REPORT

2019 Monitoring Report

Westside Landfill, West Kelowna, BC

Submitted to:

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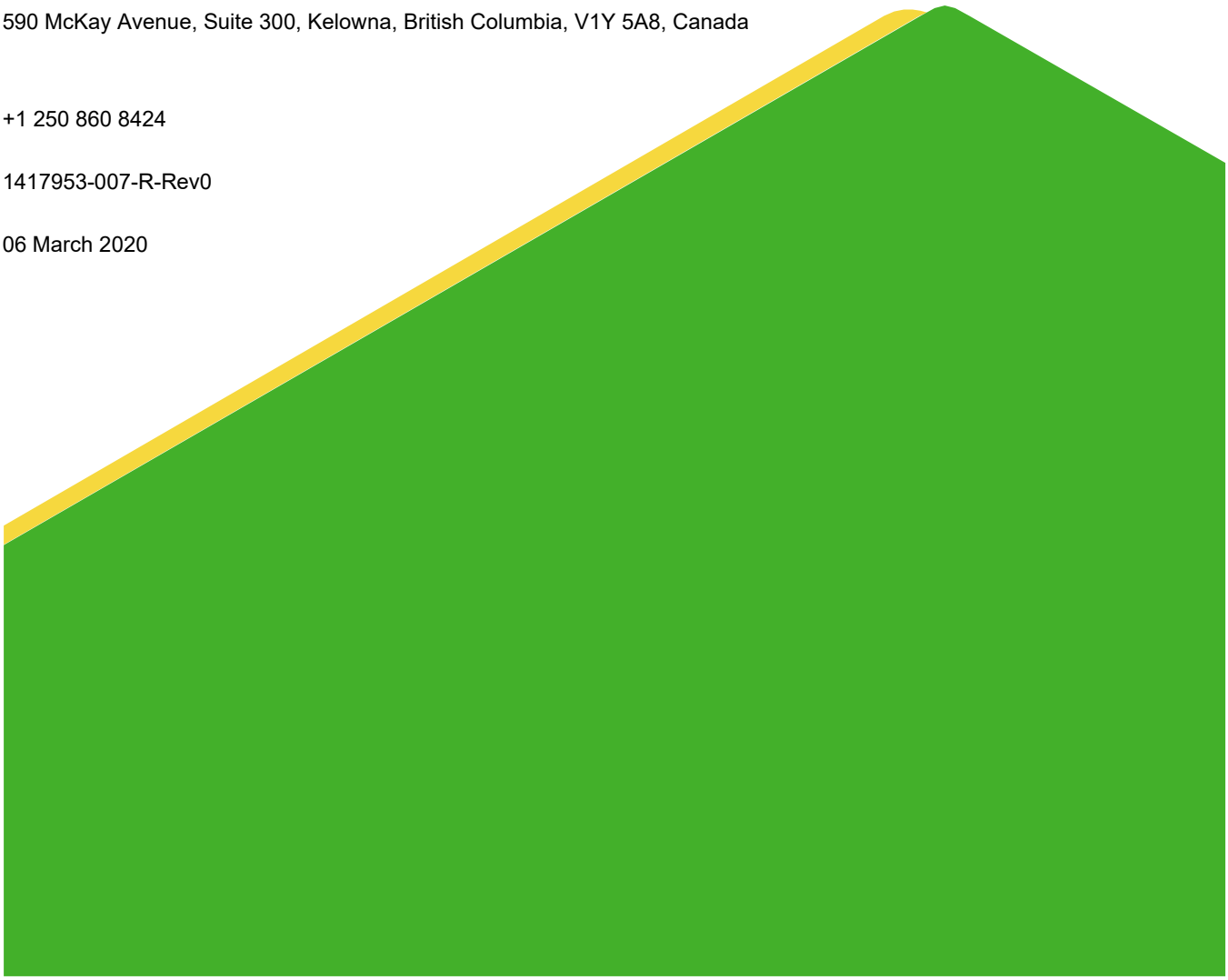
06 March 2020



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1 Copy - Regional District Central Okanagan

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by the Regional District of Central Okanagan (RDCO) to provide support services for the 2019 annual monitoring program at the Westside Landfill (the Site), located in West Kelowna, BC (Figure 1). Westside Landfill was operated as a municipal solid waste landfill under Operational Certificate (OC) PR#12217 (Appendix A) issued by British Columbia Ministry of Environment and Climate Change Strategy (MoE). Westside Landfill ceased receiving waste in 2010 and was partially covered. A Closure Plan was developed (Golder 2015), and has been accepted by the MoE, as confirmed in a letter dated 6 September 2017 (Appendix A). Golder has been provided with record drawings for the closure works, which included earthworks, drainage works and the placement of topsoil, all of which were completed in 2018 under the supervision of Urban System Ltd. (USL); the USL record drawings were provided in the 2018 Annual Report (Golder 2019). The Site was seeded and fertilized during the first week of November 2018, with a final completion date of 7 November 2018.

