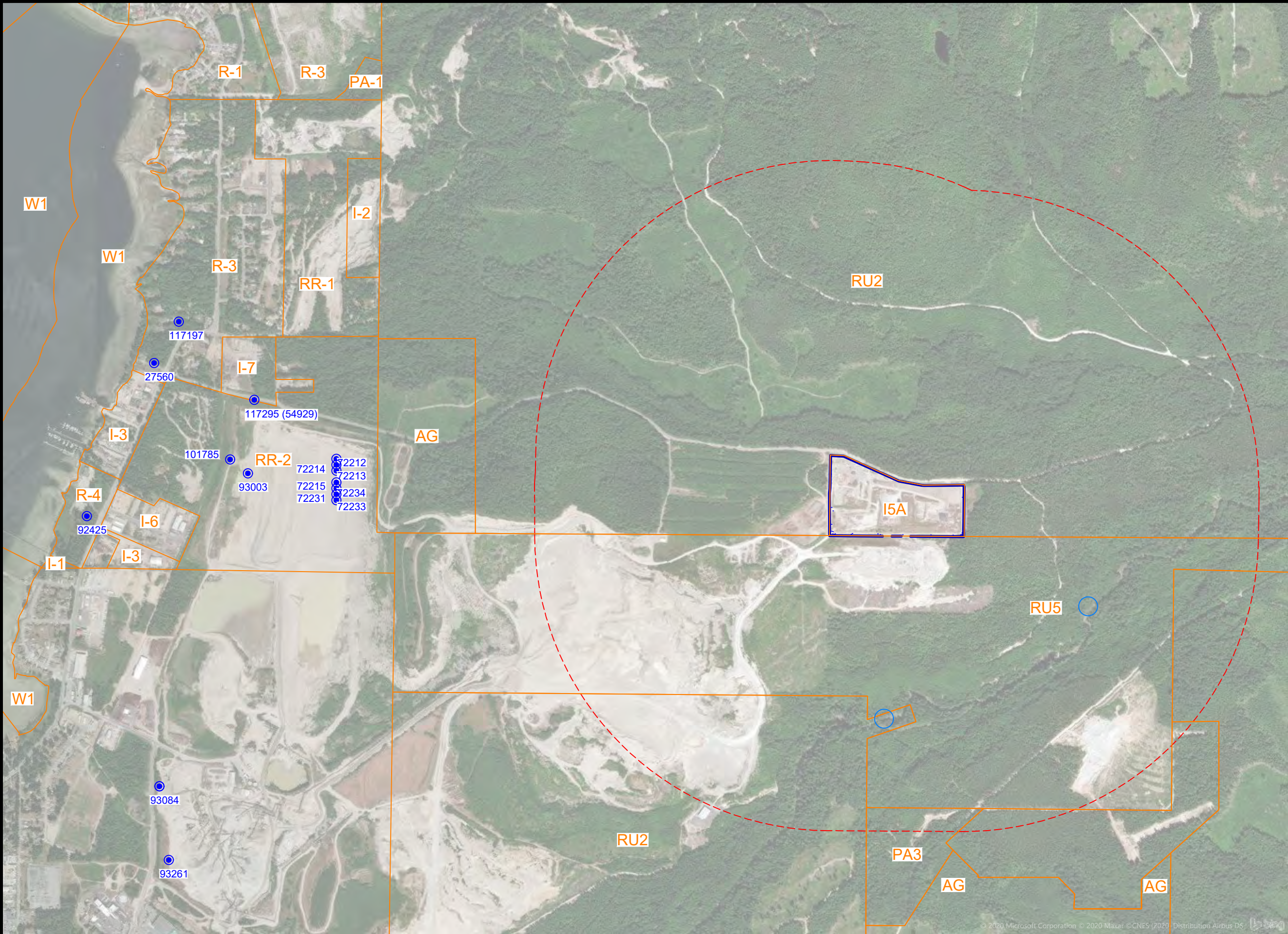
SECHULT LANDFILL
SUNSHITE COAST REGIONAL DISTRICT



DATE	JOB NO.	FIGURE NO.
AUG. 2020	4-2111-01-65	4

DRAWING REFERENCE: Figure based on data supplied by the client, British Columbia online well mapping and XCG field notes.
NOTE: Location of building, underground utilities, etc. are for reference only and should not be relied upon for detailed design, renovation, or construction purposes. Property boundary and building locations shown may not represent actual surveyed boundaries.

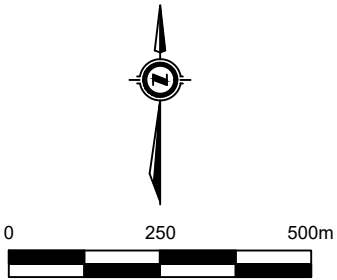
SHEET: R421110165001FIG04.pdf
FILE: R421110165001.dwg



LEGEND:

- PROPERTY BOUNDARY
- 1,000m BUFFER ON PROPERTY BOUNDARY
- WATER WELL
- ZONING

ZONING CODE	ZONING DESCRIPTION
SCRD DESIGNATIONS	
A	Rural Forest A
AG	Agriculture
I5A	Industrial Five A
PA3	Park and Assembly Three
PA4	Outdoor Firearms Range and Assembly
RU2	Rural Two
RU5	Rural Watershed Protection
W1	Water One
SECHLT DESIGNATIONS	
I-2	INDUSTRIAL
I-3	
I-6	
I-7	
PA-1	PARK, RECREATION AND ASSEMBLY 1 ZONE
R-1	RESIDENTIAL
R-3	
R-4	
RR-1	RURAL 1 ZONE
RR-2	RURAL 2 ZONE
W-1	WATER 1 ZONE



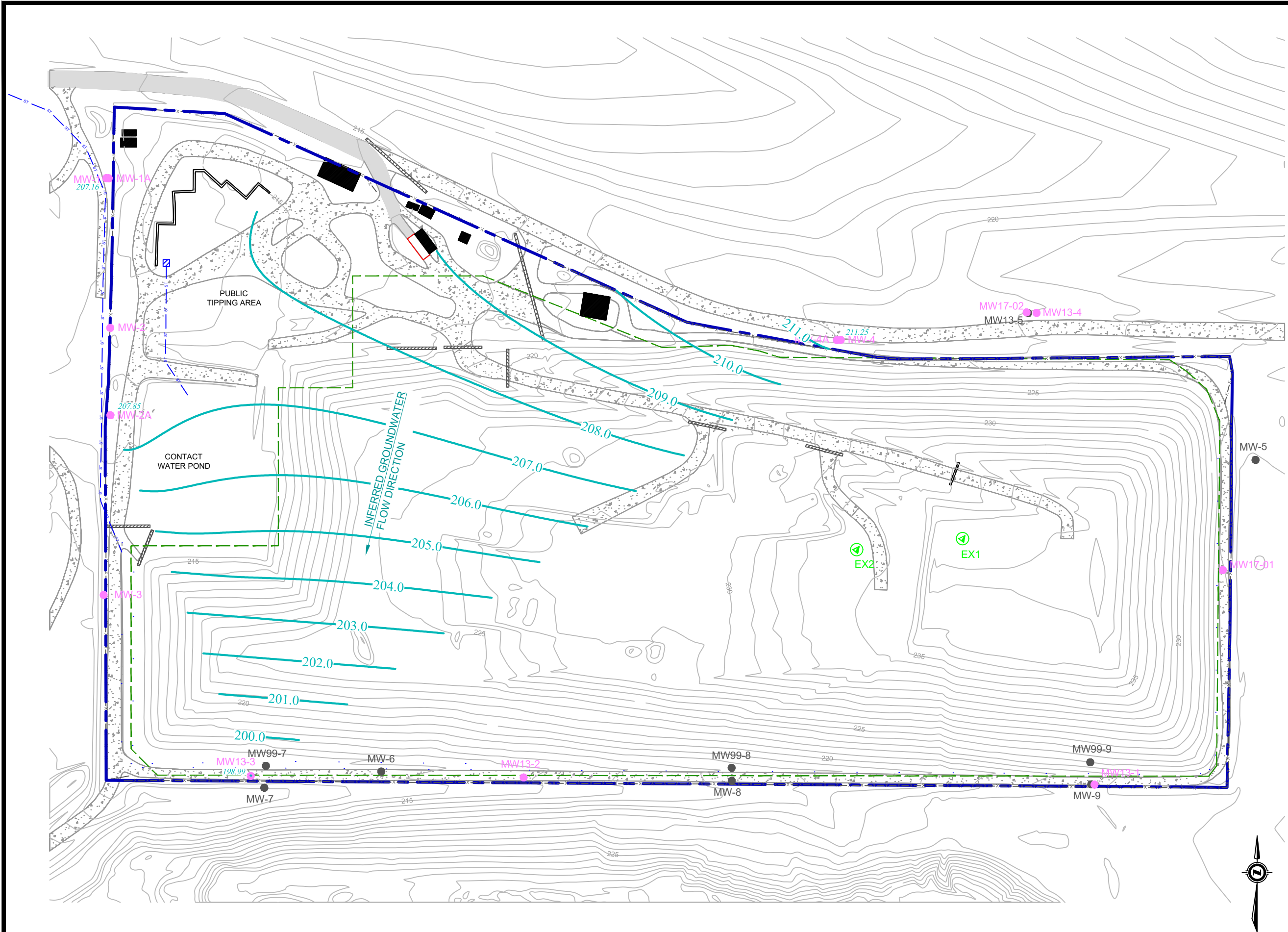
LAND USE AND LOCAL WATER WELLS

SECHLT LANDFILL
SUNSHITE COAST REGIONAL DISTRICT



DATE	JOB NO.	FIGURE NO.
AUG. 2020	4-2111-01-65	5

DRAWING REFERENCE: Figure based on data supplied by the client, British Columbia online well mapping and XCG field notes.
NOTE: Location of building, underground utilities, etc. are for reference only and should not be relied upon for detailed design, renovation, or construction purposes. Property boundary and building locations shown may not represent actual surveyed boundaries.



- LEGEND:**
- PROPERTY BOUNDARY
 - APPROXIMATE LIMIT OF WASTE
 - APPROXIMATE FENCE LINE
 - EXISTING CONTOURS
 - EXISTING ASPHALT ROAD
 - EXISTING GRAVEL ROAD
 - EXISTING BUILDING
 - EXISTING SURFACE WATERCOURSE
 - EXISTING STORMWATER GRAVITY MAIN
 - EXISTING GROUNDWATER MONITORING WELL
 - EXISTING LFG WELL
 - EXISTING LFG EXTRACTION WELL
 - GROUNDWATER CONTOURS (APRIL 1, 2019)
 - GROUNDWATER ELEVATION (APRIL 1, 2019)



GROUNDWATER ELEVATION CONTOURS (APRIL 2019)

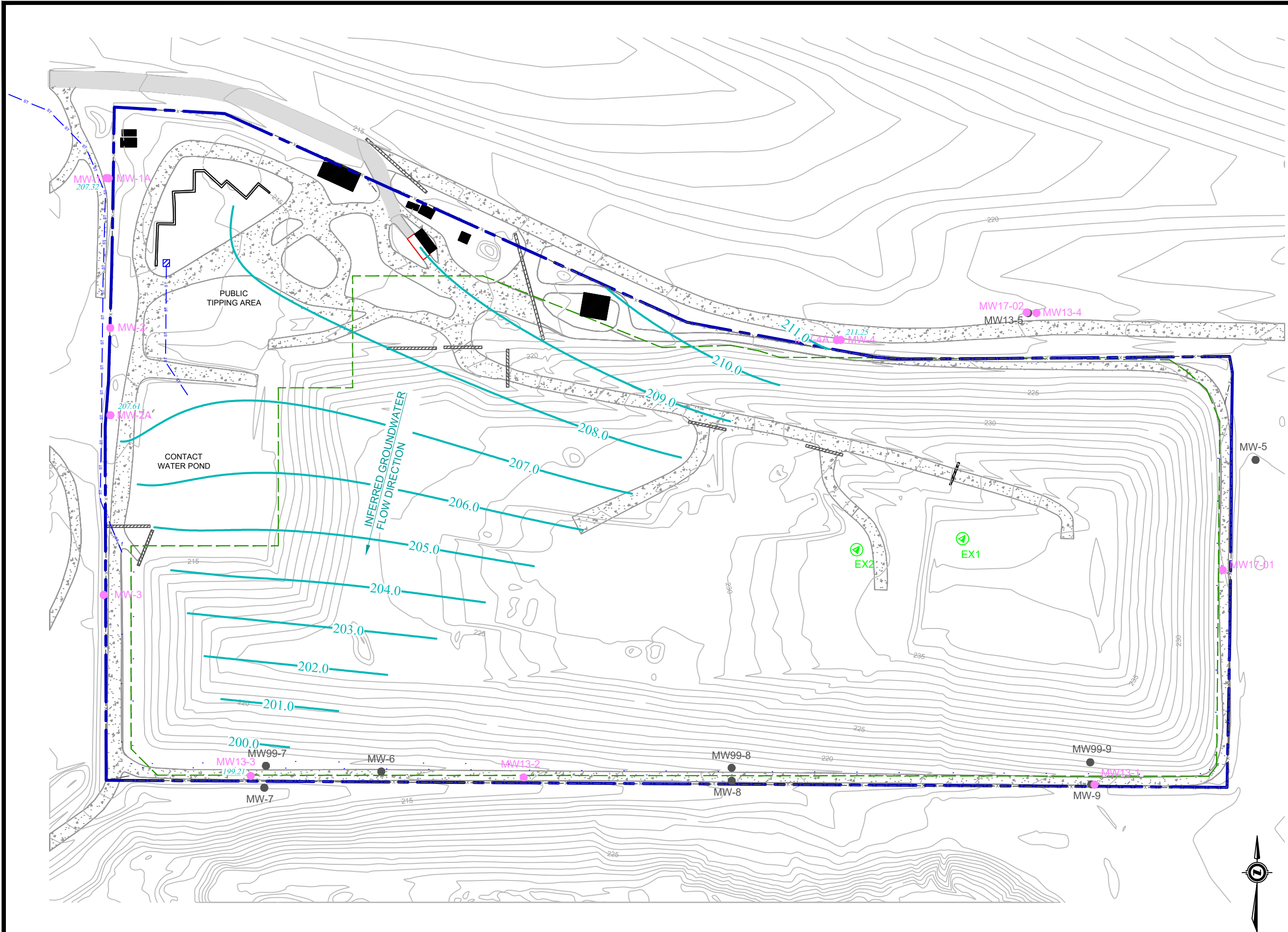
SECHULT LANDFILL
SUNSHITE COAST REGIONAL DISTRICT



DATE	JOB NO.	FIGURE NO.
AUG. 2020	4-2111-01-65	6A

DRAWING REFERENCE: Figure based on data supplied by the client and XCG field notes.
NOTE: Location of building, underground utilities, etc. are for reference only and should not be relied upon for detailed design, renovation, or construction purposes. Property boundary and building locations shown may not represent actual surveyed boundaries.

SHEET: R421110165001FIG06A.pdf
FILE: R421110165001.dwg



- LEGEND:**
- PROPERTY BOUNDARY
 - APPROXIMATE LIMIT OF WASTE
 - APPROXIMATE FENCE LINE
 - EXISTING CONTOURS
 - EXISTING ASPHALT ROAD
 - EXISTING GRAVEL ROAD
 - EXISTING BUILDING
 - EXISTING SURFACE WATERCOURSE
 - EXISTING STORMWATER GRAVITY MAIN
 - EXISTING GROUNDWATER MONITORING WELL
 - EXISTING LFG WELL
 - EXISTING LFG EXTRACTION WELL
 - GROUNDWATER CONTOURS (NOV. 4, 2019)
 - GROUNDWATER ELEVATION (NOV. 4, 2019)



GROUNDWATER ELEVATION CONTOURS (NOVEMBER 2019)

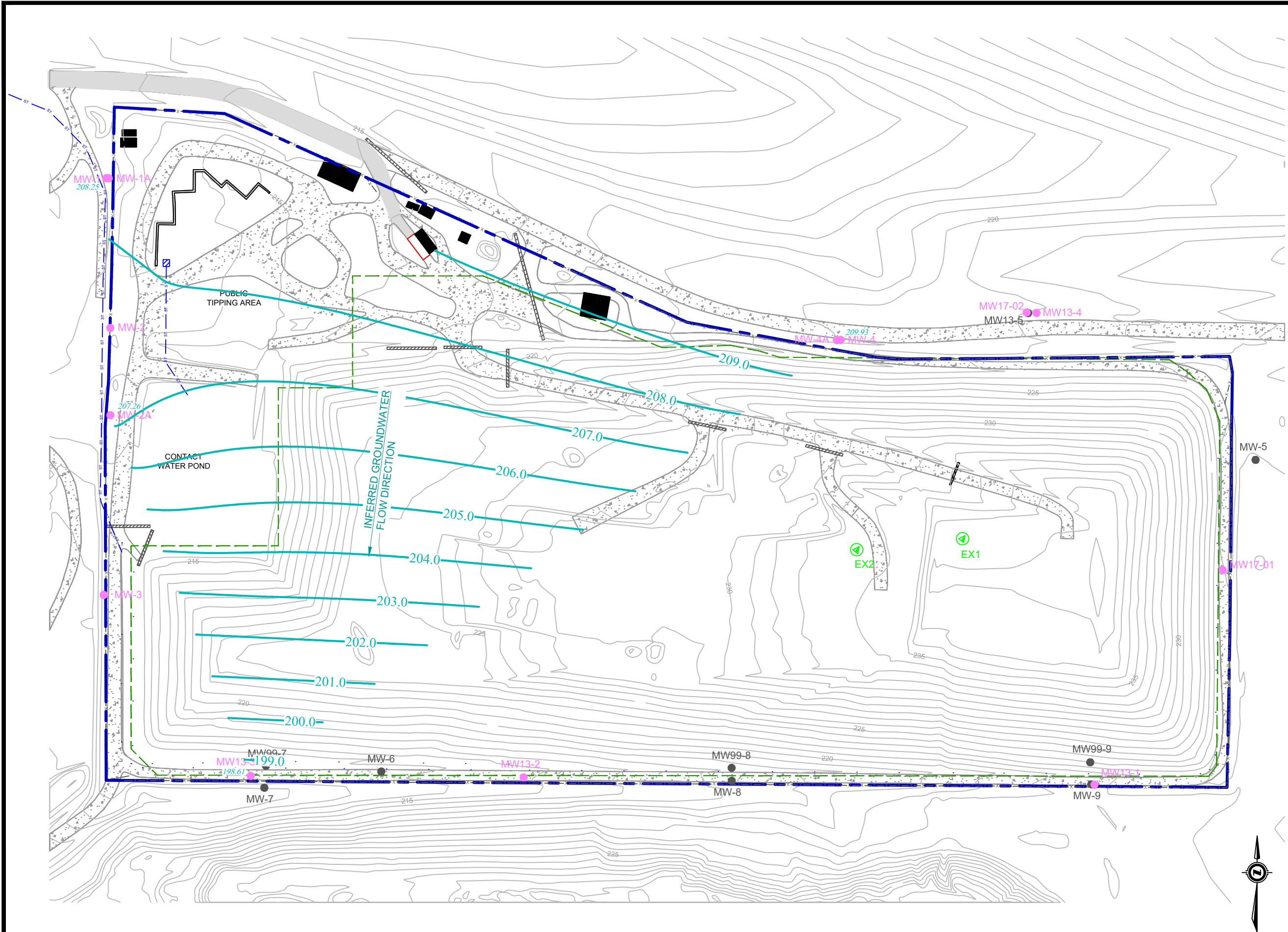
SECHULT LANDFILL
SUNSHITE COAST REGIONAL DISTRICT



DATE	JOB NO.	FIGURE NO.
AUG. 2020	4-2111-01-65	6B

DRAWING REFERENCE: Figure based on data supplied by the client and XCG field notes.
NOTE: Location of building, underground utilities, etc. are for reference only and should not be relied upon for detailed design, renovation, or construction purposes. Property boundary and building locations shown may not represent actual surveyed boundaries.

SHEET: R421110165001FIG06B.pdf
FILE: R421110165001.dwg



- LEGEND:**
- PROPERTY BOUNDARY
 - APPROXIMATE LIMIT OF WASTE
 - APPROXIMATE FENCE LINE
 - EXISTING CONTOURS
 - EXISTING ASPHALT ROAD
 - EXISTING GRAVEL ROAD
 - EXISTING BUILDING
 - EXISTING SURFACE WATERCOURSE
 - EXISTING STORMWATER GRAVITY MAIN
 - EXISTING GROUNDWATER MONITORING WELL
 - EXISTING LFG WELL
 - EXISTING LFG EXTRACTION WELL
 - GROUNDWATER CONTOURS (JULY 7, 2020)
 - GROUNDWATER ELEVATION (JULY 7, 2020)



GROUNDWATER ELEVATION CONTOURS (JULY 2020)

SECHTEL LANDFILL
SUNSHITE COAST REGIONAL DISTRICT



DATE	JOB NO.	FIGURE NO.
AUG. 2020	4-2111-01-65	6D

DRAWING REFERENCE: Figure based on data supplied by the client and XCG field notes.
NOTE: Location of building, underground utilities, etc. are for reference only and should not be relied upon for detailed design, renovation, or construction purposes. Property boundary and building locations shown may not represent actual surveyed boundaries.

SHEET: R421110165001FIG06D.pdf
FILE: R421110165001.dwg



TABLES



Table 1 Water Well Summary

Well ID	Owner	Location	Well Use	Completion Date	Well Depth (mbgs)	Water Depth (mbgs)	Yield (Gallons/Minute)	Screened Interval (mbgs)	Screened Lithology
72212	Construction Aggregates Ltd.	Approximately 1.6 km west of Site	-	1994	101	72	400	0.6 - 97	-
72214	Construction Aggregates Ltd.	Approximately 1.6 km west of Site	-	1994	88	-	-	-	-
72213	Construction Aggregates Ltd.	Approximately 1.6 km west of Site	-	1994	87	-	-	0.9 - 50	-
72215	Construction Aggregates Ltd.	Approximately 1.6 km west of Site	-	1994	105	-	-	0.8 - 97	-
72234	Construction Aggregates Ltd.	Approximately 1.6 km west of Site	-	1996	75	28	30	0.8 - 68	-
72231	Construction Aggregates Ltd.	Approximately 1.6 km west of Site	-	1996	98	-	-	-	-
72233	Construction Aggregates Ltd.	Approximately 1.6 km west of Site	-	1996	73	-	-	0.6 - 68	-
93003	Construction Aggregates Ltd.	Approximately 1.9 km west of Site	Private Domestic	2004	-	36	100	-	-
101785	Construction Aggregates Ltd.	Approximately 2.0 km west of Site	Private Domestic	2001	77	-	50	-	-
93084	Construction Aggregates Ltd.	Approximately 2.4 km southwest of Site	Private Domestic	2003	-	30	-	41 - 50	-
93094	Construction Aggregates Ltd.	Approximately 2.4 km southwest of Site	Private Domestic	2003	-	30	400	41 - 50	-
93261	Construction Aggregates Ltd.	Approximately 2.5 km southwest of Site	Private Domestic	2002	-	30	10	-	-
92425	Choquer & Sons Ltd.	Approximately 2.5 km west of Site	Private Domestic	1996	30	8	-	20 - 23	-
27560	Harry Chin	Approximately 2.3 km northwest of Site	-	1973	12	11	10	-	-
117197	Geoff White & Carolyn Pinchin	Approximately 2.3 km northwest of Site	Private Domestic	2016	24	13	-	-	-
54929	SCRD	Approximately 2 km west of Site	Test Production Well	2018	85	32.7	300	79.8-83.5	Sand and Gravel
Notes: Well information taken from iMapBC. Entries that are N/A or Unknown in the database are represented by a "-" mbgs - Metres below ground surface									

Table 2 Water Licenses for Chapman Creek

License No.	Stream Name	Purpose	Quantity	Units	Licensee	License Status
C016599	Chapman Creek	Waterworks Local Authority	8296.61	MY	Sunshine Coast Regional District	Current
C022345	Chapman Creek	Waterworks Local Authority	33186.46	MY	Sunshine Coast Regional District	Current
C065258	Chapman Creek	Waterworks Local Authority	2986781.13	MY	Sunshine Coast Regional District	Current
C069217	Chapman Creek	Waterworks Local Authority	497796.86	MY	Sunshine Coast Regional District	Current
C069999	Chapman Creek	Waterworks Local Authority	2986781.13	MY	Sunshine Coast Regional District	Current
C107474	Chapman Creek	Waterworks Local Authority	9955593.71	MY	Sunshine Coast Regional District	Current
C114222	Chapman Creek	Conserv. - Construct. Works	0.17	MS	Forests, Lands & Natural Resource Operat	Current
C129269	Chapman Creek	Ponds	0.28	MS	Sunshine Coast Salmonid Enhancement Soc.	Current

**Table 3 Water Licenses for Irgens Creek**

License No.	Stream Name	Purpose	Quantity	Units	Licensee	License Status
C025134	Irgens Creek	Domestic	2.27	MD	0889507 B.C. Ltd.	Current
C025433	Irgens Creek	Domestic	4.55	MD	Deacon Gregory W & Buckingham Linda H	Current
C025434	Irgens Creek	Domestic	2.27	MD	Deacon Gregory W & Buckingham Linda H	Current
C025435	Irgens Creek	Domestic	2.27	MD	Buckingham Sandra L	Current
C111440	Irgens Creek	Irrigation	2466.96	MY	Alvarez John Osborne	Current



Table 4 Monitoring Well Completion Details and Locations

Monitoring Well	Top of Well Casing (mAMSL)	Ground Elevation (mAMSL)	Completion Depth (mbgs)	Screened Interval (mbgs)	Screened Lithology	Depth	Location
MW-1	213.36	212.32	11.2	approx. 3.0 - 4.5	Silty sand	Shallow	Northwestern corner of landfill, near former gypsum waste disposal area
MW-1A	213.42	212.32	5.0	approx. 9.5 - 11	Silty sand	Shallow	Northwestern corner of landfill. Has not been sampled due to insufficient water. Damaged, removed from program.
MW-2	213.94	212.22	5.8	approx. 3.3 - 5.8	Silty sand	Shallow	Northwestern corner of landfill
MW-2A	214.02	213.62	7.1	approx. 5.7 - 7.2	Medium sand	Shallow	Western landfill boundary
MW-3	214.47*	213.47	4.3	approx. 2.8 - 4.3	Silty sand	Shallow	Southwestern corner of landfill by the former sludge disposal pits
MW-4	219.85	219.04	11.5	approx. 9.0 - 11.5	Compact sandy silt	Shallow	Northern landfill boundary. Considered to represent background groundwater quality
MW-4A	219.79	219.04	4.0	approx. 2.5 - 4.0	Silty sand	Shallow	Northern landfill boundary. Considered to represent background groundwater quality
MW-5	223.20	222.12	14.3	approx. 11.0 - 14.0	Sandy silt	Shallow	Decommissioned in 2017
MW6	212.82	212.20	8.4	approx. 4.4 - 7.4	Silty sand	Shallow	Not monitored
MW7	211.01	211.04	18.3	16.8 - 18.3	Gravel, sandy silt	Deep	Decommissioned in 1999
MW8	215.77	215.85	29.9	28.3 - 29.9	Gravel, silt and sand	Deep	Decommissioned in 1999
MW9	220.49	220.55	26.0	24.5 - 26	Sand, sandy gravel	Deep	Decommissioned in 1999
MW99-7	212.33	approx. 211.5	19.5	18.0 - 19.5	Sand, sandy silt, till	Deep	Decommissioned in 2013
MW99-8	216.93	approx. 216.0	29.0	27.5 - 29.0	Sand and gravel	Deep	Decommissioned in 2013
MW99-9	approx. 220.9	approx. 220.0	25.9	24.4 - 25.9	Gravelly sand	Deep	Decommissioned in 2013
MW13-01	221.91	221.91	25.9	22.9 - 25.9	Gravelly Sand	Deep	West end of southern landfill boundary
MW13-02	215.23	215.23	32.3	26.2 - 32.3	Silty Sand and Gravel	Deep	Middle of southern landfill boundary
MW13-03	213.81	213.81	17.1	14.0 - 17.1	Silty Sand	Deep	East end of southern landfill boundary
MW13-04	221.67	approx. 220.667	20.1	17.1 - 20.1	Sand, Silty Sand	Deep	Northeast of landfill. Considered to represent background groundwater quality
MW13-05	221.52	approx. 220.521	10.4	7.3 - 10.4	Sandy Gravel, Sand	Shallow	Decommissioned in 2017
MW17-01	224.79	224.00	14.9	11.9 - 14.9	Gravel and Cobbles/Silty Sand	Shallow	Eastern landfill boundary
MW17-02	222.20	221.37	9.8	6.8 - 9.8	Sandy Gravel/Sand	Shallow	Northeast of landfill. Considered to represent background groundwater quality. Has not been sampled due
Notes: 1. Monitoring well completion details for MW-1 to MW-6 obtained from Dayton & Knight (1993) 2. Monitoring well completion details for MW7 to MW9 obtained from Piteau Associates (1996) 3. Monitoring well completion details for MW99-7 to MW99-9 obtained from Piteau Associates (1999) 4. Monitoring well completion details for MW13-01 to MW13-05 provided by Strait Land Surveying Inc. (2013) 5. Monitoring well completion details for MW17-01 to MW17-02 provided by Strait Land Surveying Inc. (2017) mAMSL - Metres above mean sea level mbgs - Metres below ground surface							

Table 5 Groundwater Elevations

Monitoring Location	Date	Static Water Level (mbtoc)	Top of Casing Elevation (mAMSL)	Completion Depth (mbgs)	Groundwater Elevation (mAMSL)
MW-4	01-Apr-19	8.60	219.85	11.5	211.25
	04-Nov-19	8.60	219.85		211.25
	10-Dec-19	8.20	219.85		211.65
	07-Jul-20	9.93	219.85		209.93
MW-4A	01-Apr-19	4.02	219.79	4.0	215.77
	04-Nov-19	3.67	219.79		216.12
	10-Dec-19	3.50	219.79		216.29
	07-Jul-20	3.44	219.79		216.35
MW13-01	02-Apr-19	21.60	221.91	25.9	200.31
	06-Nov-19	22.14	221.91		199.77
	11-Dec-19	22.15	221.91		199.76
	07-Jul-20	21.93	221.91		199.98
MW13-02	02-Apr-19	26.66	215.23	32.3	188.57
	04-Nov-19	25.90	215.23		189.33
	11-Dec-19	25.92	215.23		189.31
	07-Jul-20	28.42	215.23		186.82
MW13-03	01-Apr-19	14.82	213.81	17.1	198.99
	04-Nov-19	14.60	213.81		199.21
	10-Dec-19	14.40	213.81		199.41
	07-Jul-20	15.20	213.81		198.61
mAMSL - metres above sea level					
mbtoc - metres below top of casing					

Table 6 2019 Field Parameter Results

Monitoring Location	Date	Static Water Level (mbtoc)	Purge Volume (L)	pH	Conductivity (µS/cm)	Temperature (°C)	Dissolved Oxygen (mg/L)	Redox Potential (mV)
April Sampling Event								
MW-1	02-Apr-19	6.20	8	5.59	1160	12.01	5.16	181
MW-2	02-Apr-19	5.38	2	5.57	749	11.39	6.98	221
MW-2A	02-Apr-19	6.17	5	6.04	649	11.02	5.58	222
MW-3	02-Apr-19	4.92	9	6.34	688	11.75	4.63	186
MW-4	02-Apr-19	8.60	19	5.27	464	13.23	9.52	267
MW-4A	02-Apr-19	4.02	Dry	-	-	-	-	-
MW13-1	02-Apr-19	21.60	31	6.65	931	12.36	5.72	97
MW13-2	02-Apr-19	26.66	36	6.33	854	13.21	5.88	132
MW13-3	02-Apr-19	14.82	Until Dry	6.27	910	13.3	3.62	136
MW13-4	02-Apr-19	13.4	43	5.99	66	12.85	16.54	264
MW17-01	02-Apr-19	Dry	-	-	-	-	-	-
MW17-02	02-Apr-19	Dry	-	-	-	-	-	-
Site A	03-Apr-19	-	-	4.47	43	9.3	22.92	400
Site B	03-Apr-19	-	-	6.22	14	7.02	35.78	347
Site C	03-Apr-19	-	-	4.89	66	9.73	12.53	369
Site E	20-Mar-18	-	-	4.81	29	8.85	6.35	434
November Sampling Event								
MW-1	06-Nov-19	6.04	4	5.41	1350	11.79	4.99	208
MW-2	04-Nov-19	5.66	12.76	5.59	2040	11.8	5.43	208
MW-2A	06-Nov-19	6.41	3	6.14	1630	12.56	9.53	92
MW-3	06-Nov-19	4.68	11.28	6.54	2430	12.66	6.68	37
MW-4	08-Nov-19	8.60	17.7	5.35	992	12.49	11.88	311
MW-4A	06-Nov-19	3.67	Dry	-	-	-	-	-
MW13-1	06-Nov-19	22.14	25.14	6.20	997	12.14	9.55	109
MW13-2	06-Nov-19	25.90	40.68	5.54	737	12.78	8.33	194
MW13-3	08-Nov-19	14.60	18.18	6.64	2010	12.06	6.65	46
MW13-4	04-Nov-19	16.47	24	6.27	158	10.71	10.11	273
MW17-01	04-Nov-19	Dry	-	-	-	-	-	-
MW17-02	04-Nov-19	Dry	-	-	-	-	-	-
Site A	12-Nov-19	-	-	6.45	46	9.17	33.75	275
Site B	06-Nov-19	-	-	7.07	34	7.12	27.22	99
Site C	12-Nov-19	-	-	6.79	71	8.4	28.92	185
Site E	12-Nov-19	-	-	6.45	370	10.94	8.83	267
December Sampling Event								
MW-1	11-Dec-19	4.04	10	5.34	534	11.29	5.65	259
MW-2	11-Dec-19	5.30	15	5.58	750	11.37	6.94	216
MW-2A	11-Dec-19	6.40	4	6.1	668	10.31	6.7	267
MW-3	11-Dec-19	4.65	17	6.58	841	11.01	7.95	172
MW-4	11-Dec-19	8.20	20	5.65	454	11.87	7.04	341
MW-4A	11-Dec-19	3.50	Until Dry	5.44	241	11.44	8.47	302
MW13-1	11-Dec-19	22.15	24	6.79	1410	9.54	7.73	125
MW13-2	11-Dec-19	25.92	45	6.69	628	14.09	6.37	59
MW13-3	11-Dec-19	14.40	19	6.99	869	11.12	7.7	61
MW13-4	11-Dec-19	16.24	24	5.63	89	12.04	9.34	310
MW17-01	11-Dec-19	Dry	-	-	-	-	-	-
MW17-02	11-Dec-19	Dry	-	-	-	-	-	-
Site A	11-Dec-19	-	-	7.79	42	6.86	24.82	127
Site B	11-Dec-19	-	-	6.95	60	6.95	9.66	230
Site C	11-Dec-19	-	-	7.23	30	5.17	10.57	228
Site E	11-Dec-19	-	-	7.79	29	7.32	10.08	156
Notes: mbtoc - metres below top of casing N/A - not applicable - no data available								



Table 7 2019 Groundwater Quality Results - MW-1

Sample Date:	Units	BC MOE Criteria ⁽ⁿ⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
Lab Sample ID:				9040895-11	1390189-3	1397808-4
Field Parameters						
pH	s.u.	---	6.5-9.0	5.59	5.41	5.34
Conductivity, Electrical	µS/cm	---	---	1160	1350	534
Temperature	°C	15 (AO)	---	12.01	11.79	11.29
Dissolved Oxygen	mg/L	---	---	5.16	4.99	5.65
Redox Potential	(mV)	---	---	181	208	259
General						
Chemical Oxygen Demand (COD)	mg/L	---	---	36	20	ND (10)
Dissolved Organic Carbon (DOC)	mg/L	---	---	1.67	0.6	1.1
Conductivity, Electrical	µS/cm	---	---	803	496	774
pH	s.u.	---	6.5-9.0	7.00	6.66	6.63
Alkalinity (Total as CaCO3)	mg/L	---	(o) ^(w)	70.3	67	92
Alkalinity (PP as CaCO3)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Bicarbonate (HCO ₃)	mg/L	---	---	70.3	82	110
Carbonate (as CaCO ₃)	mg/L	---	---	ND (1.0)	ND (6)	ND (6)
Hydroxide (OH)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Turbidity	NTU	(a)		180	31.7	18.3
Hardness (as CaCO ₃)	mg/L	---	---	351	250	390
Nutrients						
Ammonia	mg/L	---	0.681-28.7 ^(b)	ND (0.020)	ND (0.01)	ND (0.01)
Dissolved Nitrate (N)	mg/L	10	32.8	0.756	0.2	ND (0.01)
Dissolved Nitrite (N)	mg/L	1.0	0.06-0.6 ^(c)	0.315	ND (0.1)	ND (0.01)
Total Phosphorus (P)	mg/L	0.01 (AO)	---	0.182	0.08	0.075
Nitrate plus Nitrite (N)	mg/L	10	---	-	0.2	ND (0.020)
Total Nitrogen (N)	mg/L	---	---	-	0.26	0.2
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	0.438	0.07	ND (0.07)
Anions						
Chloride	mg/L	250 (AO)	600	47	18.7	18
Sulfate	mg/L	500 (AO)	(l)	235	136	114
Dissolved Metals						
Aluminum	mg/L	9.5	0.1 ^(d)	ND (0.0050)	0.001	0.004
Antimony	mg/L	---	0.009 ^(w)	ND (0.00020)	0.00009	0.00006
Arsenic	mg/L	0.01	0.005	ND (0.00050)	0.0002	0.0003
Barium	mg/L	---	1 ^(w)	0.0329	0.0223	0.034
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00050)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.284	0.169	0.17
Cadmium	mg/L	0.005	(e)	0.000096	0.00011	0.00006
Calcium	mg/L	---	---	124	92	140
Chromium	mg/L	---	---	ND (0.00050)	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	---	0.11	0.00012	0.00009	0.00015
Copper	mg/L	1.0	(f)	0.00067	0.0005	ND (0.0005)
Iron	mg/L	0.3 (AO)	0.35	ND (0.010)	ND (0.002)	0.005
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	ND (0.00001)	ND (0.00001)
Lithium	mg/L	---	---	0.00051	ND (0.0005)	ND (0.0005)
Magnesium	mg/L	---	---	9.97	5.9	9.6
Manganese	mg/L	0.05 (AO)	(h)	0.056	0.019	0.039
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	0.00011	0.00007	0.00008
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	0.00067	0.0005	0.0005
Phosphorus	mg/L	---	---	ND (0.050)	-	-
Potassium	mg/L	---	---	1.79	2.3	2.2
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	7.10	6.2	7.5
Silver	mg/L	---	0.0001-0.003 ^(j)	ND (0.000050)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	---	---	9.6	11	12
Strontium	mg/L	---	---	0.951	0.5679	0.9879
Sulfur	mg/L	---	---	89.8	52	92
Tellurium	mg/L	---	---	ND (0.00050)	-	-
Thallium	mg/L	---	---	ND (0.000020)	0.00001	0.00002
Thorium	mg/L	---	---	ND (0.00010)	ND (0.00005)	ND (0.00005)
Tin	mg/L	---	---	ND (0.00020)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	ND (0.0050)	ND (0.0001)	0.0003
Tungsten	mg/L	---	---	ND (0.0010)	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.000147	0.0001	0.00021
Vanadium	mg/L	---	---	ND (0.0010)	ND (0.00005)	ND (0.00005)
Zinc	mg/L	5.0 (AO)	(k)	0.0054	0.0074	0.0039
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Volatile Organic Compounds						
1,1,1,2-tetrachloroethane	mg/L	---	---	-	-	-
1,1,1-trichloroethane	mg/L	---	---	ND (0.0010)	-	-

Table 7 2019 Groundwater Quality Results - MW-1

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
1,1,2,2-tetrachloroethane	mg/L	---	---	ND (0.0005)	-	-
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	---	---	-	-	-
1,1,2-trichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
1,2,3-trichlorobenzene	mg/L	---	0.008 ^(w)	-	-	-
1,2,4-trichlorobenzene	mg/L	---	0.024 ^(w)	-	-	-
1,2-dibromoethane	mg/L	---	---	ND (0.0030)	-	-
1,2-dichlorobenzene	mg/L	---	0.0007 ^(w)	ND (0.0005)	-	-
1,2-dichloroethane	mg/L	---	0.100 ^(w)	ND (0.0010)	-	-
1,2-dichloropropane	mg/L	---	---	ND (0.0010)	-	-
1,3,5-trimethylbenzene	mg/L	---	---	-	-	-
1,3-dichlorobenzene	mg/L	---	0.150 ^(w)	ND (0.0010)	-	-
1,3-dichloropropane	mg/L	---	---	-	-	-
1,4-dichlorobenzene	mg/L	---	0.026 ^(w)	ND (0.0010)	-	-
Benzene	mg/L	0.005	0.04 ^(m)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Bromobenzene	mg/L	---	---	-	-	-
Bromodichloromethane	mg/L	---	---	ND (0.0010)	-	-
Bromoform	mg/L	---	---	ND (0.0010)	-	-
Bromomethane	mg/L	---	---		-	-
Dibromomethane	mg/L	---	---	ND (0.0010)	-	-
Carbon Tetrachloride	mg/L	---	0.0133 ^(w)	ND (0.0005)	-	-
Chlorobenzene	mg/L	---	---	ND (0.0010)	-	-
Chlorodibromomethane	mg/L	---	---	ND (0.0010)	-	-
Chloroethane	mg/L	---	---	ND (0.0020)	-	-
Chloroform	mg/L	---	0.0018 ^(w)	ND (0.0010)	-	-
Chloromethane	mg/L	---	---	-	-	-
cis-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
cis-1,3-dichloropropene	mg/L	---	---	ND (0.0010)	-	-
Dichlorodifluoromethane	mg/L	---	---	-	-	-
Dichloromethane	mg/L	---	0.0981 ^(w)	ND (0.0030)	-	-
Ethylbenzene	mg/L	0.14/0.0016 (AO)	0.20 ^(m)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Hexachlorobutadiene	mg/L	---	0.0013 ^(w)	-	-	-
Isopropylbenzene	mg/L	---	---	-	-	-
m & p-Xylene	mg/L	---	---	-	-	-
Methyl-tert-butylether (MTBE)	mg/L	0.015 (AO)	3.4	ND (0.0010)	ND (0.0005)	ND (0.0005)
o-Xylene	mg/L	---	---	-	-	-
Styrene	mg/L	---	0.072 ^(w)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Tetrachloroethene	mg/L	---	---	ND (0.0010)	-	-
Toluene	mg/L	0.06/0.024 (AO)	0.0005	ND (0.0010)	ND (0.0005)	ND (0.0005)
trans-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
trans-1,3-dichloropropene	mg/L	---	---	-	-	-
Trichloroethene	mg/L	---	---	ND (0.0010)	-	-
Trichlorofluoromethane	mg/L	---	---	ND (0.0010)	-	-
VH C6-C10	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Vinyl Chloride	mg/L	---	---	ND (0.0010)	-	-
VPH (VHW6 to 10 - BTEX)	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Xylenes (total)	mg/L	0.09/0.02 (AO)	0.03	ND (0.0020)	ND (0.0005)	ND (0.0005)
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria (DWQ): Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria (FWAL): All criteria for metals are for total metals except criteria for aluminum and iron, which are for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria a. Turbidity: 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. d. Aluminum: criteria specified for dissolved species not total. Criteria pH dependent. If pH<6.5: $e^{(1.209-2.426 \cdot \text{pH} + 0.286 \cdot \text{pH}^2)}$ e. Cadmium (mg/L) = $(e^{(1.03 \cdot \text{LN}(\text{HARDNESS}) - 5.274)})/1000$, valid for Hardness (as CaCO ₃) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO ₃) > 8 mg/L: $(e^{(1.273 \cdot \text{ln}(\text{HARDNESS}) - 1.460)})/1000$. If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, $(33 + (0.75 \cdot (\text{HARDNESS} - 90)))/1000$ for Hardness > 90 mg/L l. Sulphate: BC MOE Approved Water Quality Guidelines, Summary Report Table 40. Hardness dependent. m. Interim guideline n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 o. Alkalinity (Total as CaCO3): BC MOE Working Water Quality Guidelines, Table 1. w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short-AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria						



Table 8 2019 Groundwater Quality Results - MW-2

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
Lab Sample ID:				9040895-03	1390189-4	1397808-5
Field Parameters						
pH	s.u.	---	6.5-9.0	<u>5.57</u>	<u>5.59</u>	<u>5.58</u>
Conductivity, Electrical	µS/cm	---	---	749	2040	750
Temperature	°C	15 (AO)	---	11.39	11.8	11.37
Dissolved Oxygen	mg/L	---	---	6.98	5.43	6.94
Redox Potential	(mV)	---	---	221	208	2.16
General						
Chemical Oxygen Demand (COD)	mg/L	---	---	32	40	30
Dissolved Organic Carbon (DOC)	mg/L	---	---	3.99	3.8	5.4
Conductivity, Electrical	µS/cm	---	---	714	890	748
pH	s.u.	---	6.5-9.0	7.34	7.00	6.88
Alkalinity (Total as CaCO3)	mg/L	---	(o) ^(w)	160	131	127
Alkalinity (PP as CaCO3)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Bicarbonate (HCO ₃)	mg/L	---	---	160	160	155
Carbonate (as CaCO ₃)	mg/L	---	---	ND (1.0)	ND (6)	ND (6)
Hydroxide (OH)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Turbidity	NTU	(a)		1.87	10.2	5.13
Hardness (as CaCO ₃)	mg/L	---	---	271	390	290
Nutrients						
Ammonia	mg/L	---	0.681-28.7 ^(b)	0.057	ND (0.01)	0.06
Dissolved Nitrate (N)	mg/L	10	32.8	ND (0.010)	ND (0.1)	ND (0.01)
Dissolved Nitrite (N)	mg/L	1.0	0.06-0.6 ^(c)	0.402	ND (0.1)	ND (0.01)
Total Phosphorus (P)	mg/L	0.01 (AO)	---	0.0517	0.023	0.035
Nitrate plus Nitrite (N)	mg/L	10	---	-	ND (0.20)	ND (0.020)
Total Nitrogen (N)	mg/L	---	---	-	0.52	0.72
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	0.539	0.52	0.72
Anions						
Chloride	mg/L	250 (AO)	600	63	106	89.8
Sulfate	mg/L	500 (AO)	(l)	96.6	151	97.6
Dissolved Metals						
Aluminum	mg/L	9.5	0.1 ^(d)	ND (0.0050)	ND (0.001)	ND (0.001)
Antimony	mg/L	---	0.009 ^(w)	ND (0.00020)	0.00011	0.00012
Arsenic	mg/L	0.01	0.005	0.00104	0.0005	0.0009
Barium	mg/L	---	1 ^(w)	0.0246	0.0261	0.0272
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.254	0.225	0.286
Cadmium	mg/L	0.005	(e)	ND (0.000010)	0.00004	ND (0.00001)
Calcium	mg/L	---	---	85.8	120	92
Chromium	mg/L	---	---	ND (0.00050)	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	---	0.11	0.00169	0.00258	0.00244
Copper	mg/L	1.0	(f)	0.00059	ND (0.0005)	ND (0.0005)
Iron	mg/L	0.3 (AO)	0.35	0.013	0.107	1.66
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	ND (0.00001)	ND (0.00001)
Lithium	mg/L	---	---	ND (0.00010)	ND (0.0005)	ND (0.0005)
Magnesium	mg/L	---	---	13.8	21	15
Manganese	mg/L	0.05 (AO)	(h)	14.6	8.79	6.83
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	0.0011	0.00049	0.00072
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	0.00175	0.0015	0.0015
Phosphorus	mg/L	---	---	ND (0.050)	-	-
Potassium	mg/L	---	---	2.04	2.6	2.5
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	12.100	11	10
Silver	mg/L	---	0.0001-0.003 ^(j)	ND (0.000050)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	---	---	19.1	16	20
Strontium	mg/L	---	---	1.490	1.798	1.789
Sulfur	mg/L	---	---	36.5	51	36
Tellurium	mg/L	---	---	ND (0.00050)	-	-
Thallium	mg/L	---	---	ND (0.000020)	ND (0.00001)	ND (0.00001)
Thorium	mg/L	---	---	ND (0.00010)	ND (0.00005)	ND (0.00005)
Tin	mg/L	---	---	ND (0.00020)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	ND (0.0050)	0.0001	0.0005
Tungsten	mg/L	---	---	ND (0.0010)	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.00168	0.00098	0.00063
Vanadium	mg/L	---	---	ND (0.0010)	ND (0.00005)	ND (0.00005)
Zinc	mg/L	5.0 (AO)	(k)	0.036	0.0098	0.0049
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)



Table 8 2019 Groundwater Quality Results - MW-2

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
Volatile Organic Compounds						
1,1,1,2-tetrachloroethane	mg/L	---	---	-	-	-
1,1,1-trichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1,2,2-tetrachloroethane	mg/L	---	---	ND (0.0005)	-	-
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	---	---	-	-	-
1,1,2-trichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
1,2,3-trichlorobenzene	mg/L	---	0.008 ^(w)	-	-	-
1,2,4-trichlorobenzene	mg/L	---	0.024 ^(w)	-	-	-
1,2-dibromoethane	mg/L	---	---	ND (0.0030)	-	-
1,2-dichlorobenzene	mg/L	---	0.0007 ^(w)	ND (0.0005)	-	-
1,2-dichloroethane	mg/L	---	0.100 ^(w)	ND (0.0010)	-	-
1,2-dichloropropane	mg/L	---	---	ND (0.0010)	-	-
1,3,5-trimethylbenzene	mg/L	---	---	-	-	-
1,3-dichlorobenzene	mg/L	---	0.150 ^(w)	ND (0.0010)	-	-
1,3-dichloropropane	mg/L	---	---	-	-	-
1,4-dichlorobenzene	mg/L	---	0.026 ^(w)	ND (0.0010)	-	-
Benzene	mg/L	0.005	0.04 ^(m)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Bromobenzene	mg/L	---	---	-	-	-
Bromodichloromethane	mg/L	---	---	ND (0.0010)	-	-
Bromoform	mg/L	---	---	ND (0.0010)	-	-
Bromomethane	mg/L	---	---	-	-	-
Dibromomethane	mg/L	---	---	ND (0.0010)	-	-
Carbon Tetrachloride	mg/L	---	0.0133 ^(w)	ND (0.0005)	-	-
Chlorobenzene	mg/L	---	---	ND (0.0010)	-	-
Chlorodibromomethane	mg/L	---	---	ND (0.0010)	-	-
Chloroethane	mg/L	---	---	ND (0.0020)	-	-
Chloroform	mg/L	---	0.0018 ^(w)	ND (0.0010)	-	-
Chloromethane	mg/L	---	---	-	-	-
cis-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
cis-1,3-dichloropropene	mg/L	---	---	ND (0.0010)	-	-
Dichlorodifluoromethane	mg/L	---	---	-	-	-
Dichloromethane	mg/L	---	0.0981 ^(w)	ND (0.0030)	-	-
Ethylbenzene	mg/L	0.14/0.0016 (AO)	0.20 ^(m)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Hexachlorobutadiene	mg/L	---	0.0013 ^(w)	-	-	-
Isopropylbenzene	mg/L	---	---	-	-	-
m & p-Xylene	mg/L	---	---	-	-	-
Methyl-tert-butylether (MTBE)	mg/L	0.015 (AO)	3.4	ND (0.0010)	ND (0.0005)	ND (0.0005)
o-Xylene	mg/L	---	---	-	-	-
Styrene	mg/L	---	0.072 ^(w)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Tetrachloroethene	mg/L	---	---	ND (0.0010)	-	-
Toluene	mg/L	0.06/0.024 (AO)	0.0005	ND (0.0010)	ND (0.0005)	ND (0.0005)
trans-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
trans-1,3-dichloropropene	mg/L	---	---	-	-	-
Trichloroethene	mg/L	---	---	ND (0.0010)	-	-
Trichlorofluoromethane	mg/L	---	---	ND (0.0010)	-	-
VH C6-C10	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Vinyl Chloride	mg/L	---	---	ND (0.0010)	-	-
VPH (VHW6 to 10 - BTEX)	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Xylenes (total)	mg/L	0.09/0.02 (AO)	0.03	ND (0.0020)	ND (0.0005)	ND (0.0005)
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria (DWQ): Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria (FWAL): All criteria for metals are for total metals except criteria for aluminum and iron, which are for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria a. Turbidity: 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. d. Aluminum: criteria specified for dissolved species not total. Criteria pH dependent. If pH<6.5: e^(1.209-2.426*pH+0.286*pH²) e. Cadmium (mg/L) = (e^(1.03*LN(HARDNESS)-5.274))/1000, valid for Hardness (as CaCO3) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO3) > 8 mg/L: (e^(1.273*ln(HARDNESS)-1.460))/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L l. Sulphate: BC MOE Approved Water Quality Guidelines, Summary Report Table 40. Hardness dependent. m. Interim guideline n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 o. Alkalinity (Total as CaCO3): BC MOE Working Water Quality Guidelines, Table 1. w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria						



Table 9 2019 Groundwater Quality Results - MW-2A

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Apr-19 Duplicate	Nov-19	Dec-18
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾				
Lab Sample ID:				9040895-04	9040895-05	1390189-5	1397808-6
Field Parameters							
pH	s.u.	---	6.5-9.0	<u>6.04</u>	-	<u>6.14</u>	<u>6.1</u>
Conductivity, Electrical	µS/cm	---	---	649	-	1630	668
Temperature	°C	15 (AO)	---	11.02	-	12.56	10.31
Dissolved Oxygen	mg/L	---	---	5.58	-	9.53	6.7
Redox Potential	(mV)	---	---	222	-	92	267
General							
Chemical Oxygen Demand (COD)	mg/L	---	---	54	56	120	70
Dissolved Organic Carbon (DOC)	mg/L	---	---	11.0	11.3	16	16.1
Conductivity, Electrical	µS/cm	---	---	623	622	699	621
pH	s.u.	---	6.5-9.0	7.63	7.59	7.21	7.19
Alkalinity (Total as CaCO3)	mg/L	---	(o) ^(w)	256	258	198	172
Alkalinity (PP as CaCO3)	mg/L	---	---	ND (1.0)	ND (1.0)	ND (5)	ND (5)
Bicarbonate (HCO ₃)	mg/L	---	---	256	258	241	209
Carbonate (as CaCO ₃)	mg/L	---	---	ND (1.0)	ND (1.0)	ND (6)	ND (6)
Hydroxide (OH)	mg/L	---	---	ND (1.0)	ND (1.0)	ND (5)	ND (5)
Turbidity	NTU	(a)		28.1	18.0	77.3	28.0
Hardness (as CaCO ₃)	mg/L	---	---	165	167	180	160
Nutrients							
Ammonia	mg/L	---	0.681-28.7 ^(b)	10.9	11.2	11.1	6.9
Dissolved Nitrate (N)	mg/L	10	32.8	ND (0.010)	ND (0.010)	ND (0.1)	ND (0.01)
Dissolved Nitrite (N)	mg/L	1.0	0.06-0.6 ^(c)	0.266	0.269	ND (0.1)	ND (0.01)
Total Phosphorus (P)	mg/L	0.01 (AO)	---	0.405	0.403	0.8	0.273
Nitrate plus Nitrite (N)	mg/L	10	---	-	-	ND (0.20)	ND (0.020)
Total Nitrogen (N)	mg/L	---	---	-	-	9.89	9.65
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	13.10	12.7	9.88	9.65
Anions							
Chloride	mg/L	250 (AO)	600	38	38.6	89.8	80
Sulfate	mg/L	500 (AO)	(l)	ND (1.0)	<1.0	2	0.20
Dissolved Metals							
Aluminum	mg/L	9.5	0.1 ^(d)	ND (0.0050)	ND (0.0050)	0.001	0.003
Antimony	mg/L	---	0.009 ^(w)	0.00025	0.00028	0.00026	0.00039
Arsenic	mg/L	0.01	0.005	0.00159	0.00156	0.0017	0.002
Barium	mg/L	---	1 ^(w)	0.0852	0.0829	0.0925	0.0863
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.286	0.292	0.428	0.382
Cadmium	mg/L	0.005	(e)	0.000019	0.00003	0.0001	ND (0.00001)
Calcium	mg/L	---	---	50.4	50.8	56	50
Chromium	mg/L	---	---	0.00119	0.00123	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	---	0.11	0.00293	0.00289	0.00331	0.00292
Copper	mg/L	1.0	(f)	ND (0.00040)	ND (0.00040)	0.0044	0.0006
Iron	mg/L	0.3 (AO)	0.35	0.338	0.386	0.166	0.057
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	ND (0.00020)	ND (0.00001)	ND (0.00001)
Lithium	mg/L	---	---	0.00158	0.00154	0.0023	0.0018
Magnesium	mg/L	---	---	9.54	9.64	9.5	8.6
Manganese	mg/L	0.05 (AO)	(h)	1.34	1.35	1.77	1.28
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	0.00053	0.00054	0.00018	0.00037
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	0.00319	0.00314	0.0029	0.0042
Phosphorus	mg/L	---	---	ND (0.050)	ND (0.050)	-	-
Potassium	mg/L	---	---	16.3	16.2	19	16
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	4.9	4.8	5.8	4.1
Silver	mg/L	---	0.0001-0.003 ^(j)	ND (0.000050)	ND (0.000050)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	---	---	32.2	32.3	35	37
Strontium	mg/L	---	---	0.547	0.555	0.6526	0.4548
Sulfur	mg/L	---	---	ND (3.0)	ND (3.0)	1.3	0.31
Tellurium	mg/L	---	---	ND (0.00050)	ND (0.00050)	-	-
Thallium	mg/L	---	---	ND (0.000020)	ND (0.000020)	ND (0.00001)	ND (0.00001)
Thorium	mg/L	---	---	ND (0.00010)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Tin	mg/L	---	---	ND (0.00020)	ND (0.00020)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	ND (0.0050)	ND (0.0050)	ND (0.0001)	0.0003
Tungsten	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.000094	0.00004	0.00009	0.00005
Vanadium	mg/L	---	---	ND (0.0010)	ND (0.0010)	ND (0.00005)	ND (0.00005)
Zinc	mg/L	5.0 (AO)	(k)	ND (0.0040)	0.0183	0.0043	0.0024
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.00010)	ND (0.0001)	ND (0.0001)
Volatile Organic Compounds							
1,1,1,2-tetrachloroethane	mg/L	---	---	-	-	-	-
1,1,1-trichloroethane	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-



Table 9 2019 Groundwater Quality Results - MW-2A

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Apr-19 Duplicate	Nov-19	Dec-18
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾				
1,1,2,2-tetrachloroethane	mg/L	---	---	ND (0.0005)	ND (0.0005)	-	-
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	---	---	-	-	-	-
1,1,2-trichloroethane	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
1,1-dichloroethane	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
1,1-dichloroethene	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
1,2,3-trichlorobenzene	mg/L	---	0.008 ^(w)	-	-	-	-
1,2,4-trichlorobenzene	mg/L	---	0.024 ^(w)	-	-	-	-
1,2-dibromoethane	mg/L	---	---	ND (0.0030)	ND (0.0030)	-	-
1,2-dichlorobenzene	mg/L	---	0.0007 ^(w)	ND (0.0005)	ND (0.0005)	-	-
1,2-dichloroethane	mg/L	---	0.100 ^(w)	ND (0.0010)	ND (0.0010)	-	-
1,2-dichloropropane	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
1,3,5-trimethylbenzene	mg/L	---	---	-	-	-	-
1,3-dichlorobenzene	mg/L	---	0.150 ^(w)	ND (0.0010)	ND (0.0010)	-	-
1,3-dichloropropane	mg/L	---	---	-	-	-	-
1,4-dichlorobenzene	mg/L	---	0.026 ^(w)	ND (0.0010)	ND (0.0010)	-	-
Benzene	mg/L	0.005	0.04 ^(m)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Bromobenzene	mg/L	---	---	-	-	-	-
Bromodichloromethane	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
Bromoform	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
Bromomethane	mg/L	---	---			-	-
Dibromomethane	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
Carbon Tetrachloride	mg/L	---	0.0133 ^(w)	ND (0.0005)	ND (0.0005)	-	-
Chlorobenzene	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
Chlorodibromomethane	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
Chloroethane	mg/L	---	---	ND (0.0020)	ND (0.0020)	-	-
Chloroform	mg/L	---	0.0018 ^(w)	ND (0.0010)	ND (0.0010)	-	-
Chloromethane	mg/L	---	---	-	-	-	-
cis-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
cis-1,3-dichloropropene	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
Dichlorodifluoromethane	mg/L	---	---	-	-	-	-
Dichloromethane	mg/L	---	0.0981 ^(w)	ND (0.0010)	ND (0.0010)	-	-
Ethylbenzene	mg/L	0.14/0.0016 (AO)	0.20 ^(m)	ND (0.0010)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Hexachlorobutadiene	mg/L	---	0.0013 ^(w)	-	-	-	-
Isopropylbenzene	mg/L	---	---	-	-	-	-
m & p-Xylene	mg/L	---	---	-	-	-	-
Methyl-tert-butylether (MTBE)	mg/L	0.015 (AO)	3.4	ND (0.0010)	ND (0.0010)	ND (0.0005)	ND (0.0005)
o-Xylene	mg/L	---	---	-	-	-	-
Styrene	mg/L	---	0.072 ^(w)	ND (0.0010)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Tetrachloroethene	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
Toluene	mg/L	0.06/0.024 (AO)	0.0005	0.544	0.521	0.010	0.0007
trans-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
trans-1,3-dichloropropene	mg/L	---	---	-	-	-	-
Trichloroethene	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
Trichlorofluoromethane	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
VH C6-C10	mg/L	---	---	0.480	0.513	ND (0.050)	ND (0.050)
Vinyl Chloride	mg/L	---	---	ND (0.0010)	ND (0.0010)	-	-
VPH (VHW6 to 10 - BTEX)	mg/L	---	---	ND (0.100)	ND (0.100)	ND (0.050)	ND (0.050)
Xylenes (total)	mg/L	0.09/0.02 (AO)	0.03	ND (0.0020)	ND (0.0020)	ND (0.0005)	ND (0.0005)
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria (DWQ): Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria (FWAL): All criteria for metals are for total metals except criteria for aluminum and iron, which are for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria a. Turbidity: 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. d. Aluminum: criteria specified for dissolved species not total. Criteria pH dependent. If pH<6.5: e^(1.209-2.426*pH+0.286*pH²) e. Cadmium (mg/L) = (e^(1.03*LN(HARDNESS)-5.274))/1000, valid for Hardness (as CaCO₃) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO₃) > 8 mg/L: (e^(1.273*ln(HARDNESS)-1.460))/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L l. Sulphate: BC MOE Approved Water Quality Guidelines, Summary Report Table 40. Hardness dependent. m. Interim guideline n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 o. Alkalinity (Total as CaCO₃): BC MOE Working Water Quality Guidelines, Table 1. w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short-term maximum. AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria							



Table 10 2019 Groundwater Quality Results - MW-3

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
Lab Sample ID:				9040895-06	1390189-6	1397808-7
Field Parameters						
pH	s.u.	---	6.5-9.0	<u>6.34</u>	6.54	6.58
Conductivity, Electrical	µS/cm	---	---	688	2430	841
Temperature	°C	15 (AO)	---	11.75	12.66	11.01
Dissolved Oxygen	mg/L	---	---	4.63	6.68	7.95
Redox Potential	(mV)	---	---	186	37	172
General						
Chemical Oxygen Demand (COD)	mg/L	---	---	48	60	30
Dissolved Organic Carbon (DOC)	mg/L	---	---	9.62	11.9	11.3
Conductivity, Electrical	µS/cm	---	---	651	1013	893
pH	s.u.	---	6.5-9.0	7.64	7.31	7.19
Alkalinity (Total as CaCO3)	mg/L	---	(o) ^(w)	268	322	249
Alkalinity (PP as CaCO3)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Bicarbonate (HCO ₃)	mg/L	---	---	268	392	304
Carbonate (as CaCO ₃)	mg/L	---	---	ND (1.0)	ND (6)	ND (6)
Hydroxide (OH)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Turbidity	NTU	(a)		20	82.2	41.7
Hardness (as CaCO ₃)	mg/L	---	---	164	290	250
Nutrients						
Ammonia	mg/L	---	0.681-28.7 ^(b)	<u>13.0</u>	<u>20.8</u>	<u>15.8</u>
Dissolved Nitrate (N)	mg/L	10	32.8	0.02	ND (0.1)	ND (0.01)
Dissolved Nitrite (N)	mg/L	1.0	0.06-0.6 ^(c)	0.297	ND (0.1)	ND (0.01)
Total Phosphorus (P)	mg/L	0.01 (AO)	---	0.0833	0.024	0.031
Nitrate plus Nitrite (N)	mg/L	10	---	-	ND (0.20)	ND (0.020)
Total Nitrogen (N)	mg/L	---	---	-	18.1	16.3
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	13.4	18.1	16.3
Anions						
Chloride	mg/L	250 (AO)	600	41.6	107	88.1
Sulfate	mg/L	500 (AO)	(l)	2.7	18	44.9
Dissolved Metals						
Aluminum	mg/L	9.5	0.1 ^(d)	ND (0.0050)	0.001	0.002
Antimony	mg/L	---	0.009 ^(w)	0.00054	0.00025	0.00026
Arsenic	mg/L	0.01	0.005	0.00071	0.0009	0.0008
Barium	mg/L	---	1 ^(w)	0.21	0.3801	0.3411
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.415	0.501	0.525
Cadmium	mg/L	0.005	(e)	0.000051	ND (0.00001)	0.00002
Calcium	mg/L	---	---	47.3	88	77
Chromium	mg/L	---	---	ND (0.00050)	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	---	0.11	0.00037	0.00012	0.00014
Copper	mg/L	1.0	(f)	0.00077	ND (0.0005)	ND (0.0005)
Iron	mg/L	0.3 (AO)	0.35	0.011	0.012	0.015
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	ND (0.00001)	ND (0.00001)
Lithium	mg/L	---	---	0.00048	ND (0.0005)	ND (0.0005)
Magnesium	mg/L	---	---	11.1	16	13
Manganese	mg/L	0.05 (AO)	(h)	0.779	1.26	1.19
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	0.00016	0.00015	0.00016
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	0.00217	0.0028	0.003
Phosphorus	mg/L	---	---	ND (0.050)	-	-
Potassium	mg/L	---	---	18.3	28	24
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	3.3	3.7	3.7
Silver	mg/L	---	0.0001-0.003 ⁽ⁱ⁾	ND (0.000050)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	---	---	38.5	47	40
Strontium	mg/L	---	---	0.325	0.5334	0.4727
Sulfur	mg/L	---	---	ND (3.0)	7	16
Tellurium	mg/L	---	---	ND (0.00050)	-	-
Thallium	mg/L	---	---	ND (0.000020)	ND (0.00001)	ND (0.00001)
Thorium	mg/L	---	---	ND (0.00010)	ND (0.00005)	ND (0.00005)
Tin	mg/L	---	---	ND (0.00020)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	ND (0.0050)	ND (0.0001)	0.0003
Tungsten	mg/L	---	---	ND (0.0010)	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.000031	0.00002	0.00002
Vanadium	mg/L	---	---	ND (0.0010)	ND (0.00005)	ND (0.00005)
Zinc	mg/L	5.0 (AO)	(k)	0.0063	0.003	0.0101
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Volatile Organic Compounds						
1,1,1,2-tetrachloroethane	mg/L	---	---	-	-	-
1,1,1-trichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1,2,2-tetrachloroethane	mg/L	---	---	ND (0.00050)	-	-
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	---	---	-	-	-
1,1,2-trichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
1,2,3-trichlorobenzene	mg/L	---	0.008 ^(w)	-	-	-



Table 10 2019 Groundwater Quality Results - MW-3

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
Lab Sample ID:				9040895-06	1390189-6	1397808-7
1,2,4-trichlorobenzene	mg/L	---	0.024 ^(w)	-	-	-
1,2-dibromoethane	mg/L	---	---	ND (0.0030)	-	-
1,2-dichlorobenzene	mg/L	---	0.0007 ^(w)	ND (0.00050)	-	-
1,2-dichloroethane	mg/L	---	0.100 ^(w)	ND (0.0010)	-	-
1,2-dichloropropane	mg/L	---	---	ND (0.0010)	-	-
1,3,5-trimethylbenzene	mg/L	---	---	-	-	-
1,3-dichlorobenzene	mg/L	---	0.150 ^(w)	ND (0.0010)	-	-
1,3-dichloropropane	mg/L	---	---	-	-	-
1,4-dichlorobenzene	mg/L	---	0.026 ^(w)	ND (0.0010)	-	-
Benzene	mg/L	0.005	0.04 ^(m)	ND (0.00050)	ND (0.0005)	ND (0.0005)
Bromobenzene	mg/L	---	---	-	-	-
Bromodichloromethane	mg/L	---	---	ND (0.0010)	-	-
Bromoform	mg/L	---	---	ND (0.0010)	-	-
Bromomethane	mg/L	---	---		-	-
Dibromomethane	mg/L	---	---	ND (0.0010)	-	-
Carbon Tetrachloride	mg/L	---	0.0133 ^(w)	ND (0.00050)	-	-
Chlorobenzene	mg/L	---	---	ND (0.0010)	-	-
Chlorodibromomethane	mg/L	---	---	ND (0.0010)	-	-
Chloroethane	mg/L	---	---	ND (0.0020)	-	-
Chloroform	mg/L	---	0.0018 ^(w)	ND (0.0010)	-	-
Chloromethane	mg/L	---	---	-	-	-
cis-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
cis-1,3-dichloropropene	mg/L	---	---	ND (0.0010)	-	-
Dichlorodifluoromethane	mg/L	---	---	-	-	-
Dichloromethane	mg/L	---	0.0981 ^(w)	ND (0.0030)	-	-
Ethylbenzene	mg/L	0.14/0.0016 (AO)	0.20 ^(m)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Hexachlorobutadiene	mg/L	---	0.0013 ^(w)	-	-	-
Isopropylbenzene	mg/L	---	---	-	-	-
m & p-Xylene	mg/L	---	---	-	-	-
Methyl-tert-butylether (MTBE)	mg/L	0.015 (AO)	3.4	ND (0.0010)	ND (0.0005)	ND (0.0005)
o-Xylene	mg/L	---	---	-	-	-
Styrene	mg/L	---	0.072 ^(w)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Tetrachloroethene	mg/L	---	---	ND (0.0010)	-	-
Toluene	mg/L	0.06/0.024 (AO)	0.0005	ND (0.0010)	ND (0.0005)	ND (0.0005)
trans-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
trans-1,3-dichloropropene	mg/L	---	---	-	-	-
Trichloroethene	mg/L	---	---	ND (0.0010)	-	-
Trichlorofluoromethane	mg/L	---	---	ND (0.0010)	-	-
VH C6-C10	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Vinyl Chloride	mg/L	---	---	ND (0.0010)	-	-
VPH (VHW6 to 10 - BTEX)	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Xylenes (total)	mg/L	0.09/0.02 (AO)	0.03	ND (0.0020)	ND (0.0005)	ND (0.0005)
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria (DWQ): Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria (FWAL): All criteria for metals are for total metals except criteria for aluminum and iron, which are for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria a. Turbidity: 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. d. Aluminum: criteria specified for dissolved species not total. Criteria pH dependent. If pH<6.5: e^(1.209-2.426*pH+0.286*pH²) e. Cadmium (mg/L) = (e^(1.03*LN(HARDNESS)-5.274))/1000, valid for Hardness (as CaCO₃) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO₃) > 8 mg/L: (e^(1.273*ln(HARDNESS)-1.460))/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L l. Sulphate: BC MOE Approved Water Quality Guidelines, Summary Report Table 40. Hardness dependent. m. Interim guideline n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 o. Alkalinity (Total as CaCO3): BC MOE Working Water Quality Guidelines, Table 1. w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short-AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria						



Table 11 2019 Groundwater Quality Results - MW-4

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
Lab Sample ID:				9040895-02	1390189-2	1397808-2
Field Parameters						
pH	s.u.	---	6.5-9.0	<u>5.27</u>	<u>5.35</u>	<u>5.65</u>
Conductivity, Electrical	µS/cm	---	---	464	992	454
Temperature	°C	15 (AO)	---	13.23	12.49	11.87
Dissolved Oxygen	mg/L	---	---	9.52	11.88	7.04
Redox Potential	(mV)	---	---	267	311	341
General						
Chemical Oxygen Demand (COD)	mg/L	---	---	ND (20)	ND (10)	ND (10)
Dissolved Organic Carbon (DOC)	mg/L	---	---	2.19	1.9	2
Conductivity, Electrical	µS/cm	---	---	430	460	446
pH	s.u.	---	6.5-9.0	6.9	6.63	6.4
Alkalinity (Total as CaCO3)	mg/L	---	(o) ^(w)	226	222	217
Alkalinity (PP as CaCO3)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Bicarbonate (HCO ₃)	mg/L	---	---	226	271	264
Carbonate (as CaCO ₃)	mg/L	---	---	ND (1.0)	ND (6)	ND (6)
Hydroxide (OH)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Turbidity	NTU	(a)		10.7	6.84	2.15
Hardness (as CaCO ₃)	mg/L	---	---	184	190	190
Nutrients						
Ammonia	mg/L	---	0.681-28.7 ^(b)	0.067	0.06	ND (0.01)
Dissolved Nitrate (N)	mg/L	10	32.8	ND (0.010)	ND (0.1)	ND (0.01)
Dissolved Nitrite (N)	mg/L	1.0	0.06-0.6 ^(c)	0.037	ND (0.1)	ND (0.01)
Total Phosphorus (P)	mg/L	0.01 (AO)	---	0.0233	0.015	0.008
Nitrate plus Nitrite (N)	mg/L	10	---	-	ND (0.20)	ND (0.020)
Total Nitrogen (N)	mg/L	---	---	-	0.21	0.12
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	0.141	0.21	0.12
Anions						
Chloride	mg/L	250 (AO)	600	5.42	9.2	6.48
Sulfate	mg/L	500 (AO)	(l)	7.8	8	7.1
Dissolved Metals						
Aluminum	mg/L	9.5	0.1 ^(d)	ND (0.0050)	ND (0.001)	0.002
Antimony	mg/L	---	0.009 ^(w)	0.00028	0.00022	0.00015
Arsenic	mg/L	0.01	0.005	ND (0.00050)	0.0002	0.0002
Barium	mg/L	---	1 ^(w)	0.0635	0.05	0.0547
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.0302	0.024	0.03
Cadmium	mg/L	0.005	(e)	0.000454	0.00027	0.00012
Calcium	mg/L	---	---	56.9	62	61
Chromium	mg/L	---	---	ND (0.00050)	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	---	0.11	0.00792	0.00418	0.00342
Copper	mg/L	1.0	(f)	0.00125	0.0011	0.0008
Iron	mg/L	0.3 (AO)	0.35	0.216	ND (0.002)	ND (0.002)
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	ND (0.00001)	ND (0.00001)
Lithium	mg/L	---	---	0.00552	0.0036	0.0048
Magnesium	mg/L	---	---	10.1	9.9	9.7
Manganese	mg/L	0.05 (AO)	(h)	3.48	1.28	1.86
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	0.00019	0.00007	0.00011
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	0.0035	0.0019	0.0016
Phosphorus	mg/L	---	---	ND (0.050)	-	-
Potassium	mg/L	---	---	4.88	8.1	4.9
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	14.6	12	12
Silver	mg/L	---	0.0001-0.003 ⁽ⁱ⁾	ND (0.000050)	0.00005	ND (0.00001)
Sodium	mg/L	---	---	16.3	14	15
Strontium	mg/L	---	---	0.653	0.5436	0.6022
Sulfur	mg/L	---	---	ND (3.0)	3	2.4
Tellurium	mg/L	---	---	ND (0.00050)	-	-
Thallium	mg/L	---	---	ND (0.000020)	ND (0.00001)	ND (0.00001)
Thorium	mg/L	---	---	ND (0.00010)	ND (0.00005)	ND (0.00005)
Tin	mg/L	---	---	ND (0.00020)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	ND (0.0050)	ND (0.0001)	0.0003
Tungsten	mg/L	---	---	ND (0.0010)	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.000251	0.00019	0.00021
Vanadium	mg/L	---	---	ND (0.0010)	ND (0.00005)	ND (0.00005)
Zinc	mg/L	5.0 (AO)	(k)	0.0248	0.0191	0.0064
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Volatile Organic Compounds						
1,1,1,2-tetrachloroethane	mg/L	---	---	-	-	-
1,1,1-trichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1,2,2-tetrachloroethane	mg/L	---	---	ND (0.00050)	-	-
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	---	---		-	-
1,1,2-trichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
1,2,3-trichlorobenzene	mg/L	---	0.008 ^(w)	-	-	-



Table 11 2019 Groundwater Quality Results - MW-4

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
1,2,4-trichlorobenzene	mg/L	---	0.024 ^(w)	-	-	-
1,2-dibromoethane	mg/L	---	---	ND (0.0030)	-	-
1,2-dichlorobenzene	mg/L	---	0.0007 ^(w)	ND (0.00050)	-	-
1,2-dichloroethane	mg/L	---	0.100 ^(w)	ND (0.0010)	-	-
1,2-dichloropropane	mg/L	---	---	ND (0.0010)	-	-
1,3,5-trimethylbenzene	mg/L	---	---	-	-	-
1,3-dichlorobenzene	mg/L	---	0.150 ^(w)	ND (0.0010)	-	-
1,3-dichloropropane	mg/L	---	---	-	-	-
1,4-dichlorobenzene	mg/L	---	0.026 ^(w)	ND (0.0010)	-	-
Benzene	mg/L	0.005	0.04 ^(m)	0.0007	0.0005	0.0007
Bromobenzene	mg/L	---	---	-	-	-
Bromodichloromethane	mg/L			ND (0.0010)	-	-
Bromoform	mg/L	---	---	ND (0.0010)	-	-
Bromomethane	mg/L	---	---		-	-
Dibromomethane	mg/L	---	---	ND (0.0010)	-	-
Carbon Tetrachloride	mg/L	---	0.0133 ^(w)	ND (0.00050)	-	-
Chlorobenzene	mg/L	---	---	0.0027	-	-
Chlorodibromomethane	mg/L	---	---	ND (0.0010)	-	-
Chloroethane	mg/L	---	---	ND (0.0020)	-	-
Chloroform	mg/L	---	0.0018 ^(w)	ND (0.0010)	-	-
Chloromethane	mg/L	---	---	-	-	-
cis-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
cis-1,3-dichloropropene	mg/L	---	---	ND (0.0010)	-	-
Dichlorodifluoromethane	mg/L	---	---	-	-	-
Dichloromethane	mg/L	---	0.0981 ^(w)	ND (0.0030)	-	-
Ethylbenzene	mg/L	0.14/0.0016 (AO)	0.20 ^(m)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Hexachlorobutadiene	mg/L	---	0.0013 ^(w)	-	-	-
Isopropylbenzene	mg/L	---	---	-	-	-
m & p-Xylene	mg/L	---	---	-	-	-
Methyl-tert-butylether (MTBE)	mg/L	0.015 (AO)	3.4	ND (0.0010)	ND (0.0005)	0.0016
o-Xylene	mg/L	---	---	-	-	-
Styrene	mg/L	---	0.072 ^(w)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Tetrachloroethene	mg/L	---	---	ND (0.0010)	-	-
Toluene	mg/L	0.06/0.024 (AO)	0.0005	ND (0.0010)	0.0016	0.0017
trans-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
trans-1,3-dichloropropene	mg/L	---	---	-	-	-
Trichloroethene	mg/L	---	---	ND (0.0010)	-	-
Trichlorofluoromethane	mg/L	---	---	ND (0.0010)	-	-
VH C6-C10	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Vinyl Chloride	mg/L	---	---	ND (0.0010)	-	-
VPH (VHW6 to 10 - BTEX)	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Xylenes (total)	mg/L	0.09/0.02 (AO)	0.03	ND (0.0020)	ND (0.0005)	ND (0.0005)
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria (DWQ): Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria (FWAL): All criteria for metals are for total metals except criteria for aluminum and iron, which are for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria a. Turbidity: 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. d. Aluminum: criteria specified for dissolved species not total. Criteria pH dependent. If pH<6.5: e^(1.209-2.426*pH+0.286*pH²) e. Cadmium (mg/L) = (e^(1.03*LN(HARDNESS)-5.274))/1000, valid for Hardness (as CaCO₃) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO₃) > 8 mg/L: (e^(1.273*ln(HARDNESS)-1.460))/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L l. Sulphate: BC MOE Approved Water Quality Guidelines, Summary Report Table 40. Hardness dependent. m. Interim guideline n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 o. Alkalinity (Total as CaCO3): BC MOE Working Water Quality Guidelines, Table 1. w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short term maximum. AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria						



Table 12 2019 Groundwater Quality Results - MW-4A

dry in April 2019

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾	1397808-3
Lab Sample ID:				
Field Parameters				
pH	s.u.	---	6.5-9.0	<u>5.44</u>
Conductivity, Electrical	µS/cm	---	---	241
Temperature	°C	15 (AO)	---	11.44
Dissolved Oxygen	mg/L	---	---	8.47
Redox Potential	(mV)	---	---	302
General				
Chemical Oxygen Demand (COD)	mg/L	---	---	40
Dissolved Organic Carbon (DOC)	mg/L	---	---	9.8
Conductivity, Electrical	µS/cm	---	---	192
pH	s.u.	---	6.5-9.0	<u>5.9</u>
Alkalinity (Total as CaCO3)	mg/L	---	(o) ^(w)	86
Alkalinity (PP as CaCO3)	mg/L	---	---	ND (5)
Bicarbonate (HCO ₃)	mg/L	---	---	110
Carbonate (as CaCO ₃)	mg/L	---	---	ND (6)
Hydroxide (OH)	mg/L	---	---	ND (5)
Turbidity	NTU	(a)		64.7
Hardness (as CaCO ₃)	mg/L	---	---	78
Nutrients				
Ammonia	mg/L	---	0.681-28.7 ^(b)	0.39
Dissolved Nitrate (N)	mg/L	10	32.8	ND (0.01)
Dissolved Nitrite (N)	mg/L	1.0	0.06-0.6 ^(c)	ND (0.01)
Total Phosphorus (P)	mg/L	0.01 (AO)	---	0.032
Nitrate plus Nitrite (N)	mg/L	10	---	ND (0.020)
Total Nitrogen (N)	mg/L	---	---	1.17
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	1.17
Anions				
Chloride	mg/L	250 (AO)	600	1.57
Sulfate	mg/L	500 (AO)	(l)	ND (0.1)
Dissolved Metals				
Aluminum	mg/L	9.5	0.1 ^(d)	0.002
Antimony	mg/L	---	0.009 ^(w)	0.00007
Arsenic	mg/L	0.01	0.005	0.0005
Barium	mg/L	---	1 ^(w)	0.0622
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.0001)
Boron	mg/L	5.0	1.2	0.016
Cadmium	mg/L	0.005	(e)	0.00005
Calcium	mg/L	---	---	28
Chromium	mg/L	---	---	ND (0.00005)
Cobalt	mg/L	---	0.11	0.00957
Copper	mg/L	1.0	(f)	ND (0.0005)
Iron	mg/L	0.3 (AO)	0.35	0.003
Lead	mg/L	0.01	0.003 ^(g)	0.00001
Lithium	mg/L	---	---	0.0009
Magnesium	mg/L	---	---	2
Manganese	mg/L	0.05 (AO)	(h)	1.25
Mercury	mg/L	0.001	---	ND (0.00001)
Molybdenum	mg/L	0.25	2	ND (0.00002)
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	0.0029
Phosphorus	mg/L	---	---	-
Potassium	mg/L	---	---	2.9
Selenium	mg/L	0.01	0.002	ND (0.0002)
Silicon	mg/L	---	---	5.1
Silver	mg/L	---	0.0001-0.003 ^(j)	ND (0.00001)
Sodium	mg/L	---	---	4
Strontium	mg/L	---	---	0.1502
Sulfur	mg/L	---	---	ND (0.00002)
Tellurium	mg/L	---	---	-
Thallium	mg/L	---	---	0.00001
Thorium	mg/L	---	---	ND (0.00005)
Tin	mg/L	---	---	ND (0.0001)
Titanium	mg/L	---	---	0.0004
Tungsten	mg/L	---	---	-
Uranium	mg/L	---	0.0085 ^(w)	ND (0.00001)
Vanadium	mg/L	---	---	ND (0.00005)
Zinc	mg/L	5.0 (AO)	(k)	0.0207
Zirconium	mg/L	---	---	ND (0.0001)
Volatile Organic Compounds				
1,1,1,2-tetrachloroethane	mg/L	---	---	-
1,1,1-trichloroethane	mg/L	---	---	-
1,1,2,2-tetrachloroethane	mg/L	---	---	-
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	---	---	-

Table 12 2019 Groundwater Quality Results - MW-4A

dry in April 2019

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾	
				1397808-3
1,1,2-trichloroethane	mg/L	---	---	-
1,1-dichloroethane	mg/L	---	---	-
1,1-dichloroethene	mg/L	---	---	-
1,2,3-trichlorobenzene	mg/L	---	0.008 ^(w)	-
1,2,4-trichlorobenzene	mg/L	---	0.024 ^(w)	-
1,2-dibromoethane	mg/L	---	---	-
1,2-dichlorobenzene	mg/L	---	0.0007 ^(w)	-
1,2-dichloroethane	mg/L	---	0.100 ^(w)	-
1,2-dichloropropane	mg/L	---	---	-
1,3,5-trimethylbenzene	mg/L	---	---	-
1,3-dichlorobenzene	mg/L	---	0.150 ^(w)	-
1,3-dichloropropane	mg/L	---	---	-
1,4-dichlorobenzene	mg/L	---	0.026 ^(w)	-
Benzene	mg/L	0.005	0.04 ^(m)	0.0028
Bromobenzene	mg/L	---	---	-
Bromodichloromethane	mg/L	---	---	-
Bromoform	mg/L	---	---	-
Bromomethane	mg/L	---	---	-
Dibromomethane	mg/L	---	---	-
Carbon Tetrachloride	mg/L	---	0.0133 ^(w)	-
Chlorobenzene	mg/L	---	---	-
Chlorodibromomethane	mg/L	---	---	-
Chloroethane	mg/L	---	---	-
Chloroform	mg/L	---	0.0018 ^(w)	-
Chloromethane	mg/L	---	---	-
cis-1,2-dichloroethene	mg/L	---	---	-
cis-1,3-dichloropropene	mg/L	---	---	-
Dichlorodifluoromethane	mg/L	---	---	-
Dichloromethane	mg/L	---	0.0981 ^(w)	-
Ethylbenzene	mg/L	0.14/0.0016 (AO)	0.20 ^(m)	ND (0.0005)
Hexachlorobutadiene	mg/L	---	0.0013 ^(w)	-
Isopropylbenzene	mg/L	---	---	-
m & p-Xylene	mg/L	---	---	-
Methyl-tert-butylether (MTBE)	mg/L	0.015 (AO)	3.4	0.004
o-Xylene	mg/L	---	---	-
Styrene	mg/L	---	0.072 ^(w)	ND (0.0005)
Tetrachloroethene	mg/L	---	---	-
Toluene	mg/L	0.06/0.024 (AO)	0.0005	ND (0.0005)
trans-1,2-dichloroethene	mg/L	---	---	-
trans-1,3-dichloropropene	mg/L	---	---	-
Trichloroethene	mg/L	---	---	-
Trichlorofluoromethane	mg/L	---	---	-
VH C6-C10	mg/L	---	---	ND (0.050)
Vinyl Chloride	mg/L	---	---	-
VPH (VHW6 to 10 - BTEX)	mg/L	---	---	ND (0.050)
Xylenes (total)	mg/L	0.09/0.02 (AO)	0.03	ND (0.0005)
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria (DWQ): Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria (FWAL): All criteria for metals are for total metals except criteria for aluminum and iron, which are for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria a. Turbidity: 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. d. Aluminum: criteria specified for dissolved species not total. Criteria pH dependent. If pH<6.5: e ^{^(1.209-2.426*pH+0.286*pH²)} e. Cadmium (mg/L) = (e ^{^(1.03*LN(HARDNESS)-5.274)})/1000, valid for Hardness (as CaCO ₃) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO ₃) > 8 mg/L: (e ^{^(1.273*ln(HARDNESS)-1.460)})/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L l. Sulphate: BC MOE Approved Water Quality Guidelines, Summary Report Table 40. Hardness dependent. m. Interim guideline n.Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 o. Alkalinity (Total as CaCO3): BC MOE Working Water Quality Guidelines, Table 1. w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short-term maximum. AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria				



Table 13 2019 Groundwater Quality Results - MW13-01

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾				
						Duplicate	
Lab Sample ID:				9040895-09	1390168-3	1390168-5	1397808-10
Field Parameters							
pH	s.u.	---	6.5-9.0	6.65	6.20	-	6.99
Conductivity, Electrical	µS/cm	---	---	931	997	-	869
Temperature	°C	15 (AO)	---	12.36	12.14	-	11.12
Dissolved Oxygen	mg/L	---	---	5.72	9.55	-	7.7
Redox Potential	(mV)	---	---	97	109	-	61
General							
Chemical Oxygen Demand (COD)	mg/L	---	---	34	50	110	40
Dissolved Organic Carbon (DOC)	mg/L	---	---	6.27	6.6	8.2	6
Conductivity, Electrical	µS/cm	---	---	1040	1048	1105	1018
pH	s.u.	---	6.5-9.0	7.46	7.14	7.13	7.13
Alkalinity (Total as CaCO3)	mg/L	---	(o) ^(w)	528	498	523	475
Alkalinity (PP as CaCO3)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)	ND (5)
Bicarbonate (HCO ₃)	mg/L	---	---	528	608	638	579
Carbonate (as CaCO ₃)	mg/L	---	---	ND (1.0)	ND (6)	ND (6)	ND (6)
Hydroxide (OH)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)	ND (5)
Turbidity	NTU	(a)		101	87.4	81.8	84.4
Hardness (as CaCO ₃)	mg/L	---	---	231	200	200	190
Nutrients							
Ammonia	mg/L	---	0.681-28.7 ^(b)	52.7	63	72.7	55.7
Dissolved Nitrate (N)	mg/L	10	32.8	ND (0.010)	0.1	ND (0.1)	ND (0.01)
Dissolved Nitrite (N)	mg/L	1.0	0.06-0.6 ^(c)	0.109	ND (0.1)	ND (0.1)	ND (0.01)
Total Phosphorus (P)	mg/L	0.01 (AO)	---	0.202	0.206	0.131	0.254
Nitrate plus Nitrite (N)	mg/L	10	---	-	0.1	ND (0.20)	ND (0.020)
Total Nitrogen (N)	mg/L	---	---	-	65.5	55.5	65.6
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	52.8	65.4	55.4	65.5
Anions							
Chloride	mg/L	250 (AO)	600	17.4	20.8	22.2	21
Sulfate	mg/L	500 (AO)	(l)	3.2	3	3	3.2
Dissolved Metals							
Aluminum	mg/L	9.5	0.1 ^(d)	ND (0.0050)	0.002	ND (0.001)	ND (0.001)
Antimony	mg/L	---	0.009 ^(w)	ND (0.00020)	0.00019	0.00023	0.00022
Arsenic	mg/L	0.01	0.005	0.0014	0.0007	0.0009	0.0011
Barium	mg/L	---	1 ^(w)	0.0845	0.0908	0.1129	0.0954
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00005)	ND (0.001)	ND (0.001)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.126	0.089	0.094	0.088
Cadmium	mg/L	0.005	(e)	ND (0.000010)	0.00001	0.00002	0.00001
Calcium	mg/L	---	---	75.2	63	65	62
Chromium	mg/L	---	---	ND (0.00050)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	---	0.11	0.00425	0.00316	0.00303	0.00331
Copper	mg/L	1.0	(f)	ND (0.00040)	0.0005	0.0008	0.0007
Iron	mg/L	0.3 (AO)	0.35	ND (0.010)	0.01	0.011	0.009
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	0.00002	ND (0.00001)	ND (0.00001)
Lithium	mg/L	---	---	0.00182	0.002	0.0034	0.0021
Magnesium	mg/L	---	---	10.4	9.6	9.9	9.2
Manganese	mg/L	0.05 (AO)	(h)	6.21	4.06	4.03	4.27
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	0.00065	0.00054	0.00057	0.00068
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	0.00208	0.0021	0.0034	0.0022
Phosphorus	mg/L	---	---	ND (0.050)	-	-	-
Potassium	mg/L	---	---	12.6	15	16	14
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.0002)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	14.4	13	13	13
Silver	mg/L	---	0.0001-0.003 ⁽ⁱ⁾	ND (0.000050)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	---	---	36.3	37	40	35
Strontium	mg/L	---	---	1.37	0.9913	1.07	1.075
Sulfur	mg/L	---	---	ND (3.0)	1.6	1.7	1.2
Tellurium	mg/L	---	---	ND (0.00050)	-	-	-
Thallium	mg/L	---	---	ND (0.000020)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Thorium	mg/L	---	---	ND (0.00010)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Tin	mg/L	---	---	ND (0.00020)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	ND (0.0050)	ND (0.0001)	ND (0.0001)	0.0005
Tungsten	mg/L	---	---	ND (0.0010)	-	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.00055	0.00028	0.0003	0.0003
Vanadium	mg/L	---	---	ND (0.0010)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Zinc	mg/L	5.0 (AO)	(k)	0.0063	0.0087	0.0232	0.0087
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Volatile Organic Compounds							
1,1,1,2-tetrachloroethane	mg/L	---	---	-	-	-	-
1,1,1-trichloroethane	mg/L	---	---	ND (0.0010)	-	-	-
1,1,2,2-tetrachloroethane	mg/L	---	---	ND (0.00050)	-	-	-
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	---	---	-	-	-	-
1,1,2-trichloroethane	mg/L	---	---	ND (0.0010)	-	-	-
1,1-dichloroethane	mg/L	---	---	ND (0.0010)	-	-	-
1,1-dichloroethene	mg/L	---	---	ND (0.0010)	-	-	-



Table 13 2019 Groundwater Quality Results - MW13-01

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾				
						Duplicate	
1,2,3-trichlorobenzene	mg/L	---	0.008 ^(w)	-	-	-	-
1,2,4-trichlorobenzene	mg/L	---	0.024 ^(w)	-	-	-	-
1,2-dibromoethane	mg/L	---	---	ND (0.0030)	-	-	-
1,2-dichlorobenzene	mg/L	---	0.0007 ^(w)	ND (0.00050)	-	-	-
1,2-dichloroethane	mg/L	---	0.100 ^(w)	ND (0.0010)	-	-	-
1,2-dichloropropane	mg/L	---	---	ND (0.0010)	-	-	-
1,3,5-trimethylbenzene	mg/L	---	---	-	-	-	-
1,3-dichlorobenzene	mg/L	---	0.150 ^(w)	ND (0.0010)	-	-	-
1,3-dichloropropane	mg/L	---	---	-	-	-	-
1,4-dichlorobenzene	mg/L	---	0.026 ^(w)	ND (0.0010)	-	-	-
Benzene	mg/L	0.005	0.04 ^(m)	0.001	0.0014	0.0012	0.0013
Bromobenzene	mg/L	---	---	-	-	-	-
Bromodichloromethane	mg/L	---	---	ND (0.0010)	-	-	-
Bromoform	mg/L	---	---	ND (0.0010)	-	-	-
Bromomethane	mg/L	---	---	-	-	-	-
Dibromomethane	mg/L	---	---	ND (0.0010)	-	-	-
Carbon Tetrachloride	mg/L	---	0.0133 ^(w)	ND (0.00050)	-	-	-
Chlorobenzene	mg/L	---	---	0.0051	-	-	-
Chlorodibromomethane	mg/L	---	---	ND (0.0010)	-	-	-
Chloroethane	mg/L	---	---	ND (0.0020)	-	-	-
Chloroform	mg/L	---	0.0018 ^(w)	ND (0.0010)	-	-	-
Chloromethane	mg/L	---	---	-	-	-	-
cis-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-	-
cis-1,3-dichloropropene	mg/L	---	---	ND (0.0010)	-	-	-
Dichlorodifluoromethane	mg/L	---	---	-	-	-	-
Dichloromethane	mg/L	---	0.0981 ^(w)	ND (0.0030)	-	-	-
Ethylbenzene	mg/L	0.14/0.0016 (AO)	0.20 ^(m)	ND (0.0010)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Hexachlorobutadiene	mg/L	---	0.0013 ^(w)	-	-	-	-
Isopropylbenzene	mg/L	---	---	-	-	-	-
m & p-Xylene	mg/L	---	---	-	-	-	-
Methyl-tert-butylether (MTBE)	mg/L	0.015 (AO)	3.4	ND (0.0010)	ND (0.0005)	ND (0.0005)	0.0012
o-Xylene	mg/L	---	---	-	-	-	-
Styrene	mg/L	---	0.072 ^(w)	ND (0.0010)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Tetrachloroethene	mg/L	---	---	ND (0.0010)			
Toluene	mg/L	0.06/0.024 (AO)	0.0005	ND (0.0010)	ND (0.0005)	ND (0.0005)	ND (0.0005)
trans-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-	-
trans-1,3-dichloropropene	mg/L	---	---	-	-	-	-
Trichloroethene	mg/L	---	---	ND (0.0010)	-	-	-
Trichlorofluoromethane	mg/L	---	---	ND (0.0010)	-	-	-
VH C6-C10	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)	ND (0.050)
Vinyl Chloride	mg/L	---	---	ND (0.0010)	-	-	-
VPH (VHW6 to 10 - BTEX)	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)	ND (0.050)
Xylenes (total)	mg/L	0.09/0.02 (AO)	0.03	ND (0.0020)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria (DWQ): Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria (FWAL): All criteria for metals are for total metals except criteria for aluminum and iron, which are for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria a. Turbidity: 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. d. Aluminum: criteria specified for dissolved species not total. Criteria pH dependent. If pH<6.5: e^(1.209-2.426*pH+0.286*pH²) e. Cadmium (mg/L) = (e^(1.03*LN(HARDNESS)-5.274))/1000, valid for Hardness (as CaCO₃) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO₃) > 8 mg/L: (e^(1.273*ln(HARDNESS)-1.460))/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L l. Sulphate: BC MOE Approved Water Quality Guidelines, Summary Report Table 40. Hardness dependent. m. Interim guideline n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 o. Alkalinity (Total as CaCO3): BC MOE Working Water Quality Guidelines, Table 1. w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short-term maximum. AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria							

Table 14 2019 Groundwater Quality Results - MW13-02

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19	Dec-19
		DWQ ⁽²⁾	FWAL ⁽³⁾				
Parameters:							
Lab Sample ID:				9040895-08	1390168-2	1397808-9	1397808-11
Field Parameters							
pH	s.u.	---	6.5-9.0	<u>6.33</u>	<u>5.54</u>	6.69	-
Conductivity, Electrical	µS/cm	---	---	854	737	628	-
Temperature	°C	15 (AO)	---	13.21	12.78	14:09	-
Dissolved Oxygen	mg/L	---	---	5.88	8.33	6.37	-
Redox Potential	(mV)	---	---	132	194	59	-
General							
Chemical Oxygen Demand (COD)	mg/L	---	---	73	50	40	30
Dissolved Organic Carbon (DOC)	mg/L	---	---	5.00	5.3	3.7	3.6
Conductivity, Electrical	µS/cm	---	---	622	636	516	543
pH	s.u.	---	6.5-9.0	7.05	6.56	<u>6.47</u>	6.61
Alkalinity (Total as CaCO3)	mg/L	---	(o) ^(w)	315	324	256	266
Alkalinity (PP as CaCO3)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)	ND (5)
Bicarbonate (HCO ₃)	mg/L	---	---	315	396	312	324
Carbonate (as CaCO ₃)	mg/L	---	---	ND (1.0)	ND (6)	ND (6)	ND (6)
Hydroxide (OH)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)	ND (5)
Turbidity	NTU	(a)		801	57.7	89.1	190
Hardness (as CaCO ₃)	mg/L	---	---	205	220	180	190
Nutrients							
Ammonia	mg/L	---	0.681-28.7 ^(b)	6.82	7.01	3.85	4.22
Dissolved Nitrate (N)	mg/L	10	32.8	ND (0.010)	ND (0.1)	ND (0.01)	ND (0.01)
Dissolved Nitrite (N)	mg/L	1.0	0.06-0.6 ^(c)	0.048	ND (0.1)	ND (0.01)	ND (0.01)
Total Phosphorus (P)	mg/L	0.01 (AO)	---	0.732	0.76	0.214	0.385
Nitrate plus Nitrite (N)	mg/L	10	---	-	ND (0.20)	ND (0.020)	ND (0.020)
Total Nitrogen (N)	mg/L	---	---	-	6.19	3.95	4.74
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	7.79	6.17	3.94	4.74
Anions							
Chloride	mg/L	250 (AO)	600	8.08	7.8	3.8	5.19
Sulfate	mg/L	500 (AO)	(l)	11.7	12	13	11.8
Dissolved Metals							
Aluminum	mg/L	9.5	0.1 ^(d)	ND (0.0050)	0.002	ND (0.001)	ND (0.001)
Antimony	mg/L	---	0.009 ^(w)	ND (0.00020)	0.00009	0.00014	0.0001
Arsenic	mg/L	0.01	0.005	ND (0.00050)	0.0004	0.0005	0.0004
Barium	mg/L	---	1 ^(w)	0.0969	0.0826	0.063	0.0668
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.178	0.129	0.043	0.053
Cadmium	mg/L	0.005	(e)	0.000333	0.00002	0.00003	0.00002
Calcium	mg/L	---	---	67	74	58	61
Chromium	mg/L	---	---	ND (0.00050)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	---	0.11	0.00235	0.00031	0.00033	0.00032
Copper	mg/L	1.0	(f)	0.00215	ND (0.0005)	ND (0.0005)	ND (0.0005)
Iron	mg/L	0.3 (AO)	0.35	ND (0.010)	0.004	0.009	0.005
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Lithium	mg/L	---	---	0.00238	0.003	0.0046	0.0039
Magnesium	mg/L	---	---	9.1	9.1	8.1	8.3
Manganese	mg/L	0.05 (AO)	(h)	7.03	7.4	6.44	6.7
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	0.00041	0.00013	0.00009	0.00013
Nickel	mg/L	---	0.025-0.15 ^{(j)(w)}	0.00293	0.0013	0.0009	0.0008
Phosphorus	mg/L	---	---	ND (0.050)	-	-	-
Potassium	mg/L	---	---	10.6	10	7.2	7.5
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.0002)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	12.5	11	11	11
Silver	mg/L	---	0.0001-0.003 ^(j)	ND (0.000050)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	---	---	25.5	20	20	20
Strontium	mg/L	---	---	0.946	0.8335	0.6301	0.6767
Sulfur	mg/L	---	---	ND (3.0)	4.6	4.4	4.3
Tellurium	mg/L	---	---	ND (0.00050)	-	-	-
Thallium	mg/L	---	---	0.000058	ND (0.00001)	ND (0.00001)	ND (0.00001)
Thorium	mg/L	---	---	ND (0.00010)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Tin	mg/L	---	---	ND (0.00020)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	ND (0.0050)	ND (0.0001)	0.0003	0.0003
Tungsten	mg/L	---	---	ND (0.0010)	-	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.00028	0.00026	0.00015	0.00021
Vanadium	mg/L	---	---	ND (0.0010)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Zinc	mg/L	5.0 (AO)	(k)	0.0197	0.0151	0.012	0.0087
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Volatile Organic Compounds							
1,1,1,2-tetrachloroethane	mg/L	---	---	-	-	-	-
1,1,1-trichloroethane	mg/L	---	---	ND (0.0010)	-	-	-
1,1,2,2-tetrachloroethane	mg/L	---	---	ND (0.00050)	-	-	-
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	---	---	-	-	-	-
1,1,2-trichloroethane	mg/L	---	---	ND (0.0010)	-	-	-
1,1-dichloroethane	mg/L	---	---	ND (0.0010)	-	-	-
1,1-dichloroethene	mg/L	---	---	ND (0.0010)	-	-	-
1,2,3-trichlorobenzene	mg/L	---	0.008 ^(w)	-	-	-	-
1,2,4-trichlorobenzene	mg/L	---	0.024 ^(w)	-	-	-	-
1,2-dibromoethane	mg/L	---	---	ND (0.0030)	-	-	-
1,2-dichlorobenzene	mg/L	---	0.0007 ^(w)	ND (0.00050)	-	-	-
1,2-dichloroethane	mg/L	---	0.100 ^(w)	ND (0.0010)	-	-	-
1,2-dichloropropane	mg/L	---	---	ND (0.0010)	-	-	-
1,3,5-trimethylbenzene	mg/L	---	---	-	-	-	-

Table 14 2019 Groundwater Quality Results - MW13-02

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19	Dec-19 Duplicate
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾				
1,3-dichlorobenzene	mg/L	---	0.150 ^(w)	ND (0.0010)	-	-	-
1,3-dichloropropane	mg/L	---	---	-	-	-	-
1,4-dichlorobenzene	mg/L	---	0.026 ^(w)	ND (0.0010)	-	-	-
Benzene	mg/L	0.005	0.04 ^(m)	0.0006	0.0007	0.0008	0.0006
Bromobenzene	mg/L	---	---	-	-	-	-
Bromodichloromethane	mg/L	---	---	ND (0.0010)	-	-	-
Bromoform	mg/L	---	---	ND (0.0010)	-	-	-
Bromomethane	mg/L	---	---	-	-	-	-
Dibromomethane	mg/L	---	---	ND (0.0010)	-	-	-
Carbon Tetrachloride	mg/L	---	0.0133 ^(w)	ND (0.00050)	-	-	-
Chlorobenzene	mg/L	---	---	0.0016	-	-	-
Chlorodibromomethane	mg/L	---	---	ND (0.0010)	-	-	-
Chloroethane	mg/L	---	---	0.002	-	-	-
Chloroform	mg/L	---	0.0018 ^(w)	ND (0.0010)	-	-	-
Chloromethane	mg/L	---	---	-	-	-	-
cis-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-	-
cis-1,3-dichloropropene	mg/L	---	---	ND (0.0010)	-	-	-
Dichlorodifluoromethane	mg/L	---	---	-	-	-	-
Dichloromethane	mg/L	---	0.0981 ^(w)	ND (0.0030)	-	-	-
Ethylbenzene	mg/L	0.14/0.0016 (AO)	0.20 ^(m)	ND (0.0010)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Hexachlorobutadiene	mg/L	---	0.0013 ^(w)	-	-	-	-
Isopropylbenzene	mg/L	---	---	-	-	-	-
m & p-Xylene	mg/L	---	---	-	-	-	-
Methyl-tert-butylether (MTBE)	mg/L	0.015 (AO)	3.4	ND (0.0010)	ND (0.0005)	ND (0.0005)	ND (0.0005)
o-Xylene	mg/L	---	---	-	-	-	-
Styrene	mg/L	---	0.072 ^(w)	ND (0.0010)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Tetrachloroethene	mg/L	---	---	ND (0.0010)			
Toluene	mg/L	0.06/0.024 (AO)	0.0005	ND (0.0010)	ND (0.0005)	ND (0.0005)	ND (0.0005)
trans-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-	-
trans-1,3-dichloropropene	mg/L	---	---	-	-	-	-
Trichloroethene	mg/L	---	---	ND (0.0010)	-	-	-
Trichlorofluoromethane	mg/L	---	---	ND (0.0010)	-	-	-
VH C6-C10	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)	ND (0.050)
Vinyl Chloride	mg/L	---	---	ND (0.0010)	-	-	-
VPH (VHW6 to 10 - BTEX)	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)	ND (0.050)
Xylenes (total)	mg/L	0.09/0.02 (AO)	0.03	ND (0.0020)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria (DWQ): Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria (FWAL): All criteria for metals are for total metals except criteria for aluminum and iron, which are for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria a. Turbidity: 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. d. Aluminum: criteria specified for dissolved species not total. Criteria pH dependent. If pH<6.5: e^(1.209-2.426*pH+0.286*pH ²) e. Cadmium (mg/L) = (e^(1.03*LN(HARDNESS)-5.274))/1000, valid for Hardness (as CaCO ₃) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO ₃) > 8 mg/L: (e^(1.273*ln(HARDNESS)-1.460))/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L l. Sulphate: BC MOE Approved Water Quality Guidelines, Summary Report Table 40. Hardness dependent. m. Interim guideline n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 o. Alkalinity (Total as CaCO ₃): BC MOE Working Water Quality Guidelines, Table 1. w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short-term maximum. AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria							



Table 15 2019 Groundwater Quality Results - MW13-03

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
Lab Sample ID:				9040895-07	1390168-1	1397808-8
Field Parameters						
pH	s.u.	---	6.5-9.0	<u>6.27</u>	6.64	6.79
Conductivity, Electrical	µS/cm	---	---	910	2010	1410
Temperature	°C	15 (AO)	---	13.3	12.06	9.54
Dissolved Oxygen	mg/L	---	---	3.62	6.65	7.73
Redox Potential	(mV)	---	---	136	46	125
General						
Chemical Oxygen Demand (COD)	mg/L	---	---	135	110	40
Dissolved Organic Carbon (DOC)	mg/L	---	---	6.15	6	7.5
Conductivity, Electrical	µS/cm	---	---	708	819	795
pH	s.u.	---	6.5-9.0	6.9	6.63	6.6
Alkalinity (Total as CaCO3)	mg/L	---	(o) ^(w)	295	374	358
Alkalinity (PP as CaCO3)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Bicarbonate (HCO ₃)	mg/L	---	---	295	456	436
Carbonate (as CaCO ₃)	mg/L	---	---	ND (1.0)	ND (6)	ND (6)
Hydroxide (OH)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Turbidity	NTU	(a)		1180	80.4	84
Hardness (as CaCO ₃)	mg/L	---	---	213	230	230
Nutrients						
Ammonia	mg/L	---	0.681-28.7 ^(b)	6.17	6.27	5.94
Dissolved Nitrate (N)	mg/L	10	32.8	0.022	ND (0.1)	0.06
Dissolved Nitrite (N)	mg/L	1.0	0.06-0.6 ^(c)	0.106	ND (0.1)	ND (0.01)
Total Phosphorus (P)	mg/L	0.01 (AO)	---	1.15	0.92	0.229
Nitrate plus Nitrite (N)	mg/L	10	---	-	ND (0.20)	0.06
Total Nitrogen (N)	mg/L	---	---	-	6.32	6.96
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	6.93	6.32	6.94
Anions						
Chloride	mg/L	250 (AO)	600	17.8	17.1	16
Sulfate	mg/L	500 (AO)	(l)	60.2	45	41.6
Dissolved Metals						
Aluminum	mg/L	9.5	0.1 ^(d)	ND (0.0050)	0.002	ND (0.001)
Antimony	mg/L	---	0.009 ^(w)	ND (0.00020)	0.00013	0.00015
Arsenic	mg/L	0.01	0.005	0.0007	0.0008	0.0012
Barium	mg/L	---	1 ^(w)	0.112	0.0832	0.0928
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.178	0.185	0.173
Cadmium	mg/L	0.005	(e)	0.000012	ND (0.00001)	ND (0.00001)
Calcium	mg/L	---	---	70.4	76	77
Chromium	mg/L	---	---	ND (0.00050)	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	---	0.11	0.00232	0.00093	0.0012
Copper	mg/L	1.0	(f)	0.00043	ND (0.0005)	ND (0.0005)
Iron	mg/L	0.3 (AO)	0.35	0.043	3.99	10.3
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	0.00001	ND (0.00001)
Lithium	mg/L	---	---	0.00958	0.0073	0.0072
Magnesium	mg/L	---	---	9.05	8.8	8.9
Manganese	mg/L	0.05 (AO)	(h)	8.51	8.58	8.6
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	0.00065	0.0006	0.00083
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	0.00639	0.0026	0.0033
Phosphorus		---	---	ND (0.050)	-	-
Potassium	mg/L	---	---	6.44	6.5	6.7
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	14.2	12	13
Silver	mg/L	---	0.0001-0.003 ^(j)	ND (0.000050)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	---	---	44	39	40
Strontium	mg/L	---	---	1.39	1.291	1.327
Sulfur	mg/L	---	---	19.4	15	16
Tellurium		---	---	ND (0.00050)	-	-
Thallium	mg/L	---	---	ND (0.000020)	0.00001	ND (0.00001)
Thorium		---	---	ND (0.00010)	ND (0.00005)	0.00012
Tin	mg/L	---	---	ND (0.00020)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	ND (0.0050)	ND (0.0001)	0.0005
Tungsten		---	---	ND (0.0010)	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.00123	0.00078	0.00237
Vanadium	mg/L	---	---	ND (0.0010)	ND (0.00005)	ND (0.00005)
Zinc	mg/L	5.0 (AO)	(k)	0.0093	0.0104	0.0091
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.0001)	0.0002
Volatile Organic Compounds						
1,1,1,2-tetrachloroethane	mg/L	---	---	-	-	-
1,1,1-trichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1,2,2-tetrachloroethane	mg/L	---	---	ND (0.00050)	-	-
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	---	---	-	-	-
1,1,2-trichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
1,2,3-trichlorobenzene	mg/L	---	0.008 ^(w)	-	-	-

Table 15 2019 Groundwater Quality Results - MW13-03

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
1,2,4-trichlorobenzene	mg/L	---	0.024 ^(w)	-	-	-
1,2-dibromoethane	mg/L	---	---	ND (0.0030)	-	-
1,2-dichlorobenzene	mg/L	---	0.0007 ^(w)	ND (0.00050)	-	-
1,2-dichloroethane	mg/L	---	0.100 ^(w)	ND (0.0010)	-	-
1,2-dichloropropane	mg/L	---	---	ND (0.0010)	-	-
1,3,5-trimethylbenzene	mg/L	---	---	-	-	-
1,3-dichlorobenzene	mg/L	---	0.150 ^(w)	ND (0.0010)	-	-
1,3-dichloropropane	mg/L	---	---	-	-	-
1,4-dichlorobenzene	mg/L	---	0.026 ^(w)	0.0015	-	-
Benzene	mg/L	0.005	0.04 ^(m)	0.0011	0.0017	0.0017
Bromobenzene	mg/L	---	---	-	-	-
Bromodichloromethane	mg/L	---	---	ND (0.0010)	-	-
Bromoform	mg/L	---	---	ND (0.0010)	-	-
Bromomethane	mg/L	---	---	-	-	-
Dibromomethane	mg/L	---	---	ND (0.0010)	-	-
Carbon Tetrachloride	mg/L	---	0.0133 ^(w)	ND (0.00050)	-	-
Chlorobenzene	mg/L	---	---	0.0029	-	-
Chlorodibromomethane	mg/L	---	---	ND (0.0010)	-	-
Chloroethane	mg/L	---	---	ND (0.0020)	-	-
Chloroform	mg/L	---	0.0018 ^(w)	ND (0.0010)	-	-
Chloromethane	mg/L	---	---	-	-	-
cis-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
cis-1,3-dichloropropene	mg/L	---	---	ND (0.0010)	-	-
Dichlorodifluoromethane	mg/L	---	---	-	-	-
Dichloromethane	mg/L	---	0.0981 ^(w)	ND (0.0030)	-	-
Ethylbenzene	mg/L	0.14/0.0016 (AO)	0.20 ^(m)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Hexachlorobutadiene	mg/L	---	0.0013 ^(w)	-	-	-
Isopropylbenzene	mg/L	---	---	-	-	-
m & p-Xylene	mg/L	---	---	-	-	-
Methyl-tert-butylether (MTBE)	mg/L	0.015 (AO)	3.4	ND (0.0010)	ND (0.0005)	ND (0.0005)
o-Xylene	mg/L	---	---	-	-	-
Styrene	mg/L	---	0.072 ^(w)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Tetrachloroethene	mg/L	---	---	ND (0.0010)	-	-
Toluene	mg/L	0.06/0.024 (AO)	0.0005	ND (0.0010)	ND (0.0005)	ND (0.0005)
trans-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
trans-1,3-dichloropropene	mg/L	---	---	-	-	-
Trichloroethene	mg/L	---	---	ND (0.0010)	-	-
Trichlorofluoromethane	mg/L	---	---	ND (0.0010)	-	-
VH C6-C10	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Vinyl Chloride	mg/L	---	---	ND (0.0010)	-	-
VPH (VHW6 to 10 - BTEX)	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Xylenes (total)	mg/L	0.09/0.02 (AO)	0.03	ND (0.0020)	ND (0.0005)	ND (0.0005)
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria (DWQ): Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria (FWAL): All criteria for metals are for total metals except criteria for aluminum and iron, which are for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria a. Turbidity: 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. d. Aluminum: criteria specified for dissolved species not total. Criteria pH dependent. If pH<6.5: $e^{(1.209-2.426 \cdot \text{pH}+0.286 \cdot \text{pH}^2)}$ e. Cadmium (mg/L) = $(e^{(1.03 \cdot \text{LN}(\text{HARDNESS})-5.274)})/1000$, valid for Hardness (as CaCO ₃) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO ₃) > 8 mg/L: $(e^{(1.273 \cdot \text{LN}(\text{HARDNESS})-1.460)})/1000$. If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, $(33+(0.75 \cdot (\text{HARDNESS}-90)))/1000$ for Hardness > 90 mg/L l. Sulphate: BC MOE Approved Water Quality Guidelines, Summary Report Table 40. Hardness dependent. m. Interim guideline n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 o. Alkalinity (Total as CaCO3): BC MOE Working Water Quality Guidelines, Table 1. w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short-term maximum. AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria						