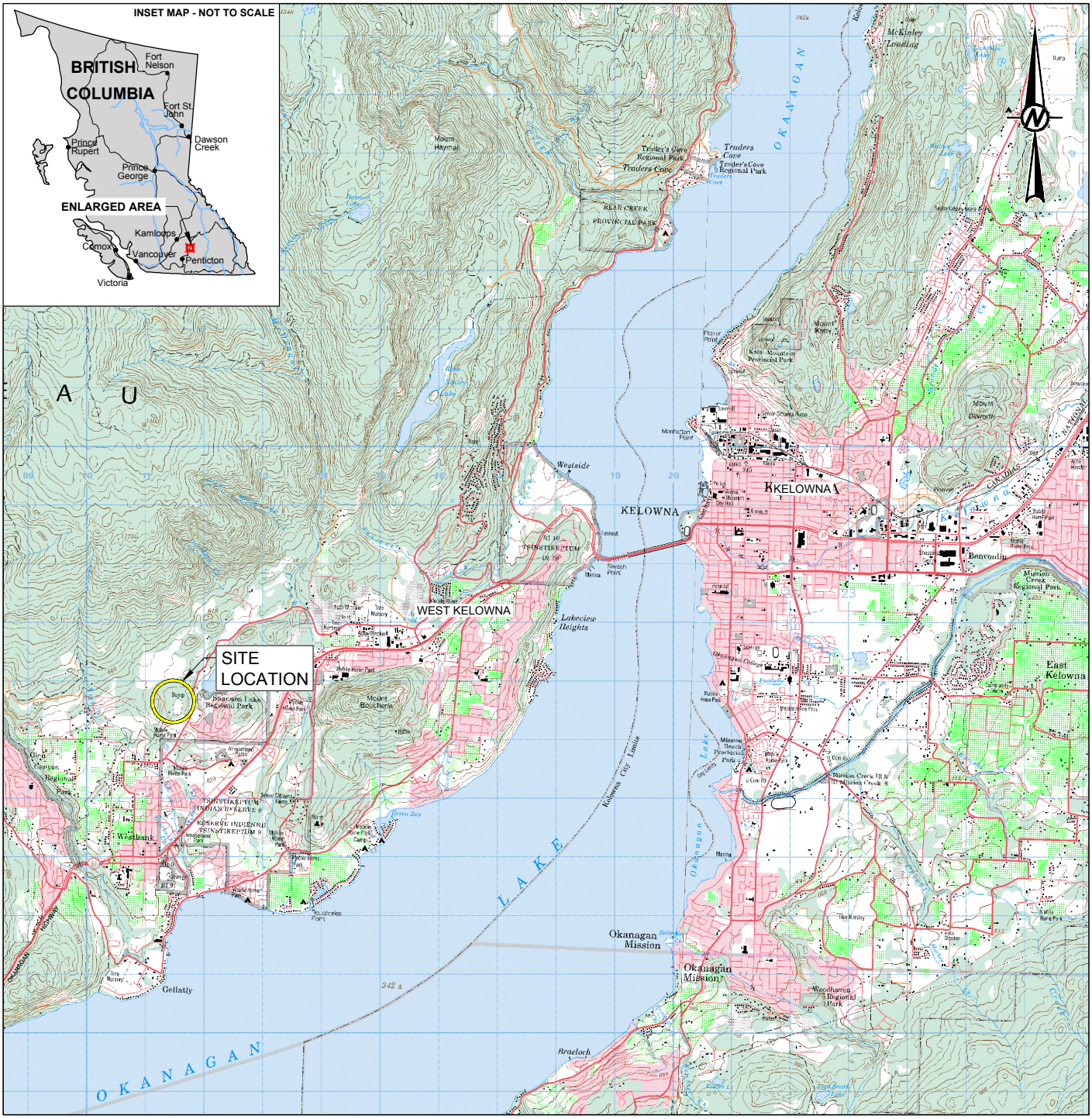
Monitoring of the Site was carried out as initially outlined in OC PR PR#12217, with modifications over the years. The current monitoring program follows recommendations outlined in the Closure Plan (Golder 2015), but with some modifications, as will be discussed further in Sections 4.0 and 7.0.

The annual monitoring program includes groundwater sampling and analysis, groundwater elevation monitoring, landfill gas sampling and analysis and an annual landfill inspection. RDCO staff completed the groundwater sampling, groundwater elevation and landfill gas monitoring components of the program in 2019. Golder completed an inspection of the Site in October of 2019 and also reviewed results from each landfill gas monitoring round within 24 hours of data collection, as outlined in the Landfill Gas Management Plan (Golder 2013a) and the Closure Plan (Golder 2015). This report summarizes the results of these inspection and monitoring activities and provides recommendations for adjustments.

2.0 APPLICABLE REGULATORY FRAMEWORK

Westside Landfill was initially permitted under PR#12217. The regulatory environment has evolved since initial permitting. In British Columbia, environmental matters pertaining to contaminated sites generally fall under the jurisdiction of the MoE, pursuant to the Environmental Management Act (“EMA”; SBC 2003, Chapter 53 assented 23 October 2003, current to 27 November 2019). Exceptions include federal lands and waters with migratory fish that fall under the jurisdiction of Environment Canada. The key regulation under the EMA relating to the assessment and remediation of contaminated sites is the Contaminated Sites Regulation (CSR), including amendments up to B.C. Reg. 13/2019, 24 January 2019. The standards listed in the CSR provide numerical concentrations for the evaluation of soil, sediment, soil vapour, and water quality.

The BC Ground Water Protection Regulation (including amendments up to B.C. Reg. 152/2016, 10 June 2016), under the Water Sustainability Act ([SBC 2014], Chapter 15), establishes standards to protect groundwater supplies by requiring wells, including environmental boreholes, test pits and monitoring wells, to be adequately constructed, maintained and, at the end of their service, adequately deactivated and ultimately closed. Additional regulations and guidance specific to landfills include Landfill Criteria for Municipal Solid Waste, Second Edition (2016) and the Landfill Gas Management Regulation (current to 24 December 2019).



REFERENCE

1. TOPOGRAPHIC MAPS 82E/13 AND /14 © 2001 AND 1999 HER MAJESTY THE QUEEN IN RIGHT OF CANADA. DEPARTMENT OF NATURAL RESOURCES. ALL RIGHTS RESERVED.
   PROJECTION: TRANSVERSE MERCATOR DATUM: NAD83
   COORDINATE SYSTEM: UTM ZONE 10

0 2,500 5,000
1:100,000 METRES

CLIENT
REGIONAL DISTRICT OF CENTRAL OKANAGAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-02-18
PREPARED	R. MARTIN
DESIGN	M. SCHERER
REVIEW	M. SCHERER
APPROVED	J. FOLEY

PROJECT
2019 LANDFILL MONITORING
WESTSIDE LANDFILL
WEST KELOWNA, BC

TITLE
KEY PLAN

PROJECT No.	PHASE/DOC#	Rev.	FIGURE
1417953	5000/007	0	1

With the acceptance of the Closure Plan (Golder 2015) by the MoE in September 2017 (see Appendix A) the monitoring and inspection requirements outlined in that document became effective. As outlined in the Closure Plan, monitoring results will be used as part of the assessment of effectiveness of closure works at Westside Landfill, in particular the use of an evapotranspiration cover at this Site. Periodic (annually, at present) inspections by a qualified professional are also part of this assessment of the effectiveness of closure works. If assessment of monitoring data and inspections suggest potential adverse impacts to the environment or risks to human health, then additional works or mitigation measures may be required.

The standards used for comparison in this report are from Schedule 3.2, Generic Numerical Water Standards, which are included in the Contaminated Sites Regulations. The standards for Drinking Water (CSR-DW) are considered the most applicable since there are aquifers underlying the Site. Although Shannon Lake is located approximately 300 m to the east/northeast of the Site, previous investigations have ruled out Shannon Lake as a receptor of groundwater from the Site. As such, the CSR freshwater aquatic life (AW) standards have not been applied.