Table 16 2019 Groundwater Quality Results - MW13-04

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
Lab Sample ID:				9040895-01	1390189-1	1397808-1
Field Parameters						
pH	s.u.	---	6.5-9.0	<u>5.99</u>	<u>6.27</u>	<u>5.63</u>
Conductivity, Electrical	µS/cm	---	---	66	158	89
Temperature	°C	15 (AO)	---	12.85	10.71	12.04
Dissolved Oxygen	mg/L	---	---	16.54	10.11	9.34
Redox Potential	(mV)	---	---	264	273	310
General						
Chemical Oxygen Demand (COD)	mg/L	---	---	ND (20)	60	ND (10)
Dissolved Organic Carbon (DOC)	mg/L	---	---	<0.50	ND (0.5)	ND (0.5)
Conductivity, Electrical	µS/cm	---	---	50.2	62	62
pH	s.u.	---	6.5-9.0	7.14	6.82	6.66
Alkalinity (Total as CaCO3)	mg/L	---	(o) ^(w)	<u>22.4</u>	<u>25</u>	<u>26</u>
Alkalinity (PP as CaCO3)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Bicarbonate (HCO ₃)	mg/L	---	---	22.4	30	31
Carbonate (as CaCO ₃)	mg/L	---	---	ND (1.0)	ND (6)	ND (6)
Hydroxide (OH)	mg/L	---	---	ND (1.0)	ND (5)	ND (5)
Turbidity	NTU	(a)		4.64	53.9	33.4
Hardness (as CaCO ₃)	mg/L	---	---	17.5	19	21
Nutrients						
Ammonia	mg/L	---	0.681-28.7 ^(b)	ND (0.020)	ND (0.01)	ND (0.01)
Dissolved Nitrate (N)	mg/L	10	32.8	0.121	ND (0.1)	0.09
Dissolved Nitrite (N)	mg/L	1.0	0.06-0.6 ^(c)	0.011	ND (0.1)	ND (0.01)
Total Phosphorus (P)	mg/L	0.01 (AO)	---	0.039	0.116	0.078
Nitrate plus Nitrite (N)	mg/L	10	---	-	ND (0.20)	0.09
Total Nitrogen (N)	mg/L	---	---	-	0.17	0.15
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	0.056	ND (0.07)	ND (0.07)
Anions						
Chloride	mg/L	250 (AO)	600	1.56	2.4	2.03
Sulfate	mg/L	500 (AO)	(l)	1.4	2	1.7
Dissolved Metals						
Aluminum	mg/L	9.5	0.1 ^(d)	ND (0.0050)	0.001	0.012
Antimony	mg/L	---	0.009 ^(w)	ND (0.00020)	0.00006	0.00012
Arsenic	mg/L	0.01	0.005	ND (0.00050)	0.0001	ND (0.0001)
Barium	mg/L	---	1 ^(w)	ND (0.0050)	0.0011	0.0014
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	ND (0.0050)	0.002	0.003
Cadmium	mg/L	0.005	(e)	0.000018	0.00002	0.00001
Calcium	mg/L	---	---	5.67	6.3	7
Chromium	mg/L	---	---	ND (0.00050)	0.00011	ND (0.00005)
Cobalt	mg/L	---	0.11	ND (0.00010)	0.00003	ND (0.00002)
Copper	mg/L	1.0	(f)	ND (0.00040)	ND (0.0005)	ND (0.0005)
Iron	mg/L	0.3 (AO)	0.35	ND (0.010)	ND (0.002)	ND (0.002)
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	0.00002	ND (0.00001)
Lithium	mg/L	---	---	0.00029	ND (0.0005)	ND (0.0005)
Magnesium	mg/L	---	---	0.802	0.87	0.9
Manganese	mg/L	0.05 (AO)	(h)	0.00314	0.005	ND (0.001)
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	ND (0.00010)	0.00006	0.00009
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	0.00046	ND (0.0002)	0.0003
Phosphorus	mg/L	---	---	ND (0.050)	-	-
Potassium	mg/L	---	---	0.47	0.46	0.56
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	9.2	8	8.2
Silver	mg/L	---	0.0001-0.003 ^(j)	ND (0.000050)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	---	---	3.18	3.3	3.6
Strontium	mg/L	---	---	0.0414	0.0409	0.045
Sulfur	mg/L	---	---	ND (3.0)	0.53	0.05
Tellurium	mg/L	---	---	ND (0.00050)	-	-
Thallium	mg/L	---	---	ND (0.000020)	0.00003	ND (0.00001)
Thorium	mg/L	---	---	ND (0.00010)	ND (0.00005)	ND (0.00005)
Tin	mg/L	---	---	ND (0.00020)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	ND (0.0050)	ND (0.0001)	0.0004
Tungsten	mg/L	---	---	ND (0.0010)	-	-
Uranium	mg/L	---	0.0085 ^(w)	ND (0.000020)	0.00004	0.00002
Vanadium	mg/L	---	---	ND (0.0010)	0.00093	0.00095
Zinc	mg/L	5.0 (AO)	(k)	0.0053	0.0052	0.0075
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Volatile Organic Compounds						
1,1,1,2-tetrachloroethane	mg/L	---	---	-	-	-
1,1,1-trichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1,2,2-tetrachloroethane	mg/L	---	---	ND (0.00050)	-	-

Table 16 2019 Groundwater Quality Results - MW13-04

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	---	---	-	-	-
1,1,2-trichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethane	mg/L	---	---	ND (0.0010)	-	-
1,1-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
1,2,3-trichlorobenzene	mg/L	---	0.008 ^(w)	-	-	-
1,2,4-trichlorobenzene	mg/L	---	0.024 ^(w)	-	-	-
1,2-dibromoethane	mg/L	---	---	ND (0.0030)	-	-
1,2-dichlorobenzene	mg/L	---	0.0007 ^(w)	ND (0.00050)	-	-
1,2-dichloroethane	mg/L	---	0.100 ^(w)	ND (0.0010)	-	-
1,2-dichloropropane	mg/L	---	---	ND (0.0010)	-	-
1,3,5-trimethylbenzene	mg/L	---	---	-	-	-
1,3-dichlorobenzene	mg/L	---	0.150 ^(w)	ND (0.0010)	-	-
1,3-dichloropropane	mg/L	---	---	-	-	-
1,4-dichlorobenzene	mg/L	---	0.026 ^(w)	ND (0.0010)	-	-
Benzene	mg/L	0.005	0.04 ^(m)	ND (0.00050)	ND (0.0005)	ND (0.0005)
Bromobenzene	mg/L	---	---	-	-	-
Bromodichloromethane	mg/L	---	---	ND (0.0010)	-	-
Bromoform	mg/L	---	---	ND (0.0010)	-	-
Bromomethane	mg/L	---	---	-	-	-
Dibromomethane	mg/L	---	---	ND (0.0010)	-	-
Carbon Tetrachloride	mg/L	---	0.0133 ^(w)	ND (0.00050)	-	-
Chlorobenzene	mg/L	---	---	ND (0.0010)	-	-
Chlorodibromomethane	mg/L	---	---	ND (0.0010)	-	-
Chloroethane	mg/L	---	---	ND (0.0020)	-	-
Chloroform	mg/L	---	0.0018 ^(w)	ND (0.0010)	-	-
Chloromethane	mg/L	---	---	-	-	-
cis-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
cis-1,3-dichloropropene	mg/L	---	---	ND (0.0010)	-	-
Dichlorodifluoromethane	mg/L	---	---	-	-	-
Dichloromethane	mg/L	---	0.0981 ^(w)	ND (0.0030)	-	-
Ethylbenzene	mg/L	0.14/0.0016 (AO)	0.20 ^(m)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Hexachlorobutadiene	mg/L	---	0.0013 ^(w)	-	-	-
Isopropylbenzene	mg/L	---	---	-	-	-
m & p-Xylene	mg/L	---	---	-	-	-
Methyl-tert-butylether (MTBE)	mg/L	0.015 (AO)	3.4	ND (0.0010)	ND (0.0005)	ND (0.0005)
o-Xylene	mg/L	---	---	-	-	-
Styrene	mg/L	---	0.072 ^(w)	ND (0.0010)	ND (0.0005)	ND (0.0005)
Tetrachloroethene	mg/L	---	---	ND (0.0010)	-	-
Toluene	mg/L	0.06/0.024 (AO)	0.0005	ND (0.0010)	ND (0.0005)	ND (0.0005)
trans-1,2-dichloroethene	mg/L	---	---	ND (0.0010)	-	-
trans-1,3-dichloropropene	mg/L	---	---	-	-	-
Trichloroethene	mg/L	---	---	ND (0.0010)	-	-
Trichlorofluoromethane	mg/L	---	---	ND (0.0010)	-	-
VH C6-C10	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Vinyl Chloride	mg/L	---	---	ND (0.0010)	-	-
VPH (VHW6 to 10 - BTEX)	mg/L	---	---	ND (0.100)	ND (0.050)	ND (0.050)
Xylenes (total)	mg/L	0.09/0.02 (AO)	0.03	ND (0.0020)	ND (0.0005)	ND (0.0005)
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria (DWQ): Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria (FWAL): All criteria for metals are for total metals except criteria for aluminum and iron, which are for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria a. Turbidity: 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. d. Aluminum: criteria specified for dissolved species not total. Criteria pH dependent. If pH<6.5: e^(1.209-2.426*pH+0.286*pH²) e. Cadmium (mg/L) = (e^(1.03*LN(HARDNESS)-5.274))/1000, valid for Hardness (as CaCO₃) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO₃) > 8 mg/L: (e^(1.273*ln(HARDNESS)-1.460))/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L l. Sulphate: BC MOE Approved Water Quality Guidelines, Summary Report Table 40. Hardness dependent. m. Interim guideline n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 o. Alkalinity (Total as CaCO₃): BC MOE Working Water Quality Guidelines, Table 1. w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short-term maximum. AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria						

Table 17 2019 Surface Water Quality Results - Site A Upper Chapman Creek

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾		Duplicate		
Lab Sample ID:				9040539-01	9040539-05	1391299-2	1397676-1
Field Parameters							
pH	s.u.	---	6.5-9.0	4.47	-	6.45	7.79
Conductivity, Electrical	µS/cm	---	---	43	-	46	42
Temperature	°C	15 (AO)	19 ⁽ⁿ⁾	9.3	-	9.17	6.86
Dissolved Oxygen	mg/L	---	>5	22.92	-	33.75	24.82
Redox Potential	mV	---	---	400	-	275	127
General							
Chemical Oxygen Demand (COD)	mg/L	---	---	23	ND (20)	11	10
Dissolved Organic Carbon (DOC)	mg/L	---	---	6.31	6.24	4.3	3.9
Conductivity, Electrical	µS/cm	---	---	10.4	10.6	21	19
pH	s.u.	---	6.5-9.0	5.99	5.88	6.9	6.49
Hardness (as CaCO ₃)	mg/L	---	---	4.85	4.71	8	7
Nutrients							
Ammonia	mg/L	---	0.681-28.7 ^(b)	0.021	ND (0.020)	ND (0.025)	ND (0.01)
Dissolved Nitrate (N)	mg/L	10	32.8	0.014	0.012	0.04	0.02
Dissolved Nitrite (N)	mg/L	1	0.06-0.6 ^(e)	ND (0.010)	ND (0.010)	ND (0.01)	ND (0.01)
Nitrate plus Nitrite (N)	mg/L	10	---	-	-	0.04	0.02
Total Nitrogen (N)	mg/L	---	---	-	-	0.14	0.2
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	0.157	0.195	0.1	0.17
Anions							
Chloride	mg/L	250 (AO)	600	0.23	0.23	0.55	0.6
Total Metals							
Aluminum	mg/L	9.5	---	0.385	0.332	0.143	0.143
Antimony	mg/L	---	0.009 ^(w)	ND (0.00020)	ND (0.00020)	0.00008	0.00005
Arsenic	mg/L	0.01	0.005	ND (0.00050)	ND (0.00050)	0.0001	0.0001
Barium	mg/L	---	1 ^w	ND (0.0050)	ND (0.0050)	0.0028	0.0025
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.0108	0.006	ND (0.002)	ND (0.002)
Cadmium	mg/L	0.005	(e)	0.000054	0.00003	0.00006	ND (0.00001)
Calcium	mg/L	---	---	1.62	1.6	2.7	2.4
Chromium	mg/L	---	---	ND (0.00050)	ND (0.00050)	0.00006	0.00007
Cobalt	mg/L	---	0.11	ND (0.00010)	ND (0.00010)	0.00002	0.00004
Copper	mg/L	1.0	(f)	0.00054	0.00059	ND (0.0005)	ND (0.0005)
Iron	mg/L	0.3 (AO)	1	0.195	0.152	0.047	0.046
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	ND (0.00020)	0.00005	0.00004
Lithium	mg/L	---	---	0.00022	0.00018	ND (0.0005)	ND (0.0005)
Magnesium	mg/L	---	---	0.192	0.174	0.42	0.25
Manganese	mg/L	0.05 (AO)	(h)	0.00844	0.00672	0.002	0.003
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	ND (0.00010)	ND (0.00010)	0.00009	0.0001
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	ND (0.00040)	ND (0.00040)	0.0002	0.0002
Phosphorus	mg/L	0.01 (AO)	---	ND (0.050)	ND (0.050)	-	-
Potassium	mg/L	---	---	ND (0.10)	ND (0.10)	0.35	0.1
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	1.6	1.5	2.2	2.4
Silver	mg/L	---	0.0001-0.003 ⁽ⁱ⁾	ND (0.000050)	ND (0.000050)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	---	---	0.53	0.51	1.9	0.9
Strontium	mg/L	---	---	0.0062	0.0059	0.0096	0.0091
Sulfur	mg/L	---	---	ND (3.0)	ND (3.0)	0.48	0.42
Tellurium	mg/L			ND (0.00050)	ND (0.00050)	-	-
Thallium	mg/L	---	---	ND (0.00020)	ND (0.00020)	ND (0.00001)	ND (0.00001)
Thorium	mg/L			ND (0.00010)	ND (0.00010)	ND (0.00005)	0.00005
Tin	mg/L	---	---	ND (0.00020)	ND (0.00020)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	0.0054	ND (0.0050)	0.0009	0.0004
Tungsten	mg/L			ND (0.0010)	ND (0.0010)	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.000054	0.000048	0.00006	0.00005
Vanadium	mg/L	---	---	0.0014	0.0011	0.0002	0.0002
Zinc	mg/L	5.0 (AO)	(k)	0.0041	ND (0.0040)	0.0047	0.0015
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.00010)	ND (0.0001)	ND (0.0001)
Notes:							
1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated.							
2. Drinking Water Criteria: Metal guidelines are for total concentrations.							
3. Freshwater Aquatic Life Criteria: All criteria for metals are for total metals.							
0.500 - Exceeds Drinking Water Criteria							
0.500 - Exceeds Freshwater Aquatic Life Criteria							
0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria							
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.							
e. Cadmium (mg/L) = (e^(1.03*LN(HARDNESS)-5.274))/1000, valid for Hardness (as CaCO ₃) of 7 to 455 mg/L.							
f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters.							
g. Lead: hardness dependent. For Hardness (as CaCO ₃) > 8 mg/L: (e^(1.273*ln(HARDNESS)-1.460))/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L.							
h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54.							
i. Nickel: BC MOE Working Water Quality Guidelines, Table 1.							
j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L							
k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L							
n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19							
w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e. average) concentrations unless identified as a short-term maximum.							
AO - Aesthetic Objective							
- No data available							
--- Currently no Standard/Criteria							

Table 18 2019 Surface Water Quality Results - Site B Lower Chapman Creek

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
Lab Sample ID:				9040539-02	1390181-1	1397676-3
Field Parameters						
pH	s.u.	---	6.5-9.0	6.22	7.07	6.95
Conductivity, Electrical	µS/cm	---	---	14	34	60
Temperature	°C	15 (AO)	19 ⁽ⁿ⁾	7.02	7.12	6.95
Dissolved Oxygen	mg/L	---	>5	35.78	27.22	9.66
Redox Potential	mV	---	---	347	99	230
General						
Chemical Oxygen Demand (COD)	mg/L	---	---	ND (20)	20	ND (10)
Dissolved Organic Carbon (DOC)	mg/L	---	---	6.52	2.6	2.4
Conductivity, Electrical	µS/cm	---	---	10.3	30	58
pH	s.u.	---	6.5-9.0	5.94	7.04	7
Hardness (as CaCO ₃)	mg/L	---	---	5.18	11	18
Nutrients						
Ammonia	mg/L	---	0.681-28.7 ^(b)	0.021	ND (0.01)	ND (0.01)
Dissolved Nitrate (N)	mg/L	10	32.8	0.014	0.04	0.12
Dissolved Nitrite (N)	mg/L	1	0.06-0.6 ^(c)	ND (0.010)	ND (0.01)	ND (0.01)
Nitrate plus Nitrite (N)	mg/L	10	---	-	0.04	0.12
Total Nitrogen (N)	mg/L	---	---	-	0.85	0.24
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	0.145	0.81	0.08
Anions						
Chloride	mg/L	250 (AO)	600	0.22	0.72	3.85
Total Metals						
Aluminum	mg/L	9.5	---	0.501	0.079	0.025
Antimony	mg/L	---	0.009 ^(w)	ND (0.00020)	0.00005	ND (0.00002)
Arsenic	mg/L	0.01	0.005	ND (0.00050)	0.0001	ND (0.0001)
Barium	mg/L	---	1 ^w	ND (0.0050)	0.0033	0.004
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.0092	0.002	0.003
Cadmium	mg/L	0.005	(e)	0.000017	0.00002	ND (0.00001)
Calcium	mg/L	---	---	1.71	3.7	5.5
Chromium	mg/L	---	---	ND (0.00050)	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	---	0.11	0.00014	0.00002	ND (0.00002)
Copper	mg/L	1.0	(f)	0.0005	ND (0.0005)	ND (0.0005)
Iron	mg/L	0.3 (AO)	1	0.294	0.035	0.019
Lead	mg/L	0.01	0.003 ^(g)	0.00022	0.00003	ND (0.00001)
Lithium	mg/L	---	---	0.00027	ND (0.0005)	ND (0.0005)
Magnesium	mg/L	---	---	0.222	0.51	1
Manganese	mg/L	0.05 (AO)	(h)	0.0134	0.001	ND (0.001)
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	ND (0.00010)	0.0002	0.00011
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	ND (0.00040)	ND (0.0002)	ND (0.0002)
Phosphorus	mg/L	0.01 (AO)	---	ND (0.050)	-	-
Potassium	mg/L	---	---	ND (0.10)	0.15	0.44
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	1.8	3.1	5.9
Silver	mg/L	---	0.0001-0.003 ^(j)	ND (0.000050)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	---	---	0.56	1.5	3.3
Strontium	mg/L	---	---	0.0068	0.0135	0.0272
Sulfur	mg/L	---	---	ND (3.0)	0.49	1
Tellurium	mg/L	---	---	ND (0.00050)	-	-
Thallium	mg/L	---	---	ND (0.000020)	0.00001	ND (0.00001)
Thorium	mg/L	---	---	ND (0.00010)	ND (0.00005)	ND (0.00005)
Tin	mg/L	---	---	ND (0.00020)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	0.0081	0.0002	ND (0.0001)
Tungsten	mg/L	---	---	ND (0.0010)	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.000067	0.00006	0.00003
Vanadium	mg/L	---	---	0.0013	ND (0.00005)	0.00053
Zinc	mg/L	5.0 (AO)	(k)	ND (0.0040)	0.0023	0.0037
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria: Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria: All criteria for metals are for total metals except criteria for aluminum, which is for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria 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. e. Cadmium (mg/L) = (e^(1.03*LN(HARDNESS)-5.274))/1000, valid for Hardness (as CaCO ₃) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO ₃) > 8 mg/L: (e^(1.273*Ln(HARDNESS)-1.460))/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short-term maximum. AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria						



Table 19 2019 Surface Water Quality Results - Site C Lower Irgens Creek

Sample Date:	Units	BC MOE Criteria ⁽¹⁾		Apr-19	Nov-19	Nov-19 Duplicate	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾				
Lab Sample ID:				9040539-03	1390181-2	1390181-3	1397676-4
Field Parameters							
pH	s.u.	---	6.5-9.0	<u>4.89</u>	6.79	-	7.23
Conductivity, Electrical	µS/cm	---	---	66	71	-	30
Temperature	°C	15 (AO)	19 ⁽ⁿ⁾	9.73	8.4	-	5.17
Dissolved Oxygen	mg/L	---	>5	12.53	28.92	-	10.57
Redox Potential	mV	---	---	369	185	-	228
General							
Chemical Oxygen Demand (COD)	mg/L	---	---	ND (20)	20	20	ND (10)
Dissolved Organic Carbon (DOC)	mg/L	---	---	4.1	1.7	1.8	3.8
Conductivity, Electrical	µS/cm	---	---	53.8	65	65	22
pH	s.u.	---	6.5-9.0	6.84	7.32	7.32	6.65
Hardness (as CaCO ₃)	mg/L	---	---	17.5	22	22	8
Nutrients							
Ammonia	mg/L	---	0.681-28.7 ^(b)	0.022	0.56	ND (0.01)	0.01
Dissolved Nitrate (N)	mg/L	10	32.8	0.192	0.13	0.13	0.02
Dissolved Nitrite (N)	mg/L	1	0.06-0.6 ^(c)	ND (0.010)	ND (0.01)	ND (0.01)	ND (0.01)
Nitrate plus Nitrite (N)	mg/L	10	---	-	0.13	0.13	0.02
Total Nitrogen (N)	mg/L	---	---	-	0.37	0.22	0.14
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	0.168	0.22	0.08	0.07
Anions							
Chloride	mg/L	250 (AO)	600	3.24	4.08	4.13	0.67
Total Metals							
Aluminum	mg/L	9.5	---	0.23	0.02	0.022	0.137
Antimony	mg/L	---	0.009 ^(w)	ND (0.00020)	ND (0.00002)	ND (0.00002)	0.00002
Arsenic	mg/L	0.01	0.005	ND (0.00050)	ND (0.0001)	ND (0.0001)	0.0001
Barium	mg/L	---	1 ^w	0.0061	0.005	0.0049	0.0027
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.0117	0.003	0.003	ND (0.002)
Cadmium	mg/L	0.005	(e)	0.00002	ND (0.00001)	ND (0.00001)	0.00001
Calcium	mg/L	---	---	5.27	6.6	6.8	2.6
Chromium	mg/L	---	---	ND (0.00050)	0.00005	ND (0.00005)	0.00007
Cobalt	mg/L	---	0.11	ND (0.00010)	ND (0.00002)	ND (0.00002)	ND (0.00002)
Copper	mg/L	1.0	(f)	0.00057	ND (0.0005)	ND (0.0005)	ND (0.0005)
Iron	mg/L	0.3 (AO)	1	0.237	0.011	0.011	0.047
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	ND (0.00001)	ND (0.00001)	0.00004
Lithium	mg/L	---	---	0.00038		ND (0.0005)	ND (0.0005)
Magnesium	mg/L	---	---	1.04	1.3	1.3	0.28
Manganese	mg/L	0.05 (AO)	(h)	0.0104	ND (0.001)	0.002	0.002
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	0.00016	0.00014	0.00014	0.00011
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	ND (0.00040)	ND (0.0002)	ND (0.0002)	0.0002
Phosphorus	mg/L	0.01 (AO)	---	ND (0.050)	-	-	-
Potassium	mg/L	---	---	0.59	0.54	0.53	0.12
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.0002)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	5.9	6.8	6.8	2.6
Silver	mg/L	---	0.0001-0.003 ^(j)	ND (0.000050)	ND (0.00001)	0.00001	ND (0.00001)
Sodium	mg/L	---	---	3.31	3.6	3.6	1
Strontium	mg/L	---	---	0.0304	0.0322	0.0338	0.01
Sulfur	mg/L	---	---	ND (3.0)	0.95	0.96	0.56
Tellurium	mg/L	---	---	ND (0.00050)	-	-	-
Thallium	mg/L	---	---	ND (0.000020)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Thorium	mg/L	---	---	ND (0.00010)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Tin	mg/L	---	---	ND (0.00020)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	---	---	0.0091	ND (0.0001)	ND (0.0001)	0.0005
Tungsten	mg/L	---	---	ND (0.0010)	-	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.000082	0.00003	0.00003	0.00005
Vanadium	mg/L	---	---	0.0018	0.00048	0.00054	0.00042
Zinc	mg/L	5.0 (AO)	(k)	ND (0.0040)	0.002	0.0006	0.0061
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Notes:							
1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated.							
2. Drinking Water Criteria: Metal guidelines are for total concentrations.							
3. Freshwater Aquatic Life Criteria: All criteria for metals are for total metals except criteria for aluminum, which is for dissolved.							
0.500 - Exceeds Drinking Water Criteria							
0.500 - Exceeds Freshwater Aquatic Life Criteria							
0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria							
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.							
e. Cadmium (mg/L) = (e^(1.03*LN(HARDNESS)-5.274))/1000, valid for Hardness (as CaCO ₃) of 7 to 455 mg/L.							
f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters.							
g. Lead: hardness dependent. For Hardness (as CaCO ₃) > 8 mg/L: (e^(1.273*ln(HARDNESS)-1.460))/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L.							
h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54.							
i. Nickel: BC MOE Working Water Quality Guidelines, Table 1.							
j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L							
k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L							
n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19							
w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short-term maximum.							
AO - Aesthetic Objective							
- No data available							
--- Currently no Standard/Criteria							



Table 20 2019 Surface Water Quality Results - Site E Upper Irgens Creek

Sample Date:	Units	BC MOE Criteria ¹		Apr-19	Nov-19	Dec-19
Parameters:		DWQ ⁽²⁾	FWAL ⁽³⁾			
Lab Sample ID:				9040539-04	1391299-1	1397676-2
Field Parameters						
pH	s.u.	---	6.5-9.0	<u>4.81</u>	<u>6.45</u>	7.79
Conductivity, Electrical	µS/cm	---	---	29	370	29
Temperature	°C	15 (AO)	19 ⁽ⁿ⁾	8.85	10.94	7.32
Dissolved Oxygen	mg/L	---	>5	6.35	8.83	10.08
Redox Potential	mV	---	---	434	267	156
General						
Chemical Oxygen Demand (COD)	mg/L	---	---	ND (20)	ND (5)	ND (10)
Dissolved Organic Carbon (DOC)	mg/L	---	---	2.27	1.6	2
Conductivity, Electrical	µS/cm	---	---	27.4	37	26
pH	s.u.	---	6.5-9.0	6.63	6.4	6.29
Hardness (as CaCO ₃)	mg/L	---	---	8.91	13	8
Nutrients						
Ammonia	mg/L	---	0.681-28.7 ^(b)	ND (0.020)	0.027	ND (0.01)
Dissolved Nitrate (N)	mg/L	10	32.8	0.091	0.11	0.07
Dissolved Nitrite (N)	mg/L	1	0.06-0.6 ^(c)	ND (0.010)	ND (0.01)	ND (0.01)
Nitrate plus Nitrite (N)	mg/L	10	---	-	0.11	0.07
Total Nitrogen (N)	mg/L	---	---	-	0.84	0.18
Total Kjeldahl Nitrogen (TKN)	mg/L	---	---	0.154	0.72	0.08
Anions						
Chloride	mg/L	250 (AO)	600	0.95	1.23	1.23
Total Metals						
Aluminum	mg/L	9.5	---	0.0786	0.039	0.038
Antimony	mg/L	---	0.009 ^(w)	ND (0.00020)	ND (0.00002)	0.0001
Arsenic	mg/L	0.01	0.005	ND (0.00050)	ND (0.0001)	ND (0.0001)
Barium	mg/L	---	1 ^w	ND (0.0050)	0.0041	0.003
Beryllium	mg/L	---	0.00013 ^(w)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	---	---	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	5.0	1.2	0.008	ND (0.002)	ND (0.002)
Cadmium	mg/L	0.005	(e)	0.000041	ND (0.00001)	0.00012
Calcium	mg/L	---	---	2.71	3.8	2.4
Chromium	mg/L	---	---	ND (0.00050)	ND (0.0005)	0.00007
Cobalt	mg/L	---	0.11	ND (0.00010)	ND (0.0002)	0.00007
Copper	mg/L	1.0	(f)	0.00076	ND (0.0005)	0.0005
Iron	mg/L	0.3 (AO)	1	0.023	ND (0.002)	0.003
Lead	mg/L	0.01	0.003 ^(g)	ND (0.00020)	0.00001	0.00006
Lithium	mg/L	---	---	ND (0.00010)	ND (0.0005)	ND (0.0005)
Magnesium	mg/L	---	---	0.521	0.86	0.42
Manganese	mg/L	0.05 (AO)	(h)	0.00251	ND (0.001)	ND (0.001)
Mercury	mg/L	0.001	---	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	0.25	2	ND (0.00010)	0.00003	0.00015
Nickel	mg/L	---	0.025-0.15 ^{(i)(w)}	ND (0.00040)	ND (0.0002)	0.0002
Phosphorus	mg/L	0.01 (AO)		ND (0.050)	-	-
Potassium	mg/L	---	---	0.25	0.44	0.1
Selenium	mg/L	0.01	0.002	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	---	---	4.2	4	4
Silver	mg/L	---	0.0001-0.003 ^(j)	ND (0.000050)	ND (0.00001)	0.00009
Sodium	mg/L	---	---	1.79	3.6	1.8
Strontium	mg/L	---	---	0.0175	0.021	0.0145
Sulfur	mg/L	---	---	ND (3.0)	0.64	0.57
Tellurium	mg/L			ND (0.00050)	-	-
Thallium	mg/L	---	---	ND (0.000020)	ND (0.00001)	0.00006
Thorium	mg/L			ND (0.00010)	ND (0.00005)	0.00007
Tin	mg/L	---	---	ND (0.00020)	ND (0.0001)	0.0001
Titanium	mg/L	---	---	ND (0.0050)	0.0003	ND (0.0001)
Tungsten	mg/L			ND (0.0010)	-	-
Uranium	mg/L	---	0.0085 ^(w)	0.000052	0.00003	0.00008
Vanadium	mg/L	---	---	ND (0.0010)	0.00008	0.00041
Zinc	mg/L	5.0 (AO)	(k)	ND (0.0040)	0.0018	0.0025
Zirconium	mg/L	---	---	ND (0.00010)	ND (0.0001)	0.0002
Notes: 1. Values reported from BC MOE - British Columbia Water Quality Guidelines, 2019 Edition, unless otherwise stated. 2. Drinking Water Criteria: Metal guidelines are for total concentrations. 3. Freshwater Aquatic Life Criteria: All criteria for metals are for total metals except criteria for aluminum, which is for dissolved. 0.500 - Exceeds Drinking Water Criteria 0.500 - Exceeds Freshwater Aquatic Life Criteria 0.500 - Exceeds Drinking Water Criteria and Freshwater Aquatic Life Criteria 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. e. Cadmium (mg/L) = (e^(1.03*LN(HARDNESS)-5.274))/1000, valid for Hardness (as CaCO ₃) of 7 to 455 mg/L. f. Copper guidelines calculated using BC MOE Biotic Ligand Model (BLM) software. Dependent on multiple other parameters. g. Lead: hardness dependent. For Hardness (as CaCO ₃) > 8 mg/L: (e^(1.273*ln(HARDNESS)-1.460))/1000 . If hardness is < or equal to 8 mg/L: 0.003 mg/L. h. Manganese (mg/L) = (0.01102*HARDNESS)+0.54. i. Nickel: BC MOE Working Water Quality Guidelines, Table 1. j. Silver: hardness <= 100 mg/L = 0.0001 mg/L, hardness > 100 mg/L = 0.003 mg/L k. Zinc (mg/L) = 0.033 for Hardness < or equal to 90 mg/L, (33+(0.75*(HARDNESS-90)))/1000 for Hardness > 90 mg/L n. Temperature: Streams with Bull Trout and/or Dolly Varden = 15, unknown fish distribution = 19 w. Values reported from BC MOE - Working Water Quality Guidelines for British Columbia (2017). Values are long-term (i.e., average) concentrations unless identified as a short-term maximum. * Results are labelled as "SL D" on COC B821547 and B8A9320 AO - Aesthetic Objective - No data available --- Currently no Standard/Criteria						

Table 21 Soil Gas Probe Completion Details

Soil Gas Probe	Location ⁽¹⁾		Top of Casing Elevation (mASL)	Ground Elevation (mASL)	Measured Depth (mbgs)	Screened Interval (mbgs)	Lithology
	Northing	Easting					
GP13-01S	5482131	448264	-	215.82	3.0*	2.2 - 3.0	Sandy Silt/Sandy Gravel
GP13-01D	5482131	448264	-	215.82	4.9*	4.1 - 4.9	Sandy Gravel
GP13-02S	5482108	448299	-	216.39	2.7*	1.8 - 2.7	Sandy Silt
GP13-02D	5482108	448299	-	216.39	4.6*	3.7 - 4.6	Sandy Gravel
GP17-01S	5482086	448375	219.32	218.51	2.7*	1.8 - 2.7	Sandy Silt
GP17-01D	5482086	448375	219.32	218.51	4.6*	3.7 - 4.6	Sandy Gravel
Notes: (1) Soil Gas Probe locations obtained from survey completed by Strait Land Surveying Inc. in 2013 (GP13-01, GP13-02) and 2017 (GP17-01). * Depth on completion mASL - Metres above sea level							



Table 22 Soil Gas Monitoring Trigger Levels and Criteria

Soil Gas Probe Locations	Contingency Trigger Level (% LEL) ³	Regulatory Criteria (% LEL) ²
GP13-01S	10%	25%
GP13-01D	10%	25%
GP13-02S	10%	25%
GP13-02D	10%	25%
GP17-01S	10%	25%
GP17-01D	10%	25%
In On-Site Structures	1%	20% ¹
In Off-Site Structures	1%	25%

Notes:

LEL - Lower Explosive Limit

¹ Source: BC MOE, Landfill Criteria for Municipal Solid Waste, June 2016.

² Source: Operational Certificate No. 106060

³ Trigger level as per the Environmental Monitoring Program prepared by XCG dated April 27, 2018.

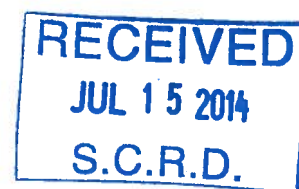


Table 23 2019 Soil Gas Field Monitoring Results

Soil Gas Probe/Building	Date	Static Water Level (mbtoc)	Static Water Level (mbgs)	Blinded	CH ₄ Trigger Level (% Gas by Vol.) ²	Pressure (inches WC)	CH ₄ (% Gas by Vol.)	CO ₂ (% Gas by Vol.)	O ₂ (% Gas by Vol.)
April Sampling Event									
GP13-01S	12-Apr-19	Dry	Dry	No	0.50	0.00	<u>0.5</u>	8.8	8.4
GP13-01D	12-Apr-19	Dry	Dry	No	0.50	0.07	<u>0.5</u>	9.3	4.6
GP13-02S	12-Apr-19	Dry	Dry	No	0.50	0.10	<u>19.0</u>	15.4	0.2
GP13-02D	12-Apr-19	Dry	Dry	No	0.50	0.15	<u>15.7</u>	14.5	0.2
GP17-01S	12-Apr-19	Dry	Dry	No	0.50	0.19	<u>67.3</u>	32.2	0.5
GP17-01D	12-Apr-19	Dry	Dry	No	0.50	0.18	<u>65.5</u>	33.9	0.5
Share Shed	16-Apr-19	-	-	-	0.05	-	0.0000	-	-
							0.0000	-	-
Special Waste Storage (Storage Bunker)	16-Apr-19	-	-	-	0.05	-	0.0000	-	-
							0.0005	-	-
Office Building	16-Apr-19	-	-	-	0.05	-	0.0000	-	-
							0.0010	-	-
Scale House	16-Apr-19	-	-	-	0.05	-	0.0000	-	-
							0.0000	-	-
Power Shed	16-Apr-19	-	-	-	0.05	-	0.0000	-	-
							0.0005	-	-
Maintenance Shop	16-Apr-19	-	-	-	0.05	-	0.0000	-	-
							0.0000	-	-
November Sampling Event									
GP13-01S	13-Nov-19	Dry	Dry	No	0.50	0.02	<u>1.5</u>	9.9	0.4
GP13-01D	13-Nov-19	Dry	Dry	No	0.50	0.03	<u>3.0</u>	15.4	0.5
GP13-02S	13-Nov-19	Dry	Dry	No	0.50	0.01	<u>11.3</u>	15.7	0.2
GP13-02D	13-Nov-19	Dry	Dry	No	0.50	-0.17	<u>8.9</u>	15.1	0.2
GP17-01S	13-Nov-19	Dry	Dry	No	0.50	0.13	<u>65.1</u>	34.9	0.1
GP17-01D	13-Nov-19	Dry	Dry	No	0.50	0.01	<u>20.1</u>	35.5	1.8
December Sampling Event									
GP13-01S	17-Dec-19	Dry	Dry	No	0.50	0.04	<u>4.1</u>	15.6	1.0
GP13-01D	17-Dec-19	Dry	Dry	No	0.50	0.05	<u>5.9</u>	10.7	1.8
GP13-02S	17-Dec-19	Dry	Dry	No	0.50	0.05	<u>11.8</u>	20.0	1.4
GP13-02D	17-Dec-19	Dry	Dry	No	0.50	-0.08	<u>9.7</u>	15.6	1.4
GP17-01S	17-Dec-19	Dry	Dry	No	0.50	0.16	<u>61.8</u>	31.7	1.9
GP17-01D	17-Dec-19	Dry	Dry	No	0.50	0.15	<u>51.2</u>	32.4	3.5
Share Shed	19-Dec-19	-	-	-	0.05	-	0.0005	-	-
							0.0010	-	-
Special Waste Storage (Storage Bunker)	19-Dec-19	-	-	-	0.05	-	0.0005	-	-
							0.0015	-	-
Office Building	19-Dec-19	-	-	-	0.05	-	0.0010	-	-
							0.0020	-	-
Scale House	19-Dec-19	-	-	-	0.05	-	0.0010	-	-
							0.0010	-	-
Power Shed	19-Dec-19	-	-	-	0.05	-	0.0010	-	-
							0.0015	-	-
Maintenance Shop	19-Dec-19	-	-	-	0.05	-	0.0005	-	-
							0.0005	-	-
Notes:									
1. All buildings were monitored using an RKI Eagle. Buildings were monitored at ground surface and at breathing level.									
2. Trigger level as per the Environmental Monitoring Program prepared by XCG dated April 27, 2018.									
<u>31.5</u>	Exceeds Environmental Monitoring Program trigger level limit								
<u>31.5</u>	Exceeds Occupational Certificate limit of 25% LEL (1.25 percent total volume)								
-	No data available								



APPENDIX A
OPERATIONAL CERTIFICATE No. 106060



July 8, 2014

Tracking Number: 243546
Authorization Number: 106060

REGISTERED MAIL

SUNSHINE COAST REGIONAL DISTRICT
1975 FIELD ROAD
SECHELT, BC
V0N 3A1

MASTER FILE COPY

Dear Operational Certificate Holder:

Enclosed is Operational Certificate 106060 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate. An annual fee will be determined according to the Permit Fees Regulation.

Please be aware that the following documents are required for submission by the specified dates set forth in the operational certificate:

- A hydrogeologic characterization and impact assessment of the landfill by August 31, 2015;
- An updated design and operating plan by December 31, 2017;
- An geotechnical and seismic assessment by April 30, 2018
- An environmental monitoring plan by April 30, 2018
- A leachate management plan for the landfill, acceptable to the Director, by December 31, 2015; and
- An annual report for the preceding 12 month period from January 1 to December 31 must be submitted to the Regional Director, Environmental Protection, by March 31 of each year.

This operational certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the operational certificate holder. It is also the responsibility of the operational certificate holder to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

.../2

RECEIVED

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Administration of this operational certificate will be carried out by staff from the Coast Region. Plans, data and reports pertinent to the operational certificate are to be submitted to the Regional Director, Environmental Protection, at Ministry of Environment, Regional Operations, Coast Region, 2nd Floor, 10470 - 152 Street, Surrey, BC V3R 0Y3.

Yours truly,



Avtar S. Sundher BSc.
for Director, *Environmental Management Act*
Coast Region

Enclosure

cc: Environment Canada



**MINISTRY OF
ENVIRONMENT**

OPERATIONAL CERTIFICATE

106060

*Under the Provisions of the Environmental Management Act and
in accordance with the Sunshine Coast Regional District's
Solid Waste Management Plan*

**SUNSHINE COAST REGIONAL DISTRICT
1975 FIELD ROAD
SECHELT, BC
V0N 3A1**

is authorized to manage municipal solid waste / recyclable material and discharge residual solid waste to the ground at the Sechelt Landfill located at 4901 Dusty Road, Sechelt, British Columbia, subject to the conditions listed herein. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may result in prosecution.

This Operational Certificate supersedes and cancels all previous versions of the permit PR-02547 issued under the authority of the *Environmental Management Act*.

1. AUTHORIZED DISCHARGES

- 1.1 This section applies to the discharge of municipal solid waste and contaminated soil to the Sechelt Landfill. The discharge of municipal solid waste must be restricted to sources within the Sunshine Coast Regional District. The site reference number for this discharge is E208123.

Date issued: July 8, 2014

Avtar S. Sundher BSc.
for Director, *Environmental Management Act*
South Coast Region

- 1.1.1 The discharge is authorized by the Sunshine Coast Regional District's approved solid waste management plan. The maximum rate of discharge is 15,000 metric tonnes per year.
- 1.1.2 The characteristics of the discharge must be municipal solid waste as defined in the *Environmental Management Act* and include other material as specifically authorized by the Director. Waste asbestos may be discharged in accordance to Section 40 of the Hazardous Waste Regulation and in accordance with the Sunshine Coast Regional District's bylaws.

Materials prohibited from discharge include hazardous waste (excluding asbestos), liquids, semi-solid waste, biomedical waste and the following:

- Recyclable Materials including:
 - a. used white goods,
 - b. auto hulks and other large metallic waste,
 - c. used tires,
 - d. used lead acid batteries,
 - e. gypsum wallboard, and
 - f. corrugated cardboard.
- any other waste and/or recyclable material regulated under the Ministry's Recycling Regulation when alternate disposal options become available;
- other materials banned by the regional district in implementing the Sunshine Coast Regional District's solid waste management plan or bylaws; and
- other materials which may be designated by the Director when alternative disposal becomes available.

- 1.1.3 Waste must not be discharged into water or within a buffer zone as identified in Section 2.9, 2.10 and 2.11. The burning of waste is prohibited.
- 1.1.4 The authorized works common to this section and Section 1.2 and 1.3 are a sanitary landfill, locking gate to control access by the public, weigh scale and related appurtenances, approximately located as shown on Site Plan A.

Date issued: July 8, 2014



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for Director, *Environmental Management Act*
South Coast Region

- 1.1.5 The authorized works specific to this section are those associated with a landfill operation and include berms, covering material, electrified bear fence, surface water diversionary works and environmental monitoring systems, approximately located as shown on attached Site Plan A and Site Plan B.
-
- 1.1.6 The authorized works must be complete and in operation while discharging.
- 1.1.7 The legal description of the location of the area of discharge is:
- Block C, District Lot 7613, Group 1, New Westminster District.
- 1.1.8 The civic address of the Sechelt Landfill is 4901 Dusty Road, Sechelt, BC.
- 1.2 This section applies to a public drop off and recycling area for the management of municipal solid waste and recyclable material from sources within the Sunshine Coast Regional District.
- 1.2.1 The types of materials which may be managed in this area include waste as set out in Section 1.1.2, and typical recyclable materials.
- 1.2.2 The quantity of recyclable material that may be stored is limited to the capacity that can be reasonably handled on the site.
- 1.2.3 The authorized works are those associated with a public drop off and recycling area and include an access area, roll-off bins and related appurtenances approximately located as shown on Site Plan A.
- 1.2.4 The facility is located on a portion of Block C, District Lot 7613, Group 1, New Westminster District.
- 1.3 This section applies to a return collection facility for the management of household hazardous waste from sources within the Sunshine Coast Regional District.
- 1.3.1 The operational certificate holder must obtain the necessary approvals prior to commencement of operation of the return collection facility and ensure compliance with all applicable legislation. The operational certificate holder must notify the Director at least 30 days prior to commencement of operations.

Date issued: July 8, 2014



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for Director, *Environmental Management Act*
South Coast Region

- 1.3.2 The types of material which may be managed at this facility are typical household hazardous wastes.
- 1.3.3 The quantity of household hazardous waste that may be stored must be in accordance with the Hazardous Waste Regulation and is limited to the registration quantity as a return collection facility.
- 1.3.4 The authorized works are those associated with a return collection facility and include an access area, a secured storage area for household hazardous waste and related appurtenances approximately located as shown on Site Plan A.
- 1.3.5 The facility location is proposed to be on a portion of Block C, District Lot 7613, Group 1, New Westminster District.
- 1.3.6 The operational certificate holder must submit an updated Site Plan A at least 30 days prior to commencement of operations.

2. **DESIGN AND PERFORMANCE REQUIREMENTS**

2.1 **Design and Operating Plan**

The operational certificate holder must operate the facilities authorized in Section 1 in accordance with a design and operating plan certified by a qualified professional. The operational certificate holder must submit an updated design and operating plan of the existing landfill authorized in Section 1, acceptable to the Director. The plan must address each of the subsections in the Landfill Criteria for Municipal Solid Waste (June 1993, or the most recent version) including performance, siting, design, operational, closure and post-closure criteria and the Guideline for Environmental Monitoring at Municipal Solid Waste Landfills (January 1996 or the most recent version).

The plan must include, but is not limited to, information regarding:

- A fill strategy for the design capacity of the landfill. The plan must incorporate the concept of progressive closure and take into consideration environmental protection measures and the proposed end use of the site.

Date issued: July 8, 2014



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for Director, *Environmental Management Act*
South Coast Region

- A contingency plan (including funding) to close the landfill is to be developed prior to the design capacity being achieved should the landfill not be supported by future Sunshine Coast Regional District solid waste management plans or is closed for any other reason;
- Estimated elevations;
- Cell size, compaction details, daily, intermediate and final cover including types of materials used;
- Actions taken to ensure slope stability;
- Anticipated schedule for progressive closure activities;
- Measures to minimize leachate generation, including surface water diversion measures;
- A groundwater monitoring program in accordance with the requirements of Section 2.5;
- Recommended action plan to be undertaken as a result of the existing and subsequent leachate management assessment required in Section 3.13;
- A landfill gas management plan if required by Section 2.4 and updated in accordance with anticipated legislation changes;
- Recommended actions as a result of the existing and subsequent geotechnical, hydrogeological, landfill gas and any other assessments;
- Contingencies to address environmental protection issues, including leachate, landfill gas management and slope stability, in the event of an earthquake or any other emergency;
- Fire prevention measures;
- Operational requirements for the return collection facility for household hazardous waste, if applicable;
- List of recyclable materials accepted and how they are managed at the site;
- Incoming waste inspection, removal of unauthorized waste and staff supervision on the active face;
- Estimated closure/post closure-costs and details of how the closure/post-closure funds will be accrued;
- Measures to minimize hazards to public safety; and
- Measures to control vectors, odours, dust, wind-blown litter and scavenging.

The facilities must be developed, operated and closed in accordance with the design and operating plan. Should there be any inconsistency between this Operational Certificate and the design and operating plan, this Operational Certificate must take precedence unless otherwise agreed in writing by the Director.

Date issued: July 8, 2014



Avtar S. Sundher BSc.
for Director, *Environmental Management Act*
South Coast Region

The Interim Design and Operating Plan was submitted in December 2012. The operational certificate holder must review the design and operating plan on an annual basis to determine if changes are required. Any revisions to the design and operating plan must be certified by a qualified professional and acceptable to the Director as part of the annual report required in Section 4.6.

The operational certificate holder must also submit an updated design and operating plan every five (5) years which includes, at a minimum, any revisions submitted as part of the previous five years of annual reporting. The next design and operating plan is required by December 31, 2017

2.2 Geotechnical and Seismic Assessment

The operational certificate holder must submit a geotechnical and seismic assessment for the landfill, acceptable to the Director, which meets the Landfill Criteria for Municipal Solid Waste (June 1993, or the most recent version). The assessment must address, at a minimum, slope stability during construction, operation, and post-closure is required. The geotechnical and seismic assessment must be reviewed and updated every five (5) years hereafter. The next assessment is required by **April 30, 2018**. Actions recommended in the assessment and subsequent reviews must be incorporated into the design and operating plan as required in Section 2.1. A qualified professional must conduct the assessment and subsequent reviews.

2.3 Hydrogeological Assessment

The operational certificate holder must review the hydrogeology of the landfill authorized in Section 1.1 annually and submit the results with the annual report required in Section 4.6. Actions recommended in the annual reviews must be incorporated into the design and operating plan as required in Section 2.1 and form the basis of a recommended groundwater monitoring program as required in Section 2.5. A qualified professional must conduct the annual reviews.

The operational certificate holder must submit an updated hydrogeologic characterization and impact assessment of the landfill authorized in Section 1.1 acceptable to the Director, by **August 31, 2015**. The assessment must meet the Landfill Criteria for Municipal Solid Waste (June 1993, or the most recent version) and be reviewed and updated every five (5) years hereafter. A qualified professional must conduct the assessment and subsequent reviews.

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for Director, *Environmental Management Act*
South Coast Region

2.4 **Landfill Gas Assessment**

The operational certificate holder must submit to the Director supplemental landfill gas assessments and generation reports every five years as required under the Landfill Gas Management Regulation. Annual monitoring and reporting of landfill gas must be done in accordance with the Landfill Gas Management Regulation and the criteria set out in the Environmental Monitoring Program (EMP) in Section 2.5.

The landfill gas assessment must address, but is not limited to, each relevant subsection in the Landfill Criteria for Municipal Solid Waste (June 1993, or the most recent version) and the Guideline for Environmental Monitoring at Municipal Solid Waste Landfills (January 1996 or the most recent version). Should the assessment indicate that the nonmethane organic compounds (NMOCs) will exceed 150 tonnes/year, then the operational certificate holder must submit a landfill gas management plan, acceptable to the Director.

At any time, based on the assessment or any other information, the Director may require the installation and operation of gas recovery and pollution prevention works, including landfill gas monitoring wells. It should be noted that the Ministry of Environment has developed the Landfill Gas Management Regulation under the Greenhouse Gas Reduction (Emissions Standards) Statutes Amendment Act, 2008. The requirements of the Regulation and its guideline documents must be incorporated by the operational certificate holder into the landfill gas management plan and design and operating plan as they come into effect.

2.5 **Environmental Monitoring Plan**

The Operational Certificate holder must submit an Environmental Monitoring Plan acceptable to the Director by April 30, 2018. The plan must be prepared by a qualified professional and meet the requirements set forth in the Landfill Criteria for Municipal Solid Waste (June 1993, or the most recent version) and the Guideline for Environmental Monitoring at Municipal Solid Waste Landfills (January 1996 or the most recent version).

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for Director, *Environmental Management Act*
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The operational certificate holder must review the environmental monitoring plan on an annual basis to determine if changes are required. Any revisions to the plan must be prepared and certified by a qualified professional acceptable to the Director. The operational certificate holder must also submit an updated environmental monitoring plan every five (5) years, which includes, at a minimum, any revisions submitted as part of the previous five years of annual reporting required in Section 4.6.

2.6 Qualified Professionals

All facilities and information, including works, plans, assessments, investigations, surveys, programs and reports, must be certified by qualified professionals. Refer to Section 3.1 of the operational certificate for the definition of a qualified professional.

2.7 Additional Facilities or Works

The Director may require investigations, surveys, and the construction of additional facilities or works including, but not limited to, leachate and bear-proofing measures. The Director may also amend the requirements of any of the information required by this operational certificate including plans, programs, assessments and reports.

2.8 Public Health, Safety and Nuisance

The landfill must be operated in a manner such that it will not create a public nuisance or become a significant threat to public health or safety with respect to landfill gas, unauthorized access, roads, traffic, airport activity, noise, dust, litter, vectors, or wildlife attraction.

2.9 Surface Water Diversion

Discharge of municipal solid waste into water is prohibited. The Operational Certificate holder must construct adequate surface water and groundwater diversion works to minimize surface water run-off and groundwater seepage from entering the landfill.

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for Director, *Environmental Management Act*
South Coast Region

2.10 Ground and Surface Water Quality Impairment

The landfill must be operated in a manner such that ground or surface water quality does not decrease beyond that specified by the British Columbia Water Quality Guidelines, or other appropriate criteria as may be specified by the Director, at or beyond the landfill property boundary.

If exceedances to the specified water quality criteria occur as a result of landfill operations, the Director may require that control measures or works be undertaken in addition to those outlined in Section 3.13.

2.11 Buffer Zones

The operational certificate holder must maintain the existing buffer zone relative to the property boundary of: 2 to 4.5 metres to the south, 10 to 98 metres to the west, 4.42 metres to the north and 4 to 18 metres to the east as shown in Site Plan A and Site Plan B.

The buffer zone must include an adequate firebreak. The firebreak must be maintained free of combustibles.

2.12 Survey of the Landfill

The Operational Certificate holder must conduct a legal survey which identifies the metes and bounds for both the limits of the landfill footprint and the boundaries of the landfill site. Copies of the land surveys are to be kept on file for review if requested by the Director. The corners and breakpoints of landfill footprint limits and landfill site boundaries are to be established and maintained in the field.

The operational certificate holder must also conduct an annual survey of the height, contour, surface area and settlement of the landfill and submit as part of the annual report required in Section 4.6.

3. OPERATIONAL REQUIREMENTS

3.1 Definitions

“**director**” means the Director or a person delegated to act on behalf of the Director, as defined in the *Environmental Management Act*;

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for Director, *Environmental Management Act*
South Coast Region

“commercial quality soil” means soil which does not contain any substance with a concentration exceeding the lowest applicable numerical soil standard for commercial land as set forth in the Contaminated Sites Regulation.

“hazardous wastes” as defined by the Hazardous Waste Regulation pursuant to the *Environmental Management Act* are prohibited from disposal unless expressly authorised by the Hazardous Waste Regulation, approved by the Director or as specified in the Operational Certificate;

“regional director” means Regional Director, Environmental Protection;

“qualified professional” means an applied scientist or technologist specializing in a particular applied science including, but not necessarily limited to, agrology, biology, chemistry, engineering, geology, or hydrogeology and

- who is registered in British Columbia with their appropriate professional organization, acting under that association’s Code of Ethics and subject to disciplinary action by that association, and
- who, through suitable education, experience, accreditation and knowledge, may be reasonably relied on to provide advice within their area of expertise;

“return collection facility” means a household hazardous waste collection facility or a mobile household hazardous waste collection facility;

“suitable cover” means soils utilized in accordance with Section 3.5 of this operational certificate or other material acceptable to the Director:

“commercial quality soil” means soil which does not contain any substance with a concentration exceeding the lowest applicable numerical soil standard for commercial land (CL) use as set forth in the Contaminated Sites Regulation.

3.2 Bypasses

The discharge of effluent which has bypassed site control works as listed in Section 1.1.5 is prohibited unless the prior approval of the Director is obtained and confirmed in writing. In the event of an emergency, Section 3.3 must be followed.

Date issued: July 8, 2014



Avtar S. Sundher BSc.
for Director, *Environmental Management Act*
South Coast Region

3.3 **Emergency Procedures**

The authorized works must be inspected regularly and maintained in good working order. In the event of an emergency or condition beyond the control of the operational certificate holder including, but not limited to, unauthorized fires arising from spontaneous combustion or other causes, or detection of leachate on the property, the operational certificate holder must take appropriate remedial action and notify the Director immediately. The Director may reduce or suspend operations to protect the environment until the authorized works has been restored, and/or corrective steps taken to prevent unauthorized discharges.

3.4 **Inspections**

The operational certificate holder must inspect the authorized works regularly and maintain them in good working order. The Director must be immediately notified of any malfunction of these works.

The operational certificate holder must inspect the property boundaries regularly and notify the Director of any visual evidence of environmental impacts on adjacent properties.

3.5 **Soil Management**

Soil meeting the commercial land use standard, as set forth in the Contaminated Sites Regulation, may be utilized for berm construction, daily, intermediate and final cover, top dressing and landscaping. Soil with any substance with a concentration exceeding the lowest applicable numerical soil standard for commercial land may only be used for internal berms or daily or intermediate cover. The utilization or discharge exceeding the industrial quality soil and hazardous waste soil is prohibited.

Soils utilized for berm construction, intermediate and final cover, top dressing and landscaping must not be included in determining the rate of discharge specified in Section 1.1.1.

Date issued: July 8, 2014



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for Director, *Environmental Management Act*
South Coast Region

3.6 **Waste Compaction and Covering**

All waste must be placed in cells of a size determined by a qualified professional, and in accordance with the design and operating plan and must address each of the subsections in the Landfill Criteria for Municipal Solid Waste (June 1993, or the most recent version). The working face must be confined to the smallest practical area. The waste must be compacted and covered as per the design and operating plan.

Daily cover consisting of a minimum of 0.15 metres of suitable cover material or a functionally alternate cover material, as authorized by the Director, must be applied to the working face at the end of each operating day. If alternate cover is utilized, then the working face must be covered with a minimum of 0.15 meters of suitable cover at least once every week or as approved by the Director. Intermediate cover, consisting of a minimum 0.30 metre of suitable cover material must be applied within thirty (30) days to any area of the landfill which will not receive any further waste for thirty (30) days. The Director may vary the frequency of covering when freezing conditions adversely affect normal operation.

3.7 **Completed Areas of the Landfill**

The operational certificate holder must apply final cover to any area of the landfill which will not receive any further waste. Final cover must be applied in accordance with the design and operating plan required in Section 2.1 and, at a minimum, must consist of a minimum of 1.0 metre of low permeability ($<1 \times 10^{-5}$ cm/s) compacted soil (or equivalent) cap plus a minimum of 0.15 metre of topsoil and suitable vegetative cover, or as approved the Director.

With the written approval of the Director, the topsoil used for the final covering may be mixed with conditioning agents such as sludge (biosolids), compost and the like to add organics and improve the moisture holding capacity and nutrient value of the soil. Soil must be utilized in accordance with Section 3.5. Final cover must be constructed and maintained with adequate drainage and erosion controls and seeded with suitable grasses. Surface water runoff must be directed away from the landfill footprint. Soils must be in accordance with the Organic Matter Recycling Regulation (OMRR) and the Contaminated Sites Regulation (CSR).

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for Director, *Environmental Management Act*
South Coast Region

3.8 Wildlife and Vector Management

Vectors (carriers capable of transmitting a pathogen from one organism to another including, but not limited to flies and other insects, rodents, and birds) must be controlled by the application of cover material at the required frequency per Section 3.6 or by such additional methods as specified by the design and operating plan and the Director. This landfill must be operated so as to minimize the attraction of wildlife such as bears and birds by applying cover at required frequencies and instituting a good housekeeping program.

Additional works may be required or other operating instructions may be issued by the Director should a wildlife nuisance or hazard arise.

3.9 Litter Control

Litter must be controlled by compacting the waste, minimizing the work face area, applying cover at the required frequencies, providing litter control fences and instituting a regular litter pickup and general good housekeeping program or as specified by the Director.

3.10 Electric Fencing

The operational certificate holder must maintain an electrified bear fence, at a minimum, around the landfill footprint, or implement alternative bear-proofing measures, acceptable to the Director, that will deter bears from entering that part of the site. The electric fence must be energized at all times, unless otherwise approved prior by the Director in writing. The fence must be maintained to the standards set out by the manufacturer until implementation of the landfill closure plan required in Section 5.2. Any penetrations through the electric fencing by bears must be immediately reported to the Ministry's Conservation Officer Service.

3.11 Fire Prevention and Control

The operational certificate holder must take all reasonable measures necessary to prevent fires from occurring at the site and is responsible for complying with all local fire safety requirements. The operational certificate holder must provide adequate fire breaks that are free of combustibles around the perimeter of the landfill footprint.

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Avtar S. Sundher BSc.
for Director, *Environmental Management Act*
South Coast Region

The operational certificate holder must maintain firefighting equipment and materials as required. In the event of a landfill fire, immediately notify the local fire department, the Provincial Emergency Program and the Director.

3.12 Posting of Signs

The operational certificate holder must post signage, to the satisfaction of the Director, at the entrance of the landfill site with the following current information including:

- Site name;
- Owner and operator;
- Contact telephone number and address for the owner and operator;
- 24 hour telephone number in case of emergency;
- Hours of operation;
- Materials and wastes accepted for recycling and land filling;
- Prohibited materials and wastes; and
- Tipping fees.

3.13 Leachate Management

The operational certificate holder must, to the satisfaction of the Director, take measures to minimize leachate generation, including but not limited to, providing effective covering and surface water runoff. Actions taken and their effectiveness must be detailed in the annual report as required in Section 4.6.

The operational certificate holder must submit a leachate management plan for the landfill authorized in Section 1.1, acceptable to the Director, by **August 31, 2015**. The plan must meet the Landfill Criteria for Municipal Solid Waste (June 1993, or the most recent version) and the Guideline for Environmental Monitoring at Municipal Solid Waste Landfills (January 1996 or the most recent version) and must be reviewed and updated every five (5) years hereafter. The leachate management plan, prepared by a qualified professional, must review the adequacy of the existing works to protect the receiving environment and identify any necessary upgrades and include a schedule for their implementation. Once implemented, the upgraded works must form part of the authorized works identified in Section 1.1.5.

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Avtar S. Sundher BSc.
for Director, *Environmental Management Act*
South Coast Region

3.14 Landfill Gas Management

The Landfill must not cause combustible gas concentrations to exceed the lower explosive limit in soils at the property boundary or 25% of the lower explosive limit at or in on-site or off-site structures.

3.15 Management of Recyclable Materials

The operational certificate holder must take all practical measures to segregate for recycling and reuse of waste destined for disposal at this site.

Recyclable materials must be managed in a manner to not cause pollution and in accordance with the *Environmental Management Act* and its regulations.

3.16 Management of Household Hazardous Waste

The amount of household hazardous waste accumulated at the facility authorized in Section 1.4 must be stored in accordance with the Hazardous Waste Regulation and is limited to the registration quantity as a return collection facility.

4. MONITORING AND REPORTING REQUIREMENTS

4.1 Monitoring

The Operational Certificate holder must implement an environmental monitoring program as required in Section 2.5. The Operational Certificate holder must maintain records of all monitoring program data and analyses available for inspection. Based on the information submitted in the annual report, or any other information relevant to the site, the Director may vary the frequency, location and analyses of environmental monitoring as warranted.

4.1.1 Slope Stability Monitoring

The operational certificate holder must regularly monitor for evidence of slope instability as part of regular operations for evidence of tension cracking, veneer instability or failure.

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Avtar S. Sundher BSc.
for Director, *Environmental Management Act*
South Coast Region

4.2 **Sampling Procedures**

Sampling is to be carried out in accordance with the procedures described in the "British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 2003 Edition (Permittee)", or most recent edition, or by suitable alternative procedures as authorized by the Director.

A copy of the above manual is available on the Ministry web page at http://www.env.gov.bc.ca/wsd/data_searches/field_sampling_manual/field_manual_03.html

4.3 **Analytical Procedures**

Analyses are to be carried out in accordance with procedures described in the "British Columbia Laboratory Manual (2009 Permittee Edition)", or the most recent edition, or by suitable alternative procedures as authorized by the Director.

A copy of the above manual is available on the Ministry web page at www.env.gov.bc.ca/epe/wamr/labsys/lab_meth_manual.html.

4.4 **Waste and Recyclable Materials Recording**

The operational certificate holder must record the quantity, in tonnes, of waste, recycling, and return collection received at the landfill. Also, the quantity of recyclable materials and household hazardous waste removed from these facilities must be recorded.

4.5 **Records Management**

The operational certificate holder must maintain the following information and records, current and suitably tabulated, at the landfill office or Regional District office for inspection:

- A copy of Operational Certificate 106060;
- Training procedures and personnel training records;
- Contingency plans and notification procedures;
- The current design and operating plan;
- Inspection records from staff and regulatory agencies;
- Most recent hydrogeological, geotechnical and landfill gas assessments;

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for Director, *Environmental Management Act*
South Coast Region

- Incoming waste and soil records;
- Records of recyclable material and household hazardous wastes shipped offsite including the name of company and location the recyclable material and household hazardous waste is sent;
- Environmental monitoring results and interpretations;
- Records of commercial quality soil used as cover material identified in Section 3.5 along with records of soil shipped offsite; and
- Annual operating and monitoring reports for the previous 5 years.

4.6 **Reporting**

The operational certificate holder must prepare an annual report which must include, but is not limited to, the following:

- A review and interpretation of the analytical data from receiving environment monitoring for the calendar year;
- Summaries of waste and recyclable material records, with the amount of waste landfilled reported as a volume and tonnage;
- Summary of recyclable material and household hazardous wastes shipped offsite including the name of company and location the recyclable material and household hazardous waste is sent;
- Summary of amount of commercial quality soil brought onsite;
- Updated estimates for the remaining capacity, closure date for the current phase and closure date for the current landfill footprint;
- Results of the annual survey required under Section 2.12;
- An evaluation of leachate generation control measures;
- Results of the landfill gas monitoring;
- Revised closure/post closure costs, confirmation of sufficient funds available, and a statement of the current dollar value of the Closure Fund and the amount earmarked for the Sechelt Landfill site;
- Revised design and operating plan and planned improvements if applicable for minor revisions;
- Revised environmental monitoring program;
- Identification of operating problems and corrective actions taken;
- An evaluation of the recycling programs including waste diversion;
- Summary of public complaint/resolutions for the landfill;
- In the event of any non-compliance with the conditions of this operational certificate, an action plan and schedule to achieve compliance; and

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for Director, *Environmental Management Act*
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- The results of all monitoring programs as specified in this Operational Certificate. Data interpretation and comparison to the performance criteria in the Landfill Criteria for Municipal Solid Waste, the Guidelines for Environmental Monitoring and Municipal Solid Waste Landfills. Trend analyses, as well as an evaluation of the impacts of the discharges on the receiving environment in the previous year must be carried out by a qualified professional.
- Monitoring data must be entered into EMS – Environmental Monitoring System electronically and submitted in electronic and printed format satisfactory to the Regional Director.

The annual report for the preceding 12 month period from January 1 to December 31 must be submitted to the Regional Director, Environmental Protection, by **March 31** of each year.

5. CLOSURE AND POST-CLOSURE REQUIREMENTS

5.1 Closure Plan / Funding

The operational certificate holder must accrue, during the life of the landfill, a dedicated reserve fund in a form acceptable to the Director, sufficient to finance closure and environmental contingencies related to the landfill. The estimated cost of carrying out closure and how the fund will be accrued must be included in the design and operating plan required in Section 2.1. The estimated costs of closure and post-closure activities must be updated annually and submitted to the Director as part of the annual report required in Section 4.6. Should the estimated costs of closure and post-closure increase then the operational certificate holder must increase the rate of accrual as

5.2 Progressive Closure

The operational certificate holder must submit a closure plan as part of a Design and Operating Plan for the facilities authorized in Section 1 by **December 31, 2015** acceptable to the Director. The plan must be reviewed and updated every 5 years as part of the Design and Operating Plan or until the site is decommissioned and a closure-plan under Section 5.3 is approved. The plan must be prepared by an independent qualified professional and include information regarding:

- Phasing plan showing areas to be progressively closed.
- Estimated total waste volumes and tonnage and the closure date;

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- A topographical plan showing the final elevation contours of the landfill and surface water diversion and drainage controls;
- Design of the final cover including the thickness and permeability of barrier layers and drainage layers and information on topsoil, vegetative cover and erosion prevention controls;
- Rodent and nuisance wildlife control procedures;
- Proposed end use of the property after closure;
- A post-closure monitoring program for groundwater, surface water, landfill gas, erosion and settlement for a minimum period of 25 years;
- Post-closure operation of pollution abatement engineering works such as leachate and landfill gas collection/treatment systems for a minimum period of 25 years; and
- Contingencies to address environmental impact concerns which may arise during the minimum post-closure period of 25 years.

5.3 **Post-Closure Operation and Maintenance**

A post-closure plan must be submitted not less than 2 years prior to decommissioning of the landfill. The closure plan must be reviewed every 5 years following closure and updated to encompass the next 10 years of post-closure activities. The post-closure plan and subsequent updates must be prepared by an independent qualified professional licensed to practice in the province of British Columbia and knowledgeable in such matters. The post-closure plan and subsequent updates must be submitted to the Director for approval and must include at least the following:

- a complete review and assessment report of the overall integrity of the landfill,
- Procedures for notifying the public about the closure and alternative waste disposal facilities;
- a detailed timetable for post-closure procedures and correction of any deficiency identified in the review and assessment report,
- a detailed schedule of inspection, monitoring and maintenance to be carried out for a minimum post-closure period of 25 years, and
- a process for the administration of the post-closure security fund required under Section 5.1 of this operational certificate.

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for Director, *Environmental Management Act*
South Coast Region

5.4 **Declaration of Landfill**

Landfills sited on titled land must register a covenant that the property was used for the purpose of waste disposal as a charge against the title to the property as provided for under Section 219 (1) of the *Land Title Act*. Landfills located on crown land are to have a "notation on file" registered that the property was used for the purpose of waste disposal. The registration of the charge or legal notification is to be submitted to the Regional Director.

5.5 **Site Decommissioning**

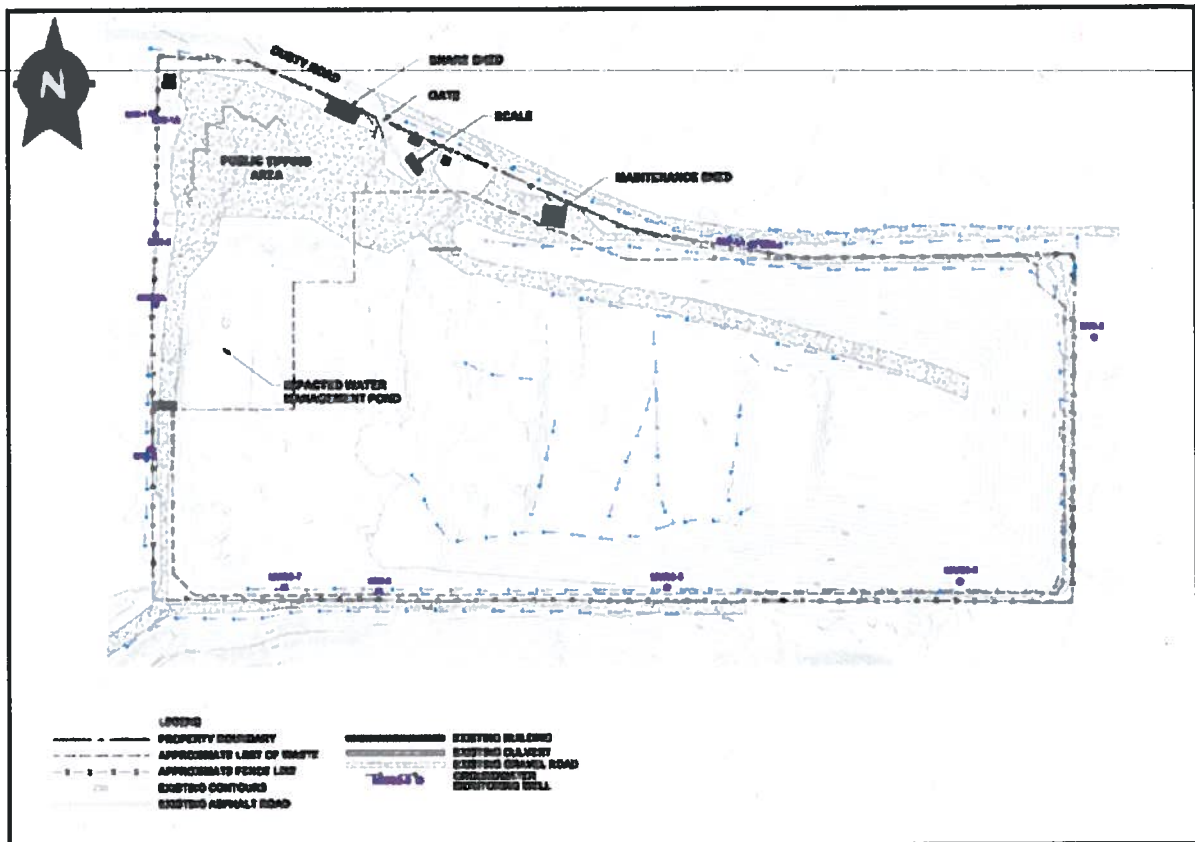
In accordance with Section 40 of the *Environmental Management Act* and Part 2 of the Contaminated Sites Regulation, the operational certificate holder must submit a site profile to the Director not less than 10 days prior to decommissioning the facilities authorized in Section 1.

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Avtar S. Sundher BSc.
for Director, *Environmental Management Act*
South Coast Region

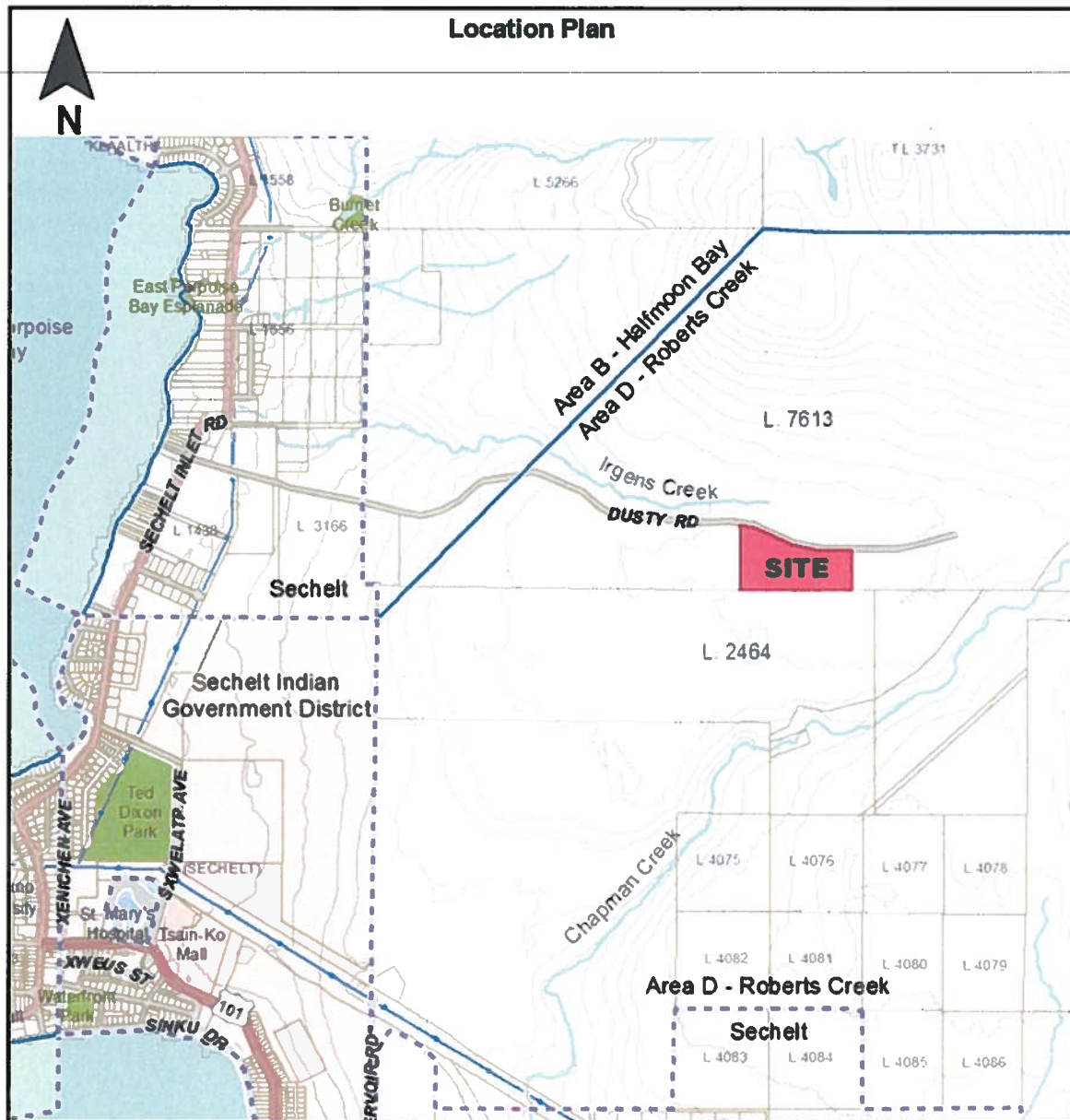
SITE PLAN A



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South Coast Region

SITE PLAN B

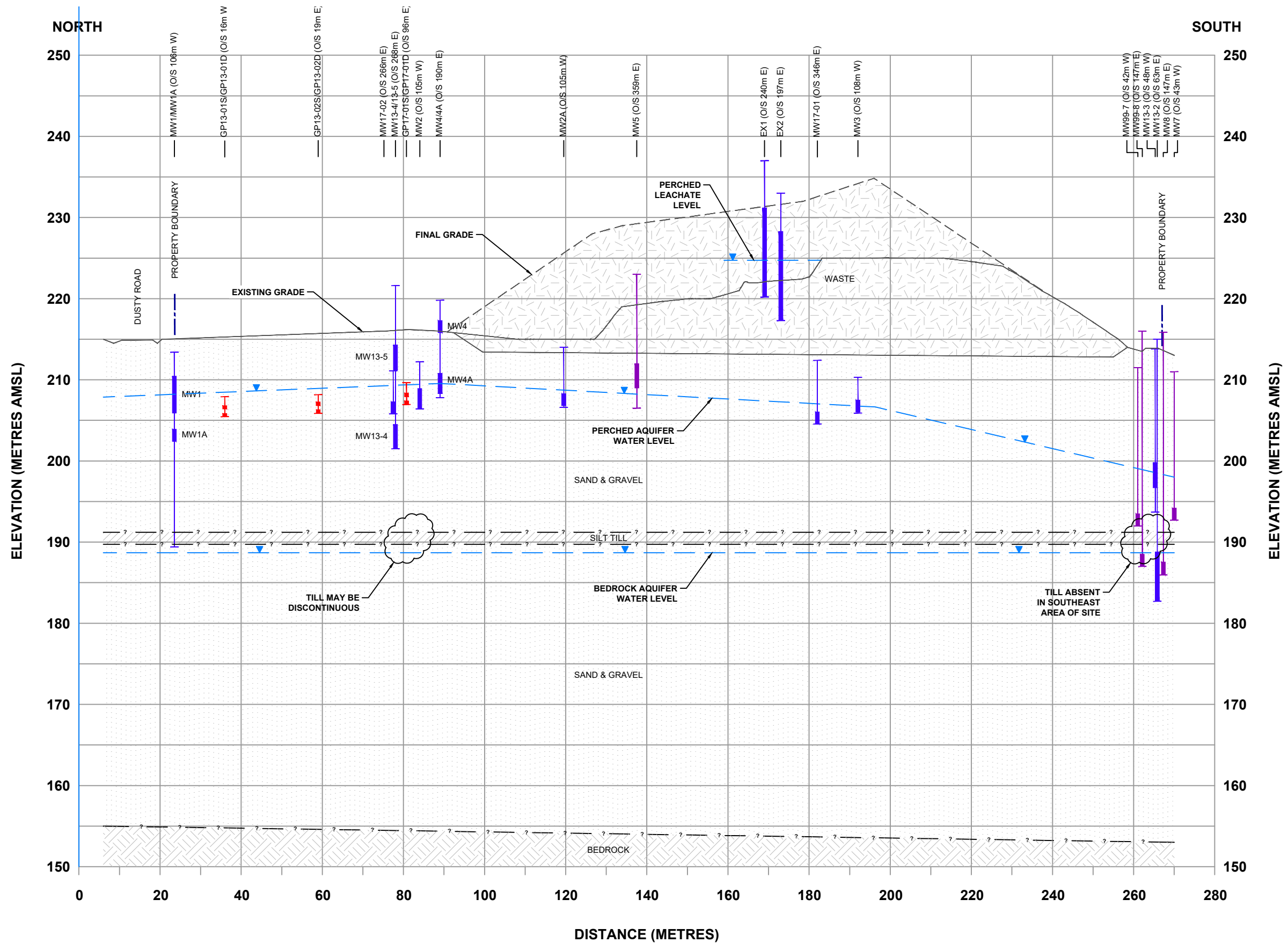


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for Director, *Environmental Management Act*
South Coast Region



APPENDIX B
HISTORIC STRATIGRAPHIC LOGS AND GEOLOGIC CROSS-SECTION



LEGEND

- EXISTING GROUNDWATER MONITORING WELL
- DECOMMISSIONED GROUNDWATER MONITORING WELL
- EXISTING LFG MONITORING WELL

GEOLOGICAL CROSS-SECTION		
SECHULT LANDFILL SUNSHITE COAST REGIONAL DISTRICT		
DATE	JOB NO.	FIGURE NO.
AUG. 2020	4-2111-01-65	B-1

SHEET: R421110165001AppB1.pdf
FILE: R421110165001AppB1.dwg

**DAYTON & KNIGHT LTD.***Consulting Engineers*P.O. BOX 91247, (612 CLYDE AVENUE), WEST VANCOUVER, BRITISH COLUMBIA, CANADA V7V 3N9
TELEPHONE: (604) 922-3255 FAX: (604) 922-3253

July 29, 1993

Mr. S. K. Lehmann
Superintendent of Public Works
Sunshine Coast Regional District
P.O. Box 800
5477 Wharf Road
Sechelt, B.C.
V0N 3A0

Attention: Ms. Cathy Kenny
Solid Waste Management Coordinator

Dear Ms. Kenny:

Re: **Monitoring Well Installation**
Sechelt Landfill

This letter documents Dayton & Knight's installation of groundwater monitoring wells, with the assistance of SDS Drilling Ltd. at the above site, and the descriptions of the wells.

1.0 PROCEDURE

A total of nine (9) groundwater monitoring wells were installed between July 21 and 23, 1993. Three deep wells were constructed. The depth of these wells is approximately 15 m from the ground surface. The rest of the wells are shallow and have the depth of 4 to 5 m. The two deep wells were each nested with a shallow well. The locations of the wells are illustrated on Figure 1.

Installation of the wells was carried out by using a Becker Hammer drill. A piledriving hammer advanced a casing of double wall construction. During driving, compressed air was continuously forced down the annulus between the walls and returned up through the centre of the casing carrying the soil up to the surface through the air induced cyclone. This ensured that the boreholes, in which the wells were installed, were not contaminated.

The boreholes were driven to depths of about 4.0 m to 23.5 m below ground surface. The advancement of deep wells was stopped when a white, fine, dry, well-compacted, low impervious silt layer was encountered. Soil samples in the boreholes were collected from the cyclone. The casing of Becker Hammer was steam-cleaned between well installations to minimize cross-contamination of the installations.

- 2 -

The wells consist of 50 mm diameter schedule 40 PVC pipes with threaded couplings. The lower 1.5 m of each well consists of 0.010 inch width, 0.250 inch spacing slotted 50 mm diameter schedule 40 PVC pipe with threaded couplings. The screened portions of the wells were surrounded with Grade 16 silica sand. Bentonite chips were placed above and below the screen portion of each shallow well, as well as at 1 m below the ground surface, for all wells to prevent contamination infiltration. The portions above the screen were backfilled with selective native granular soils. Dedicated 5/8" HDPE tubing was installed with foot valve attached on the bottom in each well for sampling.

The location of the installed wells is to be determined by survey. The groundwater level of the wells is to be determined on initial sampling.

The well installation was carried out under the full-time supervision by Mr. John Lee of Dayton & Knight Ltd., who logged the well installations.

2.0 WELLS

The detailed records of the well installations and the soil strata encountered at the well locations are presented on the Record of Borehole sheets following this text.

The well installation depths and the screened strata are summarized as follows:

Well No.	Type	Depth of Well (m)	Strata Screened
1	Nested (deep)	11.2	Silty sand
1A	Nested (shallow)	5.03	Silty sand
2	Shallow	5.77	Silty sand
2A	Shallow	7.06	Medium sand
3	Shallow	4.27	Silty sand
4	Nested (deep)	11.50	Compacted sandy silt
4A	Nested (shallow)	4.04	Silty sand
5	Deep	14.3	Sandy silt
6	Shallow (gas)	8.38	Silty sand

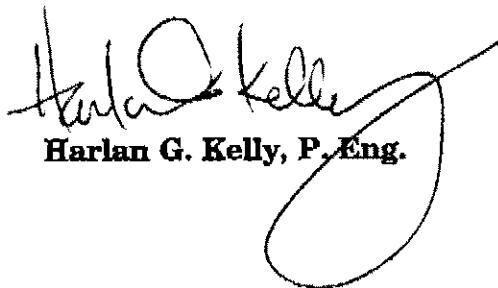
As recommended, quarterly sampling should be undertaken in accordance with Ministry of Environment requirements to determine if leachate is leaving the landfill. Analysis of the results will determine extent of required improvements.

- 3 -

We trust that this report provides the information required at this time. If you have any questions regarding the above, please do not hesitate to contact us.

Yours truly,

Dayton & Knight Ltd.

A handwritten signature in black ink, appearing to read "Harlan G. Kelly", is written over the typed name. The signature is fluid and cursive, with a large loop at the end.

Harlan G. Kelly, P. Eng.

JL:aa
28.146
Encl.

RECORD OF BOREHOLE MW 1 and 1A

ELEV.	DESCRIPTION	STRATIGRAPHY PLOT	STANDPIPE INSTALLATION
DEPTH (meters)			
	Ground surface		
0.0	Top soil organics, fine to medium, brownish (Tan) Loose compacted silty sand		
0.6	Moist, Medium compacted light brownish grey silty Sand, trace few fine gravel		 Bentonite Seal Native Sand Backfill. Silica Sand Grade 16 MICRO slot Screen
6.5	Medium compacted, moist to wet, fine to medium, silty to washed clean, medium to dark grey sand		
9.5			

Cont'd on sheet 2 of 3

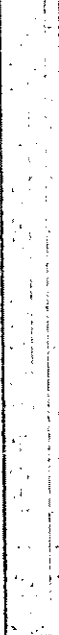
Sheet 1 of 3

Location (See Figure 1) Boring Date July 21, 1993
 Borehole Type: Becker Ham. Borehole Dia. 6 3/8"
 Vertical Scale: 1:50 Datum: Geodetic

DAYTON & KNIGHT LTD.
 CONSULTING ENGINEERS

DATE July 28, 1993 SKETCH No. _____ ISSUE _____
 DRAWN J.H.S. DRAWING No. 28.146

RECORD OF BOREHOLE MW 1 and 1A

ELEV.	DESCRIPTION	STRATIGRAPHY PLOT	STANDPIPE INSTALLATION
DEPTH (meters)			
	Cont'd from Sheet 1		
	Medium compacted, Wet to Very wet, fine to medium, silty to medium clean, brownish grey Silty sand, trace fine gravel.		 Micro Slot Screen. Silica Sand.
12.0	Wet, fine, medium Compacted, brownish grey, silty silt.		 Native Sand.
16.3	Moist, fine, grey, medium compacted, silt.		
17.8	Moist, fine to medium, medium compacted, grey, Sandy silt, trace fine gravel.		

Cont'd on Sheet 3 of 3

Sheet 2 of 3

Location (See Figure 1) Boring Date : July 21, 1993
 Borehole Type : Becker Ham. Borehole Dia. : 6 3/8"
 Vertical Scale : 1 : 50 Datum : Geodetic

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 CONSULTING ENGINEERS

DATE July 28, 1993 SKETCH No. _____ ISSUE _____
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RECORD OF BOREHOLE MW 1 and 1A

ELEV.	DESCRIPTION	STRATIGRAPHY PLOT	STANDPIPE INSTALLATION
DEPTH (meters)			
	Cont'd from Sheet 2		
20.5	Fine, moist to dry, very densely compacted, brownish grey silt, trace fine gravel.		
23.4	Very fine, dry, powder, light grey, dense, silty till		
24.0	End of Borehole		

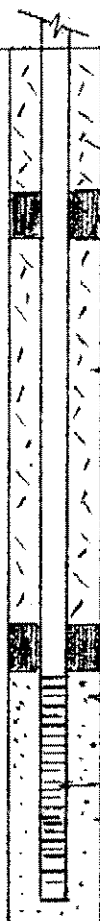
Sheet 3 of 3

Location (See Figure 1) Boring Date: July 21, 1993
 Borehole Type: Becker Ham. Borehole Dia.: 3 5/8"
 Vertical Scale: 1:50 Datum: Geodetic

DAYTON & KNIGHT LTD.
 CONSULTING ENGINEERS

DATE July 28, 1993 SKETCH No. _____ ISSUE _____
 DRAWN JHL DRAWING No. 28.146

RECORD OF BOREHOLE MW 2

ELEV.	DESCRIPTION	STRATIGRAPHY PLOT	STANDPIPE INSTALLATION
DEPTH (meters)			
	Ground Surface		
0.0	Tan Brownish grey, light compacted, fine to medium silty sand, trace gravel		
1.0	Brownish to light grey, medium compacted, moist, uniform medium silty sand, trace fine gravel.		 Bentonite seal Native sand backfill Silica sand Micro slot screen
3.3	Moist to medium wet, fine to medium, medium compacted, medium to light grey silty sand, trace fine gravel.		
5.9	End of Borehole		

Sheet of

Location (See Figure 1) Boring Date: July 21, 1993
 Borehole Type: Becker Ham. Borehole Dia.: 6 5/8"
 Vertical Scale: 1:50 Datum: Geodetic

DAYTON & KNIGHT LTD.
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DATE July 28, 1993 SKETCH No. _____ ISSUE _____
 DRAWN JHL DRAWING No. 28.146

RECORD OF BOREHOLE MW 2A

ELEV.	DESCRIPTION	STRATIGRAPHY PLOT	STANDPIPE INSTALLATION
DEPTH (meters)			
	Ground Surface		
0.0	Tan brownish grey, light Compacted, fine to medium Silty Sand, trace fine gravel		
1.0	Brownish to light grey, Medium Compacted, moist, Silty Sand		
3.3	Moist to medium wet, medium compacted, fine to medium, light to medium grey, silty Sand, trace fine gravel		
5.9	Medium compacted, moist to wet, fine to medium, Silty to washed, medium to dark grey sand		
7.4	End of Borehole		

Sheet 1 of 1

Location (See Figure 1) Boring Date : July 23, 1993
 Borehole Type : Becker Ham. Borehole Dia. : 6 5/8"
 Vertical Scale : 1 : 50 Datum :

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DATE July 28, 1993 SKETCH No. _____ ISSUE _____
 DRAWN J.V.L. DRAWING No. 28.146

RECORD OF BOREHOLE MW 4 and 4A

ELEV.	DESCRIPTION	STRATIGRAPHY PLOT	STANDPIPE INSTALLATION
DEPTH (meters)			
	Ground Surface		
0.0	Moist, medium compact, light brownish grey, Silty Sand, trace fine gravel.		
2.5	Moist, powder to fine, brownish grey, uniform, Medium compacted, Silty Sand, trace some fine gravel.		
5.4	Moist, fine to medium, dark grey, medium compacted, dusty silty Sand		
6.5	Moist to dry, fine, brownish grey, heavily compacted, sandy silt, trace boulders and fine gravel		
9.3	Dry, fine, light grey, heavily compacted silt.		

Cont'd on sheet 2 of 2

Sheet 1 of 2

Location (See Figure 1) Boring Date : July 23, 1993
 Borehole Type : Becker Ham, Borehole Dia. : 6 5/8"
 Vertical Scale : 1 : 50 Datum :

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DATE July 28, 1993 SKETCH No. _____ ISSUE _____
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JUL 29 '93 04:00PM DAYTON KNIGHT

P.11/15

RECORD OF BOREHOLE MW 4 and 4A

ELEV.	DESCRIPTION	STRATIGRAPHY PLOT	STANDPIPE INSTALLATION
DEPTH (meters)			
	cont'd from sheet 1		
	Trace boulders and fine gravel	1. < >	
10.6	Dark grey, dry, heavily compacted, sandy silt, trace fine gravel		
12.0	End of Borehole		

Sheet of

Location (See Figure 1) Boring Date : July 23, 1993
 Borehole Type : Becker Ham. Borehole Dia. : 6 5/8"
 Vertical Scale : 1 : 50 Datum :

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 DRAWN JKL DRAWING No. 28.146

RECORD OF BOREHOLE

M W 5 (Gas)

ELEV.	DESCRIPTION	STRATIGRAPHY PLOT	STANDPIPE INSTALLATION
DEPTH (meters)			
	Ground Surface		
0.0	Light brownish to grey, medium to fine, light to medium compacted, moist, silty sand. trace large sand		
4.0	Light to medium compacted, moist to dry, brownish to light grey, uniform medium fine, silty sand, trace large sand.		
7.2	Dry, dense, brownish grey, fine sandy silt trace fine gravel.		
8.1	Fine, dry, dense, grey Sandy silt. trace fine to medium gravel		

Native Sand backfill

Cont'd on sheet 2 of 2

Sheet 1 of 2

Location (See Figure 1) Boring Date : July 23, 1993
 Borehole Type : Becker Ham. Borehole Dia. : 6 5/8"
 Vertical Scale : 1 : 50 Datum :

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DATE July 23, 1993 SKETCH No. _____ ISSUE _____

RECORD OF BOREHOLE MW 5 (Gas)

ELEV.	DESCRIPTION	STRATIGRAPHY PLOT	STANDPIPE INSTALLATION
DEPTH (meters)			
	cont'd from sheet 1		
11.0	Light brownish grey, fine to medium, dry, dense, dusty, Sandy silt trace fine gravel		 Bentonite Micro slot screen Silica Sand
14.7	Powder to fine, very dense, dusty, dry, white, silty sand trace boulders		
16.5	End of Borehole Note: Fire bombs were dropped to determine Water @ 11.2 m and 16.5 m		

Sheet 2 of 2

Location (See Figure 1) Boring Date :
 Borehole Type : Becker Ham. Borehole Dia. :
 Vertical Scale: 1 : 50 Datum :

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DATE July 28, 1993 SKETCH No. _____ ISSUE _____
 DRAWN JHL DRAWING No. 28.146

RECORD OF BOREHOLE MW 6

ELEV.	DESCRIPTION	STRATIGRAPHY PLOT	STANDPIPE INSTALLATION
DEPTH (meters)			
0.0	Ground Surface		
0.0	MEDIUM COMPACTED; MOIST, LIGHT BROWNISH TO LIGHT GRAY, UNIFORM FINE TO MEDIUM SILTY SAND TRACE OF FEW FINE GRAVEL		Native backfill
4.5	MOIST, BROWNISH TO GRAY; FINE TO MEDIUM, MEDIUM COMPACTED SILTY SAND TRACE OF SOME COARSE SAND		manually slotted on site. 6 in spacing

Cont'd on sheet 2 of 2

Sheet 1 of 2

Location (See Figure 1) Boring Date : July 22, 1993
 Borehole Type : Becker Ham. Borehole Dia. : 6 5/8"
 Vertical Scale : 1 : 50 Datum :

DAYTON & KNIGHT LTD.
 CONSULTING ENGINEERS

DATE July 28, 1993 SKETCH No. _____ ISSUE _____

RECORD OF BOREHOLE MW 6

ELEV.	DESCRIPTION	STRATIGRAPHY PLOT	STANDPIPE INSTALLATION
DEPTH (meters)			
	Cont'd from sheet 1		
10.3	MOIST TO DRY, LIGHT BROWNISH GRAY MEDIUM COMPACTED SANDY SILT, TRACE OF COARSE SAND		
12.5	MEDIUM TO LIGHT BROWNISH GRAY, MOIST TO DRY, UNIFORMLY FINE, DENSELY COMPACTED SANDY SILT. TRACE OF COARSE SAND.		Native backfill
16.0	NOTE: ADVANCEMENT WAS STOPPED WHEN SIMILAR SOIL FORMATION ENCOUNTERED AS MW1		

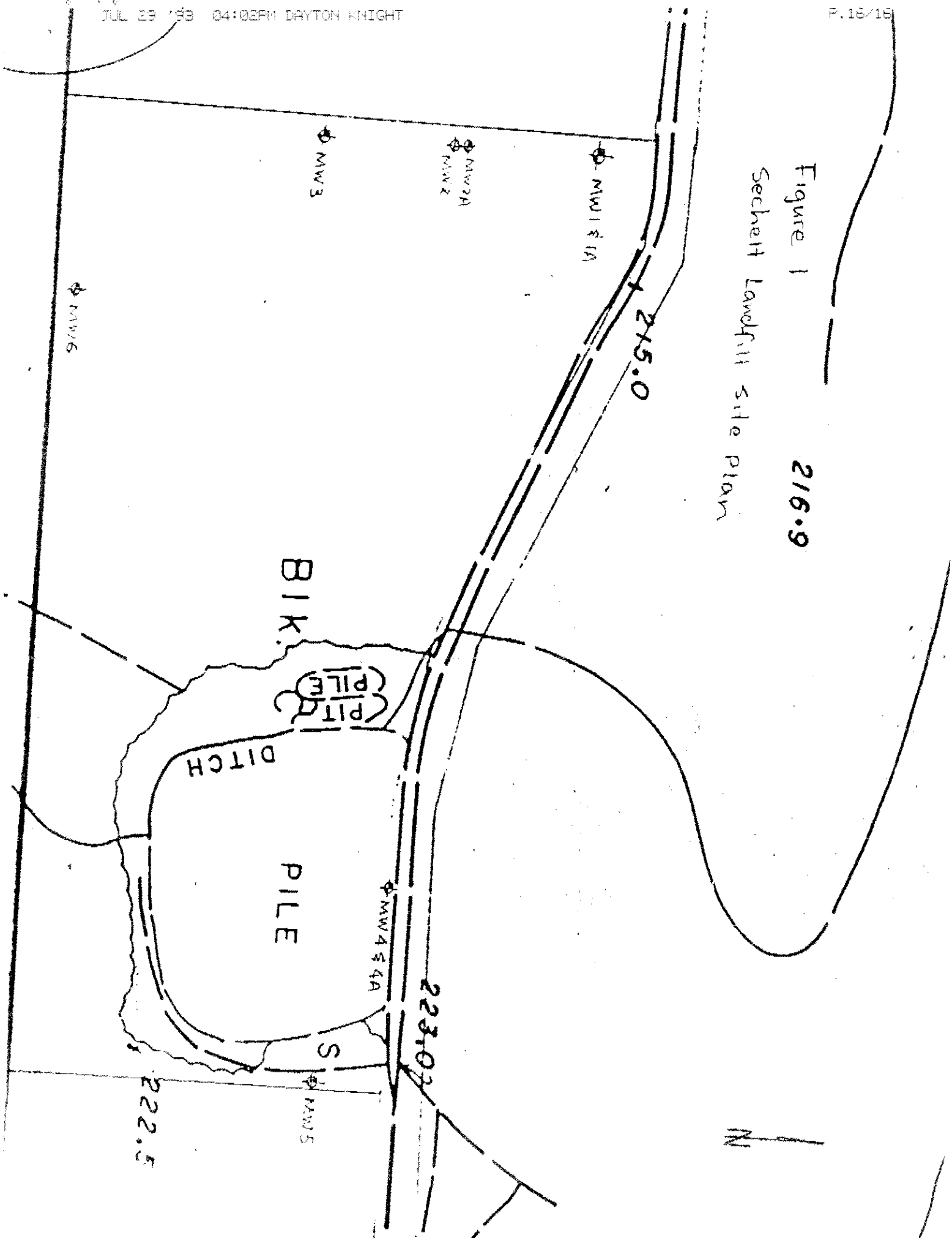
Sheet 2 of 2

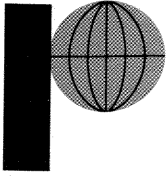
Location (See Figure 1) Boring Date : July 28, 1993
 Borehole Type : Becker Ham. Borehole Dia. : 3 3/8"
 Vertical Scale : 1 : 50 Datum :

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DATE July 28, 1993 SKETCH No. _____ ISSUE _____
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Figure 1
Sechealt Landfill site plan





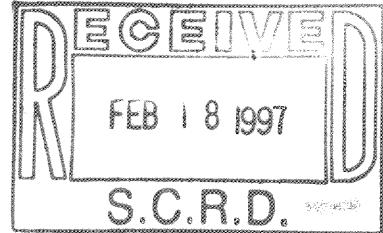
PITEAU ASSOCIATES

GEOTECHNICAL AND
HYDROGEOLOGICAL CONSULTANTS

215 - 260 WEST ESPLANADE
NORTH VANCOUVER, B.C.
CANADA V7M 3G7
TELEPHONE (604) 986-8551
FAX (604) 985-7286

Our file: 1647

February 12, 1996



Sunshine Coast Regional District
5477 Wharf Road
Box 800
Sechelt, B.C.
V0N 3A0

Attention: Ms. Cathy Kenny
Solid Waste Management Co-ordinator

Dear Sirs:

Re: Design and Installation of New Monitoring Wells
Sechelt Landfill, Sunshine Coast Regional District

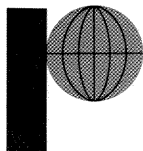
As requested in Mr. Sieg Lehmann's letter to Mr. Agris Berzins of Dayton & Knight Ltd., dated October 9, 1996, Piteau Associates Engineering Ltd. (Piteau) has expedited and supervised the construction of three new monitoring wells at the Sechelt Landfill. The scope of our services for this project included:

- Review of water level and chemistry monitoring data to determine required depth and preferred location of wells on southern boundary of site,
- Site visit to perform electromagnetic (EM) survey, to select well sites, and to make arrangements for access preparation,
- Necessary arrangements for drilling contractor to construct new wells,
- Supervision of well construction program,
- Well development and initial sampling, and
- Preparation of well logs and well completion report.

A description of the work performed and the results of the EM study and initial sampling suite are presented herein.

EM-34 SURVEY

Piteau performed a terrain electrical conductivity survey. A Geonics EM-34 was used for the survey at the Sechelt Landfill on November 21, 1996. This instrument involves two people traversing the survey area with two electromagnetic coils: one to transmit and a second to receive. By varying the spacing between the two coils, the apparent electrical conductance of the ground can be measured at depths varying up to 30m. The purpose of the survey was to detect changes in ground conductivity that would be indicative of the presence of highly conductive leachate plumes in the groundwater beneath the site.



Sunshine Coast Regional District
Attention: Ms. Cathy Kenny
Solid Waste Management Coordinator

-2- February 12, 1997

Distances were measured by pacing, with fixed landmarks noted along the actual traverse lines to assist with locating anomalies. The approximate spacing between measurements was every 10m. The east and west traverse lines were compromised by dense forest, which required surveying closer to the fences than would otherwise be desirable.

Readings were taken using the vertical coil orientation (measures to 30m depth), and the horizontal coil orientation (measures to 15m depth). Horizontal readings were not performed on the west side traverse, as the proximity of the fence produced suspect readings.

East side

This traverse extended from south of the road ditch to just short of the southeast property corner (see location on Fig. 1). Several 0.3m deep ponds were encountered in this area. One anomaly was present (Fig. 2), suggesting a localized conductive source. Measurement accuracy in the latter half of the traverse was affected by the proximity of the fence. Monitoring well MW-5 does not appear to be in an anomalous area.

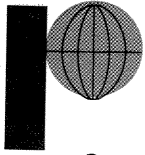
West side

The traverse was located inside the landfill property, between the toe of the refuse and the fence. This line was sited between the toe of the refuse and the fence, to minimize interference from either of these features. A uniform distance was maintained from the fence so that any contributory effects would be constant.

The survey indicated that higher conductivities are present adjacent to the toe of the landfill, and decline as distance from the landfill increases (Figs. 1 and 2). Monitoring well MW-3 is located within the higher conductance zone.

South Side

A single traverse was made across the southern boundary, at least 8m from the toe of the landfill. This is an open area with no fences parallel to the traverse. Two anomalous zones were identified, between 110 and 206m, and between 355 to 428m from the southeast property corner (Figs. 1 and 2). Drilling targets were identified at 205m and 390 from the southeast property corner. Only one monitoring well, MW-6, is present on this traverse, and is just outside an anomalous zone. It should be noted that the anomalies identified were not strong, but were interpreted to be associated with leachate, given their location on the downgradient side of the landfill, relative strength and broad distribution.



Sunshine Coast Regional District
Attention: Ms. Cathy Kenny
Solid Waste Management Coordinator

-3- February 12, 1997

MONITORING WELL DRILLING AND INSTALLATION

The monitoring well drilling and installation program was conducted on December 17 and 18, 1996 by Beck Drilling and Environmental Services Ltd. Three wells were drilled using a Becker Hammer drilling rig. All wells were drilled and cased with 4 inch (102 mm) I.D. double wall steel casing. Well locations are shown on Fig. 1.

Work was supervised by Mr. Chris Keith of Piteau. While on site, Mr. Keith logged drill cuttings, performed field water quality measurements and kept records of drilling progress and monitoring well construction details. Hydrogeologic logs and well completion details are shown in Appendix A.

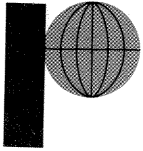
All three wells are located along the southern boundary of the landfill property line. Monitoring well MW-7 was drilled approximately 55m west of MW-6 at an EM-34 survey anomaly. Drilling encountered fine to coarse sand with some gravel and boulders to a depth of 8.8m. This was underlain by sand and gravel to gravel with some boulders to a depth of 18.0m. Drilling was terminated at 18.3m when a large boulder or bedrock was encountered. The sandy silt encountered from 18.0 to 18.3m was damp.

Monitoring well MW-8 was located roughly in the middle of the southern property line where the EM-34 survey indicated a second conductivity anomaly. Drilling encountered a complex series of fine to coarse sand and gravel layers to a depth of 29.9m. Silty sand was encountered from 2.7 to 3.4m, and there was evidence of a perched water table from 2.4 to 3.4m. Saturated soil was again encountered from 28.9 to 29.9m.

Monitoring well MW-9 was located in the southeast corner of the property, near GP-4. A complex series of fine to coarse sand and fine to coarse gravel was encountered to a depth of 26.0m. Soils were unsaturated to a depth of 24.5m.

Field electric conductivity measurements were taken for water samples blown to surface with the drill cuttings from saturated zones. These measurements are reported on the logs in Appendix A.

All screened intervals were located in the bottom 1.52m (5 ft.) of the drilled holes, with a sand filter pack set between the bottom of the hole and a point 3.1 to 3.8m above the bottom of the hole. A bentonite seal, ranging from 3.1 to 3.5m thick, was placed above the filter sand. The holes were then backfilled with drill cuttings to just below grade, where a thin bentonite seal (0.2 to 0.5m) was placed, followed by a flush mounted well casing set in concrete. MW-8 had an



Sunshine Coast Regional District
Attention: Ms. Cathy Kenny
Solid Waste Management Coordinator

-4- February 12, 1997

additional bentonite seal placed between 2.4 to 4.6m below grade, where perched water was encountered during drilling.

WELL DEVELOPMENT AND SAMPLING

Development and sampling of the three new monitoring wells was conducted on January 8, 1997. The purge volume required for the monitoring wells was calculated as three well volumes, based on water level measurements taken that same day. Electrical conductivity of the water withdrawn from the wells was also monitored, to ensure that it had stabilized prior to sample collection.

Water was withdrawn using new disposable plastic bailers and nylon twine. A plastic sheet was placed around the well to coil the twine on as the bailer was pulled from the well. Once purging was complete, the field EC, pH and temperature were recorded, and appropriate sample containers were filled. Disposable latex gloves were used during the sampling procedure.

Samples were placed in a cooler with ice, and were delivered to Analytical Services Laboratories Ltd. of Vancouver on January 9, 1997.

INTERPRETED GROUNDWATER FLOW REGIME

Groundwater beneath the site is interpreted to flow in a dominantly southward direction (Fig. 1). Flows may be perched on low permeability sediments which underlie the landfill area, but these low permeability sediments do not appear to extend south of the landfill property, where permeable sediments were noted to continue to depths of 29 to 26m in MW- 8 and MW-9, respectively.

The water table shows a very steep gradient to the south, and the equipotential contours indicate groundwater flows trend towards MW-8, where the depth of permeable sediments appears to be greatest (Fig. 1).

SAMPLING RESULTS

The first suite of sample results indicate that groundwater beneath the south landfill perimeter has been significantly impacted by leachate. COD, manganese and chloride concentrations are elevated in all three wells. Manganese exceeds the acceptable drinking water concentration of 0.05 mg/L (Health & Welfare, 1996) in all three wells, but chloride only exceeds the acceptable limit of 250 mg/L in MW-9 (Table I). Similarly, total nitrogen levels are low (<2 mg/L-N) in MW-7 and MW-8, but ammonia levels are very high (127 mg/L-N) in MW-9. The high ammonia levels indicate that very little nitrification is occurring in the unsaturated zone beneath the east end of



Sunshine Coast Regional District
Attention: Ms. Cathy Kenny
Solid Waste Management Coordinator

-5- February 12, 1997

the landfill, which suggests a fairly rapid infiltration rate to the water table. Conditions may be more favourable for subsurface renovation of leachate beneath the western portions of the landfill, as the first suite of samples indicates water quality is generally better in MW-7 and MW-8 than in MW-9.

RECOMMENDATIONS

Water level measurements and water quality sampling should continue on a bi-monthly or quarterly schedule, to properly define the leachate impact and groundwater flow regime on the south side of the landfill. A suite of samples collected in the late summer or early fall should be submitted for a detailed chemical analysis, and the remaining samples should be submitted for a reduced suite. A suggested list of parameters for both the detailed and reduced suites is included as Table II.

Water levels should be measured prior to purging and sampling. The new wells should be purged by removing two well volumes prior to sample collection. Due to the depth to water in the new wells, they should be sampled with either 2m long bailers or a 50mm diameter submersible pump. If a submersible pump is used, dedicated delivery tubes should be left in each well.

We trust this report presents the information you require regarding the three new monitoring wells at the Sechelt Landfill, and our recommendations for sampling these new installations. If you have any questions regarding this report, or require any additional assistance with the regular monitoring program, please contact us.

Yours very truly,

PITEAU ASSOCIATES ENGINEERING LTD.

Andrew T. Holmes, P.Eng.

ATH/ef

Att.

c: Daryl Sinclair, Dayton & Knight Ltd.

TABLES

TABLE I
SUMMARY OF LABORATORY CHEMISTRY DATA
FOR NEW MONITORING WELLS

Parameter	Units/ Symbols	MW-7 Jan 8/1997	MW-8 Jan 8/1997	MW-9 Jan 8/1997	GCDWQ	
					Maximum Acceptable	Objective
Physical Tests						
pH - field	µS/cm C°	6.69	6.92	6.63	-	-
EC - field		1190	940	3080		
Temp - field		11.9	10.6	10.7		
Colour - field		med. grey/br	lt. grey/br	med. grey/br		
Odour - field		none	none	faint		
pH - Lab	µS/cm NTU	6.82	6.44	6.57	6.5 - 8.5	-
EC - Lab		1420	1150	3740	-	-
Turbidity		28500	1650	2930	5	-
Dissolved Anions (mg/L)						
Alkalinity	CaCO ₃	576	454	1250	-	-
Chloride	Cl	121.0	112.0	298.0	250	250
Sulphate	SO ₄	5.7	6.7	4.1	500	500
Dissolved Cations (mg/L)						
Calcium	Ca	182	147	329	-	-
Magnesium	Mg	38.0	20.5	43.9	-	-
Potassium	K	12	6	27	-	-
Sodium	Na	75	53	180	-	-
Dissolved Metals (mg/L)						
Arsenic	As	0.0023	0.0009	0.0099	0.025	0.005
Barium	Ba	0.29	0.0500	0.68	1	0.1
Boron	B	<0.1	<0.1	<0.1	5	0.01
Cadmium	Cd	0.0002	0.0017	<0.0002	0.005	0.001
Iron	Fe	0.10	0.07	28.5	0.30	0.050
Lead	Pb	<0.001	<0.001	0.002	0.01	0.001
Manganese	Mn	38.0	20.5	43.9	0.05	0.010
Mercury	Hg	<0.00005	<0.00005	<0.00005	0.001	0.0002
Nutrients (mg/L)						
Nitrate	N	0.0070	0.0160	<0.005	10	0.001
Nitrite	N	0.003	0.009	0.018	1	0.001
Ammonia Nitrogen	N	1.38	0.70	127	-	-
Total Kjeldahl Nitrogen	N	1.84	0.72	132	-	-
Total Phosphate	P	0.197	3.2	6.16	-	-
Pollutant Tests (mg/L)						
Chemical Oxygen Demand	COD	6260	373	809	-	-
Dissolved Organic Carbon	C	29.8	92.6	32.0	-	-

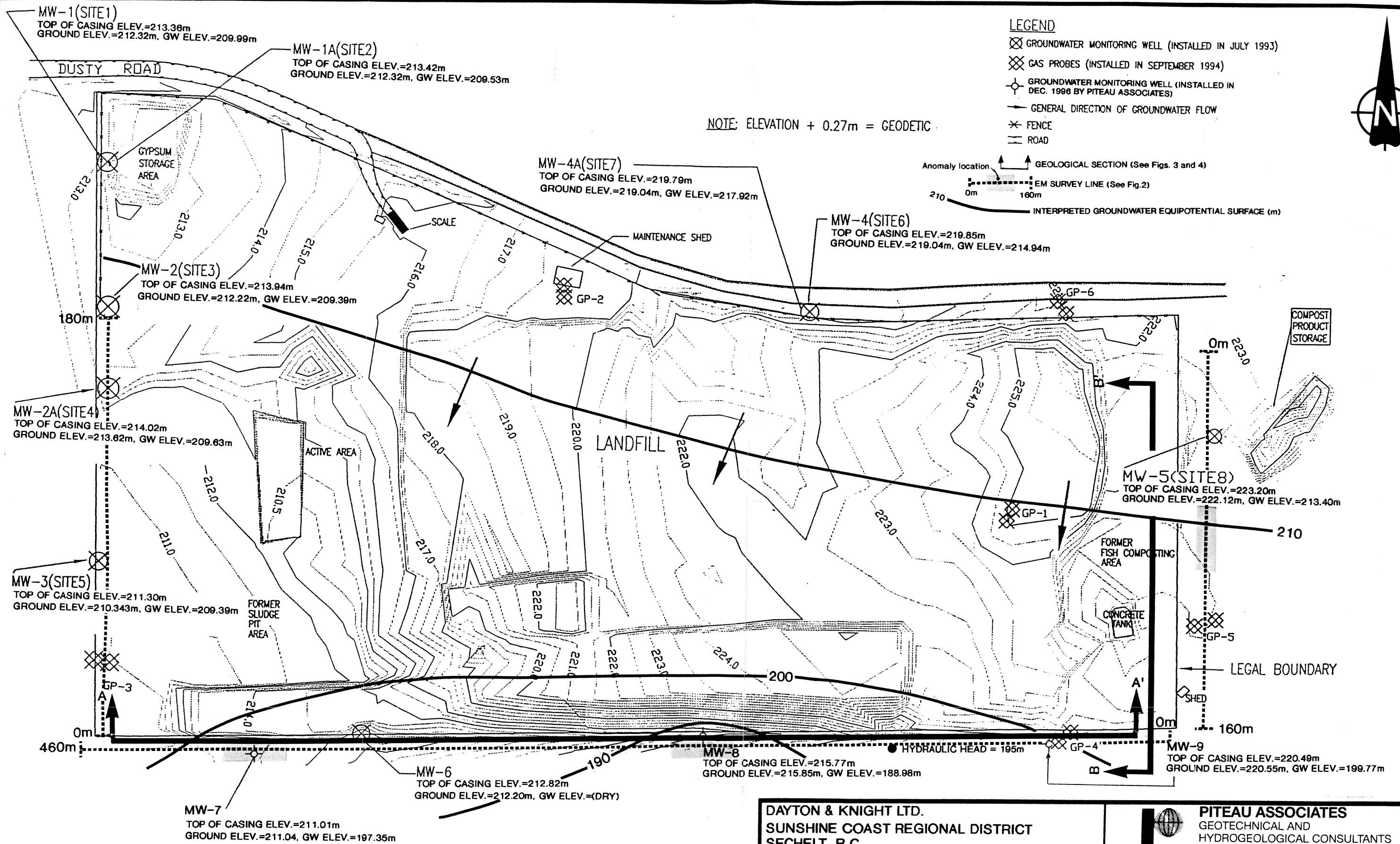
NOTES:

1. < = Less than detection limit
2. GCDWQ = Guidelines for Canadian Drinking Water Quality
3. Bolding indicates those parameters that exceed the GCDWQ criteria, or which are cause for concern.

TABLE II
RECOMMENDED WATER QUALITY ANALYSIS SUITES

Analytes for detailed suite (Once per year)	Analytes for reduced suite (Three to five times per year)
Physical Tests pH - field EC - field Temp - field Colour - field Odour - field pH - Lab EC - Lab Turbidity	Physical Tests pH - field EC - field Temp - field Colour - field Odour - field pH - Lab EC - Lab Turbidity
Dissolved Anions (mg/L) Alkalinity Chloride Sulphate	Dissolved Anions (mg/L) Chloride Sulphate
Dissolved Cations (mg/L) Calcium Magnesium Potassium Sodium	Nutrients (mg/L) Nitrate Total Kjeldahl Nitrogen
Dissolved Metals (mg/L) Arsenic Barium Boron Cadmium Iron Lead Manganese Mercury	
Nutrients (mg/L) Nitrate Nitrite Ammonia Nitrogen Total Kjeldahl Nitrogen Total Phosphate	
Pollutant Tests (mg/L) Chemical Oxygen Demand Dissolved Organic Carbon	

FIGURES

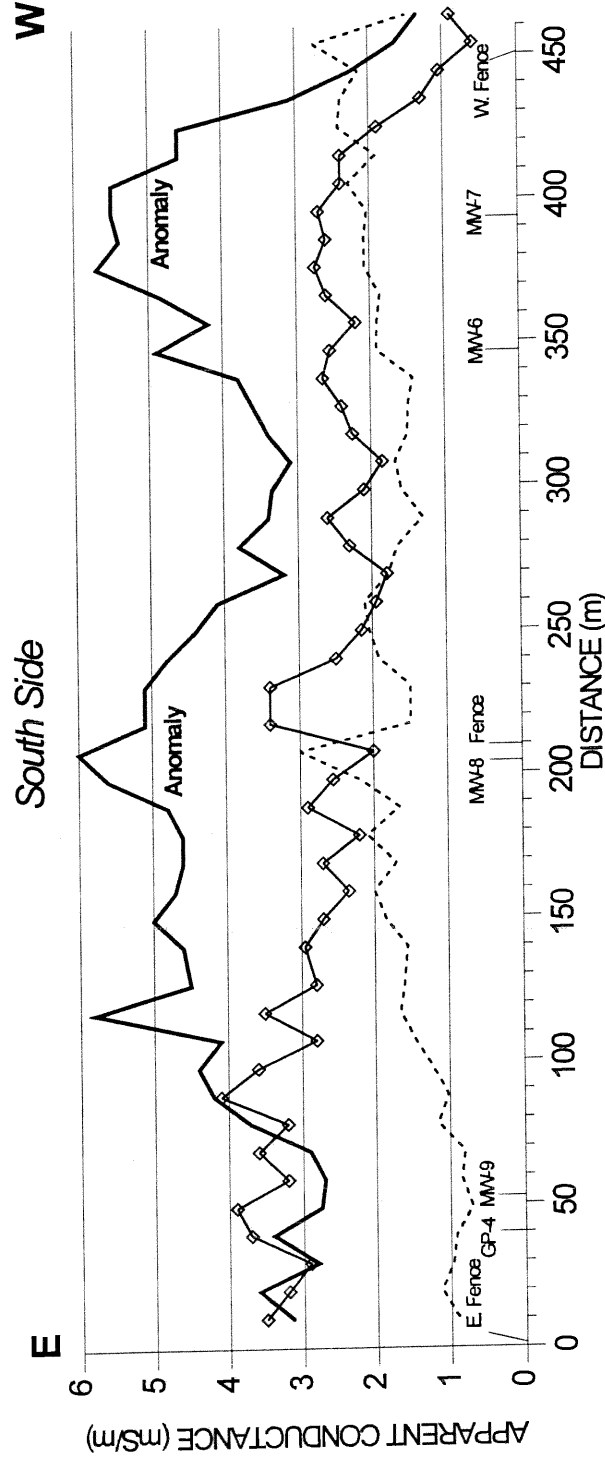
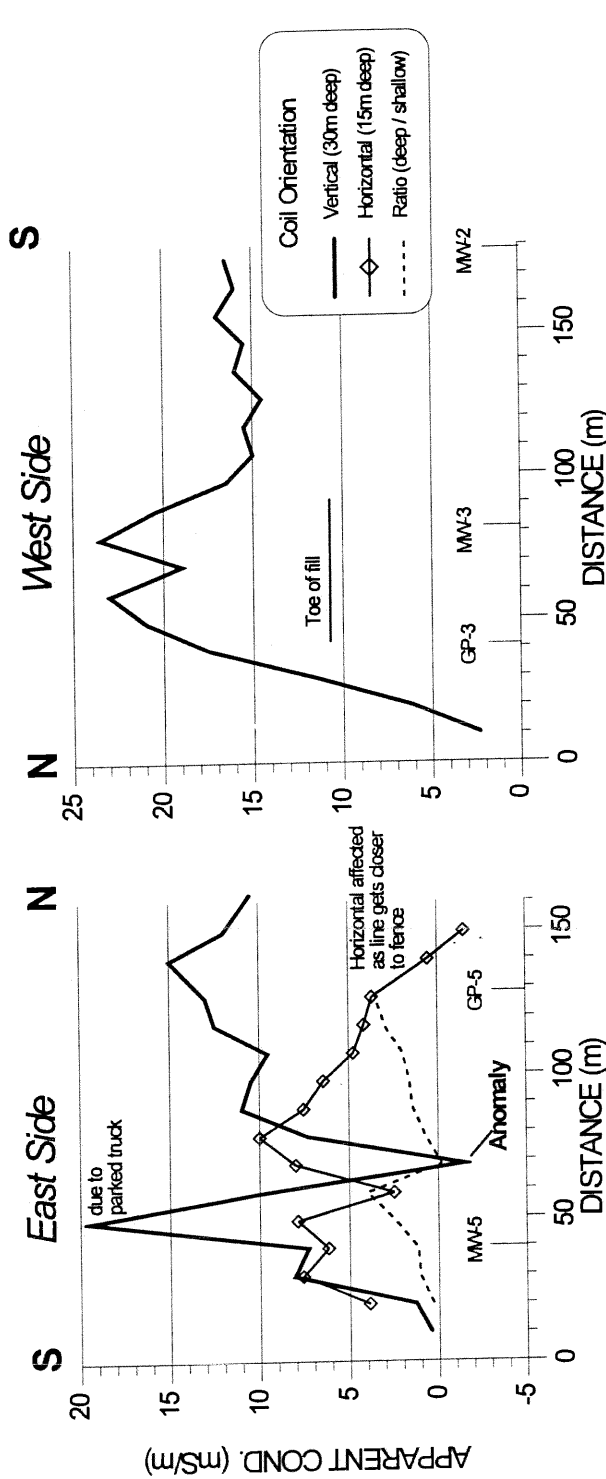


NOTE:
1. SITE PLAN MODIFIED FROM DAYTON & KNIGHT SITE PLAN
2. GROUNDWATER ELEVATIONS MEASURED ON JAN.8, 1997

MONITORING WELL
CONSTRUCTION PROGRAM
SECHULT LANDFILL

SITE PLAN

BY: CRK/CV	DATE: FEB.97
APPROVED: <i>[Signature]</i>	DWG: 1



Note: See Fig. 1 for location of survey lines.

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SECHLT, B.C.



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GEOTECHNICAL & HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

MONITORING WELL
CONSTRUCTION PROGRAM
SECHLT LANDFILL

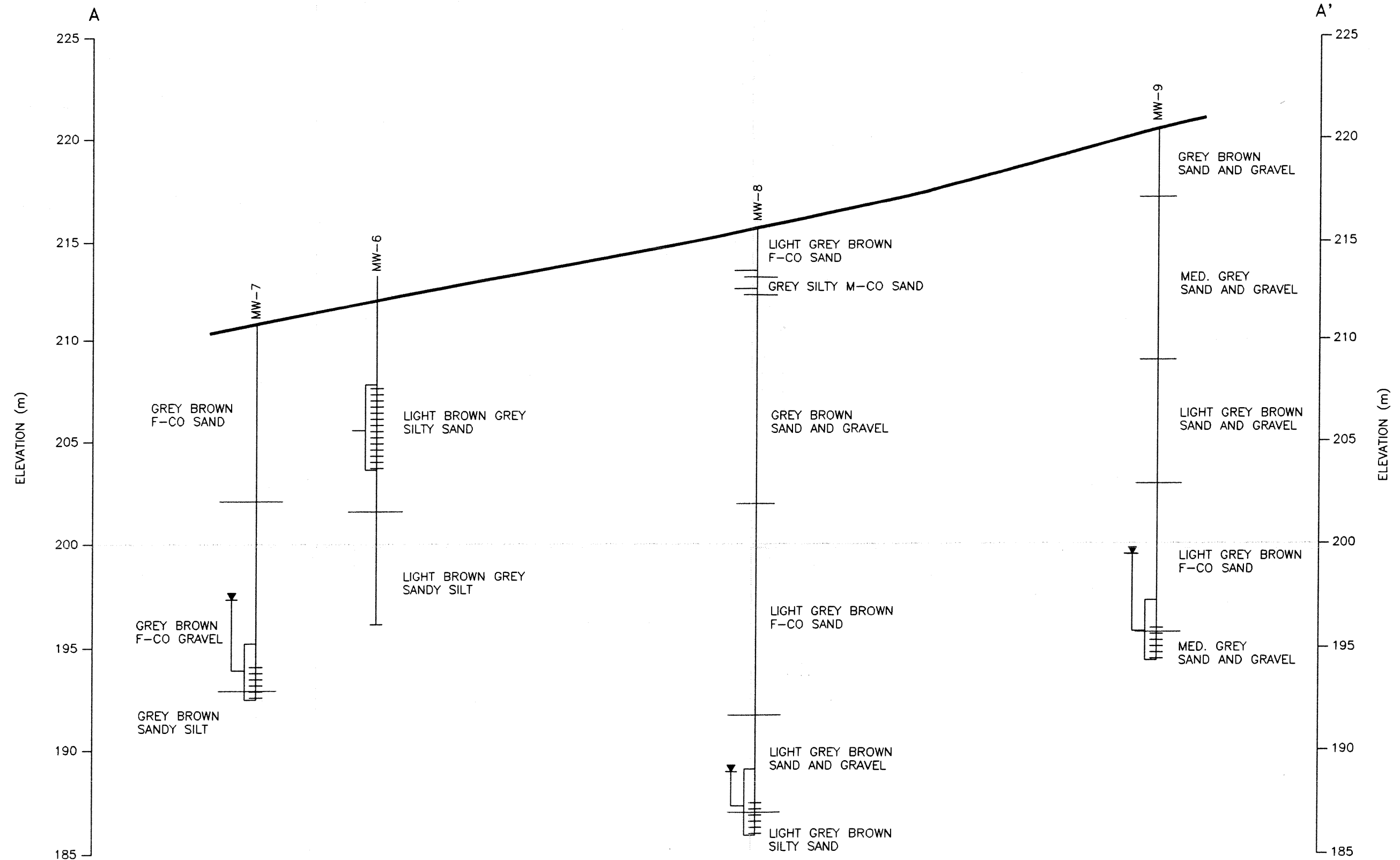
EM-31 SURVEY RESULTS -
CONDUCTANCE PROFILES
ALONG LANDFILL PERIMETER

BY:
ATH

APPROVED:
[Signature]

DATE:
OCT 96

FIG.
2



LEGEND

MONITORING WELL WITH
COMPLETION INTERVAL,
AND WATER LEVEL MEASURED
ON JAN. 8 1997

HORIZONTAL SCALE 1:1500
VERTICAL SCALE 1:200
VERTICAL EXAGGERATION = 7.5x
NOTE: WATER LEVELS MEASURED ON JAN. 8 1997

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

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SECHelt, B.C.

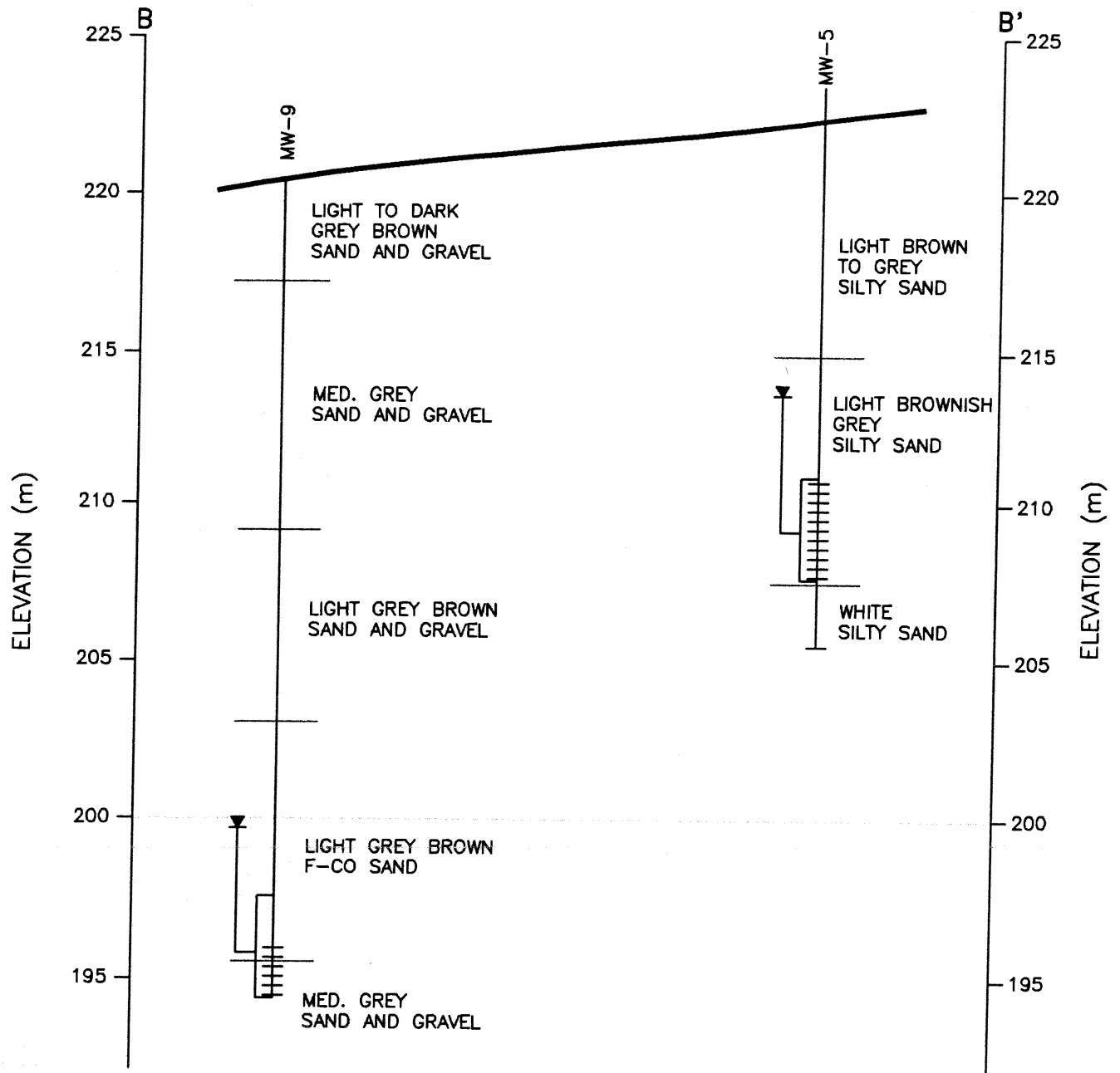
MONITORING WELL
CONSTRUCTION PROGRAM
SECHelt LANDFILL



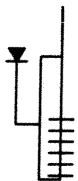
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VANCOUVER CALGARY

SECTION A-A'

BY:	DATE:
CRK/CV	FEB. 97
APPROVED:	FIG:
<i>[Signature]</i>	3



LEGEND



MONITORING WELL WITH
COMPLETION INTERVAL,
AND WATER LEVEL MEASURED
ON JAN. 8 1997

HORIZONTAL SCALE 1:1500
VERTICAL SCALE 1:200
VERTICAL EXAGGERATION = 7.5x

NOTE: WATER LEVELS MEASURED ON JAN. 8 1997

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

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VANCOUVER CALGARY

MONITORING WELL
CONSTRUCTION PROGRAM
SECHLT LANDFILL

SECTION B-B'

BY:	DATE:
CRK/CV	FEB. 97
APPROVED:	FIG:
<i>CH</i>	4

APPENDIX A

WELL LOGS

HYDROGEOLOGIC LOG

PURPOSE OF HOLE: MONITORING WELL

TYPE OF RIG: BECKER HAMMER

DRILLING CONTRACTOR: BECK DRILLING AND ENVIRONMENTAL SERVICES LTD.

DATE DRILLED: DEC. 17, 1996

GROUND ELEVATION (m-asl): 211.04

STEEL CASING STICK UP: FLUSH MOUNTED

BOREHOLE:

MW7

ELEV. TOP OF PVC CASE: 211.01 m-asl

DEPTH TO WATER: 13.66 m-btoc

ELEVATION OF WATER: 197.35 m-asl

Note: Water levels were measured on Jan. 8, 97

Depth (m)	Elev. (m-asl)	DESCRIPTION OF LITHOLOGY ENCOUNTERED	WELL CONSTRUCTION MATERIALS	Well Diagram	Sample depths (m)
0.0	211.04	Ground surface	Flush Mount Well Casing		
1.0		Med. brown to light-med. grey fine to med. SAND, some f-co gravel moist, lightly compacted	Cement Bentonite seal (0.3-0.8m)		
2.0	208.94				
3.0			50mm dia. PVC pipe, with threaded joints		
4.0		Light grey brown m-co SAND some m-co gravel and cobbles moist, lightly compacted Boulder @3.0-3.7m			
5.0	205.84				
6.0			Backfill with Drill Cuttings (0.8-12.7m)		
7.0	211.04	Grey brown f-m SAND, trace to some m-co gravel and cobbles moist, light to med compacted			
8.0		Grey brown f-co gravelly co SAND moist, lightly compacted			
9.0		Grey brown fine to med. SAND, some m-co gravel, moist, lightly compacted large boulder @7.9m			
10.0					
11.0		Grey brown fine sandy m-co GRAVEL trace to some cobbles and boulders trace silt, dry to moist, light to med. compacted			
12.0					
13.0					
14.0	197.34		Bentonite seal (12.7-15.8m)		
15.0		Grey brown f-m SAND and f-co GRAVEL, trace cobbles, moist, med. compacted			
SUNSHINE COAST REGIONAL DISTRICT SECHLT, B.C.			 PITEAU ASSOCIATES GEOTECHNICAL & HYDROGEOLOGICAL CONSULTANTS VANCOUVER CALGARY		
MONITORING WELL CONSTRUCTION PROGRAM SECHLT LANDFILL		WELL LOG OF BOREHOLE MW7		BY: CRK APPROVED: 	DATE: DEC 96 FIG #: A-1

File: 1647\logs\mwells.xls

HYDROGEOLOGIC LOG

PURPOSE OF HOLE: MONITORING WELL

TYPE OF RIG: BECKER HAMMER

DRILLING CONTRACTOR: BECK DRILLING AND ENVIRONMENTAL SERVICES LTD.

DATE DRILLED: DEC. 17-18, 1996

GROUND ELEVATION (m-asl): 215.85

STEEL CASING STICK UP: FLUSH MOUNTED

BOREHOLE:

MW8

ELEV. TOP OF PVC CASE: 215.77 m-asl

DEPTH TO WATER: 26.79 m-btoc

ELEVATION OF WATER: 188.98 m-asl

Note: Water levels were measured on Jan. 8, 97

Depth (m)	Elev. (m-asl)	DESCRIPTION OF LITHOLOGY ENCOUNTERED	WELL CONSTRUCTION MATERIALS	Well Diagram	Sample depths (m)
<u>15.0</u>					
		cont'd 15.5			
<u>16.0</u>	199.75	Light greyish brown m-co SAND, some m-co gravel, moist, lightly compacted 16.1			
<u>17.0</u>					
<u>18.0</u>			50mm dia. PVC pipe, with threaded joints		
<u>19.0</u>		Light greyish brown f-m SAND, tr f-co gravel and cobble, moist, lightly compacted, densely compacted @19.2-20.4m	Backfill with Drill Cuttings (4.5-23.5m)		
<u>20.0</u>					
<u>21.0</u>					
<u>22.0</u>	193.55				
<u>23.0</u>		Light greyish brown, f-m SAND with some silt to f sandy silt, moist, med to densely compacted			
<u>24.0</u>	191.75				23.2
<u>25.0</u>		Light greyish brown f-co gravelly f-co SAND, tr. silt and cobble, moist, light to med. compacted 25.3	Bentonite seal (23.5-26.8m)		
<u>26.0</u>		Light greyish brown f-m SAND and f-co GRAVEL, some cobbles, moist, med to densely compacted			
<u>27.0</u>	188.45				
<u>28.0</u>		Light brownish grey m-co GRAVEL, some m-co sand, moist, med to densely compacted	Sand Filter Pack (26.8-29.9m)		
<u>29.0</u>	186.95		EC(uS/cm)		
		L gr br f-co gr SILT, some m-co sand, wet 29.3	591		
		L gr br m-co SAND, tr. silt, wet, m comp 29.6	768		
<u>30.0</u>		M gr m-co gravelly m-co SAND 29.9	865		
			976		
		END OF HOLE 29.9m	50mm dia. PVC screen (28.3-29.9m)		
SUNSHINE COAST REGIONAL DISTRICT SECHLT, B.C.			 PITEAU ASSOCIATES GEOTECHNICAL & HYDROGEOLOGICAL CONSULTANTS VANCOUVER CALGARY		
MONITORING WELL CONSTRUCTION PROGRAM SECHLT LANDFILL			WELL LOG OF BOREHOLE MW8 (Cont'd)		BY: CRK DATE: DEC 96 APPROVED:  FIG #: A-2

File: 1647\logs\mwells.xls

HYDROGEOLOGIC LOG

PURPOSE OF HOLE: MONITORING WELL

TYPE OF RIG: BECKER HAMMER

DRILLING CONTRACTOR: BECK DRILLING AND ENVIRONMENTAL SERVICES LTD.

DATE DRILLED: DEC. 18, 1996

GROUND ELEVATION (m-asl): 220.55

STEEL CASING STICK UP: FLUSH MOUNTED

BOREHOLE:

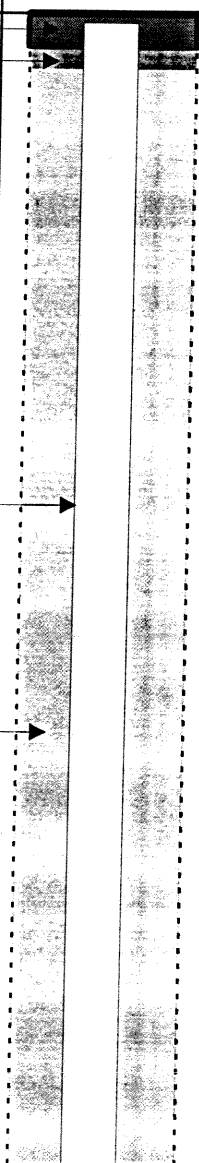
MW9

ELEV. TOP OF PVC CASE: 220.49 m-asl

DEPTH TO WATER: 20.72 m-btoc

ELEVATION OF WATER: 199.77 m-asl

Note: Water levels were measured on Jan. 8, 97

Depth (m)	Elev. (m-asl)	DESCRIPTION OF LITHOLOGY ENCOUNTERED	WELL CONSTRUCTION MATERIALS	Well Diagram	Sample depths (m)
0.0	220.55	Ground surface	Flush Mount Well Casing		
1.0		Med. to dark brown f-co GRAVEL, some co sand, tr silt and cobble, damp, light to med compacted 0.9	Cement Bentonite seal (0.3-0.5m)		
2.0		Light grey brown to med grey, m-co SAND and f-co GRAVEL, tr cobble and silt, moist, med to densely compacted			
3.0	217.15	boulder @1.2m 3.4			
4.0					
5.0		Med grey m-co SAND, m-co gravelly to some f-co gravel, trace f sand, silt, and cobble, moist, med to densely compacted			
6.0					
7.0	220.55		50mm dia. PVC pipe, with threaded joints		6.1
8.0		Med. grey, m-co GRAVEL, some m-co sand, tr cobble and silt, moist, light to med compacted 8.2			
9.0	212.35	Med grey to light grey brown, m-co SAND, m-co gravelly to some m-co gravel, tr to some silt, tr cobble, med compacted 9.5	Backfill with Drill Cuttings (0.5-19.7m)		
10.0		Med grey f-m GRAVEL, some silty f-co sand, trco gravel, moist, light to med compacted 11.3			
11.0	209.25				
12.0		Grey to brown f-m SAND, some f-m gravel tr silt, moist, med compacted 11.9		11.6	
13.0		M grey f-m GRAV, some co grav + cobble, some silty m-co sand, moist, med comp 12.5			
14.0	206.25	Light grey brown m-co SAND and f-m GRAVEL, some co grav and cobble tr silt, moist, lightly compacted 14.3			
15.0	205.65	L grey brown f-m SAND + m-co GRAVEL 14.9			
SUNSHINE COAST REGIONAL DISTRICT SECHLT, B.C.			PITEAU ASSOCIATES GEOTECHNICAL & HYDROGEOLOGICAL CONSULTANTS VANCOUVER CALGARY		
MONITORING WELL CONSTRUCTION PROGRAM SECHLT LANDFILL			WELL LOG OF BOREHOLE MW9		BY: CRK DATE: DEC 96 APPROVED:  FIG #: A-3

File: 1647\logs\mwells.xls

HYDROGEOLOGIC LOG

PURPOSE OF HOLE: MONITORING WELL

TYPE OF RIG: BECKER HAMMER

DRILLING CONTRACTOR: BECK DRILLING AND ENVIRONMENTAL SERVICES LTD.

DATE DRILLED: DEC. 18, 1996

GROUND ELEVATION (m-asl): 220.55

STEEL CASING STICK UP: FLUSH MOUNTED

BOREHOLE:

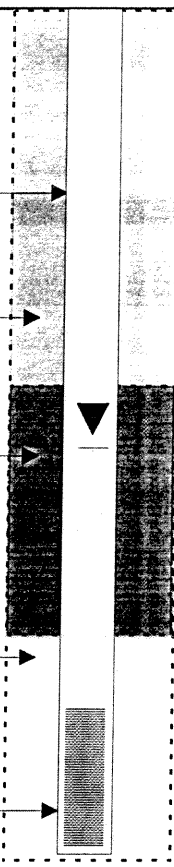
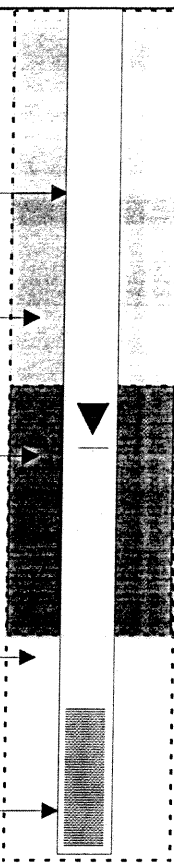
MW9

ELEV. TOP OF PVC CASE: 220.49 m-asl

DEPTH TO WATER: 20.72 m-btoc

ELEVATION OF WATER: 199.77 m-asl

Note: Water levels were measured on Jan. 8, 97

Depth (m)	Elev. (m- asl)	DESCRIPTION OF LITHOLOGY ENCOUNTERED	WELL CONSTRUCTION MATERIALS	Well Diagram	Sample depths (m)
<u>15.0</u>					
<u>16.0</u>	204.35	Light grey brown f-m SAND, tr to some f-co gravel and cobble, moist, light to med compacted 16.2	50mm dia. PVC pipe, with threaded joints		17.1
<u>17.0</u>	203.15	Light grey brown m-co GRAVEL, some f-m sand, tr cobble, moist, lightly compacted 17.4			
<u>18.0</u>	201.95	Light grey brown, f-co SAND, tr f-co grav, moist, lightly compacted 18.6			
<u>19.0</u>		L gr br f-m gravelly m-co SAND, moist, lightly compacted 19.2			
<u>20.0</u>		Light grey brown, f-co SAND, some f-co gravel, tr cobble, moist, lightly compacted 21.0			
<u>21.0</u>	220.55	Light grey brown f-m SAND, moist, lightly compacted 22.3	Bentonite seal (19.7-23.2m)		22.6
<u>22.0</u>	198.25	Med grey f SAND, some silt, damp, med compacted 23.5	Sand Filter Pack (23.2-26.0m)		
<u>23.0</u>		Light grey brown, f-m SAND, some f-co gravel, moist to wet, light to med compacted 24.7			
<u>24.0</u>	195.85	Med grey, f gravelly m-co SAND to m-co sandy f-co GRAVEL, tr silt and cobble, wet, light to med compacted 26.0			
<u>25.0</u>	220.55		EC(mS/cm) 2.76 2.94 2.89 2.96 2.99		
<u>26.0</u>			50mm dia. PVC screen (24.5-26.0m)		
<u>27.0</u>		END OF HOLE 26.0m			
<u>28.0</u>					
<u>29.0</u>					
<u>30.0</u>					

SUNSHINE COAST REGIONAL DISTRICT
SECHLT, B.C.**PITEAU ASSOCIATES**

GEOTECHNICAL & HYDROGEOLOGICAL CONSULTANTS

VANCOUVER CALGARY

MONITORING WELL
CONSTRUCTION PROGRAM
SECHLT LANDFILLWELL LOG OF
BOREHOLE MW9 (Cont'd)

BY: CRK	DATE: DEC 96
APPROVED: 	FIG #: A-3

File: 1647\logs\mwells.xls

APPENDIX B

CHEMICAL ANALYSIS RESULTS



CHEMICAL ANALYSIS REPORT

Date: January 29, 1997

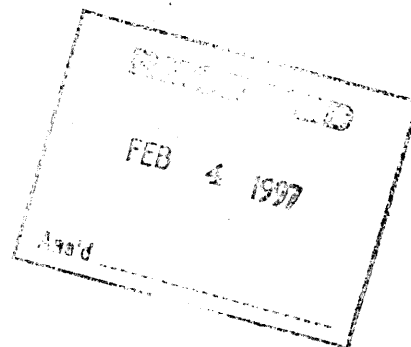
ASL File No. G8356

Report On: 1647 Water Analysis

Report To: **Piteau Assoc. Engineering Ltd.**
215 - 260 West Esplanade
North Vancouver, BC
V7M 3G7

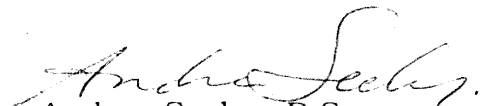
Attention: **Mr. Andy Holmes**

Received: January 9, 1997



ASL ANALYTICAL SERVICE LABORATORIES LTD.

per:


Andrea Seeley, B.Sc.
Project Chemist


Joyce Chow, B.Sc.
Project Chemist

**RESULTS OF ANALYSIS - Water**

File No. G8356

		MW7	MW8	MW9
		97 01 08 14:00	97 01 08 12:05	97 01 08 13:15
<u>Physical Tests</u>				
Conductivity	(umhos/cm)	1420	1150	3740
pH		6.82	6.44	6.57
Turbidity	(NTU)	28500	1650	2930
<u>Dissolved Anions</u>				
Alkalinity-Total	CaCO3	576	454	1250
Chloride	Cl	121	112	298
Sulphate	SO4	26	3	<1
<u>Nutrients</u>				
Ammonia Nitrogen	N	1.38	0.699	127
Total Kjeldahl Nitrogen	N	1.84	0.72	132
Nitrate Nitrogen	N	0.007	0.016	<0.005
Nitrite Nitrogen	N	0.003	0.009	0.018
Total Phosphate	P	0.197	3.20	6.16
<u>Dissolved Metals</u>				
Arsenic	D-As	0.0023	0.0009	0.0099
Barium	D-Ba	0.29	0.05	0.68
Boron	D-B	<0.1	<0.1	<0.1
Cadmium	D-Cd	0.0002	0.0017	<0.0002
Calcium	D-Ca	182	147	329
Iron	D-Fe	0.10	0.07	28.5
Lead	D-Pb	<0.001	<0.001	<0.001
Magnesium	D-Mg	38.0	20.5	43.9
Manganese	D-Mn	4.61	10.3	15.5
Mercury	D-Hg	<0.00005	<0.00005	<0.00005
Potassium	D-K	12	6	27
Sodium	D-Na	75	53	180
<u>Organic Parameters</u>				
Chemical Oxygen Demand	COD	6260	373	809
Dissolved Organic Carbon	C	29.8	92.6	32.0

Results are expressed as milligrams per litre except for pH,
Conductivity (umhos/cm), and Turbidity (NTU).
< = Less than the detection limit indicated.



METHODOLOGY

File No. G8356

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows:

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

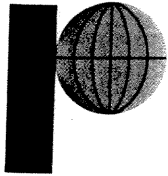
Metals in Water

This analysis is carried out in accordance with procedures described in "Standard Methods for the Examination of Water and Wastewater" 19th Edition 1995 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005), followed by instrumental analysis by atomic absorption spectrophotometry (EPA Method 7000), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 19th Edition 1995 published by the American Public Health Association. A cold-oxidation procedure involving bromine monochloride is used, followed by instrumental analysis by cold-vapour atomic absorption spectrophotometry (CVAAS).

End of Report



PITEAU ASSOCIATES

GEOTECHNICAL AND
HYDROGEOLOGICAL CONSULTANTS

215 - 260 WEST ESPLANADE
NORTH VANCOUVER, B.C.
CANADA V7M 3G7
TELEPHONE (604) 986-8551
FAX (604) 985-7286

Our file: 2077

December 30, 1999

Sunshine Coast Regional District
5477 Warf Road
Sechelt, B.C.
V0N 3A0

Attention: Ms. Cathy Kenny
Solid Waste Management Co-ordinator

Dear Sirs:

Re: Replacement of Three Monitoring Wells
Sechelt Landfill, Sunshine Coast Regional District

The Sunshine Coast Regional District (SCRD) operates the Sechelt Landfill, located about 6.5 km northeast of Sechelt (Fig. 1). Three monitoring wells installed on the south side of the landfill were recently destroyed and required replacement. Piteau Associates Engineering Ltd. (Piteau) has expedited and supervised the construction of the three new replacement monitoring wells. The scope of our services for this project included:

- Review of previous well logs, water levels and chemistry to determine the required depth and preferred location of the wells on the southern landfill boundary;
- Coordinating the monitoring well drilling contractor;
- Supervision of well construction program;
- Well development and initial sampling; and
- Preparation of well logs and well completion report.

A description of the work performed and results of the drilling and sampling program are presented herein.

MONITORING WELL DRILLING AND INSTALLATION

The monitoring well drilling and installation program was conducted between November 29 and December 1, 1999 by Beck Drilling and Environmental Services Ltd. The three wells were installed using a Becker Hammer drilling rig. All wells were drilled and cased with 102mm (4 inch) I.D. double wall steel casing. Well locations are shown on Fig. 1.

Work was supervised by Mr. Matt Pye of Piteau. While on site, Mr. Pye sited well locations with the assistance of Ms. Kathy Kenny from the SCRD, logged drill cuttings, and kept records of



Sunshine Coast Regional District
Attention: Ms. Cathy Kenny
Solid Waste Management Co-ordinator

-2- December 30, 1999

drilling progress and monitoring well construction details. Hydrogeological logs and well completion details are shown in Appendix A.

All three wells are located along the southern toe of the landfill footprint, within about 3 to 5m of the property line (Fig. 2). A loader was used to remove a portion of the landfill toe at each well location, to provide access for the drill rig to collar the wells off the north side of the perimeter access road.

Monitoring Well MW99-7

Monitoring Well MW99-7 was drilled approximately 68m from the western landfill property line. Drilling encountered the following lithologic profile:

0 to 1.8m	WASTE and FILL materials
1.8 to 8.2m	moist, medium to coarse SAND, some gravel to sand and gravel, trace silt and boulders
8.2 to 10.1m	moist, medium to coarse SAND and GRAVEL, trace silt
10.1 to 13.0m	dry, fine to medium SAND, some gravel, trace to some silt and boulders
13.0 to 14.6	moist, fine to medium SAND, some silt to silty, some gravel and trace boulders
14.6 to 18.6m	moist, well-graded, SAND, some gravel, trace to some silt; a large boulder was encountered from 16.5 to 17.0m
18.6 to 19.2m	wet sandy SILT, trace clay
19.2 to 19.5m	dry, dense, bouldery TILL

Monitoring Well MW99-8

Monitoring Well MW99-8 was located roughly in the middle of the southern property line, approximately 257m from the western landfill property line (Fig. 2). Drilling encountered the following:

0 to 1.2m	WASTE and FILL materials
1.2 to 11.3m	moist to wet, medium to coarse SAND to SAND and GRAVEL, trace silt
11.3 to 14.0m	dry, well graded SAND to SAND and GRAVEL, occasional boulders
14.0 to 20.4m	moist to dry, fine to coarse SAND, some gravel
20.4 to 21.6m	wet, fine to medium silty SAND
21.6 to 22.3m	dense TILL
22.3 to 29.0m	moist becoming wet, medium to coarse SAND to well graded SAND and GRAVEL, trace silt; saturated below 28.0m.



Sunshine Coast Regional District
Attention: Ms. Cathy Kenny
Solid Waste Management Co-ordinator

-3- December 30, 1999

Monitoring Well MW99-9

Monitoring Well MW99-9 was located near the southeast corner of the property, approximately 400m from the western landfill property line (Fig. 2). Sediments encountered during drilling consisted of the following:

0 to 1.8m	WASTE and FILL materials
1.8 to 7.0m	moist to wet, medium to coarse SAND and GRAVEL, some boulders
7.0 to 10.4m	wet, gravelly SAND
10.4 to 15.9m	slightly moist, well graded SAND and GRAVEL, trace to some silt and boulders
15.9 to 20.4m	moist, fine to coarse SAND, some gravel
20.4 to 22.0m	dry, fine to medium SAND and GRAVEL, trace to some silt, boulders
22.0 to 25.9m	wet, medium to coarse gravelly SAND, trace silt

All well screens were set over the bottom 1.52m (5 ft) of the drilled holes. A sand filter pack was placed around the screens from the bottom of the hole to 3 to 3.5m above the top of the screens. A bentonite seal, ranging from 4.2 to 4.5m thick, was then placed above the sand pack. The holes were then backfilled with drill cuttings to just below grade, where a second bentonite seal was placed from 0.9 to 0.3m depth. A 1.5m steel surface casing was set in the bentonite from about 0.6 to 0.3m depth followed by concrete to ground surface. The wells were left with an approximate stick-up of 0.9m. Details of the well completions are shown graphically on the well logs (Appendix A).

The wet sediments encountered during the drilling of Monitoring Well MW99-7 did not produce any water and the piezometer was dry two days after it had been installed. Therefore, an attempt was made to drill a deeper well approximately 2m away. This second attempt encountered a similar dense bouldery till at about 18.3m depth. The Becker Hammer met refusal at this depth, as it was only able to penetrate 0.15m after 40 minutes of drilling at 90 blows/minute. A second piezometer was not installed at this location since the first hole reached a greater depth and would be more likely to intercept groundwater during peak water table conditions.

WELL DEVELOPMENT AND SAMPLING

Monitoring Well MW99-7 was dry at the time of the drilling program but it will possibly contain water in the late winter, following the winter precipitation.

Monitoring wells MW99-8 and MW99-9 were developed and sampled on December 1, 1999. The purge volume required to develop the wells was calculated as seven well volumes, based on water level measurements taken that day. However, it will only be necessary to purge three standing water columns during subsequent sampling of these wells.



Sunshine Coast Regional District
Attention: Ms. Cathy Kenny
Solid Waste Management Co-ordinator

-4- December 30, 1999

Water was withdrawn using Waterra foot valves on high density polyethylene tubing. These foot valves are operated simply by moving the tubing up and down inside the piezometer pipe. Once purging was complete, the appropriate sample containers were filled. The dissolved metals samples were filtered in the field and preserved with nitric acid. The COD, ammonia and organic carbon sample was preserved with hydrochloric acid. Disposable latex gloves were used during the sampling procedure.

Samples were placed in a cooler with ice, and were delivered to Analytical Services Laboratories Ltd. of Vancouver on December 2, 1999.

INTERPRETED GROUNDWATER FLOW REGIME

The basal groundwater flow regime (i.e. flow along the bedrock surface) beneath the site is interpreted to flow in a south to southwesterly direction (Fig. 1). Perched flows appear to be present on layers of low permeability sediments above the basal flow regime (Figs. 3 and 4), but over significant distances, these flows would eventually percolate down to the deeper sediments.

A test well, drilled at the approximate location shown on Fig. 1, encountered bedrock at about 120m elevation, with no indication of a water table (Piteau Associates Engineering Ltd., 1999). This information suggests that the groundwater will concentrate along low points in the bedrock surface and flow in the direction of the bedrock surface gradient. Bedrock will therefore control the flow direction. The possible range of flow directions is indicated on Fig. 1.

Most of the monitoring wells surrounding the Sechelt Landfill appear to encounter perched water tables. Deeper wells typically encounter deeper water tables, indicative of a strong downward hydraulic gradient. Leachate seeping from the landfill is therefore interpreted to migrate vertically through the layered sediments beneath the site, with some minor lateral flow to the west or south on the lower permeability layers. Ultimately, the leachate will seep to the basal sediment layer, and then flow in a southerly direction towards Chapman Creek, or in a westerly direction towards Trail Bay, or possibly to the head of Porpoise Bay.

There appears to be a relatively continuous perched flow regime at about elevation 210m, which displays a gradient towards the west-southwest (see posted heads on Fig. 2). This flow is interpreted to seep to depth as it moves away from the landfill, and should eventually reach the basal flow regime perched on the bedrock surface.

A water depth of 8.0m was measured in the shallow piezometer MW-6, located about 40m east of MW99-7, on November 30, 1999. Wet sediments were also seen in monitoring wells MW99-8 and MW99-9 at depths between 5 and 10m. These observations indicate the presence of some

* Piteau Associates Engineering Ltd., 1999. Letter to Mr. Apris Berzins at Dayton & Knight Ltd., regarding Sunshine Coast Aquifer Protection Plan, Monitoring Well Update, Jan. 19, 8p.



Sunshine Coast Regional District
Attention: Ms. Cathy Kenny
Solid Waste Management Co-ordinator

-5- December 30, 1999

shallow perched groundwater flow south of the landfill, but as noted above, this shallow groundwater is expected to seep to depth within a relatively short distance of the landfill.

SAMPLING RESULTS

There have been two suites of chemical analyses performed on samples collected from deep monitoring wells installed south of the landfill. The first suite was performed on samples collected from the three destroyed wells, MW-7, MW-8 and MW-9, on January 8, 1997 (Table I). The second suite of samples was collected on December 1, 1999 from the replacement wells constructed as a part of this study (Table II). The general characteristics of the samples collected in 1999 are similar to those collected 1997, but the concentrations of most parameters are slightly lower. This may indicate that the first seasonal flush, which likely conveys the largest leachate component, had not yet reached the depth of the wells at the time of the 1999 sampling event.

The results of the two sampling suites indicate that groundwater beneath the south landfill perimeter has been significantly impacted by leachate. COD, manganese, EC and chloride concentrations are elevated in all samples collected from the three wells. Manganese concentrations exceed the aesthetic drinking water objective (AO) of 0.05 mg/L (Health & Welfare, 1996) in all samples collected to date, and chloride concentration exceeded the AO of 250 mg/L in the 1997 sample from MW-9.

The total nitrogen concentrations levels are low (<2 mg/L) in samples collected from MW-7, MW-8 and MW99-8. However, ammonia concentrations were very high in the sample collected from MW-9, and were elevated in the sample collected from MW99-9. The high ammonia and low nitrate concentrations indicate that very little nitrification is occurring in the unsaturated zone beneath the east end of the landfill, suggesting a fairly rapid infiltration rate to the water table. Conditions may be more favourable for subsurface renovation of leachate beneath the western portions of the landfill, as the sampling results indicate that water quality is generally better in MW-7, MW-8 and MW99-8 (west end of the landfill) than in MW-9 and MW99-9 (east end of the landfill). The differences in water quality may also be the result of waste partitioning within the landfill. If different types of waste have been placed in separate zones, then the resulting leachate generated from the separate zones will have different properties. Monitoring well chemistry data will reflect the leachate generated upgradient of the well locations.

RECOMMENDATIONS

Water level measurements and water quality sampling should continue on a bi-monthly or quarterly schedule, to properly define the leachate impact and groundwater flow regime on the south side of the landfill. Two suites of samples, collected in the late summer or early fall and again in mid winter, should be submitted for a detailed chemical analysis, and the remaining



Sunshine Coast Regional District
Attention: Ms. Cathy Kenny
Solid Waste Management Co-ordinator

-6- December 30, 1999

samples should be submitted for a reduced suite. A suggested list of parameters for both the detailed and reduced suites are included as Table III.

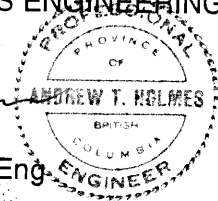
Water levels should be measured prior to purging and sampling. The new wells should be purged by removing three well volumes prior to sample collection. A Waterra foot valve on high density polyethylene tubing has been dedicated to each of the wells for use during sampling.

We trust this report presents the information you require regarding the recent construction of the three new monitoring wells at the Sechelt Landfill, and recommendations for sampling. If you have any further questions regarding this report, or require any additional assistance with the regular monitoring program, please contact us.

Yours truly,

PITEAU ASSOCIATES ENGINEERING LTD.

Andrew T. Holmes, P.Eng.



Matthew D. Pye, E.I.T.

MDP/bms

Att.

TABLES

TABLE I
SUMMARY OF LABORATORY CHEMISTRY DATA
FOR DESTROYED AND REPLACEMENT MONITORING WELLS

Parameter	Units/ Symbols	MW-7 8-Jan-97	MW-8 8-Jan-97	MW99-8 1-Dec-99	MW-9 8-Jan-97	MW99-9 1-Dec-99	GCDWQ		
							Maximum Acceptable	Objective	
Physical Tests									
pH-Field	uS/cm	6.69	6.92		6.63		6.5-8.5	-	
EC-Field		1190	940		3080		-	-	
Temp-Field		11.9	10.6		10.7		-	-	
Colour-Field		m grey/br	lt grey/br		m grey/br		-	-	
Odour-Field		none	none		faint		-	-	
pH-Lab	umhos/cm	6.82	6.44	7.52	6.57	7.48	6.5-8.5	-	
EC-Lab		1420	1150	1240	3740	2040	-	-	
Turbidity		NTU	28500	1650	9300	2930	1780	5	-
Dissolved Anions (mg/L)									
Alkalinity	CaCO ₃	576	454	598	1250	1030	-	-	
Chloride	Cl	121	112	94.2	298	151	250	250	
Sulphate	SO ₄	5.7	6.7	7	4.1	2	500	500	
Dissolved Cations (mg/L)									
Calcium	Ca	182	147	140	329	232	-	-	
Magnesium	Mg	38.0	20.5	22.0	43.9	32.8	-	-	
Potassium	K	12	6	8	27	14	-	-	
Sodium	Na	75	53	90	180	150	-	-	
Dissolved Metals (mg/L)									
Arsenic	As	0.0023	0.0009	0.0003	0.0099	0.0067	0.025	0.005	
Barium	Ba	0.29	0.05	0.05	0.68	0.15	1	0.1	
Boron	Ba	<0.1	<0.1	0.2	<0.1	<0.1	5	0.01	
Cadmium	Cd	0.0002	0.0017	0.0003	<0.0002	<0.0002	0.005	0.001	
Iron	Fe	0.10	0.07	<0.03	28.5	<0.03	0.3	0.05	
Lead	Pb	<0.001	<0.001	<0.001	0.002	<0.001	0.01	0.001	
Manganese	Mn	38.0	20.5	6.78	43.9	7.94	0.05	0.01	
Mercury	Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.001	0.0002	
Nutrients (mg/L)									
Nitrate	N	0.0070	0.0160	<0.005	<0.005	0.0090	10	0.001	
Nitrite	N	0.003	0.009	0.005	0.018	0.005	1	0.001	
Ammonia Nitrogen	N	1.38	0.70	0.34	127	17.4	-	-	
Total Kjeldahl Nitrogen	N	1.84	0.72	1.17	132	17.4	-	-	
Total Phosphate	P	0.197	3.2	7.88	6.16	1.96	-	-	
Pollutant Tests (mg/L)									
Chemical Oxygen Demand	COD	6260	373	100	809	112	-	-	
Dissolved Organic Carbon	C	29.8	92.6	9.7	32.0	24.7	-	-	

NOTES:

1. < = Less than detection limit
2. GCDWQ = Guideline for Canadian Drinking Water Quality
3. Bolding indicates those parameters that exceed GCDWQ criteria, or which are cause for concern.

TABLE II
RECOMMENDED WATER QUALITY ANALYSIS SUITES

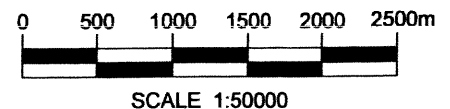
Analytes for detailed suite (Twice per year)	Analytes for reduced suite (Two to four times per year)
Physical Tests pH-Field EC-Field Temp-Field Colour-Field Odour-Field pH-Lab EC-Lab Turbidity	Physical Tests pH-Field EC-Field Temp-Field Colour-Field Odour-Field pH-Lab EC-Lab Turbidity
Dissolved Anions (mg/L) Alkalinity Chloride Sulphate	Dissolved Anions (mg/L) Chloride
Dissolved Cations (mg/L) Calcium Magnesium Potassium Sodium	Nutrients (mg/L) Nitrate Ammonia
Dissolved Metals (mg/L) Arsenic Barium Boron Cadmium Iron Lead Manganese Mercury	
Nutrients (mg/L) Nitrate Nitrite Ammonia Nitrogen Total Kjeldahl Nitrogen Total Phosphate	
Pollutant Tests (mg/L) Chemical Oxygen Demand Dissolved Organic Carbon	

FIGURES



SYMBOLS

-  INTERPRETED RANGE FOR GROUNDWATER FLOW DIRECTION
-  1998 TEST WELL LOCATION (PITEAU, 1999)



PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

SUNSHINE COAST REGIONAL DISTRICT



PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

MONITORING WELL
CONSTRUCTION PROGRAM
SECHULT LANDFILL
SECHULT, B.C.

LANDFILL LOCATION PLAN

BY:	DATE:
ATH/cz	DEC. 99
APPROVED:	FIG:
	1

MW-1(SITE1)
TOP OF CASING ELEV.=213.36m
GROUND ELEV.=212.32m, GW ELEV.=210.22m

MW-1A(SITE2)
TOP OF CASING ELEV.=213.42m
GROUND ELEV.=212.32m, GW ELEV.=209.39m

MW-4A(SITE7)
TOP OF CASING ELEV.=219.79m
GROUND ELEV.=219.04m, GW ELEV.=217.12m

GW ELEV.=213.46m
GW ELEV.=188.98m

MW-4(SITE6)
TOP OF CASING ELEV.=219.85m
GROUND ELEV.=219.04m, GW ELEV.=213.46m

MW-2(SITE3)
TOP OF CASING ELEV.=213.94m
GROUND ELEV.=212.22m, GW ELEV.=208.71m

MW-2A(SITE4)
TOP OF CASING ELEV.=214.02m
GROUND ELEV.=213.62m, GW ELEV.=208.71m

MW-3(SITE5)
TOP OF CASING ELEV.=211.30m
GROUND ELEV.=210.343m, GW ELEV.=208.83m

MW99-7
TOP OF CASING ELEV.=212.33m
GROUND ELEV.=~211.5m, GW ELEV.=~192.33m

GP-3

MW-6
TOP OF CASING ELEV.=212.82m
GROUND ELEV.=212.20m, GW ELEV.=204.20m (TRANSIENT PERCHED WATERTABLE)

MW99-8
TOP OF CASING ELEV.=216.93m
GROUND ELEV.=~216.0m, GW ELEV.=188.53m

MW-8
TOP OF CASING ELEV.=215.77m
GROUND ELEV.=215.85m, GW ELEV.=188.98m

MW-7
TOP OF CASING ELEV.=211.01m
GROUND ELEV.=211.04m, GW ELEV.=197.35m

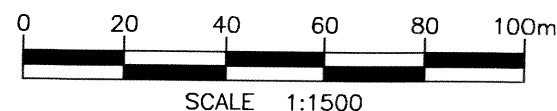
LEGEND

- ⊕ GROUNDWATER MONITORING WELL (INSTALLED IN JUL. 1993)
- ⊕ GAS PROBES (INSTALLED IN SEP. 1994)
- ⊕ GROUNDWATER MONITORING WELL (INSTALLED IN DEC. 1996 AND NOV. 1999 BY PITEAU ASSOCIATES)
- PERCHED WATERTABLE CONTOUR
- DEEP WATERTABLE CONTOUR
- ELEVATION OF PERCHED WATERTABLE
- ELEVATION OF DEEP WATERTABLE
- GENERAL DIRECTION OF GROUNDWATER FLOW
- × FENCE
- ROAD
- ↑ GEOLOGICAL SECTION (SEE FIGS. 3 AND 4)



LANDFILL

NOTE: ELEVATION + 0.27m = GEODETIC



- NOTES:
1. SITE PLAN MODIFIED FROM DAYTON & KNIGHT SITE PLAN.
 2. GROUNDWATER ELEVATIONS MEASURED ON JAN. 8, 1997, AND DEC. 1, 1999.

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

SUNSHINE COAST REGIONAL DISTRICT

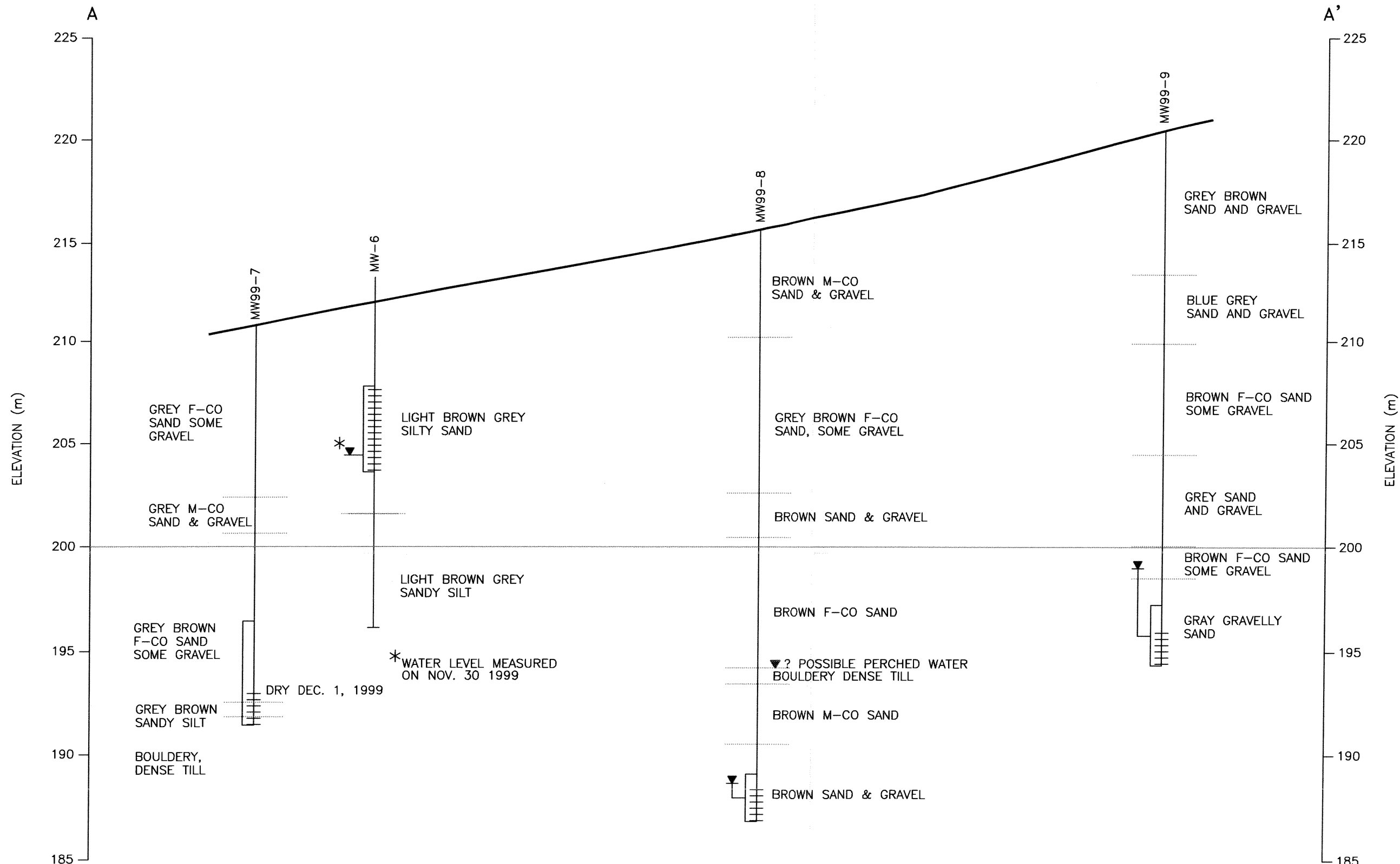
MONITORING WELL
CONSTRUCTION PROGRAM
SECHLT LANDFILL
SECHLT, B.C.

SITE PLAN

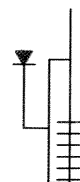


PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

BY: MDP/AB
DATE: FEB. 2000
APPROVED: [Signature]
FIG: 2



LEGEND



MONITORING WELL WITH
COMPLETION INTERVAL,
AND WATER LEVEL MEASURED
ON DEC. 1 1999

HORIZONTAL SCALE 1:1500
VERTICAL SCALE 1:200
VERTICAL EXAGGERATION = 7.5x

NOTE: WATER LEVELS MEASURED ON DEC. 1 1999

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO
OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

SUNSHINE COAST REGIONAL DISTRICT

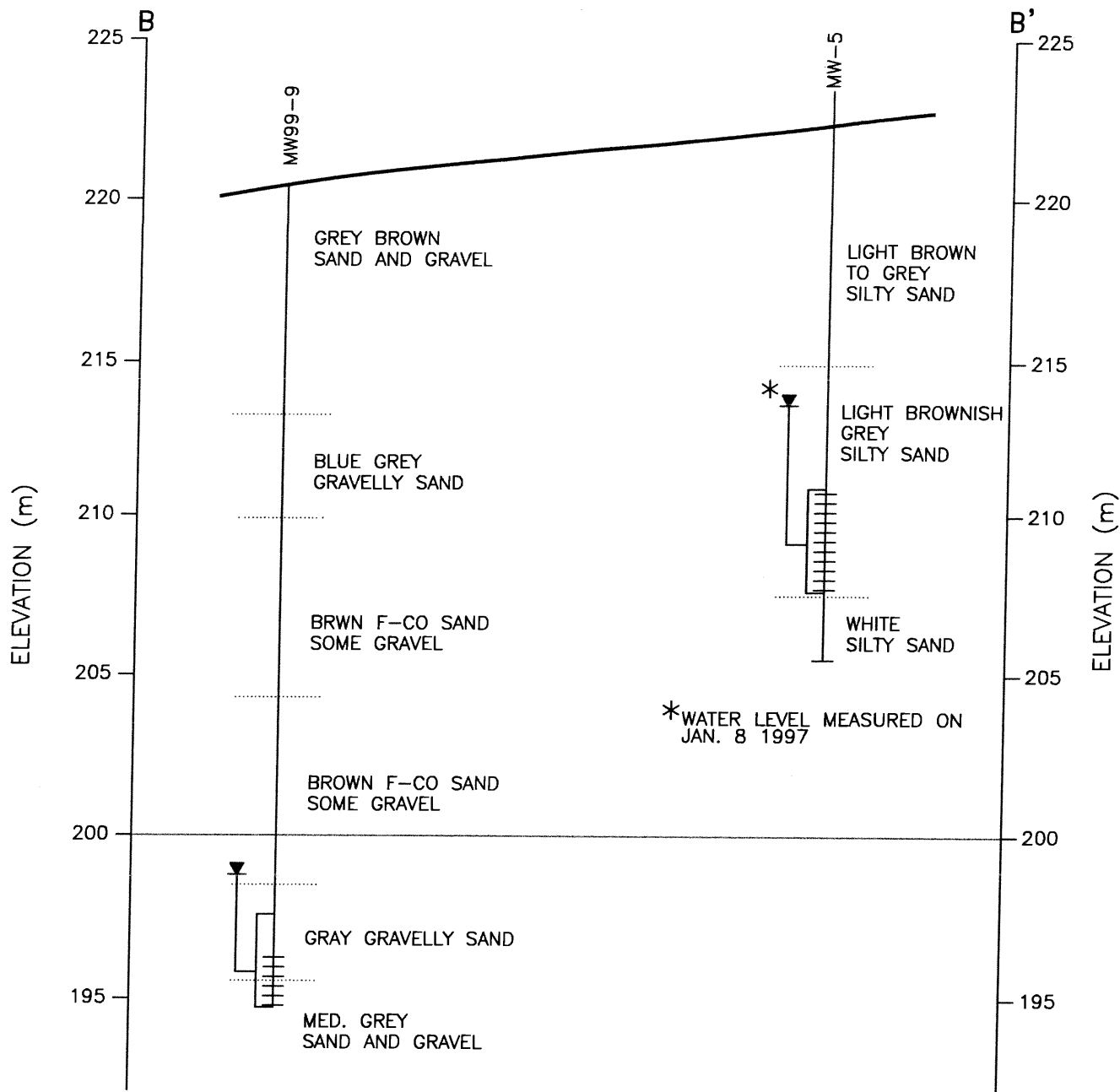


PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

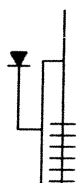
MONITORING WELL
CONSTRUCTION PROGRAM
SECHULT LANDFILL
SECHULT, B.C.

SECTION A-A'

BY:	DATE:
MDP/cz	DEC. 99
APPROVED:	FIG:
<i>[Signature]</i>	3



LEGEND



MONITORING WELL WITH
COMPLETION INTERVAL,
AND WATER LEVEL MEASURED
ON DEC. 1 1999

HORIZONTAL SCALE 1:1500
VERTICAL SCALE 1:200
VERTICAL EXAGGERATION = 7.5x

NOTE: WATER LEVELS MEASURED ON DEC. 1 1999

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO
OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

SUNSHINE COAST REGIONAL DISTRICT



PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

MONITORING WELL
CONSTRUCTION PROGRAM
SECHLT LANDFILL
SECHLT, B.C.

SECTION B-B'

BY:	DATE:
MDP/cz	DEC. 99
APPROVED:	FIG:
<i>[Signature]</i>	4

APPENDIX A

WELL LOGS



PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

LOG OF BORING : MW99-7

(Page 1 of 1)

SUNSHINE COAST REGIONAL DISTRICT
SECHULT LANDFILL

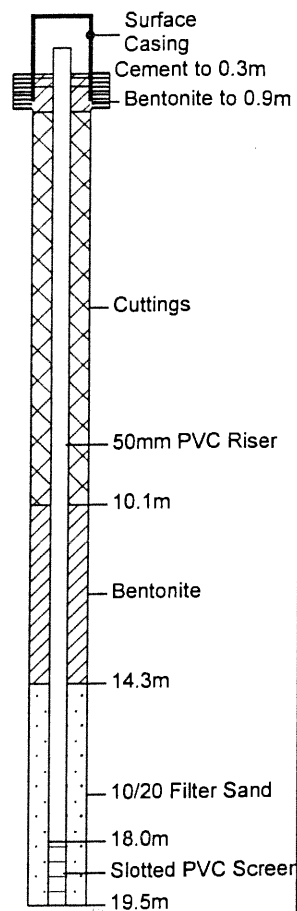
MONITORING WELL INSTALLATION

Date Completed : 11/29/99
Hole Diameter : 0.17
Drilling Method : Becker Hammer
Sampling Method : Cyclone
Field Engineer : M. Pye

Project Engineer : A.T. Holmes
Driller : Beck Drilling
Water Level (Date) : dry (11/30/99)

Depth in Meters	GRAPHIC	DESCRIPTION	REMARKS
0		Brown, SAND, some gravel with waste material (fill). 1.8m	
5		Grey, medium to coarse SAND, some gravel, trace silt and boulders, moist. 8.2m	
10		Grey, medium to coarse SAND and GRAVEL, trace silt, moist. 10.1m	
		Grey, fine to medium SAND, some gravel, trace to some silt and boulders, dry. 13.0m	
15		Grey/brown, fine to medium, SAND, some silt to silty, some gravel, trace boulders, very slightly moist. 14.6m	
		Brown, well-graded SAND, some gravel and silt, trace clay, moist. 16.5m	
		Boulders. 17.0m	
		Brown, well-graded SAND, some gravel, trace to some silt, moist. 18.6m	
		Grey, sandy SILT, trace clay, wet. 19.2m	
20		Bouldery, dense TILL. End of Hole at 19.5m	
25			
30			

Well: MW99-7
Elev.:





LOG OF BORING : MW99-8

(Page 1 of 1)

SUNSHINE COAST REGIONAL DISTRICT
SECHLT LANDFILL

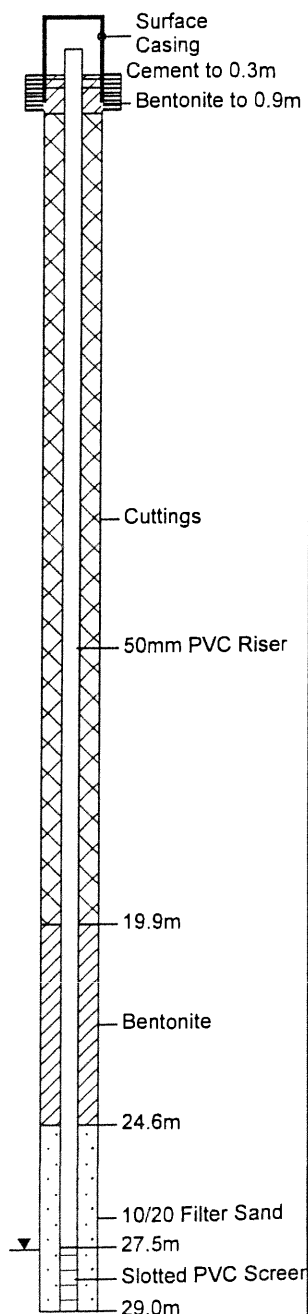
MONITORING WELL INSTALLATION

Date Completed : 11/30/99
Hole Diameter : 0.17
Drilling Method : Becker Hammer
Sampling Method : Cyclone
Field Engineer : M. Pye

Project Engineer : A.T. Holmes
Driller : Beck Drilling
Water Level (Date) : 28.405m tPVC (12/01/99)

Depth in Meters	GRAPHIC	DESCRIPTION	REMARKS
0		Brown, SAND, some gravel with waste material (fill). 1.2m	Purged and sampled well on 12/01/99.
		Brown, medium to coarse SAND and GRAVEL, moist. 2.1m	
		Grey, medium to coarse SAND and GRAVEL, moist to wet. 4.0m	
		Brown/grey, coarse SAND and GRAVEL, wet. 5.2m	
5		Grey, well-graded SAND, some gravel, trace to some silt, wet. 6.9m	
		Brown, medium to coarse SAND, trace to some gravel, trace silt, moist. 11.3m	
10		Brown, well-graded SAND, some gravel and boulders, dry. 13.1m	
		Brown, well graded SAND and GRAVEL, dry. 14.0m	
		Brown, silty SAND and GRAVEL, wet. 14.9m	
15		Brown, fine to medium SAND, some gravel, moist. 16.2m	
		Brown, medium to coarse SAND, dry. 20.4m	
20		Brown, fine to medium, silty SAND, wet. 21.6m	
		Bouldery, dense TILL. 22.3m	
		Brown, medium to coarse SAND, trace gravel, slightly moist. 25.3m	
25		Brown, well-graded SAND and GRAVEL, trace silt and boulders, slightly moist. 28.0m	
		Brown, coarse SAND and GRAVEL, some fine sand, trace silt, wet. End of Hole at 29.0m	
30			

Well: MW99-8
Elev.:





PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

LOG OF BORING : MW99-9

(Page 1 of 1)

**SUNSHINE COAST REGIONAL DISTRICT
SECHelt LANDFILL**

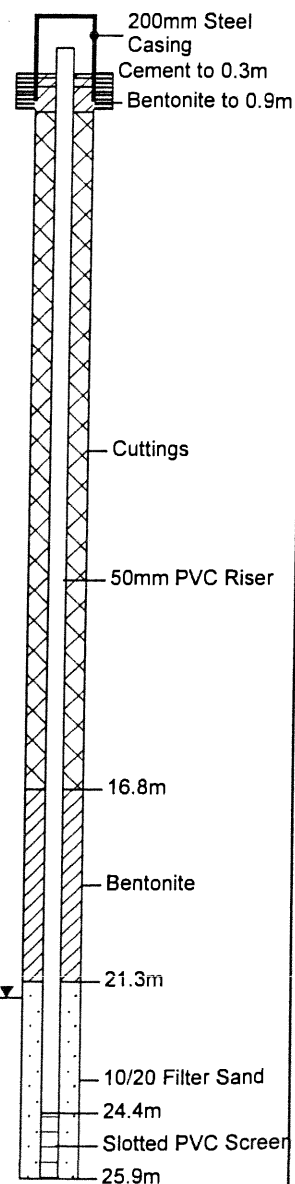
MONITORING WELL INSTALLATION

Date Completed : 11/30/99
Hole Diameter : 0.17
Drilling Method : Becker Hammer
Sampling Method : Cyclone
Field Engineer : M. Pye

Project Engineer : A.T. Holmes
Driller : Beck Drilling
Water Level (Date) : 22.580m tPVC (12/01/99)

Depth in Meters	GRAPHIC	DESCRIPTION	REMARKS
0		Brown, SAND, some gravel with waste material (fill).	Purged and sampled well on 12/01/99.
		1.8m	
		Grey/brown, medium to coarse SAND and GRAVEL, some boulders, moist.	
		3.7m	
5		Blue/grey, coarse SAND and GRAVEL, wet.	
		7.0m	
		Blue/grey, gravelly SAND, wet.	
10		10.4m	
		Grey, well-graded SAND and GRAVEL, trace to some silt, trace boulders, slightly moist.	
		15.9m	
15		Brown, medium to coarse SAND, some gravel, moist.	
		19.2m	
20		Brown, fine to medium SAND, some gravel, slightly moist.	
		20.4m	
		Grey, fine to medium SAND and GRAVEL, trace to some silt, trace boulders, dry.	
		22.0m	
25		Grey/brown, medium to coarse, gravelly SAND, trace silt, saturated.	End of Hole at 25.9m
30			

Well: MW99-9
Elev.:



APPENDIX B

CHEMICAL ANALYSIS RESULTS



CHEMICAL ANALYSIS REPORT

Date: December 17, 1999

ASL File No. L3049

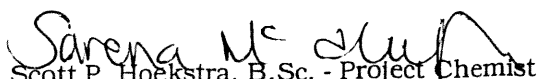
Report On: Water Analysis
2077

Report To: **Piteau Assoc. Engineering Ltd.**
215 - 260 West Esplanade
North Vancouver, BC
V7M 3G7

Attention: **Mr. Ryan Martin**

Received: December 2, 1999

ASL ANALYTICAL SERVICE LABORATORIES LTD.
per:


Scott P. Hoekstra, B.Sc. - Project Chemist
Sarena McHugh, B.Sc. - Project Chemist

**RESULTS OF ANALYSIS - Water**

File No. L3049

Sample ID

MW99-8

MW99-9

Physical Tests

Conductivity	(umhos/cm)	1240	2040
pH		7.52	7.48
Turbidity	(NTU)	9300	1780

Dissolved Anions

Alkalinity-Total	CaCO3	598	1030
Chloride	Cl	94.2	151
Sulphate	SO4	7	2

Nutrients

Ammonia Nitrogen	N	0.34	17.4
Total Kjeldahl Nitrogen	N	1.17	17.4
Nitrate Nitrogen	N	<0.005	0.009
Nitrite Nitrogen	N	0.005	0.005
Total Phosphate	P	7.88	1.96

Dissolved Metals

Arsenic	D-As	0.0003	0.0067
Barium	D-Ba	0.05	0.15
Boron	D-B	0.2	<0.1
Cadmium	D-Cd	0.0003	<0.0002
Calcium	D-Ca	140	232
Iron	D-Fe	<0.03	<0.03
Lead	D-Pb	<0.001	<0.001
Magnesium	D-Mg	22.0	32.8
Manganese	D-Mn	6.78	7.94
Mercury	D-Hg	<0.00005	<0.00005
Potassium	D-K	8	14
Sodium	D-Na	90	150

Organic Parameters

Chemical Oxygen Demand	COD	100	112
Dissolved Organic Carbon C		9.7	24.7

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.



METHODOLOGY

File No. L3049

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows:

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	EPA
For more detail see:	ASL "Collection & Sampling Guide"

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic absorption spectrophotometry (EPA Method 7470A/7471A).

Recommended Holding Time:



METHODOLOGY (cont'd)

File No. L3049

Sample:	28 days
Reference:	EPA
For more detail see:	ASL "Collection & Sampling Guide"

End of Report

Driller: Mud Bay Drilling Co. Inc.,
Drill Method: Sonic Drilling Rig
Sample Method: N/A

Borehole Diameter: 20 cm

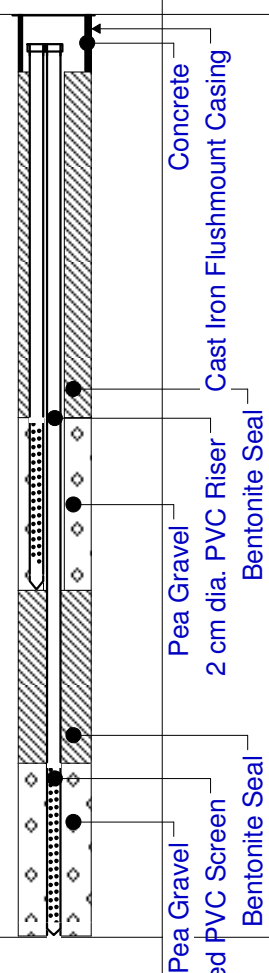
Start Date: Sept. 12, 2013

Completed: Sept. 12, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Conc (ppm)	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
ft m						Ground Surface	0.0		
0						Rock	-0.3		
2						Silty Sand and Gravel with some cobbles, compact, coarse grained, brown, moist.	-1.8		
4									
6						Sandy Silt with some gravel and cobbles, non-plastic, compact, coarse grained, brown, moist.	-2.7		
8									
10						Sandy Gravel with some cobbles, compact, coarse grained, brown, dry.	-4.9		
12									
14									
16						End of Borehole			
18									
20									



Driller: Mud Bay Drilling Co. Inc.,
Drill Method: Sonic Drilling Rig
Sample Method: N/A

Borehole Diameter: 20 cm

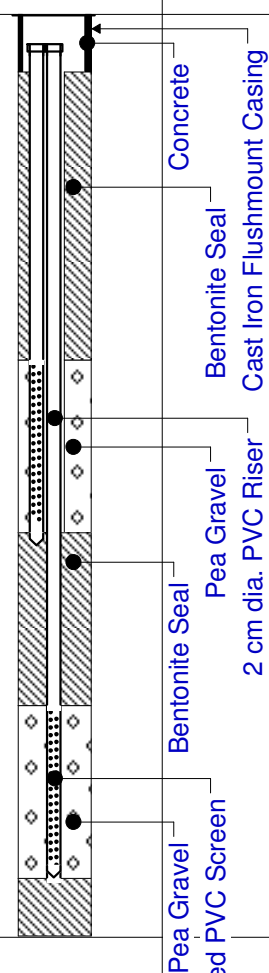
Start Date: Sept. 12, 2013

Completed: Sept. 12, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Conc (ppm)	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
ft m						Ground Surface	0.0		
0						Gravelly Sand with some cobbles, compact, coarse grained, brown, dry.	-0.3		
2						Silty Sand and Gravel with some cobbles, compact, coarse grained, brown, moist.	-1.8		
4						Sandy Silt with some gravel and cobbles, non-plastic, compact, coarse grained, brown, moist.	-2.7		
6						Sandy Gravel with some cobbles, compact, coarse grained, brown, dry.	-4.9		
8									
10									
12									
14									
16									
18									
20						End of Borehole			



Groundwater Elevation: 0
T.O.P Elevation: 0
Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 1 of 1

Driller: Mud Bay Drilling Co. Inc,

Drill Method: Sonic Drilling Rig

Sample Method: N/A

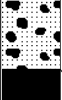
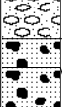
Borehole Diameter: 20 cm

Start Date: Sept. 9, 2013

Completed: Sept. 10, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
0 ft 0 m						Ground Surface	0.0		
2						Gravelly Sand with some cobbles, loose, coarse grained, brown, moist.	-0.8		
4						Asphalt	-1.2		
6						Sandy Gravel loose, coarse grained, brown, moist.			
8							-3.0		
10						Gravelly Sand with cobbles and boulders, compact, coarse grained, greyish brown, dry.	-3.4		
12							-4.3		
14						Gravelly Sand with some boulders, compact, coarse grained, brown, slightly moist.	-4.9		
16									
18						Gravel with some sand, compact, coarse grained, brown, slightly moist.			
20									
22						Gravel with some sand, cobbles, and boulders, compact, coarse grained, grey, wet.			
24									
26							-8.2		
28						Silty Clayey Gravel with some cobbles and sand, non-plastic, dense, coarse grained, grey, moist.			
30									
32						Silty Gravel with some cobbles, non-plastic, compact, coarse grained, brown, moist to wet.	-9.8		
34									
36									
38							-11.4		
40									

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 1 of 3

Driller: Mud Bay Drilling Co. Inc,

Drill Method: Sonic Drilling Rig

Sample Method: N/A

Borehole Diameter: 20 cm

Start Date: Sept. 9, 2013

Completed: Sept. 10, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
42						Sand with some silt, clay, and cobbles, compact, coarse grained, grey, dry.	-12.5		
44						Sandy Gravel with some cobbles and boulders, compact, coarse grained, grey, moist.			
46	14								
48									
50									
52	16								
54									
56							-17.1		
58						Sandy Gravel with some silt, compact, medium grained, grey, moist.			
60	18								
62							-18.6		
64						Gravel with some sand and cobbles, compact, coarse grained, grey, moist.			
66	20								
68							-20.4		
70						Sand with some gravel, compact, coarse grained, grey, moist.			
72	22						-21.6		
74						Gravel with sand, compact, coarse grained, grey, moist.			
76							-23.2		
78	24					Gravelly Sand with boulders, loose, coarse grained, wet.			
80									

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 2 of 3



Project #: 4-2111-01-27-02

Project: 2013 MW and GP Installation
Client: Sunshine Coast Regional District
Location: Sechelt Landfill

Privileged and Confidential

LOG OF WELL: MW13-01

Driller: Mud Bay Drilling Co. Inc,
Drill Method: Sonic Drilling Rig
Sample Method: N/A

Borehole Diameter: 20 cm

Start Date: Sept. 9, 2013

Completed: Sept. 10, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
82									
84									
86	26						-26.2		
88						End of Borehole			
90									
92	28								
94									
96									
98									
100	30								
102									
104									
106	32								
108									
110									
112	34								
114									
116									
118	36								
120									

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 3 of 3

Driller: Mud Bay Drilling Co. Inc,

Drill Method: Sonic Drilling Rig

Sample Method: N/A

Borehole Diameter: 20 cm

Start Date: Sept. 10, 2013

Completed: Sept. 10, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
0 ft 0 m						Ground Surface	0.0		
2						Gravel with some sand and boulders, dense, coarse grained, brown, dry.	-0.9		
4						Sand compact, medium grained, brown, dry.	-1.7		
6						Gravel with some sand, cobbles and boulders, compact, coarse grained, brown, dry.	-2.7		
8						Sandy Gravel with some cobbles and boulders, compact, coarse grained, grey, dry.	-4.9		
10						Gravel with some boulders and trace sand, compact, coarse grained, brown, dry.	-6.1		
12						Sandy Gravel with some boulders, compact, coarse grained, greyish brown, moist.	-7.9		
14						Silty Sand and Gravel with some cobbles and boulders, non-plastic, compact, coarse grained, greyish brown, wet.	-8.8		
16						Gravelly Sand with some cobbles and boulders, compact, coarse grained, greyish brown, wet.	-11.0		
18						Silty Sand and Gravel with some cobbles and boulders, non-plastic, compact, medium grained, grey, moist.			
20									
22									
24									
26									
28									
30									
32									
34									
36									
38									
40									

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 1 of 3



Project #: 4-2111-01-27-02

Project: 2013 MW and GP Installation
Client: Sunshine Coast Regional District
Location: Sechelt Landfill

Privileged and Confidential

LOG OF WELL: MW13-02

Driller: Mud Bay Drilling Co. Inc.,
Drill Method: Sonic Drilling Rig
Sample Method: N/A

Borehole Diameter: 20 cm

Start Date: Sept. 10, 2013

Completed: Sept. 10, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
42									
44									
46	14								
48							-14.6		
50						Sandy Gravel with some silt and cobbles, compact, coarse grained, grey and brown, moist.			
52	16								
54									
56									
58	18								
60									
62									
64									
66	20								
68									
70									
72	22								
74									
76							-23.2		
78	24					Silty Sand with boulders, non-plastic, compact, medium grained, greyish brown, wet.			
80									

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 2 of 3

Driller: Mud Bay Drilling Co. Inc,

Drill Method: Sonic Drilling Rig

Sample Method: N/A

Borehole Diameter: 20 cm

Start Date: Sept. 10, 2013

Completed: Sept. 10, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
82						Sand with some gravel and cobbles, dense, coarse grained, grey, moist.	-24.7		
84	26					Silt with some cobbles and boulders, non-plastic, dense, fine grained, grey, moist.	-25.3		
86									
88							-26.8		
90						Rock	-27.4		
92	28					Silty Sand and Gravel with some boulders, non-plastic, compact, coarse grained, grey, wet at 29.9 metres.			
94									
96									
98	30								
100									
102									
104	32								
106							-32.3		
108						End of Borehole			
110									
112	34								
114									
116									
118	36								
120									

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 3 of 3

Driller: Mud Bay Drilling Co. Inc,

Drill Method: Sonic Drilling Rig

Sample Method: N/A

Borehole Diameter: 20 cm

Start Date: Sept. 11, 2013

Completed: Sept. 11, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
ft m						Ground Surface	0.0		
0						Sandy Gravel with some cobbles, boulders, and silt, compact, coarse grained, brown, slightly moist.	-1.7		
2						Gravelly Sand with some cobbles and boulders, compact, coarse grained, brown, slightly moist.	-4.0		
4						Sandy Gravel with some cobbles and boulders, compact, coarse grained, greyish brown, moist.	-5.2		
6						Sand with some gravel, cobbles, and trace silt, compact, medium grained, greyish brown, moist.	-6.1		
8						Rock	-6.4		
10						Gravelly Sand with some cobbles and trace silt, compact, coarse grained, grey, moist.	-7.9		
12						Silty Sand with some cobbles and boulders, non-plastic, compact, medium grained, grey and brown, wet.			

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 1 of 2

Driller: Mud Bay Drilling Co. Inc,
Drill Method: Sonic Drilling Rig
Sample Method: N/A

Borehole Diameter: 20 cm

Start Date: Sept. 11, 2013

Completed: Sept. 11, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
42							-13.3		
44						Rock	-13.6		
46	14					Silty Sand with some cobbles and boulders, non-plastic, compact, medium grained, grey, wet.			
48									
50									
52	16								
54							-17.1		
56						Silty Sand with cobbles and boulders, non- plastic, compact, medium grained, grey and brown, moist.			
58	18								
60									
62						Rock	-18.9		
64							-19.2		
66	20					Silty Sand with cobbles and boulders, non- plastic, compact, medium grained, grey and brown, moist.	-20.1		
68									
70						End of Borehole			
72	22								
74									
76									
78	24								
80									

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 2 of 2

Driller: Mud Bay Drilling Co. Inc,

Drill Method: Sonic Drilling Rig

Sample Method: N/A

Borehole Diameter: 20 cm

Start Date: Sept. 11, 2013

Completed: Sept. 11, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
ft m									
-3									
-1									
1						Ground Surface	0.0		
3						Sand and Gravel with some cobbles, compact, coarse grained, brown and grey, dry.	-1.8		
5									
7	2					Sandy Gravel with some cobbles and boulders, compact, coarse grained, brownish grey, moist.	-2.6		
9									
11						Rock			
13	4					Sandy Gravel with some cobbles and boulders, compact, coarse grained, brownish grey, moist.	-4.9		
15									
17						Gravelly Sand with some boulders, compact, coarse grained, brown and grey, slightly moist.	-7.6		
19	6								
21									
23									
25						Gravel with some sand, cobbles, and boulders, compact, coarse grained, grey, wet.	-10.1		
27	8								
29									
31									
33	10					Silty Sand and Gravel with some boulders, non-plastic, compact, coarse grained, grey, wet.	-11.0		
35									

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 1 of 2

Driller: Mud Bay Drilling Co. Inc,
Drill Method: Sonic Drilling Rig
Sample Method: N/A

Borehole Diameter: 20 cm

Start Date: Sept. 11, 2013

Completed: Sept. 11, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
38	12					Sand with silty mottling, compact, medium grained, greyish brown, moist.			
40									
42									
44									
46	14					Sand with trace silt, loose, medium grained, brownish grey, wet.	-14.0		
48									
50									
52									
54	16								
56									
58									
60									
62	18								
64									
66									
68									
70	20					Silty Sand non-plastic, dense, medium grained, brownish grey, wet.	-19.2 -20.1		
72									
74									
76									
						End of Borehole			

Filter Sand Pack
5 cm dia. PVC 10 Slot Screen

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 2 of 2

Driller: Mud Bay Drilling Co. Inc,

Drill Method: Sonic Drilling Rig

Sample Method: N/A

Borehole Diameter: 20 cm

Start Date: Sept. 11, 2013

Completed: Sept. 11, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
ft m									
-3									
-1									
						Ground Surface	0.0		
1						Sand and Gravel with some cobbles, compact, coarse grained, brown and grey, dry.			
3									
5							-1.8		
7	2					Sandy Gravel with some cobbles and boulders, compact, coarse grained, brownish grey, dry.			
9									
11									
13	4								
15							-4.9		

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 1 of 2

Driller: Mud Bay Drilling Co. Inc,

Drill Method: Sonic Drilling Rig

Sample Method: N/A

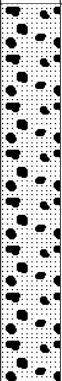
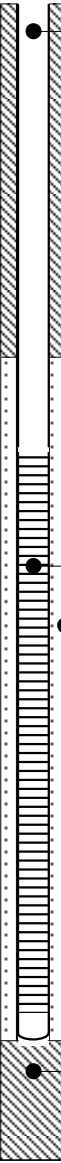
Borehole Diameter: 20 cm

Start Date: Sept. 11, 2013

Completed: Sept. 11, 2013

Checked By: ML

Logged By: MV

Depth	Sample No.	N-Value	Recovery (%)	Vapour Reading	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
18						Gravelly Sand with some cobbles and boulders, compact, coarse grained, brown, moist.			5 cm dia. PVC Riser
20	6						-7.0		
22									
24						Sandy Gravel with silty mottling and some cobbles, compact, coarse grained, grey, wet.	-7.9		
26	8								
28						Sand with some cobbles and boulders, compact, medium grained, grey, wet.			
30									
32							-9.8		
34	10					Sand with some cobbles and boulders, compact, medium grained, greyish brown, moist.			
36							-11.0		
						End of Borehole			Bentonite

Groundwater Elevation: 0

T.O.P Elevation: 0

Ground Surface Elevation: 0

Screening Tool: N/A

Monitoring Well Log
For Environmental Purposes Only

Sheet: 2 of 2



Project #: 4-2111-01-49

Privileged and Confidential

Project: Sechelt Landfill

LOG OF: GP17-01

Client: Sunshine Coast Regional District

Location: 4901 Dusty Road, Sechelt, British Columbia

Driller: Mud Bay Drilling

Monitoring Well Diameter: 15.24 cm

Drill Method: DB320

Start Date: August 16, 2017

Checked By: CS

Sample Method: Continuous

Completed: August 16, 2017

Logged By: TM

Depth	Sample No.	N-Value	Recovery (%)	Vapour Conc (ppm)	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
-3 ft m									
-2									
-1									
0						Ground Surface			Monument Steel Casing Set In Concrete Collar
1						SILTY SAND AND GRAVEL Some cobbles, compact, coarse-grained, light brown, dry.	-0.3		
2						SILTY SAND Some gravel, trace cobbles, coarse-grained, brown and grey, moist.			
3						Large boulder at 1.2 mbgs.			Bentonite
4							-1.5		
5						SANDY SILT Some gravel and cobbles, grey, dry.			
6									
7									1.9 cm PVC Screen
8									
9							-2.7		Pea Gravel
10						SANDY GRAVEL Compact, coarse-grained, brownish grey, dry.			Bentonite
11									
12									1.9 cm PVC Screen
13									
14									Pea Gravel
15							-4.6		
16						End of Borehole			
17									

Groundwater Elevation: NM

Northing: 5482084.863

T.O.P. Elevation: 219.32 masl

FOR ENVIRONMENTAL PURPOSES ONLY

Easting: 448375.297

Ground Surface Elevation: 218.51 masl

Sheet: 1 of 1



Project #: 4-2111-01-49

Privileged and Confidential

Project: Sechelt Landfill

LOG OF: MW17-01

Client: Sunshine Coast Regional District

Location: 4901 Dusty Road, Sechelt, British Columbia

Driller: Mud Bay Drilling

Monitoring Well Diameter: 15.24 cm

Drill Method: DB320

Start Date: August 16, 2017

Checked By: CS

Sample Method: Continuous

Completed: August 16, 2017

Logged By: TM

Depth	Sample No.	N-Value	Recovery (%)	Vapour Conc (ppm)	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
ft m									
-2						Ground Surface			
0						SAND and GRAVEL Compact, dry, grey to light brown at 0.4 mbgs.			Monument Steel Casing Set In Concrete Collar
2									
4						Seam of assorted refuse from 0.9 to 1.1 mbgs.	-1.1		
6						ORGANIC SOIL Trace wood fragments and rootlets, dark brown to black, moist.	-1.6		
8						SAND Trace subangular gravel, medium-grained, grey, moist.	-2.1 -2.2		
10						ORGANIC SOIL Trace wood fragments, dark brown to black, moist.			
12						SAND and GRAVEL Compact, medium-grained, dark brown, dry.	-3.7		
14						Becomes light grey with cobbles at 2.4 mbgs.			
16						SANDY GRAVEL Some silt, some cobbles, compact, coarse-grained, grey, wet.			
18						Light grey and dry at 4.7 mbgs.			
20						Moist at 5.5 mbgs.	-5.8		
22						GRAVELLY SAND Trace cobbles, compact, grey, moist.			Bentonite
24									

Groundwater Elevation: NM

T.O.P. Elevation: 224.79 masl

Ground Surface Elevation: 224.00 masl

FOR ENVIRONMENTAL PURPOSES ONLY

Northing: 5481984.527

Easting: 448624.957

Sheet: 1 of 2



Project #: 4-2111-01-49

Privileged and Confidential

Project: Sechelt Landfill

LOG OF: MW17-01

Client: Sunshine Coast Regional District

Location: 4901 Dusty Road, Sechelt, British Columbia

Driller: Mud Bay Drilling

Monitoring Well Diameter: 15.24 cm

Drill Method: DB320

Start Date: August 16, 2017

Checked By: CS

Sample Method: Continuous

Completed: August 16, 2017

Logged By: TM

Depth	Sample No.	N-Value	Recovery (%)	Vapour Conc (ppm)	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
ft-m									
26-8						GRAVELLY SAND Trace cobbles, compact, grey, moist. (continued)			
28							-8.8		
30						SAND Some silt, some gravel and subangular cobbles, grey, moist.			
32							-9.8		
34-10						GRAVELLY SAND Trace cobbles, compact, grey, moist.			
36									
38							-11.6		
40-12						GRAVEL and COBBLES Trace sand, rounded gravel, grey, very moist.			Pea Gravel
42									
44							-13.3		
46-14						SILTY SAND Some coarse subangular gravel, trace cobbles, grey, very moist to wet.			5.08 cm PVC Screen
48									
50						Brownish grey and damp at 14.9 metres bgs.	-14.9		
52						End of Borehole			
						Note- Well magnet present in casing.			

Groundwater Elevation: NM

Northing: 5481984.527

T.O.P. Elevation: 224.79 masl

FOR ENVIRONMENTAL PURPOSES ONLY

Easting: 448624.957

Ground Surface Elevation: 224.00 masl

Sheet: 2 of 2



Project #: 4-2111-01-49

Privileged and Confidential

Project: Sechelt Landfill

LOG OF: MW17-02

Client: Sunshine Coast Regional District

Location: 4901 Dusty Road, Sechelt, British Columbia

Driller: Mud Bay Drilling

Monitoring Well Diameter: 15.24 cm

Drill Method: DB320

Start Date: August 16, 2017

Checked By: CS

Sample Method: Continuous

Completed: August 16, 2017

Logged By: TM

Depth	Sample No.	N-Value	Recovery (%)	Vapour Conc (ppm)	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
-3 ft m									
-2									
-1									
0						Ground Surface			
1						TOPSOIL Rootlets.	-0.2		Monument Steel Casing Set In Concrete Collar
2						SAND and GRAVEL Some cobbles, compact, coarse-grained, brown and grey, dry.			
3									
4						Large boulder from 1.2 to 1.8 mbgs.			
5									
6							-1.8		
7						SANDY GRAVEL Trace large boulders and cobbles, compact, light grey, dry.			
8									
9									
10									
11									
12									Bentonite
13									
14									
15							-4.6		
16									

Groundwater Elevation: NM

Northing: 5482088.822

T.O.P. Elevation: 222.20 masl

FOR ENVIRONMENTAL PURPOSES ONLY

Easting: 448545.540

Ground Surface Elevation: 221.37 masl

Sheet: 1 of 2



Project #: 4-2111-01-49

Privileged and Confidential

Project: Sechelt Landfill

LOG OF: MW17-02

Client: Sunshine Coast Regional District

Location: 4901 Dusty Road, Sechelt, British Columbia

Driller: Mud Bay Drilling

Monitoring Well Diameter: 15.24 cm

Drill Method: DB320

Start Date: August 16, 2017

Checked By: CS

Sample Method: Continuous

Completed: August 16, 2017

Logged By: TM

Depth	Sample No.	N-Value	Recovery (%)	Vapour Conc (ppm)	Graphic Log	Geology Description	Depth/Elev (m)	Well Completion	Well Details
ft m									
17						GRAVELLY SAND Some cobbles, compact, coarse-grained. brown, moist. <i>(continued)</i>			
18									
19									
20							-6.4		
21						SANDY GRAVEL Some cobbles, compact, brown, moist.			
22							-7.0		
23						SAND Some rounded cobbles, medium-grained, brown, wet.			← Pea Gravel
24									
25									
26									← 5.08 cm PVC Screen
27									
28									
29									
30						Very moist with trace subangular gravel at 9.1 mbgs.			
31									
32							-9.8		
33						End of Borehole			
34									
35									

Groundwater Elevation: NM

Northing: 5482088.822

T.O.P. Elevation: 222.20 masl

FOR ENVIRONMENTAL PURPOSES ONLY

Easting: 448545.540

Ground Surface Elevation: 221.37 masl

Sheet: 2 of 2



APPENDIX C
HISTORIC GROUNDWATER ELEVATIONS AND HYDROGRAPHS



Table C1 Historic Groundwater Elevations

Date:		Jun-94			Sep-94			Dec-94			Mar-95			Jun-95			Dec-95		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	5.15	4.09	208.23	5.73	4.67	207.65	4.81	3.75	208.57	4.19	3.13	209.19	5.27	4.21	208.11	3.63	2.57	209.75
MW-1A	5.03	5.03	3.97	208.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-2	5.77	6.22	5.51	206.71	6.90	6.19	206.03	6.45	5.74	206.48	5.15	4.44	207.78	6.38	5.67	206.55	5.00	4.29	207.93
MW-2A	7.06	6.24	5.87	207.75	6.26	5.89	207.73	6.26	5.89	207.73	5.32	4.95	208.67	5.90	5.53	208.09	5.23	4.86	208.76
MW-3	4.27	3.19	2.24	208.10	3.84	2.89	207.45	3.40	2.45	207.89	2.49	1.54	208.80	3.62	2.67	207.67	1.67	0.72	209.62
MW-4	11.50	8.76	8.06	210.98	10.54	9.84	209.20	8.38	7.68	211.36	5.84	5.14	213.90	9.22	8.52	210.52	6.19	5.49	213.55
MW-4A	4.04	4.00	3.35	215.69	4.50	3.85	215.19	3.25	2.60	216.44	3.38	2.73	216.31	3.72	3.07	215.97	1.70	1.05	217.99
MW-5	14.30	-	-	-	15.23	15.18	206.95	15.27	15.22	206.91	10.57	10.07	212.06	13.28	13.23	208.89	12.48	12.43	209.69
MW99-7	19.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-8	29.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-9	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-1	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-2	32.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-3	17.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-4	20.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Mar-96			Jun-96			Jan-97			Apr-97			Jun-97			Oct-97		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	4.31	3.25	209.07	4.31	3.25	209.07	3.43	2.37	209.95	5.15	4.09	208.23	4.76	3.70	208.62	4.51	3.45	208.87
MW-1A	5.03	-	-	-	-	-	-	-	-	-	4.39	3.33	208.99	-	-	-	3.31	2.25	210.07
MW-2	5.77	5.00	4.29	207.93	6.00	5.29	206.93	4.41	3.70	208.52	5.12	4.41	207.81	5.65	4.94	207.28	5.75	5.04	207.18
MW-2A	7.06	5.17	4.80	208.82	6.21	5.84	207.78	4.58	4.21	209.41	5.28	4.91	208.71	5.73	5.36	208.26	6.14	5.77	207.85
MW-3	4.27	2.58	1.63	208.71	2.84	1.89	208.45	1.89	0.94	209.40	3.75	2.80	207.54	4.76	3.81	206.53	2.14	1.19	209.15
MW-4	11.50	5.73	5.03	214.01	7.93	7.23	211.81	4.91	4.21	214.83	5.67	4.97	214.07	5.71	5.01	214.03	8.00	7.30	211.74
MW-4A	4.04	2.87	2.22	216.82	4.24	3.59	215.45	4.18	3.53	215.51	2.79	2.14	216.90	2.78	2.13	216.91	2.53	1.88	217.16
MW-5	14.30	10.14	10.09	212.03	13.94	13.89	208.23	9.79	9.74	212.38	10.52	10.47	211.65	12.34	12.29	209.83	14.30	14.25	207.87
MW99-7	19.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-8	29.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-9	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-1	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-2	32.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-3	17.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-4	20.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Jan-98			May-98			Jul-98			Oct-98			Dec-98			Mar-99		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	3.43	2.37	209.95	6.10	5.04	207.28	6.42	5.36	206.96	6.10	5.04	207.28	2.60	1.54	210.78	4.70	3.64	208.68
MW-1A	5.03	3.42	2.36	209.96	4.45	3.39	208.93	-	-	-	-	-	-	-	-	-	-	-	-
MW-2	5.77	5.47	4.76	207.46	5.80	5.09	207.13	5.32	4.61	207.61	5.50	4.79	207.43	4.12	3.41	208.81	4.45	3.74	208.48
MW-2A	7.06	5.47	5.10	208.52	7.00	6.63	206.99	6.12	5.75	207.87	6.22	5.85	207.77	5.42	5.05	208.57	4.64	4.27	209.35
MW-3	4.27	3.31	2.36	207.98	3.13	2.18	208.16	3.40	2.45	207.89	4.22	3.27	207.07	1.55	0.60	209.74	1.80	0.85	209.49
MW-4	11.50	6.26	5.56	213.48	8.41	7.71	211.33	8.18	7.48	211.56	11.00	10.30	208.74	5.28	4.58	214.46	4.26	3.56	215.48
MW-4A	4.04	2.79	2.14	216.90	3.85	3.20	215.84	4.00	3.35	215.69	2.81	2.16	216.88	1.80	1.15	217.89	2.88	2.23	216.81
MW-5	14.30	11.72	11.67	210.45	13.78	13.73	208.39	15.33	15.28	206.84	14.00	13.95	208.17	10.19	10.14	211.98	6.70	6.65	215.47
MW99-7	19.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-8	29.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-9	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-1	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-2	32.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-3	17.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-4	20.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Oct-99			Dec-99			May-00			Jun-00			Sep-00			Dec-00		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	5.89	4.83	207.49	3.14	2.08	210.24	4.74	3.68	208.64	4.98	3.92	208.40	5.87	4.81	207.51	3.88	2.82	209.50
MW-1A	5.03	-	-	-	-	-	-	4.41	3.35	208.97	5.00	3.94	208.38	4.41	3.35	208.97	5.00	3.94	208.38
MW-2	5.77	7.00	6.29	205.93	5.23	4.52	207.70	5.69	4.98	207.24	5.90	5.19	207.03	6.70	5.99	206.23	6.45	5.74	206.48
MW-2A	7.06	6.23	5.86	207.76	5.31	4.94	208.68	5.75	5.38	208.24	6.03	5.66	207.96	6.11	5.74	207.88	6.10	5.73	207.89
MW-3	4.27	4.00	3.05	207.29	2.47	1.52	208.82	2.00	1.05	209.29	2.33	1.38	208.96	3.87	2.92	207.42	2.32	1.37	208.97
MW-4	11.50	10.78	10.08	208.96	6.39	5.69	213.35	7.23	6.53	212.51	8.13	7.43	211.61	10.46	9.76	209.28	9.37	8.67	210.37
MW-4A	4.04	3.00	2.35	216.69	2.67	2.02	217.02	1.83	1.18	217.86	1.93	1.28	217.76	3.94	3.29	215.75	3.38	2.73	216.31
MW-5	14.30	14.33	14.28	207.84	13.88	13.83	208.29	12.73	12.68	209.44	14.33	14.28	207.84	15.19	15.14	206.98	15.16	15.11	207.01
MW99-7	19.50	-	-	-	20.07	19.17	192.33	15.46	14.56	196.94	15.34	14.44	197.06	16.90	16.00	195.50	15.50	14.60	196.90
MW99-8	29.00	-	-	-	28.37	27.47	188.53	27.78	26.88	189.12	27.94	27.04	188.96	28.25	27.35	188.65	28.51	27.61	188.39
MW99-9	25.90	-	-	-	22.60	21.70	199.20	21.97	21.07	199.83	22.20	21.30	199.60	22.50	21.60	199.30	22.65	21.75	199.15
MW13-1	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-2	32.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-3	17.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-4	20.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Mar-01			Jul-01			Sep-01			Dec-01			Mar-02			Jun-02		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	4.80	3.74	208.58	5.50	4.44	207.88	5.84	4.78	207.54	3.88	2.82	209.50	4.24	3.18	209.14	5.57	4.51	207.81
MW-1A	5.03	-	-	-	-	-	-	-	-	-	-	-	-	4.37	3.31	209.01	4.37	3.31	209.01
MW-2	5.77	4.60	3.89	208.33	6.49	5.78	206.44	6.77	6.06	206.16	5.47	4.76	207.46	5.45	4.74	207.48	6.76	6.05	206.17
MW-2A	7.06	4.85	4.48	209.14	6.12	5.75	207.87	6.13	5.76	207.86	5.58	5.21	208.41	5.92	5.55	208.07	-	-	-
MW-3	4.27	2.50	1.55	208.79	3.40	2.45	207.89	3.10	2.15	208.19	2.29	1.34	209.00	2.57	1.62	208.72	3.75	2.80	207.54
MW-4	11.50	5.45	4.75	214.29	9.79	9.09	209.95	10.60	9.90	209.14	7.14	6.44	212.60	5.68	4.98	214.06	9.37	8.67	210.37
MW-4A	4.04	-	-	-	3.72	3.07	215.97	3.64	2.99	216.05	1.85	1.20	217.84	3.71	3.06	215.98	3.98	3.33	215.71
MW-5	14.30	7.10	7.05	215.07	15.18	15.13	206.99	15.15	15.10	207.02	14.75	14.70	207.42	-	-	-	15.82	15.77	206.35
MW99-7	19.50	16.70	15.80	195.70	15.61	14.71	196.79	15.17	14.27	197.23	14.73	13.83	197.67	14.90	14.00	197.50	15.85	14.95	196.55
MW99-8	29.00	27.79	26.89	189.11	28.61	27.71	188.29	28.34	27.44	188.56	28.40	27.50	188.50	27.68	26.78	189.22	28.00	27.10	188.90
MW99-9	25.90	21.85	20.95	199.95	22.48	21.58	199.32	22.65	21.75	199.15	22.57	21.67	199.23	21.70	20.80	200.10	22.25	21.35	199.55
MW13-1	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-2	32.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-3	17.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-4	20.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Oct-02			Feb-03			Mar-03			Sep-03			Mar-04			Dec-04		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	6.10	5.04	207.28	4.49	3.43	208.89	4.35	3.29	209.03	6.70	5.64	206.68	4.27	3.21	209.11	4.70	3.64	208.68
MW-1A	5.03	4.50	3.44	208.88	4.22	3.16	209.16	4.25	3.19	209.13	4.43	3.37	208.95	-	-	-	4.39	3.33	208.99
MW-2	5.77	7.56	6.85	205.37	5.95	5.24	206.98	5.74	5.03	207.19	7.06	6.35	205.87	5.23	4.52	207.70	5.69	4.98	207.24
MW-2A	7.06	6.88	6.51	207.11	6.40	6.03	207.59	6.35	5.98	207.64	6.80	6.43	207.19	5.95	5.58	208.04	6.85	6.48	207.14
MW-3	4.27	4.24	3.29	207.05	2.17	1.22	209.12	2.00	1.05	209.29	4.23	3.28	207.06	2.42	1.47	208.87	2.21	1.26	209.08
MW-4	11.50	11.46	10.76	208.28	7.48	6.78	212.26	7.59	6.89	212.15	11.49	10.79	208.25	6.20	5.50	213.54	9.76	9.06	209.98
MW-4A	4.04	4.00	3.35	215.69	3.27	2.62	216.42	3.14	2.49	216.55	4.10	3.45	215.59	3.20	2.55	216.49	2.88	2.23	216.81
MW-5	14.30	16.70	16.65	205.47	15.12	15.07	207.05	15.40	15.35	206.77	16.80	16.75	205.37	12.30	12.25	209.87	15.30	15.25	206.87
MW99-7	19.50	16.30	15.40	196.10	14.75	13.85	197.65	14.59	13.69	197.81	16.90	16.00	195.50	15.00	14.10	197.40	14.34	13.44	198.06
MW99-8	29.00	28.46	27.56	188.44	28.28	27.38	188.62	28.00	27.10	188.90	28.34	27.44	188.56	27.63	26.73	189.27	28.70	27.80	188.20
MW99-9	25.90	22.66	21.76	199.14	22.42	21.52	199.38	22.23	21.33	199.57	22.54	21.64	199.26	21.73	20.83	200.07	22.70	21.80	199.10
MW13-1	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-2	32.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-3	17.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-4	20.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Mar-05			Feb-06			May-06			Sep-06			Nov-06			Apr-07		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	4.81	3.75	208.57	3.38	2.32	210.00	4.87	3.81	208.51	6.00	4.94	207.38	3.37	2.31	210.01	4.70	3.64	208.68
MW-1A	5.03	4.47	3.41	208.91	4.40	3.34	208.98	-	-	-	4.40	3.34	208.98	4.45	3.39	208.93	-	-	-
MW-2	5.77	5.54	4.83	207.39	4.44	3.73	208.49	5.56	4.85	207.37	7.20	6.49	205.73	5.29	4.58	207.64	5.50	4.79	207.43
MW-2A	7.06	6.25	5.88	207.74	5.23	4.86	208.76	6.60	6.23	207.39	6.80	6.43	207.19	6.60	6.23	207.39	5.60	5.23	208.39
MW-3	4.27	3.65	2.70	207.64	2.11	1.16	209.18	3.64	2.69	207.65	4.22	3.27	207.07	1.45	0.50	209.84	2.99	2.04	208.30
MW-4	11.50	7.30	6.60	212.44	2.50	1.80	217.24	7.84	7.14	211.90	10.46	9.76	209.28	6.95	6.25	212.79	5.29	4.59	214.45
MW-4A	4.04	3.59	2.94	216.10	5.50	4.85	214.19	1.87	1.22	217.82	4.60	3.95	215.09	1.91	1.26	217.78	2.41	1.76	217.28
MW-5	14.30	11.57	11.52	210.60	14.43	14.38	207.74	14.50	14.45	207.67	16.70	16.65	205.47	14.76	14.71	207.41	9.37	9.32	212.80
MW99-7	19.50	15.61	14.71	196.79	14.43	13.53	197.97	15.77	14.87	196.63	16.48	15.58	195.92	13.90	13.00	198.50	13.98	13.08	198.42
MW99-8	29.00	27.52	26.62	189.38	27.73	26.83	189.17	28.87	27.97	188.03	28.44	27.54	188.46	28.59	27.69	188.31	26.48	25.58	190.42
MW99-9	25.90	21.67	20.77	200.13	24.74	23.84	197.06	22.08	21.18	199.72	22.63	21.73	199.17	22.68	21.78	199.12	20.56	19.66	201.24
MW13-1	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-2	32.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-3	17.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-4	20.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Jul-08			Nov-08			Jul-09			Nov-09			Mar-10			Aug-10		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	5.75	4.69	207.63	4.95	3.89	208.43	5.64	4.58	207.74	5.96	4.90	207.42	4.22	3.16	209.16	5.66	4.60	207.72
MW-1A	5.03	4.50	3.44	208.88	4.39	3.33	208.99	-	-	-	-	-	-	-	-	-	-	-	-
MW-2	5.77	7.85	7.14	205.08	6.31	5.60	206.62	6.46	5.75	206.47	6.93	6.22	206.00	5.67	4.96	207.26	6.63	5.92	206.30
MW-2A	7.06	6.78	6.41	207.21	7.82	7.45	206.17	6.78	6.41	207.21	6.82	6.45	207.17	5.87	5.50	208.13	6.79	6.42	207.20
MW-3	4.27	4.00	3.05	207.29	2.39	1.44	208.90	3.90	2.95	207.39	1.95	1.00	209.34	1.99	1.04	209.30	3.85	2.90	207.44
MW-4	11.50	10.05	9.35	209.69	8.47	7.77	211.27	9.85	9.15	209.89	10.93	10.23	208.81	6.31	5.61	213.43	10.85	10.15	208.89
MW-4A	4.04	4.30	3.65	215.39	3.21	2.56	216.48	4.70	4.05	214.99	3.98	3.33	215.71	2.95	2.30	216.75	4.17	3.52	215.52
MW-5	14.30	16.00	15.95	206.17	16.10	16.05	206.07	-	-	-	16.80	16.75	205.37	-	-	-	-	-	-
MW99-7	19.50	15.41	14.51	196.99	14.50	13.60	197.90	15.95	15.05	196.45	15.16	14.26	197.24	-	-	-	-	-	-
MW99-8	29.00	28.29	27.39	188.61	28.72	27.82	188.18	28.80	27.90	188.10	28.99	28.09	187.91	-	-	-	28.17	27.27	188.73
MW99-9	25.90	22.47	21.57	199.33	22.80	21.90	199.00	22.32	21.42	199.48	23.00	22.10	198.80	-	-	-	-	-	-
MW13-1	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-2	32.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-3	17.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-4	20.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Dec-10			Jul-11			Oct-11			Dec-11			Feb-12			Mar-12		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	3.45	2.39	209.93	5.40	4.34	207.98	6.07	5.01	207.31	5.26	4.20	208.12	-	-	-	-	-	-
MW-1A	5.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-2	5.77	6.26	5.55	206.67	6.49	5.78	206.44	7.03	6.32	205.90	6.45	5.74	206.48	-	-	-	-	-	-
MW-2A	7.06	5.77	5.40	208.22	6.79	6.42	207.20	6.81	6.44	207.19	6.80	6.43	207.19	-	-	-	6.78	6.41	207.21
MW-3	4.27	2.50	1.55	208.79	3.60	2.65	207.69	3.35	2.40	207.95	3.16	2.21	208.13	-	-	-	-	-	-
MW-4	11.50	7.74	7.04	212.00	8.99	8.29	210.75	11.12	10.42	208.62	9.30	8.60	210.44	-	-	-	-	-	-
MW-4A	4.04	1.97	1.32	217.72	4.20	3.55	215.49	3.43	2.78	216.26	3.92	3.27	215.77	3.20	2.55	216.49	-	-	-
MW-5	14.30	16.30	16.25	205.87	15.24	15.19	206.93	16.05	16.00	206.12	16.15	16.10	206.02	13.97	13.92	208.20	-	-	-
MW99-7	19.50	14.50	13.60	197.90	15.71	14.81	196.69	16.05	15.15	196.36	15.10	14.20	197.30	-	-	-	-	-	-
MW99-8	29.00	28.53	27.63	188.37	27.94	27.04	188.96	28.37	27.47	188.53	28.56	27.66	188.34	-	-	-	-	-	-
MW99-9	25.90	22.71	21.81	199.09	22.34	21.44	199.46	22.61	21.71	199.19	22.72	21.82	199.08	-	-	-	-	-	-
MW13-1	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-2	32.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-3	17.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-4	20.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Jul-12			Dec-12			Mar-13			Jun-13			Sep-13			Nov-13		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	5.26	4.20	208.12	3.84	2.78	209.54	4.30	3.26	209.06	4.73	3.69	208.63	5.92	4.88	207.44	-	-	-
MW-1A	5.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-2	5.77	6.18	5.47	206.75	4.67	3.96	208.26	-	-	-	5.52	3.80	208.42	7.11	5.39	206.83	-	-	-
MW-2A	7.06	5.61	5.24	208.38	5.42	5.05	208.57	-	-	-	6.19	5.79	207.83	6.88	6.48	207.14	-	-	-
MW-3	4.27	3.79	2.84	207.50	2.20	1.25	209.09	2.78	1.82	208.52	3.96	3.00	210.47	5.80	4.80	208.67	-	-	-
MW-4	11.50	8.50	7.80	211.24	7.40	6.70	212.34	5.84	5.03	216.35	7.64	6.83	212.21	10.27	9.46	209.58	-	-	-
MW-4A	4.04	4.00	3.35	215.69	1.91	1.26	217.78	3.44	2.69	216.35	3.49	2.74	216.30	4.10	3.35	215.69	-	-	-
MW-5	14.30	15.60	15.55	206.57	14.94	14.89	207.23	12.34	11.26	210.86	14.10	13.02	209.10	16.39	15.31	206.81	-	-	-
MW99-7	19.50	15.20	14.30	197.20	13.88	12.98	198.52	14.60	13.77	197.73	14.73	13.90	197.60	-	-	-	-	-	-
MW99-8	29.00	28.80	27.90	188.10	28.48	27.58	188.42	27.71	26.78	189.22	27.84	26.91	189.09	-	-	-	-	-	-
MW99-9	25.90	22.31	21.41	199.49	22.57	21.67	199.23	21.93	21.03	198.97	22.50	21.60	198.40	-	-	-	-	-	-
MW13-1	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.12	22.12	199.80
MW13-2	32.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.16	26.16	189.08
MW13-3	17.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.73	14.73	199.08
MW13-4	20.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.14	15.14	205.53
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.26	10.26	210.26
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Dec-13			Apr-14			Jun-14			Sep-14			Dec-14			Mar-15		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	-	-	-	4.30	3.26	209.06	5.08	4.04	208.28	-	-	-	3.28	2.24	210.08	4.31	3.27	209.05
MW-1A	5.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-2	5.77	-	-	-	4.58	2.86	209.36	5.65	3.93	208.29	7.09	5.37	206.85	4.10	2.38	209.84	4.95	3.23	208.99
MW-2A	7.06	-	-	-	5.37	4.97	208.65	-	-	-	-	-	-	4.82	4.42	209.20	5.47	5.07	208.55
MW-3	4.27	-	-	-	4.17	3.17	210.30	5.02	4.02	209.45	5.64	4.64	208.83	4.17	3.17	210.30	209.30	2.94	210.53
MW-4	11.50	-	-	-	6.27	5.46	213.58	8.60	7.79	211.25	-	-	-	6.28	5.47	213.57	6.89	6.08	212.96
MW-4A	4.04	-	-	-	3.30	2.55	216.49	-	-	-	4.00	3.25	215.79	1.61	0.86	218.18	3.10	2.35	216.69
MW-5	14.30	-	-	-	13.20	12.12	210.00	14.97	13.89	208.23	-	-	-	15.40	14.32	207.80	12.33	11.25	210.87
MW99-7	19.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-8	29.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-9	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-1	25.90	22.14	22.14	199.77	21.50	21.50	200.41	21.68	21.68	200.23	22.95	22.95	198.96	22.70	22.70	199.21	21.35	21.35	200.56
MW13-2	32.30	26.38	26.38	188.86	24.78	24.78	190.45	27.26	27.26	187.97	29.25	29.25	185.98	23.97	23.97	191.26	25.28	25.28	189.95
MW13-3	17.10	14.90	14.90	198.91	13.79	13.79	200.02	14.90	14.90	198.91	15.63	15.63	198.18	11.86	11.86	201.95	14.79	14.79	199.02
MW13-4	20.10	16.23	15.23	205.44	14.32	13.32	207.35	14.90	13.90	206.77	15.98	14.98	205.69	14.96	13.96	206.71	12.21	11.21	209.46
MW13-5	10.36	11.23	10.23	210.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Jul-15			Oct-15			Nov-15			Mar-16			Jul-16			Sep-16		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	5.68	4.64	207.68	5.92	4.88	207.44	4.40	3.36	208.96	4.11	3.07	209.25	5.31	4.27	208.05	5.87	4.83	207.49
MW-1A	5.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-2	5.77	6.44	4.72	207.50	6.84	5.12	207.10	5.18	3.46	208.76	4.45	2.73	209.49	6.10	4.38	207.84	6.78	5.06	207.16
MW-2A	7.06	-	-	-	-	-	-	6.00	5.60	208.02	5.27	4.87	208.75	6.77	6.37	207.25	6.80	6.40	207.22
MW-3	4.27	5.11	4.11	209.36	5.20	4.20	209.27	4.75	3.75	209.72	4.47	3.47	210.00	5.20	4.20	209.27	5.30	4.30	209.17
MW-4	11.50	9.92	9.11	209.93	11.10	10.29	208.75	8.00	7.19	211.85	6.14	5.33	213.71	9.34	8.53	210.51	11.40	10.59	208.45
MW-4A	4.04	-	-	-	-	-	-	3.65	2.90	216.14	3.48	2.73	216.31	4.00	3.25	215.79	Dry	-	-
MW-5	14.30	-	-	-	-	-	-	-	-	-	11.78	10.70	211.42	16.20	15.12	207.00	15.97	14.89	207.23
MW99-7	19.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-8	29.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-9	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-1	25.90	21.80	21.80	200.11	-	-	-	22.24	22.24	199.67	21.33	21.33	200.58	21.88	21.88	200.03	22.14	22.14	199.77
MW13-2	32.30	28.06	28.06	187.17	28.43	28.43	186.80	25.20	25.20	190.03	25.70	25.70	189.53	26.99	26.99	188.24	28.75	28.75	186.48
MW13-3	17.10	15.42	15.42	198.39	15.29	15.29	198.52	14.40	14.40	199.41	14.62	14.62	199.19	14.91	14.91	198.90	15.25	15.25	198.56
MW13-4	20.10	14.68	13.68	206.99	17.62	16.62	204.05	16.72	15.72	204.95	12.15	11.15	209.52	13.78	12.78	207.89	16.19	15.19	205.48
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																			



Table C1 Historic Groundwater Elevations

Date:		Dec-16			Apr-17			Jun-17			Nov-17			Dec-17		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	3.95	2.91	209.41	3.65	2.61	209.71	4.50	3.46	208.86	5.78	4.74	207.58	4.30	3.26	209.60
MW-1A	5.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-2	5.77	2.53	0.81	211.41	4.35	2.63	209.59	5.17	3.45	208.77	5.67	3.95	208.27	4.40	2.68	209.54
MW-2A	7.06	5.31	4.91	208.71	5.15	4.75	208.87	5.95	5.55	209.39	6.80	6.40	207.22	6.74	6.34	207.28
MW-3	4.27	4.57	3.57	209.90	4.40	3.40	210.07	4.63	3.63	209.84	4.89	3.89	207.22	4.55	3.55	207.28
MW-4	11.50	6.30	5.49	213.55	8.84	8.03	213.01	7.50	6.69	212.35	10.97	10.16	208.88	7.61	6.80	212.24
MW-4A	4.04	3.51	2.76	216.28	3.14	2.39	216.65	Dry	-	-	3.68	2.93	216.11	3.30	2.55	216.49
MW-5	14.30	14.20	13.12	209.00	12.90	11.82	210.30	13.28	12.20	209.92	-	-	-	-	-	-
MW99-7	19.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-8	29.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-9	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-1	25.90	21.88	21.88	200.03	20.50	20.50	201.41	21.47	21.47	200.44	22.14	22.14	199.77	22.10	22.10	199.81
MW13-2	32.30	24.44	24.44	190.79	24.30	24.30	190.93	26.70	26.70	188.53	26.74	26.74	188.49	25.00	25.00	190.23
MW13-3	17.10	14.16	14.16	199.65	12.40	12.40	201.41	14.88	14.88	198.93	15.17	15.17	198.64	14.20	14.20	199.61
MW13-4	20.10	15.59	14.59	206.08	13.10	12.10	208.57	12.45	11.45	209.22	16.39	15.39	205.28	16.15	15.15	205.52
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	-	-	-	-	-	-	-	-	-	14.94	14.15	209.85	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																



Table C1 Historic Groundwater Elevations

Date:		Mar-18			Jun-18			Jul-18			Sep-18			Dec-18		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	3.97	2.93	209.39	5.30	4.26	208.06	5.40	4.36	207.96	6.04	5.00	207.32	4.04	3.00	209.32
MW-1A	5.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-2	5.77	4.40	3.30	209.54	5.72	213.94	208.22	4.43	2.71	209.51	6.85	5.13	207.09	5.09	3.37	208.85
MW-2A	7.06	5.22	3.50	208.80	6.34	5.94	207.68	-	-	-	6.84	6.44	207.18	5.91	5.51	208.11
MW-3	4.27	4.40	4.00	210.07	4.80	3.80	209.67	4.83	3.83	209.64	5.06	4.06	209.41	4.43	3.43	210.04
MW-4	11.50	6.43	5.43	213.42	8.78	7.97	211.07	9.56	8.75	210.29	11.50	10.69	208.35	7.60	6.79	212.25
MW-4A	4.04	3.50	2.69	216.29	3.81	3.06	215.98	-	-	-	3.50	2.75	216.29	2.78	2.03	217.01
MW-5	14.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-7	19.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-8	29.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW99-9	25.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13-1	25.90	21.31	21.31	200.60	21.61	21.61	200.30	21.80	21.80	200.11	22.07	22.07	199.84	22.12	22.12	199.79
MW13-2	32.30	25.10	25.10	190.13	27.10	27.10	188.13	27.56	27.56	187.67	29.25	29.25	185.98	25.22	25.22	190.01
MW13-3	17.10	14.42	14.42	199.39	15.10	15.10	198.71	15.20	15.20	198.61	14.53	14.53	199.28	13.74	13.74	200.07
MW13-4	20.10	12.24	11.24	209.43	13.27	12.27	208.40	14.14	13.14	207.53	16.00	15.00	205.67	16.39	15.39	205.28
MW13-5	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW17-01	-	11.21	#REF!	213.58	-	-	-	-	-	-	14.95	#REF!	209.84	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level																



Table C1 Historic Groundwater Elevations

Date:		Apr-19			Nov-19			Dec-19		
Monitoring Well	Well Depth (m)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)	Depth to GW (m)	Depth Below Ground Level (m)	Groundwater Elevation (mAMSL)
MW-1	11.20	6.20	5.16	207.16	6.04	5.00	207.32	4.04	3.00	209.32
MW-1A	5.03	-	-	-	-	-	-	-	-	-
MW-2	5.77	5.38	3.66	208.56	5.66	3.94	208.28	5.30	3.58	208.64
MW-2A	7.06	6.17	5.77	207.85	6.41	6.01	207.61	6.40	6.00	207.62
MW-3	4.27	4.92	3.92	209.55	4.68	3.68	209.79	4.65	3.65	209.82
MW-4	11.50	8.60	7.79	211.25	8.60	7.79	211.25	8.20	7.39	211.65
MW-4A	4.04	4.02	3.27	215.77	3.67	2.92	216.12	3.50	2.75	216.29
MW-5	14.30	-	-	-	-	-	-	-	-	-
MW99-7	19.50	-	-	-	-	-	-	-	-	-
MW99-8	29.00	-	-	-	-	-	-	-	-	-
MW99-9	25.90	-	-	-	-	-	-	-	-	-
MW13-1	25.90	21.60	21.60	200.31	22.14	22.14	199.77	22.15	22.15	199.76
MW13-2	32.30	26.66	26.66	188.57	25.90	25.90	189.33	25.92	25.92	189.31
MW13-3	17.10	14.82	14.82	198.99	14.60	14.60	199.21	14.40	14.40	199.41
MW13-4	20.10	13.40	12.40	208.27	16.47	15.47	205.20	16.24	15.24	205.43
MW13-5	10.36	-	-	-	-	-	-	-	-	-
MW17-01	-	11.21	10.42	213.58	-	-	-	-	-	-
MW17-02	10.36	-	-	-	-	-	-	-	-	-
Notes: m - metres mAMSL - metres above sea level										

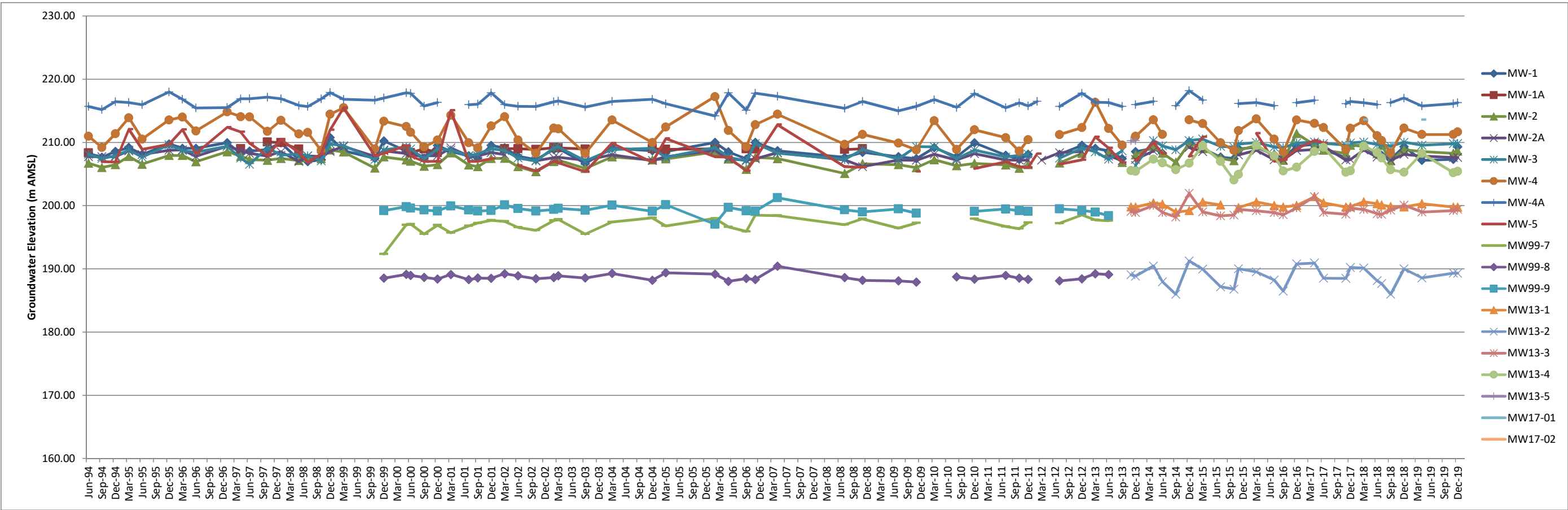


Figure C1
Historic Groundwater Elevations
Sechelt Landfill



APPENDIX D
MINISTRY OF ENVIRONMENT – CONDITIONAL WATER
LICENCE

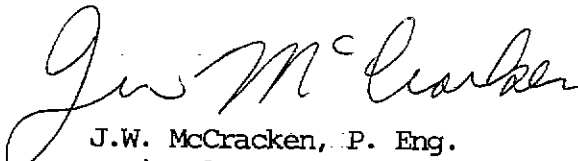
THE PROVINCE OF BRITISH COLUMBIA—WATER ACT

CONDITIONAL WATER LICENCE

Sunshine Coast Regional District of Box 800, Sechelt, B.C. V0N 3A0

is hereby authorized to divert and use water as follows:

- (a) The stream on which the rights are granted is Chapman Creek.
- (b) The point of diversion is located as shown on the attached plan.
- (c) The date from which this licence shall have precedence is 3rd June, 1929.
- (d) The purpose for which this licence is issued is waterworks.
- (e) The maximum quantity of water which may be diverted is 300,000 gallons a day.
- (f) The period of the year during which the water may be used is the whole year.
- (g) This licence is appurtenant to the waterworks undertaking of the licensee within the boundaries of the Sunshine Coast Regional District.
- (h) The works authorized to be constructed are diversion structure, tank, pipe and distribution system, which shall be located approximately as shown on the attached plan.
- (i) The construction of the said works has been completed and the water is being beneficially used. The licensee shall continue to make a regular beneficial use of the water in the manner authorized herein.
- (j) This licence is issued in substitution of Conditional Licence 11728.