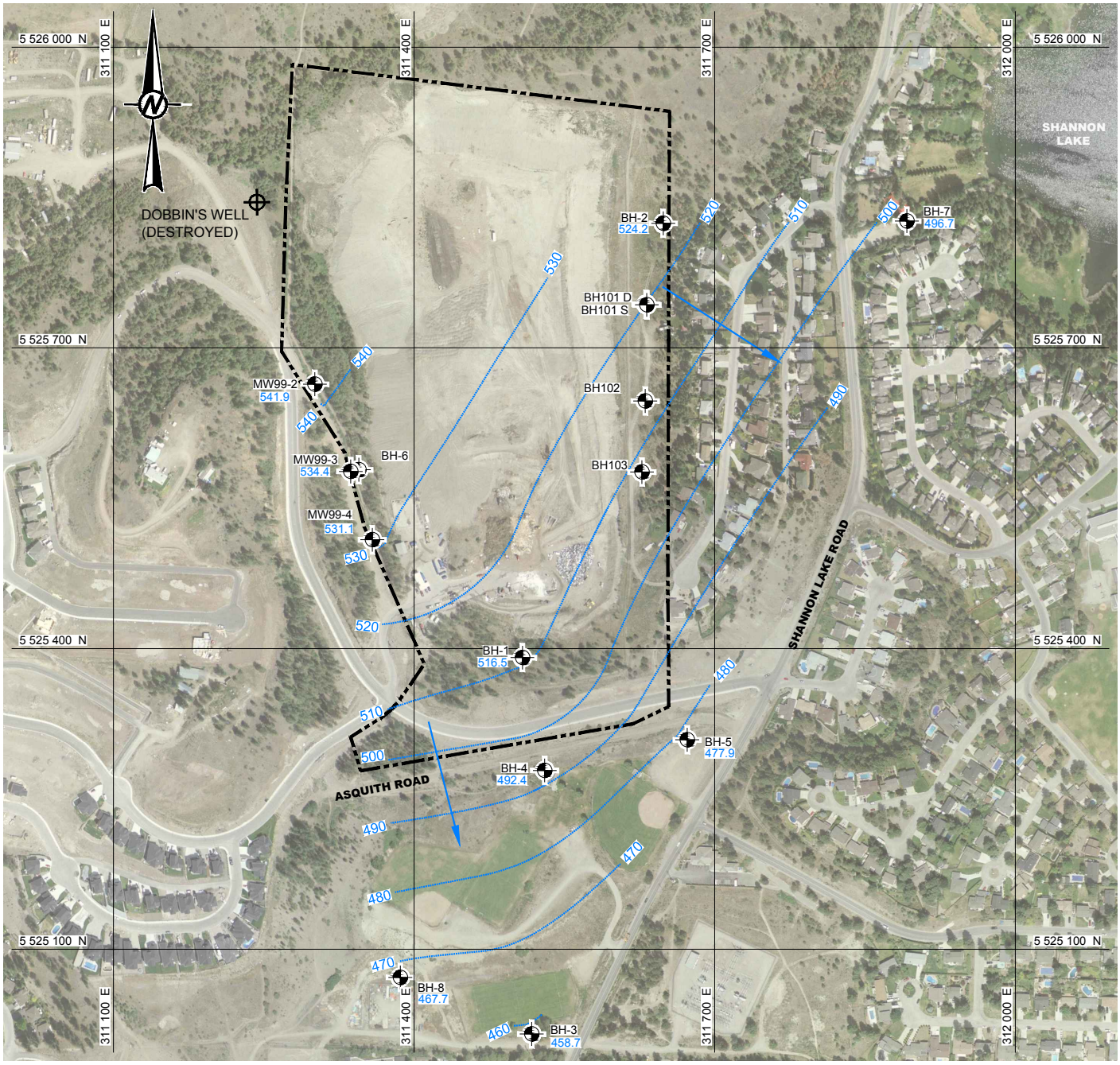
3.0 HYDROLOGY AND HYDROGEOLOGY

Based on available information and previous reports, the regional direction of groundwater flow is inferred to be towards the south to southeast (Figure 2).

Surface ponding consisting of two small transient surface water bodies located along the northwest side of the landfill was first observed during Site visits conducted in early 2013. The surface ponding, referred to as North and South Ponds in Golder's *2013 Annual Operations and Monitoring Report* (Golder 2014) was monitored in 2013 and 2015 for possible changes in groundwater conditions or surface water inflow. The results suggested that the surface water was not being impacted with leachate from the landfill. The surface water appeared to be collecting in an excavated area from groundwater seepage located on the west side of the landfill. Golder believes that the ponds appeared primarily as a result of flow from groundwater seepage into the excavation. Remedial works were proposed in the Closure Plan, and were undertaken in 2018. This area was observed during the Site inspection of 25 October 2019, as discussed further in Section 5.1.

According to the MoE's BC Water Resources Atlas, two aquifers underlie the Site:

- Aquifer No. 0301 is a sand and gravel aquifer with domestic water uses. It is classified as having a moderate demand, productivity, and vulnerability. It is also locally known as the Shannon Lake Aquifer.
- Aquifer No. 0305 is a bedrock aquifer with domestic water uses. It is classified as having a moderate demand and vulnerability, and low productivity.