J.W. McCracken, P. Eng.
Regional Water Manager



Province of British Columbia



Signature J W Mc Barker
Date 14th April, 1989.

LEGEND

C.L. 69217
File 0086708
P.C.L. | 735 |

This licence is appurtenant to all the land within The Sunshine Coast Regional District.



APPENDIX E
HISTORIC DATA AND CONCENTRATION VERSUS TIME
GRAPHS

Table E1 Historic Groundwater Quality Results - Site MW-1

Table E1 Historic Groundwater Quality Results - Site MW-1

Sample Date:		Units	Apr-14	Jun-14	Dec-14	Mar-15	Jul-15	Dec-15	Mar-16	Jul-16	Sep-16	Dec-16	Apr-17	Jun-17	Nov-17	Dec-17	Mar-18	Jul-18	Jul-18 Duplicate	Dec-18	Apr-19	Nov-19	Dec-19
Parameters:																							
General																							
Chemical Oxygen Demand (COD)	mg/L	12	16	16	14	29	12	15	16	15	17	45	38	28	16	41	42	40	13	36	20	ND (10)	
Dissolved Organic Carbon	mg/L	3.7	1.2	1.73	0.92	1.22	0.95	ND (0.50)	0.98	1.11	2.75	2.71	1.51	ND (0.50)	0.99	1.88	1.2	1.3	0.92	1.67	0.6	1.1	
Conductivity, Electrical	mS/cm	1290	979	343	437	772	503	418	611	516	1100	785	503	317	863	1410	851	791	828	803	496	774	
pH	s.u.	6.75	7.15	6.53	7.28	7.37	6.95	7.04	7.65	6.35	6.81	6.88	7.26	7.60	7.44	7.82	7.90	7.79	7.20	7.00	6.66	6.63	
Alkalinity (Total as CaCO3)	mg/L	79.9	75.7	38.5	31	78.8	59	37.7	57.2	49.7	87.5	58.4	70.7	30.9	91.9	99.8	68.9	64.0	95.3	70.3	67	92	
Alkalinity (PP as CaCO3)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (5)	ND (5)	
Bicarbonate (HCO3)	mg/L	97.4	92.4	47	37.8	96.2	71.9	46.0	69.8	60.6	107	71.2	86.3	37.6	112	122	84.0	78.1	116	70.3	82	110	
Carbonate (as CaCO3)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (6)	ND (6)	
Hydroxide (OH)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (5)	ND (5)	
Turbidity	NTU	6.01	76.8	33	29.4	249	18.2	42.4	24.5	32.9	52.3	33.1	299	104	38.5	175	140	136	37.0	180	31.7	18.3	
Hardness (as CaCO3)	mg/L	706	451	145	181	367	224	182	236	216	544	365	494	113	380	707	371	339	371	351	250	390	
Nutrients																							
Ammonia	mg/L	ND (0.005)	0.0054	0.009	0.019	0.0092	0.02	0.075	0.025	0.036	0.034	0.058	0.02	0.044	ND (0.020)	0.041	0.047	0.048	ND (0.020)	ND (0.020)	ND (0.01)	ND (0.01)	
Dissolved Nitrate (N)	mg/L	0.332	1.03	0.162	0.128	0.877	0.163	0.075	0.881	0.143	0.177	0.129	0.645	0.051	0.142	0.253	1.59	1.52	0.133	0.756	0.2	ND (0.01)	
Dissolved Nitrite (N)	mg/L	ND (0.0050)	0.0244	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.01	ND (0.0050)	ND (0.0050)	0.0211	0.0176	ND (0.0050)	0.315	ND (0.1)	
Total Phosphorus	mg/L	0.371	1.12	0.321	0.0058	0.379	0.0352	0.0360	0.0534	0.0535	0.052	0.38	0.287	0.163	0.0582	0.262	0.198	0.176	0.0671	0.182	0.08	0.075	
Nitrate plus Nitrite (N)	mg/L	-	-	-	0.128	0.877	0.163	0.075	0.881	0.143	0.177	0.129	0.645	0.057	0.142	0.253	1.61	1.54	0.133	0.756	0.2	ND (0.020)	
Total Nitrogen (N)	mg/L	-	-	-	0.211	1.05	0.294	0.128	0.739	0.448	0.312	0.313	0.744	ND (0.20)	0.304	0.448	1.72	1.76	0.397	-	0.26	0.2	
Total Kjeldahl Nitrogen	mg/L	0.04	0.065	0.16	0.084	0.17	0.131	0.053	ND (0.020)	0.306	0.135	0.184	0.1	ND (0.20)	0.161	0.195	0.104	0.222	0.264	0.438	0.07	ND (0.07)	
Anions																							
Chloride	mg/L	37	72	9.2	14	50	15	12	25	80	51	51	43	51	47	54	64	55	37	47	18.7	18	
Sulfate	mg/L	507	278	110	155	218	155	150	188	72	386	232	362	34.4	242	571	253	212	202	235	136	114	
Dissolved Metals																							
Aluminum	mg/L	0.221	0.0064	0.861	ND (0.0030)	ND (0.0030)	-	0.0072	0.01	0.01	0.01	ND (0.003)	0.00	0.01	0.00	0.0048	ND (0.0030)	ND (0.0030)	0.0041	ND (0.0050)	0.001	0.004	
Antimony	mg/L	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	-	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	0.00009	0.00006	
Arsenic	mg/L	0.00021	0.00011	0.00033	ND (0.00010)	ND (0.00010)	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	0.00015	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	0.0002	0.0003	
Barium	mg/L	0.0532	0.0376	0.0379	0.03	0.03	-	0.0229	0.02	0.03	0.05	0.0304	0.04	0.02	0.04	0.0516	0.0334	0.0303	0.0326	0.0329	0.0223	0.034	
Beryllium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.0005)	ND (0.0005)	
Bismuth	mg/L	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	-	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.00100)	ND (0.0005)	ND (0.0001)	
Boron	mg/L	0.267	0.136	0.138	0.14	0.38	-	0.099	0.26	0.17	0.33	0.232	0.34	0.11	0.18	0.306	0.345	0.315	0.211	0.234	0.169	0.17	
Cadmium	mg/L	0.000081	0.000152	0.0012	0.00	0.00	-	0.000989	0.00	0.00	0.00	0.000061	0.00	0.00	0.00	0.000199	0.000286	0.000076	0.000082	0.000096	0.00011	0.00006	
Calcium	mg/L	257	165	50.4	61.90	132.00	-	63.9	84.5	77.3	195	130	180.00	37.50	137.00	252	132	121	131	124	92	140	
Chromium	mg/L	0.0017	0.0013	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00050)	ND (0.00005)	ND (0.00005)	
Cobalt	mg/L	ND (0.00050)	ND (0.00050)	0.00069	ND (0.00050)	ND (0.00050)	-	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00020)	ND (0.00020)	0.00	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	0.00012	0.00009	0.00015	
Copper	mg/L	0.00218	0.00289	0.00435	0.00	0.00	-	0.00057	0.00	0.00057	0.00	0.00057	0.00	0.00	0.00	0.00057	0.00	0.00057	0.00057	0.00057	0.00057	0.00057	
Iron	mg/L	0.202	0.0088	0.897	ND (0.0050)	ND (0.0050)	-	ND (0.0050)	0.02	ND (0.0050)	0.01	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.01	ND (0.0050)	0.0062	ND (0.0050)	0.0102	ND (0.010)	ND (0.002)	
Lead	mg/L	0.00024	0.0002	0.00187	ND (0.00020)	ND (0.00020)	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00001)	ND (0.00001)	
Lithium	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	-	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0050)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	0.00051	ND (0.0005)	
Magnesium	mg/L	15.8	9.66	4.62	6.52	9.04	-	5.47	6.09	5.52	14.0	9.88	10.70	4.60	8.98	18.6	10.0	9.05	10.8	9.97	5.9	9.6	
Manganese	mg/L	0.0274	0.0364	0.0846	0.02	0.02	-	0.0105	0.01	0.02	0.06	0.0018	0.01	0.05	0.03	0.0465	0.0193	0.0123	0.0191	0.056	0.019	0.039	
Mercury	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	
Molybdenum	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.00011	0.00007	0.00008	
Nickel	mg/L	ND (0.0010)	0.0011	0.0016	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.00067	0.0005	0.0005	0.0005	
Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.050)	-	-	
Potassium	mg/L	2.58	2.49	1.68	1.48	3.38	-	1.25	1.84	2.32	2.22	1.64	2.26	1.49	2.06	2.52	2.88	2.53	2.19	1.79	2.3	2.2	
Selenium	mg/L	ND (0.00010)																					

Table E2 Historic Groundwater Quality Results - Site MW-2

Notes:
 - No data available

Sample Date:	Units	Apr-14	Jun-14	Sep-14	Dec-14	Mar-15	Jul-15	Oct-15	Dec-15	Dec-15	Mar-16	Jul-16	Sep-16	Dec-16	Apr-17	Jun-17	Nov-17	Dec-17	Mar-18	Jul-18	Sep-18	Sep-18	Dec-18	Dec-18	Apr-19	Nov-19	Dec-19	
Parameters:																												
General																												
Chemical Oxygen Demand (COD)	mg/L	13	13	14	ND (10)	19	27	47	18	26	ND (10)	14	21	ND (10)	11	14	17	21	36	63	19	24	113	61	32	40	30	
Dissolved Organic Carbon	mg/L	2.72	1.4	1.67	1.92	2.78	2.65	9.1	8.9	1.48	1.90	0.88	2.01	3.21	2.6	1.4	0.96	2.13	7.14	2.8	0.90	1.41	13	0.9	3.99	3.8	5.4	
Conductivity, Electrical	mS/cm	437	701	1420	280	811	1620	923	498	452	679	937	1200	489	498	987	977	752	764	1370	986	982	844	836	714	890	748	
pH	s.u.	7.05	7.47	6.82	7.11	7.63	7.01	7.07	7.23	7.24	7.02	7.54	6.56	7.03	7.18	7.05	7.92	7.58	8.29	7.79	7.25	7.36	7.38	7.84	7.34	7.90	6.88	
Alkalinity (as CaCO3)	mg/L	88	97.5	95.7	62.2	67.2	66	50.7	50.3	50.3	50.7	57.9	60.9	87.4	75.5	60.2	52.4	75.2	165	78.2	135	168	168	168	174	160	127	
Alkalinity (PP as CaCO3)	mg/L	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (5)	ND (5)	
Bicarbonate (HCO3)	mg/L	107	119	117	75.9	92.3	80.5	61.3	40.2	37.8	101	70.6	64.5	74.3	107	89.7	69.4	97.8	395	165	93.1	95.4	199	205	160	160	155	
Carbonate (as CaCO3)	mg/L	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (6)	ND (6)	
Hydroxide (OH)	mg/L	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (5)	ND (5)	ND (5)	
Turbidity	NTU	3.92	4.3	2.84	0.58	1.53	3.52	2.42	2.94	0.98	0.41	1.71	1.40	0.66	3.46	9.47	1.66	0.44	51.1	59.0	12.5	13.2	20.6	20.0	1.87	10.2	5.13	
Hardness (as CaCO3)	mg/L	183	296	705	109	309	728	184	288	164	286	396	604	182	199	443	459	271	347	572	428	432	352	439	390	290	290	
Nutrients																												
Ammonia	mg/L	0.015	0.0091	0.014	ND (0.0050)	0.0078	0.017	0.039	0.018	0.013	0.042	0.10	0.36	0.045	0.029	0.04	0.048	0.12	0.057	0.24	0.065	0.040	0.038	0.046	0.057	ND (0.01)	0.06	
Dissolved Nitrate (N)	mg/L	0.021	0.038	0.346	2.4	ND (0.020)	0.149	0.06	0.31	2.67	ND (0.020)	0.241	1.33	7.17	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.01)	ND (0.1)	ND (0.01)	
Dissolved Nitrite (N)	mg/L	ND (0.0050)	ND (0.0050)	0.0066	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0356	0.0471	ND (0.0050)	0.0069	ND (0.0050)	0.0069	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0177	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.402	ND (0.1)	ND (0.01)	ND (0.01)	
Total Phosphorus	mg/L	0.0275	0.0293	0.0319	0.0117	0.0093	0.0198	0.0356	0.0147	0.0068	0.0168	0.0064	0.0207	0.0252														

Notes:
- No data available

Notes:

- No data available

Table E3 Historic Groundwater Quality Results - Site MW-2A

Sample Date:		Units	Jul-11	Dec-11	Feb-12	Aug-12	Dec-12	Mar-13	Jun-13	Apr-14	Dec-14	Mar-15	Dec-15	Mar-16	Dec-16	Apr-17	Jun-17	Dec-17	Mar-18	Dec-18	Apr-19	Apr-19	Nov-19	Dec-18		
Parameters:																					Duplicate					
General																										
Chemical Oxygen Demand (COD)		mg/L	-	-	-	-	17	30	16	169	30	46	79	133	210	173	97	162	687	166	54	56	120	70		
Dissolved Organic Carbon		mg/L	-	-	-	-	3.34	-	3.36	33.8	7.3	6.17	3.02	27.9	55.2	46.9	21.1	35.8	174.0	32.0	11.0	11.3	16	16.1		
Conductivity, Electrical		mS/cm	-	-	-	-	190	238	469	467	223	341	232	477	492	516	676	598	961	61.3	623	622	699	621		
pH		s.u.	-	-	-	-	6.79	7.77	7.31	7.53	7.35	7.99	7.48	7.93	7.55	7.75	7.74	7.91	8.20	7.70	7.63	7.59	7.21	7.19		
Alkalinity (Total as CaCO3)		mg/L	-	-	131	-	47	90.7	40.3	171	78.9	128	53.6	211	184	204	279	228	361	221	256	258	198	172		
Alkalinity (PP as CaCO3)		mg/L	-	-	ND (0.5)	-	ND (0.5)	ND	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (5)	ND (5)		
Bicarbonate (HCO ₃)		mg/L	-	-	160	-	57	111	49.1	208	96.3	157	65.4	257	225	249	341	278	440	269	256	258	241	209		
Carbonate (as CaCO ₃)		mg/L	-	-	ND (0.5)	-	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (6)	ND (6)		
Hydroxide (OH)		mg/L	-	-	ND (0.5)	-	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (10)	ND (10)		
Turbidity		NTU	-	-	101	-	7.6	45.8	6.82	15.9	4.16	37.1	56.5	24.8	29.8	56.4	30.4	36.9	132	28.1	28.7	18.0	77.3	28.0		
Hardness (as CaCO ₃)		mg/L	-	-	124	-	53	79.5	148	162	91.6	126	72.9	171	194	197	232	194	368	185	165	167	180	160		
Nutrients																										
Ammonia		mg/L	-	-	0.36	-	0.011	0.7	0.76	1.3	0.25	1.2	0.53	1.9	0.99	3.6 (2)	3.5 (2)	2.7 (2)	4.4	7.2	10.9	11.2	11.1	6.9		
Dissolved Nitrate (N)		mg/L	-	-	ND (0.02)	-	0.12	0.135	13.8	ND (0.020)	ND (0.020)	ND (0.020)	0.834	ND (0.020)	ND (0.20)	ND (0.020)	ND (0.020)	ND (0.20)	ND (0.020)	ND (0.020)	ND (0.010)	ND (0.1)	ND (0.01)			
Dissolved Nitrite (N)		mg/L	-	-	ND (0.005)	-	0.005	0.0952	0.0763	ND (0.0050)	0.0116	0.0125	0.018	0.0132	ND (0.0050)	0.0132 (3)	ND (0.0050)	0.0055	ND (0.0050)	ND (0.0050)	0.266	0.269	ND (0.1)	ND (0.01)		
Total Phosphorus		mg/L	-	-	ND (0.01)	-	0.035	0.234	0.0169	0.236	0.0931	0.154	0.154	0.374	0.388	0.522(2)	0.439	0.0457	0.8510	0.612	0.405	0.403	0.8	0.275		
Nitrate plus Nitrite (N)		mg/L	-	-	-	-	-	-	-	ND (0.020)	0.852	ND (0.020)	0.852	ND (0.020)	ND (0.020)	ND (0.020) (3)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	-	-	ND (0.20)	ND (0.020)		
Total Nitrogen (N)		mg/L	-	-	-	-	-	-	-	2.06	2.02	3.14 (1)	2.89 (1)	5.46 (2)	5.11 (2)	4.21	7.04	12.6 (1)	-	-	-	9.89	9.65			
Total Kjeldahl Nitrogen		mg/L	-	-	1.32	-	0.531	1.05	ND (0.20)	2.87	1.08	2.06	1.17	3.14	2.89	5.46	5.11	4.21	7.04	12.6	13.10	12.7	9.88	9.65		
Anions																										
Chloride		mg/L	-	-	33	-	19	16	76	32	19	21	23	27	35	35	43	51	65	60	38	38.6	89.8	80		
Sulfate		mg/L	-	-	ND (0.5)	-	12.4	4.15	16.6	ND (0.50)	5.85	4.76	14	ND (0.50)	0.61	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	<1.0	2	0.20		
Dissolved Metals																										
Aluminum		mg/L	-	-	0.0035	-	0.005	ND (0.0030)	0.0048	0.254	0.22	ND (0.0030)	-	0.0044	0.0044	ND (0.0030)	ND (0.0030)	ND (0.0030)	0.0034	ND (0.0050)	ND (0.0050)	0.001	0.003			
Antimony		mg/L	-	-	ND (0.0005)	-	ND (0.0005)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	-	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	0.00059	0.00028	0.00026	0.00039			
Arsenic		mg/L	-	-	0.00296	-	0.00044	0.0016	0.00024	0.00555	0.00188	0.00109	-	0.00379	0.00355	0.00217	0.00383	0.00267	0.00293	0.00658	0.00159	0.00156	0.0017	0.002		
Barium		mg/L	-	-	0.0245	-	0.0109	0.0162	0.0345	0.0496	0.0219	0.0249	-	0.0328	0.0352	0.0527	0.0709	0.0539	0.114	0.121	0.0852	0.0829	0.0925	0.0863		
Beryllium		mg/L	-	-	ND (0.0001)	-	ND (0.0001)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00005)	ND (0.00005)			
Bismuth		mg/L	-	-	ND (0.0001)	-	ND (0.0001)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)		
Boron		mg/L	-	-	0.151	-	0.124	0.141	0.213	0.236	0.123	0.182	-	0.22	0.218	0.229	0.334	0.302	0.589	0.377	0.286	0.292	0.428	0.382		
Cadmium		mg/L	-	-	0.000108	-	0.000332	0.00014	0.000948	0.000273	0.000634	0.00148	-	0.000028	0.00011	0.00032	0.000031	0.000042	ND (0.00010)	0.000013	0.000019	0.00003	0.0001	ND (0.00001)		
Calcium		mg/L	-	-	38.7	-	16.3	0.023	0.0438	47	25.9	37.6	-	52.2	55.5	60.4	70.9	58.4	115	57.9	50.4	50.8	56	50		
Chromium		mg/L	-	-	ND (0.0001)	-	ND (0.0001)	ND (0.00010)	ND (0.00010)	0.0022	ND (0.00010)	ND (0.00010)	-	ND (0.00010)	0.0014	ND (0.00010)	ND (0.00010)	0.0016	0.0033	0.0017	0.00119	0.00123	ND (0.00005)	ND (0.00005)		
Cobalt		mg/L	-	-	ND (0.0005)	-	0.00115	0.00134	0.0031	0.00324	0.00157	0.00106	-	0.00132	0.00065	0.00334	0.00434	0.00237	0.00069	0.00293	0.00293	0.00231	0.00292			
Copper		mg/L	-	-	0.00091	-	0.00149	0.00157	0.00099	0.0152	0.0106	0.00405	-	0.00132	0.00041	0.00089	0.00033	0.00116	0.00074	0.00219	ND (0.00040)	0.00044	0.0006			
Iron		mg/L	-	-	0.0736	-	0.0166	0.0108	0.0119	3.61	1.03	0.0506	-	0.262	1.02	0.0949	1.38	0.474	3.71	6.940	0.338	0.386	0.166	0.057		
Lead		mg/L	-	-	ND (0.0002)	-	ND (0.0002)	ND (0.00020)	ND (0.0002)	0.00072	0.00065	ND (0.00020)	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00001)	ND (0.00001)		
Lithium		mg/L	-	-	ND (0.0005)	-	ND (0.0005)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	-	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	0.0031	0.0026	0.00158	0.00154	0.0023	0.0018		
Magnesium		mg/L	-	-	6.56	-	2.95	0.00537	0.00939	10.9	6.56	7.79	-	9.95	13.5	11.2	13.3	11.6	19.4	9.71	9.54	9.64	9.5	8.6		
Manganese		mg/L	-	-	1.8	-	1.8	1.36	2.25	2.34	1.12	1.31	-	1.12	1.31	1.96	2.74	5.600	2.270	1.34	1.35	1.77	1.28			
Mercury		mg/L	-	-	ND (0.00005)	-	ND (0.00005)	ND (0.000050)	ND (0.000050)	ND (0.000010)	ND (0.000010)	ND (0.00001)	-	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.000020)	ND (0.000020)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.00001)	ND (0.00001)		
Molybdenum		mg/L	-	-	0.0013	-	ND (0.0001)	0.0018	ND (0.00010)	0.0013	0.0025	0.0018	-	0.002	0.0018	ND (0.00010)	0.0018	0.0013	0.0013	ND (0.00010)	0.00053	0.00054	0.00018	0.00037		
Nickel		mg/L	-	-	0.0019	-	0.0013	0.0011	0.0013	0.0027	0.002	0.0018	-	0.0025	0.0021	0.0025	0.0033	0.0027	0.0045	0.0037	0.00319	0.00314	0.0029	0.0042		
Phosphorus		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.050)	-	-	-	-		
Potassium		mg/L	-	-	3.25	-	1.77	0.0437	0.00684	7.01	4.52	5.04	-	5.70	5.26	9.62	11.5	9.17	12.4	20.5	16.3	1				

Sample Date:	Units	Jun-00	Dec-00	Jul-01	Dec-01	Jun-02	Oct-02	Mar-03	Sep-03	Mar-04	Dec-04	Mar-05	Feb-06	May-06	Sep-06	Nov-06	Apr-07	Sep-07	Nov-07	Jul-08	Dec-08	Jul-09	Nov-09	Nov-09	Aug-10	Dec-10	Jul-11	Jul-11	Dec-11	Dec-11	Aug-12	Aug-12	Dec-12	Dec-12	Mar-13	Mar-13	Jun-13			
Parameters:																								Duplicate				Duplicate		Duplicate		Duplicate		Duplicate		Duplicate		Duplicate		Duplicate
General																																								
Chemical Oxygen Demand (COD)	mg/L	65	15	47	19	23	19	36	32	15	57	15	46	20	16	ND (10)	ND (10)	34	35	23	187	39	23	ND (10)	241	ND (10)	66	63	34	37	35	39	36	35	21	14	25			
Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	5.9	5.3	6.1	6.73	6.01	5.82	5.03	5.34	-	-	4.19			
Conductivity, Electrical	µS/cm	1170	581	409	267	333	468	360	409	271	327	323	361	406	484	487	403	578	490	560	870	910	739	734	680	674	547	543	763	1050	807	921	348	348	248					
pH	s.u.	7.2	7.3	7.2	-	7.5	7.9	7.2	7.2	7.1	7.1	7.1	7.1	6.8	7	7.1	7.6	7.2	7.8	7	7	7.1	7.9	7.5	6.8	7.5	7.7	7.9	7.83	7.41	7.49	7.34	7.26	7.87	7.92	7.66				
Alkalinity (Total as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	240	360	-	-	270	-	210	210	105	ND (0.5)	114	113	222	220	113	116	113			
Alkalinity (PP as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	ND (0.5)	-	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	0.5	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)			
Bicarbonate (HCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	290	440	-	-	330	-	260	260	128	128	140	138	271	268	138	141	138			
Carbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	ND (0.5)	-	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)			
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	ND (0.5)	-	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)			
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	132	34	-	-	67.2	-	27.1	33	27	33	44.1	48.4	55.9	24.3	33	29.8	51.5			
Hardness (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	284	213	-	-	379	221	168	163	262	283	364	376	336	336	122	123	179			
Nutrients																																								
Ammonia	mg/L	40.9	24.5	15.8	5.15	7.62	9.61	4.33	5.45	3.29	3.69	3.75	4.75	4.66	6.6	6.7	4.3	6.8	7.4	6.1	9	13.4	11.4	11.4	21	13	7.3	7.4	7.5	7.76	7.5	7.4	7.8	7.8	3.9	3.9	3			
Dissolved Nitrate (N)	mg/L	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	0.06	ND (0.02)	0.06	ND (0.02)	0.05	ND (0.02)	0.03	ND (0.02)	ND (0.02)	0.02	0.14	ND (0.02)	0.065	0.055	0.089	0.089	ND (0.02)	ND (0.02)	0.057	0.044	ND (0.020)		
Dissolved Nitrite (N)	mg/L	ND (0.005)	ND (0.005)	ND (0.005)	0.012	ND (0.005)	ND (0.005)	0.005	ND (0.005)	0.007	ND (0.005)	ND (0.005)	0.006	ND (0.005)	0.025	0.006	0.005	0.005	0.006	0.037	ND (0.05)	ND (0.05)	0.008	0.009	-	0.011	ND (0.05)	ND (0.05)	0.012	0.011	ND (0.05)	0.0059	0.0051	ND (0.05)	0.0312	0.0254	0.0092			
Total Phosphorus	mg/L	-	-	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.074	0.063	-	-	0.021	-	0.202	0.185	0.0472	0.0452	0.0595	0.0161	0.0154	0.0366	0.0342	0.0028				
Nitrate plus Nitrite (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total Nitrogen (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.7	13.6	-	-	18.9	-	8.5	8.8	7.84	7.74	7.86	7.68	8.06	8.13	4.18	4.13	4.61			
Anions																																								
Chloride	mg/L	27	17	11	13.8	16.8	17.6	18.2	15.8	22.3	22.6	30.7	37.9	32	37.1	39.4	30.7	58.2	61.6	48	120	71	120	120	-	68	38	40	150	140	210	220	150	160	27	27	100			
Sulfate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	1	-	1	45	45.3	9.62	8.63	8.29	8.16	18	17.4	11.9				
Dissolved Metals																																								
Aluminum	mg/L	-	-	0.09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01	0.574	-	-	0.241	0.155	0.081	0.823	ND (0.003)	0.0057	0.007	0.008	ND (0.003)	0.0042	ND (0.0030)	0.0034				
Antimony	mg/L	-	-	ND (0.05)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0005)	0.0005	-	-	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)				
Arsenic	mg/L	-	-	ND (0.001)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0012	0.0022	-	-	0.0018	0.0014	0.0013	0.0016	0.00046	0.00109	0.00144	0.00143	0.00046	0.00048	0.00047	0.00048	0.00108			
Barium	mg/L	-	-	0.175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.343	0.441	-	-	0.67	0.168	0.208	0.22	0.173	0.19	0.234	0.241	0.219	0.213	0.078	0.0823	0.104			
Beryllium	mg/L	-	-	ND (0.0002)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0001)	ND (0.0001)	-	-	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)				
Bismuth	mg/L	-	-	ND (0.05)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0010)	ND (0.0010)	ND (0.0010)			
Boron	mg/L	-	-	0.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.252	0.357	-	-	0.401	0.493	0.319	0.314	0.435	0.486	0.457	0.466	0.509	0.521	0.347	0.372	0.323			
Cadmium	mg/L	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00003	0.00107	-	-	0.00021	0.00242	0.00114	0.00018	0.000075	0.000074	0.00008	0.000175	0.000162	0.000347	0.000339	0.000107				
Calcium	mg/L	-	-	26.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63.8	52.6	-	-	94.4	36	42.3	41.2	48.6	52.1	59.7	63.6	52.9	54.3	20.2	19.9	31.2			
Chromium	mg/L	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	-	ND (0.001)	ND (0.001)	ND (0.001)	0.001	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0010)	ND (0.0010)	ND (0.0010)			
Cobalt	mg/L	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0005)	ND (0.0005)	-	-	ND (0.0005)	ND (0.0005)	0.00024	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.00050)	ND (0.00050)			
Copper	mg/L	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0002	0.0027	-	-	0.0006	0.0022	0.0007	0.0108	0.00051	0.0002	0.00175	0.00211	0.00025	ND (0.0002)	ND (0.00020)	ND (0.00020)	ND (0.00020)			
Iron	mg/L	0.17	0.18	-	0.45	0.73	0.16	19.5	14.5	7.67	8.96	0.38	3.86	0.84	6.52	3.37	5.61	1.13	0.01	0.01	1.15	3.51	11.2	11.2	-	0.002	0.0022	0.0007	0.0108	0.00051	0.0002	0.00175	0.00211	0.00025	ND (0.0002)	ND (0.00020)	ND (0.00020)			
Lead	mg/L	-	-	ND (0.001)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0002)	0.0005	-	-	ND (0.0002)	ND (0.0002)	0.0004	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)				
Lithium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Magnesium	mg/L	-	-	3.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.2	19.8	-	-	34.7	31.8	14.5	14.6	34.1	37.1	52.2	48.9	48.7	17.5	17.7	24.6				
Manganese	mg/L	-	-	156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.66	0.33	-	-	1.82	0.843	1.02	1.14	1.42	1.42	1.42	1.48	1.48	0.712	0.717	0.833				
Mercury	mg/L	-	-	ND (0.0005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.00005)	ND (0.00005)	-	-	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.000050)	ND (0.000050)	ND (0.000050)				
Molybdenum	mg/L	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	-	ND (0.001)	ND (0.001)	0.002	ND (0.001)	ND (0.001											

Table E4 Historic Groundwater Quality Results - Site MW-3

Sample Date:		Jun-13	Sep-13	Sep-13	Dec-13	Apr-14	Jun-14	Sep-14	Sep-14	Dec-14	Dec-14	Mar-15	Jul-15	Jul-15	Oct-15	Dec-15	Dec-15	Apr-16	Jul-16	Sep-16	Dec-16	Dec-16	Apr-17	Jun-17	Nov-17	Dec-17	Mar-18	Jul-18	Sep-18	Dec-18	Apr-19	Nov-19	Dec-19	
Units		Duplicate		Duplicate				Duplicate		Duplicate			Duplicate			Duplicate						Duplicate												
Parameters:																																		
General																																		
Chemical Oxygen Demand (COD)	mg/L	23	39	41	57	34	57	50	46	38	43	28	34	32	50	58	61	29	26	39	23	23	15	28	48	50	14	35	35	61	48	60	30	
Dissolved Organic Carbon	mg/L	4.05	5.87	6.39	7.8	8.81	15	13.5	11.4	11.9	10.2	3.82	4.4	3.65	5.8	11	9.47	10	6.43	5.80	7.71	8.64	10.0	6.73	7.79	9.83	10.2	8.06	9.9	11.5	8.4	9.62	11.9	11.3
Conductivity, Electrical	mS/cm	7.7	976	974	796	831	883	1070	1060	755	776	776	776	776	776	776	778	794	848	802	971	841	651	941	841	652	944	1050	882	651	1013	893	893	
pH	na	7.2	7.82	7.8	7.69	7.68	7.57	7.40	7.40	7.42	8.01	7.41	7.39	7.5	7.65	7.72	7.82	8.00	7.11	7.48	7.40	7.5	7.67	8.37	7.95	8.24	7.75	7.78	7.61	7.31	7.19	7.94		
Alkalinity (Total as CaCO3)	mg/L	110	158	160	233	325	341	473	474	273	273	135	166	162	270	228	230	142	180	208	128	125	185	255	344	244	242	375	376	238	268	322	249	
Alkalinity (PP as CaCO3)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	
Bicarbonate (HCO ₃)	mg/L	134	193	195	285	396	416	577	578	333	333	165	202	198	330	278	281	174	219	254	156	153	225	311	405	298	289	457	459	290	268	392	304	
Carbonate (as CaCO ₃)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	7.1	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)		
Hydroxide (OH)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)		
Turbidity	NTU	50.4	141	168	93.6	41.1	15.6	33	34.6	52.3	46.5	8.8	12.2	10	13.8	77.3	88.7	18.6	38.9	57.3	19.8	23.0	16.8	30.1	66.6	103	22.9	17.2	122	26.4	20	82.2	41.7	
Hardness (as CaCO ₃)	mg/L	181	320	327	293	273	295	367	366	251	251	113	128	134	261	234	231	127	164	263	144	149	166	200	304	219	191	270	278	196	164	290	250	
Nutrients																																		
Ammonia	mg/L	4.7	6.5	6.1	6.1	4.7	5.5	9.4	9.8	5.6	8.4	5.2	5.8	5.9	9.4	7.8	9.6	5	6.1	1.9	5.6	5.9	4.7 (2)	7.0 (2)	14 (2)	16 (2)	6.7	13.0	16.0	17.0	13.0	20.8	15.8	
Dissolved Nitrate (N)	mg/L	0.02	0.086	0.095	ND (0.20)	ND (0.020)	ND (0.020)	0.062	0.062	ND (0.20)	ND (0.20)	ND (0.020)	ND (0.020)	ND (0.020)	0.024	ND (0.20)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	0.064	0.064	ND (0.020)	0.02	ND (0.1)	
Dissolved Nitrite (N)	mg/L	ND (0.005)	0.0128	0.0148	0.011	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0134	0.0156	0.0097	ND (0.0050)	ND (0.0050)	0.0097	ND (0.0050)	0.0097	0.0097	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0079	0.297	ND (0.1)	ND (0.01)	
Total Phosphorus	mg/L	0.0295	0.0234	0.0334	0.188	0.0323	0.0398	0.0622	0.0743	0.0293	0.0418	0.0108	0.0616	0.0679	0.0261	0.0437	0.0709	0.0223	0.0133	0.0339	0.0187	0.0193	0.0223	0.0892	0.0272	0.0226	0.0255	0.0379	0.0474	0.0833	0.024	0.031	0.031	
Nitrate plus Nitrite (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Nitrogen (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Kjeldahl Nitrogen	mg/L	5.03	6.76	6.15	6.56	5.97	7.52	9.3	9.18	8.8	8.86	5.19	5.88	5.81	9.31	9.1	9.32	4.41 (1)	5.76 (1)	1.64 (1)	6.32 (1)	6.21 (1)	4.61 (2)	6.86 (2)	17.5 (2)	11	8.41	13.2	20.7	10.3	13.4	18.1	16.3	
Anions																																		
Chloride	mg/L	99	190	190	100	69	87	72	71	53	54	23	28	28	78	71	73	25	53	110	49	50	40	47	110	94	53	75	94	41.6	107	88.1		
Sulfate	mg/L	10.2	18.1	17.8	16	4.29	ND (0.50)	1.13	1.79	31.3	34.5	8.79	6	6.45	7.23	43.8	44	15.2	6.81	20	26.4	26.3	7.32	3.54	2	31.7	2.8	3.2	2.5	35.0	2.7	18	44.9	
Dissolved Metals																																		
Aluminum	mg/L	0.0037	0.0067	0.0082	ND (0.0030)	ND (0.003)	ND (0.003)	ND (0.003)	ND (0.003)	0.181	0.293	ND (0.0030)	ND (0.0030)	ND (0.0030)	0.15	-	-	-	0.0034	0.0035	ND (0.0030)	ND (0.0030)	0.0032	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	0.0037	0.002	0.002	
Antimony	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	-	-	-	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0054	0.00025	0.00026	
Arsenic	mg/L	0.0011	0.00144	0.00143	0.00064	0.00077	0.00012	0.0017	0.0018	0.001	0.00112	0.00027	0.00033	0.00048	0.0011	-	-	-	0.00052	0.00043	0.00081	0.00083	0.00077	0.00057	0.00052	0.00068	0.00062	0.00069	0.00066	0.00071	0.00069	0.0008		
Barium	mg/L	0.109	0.236	0.245	0.186	0.204	0.27	0.442	0.437	0.289	0.313	0.099	0.142	0.153	0.233	-	-	-	0.112	0.15	0.311	0.138	0.141	0.124	0.19	0.365	0.299	0.265	0.308	0.501	0.380	0.341		
Beryllium	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	-	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)		
Bismuth	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	-	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)		
Boron	mg/L	0.319	0.483	0.506	0.576	0.442	0.41	0.442	0.437	0.466	0.479	0.284	0.314	0.304	0.377	-	-	-	0.229	0.216	0.327	0.303	0.297	0.265	0.28	0.425	0.412	0.322	0.374	0.433	0.415	0.501	0.525	
Cadmium	mg/L	0.00076	0.000285	0.000403	0.00064	0.00016	0.00064	0.00063	0.00066	0.00096	0.00086	0.00094	0.00035	0.00021	0.00053	0.00025	-	-	0.00033	0.00017	0.00044	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011		
Calcium	mg/L	31.2	51.6	53.5	46.4	47.7	54.5	82.3	82.3	64.5	64.5	45	44.3	44.3	44																			

Sample Date:	Units	Jun-00	Dec-00	Jul-01	Dec-01	Jun-02	Mar-03	Mar-04	Dec-04	Mar-05	Feb-06	May-06	Sep-06	Nov-06	Apr-07	Sep-07	Nov-07	Jul-08	Jul-08	Dec-08	Jul-09	Nov-09	Aug-10	Dec-10	Jul-11	Dec-11	Aug-12	Aug-12	Dec-12	Dec-12	Mar-13	Jun-13	Sep-13	Dec-13	Apr-14	Dec-14	Mar-15		
Parameters:																			Duplicate									Duplicate		Duplicate									
General																																							
Chemical Oxygen Demand (COD)	mg/L	11	ND (10)	ND (10)	ND (10)	15	ND (10)	ND (10)	42	ND (10)	ND (10)	20	ND (10)	ND (10)	ND (10)	ND (10)	16	ND (10)	ND (10)	11	12	ND (10)	23	ND (10)	24	30	ND (10)	ND (10)	11	11	ND (10)	11	17	18	19	48	ND (10)		
Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Conductivity, Electrical	µS/cm	240	249	229	239	185	178	156	192	176	163	406	200	172	185	204	160	190	190	220	210	241	90	265	239	261	258	255	279	276	290	281	191	198	354	354	354	354	
pH	u.u.	6.7	6.6	6.4	6.5	7.1	7.1	6.9	6.9	6.9	6.8	7.1	6.9	7.2	7.2	7.2	6.7	6.7	6.7	6.9	7.5	7.1	6.5	6.8	6.9	7.3	6.69	6.67	6.75	6.74	7.38	6.98	7.06	6.77	5.97	6.24	7.54		
Alkalinity (Total as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	88	83	-	78	-	96	112	114	114	123	120	127	123	120	128	70.6	108	164		
Alkalinity (PP as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	ND (0.5)	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)		
Bicarbonate (HCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	100	-	95	-	120	136	139	140	150	146	155	150	146	156	86.1	132	200		
Carbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	ND (0.5)	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)		
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	ND (0.5)	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)			
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.8	58.8	-	23.6	-	3.1	137	62.4	27.9	1.72	1.99	0.69	15.5	93.2	77.2	69.7	17.9	1.1		
Hardness (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	71.7	64.3	-	65.7	-	95	101	99.7	99.7	109	110	111	111	112	122	28.5	52.7	138		
Nutrients																																							
Ammonia	mg/L	ND (0.005)	0.01	0.017	0.023	0.009	0.033	0.033	0.019	0.086	ND (0.005)	4.66	ND (0.005)	0.016	0.016	ND (0.005)	0.011	0.054	0.076	0.04	0.022	0.008	0.15	0.15	0.027	0.015	0.019	0.014	0.09	0.042	0.029	0.017	0.014	ND (0.0050)	0.46	1.6	0.012		
Dissolved Nitrate (N)	mg/L	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	0.04	ND (0.02)	ND (0.02)	ND (0.02)	0.06	0.04	ND (0.02)	ND (0.02)	0.08	ND (0.02)	0.03	0.09	0.034	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	0.04	0.073	0.056	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)		
Dissolved Nitrite (N)	mg/L	ND (0.005)	ND (0.005)	0.005	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.006	ND (0.005)	0.037	0.036	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)			
Total Phosphorus	mg/L	-	-	ND (0.1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.057	0.099	-	ND (0.005)	-	0.014	0.218	0.0774	0.0667	0.0113	0.0187	0.0051	0.0189	0.108	0.157	0.0509	0.0776	0.0064		
Nitrate plus Nitrite (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.020)		
Total Nitrogen (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.11		
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	0.14	-	0.15	-	0.09	0.305	0.193	0.126	0.095	0.124	0.058	0.109	0.078	0.136	0.798	2.18	0.11		
Anions																																							
Chloride	mg/L	2	2	2.3	2	1.6	1.7	1.6	1.6	1.9	1.9	32	1.9	2.2	1.8	4.8	7.5	8.7	8.7	11	10	14	ND (0.5)	15	9.2	9.8	7.6	7.2	7.9	8.4	8.8	8.8	7.6	7.1	2.2	3.5	5.3		
Sulfate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5	6.8	-	6.7	-	8	11	6.46	6.44	9.89	10.7	11.2	9.65	11.8	9.68	2.76	ND (0.50)	8.72		
Dissolved Metals																																							
Aluminum	mg/L	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.015	0.006	-	0.012	-	0.013	0.0069	0.0157	0.0077	ND (0.003)	0.0047	ND (0.0030)	0.0065	0.0092	ND (0.0030)	0.239	0.269	ND (0.0030)		
Antimony	mg/L	-	-	ND (0.05)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0005)	ND (0.0005)	-	ND (0.0005)	-	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)			
Arsenic	mg/L	-	-	ND (0.001)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0001)	ND (0.0001)	-	ND (0.0001)	-	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.00010)	ND (0.00010)	ND (0.00010)	0.00223	0.00168	0.00019			
Boron	mg/L	-	-	0.026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.026	0.026	-	0.027	-	0.03	0.032	0.032	0.035	0.035	0.032	0.032	0.032	0.0397	0.0643	0.0612	0.0612			
Beryllium	mg/L	-	-	ND (0.0002)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0001)	ND (0.0001)	-	ND (0.0001)	-	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)			
Bismuth	mg/L	-	-	ND (0.05)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	ND (0.001)	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)			
Boron	mg/L	-	-	0.022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.05)	ND (0.05)	-	ND (0.05)	-	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)			
Cadmium	mg/L	-	-	0.0009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0006	0.0003	-	0.0003	-	0.0006	0.000345	0.000298	0.000291	0.000594	0.00055	0.00062	0.00005	0.00045	0.000102	0.000168	0.000176	0.00155		
Calcium	mg/L	-	-	15.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.2	30.2	-	30.6	-	30.2	31.5	31	30.8	33.9	34.3	34	34.3	35.4	38.2	9.71	42.4	42.4		
Chromium	mg/L	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	ND (0.001)	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0010)	ND (0.0010)	ND (0.0010						

Table E5 Historic Groundwater Quality Results - Site MW-4

Sample Date:		Mar-15	Jul-15	Oct-15	Dec-15	Mar-16	Jul-16	Dec-16	Apr-17	Jun-17	Nov-17	Dec-17	Mar-18	Mar-18	Jul-18	Dec-18	Apr-19	Nov-19	Dec-19
Parameters:	Units	Duplicate												Duplicate					
General																			
Chemical Oxygen Demand (COD)	mg/L	13	ND (10)	41	16	12	16	ND (10)	ND (10)	ND (10)	ND (10)	19	ND (10)	ND (10)	49	ND (10)	ND (20)	ND (10)	ND (10)
Dissolved Organic Carbon	mg/L	1.11	0.91	6.1	1.03	0.86	0.96	1.86	1.27	1.50	1.95	0.97	1.31	1.28	1.6	1.1	2.19	1.9	2
Conductivity, Electrical	µS/cm	353	355	344	381	422	384	417	398	409	427	402	398	430	400	405	460	463	446
pH		7.72	6.81	7.66	6.66	6.81	7.46	6.63	6.80	6.70	7.93	7.41	7.46	7.83	7.48	7.28	6.9	6.63	6.4
Alkalinity (Total as CaCO3)	mg/L	162	165	163	185	208	194	210	204	203	191	209	215	216	198	188	226	222	217
Alkalinity (PP as CaCO3)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (5)	ND (5)
Bicarbonate (HCO3)	mg/L	198	201	199	226	254	237	256	249	248	233	255	262	263	241	229	226	271	264
Carbonate (as CaCO3)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (6)	ND (6)
Hydrosulfide (OH)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (5)	ND (5)
Turbidity	NTU	1.48	5.54	13.1	1.34	1.58	3.68	5.61	3.90	4.01	1.40	5.7	4.97	8.14	56.3	1.70	10.7	6.84	2.15
Hardness (as CaCO3)	mg/L	142	157	138	155	169	152	177	165	173	170	158	176	166	172	158	184	190	190
Nutrients																			
Ammonia	mg/L	0.01	0.0093	0.049	0.0096	0.024	0.059	0.051	0.031	0.030	0.054	0.310	ND (0.020)	0.14	ND (0.020)	ND (0.020)	0.067	0.06	ND (0.01)
Disolved Nitrite (N)	mg/L	ND (0.020)	ND (0.020)	0.032	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	0.147	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.010)	ND (0.01)	ND (0.01)
Dissolved Nitrite (N)	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.037	ND (0.1)	ND (0.01)
Total Phosphorus	mg/L	0.0094	0.0182	0.0294	0.0248	0.0068	0.0149	0.0070	0.0052	0.0159	0.0091	ND (0.0050)	0.0064	0.0061	0.113	0.0060	0.0233	0.015	0.008
Nitrate plus Nitrite (N)	mg/L	ND (0.020)	ND (0.020)	0.032	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	0.147	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	-	ND (0.20)	ND (0.020)
Total Nitrogen (N)	mg/L	0.142	0.124	0.152	0.089	0.103	0.076	0.104	0.123	0.130	0.092	0.114	0.147	0.114	0.147	0.137	0.115	0.21	0.12
Total Kjeldahl Nitrogen	mg/L	0.142	0.124	0.52	0.089	0.103	0.076	0.104	0.123	0.130	0.030	0.092	0.114	0.147	0.137	0.115	0.141	0.21	0.12
Anions																			
Chloride	mg/L	5.4	5.8	4.6	3.8	5.0	4.6	4.5	5.3	5.2	5.7	5.2	5.6	5.3	6.4	5.8	5.42	9.2	6.48
Sulfate	mg/L	9.25	10.1	10.7	7.75	7.62	6.52	7.90	7.70	6.50	12.2	5.7	6.6	7.0	7.1	7.3	7.8	8	7.1
Dissolved Metals																			
Aluminum	mg/L	ND (0.0030)	ND (0.0030)	0.0111	-	0.004	0.0034	0.0035	ND (0.0030)	ND (0.0030)	ND (0.0030)	0.0086	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0050)	ND (0.001)	0.002
Antimony	mg/L	ND (0.0050)	ND (0.0050)	0.00081	-	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.00028	ND (0.0050)	0.00022	0.00015
Arsenic	mg/L	0.00021	0.00011	0.00029	-	0.00024	0.00035	0.00010	ND (0.00010)	ND (0.00010)	0.00036	0.00015	0.00011	0.00012	0.0001	0.00015	ND (0.00010)	0.0002	0.0002
Barium	mg/L	0.0581	0.0546	0.0416	-	0.0756	0.0583	0.0713	0.0631	0.0599	0.0642	0.0629	0.0633	0.0625	0.0558	0.0528	0.0635	0.05	0.0547
Beryllium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	ND (0.050)	ND (0.050)	ND (0.050)	-	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	0.0302	0.024	0.03
Cadmium	mg/L	0.00111	0.00071	0.0123	-	0.000202	0.00032	0.000642	0.000276	0.00143	0.000151	0.000173	0.000212	0.00040	0.000441	0.00054	0.00027	0.00012	0.00012
Calcium	mg/L	44.4	49	42.6	-	53.2	47.3	54.9	51.3	53.3	53.3	49.3	53.8	51.1	54.6	48.8	56.9	62	61
Chromium	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00050)	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	0.00071	0.00067	ND (0.00050)	-	0.00602	0.00273	0.00796	0.00813	0.00933	0.00664	0.00635	0.00882	0.00544	0.0001	0.00327	0.00792	0.00048	0.00342
Copper	mg/L	0.00105	0.00079	0.0028	-	0.00106	0.0006	0.00311	0.00083	0.0003	0.00212	0.00092	0.00072	0.00079	0.00201	0.00129	0.00125	0.0011	0.0008
Iron	mg/L	0.0175	0.0053	0.0262	-	1.36	0.25	0.215	0.0073	0.38	0.0192	0.0089	0.0092	0.0095	ND (0.0050)	0.00377	0.0216	ND (0.00020)	ND (0.00020)
Lead	mg/L	ND (0.00020)	ND (0.00020)	ND (0.00020)	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00001)	ND (0.00001)
Lithium	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	-	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0040	0.005	0.0043	0.0046	0.0047	0.0050	0.0042	0.0049	0.00552	0.0036	0.0048
Magnesium	mg/L	7.51	8.33	7.65	-	8.84	8.36	9.60	8.93	9.73	9.01	8.46	10.2	9.32	8.65	8.87	10.1	9.9	9.7
Manganese	mg/L	1.69	1.25	0.0694	-	1.07	2.56	2.53	3.24	1.87	0.465	2.02	3.520	2.900	0.938	2.420	3.48	1.28	1.86
Mercury	mg/L	ND (0.00001)	ND (0.00001)	ND (0.00001)	-	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.00019	0.00007	0.00011	0.00011
Nickel	mg/L	0.0035	0.0028	0.0037	-	0.0045	0.0047	0.0022	0.0020	0.0022	0.0003	0.0017	0.0023	0.0023	0.0001	0.0023	0.0035	0.0019	0.0016
Phosphorus	mg/L	-	-	-	-	4.43	4.11	4.93	4.86	4.44	4.41	4.36	5.07	4.65	4.94	4.53	4.48	4.1	4.49
Potassium	mg/L	4.05	4.86	4.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.00018	0.00023	ND (0.00010)	-	0.00013	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silver	mg/L	13	13.5	11.3	-	13.4	12.1	13.2	11.8	14.2	13.0	12.4	11.900	11.200	12.300	12.800	14.6	12	12
Silicon	mg/L	ND (0.00002)	ND (0.00002)	ND (0.00002)	-	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000050)	0.00005	ND (0.00001)
Sodium	mg/L	14.6	15.6	16.5	-	15.3	15.7	16.0	14.7	16.4	15.5	14.6	16.8	16.1	15.5	16.9	16.3	14	15
Strontium	mg/L	0.459	0.45	0.404	-	0.515	0.448	0.599	0.533	0.58	0.496	0.506	0.438	0.56	0.653	0.506	0.5436	0.6022	0.6022
Sulfur	mg/L	ND (3.0)	4.1	ND (3.0)	-	5.6	ND (3.0)	ND (3.0)	3.0	ND (3.0)	4.3	ND (3.0)	3.3	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	2.4	-
Tellurium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	ND (0.00005)	ND (0.00005)	ND (0.00005)	-	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.000010)	ND (0.000010)	0.000016	ND (0.000010)	ND (0.000010)	ND (0.000010)	0.000012	ND (0.000020)	ND (0.000020)	ND (0.00001)	ND (0.00001)
Thorium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table E6 Historic Groundwater Quality Results - Site MW-4A

Sample Date:	Units	Jun-00	Dec-00	Jul-01	Dec-01	Jul-02	Oct-02	Mar-03	Mar-04	Dec-04	Mar-05	Feb-06	May-06	Sep-06	Nov-06	Apr-07	Sep-07	Nov-07	Jul-08	Dec-08	Jul-09	Nov-09	Nov-09	Aug-10	Dec-10	Jul-11	Dec-11	Feb-12	Feb-12	Aug-12	Dec-12	Mar-13	Jun-13	Apr-14	Jun-14		
Parameters:																						Duplicate							Duplicate								
General																																					
Chemical Oxygen Demand (COD)	mg/L	19	19	-	12	-	-	20	ND (10)	ND (10)	-	12	ND (10)	-	ND (10)	ND (10)	-	47	-	11	-	ND (10)	15	-	-	-	-	-	24	28	-	25	22	45	ND (10)	ND (10)	
Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Conductivity, Electrical	µS/cm	66	43	-	46	-	-	56	40	38	-	42	65	-	35	89	-	43	-	55	-	67	66	-	748	-	-	193	191	-	136	99.9	206	314	315		
pH	s.u.	5.7	6.2	-	6	-	-	6.7	6.4	6.6	-	6.6	6.2	-	6.5	6.8	-	6.5	-	6.6	-	6.6	6.6	-	6.5	-	-	6.41	6.27	-	5.92	5.86	6.29	6.75	7.12		
Alkalinity (Total as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65.9	91	-	44.3	106	142	148			
Alkalinity (PP as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	-	-	-	-	-	-	ND (0.5)	ND (0.5)	-	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)		
Bicarbonate (HCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-	111	111	-	80.4	54.1	130	174	181			
Carbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	-	-	-	-	-	-	ND (0.5)	ND (0.5)	-	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)		
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	-	-	-	-	-	-	ND (0.5)	ND (0.5)	-	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)		
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.5	-	-	-	-	-	-	201	165	-	16.8	81.1	23.5	26.4	13.5			
Hardness (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.7	-	-	-	-	27.5	-	69.5	239	-	53.7	39.5	16.7	120	122			
Nutrients																																					
Ammonia	mg/L	0.089	0.033	-	0.097	-	-	0.025	0.01	0.007	-	0.79	0.181	-	0.168	ND (0.005)	-	0.013	-	0.03	-	0.024	0.009	-	-	-	0.14	0.16	-	0.2	0.22	0.24	0.011	0.014			
Dissolved Nitrate (N)	mg/L	ND (0.02)	ND (0.02)	-	ND (0.02)	-	-	0.72	0.44	0.25	-	0.17	1.53	-	0.66	0.27	-	0.14	-	0.41	-	0.86	0.89	-	0.12	-	-	0.024	0.029	-	ND (0.02)	ND (0.0020)	ND (0.020)	ND (0.020)	ND (0.020)		
Dissolved Nitrite (N)	mg/L	0.005	ND (0.005)	-	0.005	-	-	0.007	ND (0.005)	ND (0.005)	-	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	-	0.012	-	ND (0.005)	-	ND (0.005)	ND (0.005)	-	0.006	-	-	ND (0.005)	0.006	-	ND (0.005)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0055		
Total Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.031	-	-	-	-	-	-	0.041	ND (0.005)	-	0.0569	0.0618	0.0623	0.0659	0.0257			
Nitrate plus Nitrite (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total Nitrogen (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-	-	-	-	-	-	-	0.65	0.54	-	0.636	0.693	0.896	0.107	0.194		
Anions																																					
Chloride	mg/L	ND (1.0)	ND (1.0)	-	ND (1.0)	-	-	0.7	1.2	1.9	-	2.9	1.8	-	2.1	15.8	-	3.8	-	1.8	-	2.8	3.3	-	9.7	-	-	2.2	2	-	1.4	2	5.9	6	5.5		
Sulfate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.8	-	-	-	-	-	-	1.18	ND (0.5)	-	0.63	3.34	ND (0.50)	9.48	7.57			
Dissolved Metals																																					
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.031	-	-	-	-	0.092	-	-	0.0066	0.0059	-	0.0098	0.011	0.026	0.562	0.0067		
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0005)	-	-	-	-	0.0006	-	ND (0.0005)	ND (0.0005)	-	ND (0.0005)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)			
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0001)	-	-	-	-	0.0003	-	-	0.00022	0.00023	-	0.00029	0.00036	0.0002	0.0003	ND (0.00010)		
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.021	-	-	-	-	0.038	-	-	0.0697	0.0714	-	0.0592	0.0492	0.0157	0.0632	0.0453		
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0001)	-	-	-	-	ND (0.0001)	-	-	ND (0.0001)	ND (0.0001)	-	ND (0.0001)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)		
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	-	-	-	-	ND (0.001)	-	-	ND (0.001)	ND (0.001)	-	ND (0.001)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)		
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.05)	-	-	-	-	ND (0.05)	-	-	ND (0.05)	ND (0.05)	-	ND (0.05)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)		
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00063	-	-	-	-	0.00568	-	-	0.000173	0.00023	-	0.00007	0.000056	0.000011	0.000364	0.000361		
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.23	-	-	-	-	8.69	-	-	23.3	24.5	-	18.2	0.0133	0.00572	36.7	37.5		
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	-	-	-	-	ND (0.001)	-	-	ND (0.001)	ND (0.001)	-	ND (0.001)	ND (0.0010)	ND (0.0010)	0.0021	ND (0.0010)		
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0005)	-	-	-	-	0.0006	-	-	0.0005	0.000534	-	0.0008	0.00054	0.00077	0.00065			
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0017	-	-	-	-	0.004	-	-	0.00135	0.000202	-	0.00227	0.00037	0.00021	0.00557	0.00308		
Iron	mg/L	1.52	0.052	-	3.82	-	-	0.028	0.024	0.014	-	0.008	0.006	-	0.009	0.025	-	0.008	-	ND (0.005)	-	0.151	0.174	-	3.49	-	-	0.0292	0.045	-	0.0172	7.34	11.5	1.05	ND (0.0050)		
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0002)	-	-	-	-	0.001	-	-	ND (0.0002)	ND (0.0002)	-	ND (0.0002)	ND (0.00020)	ND (0.00020)	0.00045	ND (0.00020)		
Lithium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.52	-	-	-	-	1.4	-	-	ND (0.005)	ND (0.005)	-	ND (0.005)	ND (0.0050)	ND (0.0050)	0.006	0.0052		
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.003	-	-	-	-	0.652	-	-	2.72	2.89	-	1.97	0.00151	0.000581	6.91	6.84		
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0005	-	-	-	-	2.6	-	-	1.8	2.79	-	1.8	1.56	0.497	1.73	2.63		
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.00005)	-	-	-	-	ND (0.00005)	-	-	ND (0.00005)	-	-	-	ND (0.00005)	ND (0.000050)	ND (0.000020)	ND (0.000010)	ND (0.000010)	
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	-	-	-	-	ND (0.001)	-	-	ND (0.001)	ND (0.001)	-	ND (0.001)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)		
Niobium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	-	-	-	-	ND (0.001)	-	-	ND (0.001)	ND (0.001)	-	ND (0.001)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)		
Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.23	-	-	-	-	1.53	-	-	2.01	2.08	-	2.7	0.00219	0.000617	4.08	3.7		
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0001)	-	-	-	-	ND (0.0001)	-	-	ND (0.0001)	ND (0.0001)	-	ND (0.0001)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)		
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.02	-	-	-	-	3.08	-	-	3.9	3.75	-	4.15	4.93	1.35	12.6	12.9		
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.00002)	-	-	-	-	ND (0.00002)	-	-	ND (0.00002)	ND (0.00002)	-	ND (0.00002)	ND (0.000020)	ND (0.000020)	0.00004	ND (0.000020)		
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.93	-	-	-	-	4	-	-	4.1	4.08	-</							

Notes:

- No data available

Table E7 Historic Groundwater Quality Results - Site MW5

Sample Date:		Units	Jun-00	Dec-00	Jul-01	Dec-01	Jun-02	Oct-02	Mar-03	Mar-04	Dec-04	Mar-05	Feb-06	May-06	Nov-06	Apr-07	Jul-08	Dec-08	Jul-09	Nov-09		Dec-10		Jul-11	Dec-11	Feb-12	Aug-12	Dec-12	Mar-13	Jun-13	Apr-14	Jun-14	Mar-15	Apr-16	Dec-16	Apr-17	Jun-17
Parameters:																																					
General																																					
Chemical Oxygen Demand (COD)	mg/L	217	-	-	-	-	-	-	131	206	164	173	143	106	83	80	-	-	-	-	-	-	139	-	81	-	69	55	64	67	115	82	34	43	50	50	
Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.8	-	-	-	-	-	10.6	11.1	11	13.6	8.87	11.6	12.5	11.4		
Conductivity, Electrical	µS/cm	3010	-	-	-	-	-	-	2750	2780	2910	3140	2700	2780	2230	2330	-	-	-	-	-	1880	744	-	1870	-	1620	1430	1660	1660	1660	1740	1010	1220	1340	1300	
pH	unit	7.4	-	-	-	-	-	-	7.5	7.2	7.3	7.3	7.4	7.5	7.2	7.5	-	-	-	-	-	7.5	7.45	-	7.44	-	7.12	7.7	7.69	7.43	7.31	7.37	7.14	7.17	7.11		
Alkalinity (Total as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	690	-	827	-	591	634	737	773	736	826	469	590	667	672		
Alkalinity (PP as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	-	ND (0.5)	-	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)		
Bicarbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	840	-	1010	-	721	774	900	943	897	1010	572	720	814	820		
Carbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	-	ND (0.5)	-	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)		
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	-	ND (0.5)	-	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)		
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	196	-	94.7	-	31.1	29.2	35	21.4	34.1	47.8	8.78	14.4	34.1	62.2		
Hardness (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	194	-	239	-	240	215	196	206	194	250	203	214	246	238		
Nutrients																																					
Ammonia	mg/L	153	-	-	-	-	-	-	30	153	112	161	231	151	74	113	-	-	-	-	-	120	97.9	-	120	-	96	82	120	130	130	96	53	72	79 (2)	92 (2)	
Dissolved Nitrate (N)	mg/L	ND (0.02)	-	-	-	-	-	-	33.8	0.61	21.4	0.09	4.09	14.9	35.2	3.1	-	-	-	-	-	16.5	33.7	-	9.86	-	37.7	7.02	7.82	0.723	15.3	0.081	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	
Dissolved Nitrite (N)	mg/L	0.009	-	-	-	-	-	-	0.053	0.026	0.016	0.77	0.15	1.05	0.047	0.79	-	-	-	-	-	0.103	0.207	-	0.192	-	0.0222	0.0977	0.477	0.058	0.0141	0.0601	0.0057	ND (0.0050)	ND (0.0050)	ND (0.0050)	
Total Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.494	0.29	-	0.414	0.113	0.103	0.162	0.1	0.395	0.0341	0.164	0.272	0.249	0.249		
Nitrate plus Nitrite (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total Nitrogen (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Anions																																					
Chloride	mg/L	290	-	-	-	-	-	-	455	365	314	335	179	174	184	119	-	-	-	-	-	53	14	-	42	-	29	39	24	21	19	22	25	23	23	20	
Sulfate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	13	-	14.5	-	13.1	14.1	13.6	11.9	11.1	10.2	9.50	7.30	5.58	ND (0.50)	
Dissolved Metals																																					
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.014	-	0.0043	-	ND (0.003)	ND (0.0030)	ND (0.0030)	0.346	0.0056	0.299	0.0037	0.0035	ND (0.0030)	ND (0.0030)		
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0005)	-	ND (0.0005)	-	ND (0.0005)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)		
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0005	-	0.0008	-	0.00062	0.00053	0.00051	0.0021	0.00046	0.00015	0.00246	0.00074	0.00072	0.00208		
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.363	-	0.398	-	0.352	0.388	0.356	0.398	0.341	0.183	0.219	0.183	0.251	0.256		
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0001)	-	ND (0.0001)	-	ND (0.0001)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)			
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	-	ND (0.001)	-	ND (0.001)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)		
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.05)	-	ND (0.05)	-	ND (0.05)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)		
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00017	-	0.000306	-	0.000223	0.000156	0.000142	0.000177	0.000192	0.000573	0.00018	0.00034	0.000152	0.00003		
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	67.2	-	81.9	-	83.6	72.4	67.4	70.8	65.9	84.8	71.0	72.5	83.6	82.2		
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	-	ND (0.001)	-	ND (0.001)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)		
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0015	-	0.00179	-	0.00161	0.00158	0.00195	0.00195	0.00154	0.00276	0.00167	0.00216	0.00249	0.00185		
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0112	-	0.0159	-	0.00856	0.00633	0.00817	0.0129	0.0413	0.00904	0.00142	0.00278	0.00239	ND (0.00020)		
Iron	mg/L	0.208	-	-	-	-	-	-	0.032	0.602	0.009	0.763	0.096	0.062	0.024	0.071	-	-	-	-	-	0.061	0.029	-	0.0135	-	0.0102	0.0081	0.007	1.21	0.0076	9.6	0.545	1.08	1.08	1.07	
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0002)	-	ND (0.0002)	-	ND (0.0002)	ND (0.00020)	ND (0.00020)	0.00062	ND (0.00020)	0.00052	ND (0.00020)	ND (0.00020)	ND (0.00020)			
Lithium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.005)	-	ND (0.005)	-	ND (0.005)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)		
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.42	-	8.48	-	7.47	8.38	6.63	7.18	7.2	8.07	8.91	8.91	7.82	7.82		
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.14	-	4.15	-	4.68	4.11	3.25	3.48	3.69	4.4	3.74	4.25	4.16	4.57		
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.00005)	-	ND (0.00005)	-	ND (0.00005)	ND (0.000050)	ND (0.000050)	ND (0.000050)	ND (0.000050)	ND (0.000050)	ND (0.000050)	ND (0.000050)	ND (0.000050)	ND (0.000050)		
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-</																										

Table E8 Historic Groundwater Quality Results - Site MW13-1 (MW99-9)

Sample Date:	Units	Jun-00	Dec-00	Jul-01	Dec-01	Jun-02	Oct-02	Mar-03	Sep-03	Mar-04	Dec-04	Mar-05	Feb-06	May-06	Sep-06	Sep-06	Nov-06	Apr-07	Sep-07	Nov-07	Jul-08	Dec-08	Jul-09	Jul-09	Nov-09	Aug-10	Dec-10	Jul-11	Dec-11	Dec-11	Aug-12	Aug-12	Dec-12	Dec-12	Mar-13	
Parameters:																Duplicate								Duplicate							Duplicate		Duplicate		Duplicate	
General																																				
Chemical Oxygen Demand (COD)	mg/L	76	61	87	50	57	54	60	56	41	53	38	54	31	16	16	48	28	34	216	34	46	ND (10)	31	30	46	-	52	52	-	46	38	77	69	65	
Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	8.4	10.5	-	8.9	10.1	8.93	10.6	10.3	-	-	-		
Conductivity, Electrical	µS/cm	2120	1990	1970	2150	1790	2150	2030	2010	1730	1920	1790	1890	1780	1710	1730	1830	2030	1540	1800	1600	1700	1300	1300	1580	-	1370	1320	1270	1490	1470	1460				
pH	s.u.	7	7	6.8	7.1	7.5	7.8	7.7	7.4	7.4	7.3	7.6	7.5	7.5	7.5	7.5	7.4	7.7	7.6	7.2	7.2	7.7	8	8	7.7	7.5	7.7	8	7.56	7.51	7.82	7.79	7.57			
Alkalinity (Total as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	590	590	550	541	526	588	623	611	615					
Alkalinity (PP as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	ND (0.5)	ND (0.5)	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)			
Bicarbonate (HCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	950	720	720	-	700	-	680	660	642	716	718	760	746	750	
Carbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	ND (0.5)	ND (0.5)	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)		
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	ND (0.5)	ND (0.5)	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)		
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	ND (0.5)	ND (0.5)	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)		
Hardness (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	145	118	115	-	82.6	-	45.3	16.2	13.7	44.7	48.8	86.1	56.9		
Nutrients																						371	287	261	-	239	286	249	248	256	263	270	289	276	252	
Ammonia	mg/L	100	61	72	114	98	ND (0.005)	75	97	104	86	107	763	45	72	71	71	135	69	96	76	50	63	64	96	190	79	61	66	64	77	85	86	84	88	
Dissolved Nitrate (N)	mg/L	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	0.12	ND (0.02)	0.03	ND (0.02)	0.04	0.02	25	4.25	0.35	0.2	0.05	0.07	0.2	0.11	1.32	0.16	0.12	0.85	-	6.1	5.7	5.16	6.77	3.17	2.56	4.63	4.6	3.37	
Dissolved Nitrite (N)	mg/L	ND (0.005)	ND (0.005)	ND (0.005)	0.017	ND (0.005)	ND (0.005)	0.012	ND (0.005)	0.016	0.011	0.028	0.01	0.084	2.1	0.24	0.033	0.007	0.017	0.08	0.043	0.051	0.031	0.019	0.042	-	0.109	0.075	0.126	0.172	0.0771	0.0625	0.0531	0.0577	0.644	
Total Phosphorus	mg/L	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.258	0.28	0.289	-	0.017	-	0.059	0.0848	0.0967	0.233	0.243	0.274	0.271	0.245	
Nitrate plus Nitrite (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total Nitrogen (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93	63	61	-	78	-	77	66.1	65.2	97.6	78.3	80.5	78.3	81.6	
Anions																																				
Chloride	mg/L	140	130	140	117	109	111	107	104	84.6	87.3	67.4	99.5	106	84.4	83.6	99.9	87.5	75.8	97.5	70	73	50	51	63	-	51	54	60	-	60	63	65	63	71	
Sulfate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	-	-	4.7	-	5.1	5.67	-	ND (0.5)	ND(5.0)	6.44	5.4	5.91	
Dissolved Metals																																				
Aluminum	mg/L	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01	0.003	-	-	ND (0.003)	0.03	0.004	0.019	0.0321	0.0065	0.0132	0.0038	ND (0.003)	ND (0.0030)	
Antimony	mg/L	-	-	ND (0.05)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0005)	0.00069	0.00068	ND (0.0005)	0.00068	ND (0.0005)	0.00068	ND (0.0005)	0.00068	ND (0.0005)	0.00068	ND (0.0005)	0.00068		
Arsenic	mg/L	-	-	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0006	0.0059	-	-	0.0041	0.0011	0.002	0.00061	0.00073	0.00313	0.00302	0.00177	0.00149	0.00086	
Barium	mg/L	-	-	0.262	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.218	0.175	-	-	0.186	0.207	0.182	0.172	0.184	0.21	0.214	0.205	0.206	0.194	
Beryllium	mg/L	-	-	ND (0.0002)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0001)	ND (0.0001)	-	-	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.00010)	
Bismuth	mg/L	-	-	ND (0.05)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0010)	
Boron	mg/L	-	-	0.033	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.063	ND (0.05)	-	-	ND (0.05)	0.075	ND (0.05)	ND (0.05)	ND (0.05)	0.05	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.050)	
Cadmium	mg/L	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00086	0.00017	-	-	0.0003	0.00481	0.00175	0.00153	0.00152	0.000835	0.000787	0.000162	0.000199	0.000407	
Calcium	mg/L	-	-	172	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	124	96.3	-	-	81.7	93	81.1	85.9	83.4	93.1	88.4	93.1	88.9	74	
Chromium	mg/L	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0010)	
Cobalt	mg/L	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0005)	ND (0.0005)	-	-	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.00050)	
Copper	mg/L	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0035	0.0005	-	-	0.0005	0.0055	0.0017	0.00367	0.00365	0.00108	0.00105	0.00045	0.00049	0.00155	
Iron	mg/L	0.365	0.918	0.395	1.96	0.729	8.13	2.71	0.166	1.45	1.18	0.394	0.821	0.024	0.386	0.622	0.803	1.06	1.57	0.014	0.013	0.048	6.3	-	8.31	5.39	1.41	1.87	0.567	0.737	4.54	2.12	0.932	1.06		
Lead	mg/L	-	-	ND (0.001)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0002)	ND (0.0002)	-	-	ND (0.0002)	0.0003	0.0004	0.00055	0.0004	0.00055	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.00020)	
Lithium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Magnesium	mg/L	-	-	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.1	11.4	-	-	11.6	13.1	11	11.5	11.7	11.9	13.7	13.2	11.3		
Manganese	mg/L	-	-	9.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.73	4.01	-	-	3.51	4.15	3.79	3.46	3.67	4.08	4.13	4.26	4.16	3.7	
Mercury	mg/L	-	-	ND (0.00005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.00005)	ND (0.00005)	-	-	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.000050)	
Molybdenum	mg/L	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0001)	ND (0.0001)	-	-	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.00010)	
Nickel	mg/L	-	-	ND (0.008)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.003	0.001	-	-	0.001	0.003	0.002	0.002	0.002	0.002	0.0023	0.0021	0.0022		
Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Potassium	mg/L	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.4	15.4	-	-	17.9	19.5	18.1	16.7	17.6	18	19.7	18.7	18.1		
Selenium	mg/L	-	-	ND (0.001)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.0001	-	-	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.00010)		
Silicon	mg/L	-																																		

Notes:
- No data available

Table E9 Historic Groundwater Quality Results - Site MW 13-2 (MW99-8)

Sample Date:		Mar-16	Jul-16	Jul-16	Sep-16	Dec-16	Apr-17	Jun-17	Nov-17	Dec-17	Mar-18	Jul-18	Sep-18	Dec-18	Apr-19	Nov-19	Dec-19	Dec-19
Parameters:	Units			Duplicate														Duplicate
General																		
Chemical Oxygen Demand (COD)	mg/L	45	59	52	46	31	25	30	16	48	19	39	154	23	73	50	40	30
Dissolved Organic Carbon	mg/L	6.18	7.70	7.97	8.64	7.54	7.34	4.93	0.71	9.46	5.56	6.7	9.33	3.3	5.00	5.3	3.7	3.6
Conductivity, Electrical	µS/cm	548	745	743	935	543	595	599	251	537	441	726	939	420	622	636	516	543
pH	s.u.	7.00	7.59	7.53	6.77	6.80	6.59	6.63	7.17	7.84	6.99	7.59	7.07	7.44	7.05	6.56	6.47	6.61
Alkalinity (Total as CaCO3)	mg/L	268	368	367	447	261	268	269	84.9	249	220	337	439	302	315	324	256	266
Alkalinity (PP as CaCO3)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Bicarbonate (HCO3)	mg/L	328	448	449	536	327	328	328	104	303	191	411	536	396	315	396	312	324
Carbonate (as CaCO3)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (6)	ND (6)	ND (6)
Hydroxide (OH)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (5)	ND (5)	ND (5)
Turbidity	NTU	12.1	86.8	70.4	89.3	15.4	14.9	29.7	13.2	109	114	169	3400	51.5	801	57.7	89.1	190
Hardness (as CaCO3)	mg/L	186	237	241	268	182	196	198	74.6	179	194	226	279	162	205	220	180	190
Nutrients																		
Ammonia	mg/L	6.2	11	11	24	6	7.8 (2)	7.0 (2)	2.7 (2)	6.8 (2)	8.2	14	22	4.4	6.82	7.01	3.85	4.22
Dissolved Nitrate (N)	mg/L	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.20)	ND (0.20)	ND (0.020)	ND (0.020)	0.038	0.024	ND (0.020)	0.080	ND (0.020)	0.138	ND (0.010)	ND (0.1)	ND (0.01)	ND (0.01)
Dissolved Nitrite (N)	mg/L	0.0068	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0118	0.0062	ND (0.0050)	0.0053	0.0077	ND (0.0050)	0.0090	ND (0.0050)	ND (0.0050)	0.048	ND (0.1)	ND (0.01)	ND (0.01)
Total Phosphorus	mg/L	0.200	0.203	0.209	0.373	0.144	0.159	0.263	0.0629	0.183	0.172	0.134	1.440	0.143	0.732	0.76	0.214	0.385
Nitrate plus Nitrite (N)	mg/L	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.20) (2)	ND (0.020)	ND (0.020)	ND (0.020)	0.044	0.032	ND (0.020)	0.089	ND (0.020)	0.138	-	ND (0.20)	ND (0.020)	ND (0.020)
Total Nitrogen (N)	mg/L	7.37 (1)	10.0 (1)	9.21 (1)	21.9 (1)	6.71 (1)	6.91 (2)	6.80 (2)	7.4 (2)	6.89	7.99	10.9	19.9	2.56	-	6.19	3.95	4.74
Total Kjeldahl Nitrogen	mg/L	7.37	10.0	9.21	21.9	6.71	6.91	6.8	7.4	6.86	7.99	10.8	19.9	2.42	7.79	6.17	3.94	4.74
Anions																		
Chloride	mg/L	9.1	10	11	17	11	15	18	22	14	14	17	20	6.3	8.08	7.8	3.8	5.19
Sulfate	mg/L	7.00	14.5	15.4	13	10.3	16.8	6.55	3.3	5.3	4.2	6.7	ND (1.0)	8.1	11.7	12	13	11.8
Dissolved Metals																		
Aluminum	mg/L	0.0037	ND (0.0030)	0.0034	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	0.002	ND (0.001)	ND (0.001)
Antimony	mg/L	ND (0.00050)	ND (0.00050)	0.00059	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	0.00009	0.00014	0.0001
Arsenic	mg/L	0.00246	0.00127	0.00147	0.00371	0.00325	0.00035	0.00074	0.00045	0.0017	0.00246	0.00033	0.00133	0.00049	ND (0.00050)	0.0004	0.0005	0.0004
Barium	mg/L	0.09	0.115	0.119	0.183	0.085	0.0702	0.0869	0.0582	0.0889	0.0991	0.11	0.201	0.0612	0.0969	0.0826	0.063	0.0668
Beryllium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)
Boron	mg/L	0.174	0.205	0.216	0.33	0.15	0.231	0.159	0.191	0.182	0.231	0.378	0.071	0.178	0.043	0.178	0.053	0.053
Cadmium	mg/L	ND (0.00001)	0.000021	0.000016	ND (0.00001)	ND (0.00001)	0.000015	0.000012	0.000058	0.00001	0.000014	ND (0.000010)	0.000037	0.000333	0.00002	0.00003	0.00002	0.00002
Calcium	mg/L	61.2	76.5	77.5	88.4	59.4	64.6	66.2	26	59.1	65.8	75	90.9	53.4	67	74	58	61
Chromium	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00050)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	ND (0.00050)	0.00221	0.00232	0.00101	0.00091	0.00098	0.00027	0.00041	0.00031	0.00062	0.00204	0.00173	0.00032	0.00235	0.00031	0.00033	0.00032
Copper	mg/L	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	0.00032	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	mg/L	24	5.32	7.23	20.9	26	0.0653	6.12	ND (0.005)	16.9	24.200	0.015	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105
Lead	mg/L	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Lithium	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0033	0.0093	0.0031	ND (0.0020)	0.0021	ND (0.0020)	0.0035	0.00238	0.003	0.0046	0.0039	0.0039
Magnesium	mg/L	8.06	11.1	11.4	11.5	8.20	8.51	7.95	2.37	7.74	7.21	9.48	12.5	6.89	9.1	9.1	8.1	8.3
Manganese	mg/L	7.14	5.97	7.12	6.71	6.03	5.64	6.15	1.17	5.61	6.120	6.340	6.950	4.880	7.03	7.4	6.44	6.7
Mercury	mg/L	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.0015	ND (0.0010)	0.00041	0.00013	0.00009	0.00013
Nickel	mg/L	ND (0.0010)	0.0031	0.0033	0.0024	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.0012	ND (0.0010)	0.0033	0.0051	0.0012	0.00293	0.0013	0.0009	0.0008	0.0008
Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0050)	-	-	-
Potassium	mg/L	11.5	14.5	14.6	20.9	9.16	10.5	10.5	4.44	9.67	10.8	14.2	19.6	7.35	10.6	10	7.2	7.5
Selenium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.0002)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	13	12.9	13.6	14	11.4	10.2	12.7	2.94	10.6	11.900	11.300	12.300	9.230	12.5	11	11	11
Silver	mg/L	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	20.9	50.2	50.6	40.1	18.1	18.3	21.1	12.5	15.3	15.6	34	35.6	13.2	25.5	20	20	20
Strontium	mg/L	0.861	1.07	1.18	1.63	0.804	0.861	0.881	0.372	0.783	0.949	1.11	1.61	0.611	0.946	0.8335	0.6301	0.6767
Sulfur	mg/L	4.1	7.3	6.1	4.5	5.3	6.7	5	ND (3.0)	4.9	4.1	3.2	3.8	3.0	ND (3.0)	4.6	4.4	4.3
Tellurium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	0.000058	ND (0.00001)	ND (0.00001)	ND (0.00001)
Thorium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.00010)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Tin	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.00020)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050														

Table E10 Historic Groundwater Quality Results - Site MW13-3 (MW99-7)

Sample Date:	Units	Jun-00	Dec-00	Apr-01	Jul-01	Dec-01	Jun-02	Oct-02	Mar-03	Sep-03	Mar-04	Dec-04	Mar-05	Feb-06	May-06	Sep-06	Nov-06	Apr-07	Sep-07	Nov-07	Jul-08	Dec-08	Jul-09	Nov-09	Aug-10	Dec-10	Jul-11	Dec-11	Aug-12	Dec-12	Mar-13	Jun-13	Dec-13	Dec-13	Apr-14	
Parameters:																																				Duplicate
General																																				
Chemical Oxygen Demand (COD)	mg/L	103	80	83	102	62	69	73	71	67	60	50	41	39	51	32	12	ND (10)	30	59	ND (10)	42	31	26	55	-	138	82	64	36	29	45	294	309	136	
Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.3	-	8.1	8.21	8.33	-	-	6.93	4.41	22.9	10.8	
Conductivity, Electrical	µS/cm	2380	2360	2470	2300	2300	2230	2210	2260	2180	1760	1940	1920	1790	1750	1690	1660	1640	1530	1500	1500	1400	-	1390	1350	1340	1240	1290	1220	1240	1240	1230	1510	1490	1060	
pH	s.s.	6.7	6.6	6.6	6.4	6.6	6.9	7.2	7	7.1	6.8	6.9	7	7	6.9	7.1	6.9	7.4	7.1	6.9	6.9	7.4	-	7.6	6.6	7.3	7.2	7.7	7.34	7.55	7.22	7.68	6.99	6.97	6.82	
Alkalinity (Total as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	750	-	-	600	588	620	671	628	631	648	627	760	571	564	
Alkalinity (PP as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	-	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	
Bicarbonate (HCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	920	-	-	740	-	760	767	790	725	722	765	828	916	689	
Carbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	-	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.5)	-	-	ND (0.5)	-	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	376	-	-	37.7	-	150	207	410	183	90.2	29.7	218	230	208	
Hardness (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	587	531	-	545	588	536	545	506	532	498	477	298	301	215	
Nutrients																																				
Ammonia	mg/L	1	0.583	0.751	0.962	1.16	1.66	1.5	13.4	1.19	1.34	1.25	1.6	2.02	1.36	1.25	1.1	1.83	1.32	1.6	1.52	1.8	-	0.83	2.4	0.8	1.14	0.64	0.89	0.86	0.92	0.91	1.3	1.4	3	
Dissolved Nitrate (N)	mg/L	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	0.86	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	0.03	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	0.04	0.03	ND (0.02)	-	0.03	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.020)	0.066	ND (0.20)	ND (0.20)	ND (0.020)		
Dissolved Nitrite (N)	mg/L	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.005	ND (0.005)	0.005	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.005	0.005	ND (0.005)	ND (0.005)	ND (0.005)	0.005	0.006	0.017	0.06	ND (0.05)	-	ND (0.05)	ND (0.05)	0.006	ND (0.05)	ND (0.05)	ND (0.05)	0.0107	0.011	0.083	0.055	0.0067		
Total Phosphorus	mg/L	-	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.405	0.65	-	-	0.016	-	1.05	0.014	1.1	0.12	0.0582	0.211	0.528	0.56	0.582
Nitrate plus Nitrite (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total Nitrogen (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Anions																																				
Chloride	mg/L	270	260	270	260	234	217	214	189	176	136	110	110	97.5	82.4	76.5	72.1	60.3	58.5	55.9	49	44	-	52	-	45	39	45	37	31	39	31	16	61	18	
Sulfate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-	3.9	-	4.6	4.51	4.57	6.11	6.91	6.52	12.2	-	0.72	
Dissolved Metals																																				
Aluminum	mg/L	-	-	-	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.041	1.78	-	0.005	4.45	0.043	0.0118	0.0141	0.0048	ND (0.0030)	-	ND (0.0030)	0.0092	ND (0.0030)	
Antimony	mg/L	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7	0.0039	-	0.0009	0.0007	0.0017	0.00091	0.00062	ND (0.0005)	ND (0.00050)	-	ND (0.00050)	ND (0.00050)		
Arsenic	mg/L	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0013	0.0056	-	0.0017	0.0016	0.00083	0.00093	0.00086	0.00082	-	0.00283	0.00369	0.00869		
Barium	mg/L	-	-	-	0.305	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.178	0.224	-	0.156	0.218	0.146	0.132	0.124	0.127	0.121	-	0.232	0.242	0.168	
Beryllium	mg/L	-	-	-	ND (0.0002)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0001)	0.0001	-	0.0002	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.00010)	-	ND (0.00010)	ND (0.00010)	ND (0.00010)		
Bismuth	mg/L	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)		
Boron	mg/L	-	-	-	0.549	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.540	0.501	-	0.46	0.407	0.462	0.503	0.469	0.481	0.073	0.071	0.137	-	-	
Cadmium	mg/L	-	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00222	0.00245	-	0.00073	0.00467	0.00189	0.00108	0.00103	0.00153	0.00139	-	ND (0.000010)	ND (0.000010)	ND (0.000010)	
Calcium	mg/L	-	-	-	322	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	188	167	-	170	185	172	170	160	168	154	148	99.1	100	71.9	
Chromium	mg/L	-	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.001)	0.003	-	ND (0.001)	0.007	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	
Cobalt	mg/L	-	-	-	0.0009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0027	0.0059	-	0.0037	0.0083	0.00332	0.00361	0.00332	0.00356	-	0.018	0.0193	0.0182		
Copper	mg/L	-	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0004	0.0005	-	0.0004	0.0008	0.00042	0.00075	0.00059	0.00059	0.00059	0.00059	0.00059	0.00059	0.00059	
Iron	mg/L	0.763	0.751	2.23	0.188	2.21	0.407	3.95	2.97	0.645	1.94	1.58	0.711	0.397	0.034	0.28	0.402	0.188	0.582	0.014	0.021	0.0004	1.84	0.27	0.399	5.36	0.12	0.1	0.941	0.0201	0.0173	0.0182	78.1	69.7		
Lead	mg/L	-	-	-	ND (0.0002)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0029	0.0049	-	ND (0.0002)	0.0052	0.0002	ND (0.0002)	ND (0.0002)	ND (0.0002)	ND (0.00020)	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	
Lithium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Magnesium	mg/L	-	-	-	57.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28.7	27.8	-	29.3	30.8	25.8	29.4	25.7	27.5	27.7	26.4	12.2	12.3	8.53	
Manganese	mg/L	-	-	-	9.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.28	3.31	-	4.24	4.34	4.06	4.54	4.06	4.06	4.06	4.06	4.06	4.06	4.06	
Mercury	mg/L	-	-	-	ND (0.00005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.00005)	0.00005	-	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.000050)	-	ND (0.010)	ND (0.010)	ND (0.000010)	
Molybdenum	mg/L	-	-	-	ND (0.005)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.004	0.01	-	0.005	0.002	0.003	0.0036	0.0042	0.0032	0.0034	-	0.0034	0.0032	0.0012	
Nickel	mg/L	-	-	-	<0.018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.012	0.025	-	0.007	0.0089	0.007	0.0086	0.007	0.0142	0.0107	-	0.0142	0.0147	0.0114	
Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Potassium	mg/L	-	-	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.8	9.55	-	9.86	9.17	9.47	8.88	8.5	8.62	8.61	8.72	8.91	9.09	7.35	
Selenium	mg/L	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0003	0.0003	-	0.0003	0.0003	0.0001	0.00012	0.00023	0.00021	-	ND (0.00010)	ND (0.00010)	ND (0.00010)		

Table E10 Historic Groundwater Quality Results - Site MW13-3 (MW99-7)

Sample Date:	Units	Jun-14	Jun-14	Dec-14	Mar-15	Mar-15	Jul-15	Oct-15	Oct-15	Dec-15	Mar-16	Jul-16	Sep-16	Dec-16	Apr-17	Jun-17	Nov-17	Dec-17	Mar-18	Jul-18	Sep-18	Dec-18	Apr-19	Nov-19	Dec-19
Parameters:		Duplicate						duplicate																	
General																									
Chemical Oxygen Demand (COD)	mg/L	104	104	32	173	164	204	627	723	61	25	65	51	66	27	106	38	38	16	50	37	44	135	110	40
Dissolved Organic Carbon	mg/L	7.23	4.81	7.75	6.2	6.19	5.87	8.2	8.4	8.64	6.43	11.2	9.10	7.15	5.17	9.27	3.76	4.42	5.55	3.7	5.57	4.5	6.15	6	7.5
Conductivity, Electrical	µS/cm	1130	1540	478	928	927	1000	926	943	893	563	903	883	329	535	643	559	440	659	478	626	719	708	819	795
pH	s.a.	6.77	7.33	7.19	7.15	6.84	6.7	7.24	6.92	6.73	7.10	7.58	6.63	6.92	6.8	6.71	7.3	7.55	7.11	7.06	7.04	6.90	6.9	6.63	6.6
Alkalinity (Total as CaCO3)	mg/L	583	699	229	394	417	490	403	412	423	624	300	359	109	213	237	195	178	260	142	237	306	295	374	358
Alkalinity (PP as CaCO3)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (5)	ND (5)
Bicarbonate (HCO3)	mg/L	711	853	280	481	509	598	492	516	516	761	366	436	132	175	209	237	217	317	173	295	374	295	456	436
Carbonate (as CaCO3)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (6)	ND (6)
Hydroxide (OH)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (5)	ND (5)
Turbidity	NTU	184	194	23.6	521	405	437	>4000	>4000	193	2.96	109	122	25.9	75	393	33.3	81.7	103	73.7	40.0	52.1	1180	80.4	84
Hardness (as CaCO3)	mg/L	186	186	113	188	187	216	206	274	227	107	237	232	60.5	162	185	152	119	196	118	177	218	213	230	230
Nutrients																									
Ammonia	mg/L	1.9	2	21	2.5	2.1	1.8	1.6	2.4	2.8	0.25	1.1	1.6	2.9	6.9 (2)	5.8 (2)	3.6 (2)	3.6 (2)	6.5	4.0	3.8	5.9	6.17	6.27	5.94
Dissolved Nitrate (N)	mg/L	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.020)	ND (0.20)	0.027	0.051	ND (0.020)	ND (0.20)	0.028	0.054	0.090	0.034	ND (0.020)	0.022	ND (0.1)	0.06
Dissolved Nitrite (N)	mg/L	0.0061	0.0072	0.0092	0.0065	0.0057	0.0062	ND (0.050)	ND (0.050)	0.087	ND (0.050)	ND (0.050)	0.0099	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	0.0138	0.0129	ND (0.050)	0.106	ND (0.1)	ND (0.01)	ND (0.01)
Total Phosphorus	mg/L	0.625	0.615	0.0739	0.94	0.814	1.42	3.74	5.97	0.252	0.0314	0.205	0.264	0.136	0.129	0.0892	0.064	0.064	0.0575	0.0862	0.138	1.15	0.92	0.229	0.06
Nitrate plus Nitrite (N)	mg/L	-	-	-	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.020)	ND (0.020)	ND (0.20)	0.037	0.051	ND (0.020)	ND (0.020)	0.028	0.054	0.104	0.047	ND (0.020)	-	ND (0.20)	0.06
Total Nitrogen (N)	mg/L	-	-	-	3.11	2.96	2.77	5.2	6.42	3.45	0.650	2.35	2.51	3.53	6.13 (2)	6.65 (2)	3.18 (2)	4.2	5.76	4.24	4.6	5.40	6.32	6.96	6.94
Total Kjeldahl Nitrogen	mg/L	2.81	2.55	22.2	3.11	2.96	2.77	5.2	6.42	3.45	0.650	2.35	2.51	3.49	6.07	6.65	3.18	4.17	5.71	4.13	4.56	5.40	6.93	6.32	6.94
Anions																									
Chloride	mg/L	18	18	8.5	19	17	20	18	19	15	13	53	23	9.2	15	14	22	11	15	16	15	17	17.8	17.1	16
Sulfate	mg/L	ND (0.50)	4.71	ND (0.50)	29.1	54.1	63.7	86.2	85.3	23.1	162	82.1	83	40.0	32.7	66.7	60.4	27.7	52.2	83.0	65.1	55.5	60.2	45	41.6
Dissolved Metals																									
Aluminum	mg/L	0.0042	0.0083	0.379	0.0039	ND (0.0030)	0.0038	0.124	16.9	-	0.0039	0.0037	ND (0.0030)	0.0032	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	ND (0.0030)	0.002	ND (0.001)	ND (0.001)
Antimony	mg/L	ND (0.0050)	0.00053	0.00067	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	-	ND (0.0050)	ND (0.0050)	0.00062	0.00071	ND (0.0050)	0.00051	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.00013	0.00015
Arsenic	mg/L	0.00976	0.00972	0.00212	0.00136	0.00106	0.00118	0.0236	0.00468	-	0.00166	0.0083	0.0182	0.00061	0.00035	0.00198	0.00175	0.0009	0.00419	0.00132	0.00128	0.00055	0.0008	0.0008	0.0012
Barium	mg/L	0.151	0.147	0.0773	0.0872	0.0925	0.0909	0.149	0.77	-	0.067	0.127	0.111	0.0417	0.0957	0.0912	0.0931	0.0726	0.116	0.075	0.0975	0.097	0.112	0.0832	0.0928
Beryllium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	0.00167	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)
Boron	mg/L	0.105	0.102	0.105	0.116	0.111	0.1	0.19	0.095	-	0.119	0.121	0.085	0.175	0.158	0.095	0.154	0.151	0.178	0.178	0.178	0.178	0.185	0.173	0.173
Cadmium	mg/L	ND (0.00010)	ND (0.00010)	0.000679	0.000141	0.000099	0.000011	0.000031	0.00055	-	0.000123	0.000012	ND (0.00001)	0.000044	0.00003	0.000019	0.00007	0.000035	0.000012	0.000069	0.000098	0.000015	0.000012	ND (0.00001)	ND (0.00001)
Calcium	mg/L	61.5	61.4	38.9	63.6	63.6	72.8	68.4	87.1	-	35.5	76.0	78.1	19.9	53.3	62.2	50.9	39.2	63.6	39.3	57.5	71.5	70.4	76	77
Chromium	mg/L	ND (0.0010)	ND (0.0010)	0.0021	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.0316	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00050)	ND (0.00005)	ND (0.00005)
Cobalt	mg/L	0.01	0.0107	0.00398	0.00991	0.00966	0.00443	0.00372	0.036	-	0.0328	0.00947	0.00314	0.00282	0.00211	0.00519	0.0105	0.0054	0.00262	0.00819	0.00918	0.00918	0.00232	0.00093	0.0012
Copper	mg/L	ND (0.00020)	0.00143	0.00093	0.00172	0.00111	ND (0.00020)	0.00117	0.00039	-	0.00039	ND (0.00020)	0.00037	0.00035	0.00037	0.00035	0.00035	0.00035	0.00035	0.00035	0.00035	0.00035	0.00035	ND (0.00005)	ND (0.00005)
Iron	mg/L	57.8	58.5	6	0.0097	0.009	8.98	46.6	95.9	-	0.0485	5.7	19.8	0.17	0.015	0.0475	0.0212	5.04	17.200	0.0126	0.0258	0.0252	0.043	3.99	10.3
Lead	mg/L	ND (0.00020)	ND (0.00020)	0.00088	ND (0.00020)	ND (0.00020)	ND (0.00020)	0.00029	0.0061	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	0.00001	ND (0.00001)
Lithium	mg/L	0.0137	0.0137	0.0137	0.0173	0.0163	0.0134	0.0141	0.0314	-	0.0096	0.0487	0.0368	0.0152	0.0133	0.0129	0.0108	0.011	0.0073	0.0084	0.0096	0.00958	0.0073	0.0072	0.0072
Magnesium	mg/L	7.84	7.98	3.89	7.06	6.89	8.21	8.42	13.6	-	4.52	11.4	9.04	2.61	6.96	7.26	6.02	5.02	9.05	4.81	9.05	9.57	9.05	8.8	8.9
Manganese	mg/L	10	9.97	2.42	8.41	8.25	9.08	9.0.9																	

Table E11 Historic Groundwater Quality Results - Site MW13-4

Sample Date:	Units	Dec-13	Apr-14	Jun-14	Dec-14	Mar-15	Jul-15	Dec-15	Mar-16	Jul-16	Sep-16	Dec-16	Apr-17	Jun-17	Dec-17	Mar-18	Jul-18	Sep-18	Dec-18	Apr-19	Nov-19	Dec-19
Parameters:																						
General																						
Chemical Oxygen Demand (COD)	mg/L	378	45	60	135	ND (10)	11	80	23	66	58	65	12	30	20	ND (10)	ND (5.0)	40	38	ND (20)	60	ND (10)
Dissolved Organic Carbon	mg/L	2.40	2.06	2.38	1.75	ND (0.5)	0.5	0.95	0.58	ND (0.4)	0.67	0.92	0.99	ND (0.50)	0.81	ND (0.50)	1.53	1.99	ND (0.50)	<0.50	ND (0.5)	ND (0.5)
Conductivity, Electrical	µS/cm	74.5	71.4	113	75.2	58	56.4	63.6	56.5	50.4	65.4	56.5	55.1	52.1	55.2	54.4	52.7	53.4	60.1	50.2	62	62
pH	s.u.	6.68	7.16	7.28	7.2	7.4	7.4	6.99	7.30	7.50	6.72	6.98	7.11	7.36	7.62	6.71	7.45	7.01	7.28	7.14	6.82	6.66
Alkalinity (Total as CaCO3)	mg/L	32.8	28.9	49.6	34.9	22.7	25.4	26.3	26.3	21.9	22.6	24.5	22.5	22.8	24.4	24.2	24.1	23.2	29.6	22.4	25	26
Alkalinity (PP as CaCO3)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (0.25)	ND (0.25)
Bicarbonate (HCO3)	mg/L	40	31	60.5	42.6	27.7	31	32.1	32.1	26.7	27.5	29.9	27.4	27.8	29.8	29.6	29.4	28.3	36.1	22.4	30	31
Carbonate (as CaCO3)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (0.6)	ND (0.6)
Hydroxide (OH)	mg/L	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (0.15)	ND (0.15)
Turbidity	NTU	>4000	129	26.9	827	0.61	9.67	1350	56.5	1100	229	433	113	266	102	23.0	424	44.5	97.1	4.64	33.8	3.4
Hardness (as CaCO3)	mg/L	28.3	27.8	2.34	151	19.4	21.5	105	18.8	16.4	17.7	18.6	21.4	16.5	18.9	18.7	17.7	17.3	21.2	17.5	19	21
Nutrients																						
Ammonia	mg/L	0.049	0.017	0.022	0.047	0.009	0.0092	0.06	0.032	0.065	0.31	0.10	0.044	0.026	0.046	ND (0.020)	0.022	0.035	0.020	ND (0.020)	ND (0.01)	ND (0.01)
Dissolved Nitrate (N)	mg/L	ND (0.020)	ND (0.020)	ND (0.020)	0.037	0.089	0.063	ND (0.20)	0.079	0.108	0.088	0.120	0.09	0.089	0.069	0.084	0.133	0.160	0.062	0.121	ND (0.1)	0.09
Dissolved Nitrite (N)	mg/L	ND (0.0050)	0.0069	0.0069	0.0139	ND (0.0050)	0.0058	0.138	0.0111	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0212	ND (0.0050)	0.0291	ND (0.0050)	0.011	ND (0.1)	ND (0.01)	
Total Phosphorus	mg/L	2.51	0.271	0.599	1.24	0.0178	0.0264	1.16	0.0988	0.855 (1)	0.622 (1)	0.450	0.162	0.355	0.164	0.0594	0.0292	0.127	0.192	0.039	0.116	0.078
Nitrate plus Nitrite (N)	mg/L	-	-	-	-	0.089	0.068	ND (0.20)	0.108	0.088	0.120	0.09	0.089	0.113	0.084	0.133	0.189	0.062	0.127	-	-	0.09
Total Nitrogen (N)	mg/L	-	-	-	-	0.135	0.139	0.837	0.162	0.157	0.748	0.366	0.326	0.377	0.33 (2)	0.252	0.196	0.271	0.371	-	-	0.15
Total Kjeldahl Nitrogen	mg/L	1.23	0.257	8.4	1.84	0.046	0.071	0.84	0.072	0.049	0.660	0.245	0.236	0.288	0.2	0.168	0.063	0.082	0.309	0.056	ND (0.07)	ND (0.07)
Anions																						
Chloride	mg/L	7.8	2.3	1.8	2	2.2	2.2	1.5	1.8	3.2	3.1	1.9	2	2	2.2	2.3	1.5	2.8	1.8	1.56	2.4	2.03
Sulfate	mg/L	11.8	2.79	7.62	2.5	1.58	1.74	2.44	2.11	5.00	2.7	2.30	2.64	1.87	2.5	2.9	2.7	3.1	1.9	1.4	2	1.7
Dissolved Metals																						
Aluminum	mg/L	0.0052	1.53	0.0454	3.88	ND (0.0030)	ND (0.0030)	-	0.0038	0.0055	0.0039	0.0082	0.0034	ND (0.0030)	0.0036	0.0079	0.0333	ND (0.0030)	0.0041	ND (0.0050)	0.001	0.012
Antimony	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	-	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0039	ND (0.0020)	0.0006	0.0012	
Arsenic	mg/L	0.00134	0.0039	0.00084	0.00012	0.00012	0.00013	-	0.0002	0.00021	0.0001	0.00014	0.00014	0.00011	0.0001	0.0001	ND (0.00010)	0.00012	ND (0.00010)	0.0001	ND (0.0001)	
Barium	mg/L	0.0037	0.0432	0.0015	0.0026	0.0023	0.0024	-	0.0025	0.0024	0.0024	0.0027	0.0019	0.0018	0.0019	0.002	0.0015	0.0015	ND (0.0010)	0.0010	0.001	0.0014
Beryllium	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.00032	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0005)	ND (0.0005)	
Bismuth	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0001)	ND (0.0001)	
Boron	mg/L	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	-	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	0.002	0.003	
Cadmium	mg/L	ND (0.00010)	0.000095	ND (0.00010)	0.000074	0.000034	0.000034	-	0.000178	0.000025	0.000049	0.000045	0.000045	0.000044	0.000047	0.000025	0.000031	0.000055	0.000094	0.000018	0.00002	0.00001
Calcium	mg/L	9.52	8.79	8.007	43.5	6.14	6.68	-	71.0	5.14	5.58	5.72	7.13	5.17	6.09	6.05	5.92	5.58	6.54	5.67	6.3	
Chromium	mg/L	ND (0.0010)	0.0029	ND (0.0010)	0.0058	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.0013	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.00014	ND (0.0005)	
Cobalt	mg/L	0.00109	0.00362	ND (0.00050)	0.0124	ND (0.00050)	ND (0.00050)	-	ND (0.00050)	0.00068	0.00068	0.00038	ND (0.00020)	0.00038	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	0.00003	ND (0.00002)	
Copper	mg/L	0.00021	0.00448	0.00122	0.00702	0.00062	ND (0.00020)	-	0.000028	ND (0.00020)	0.00008	ND (0.00020)	0.00008	0.00013	0.00008	0.00013	0.00008	0.00013	0.00015	ND (0.00040)	ND (0.0005)	
Iron	mg/L	1.19	4.74	0.0531	21.6	ND (0.0050)	ND (0.0050)	-	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0033	ND (0.0050)	0.0166	ND (0.0050)	0.0054	0.0259	0.0071	0.0081	ND (0.010)	ND (0.002)	
Lead	mg/L	ND (0.00020)	0.001	0.00036	0.0273	ND (0.00020)	ND (0.00020)	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	0.00002	ND (0.00001)	
Lithium	mg/L	ND (0.0050)	1.43	0.008	0.0194	ND (0.0050)	1.16	-	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.00029	ND (0.0005)	
Magnesium	mg/L	1	0.08	10.3	0.86	1.16	-	6.29	0.862	0.907	1.05	0.876	0.861	0.909	0.880	0.796	0.814	1.01	0.802	0.87	0.9	
Manganese	mg/L	0.575	0.502	0.0019	0.721	0.0053	0.0116	-	0.0269	0.0441	0.026	0.0339	0.013	0.0212	0.0056	0.0050	0.0064	0.0039	ND (0.0010)	0.00314	0.005	
Mercury	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000010)	ND (0.00001)	
Nickel	mg/L	0.0014	ND (0.0010)	0.0016	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000010)	ND (0.00001)	
Nickel	mg/L	0.0021	0.007	ND (0.0010)	0.025	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.0092	ND (0.0010)	0.0092	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.00046	ND (0.0002)	
Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Potassium	mg/L	4.85	4.884	0.506	1.140	0.633	0.631	-	10.4	0.484	0.503	0.533	0.536	0.5	0.516	0.498	0.53	0.511	0.629	0.47	0.46	
Selenium	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00050)	ND (0.0002)	
Silicon	mg/L	8.98	10.4	8.57	26.4	8.05	9.49	-	8.91	8.52	9	8.25	10.1	8.54	8.97	8.00	8.580	8.340	8.770	9.2	8	
Silver	mg/L	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000010)	ND (0.00001)	
Solids	mg/L	4.55	4	22.9	4.44	3.59																