LEGEND

- APPROXIMATE LANDFILL BOUNDARY
- GROUNDWATER MONITORING WELL LOCATION
- DOMESTIC WATER WELL LOCATION
- 458.3 — MONITORING WELL GROUNDWATER ELEVATION (MEASURED ON AUG. 12, 2015)
- INFERRED DIRECTION OF GROUNDWATER FLOW
- 470 — INFERRED GROUNDWATER CONTOUR (10m INTERVAL)

NOTES

1. ALL UNITS IN METRES UNLESS OTHERWISE STATED.
2. COORDINATES ARE IN UTM NAD83, ZONE 10.

REFERENCE

1. ORTHOPHOTO OBTAINED FROM RDCO. IMAGERY DATE: 2009

0 100 200
1:6,000 METRES

CLIENT
REGIONAL DISTRICT OF CENTRAL OKANAGAN

PROJECT
2019 LANDFILL MONITORING
WESTSIDE LANDFILL
WEST KELOWNA, BC

CONSULTANT
GOLDER

YYYY-MM-DD	2020-02-18
PREPARED	R. MARTIN
DESIGN	M. SCHERER
REVIEW	M. SCHERER
APPROVED	J. FOLEY

TITLE
GROUNDWATER MONITOR LOCATIONS

PROJECT No.	PHASE/DOC#	Rev.	FIGURE
1417953	5000/007	0	2

According to MoE's BC Water Resource Atlas, several wells are present in Aquifers No. 0301 and No. 0305. The majority of the wells are completed in Aquifer 301 and are located to the east and south of the Site. The wells are reportedly used for private domestic, commercial and industrial purposes. Generally, the depth to groundwater ranged between 2.1 m to 4.6 m below ground surface (m bgs).

There was one well registered within (Well Tag Number [WTN] 61675), and one well immediately adjacent to (WTN 56228), the Site boundary. According to the detailed well reports, WTN 61675, referred to as Gartner Lee in the detailed well report, corresponds to BH-6 in Golder borehole records. It is located along the western boundary and within the landfill. It was reportedly constructed in 1994 for commercial and industrial use, drilled to a total depth of 12.2 m bgs, and terminated in bedrock.

WTN 56228, also known as Dobbin's Well, was located immediately adjacent and outside the landfill, along the northwestern boundary (Figure 2). It was reportedly constructed in 1986 for private domestic use, terminated in bedrock at a total depth of 54.7 m below ground surface. The well was disconnected in 2006 due to a pipeline rupture and is no longer accessible. Given the depth of Dobbin's Well and the fact that it is in bedrock, it is inferred that Dobbin's Well is likely associated with Aquifer Tag No. 0305. Golder also infers that the monitor locations outside the Site boundary, including monitor wells BH-3, BH-4, BH-5, BH-7 and BH-8 are likely associated with Aquifer Tag No. 0305. The other monitors on Site are likely completed in shallower groundwater zones that are more likely to discharge to the sand and gravel "Shannon Lake" aquifer rather than the deeper bedrock aquifer.

4.0 METHODS

4.1 Groundwater Monitoring

The groundwater quality sampling program for the Westside Landfill was carried out by RDCO staff in May and November 2019. Water level measurements for January, February, March, April, May, August, November and December are summarised in Table C-1, Appendix C. The borehole locations used for water quality and level monitoring are shown on Figure 3.