Table E12 Historic Groundwater Quality Results - Site MW13-5

Sample Date:	Units	Dec-13	Sep-14
Parameters:			
General			
Chemical Oxygen Demand (COD)	mg/L	-	436
Dissolved Organic Carbon	mg/L	-	1.69
Conductivity, Electrical	µS/cm	-	71.3
pH	s.u.	-	7.02
Alkalinity (Total as CaCO3)	mg/L	-	30.8
Alkalinity (PP as CaCO3)	mg/L	-	ND (0.50)
Bicarbonate (HCO ₃)	mg/L	-	37.6
Carbonate (as CaCO ₃)	mg/L	-	ND (0.50)
Hydroxide (OH)	mg/L	-	ND (0.50)
Turbidity	NTU	-	>4000
Hardness (as CaCO ₃)	mg/L	-	27.1
Nutrients			
Ammonia	mg/L	-	0.05
Dissolved Nitrate (N)	mg/L	-	ND (0.020)
Dissolved Nitrite (N)	mg/L	-	0.0178
Total Phosphorus	mg/L	-	1.8
Nitrate plus Nitrite (N)	mg/L	-	-
Total Nitrogen (N)	mg/L	-	-
Total Kjeldahl Nitrogen	mg/L	-	0.981
Anions			
Chloride	mg/L	-	2
Sulfate	mg/L	-	4.35
Dissolved Metals			
Aluminum	mg/L	-	ND (0.0030)
Antimony	mg/L	-	ND (0.00050)
Arsenic	mg/L	-	0.00039
Barium	mg/L	-	0.0055
Beryllium	mg/L	-	ND (0.00010)
Bismuth	mg/L	-	ND (0.0010)
Boron	mg/L	-	ND (0.050)
Cadmium	mg/L	-	0.000013
Calcium	mg/L	-	8.57
Chromium	mg/L	-	ND (0.0010)
Cobalt	mg/L	-	0.00075
Copper	mg/L	-	0.00029
Iron	mg/L	-	ND (0.0050)
Lead	mg/L	-	ND (0.00020)
Lithium	mg/L	-	ND (0.0050)
Magnesium	mg/L	-	1.37
Manganese	mg/L	-	0.189
Mercury	mg/L	-	ND (0.000010)
Molybdenum	mg/L	-	ND (0.0010)
Nickel	mg/L	-	0.0019
Potassium	mg/L	-	0.621
Selenium	mg/L	-	ND (0.00010)
Silicon	mg/L	-	8.71
Silver	mg/L	-	ND (0.000020)
Sodium	mg/L	-	5.79
Strontium	mg/L	-	0.0565
Sulfur	mg/L	-	ND (3.0)
Thallium	mg/L	-	ND (0.000050)
Tin	mg/L	-	ND (0.0050)
Titanium	mg/L	-	ND (0.0050)
Uranium	mg/L	-	ND (0.00010)
Vanadium	mg/L	-	ND (0.0050)
Zinc	mg/L	-	ND (0.0050)
Zirconium	mg/L	-	ND (0.00050)
Volatile Organic Compounds			
1,1,1,2-tetrachloroethane	mg/L	-	ND
1,1,1-trichloroethane	mg/L	-	ND
1,1,2,2-tetrachloroethane	mg/L	-	ND
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	-	ND
1,1,2-trichloroethane	mg/L	-	ND
1,1-dichloroethane	mg/L	-	ND
1,1-dichloroethene	mg/L	-	ND
1,2,3-trichlorobenzene	mg/L	-	-
1,2,4-trichlorobenzene	mg/L	-	-
1,2-dibromoethane	mg/L	-	-
1,2-dichlorobenzene	mg/L	-	ND
1,2-dichloroethane	mg/L	-	ND
1,2-dichloropropane	mg/L	-	ND
1,3,5-trimethylbenzene	mg/L	-	
1,3-Butadiene	mg/L	-	ND
1,3-dichlorobenzene	mg/L	-	ND
1,3-dichloropropane	mg/L	-	-
1,4-dichlorobenzene	mg/L	-	ND
Benzene	mg/L	-	ND
Bromobenzene	mg/L	-	ND
Bromodichloromethane	mg/L	-	ND
Bromoform	mg/L	-	ND
Bromomethane	mg/L	-	ND
Carbon tetrachloride	mg/L	-	ND
Chlorobenzene	mg/L	-	ND
Chlorodibromomethane	mg/L	-	ND
Chloroethane	mg/L	-	ND
Chloroform	mg/L	-	ND
Chloromethane	mg/L	-	ND
cis-1,2-dichloroethene	mg/L	-	ND
cis-1,3-dichloropropene	mg/L	-	ND
Dibromomethane	mg/L	-	ND
Dichlorodifluoromethane	mg/L	-	ND
Dichloromethane	mg/L	-	ND
Ethylbenzene	mg/L	-	ND
Hexachlorobutadiene	mg/L	-	-
Isopropylbenzene	mg/L	-	-
m & p-Xylene	mg/L	-	ND
Methyl-tert-butylether (MTBE)	mg/L	-	ND
o-Xylene	mg/L	-	ND
Styrene	mg/L	-	ND
Tetrachloroethene	mg/L	-	ND
Toluene	mg/L	-	ND
trans-1,2-dichloroethene	mg/L	-	ND
trans-1,3-dichloropropene	mg/L	-	ND
Trichloroethene	mg/L	-	ND
Trichlorofluoromethane	mg/L	-	ND
VH C6-C10	mg/L	-	ND
Vinyl chloride	mg/L	-	ND
VPH (VHW6 to 10 - BTEX)	mg/L	-	ND
Xylenes (Total)	mg/L	-	ND
Notes:			
- No data available			

Table E13 Historic Groundwater Quality Results - Site MW17-01

Sample Date:	Units	Mar-18
Parameters:		
General		
Chemical Oxygen Demand (COD)	mg/L	115
Dissolved Organic Carbon	mg/L	6.56
Conductivity, Electrical	µS/cm	1000
pH	s.u.	7.61
Alkalinity (Total as CaCO3)	mg/L	470
Alkalinity (PP as CaCO3)	mg/L	ND (1.0)
Bicarbonate (HCO ₃)	mg/L	573
Carbonate (as CaCO ₃)	mg/L	ND (1.0)
Hydroxide (OH)	mg/L	ND (1.0)
Turbidity	NTU	2450
Hardness (as CaCO ₃)	mg/L	177
Nutrients		
Ammonia	mg/L	49.0
Dissolved Nitrate (N)	mg/L	ND (0.050)
Dissolved Nitrite (N)	mg/L	ND (0.050)
Total Phosphorus	mg/L	1.790
Nitrate plus Nitrite (N)	mg/L	ND (0.020)
Total Nitrogen (N)	mg/L	43.7
Total Kjeldahl Nitrogen	mg/L	43.7
Anions		
Chloride	mg/L	14
Sulfate	mg/L	29.9
Dissolved Metals		
Aluminum	mg/L	ND (0.0030)
Antimony	mg/L	ND (0.00050)
Arsenic	mg/L	0.00177
Barium	mg/L	0.161
Beryllium	mg/L	ND (0.00010)
Bismuth	mg/L	ND (0.0010)
Boron	mg/L	ND (0.050)
Cadmium	mg/L	ND (0.000010)
Calcium	mg/L	59.6
Chromium	mg/L	ND (0.0010)
Cobalt	mg/L	0.00313
Copper	mg/L	ND (0.00020)
Iron	mg/L	7.72
Lead	mg/L	ND (0.00020)
Lithium	mg/L	0.0050
Magnesium	mg/L	6.97
Manganese	mg/L	5.24
Mercury	mg/L	ND (0.0000020)
Molybdenum	mg/L	0.0011
Nickel	mg/L	0.0058
Potassium	mg/L	10.7
Selenium	mg/L	0.00012
Silicon	mg/L	12.10
Silver	mg/L	ND (0.000020)
Sodium	mg/L	64.0
Strontium	mg/L	0.993
Sulfur	mg/L	9.5
Thallium	mg/L	ND (0.000010)
Tin	mg/L	ND (0.0050)
Titanium	mg/L	ND (0.0050)
Uranium	mg/L	0.00117
Vanadium	mg/L	ND (0.0050)
Zinc	mg/L	ND (0.0050)
Zirconium	mg/L	ND (0.00010)
Volatile Organic Compounds		
1,1,1,2-tetrachloroethane	mg/L	ND (0.00050)
1,1,1-trichloroethane	mg/L	ND (0.00050)
1,1,2,2-tetrachloroethane	mg/L	ND (0.00050)
1,1,2Trichloro-1,2,2Trifluoroethane	mg/L	ND (0.0020)
1,1,2-trichloroethane	mg/L	ND (0.00050)
1,1-dichloroethane	mg/L	ND (0.00050)
1,1-dichloroethene	mg/L	ND (0.00050)
1,2,3-trichlorobenzene	mg/L	ND (0.0020)
1,2,4-trichlorobenzene	mg/L	ND (0.0020)
1,2-dibromoethane	mg/L	ND (0.00020)
1,2-dichlorobenzene	mg/L	ND (0.00050)
1,2-dichloroethane	mg/L	ND (0.00050)
1,2-dichloropropane	mg/L	ND (0.00050)
1,3,5-trimethylbenzene	mg/L	ND (0.0020)
1,3-dichlorobenzene	mg/L	ND (0.00050)
1,3-dichloropropane	mg/L	ND (0.0010)
1,4-dichlorobenzene	mg/L	ND (0.00050)
Benzene	mg/L	0.00081
Bromobenzene	mg/L	ND (0.0020)
Bromodichloromethane	mg/L	ND (0.0010)
Bromoform	mg/L	ND (0.0010)
Bromomethane	mg/L	ND (0.0010)
Carbon tetrachloride	mg/L	ND (0.00050)
Chlorobenzene	mg/L	ND (0.00050)
Chlorodibromomethane	mg/L	ND (0.0010)
Chloroethane	mg/L	ND (0.0010)
Chloroform	mg/L	ND (0.0010)
Chloromethane	mg/L	ND (0.0010)
cis-1,2-dichloroethene	mg/L	ND (0.0010)
cis-1,3-dichloropropene	mg/L	ND (0.0010)
Dichlorodifluoromethane	mg/L	ND (0.0020)
Dichloromethane	mg/L	ND (0.0020)
Ethylbenzene	mg/L	ND (0.00040)
Hexachlorobutadiene	mg/L	ND (0.00050)
Isopropylbenzene	mg/L	ND (0.0020)
m & p-Xylene	mg/L	ND (0.00040)
Methyl-tert-butylether (MTBE)	mg/L	ND (0.0040)
o-Xylene	mg/L	ND (0.00040)
Styrene	mg/L	ND (0.00050)
Tetrachloroethene	mg/L	ND (0.00050)
Toluene	mg/L	ND (0.00040)
trans-1,2-dichloroethene	mg/L	ND (0.0010)
trans-1,3-dichloropropene	mg/L	ND (0.0010)
Trichloroethene	mg/L	ND (0.00050)
Trichlorofluoromethane	mg/L	ND (0.0040)
VH C6-C10	mg/L	ND (0.30)
Vinyl chloride	mg/L	ND (0.00050)
VPH (VHW6 to 10 - BTEX)	mg/L	ND (0.30)
Xylenes (Total)	mg/L	ND (0.00040)
Notes:		
- No data available		



Table E14 Historic Surface Water Quality Results - Site A Upper Chapman Creek

Sample Date:	Units	Apr-16	Jul-16	Sep-16	Dec-16	Apr-17	Jun-17	Nov-17	Dec-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Apr-19	Apr-19	Nov-19	Dec-19
																Duplicate		
Parameters:									Duplicate									
General																		
Chemical Oxygen Demand (COD)	mg/L	11	12	17	35	17	11	16	17	17	ND (10)	ND (10)	11	24	23	ND (20)	11	10
Dissolved Organic Carbon	mg/L	3.47	1.82	4.65	2.34	4.99	3.6	5.13	4.96	4.82	3.10	2.76	2.08	5.4	6.31	6.24	4.3	3.9
Conductivity, Electrical	µS/cm	24.1	23.1	23.6	21.4	11	10.1	13.8	17.9	17.5	18.5	12.8	21.1	10.8	10.4	10.6	21	19
pH	s.u.	5.00	7.37	7.25	7.13	6.75	6.89	6.45	6.62	6.59	7.09	6.83	7.03	6.46	5.99	5.88	6.9	6.49
Hardness (as CaCO ₃)	mg/L	4.59	9.20	9.37	8.29	4.58	5.1	4.53	6.47	5.66	7.05	4.89	7.98	3.73	4.85	4.71	8	7
Alkalinity (Total as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity (PP as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicarbonate (HCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nutrients																		
Ammonia	mg/L	0.0309	0.012	0.019	0.040	0.047	0.022	0.027	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	0.021	ND (0.020)	ND (0.025)	ND (0.01)
Dissolved Nitrate (N)	mg/L	ND (0.020)	0.042	0.029	0.070	0.027	ND (0.020)	0.104	0.054	0.05	0.041	ND (0.020)	0.048	0.030	0.014	0.012	0.04	0.02
Dissolved Nitrite (N)	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.010)	ND (0.010)	ND (0.01)	ND (0.01)
Nitrate plus Nitrite (N)	mg/L	ND (0.020)	0.042	0.029	0.070	ND (0.020)	0.104	0.054	0.05	0.05	0.041	ND (0.020)	0.048	0.030	-	-	0.04	0.02
Total Nitrogen (N)	mg/L	0.082	0.144	0.116	0.193	0.1	0.404	0.186	0.169	0.169	0.237	0.147	0.182	0.243	-	-	0.14	0.2
Total Kjeldahl Nitrogen	mg/L	0.082	0.102	0.087	0.124	-	-	-	-	-	-	-	0.135	0.213	0.157	0.195	0.1	0.17
Anions																		
Chloride	mg/L	0.66	0.60	1.1	0.66	0.78	0.7	1.6	ND (1.0)	1.5	ND (1.0)	ND (1.0)	1.7	ND (1.0)	0.23	0.23	0.55	0.6
Sulfate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																		
Aluminum	mg/L	0.191	0.0629	0.139	0.126	0.35	0.187	0.311	0.213	0.191	0.145	0.135	0.126	0.275	0.385	0.332	0.143	0.143
Antimony	mg/L	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00020)	ND (0.00020)	0.00008	0.00005
Arsenic	mg/L	0.00011	0.0001	0.00016	ND (0.00010)	0.00018	ND (0.00010)	0.00012	0.00014	0.00012	ND (0.00010)	0.0001	0.00014	ND (0.00010)	ND (0.00050)	ND (0.00050)	0.0001	0.0001
Barium	mg/L	0.0018	0.0038	0.0034	0.0034	0.003	0.002	0.0041	0.0034	0.003	0.0029	0.0020	0.0032	0.0030	ND (0.0050)	ND (0.0050)	0.0028	0.0025
Beryllium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00010)	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	0.0108	0.006	ND (0.002)	ND (0.002)
Cadmium	mg/L	0.000039	0.000031	0.000047	0.000031	0.00003	0.000094	0.000079	0.00139	0.000606	0.000208	0.000074	0.000039	0.00012	0.000054	0.00003	0.00006	ND (0.00001)
Calcium	mg/L	1.60	3.11	3.13	2.67	1.5	1.79	1.45	2.11	1.89	2.32	1.69	2.69	1.23	1.62	1.6	2.7	2.4
Chromium	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.0013	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00050)	ND (0.00050)	0.00006	0.00007
Cobalt	mg/L	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00010)	ND (0.00010)	0.00002	0.00004
Copper	mg/L	ND (0.00050)	0.00065	ND (0.00050)	ND (0.00050)	0.00081	0.00051	0.00052	0.00136	0.00079	0.00065	0.00064	0.00107	0.00075	0.00054	0.00059	ND (0.0005)	ND (0.0005)
Iron	mg/L	0.056	0.049	0.081	0.08	0.151	0.063	0.143	0.081	0.066	0.055	0.056	0.069	0.102	0.195	0.152	0.047	0.046
Lead	mg/L	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	0.00024	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	0.00005	0.00004
Lithium	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	0.00022	0.00018	ND (0.0005)	ND (0.0005)
Magnesium	mg/L	0.146	0.347	0.377	0.391	0.207	0.153	0.221	0.29	0.232	0.308	0.161	0.306	0.161	0.192	0.174	0.42	0.25
Manganese	mg/L	0.0013	0.0012	0.0017	0.0043	0.0057	0.002	0.0073	0.003	0.003	0.0013	0.0027	0.0021	0.0043	0.00844	0.00672	0.002	0.003
Mercury	mg/L	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.0000020)	ND (0.0000020)	ND (0.0000020)	0.0000026	ND (0.000010)	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.0011	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00010)	0.00009	0.0001
Nickel	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00040)	ND (0.00040)	0.0002	0.0002
Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.050)	ND (0.050)	-	-
Potassium	mg/L	0.072	0.131	0.157	0.168	0.255	0.065	0.151	0.475	0.387	0.128	0.101	0.146	0.085	ND (0.10)	ND (0.10)	0.35	0.1
Selenium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00050)	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	1.27	2.42	3.29	3.07	1.29	1.4	1.87	2.56	2.45	2.640	1.080	2.380	1.390	1.6	1.5	2.2	2.4
Silver	mg/L	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000050)	ND (0.000050)	ND (0.00001)	ND (0.00001)
Sodium	mg/L	0.467	0.896	1.13	1.09	2.49	0.426	0.727	1.01	0.773	0.992	0.457	0.895	0.576	0.53	0.51	1.9	0.9
Strontium	mg/L	0.0051	0.0118	0.0122	0.0119	0.0066	0.0051	0.008	0.0093	0.0097	0.0103	0.0057	0.0101	0.0062	0.0062	0.0059	0.0096	0.0091
Sulfur	mg/L	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	0.48	0.42
Tellurium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.00050)	ND (0.00050)	-	-
Thallium	mg/L	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.00005)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.00001)	ND (0.00001)
Thorium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.00010)	ND (0.00010)	0.00005
Tin	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.00020)	ND (0.00020)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0054	ND (0.0050)	0.0009	0.0004
Tungsten	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0010)	ND (0.0010)	-	-
Uranium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	0.000054	0.000048	0.00006	0.00005
Vanadium	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0014	0.0011	0.0002	0.0002
Zinc	mg/L	ND (0.0050)	0.0051	ND (0.0050)	ND (0.0050)	0.0071	ND (0.0050)	ND (0.0050)	0.0074	0.0058	0.0061	ND (0.0050)	0.0077	ND (0.0050)	0.0041	ND (0.0040)	0.0047	0.0015
Zirconium	mg/L	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.0001)	ND (0.0001)
Notes:																		
-	No data available																	

Table E15 Historic Surface Water Quality Results - Site B Lower Chapman Creek

Sample Date:		Jun-00	Dec-00	Jul-01	Dec-01	Dec-01	Jun-02	Oct-02	Mar-03	Sep-03	Sep-03	Mar-04	Mar-04	Dec-04	Dec-04	Mar-05	Feb-06	May-06	Sep-06	Nov-06	Apr-07	Sep-07	Nov-07	Jul-08	Dec-08	Dec-08	Jul-09	Nov-09
	Units					Duplicate					Duplicate		Duplicate		Duplicate											Duplicate		
Parameters:																												
General																												
Chemical Oxygen Demand (COD)	mg/L	27	15	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	12	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	19	ND (10)	31	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	42	42	11	ND (10)
Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity, Electrical	µS/cm	8	24	16	18	34	12	31	16	29	25	18	19	19	18	19	17	9	33	16	30	15	19	18	16	32	19	
pH	s.u.	6.6	7	7	6.8	6.8	6.9	7.2	6.9	7.5	7.3	7	6.9	6.9	6.8	6.7	6.8	6.5	6.7	7.2	7	7.3	6.8	7	6.8	6.8	7.6	7
Hardness (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity (Total as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity (PP as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicarbonate (HCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nutrients																												
Ammonia	mg/L	0.01	0.005	0.008	0.005	ND (0.005)	0.01	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.014	0.013	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.057	0.017	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.05	0.02	0.035	0.021
Dissolved Nitrate (N)	mg/L	ND (0.02)	0.06	0.03	0.1	0.34	ND (0.02)	0.05	0.04	0.04	0.03	0.05	0.05	0.05	0.05	ND (0.02)	0.02	0.02	ND (0.02)	-	0.02	0.09	0.05	0.04	0.12	0.12	0.07	0.04
Dissolved Nitrite (N)	mg/L	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	-	ND (0.005)	ND (0.005)	ND (0.005)	-	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	0.07	0.04
Nitrate plus Nitrite (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Nitrogen (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anions																												
Chloride	mg/L	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	1.8	0.7	0.9	0.9	0.6	0.6	0.6	1.1	0.7	0.6	ND (1.0)	0.7	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	0.9	1	0.6	0.8	1.3	0.9
Sulfate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total 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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.059	0.058	0.026	0.055
Lithium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphorus	mg/L	-	-	0.1	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tellurium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thorium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tungsten	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes																												

Table E15 Historic Surface Water Quality Results - Site B Lower Chapman Creek

Sample Date:		Aug-10	Dec-10	Jul-11	Jul-11	Dec-11	Jul-12	Jul-12	Dec-12	Dec-12	Mar-13	Mar-13	Jun-13	Sep-13	Sep-13	Dec-13	Dec-13	Apr-14	Apr-14	Jun-14	Jun-14	Sep-13	Sep-14	Dec-14	Mar-15	Jul-15	Jul-15	Oct-15
	Units				Duplicate			Duplicate		Duplicate		Duplicate			Duplicate		Duplicate		Duplicate		Duplicate		Duplicate				Duplicate	
Parameters:																												
General																												
Chemical Oxygen Demand (COD)	mg/L	ND (10)	21	ND (10)	ND (10)	25	ND (10)	ND (10)	14	37	ND (10)	11	13	12	ND (10)	ND (10)	ND (10)	12	10	ND (10)	12	ND (10)	ND (10)	20	18	ND (10)	ND (10)	17
Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	2.62	1.91	1.53	-	-	5.34	5.57	2.47	2.27	4	2.1	4.98	4.82	1.77	0.7	1.7
Conductivity, Electrical	µS/cm	32	11	12	11	60	27.2	26.4	12	12.2	22	21.6	12.1	45.2	47.6	29.9	29.3	14.2	14.3	17.9	17.9	45.7	45.9	11.3	55.3	44.2	44.6	80.4
pH	s.u.	7.3	6	7	6.7	7.4	7.4	7.31	6.65	6.65	6.94	7.1	6.9	7.36	7.51	7.27	7.24	6.91	6.85	7.21	7.31	7.57	7.51	6.64	7.46	7.31	7.54	7.69
Hardness (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	4.46	4.45	-	-	4.42	17	17.5	17.5	10.5	5.49	5.33	17	7.08	6.84	17.7	17.8	4.7	13.6	16.6	34.5
Alkalinity (Total as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity (PP as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicarbonate (HCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nutrients																												
Ammonia	mg/L	ND (0.005)	0.005	0.009	0.01	ND (0.005)	0.007	0.006	0.0096	0.012	0.019	0.026	0.044	0.0076	0.016	0.016	0.0052	0.013	0.014	0.013	0.019	0.015	0.014	0.17	0.04	0.0061	0.0076	0.012
Dissolved Nitrate (N)	mg/L	0.05	ND (0.02)	ND (0.02)	ND (0.02)	0.05	0.08	0.07	0.05	0.054	0.081	0.082	ND (0.020)	0.132	0.131	0.182	0.179	0.041	0.041	ND (0.020)	ND (0.020)	0.063	0.063	0.028	0.285	0.077	0.084	0.173
Dissolved Nitrite (N)	mg/L	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)
Nitrate plus Nitrite (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.285	0.077	0.084	0.173
Total Nitrogen (N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.869	0.249	0.2	0.323
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	0.12	0.144	0.134	-	-	0.083	0.089	0.066	0.074	0.18	0.158	0.353	0.584	0.172	0.116	0.151
Anions																												
Chloride	mg/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	0.8	0.77	0.89	0.8	0.75	1.2	1.3	ND (0.50)	1.6	1.3	1.1	1	0.72	0.73	ND (0.50)	1.2	1.3	1.3	0.81	3.1	0.87	1	6.9
Sulfate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																												
Aluminum	mg/L	-	-	-	-	-	-	-	0.211	0.217	-	-	0.169	0.0369	0.0346	0.129	0.126	0.201	0.203	0.0882	0.0898	0.0247	0.026	0.303	0.323	0.0357	0.0377	0.609
Antimony	mg/L	-	-	-	-	-	-	-	ND (0.0005)	ND (0.0005)	-	-	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)
Arsenic	mg/L	-	-	-	-	-	-	-	ND (0.0005)	ND (0.0005)	-	-	ND (0.00010)	0.00015	0.00014	0.00012	0.00013	0.00012	0.00014	0.00012	0.00013	0.00012	0.00013	0.00014	0.00014	0.00013	0.00013	0.00022
Barium	mg/L	-	-	-	-	-	-	-	0.0025	0.0025	-	-	0.0025	0.0053	0.0072	0.0026	0.0026	0.0026	0.0026	0.0025	0.0024	0.0049	0.005	0.0028	0.0062	0.0048	0.0046	0.0108
Beryllium	mg/L	-	-	-	-	-	-	-	ND (0.0001)	ND (0.0001)	-	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)
Bismuth	mg/L	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)
Boron	mg/L	-	-	-	-	-	-	-	ND (0.05)	ND (0.05)	-	-	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)
Cadmium	mg/L	-	-	-	-	-	-	-	0.000078	0.000073	-	-	0.000015	ND (0.000010)	ND (0.000010)	0.000044	0.000054	ND (0.000010)	0.00001	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	0.00036	0.000512	ND (0.00001)	ND (0.00001)	0.000092
Calcium	mg/L	-	-	-	-	-	-	-	1.45	1.45	-	-	1.51	5.52	5.69	3.59	3.4	1.8	1.76	2.35	2.27	5.62	5.69	1.55	4.11	5.35	5.46	10.1
Chromium	mg/L	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)
Cobalt	mg/L	-	-	-	-	-	-	-	ND (0.0005)	ND (0.0005)	-	-	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)
Copper	mg/L	-	-	-	-	-	-	-	0.00045	0.00034	-	-	0.00034	0.00028	0.00023	0.00056	0.00033	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	0.00089	0.00335	ND (0.00050)	ND (0.00050)	0.00181
Iron	mg/L	0.027	0.071	0.04	0.044	0.027	0.0556	0.0544	0.0584	0.0637	0.0627	0.0632	0.063	0.0896	0.0921	0.104	0.0969	0.083	0.083	0.052	0.048	0.081	0.078	0.115	0.392	0.093	0.082	0.716
Lead	mg/L	-	-	-	-	-	-	-	ND (0.0002)	ND (0.0002)	-	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	0.00047	ND (0.00020)	0.00033
Lithium	mg/L	-	-	-	-	-	-	-	ND (0.005)	ND (0.005)	-	-	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)
Magnesium	mg/L	-	-	-	-	-	-	-	0.204	0.204	-	-	0.155	0.786	0.803	0.529	0.487	0.243	0.23	0.295	0.282	0.89	0.86	0.202	0.802	0.785	0.771	2.27
Manganese	mg/L	-	-	-	-	-	-	-	0.0034	0.0034	-	-	0.0018	0.0022	0.0023	0.0026	0.0023	0.0012	0.0012	0.0014	0.0011	ND (0.0010)	ND (0.0010)	0.0026	0.0217	0.0079	0.0022	0.0245
Mercury	mg/L	-	-	-	-	-	-	-	ND (0.00005)	ND (0.00005)	-	-	ND (0.000050)	ND (0.000050)	ND (0.000050)	ND (0.000010)	ND (0.000010)	0.000012	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)
Molybdenum	mg/L	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)
Nickel	mg/L	-	-	-	-	-	-	-	ND (0.001)	ND (0.001)	-	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.002	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.0011	ND (0.0010)	ND (0.0010)
Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	0.099	0.103	-	-	0.061	0.323	0.323	0.2	0.175	0.079	0.09	0.119	0.112	0.34	0.34	0.067	0.698	0.352	0.374	0.645
Selenium	mg/L	-	-	-	-	-	-	-	ND (0.0001)	ND (0.0001)	-	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.0010)	ND (0.0010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)
Silicon	mg/L	-	-	-	-	-	-	-	1.97	1.98	-	-	1.15	4.66	4.87	3.91	3.67	1.87	1.84	1.76	1.68	3.96	3.96	1.68	4.85	4	4.04	10.5
Silver	mg/L	-	-	-	-	-	-	-	ND (0.00002)	ND (0.00002)	-	-	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)
Sodium	mg/L	-	-	-	-	-	-	-	0.759	0.766	-	-	0.45	2.29	2.38	1.5	1.41	0.702	0.694	0.757	0.778	2.35						



Table E16 Historic Surface Water Quality Results - Site C Irgens Creek

Sample Date:		Apr-17	Jun-17	Jun-17	Nov-17	Dec-17	Mar-18	Mar-18	Jun-18	Jun-18	Sep-18	Dec-18	Apr-19	Nov-19	Nov-19	Dec-19
				Duplicate				Duplicate		Duplicate					Duplicate	
Parameters:																
General																
Chemical Oxygen Demand (COD)	mg/L	15	ND (10)	ND (10)	29	17	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	24	ND (20)	20	20	ND (10)
Dissolved Organic Carbon	mg/L	4.3	2.67	3.04	6.27	3.41	2.60	2.31	1.37	0.84	1.18	4.9	4.1	1.7	1.8	3.8
Conductivity, Electrical	µS/cm	23.2	60.9	61.6	31.7	39.3	40.2	40.4	63.1	63.7	75.8	32.8	53.8	65	65	22
pH	s.u.	7.21	7.61	7.75	6.77	7.01	7.40	7.40	7.48	7.26	7.35	7.09	6.84	7.32	7.32	6.65
Hardness (as CaCO ₃)	mg/L	4.91	25.5	24.5	9.7	11.3	12.9	13.1	21.3	21.6	25.8	10.1	17.5	22	22	8
Alkalinity (Total as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity (PP as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicarbonate (HCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nutrients																
Ammonia	mg/L	0.028	0.023	0.011	0.024	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	0.071	ND (0.020)	ND (0.020)	0.022	0.56	ND (0.01)	0.01
Dissolved Nitrate (N)	mg/L	0.038	0.175	0.175	0.514	0.299	0.172	0.170	0.167	0.176	0.258	0.121	0.192	0.13	0.13	0.02
Dissolved Nitrite (N)	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0053	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.010)	ND (0.01)	ND (0.01)	ND (0.01)
Nitrate plus Nitrite (N)	mg/L	0.038	0.175	0.175	0.519	0.299	0.172	0.170	0.167	0.176	0.258	0.121	-	0.13	0.13	0.02
Total Nitrogen (N)	mg/L	0.235	0.244	0.296	0.962	0.378	0.243	0.233	0.376	0.262	0.326	0.305	-	0.37	0.22	0.14
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	0.068	0.185	0.168	0.22	0.08	0.07
Anions																
Chloride	mg/L	0.72	3.8	3.7	3.4	3.2	2.8	2.7	4.5	5.6	6.6	2.4	3.24	4.08	4.13	0.67
Sulfate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																
Aluminum	mg/L	0.354	0.044	0.0425	0.53	0.0845	0.0531	0.0528	0.0330	0.0329	0.0199	0.196	0.23	0.02	0.022	0.137
Antimony	mg/L	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00020)	ND (0.00002)	ND (0.00002)	0.00002
Arsenic	mg/L	0.00013	ND (0.00010)	ND (0.00010)	0.00022	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00050)	ND (0.0001)	ND (0.0001)	0.0001
Barium	mg/L	0.0031	0.0061	0.0061	0.0065	0.0036	0.0037	0.0037	0.0059	0.0059	0.0067	0.0040	0.0061	0.005	0.0049	0.0027
Beryllium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Boron	mg/L	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	0.0117	0.003	0.003	ND (0.002)
Cadmium	mg/L	0.000019	0.00003	0.000025	0.000053	0.000167	0.000013	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	0.00002	ND (0.00001)	ND (0.00001)	0.00001
Calcium	mg/L	1.58	7.89	7.52	2.93	3.49	3.86	3.93	6.28	6.48	7.56	3.10	5.27	6.6	6.8	2.6
Chromium	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00050)	0.00005	ND (0.00005)	0.00007
Cobalt	mg/L	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00010)	ND (0.00002)	ND (0.00002)	ND (0.00002)
Copper	mg/L	0.00095	0.00082	ND (0.00050)	0.00085	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	0.00051	0.00057	ND (0.0005)	ND (0.0005)	ND (0.0005)
Iron	mg/L	0.171	0.057	0.052	0.445	0.055	0.036	0.036	0.025	0.026	0.015	0.164	0.237	0.011	0.011	0.047
Lead	mg/L	ND (0.00020)	ND (0.00020)	ND (0.00020)	0.00021	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00001)	ND (0.00001)	0.00004
Lithium	mg/L	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0050)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0020)	0.00038		ND (0.0005)	ND (0.0005)
Magnesium	mg/L	0.231	1.42	1.39	0.578	0.633	0.800	0.804	1.36	1.31	1.67	0.562	1.04	1.3	1.3	0.28
Manganese	mg/L	0.0071	0.0025	0.0021	0.0272	0.0027	0.0013	0.0015	0.0011	0.0015	ND (0.0010)	0.0105	0.0104	ND (0.001)	0.002	0.002
Mercury	mg/L	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.0000020)	ND (0.0000020)	ND (0.0000020)	ND (0.0000020)	ND (0.0000020)	0.0000023	ND (0.000010)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	0.00016	0.00014	0.00014	0.00011
Nickel	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00040)	ND (0.0002)	0.0002
Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	ND (0.050)	-	-	-
Potassium	mg/L	0.085	0.559	0.559	0.488	0.278	0.335	0.344	0.648	0.618	0.707	0.314	0.59	0.54	0.53	0.12
Selenium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00050)	ND (0.0002)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	1.5	9.72	9.18	4.43	5.93	5.490	5.540	7.820	8.280	8.830	4.240	5.9	6.8	6.8	2.6
Silver	mg/L	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000050)	ND (0.00001)	0.00001	ND (0.00001)
Sodium	mg/L	0.587	4.19	4.02	1.86	2.36	2.67	2.70	3.85	3.80	4.02	2.38	3.31	3.6	3.6	1
Strontium	mg/L	0.0073	0.0372	0.0376	0.0183	0.0235	0.0222	0.0226	0.0374	0.0365	0.0434	0.0193	0.0304	0.0322	0.0338	0.01
Sulfur	mg/L	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	0.95	0.96	0.56
Tellurium	mg/L	-	-	-	-	-	-	-	-	-	-	-	ND (0.00050)	-	-	-
Thallium	mg/L	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.00005)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000020)	ND (0.00001)	ND (0.00001)	ND (0.00001)
Thorium	mg/L	-	-	-	-	-	-	-	-	-	-	-	ND (0.00010)	ND (0.00005)	ND (0.00005)	ND (0.00005)
Tin	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.00020)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Titanium	mg/L	0.005	ND (0.0050)	ND (0.0050)	0.0147	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0091	ND (0.0001)	ND (0.0001)	0.0005
Tungsten	mg/L	-	-	-	-	-	-	-	-	-	-	-	ND (0.0010)	-	-	-
Uranium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	0.00018	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	0.000082	0.00003	0.00003	0.00005
Vanadium	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0018	0.00048	0.00054	0.00042
Zinc	mg/L	ND (0.0050)	ND (0.0050)	0.0053	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0040)	0.002	0.0006	0.0061
Zirconium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Notes:																
-	No data available															



Table E17 Historic Surface Water Quality Results - Site E Irgens Creek

Sample Date:		Dec-13	Apr-14	Jun-14	Sep-14	Dec-14	Mar-15	Nov-15	Mar-16	Mar-16	Dec-16	Apr-17	Nov-17	Nov-17	Dec-17	Mar-18	Dec-18	Dec-18	Apr-19	Nov-19	Dec-19
										Duplicate				Duplicate							
Parameters:																					
General																					
Chemical Oxygen Demand (COD)	mg/L	11	ND (10)	ND (10)	ND (10)	12	14	ND (10)	ND (10)	17	10	ND (10)	15	17	13	ND (10)	12	15	ND (20)	ND (5)	ND (10)
Dissolved Organic Carbon	mg/L	-	3.91	1.36	2.18	2.72	2.35	1.35	-	2.10	1.72	2.19	4.87	4.26	1.89	2.17	3.9	3.8	2.27	1.6	2
Conductivity, Electrical	µS/cm	27.2	24.4	70.9	73.8	21.3	23.2	63.5	22.8	44.6	24.5	20.2	23.6	23.9	23.1	20.6	18.0	21.4	27.4	37	26
pH	s.u.	7.09	7.13	7.78	7.76	7.03	7.01	7.71	6.89	7.16	7.05	6.95	6.64	6.64	6.74	7.02	6.83	6.78	6.63	6.4	6.29
Hardness (as CaCO ₃)	mg/L	9.23	7.11	28.3	28.7	7.06	7.69	24.7	-	15.5	7.62	6.3	6.78	6.72	6.53	6.39	6.01	5.27	8.91	13	8
Alkalinity (Total as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity (PP as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicarbonate (HCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate (as CaCO ₃)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide (OH)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nutrients																					
Ammonia	mg/L	0.0069	0.032	0.012	0.012	0.21	0.012	0.01	0.0099	0.030	0.026	0.037	ND (0.020)	0.023	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	ND (0.020)	0.027	ND (0.01)
Dissolved Nitrate (N)	mg/L	0.292	0.085	0.104	0.106	0.118	0.139	0.125	0.100	0.264	0.236	0.1	0.358	0.373	0.18	0.062	0.053	0.061	0.091	0.11	0.07
Dissolved Nitrite (N)	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.010)	ND (0.01)	ND (0.01)
Nitrate plus Nitrite (N)	mg/L	-	-	-	-	-	0.139	0.125	0.100	0.264	0.236	0.1	0.358	0.373	0.18	0.062	0.053	0.061	-	0.11	0.07
Total Nitrogen (N)	mg/L	-	-	-	-	-	0.21	0.177	0.145	0.386	0.323	0.242	0.635	0.643	0.268	0.113	0.225	0.171	-	0.84	0.18
Total Kjeldahl Nitrogen	mg/L	-	0.062	0.068	0.129	0.087	0.071	0.052	0.046	0.122	0.087	-	-	-	-	-	0.172	0.110	0.154	0.72	0.08
Anions																					
Chloride	mg/L	1.3	0.68	1.6	1.9	1.3	0.77	1.3	0.71	2.4	1.1	1.1	2.8	2.9	1.7	1.4	ND (1.0)	1.0	0.95	1.23	1.23
Sulfate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals																					
Aluminum	mg/L	0.129	0.127	0.0383	0.0406	0.0974	0.0712	0.0216	-	0.0414	0.0612	0.0627	0.122	0.122	0.0623	0.0539	0.0944	0.0917	0.0786	0.039	0.038
Antimony	mg/L	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	-	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00020)	ND (0.00002)	0.0001
Arsenic	mg/L	ND (0.00010)	ND (0.00010)	0.00014	ND (0.00010)	0.00011	ND (0.00010)	ND (0.00010)	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00050)	ND (0.0001)	ND (0.0001)
Barium	mg/L	0.0037	0.0031	0.0045	0.0041	0.0027	0.003	0.0041	-	0.0038	0.0029	0.0025	0.0032	0.0033	0.0028	0.0025	0.0026	0.0022	ND (0.0050)	0.0041	0.003
Beryllium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00005)	ND (0.00005)
Bismuth	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00010)	ND (0.0001)	ND (0.0001)
Boron	mg/L	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	-	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	ND (0.050)	0.008	ND (0.002)	ND (0.002)
Cadmium	mg/L	0.000024	0.000018	0.000043	ND (0.000010)	0.000019	0.000088	0.000041	-	0.00003	0.000042	0.00001	0.000033	0.000021	0.0000321	0.000036	ND (0.000010)	ND (0.000010)	0.000041	ND (0.00001)	0.00012
Calcium	mg/L	2.83	2.16	8.83	8.86	2.17	2.35	7.57	-	4.78	2.32	1.97	2.12	2.09	2.01	1.95	1.80	1.63	2.71	3.8	2.4
Chromium	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00050)	ND (0.0005)	0.00007
Cobalt	mg/L	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	-	ND (0.00050)	ND (0.00050)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00010)	ND (0.0002)	0.00007
Copper	mg/L	0.0007	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	0.00166	ND (0.00050)	-	0.00051	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	ND (0.00050)	0.00076	ND (0.0005)	0.00005
Iron	mg/L	0.0536	0.058	0.053	0.052	0.028	0.036	0.031	-	0.0275	ND (0.010)	ND (0.010)	0.025	0.024	ND (0.010)	ND (0.010)	0.014	0.013	0.023	ND (0.002)	0.003
Lead	mg/L	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	0.00001	0.00006
Lithium	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	-	ND (0.0050)	ND (0.0050)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00010)	ND (0.0005)	ND (0.0005)
Magnesium	mg/L	0.526	0.414	1.5	1.58	0.4	0.444	1.41	-	0.874	0.447	0.337	0.361	0.368	0.363	0.367	0.370	0.292	0.521	0.86	0.42
Manganese	mg/L	0.0057	0.005	0.0029	0.003	0.0018	0.001	0.002	-	0.0013	0.002	0.001	0.0016	0.0017	ND (0.0010)	ND (0.0010)	0.001	0.0012	0.00251	ND (0.001)	ND (0.001)
Mercury	mg/L	ND (0.000050)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.00001)	ND (0.00001)	-	-	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.00001)	ND (0.0000020)	0.0000026	0.0000024	ND (0.000010)	ND (0.00001)	ND (0.00001)
Molybdenum	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00010)	0.00003	0.00015
Nickel	mg/L	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	-	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.0010)	ND (0.00040)	ND (0.0002)	0.0002
Total Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.050)	-	-
Potassium	mg/L	0.129	0.108	0.601	0.61	0.109	0.162	0.526	-	0.402	0.204	0.129	0.259	0.254	0.142	0.148	0.168	0.139	0.25	0.44	0.1
Selenium	mg/L	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	-	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00010)	ND (0.00050)	ND (0.0002)	ND (0.0002)
Silicon	mg/L	4.66	3.82	9.72	9.33	4.09	3.87	9.3	-	5.93	3.89	3.88	3.36	3.39	4.34	3.750	3.270	3.220	4.2	4	4
Silver	mg/L	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.00002)	ND (0.00002)	-	0.000023	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.00002)	ND (0.000020)	ND (0.000020)	ND (0.000020)	ND (0.000050)	ND (0.00001)	0.00009
Sodium	mg/L	1.68	1.46	3.67	3.76	1.5	1.57	3.51	-	3.06	1.45	1.41	1.36	1.4	1.48	1.52	0.00153	1.79	3.6	1.8	
Strontium	mg/L	0.0174	0.0129	0.042	0.0415	0.0126	0.016	0.0389	-	0.0256	0.0137	0.0119	0.0148	0.0135	0.0142	0.0115	0.0115	0.0103	0.0175	0.021	0.0145
Sulfur	mg/L	ND (0.0030)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	-	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	ND (3.0)	0.64	0.57
Tellurium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.00050)	-	-
Thallium	mg/L	ND (0.000050)	ND (0.000050)	ND (0.000050)	ND (0.000050)	ND (0.000050)	ND (0.00005)	ND (0.00005)	-	ND (0.00005)	ND (0.00005)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.00005)	ND (0.000010)	ND (0.000010)	ND (0.000010)	ND (0.000020)	ND (0.00001)	0.00006
Thorium	mg/L																		ND (0.00010)	ND (0.00005)	0.00007
Tin	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	-	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.00020)	ND (0.0001)	0.0001
Titanium	mg/L	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	-	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)	0.0003	ND (0.0001)
Tungsten	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.0010)	-	-
Uranium	mg/L	ND (0.00010																			

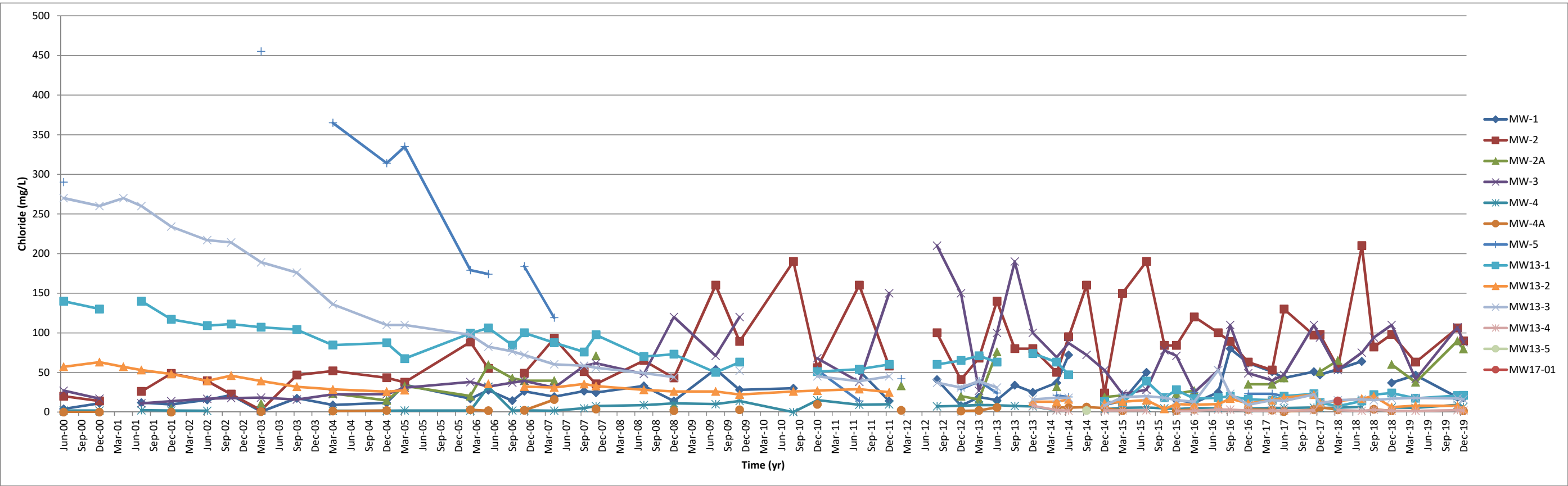


Figure E1
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

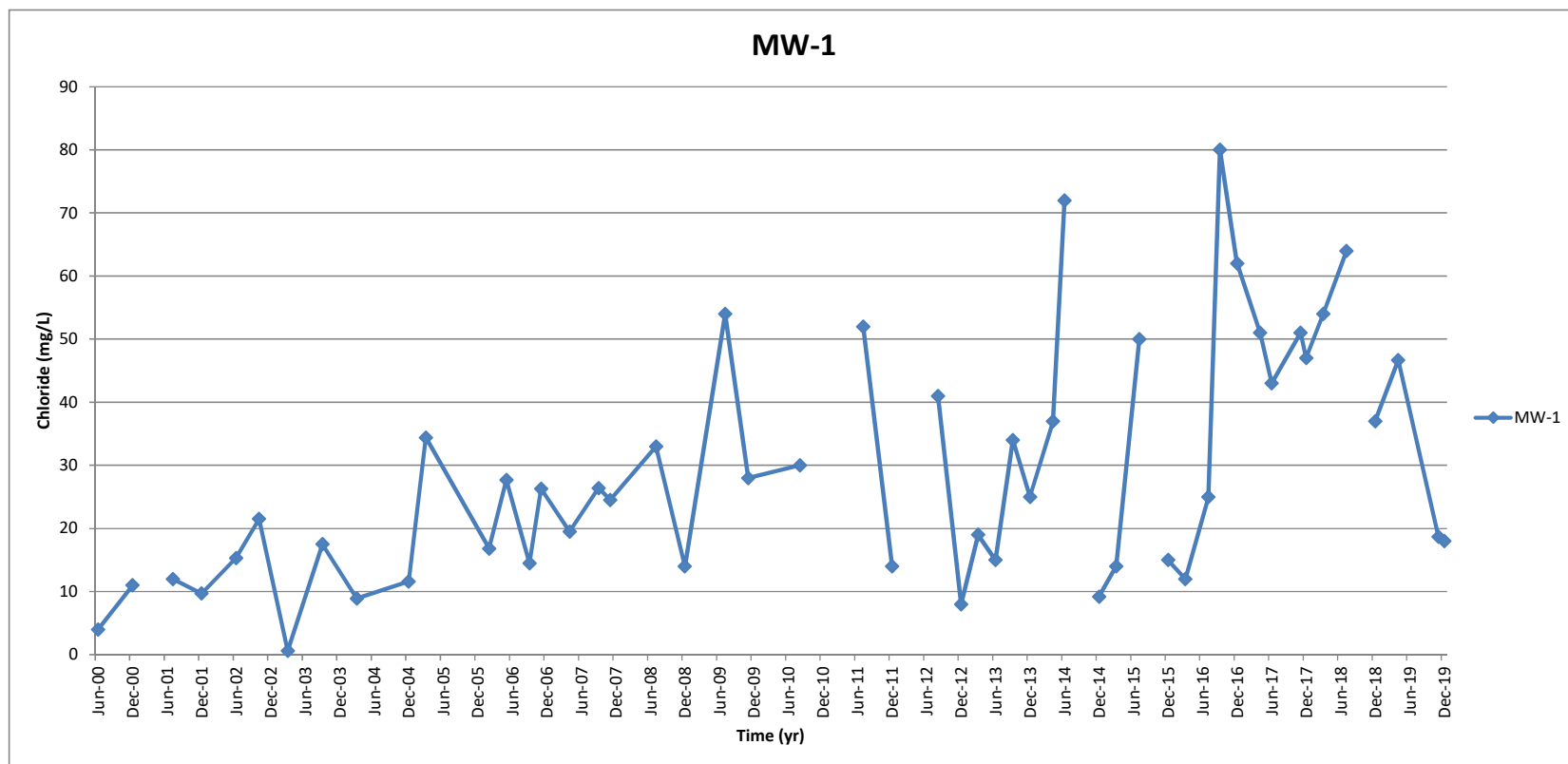


Figure E2
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

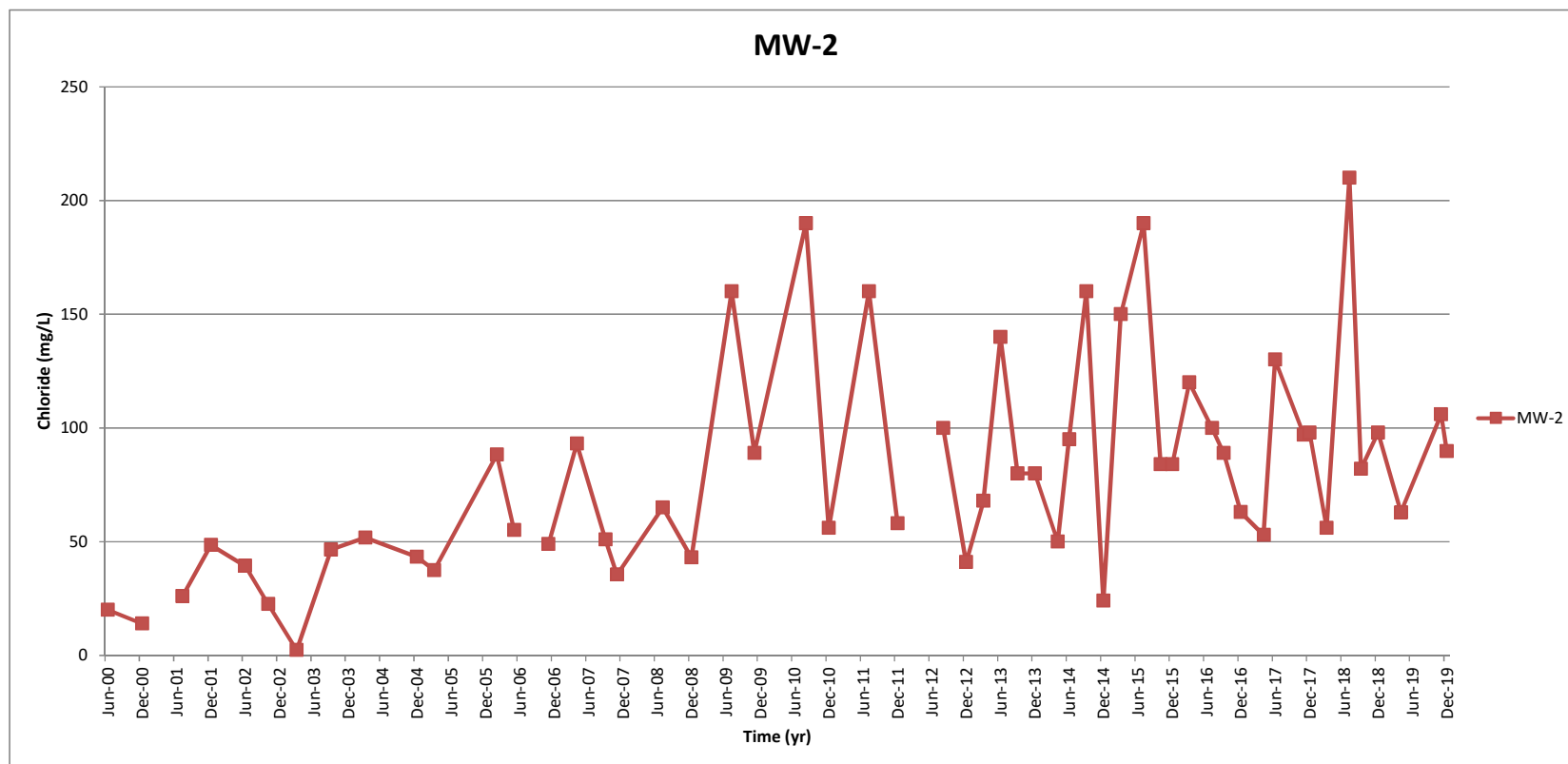


Figure E3
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

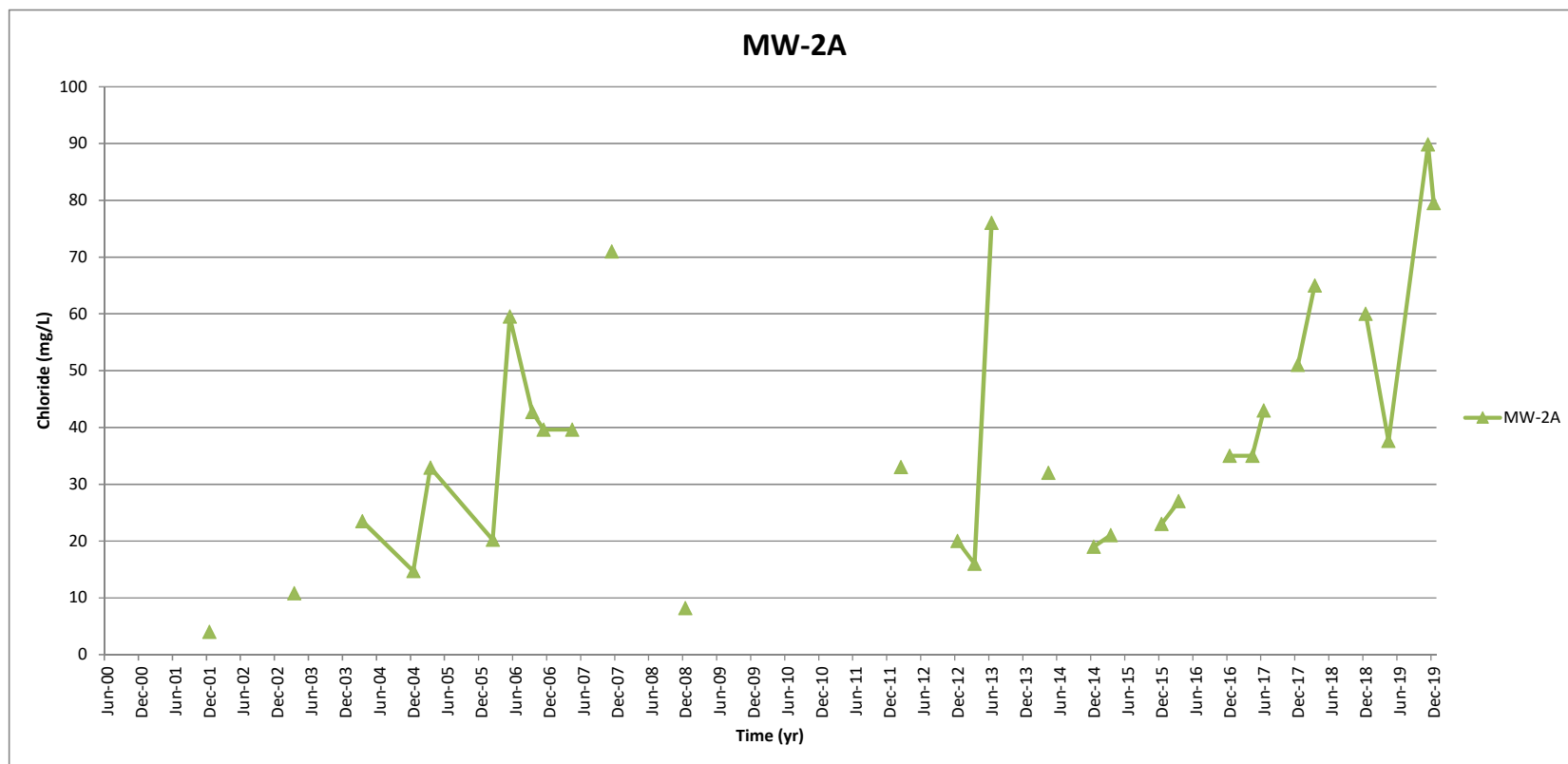


Figure E4
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

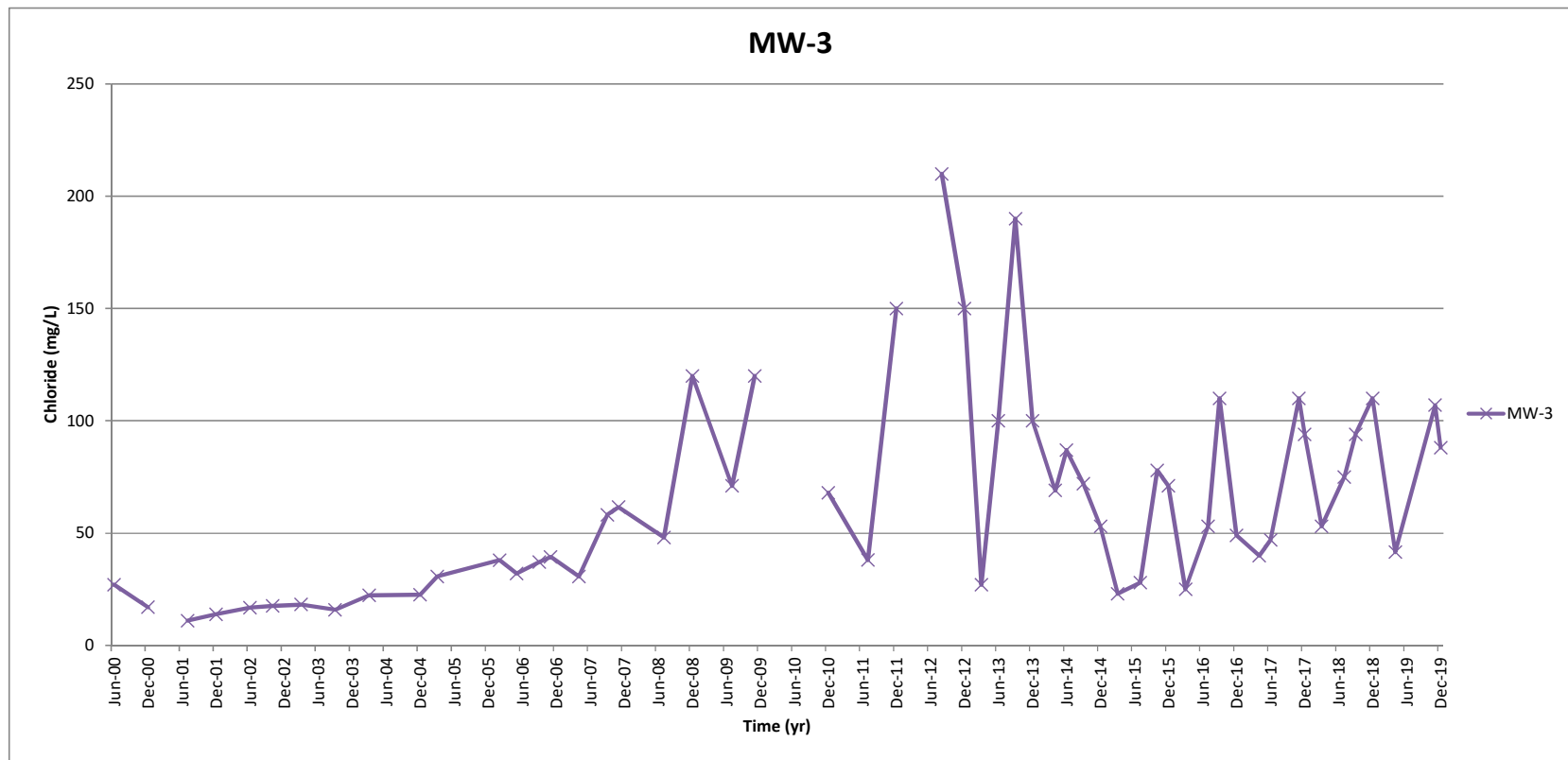


Figure E5
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

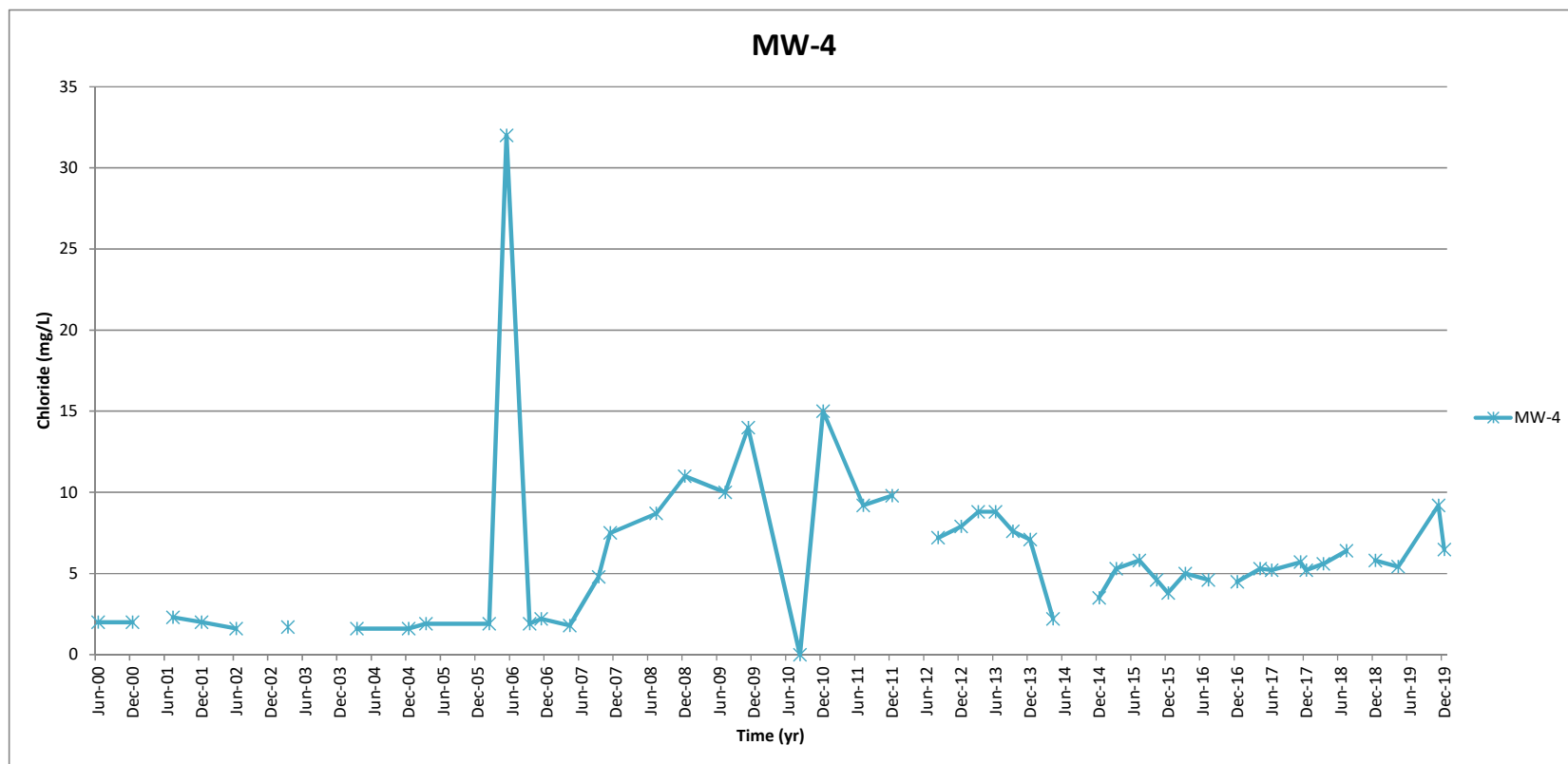


Figure E6
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

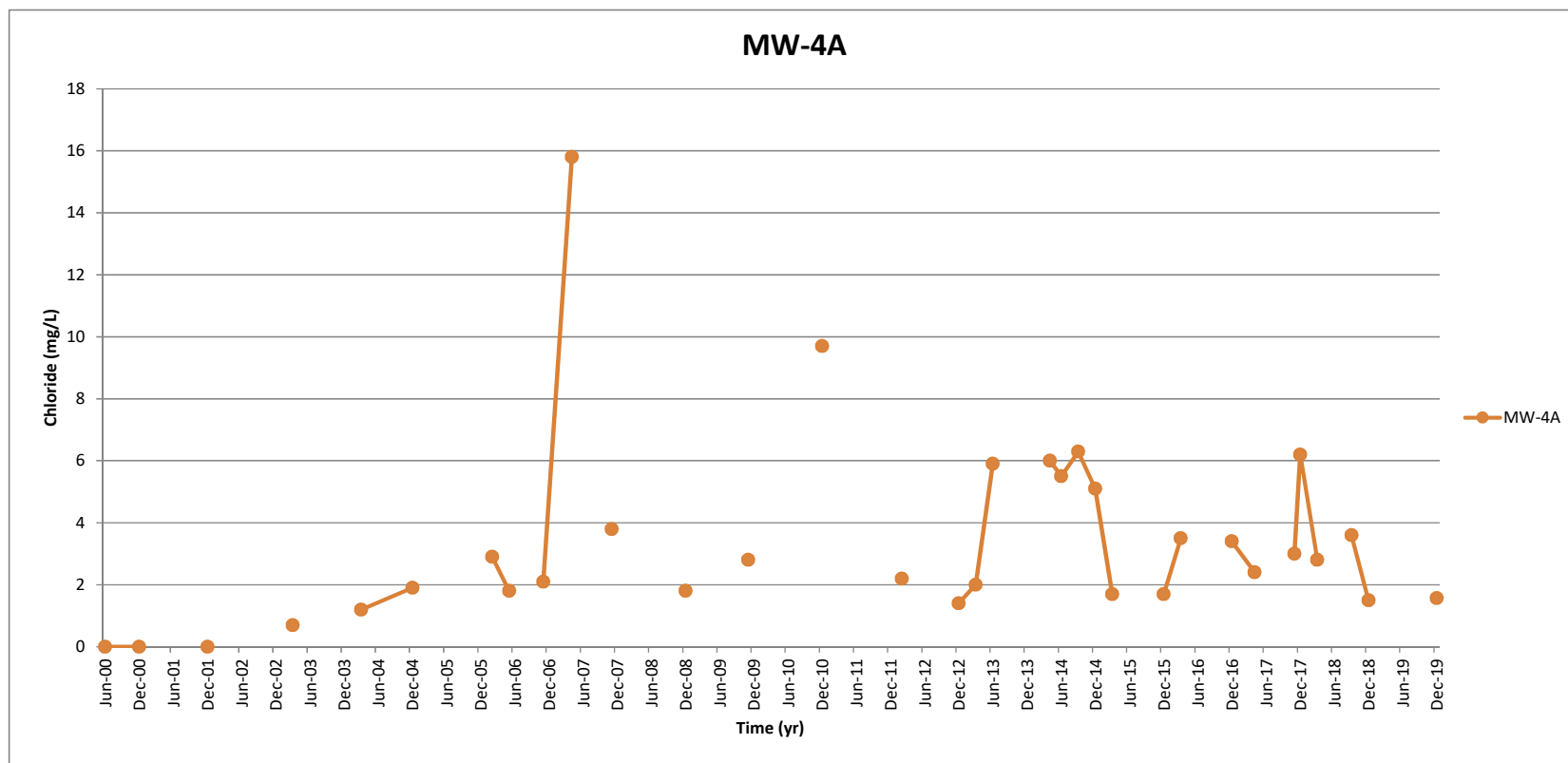


Figure E7
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

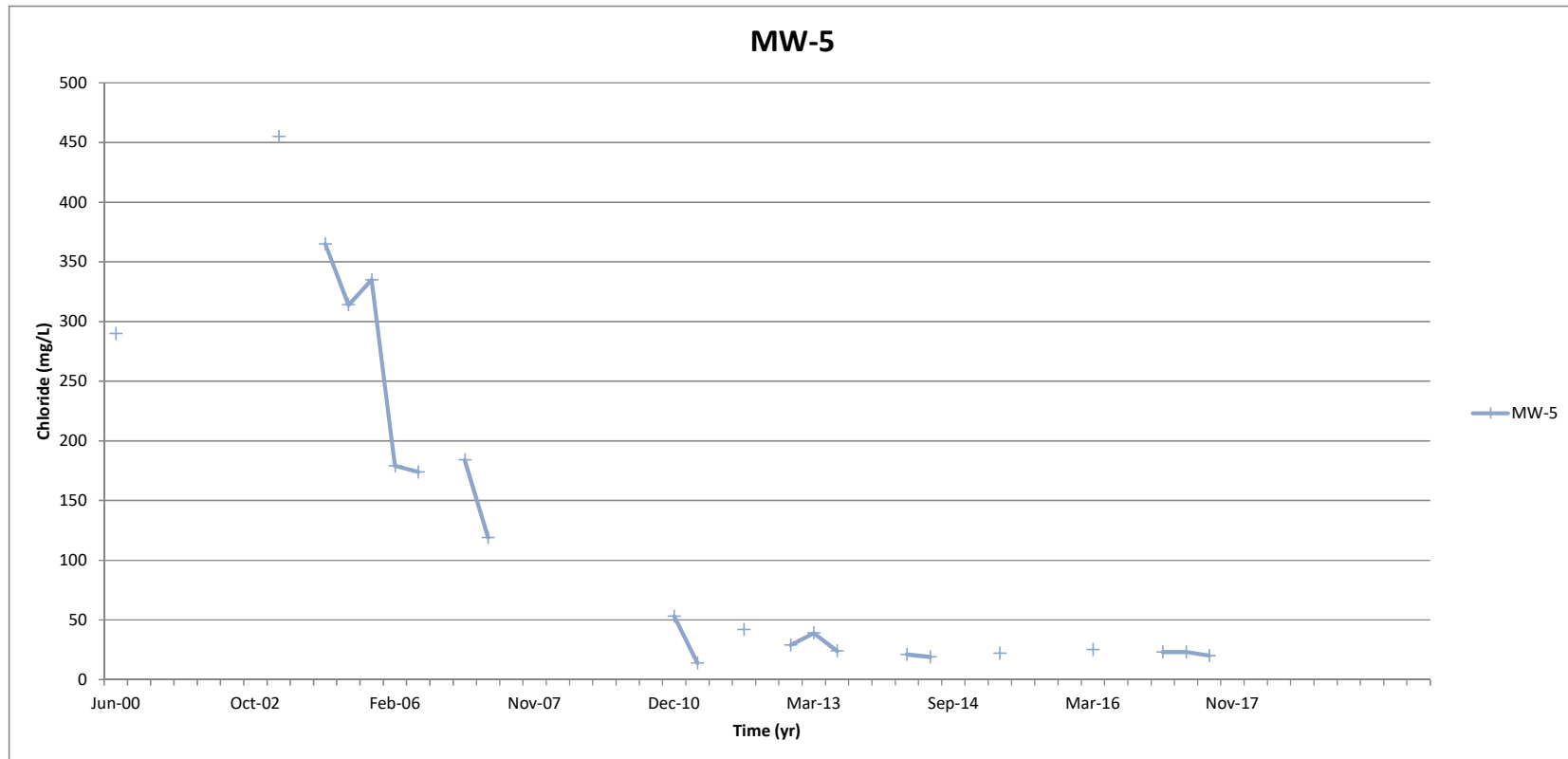


Figure E8
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

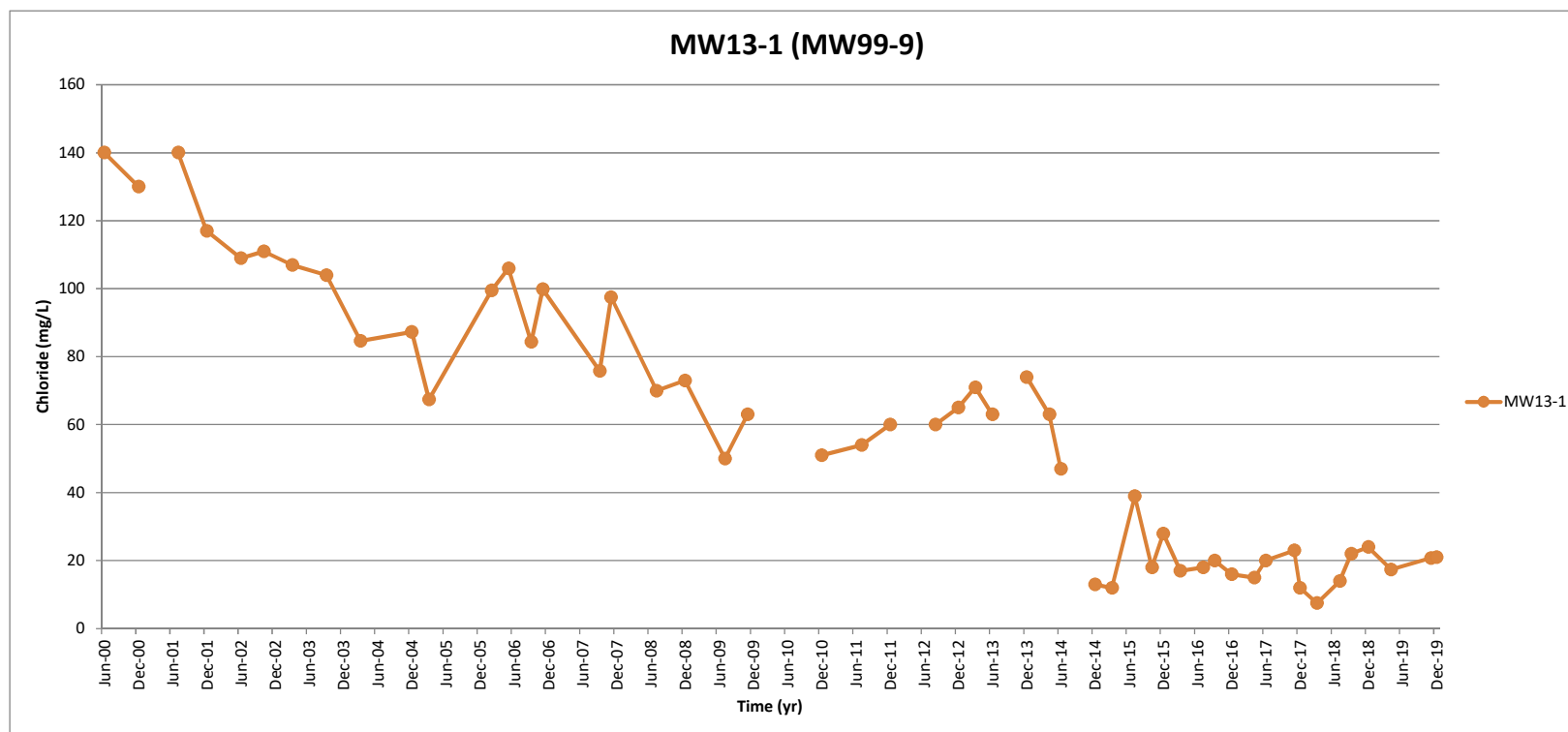


Figure E9
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

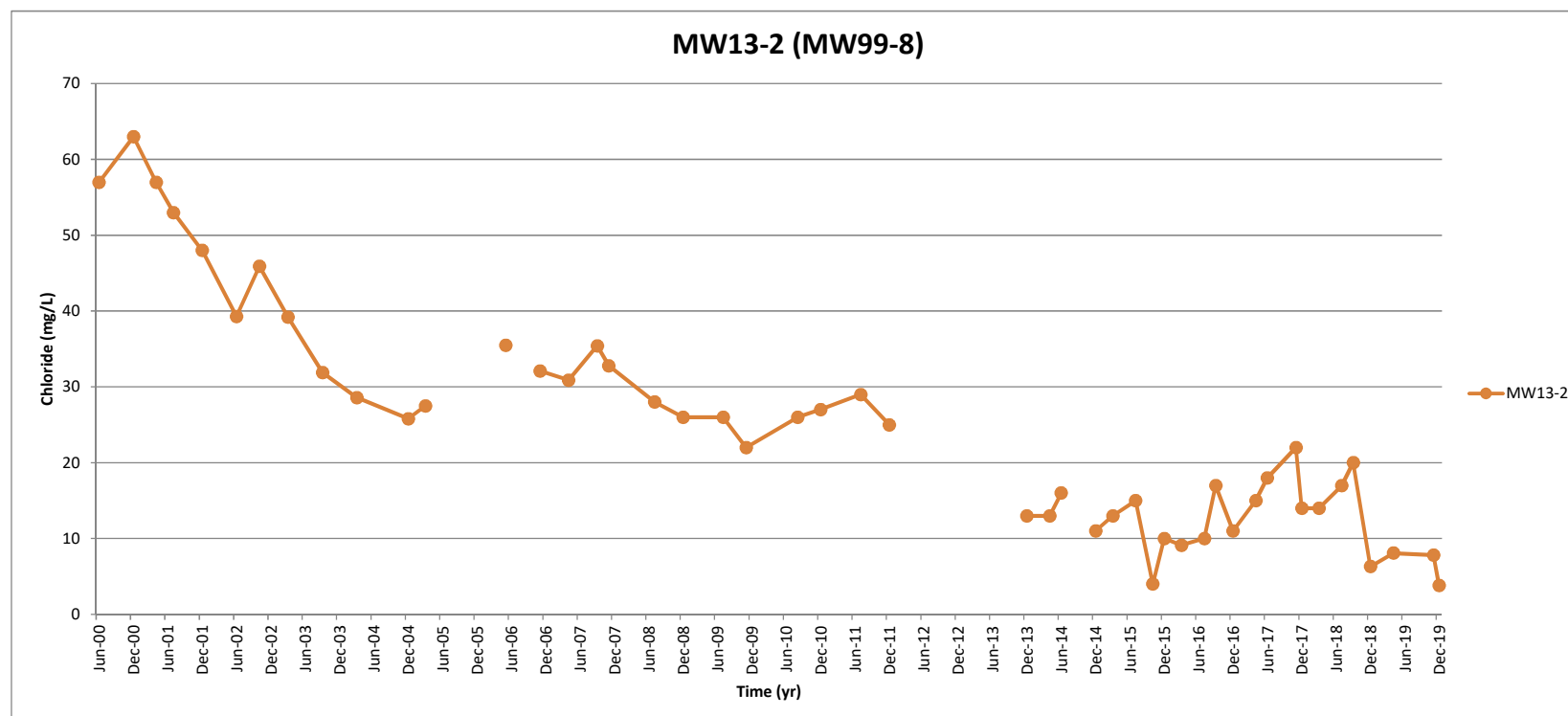


Figure E10
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

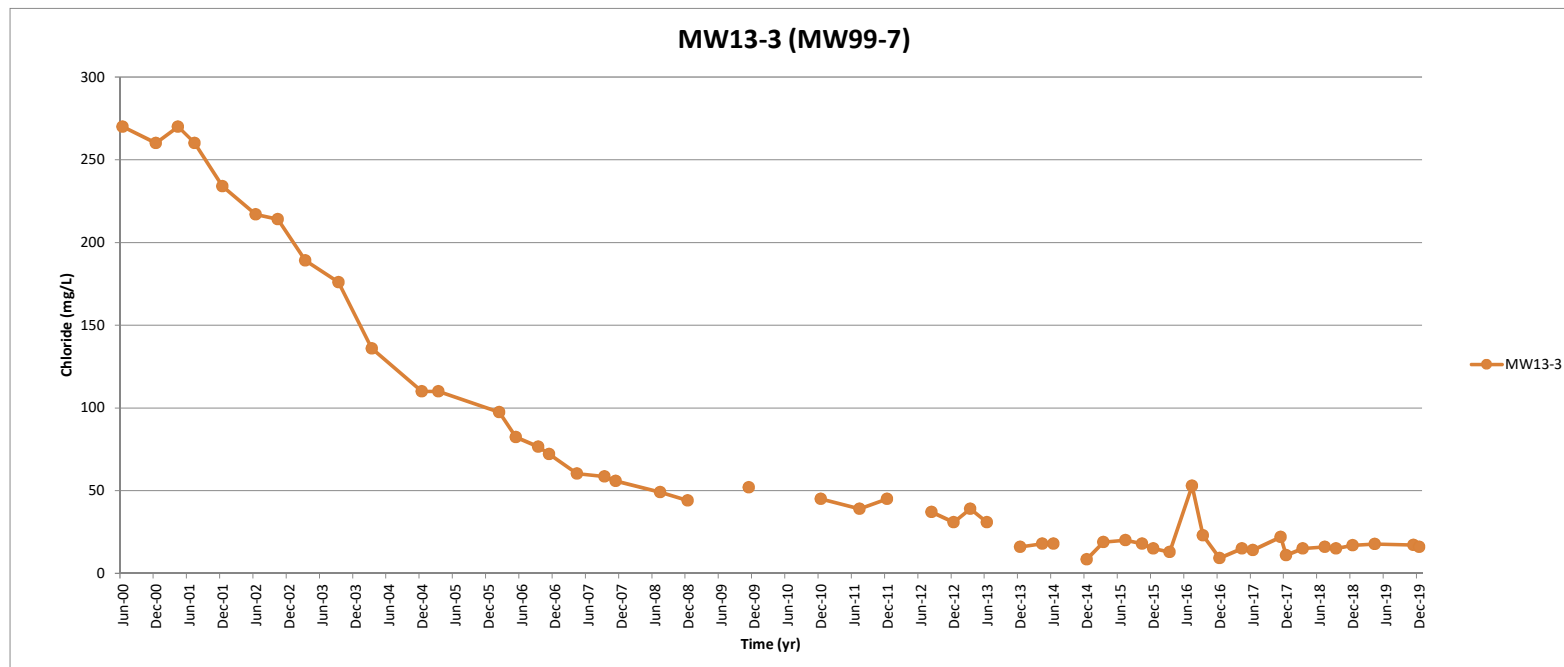


Figure E11
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

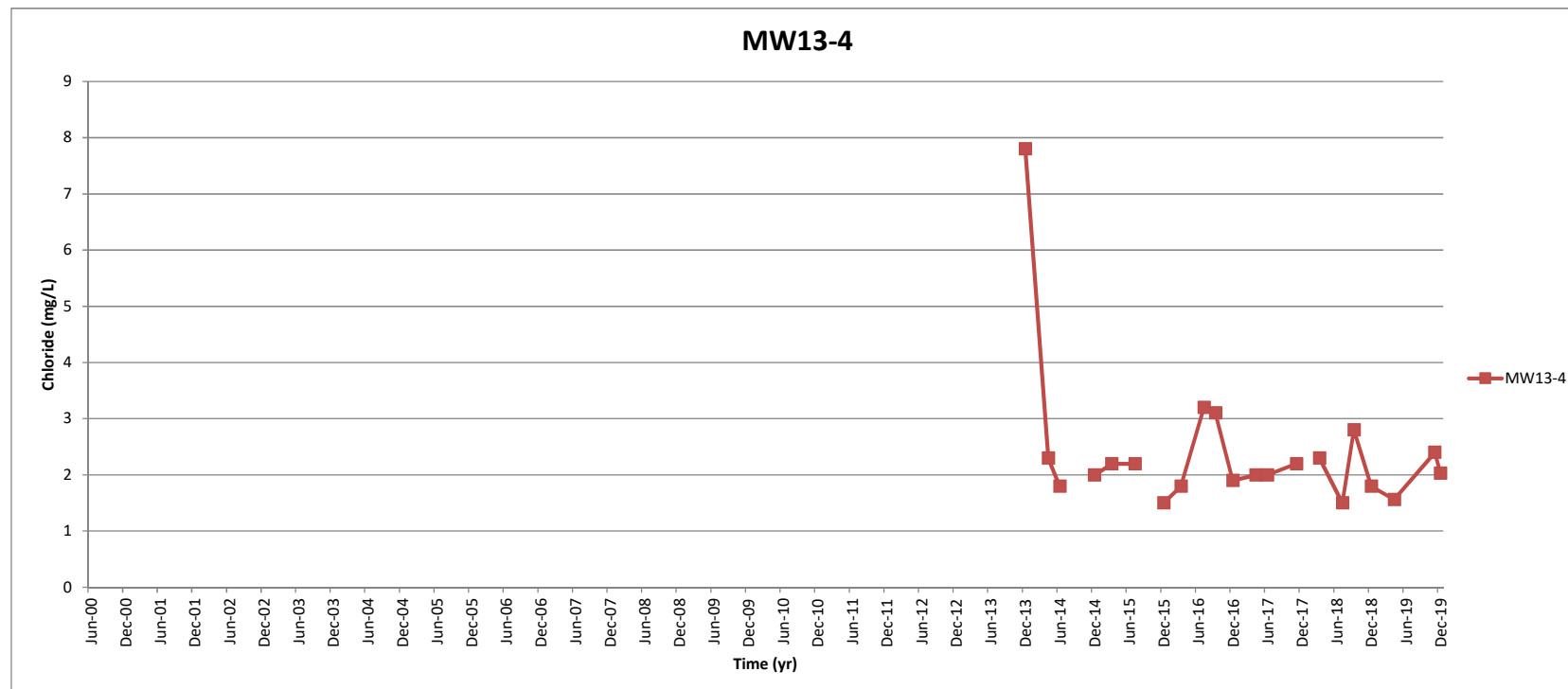


Figure E12
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

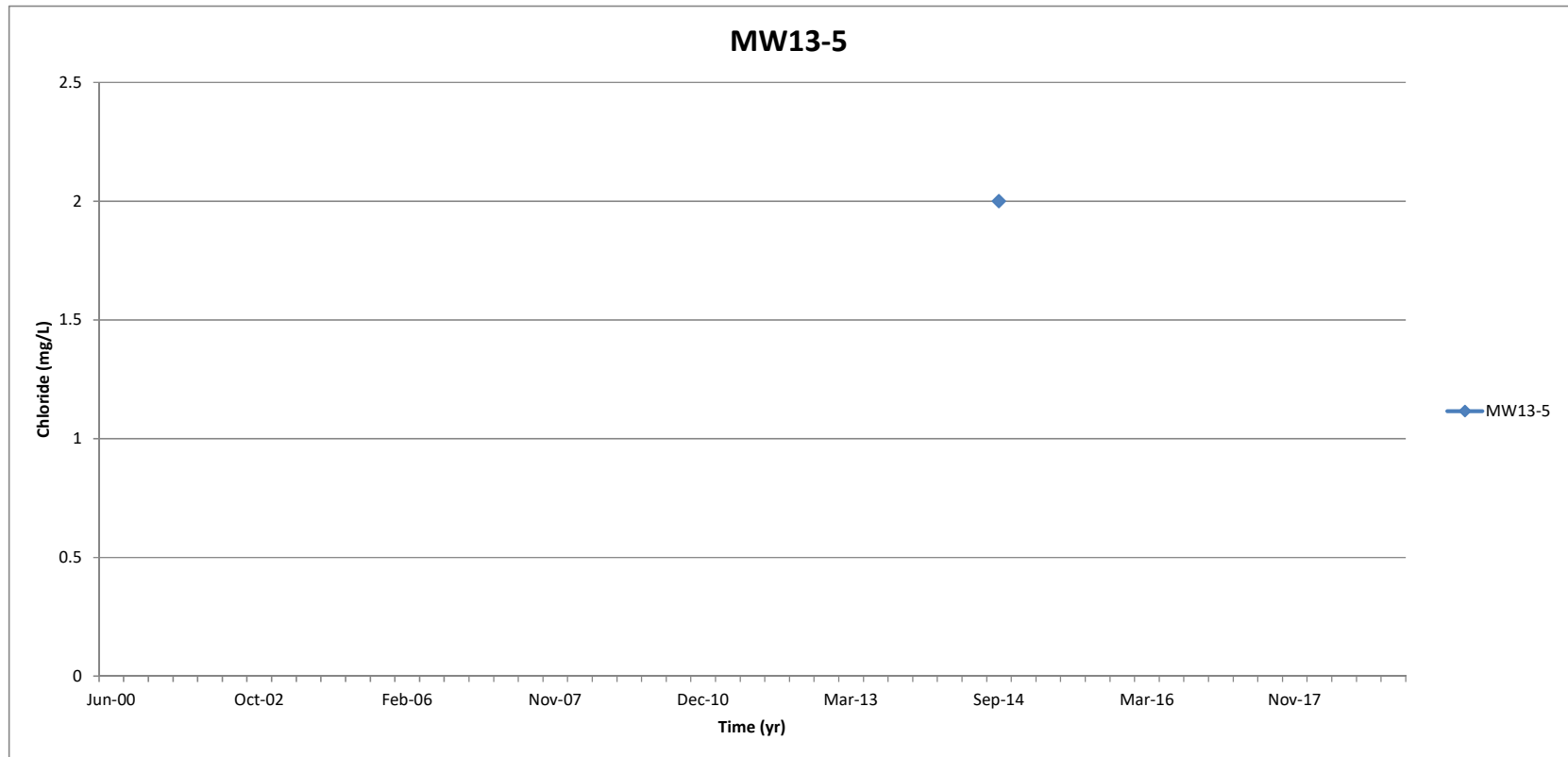


Figure E13
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

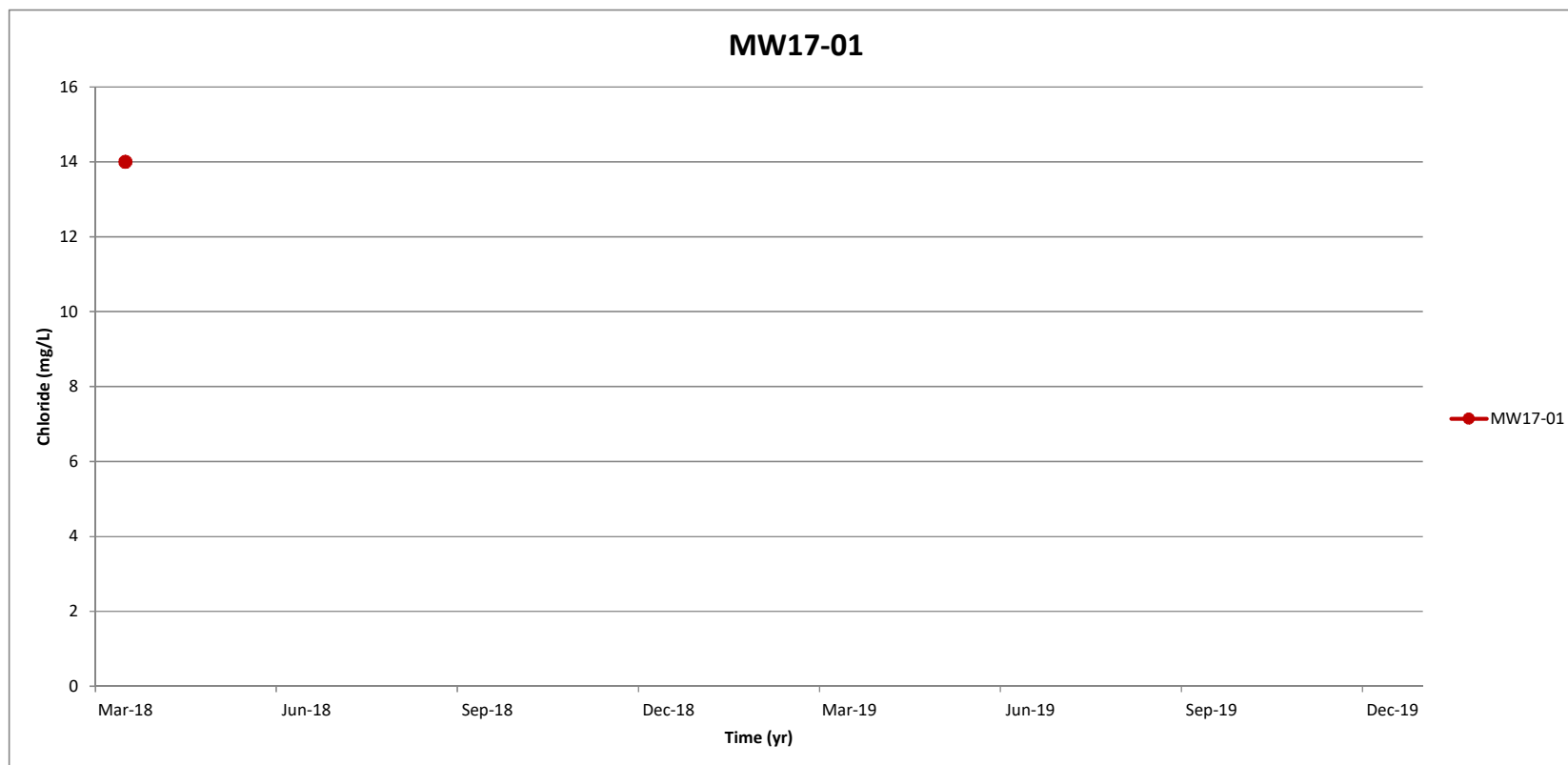


Figure E14
Monitoring Well Locations - Historic Chloride Concentrations
Sechelt Landfill

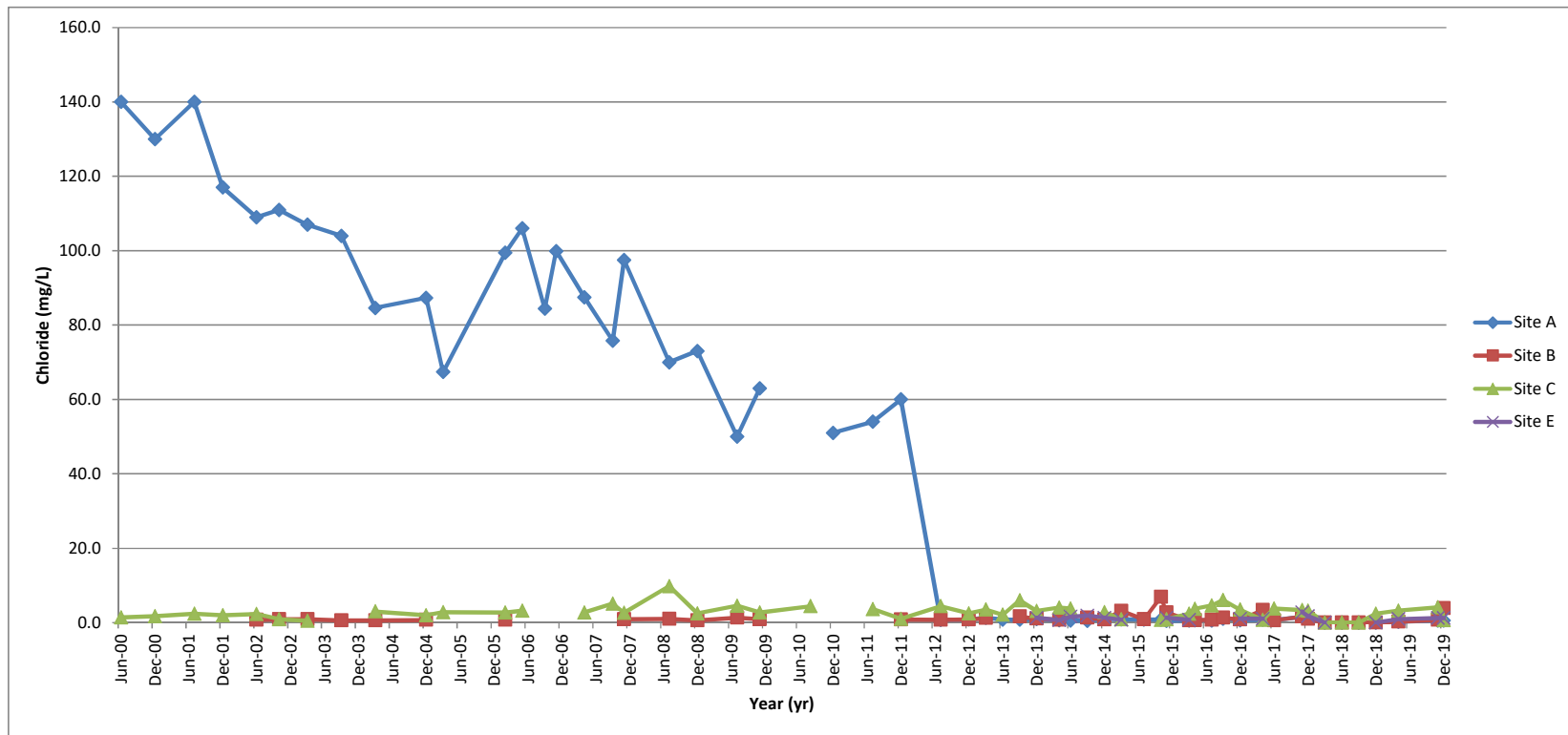


Figure E15
Surface Water Monitoring Locations - Historic Chloride Concentrations
Sechelt Landfill