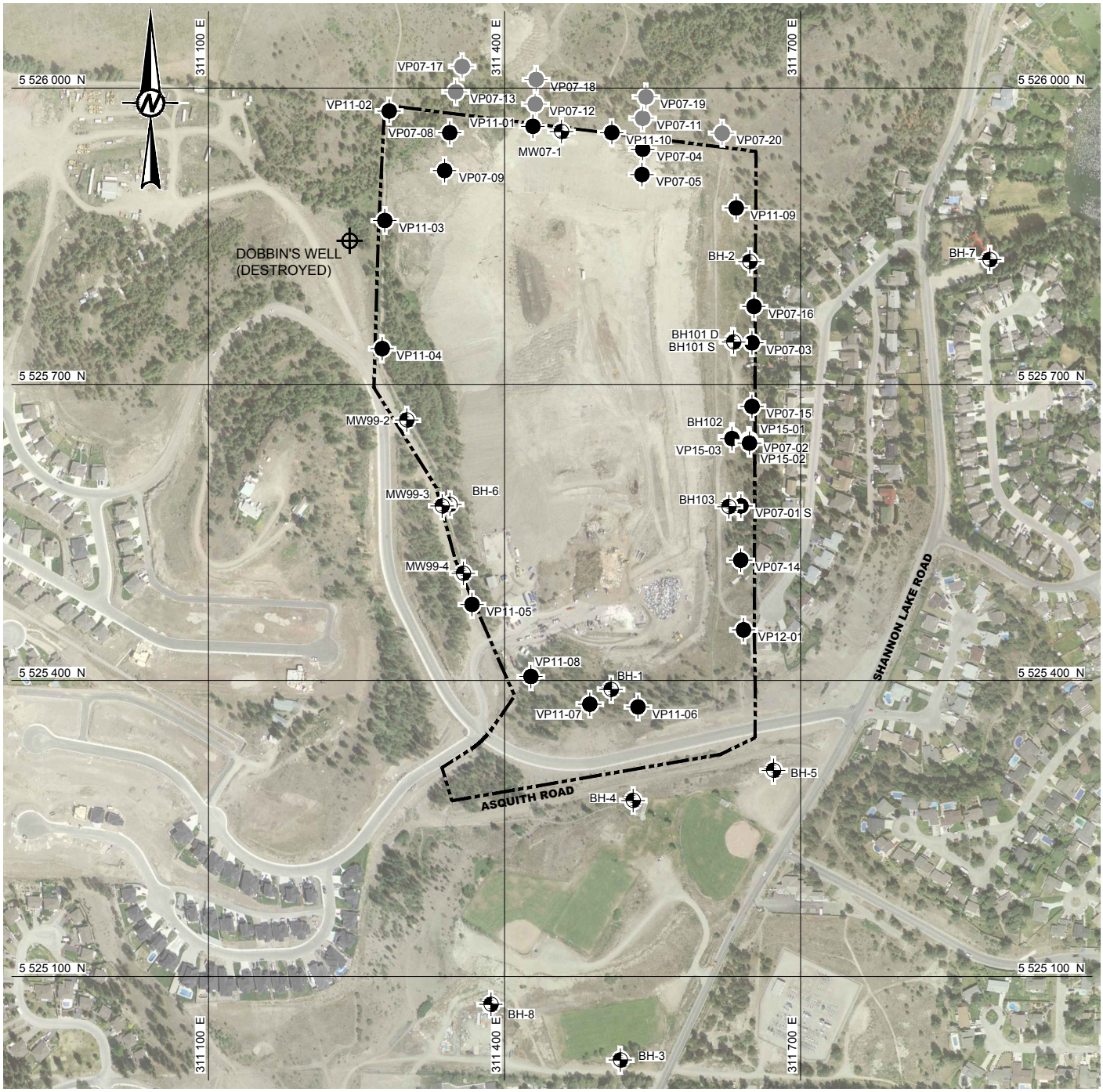
Groundwater samples collected from the wells during the 2019 monitoring program were submitted to CARO Analytical Services of Kelowna, BC (CARO) and ALS Environmental (ALS) for chemical analyses. As outlined in the Closure Plan (Golder 2015) and the groundwater monitoring requirements based on the MoE OC, the samples were analyzed for the following parameters: pH, conductivity, total dissolved solids, hardness, alkalinity, chloride, sulphate, ammonia nitrogen, nitrate nitrogen and dissolved metals for samples collected from monitoring wells BH-1, BH-2, BH-3, BH-4, BH-5, BH-7 and MW99-2. In addition the aforementioned parameters, in accordance with the MoE OC, the groundwater samples collected from BH1 and BH4 in May 2019 were analyzed for total dissolved solids, biological oxygen demand, chemical oxygen demand, boron, volatile organic compounds (VOCs), light/heavy extractable petroleum hydrocarbons (LEPH/HEPH), and acid and base neutral extractables.

In the Closure Plan (Golder, 2015) it was noted that a well formerly used for background monitoring (referred to as Dobbin's Well) was destroyed. Golder considered options for replacing this monitoring well and suggested that an existing monitoring well, MW99-2 (prior to 2016 used for landfill gas monitoring only), might be suitable as a background monitoring well. Golder recommended including monitoring MW99-2 for a period of one year, and then assessing whether or not to use it to serve as a background monitoring well, subject to MoE approval.

In 2016, MW99-2 was included in the groundwater monitoring program and sampled by RDCO staff. Based on assessment of the results from 2016, MW99-2 has been included in the groundwater quality monitoring program.

4.2 Landfill Gas Monitoring

The 2019 landfill gas monitoring program was conducted by RDCO staff. Monitoring events were completed in January, February, March, April, May, August, November and December of 2019. Partial sampling events in key locations were completed in June, July, September and October. The vapour monitoring locations are shown on Figure 3.



LEGEND

- APPROXIMATE LANDFILL BOUNDARY
- MONITORING WELL LOCATION
- SOIL VAPOUR WELL LOCATION
- MONITORING LOCATION DECOMMISSIONED IN JUNE 2018
- APPROXIMATE FORMER LOCATION OF DOMESTIC WATER WELL

NOTES

1. ALL UNITS IN METRES UNLESS OTHERWISE STATED.
2. COORDINATES ARE IN UTM NAD83, ZONE 10.

REFERENCE

1. ORTHOPHOTO OBTAINED FROM RDCO. IMAGERY DATE: 2009

0 100 200
1:6,000 METRES

CLIENT
REGIONAL DISTRICT OF CENTRAL OKANAGAN

PROJECT
2019 LANDFILL MONITORING
WESTSIDE LANDFILL
WEST KELOWNA, BC

CONSULTANT
GOLDER

YYYY-MM-DD	2020-02-18
PREPARED	R. MARTIN
DESIGN	M. SCHERER
REVIEW	M. SCHERER
APPROVED	J. FOLEY

TITLE
GROUNDWATER MONITORING AND SOIL VAPOUR WELL LOCATIONS

PROJECT No.	PHASE/DOC#	Rev.	FIGURE
1417953	5000/007	0	3

4.3 Groundwater Elevation Data

Groundwater depths were measured for selected monitors in January, February, March, April, May, August, November and December 2019. Additional water level measurements were made, or attempted, for the groundwater monitors: BH-1, BH-2, BH-3, BH-4, BH-5, BH-7, BH-8, and MW99-2.

4.4 Monitoring Well Survey

A survey of both vapour and groundwater monitoring locations and elevations was completed by AllTerra Land Surveying Ltd. in January 2015. This information was used to adjust historical groundwater elevation data. The information from this survey was incorporated into the assessment of groundwater elevations and flow directions presented in the 2015 Monitoring Report (Golder 2015b), subsequent reports and this (current) report. The 2015 survey elevations are used to convert depth measurements of groundwater to elevations, even for historical data.

5.0 RESULTS

The 2019 Site inspection, groundwater quality, landfill gas monitoring and water level results are discussed in this section.

5.1 Site Inspection

The Westside Landfill is inspected annually by a qualified professional, as part of the monitoring program. During the 2018 Site inspection, conducted on 21 September 2018, the earthworks and drainage works recommended in the Closure Plan (Golder 2015) were only partially completed with the remaining work to be completed following the Site inspection. It was apparent that the outstanding closure work had been completed prior to the 2019 Site inspection, completed by Jacqueline Foley and Mackenzie Scherer, both of Golder, on 25 October 2019. At the time of the Site inspection it was actively raining; however, no ponding water was observed on the surface of the landfill. A drainage network was visible in the northwest portion of the Site that contained bulrushes and cattails (Photo 1). The entirety of the landfill footprint was covered in vegetation that did not appear to be stressed with only localized sections of bare earth showing (Photo 2). No evidence of erosion, differential settlement, or slope failure were observed.

Photo 1. Drainage network in the northwest portion of the Site, facing northwest.

Photo 2. Westside Landfill vegetation cover facing north.

5.2 Groundwater Quality

The CARO and ALS laboratory reports are included as Appendix B. Groundwater sampling and submission to laboratories was completed by RDCO staff in 2019. The analytical results were provided to Golder by the RDCO for preparation of this report.

5.2.1 Monitoring Results Relative to Standards

As noted in Section 2.0, the results of the groundwater analyses are compared against CSR-DW (drinking water) standards, current to 27 November 2019. As of the 2017 update to the CSR-DW standards, and continuing to the present, drinking water standards were established for some parameters that previously did not have any. Some of the 2019 results exceed these recently added drinking water standards.

Results for water quality sampling competed in May and November of 2019 are provided in Figure 4 (May) and Figure 5 (November). The results are presented for monitors located up-gradient of the landfill, within the landfill footprint, downgradient within 50 m of the Site boundary and downgradient more than 50 m from the Site boundary to facilitate interpretation of the results. The analytes are arranged in ascending order of concentration (approximately) to make reading of the figures easier.