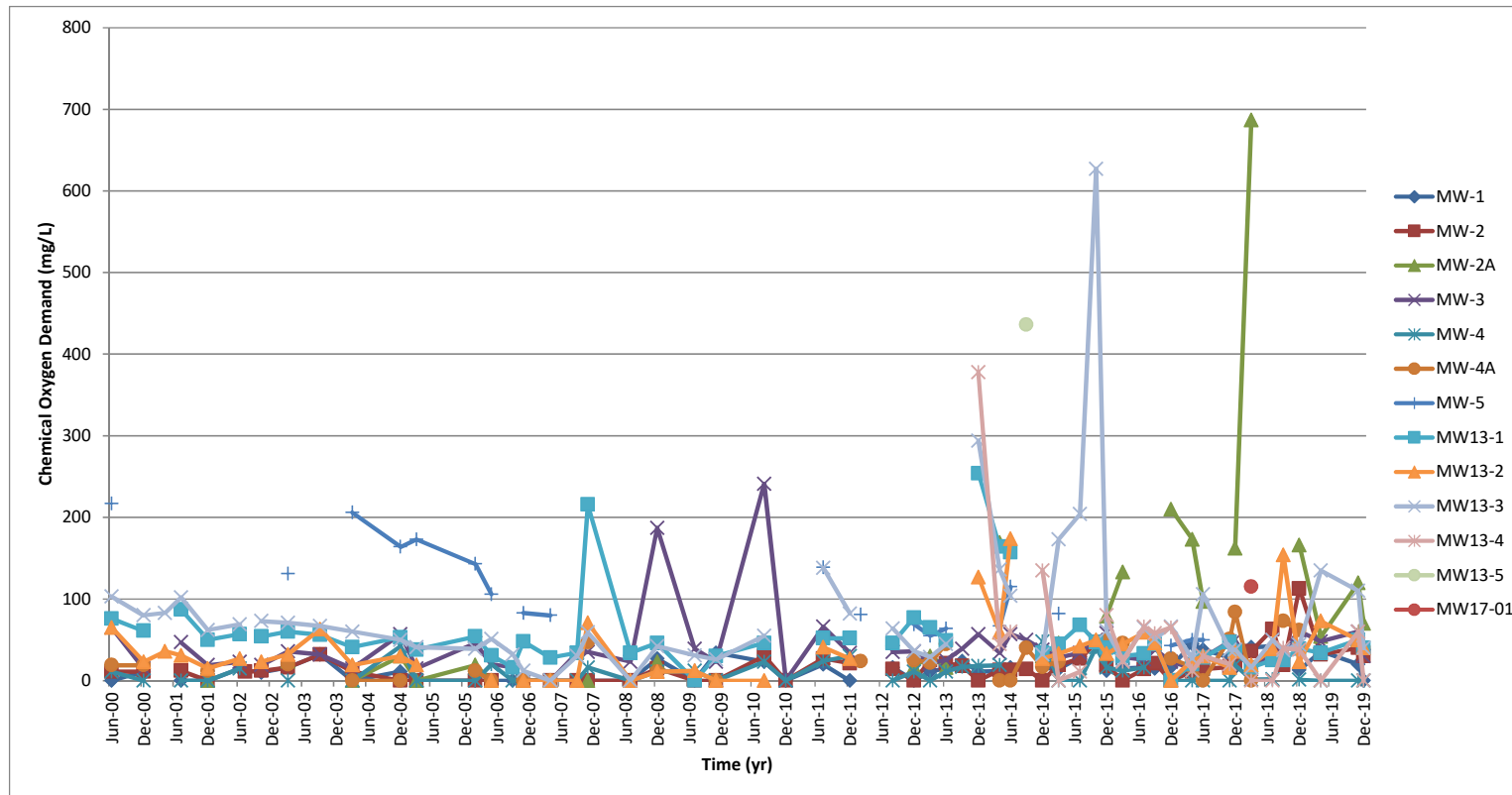


Figure E16
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

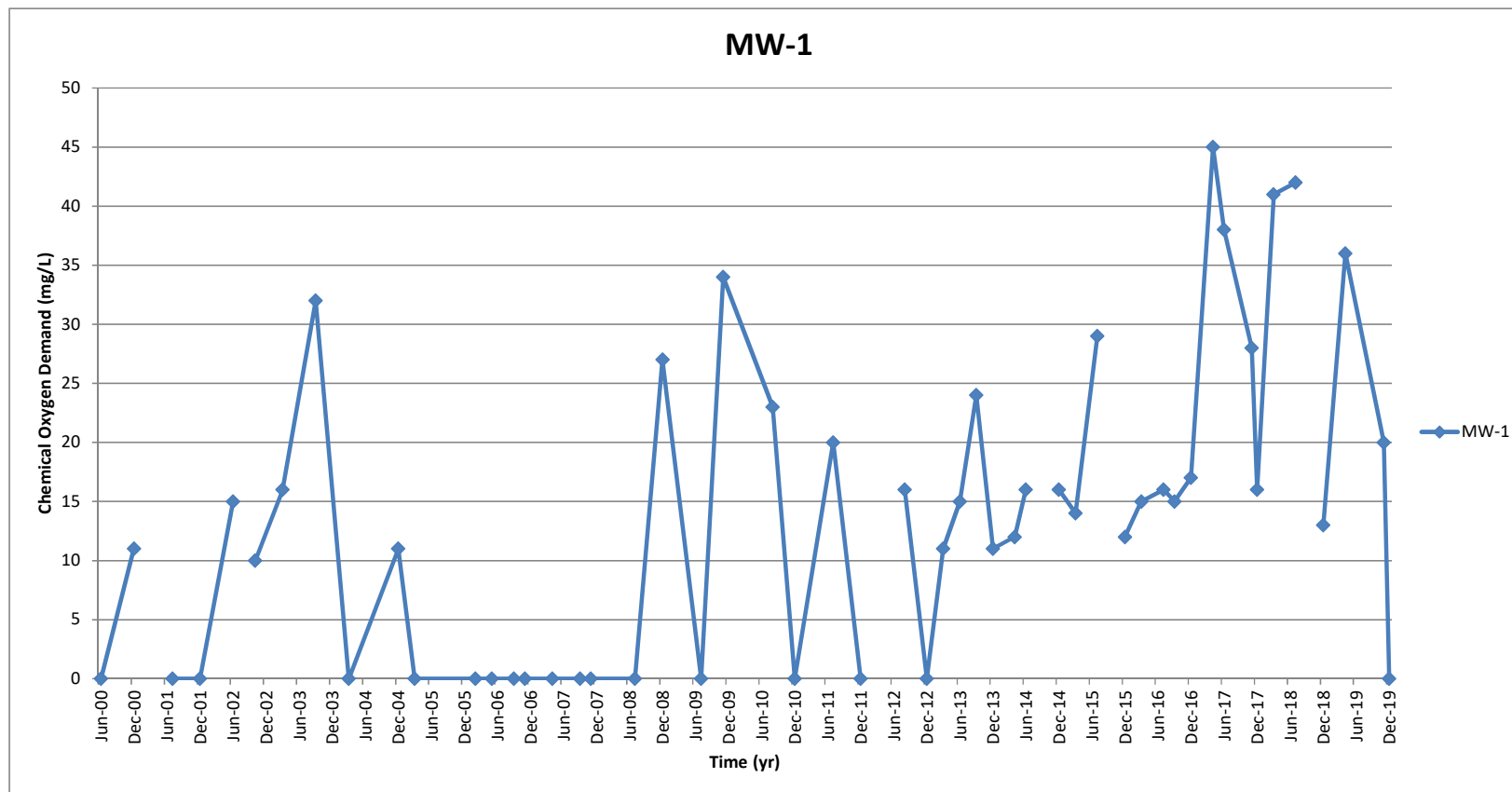


Figure E17
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

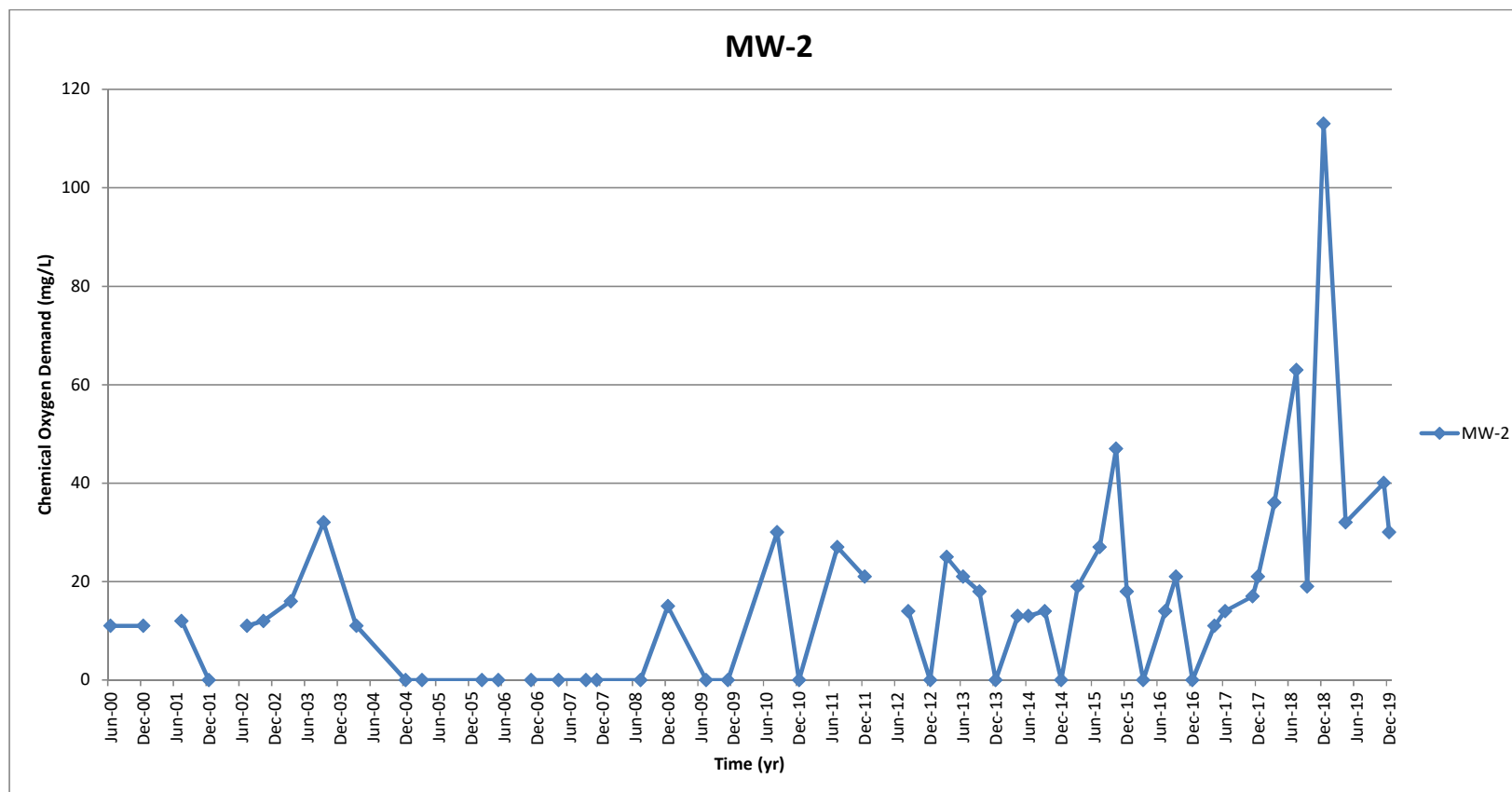


Figure E18
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

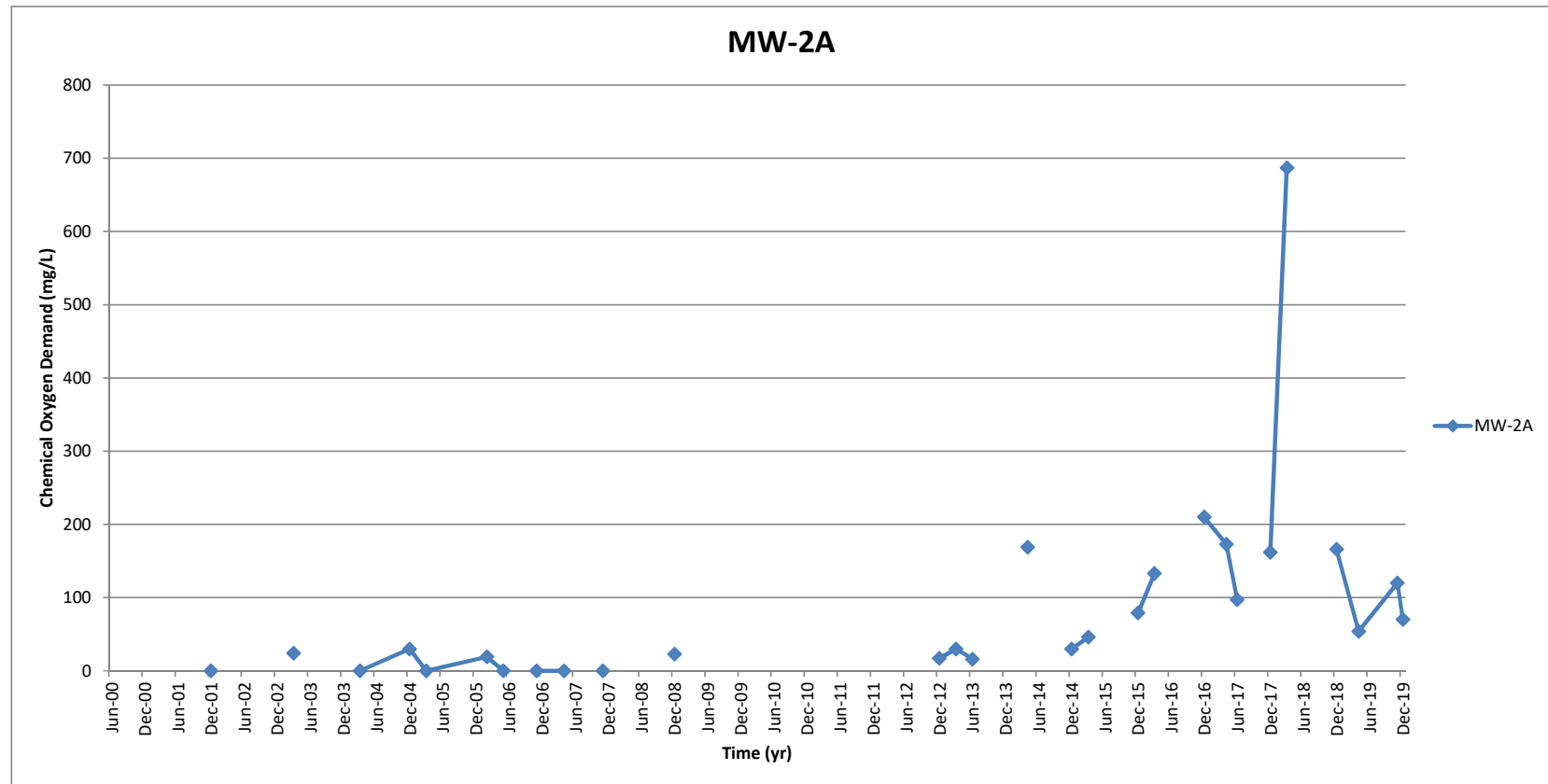


Figure E19
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

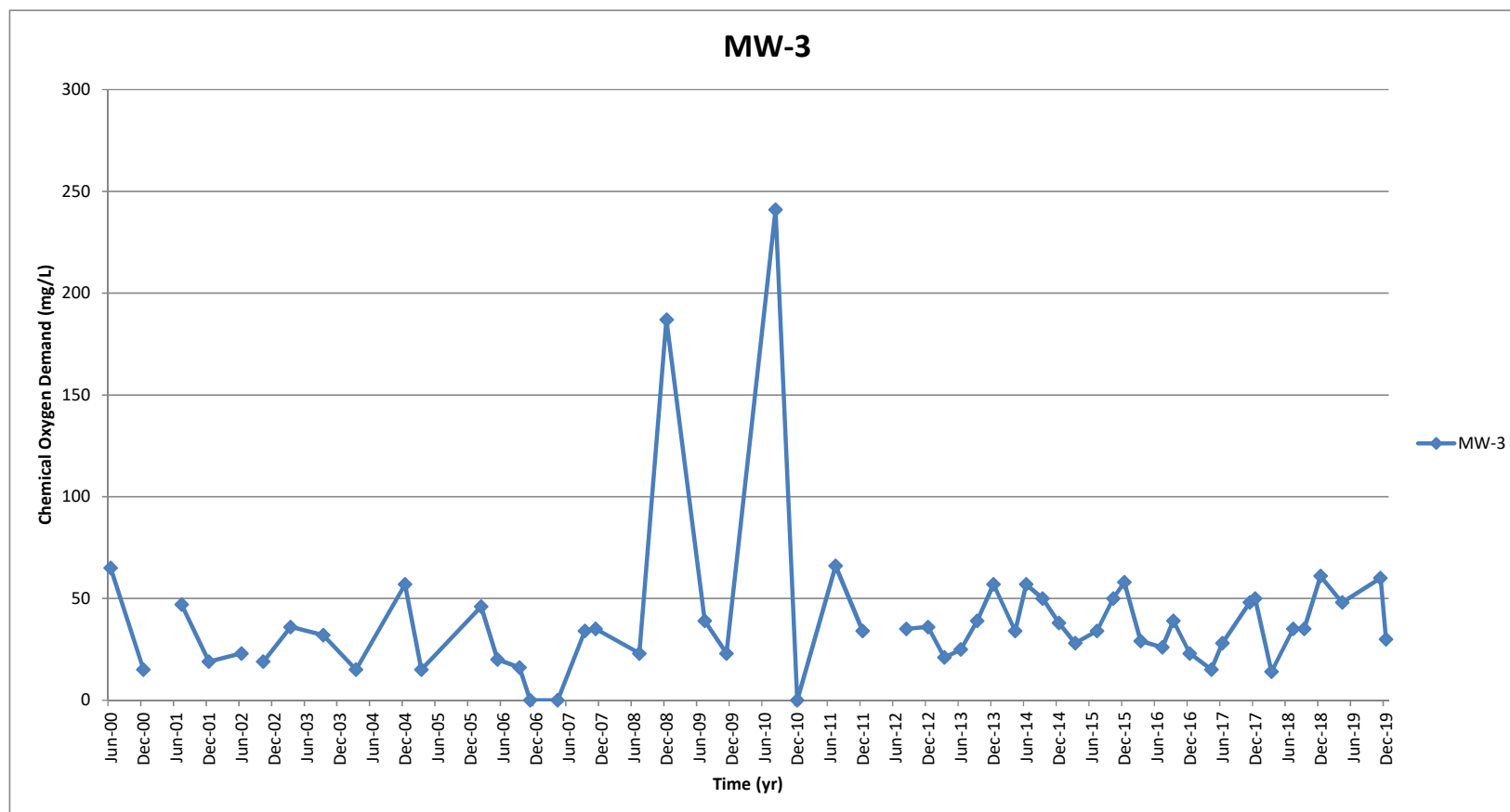


Figure E20
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

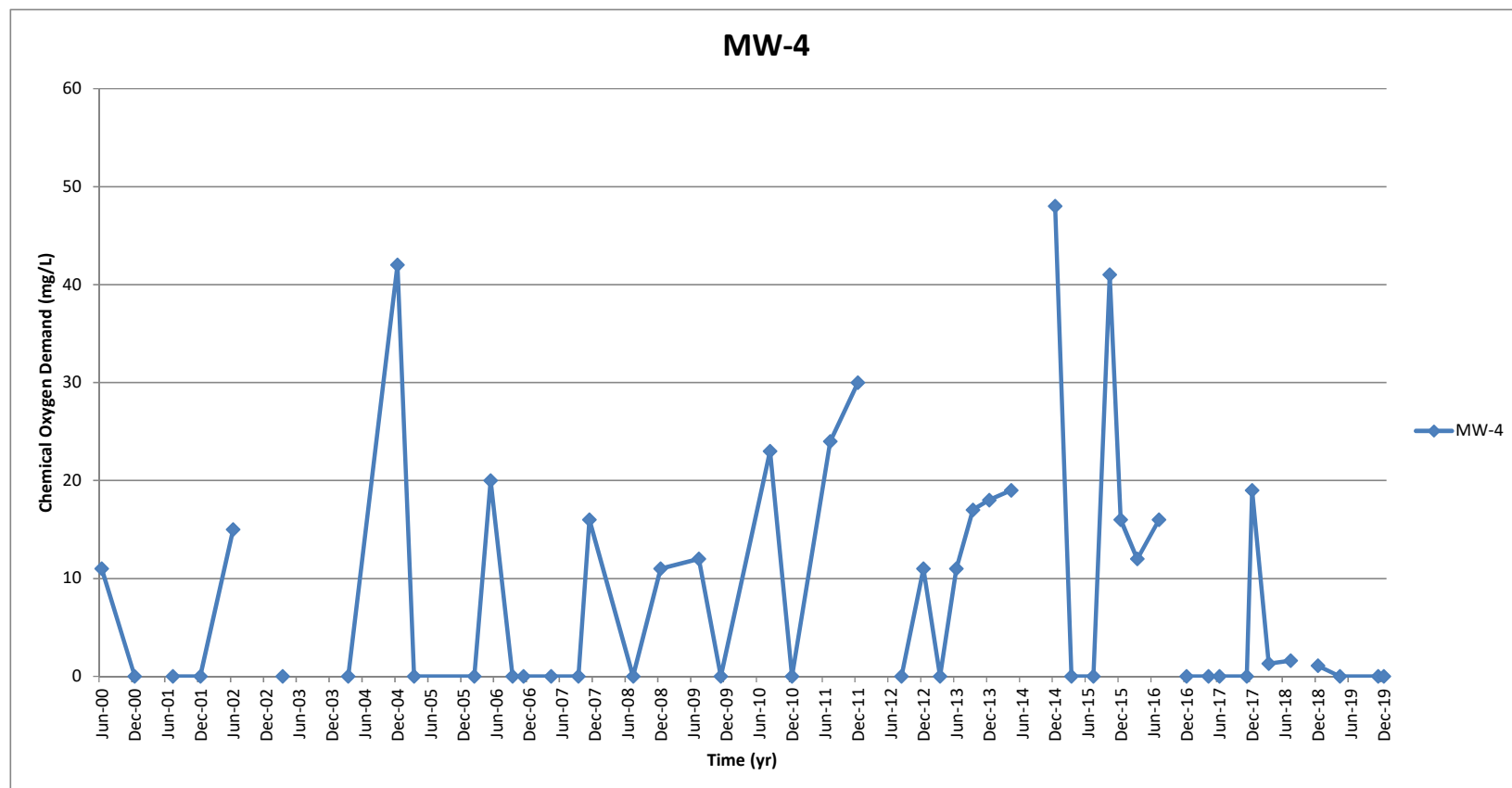


Figure E21
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

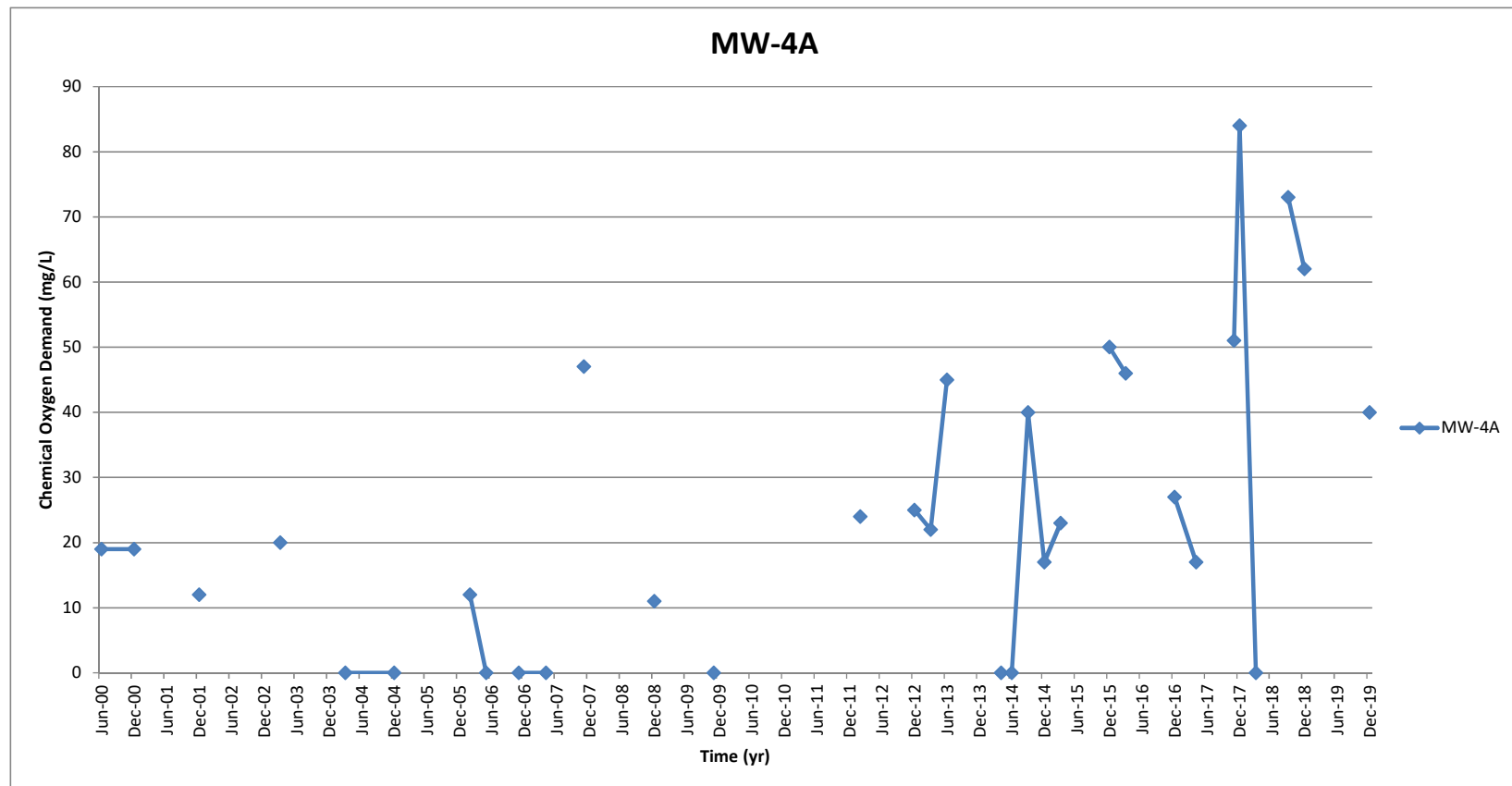


Figure E22
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

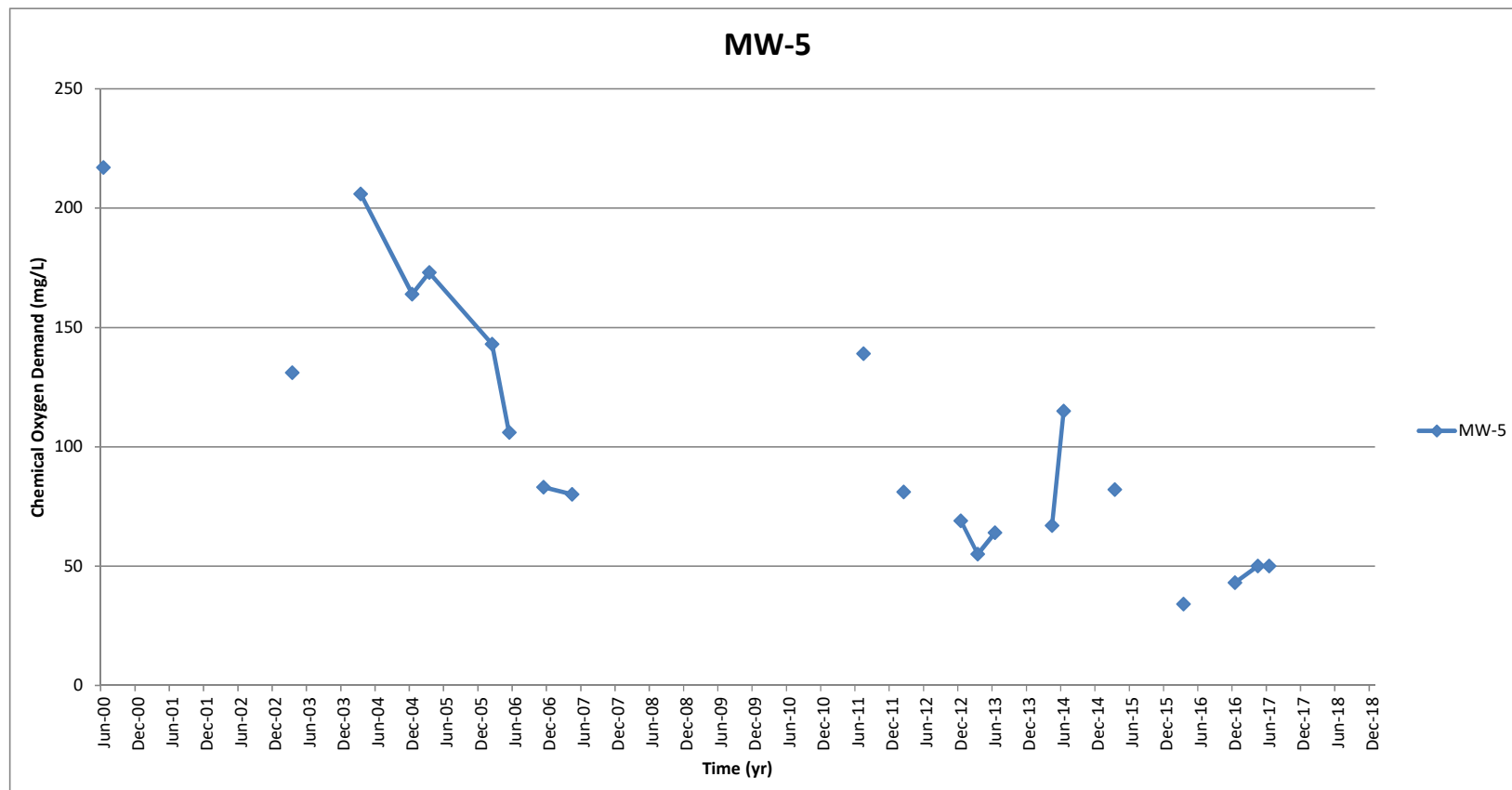


Figure E23
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

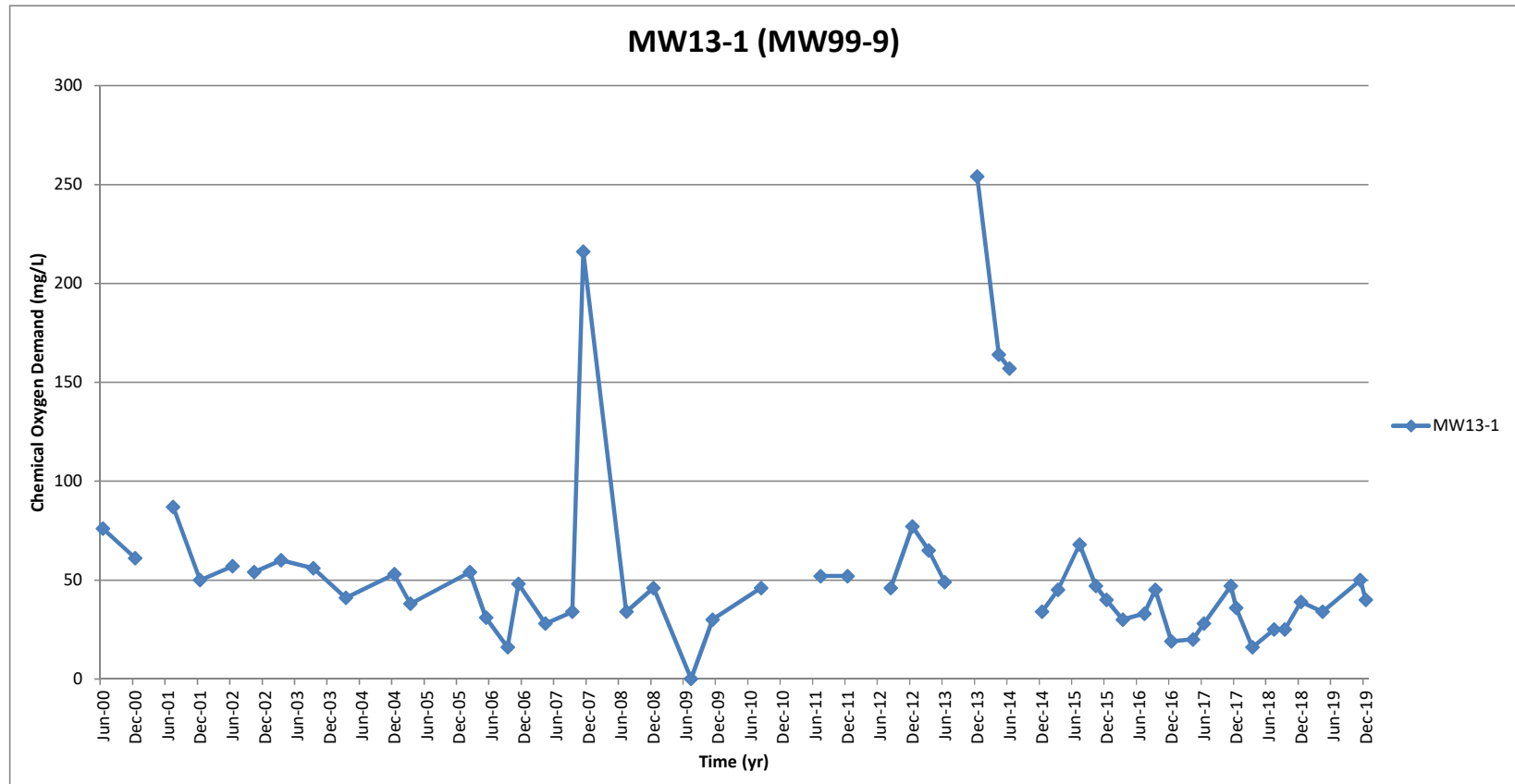


Figure E24
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

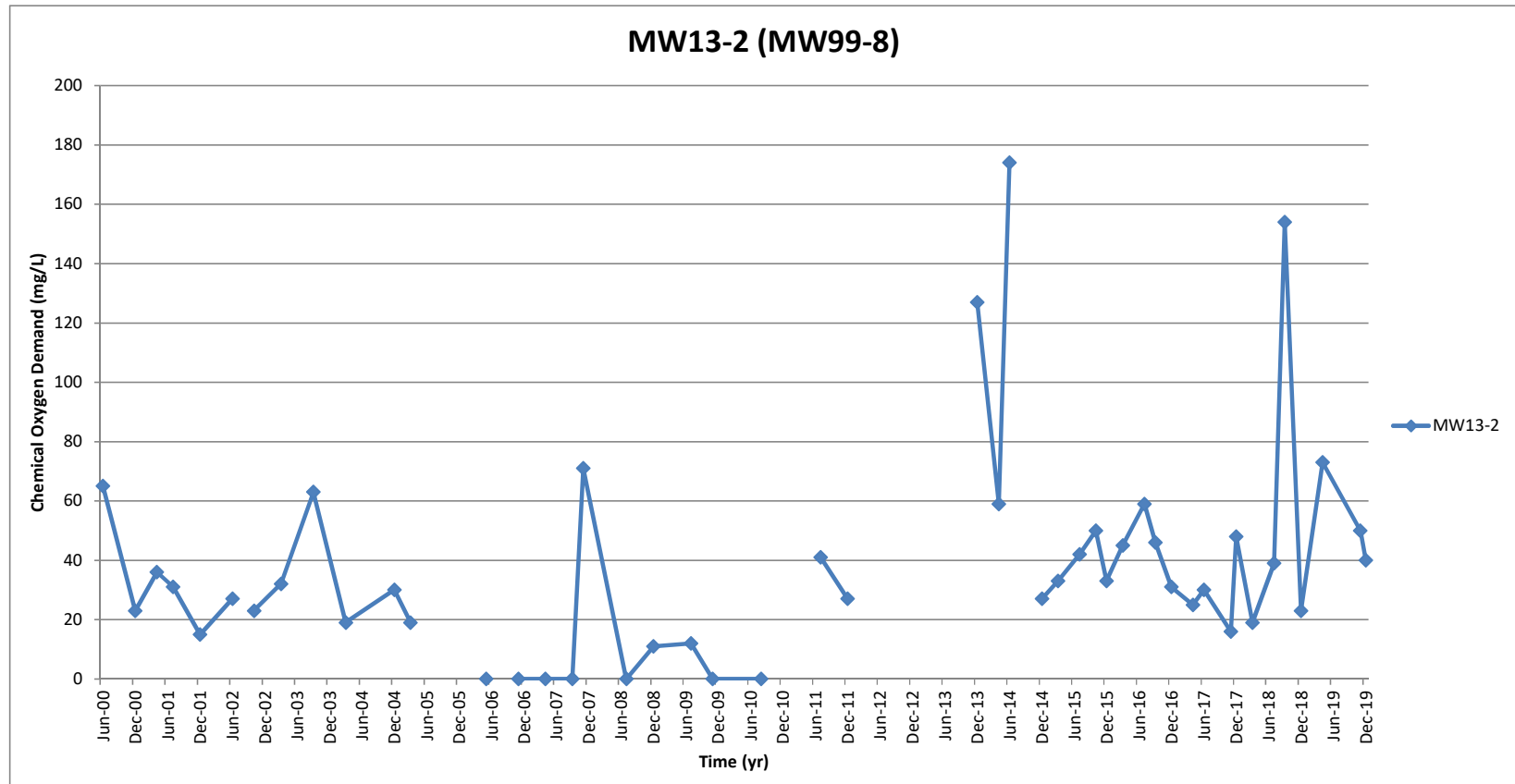


Figure E25
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

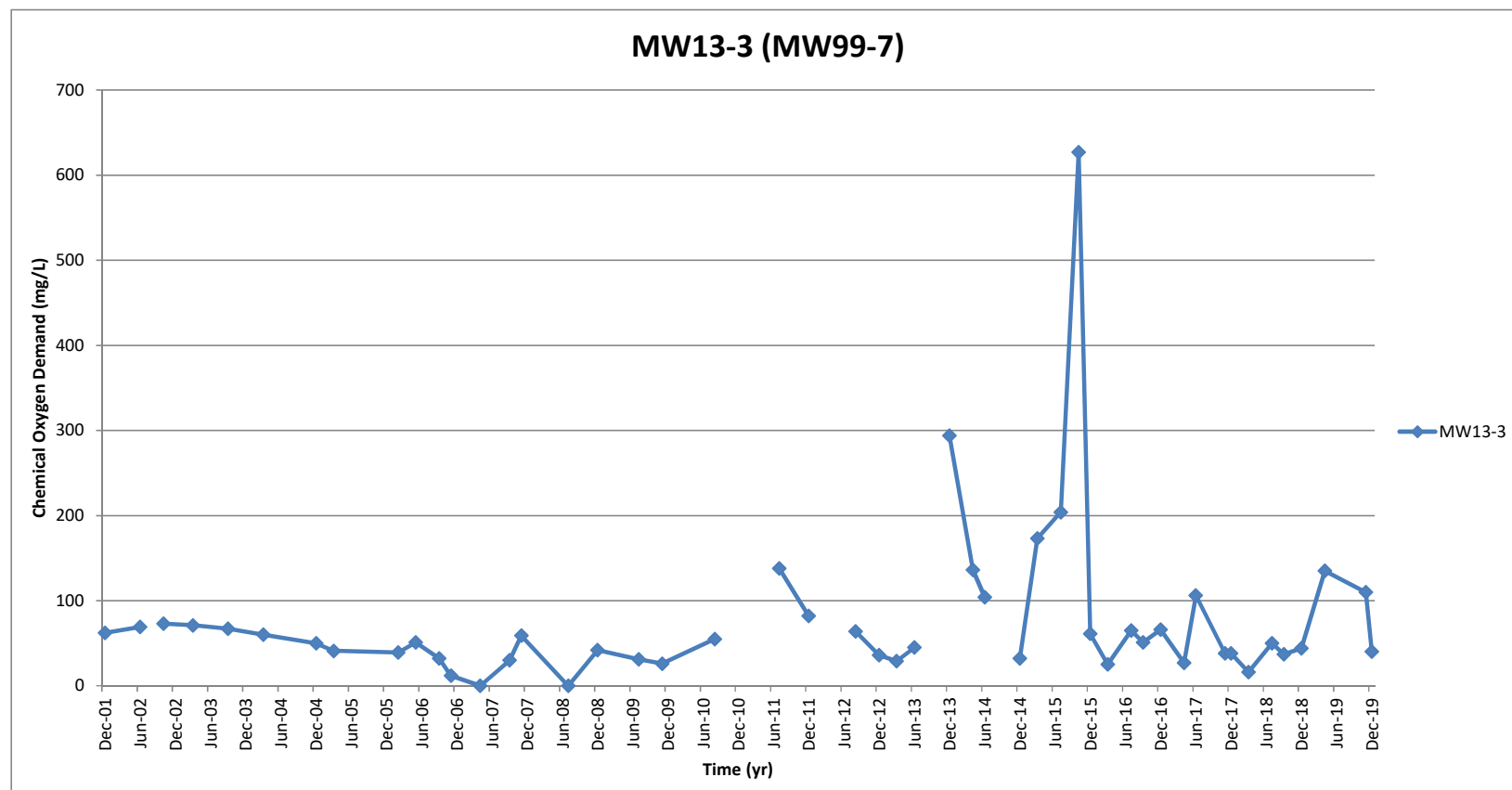


Figure E26
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

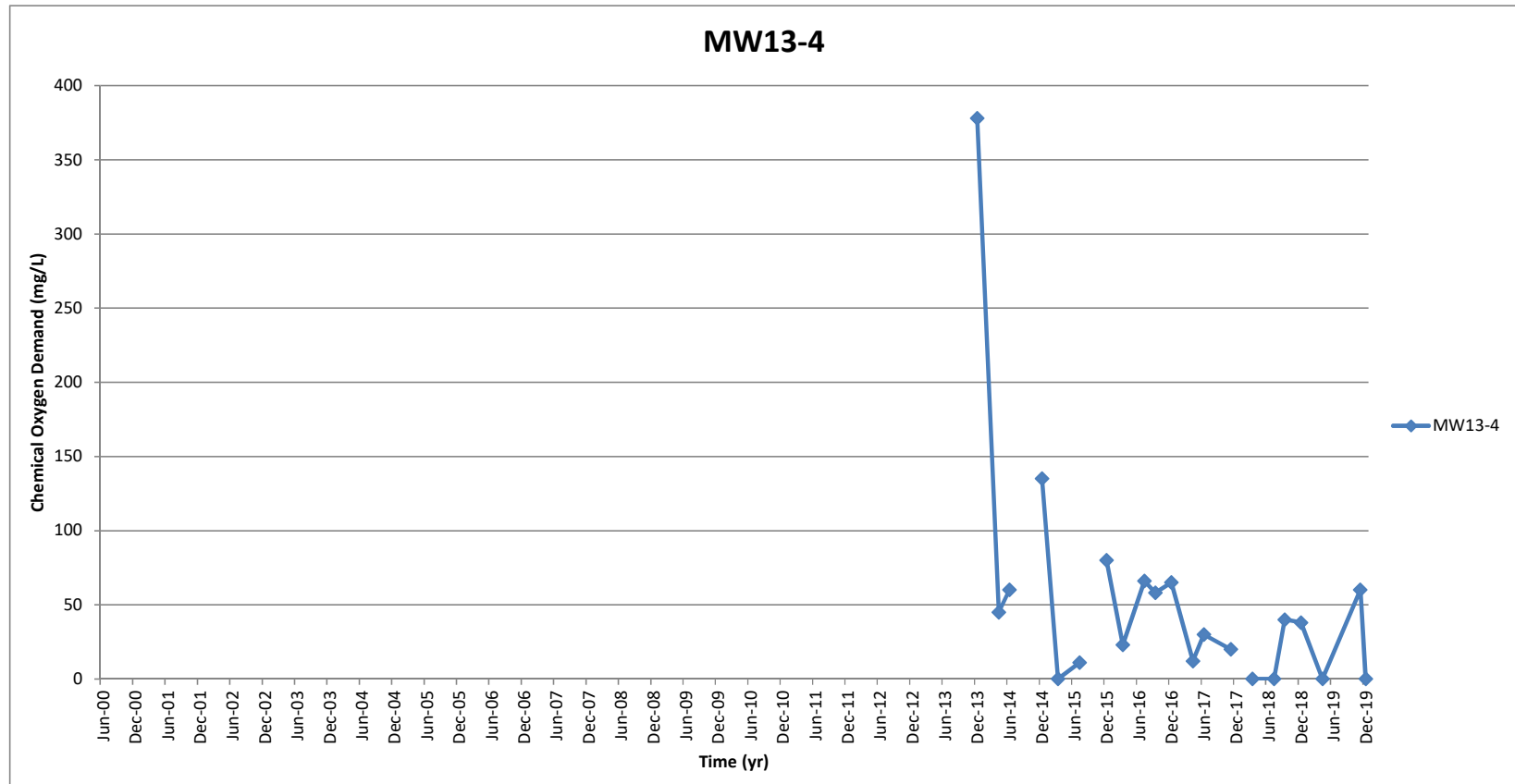


Figure E27
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

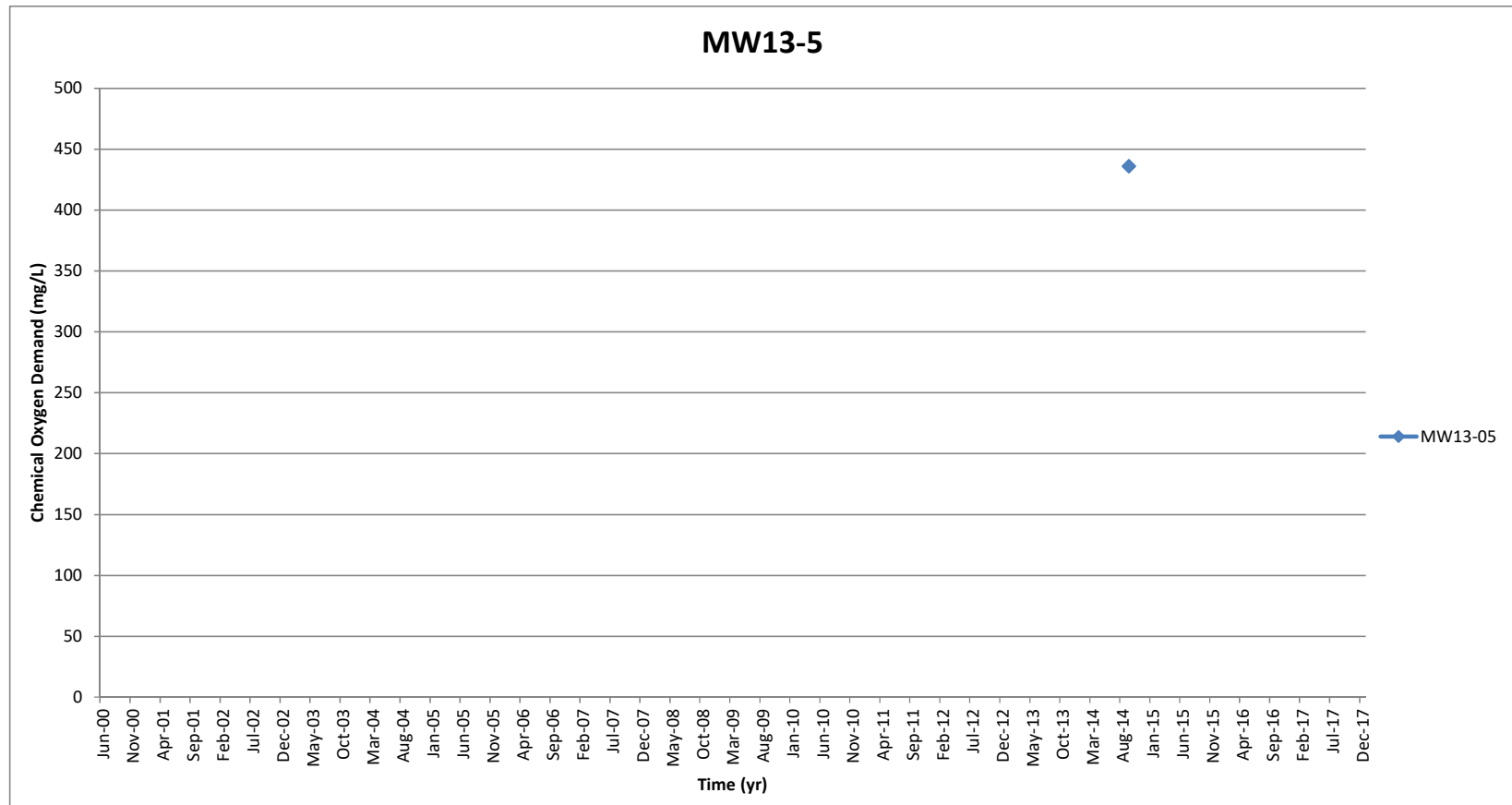


Figure E28
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

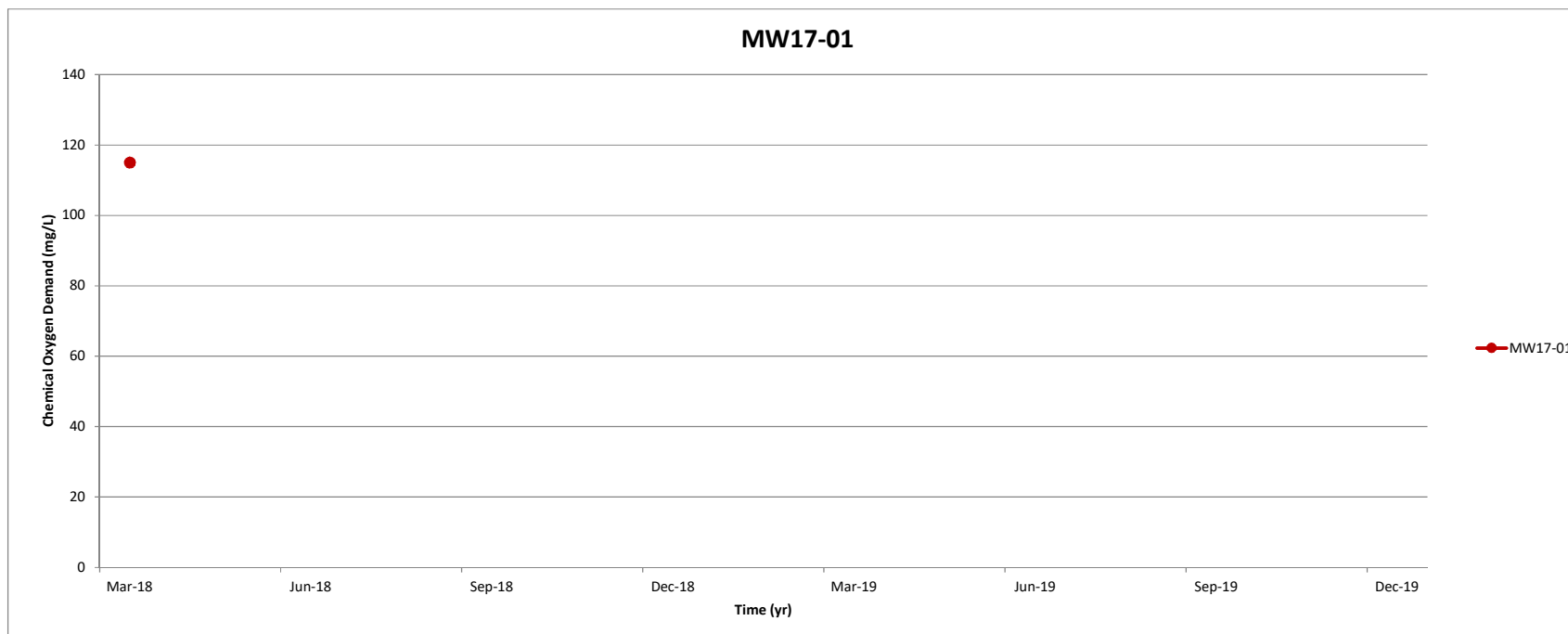


Figure E29
Monitoring Well Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

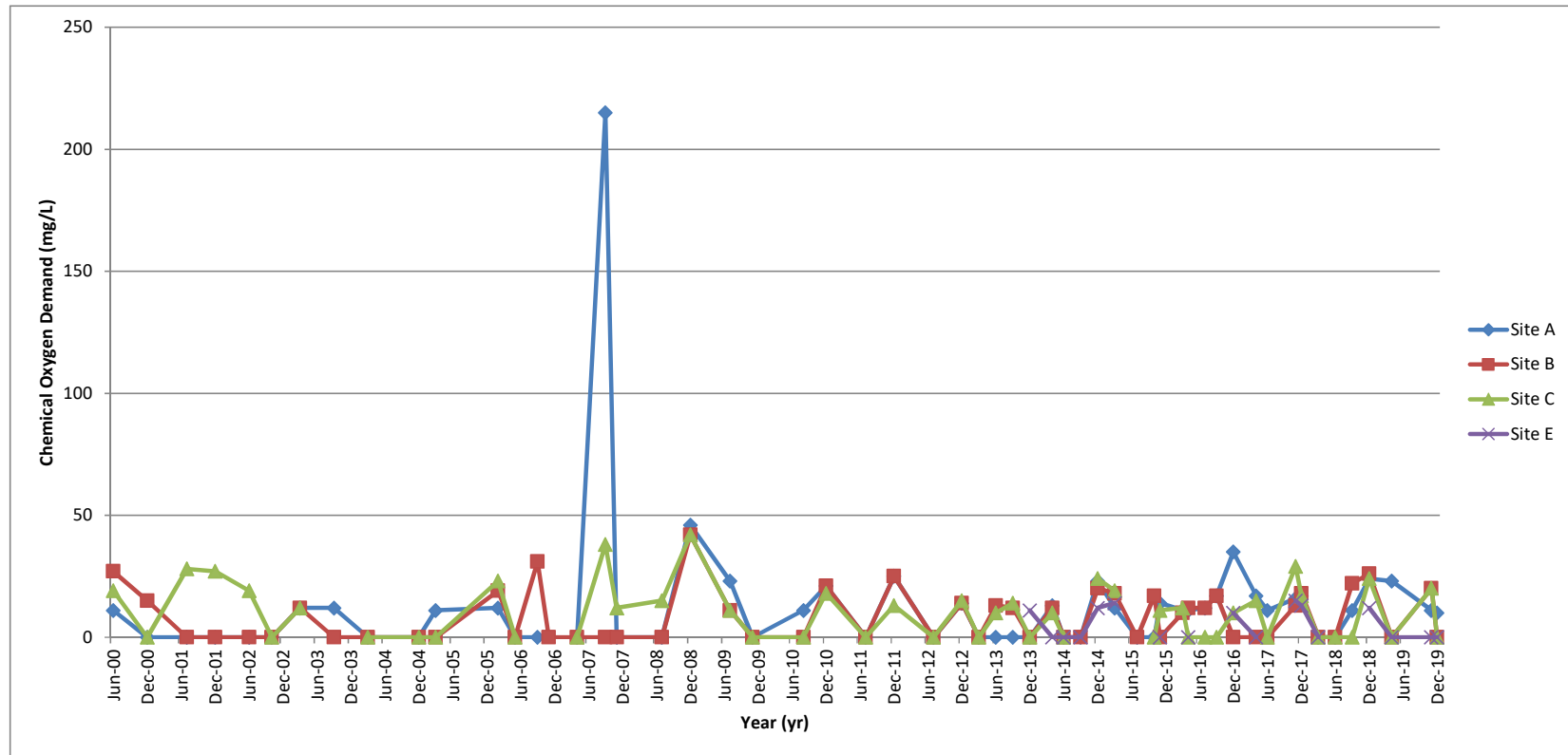


Figure E30
Surface Water Monitoring Locations - Historic Chemical Oxygen Demand
Sechelt Landfill

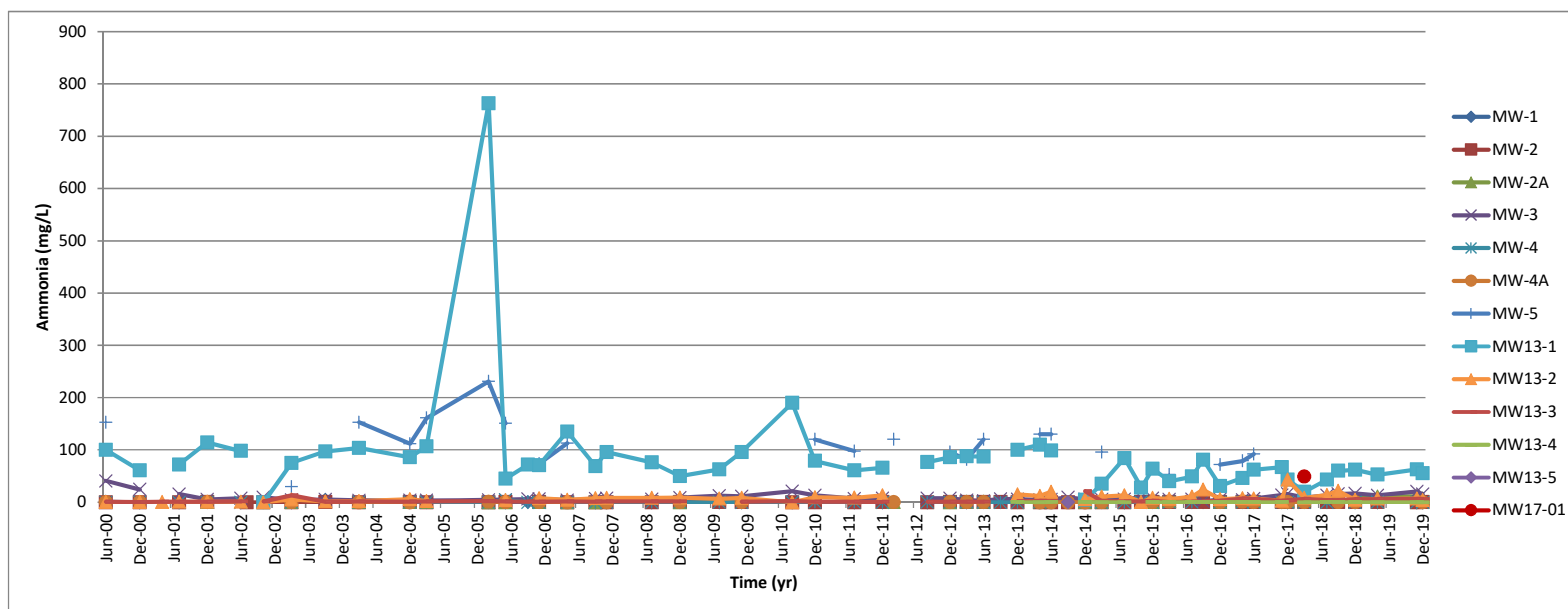


Figure E31
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

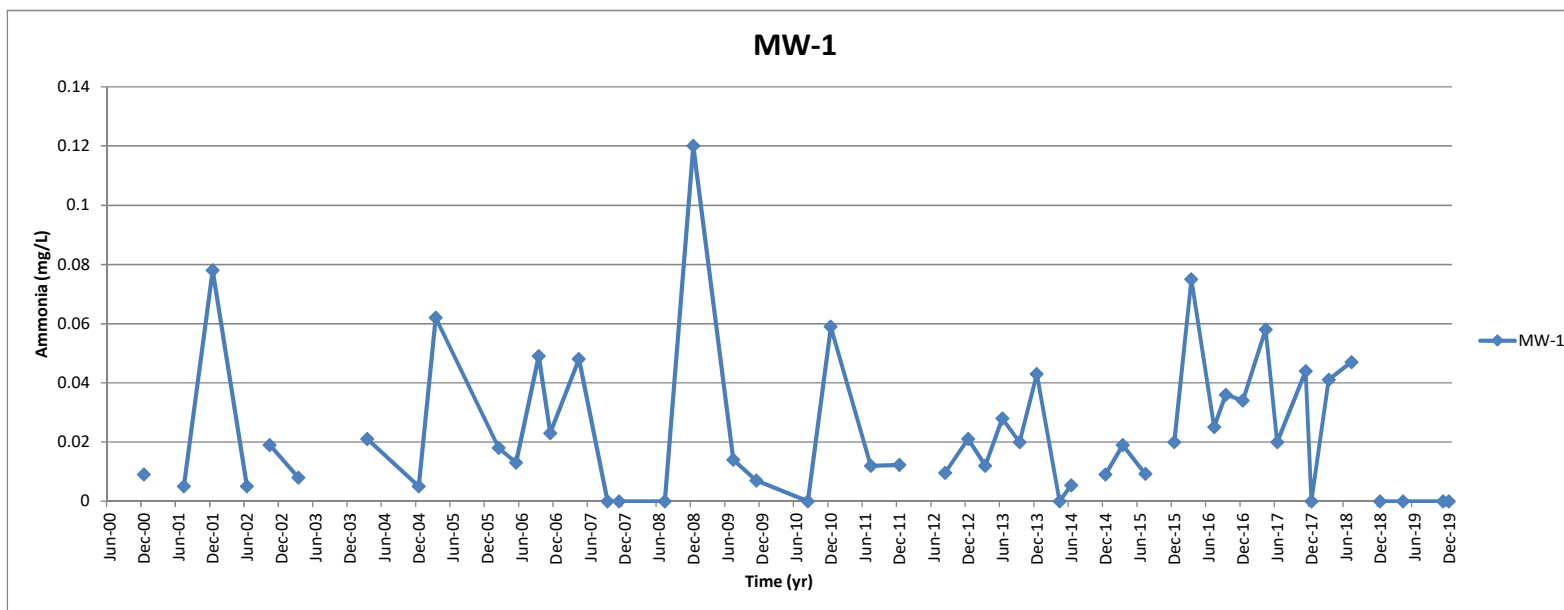


Figure E32
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

June 2000 concentration of 0.98 mg/L and September 2003 concentration of 4.4 mg/L omitted from graph to improve the resolution of the remaining data.

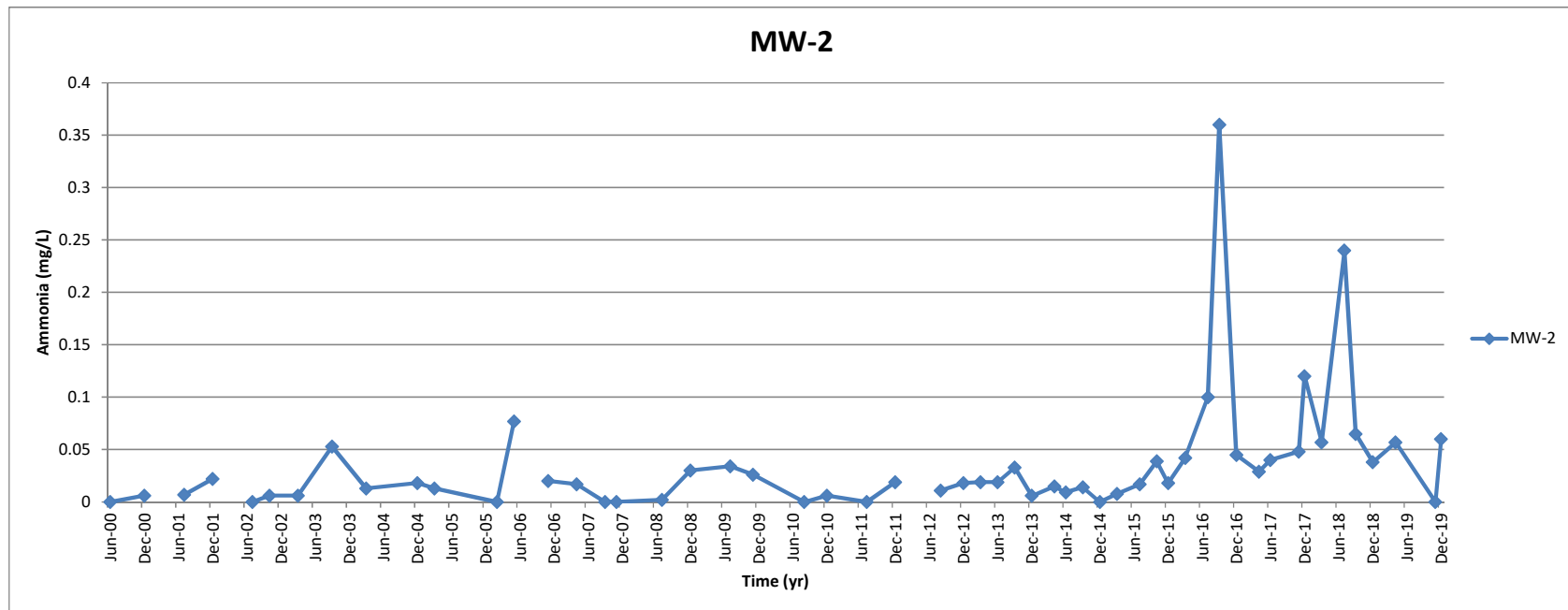


Figure E33
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

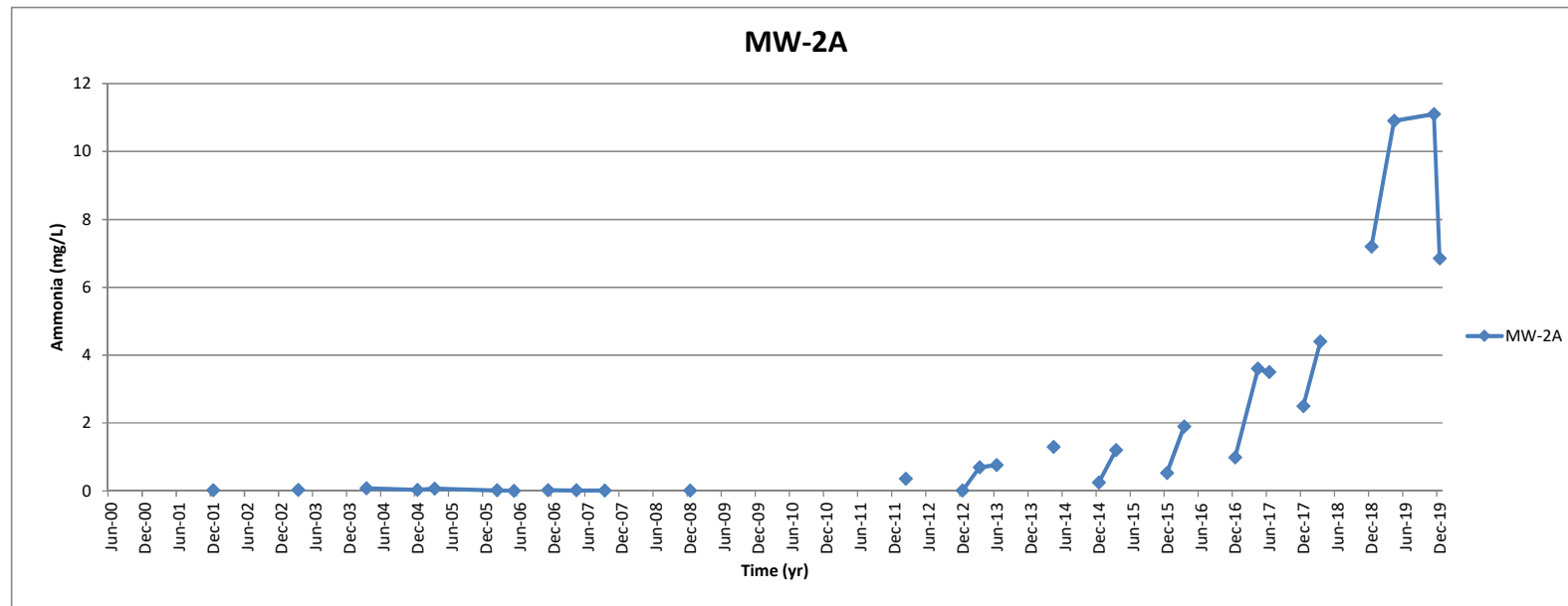


Figure E34
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

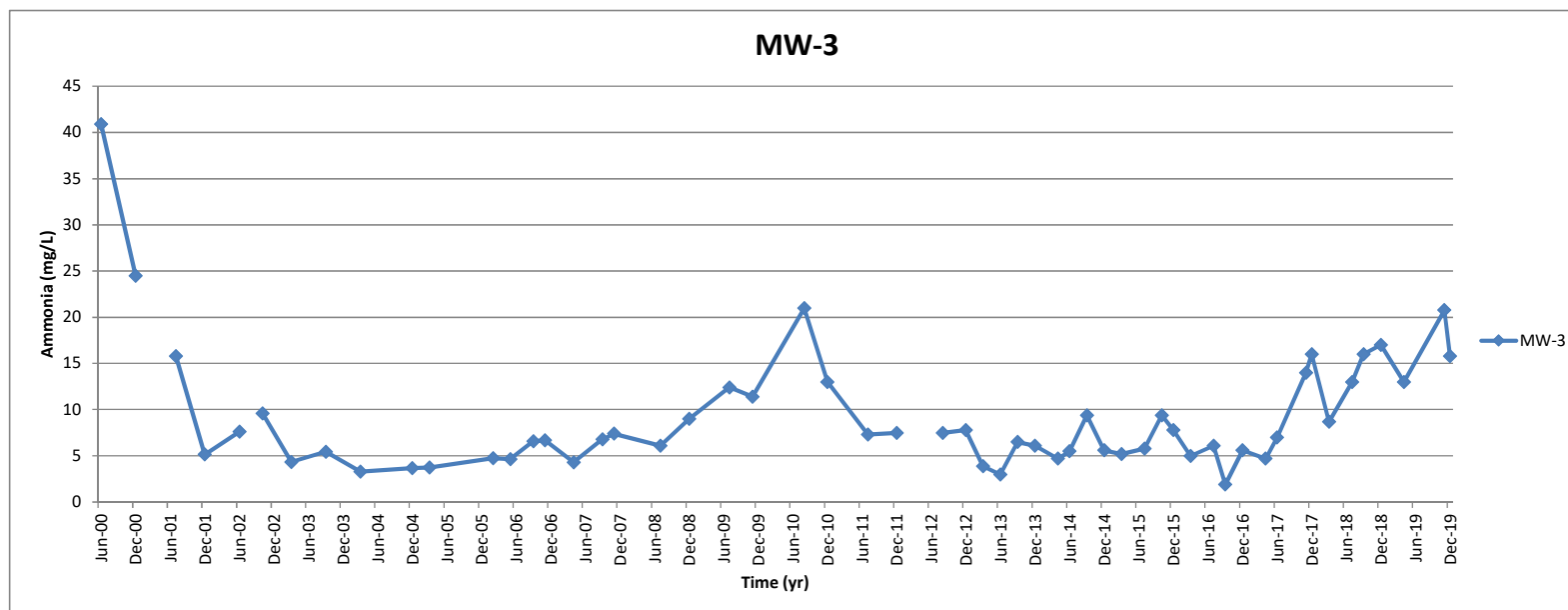


Figure E35
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

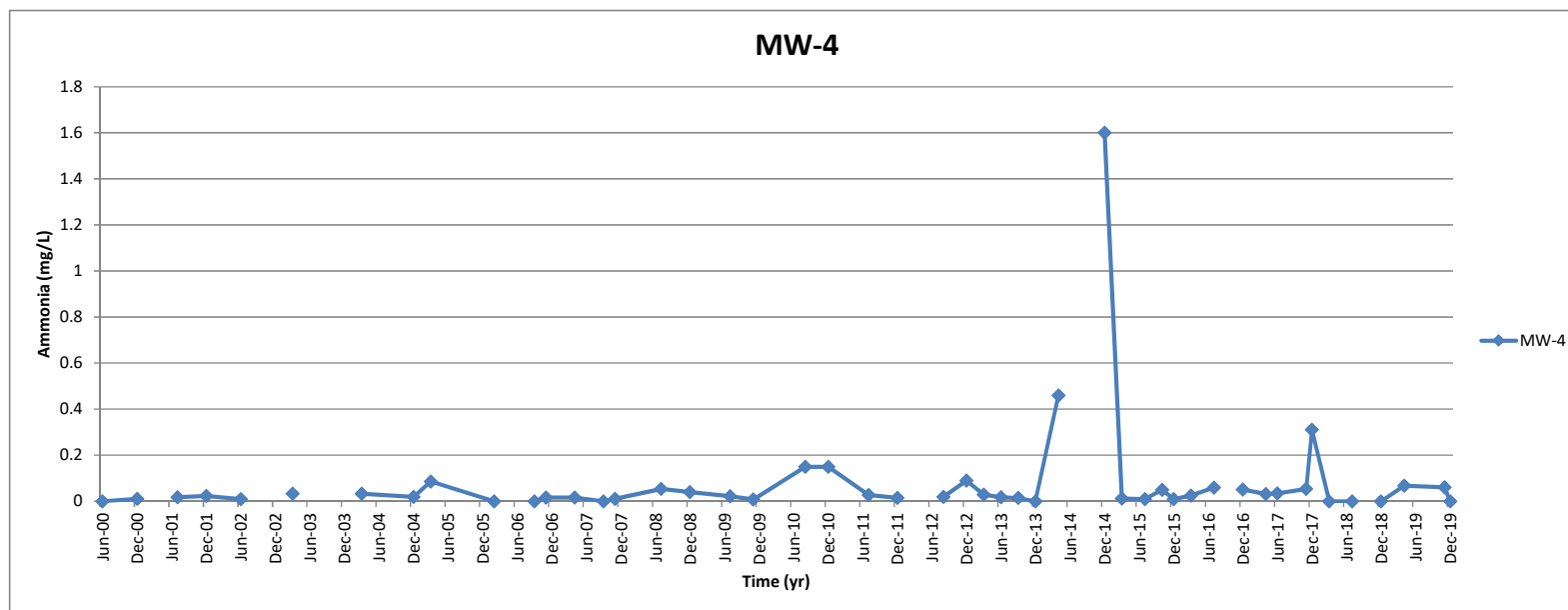


Figure E36
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

May 2006 concentration of 4.66 mg/L omitted from graph to improve the resolution of the remaining data.

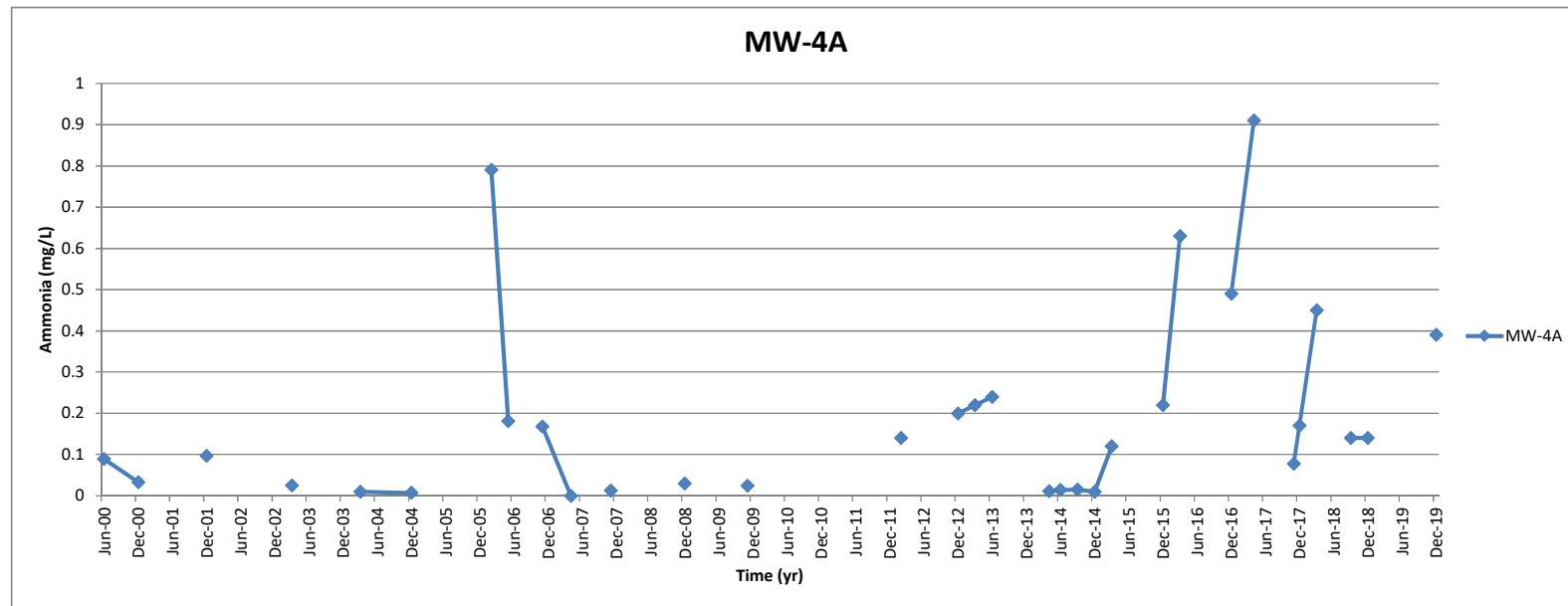


Figure E37
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

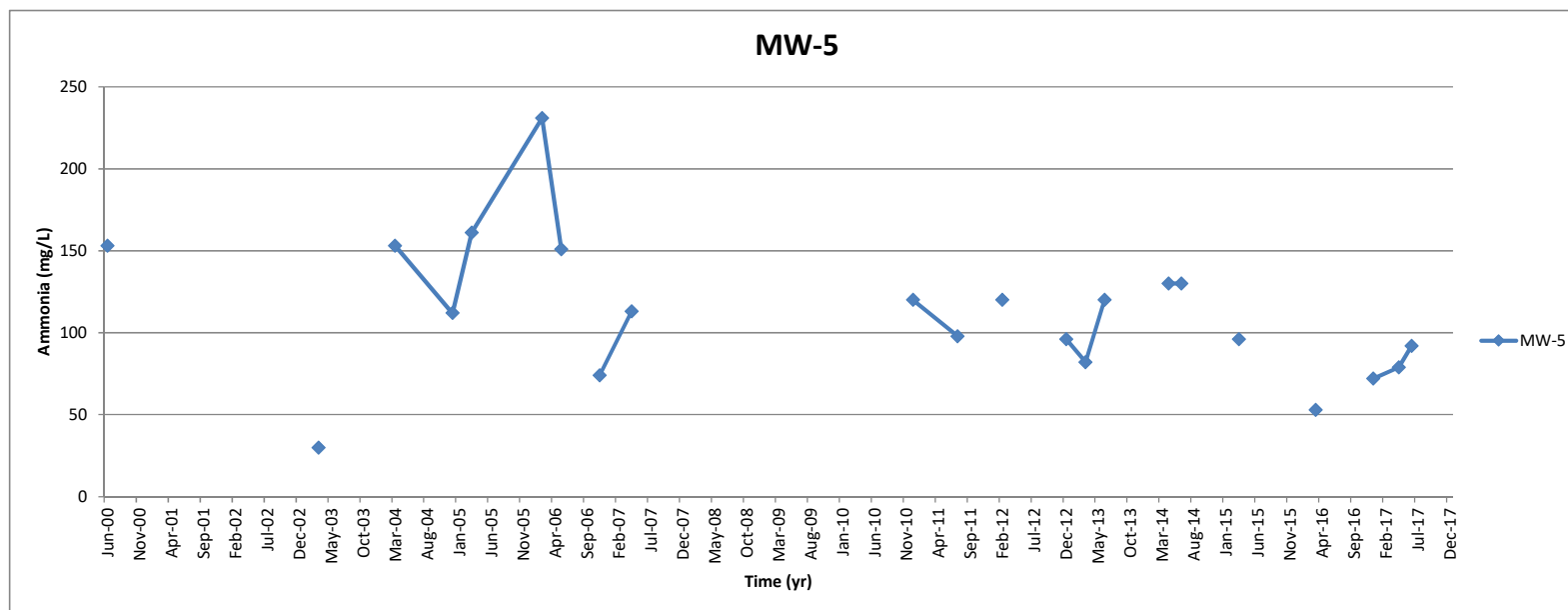


Figure E38
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

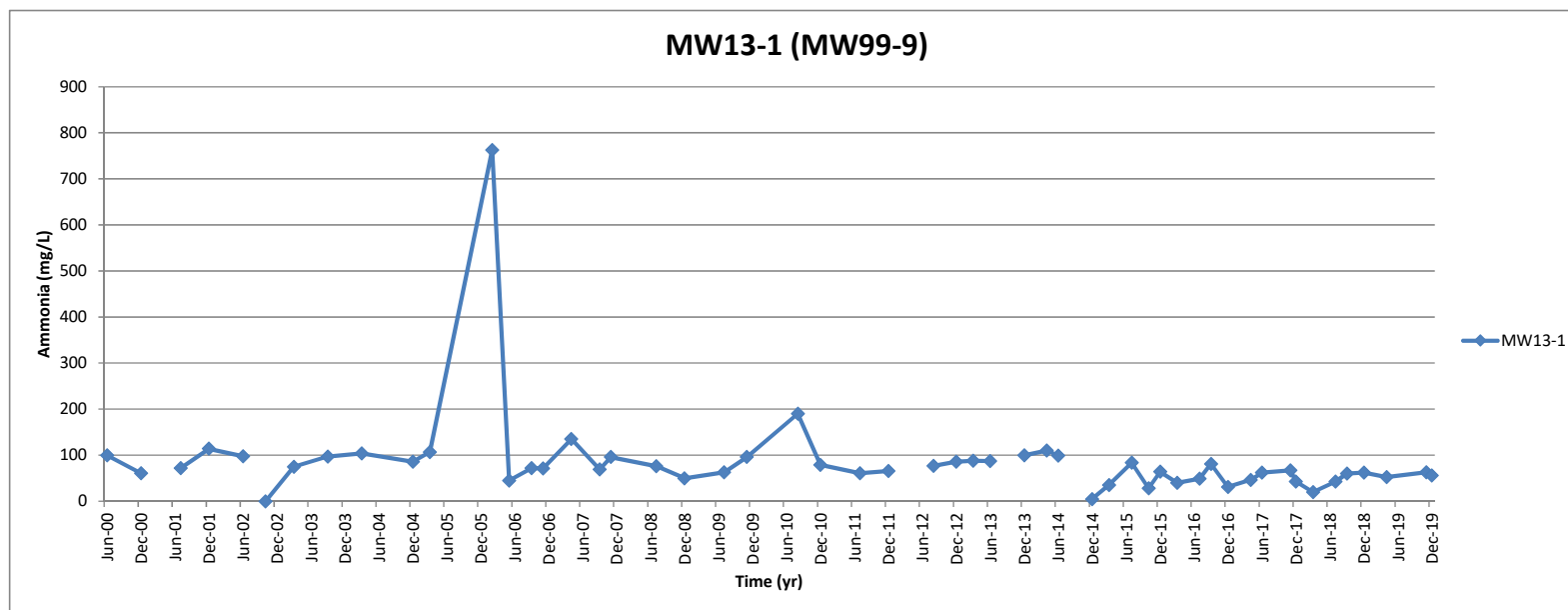


Figure E39
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

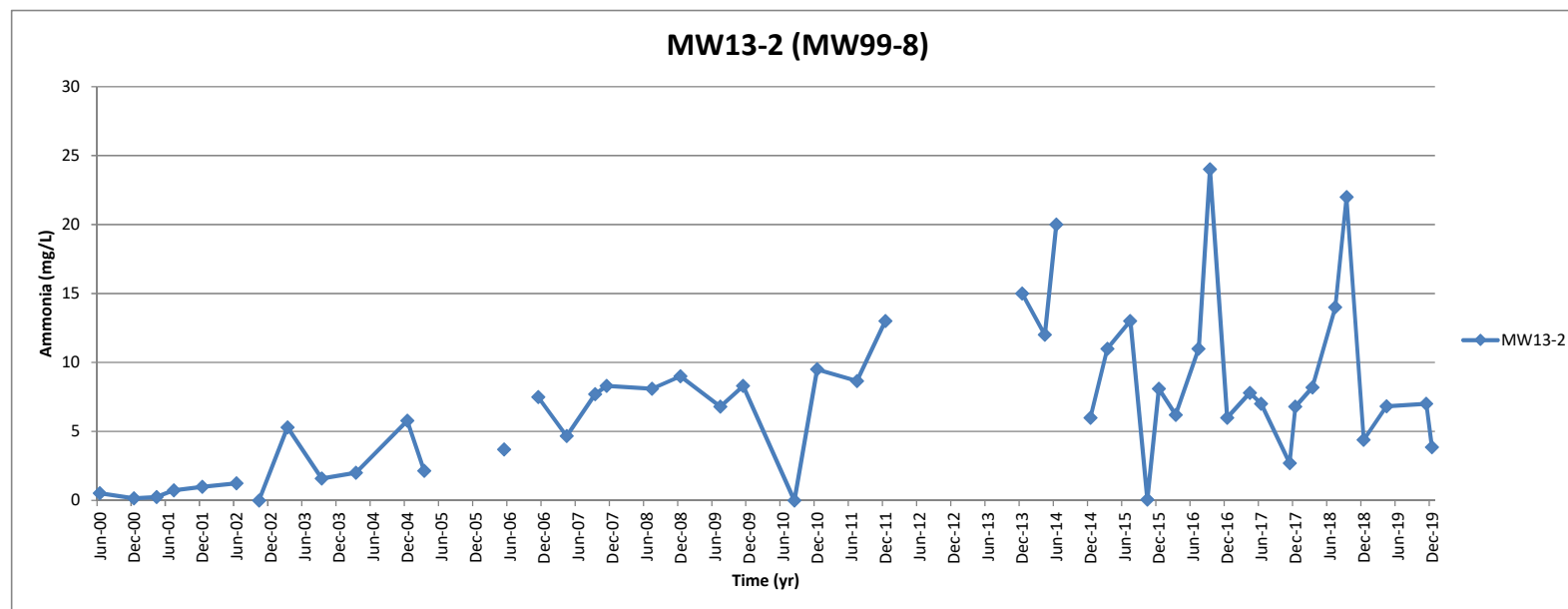


Figure E40
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

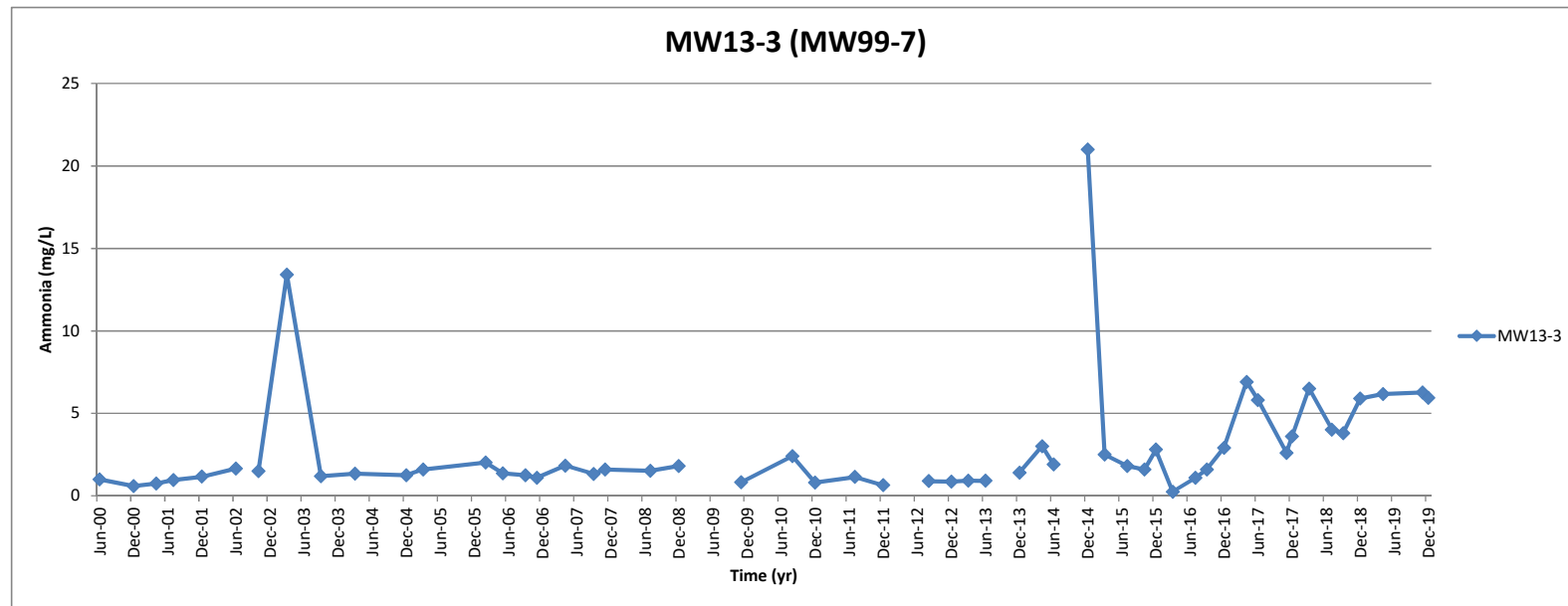


Figure E41
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

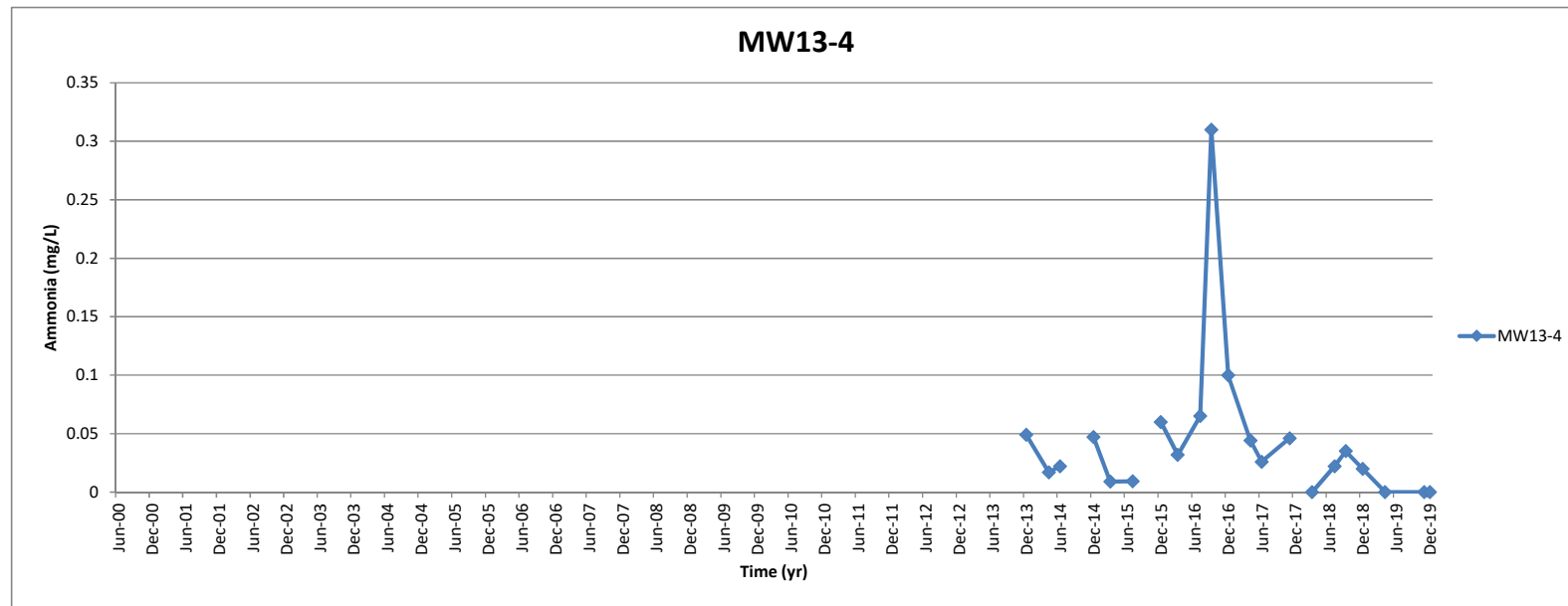


Figure E42
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

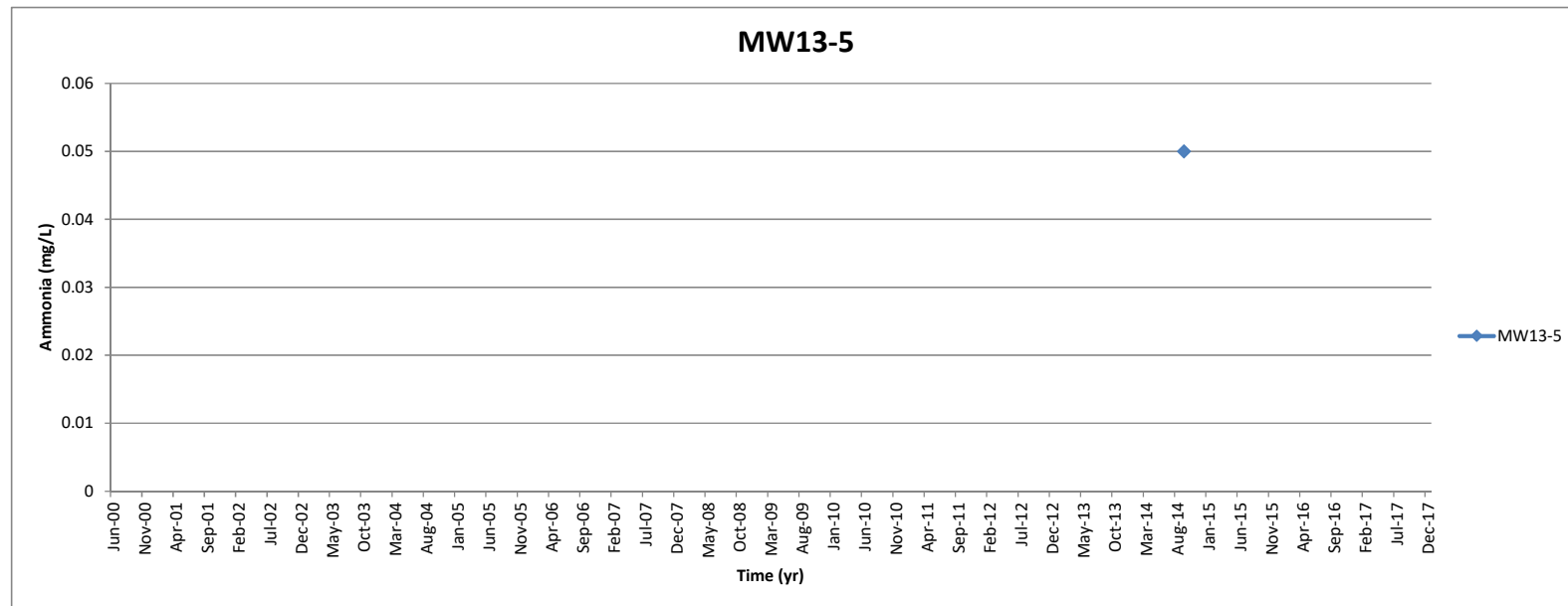


Figure E43
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

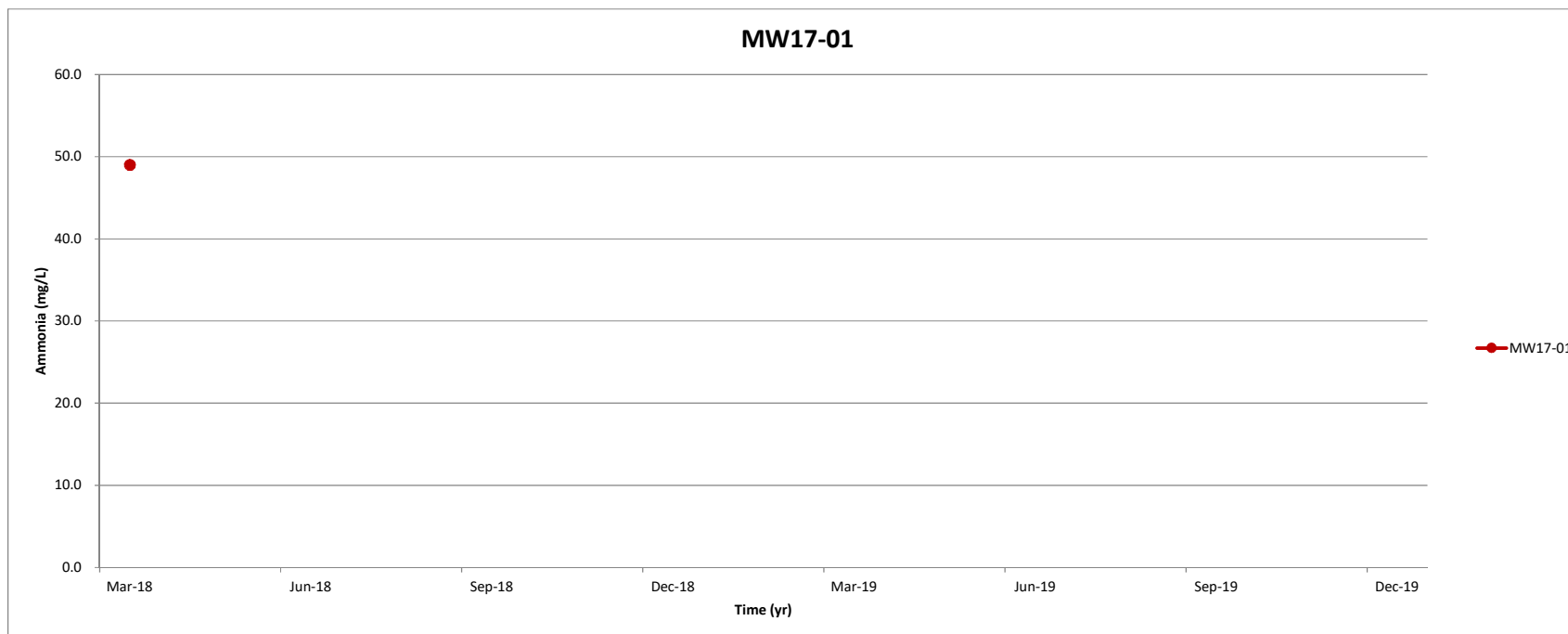


Figure E44
Monitoring Well Locations - Historic Ammonia Concentrations
Sechelt Landfill

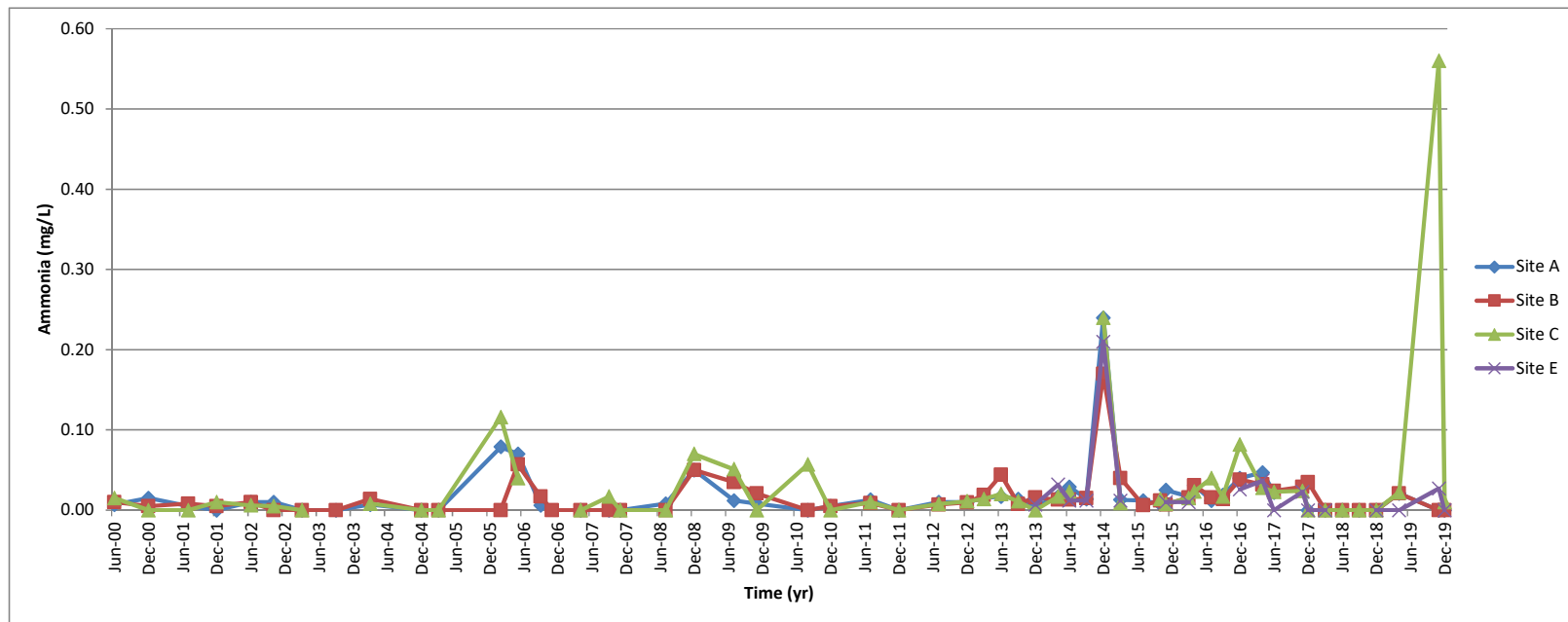


Figure E45
Surface Water Monitoring Locations - Historic Ammonia Concentrations
Sechelt Landfill



APPENDIX F
CERTIFICATES OF LABORATORY ANALYSIS

CERTIFICATE OF ANALYSIS

REPORTED TO Sunshine Coast Regional District
5920 Mason Road
Sechelt, BC V0N3A8

ATTENTION Lynda Fyfe

PO NUMBER

PROJECT SP100543

PROJECT INFO

WORK ORDER 9040895

RECEIVED / TEMP 2019-04-09 11:30 / NA
REPORTED 2019-04-15 18:14

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry



It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve



Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

If you have any questions or concerns, please contact me at bshaw@caro.ca

Authorized By:

Bryan Shaw, Ph.D., P.Chem.
Client Service Coordinator

1-888-311-8846 | www.caro.ca

#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW-13-4 (9040895-01) Matrix: Water Sampled: 2019-04-02 10:37					F1
Anions					
Chloride	1.56	0.10	mg/L	2019-04-11	
Nitrate (as N)	0.121	0.010	mg/L	2019-04-11	HT1
Nitrite (as N)	0.011	0.010	mg/L	2019-04-11	HT1
Sulfate	1.4	1.0	mg/L	2019-04-11	
BCMOE Aggregate Hydrocarbons					
VHw (6-10)	< 100	100	µg/L	2019-04-11	
VPW	< 100	100	µg/L	N/A	
Calculated Parameters					
Hardness, Total (as CaCO ₃)	17.5	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Arsenic, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Barium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Boron, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Cadmium, dissolved	0.000018	0.000010	mg/L	2019-04-11	
Calcium, dissolved	5.67	0.20	mg/L	2019-04-11	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Cobalt, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Copper, dissolved	< 0.00040	0.00040	mg/L	2019-04-11	
Iron, dissolved	< 0.010	0.010	mg/L	2019-04-11	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Lithium, dissolved	0.00029	0.00010	mg/L	2019-04-11	
Magnesium, dissolved	0.802	0.010	mg/L	2019-04-11	
Manganese, dissolved	0.00314	0.00020	mg/L	2019-04-11	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-04-10	
Molybdenum, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Nickel, dissolved	0.00046	0.00040	mg/L	2019-04-11	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-04-11	
Potassium, dissolved	0.47	0.10	mg/L	2019-04-11	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Silicon, dissolved	9.2	1.0	mg/L	2019-04-11	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-11	
Sodium, dissolved	3.18	0.10	mg/L	2019-04-11	
Strontium, dissolved	0.0414	0.0010	mg/L	2019-04-11	
Sulfur, dissolved	< 3.0	3.0	mg/L	2019-04-11	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW-13-4 (9040895-01) Matrix: Water Sampled: 2019-04-02 10:37, Continued					F1
Dissolved Metals, Continued					
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Uranium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Zinc, dissolved	0.0053	0.0040	mg/L	2019-04-11	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
General Parameters					
Alkalinity, Total (as CaCO ₃)	22.4	1.0	mg/L	2019-04-12	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Bicarbonate (as CaCO ₃)	22.4	1.0	mg/L	2019-04-12	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Ammonia, Total (as N)	< 0.020	0.020	mg/L	2019-04-11	
Carbon, Dissolved Organic	< 0.50	0.50	mg/L	2019-04-12	
Chemical Oxygen Demand	< 20	20	mg/L	2019-04-12	
Conductivity (EC)	50.2	2.0	µS/cm	2019-04-12	
Nitrogen, Total Kjeldahl	0.056	0.050	mg/L	2019-04-12	
pH	7.14	0.10	pH units	2019-04-12	HT2
Phosphorus, Total (as P)	0.0390	0.0020	mg/L	2019-04-12	
Turbidity	4.64	0.10	NTU	2019-04-11	
Volatile Organic Compounds (VOC)					
Benzene	< 0.5	0.5	µg/L	2019-04-11	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-04-11	
Bromoform	< 1.0	1.0	µg/L	2019-04-11	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-04-11	
Chlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
Chloroethane	< 2.0	2.0	µg/L	2019-04-11	
Chloroform	< 1.0	1.0	µg/L	2019-04-11	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-04-11	
Dibromomethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-04-11	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW-13-4 (9040895-01) Matrix: Water Sampled: 2019-04-02 10:37, Continued					F1
Volatile Organic Compounds (VOC), Continued					
Dichloromethane	< 3.0	3.0	µg/L	2019-04-11	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-04-11	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-04-11	
Ethylbenzene	< 1.0	1.0	µg/L	2019-04-11	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-04-11	
Styrene	< 1.0	1.0	µg/L	2019-04-11	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-04-11	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Toluene	< 1.0	1.0	µg/L	2019-04-11	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
Trichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-04-11	
Vinyl chloride	< 1.0	1.0	µg/L	2019-04-11	
Xylenes (total)	< 2.0	2.0	µg/L	2019-04-11	
Surrogate: Toluene-d8	87	70-130	%	2019-04-11	
Surrogate: 4-Bromofluorobenzene	92	70-130	%	2019-04-11	
Surrogate: 1,4-Dichlorobenzene-d4	97	70-130	%	2019-04-11	

MW-4 (9040895-02) | Matrix: Water | Sampled: 2019-04-02 10:55

F1

Anions

Chloride	5.42	0.10	mg/L	2019-04-11	
Nitrate (as N)	< 0.010	0.010	mg/L	2019-04-11	HT1
Nitrite (as N)	0.037	0.010	mg/L	2019-04-11	HT1
Sulfate	7.8	1.0	mg/L	2019-04-11	

BCMOE Aggregate Hydrocarbons

VHw (6-10)	< 100	100	µg/L	2019-04-11	
VPHw	< 100	100	µg/L	N/A	

Calculated Parameters

Hardness, Total (as CaCO3)	184	0.500	mg/L	N/A	

Dissolved Metals

Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Antimony, dissolved	0.00028	0.00020	mg/L	2019-04-11	
Arsenic, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Barium, dissolved	0.0635	0.0050	mg/L	2019-04-11	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Boron, dissolved	0.0302	0.0050	mg/L	2019-04-11	
Cadmium, dissolved	0.000454	0.000010	mg/L	2019-04-11	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW-4 (9040895-02) Matrix: Water Sampled: 2019-04-02 10:55, Continued					F1

Dissolved Metals, Continued

Calcium, dissolved	56.9	0.20	mg/L	2019-04-11	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Cobalt, dissolved	0.00792	0.00010	mg/L	2019-04-11	
Copper, dissolved	0.00125	0.00040	mg/L	2019-04-11	
Iron, dissolved	0.216	0.010	mg/L	2019-04-11	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Lithium, dissolved	0.00552	0.00010	mg/L	2019-04-11	
Magnesium, dissolved	10.1	0.010	mg/L	2019-04-11	
Manganese, dissolved	3.48	0.00020	mg/L	2019-04-11	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-04-10	
Molybdenum, dissolved	0.00019	0.00010	mg/L	2019-04-11	
Nickel, dissolved	0.00350	0.00040	mg/L	2019-04-11	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-04-11	
Potassium, dissolved	4.88	0.10	mg/L	2019-04-11	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Silicon, dissolved	14.6	1.0	mg/L	2019-04-11	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-11	
Sodium, dissolved	16.3	0.10	mg/L	2019-04-11	
Strontium, dissolved	0.653	0.0010	mg/L	2019-04-11	
Sulfur, dissolved	< 3.0	3.0	mg/L	2019-04-11	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Uranium, dissolved	0.000251	0.000020	mg/L	2019-04-11	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Zinc, dissolved	0.0248	0.0040	mg/L	2019-04-11	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	

General Parameters

Alkalinity, Total (as CaCO ₃)	226	1.0	mg/L	2019-04-12	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Bicarbonate (as CaCO ₃)	226	1.0	mg/L	2019-04-12	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Ammonia, Total (as N)	0.067	0.020	mg/L	2019-04-11	
Carbon, Dissolved Organic	2.19	0.50	mg/L	2019-04-12	
Chemical Oxygen Demand	< 20	20	mg/L	2019-04-12	
Conductivity (EC)	430	2.0	µS/cm	2019-04-12	
Nitrogen, Total Kjeldahl	0.141	0.050	mg/L	2019-04-12	
pH	6.90	0.10	pH units	2019-04-12	HT2

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW-4 (9040895-02) Matrix: Water Sampled: 2019-04-02 10:55, Continued					F1
General Parameters, Continued					
Phosphorus, Total (as P)	0.0233	0.0020	mg/L	2019-04-12	
Turbidity	10.7	0.10	NTU	2019-04-11	
Volatile Organic Compounds (VOC)					
Benzene	0.7	0.5	µg/L	2019-04-11	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-04-11	
Bromoform	< 1.0	1.0	µg/L	2019-04-11	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-04-11	
Chlorobenzene	2.7	1.0	µg/L	2019-04-11	
Chloroethane	< 2.0	2.0	µg/L	2019-04-11	
Chloroform	< 1.0	1.0	µg/L	2019-04-11	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-04-11	
Dibromomethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-04-11	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Dichloromethane	< 3.0	3.0	µg/L	2019-04-11	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-04-11	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-04-11	
Ethylbenzene	< 1.0	1.0	µg/L	2019-04-11	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-04-11	
Styrene	< 1.0	1.0	µg/L	2019-04-11	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-04-11	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Toluene	< 1.0	1.0	µg/L	2019-04-11	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
Trichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-04-11	
Vinyl chloride	< 1.0	1.0	µg/L	2019-04-11	
Xylenes (total)	< 2.0	2.0	µg/L	2019-04-11	
Surrogate: Toluene-d8	93	70-130	%	2019-04-11	
Surrogate: 4-Bromofluorobenzene	101	70-130	%	2019-04-11	
Surrogate: 1,4-Dichlorobenzene-d4	106	70-130	%	2019-04-11	

MW-2 (9040895-03) | Matrix: Water | Sampled: 2019-04-02 11:20

F1

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW-2 (9040895-03) Matrix: Water Sampled: 2019-04-02 11:20, Continued					F1
Anions					
Chloride	62.9	0.10	mg/L	2019-04-11	
Nitrate (as N)	< 0.010	0.010	mg/L	2019-04-11	HT1
Nitrite (as N)	0.402	0.010	mg/L	2019-04-11	HT1
Sulfate	96.6	1.0	mg/L	2019-04-11	
BCMOE Aggregate Hydrocarbons					
VHw (6-10)	< 100	100	µg/L	2019-04-11	
VPW	< 100	100	µg/L	N/A	
Calculated Parameters					
Hardness, Total (as CaCO ₃)	271	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Arsenic, dissolved	0.00104	0.00050	mg/L	2019-04-11	
Barium, dissolved	0.0246	0.0050	mg/L	2019-04-11	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Boron, dissolved	0.254	0.0050	mg/L	2019-04-11	
Cadmium, dissolved	< 0.000010	0.000010	mg/L	2019-04-11	
Calcium, dissolved	85.8	0.20	mg/L	2019-04-11	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Cobalt, dissolved	0.00169	0.00010	mg/L	2019-04-11	
Copper, dissolved	0.00059	0.00040	mg/L	2019-04-11	
Iron, dissolved	0.013	0.010	mg/L	2019-04-11	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Lithium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Magnesium, dissolved	13.8	0.010	mg/L	2019-04-11	
Manganese, dissolved	14.6	0.00020	mg/L	2019-04-12	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-04-10	
Molybdenum, dissolved	0.00110	0.00010	mg/L	2019-04-11	
Nickel, dissolved	0.00175	0.00040	mg/L	2019-04-11	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-04-11	
Potassium, dissolved	2.04	0.10	mg/L	2019-04-11	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Silicon, dissolved	12.1	1.0	mg/L	2019-04-11	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-11	
Sodium, dissolved	19.1	0.10	mg/L	2019-04-11	
Strontium, dissolved	1.49	0.0010	mg/L	2019-04-11	
Sulfur, dissolved	36.5	3.0	mg/L	2019-04-11	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW-2 (9040895-03) Matrix: Water Sampled: 2019-04-02 11:20, Continued					F1
Dissolved Metals, Continued					
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Uranium, dissolved	0.00168	0.000020	mg/L	2019-04-11	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Zinc, dissolved	0.0360	0.0040	mg/L	2019-04-11	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
General Parameters					
Alkalinity, Total (as CaCO ₃)	160	1.0	mg/L	2019-04-12	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Bicarbonate (as CaCO ₃)	160	1.0	mg/L	2019-04-12	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Ammonia, Total (as N)	0.057	0.020	mg/L	2019-04-11	
Carbon, Dissolved Organic	3.99	0.50	mg/L	2019-04-12	
Chemical Oxygen Demand	32	20	mg/L	2019-04-12	
Conductivity (EC)	714	2.0	µS/cm	2019-04-12	
Nitrogen, Total Kjeldahl	0.539	0.050	mg/L	2019-04-12	
pH	7.34	0.10	pH units	2019-04-12	HT2
Phosphorus, Total (as P)	0.0517	0.0020	mg/L	2019-04-12	
Turbidity	1.87	0.10	NTU	2019-04-11	
Volatile Organic Compounds (VOC)					
Benzene	< 0.5	0.5	µg/L	2019-04-11	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-04-11	
Bromoform	< 1.0	1.0	µg/L	2019-04-11	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-04-11	
Chlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
Chloroethane	< 2.0	2.0	µg/L	2019-04-11	
Chloroform	< 1.0	1.0	µg/L	2019-04-11	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-04-11	
Dibromomethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-04-11	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW-2 (9040895-03) Matrix: Water Sampled: 2019-04-02 11:20, Continued					F1
Volatile Organic Compounds (VOC), Continued					
Dichloromethane	< 3.0	3.0	µg/L	2019-04-11	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-04-11	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-04-11	
Ethylbenzene	< 1.0	1.0	µg/L	2019-04-11	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-04-11	
Styrene	< 1.0	1.0	µg/L	2019-04-11	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-04-11	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Toluene	< 1.0	1.0	µg/L	2019-04-11	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
Trichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-04-11	
Vinyl chloride	< 1.0	1.0	µg/L	2019-04-11	
Xylenes (total)	< 2.0	2.0	µg/L	2019-04-11	
Surrogate: Toluene-d8	87	70-130	%	2019-04-11	
Surrogate: 4-Bromofluorobenzene	93	70-130	%	2019-04-11	
Surrogate: 1,4-Dichlorobenzene-d4	99	70-130	%	2019-04-11	

MW-2A (9040895-04) | Matrix: Water | Sampled: 2019-04-02 11:47

F1

Anions

Chloride	37.6	0.10	mg/L	2019-04-11	
Nitrate (as N)	< 0.010	0.010	mg/L	2019-04-11	HT1
Nitrite (as N)	0.266	0.010	mg/L	2019-04-11	HT1
Sulfate	< 1.0	1.0	mg/L	2019-04-11	

BCMOE Aggregate Hydrocarbons

VHw (6-10)	480	100	µg/L	2019-04-11	
VPHw	< 100	100	µg/L	N/A	

Calculated Parameters

Hardness, Total (as CaCO3)	165	0.500	mg/L	N/A	

Dissolved Metals

Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Antimony, dissolved	0.00025	0.00020	mg/L	2019-04-11	
Arsenic, dissolved	0.00159	0.00050	mg/L	2019-04-11	
Barium, dissolved	0.0852	0.0050	mg/L	2019-04-11	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Boron, dissolved	0.286	0.0050	mg/L	2019-04-11	
Cadmium, dissolved	0.000019	0.000010	mg/L	2019-04-11	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW-2A (9040895-04) Matrix: Water Sampled: 2019-04-02 11:47, Continued					F1

Dissolved Metals, Continued

Calcium, dissolved	50.4	0.20	mg/L	2019-04-11	
Chromium, dissolved	0.00119	0.00050	mg/L	2019-04-11	
Cobalt, dissolved	0.00293	0.00010	mg/L	2019-04-11	
Copper, dissolved	< 0.00040	0.00040	mg/L	2019-04-11	
Iron, dissolved	0.338	0.010	mg/L	2019-04-11	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Lithium, dissolved	0.00158	0.00010	mg/L	2019-04-11	
Magnesium, dissolved	9.54	0.010	mg/L	2019-04-11	
Manganese, dissolved	1.34	0.00020	mg/L	2019-04-11	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-04-10	
Molybdenum, dissolved	0.00053	0.00010	mg/L	2019-04-11	
Nickel, dissolved	0.00319	0.00040	mg/L	2019-04-11	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-04-11	
Potassium, dissolved	16.3	0.10	mg/L	2019-04-11	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Silicon, dissolved	4.9	1.0	mg/L	2019-04-11	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-11	
Sodium, dissolved	32.2	0.10	mg/L	2019-04-11	
Strontium, dissolved	0.547	0.0010	mg/L	2019-04-11	
Sulfur, dissolved	< 3.0	3.0	mg/L	2019-04-11	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Uranium, dissolved	0.000094	0.000020	mg/L	2019-04-11	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-04-11	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	

General Parameters

Alkalinity, Total (as CaCO ₃)	256	1.0	mg/L	2019-04-12	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Bicarbonate (as CaCO ₃)	256	1.0	mg/L	2019-04-12	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Ammonia, Total (as N)	10.9	0.020	mg/L	2019-04-11	
Carbon, Dissolved Organic	11.0	0.50	mg/L	2019-04-12	
Chemical Oxygen Demand	54	20	mg/L	2019-04-12	
Conductivity (EC)	623	2.0	µS/cm	2019-04-12	
Nitrogen, Total Kjeldahl	13.1	0.050	mg/L	2019-04-12	
pH	7.63	0.10	pH units	2019-04-12	HT2

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW-2A (9040895-04) Matrix: Water Sampled: 2019-04-02 11:47, Continued					F1
<i>General Parameters, Continued</i>					
Phosphorus, Total (as P)	0.405	0.0020	mg/L	2019-04-12	
Turbidity	28.1	0.10	NTU	2019-04-11	
<i>Volatile Organic Compounds (VOC)</i>					
Benzene	< 0.5	0.5	µg/L	2019-04-11	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-04-11	
Bromoform	< 1.0	1.0	µg/L	2019-04-11	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-04-11	
Chlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
Chloroethane	< 2.0	2.0	µg/L	2019-04-11	
Chloroform	< 1.0	1.0	µg/L	2019-04-11	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-04-11	
Dibromomethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-04-11	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Dichloromethane	< 3.0	3.0	µg/L	2019-04-11	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-04-11	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-04-11	
Ethylbenzene	< 1.0	1.0	µg/L	2019-04-11	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-04-11	
Styrene	< 1.0	1.0	µg/L	2019-04-11	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-04-11	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Toluene	544	1.0	µg/L	2019-04-12	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
Trichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-04-11	
Vinyl chloride	< 1.0	1.0	µg/L	2019-04-11	
Xylenes (total)	< 2.0	2.0	µg/L	2019-04-11	
Surrogate: Toluene-d8	85	70-130	%	2019-04-11	
Surrogate: 4-Bromofluorobenzene	89	70-130	%	2019-04-11	
Surrogate: 1,4-Dichlorobenzene-d4	95	70-130	%	2019-04-11	

MW-00 (9040895-05) | Matrix: Water | Sampled: 2019-04-02 11:55

F1

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW-00 (9040895-05) Matrix: Water Sampled: 2019-04-02 11:55, Continued					F1
Anions					
Chloride	38.6	0.10	mg/L	2019-04-11	
Nitrate (as N)	< 0.010	0.010	mg/L	2019-04-11	HT1
Nitrite (as N)	0.269	0.010	mg/L	2019-04-11	HT1
Sulfate	< 1.0	1.0	mg/L	2019-04-11	
BCMOE Aggregate Hydrocarbons					
VHw (6-10)	513	100	µg/L	2019-04-11	
VPW	< 100	100	µg/L	N/A	
Calculated Parameters					
Hardness, Total (as CaCO ₃)	167	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Antimony, dissolved	0.00028	0.00020	mg/L	2019-04-11	
Arsenic, dissolved	0.00156	0.00050	mg/L	2019-04-11	
Barium, dissolved	0.0829	0.0050	mg/L	2019-04-11	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Boron, dissolved	0.292	0.0050	mg/L	2019-04-11	
Cadmium, dissolved	0.000030	0.000010	mg/L	2019-04-11	
Calcium, dissolved	50.8	0.20	mg/L	2019-04-11	
Chromium, dissolved	0.00123	0.00050	mg/L	2019-04-11	
Cobalt, dissolved	0.00289	0.00010	mg/L	2019-04-11	
Copper, dissolved	< 0.00040	0.00040	mg/L	2019-04-11	
Iron, dissolved	0.386	0.010	mg/L	2019-04-11	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Lithium, dissolved	0.00154	0.00010	mg/L	2019-04-11	
Magnesium, dissolved	9.64	0.010	mg/L	2019-04-11	
Manganese, dissolved	1.35	0.00020	mg/L	2019-04-11	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-04-10	
Molybdenum, dissolved	0.00054	0.00010	mg/L	2019-04-11	
Nickel, dissolved	0.00314	0.00040	mg/L	2019-04-11	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-04-11	
Potassium, dissolved	16.2	0.10	mg/L	2019-04-11	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Silicon, dissolved	4.8	1.0	mg/L	2019-04-11	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-11	
Sodium, dissolved	32.3	0.10	mg/L	2019-04-11	
Strontium, dissolved	0.555	0.0010	mg/L	2019-04-11	
Sulfur, dissolved	< 3.0	3.0	mg/L	2019-04-11	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	

TEST RESULTS

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Analyte	Result	RL	Units	Analyzed	Qualifier
MW-00 (9040895-05) Matrix: Water Sampled: 2019-04-02 11:55, Continued					F1
Dissolved Metals, Continued					
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Uranium, dissolved	0.000040	0.000020	mg/L	2019-04-11	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Zinc, dissolved	0.0183	0.0040	mg/L	2019-04-11	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
General Parameters					
Alkalinity, Total (as CaCO ₃)	258	1.0	mg/L	2019-04-12	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Bicarbonate (as CaCO ₃)	258	1.0	mg/L	2019-04-12	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Ammonia, Total (as N)	11.2	0.020	mg/L	2019-04-11	
Carbon, Dissolved Organic	11.3	0.50	mg/L	2019-04-12	
Chemical Oxygen Demand	56	20	mg/L	2019-04-12	
Conductivity (EC)	622	2.0	µS/cm	2019-04-12	
Nitrogen, Total Kjeldahl	12.7	0.050	mg/L	2019-04-12	
pH	7.59	0.10	pH units	2019-04-12	HT2
Phosphorus, Total (as P)	0.403	0.0020	mg/L	2019-04-12	
Turbidity	18.0	0.10	NTU	2019-04-11	
Volatile Organic Compounds (VOC)					
Benzene	< 0.5	0.5	µg/L	2019-04-11	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-04-11	
Bromoform	< 1.0	1.0	µg/L	2019-04-11	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-04-11	
Chlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
Chloroethane	< 2.0	2.0	µg/L	2019-04-11	
Chloroform	< 1.0	1.0	µg/L	2019-04-11	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-04-11	
Dibromomethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-04-11	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	

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Analyte	Result	RL	Units	Analyzed	Qualifier

MW-00 (9040895-05) | Matrix: Water | Sampled: 2019-04-02 11:55, Continued

F1

Volatile Organic Compounds (VOC), Continued

Dichloromethane	< 3.0	3.0	µg/L	2019-04-11	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-04-11	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-04-11	
Ethylbenzene	< 1.0	1.0	µg/L	2019-04-11	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-04-11	
Styrene	< 1.0	1.0	µg/L	2019-04-11	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-04-11	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Toluene	521	1.0	µg/L	2019-04-12	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
Trichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-04-11	
Vinyl chloride	< 1.0	1.0	µg/L	2019-04-11	
Xylenes (total)	< 2.0	2.0	µg/L	2019-04-11	
Surrogate: Toluene-d8	86	70-130	%	2019-04-11	
Surrogate: 4-Bromofluorobenzene	92	70-130	%	2019-04-11	
Surrogate: 1,4-Dichlorobenzene-d4	96	70-130	%	2019-04-11	

MW 3 (9040895-06) | Matrix: Water | Sampled: 2019-04-02 12:11

F1

Anions

Chloride	41.6	0.10	mg/L	2019-04-11	
Nitrate (as N)	0.020	0.010	mg/L	2019-04-11	HT1
Nitrite (as N)	0.297	0.010	mg/L	2019-04-11	HT1
Sulfate	2.7	1.0	mg/L	2019-04-11	

BCMOE Aggregate Hydrocarbons

VHw (6-10)	< 100	100	µg/L	2019-04-11	
VPHw	< 100	100	µg/L	N/A	

Calculated Parameters

Hardness, Total (as CaCO3)	164	0.500	mg/L	N/A	

Dissolved Metals

Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Antimony, dissolved	0.00054	0.00020	mg/L	2019-04-11	
Arsenic, dissolved	0.00071	0.00050	mg/L	2019-04-11	
Barium, dissolved	0.210	0.0050	mg/L	2019-04-11	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Boron, dissolved	0.415	0.0050	mg/L	2019-04-11	
Cadmium, dissolved	0.000051	0.000010	mg/L	2019-04-11	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040895
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Analyte	Result	RL	Units	Analyzed	Qualifier
MW 3 (9040895-06) Matrix: Water Sampled: 2019-04-02 12:11, Continued					F1

Dissolved Metals, Continued

Calcium, dissolved	47.3	0.20	mg/L	2019-04-11	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Cobalt, dissolved	0.00037	0.00010	mg/L	2019-04-11	
Copper, dissolved	0.00077	0.00040	mg/L	2019-04-11	
Iron, dissolved	0.011	0.010	mg/L	2019-04-11	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Lithium, dissolved	0.00048	0.00010	mg/L	2019-04-11	
Magnesium, dissolved	11.1	0.010	mg/L	2019-04-11	
Manganese, dissolved	0.779	0.00020	mg/L	2019-04-11	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-04-10	
Molybdenum, dissolved	0.00016	0.00010	mg/L	2019-04-11	
Nickel, dissolved	0.00217	0.00040	mg/L	2019-04-11	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-04-11	
Potassium, dissolved	18.3	0.10	mg/L	2019-04-11	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Silicon, dissolved	3.3	1.0	mg/L	2019-04-11	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-11	
Sodium, dissolved	38.5	0.10	mg/L	2019-04-11	
Strontium, dissolved	0.325	0.0010	mg/L	2019-04-11	
Sulfur, dissolved	< 3.0	3.0	mg/L	2019-04-11	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Uranium, dissolved	0.000031	0.000020	mg/L	2019-04-11	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Zinc, dissolved	0.0063	0.0040	mg/L	2019-04-11	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	

General Parameters

Alkalinity, Total (as CaCO ₃)	268	1.0	mg/L	2019-04-12	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Bicarbonate (as CaCO ₃)	268	1.0	mg/L	2019-04-12	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Ammonia, Total (as N)	13.0	0.020	mg/L	2019-04-11	
Carbon, Dissolved Organic	9.62	0.50	mg/L	2019-04-12	
Chemical Oxygen Demand	48	20	mg/L	2019-04-12	
Conductivity (EC)	651	2.0	µS/cm	2019-04-12	
Nitrogen, Total Kjeldahl	13.4	0.050	mg/L	2019-04-12	
pH	7.64	0.10	pH units	2019-04-12	HT2

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW 3 (9040895-06) Matrix: Water Sampled: 2019-04-02 12:11, Continued					F1
<i>General Parameters, Continued</i>					
Phosphorus, Total (as P)	0.0833	0.0020	mg/L	2019-04-12	
Turbidity	20.0	0.10	NTU	2019-04-11	
<i>Volatile Organic Compounds (VOC)</i>					
Benzene	< 0.5	0.5	µg/L	2019-04-11	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-04-11	
Bromoform	< 1.0	1.0	µg/L	2019-04-11	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-04-11	
Chlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
Chloroethane	< 2.0	2.0	µg/L	2019-04-11	
Chloroform	< 1.0	1.0	µg/L	2019-04-11	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-04-11	
Dibromomethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-04-11	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Dichloromethane	< 3.0	3.0	µg/L	2019-04-11	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-04-11	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-04-11	
Ethylbenzene	< 1.0	1.0	µg/L	2019-04-11	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-04-11	
Styrene	< 1.0	1.0	µg/L	2019-04-11	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-04-11	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Toluene	< 1.0	1.0	µg/L	2019-04-11	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
Trichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-04-11	
Vinyl chloride	< 1.0	1.0	µg/L	2019-04-11	
Xylenes (total)	< 2.0	2.0	µg/L	2019-04-11	
Surrogate: Toluene-d8	85	70-130	%	2019-04-11	
Surrogate: 4-Bromofluorobenzene	91	70-130	%	2019-04-11	
Surrogate: 1,4-Dichlorobenzene-d4	97	70-130	%	2019-04-11	

MW 13-3 (9040895-07) | Matrix: Water | Sampled: 2019-04-02 12:27

F1

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW 13-3 (9040895-07) Matrix: Water Sampled: 2019-04-02 12:27, Continued					F1
Anions					
Chloride	17.8	0.10	mg/L	2019-04-11	
Nitrate (as N)	0.022	0.010	mg/L	2019-04-11	HT1
Nitrite (as N)	0.106	0.010	mg/L	2019-04-11	HT1
Sulfate	60.2	1.0	mg/L	2019-04-11	
BCMOE Aggregate Hydrocarbons					
VHw (6-10)	< 100	100	µg/L	2019-04-11	
VPW	< 100	100	µg/L	N/A	
Calculated Parameters					
Hardness, Total (as CaCO ₃)	213	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Arsenic, dissolved	0.00070	0.00050	mg/L	2019-04-11	
Barium, dissolved	0.112	0.0050	mg/L	2019-04-11	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Boron, dissolved	0.178	0.0050	mg/L	2019-04-11	
Cadmium, dissolved	0.000012	0.000010	mg/L	2019-04-11	
Calcium, dissolved	70.4	0.20	mg/L	2019-04-11	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Cobalt, dissolved	0.00232	0.00010	mg/L	2019-04-11	
Copper, dissolved	0.00043	0.00040	mg/L	2019-04-11	
Iron, dissolved	0.043	0.010	mg/L	2019-04-11	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Lithium, dissolved	0.00958	0.00010	mg/L	2019-04-11	
Magnesium, dissolved	9.05	0.010	mg/L	2019-04-11	
Manganese, dissolved	8.51	0.00020	mg/L	2019-04-11	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-04-10	
Molybdenum, dissolved	0.00065	0.00010	mg/L	2019-04-11	
Nickel, dissolved	0.00639	0.00040	mg/L	2019-04-11	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-04-11	
Potassium, dissolved	6.44	0.10	mg/L	2019-04-11	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Silicon, dissolved	14.2	1.0	mg/L	2019-04-11	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-11	
Sodium, dissolved	44.0	0.10	mg/L	2019-04-11	
Strontium, dissolved	1.39	0.0010	mg/L	2019-04-11	
Sulfur, dissolved	19.4	3.0	mg/L	2019-04-11	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040895
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Analyte	Result	RL	Units	Analyzed	Qualifier
MW 13-3 (9040895-07) Matrix: Water Sampled: 2019-04-02 12:27, Continued					F1
Dissolved Metals, Continued					
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Uranium, dissolved	0.00123	0.000020	mg/L	2019-04-11	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Zinc, dissolved	0.0093	0.0040	mg/L	2019-04-11	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
General Parameters					
Alkalinity, Total (as CaCO ₃)	295	1.0	mg/L	2019-04-12	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Bicarbonate (as CaCO ₃)	295	1.0	mg/L	2019-04-12	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Ammonia, Total (as N)	6.17	0.020	mg/L	2019-04-11	
Carbon, Dissolved Organic	6.15	0.50	mg/L	2019-04-12	
Chemical Oxygen Demand	135	20	mg/L	2019-04-12	
Conductivity (EC)	708	2.0	µS/cm	2019-04-12	
Nitrogen, Total Kjeldahl	6.93	0.050	mg/L	2019-04-12	
pH	6.90	0.10	pH units	2019-04-12	HT2
Phosphorus, Total (as P)	1.15	0.0020	mg/L	2019-04-12	
Turbidity	1180	0.10	NTU	2019-04-11	
Volatile Organic Compounds (VOC)					
Benzene	1.1	0.5	µg/L	2019-04-11	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-04-11	
Bromoform	< 1.0	1.0	µg/L	2019-04-11	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-04-11	
Chlorobenzene	2.9	1.0	µg/L	2019-04-11	
Chloroethane	< 2.0	2.0	µg/L	2019-04-11	
Chloroform	< 1.0	1.0	µg/L	2019-04-11	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-04-11	
Dibromomethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-04-11	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,4-Dichlorobenzene	1.5	1.0	µg/L	2019-04-11	
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	

TEST RESULTS

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Analyte	Result	RL	Units	Analyzed	Qualifier
MW 13-3 (9040895-07) Matrix: Water Sampled: 2019-04-02 12:27, Continued					F1

Volatile Organic Compounds (VOC), Continued

Dichloromethane	< 3.0	3.0	µg/L	2019-04-11	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-04-11	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-04-11	
Ethylbenzene	< 1.0	1.0	µg/L	2019-04-11	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-04-11	
Styrene	< 1.0	1.0	µg/L	2019-04-11	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-04-11	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Toluene	< 1.0	1.0	µg/L	2019-04-11	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
Trichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-04-11	
Vinyl chloride	< 1.0	1.0	µg/L	2019-04-11	
Xylenes (total)	< 2.0	2.0	µg/L	2019-04-11	
Surrogate: Toluene-d8	86	70-130	%	2019-04-11	
Surrogate: 4-Bromofluorobenzene	91	70-130	%	2019-04-11	
Surrogate: 1,4-Dichlorobenzene-d4	98	70-130	%	2019-04-11	

MW 13-2 (9040895-08) | Matrix: Water | Sampled: 2019-04-02 12:48 F1

Anions

Chloride	8.08	0.10	mg/L	2019-04-11	
Nitrate (as N)	< 0.010	0.010	mg/L	2019-04-11	HT1
Nitrite (as N)	0.048	0.010	mg/L	2019-04-11	HT1
Sulfate	11.7	1.0	mg/L	2019-04-11	

BCMOE Aggregate Hydrocarbons

VHw (6-10)	< 100	100	µg/L	2019-04-11	
VPHw	< 100	100	µg/L	N/A	

Calculated Parameters

Hardness, Total (as CaCO3)	205	0.500	mg/L	N/A	

Dissolved Metals

Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Arsenic, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Barium, dissolved	0.0969	0.0050	mg/L	2019-04-11	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Boron, dissolved	0.178	0.0050	mg/L	2019-04-11	
Cadmium, dissolved	0.000333	0.000010	mg/L	2019-04-11	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040895
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Analyte	Result	RL	Units	Analyzed	Qualifier
MW 13-2 (9040895-08) Matrix: Water Sampled: 2019-04-02 12:48, Continued					F1

Dissolved Metals, Continued

Calcium, dissolved	67.0	0.20	mg/L	2019-04-11	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Cobalt, dissolved	0.00235	0.00010	mg/L	2019-04-11	
Copper, dissolved	0.00215	0.00040	mg/L	2019-04-11	
Iron, dissolved	< 0.010	0.010	mg/L	2019-04-11	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Lithium, dissolved	0.00238	0.00010	mg/L	2019-04-11	
Magnesium, dissolved	9.10	0.010	mg/L	2019-04-11	
Manganese, dissolved	7.03	0.00020	mg/L	2019-04-11	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-04-10	
Molybdenum, dissolved	0.00041	0.00010	mg/L	2019-04-11	
Nickel, dissolved	0.00293	0.00040	mg/L	2019-04-11	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-04-11	
Potassium, dissolved	10.6	0.10	mg/L	2019-04-11	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Silicon, dissolved	12.5	1.0	mg/L	2019-04-11	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-11	
Sodium, dissolved	25.5	0.10	mg/L	2019-04-11	
Strontium, dissolved	0.946	0.0010	mg/L	2019-04-11	
Sulfur, dissolved	< 3.0	3.0	mg/L	2019-04-11	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Thallium, dissolved	0.000058	0.000020	mg/L	2019-04-11	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Uranium, dissolved	0.000280	0.000020	mg/L	2019-04-11	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Zinc, dissolved	0.0197	0.0040	mg/L	2019-04-11	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	

General Parameters

Alkalinity, Total (as CaCO3)	315	1.0	mg/L	2019-04-12	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Bicarbonate (as CaCO3)	315	1.0	mg/L	2019-04-12	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L	2019-04-12	
Ammonia, Total (as N)	6.82	0.020	mg/L	2019-04-11	
Carbon, Dissolved Organic	5.00	0.50	mg/L	2019-04-12	
Chemical Oxygen Demand	73	20	mg/L	2019-04-12	
Conductivity (EC)	622	2.0	µS/cm	2019-04-12	
Nitrogen, Total Kjeldahl	7.79	0.050	mg/L	2019-04-12	
pH	7.05	0.10	pH units	2019-04-12	HT2

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW 13-2 (9040895-08) Matrix: Water Sampled: 2019-04-02 12:48, Continued					F1
<i>General Parameters, Continued</i>					
Phosphorus, Total (as P)	0.732	0.0020	mg/L	2019-04-12	
Turbidity	801	0.10	NTU	2019-04-11	
<i>Volatile Organic Compounds (VOC)</i>					
Benzene	0.6	0.5	µg/L	2019-04-11	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-04-11	
Bromoform	< 1.0	1.0	µg/L	2019-04-11	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-04-11	
Chlorobenzene	1.6	1.0	µg/L	2019-04-11	
Chloroethane	2.0	2.0	µg/L	2019-04-11	
Chloroform	< 1.0	1.0	µg/L	2019-04-11	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-04-11	
Dibromomethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-04-11	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Dichloromethane	< 3.0	3.0	µg/L	2019-04-11	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-04-11	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-04-11	
Ethylbenzene	< 1.0	1.0	µg/L	2019-04-11	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-04-11	
Styrene	< 1.0	1.0	µg/L	2019-04-11	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-04-11	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Toluene	< 1.0	1.0	µg/L	2019-04-11	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
Trichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-04-11	
Vinyl chloride	< 1.0	1.0	µg/L	2019-04-11	
Xylenes (total)	< 2.0	2.0	µg/L	2019-04-11	
Surrogate: Toluene-d8	90	70-130	%	2019-04-11	
Surrogate: 4-Bromofluorobenzene	96	70-130	%	2019-04-11	
Surrogate: 1,4-Dichlorobenzene-d4	103	70-130	%	2019-04-11	

MW 13-1 (9040895-09) | Matrix: Water | Sampled: 2019-04-02 13:10

F1

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL	Units	Analyzed	Qualifier
MW 13-1 (9040895-09) Matrix: Water Sampled: 2019-04-02 13:10, Continued					F1
Anions					
Chloride	17.4	0.10	mg/L	2019-04-11	
Nitrate (as N)	< 0.010	0.010	mg/L	2019-04-11	HT1
Nitrite (as N)	0.109	0.010	mg/L	2019-04-11	HT1
Sulfate	3.2	1.0	mg/L	2019-04-11	
BCMOE Aggregate Hydrocarbons					
VHw (6-10)	< 100	100	µg/L	2019-04-11	
VPW	< 100	100	µg/L	N/A	
Calculated Parameters					
Hardness, Total (as CaCO ₃)	231	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Arsenic, dissolved	0.00140	0.00050	mg/L	2019-04-11	
Barium, dissolved	0.0845	0.0050	mg/L	2019-04-11	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Boron, dissolved	0.126	0.0050	mg/L	2019-04-11	
Cadmium, dissolved	< 0.000010	0.000010	mg/L	2019-04-11	
Calcium, dissolved	75.2	0.20	mg/L	2019-04-11	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Cobalt, dissolved	0.00425	0.00010	mg/L	2019-04-11	
Copper, dissolved	< 0.00040	0.00040	mg/L	2019-04-11	
Iron, dissolved	< 0.010	0.010	mg/L	2019-04-11	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Lithium, dissolved	0.00182	0.00010	mg/L	2019-04-11	
Magnesium, dissolved	10.4	0.010	mg/L	2019-04-11	
Manganese, dissolved	6.21	0.00020	mg/L	2019-04-11	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-04-10	
Molybdenum, dissolved	0.00065	0.00010	mg/L	2019-04-11	
Nickel, dissolved	0.00208	0.00040	mg/L	2019-04-11	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-04-11	
Potassium, dissolved	12.6	0.10	mg/L	2019-04-11	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Silicon, dissolved	14.4	1.0	mg/L	2019-04-11	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-11	
Sodium, dissolved	36.3	0.10	mg/L	2019-04-11	
Strontium, dissolved	1.37	0.0010	mg/L	2019-04-11	
Sulfur, dissolved	< 3.0	3.0	mg/L	2019-04-11	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040895
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Analyte	Result	RL	Units	Analyzed	Qualifier
MW 13-1 (9040895-09) Matrix: Water Sampled: 2019-04-02 13:10, Continued					F1
Dissolved Metals, Continued					
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Uranium, dissolved	0.000550	0.000020	mg/L	2019-04-11	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Zinc, dissolved	0.0063	0.0040	mg/L	2019-04-11	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
General Parameters					
Alkalinity, Total (as CaCO ₃)	528	1.0	mg/L	2019-04-12	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Bicarbonate (as CaCO ₃)	528	1.0	mg/L	2019-04-12	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Ammonia, Total (as N)	52.7	0.020	mg/L	2019-04-11	
Carbon, Dissolved Organic	6.27	0.50	mg/L	2019-04-12	
Chemical Oxygen Demand	34	20	mg/L	2019-04-12	
Conductivity (EC)	1040	2.0	µS/cm	2019-04-12	
Nitrogen, Total Kjeldahl	52.8	0.050	mg/L	2019-04-12	
pH	7.46	0.10	pH units	2019-04-12	HT2
Phosphorus, Total (as P)	0.202	0.0020	mg/L	2019-04-12	
Turbidity	101	0.10	NTU	2019-04-11	
Volatile Organic Compounds (VOC)					
Benzene	1.0	0.5	µg/L	2019-04-11	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-04-11	
Bromoform	< 1.0	1.0	µg/L	2019-04-11	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-04-11	
Chlorobenzene	5.1	1.0	µg/L	2019-04-11	
Chloroethane	< 2.0	2.0	µg/L	2019-04-11	
Chloroform	< 1.0	1.0	µg/L	2019-04-11	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-04-11	
Dibromomethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-04-11	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	

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Analyte	Result	RL	Units	Analyzed	Qualifier
MW 13-1 (9040895-09) Matrix: Water Sampled: 2019-04-02 13:10, Continued					F1
<i>Volatile Organic Compounds (VOC), Continued</i>					
Dichloromethane	< 3.0	3.0	µg/L	2019-04-11	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-04-11	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-04-11	
Ethylbenzene	< 1.0	1.0	µg/L	2019-04-11	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-04-11	
Styrene	< 1.0	1.0	µg/L	2019-04-11	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-04-11	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Toluene	< 1.0	1.0	µg/L	2019-04-11	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
Trichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-04-11	
Vinyl chloride	< 1.0	1.0	µg/L	2019-04-11	
Xylenes (total)	< 2.0	2.0	µg/L	2019-04-11	
Surrogate: Toluene-d8	87	70-130	%	2019-04-11	
Surrogate: 4-Bromofluorobenzene	92	70-130	%	2019-04-11	
Surrogate: 1,4-Dichlorobenzene-d4	99	70-130	%	2019-04-11	

Field Blank (9040895-10) | Matrix: Water | Sampled: 2019-04-02 13:20

F1

Anions

Chloride	< 0.10	0.10	mg/L	2019-04-11	
Nitrate (as N)	< 0.010	0.010	mg/L	2019-04-11	HT1
Nitrite (as N)	< 0.010	0.010	mg/L	2019-04-11	HT1
Sulfate	< 1.0	1.0	mg/L	2019-04-11	

BCMOE Aggregate Hydrocarbons

VHw (6-10)	< 100	100	µg/L	2019-04-11	
VPHw	< 100	100	µg/L	N/A	

Calculated Parameters

Hardness, Total (as CaCO3)	< 0.500	0.500	mg/L	N/A	

Dissolved Metals

Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Arsenic, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Barium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Boron, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Cadmium, dissolved	< 0.000010	0.000010	mg/L	2019-04-11	

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Analyte	Result	RL	Units	Analyzed	Qualifier
Field Blank (9040895-10) Matrix: Water Sampled: 2019-04-02 13:20, Continued					F1

Dissolved Metals, Continued

Calcium, dissolved	< 0.20	0.20	mg/L	2019-04-11	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Cobalt, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Copper, dissolved	< 0.00040	0.00040	mg/L	2019-04-11	
Iron, dissolved	< 0.010	0.010	mg/L	2019-04-11	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Lithium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Magnesium, dissolved	< 0.010	0.010	mg/L	2019-04-11	
Manganese, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-04-10	
Molybdenum, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Nickel, dissolved	< 0.00040	0.00040	mg/L	2019-04-11	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-04-11	
Potassium, dissolved	< 0.10	0.10	mg/L	2019-04-11	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Silicon, dissolved	< 1.0	1.0	mg/L	2019-04-11	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-11	
Sodium, dissolved	< 0.10	0.10	mg/L	2019-04-11	
Strontium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Sulfur, dissolved	< 3.0	3.0	mg/L	2019-04-11	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Uranium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-04-11	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	

General Parameters

Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L	2019-04-12	
Ammonia, Total (as N)	< 0.020	0.020	mg/L	2019-04-11	
Carbon, Dissolved Organic	< 0.50	0.50	mg/L	2019-04-12	
Chemical Oxygen Demand	< 20	20	mg/L	2019-04-12	
Conductivity (EC)	< 2.0	2.0	µS/cm	2019-04-12	
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L	2019-04-12	
pH	5.50	0.10	pH units	2019-04-12	HT2

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Analyte	Result	RL	Units	Analyzed	Qualifier
Field Blank (9040895-10) Matrix: Water Sampled: 2019-04-02 13:20, Continued					F1
General Parameters, Continued					
Phosphorus, Total (as P)	< 0.0020	0.0020	mg/L	2019-04-12	
Turbidity	< 0.10	0.10	NTU	2019-04-11	
Volatile Organic Compounds (VOC)					
Benzene	< 0.5	0.5	µg/L	2019-04-11	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-04-11	
Bromoform	< 1.0	1.0	µg/L	2019-04-11	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-04-11	
Chlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
Chloroethane	< 2.0	2.0	µg/L	2019-04-11	
Chloroform	< 1.0	1.0	µg/L	2019-04-11	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-04-11	
Dibromomethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-04-11	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Dichloromethane	< 3.0	3.0	µg/L	2019-04-11	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-04-11	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-04-11	
Ethylbenzene	< 1.0	1.0	µg/L	2019-04-11	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-04-11	
Styrene	< 1.0	1.0	µg/L	2019-04-11	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-04-11	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Toluene	< 1.0	1.0	µg/L	2019-04-11	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
Trichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-04-11	
Vinyl chloride	< 1.0	1.0	µg/L	2019-04-11	
Xylenes (total)	< 2.0	2.0	µg/L	2019-04-11	
Surrogate: Toluene-d8	86	70-130	%	2019-04-11	
Surrogate: 4-Bromofluorobenzene	93	70-130	%	2019-04-11	
Surrogate: 1,4-Dichlorobenzene-d4	100	70-130	%	2019-04-11	

MW 1 (9040895-11) | Matrix: Water | Sampled: 2019-04-02 11:20

F1

TEST RESULTS

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Analyte	Result	RL	Units	Analyzed	Qualifier
MW 1 (9040895-11) Matrix: Water Sampled: 2019-04-02 11:20, Continued					F1
Anions					
Chloride	46.7	0.10	mg/L	2019-04-11	
Nitrate (as N)	0.756	0.010	mg/L	2019-04-11	HT1
Nitrite (as N)	0.315	0.010	mg/L	2019-04-11	HT1
Sulfate	235	1.0	mg/L	2019-04-11	
BCMOE Aggregate Hydrocarbons					
VHw (6-10)	< 100	100	µg/L	2019-04-11	
VPW	< 100	100	µg/L	N/A	
Calculated Parameters					
Hardness, Total (as CaCO ₃)	351	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Arsenic, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Barium, dissolved	0.0329	0.0050	mg/L	2019-04-11	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Boron, dissolved	0.284	0.0050	mg/L	2019-04-11	
Cadmium, dissolved	0.000096	0.000010	mg/L	2019-04-11	
Calcium, dissolved	124	0.20	mg/L	2019-04-11	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Cobalt, dissolved	0.00012	0.00010	mg/L	2019-04-11	
Copper, dissolved	0.00067	0.00040	mg/L	2019-04-11	
Iron, dissolved	< 0.010	0.010	mg/L	2019-04-11	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Lithium, dissolved	0.00051	0.00010	mg/L	2019-04-11	
Magnesium, dissolved	9.97	0.010	mg/L	2019-04-11	
Manganese, dissolved	0.0560	0.00020	mg/L	2019-04-11	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-04-10	
Molybdenum, dissolved	0.00011	0.00010	mg/L	2019-04-11	
Nickel, dissolved	0.00067	0.00040	mg/L	2019-04-11	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-04-11	
Potassium, dissolved	1.79	0.10	mg/L	2019-04-11	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Silicon, dissolved	7.1	1.0	mg/L	2019-04-11	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-04-11	
Sodium, dissolved	9.60	0.10	mg/L	2019-04-11	
Strontium, dissolved	0.951	0.0010	mg/L	2019-04-11	
Sulfur, dissolved	89.8	3.0	mg/L	2019-04-11	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-04-11	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-04-11	

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Analyte	Result	RL	Units	Analyzed	Qualifier
MW 1 (9040895-11) Matrix: Water Sampled: 2019-04-02 11:20, Continued					F1
Dissolved Metals, Continued					
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-04-11	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-04-11	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Uranium, dissolved	0.000147	0.000020	mg/L	2019-04-11	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-04-11	
Zinc, dissolved	0.0054	0.0040	mg/L	2019-04-11	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-04-11	
General Parameters					
Alkalinity, Total (as CaCO ₃)	70.3	1.0	mg/L	2019-04-12	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Bicarbonate (as CaCO ₃)	70.3	1.0	mg/L	2019-04-12	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0	mg/L	2019-04-12	
Ammonia, Total (as N)	< 0.020	0.020	mg/L	2019-04-11	
Carbon, Dissolved Organic	1.67	0.50	mg/L	2019-04-12	
Chemical Oxygen Demand	36	20	mg/L	2019-04-12	
Conductivity (EC)	803	2.0	µS/cm	2019-04-12	
Nitrogen, Total Kjeldahl	0.438	0.050	mg/L	2019-04-12	
pH	7.00	0.10	pH units	2019-04-12	HT2
Phosphorus, Total (as P)	0.182	0.0020	mg/L	2019-04-12	
Turbidity	180	0.10	NTU	2019-04-11	
Volatile Organic Compounds (VOC)					
Benzene	< 0.5	0.5	µg/L	2019-04-11	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-04-11	
Bromoform	< 1.0	1.0	µg/L	2019-04-11	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-04-11	
Chlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
Chloroethane	< 2.0	2.0	µg/L	2019-04-11	
Chloroform	< 1.0	1.0	µg/L	2019-04-11	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-04-11	
Dibromomethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-04-11	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-04-11	

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Analyte	Result	RL	Units	Analyzed	Qualifier
MW 1 (9040895-11) Matrix: Water Sampled: 2019-04-02 11:20, Continued					F1
<i>Volatile Organic Compounds (VOC), Continued</i>					
Dichloromethane	< 3.0	3.0	µg/L	2019-04-11	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-04-11	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-04-11	
Ethylbenzene	< 1.0	1.0	µg/L	2019-04-11	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-04-11	
Styrene	< 1.0	1.0	µg/L	2019-04-11	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-04-11	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Toluene	< 1.0	1.0	µg/L	2019-04-11	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-04-11	
Trichloroethylene	< 1.0	1.0	µg/L	2019-04-11	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-04-11	
Vinyl chloride	< 1.0	1.0	µg/L	2019-04-11	
Xylenes (total)	< 2.0	2.0	µg/L	2019-04-11	
Surrogate: Toluene-d8	83	70-130	%	2019-04-11	
Surrogate: 4-Bromofluorobenzene	88	70-130	%	2019-04-11	
Surrogate: 1,4-Dichlorobenzene-d4	94	70-130	%	2019-04-11	

Sample Qualifiers:

F1	The sample was not field-filtered and was therefore filtered through a 0.45 µm membrane in the laboratory and preserved with HNO3 prior to analysis for dissolved metals.
HT1	The sample was prepared and/or analyzed past the recommended holding time.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX 1: SUPPORTING INFORMATION

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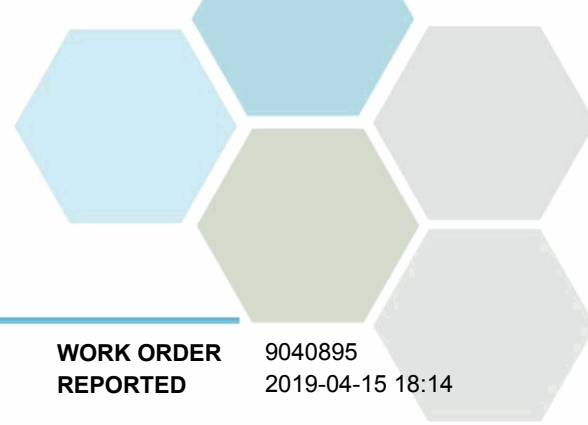
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Analysis Description	Method Ref.	Technique	Location
Alkalinity in Water	SM 2320 B* (2011)	Titration with H2SO4	Kelowna
Ammonia, Total in Water	SM 4500-NH3 G* (2011)	Automated Colorimetry (Phenate)	Kelowna
Anions in Water	SM 4110 B (2011)	Ion Chromatography	Kelowna
Carbon, Dissolved Organic in Water	SM 5310 B (2011)	Combustion, Infrared CO2 Detection	Kelowna
Chemical Oxygen Demand in Water	SM 5220 D* (2011)	Closed Reflux, Colorimetry	Kelowna
Conductivity in Water	SM 2510 B (2011)	Conductivity Meter	Kelowna
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	Richmond
Hardness in Water	SM 2340 B (2011)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]	N/A
Mercury, dissolved in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2011)	Block Digestion and Flow Injection Analysis	Kelowna
pH in Water	SM 4500-H+ B (2011)	Electrometry	Kelowna
Phosphorus, Total in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2011)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	Kelowna
Turbidity in Water	SM 2130 B (2011)	Nephelometry	Kelowna
VH in Water	EPA 5030B / BCMOE VHW	Purge&Trap / Gas Chromatography (GC-FID)	Richmond
Volatile Organic Compounds in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	Richmond
VPHW in Water	BCMOE VPH	Calculation: VH - (Benzene + Toluene + Ethylbenzene + Xylenes + Styrene)	N/A

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
pH units	pH < 7 = acidic, pH > 7 = basic
µg/L	Micrograms per litre
µS/cm	Microsiemens per centimetre
BCMOE	British Columbia Environmental Laboratory Manual, British Columbia Ministry of Environment
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO Sunshine Coast Regional District
PROJECT SP100543

WORK ORDER 9040895
REPORTED 2019-04-15 18:14

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: bshaw@caro.ca

APPENDIX 2: QUALITY CONTROL RESULTS

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The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (BLK):** A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup):** An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS):** A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS):** A second aliquot of sample is fortified with with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM):** A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B9D0912									
Blank (B9D0912-BLK1)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Chloride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
Blank (B9D0912-BLK2)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Chloride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
LCS (B9D0912-BS1)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Chloride	16.0	0.10 mg/L	16.0		100	90-110			
Nitrate (as N)	3.98	0.010 mg/L	4.00		100	93-108			
Nitrite (as N)	2.10	0.010 mg/L	2.00		105	85-114			
Sulfate	15.7	1.0 mg/L	16.0		98	91-109			
LCS (B9D0912-BS2)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Chloride	16.1	0.10 mg/L	16.0		101	90-110			
Nitrate (as N)	4.02	0.010 mg/L	4.00		100	93-108			
Nitrite (as N)	1.92	0.010 mg/L	2.00		96	85-114			
Sulfate	16.0	1.0 mg/L	16.0		100	91-109			
Duplicate (B9D0912-DUP1)			Source: 9040895-01		Prepared: 2019-04-12, Analyzed: 2019-04-12				
Chloride	1.56	0.10 mg/L		1.56			< 1	10	
Nitrate (as N)	0.120	0.010 mg/L		0.121			< 1	10	
Nitrite (as N)	0.011	0.010 mg/L		0.011				6	
Sulfate	1.4	1.0 mg/L		1.4				6	
Matrix Spike (B9D0912-MS1)			Source: 9040895-01		Prepared: 2019-04-12, Analyzed: 2019-04-12				
Chloride	17.6	0.10 mg/L	16.0	1.56	100	75-125			
Nitrate (as N)	4.01	0.010 mg/L	4.00	0.121	97	75-125			
Nitrite (as N)	1.93	0.010 mg/L	2.00	0.011	96	80-120			
Sulfate	17.2	1.0 mg/L	16.0	1.4	98	75-125			

APPENDIX 2: QUALITY CONTROL RESULTS

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
BCMOE Aggregate Hydrocarbons, Batch B9D0815									
Blank (B9D0815-BLK1)				Prepared: 2019-04-11, Analyzed: 2019-04-11					
VHw (6-10)	< 100	100 µg/L							
LCS (B9D0815-BS2)				Prepared: 2019-04-11, Analyzed: 2019-04-11					
VHw (6-10)	2700	100 µg/L	2610		103	70-130			
Duplicate (B9D0815-DUP1)				Source: 9040895-01		Prepared: 2019-04-11, Analyzed: 2019-04-11			
VHw (6-10)	< 100	100 µg/L		< 100				19	

Dissolved Metals, Batch B9D0770

Blank (B9D0770-BLK1)				Prepared: 2019-04-10, Analyzed: 2019-04-10					
Mercury, dissolved	< 0.000010	0.000010 mg/L							
Reference (B9D0770-SRM1)				Prepared: 2019-04-10, Analyzed: 2019-04-10					
Mercury, dissolved	0.00445	0.000010 mg/L	0.00489		91	80-120			

Dissolved Metals, Batch B9D0917

Blank (B9D0917-BLK1)				Prepared: 2019-04-11, Analyzed: 2019-04-11					
Aluminum, dissolved	< 0.0050	0.0050 mg/L							
Antimony, dissolved	< 0.00020	0.00020 mg/L							
Arsenic, dissolved	< 0.00050	0.00050 mg/L							
Barium, dissolved	< 0.0050	0.0050 mg/L							
Beryllium, dissolved	< 0.00010	0.00010 mg/L							
Bismuth, dissolved	< 0.00010	0.00010 mg/L							
Boron, dissolved	< 0.0050	0.0050 mg/L							
Cadmium, dissolved	< 0.000010	0.000010 mg/L							
Calcium, dissolved	< 0.20	0.20 mg/L							
Chromium, dissolved	< 0.00050	0.00050 mg/L							
Cobalt, dissolved	< 0.00010	0.00010 mg/L							
Copper, dissolved	< 0.00040	0.00040 mg/L							
Iron, dissolved	< 0.010	0.010 mg/L							
Lead, dissolved	< 0.00020	0.00020 mg/L							
Lithium, dissolved	< 0.00010	0.00010 mg/L							
Magnesium, dissolved	< 0.010	0.010 mg/L							
Manganese, dissolved	< 0.00020	0.00020 mg/L							
Molybdenum, dissolved	< 0.00010	0.00010 mg/L							
Nickel, dissolved	< 0.00040	0.00040 mg/L							
Phosphorus, dissolved	< 0.050	0.050 mg/L							
Potassium, dissolved	< 0.10	0.10 mg/L							
Selenium, dissolved	< 0.00050	0.00050 mg/L							
Silicon, dissolved	< 1.0	1.0 mg/L							
Silver, dissolved	< 0.000050	0.000050 mg/L							
Sodium, dissolved	< 0.10	0.10 mg/L							
Strontium, dissolved	< 0.0010	0.0010 mg/L							
Sulfur, dissolved	< 3.0	3.0 mg/L							
Tellurium, dissolved	< 0.00050	0.00050 mg/L							
Thallium, dissolved	< 0.000020	0.000020 mg/L							
Thorium, dissolved	< 0.00010	0.00010 mg/L							
Tin, dissolved	< 0.00020	0.00020 mg/L							
Titanium, dissolved	< 0.0050	0.0050 mg/L							
Tungsten, dissolved	< 0.0010	0.0010 mg/L							
Uranium, dissolved	< 0.000020	0.000020 mg/L							
Vanadium, dissolved	< 0.0010	0.0010 mg/L							
Zinc, dissolved	< 0.0040	0.0040 mg/L							

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B9D0917, Continued									
Blank (B9D0917-BLK1), Continued					Prepared: 2019-04-11, Analyzed: 2019-04-11				
Zirconium, dissolved	< 0.00010	0.00010 mg/L							
Blank (B9D0917-BLK2)					Prepared: 2019-04-11, Analyzed: 2019-04-11				
Aluminum, dissolved	< 0.0050	0.0050 mg/L							
Antimony, dissolved	< 0.00020	0.00020 mg/L							
Arsenic, dissolved	< 0.00050	0.00050 mg/L							
Barium, dissolved	< 0.0050	0.0050 mg/L							
Beryllium, dissolved	< 0.00010	0.00010 mg/L							
Bismuth, dissolved	< 0.00010	0.00010 mg/L							
Boron, dissolved	< 0.0050	0.0050 mg/L							
Cadmium, dissolved	< 0.000010	0.000010 mg/L							
Calcium, dissolved	< 0.20	0.20 mg/L							
Chromium, dissolved	< 0.00050	0.00050 mg/L							
Cobalt, dissolved	< 0.00010	0.00010 mg/L							
Copper, dissolved	< 0.00040	0.00040 mg/L							
Iron, dissolved	< 0.010	0.010 mg/L							
Lead, dissolved	< 0.00020	0.00020 mg/L							
Lithium, dissolved	< 0.00010	0.00010 mg/L							
Magnesium, dissolved	< 0.010	0.010 mg/L							
Manganese, dissolved	< 0.00020	0.00020 mg/L							
Molybdenum, dissolved	< 0.00010	0.00010 mg/L							
Nickel, dissolved	< 0.00040	0.00040 mg/L							
Phosphorus, dissolved	< 0.050	0.050 mg/L							
Potassium, dissolved	< 0.10	0.10 mg/L							
Selenium, dissolved	< 0.00050	0.00050 mg/L							
Silicon, dissolved	< 1.0	1.0 mg/L							
Silver, dissolved	< 0.000050	0.000050 mg/L							
Sodium, dissolved	< 0.10	0.10 mg/L							
Strontium, dissolved	< 0.0010	0.0010 mg/L							
Sulfur, dissolved	< 3.0	3.0 mg/L							
Tellurium, dissolved	< 0.00050	0.00050 mg/L							
Thallium, dissolved	< 0.000020	0.000020 mg/L							
Thorium, dissolved	< 0.00010	0.00010 mg/L							
Tin, dissolved	< 0.00020	0.00020 mg/L							
Titanium, dissolved	< 0.0050	0.0050 mg/L							
Tungsten, dissolved	< 0.0010	0.0010 mg/L							
Uranium, dissolved	< 0.000020	0.000020 mg/L							
Vanadium, dissolved	< 0.0010	0.0010 mg/L							
Zinc, dissolved	< 0.0040	0.0040 mg/L							
Zirconium, dissolved	< 0.00010	0.00010 mg/L							
LCS (B9D0917-BS1)					Prepared: 2019-04-11, Analyzed: 2019-04-11				
Aluminum, dissolved	0.0236	0.0050 mg/L	0.0200		118	80-120			
Antimony, dissolved	0.0195	0.00020 mg/L	0.0200		97	80-120			
Arsenic, dissolved	0.0188	0.00050 mg/L	0.0200		94	80-120			
Barium, dissolved	0.0198	0.0050 mg/L	0.0200		99	80-120			
Beryllium, dissolved	0.0209	0.00010 mg/L	0.0200		105	80-120			
Bismuth, dissolved	0.0210	0.00010 mg/L	0.0200		105	80-120			
Boron, dissolved	0.0210	0.0050 mg/L	0.0200		105	80-120			
Cadmium, dissolved	0.0198	0.000010 mg/L	0.0200		99	80-120			
Calcium, dissolved	1.89	0.20 mg/L	2.00		95	80-120			
Chromium, dissolved	0.0191	0.00050 mg/L	0.0200		96	80-120			
Cobalt, dissolved	0.0198	0.00010 mg/L	0.0200		99	80-120			
Copper, dissolved	0.0205	0.00040 mg/L	0.0200		102	80-120			
Iron, dissolved	1.83	0.010 mg/L	2.00		91	80-120			
Lead, dissolved	0.0206	0.00020 mg/L	0.0200		103	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B9D0917, Continued									
LCS (B9D0917-BS1), Continued					Prepared: 2019-04-11, Analyzed: 2019-04-11				
Lithium, dissolved	0.0213	0.00010 mg/L	0.0200		107	80-120			
Magnesium, dissolved	1.92	0.010 mg/L	2.00		96	80-120			
Manganese, dissolved	0.0200	0.00020 mg/L	0.0200		100	80-120			
Molybdenum, dissolved	0.0191	0.00010 mg/L	0.0200		96	80-120			
Nickel, dissolved	0.0206	0.00040 mg/L	0.0200		103	80-120			
Phosphorus, dissolved	1.98	0.050 mg/L	2.00		99	80-120			
Potassium, dissolved	1.90	0.10 mg/L	2.00		95	80-120			
Selenium, dissolved	0.0205	0.00050 mg/L	0.0200		103	80-120			
Silicon, dissolved	1.9	1.0 mg/L	2.00		95	80-120			
Silver, dissolved	0.0200	0.000050 mg/L	0.0200		100	80-120			
Sodium, dissolved	2.00	0.10 mg/L	2.00		100	80-120			
Strontium, dissolved	0.0191	0.0010 mg/L	0.0200		96	80-120			
Sulfur, dissolved	4.3	3.0 mg/L	5.00		85	80-120			
Tellurium, dissolved	0.0191	0.00050 mg/L	0.0200		96	80-120			
Thallium, dissolved	0.0210	0.000020 mg/L	0.0200		105	80-120			
Thorium, dissolved	0.0202	0.00010 mg/L	0.0200		101	80-120			
Tin, dissolved	0.0200	0.00020 mg/L	0.0200		100	80-120			
Titanium, dissolved	0.0196	0.0050 mg/L	0.0200		98	80-120			
Tungsten, dissolved	0.0197	0.0010 mg/L	0.0200		98	80-120			
Uranium, dissolved	0.0216	0.000020 mg/L	0.0200		108	80-120			
Vanadium, dissolved	0.0189	0.0010 mg/L	0.0200		94	80-120			
Zinc, dissolved	0.0209	0.0040 mg/L	0.0200		104	80-120			
Zirconium, dissolved	0.0208	0.00010 mg/L	0.0200		104	80-120			
Reference (B9D0917-SRM1)					Prepared: 2019-04-11, Analyzed: 2019-04-11				
Aluminum, dissolved	0.212	0.0050 mg/L	0.233		91	79-114			
Antimony, dissolved	0.0432	0.00020 mg/L	0.0430		100	89-123			
Arsenic, dissolved	0.417	0.00050 mg/L	0.438		95	87-113			
Barium, dissolved	2.88	0.0050 mg/L	3.35		86	85-114			
Beryllium, dissolved	0.219	0.00010 mg/L	0.213		103	79-122			
Boron, dissolved	1.65	0.0050 mg/L	1.74		95	79-117			
Cadmium, dissolved	0.218	0.000010 mg/L	0.224		97	89-112			
Calcium, dissolved	7.28	0.20 mg/L	7.69		95	85-120			
Chromium, dissolved	0.412	0.00050 mg/L	0.437		94	87-113			
Cobalt, dissolved	0.123	0.00010 mg/L	0.128		96	90-117			
Copper, dissolved	0.826	0.00040 mg/L	0.844		98	90-115			
Iron, dissolved	1.15	0.010 mg/L	1.29		89	86-112			
Lead, dissolved	0.110	0.00020 mg/L	0.112		99	90-113			
Lithium, dissolved	0.105	0.00010 mg/L	0.104		101	77-127			
Magnesium, dissolved	6.35	0.010 mg/L	6.92		92	84-116			
Manganese, dissolved	0.327	0.00020 mg/L	0.345		95	85-113			
Molybdenum, dissolved	0.400	0.00010 mg/L	0.426		94	87-112			
Nickel, dissolved	0.828	0.00040 mg/L	0.840		99	90-114			
Phosphorus, dissolved	0.479	0.050 mg/L	0.495		97	74-119			
Potassium, dissolved	2.78	0.10 mg/L	3.19		87	78-119			
Selenium, dissolved	0.0342	0.00050 mg/L	0.0331		103	89-123			
Sodium, dissolved	17.4	0.10 mg/L	19.1		91	81-117			
Strontium, dissolved	0.870	0.0010 mg/L	0.916		95	82-111			
Thallium, dissolved	0.0399	0.000020 mg/L	0.0393		101	90-113			
Uranium, dissolved	0.246	0.000020 mg/L	0.266		93	87-113			
Vanadium, dissolved	0.799	0.0010 mg/L	0.869		92	85-110			
Zinc, dissolved	0.852	0.0040 mg/L	0.881		97	88-114			

General Parameters, Batch B9D0731

APPENDIX 2: QUALITY CONTROL RESULTS

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9D0731, Continued									
Blank (B9D0731-BLK1)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Carbon, Dissolved Organic	< 0.50	0.50 mg/L							
Blank (B9D0731-BLK2)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Carbon, Dissolved Organic	< 0.50	0.50 mg/L							
LCS (B9D0731-BS1)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Carbon, Dissolved Organic	9.56	0.50 mg/L	10.0		96	78-116			
LCS (B9D0731-BS2)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Carbon, Dissolved Organic	9.93	0.50 mg/L	10.0		99	78-116			
General Parameters, Batch B9D0819									
Blank (B9D0819-BLK1)			Prepared: 2019-04-11, Analyzed: 2019-04-11						
Ammonia, Total (as N)	< 0.020	0.020 mg/L							
Blank (B9D0819-BLK2)			Prepared: 2019-04-11, Analyzed: 2019-04-11						
Ammonia, Total (as N)	< 0.020	0.020 mg/L							
Blank (B9D0819-BLK3)			Prepared: 2019-04-11, Analyzed: 2019-04-11						
Ammonia, Total (as N)	< 0.020	0.020 mg/L							
LCS (B9D0819-BS1)			Prepared: 2019-04-11, Analyzed: 2019-04-11						
Ammonia, Total (as N)	1.05	0.020 mg/L	1.00		105	90-115			
LCS (B9D0819-BS2)			Prepared: 2019-04-11, Analyzed: 2019-04-11						
Ammonia, Total (as N)	1.04	0.020 mg/L	1.00		104	90-115			
LCS (B9D0819-BS3)			Prepared: 2019-04-11, Analyzed: 2019-04-11						
Ammonia, Total (as N)	1.05	0.020 mg/L	1.00		105	90-115			
Duplicate (B9D0819-DUP3)			Source: 9040895-01		Prepared: 2019-04-11, Analyzed: 2019-04-11				
Ammonia, Total (as N)	< 0.020	0.020 mg/L		< 0.020				15	
Matrix Spike (B9D0819-MS3)			Source: 9040895-01		Prepared: 2019-04-11, Analyzed: 2019-04-11				
Ammonia, Total (as N)	0.256	0.020 mg/L	0.250	< 0.020	98	75-125			
General Parameters, Batch B9D0905									
Blank (B9D0905-BLK1)			Prepared: 2019-04-11, Analyzed: 2019-04-11						
Turbidity	< 0.10	0.10 NTU							
Blank (B9D0905-BLK2)			Prepared: 2019-04-11, Analyzed: 2019-04-11						
Turbidity	< 0.10	0.10 NTU							
LCS (B9D0905-BS1)			Prepared: 2019-04-11, Analyzed: 2019-04-11						
Turbidity	38.1	0.10 NTU	40.0		95	90-110			
LCS (B9D0905-BS2)			Prepared: 2019-04-11, Analyzed: 2019-04-11						
Turbidity	38.5	0.10 NTU	40.0		96	90-110			
General Parameters, Batch B9D0936									
Blank (B9D0936-BLK1)			Prepared: 2019-04-11, Analyzed: 2019-04-12						
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier

General Parameters, Batch B9D0936, Continued

LCS (B9D0936-BS1)			Prepared: 2019-04-11, Analyzed: 2019-04-12						
Nitrogen, Total Kjeldahl	1.03	0.050 mg/L	1.00		103	84-121			

General Parameters, Batch B9D0950

Blank (B9D0950-BLK1)			Prepared: 2019-04-11, Analyzed: 2019-04-12						
Phosphorus, Total (as P)	< 0.0020	0.0020 mg/L							
LCS (B9D0950-BS1)			Prepared: 2019-04-11, Analyzed: 2019-04-12						
Phosphorus, Total (as P)	0.105	0.0020 mg/L	0.100		105	80-112			
Duplicate (B9D0950-DUP1)			Source: 9040895-09		Prepared: 2019-04-11, Analyzed: 2019-04-12				
Phosphorus, Total (as P)	0.194	0.0020 mg/L		0.202			4	20	
Matrix Spike (B9D0950-MS1)			Source: 9040895-09		Prepared: 2019-04-11, Analyzed: 2019-04-12				
Phosphorus, Total (as P)	0.727	0.0020 mg/L	0.500	0.202	105	70-122			

General Parameters, Batch B9D0990

Blank (B9D0990-BLK1)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Chemical Oxygen Demand	< 20	20 mg/L							
Blank (B9D0990-BLK2)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Chemical Oxygen Demand	< 20	20 mg/L							
LCS (B9D0990-BS1)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Chemical Oxygen Demand	518	20 mg/L	500		104	89-115			
LCS (B9D0990-BS2)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Chemical Oxygen Demand	528	20 mg/L	500		106	89-115			
Duplicate (B9D0990-DUP1)			Source: 9040895-01		Prepared: 2019-04-12, Analyzed: 2019-04-12				
Chemical Oxygen Demand	< 20	20 mg/L		< 20				14	
Duplicate (B9D0990-DUP2)			Source: 9040895-02		Prepared: 2019-04-12, Analyzed: 2019-04-12				
Chemical Oxygen Demand	< 20	20 mg/L		< 20				14	
Matrix Spike (B9D0990-MS1)			Source: 9040895-01		Prepared: 2019-04-12, Analyzed: 2019-04-12				
Chemical Oxygen Demand	2050	20 mg/L	2000	< 20	102	75-125			
Matrix Spike (B9D0990-MS2)			Source: 9040895-02		Prepared: 2019-04-12, Analyzed: 2019-04-12				
Chemical Oxygen Demand	2050	20 mg/L	2000	< 20	102	75-125			

General Parameters, Batch B9D0992

Blank (B9D0992-BLK1)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Blank (B9D0992-BLK2)			Prepared: 2019-04-12, Analyzed: 2019-04-12						
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9D0992, Continued									
Blank (B9D0992-BLK2), Continued				Prepared: 2019-04-12, Analyzed: 2019-04-12					
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
Blank (B9D0992-BLK3)				Prepared: 2019-04-12, Analyzed: 2019-04-12					
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
LCS (B9D0992-BS1)				Prepared: 2019-04-12, Analyzed: 2019-04-12					
Alkalinity, Total (as CaCO ₃)	104	1.0 mg/L	100		104	92-106			
LCS (B9D0992-BS2)				Prepared: 2019-04-12, Analyzed: 2019-04-12					
Alkalinity, Total (as CaCO ₃)	104	1.0 mg/L	100		104	92-106			
LCS (B9D0992-BS3)				Prepared: 2019-04-12, Analyzed: 2019-04-12					
Alkalinity, Total (as CaCO ₃)	104	1.0 mg/L	100		104	92-106			
LCS (B9D0992-BS4)				Prepared: 2019-04-12, Analyzed: 2019-04-12					
Conductivity (EC)	1440	2.0 µS/cm	1410		102	95-104			
LCS (B9D0992-BS5)				Prepared: 2019-04-12, Analyzed: 2019-04-12					
Conductivity (EC)	1440	2.0 µS/cm	1410		102	95-104			
LCS (B9D0992-BS6)				Prepared: 2019-04-12, Analyzed: 2019-04-12					
Conductivity (EC)	1450	2.0 µS/cm	1410		103	95-104			
Duplicate (B9D0992-DUP1)				Source: 9040895-01		Prepared: 2019-04-12, Analyzed: 2019-04-12			
Alkalinity, Total (as CaCO ₃)	22.6	1.0 mg/L		22.4			1	10	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Alkalinity, Bicarbonate (as CaCO ₃)	22.6	1.0 mg/L		22.4			1	10	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L		< 1.0				10	
Conductivity (EC)	50.1	2.0 µS/cm		50.2			< 1	5	
pH	7.17	0.10 pH units		7.14			< 1	4	
Reference (B9D0992-SRM1)				Prepared: 2019-04-12, Analyzed: 2019-04-12					
pH	6.99	0.10 pH units		7.01			100	98-102	
Reference (B9D0992-SRM2)				Prepared: 2019-04-12, Analyzed: 2019-04-12					
pH	6.99	0.10 pH units		7.01			100	98-102	
Reference (B9D0992-SRM3)				Prepared: 2019-04-12, Analyzed: 2019-04-12					
pH	6.99	0.10 pH units		7.01			100	98-102	
Volatile Organic Compounds (VOC), Batch B9D0815									
Blank (B9D0815-BLK1)				Prepared: 2019-04-11, Analyzed: 2019-04-11					
Benzene	< 0.5	0.5 µg/L							
Bromodichloromethane	< 1.0	1.0 µg/L							
Bromoform	< 1.0	1.0 µg/L							
Carbon tetrachloride	< 0.5	0.5 µg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Volatile Organic Compounds (VOC), Batch B9D0815, Continued									
Blank (B9D0815-BLK1), Continued					Prepared: 2019-04-11, Analyzed: 2019-04-11				
Chlorobenzene	< 1.0	1.0 µg/L							
Chloroethane	< 2.0	2.0 µg/L							
Chloroform	< 1.0	1.0 µg/L							
Dibromochloromethane	< 1.0	1.0 µg/L							
1,2-Dibromoethane	< 0.3	0.3 µg/L							
Dibromomethane	< 1.0	1.0 µg/L							
1,2-Dichlorobenzene	< 0.5	0.5 µg/L							
1,3-Dichlorobenzene	< 1.0	1.0 µg/L							
1,4-Dichlorobenzene	< 1.0	1.0 µg/L							
1,1-Dichloroethane	< 1.0	1.0 µg/L							
1,2-Dichloroethane	< 1.0	1.0 µg/L							
1,1-Dichloroethylene	< 1.0	1.0 µg/L							
cis-1,2-Dichloroethylene	< 1.0	1.0 µg/L							
trans-1,2-Dichloroethylene	< 1.0	1.0 µg/L							
Dichloromethane	< 3.0	3.0 µg/L							
1,2-Dichloropropane	< 1.0	1.0 µg/L							
1,3-Dichloropropene (cis + trans)	< 1.0	1.0 µg/L							
Ethylbenzene	< 1.0	1.0 µg/L							
Methyl tert-butyl ether	< 1.0	1.0 µg/L							
Styrene	< 1.0	1.0 µg/L							
1,1,2,2-Tetrachloroethane	< 0.5	0.5 µg/L							
Tetrachloroethylene	< 1.0	1.0 µg/L							
Toluene	< 1.0	1.0 µg/L							
1,1,1-Trichloroethane	< 1.0	1.0 µg/L							
1,1,2-Trichloroethane	< 1.0	1.0 µg/L							
Trichloroethylene	< 1.0	1.0 µg/L							
Trichlorofluoromethane	< 1.0	1.0 µg/L							
Vinyl chloride	< 1.0	1.0 µg/L							
Xylenes (total)	< 2.0	2.0 µg/L							
Surrogate: Toluene-d8	22.8	µg/L	26.2		87	70-130			
Surrogate: 4-Bromofluorobenzene	23.1	µg/L	25.0		93	70-130			
Surrogate: 1,4-Dichlorobenzene-d4	24.5	µg/L	25.0		98	70-130			
LCS (B9D0815-BS1)					Prepared: 2019-04-11, Analyzed: 2019-04-11				
Benzene	23.0	0.5 µg/L	20.1		114	70-130			
Bromodichloromethane	21.8	1.0 µg/L	20.2		108	70-130			
Bromoform	24.0	1.0 µg/L	20.1		119	70-130			
Carbon tetrachloride	20.1	0.5 µg/L	20.1		100	70-130			
Chlorobenzene	22.7	1.0 µg/L	20.2		112	70-130			
Chloroethane	23.7	2.0 µg/L	20.0		119	60-140			
Chloroform	22.4	1.0 µg/L	20.1		111	70-130			
Dibromochloromethane	22.0	1.0 µg/L	20.2		109	70-130			
1,2-Dibromoethane	22.6	0.3 µg/L	20.1		113	70-130			
Dibromomethane	23.8	1.0 µg/L	20.1		119	70-130			
1,2-Dichlorobenzene	23.4	0.5 µg/L	20.1		116	70-130			
1,3-Dichlorobenzene	23.1	1.0 µg/L	20.1		115	70-130			
1,4-Dichlorobenzene	23.1	1.0 µg/L	20.1		115	70-130			
1,1-Dichloroethane	23.3	1.0 µg/L	20.1		116	70-130			
1,2-Dichloroethane	22.5	1.0 µg/L	20.1		112	70-130			
1,1-Dichloroethylene	20.9	1.0 µg/L	20.1		104	70-130			
cis-1,2-Dichloroethylene	22.4	1.0 µg/L	20.1		112	70-130			
trans-1,2-Dichloroethylene	21.8	1.0 µg/L	20.1		108	70-130			
Dichloromethane	23.2	3.0 µg/L	20.1		116	70-130			
1,2-Dichloropropane	23.3	1.0 µg/L	20.2		115	70-130			
1,3-Dichloropropene (cis + trans)	35.2	1.0 µg/L	40.0		88	70-130			
Ethylbenzene	23.5	1.0 µg/L	20.1		117	70-130			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Volatile Organic Compounds (VOC), Batch B9D0815, Continued									
LCS (B9D0815-BS1), Continued				Prepared: 2019-04-11, Analyzed: 2019-04-11					
Methyl tert-butyl ether	18.4	1.0 µg/L	20.0		92	70-130			
Styrene	23.6	1.0 µg/L	20.1		117	70-130			
1,1,2,2-Tetrachloroethane	21.9	0.5 µg/L	20.2		108	70-130			
Tetrachloroethylene	23.6	1.0 µg/L	20.1		117	70-130			
Toluene	23.4	1.0 µg/L	20.1		116	70-130			
1,1,1-Trichloroethane	21.6	1.0 µg/L	20.2		107	70-130			
1,1,2-Trichloroethane	23.8	1.0 µg/L	20.1		118	70-130			
Trichloroethylene	23.1	1.0 µg/L	20.1		115	70-130			
Trichlorofluoromethane	22.3	1.0 µg/L	20.0		111	60-140			
Vinyl chloride	21.4	1.0 µg/L	20.0		107	60-140			
Xylenes (total)	68.9	2.0 µg/L	60.1		115	70-130			
Surrogate: Toluene-d8	24.1	µg/L	26.2		92	70-130			
Surrogate: 4-Bromofluorobenzene	24.8	µg/L	25.0		99	70-130			
Surrogate: 1,4-Dichlorobenzene-d4	26.5	µg/L	25.0		106	70-130			
Duplicate (B9D0815-DUP1)				Source: 9040895-01	Prepared: 2019-04-11, Analyzed: 2019-04-11				
Benzene	< 0.5	0.5 µg/L		< 0.5				22	
Bromodichloromethane	< 1.0	1.0 µg/L		< 1.0				23	
Bromoform	< 1.0	1.0 µg/L		< 1.0				23	
Carbon tetrachloride	< 0.5	0.5 µg/L		< 0.5				30	
Chlorobenzene	< 1.0	1.0 µg/L		< 1.0				26	
Chloroethane	< 2.0	2.0 µg/L		< 2.0				50	
Chloroform	< 1.0	1.0 µg/L		< 1.0				22	
Dibromochloromethane	< 1.0	1.0 µg/L		< 1.0				28	
1,2-Dibromoethane	< 0.3	0.3 µg/L		< 0.3				30	
Dibromomethane	< 1.0	1.0 µg/L		< 1.0				30	
1,2-Dichlorobenzene	< 0.5	0.5 µg/L		< 0.5				27	
1,3-Dichlorobenzene	< 1.0	1.0 µg/L		< 1.0				30	
1,4-Dichlorobenzene	< 1.0	1.0 µg/L		< 1.0				30	
1,1-Dichloroethane	< 1.0	1.0 µg/L		< 1.0				24	
1,2-Dichloroethane	< 1.0	1.0 µg/L		< 1.0				24	
1,1-Dichloroethylene	< 1.0	1.0 µg/L		< 1.0				30	
cis-1,2-Dichloroethylene	< 1.0	1.0 µg/L		< 1.0				22	
trans-1,2-Dichloroethylene	< 1.0	1.0 µg/L		< 1.0				27	
Dichloromethane	< 3.0	3.0 µg/L		< 3.0				27	
1,2-Dichloropropane	< 1.0	1.0 µg/L		< 1.0				28	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0 µg/L		< 1.0				30	
Ethylbenzene	< 1.0	1.0 µg/L		< 1.0				30	
Methyl tert-butyl ether	< 1.0	1.0 µg/L		< 1.0				20	
Styrene	< 1.0	1.0 µg/L		< 1.0				30	
1,1,2,2-Tetrachloroethane	< 0.5	0.5 µg/L		< 0.5				30	
Tetrachloroethylene	< 1.0	1.0 µg/L		< 1.0				30	
Toluene	< 1.0	1.0 µg/L		< 1.0				24	
1,1,1-Trichloroethane	< 1.0	1.0 µg/L		< 1.0				30	
1,1,2-Trichloroethane	< 1.0	1.0 µg/L		< 1.0				30	
Trichloroethylene	< 1.0	1.0 µg/L		< 1.0				27	
Trichlorofluoromethane	< 1.0	1.0 µg/L		< 1.0				50	
Vinyl chloride	< 1.0	1.0 µg/L		< 1.0				40	
Xylenes (total)	< 2.0	2.0 µg/L		< 2.0				29	
Surrogate: Toluene-d8	21.8	µg/L	26.2		83	70-130			
Surrogate: 4-Bromofluorobenzene	22.0	µg/L	25.0		88	70-130			
Surrogate: 1,4-Dichlorobenzene-d4	23.6	µg/L	25.0		94	70-130			
Matrix Spike (B9D0815-MS1)				Source: 9040895-01	Prepared: 2019-04-11, Analyzed: 2019-04-11				
Benzene	23.5	0.5 µg/L	20.1	< 0.5	117	70-130			
Bromodichloromethane	21.5	1.0 µg/L	20.2	< 1.0	106	70-130			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040895
2019-04-15 18:14

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Volatile Organic Compounds (VOC), Batch B9D0815, Continued									
Matrix Spike (B9D0815-MS1), Continued		Source: 9040895-01		Prepared: 2019-04-11, Analyzed: 2019-04-11					
Bromoform	23.8	1.0 µg/L	20.1	< 1.0	119	70-130			
Carbon tetrachloride	20.3	0.5 µg/L	20.1	< 0.5	101	70-130			
Chlorobenzene	22.8	1.0 µg/L	20.2	< 1.0	113	70-130			
Chloroethane	23.4	2.0 µg/L	20.0	< 2.0	117	60-140			
Chloroform	22.1	1.0 µg/L	20.1	< 1.0	110	70-130			
Dibromochloromethane	21.4	1.0 µg/L	20.2	< 1.0	106	70-130			
1,2-Dibromoethane	22.0	0.3 µg/L	20.1	< 0.3	109	70-130			
Dibromomethane	23.5	1.0 µg/L	20.1	< 1.0	117	70-130			
1,2-Dichlorobenzene	23.4	0.5 µg/L	20.1	< 0.5	116	70-130			
1,3-Dichlorobenzene	23.6	1.0 µg/L	20.1	< 1.0	117	70-130			
1,4-Dichlorobenzene	23.8	1.0 µg/L	20.1	< 1.0	119	70-130			
1,1-Dichloroethane	23.8	1.0 µg/L	20.1	< 1.0	118	70-130			
1,2-Dichloroethane	22.6	1.0 µg/L	20.1	< 1.0	112	70-130			
1,1-Dichloroethylene	21.0	1.0 µg/L	20.1	< 1.0	104	70-130			
cis-1,2-Dichloroethylene	21.8	1.0 µg/L	20.1	< 1.0	108	70-130			
trans-1,2-Dichloroethylene	21.3	1.0 µg/L	20.1	< 1.0	106	70-130			
Dichloromethane	22.8	3.0 µg/L	20.1	< 3.0	113	70-130			
1,2-Dichloropropane	22.8	1.0 µg/L	20.2	< 1.0	113	70-130			
1,3-Dichloropropene (cis + trans)	33.2	1.0 µg/L	40.0	< 1.0	83	70-130			
Ethylbenzene	23.5	1.0 µg/L	20.1	< 1.0	117	70-130			
Methyl tert-butyl ether	14.0	1.0 µg/L	20.0	< 1.0	70	70-130			
Styrene	5.3	1.0 µg/L	20.1	< 1.0	26	70-130			SPK
1,1,2,2-Tetrachloroethane	32.0	0.5 µg/L	20.2	< 0.5	158	70-130			SPK
Tetrachloroethylene	17.2	1.0 µg/L	20.1	< 1.0	86	70-130			
Toluene	23.5	1.0 µg/L	20.1	< 1.0	116	70-130			
1,1,1-Trichloroethane	21.7	1.0 µg/L	20.2	< 1.0	107	70-130			
1,1,2-Trichloroethane	23.1	1.0 µg/L	20.1	< 1.0	115	70-130			
Trichloroethylene	21.1	1.0 µg/L	20.1	< 1.0	105	70-130			
Trichlorofluoromethane	22.6	1.0 µg/L	20.0	< 1.0	113	60-140			
Vinyl chloride	21.2	1.0 µg/L	20.0	< 1.0	106	60-140			
Xylenes (total)	68.9	2.0 µg/L	60.1	< 2.0	115	70-130			
Surrogate: Toluene-d8	23.3	µg/L	26.2		89	70-130			
Surrogate: 4-Bromofluorobenzene	24.1	µg/L	25.0		97	70-130			
Surrogate: 1,4-Dichlorobenzene-d4	26.2	µg/L	25.0		105	70-130			

QC Qualifiers:

SPK The recovery of this analyte was outside of established control limits.

CERTIFICATE OF ANALYSIS

REPORTED TO Sunshine Coast Regional District
5920 Mason Road
Sechelt, BC V0N3A8

ATTENTION Lynda Fyfe

PO NUMBER

PROJECT SP100543

PROJECT INFO

WORK ORDER 9040539

RECEIVED / TEMP 2019-04-04 15:36 / 3°C

REPORTED 2019-04-15 13:14

COC NUMBER B75528

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry



It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve



Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

If you have any questions or concerns, please contact me at bshaw@caro.ca

Authorized By:

Bryan Shaw, Ph.D., P.Chem.
Client Service Coordinator



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TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040539
2019-04-15 13:14

Analyte	Result	RL	Units	Analyzed	Qualifier
SLA (9040539-01) Matrix: Water Sampled: 2019-04-03 13:40					PRES
Anions					
Chloride	0.23	0.10	mg/L	2019-04-07	
Nitrate (as N)	0.014	0.010	mg/L	2019-04-07	HT1
Nitrite (as N)	< 0.010	0.010	mg/L	2019-04-07	HT1
Calculated Parameters					
Hardness, Total (as CaCO ₃)	4.85	0.500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	0.021	0.020	mg/L	2019-04-08	
Carbon, Dissolved Organic	6.31	0.50	mg/L	2019-04-09	
Chemical Oxygen Demand	23	20	mg/L	2019-04-11	
Conductivity (EC)	10.4	2.0	µS/cm	2019-04-10	
Nitrogen, Total Kjeldahl	0.157	0.050	mg/L	2019-04-08	
pH	5.99	0.10	pH units	2019-04-10	HT2
Total Metals					
Aluminum, total	0.385	0.0050	mg/L	2019-04-12	
Antimony, total	< 0.00020	0.00020	mg/L	2019-04-12	
Arsenic, total	< 0.00050	0.00050	mg/L	2019-04-12	
Barium, total	< 0.0050	0.0050	mg/L	2019-04-12	
Beryllium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Bismuth, total	< 0.00010	0.00010	mg/L	2019-04-12	
Boron, total	0.0108	0.0050	mg/L	2019-04-12	
Cadmium, total	0.000054	0.000010	mg/L	2019-04-12	
Calcium, total	1.62	0.20	mg/L	2019-04-12	
Chromium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Cobalt, total	< 0.00010	0.00010	mg/L	2019-04-12	
Copper, total	0.00054	0.00040	mg/L	2019-04-12	
Iron, total	0.195	0.010	mg/L	2019-04-12	
Lead, total	< 0.00020	0.00020	mg/L	2019-04-12	
Lithium, total	0.00022	0.00010	mg/L	2019-04-12	
Magnesium, total	0.192	0.010	mg/L	2019-04-12	
Manganese, total	0.00844	0.00020	mg/L	2019-04-12	
Mercury, total	< 0.000010	0.000010	mg/L	2019-04-11	
Molybdenum, total	< 0.00010	0.00010	mg/L	2019-04-12	
Nickel, total	< 0.00040	0.00040	mg/L	2019-04-12	
Phosphorus, total	< 0.050	0.050	mg/L	2019-04-12	
Potassium, total	< 0.10	0.10	mg/L	2019-04-12	
Selenium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Silicon, total	1.6	1.0	mg/L	2019-04-12	
Silver, total	< 0.000050	0.000050	mg/L	2019-04-12	
Sodium, total	0.53	0.10	mg/L	2019-04-12	
Strontium, total	0.0062	0.0010	mg/L	2019-04-12	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040539
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Analyte	Result	RL	Units	Analyzed	Qualifier

SLA (9040539-01) | Matrix: Water | Sampled: 2019-04-03 13:40, Continued

PRES

Total Metals, Continued

Sulfur, total	< 3.0	3.0	mg/L	2019-04-12	
Tellurium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Thallium, total	< 0.000020	0.000020	mg/L	2019-04-12	
Thorium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Tin, total	< 0.00020	0.00020	mg/L	2019-04-12	
Titanium, total	0.0054	0.0050	mg/L	2019-04-12	
Tungsten, total	< 0.0010	0.0010	mg/L	2019-04-12	
Uranium, total	0.000054	0.000020	mg/L	2019-04-12	
Vanadium, total	0.0014	0.0010	mg/L	2019-04-12	
Zinc, total	0.0041	0.0040	mg/L	2019-04-12	
Zirconium, total	< 0.00010	0.00010	mg/L	2019-04-12	

SLB (9040539-02) | Matrix: Water | Sampled: 2019-04-03 15:30

PRES

Anions

Chloride	0.22	0.10	mg/L	2019-04-07	
Nitrate (as N)	0.014	0.010	mg/L	2019-04-07	HT1
Nitrite (as N)	< 0.010	0.010	mg/L	2019-04-07	HT1

Calculated Parameters

Hardness, Total (as CaCO ₃)	5.18	0.500	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	0.021	0.020	mg/L	2019-04-08	
Carbon, Dissolved Organic	6.52	0.50	mg/L	2019-04-09	
Chemical Oxygen Demand	< 20	20	mg/L	2019-04-11	
Conductivity (EC)	10.3	2.0	µS/cm	2019-04-10	
Nitrogen, Total Kjeldahl	0.145	0.050	mg/L	2019-04-08	
pH	5.94	0.10	pH units	2019-04-10	HT2

Total Metals

Aluminum, total	0.501	0.0050	mg/L	2019-04-12	
Antimony, total	< 0.00020	0.00020	mg/L	2019-04-12	
Arsenic, total	< 0.00050	0.00050	mg/L	2019-04-12	
Barium, total	< 0.0050	0.0050	mg/L	2019-04-12	
Beryllium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Bismuth, total	< 0.00010	0.00010	mg/L	2019-04-12	
Boron, total	0.0092	0.0050	mg/L	2019-04-12	
Cadmium, total	0.000017	0.000010	mg/L	2019-04-12	
Calcium, total	1.71	0.20	mg/L	2019-04-12	
Chromium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Cobalt, total	0.00014	0.00010	mg/L	2019-04-12	
Copper, total	0.00050	0.00040	mg/L	2019-04-12	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040539
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Analyte	Result	RL	Units	Analyzed	Qualifier
SLB (9040539-02) Matrix: Water Sampled: 2019-04-03 15:30, Continued					PRES

Total Metals, Continued

Iron, total	0.294	0.010	mg/L	2019-04-12	
Lead, total	0.00022	0.00020	mg/L	2019-04-12	
Lithium, total	0.00027	0.00010	mg/L	2019-04-12	
Magnesium, total	0.222	0.010	mg/L	2019-04-12	
Manganese, total	0.0134	0.00020	mg/L	2019-04-12	
Mercury, total	< 0.000010	0.000010	mg/L	2019-04-11	
Molybdenum, total	< 0.00010	0.00010	mg/L	2019-04-12	
Nickel, total	< 0.00040	0.00040	mg/L	2019-04-12	
Phosphorus, total	< 0.050	0.050	mg/L	2019-04-12	
Potassium, total	< 0.10	0.10	mg/L	2019-04-12	
Selenium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Silicon, total	1.8	1.0	mg/L	2019-04-12	
Silver, total	< 0.000050	0.000050	mg/L	2019-04-12	
Sodium, total	0.56	0.10	mg/L	2019-04-12	
Strontium, total	0.0068	0.0010	mg/L	2019-04-12	
Sulfur, total	< 3.0	3.0	mg/L	2019-04-12	
Tellurium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Thallium, total	< 0.000020	0.000020	mg/L	2019-04-12	
Thorium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Tin, total	< 0.00020	0.00020	mg/L	2019-04-12	
Titanium, total	0.0081	0.0050	mg/L	2019-04-12	
Tungsten, total	< 0.0010	0.0010	mg/L	2019-04-12	
Uranium, total	0.000067	0.000020	mg/L	2019-04-12	
Vanadium, total	0.0013	0.0010	mg/L	2019-04-12	
Zinc, total	< 0.0040	0.0040	mg/L	2019-04-12	
Zirconium, total	< 0.00010	0.00010	mg/L	2019-04-12	

SLC (9040539-03) | Matrix: Water | Sampled: 2019-04-03 14:40

PRES

Anions

Chloride	3.24	0.10	mg/L	2019-04-07	
Nitrate (as N)	0.192	0.010	mg/L	2019-04-07	HT1
Nitrite (as N)	< 0.010	0.010	mg/L	2019-04-07	HT1

Calculated Parameters

Hardness, Total (as CaCO ₃)	17.5	0.500	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	0.022	0.020	mg/L	2019-04-08	
Carbon, Dissolved Organic	4.10	0.50	mg/L	2019-04-09	
Chemical Oxygen Demand	< 20	20	mg/L	2019-04-11	
Conductivity (EC)	53.8	2.0	µS/cm	2019-04-10	
Nitrogen, Total Kjeldahl	0.168	0.050	mg/L	2019-04-08	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040539
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Analyte	Result	RL	Units	Analyzed	Qualifier
SLC (9040539-03) Matrix: Water Sampled: 2019-04-03 14:40, Continued					PRES
<i>General Parameters, Continued</i>					
pH	6.84	0.10	pH units	2019-04-10	HT2
<i>Total Metals</i>					
Aluminum, total	0.230	0.0050	mg/L	2019-04-12	
Antimony, total	< 0.00020	0.00020	mg/L	2019-04-12	
Arsenic, total	< 0.00050	0.00050	mg/L	2019-04-12	
Barium, total	0.0061	0.0050	mg/L	2019-04-12	
Beryllium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Bismuth, total	< 0.00010	0.00010	mg/L	2019-04-12	
Boron, total	0.0117	0.0050	mg/L	2019-04-12	
Cadmium, total	0.000020	0.000010	mg/L	2019-04-12	
Calcium, total	5.27	0.20	mg/L	2019-04-12	
Chromium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Cobalt, total	< 0.00010	0.00010	mg/L	2019-04-12	
Copper, total	0.00057	0.00040	mg/L	2019-04-12	
Iron, total	0.237	0.010	mg/L	2019-04-12	
Lead, total	< 0.00020	0.00020	mg/L	2019-04-12	
Lithium, total	0.00038	0.00010	mg/L	2019-04-12	
Magnesium, total	1.04	0.010	mg/L	2019-04-12	
Manganese, total	0.0104	0.00020	mg/L	2019-04-12	
Mercury, total	< 0.000010	0.000010	mg/L	2019-04-11	
Molybdenum, total	0.00016	0.00010	mg/L	2019-04-12	
Nickel, total	< 0.00040	0.00040	mg/L	2019-04-12	
Phosphorus, total	< 0.050	0.050	mg/L	2019-04-12	
Potassium, total	0.59	0.10	mg/L	2019-04-12	
Selenium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Silicon, total	5.9	1.0	mg/L	2019-04-12	
Silver, total	< 0.000050	0.000050	mg/L	2019-04-12	
Sodium, total	3.31	0.10	mg/L	2019-04-12	
Strontium, total	0.0304	0.0010	mg/L	2019-04-12	
Sulfur, total	< 3.0	3.0	mg/L	2019-04-12	
Tellurium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Thallium, total	< 0.000020	0.000020	mg/L	2019-04-12	
Thorium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Tin, total	< 0.00020	0.00020	mg/L	2019-04-12	
Titanium, total	0.0091	0.0050	mg/L	2019-04-12	
Tungsten, total	< 0.0010	0.0010	mg/L	2019-04-12	
Uranium, total	0.000082	0.000020	mg/L	2019-04-12	
Vanadium, total	0.0018	0.0010	mg/L	2019-04-12	
Zinc, total	< 0.0040	0.0040	mg/L	2019-04-12	
Zirconium, total	< 0.00010	0.00010	mg/L	2019-04-12	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040539
2019-04-15 13:14

Analyte	Result	RL	Units	Analyzed	Qualifier
SLE (9040539-04) Matrix: Water Sampled: 2019-04-03 14:00					PRES
Anions					
Chloride	0.95	0.10	mg/L	2019-04-07	
Nitrate (as N)	0.091	0.010	mg/L	2019-04-07	HT1
Nitrite (as N)	< 0.010	0.010	mg/L	2019-04-07	HT1
Calculated Parameters					
Hardness, Total (as CaCO ₃)	8.91	0.500	mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	< 0.020	0.020	mg/L	2019-04-08	
Carbon, Dissolved Organic	2.27	0.50	mg/L	2019-04-09	
Chemical Oxygen Demand	< 20	20	mg/L	2019-04-11	
Conductivity (EC)	27.4	2.0	µS/cm	2019-04-10	
Nitrogen, Total Kjeldahl	0.154	0.050	mg/L	2019-04-08	
pH	6.63	0.10	pH units	2019-04-10	HT2
Total Metals					
Aluminum, total	0.0786	0.0050	mg/L	2019-04-12	
Antimony, total	< 0.00020	0.00020	mg/L	2019-04-12	
Arsenic, total	< 0.00050	0.00050	mg/L	2019-04-12	
Barium, total	< 0.0050	0.0050	mg/L	2019-04-12	
Beryllium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Bismuth, total	< 0.00010	0.00010	mg/L	2019-04-12	
Boron, total	0.0080	0.0050	mg/L	2019-04-12	
Cadmium, total	0.000041	0.000010	mg/L	2019-04-12	
Calcium, total	2.71	0.20	mg/L	2019-04-12	
Chromium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Cobalt, total	< 0.00010	0.00010	mg/L	2019-04-12	
Copper, total	0.00076	0.00040	mg/L	2019-04-12	
Iron, total	0.023	0.010	mg/L	2019-04-12	
Lead, total	< 0.00020	0.00020	mg/L	2019-04-12	
Lithium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Magnesium, total	0.521	0.010	mg/L	2019-04-12	
Manganese, total	0.00251	0.00020	mg/L	2019-04-12	
Mercury, total	< 0.000010	0.000010	mg/L	2019-04-11	
Molybdenum, total	< 0.00010	0.00010	mg/L	2019-04-12	
Nickel, total	< 0.00040	0.00040	mg/L	2019-04-12	
Phosphorus, total	< 0.050	0.050	mg/L	2019-04-12	
Potassium, total	0.25	0.10	mg/L	2019-04-12	
Selenium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Silicon, total	4.2	1.0	mg/L	2019-04-12	
Silver, total	< 0.000050	0.000050	mg/L	2019-04-12	
Sodium, total	1.79	0.10	mg/L	2019-04-12	
Strontium, total	0.0175	0.0010	mg/L	2019-04-12	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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Analyte	Result	RL	Units	Analyzed	Qualifier

SLE (9040539-04) | Matrix: Water | Sampled: 2019-04-03 14:00, Continued

PRES

Total Metals, Continued

Sulfur, total	< 3.0	3.0	mg/L	2019-04-12	
Tellurium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Thallium, total	< 0.000020	0.000020	mg/L	2019-04-12	
Thorium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Tin, total	< 0.00020	0.00020	mg/L	2019-04-12	
Titanium, total	< 0.0050	0.0050	mg/L	2019-04-12	
Tungsten, total	< 0.0010	0.0010	mg/L	2019-04-12	
Uranium, total	0.000052	0.000020	mg/L	2019-04-12	
Vanadium, total	< 0.0010	0.0010	mg/L	2019-04-12	
Zinc, total	< 0.0040	0.0040	mg/L	2019-04-12	
Zirconium, total	< 0.00010	0.00010	mg/L	2019-04-12	

SLF (9040539-05) | Matrix: Water | Sampled: 2019-04-03 13:50

PRES

Anions

Chloride	0.23	0.10	mg/L	2019-04-07	
Nitrate (as N)	0.012	0.010	mg/L	2019-04-07	HT1
Nitrite (as N)	< 0.010	0.010	mg/L	2019-04-07	HT1

Calculated Parameters

Hardness, Total (as CaCO3)	4.71	0.500	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.020	0.020	mg/L	2019-04-08	
Carbon, Dissolved Organic	6.24	0.50	mg/L	2019-04-09	
Chemical Oxygen Demand	< 20	20	mg/L	2019-04-11	
Conductivity (EC)	10.6	2.0	µS/cm	2019-04-10	
Nitrogen, Total Kjeldahl	0.195	0.050	mg/L	2019-04-08	
pH	5.88	0.10	pH units	2019-04-10	HT2

Total Metals

Aluminum, total	0.332	0.0050	mg/L	2019-04-12	
Antimony, total	< 0.00020	0.00020	mg/L	2019-04-12	
Arsenic, total	< 0.00050	0.00050	mg/L	2019-04-12	
Barium, total	< 0.0050	0.0050	mg/L	2019-04-12	
Beryllium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Bismuth, total	< 0.00010	0.00010	mg/L	2019-04-12	
Boron, total	0.0060	0.0050	mg/L	2019-04-12	
Cadmium, total	0.000030	0.000010	mg/L	2019-04-12	
Calcium, total	1.60	0.20	mg/L	2019-04-12	
Chromium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Cobalt, total	< 0.00010	0.00010	mg/L	2019-04-12	
Copper, total	0.00059	0.00040	mg/L	2019-04-12	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040539
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Analyte	Result	RL	Units	Analyzed	Qualifier

SLF (9040539-05) | Matrix: Water | Sampled: 2019-04-03 13:50, Continued

PRES

Total Metals, Continued

Iron, total	0.152	0.010	mg/L	2019-04-12	
Lead, total	< 0.00020	0.00020	mg/L	2019-04-12	
Lithium, total	0.00018	0.00010	mg/L	2019-04-12	
Magnesium, total	0.174	0.010	mg/L	2019-04-12	
Manganese, total	0.00672	0.00020	mg/L	2019-04-12	
Mercury, total	< 0.000010	0.000010	mg/L	2019-04-11	
Molybdenum, total	< 0.00010	0.00010	mg/L	2019-04-12	
Nickel, total	< 0.00040	0.00040	mg/L	2019-04-12	
Phosphorus, total	< 0.050	0.050	mg/L	2019-04-12	
Potassium, total	< 0.10	0.10	mg/L	2019-04-12	
Selenium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Silicon, total	1.5	1.0	mg/L	2019-04-12	
Silver, total	< 0.000050	0.000050	mg/L	2019-04-12	
Sodium, total	0.51	0.10	mg/L	2019-04-12	
Strontium, total	0.0059	0.0010	mg/L	2019-04-12	
Sulfur, total	< 3.0	3.0	mg/L	2019-04-12	
Tellurium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Thallium, total	< 0.000020	0.000020	mg/L	2019-04-12	
Thorium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Tin, total	< 0.00020	0.00020	mg/L	2019-04-12	
Titanium, total	< 0.0050	0.0050	mg/L	2019-04-12	
Tungsten, total	< 0.0010	0.0010	mg/L	2019-04-12	
Uranium, total	0.000048	0.000020	mg/L	2019-04-12	
Vanadium, total	0.0011	0.0010	mg/L	2019-04-12	
Zinc, total	< 0.0040	0.0040	mg/L	2019-04-12	
Zirconium, total	< 0.00010	0.00010	mg/L	2019-04-12	

Field Blank (9040539-06) | Matrix: Water | Sampled: 2019-04-03 15:47

PRES

Anions

Chloride	< 0.10	0.10	mg/L	2019-04-07	
Nitrate (as N)	< 0.010	0.010	mg/L	2019-04-07	HT1
Nitrite (as N)	< 0.010	0.010	mg/L	2019-04-07	HT1

Calculated Parameters

Hardness, Total (as CaCO ₃)	< 0.500	0.500	mg/L	N/A	

General Parameters

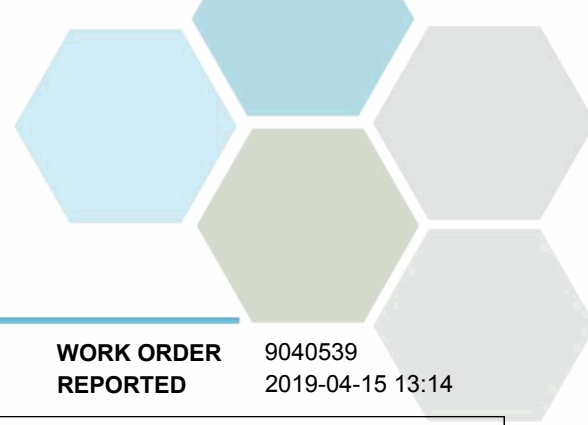
Ammonia, Total (as N)	< 0.020	0.020	mg/L	2019-04-08	
Carbon, Dissolved Organic	< 0.50	0.50	mg/L	2019-04-09	
Chemical Oxygen Demand	< 20	20	mg/L	2019-04-11	
Conductivity (EC)	< 2.0	2.0	µS/cm	2019-04-10	
Nitrogen, Total Kjeldahl	< 0.050	0.050	mg/L	2019-04-08	

TEST RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
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WORK ORDER REPORTED 9040539
2019-04-15 13:14

Analyte	Result	RL	Units	Analyzed	Qualifier
Field Blank (9040539-06) Matrix: Water Sampled: 2019-04-03 15:47, Continued					PRES
<i>General Parameters, Continued</i>					
pH	5.20	0.10	pH units	2019-04-10	HT2
<i>Total Metals</i>					
Aluminum, total	< 0.0050	0.0050	mg/L	2019-04-12	
Antimony, total	< 0.00020	0.00020	mg/L	2019-04-12	
Arsenic, total	< 0.00050	0.00050	mg/L	2019-04-12	
Barium, total	< 0.0050	0.0050	mg/L	2019-04-12	
Beryllium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Bismuth, total	< 0.00010	0.00010	mg/L	2019-04-12	
Boron, total	< 0.0050	0.0050	mg/L	2019-04-12	
Cadmium, total	< 0.000010	0.000010	mg/L	2019-04-12	
Calcium, total	< 0.20	0.20	mg/L	2019-04-12	
Chromium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Cobalt, total	< 0.00010	0.00010	mg/L	2019-04-12	
Copper, total	< 0.00040	0.00040	mg/L	2019-04-12	
Iron, total	< 0.010	0.010	mg/L	2019-04-12	
Lead, total	< 0.00020	0.00020	mg/L	2019-04-12	
Lithium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Magnesium, total	< 0.010	0.010	mg/L	2019-04-12	
Manganese, total	< 0.00020	0.00020	mg/L	2019-04-12	
Mercury, total	< 0.000010	0.000010	mg/L	2019-04-11	
Molybdenum, total	< 0.00010	0.00010	mg/L	2019-04-12	
Nickel, total	< 0.00040	0.00040	mg/L	2019-04-12	
Phosphorus, total	< 0.050	0.050	mg/L	2019-04-12	
Potassium, total	< 0.10	0.10	mg/L	2019-04-12	
Selenium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Silicon, total	< 1.0	1.0	mg/L	2019-04-12	
Silver, total	< 0.000050	0.000050	mg/L	2019-04-12	
Sodium, total	< 0.10	0.10	mg/L	2019-04-12	
Strontium, total	< 0.0010	0.0010	mg/L	2019-04-12	
Sulfur, total	< 3.0	3.0	mg/L	2019-04-12	
Tellurium, total	< 0.00050	0.00050	mg/L	2019-04-12	
Thallium, total	< 0.000020	0.000020	mg/L	2019-04-12	
Thorium, total	< 0.00010	0.00010	mg/L	2019-04-12	
Tin, total	< 0.00020	0.00020	mg/L	2019-04-12	
Titanium, total	< 0.0050	0.0050	mg/L	2019-04-12	
Tungsten, total	< 0.0010	0.0010	mg/L	2019-04-12	
Uranium, total	< 0.000020	0.000020	mg/L	2019-04-12	
Vanadium, total	< 0.0010	0.0010	mg/L	2019-04-12	
Zinc, total	< 0.0040	0.0040	mg/L	2019-04-12	
Zirconium, total	< 0.00010	0.00010	mg/L	2019-04-12	



TEST RESULTS

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Sample Qualifiers:

HT1 The sample was prepared and/or analyzed past the recommended holding time.
HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES Sample has been preserved for NH3 TKN in the laboratory and the holding time has been extended.

APPENDIX 1: SUPPORTING INFORMATION

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Analysis Description	Method Ref.	Technique	Location
Ammonia, Total in Water	SM 4500-NH3 G* (2011)	Automated Colorimetry (Phenate)	Kelowna
Anions in Water	SM 4110 B (2011)	Ion Chromatography	Kelowna
Carbon, Dissolved Organic in Water	SM 5310 B (2011)	Combustion, Infrared CO2 Detection	Kelowna
Chemical Oxygen Demand in Water	SM 5220 D* (2011)	Closed Reflux, Colorimetry	Richmond
Conductivity in Water	SM 2510 B (2011)	Conductivity Meter	Richmond
Hardness in Water	SM 2340 B* (2011)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	N/A
Mercury, total in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2011)	Block Digestion and Flow Injection Analysis	Kelowna
pH in Water	SM 4500-H+ B (2011)	Electrometry	Richmond
Total Metals in Water	EPA 200.2* / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
mg/L	Milligrams per litre
pH units	pH < 7 = acidic, pH > 7 = basic
µS/cm	Microsiemens per centimetre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: bshaw@caro.ca

APPENDIX 2: QUALITY CONTROL RESULTS

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The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (BLK):** A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup):** An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS):** A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS):** A second aliquot of sample is fortified with with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM):** A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Anions, Batch B9D0519									
Blank (B9D0519-BLK1)			Prepared: 2019-04-06, Analyzed: 2019-04-06						
Chloride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Blank (B9D0519-BLK2)			Prepared: 2019-04-07, Analyzed: 2019-04-07						
Chloride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
LCS (B9D0519-BS1)			Prepared: 2019-04-06, Analyzed: 2019-04-06						
Chloride	16.0	0.10 mg/L	16.0		100	90-110			
Nitrate (as N)	3.93	0.010 mg/L	4.00		98	93-108			
Nitrite (as N)	2.00	0.010 mg/L	2.00		100	85-114			
LCS (B9D0519-BS2)			Prepared: 2019-04-07, Analyzed: 2019-04-07						
Chloride	15.9	0.10 mg/L	16.0		100	90-110			
Nitrate (as N)	3.97	0.010 mg/L	4.00		99	93-108			
Nitrite (as N)	1.95	0.010 mg/L	2.00		97	85-114			
General Parameters, Batch B9D0529									
Blank (B9D0529-BLK1)			Prepared: 2019-04-08, Analyzed: 2019-04-08						
Ammonia, Total (as N)	< 0.020	0.020 mg/L							
Blank (B9D0529-BLK2)			Prepared: 2019-04-08, Analyzed: 2019-04-08						
Ammonia, Total (as N)	< 0.020	0.020 mg/L							
Blank (B9D0529-BLK3)			Prepared: 2019-04-08, Analyzed: 2019-04-08						
Ammonia, Total (as N)	< 0.020	0.020 mg/L							
LCS (B9D0529-BS1)			Prepared: 2019-04-08, Analyzed: 2019-04-08						
Ammonia, Total (as N)	1.01	0.020 mg/L	1.00		101	90-115			
LCS (B9D0529-BS2)			Prepared: 2019-04-08, Analyzed: 2019-04-08						
Ammonia, Total (as N)	1.06	0.020 mg/L	1.00		106	90-115			

APPENDIX 2: QUALITY CONTROL RESULTS

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9D0529, Continued									
LCS (B9D0529-BS3)				Prepared: 2019-04-08, Analyzed: 2019-04-08					
Ammonia, Total (as N)	1.07	0.020 mg/L	1.00		107	90-115			
General Parameters, Batch B9D0540									
Blank (B9D0540-BLK1)				Prepared: 2019-04-07, Analyzed: 2019-04-08					
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							
Blank (B9D0540-BLK2)				Prepared: 2019-04-07, Analyzed: 2019-04-08					
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							
LCS (B9D0540-BS1)				Prepared: 2019-04-07, Analyzed: 2019-04-08					
Nitrogen, Total Kjeldahl	1.04	0.050 mg/L	1.00		104	84-121			
LCS (B9D0540-BS2)				Prepared: 2019-04-07, Analyzed: 2019-04-08					
Nitrogen, Total Kjeldahl	1.08	0.050 mg/L	1.00		108	84-121			
General Parameters, Batch B9D0565									
Blank (B9D0565-BLK1)				Prepared: 2019-04-09, Analyzed: 2019-04-09					
Carbon, Dissolved Organic	< 0.50	0.50 mg/L							
Blank (B9D0565-BLK2)				Prepared: 2019-04-09, Analyzed: 2019-04-09					
Carbon, Dissolved Organic	< 0.50	0.50 mg/L							
LCS (B9D0565-BS1)				Prepared: 2019-04-09, Analyzed: 2019-04-09					
Carbon, Dissolved Organic	9.72	0.50 mg/L	10.0		97	78-116			
LCS (B9D0565-BS2)				Prepared: 2019-04-09, Analyzed: 2019-04-09					
Carbon, Dissolved Organic	9.84	0.50 mg/L	10.0		98	78-116			
General Parameters, Batch B9D0813									
General Parameters, Batch B9D0816									
Blank (B9D0816-BLK1)				Prepared: 2019-04-10, Analyzed: 2019-04-10					
Conductivity (EC)	< 2.0	2.0 µS/cm							
LCS (B9D0816-BS1)				Prepared: 2019-04-10, Analyzed: 2019-04-10					
Conductivity (EC)	149	2.0 µS/cm	147		101	90-110			
Reference (B9D0816-SRM1)				Prepared: 2019-04-10, Analyzed: 2019-04-10					
Conductivity (EC)	1030	2.0 µS/cm	1000		103	95-105			
General Parameters, Batch B9D0893									
Blank (B9D0893-BLK1)				Prepared: 2019-04-11, Analyzed: 2019-04-11					
Chemical Oxygen Demand	< 20	20 mg/L							
LCS (B9D0893-BS1)				Prepared: 2019-04-11, Analyzed: 2019-04-11					
Chemical Oxygen Demand	324	20 mg/L	300		108	93-109			
Duplicate (B9D0893-DUP1)				Source: 9040539-01 Prepared: 2019-04-11, Analyzed: 2019-04-11					
Chemical Oxygen Demand	< 20	20 mg/L		23				12	

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9D0953									
Blank (B9D0953-BLK1)				Prepared: 2019-04-11, Analyzed: 2019-04-11					
Mercury, total	< 0.000010	0.000010 mg/L							
Blank (B9D0953-BLK2)				Prepared: 2019-04-11, Analyzed: 2019-04-11					
Mercury, total	< 0.000010	0.000010 mg/L							
Reference (B9D0953-SRM1)				Prepared: 2019-04-11, Analyzed: 2019-04-11					
Mercury, total	0.00409	0.000010 mg/L	0.00489		84	80-120			
Reference (B9D0953-SRM2)				Prepared: 2019-04-11, Analyzed: 2019-04-11					
Mercury, total	0.00408	0.000010 mg/L	0.00489		83	80-120			
Total Metals, Batch B9D0970									
Blank (B9D0970-BLK1)				Prepared: 2019-04-11, Analyzed: 2019-04-12					
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Beryllium, total	< 0.00010	0.00010 mg/L							
Bismuth, total	< 0.00010	0.00010 mg/L							
Boron, total	< 0.0050	0.0050 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Cobalt, total	< 0.00010	0.00010 mg/L							
Copper, total	< 0.00040	0.00040 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00020	0.00020 mg/L							
Lithium, total	< 0.00010	0.00010 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							
Molybdenum, total	< 0.00010	0.00010 mg/L							
Nickel, total	< 0.00040	0.00040 mg/L							
Phosphorus, total	< 0.050	0.050 mg/L							
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Silicon, total	< 1.0	1.0 mg/L							
Silver, total	< 0.000050	0.000050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Strontium, total	< 0.0010	0.0010 mg/L							
Sulfur, total	< 3.0	3.0 mg/L							
Tellurium, total	< 0.00050	0.00050 mg/L							
Thallium, total	< 0.000020	0.000020 mg/L							
Thorium, total	< 0.00010	0.00010 mg/L							
Tin, total	< 0.00020	0.00020 mg/L							
Titanium, total	< 0.0050	0.0050 mg/L							
Tungsten, total	< 0.0010	0.0010 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Vanadium, total	< 0.0010	0.0010 mg/L							
Zinc, total	< 0.0040	0.0040 mg/L							
Zirconium, total	< 0.00010	0.00010 mg/L							
Blank (B9D0970-BLK2)				Prepared: 2019-04-11, Analyzed: 2019-04-12					
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9D0970, Continued									
Blank (B9D0970-BLK2), Continued					Prepared: 2019-04-11, Analyzed: 2019-04-12				
Barium, total	< 0.0050	0.0050 mg/L							
Beryllium, total	< 0.00010	0.00010 mg/L							
Bismuth, total	< 0.00010	0.00010 mg/L							
Boron, total	< 0.0050	0.0050 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Cobalt, total	< 0.00010	0.00010 mg/L							
Copper, total	< 0.00040	0.00040 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00020	0.00020 mg/L							
Lithium, total	< 0.00010	0.00010 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							
Molybdenum, total	< 0.00010	0.00010 mg/L							
Nickel, total	< 0.00040	0.00040 mg/L							
Phosphorus, total	< 0.050	0.050 mg/L							
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Silicon, total	< 1.0	1.0 mg/L							
Silver, total	< 0.000050	0.000050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Strontium, total	< 0.0010	0.0010 mg/L							
Sulfur, total	< 3.0	3.0 mg/L							
Tellurium, total	< 0.00050	0.00050 mg/L							
Thallium, total	< 0.000020	0.000020 mg/L							
Thorium, total	< 0.00010	0.00010 mg/L							
Tin, total	< 0.00020	0.00020 mg/L							
Titanium, total	< 0.0050	0.0050 mg/L							
Tungsten, total	< 0.0010	0.0010 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Vanadium, total	< 0.0010	0.0010 mg/L							
Zinc, total	< 0.0040	0.0040 mg/L							
Zirconium, total	< 0.00010	0.00010 mg/L							
Blank (B9D0970-BLK3)					Prepared: 2019-04-11, Analyzed: 2019-04-12				
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00020	0.00020 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Beryllium, total	< 0.00010	0.00010 mg/L							
Bismuth, total	< 0.00010	0.00010 mg/L							
Boron, total	< 0.0050	0.0050 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Cobalt, total	< 0.00010	0.00010 mg/L							
Copper, total	< 0.00040	0.00040 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00020	0.00020 mg/L							
Lithium, total	< 0.00010	0.00010 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							
Molybdenum, total	< 0.00010	0.00010 mg/L							
Nickel, total	< 0.00040	0.00040 mg/L							
Phosphorus, total	< 0.050	0.050 mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9D0970, Continued									
Blank (B9D0970-BLK3), Continued					Prepared: 2019-04-11, Analyzed: 2019-04-12				
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Silicon, total	< 1.0	1.0 mg/L							
Silver, total	< 0.000050	0.000050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Strontium, total	< 0.0010	0.0010 mg/L							
Sulfur, total	< 3.0	3.0 mg/L							
Tellurium, total	< 0.00050	0.00050 mg/L							
Thallium, total	< 0.000020	0.000020 mg/L							
Thorium, total	< 0.00010	0.00010 mg/L							
Tin, total	< 0.00020	0.00020 mg/L							
Titanium, total	< 0.0050	0.0050 mg/L							
Tungsten, total	< 0.0010	0.0010 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Vanadium, total	< 0.0010	0.0010 mg/L							
Zinc, total	< 0.0040	0.0040 mg/L							
Zirconium, total	< 0.00010	0.00010 mg/L							
LCS (B9D0970-BS1)					Prepared: 2019-04-11, Analyzed: 2019-04-12				
Aluminum, total	0.0200	0.0050 mg/L	0.0200		100	80-120			
Antimony, total	0.0209	0.00020 mg/L	0.0200		104	80-120			
Arsenic, total	0.0199	0.00050 mg/L	0.0200		99	80-120			
Barium, total	0.0198	0.0050 mg/L	0.0200		99	80-120			
Beryllium, total	0.0204	0.00010 mg/L	0.0200		102	80-120			
Bismuth, total	0.0210	0.00010 mg/L	0.0200		105	80-120			
Boron, total	0.0206	0.0050 mg/L	0.0200		103	80-120			
Cadmium, total	0.0199	0.000010 mg/L	0.0200		100	80-120			
Calcium, total	2.02	0.20 mg/L	2.00		101	80-120			
Chromium, total	0.0197	0.00050 mg/L	0.0200		99	80-120			
Cobalt, total	0.0199	0.00010 mg/L	0.0200		100	80-120			
Copper, total	0.0207	0.00040 mg/L	0.0200		104	80-120			
Iron, total	1.83	0.010 mg/L	2.00		91	80-120			
Lead, total	0.0207	0.00020 mg/L	0.0200		104	80-120			
Lithium, total	0.0205	0.00010 mg/L	0.0200		102	80-120			
Magnesium, total	2.00	0.010 mg/L	2.00		100	80-120			
Manganese, total	0.0199	0.00020 mg/L	0.0200		100	80-120			
Molybdenum, total	0.0200	0.00010 mg/L	0.0200		100	80-120			
Nickel, total	0.0202	0.00040 mg/L	0.0200		101	80-120			
Phosphorus, total	2.00	0.050 mg/L	2.00		100	80-120			
Potassium, total	2.03	0.10 mg/L	2.00		102	80-120			
Selenium, total	0.0206	0.00050 mg/L	0.0200		103	80-120			
Silicon, total	2.1	1.0 mg/L	2.00		106	80-120			
Silver, total	0.0201	0.000050 mg/L	0.0200		101	80-120			
Sodium, total	2.04	0.10 mg/L	2.00		102	80-120			
Strontium, total	0.0200	0.0010 mg/L	0.0200		100	80-120			
Sulfur, total	4.9	3.0 mg/L	5.00		99	80-120			
Tellurium, total	0.0200	0.00050 mg/L	0.0200		100	80-120			
Thallium, total	0.0210	0.000020 mg/L	0.0200		105	80-120			
Thorium, total	0.0198	0.00010 mg/L	0.0200		99	80-120			
Tin, total	0.0208	0.00020 mg/L	0.0200		104	80-120			
Titanium, total	0.0201	0.0050 mg/L	0.0200		100	80-120			
Tungsten, total	0.0203	0.0010 mg/L	0.0200		102	80-120			
Uranium, total	0.0232	0.000020 mg/L	0.0200		116	80-120			
Vanadium, total	0.0201	0.0010 mg/L	0.0200		101	80-120			
Zinc, total	0.0208	0.0040 mg/L	0.0200		104	80-120			
Zirconium, total	0.0215	0.00010 mg/L	0.0200		107	80-120			

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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9D0970, Continued									
Duplicate (B9D0970-DUP1)		Source: 9040539-01		Prepared: 2019-04-11, Analyzed: 2019-04-12					
Aluminum, total	0.403	0.0050 mg/L		0.385			5	20	
Antimony, total	< 0.00020	0.00020 mg/L		< 0.00020				20	
Arsenic, total	< 0.00050	0.00050 mg/L		< 0.00050				15	
Barium, total	< 0.0050	0.0050 mg/L		< 0.0050				9	
Beryllium, total	< 0.00010	0.00010 mg/L		< 0.00010				16	
Bismuth, total	< 0.00010	0.00010 mg/L		< 0.00010				20	
Boron, total	0.0100	0.0050 mg/L		0.0108				20	
Cadmium, total	0.000038	0.000010 mg/L		0.000054			35	20	
Calcium, total	1.66	0.20 mg/L		1.62			2	12	
Chromium, total	< 0.00050	0.00050 mg/L		< 0.00050				12	
Cobalt, total	0.00010	0.00010 mg/L		0.00010				13	
Copper, total	0.00059	0.00040 mg/L		0.00054				20	
Iron, total	0.203	0.010 mg/L		0.195			4	18	
Lead, total	0.00020	0.00020 mg/L		< 0.00020				20	
Lithium, total	0.00022	0.00010 mg/L		0.00022				19	
Magnesium, total	0.200	0.010 mg/L		0.192			4	10	
Manganese, total	0.00882	0.00020 mg/L		0.00844			5	13	
Molybdenum, total	< 0.00010	0.00010 mg/L		< 0.00010				20	
Nickel, total	< 0.00040	0.00040 mg/L		< 0.00040				20	
Phosphorus, total	< 0.050	0.050 mg/L		< 0.050				20	
Potassium, total	0.10	0.10 mg/L		< 0.10				13	
Selenium, total	< 0.00050	0.00050 mg/L		< 0.00050				20	
Silicon, total	1.7	1.0 mg/L		1.6				11	
Silver, total	< 0.000050	0.000050 mg/L		< 0.000050				18	
Sodium, total	0.55	0.10 mg/L		0.53			5	10	
Strontium, total	0.0064	0.0010 mg/L		0.0062			4	9	
Sulfur, total	< 3.0	3.0 mg/L		< 3.0				20	
Tellurium, total	< 0.00050	0.00050 mg/L		< 0.00050				20	
Thallium, total	< 0.000020	0.000020 mg/L		< 0.000020				20	
Thorium, total	< 0.00010	0.00010 mg/L		< 0.00010				18	
Tin, total	< 0.00020	0.00020 mg/L		< 0.00020				20	
Titanium, total	0.0057	0.0050 mg/L		0.0054				20	
Tungsten, total	< 0.0010	0.0010 mg/L		< 0.0010				20	
Uranium, total	0.000054	0.000020 mg/L		0.000054				14	
Vanadium, total	0.0017	0.0010 mg/L		0.0014				17	
Zinc, total	0.0050	0.0040 mg/L		0.0041				8	
Zirconium, total	< 0.00010	0.00010 mg/L		< 0.00010				20	

Reference (B9D0970-SRM1)		Prepared: 2019-04-11, Analyzed: 2019-04-12							
Aluminum, total	0.283	0.0050 mg/L	0.303		93	82-114			
Antimony, total	0.0519	0.00020 mg/L	0.0511		102	88-115			
Arsenic, total	0.119	0.00050 mg/L	0.118		100	88-111			
Barium, total	0.790	0.0050 mg/L	0.823		96	83-110			
Beryllium, total	0.0504	0.00010 mg/L	0.0496		102	80-119			
Boron, total	3.34	0.0050 mg/L	3.45		97	80-118			
Cadmium, total	0.0488	0.000010 mg/L	0.0495		99	90-110			
Calcium, total	11.0	0.20 mg/L	11.6		95	85-113			
Chromium, total	0.250	0.00050 mg/L	0.250		100	88-111			
Cobalt, total	0.0387	0.00010 mg/L	0.0377		103	90-114			
Copper, total	0.519	0.00040 mg/L	0.486		107	90-117			
Iron, total	0.458	0.010 mg/L	0.488		94	90-116			
Lead, total	0.207	0.00020 mg/L	0.204		102	90-110			
Lithium, total	0.410	0.00010 mg/L	0.403		102	79-118			
Magnesium, total	3.87	0.010 mg/L	3.79		102	88-116			
Manganese, total	0.107	0.00020 mg/L	0.109		98	88-108			
Molybdenum, total	0.198	0.00010 mg/L	0.198		100	88-110			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Sunshine Coast Regional District
SP100543

WORK ORDER REPORTED 9040539
2019-04-15 13:14

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B9D0970, Continued									
Reference (B9D0970-SRM1), Continued				Prepared: 2019-04-11, Analyzed: 2019-04-12					
Nickel, total	0.249	0.00040 mg/L	0.249		100	90-112			
Phosphorus, total	0.224	0.050 mg/L	0.227		99	72-118			
Potassium, total	7.52	0.10 mg/L	7.21		104	87-116			
Selenium, total	0.123	0.00050 mg/L	0.121		102	90-122			
Sodium, total	7.47	0.10 mg/L	7.54		99	86-118			
Strontium, total	0.379	0.0010 mg/L	0.375		101	86-110			
Thallium, total	0.0837	0.000020 mg/L	0.0805		104	90-113			
Uranium, total	0.0324	0.000020 mg/L	0.0306		106	88-112			
Vanadium, total	0.383	0.0010 mg/L	0.386		99	87-110			
Zinc, total	2.42	0.0040 mg/L	2.49		97	90-113			

Report Transmission Cover Page

Bill To: Sunshine Coast Regional District 1975 Field Road Sechelt, BC, Canada V0N 3A1	Project ID: Project Name: Sechelt Landfill Project Location: LSD: P.O.: 3001842 Proj. Acct. code:	Lot ID: 1390189 Control Number: Date Received: Nov 8, 2019 Date Reported: Nov 15, 2019 Report Number: 2463529
Attn: Accounts Payable Sampled By: Sandi Bandara Company: SCRD		

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
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Single Report	PDF	Invoice
Arun Kumar	Sunshine Coast Regional District	1975 Field Road Sechelt, BC V0N 3A1 Phone: (604) 885-6800 Fax: Email: Arun.kumar@scrd.ca
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COA
Sandi Bandara	Sunshine Coast Regional District	1975 Field Road Sechelt, BC V0N 3A1 Phone: (604) 885-6800 Fax: Email: sandi.bandara@scrd.ca
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Single Report	PDF	Test Report

Notes To Clients:

- Nov 12, 2019 - Reduction of analytical volume was necessary for ammonia to bring results within the analytical range for samples 1390189-5 and 6. Detection limits are adjusted accordingly.
- Nov 12, 2019 - Reduction of analytical volume was necessary for anion analysis due to matrix effects in lot 1390189. Detection limits are adjusted accordingly.
- Nov 12, 2019 - Reduction of analytical volume was necessary for total phosphorus analysis to bring results within the analytical range for sample 1390189-5. Detection limits are adjusted accordingly.
- Nov 14, 2019 - Sample 1390189-4; 6845370: Reduction of analytical volume was necessary for strontium to bring results within the analytical range for sample 1390189-4. Detection limits are adjusted accordingly.

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Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390189
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
VON 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463529
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390189-1	1390189-2	1390189-3
		Sample Date	Nov 06, 2019	Nov 06, 2019	Nov 06, 2019
		Sample Time	12:10	11:30	12:20
		Sample Location			
		Sample Description	MW13-4 (Groundwater) / 4.4 °C	MW-4 (Groundwater) / 4.4 °C	MW-1 (Groundwater) / 4.4 °C
		Matrix	Water	Water	Water
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents					
Chemical Oxygen Demand	mg/L	60	<10	20	10
Inorganic Nonmetallic Parameters					
Kjeldahl Nitrogen	Total mg/L	<0.07	0.21	0.07	0.07
Organic Carbon	Dissolved Nonpurgeable mg/L	<0.5	1.9	0.6	0.5
Ammonia - N	mg/L	<0.01	0.06	<0.01	0.01
Phosphorus	Total mg/L	0.116	0.015	0.080	0.003
Metals Dissolved					
Mercury	Dissolved µg/L	<0.01	<0.01	<0.01	0.05
Physical and Aggregate Properties					
Turbidity	NTU	53.9	6.84	31.7	0.1
Routine Water					
pH - Holding Time		Exceeded	Exceeded	Exceeded	
pH	at 25 °C	6.82	6.63	6.66	0.01
Electrical Conductivity	µS/cm at 25 °C	62	460	496	1
Calcium	Dissolved mg/L	6.3	62	92	0.01
Magnesium	Dissolved mg/L	0.87	9.9	5.9	0.02
Potassium	Dissolved mg/L	0.46	8.1	2.3	0.04
Sodium	Dissolved mg/L	3.3	14	11	0.1
Sulfur	Dissolved mg/L	0.53	3.0	52	0.02
Bicarbonate	mg/L	30	271	82	5
Carbonate	mg/L	<6	<6	<6	6
Hydroxide	mg/L	<5	<5	<5	5
P-Alkalinity	as CaCO3 mg/L	<5	<5	<5	5
T-Alkalinity	as CaCO3 mg/L	25	222	67	5
Chloride	Dissolved mg/L	2.4	9.2	18.7	0.05
Nitrate - N	Dissolved mg/L	<0.1	<0.1	0.2	0.01
Nitrite - N	Dissolved mg/L	<0.1	<0.1	<0.1	0.01
Sulfate (SO4)	Dissolved mg/L	2	8	136	0.1
Hardness	as CaCO3 (dissolved) mg/L	19	190	250	5
Salinity	Dissolved g/L	0.0083	0.036	0.027	0.0001
Silicon	Dissolved µg/L	8000	12000	6200	5
Mono-Aromatic Hydrocarbons - Water					
Benzene	µg/L	<0.5	0.5	<0.5	0.5
Ethylbenzene	µg/L	<0.5	<0.5	<0.5	0.5
Methyl t-Butyl Ether	µg/L	<0.5	<0.5	<0.5	0.5
Styrene	µg/L	<0.5	<0.5	<0.5	0.5
Toluene	µg/L	<0.5	1.6	<0.5	0.5

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390189
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
VON 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463529
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390189-1	1390189-2	1390189-3
		Sample Date	Nov 06, 2019	Nov 06, 2019	Nov 06, 2019
		Sample Time	12:10	11:30	12:20
		Sample Location			
		Sample Description	MW13-4 (Groundwater) / 4.4 °C	MW-4 (Groundwater) / 4.4 °C	MW-1 (Groundwater) / 4.4 °C
		Matrix	Water	Water	Water
Analyte		Units	Results	Results	Results
Nominal Detection Limit					
Mono-Aromatic Hydrocarbons - Water - Continued					
Total Xylenes (m,p,o)		µg/L	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	%	102	98.4	97.9
Dibromofluoromethane	Surrogate	%	99.8	98.9	96.1
Toluene-d8	Surrogate	%	103	104	102
Volatile Petroleum Hydrocarbons - Water					
VPHw (VHW6-10 minus BTEX)		µg/L	<50	<50	<50
VHW6-10		µg/L	<50	<50	<50
Trace Metals Dissolved					
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	Lab filtered & preserved
Aluminum	Dissolved	µg/L	1	<1	1
Antimony	Dissolved	µg/L	0.06	0.22	0.09
Arsenic	Dissolved	µg/L	0.1	0.2	0.2
Barium	Dissolved	µg/L	1.1	50.0	22.3
Beryllium	Dissolved	µg/L	<0.05	<0.05	<0.05
Bismuth	Dissolved	µg/L	<0.1	<0.1	<0.1
Boron	Dissolved	µg/L	2	24	169
Cadmium	Dissolved	µg/L	0.02	0.27	0.11
Chromium	Dissolved	µg/L	0.11	<0.05	<0.05
Cobalt	Dissolved	µg/L	0.03	4.18	0.09
Copper	Dissolved	µg/L	<0.5	1.1	0.5
Iron	Dissolved	µg/L	<2	<2	<2
Lead	Dissolved	µg/L	0.02	<0.01	<0.01
Lithium	Dissolved	µg/L	<0.5	3.6	<0.5
Manganese	Dissolved	µg/L	5	1280	19
Molybdenum	Dissolved	µg/L	0.06	0.07	0.07
Nickel	Dissolved	µg/L	<0.2	1.9	0.5
Selenium	Dissolved	µg/L	<0.2	<0.2	<0.2
Silver	Dissolved	µg/L	<0.01	0.05	<0.01
Strontium	Dissolved	µg/L	40.9	543.6	567.9
Thallium	Dissolved	µg/L	0.03	<0.01	0.01
Thorium	Dissolved	µg/L	<0.05	<0.05	<0.05
Tin	Dissolved	µg/L	<0.1	<0.1	<0.1
Uranium	Dissolved	µg/L	0.04	0.19	0.10
Vanadium	Dissolved	µg/L	0.93	<0.05	<0.05
Zinc	Dissolved	µg/L	5.2	19.1	7.4
Zirconium	Dissolved	µg/L	<0.1	<0.1	<0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390189
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463529
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390189-1	1390189-2	1390189-3
		Sample Date	Nov 06, 2019	Nov 06, 2019	Nov 06, 2019
		Sample Time	12:10	11:30	12:20
		Sample Location			
		Sample Description	MW13-4 (Groundwater) / 4.4 °C	MW-4 (Groundwater) / 4.4 °C	MW-1 (Groundwater) / 4.4 °C
		Matrix	Water	Water	Water
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved - Continued					
Titanium	Dissolved	µg/L	<0.1	<0.1	<0.1
					0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390189
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463529
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390189-4	1390189-5	1390189-6	
		Sample Date	Nov 06, 2019	Nov 06, 2019	Nov 06, 2019	
		Sample Time	12:32	12:45	12:55	
		Sample Location				
		Sample Description	MW-2 (Groundwater) / 4.4 °C	MW-2A (Groundwater) / 4.4 °C	MW-3 (Groundwater) / 4.4 °C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Chemical Oxygen Demand		mg/L	40	120	60	10
Inorganic Nonmetallic Parameters						
Kjeldahl Nitrogen	Total	mg/L	0.52	9.88	18.1	0.07
Organic Carbon	Dissolved Nonpurgeable	mg/L	3.8	16.0	11.9	0.5
Ammonia - N		mg/L	<0.01	11.1	20.8	0.01
Phosphorus	Total	mg/L	0.023	0.80	0.024	0.003
Metals Dissolved						
Mercury	Dissolved	µg/L	<0.01	<0.01	<0.01	0.05
Physical and Aggregate Properties						
Turbidity		NTU	10.2	77.3	82.2	0.1
Routine Water						
pH - Holding Time			Exceeded	Exceeded	Exceeded	
pH	at 25 °C		7.00	7.21	7.31	0.01
Electrical Conductivity		µS/cm at 25 °C	890	699	1013	1
Calcium	Dissolved	mg/L	120	56	88	0.01
Magnesium	Dissolved	mg/L	21	9.5	16	0.02
Potassium	Dissolved	mg/L	2.6	19	28	0.04
Sodium	Dissolved	mg/L	16	35	47	0.1
Sulfur	Dissolved	mg/L	51	1.3	7.0	0.02
Bicarbonate		mg/L	160	241	392	5
Carbonate		mg/L	<6	<6	<6	6
Hydroxide		mg/L	<5	<5	<5	5
P-Alkalinity	as CaCO3	mg/L	<5	<5	<5	5
T-Alkalinity	as CaCO3	mg/L	131	198	322	5
Chloride	Dissolved	mg/L	106	89.8	107	0.05
Nitrate - N	Dissolved	mg/L	<0.1	<0.1	<0.1	0.01
Nitrite - N	Dissolved	mg/L	<0.1	<0.1	<0.1	0.01
Sulfate (SO4)	Dissolved	mg/L	151	2	18	0.1
Hardness	as CaCO3 (dissolved)	mg/L	390	180	290	5
Salinity	Dissolved	g/L	0.039	0.089	0.12	0.0001
Silicon	Dissolved	µg/L	11000	5800	3700	5
Mono-Aromatic Hydrocarbons - Water						
Benzene		µg/L	<0.5	<0.5	<0.5	0.5
Ethylbenzene		µg/L	<0.5	<0.5	<0.5	0.5
Methyl t-Butyl Ether		µg/L	<0.5	<0.5	<0.5	0.5
Styrene		µg/L	<0.5	<0.5	<0.5	0.5
Toluene		µg/L	<0.5	10.0	<0.5	0.5

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390189
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
VON 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463529
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390189-4	1390189-5	1390189-6
		Sample Date	Nov 06, 2019	Nov 06, 2019	Nov 06, 2019
		Sample Time	12:32	12:45	12:55
		Sample Location			
		Sample Description	MW-2 (Groundwater) / 4.4 °C	MW-2A (Groundwater) / 4.4 °C	MW-3 (Groundwater) / 4.4 °C
		Matrix	Water	Water	Water
Analyte		Units	Results	Results	Results
Nominal Detection Limit					
Mono-Aromatic Hydrocarbons - Water - Continued					
Total Xylenes (m,p,o)		µg/L	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	%	100	99.5	98.2
Dibromofluoromethane	Surrogate	%	96.3	96.8	96.8
Toluene-d8	Surrogate	%	102	104	104
Volatile Petroleum Hydrocarbons - Water					
VPHw (VHW6-10 minus BTEX)		µg/L	<50	<50	<50
VHW6-10		µg/L	<50	<50	<50
Trace Metals Dissolved					
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	Lab filtered & preserved
Aluminum	Dissolved	µg/L	<1	1	1
Antimony	Dissolved	µg/L	0.11	0.26	0.25
Arsenic	Dissolved	µg/L	0.5	1.7	0.9
Barium	Dissolved	µg/L	26.1	92.5	380.1
Beryllium	Dissolved	µg/L	<0.05	<0.05	<0.05
Bismuth	Dissolved	µg/L	<0.1	<0.1	<0.1
Boron	Dissolved	µg/L	225	428	501
Cadmium	Dissolved	µg/L	0.04	0.10	<0.01
Chromium	Dissolved	µg/L	<0.05	<0.05	<0.05
Cobalt	Dissolved	µg/L	2.58	3.31	0.12
Copper	Dissolved	µg/L	<0.5	4.4	<0.5
Iron	Dissolved	µg/L	107	166	12
Lead	Dissolved	µg/L	<0.01	<0.01	<0.01
Lithium	Dissolved	µg/L	<0.5	2.3	<0.5
Manganese	Dissolved	µg/L	8790	1770	1260
Molybdenum	Dissolved	µg/L	0.49	0.18	0.15
Nickel	Dissolved	µg/L	1.5	2.9	2.8
Selenium	Dissolved	µg/L	<0.2	<0.2	<0.2
Silver	Dissolved	µg/L	<0.01	<0.01	<0.01
Strontium	Dissolved	µg/L	1798	652.6	533.4
Thallium	Dissolved	µg/L	<0.01	<0.01	<0.01
Thorium	Dissolved	µg/L	<0.05	<0.05	<0.05
Tin	Dissolved	µg/L	<0.1	<0.1	<0.1
Uranium	Dissolved	µg/L	0.98	0.09	0.02
Vanadium	Dissolved	µg/L	<0.05	<0.05	<0.05
Zinc	Dissolved	µg/L	9.8	4.3	3.0
Zirconium	Dissolved	µg/L	<0.1	<0.1	<0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390189
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463529
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390189-4	1390189-5	1390189-6
		Sample Date	Nov 06, 2019	Nov 06, 2019	Nov 06, 2019
		Sample Time	12:32	12:45	12:55
		Sample Location			
		Sample Description	MW-2 (Groundwater) / 4.4 °C	MW-2A (Groundwater) / 4.4 °C	MW-3 (Groundwater) / 4.4 °C
		Matrix	Water	Water	Water
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved - Continued					
Titanium	Dissolved	µg/L	0.1	<0.1	<0.1
					0.1

Approved by:



Benjamin Morris, B.Sc
Operations Manager

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.

Methodology and Notes

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390189
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463529
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alk, pH, EC, Turb in water (BC)	APHA	* Alkalinity - Titration Method, 2320 B	Nov 8, 2019	Element Vancouver
Alk, pH, EC, Turb in water (BC)	APHA	* Conductivity, 2510 B	Nov 8, 2019	Element Vancouver
Alk, pH, EC, Turb in water (BC)	APHA	* pH - Electrometric Method, 4500-H+ B	Nov 8, 2019	Element Vancouver
Ammonia-N in Water (VAN)	APHA	* Flow Injection Analysis, 4500-NH3 H	Nov 12, 2019	Element Vancouver
Anions by IEC in water (VAN)	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Nov 8, 2019	Element Vancouver
BTEX-VPH - Water (MS) (VAN)	BCELM	* Calculation of Volatile Petroleum Hydrocarbons in Solids, Waters, or Air (Vapour) – VPH (June 26, 2009), VPH	Nov 8, 2019	Element Vancouver
BTEX-VPH - Water (MS) (VAN)	BCELM	* Volatile Hydrocarbons in Water by GC/FID, VH Water	Nov 8, 2019	Element Vancouver
Carbon Organic (Dissolved) in water (DOC)	APHA	High-Temperature Combustion Method, 5310 B	Nov 14, 2019	Element Edmonton - Roper Road
Chemical Oxygen Demand (water-VAN)	APHA	* Closed Reflux, Colorimetric Method, 5220 D	Nov 13, 2019	Element Vancouver
Chemical Oxygen Demand (water-VAN)	APHA	* Closed Reflux, Colorimetric Method, 5220 D	Nov 14, 2019	Element Vancouver
Mercury Low Level (Dissolved) in water (VAN)	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Nov 15, 2019	Element Vancouver
Metals SemiTrace (Dissolved) in water (VAN)	US EPA	* Metals & Trace Elements by ICP-AES, 6010C	Nov 13, 2019	Element Vancouver
Phosphorus - total by Smartchem (VAN)	APHA	* Persulfate digestion method, 4500-P B5	Nov 12, 2019	Element Vancouver
Total and Kjeldahl Nitrogen (Total) in Water	ISO	* Water Quality - Determination of nitrogen, ISO/TR 11905-2	Nov 13, 2019	Element Edmonton - Roper Road
Trace Metals (dissolved) in Water (VAN)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Nov 13, 2019	Element Vancouver
Turbidity - Water (VAN)	APHA	* Turbidity - Nephelometric Method, 2130 B	Nov 8, 2019	Element Vancouver

* Reference Method Modified

References

APHA	Standard Methods for the Examination of Water and Wastewater
BCELM	B.C. Environmental Laboratory Manual
EPA	Environmental Protection Agency Test Methods - US
ISO	International Organization for Standardization
US EPA	US Environmental Protection Agency Test Methods

Comments:

- Nov 12, 2019 - Reduction of analytical volume was necessary for ammonia to bring results within the analytical range for samples 1390189-5 and 6. Detection limits are adjusted accordingly.
- Nov 12, 2019 - Reduction of analytical volume was necessary for anion analysis due to matrix effects in lot 1390189. Detection limits are adjusted accordingly.
- Nov 12, 2019 - Reduction of analytical volume was necessary for total phosphorus analysis to bring results within the analytical range for sample 1390189-5. Detection limits are adjusted accordingly.
- Nov 14, 2019 - Sample 1390189-4; 6845370: Reduction of analytical volume was necessary for strontium to bring results within the analytical range for sample 1390189-4. Detection limits are adjusted accordingly.

Methodology and Notes

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390189
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463529
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Project Information

Project ID: Sechelt Landfill
Project Name: _____
Project Location: _____
Legal Location: _____
PO/AFE#: _____
Proj. Acct. Code: _____
Quote #: _____

Invoice To

Company: Sunshine Coast Regional District
Address: 1975 Field Rd.
Sechelt, BC V0N 3A1
Attention: Accounts Payable
Phone: 604-885-6800
Cell: _____
Fax: _____
E-mail: accounts.payable@scrd.ca
Agreement ID: 113277
Copy of Report: YES / (NO)

Report To

Company: Sunshine Coast Regional District
Address: 5920 Mason Rd.
Sechelt, BC V0N 3A8
Attention: Arun Kumar
Phone: 604-885-6800
E-mail: Arun.kumar@scrd.ca
E-mail: sandi.bandera@scrd.ca
E-mail: _____
E-mail: _____

Additional Reports to

1) Name: Sandi Bandera
E-mail: sandi.bandera@scrd.ca
2) Name: _____
E-mail: _____

Sample Custody

Sampled by: Sandi Bandera
Company: SCRD
I authorize Element to proceed with the work indicated on this form:
Signature: [Signature]
Date/Time: _____

RUSH Priority

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

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)

Date Required: _____

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

Dissolved metals (pink lid) and mercury (40ml vial) require filtration prior to preserving.

Site I.D.	Sample Description	Depth start end in cm m	Date/Time sampled	Matrix Time	Sampling method MATRIX	#	MeOH Field Preserved?	Enter tests above (✓ relevant samples below)
1 MW13-4	Ground Water		19/11/06	12:01	Water	8	✓	
2 MW-4			19/11/06	11:30		8	✓	
3 MW-1			19/11/06	12:20		8	✓	
4 MW-2			19/11/06	12:32		8	✓	
5 MW-2A			19/11/06	12:45		8	✓	
6 MW-3			19/11/06	12:55		8	✓	
7 ~~MW-3~~								
8 ~~MW-3~~								
9 ~~MW-3~~								
10 ~~Red Book~~								
11								
12								
13								
14								
15								

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: 1390189 COC



Temp. received: 4.4 °C
Date/Time stamp: NOV 8 19 11:19
Delivery Method: Courier

Waybill:

Report Transmission Cover Page

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390168
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463516
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

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
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Single Report	PDF	Invoice
Arun Kumar	Sunshine Coast Regional District	1975 Field Road Sechelt, BC V0N 3A1 Phone: (604) 885-6800 Fax: Email: Arun.kumar@scrd.ca
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COA
Sandi Bandara	Sunshine Coast Regional District	1975 Field Road Sechelt, BC V0N 3A1 Phone: (604) 885-6800 Fax: Email: sandi.bandara@scrd.ca
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Single Report	PDF	Test Report

Notes To Clients:

- Nov 12, 2019 - Reduction of analytical volume was necessary for ammonia to bring results within the analytical range for samples 1390168-1, 2, 3, and 5. Detection limits are adjusted accordingly.
- Nov 12, 2019 - Reduction of analytical volume was necessary for anion analysis due to matrix effects in lot 1390168. Detection limits are adjusted accordingly.
- Nov 12, 2019 - Reduction of analytical volume was necessary for total phosphorus analysis to bring results within the analytical range for samples 1390168-1 & 2. Detection limits are adjusted accordingly.
- Nov 14, 2019 - Sample 1390168-1; 6845229: Reduction of analytical volume was necessary for copper to bring results within the analytical range for sample 1390168-1. Detection limits are adjusted accordingly.
- Nov 14, 2019 - Sample 1390168-1; 6845229: Reduction of analytical volume was necessary for manganese to bring results within the analytical range for sample 1390168-1, 1390168-2, 1390168-3 and 1390168-5. Detection limits are adjusted accordingly.
- Nov 14, 2019 - Sample 1390168-1; 6845229: Reduction of analytical volume was necessary for manganese to bring results within the analytical range for sample 1390189-1, 1390189-4, 1390189-5 and 1390189-6. Detection limits are adjusted accordingly.
- Nov 14, 2019 - Sample 1390168-1; 6845229: Reduction of analytical volume was necessary for strontium to bring results within the analytical range for sample 1390168-1 and 1390168-5. Detection limits are adjusted accordingly.

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Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390168
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463516
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390168-1	1390168-2	1390168-3
		Sample Date	Nov 06, 2019	Nov 06, 2019	Nov 06, 2019
		Sample Time	13:10	14:00	14:30
		Sample Location			
		Sample Description	MW13-3 (Groundwater) / 4.4 °C	MW13-2 (Groundwater) / 4.4 °C	MW13-1 (Groundwater) / 4.4 °C
		Matrix	Water	Water	Water
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents					
Chemical Oxygen Demand	mg/L	110	50	50	10
Inorganic Nonmetallic Parameters					
Kjeldahl Nitrogen	Total	mg/L	6.32	6.17	65.4
Organic Carbon	Dissolved Nonpurgeable	mg/L	6.0	5.3	6.6
Ammonia - N		mg/L	6.27	7.01	63.0
Phosphorus	Total	mg/L	0.92	0.76	0.206
Metals Dissolved					
Mercury	Dissolved	µg/L	<0.01	<0.01	<0.01
Physical and Aggregate Properties					
Turbidity	NTU	80.4	57.7	87.4	0.1
Routine Water					
pH - Holding Time		Exceeded	Exceeded	Exceeded	
pH	at 25 °C	6.63	6.56	7.14	0.01
Electrical Conductivity	µS/cm at 25 °C	819	636	1048	1
Calcium	Dissolved	mg/L	76	74	63
Magnesium	Dissolved	mg/L	8.8	9.1	9.6
Potassium	Dissolved	mg/L	6.5	10	15
Sodium	Dissolved	mg/L	39	20	37
Sulfur	Dissolved	mg/L	15	4.6	1.6
Bicarbonate		mg/L	456	396	608
Carbonate		mg/L	<6	<6	<6
Hydroxide		mg/L	<5	<5	<5
P-Alkalinity	as CaCO ₃	mg/L	<5	<5	<5
T-Alkalinity	as CaCO ₃	mg/L	374	324	498
Chloride	Dissolved	mg/L	17.1	7.8	20.8
Nitrate - N	Dissolved	mg/L	<0.1	<0.1	0.1
Nitrite - N	Dissolved	mg/L	<0.1	<0.1	<0.1
Sulfate (SO ₄)	Dissolved	mg/L	45	12	3
Hardness	as CaCO ₃ (dissolved)	mg/L	230	220	200
Salinity	Dissolved	g/L	0.098	0.050	0.093
Silicon	Dissolved	µg/L	12000	11000	13000
Mono-Aromatic Hydrocarbons - Water					
Benzene		µg/L	1.7	0.7	1.4
Ethylbenzene		µg/L	<0.5	<0.5	<0.5
Methyl t-Butyl Ether		µg/L	<0.5	<0.5	<0.5
Styrene		µg/L	<0.5	<0.5	<0.5
Toluene		µg/L	<0.5	<0.5	<0.5

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390168
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
VON 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463516
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390168-1	1390168-2	1390168-3	
		Sample Date	Nov 06, 2019	Nov 06, 2019	Nov 06, 2019	
		Sample Time	13:10	14:00	14:30	
		Sample Location				
		Sample Description	MW13-3 (Groundwater) / 4.4 °C	MW13-2 (Groundwater) / 4.4 °C	MW13-1 (Groundwater) / 4.4 °C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Water - Continued						
Total Xylenes (m,p,o)		µg/L	<0.5	<0.5	<0.5	0.5
4-Bromofluorobenzene	Surrogate	%	98.3	97.4	99.2	80-120
Dibromofluoromethane	Surrogate	%	97.1	98.3	96.2	80-120
Toluene-d8	Surrogate	%	103	104	104	80-120
Volatile Petroleum Hydrocarbons - Water						
VPHw (VHw6-10 minus BTEX)		µg/L	<50	<50	<50	50
VHw6-10		µg/L	<50	<50	<50	50
Trace Metals Dissolved						
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	Lab filtered & preserved	
Aluminum	Dissolved	µg/L	2	2	2	1
Antimony	Dissolved	µg/L	0.13	0.09	0.19	0.02
Arsenic	Dissolved	µg/L	0.8	0.4	0.7	0.1
Barium	Dissolved	µg/L	83.2	82.6	90.8	0.1
Beryllium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Bismuth	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Boron	Dissolved	µg/L	185	129	89	2
Cadmium	Dissolved	µg/L	<0.01	0.02	0.01	0.01
Chromium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Cobalt	Dissolved	µg/L	0.93	0.31	3.16	0.02
Copper	Dissolved	µg/L	<0.5	<0.5	0.5	0.5
Iron	Dissolved	µg/L	3990	4	10	2
Lead	Dissolved	µg/L	0.01	<0.01	0.02	0.01
Lithium	Dissolved	µg/L	7.3	3.0	2.0	0.5
Manganese	Dissolved	µg/L	8580	7400	4060	1
Molybdenum	Dissolved	µg/L	0.60	0.13	0.54	0.02
Nickel	Dissolved	µg/L	2.6	1.3	2.1	0.2
Selenium	Dissolved	µg/L	<0.2	<0.2	<0.2	0.2
Silver	Dissolved	µg/L	<0.01	<0.01	<0.01	0.01
Strontium	Dissolved	µg/L	1291	833.5	991.3	0.1
Thallium	Dissolved	µg/L	0.01	<0.01	<0.01	0.01
Thorium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Tin	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Uranium	Dissolved	µg/L	0.78	0.26	0.28	0.01
Vanadium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Zinc	Dissolved	µg/L	10.4	15.1	8.7	0.5
Zirconium	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390168
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463516
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390168-1	1390168-2	1390168-3	
		Sample Date	Nov 06, 2019	Nov 06, 2019	Nov 06, 2019	
		Sample Time	13:10	14:00	14:30	
		Sample Location				
		Sample Description	MW13-3 (Groundwater) / 4.4 °C	MW13-2 (Groundwater) / 4.4 °C	MW13-1 (Groundwater) / 4.4 °C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved - Continued						
Titanium	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390168
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463516
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390168-4	1390168-5	
		Sample Date	Nov 06, 2019	Nov 06, 2019	
		Sample Time	14:40	14:50	
		Sample Location			
		Sample Description	Field Blank (De-ionized Water) / 4.4 °C	Duplicate (Groundwater) / 4.4 °C	
		Matrix	Water	Water	
Analyte		Units	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents					
Chemical Oxygen Demand		mg/L	10	110	10
Inorganic Nonmetallic Parameters					
Kjeldahl Nitrogen	Total	mg/L	0.17	55.4	0.07
Organic Carbon	Dissolved Nonpurgeable	mg/L	<0.5	8.2	0.5
Ammonia - N		mg/L	<0.01	72.7	0.01
Phosphorus	Total	mg/L	<0.003	0.131	0.003
Metals Dissolved					
Mercury	Dissolved	µg/L	<0.01	<0.01	0.05
Physical and Aggregate Properties					
Turbidity		NTU	0.35	81.8	0.1
Routine Water					
pH - Holding Time			Exceeded	Exceeded	
pH	at 25 °C		5.70	7.13	0.01
Electrical Conductivity		µS/cm at 25 °C	2	1105	1
Calcium	Dissolved	mg/L	<0.01	65	0.01
Magnesium	Dissolved	mg/L	<0.02	9.9	0.02
Potassium	Dissolved	mg/L	<0.04	16	0.04
Sodium	Dissolved	mg/L	<0.1	40	0.1
Sulfur	Dissolved	mg/L	<0.02	1.7	0.02
Bicarbonate		mg/L	<5	638	5
Carbonate		mg/L	<6	<6	6
Hydroxide		mg/L	<5	<5	5
P-Alkalinity	as CaCO ₃	mg/L	<5	<5	5
T-Alkalinity	as CaCO ₃	mg/L	<5	523	5
Chloride	Dissolved	mg/L	<0.5	22.2	0.05
Nitrate - N	Dissolved	mg/L	<0.1	<0.1	0.01
Nitrite - N	Dissolved	mg/L	<0.1	<0.1	0.01
Sulfate (SO ₄)	Dissolved	mg/L	<1	3	0.1
Hardness	as CaCO ₃ (dissolved)	mg/L	<5	200	5
Salinity	Dissolved	g/L	<0.0003	0.10	0.0001
Silicon	Dissolved	µg/L	<5	13000	5
Mono-Aromatic Hydrocarbons - Water					
Benzene		µg/L	<0.5	1.2	0.5
Ethylbenzene		µg/L	<0.5	<0.5	0.5
Methyl t-Butyl Ether		µg/L	<0.5	<0.5	0.5
Styrene		µg/L	<0.5	<0.5	0.5
Toluene		µg/L	<0.5	<0.5	0.5

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390168
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463516
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390168-4	1390168-5	
		Sample Date	Nov 06, 2019	Nov 06, 2019	
		Sample Time	14:40	14:50	
		Sample Location			
		Sample Description	Field Blank (De-ionized Water) / 4.4 °C	Duplicate (Groundwater) / 4.4 °C	
		Matrix	Water	Water	
Analyte		Units	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Water - Continued					
Total Xylenes (m,p,o)		µg/L	<0.5	<0.5	0.5
4-Bromofluorobenzene	Surrogate	%	99.4	98.7	80-120
Dibromofluoromethane	Surrogate	%	98.5	98.7	80-120
Toluene-d8	Surrogate	%	103	104	80-120
Volatile Petroleum Hydrocarbons - Water					
VPWhw (VHw6-10 minus BTEX)		µg/L	<50	<50	50
VHw6-10		µg/L	<50	<50	50
Trace Metals Dissolved					
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	
Aluminum	Dissolved	µg/L	<1	<1	1
Antimony	Dissolved	µg/L	<0.02	0.23	0.02
Arsenic	Dissolved	µg/L	<0.1	0.9	0.1
Barium	Dissolved	µg/L	<0.1	112.9	0.1
Beryllium	Dissolved	µg/L	<0.05	<0.05	0.05
Bismuth	Dissolved	µg/L	<0.1	<0.1	0.1
Boron	Dissolved	µg/L	<2	94	2
Cadmium	Dissolved	µg/L	<0.01	0.02	0.01
Chromium	Dissolved	µg/L	<0.05	<0.05	0.05
Cobalt	Dissolved	µg/L	<0.02	3.03	0.02
Copper	Dissolved	µg/L	<0.5	0.8	0.5
Iron	Dissolved	µg/L	<2	11	2
Lead	Dissolved	µg/L	<0.01	<0.01	0.01
Lithium	Dissolved	µg/L	<0.5	3.4	0.5
Manganese	Dissolved	µg/L	<1	4030	1
Molybdenum	Dissolved	µg/L	<0.02	0.57	0.02
Nickel	Dissolved	µg/L	0.2	3.4	0.2
Selenium	Dissolved	µg/L	<0.2	<0.2	0.2
Silver	Dissolved	µg/L	<0.01	<0.01	0.01
Strontium	Dissolved	µg/L	<0.1	1070	0.1
Thallium	Dissolved	µg/L	<0.01	<0.01	0.01
Thorium	Dissolved	µg/L	<0.05	<0.05	0.05
Tin	Dissolved	µg/L	<0.1	<0.1	0.1
Uranium	Dissolved	µg/L	<0.01	0.30	0.01
Vanadium	Dissolved	µg/L	<0.05	<0.05	0.05
Zinc	Dissolved	µg/L	<0.5	23.2	0.5
Zirconium	Dissolved	µg/L	<0.1	<0.1	0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390168
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463516
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Reference Number	1390168-4	1390168-5
Sample Date	Nov 06, 2019	Nov 06, 2019
Sample Time	14:40	14:50
Sample Location		
Sample Description	Field Blank (De-ionized Water) / 4.4 °C	Duplicate (Groundwater) / 4.4 °C
Matrix	Water	Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved - Continued					
Titanium	Dissolved	µg/L	<0.1	<0.1	0.1

Approved by:



Benjamin Morris, B.Sc
Operations Manager

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.

Methodology and Notes

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390168
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463516
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alk, pH, EC, Turb in water (BC)	APHA	* Alkalinity - Titration Method, 2320 B	Nov 8, 2019	Element Vancouver
Alk, pH, EC, Turb in water (BC)	APHA	* Conductivity, 2510 B	Nov 8, 2019	Element Vancouver
Alk, pH, EC, Turb in water (BC)	APHA	* pH - Electrometric Method, 4500-H+ B	Nov 8, 2019	Element Vancouver
Ammonia-N in Water (VAN)	APHA	* Flow Injection Analysis, 4500-NH3 H	Nov 12, 2019	Element Vancouver
Anions by IEC in water (VAN)	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Nov 8, 2019	Element Vancouver
BTEX-VPH - Water (MS) (VAN)	BCELM	* Calculation of Volatile Petroleum Hydrocarbons in Solids, Waters, or Air (Vapour) – VPH (June 26, 2009), VPH	Nov 8, 2019	Element Vancouver
BTEX-VPH - Water (MS) (VAN)	BCELM	* Volatile Hydrocarbons in Water by GC/FID, VH Water	Nov 8, 2019	Element Vancouver
Carbon Organic (Dissolved) in water (DOC)	APHA	High-Temperature Combustion Method, 5310 B	Nov 14, 2019	Element Edmonton - Roper Road
Chemical Oxygen Demand (water-VAN)	APHA	* Closed Reflux, Colorimetric Method, 5220 D	Nov 13, 2019	Element Vancouver
Mercury Low Level (Dissolved) in water (VAN)	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Nov 15, 2019	Element Vancouver
Metals SemiTrace (Dissolved) in water (VAN)	US EPA	* Metals & Trace Elements by ICP-AES, 6010C	Nov 13, 2019	Element Vancouver
Phosphorus - total by Smartchem (VAN)	APHA	* Persulfate digestion method, 4500-P B5	Nov 12, 2019	Element Vancouver
Total and Kjeldahl Nitrogen (Total) in Water	ISO	* Water Quality - Determination of nitrogen, ISO/TR 11905-2	Nov 13, 2019	Element Edmonton - Roper Road
Trace Metals (dissolved) in Water (VAN)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Nov 13, 2019	Element Vancouver
Turbidity - Water (VAN)	APHA	* Turbidity - Nephelometric Method, 2130 B	Nov 8, 2019	Element Vancouver

* Reference Method Modified

References

APHA	Standard Methods for the Examination of Water and Wastewater
BCELM	B.C. Environmental Laboratory Manual
EPA	Environmental Protection Agency Test Methods - US
ISO	International Organization for Standardization
US EPA	US Environmental Protection Agency Test Methods

Comments:

- Nov 12, 2019 - Reduction of analytical volume was necessary for ammonia to bring results within the analytical range for samples 1390168-1, 2, 3, and 5. Detection limits are adjusted accordingly.
- Nov 12, 2019 - Reduction of analytical volume was necessary for anion analysis due to matrix effects in lot 1390168. Detection limits are adjusted accordingly.
- Nov 12, 2019 - Reduction of analytical volume was necessary for total phosphorus analysis to bring results within the analytical range for samples 1390168-1 & 2. Detection limits are adjusted accordingly.
- Nov 14, 2019 - Sample 1390168-1; 6845229: Reduction of analytical volume was necessary for copper to bring results within the analytical range for sample 1390168-1. Detection limits are adjusted accordingly.
- Nov 14, 2019 - Sample 1390168-1; 6845229: Reduction of analytical volume was necessary for manganese to bring results within the analytical range for sample 1390168-1, 1390168-2, 1390168-3 and 1390168-5. Detection limits are adjusted accordingly.

Methodology and Notes

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390168
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463516
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

- Nov 14, 2019 - Sample 1390168-1; 6845229: Reduction of analytical volume was necessary for manganese to bring results within the analytical range for sample 1390189-1, 1390189-4, 1390189-5 and 1390189-6. Detection limits are adjusted accordingly.
- Nov 14, 2019 - Sample 1390168-1; 6845229: Reduction of analytical volume was necessary for strontium to bring results within the analytical range for sample 1390168-1 and 1390168-5. Detection limits are adjusted accordingly.

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Report Transmission Cover Page

Bill To: Sunshine Coast Regional District 1975 Field Road Sechelt, BC, Canada V0N 3A1	Project ID: Project Name: Sechelt Landfill Project Location: LSD: P.O.: 3001842 Proj. Acct. code:	Lot ID: 1390181 Control Number: Date Received: Nov 8, 2019 Date Reported: Nov 15, 2019 Report Number: 2463523
Attn: Accounts Payable Sampled By: Sandi Bandara Company: SCRD		

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
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Single Report	PDF	Invoice
Arun Kumar	Sunshine Coast Regional District	1975 Field Road Sechelt, BC V0N 3A1 Phone: (604) 885-6800 Fax: Email: Arun.kumar@scrd.ca
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COA
Sandi Bandara	Sunshine Coast Regional District	1975 Field Road Sechelt, BC V0N 3A1 Phone: (604) 885-6800 Fax: Email: sandi.bandara@scrd.ca
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Single Report	PDF	Test Report

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Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390181
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463523
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390181-1	1390181-2	1390181-3	
		Sample Date	Nov 06, 2019	Nov 06, 2019	Nov 06, 2019	
		Sample Time	15:39	16:38	16:45	
		Sample Location				
		Sample Description	SLB (Surface Water) / 2.9 °C	SLC (Surface Water) / 2.9 °C	SLD (Surface Water) / 2.9 °C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Chemical Oxygen Demand		mg/L	20	20	20	10
Inorganic Nonmetallic Parameters						
Kjeldahl Nitrogen	Total	mg/L	0.81	0.22	0.08	0.07
Organic Carbon	Dissolved Nonpurgeable	mg/L	2.6	1.7	1.8	0.5
Ammonia - N		mg/L	<0.01	0.56	<0.01	0.01
Metals Dissolved						
Mercury	Dissolved	µg/L	<0.01	<0.01	<0.01	0.05
Routine Water						
pH - Holding Time			Exceeded	Exceeded	Exceeded	
pH	at 25 °C		7.04	7.32	7.32	0.01
Electrical Conductivity		µS/cm at 25 °C	30	65	65	1
Calcium	Dissolved	mg/L	3.7	6.6	6.8	0.01
Magnesium	Dissolved	mg/L	0.51	1.3	1.3	0.02
Potassium	Dissolved	mg/L	0.15	0.54	0.53	0.04
Sodium	Dissolved	mg/L	1.5	3.6	3.6	0.1
Sulfur	Dissolved	mg/L	0.49	0.95	0.96	0.02
Chloride	Dissolved	mg/L	0.72	4.08	4.13	0.05
Nitrate - N	Dissolved	mg/L	0.04	0.13	0.13	0.01
Nitrite - N	Dissolved	mg/L	<0.01	<0.01	<0.01	0.01
Hardness	as CaCO ₃ (dissolved)	mg/L	11	22	22	5
Salinity	Dissolved	g/L	0.0038	0.0091	0.0090	0.0001
Silicon	Dissolved	µg/L	3100	6800	6800	5
Trace Metals Dissolved						
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	Lab filtered & preserved	
Aluminum	Dissolved	µg/L	79	20	22	1
Antimony	Dissolved	µg/L	0.05	<0.02	<0.02	0.02
Arsenic	Dissolved	µg/L	0.1	<0.1	<0.1	0.1
Barium	Dissolved	µg/L	3.3	5.0	4.9	0.1
Beryllium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Bismuth	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Boron	Dissolved	µg/L	2	3	3	2
Cadmium	Dissolved	µg/L	0.02	<0.01	0.01	0.01
Chromium	Dissolved	µg/L	<0.05	0.05	<0.05	0.05
Cobalt	Dissolved	µg/L	0.02	<0.02	<0.02	0.02
Copper	Dissolved	µg/L	<0.5	<0.5	<0.5	0.5
Iron	Dissolved	µg/L	35	11	11	2
Lead	Dissolved	µg/L	0.03	<0.01	<0.01	0.01

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390181
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463523
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1390181-1	1390181-2	1390181-3	
		Sample Date	Nov 06, 2019	Nov 06, 2019	Nov 06, 2019	
		Sample Time	15:39	16:38	16:45	
		Sample Location				
		Sample Description	SLB (Surface Water) / 2.9 °C	SLC (Surface Water) / 2.9 °C	SLD (Surface Water) / 2.9 °C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved - Continued						
Lithium	Dissolved	µg/L	<0.5	<0.5	<0.5	0.5
Manganese	Dissolved	µg/L	1	<1	2	1
Molybdenum	Dissolved	µg/L	0.20	0.14	0.14	0.02
Nickel	Dissolved	µg/L	<0.2	<0.2	<0.2	0.2
Selenium	Dissolved	µg/L	<0.2	<0.2	<0.2	0.2
Silver	Dissolved	µg/L	<0.01	<0.01	0.01	0.01
Strontium	Dissolved	µg/L	13.5	32.2	33.8	0.1
Thallium	Dissolved	µg/L	0.01	<0.01	<0.01	0.01
Thorium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Tin	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Uranium	Dissolved	µg/L	0.06	0.03	0.03	0.01
Vanadium	Dissolved	µg/L	<0.05	0.48	0.54	0.05
Zinc	Dissolved	µg/L	2.3	2.0	0.6	0.5
Zirconium	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Titanium	Dissolved	µg/L	0.2	<0.1	<0.1	0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390181
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463523
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Reference Number 1390181-4
Sample Date Nov 06, 2019
Sample Time 16:50
Sample Location
Sample Description Field Blank (De-ionized Water) / 2.9 °C

Matrix Water

Analyte		Units	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents					
Chemical Oxygen Demand		mg/L	<10		10
Inorganic Nonmetallic Parameters					
Kjeldahl Nitrogen	Total	mg/L	0.11		0.07
Organic Carbon	Dissolved Nonpurgeable	mg/L	<0.5		0.5
Ammonia - N		mg/L	<0.01		0.01
Metals Dissolved					
Mercury	Dissolved	µg/L	<0.01		0.05
Routine Water					
pH - Holding Time			Exceeded		
pH	at 25 °C		5.76		0.01
Electrical Conductivity		µS/cm at 25 °C	1		1
Calcium	Dissolved	mg/L	<0.01		0.01
Magnesium	Dissolved	mg/L	<0.02		0.02
Potassium	Dissolved	mg/L	<0.04		0.04
Sodium	Dissolved	mg/L	<0.1		0.1
Sulfur	Dissolved	mg/L	<0.02		0.02
Chloride	Dissolved	mg/L	<0.05		0.05
Nitrate - N	Dissolved	mg/L	<0.01		0.01
Nitrite - N	Dissolved	mg/L	<0.01		0.01
Hardness	as CaCO ₃ (dissolved)	mg/L	<5		5
Salinity	Dissolved	g/L	<0.0003		0.0001
Silicon	Dissolved	µg/L	47		5
Trace Metals Dissolved					
Digestion	Dissolved		Lab filtered & preserved		
Aluminum	Dissolved	µg/L	<1		1
Antimony	Dissolved	µg/L	<0.02		0.02
Arsenic	Dissolved	µg/L	<0.1		0.1
Barium	Dissolved	µg/L	<0.1		0.1
Beryllium	Dissolved	µg/L	<0.05		0.05
Bismuth	Dissolved	µg/L	<0.1		0.1
Boron	Dissolved	µg/L	<2		2
Cadmium	Dissolved	µg/L	<0.01		0.01
Chromium	Dissolved	µg/L	<0.05		0.05
Cobalt	Dissolved	µg/L	<0.02		0.02
Copper	Dissolved	µg/L	<0.5		0.5
Iron	Dissolved	µg/L	<2		2

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390181
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463523
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Reference Number 1390181-4
Sample Date Nov 06, 2019
Sample Time 16:50
Sample Location
Sample Description Field Blank (De-ionized Water) / 2.9 °C

Matrix Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved - Continued					
Lead	Dissolved	µg/L	<0.01		0.01
Lithium	Dissolved	µg/L	<0.5		0.5
Manganese	Dissolved	µg/L	<1		1
Molybdenum	Dissolved	µg/L	<0.02		0.02
Nickel	Dissolved	µg/L	0.3		0.2
Selenium	Dissolved	µg/L	<0.2		0.2
Silver	Dissolved	µg/L	<0.01		0.01
Strontium	Dissolved	µg/L	<0.1		0.1
Thallium	Dissolved	µg/L	<0.01		0.01
Thorium	Dissolved	µg/L	<0.05		0.05
Tin	Dissolved	µg/L	<0.1		0.1
Uranium	Dissolved	µg/L	<0.01		0.01
Vanadium	Dissolved	µg/L	<0.05		0.05
Zinc	Dissolved	µg/L	<0.5		0.5
Zirconium	Dissolved	µg/L	<0.1		0.1
Titanium	Dissolved	µg/L	<0.1		0.1

Approved by:



Benjamin Morris, B.Sc
Operations Manager

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.

Methodology and Notes

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1390181
1975 Field Road	Project Name: Sechelt Landfill	Control Number:
Sechelt, BC, Canada	Project Location:	Date Received: Nov 8, 2019
V0N 3A1	LSD:	Date Reported: Nov 15, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2463523
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alk, pH, EC, Turb in water (BC)	APHA	* Conductivity, 2510 B	Nov 8, 2019	Element Vancouver
Alk, pH, EC, Turb in water (BC)	APHA	* pH - Electrometric Method, 4500-H+ B	Nov 8, 2019	Element Vancouver
Ammonia-N in Water (VAN)	APHA	* Flow Injection Analysis, 4500-NH3 H	Nov 12, 2019	Element Vancouver
Anions by IEC in water (VAN)	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Nov 8, 2019	Element Vancouver
Carbon Organic (Dissolved) in water (DOC)	APHA	High-Temperature Combustion Method, 5310 B	Nov 14, 2019	Element Edmonton - Roper Road
Chemical Oxygen Demand (water-VAN)	APHA	* Closed Reflux, Colorimetric Method, 5220 D	Nov 13, 2019	Element Vancouver
Mercury Low Level (Dissolved) in water (VAN)	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Nov 15, 2019	Element Vancouver
Metals SemiTrace (Dissolved) in water (VAN)	US EPA	* Metals & Trace Elements by ICP-AES, 6010C	Nov 13, 2019	Element Vancouver
Total and Kjeldahl Nitrogen (Total) in Water	ISO	* Water Quality - Determination of nitrogen, ISO/TR 11905-2	Nov 13, 2019	Element Edmonton - Roper Road
Trace Metals (dissolved) in Water (VAN)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Nov 13, 2019	Element Vancouver

* Reference Method Modified

References

APHA	Standard Methods for the Examination of Water and Wastewater
EPA	Environmental Protection Agency Test Methods - US
ISO	International Organization for Standardization
US EPA	US Environmental Protection Agency Test Methods

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Project Information

Project ID: _____
Project Name: Sechelt Landfill
Project Location: _____
Legal Location: _____
PO/AFE#: _____
Proj. Acct. Code: _____
Quote #: _____

Invoice To

Company: Sunshine Coast Regional District
Address: 1975 Field Rd.
Sechelt, BC V0N 3A1
Attention: Accounts Payable
Phone: 604-885-6800
Cell: _____
Fax: _____
E-mail: accounts.payable@scrd.ca
Agreement ID: 113277
Copy of Report: YES / NO

Report To

Company: Sunshine Coast Regional District
Address: 5920 Mason Rd.
Sechelt, BC V0N 3A8
Attention: Arun Kumar
Phone: 604-885-6800
E-mail: Arun.kumar@scrd.ca
E-mail: Sandi.bandara@Scrd.ca
E-mail: _____

Additional Reports to

1) Name: Sandi Bandara
E-mail: Sandi.bandara@Scrd.ca
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: [Signature]
Date/Time: _____

RUSH Priority

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

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).

Dissolved metals (pink lid) and mercury (40ml vial) require filtration prior to preserving.

	Site I.D.	Sample Description	Depth start end in cm m	Date/Time sampled	Matrix	Sampling method Time	#	Enter tests above (✓ relevant samples below)
1	SLB	Surface water		19/11/6	water	3:39	5	
2	SLC	↓		↓	↓	4:38	5	
3	SLD	↓		↓	↓	4:45	5	
4	Field Blank	↓		↓	↓	4:50	5	
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

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>)

Page _____ of _____ Control #
ED 120-005

Lot: 1390181 ^{COC}



Temp. received: 2.9 °C Date/Time stamp: NOV 8 11:48
Delivery Method: COURIER
Waybill: _____
Received by: Ro

Report Transmission Cover Page

Bill To: Sunshine Coast Regional District 1975 Field Road Sechelt, BC, Canada V0N 3A1	Project ID: Project Name: Sechelt Sampling Project Location: Sechelt Landfill LSD: P.O.: 3001842 Proj. Acct. code:	Lot ID: 1391299 Control Number: Date Received: Nov 14, 2019 Date Reported: Nov 20, 2019 Report Number: 2465410
Attn: Accounts Payable Sampled By: Sandi Bandara Company: SCRD		

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
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Single Report	PDF	Invoice
Sandi Bandara	Sunshine Coast Regional District	1975 Field Road Sechelt, BC V0N 3A1 Phone: (604) 885-6800 Fax: Email: sandi.bandara@scrd.ca
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
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Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1391299
1975 Field Road	Project Name: Sechelt Sampling	Control Number:
Sechelt, BC, Canada	Project Location: Sechelt Landfill	Date Received: Nov 14, 2019
V0N 3A1	LSD:	Date Reported: Nov 20, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2465410
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1391299-1	1391299-2	
		Sample Date	Nov 12, 2019	Nov 12, 2019	
		Sample Time	NA	NA	
		Sample Location			
		Sample Description	SLE / 3.9 °C	SLA / 3.9 °C	
		Matrix	Water	Water	
Analyte		Units	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents					
Chemical Oxygen Demand		mg/L	<5	11	5
Inorganic Nonmetallic Parameters					
Ammonia - N		mg/L	0.027	<0.025	0.025
Ammonium/Ammonia			Yes	Yes	
Preservation					
Kjeldahl Nitrogen	Total	mg/L	0.72	0.10	0.07
Organic Carbon	Dissolved Nonpurgeable	mg/L	1.6	4.3	0.5
Metals Dissolved					
Mercury	Dissolved	µg/L	<0.01	<0.01	0.05
Routine Water					
pH - Holding Time			Exceeded	Exceeded	
pH	at 25 °C		6.40	6.90	0.01
Electrical Conductivity		µS/cm at 25 °C	37	21	1
Calcium	Dissolved	mg/L	3.8	2.7	0.01
Magnesium	Dissolved	mg/L	0.86	0.42	0.02
Potassium	Dissolved	mg/L	0.44	0.35	0.04
Sodium	Dissolved	mg/L	3.6	1.9	0.1
Sulfur	Dissolved	mg/L	0.64	0.48	0.02
Chloride	Dissolved	mg/L	1.23	0.55	0.05
Nitrate - N	Dissolved	mg/L	0.11	0.04	0.01
Nitrite - N	Dissolved	mg/L	<0.01	<0.01	0.01
Hardness	as CaCO ₃ (dissolved)	mg/L	13	8	5
Salinity	Dissolved	g/L	0.0090	0.0048	0.0001
Silicon	Dissolved	µg/L	4000	2200	5
Trace Metals Dissolved					
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	
Aluminum	Dissolved	µg/L	39	143	1
Antimony	Dissolved	µg/L	<0.02	0.08	0.02
Arsenic	Dissolved	µg/L	<0.1	0.1	0.1
Barium	Dissolved	µg/L	4.1	2.8	0.1
Beryllium	Dissolved	µg/L	<0.05	<0.05	0.05
Bismuth	Dissolved	µg/L	<0.1	<0.1	0.1
Boron	Dissolved	µg/L	<2	<2	2
Cadmium	Dissolved	µg/L	<0.01	0.06	0.01
Chromium	Dissolved	µg/L	<0.05	0.06	0.05
Cobalt	Dissolved	µg/L	<0.02	0.02	0.02
Copper	Dissolved	µg/L	<0.5	<0.5	0.5
Iron	Dissolved	µg/L	<2	47	2

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1391299
1975 Field Road	Project Name: Sechelt Sampling	Control Number:
Sechelt, BC, Canada	Project Location: Sechelt Landfill	Date Received: Nov 14, 2019
V0N 3A1	LSD:	Date Reported: Nov 20, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2465410
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1391299-1	1391299-2	
		Sample Date	Nov 12, 2019	Nov 12, 2019	
		Sample Time	NA	NA	
		Sample Location			
		Sample Description	SLE / 3.9 °C	SLA / 3.9 °C	
		Matrix	Water	Water	
Analyte		Units	Results	Results	Nominal Detection Limit
Trace Metals Dissolved - Continued					
Lead	Dissolved	µg/L	0.01	0.05	0.01
Lithium	Dissolved	µg/L	<0.5	<0.5	0.5
Manganese	Dissolved	µg/L	<1	2	1
Molybdenum	Dissolved	µg/L	0.03	0.09	0.02
Nickel	Dissolved	µg/L	<0.2	0.2	0.2
Selenium	Dissolved	µg/L	<0.2	<0.2	0.2
Silver	Dissolved	µg/L	<0.01	<0.01	0.01
Strontium	Dissolved	µg/L	21.0	9.6	0.1
Thallium	Dissolved	µg/L	<0.01	<0.01	0.01
Thorium	Dissolved	µg/L	<0.05	<0.05	0.05
Tin	Dissolved	µg/L	<0.1	<0.1	0.1
Uranium	Dissolved	µg/L	0.03	0.06	0.01
Vanadium	Dissolved	µg/L	0.08	0.20	0.05
Zinc	Dissolved	µg/L	1.8	4.7	0.5
Zirconium	Dissolved	µg/L	<0.1	<0.1	0.1
Titanium	Dissolved	µg/L	0.3	0.9	0.1

Approved by:



Randy Neumann, BSc
Division Director

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.

Methodology and Notes

Bill To: Sunshine Coast Regional District	Project ID:	Lot ID: 1391299
1975 Field Road	Project Name: Sechelt Sampling	Control Number:
Sechelt, BC, Canada	Project Location: Sechelt Landfill	Date Received: Nov 14, 2019
V0N 3A1	LSD:	Date Reported: Nov 20, 2019
Attn: Accounts Payable	P.O.: 3001842	Report Number: 2465410
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alk, pH, EC, Turb in water (BC)	APHA	* Conductivity, 2510 B	Nov 16, 2019	Element Vancouver
Alk, pH, EC, Turb in water (BC)	APHA	* pH - Electrometric Method, 4500-H+ B	Nov 16, 2019	Element Vancouver
Ammonium-N in Water	APHA	* Automated Phenate Method, 4500-NH3 G	Nov 19, 2019	Element Edmonton - Roper Road
Anions by IEC in water (VAN)	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Nov 15, 2019	Element Vancouver
Carbon Organic (Dissolved) in water (DOC)	APHA	High-Temperature Combustion Method, 5310 B	Nov 18, 2019	Element Edmonton - Roper Road
Chemical Oxygen Demand in water	APHA	* Closed Reflux, Colorimetric Method, 5220 D	Nov 18, 2019	Element Edmonton - Roper Road
Chemical Oxygen Demand in water	US EPA	* US EPA method, 8000	Nov 18, 2019	Element Edmonton - Roper Road
Mercury Low Level (Dissolved) in water (VAN)	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Nov 15, 2019	Element Vancouver
Metals SemiTrace (Dissolved) in water (VAN)	US EPA	* Metals & Trace Elements by ICP-AES, 6010C	Nov 15, 2019	Element Vancouver
Total and Kjeldahl Nitrogen (Total) in Water	ISO	* Water Quality - Determination of nitrogen, ISO/TR 11905-2	Nov 18, 2019	Element Edmonton - Roper Road
Trace Metals (dissolved) in Water (VAN)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Nov 15, 2019	Element Vancouver

* Reference Method Modified

References

APHA	Standard Methods for the Examination of Water and Wastewater
EPA	Environmental Protection Agency Test Methods - US
ISO	International Organization for Standardization
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.



www.Element.com

Project Information

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

Invoice To

Company: Sunshine Coast Regional District
 Address: 1975 Field Rd.
 Sechelt, BC V0N 3A1
 Attention: Accounts Payable
 Phone: 604-885-6800
 Cell: _____
 Fax: _____
 E-mail: accounts.payable@scrd.ca
 Agreement ID: 113277
 Copy of Report: YES / NO

Report To

Company: Sunshine Coast Regional District
 Address: 5920 Mason Rd.
 Sechelt, BC V0N 3A8
 Attention: Sandi Bandara
 Phone: 604-885-6800
 E-mail: Anna.kumar@scrd.ca
Sandi.bandara@scrd.ca

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: [Signature]
 Date/Time: Nov 13/2019

RUSH Priority

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

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)

Date Required _____

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

No samples were field filtered. Preservatives added to Nutrients and mercury.
Dissolved metals (pink lid) and mercury (40ml vial) require filtration prior to preserving.

	Site I.D.	Sample Description	Depth start end in cm m	Date/Time sampled	Matrix	Sampling method	#	Enter tests above (✓ relevant samples below)
1	<u>SLE</u>	<u>Surface Water</u>		<u>Nov 12/19</u>	<u>Water</u>		<u>5</u>	✓
2	<u>SLA</u>	<u>"</u>		<u>"</u>	<u>"</u>		<u>5</u>	✓
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Number of Containers

MeOH Field Preserved?

Sechelt Landfill

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>)

Page _____ of _____ Control #
 ED 120-005

Lot: 1391299 COC



Temp. received: 3.9 °C Date/Time stamp: NOV 14 '19 12:07
 Delivery Method: _____
 Waybill: _____
 Received by: _____

Report Transmission Cover Page

Bill To: Sunshine Coast Regional District 1975 Field Road Sechelt, BC, Canada V0N 3A1	Project ID: SP100543 Project Name: SLF Sampling Project Location: Sechelt LSD: P.O.: SP100543 Proj. Acct. code:	Lot ID: 1397808 Control Number: C014039 Date Received: Dec 12, 2019 Date Reported: Dec 18, 2019 Report Number: 2475972
Attn: Accounts Payable Sampled By: Sandi Bandara Company: SCRD		

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

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

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

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:

- Dec 17, 2019 - Reduction of analytical volume was necessary for ammonia to bring results within the analytical range for samples 1397808-6, 7, 8, and 10. Detection limits are adjusted accordingly.
- Dec 17, 2019 - Reduction of analytical volume was necessary for chloride analysis to bring results within the analytical range for sample 1397808-5, 1397808-6, and 1397808-7. Detection limits are adjusted accordingly.
- Dec 17, 2019 - Reduction of analytical volume was necessary for sulfate analysis to bring results within the analytical range for sample 1397808-4. Detection limits are adjusted accordingly.
- Dec 17, 2019 - Sample 1397808-8; 6905417: Reduction of analytical volume was necessary for iron to bring results within the analytical range for sample 1397808-5 and 1397808-8. Detection limits are adjusted accordingly.
- Dec 17, 2019 - Sample 1397808-2; 6905411: Reduction of analytical volume was necessary for manganese to bring results within the analytical range for sample 1397808-2, 1397808-3, 1397808-5, 1397808-6, 1397808-7, 1397808-8, 1397808-9, 1397808-10, 1397808-11 and 1397808-12. Detection limits are adjusted accordingly.
- Dec 17, 2019 - Sample 1397808-5; 6905414: Reduction of analytical volume was necessary for strontium to bring results within the analytical range for sample 1397808-5, 1397808-8 and 1397808-10. Detection limits are adjusted accordingly.

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Report Transmission Cover Page

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1397808-1	1397808-2	1397808-3	
		Sample Date	Dec 11, 2019	Dec 11, 2019	Dec 11, 2019	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW13-04 / 4.5 °C	MW-4 / 4.5 °C	MW-4A / 4.5 °C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Chemical Oxygen Demand		mg/L	<10	<10	40	10
Inorganic Nonmetallic Parameters						
Kjeldahl Nitrogen	Total	mg/L	<0.07	0.12	1.17	0.07
Organic Carbon	Dissolved Nonpurgeable	mg/L	<0.5	2.0	9.8	0.5
Ammonia - N		mg/L	<0.01	<0.01	0.39	0.01
Phosphorus	Total	mg/L	0.078	0.008	0.032	0.003
Metals Dissolved						
Mercury	Dissolved	µg/L	<0.01	<0.01	<0.01	0.05
Physical and Aggregate Properties						
Turbidity		NTU	33.4	2.15	64.7	0.1
Routine Water						
pH - Holding Time			Exceeded	Exceeded	Exceeded	
pH	at 25 °C		6.66	6.40	5.90	0.01
Electrical Conductivity		µS/cm at 25 °C	62	446	192	1
Calcium	Dissolved	mg/L	7.0	61	28	0.01
Magnesium	Dissolved	mg/L	0.90	9.7	2.0	0.02
Potassium	Dissolved	mg/L	0.56	4.9	2.9	0.04
Sodium	Dissolved	mg/L	3.6	15	4.0	0.1
Sulfur	Dissolved	mg/L	0.05	2.4	<0.02	0.02
Bicarbonate		mg/L	31	264	110	5
Carbonate		mg/L	<6	<6	<6	6
Hydroxide		mg/L	<5	<5	<5	5
P-Alkalinity	as CaCO3	mg/L	<5	<5	<5	5
T-Alkalinity	as CaCO3	mg/L	26	217	86	5
Chloride	Dissolved	mg/L	2.03	6.48	1.57	0.05
Nitrate - N	Dissolved	mg/L	0.09	<0.01	<0.01	0.01
Nitrite - N	Dissolved	mg/L	<0.01	<0.01	<0.01	0.01
Sulfate (SO4)	Dissolved	mg/L	1.7	7.1	<0.1	0.1
Hardness	as CaCO3 (dissolved)	mg/L	21	190	78	5
Salinity	Dissolved	g/L	0.0090	0.037	0.010	0.0001
Silicon	Dissolved	µg/L	8200	12000	5100	5
Mono-Aromatic Hydrocarbons - Water						
Benzene		µg/L	<0.5	0.7	2.8	0.5
Ethylbenzene		µg/L	<0.5	<0.5	<0.5	0.5
Methyl t-Butyl Ether		µg/L	<0.5	1.6	4.0	0.5
Styrene		µg/L	<0.5	<0.5	<0.5	0.5
Toluene		µg/L	<0.5	1.7	<0.5	0.5
Total Xylenes (m,p,o)		µg/L	<0.5	<0.5	<0.5	0.5

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1397808-1	1397808-2	1397808-3	
		Sample Date	Dec 11, 2019	Dec 11, 2019	Dec 11, 2019	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW13-04 / 4.5 °C	MW-4 / 4.5 °C	MW-4A / 4.5 °C	
		Matrix	Water	Water	Water	
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Water - Continued						
4-Bromofluorobenzene	Surrogate	%	99.9	104	103	80-120
Dibromofluoromethane	Surrogate	%	96.3	97.4	96.1	80-120
Toluene-d8	Surrogate	%	104	105	106	80-120
Volatile Petroleum Hydrocarbons - Water						
VPHw (VHW6-10 minus BTEX)	µg/L	<50	<50	<50	<50	50
VHW6-10	µg/L	<50	<50	<50	<50	50
Trace Metals Dissolved						
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	Lab filtered & preserved	
Aluminum	Dissolved	µg/L	12	2	2	1
Antimony	Dissolved	µg/L	0.12	0.15	0.07	0.02
Arsenic	Dissolved	µg/L	<0.1	0.2	0.5	0.1
Barium	Dissolved	µg/L	1.4	54.7	62.2	0.1
Beryllium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Bismuth	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Boron	Dissolved	µg/L	3	30	16	2
Cadmium	Dissolved	µg/L	0.01	0.12	0.05	0.01
Chromium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Cobalt	Dissolved	µg/L	<0.02	3.42	9.57	0.02
Copper	Dissolved	µg/L	<0.5	0.8	<0.5	0.5
Iron	Dissolved	µg/L	<2	<2	3	2
Lead	Dissolved	µg/L	<0.01	<0.01	0.01	0.01
Lithium	Dissolved	µg/L	<0.5	4.8	0.9	0.5
Manganese	Dissolved	µg/L	<1	1860	1250	1
Molybdenum	Dissolved	µg/L	0.09	0.11	<0.02	0.02
Nickel	Dissolved	µg/L	0.3	1.6	2.9	0.2
Selenium	Dissolved	µg/L	<0.2	<0.2	<0.2	0.2
Silver	Dissolved	µg/L	<0.01	<0.01	<0.01	0.01
Strontium	Dissolved	µg/L	45.0	602.2	150.2	0.1
Thallium	Dissolved	µg/L	<0.01	<0.01	0.01	0.01
Thorium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Tin	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Uranium	Dissolved	µg/L	0.02	0.21	<0.01	0.01
Vanadium	Dissolved	µg/L	0.95	<0.05	<0.05	0.05
Zinc	Dissolved	µg/L	7.5	6.4	20.7	0.5
Zirconium	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Titanium	Dissolved	µg/L	0.4	0.3	0.4	0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1397808-4	1397808-5	1397808-6	
		Sample Date	Dec 11, 2019	Dec 11, 2019	Dec 11, 2019	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW-1 / 4.5 °C	MW-2 / 4.5 °C	MW-2A / 4.5 °C	
		Matrix	Water	Water	Water	
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Aggregate Organic Constituents						
Chemical Oxygen Demand	mg/L	<10	30	70	10	
Inorganic Nonmetallic Parameters						
Kjeldahl Nitrogen	Total	mg/L	<0.07	0.72	9.65	0.07
Organic Carbon	Dissolved Nonpurgeable	mg/L	1.1	5.4	16.1	0.5
Ammonia - N		mg/L	<0.01	0.06	6.85	0.01
Phosphorus	Total	mg/L	0.075	0.035	0.273	0.003
Metals Dissolved						
Mercury	Dissolved	µg/L	<0.01	<0.01	<0.01	0.05
Physical and Aggregate Properties						
Turbidity		NTU	18.3	5.13	28.0	0.1
Routine Water						
pH - Holding Time			Exceeded	Exceeded	Exceeded	
pH	at 25 °C		6.63	6.88	7.19	0.01
Electrical Conductivity		µS/cm at 25 °C	774	748	621	1
Calcium	Dissolved	mg/L	140	92	50	0.01
Magnesium	Dissolved	mg/L	9.6	15	8.6	0.02
Potassium	Dissolved	mg/L	2.2	2.5	16	0.04
Sodium	Dissolved	mg/L	12	20	37	0.1
Sulfur	Dissolved	mg/L	92	36	0.31	0.02
Bicarbonate		mg/L	110	155	209	5
Carbonate		mg/L	<6	<6	<6	6
Hydroxide		mg/L	<5	<5	<5	5
P-Alkalinity	as CaCO ₃	mg/L	<5	<5	<5	5
T-Alkalinity	as CaCO ₃	mg/L	92	127	172	5
Chloride	Dissolved	mg/L	18.0	89.8	79.5	0.05
Nitrate - N	Dissolved	mg/L	<0.01	<0.01	<0.01	0.01
Nitrite - N	Dissolved	mg/L	<0.01	<0.01	<0.01	0.01
Sulfate (SO ₄)	Dissolved	mg/L	114	97.6	0.2	0.1
Hardness	as CaCO ₃ (dissolved)	mg/L	390	290	160	5
Salinity	Dissolved	g/L	0.030	0.051	0.093	0.0001
Silicon	Dissolved	µg/L	7500	10000	4100	5
Mono-Aromatic Hydrocarbons - Water						
Benzene		µg/L	<0.5	<0.5	<0.5	0.5
Ethylbenzene		µg/L	<0.5	<0.5	<0.5	0.5
Methyl t-Butyl Ether		µg/L	<0.5	<0.5	<0.5	0.5
Styrene		µg/L	<0.5	<0.5	<0.5	0.5
Toluene		µg/L	<0.5	<0.5	0.7	0.5
Total Xylenes (m,p,o)		µg/L	<0.5	<0.5	<0.5	0.5

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1397808-4	1397808-5	1397808-6	
		Sample Date	Dec 11, 2019	Dec 11, 2019	Dec 11, 2019	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW-1 / 4.5 °C	MW-2 / 4.5 °C	MW-2A / 4.5 °C	
		Matrix	Water	Water	Water	
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Water - Continued						
4-Bromofluorobenzene	Surrogate	%	103	102	103	80-120
Dibromofluoromethane	Surrogate	%	93.5	96.2	96.6	80-120
Toluene-d8	Surrogate	%	107	107	107	80-120
Volatile Petroleum Hydrocarbons - Water						
VPHw (VHW6-10 minus BTEX)	µg/L	<50	<50	<50	<50	50
VHW6-10	µg/L	<50	<50	<50	<50	50
Trace Metals Dissolved						
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	Lab filtered & preserved	
Aluminum	Dissolved	µg/L	4	1	3	1
Antimony	Dissolved	µg/L	0.06	0.12	0.39	0.02
Arsenic	Dissolved	µg/L	0.3	0.9	2.0	0.1
Barium	Dissolved	µg/L	34.0	27.2	86.3	0.1
Beryllium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Bismuth	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Boron	Dissolved	µg/L	170	286	382	2
Cadmium	Dissolved	µg/L	0.06	<0.01	<0.01	0.01
Chromium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Cobalt	Dissolved	µg/L	0.15	2.44	2.92	0.02
Copper	Dissolved	µg/L	<0.5	<0.5	0.6	0.5
Iron	Dissolved	µg/L	5	1660	57	2
Lead	Dissolved	µg/L	<0.01	<0.01	<0.01	0.01
Lithium	Dissolved	µg/L	<0.5	<0.5	1.8	0.5
Manganese	Dissolved	µg/L	39	6830	1280	1
Molybdenum	Dissolved	µg/L	0.08	0.72	0.37	0.02
Nickel	Dissolved	µg/L	0.5	1.5	4.2	0.2
Selenium	Dissolved	µg/L	<0.2	<0.2	<0.2	0.2
Silver	Dissolved	µg/L	<0.01	<0.01	<0.01	0.01
Strontium	Dissolved	µg/L	987.9	1789	454.8	0.1
Thallium	Dissolved	µg/L	0.02	<0.01	<0.01	0.01
Thorium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Tin	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Uranium	Dissolved	µg/L	0.21	0.63	0.05	0.01
Vanadium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Zinc	Dissolved	µg/L	3.9	4.9	2.4	0.5
Zirconium	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Titanium	Dissolved	µg/L	0.3	0.5	0.3	0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1397808-7	1397808-8	1397808-9	
		Sample Date	Dec 11, 2019	Dec 11, 2019	Dec 11, 2019	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW-3 / 4.5 °C	MW13-1 / 4.5 °C	MW13-2 / 4.5 °C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Chemical Oxygen Demand		mg/L	30	40	40	10
Inorganic Nonmetallic Parameters						
Kjeldahl Nitrogen	Total	mg/L	16.3	6.94	3.94	0.07
Organic Carbon	Dissolved Nonpurgeable	mg/L	11.3	7.5	3.7	0.5
Ammonia - N		mg/L	15.8	5.94	3.85	0.01
Phosphorus	Total	mg/L	0.031	0.229	0.214	0.003
Metals Dissolved						
Mercury	Dissolved	µg/L	<0.01	<0.01	<0.01	0.05
Physical and Aggregate Properties						
Turbidity		NTU	41.7	84.0	89.1	0.1
Routine Water						
pH - Holding Time			Exceeded	Exceeded	Exceeded	
pH	at 25 °C		7.19	6.60	6.47	0.01
Electrical Conductivity		µS/cm at 25 °C	893	795	516	1
Calcium	Dissolved	mg/L	77	77	58	0.01
Magnesium	Dissolved	mg/L	13	8.9	8.1	0.02
Potassium	Dissolved	mg/L	24	6.7	7.2	0.04
Sodium	Dissolved	mg/L	40	40	20	0.1
Sulfur	Dissolved	mg/L	16	16	4.4	0.02
Bicarbonate		mg/L	304	436	312	5
Carbonate		mg/L	<6	<6	<6	6
Hydroxide		mg/L	<5	<5	<5	5
P-Alkalinity	as CaCO3	mg/L	<5	<5	<5	5
T-Alkalinity	as CaCO3	mg/L	249	358	256	5
Chloride	Dissolved	mg/L	88.1	16.0	3.80	0.05
Nitrate - N	Dissolved	mg/L	<0.01	0.06	<0.01	0.01
Nitrite - N	Dissolved	mg/L	<0.01	<0.01	<0.01	0.01
Sulfate (SO4)	Dissolved	mg/L	44.9	41.6	13.0	0.1
Hardness	as CaCO3 (dissolved)	mg/L	250	230	180	5
Salinity	Dissolved	g/L	0.10	0.10	0.051	0.0001
Silicon	Dissolved	µg/L	3700	13000	11000	5
Mono-Aromatic Hydrocarbons - Water						
Benzene		µg/L	<0.5	1.7	0.8	0.5
Ethylbenzene		µg/L	<0.5	<0.5	<0.5	0.5
Methyl t-Butyl Ether		µg/L	<0.5	<0.5	<0.5	0.5
Styrene		µg/L	<0.5	<0.5	<0.5	0.5
Toluene		µg/L	<0.5	<0.5	<0.5	0.5
Total Xylenes (m,p,o)		µg/L	<0.5	<0.5	<0.5	0.5

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1397808-7	1397808-8	1397808-9	
		Sample Date	Dec 11, 2019	Dec 11, 2019	Dec 11, 2019	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW-3 / 4.5 °C	MW13-1 / 4.5 °C	MW13-2 / 4.5 °C	
		Matrix	Water	Water	Water	
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Water - Continued						
4-Bromofluorobenzene	Surrogate	%	101	103	99.3	80-120
Dibromofluoromethane	Surrogate	%	96.0	96.7	96.8	80-120
Toluene-d8	Surrogate	%	105	106	107	80-120
Volatile Petroleum Hydrocarbons - Water						
VPHw (VHW6-10 minus BTEX)	µg/L	<50	<50	<50	<50	50
VHW6-10	µg/L	<50	<50	<50	<50	50
Trace Metals Dissolved						
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	Lab filtered & preserved	
Aluminum	Dissolved	µg/L	2	<1	<1	1
Antimony	Dissolved	µg/L	0.26	0.15	0.14	0.02
Arsenic	Dissolved	µg/L	0.8	1.2	0.5	0.1
Barium	Dissolved	µg/L	341.1	92.8	63.0	0.1
Beryllium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Bismuth	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Boron	Dissolved	µg/L	525	173	43	2
Cadmium	Dissolved	µg/L	0.02	<0.01	0.03	0.01
Chromium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Cobalt	Dissolved	µg/L	0.14	1.20	0.33	0.02
Copper	Dissolved	µg/L	<0.5	<0.5	<0.5	0.5
Iron	Dissolved	µg/L	15	10300	9	2
Lead	Dissolved	µg/L	<0.01	<0.01	<0.01	0.01
Lithium	Dissolved	µg/L	<0.5	7.2	4.6	0.5
Manganese	Dissolved	µg/L	1190	8600	6440	1
Molybdenum	Dissolved	µg/L	0.16	0.83	0.09	0.02
Nickel	Dissolved	µg/L	3.0	3.3	0.9	0.2
Selenium	Dissolved	µg/L	<0.2	<0.2	<0.2	0.2
Silver	Dissolved	µg/L	<0.01	<0.01	<0.01	0.01
Strontium	Dissolved	µg/L	472.7	1327	630.1	0.1
Thallium	Dissolved	µg/L	<0.01	<0.01	<0.01	0.01
Thorium	Dissolved	µg/L	<0.05	0.12	<0.05	0.05
Tin	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Uranium	Dissolved	µg/L	0.02	2.37	0.15	0.01
Vanadium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Zinc	Dissolved	µg/L	10.1	9.1	12.0	0.5
Zirconium	Dissolved	µg/L	<0.1	0.2	<0.1	0.1
Titanium	Dissolved	µg/L	0.3	0.5	0.3	0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1397808-10	1397808-11	1397808-12	
		Sample Date	Dec 11, 2019	Dec 11, 2019	Dec 11, 2019	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW13-3 / 4.5 °C	Duplicate / 4.5 °C	Field Blank / 4.5 °C	
		Matrix	Water	Water	Water	
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Aggregate Organic Constituents						
Chemical Oxygen Demand	mg/L	40	30	<10	10	
Inorganic Nonmetallic Parameters						
Kjeldahl Nitrogen	Total	mg/L	65.5	4.74	<0.07	0.07
Organic Carbon	Dissolved Nonpurgeable	mg/L	6.0	3.6	<0.5	0.5
Ammonia - N		mg/L	55.7	4.22	<0.01	0.01
Phosphorus	Total	mg/L	0.254	0.385	<0.003	0.003
Metals Dissolved						
Mercury	Dissolved	µg/L	<0.01	<0.01	<0.01	0.05
Physical and Aggregate Properties						
Turbidity		NTU	84.4	190	<0.10	0.1
Routine Water						
pH - Holding Time			Exceeded	Exceeded	Exceeded	
pH	at 25 °C		7.13	6.61	5.41	0.01
Electrical Conductivity		µS/cm at 25 °C	1018	543	1	1
Calcium	Dissolved	mg/L	62	61	<0.01	0.01
Magnesium	Dissolved	mg/L	9.2	8.3	<0.02	0.02
Potassium	Dissolved	mg/L	14	7.5	<0.04	0.04
Sodium	Dissolved	mg/L	35	20	<0.1	0.1
Sulfur	Dissolved	mg/L	1.2	4.3	<0.02	0.02
Bicarbonate		mg/L	579	324	<5	5
Carbonate		mg/L	<6	<6	<6	6
Hydroxide		mg/L	<5	<5	<5	5
P-Alkalinity	as CaCO ₃	mg/L	<5	<5	<5	5
T-Alkalinity	as CaCO ₃	mg/L	475	266	<5	5
Chloride	Dissolved	mg/L	21.0	5.19	<0.05	0.05
Nitrate - N	Dissolved	mg/L	<0.01	<0.01	<0.01	0.01
Nitrite - N	Dissolved	mg/L	<0.01	<0.01	<0.01	0.01
Sulfate (SO ₄)	Dissolved	mg/L	3.2	11.8	<0.1	0.1
Hardness	as CaCO ₃ (dissolved)	mg/L	190	190	<5	5
Salinity	Dissolved	g/L	0.089	0.051	<0.0003	0.0001
Silicon	Dissolved	µg/L	13000	11000	<5	5
Mono-Aromatic Hydrocarbons - Water						
Benzene		µg/L	1.3	0.6	<0.5	0.5
Ethylbenzene		µg/L	<0.5	<0.5	<0.5	0.5
Methyl t-Butyl Ether		µg/L	1.2	<0.5	<0.5	0.5
Styrene		µg/L	<0.5	<0.5	<0.5	0.5
Toluene		µg/L	<0.5	<0.5	<0.5	0.5
Total Xylenes (m,p,o)		µg/L	<0.5	<0.5	<0.5	0.5

Analytical Report

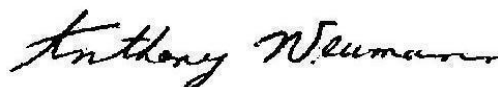
Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1397808-10	1397808-11	1397808-12	
		Sample Date	Dec 11, 2019	Dec 11, 2019	Dec 11, 2019	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW13-3 / 4.5 °C	Duplicate / 4.5 °C	Field Blank / 4.5 °C	
		Matrix	Water	Water	Water	
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Mono-Aromatic Hydrocarbons - Water - Continued						
4-Bromofluorobenzene	Surrogate	%	101	101	103	80-120
Dibromofluoromethane	Surrogate	%	95.6	99.9	96.7	80-120
Toluene-d8	Surrogate	%	107	107	106	80-120
Volatile Petroleum Hydrocarbons - Water						
VPHw (VHW6-10 minus BTEX)	µg/L	<50	<50	<50	<50	50
VHW6-10	µg/L	<50	<50	<50	<50	50
Trace Metals Dissolved						
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	Lab filtered & preserved	
Aluminum	Dissolved	µg/L	<1	<1	<1	1
Antimony	Dissolved	µg/L	0.22	0.10	<0.02	0.02
Arsenic	Dissolved	µg/L	1.1	0.4	<0.1	0.1
Barium	Dissolved	µg/L	95.4	66.8	<0.1	0.1
Beryllium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Bismuth	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Boron	Dissolved	µg/L	88	53	<2	2
Cadmium	Dissolved	µg/L	0.01	0.02	<0.01	0.01
Chromium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Cobalt	Dissolved	µg/L	3.31	0.32	<0.02	0.02
Copper	Dissolved	µg/L	0.7	<0.5	<0.5	0.5
Iron	Dissolved	µg/L	9	5	<2	2
Lead	Dissolved	µg/L	<0.01	<0.01	<0.01	0.01
Lithium	Dissolved	µg/L	2.1	3.9	<0.5	0.5
Manganese	Dissolved	µg/L	4270	6700	<1	1
Molybdenum	Dissolved	µg/L	0.68	0.13	<0.02	0.02
Nickel	Dissolved	µg/L	2.2	0.8	<0.2	0.2
Selenium	Dissolved	µg/L	<0.2	<0.2	<0.2	0.2
Silver	Dissolved	µg/L	<0.01	<0.01	<0.01	0.01
Strontium	Dissolved	µg/L	1075	676.7	<0.1	0.1
Thallium	Dissolved	µg/L	<0.01	<0.01	<0.01	0.01
Thorium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Tin	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Uranium	Dissolved	µg/L	0.30	0.21	<0.01	0.01
Vanadium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Zinc	Dissolved	µg/L	8.7	8.7	<0.5	0.5
Zirconium	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Titanium	Dissolved	µg/L	0.5	0.3	<0.1	0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Approved by:

Anthony Neumann, MSc
General Manager

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.

Methodology and Notes

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
VON 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alk, pH, EC, Turb in water (BC)	APHA	* Alkalinity - Titration Method, 2320 B	Dec 13, 2019	Element Vancouver
Alk, pH, EC, Turb in water (BC)	APHA	* Conductivity, 2510 B	Dec 13, 2019	Element Vancouver
Alk, pH, EC, Turb in water (BC)	APHA	* pH - Electrometric Method, 4500-H+ B	Dec 13, 2019	Element Vancouver
Ammonia-N in Water (VAN)	APHA	* Flow Injection Analysis, 4500-NH3 H	Dec 17, 2019	Element Vancouver
Ammonia-N in Water (VAN)	APHA	* Flow Injection Analysis, 4500-NH3 H	Dec 18, 2019	Element Vancouver
Anions by IEC in water (VAN)	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Dec 13, 2019	Element Vancouver
BTEX-VPH - Water (MS) (VAN)	BCELM	* Calculation of Volatile Petroleum Hydrocarbons in Solids, Waters, or Air (Vapour) – VPH (June 26, 2009), VPH	Dec 13, 2019	Element Vancouver
BTEX-VPH - Water (MS) (VAN)	BCELM	* Volatile Hydrocarbons in Water by GC/FID, VH Water	Dec 13, 2019	Element Vancouver
Carbon Organic (Dissolved) in water (DOC)	APHA	High-Temperature Combustion Method, 5310 B	Dec 16, 2019	Element Edmonton - Roper Road
Chemical Oxygen Demand (water-VAN)	APHA	* Closed Reflux, Colorimetric Method, 5220 D	Dec 17, 2019	Element Vancouver
Mercury Low Level (Dissolved) in water (VAN)	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Dec 17, 2019	Element Vancouver
Metals SemiTrace (Dissolved) in water (VAN)	US EPA	* Metals & Trace Elements by ICP-AES, 6010C	Dec 16, 2019	Element Vancouver
Metals SemiTrace (Dissolved) in water (VAN)	US EPA	* Metals & Trace Elements by ICP-AES, 6010C	Dec 18, 2019	Element Vancouver
Phosphorus - total by Smartchem (VAN)	APHA	* Persulfate digestion method, 4500-P B5	Dec 16, 2019	Element Vancouver
Total and Kjeldahl Nitrogen (Total) in Water	ISO	* Water Quality - Determination of nitrogen, ISO/TR 11905-2	Dec 16, 2019	Element Edmonton - Roper Road
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
Trace Metals (dissolved) in Water (VAN)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Dec 18, 2019	Element Vancouver
Turbidity - Water (VAN)	APHA	* Turbidity - Nephelometric Method, 2130 B	Dec 13, 2019	Element Vancouver

* Reference Method Modified

References

APHA	Standard Methods for the Examination of Water and Wastewater
BCELM	B.C. Environmental Laboratory Manual
EPA	Environmental Protection Agency Test Methods - US
ISO	International Organization for Standardization
US EPA	US Environmental Protection Agency Test Methods

Comments:

- Dec 17, 2019 - Reduction of analytical volume was necessary for ammonia to bring results within the analytical range for samples 1397808-6, 7, 8, and 10. Detection limits are adjusted accordingly.
- Dec 17, 2019 - Reduction of analytical volume was necessary for chloride analysis to bring results within the analytical range for sample 1397808-5, 1397808-6, and 1397808-7. Detection limits are adjusted accordingly.

Methodology and Notes

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397808
1975 Field Road	Project Name: SLF Sampling	Control Number: C014039
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 18, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475972
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

- Dec 17, 2019 - Reduction of analytical volume was necessary for sulfate analysis to bring results within the analytical range for sample 1397808-4. Detection limits are adjusted accordingly.
- Dec 17, 2019 - Sample 1397808-8; 6905417: Reduction of analytical volume was necessary for iron to bring results within the analytical range for sample 1397808-5 and 1397808-8. Detection limits are adjusted accordingly.
- Dec 17, 2019 - Sample 1397808-2; 6905411: Reduction of analytical volume was necessary for manganese to bring results within the analytical range for sample 1397808-2, 1397808-3, 1397808-5, 1397808-6, 1397808-7, 1397808-8, 1397808-9, 1397808-10, 1397808-11 and 1397808-12. Detection limits are adjusted accordingly.
- Dec 17, 2019 - Sample 1397808-5; 6905414: Reduction of analytical volume was necessary for strontium to bring results within the analytical range for sample 1397808-5, 1397808-8 and 1397808-10. Detection limits are adjusted accordingly.

Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.



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Invoice To

Report To

Additional Report To

Company: SCRDCompany: SCRD

1. Name:

Address: 1975 Field RoadAddress: 1975 Field Road

E-mail:

Project Information

Sechelt BCSechelt BC

2. Name:

Project ID: SP100543Attention: Accounts PayableAttention: Sandi Bandara

E-mail:

Project Name: SLF SamplingPhone: 604-885-6800Phone: 604-885-6800

Sample Custody

Project Location: Sechelt

Cell:

Cell:

Sampled by: Sandi Bandara

Legal Location:

Fax:

Fax:

Company: SCRDPO/AFE#: SP100543E-mail: accounts-payable@scrd.caE-mail 1: sandi.bandara@scrd.ca

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

Proj. Acct. Code:

Agreement ID: 113277

E-mail 2:

Quote#:

Copy of Report:

YES

NO

Copy of Invoice:

YES

NO

Signature: [Signature]

RUSH Priority

Report Results

Requirements

Date/Time: Dec. 12/2019☐ Same Day (200%)☐ Next Day/Two Days (100%)☐ 3 or 4 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.

☒ Email☐ Online☐ Fax☐ QA/QC☒ PDF☒ Excel☐ HCDWORG☐ AB Tier 1☐ SPIGEC☐ BCCSR

Other (List Below)

Number of Containers

MeOH Field Preserved?

Sechelt Landfill Groundwater

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

Samples not Field Filtered.

Site I.D.

Sample Description

Depth
Start End
in cm mDate/Time
sampled

Matrix

Sampling
method

✓

Enter tests above
(✓relevant samples below)1. MW13-04Groundwater12/11/19WaterDip7☒2. MW-47☒3. MW-4A7☒4. MW-17☒6. MW-27☒7. MW-2A7☒8. MW-37☒

Please indicate any potentially hazardous samples

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Page 1 of 2

ED 120-005

Control # C 014039

Lot: 1397808 COC

Temp
ReceivedDEC 12C
4.5

Date/Time Stamp

Delivery Method:

Waybill:

Received by:



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Invoice To

Report To

Additional Report To

Company: SCRDAddress: 1975 Field RoadCompany: SCRDAddress: 1975 Field Road

1. Name:

E-mail:

Project Information

Sechelt BCSechelt BC

2. Name:

E-mail:

Project ID: SP100543Attention: Accounts PayableAttention: Sandi Bandara

Sample Custody

Project Name: SLF SamplingPhone: 604-885-6800Phone: 604-885-6800Sampled by: Sandi BandaraProject Location: Sechelt

Cell:

Cell:

Company: SCRD

Legal Location:

Fax:

Fax:

PO/AFE#: SP100543E-mail: accounts-payable@scrd.caE-mail 1: Sandi-bandara@scrd.ca

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

Proj. Acct. Code:

Agreement ID: 113277

E-mail 2:

Quote#:

Copy of Report:

YES

NO

Copy of Invoice:

YES

NO

Signature: [Signature]

RUSH Priority

Report Results

Requirements

Date/Time: Dec 12/2019☐ Same Day (200%)☐ Next Day/Two Days (100%)☐ 3 or 4 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.

☒ Email☐ Online☐ Fax☐ QA/QC☒ PDF☒ Excel☐ HCDWORG☐ AB Tier 1☐ SPIGEC☐ BCCSR

Other (List Below)

Number of Containers
MeOH Field Preserved?Sechelt Landfill Groundwater

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

Samples not Field Filtered.

	Site I.D.	Sample Description	Depth Start End in cm m	Date/Time sampled	Matrix	Sampling method	#	✓	Enter tests above (✓relevant samples below)											
1.	<u>MW13-1</u>	<u>Groundwater</u>			<u>12/11/19</u>	<u>water</u>	<u>Dip</u>	<u>7</u>	☒											
2.	<u>MW13-2</u>	↓			↓	↓	↓	<u>7</u>	☒											
3.	<u>MW13-3</u>	↓			↓	↓	↓	<u>7</u>	☒											
4.	<u>Duplicate</u>	↓			<u>12/11/19</u>	<u>water</u>		<u>7</u>	☒											
6.	<u>Field Blank</u>				<u>12/11/19</u>	<u>water</u>		<u>7</u>	☒											
7.																				
8.																				

Please indicate any potentially hazardous samples

Indicate lot # or affix barcode here

Temp
Received

°C

Date/Time Stamp

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Page 2 of 2

ED 120-005

Control # C 014038

Report Transmission Cover Page

Bill To: Sunshine Coast Regional District 1975 Field Road Sechelt, BC, Canada V0N 3A1	Project ID: SP100543 Project Name: SLF Sampling Project Location: Sechelt LSD: P.O.: SP100543 Proj. Acct. code:	Lot ID: 1397676 Control Number: C014037 Date Received: Dec 12, 2019 Date Reported: Dec 19, 2019 Report Number: 2475748
Attn: Accounts Payable Sampled By: Sandi Bandara Company: SCRD		

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
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Single Report	PDF	Invoice
Anna Agnew	Sunshine Coast Regional District	5920 Mason Road Sechelt, BC V0N 3A8 Phone: (604) 885-6800 Fax: Email: anna.agnew@scrd.ca
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
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
Paul Sheridan	Sunshine Coast Regional District	5920 Mason Road Sechelt, BC V0N 3A8 Phone: (604) 885-6800 Fax: Email: paul.sheridan@scrd.ca
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
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
Sandi Bandara	Sunshine Coast Regional District	1975 Field Road Sechelt, BC V0N 3A1 Phone: (604) 885-6800 Fax: Email: sandi.bandara@scrd.ca
<u>Delivery</u>	<u>Format</u>	<u>Deliverables</u>
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COA
Email - Single Report	Standard Crosstab without Tabs	Test Report

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Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397676
1975 Field Road	Project Name: SLF Sampling	Control Number: C014037
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 19, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475748
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1397676-1	1397676-2	1397676-3	
		Sample Date	Dec 11, 2019	Dec 11, 2019	Dec 11, 2019	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	SL-A / Surface Water / 4.5 °C	SL-E / Surface Water / 4.5 °C	SL-B / Surface Water / 4.5 °C	
		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						
Kjeldahl Nitrogen	Total	mg/L	0.17	0.08	0.08	0.07
Organic Carbon	Dissolved Nonpurgeable	mg/L	3.9	2.0	2.4	0.5
Ammonia - N		mg/L	<0.01	<0.01	<0.01	0.01
Metals Dissolved						
Mercury	Dissolved	µg/L	<0.01	<0.01	<0.01	0.05
Routine Water						
pH - Holding Time			Exceeded	Exceeded	Exceeded	
pH	at 25 °C		6.49	6.29	7.00	0.01
Electrical Conductivity		µS/cm at 25 °C	19	26	58	1
Calcium	Dissolved	mg/L	2.4	2.4	5.5	0.01
Magnesium	Dissolved	mg/L	0.25	0.42	1.0	0.02
Potassium	Dissolved	mg/L	0.10	0.10	0.44	0.04
Sodium	Dissolved	mg/L	0.9	1.8	3.3	0.1
Sulfur	Dissolved	mg/L	0.42	0.57	1.0	0.02
Chloride	Dissolved	mg/L	0.60	1.23	3.85	0.05
Nitrate - N	Dissolved	mg/L	0.02	0.07	0.12	0.01
Nitrite - N	Dissolved	mg/L	<0.01	<0.01	<0.01	0.01
Hardness	as CaCO ₃ (dissolved)	mg/L	7	8	18	5
Salinity	Dissolved	g/L	0.002	0.0044	0.0084	0.0001
Silicon	Dissolved	µg/L	2400	4000	5900	5
Trace Metals Dissolved						
Digestion	Dissolved		Lab filtered & preserved	Lab filtered & preserved	Lab filtered & preserved	
Aluminum	Dissolved	µg/L	143	38	25	1
Antimony	Dissolved	µg/L	0.05	0.10	<0.02	0.02
Arsenic	Dissolved	µg/L	0.1	<0.1	<0.1	0.1
Barium	Dissolved	µg/L	2.5	3.0	4.0	0.1
Beryllium	Dissolved	µg/L	<0.05	<0.05	<0.05	0.05
Bismuth	Dissolved	µg/L	<0.1	<0.1	<0.1	0.1
Boron	Dissolved	µg/L	<2	<2	3	2
Cadmium	Dissolved	µg/L	<0.01	0.12	<0.01	0.01
Chromium	Dissolved	µg/L	0.07	0.07	<0.05	0.05
Cobalt	Dissolved	µg/L	0.04	0.07	<0.02	0.02
Copper	Dissolved	µg/L	<0.5	0.5	<0.5	0.5
Iron	Dissolved	µg/L	46	3	19	2
Lead	Dissolved	µg/L	0.04	0.06	<0.01	0.01

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397676
1975 Field Road	Project Name: SLF Sampling	Control Number: C014037
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 19, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475748
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

		Reference Number	1397676-1	1397676-2	1397676-3	
		Sample Date	Dec 11, 2019	Dec 11, 2019	Dec 11, 2019	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	SL-A / Surface Water / 4.5 °C	SL-E / Surface Water / 4.5 °C	SL-B / Surface Water / 4.5 °C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved - Continued						
Lithium	Dissolved	µg/L	<0.5	<0.5	<0.5	0.5
Manganese	Dissolved	µg/L	3	<1	<1	1
Molybdenum	Dissolved	µg/L	0.10	0.15	0.11	0.02
Nickel	Dissolved	µg/L	0.2	0.2	<0.2	0.2
Selenium	Dissolved	µg/L	<0.2	<0.2	<0.2	0.2
Silver	Dissolved	µg/L	<0.01	0.09	<0.01	0.01
Strontium	Dissolved	µg/L	9.1	14.5	27.2	0.1
Thallium	Dissolved	µg/L	<0.01	0.06	<0.01	0.01
Thorium	Dissolved	µg/L	0.05	0.07	<0.05	0.05
Tin	Dissolved	µg/L	<0.1	0.1	<0.1	0.1
Uranium	Dissolved	µg/L	0.05	0.08	0.03	0.01
Vanadium	Dissolved	µg/L	0.20	0.41	0.53	0.05
Zinc	Dissolved	µg/L	1.5	2.5	3.7	0.5
Zirconium	Dissolved	µg/L	<0.1	0.2	<0.1	0.1
Titanium	Dissolved	µg/L	0.4	<0.1	<0.1	0.1

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397676
1975 Field Road	Project Name: SLF Sampling	Control Number: C014037
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 19, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475748
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Reference Number	1397676-4
Sample Date	Dec 11, 2019
Sample Time	NA
Sample Location	
Sample Description	SL-C / Surface Water / 4.5 °C

		Matrix	Water		
Analyte		Units	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents					
Chemical Oxygen Demand		mg/L	<10		10
Inorganic Nonmetallic Parameters					
Kjeldahl Nitrogen	Total	mg/L	0.07		0.07
Organic Carbon	Dissolved Nonpurgeable	mg/L	3.8		0.5
Ammonia - N		mg/L	0.01		0.01
Metals Dissolved					
Mercury	Dissolved	µg/L	<0.01		0.05
Routine Water					
pH - Holding Time			Exceeded		
pH	at 25 °C		6.65		0.01
Electrical Conductivity		µS/cm at 25 °C	22		1
Calcium	Dissolved	mg/L	2.6		0.01
Magnesium	Dissolved	mg/L	0.28		0.02
Potassium	Dissolved	mg/L	0.12		0.04
Sodium	Dissolved	mg/L	1.0		0.1
Sulfur	Dissolved	mg/L	0.56		0.02
Chloride	Dissolved	mg/L	0.67		0.05
Nitrate - N	Dissolved	mg/L	0.02		0.01
Nitrite - N	Dissolved	mg/L	<0.01		0.01
Hardness	as CaCO ₃ (dissolved)	mg/L	8		5
Salinity	Dissolved	g/L	0.0026		0.0001
Silicon	Dissolved	µg/L	2600		5
Trace Metals Dissolved					
Digestion	Dissolved		Lab filtered & preserved		
Aluminum	Dissolved	µg/L	137		1
Antimony	Dissolved	µg/L	0.02		0.02
Arsenic	Dissolved	µg/L	0.1		0.1
Barium	Dissolved	µg/L	2.7		0.1
Beryllium	Dissolved	µg/L	<0.05		0.05
Bismuth	Dissolved	µg/L	<0.1		0.1
Boron	Dissolved	µg/L	<2		2
Cadmium	Dissolved	µg/L	0.01		0.01
Chromium	Dissolved	µg/L	0.07		0.05
Cobalt	Dissolved	µg/L	<0.02		0.02
Copper	Dissolved	µg/L	<0.5		0.5
Iron	Dissolved	µg/L	47		2
Lead	Dissolved	µg/L	0.04		0.01

Analytical Report

Bill To: Sunshine Coast Regional District	Project ID: SP100543	Lot ID: 1397676
1975 Field Road	Project Name: SLF Sampling	Control Number: C014037
Sechelt, BC, Canada	Project Location: Sechelt	Date Received: Dec 12, 2019
V0N 3A1	LSD:	Date Reported: Dec 19, 2019
Attn: Accounts Payable	P.O.: SP100543	Report Number: 2475748
Sampled By: Sandi Bandara	Proj. Acct. code:	
Company: SCRD		

Reference Number 1397676-4
Sample Date Dec 11, 2019
Sample Time NA
Sample Location
Sample Description SL-C / Surface
Water / 4.5 °C
Matrix Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved - Continued					
Lithium	Dissolved	µg/L	<0.5		0.5
Manganese	Dissolved	µg/L	2		1
Molybdenum	Dissolved	µg/L	0.11		0.02
Nickel	Dissolved	µg/L	0.2		0.2
Selenium	Dissolved	µg/L	<0.2		0.2
Silver	Dissolved	µg/L	<0.01		0.01
Strontium	Dissolved	µg/L	10.0		0.1
Thallium	Dissolved	µg/L	<0.01		0.01
Thorium	Dissolved	µg/L	<0.05		0.05
Tin	Dissolved	µg/L	<0.1		0.1
Uranium	Dissolved	µg/L	0.05		0.01
Vanadium	Dissolved	µg/L	0.42		0.05
Zinc	Dissolved	µg/L	6.1		0.5
Zirconium	Dissolved	µg/L	<0.1		0.1
Titanium	Dissolved	µg/L	0.5		0.1

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.

Methodology and Notes

Bill To: Sunshine Coast Regional District 1975 Field Road Sechelt, BC, Canada V0N 3A1	Project ID: SP100543 Project Name: SLF Sampling Project Location: Sechelt LSD: P.O.: SP100543 Proj. Acct. code:	Lot ID: 1397676 Control Number: C014037 Date Received: Dec 12, 2019 Date Reported: Dec 19, 2019 Report Number: 2475748
Attn: Accounts Payable Sampled By: Sandi Bandara Company: SCRD		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alk, pH, EC, Turb in water (BC)	APHA	* Conductivity, 2510 B	Dec 13, 2019	Element Vancouver
Alk, pH, EC, Turb in water (BC)	APHA	* pH - Electrometric Method, 4500-H+ B	Dec 13, 2019	Element Vancouver
Ammonia-N in Water (VAN)	APHA	* Flow Injection Analysis, 4500-NH3 H	Dec 13, 2019	Element Vancouver
Anions by IEC in water (VAN)	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Dec 13, 2019	Element Vancouver
Carbon Organic (Dissolved) in water (DOC)	APHA	High-Temperature Combustion Method, 5310 B	Dec 16, 2019	Element Edmonton - Roper Road
Chemical Oxygen Demand (water-VAN)	APHA	* Closed Reflux, Colorimetric Method, 5220 D	Dec 17, 2019	Element Vancouver
Mercury Low Level (Dissolved) in water (VAN)	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Dec 17, 2019	Element Vancouver
Metals SemiTrace (Dissolved) in water (VAN)	US EPA	* Metals & Trace Elements by ICP-AES, 6010C	Dec 13, 2019	Element Vancouver
Total and Kjeldahl Nitrogen (Total) in Water	ISO	* Water Quality - Determination of nitrogen, ISO/TR 11905-2	Dec 13, 2019	Element Edmonton - Roper Road
Trace Metals (dissolved) in Water (VAN)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Dec 13, 2019	Element Vancouver

* Reference Method Modified

References

APHA	Standard Methods for the Examination of Water and Wastewater
EPA	Environmental Protection Agency Test Methods - US
ISO	International Organization for Standardization
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

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Project Information

Project ID: <u>SP100543</u>	Company: <u>SCRD</u>	Company: <u>SCRD</u>	1. Name:
Project Name: <u>SLF Sampling</u>	Address: <u>1975 Field Road</u>	Address: <u>1975 Field Road</u>	E-mail:
Project Location: <u>Sechelt BC</u>	Attention: <u>Accounts Payable</u>	Attention: <u>Sandi Bandara</u>	2. Name:
Legal Location:	Phone: <u>604-885-6800</u>	Phone: <u>604-885-6800</u>	E-mail:
PO/AFE#: <u>SP100543</u>	Cell:	Cell:	Sample Custody
Proj. Acct. Code:	Fax:	Fax:	Sampled by: <u>Sandi Bandara</u>
Quote#:	E-mail: <u>accounts.payable@scrd.ca</u>	E-mail 1: <u>Sandi.bandara@scrd.ca</u>	Company: <u>SCRD</u>
	Agreement ID:	E-mail 2:	I authorize Element to proceed with the work indicated on this form:
	Copy of Report: YES <u>NO</u>	Copy of Invoice: YES <u>YES</u> NO	Signature: <u>[Signature]</u>

RUSH Priority

Report Results

Requirements

Date/Time: Dec. 12/19☐ Same Day (200%)☐ Next Day/Two Days (100%)☐ 3 or 4 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.

☐ Email☐ Online☐ Fax☐ QA/QC☐ PDF☐ Excel☐ HCDWORG☐ AB Tier 1☐ SPIGEC☐ BCCSR

Other (List Below) _____

Number of Containers
MeOH Field Preserved?Sechelt Landfill Surface water

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

	Site I.D.	Sample Description	Depth Start End in cm m	Date/Time sampled	Matrix	Sampling method	#	✓	Enter tests above (✓relevant samples below)											
1.	<u>SL-A</u>	<u>Surface water</u>		<u>12/11/19</u>	<u>Water</u>	<u>Dip</u>	<u>6</u>	<u>✓</u>												
2.	<u>SL-E</u>						<u>6</u>	<u>✓</u>												
3.	<u>SL-B</u>						<u>6</u>	<u>✓</u>												
4.	<u>SL-C</u>						<u>6</u>	<u>✓</u>												
6.																				
7.																				
8.																				

Please indicate any potentially hazardous samples

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

Page L of L

ED 120-005

Control # C 014037

Lot: 1397676 COC

Temp
Received4.5°

Date/Time Stamp

Delivery Method:

Waybill:

Received by:



APPENDIX G
HISTORIC LANDFILL GAS MONITORING RESULTS



Table G1 Historic Groundwater Elevations

Monitoring Location	Top of Casing Elevation	Ground Elevation (mASL)	Groundwater Elevation (mASL)											
			15-Jun-17	20-Oct-17	22-Dec-17	14-Feb-18	15-Feb-18	14-Mar-18	25-Jun-18	27-Sep-18	18-Dec-18	12-Apr-19	13-Nov-19	17-Dec-19
GP13-01S	-	215.82	213.02	213.02	<212.82	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
GP13-01D	-	215.82	<210.92	<210.92	<210.92	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
GP13-02S	-	216.39	213.94	<213.69	<213.69	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
GP13-02D	-	216.39	212.07	212.07	<211.79	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
GP17-01S	219.32	218.51	-	<215.81	<215.81	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
GP17-01D	219.32	218.51	-	<213.91	<213.91	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Notes: (1) Soil Gas Probe locations obtained from survey completed by Strait Land Surveying Inc. in 2013 (GP13-01, GP13-02) and 2017 (GP17-01). (2) All groundwater elevations reported in metres above mean sea level. (3) < indicates that the probe was dry and the water level was below the bottom elevation of the probe.														



Table G2 Historic Results - GP13-01S

Sample Date:	Units	15-Jun-17	20-Oct-17	22-Dec-17	14-Feb-18	15-Feb-18	14-Mar-18	25-Jun-18	27-Sep-18	18-Dec-18	12-Apr-19	13-Nov-19	17-Dec-19
Parameters:													
Field													
Pressure	inches of water	0.0	-1.56	0.0	-0.13	-0.30	-0.15	0.06	0.14	-0.28	0.00	0.02	0.04
Methane (CH ₄)	%	0.0	0.0	0.1	3.0	2.2	1.1	0.0	0.0	3.1	0.5	1.5	4.1
Carbon Dioxide (CO ₂)	%	6.9	8.5	5.6	7.2	7.3	6.5	9.2	6.9	6.3	8.8	9.9	15.6
Oxygen (O ₂)	%	6.9	6.7	1.6	1.4	1.4	2.1	10	9.2	0.4	8.4	0.4	1.0
Notes:													
-	Not analyzed												
No Cap	Indicates that the well did not have a gas cap, or the cap was not sealed												
ND	Non-detect (detection limit)												
	Well blinded												



Table G3 Historic Results - GP13-01D

Sample Date:													
Parameters:	Units	15-Jun-17	20-Oct-17	22-Dec-17	14-Feb-18	15-Feb-18	14-Mar-18	25-Jun-18	27-Sep-18	18-Dec-18	12-Apr-19	13-Nov-19	17-Dec-19
Field													
Pressure	inches of water	0.0	-1.63	0.0	-0.22	-0.31	-0.20	0.04	0.15	-0.15	0.07	0.03	0.05
Methane (CH ₄)	%	0.0	0.0	0.1	0.5	0.2	0.0	0.0	0.0	12.3	0.5	3.0	5.9
Carbon Dioxide (CO ₂)	%	7.4	11.3	9.2	7.8	7.5	6.5	8.8	11.2	13.8	9.3	15.4	10.7
Oxygen (O ₂)	%	5.9	1.6	2.4	2.4	3.3	5.6	6.1	3.1	0.2	4.6	0.5	1.8
Notes:													
-	Not analyzed												
No Cap	Indicates that the well did not have a gas cap, or the cap was not sealed												
ND	Non-detect (detection limit)												
	Well blinded												



Table G4 Historic Results - GP13-02S

Sample Date:													
Parameters:	Units	15-Jun-17	20-Oct-17	22-Dec-17	14-Feb-18	15-Feb-18	14-Mar-18	25-Jun-18	27-Sep-18	18-Dec-18	12-Apr-19	13-Nov-19	17-Dec-19
Field													
Pressure	inches of water	0.0	-0.09	-1.09	0.00	-0.21	-0.19	-0.14	0.13	-0.20	0.10	0.01	0.05
Methane (CH ₄)	%	1.4	0.0	4.7	26.8	26.9	25.3	19.3	3.5	27.3	19.0	11.3	11.8
Carbon Dioxide (CO ₂)	%	13.5	14.7	11.4	11.0	11.1	9.9	14.3	13.4	15.9	15.4	15.7	20.0
Oxygen (O ₂)	%	0.9	2.0	0.4	1.0	1.1	1.9	0.6	1.2	0.2	0.2	0.2	1.4
Notes:													
-	Not analyzed												
No Cap	Indicates that the well did not have a gas cap, or the cap was not sealed												
ND	Non-detect (detection limit)												
	Well blinded												



Table G5 Historic Results - GP13-02D

Sample Date:	Units	15-Jun-17	20-Oct-17	22-Dec-17	14-Feb-18	15-Feb-18	14-Mar-18	25-Jun-18	27-Sep-18	18-Dec-18	12-Apr-19	13-Nov-19	17-Dec-19
Parameters:													
Field													
Pressure	inches of water	0.0	-1.67	-0.62	0.00	-0.27	-0.21	-0.01	0.19	-0.26	0.15	-0.17	-0.08
Methane (CH ₄)	%	0.0	-	0.0	2.0	0.4	6.3	9.5	2.0	12.8	15.7	8.9	9.7
Carbon Dioxide (CO ₂)	%	10.3	-	9.7	11.8	12.3	11.2	13.4	13.0	13.4	14.5	15.1	15.6
Oxygen (O ₂)	%	1.4	-	3.3	1.1	2.0	2.0	1.9	1.1	0.1	0.2	0.2	1.4
Notes:													
-	Not analyzed												
No Cap	Indicates that the well did not have a gas cap, or the cap was not sealed												
ND	Non-detect (detection limit)												
	Well blinded												



Table G6 Historic Results - GP17-01S

Sample Date:													
Parameters:	Units	15-Jun-17	20-Oct-17	22-Dec-17	14-Feb-18	15-Feb-18	14-Mar-18	25-Jun-18	27-Sep-18	18-Dec-18	12-Apr-19	13-Nov-19	17-Dec-19
Field													
Pressure	inches of water	-	-0.11	0.0	-0.16	-0.31	-0.21	0.09	0.24	-0.32	0.19	0.13	0.16
Methane (CH ₄)	%	-	0.0	43.8	64.9	47.6	58.3	60.5	51.9	15.5	67.3	65.1	61.8
Carbon Dioxide (CO ₂)	%	-	0.0	24.7	26.1	22.1	23.7	35.7	37.4	13.6	32.2	34.9	31.7
Oxygen (O ₂)	%	-	21.2	1.4	1.1	3.6	2.5	0.3	1.2	11.1	0.5	0.1	1.9
Notes:													
-	Not analyzed												
No Cap	Indicates that the well did not have a gas cap, or the cap was not sealed												
ND	Non-detect (detection limit)												
	Well blinded												



Table G7 Historic Results - GP17-01D

Sample Date:													
Parameters:	Units	15-Jun-17	20-Oct-17	22-Dec-17	14-Feb-18	15-Feb-18	14-Mar-18	25-Jun-18	27-Sep-18	18-Dec-18	12-Apr-19	13-Nov-19	17-Dec-19
Field													
Pressure	inches of water	-	-0.1	0.0	-0.12	-0.28	-0.21	0.09	0.28	-0.37	0.18	0.01	0.15
Methane (CH ₄)	%	-	3.0	31.9	48.9	52.2	49.5	59.9	48.1	52.1	65.5	20.1	51.2
Carbon Dioxide (CO ₂)	%	-	2.8	25.1	28.1	27.8	27.3	35.9	39.1	34.0	33.9	35.5	32.4
Oxygen (O ₂)	%	-	20.0	3.5	2.2	2.6	3.5	0.3	1.9	2.6	0.5	1.8	3.5
Notes:													
-	Not analyzed												
No Cap	Indicates that the well did not have a gas cap, or the cap was not sealed												
ND	Non-detect (detection limit)												
	Well blinded												



Table G8 Historic Landfill Gas Building Monitoring

Sample Date:	Share Shed		Special Waste Storage (Storage Bunker)		Office Building		Scale House		Power Shed		Maintenance Shop	
Parameters:												
Methane (CH4) %												
14-Feb-18	0.0025	0.0035	-		0.0025	0.0035	0.0025	0.0035	0.0025	0.0035	0.0025	0.0035
15-Feb-18	0.0000	0.0005	-		-		0.0025	0.0035	0.0000	0.0005	0.0000	0.0005
25-Jun-18	0.0000	0.0000	0.0015	0.0015	0.0015	0.0010	0.0000	0.0000	0.0030	0.0025	0.0005	0.0270
28-Sep-18	0.0065	0.0015	0.0005	0.0025	0.0000	0.0010	0.0015	0.0030	0.0010	0.0030	0.0040	0.0035
19-Dec-18	0.0005	0.0005	0.0025	0.0025	0.0025	0.0045	0.0005	0.0005	0.0005	0.0025	0.0000	0.0000
16-Apr-19	0.0000	0.0000	0.0000	0.0005	0.0000	0.0010	0.0000	0.0000	0.0000	0.0005	0.0000	0.0000
19-Dec-19	0.0005	0.0010	0.0005	0.0015	0.0010	0.0020	0.0010	0.0010	0.0010	0.0015	0.0005	0.0005
Notes:												
1. All building were monitored using an RKI Eagle. Buildings were monitored at ground surface and at breathing level.												
- No data available												

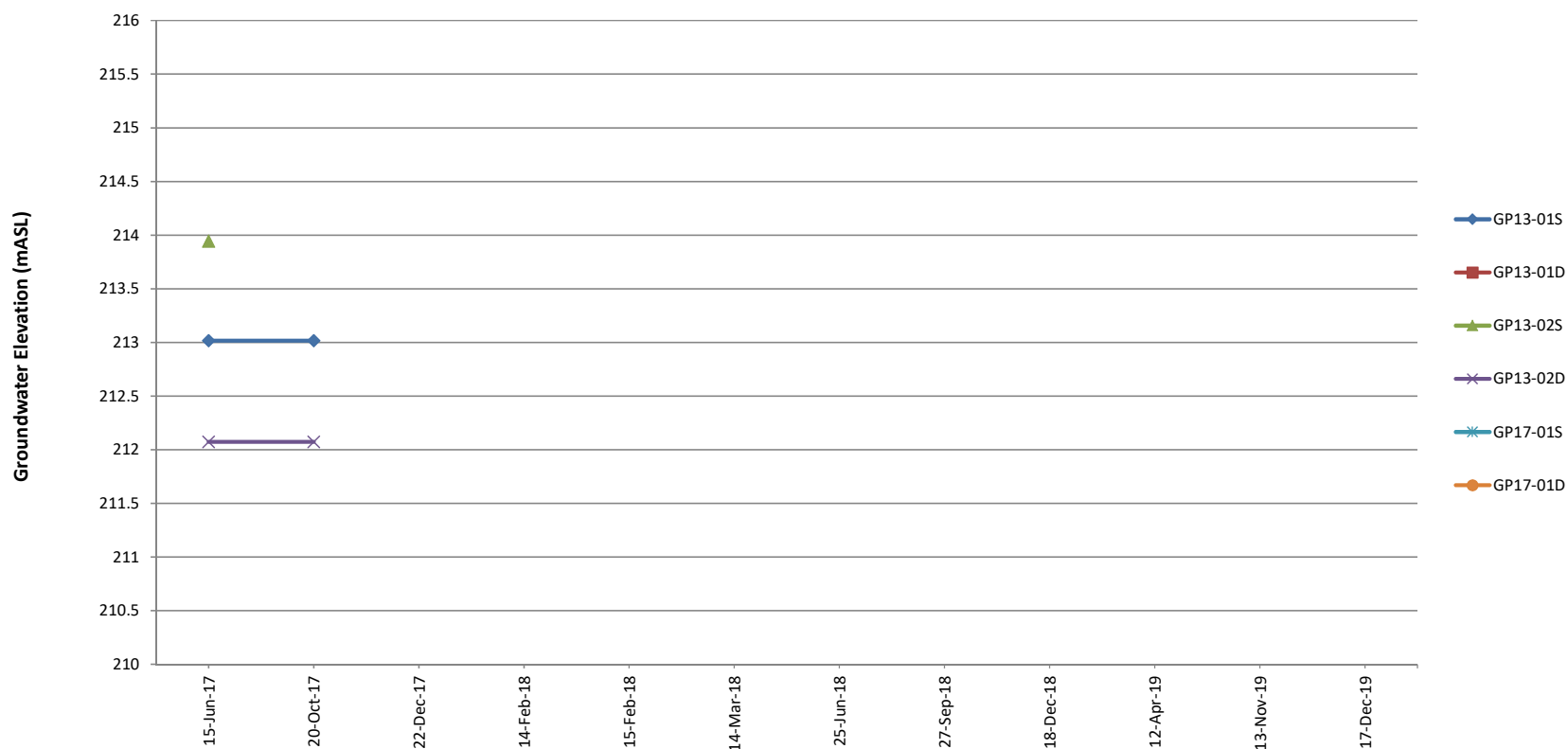


Figure G1
Soil Gas Probe Groundwater Hydrograph
Sechelt Landfill



APPENDIX H
RESULTS OF IN-SITU HYDRAULIC CONDUCTIVITY TESTING

XCG Consulting Ltd.
820 Trillium Drive
Kitchener, ON

Slug Test Analysis Report

Project: Sechelt Landfill

Number: 4-2111-01-65

Client: SCRCD

Location: Sechelt, BC

Slug Test: MW3

Test Well: MW3

Test Conducted by: MPS

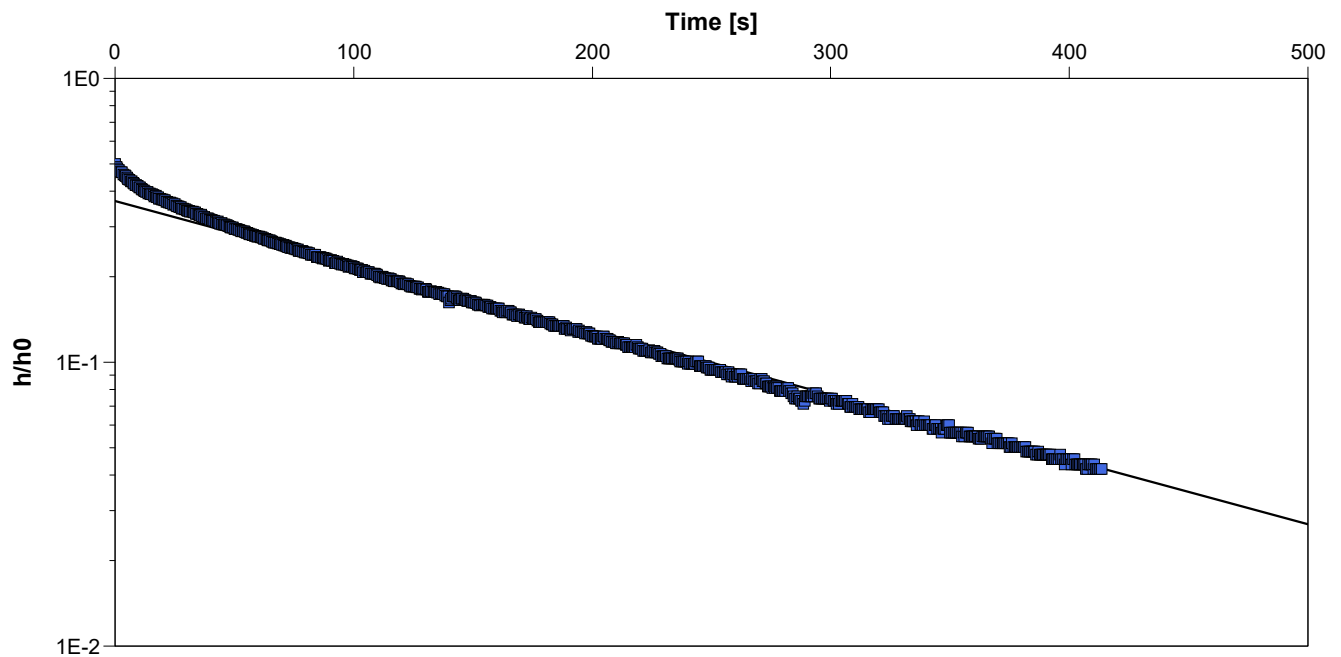
Test Date: 7/7/2020

Analysis Performed by: MPS

MW3_BR

Analysis Date: 7/21/2020

Aquifer Thickness: 10.00 m



Calculation using Bouwer & Rice

Observation Well

Hydraulic Conductivity
[m/s]

MW3

7.50×10^{-6}

XCG Consulting Ltd.
820 Trillium Drive
Kitchener, ON

Slug Test Analysis Report

Project: Sechelt Landfill

Number: 4-2111-01-65

Client: SCR D

Location: Sechelt, BC

Slug Test: MW4

Test Well: MW4

Test Conducted by: MPS

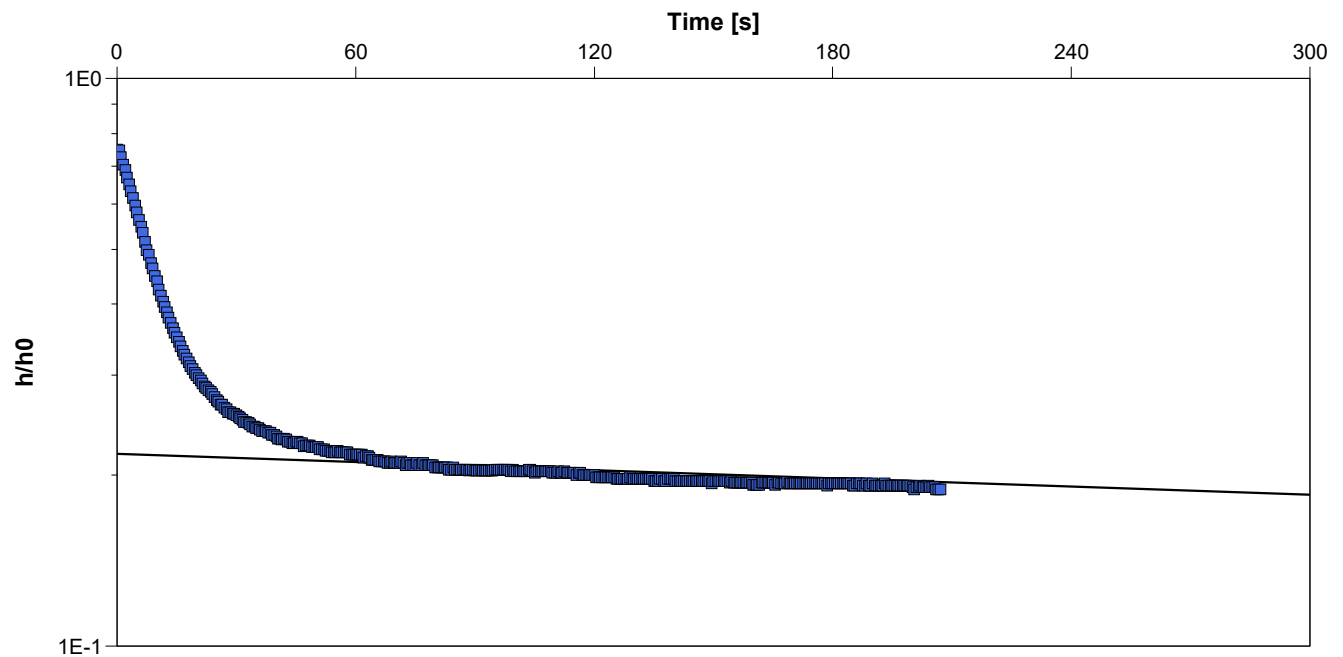
Test Date: 7/7/2020

Analysis Performed by: MPS

MW4_BR

Analysis Date: 7/21/2020

Aquifer Thickness: 10.00 m



Calculation using Bouwer & Rice

Observation Well

Hydraulic Conductivity
[m/s]

MW4

2.00×10^{-7}

XCG Consulting Ltd.
820 Trillium Drive
Kitchener, ON

Slug Test Analysis Report

Project: Sechelt Landfill

Number: 4-2111-01-65

Client: SCRD

Location: Sechelt, BC

Slug Test: MW4A

Test Well: MW4A

Test Conducted by: MPS

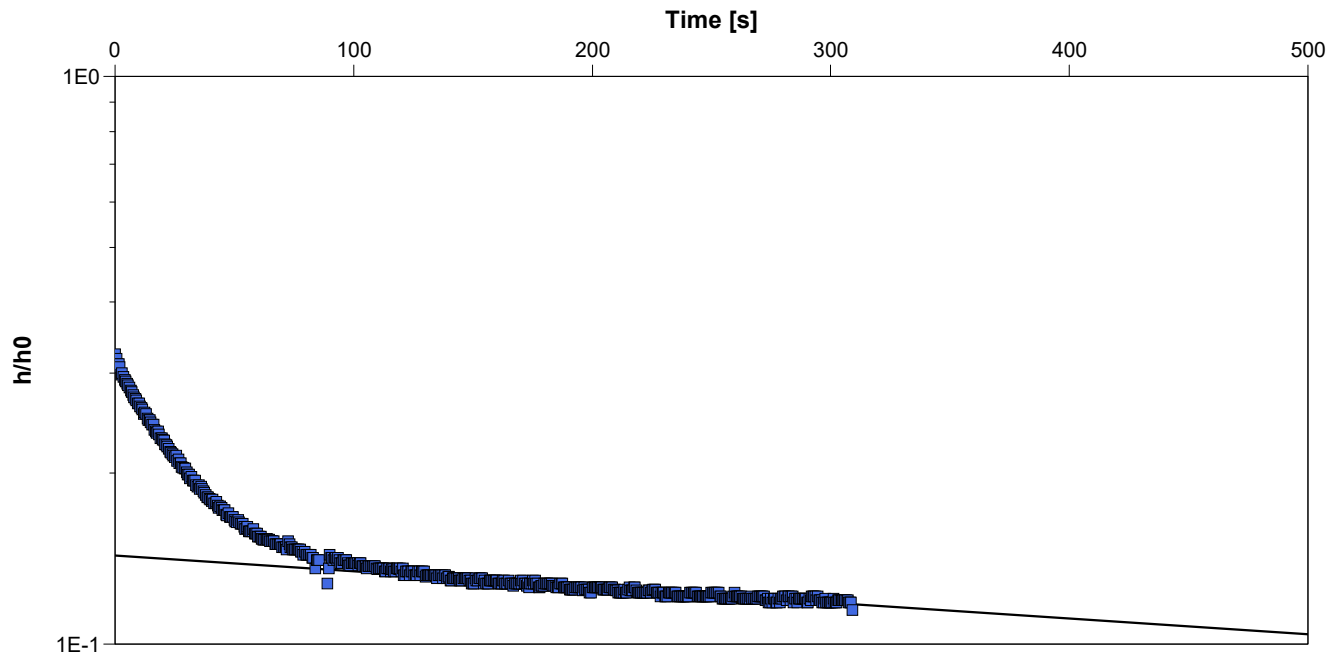
Test Date: 7/7/2020

Analysis Performed by: MPS

MW4A_BR

Analysis Date: 7/21/2020

Aquifer Thickness: 10.00 m



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW4A	3.90×10^{-7}	

XCG Consulting Ltd.
820 Trillium Drive
Kitchener, ON

Slug Test Analysis Report

Project: Sechelt Landfill

Number: 4-2111-01-65

Client: SCRD

Location: Sechelt, BC

Slug Test: MW13-01

Test Well: MW13-01

Test Conducted by: MPS

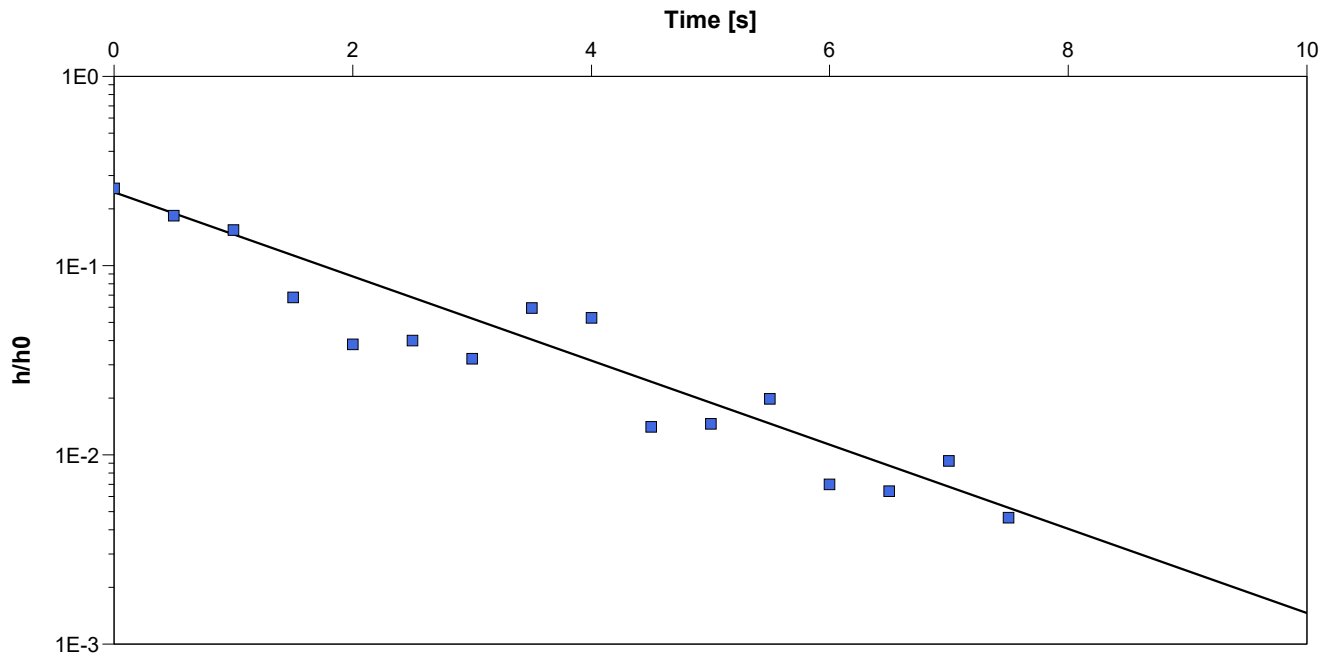
Test Date: 7/7/2020

Analysis Performed by: MPS

MW13-01_BR

Analysis Date: 7/21/2020

Aquifer Thickness: 5.00 m



Calculation using Bouwer & Rice

Observation Well

Hydraulic Conductivity
[m/s]

MW13-01

1.90×10^{-4}

XCG Consulting Ltd.
820 Trillium Drive
Kitchener, ON

Slug Test Analysis Report

Project: Sechelt Landfill

Number: 4-2111-01-65

Client: SCRCD

Location: Sechelt, BC

Slug Test: MW13-02

Test Well: MW13-02

Test Conducted by: MPS

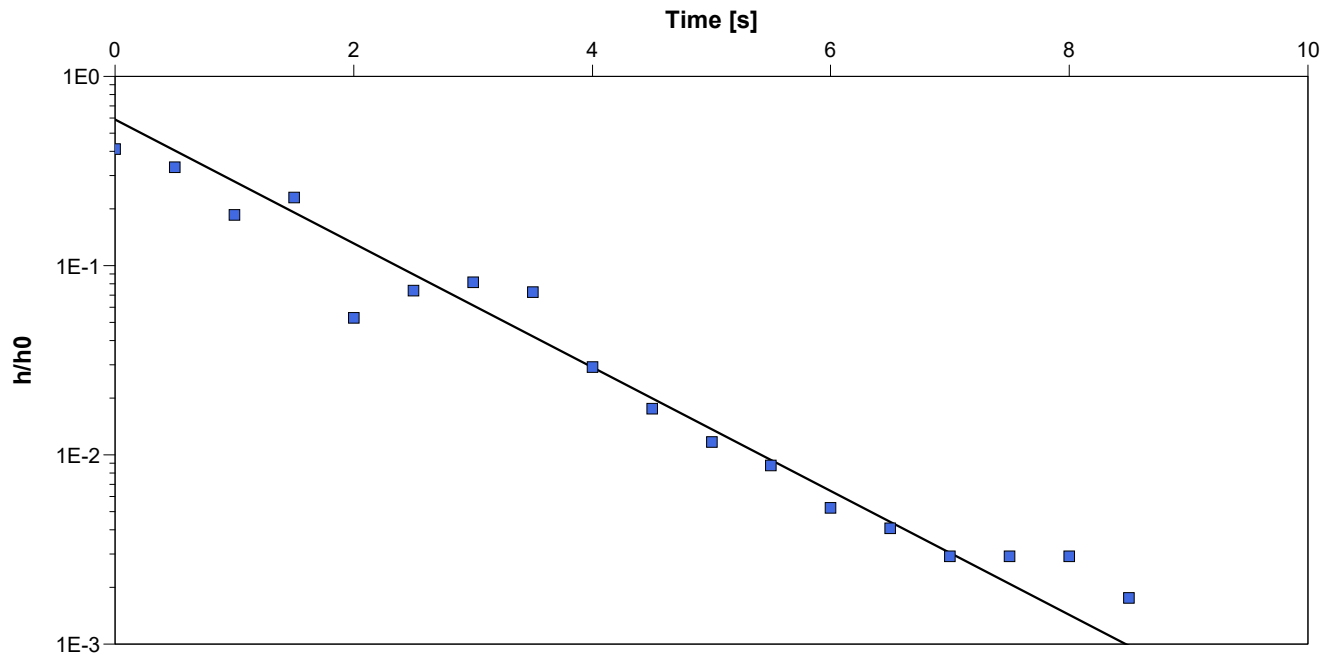
Test Date: 7/7/2020

Analysis Performed by:

MW13-02_BR

Analysis Date: 7/21/2020

Aquifer Thickness: 5.00 m



Calculation using Bouwer & Rice

Observation Well

Hydraulic Conductivity
[m/s]

MW13-02

2.80×10^{-4}

XCG Consulting Ltd.
820 Trillium Drive
Kitchener, ON

Slug Test Analysis Report

Project: Sechelt Landfill

Number: 4-2111-01-65

Client: SCRCD

Location: Sechelt, BC

Slug Test: MW13-03

Test Well: MW13-03

Test Conducted by: MPS

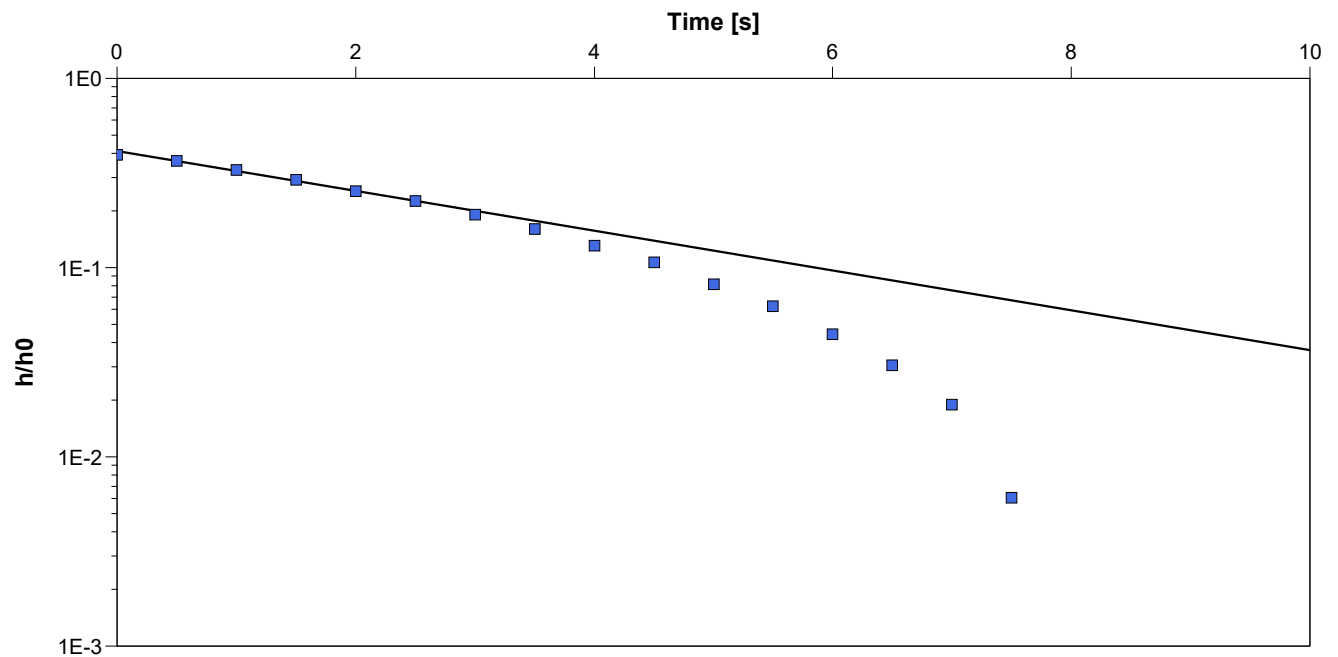
Test Date: 7/7/2020

Analysis Performed by:

MW13-03

Analysis Date: 7/21/2020

Aquifer Thickness: 5.00 m



Calculation using Bouwer & Rice

Observation Well

Hydraulic Conductivity
[m/s]

MW13-03

1.10×10^{-4}