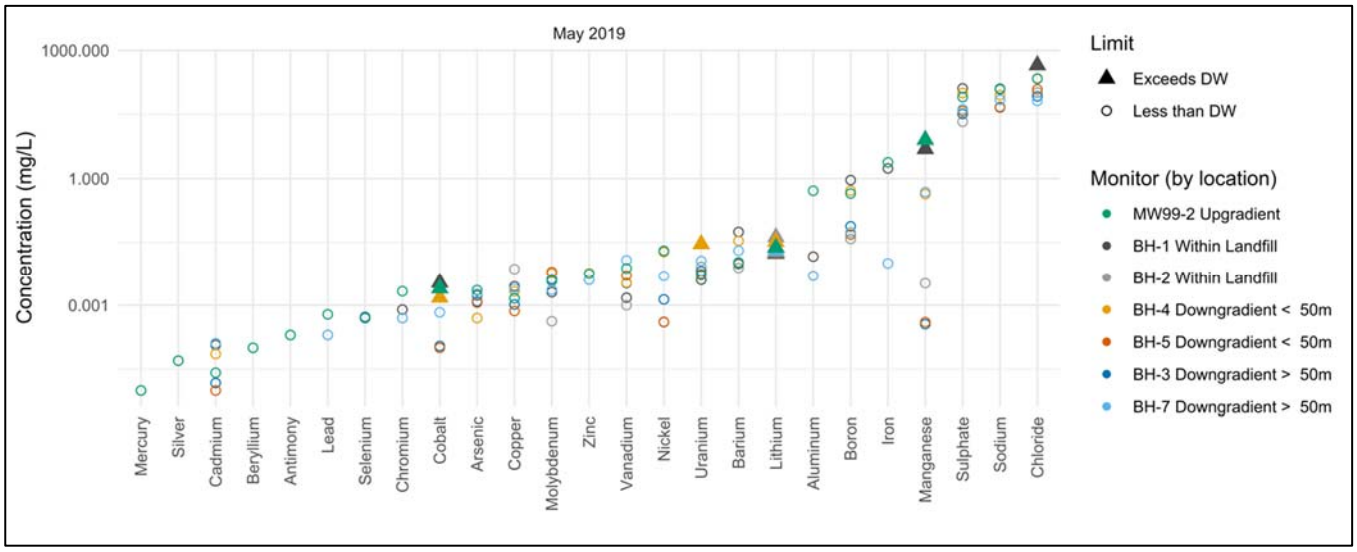


Figure 4: Drinking Water CSR Exceedances, May 2019

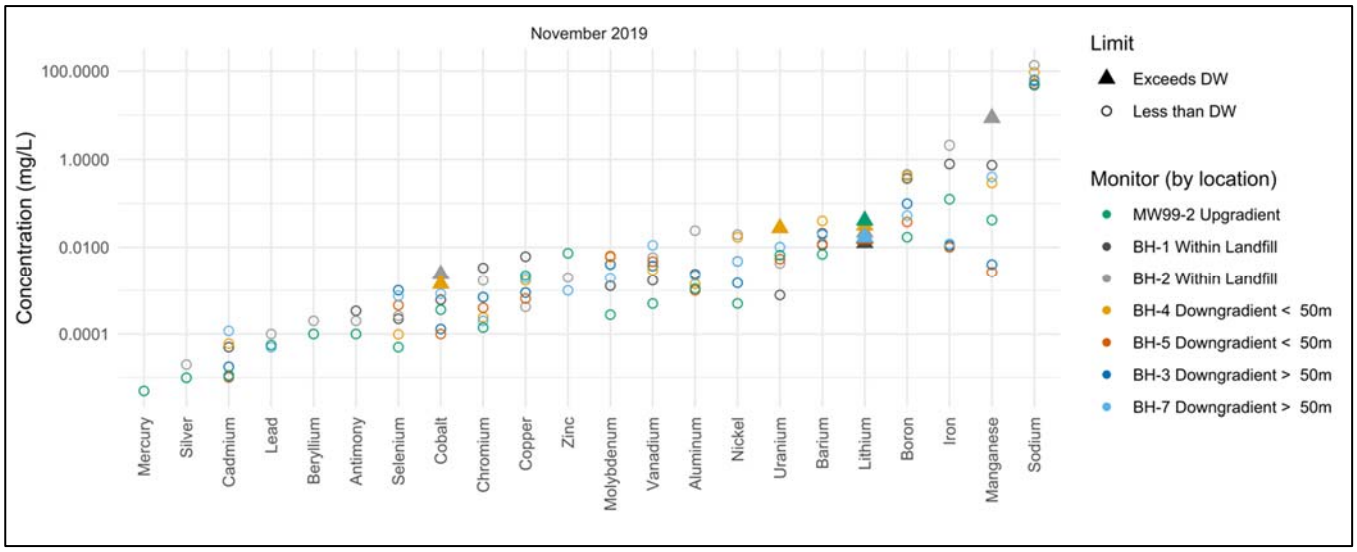


Figure 5: Drinking Water CSR Exceedances, November 2019

The concentrations of the parameters included in Figures 4 and 5 vary over a wide range, hence a logarithmic scale is used. For a number of the parameters, the results are all at or below the detection limit, which results in all data being plotted effectively as a single point (mercury, for example). There is a large variation in manganese and iron values, which is likely due to the fact that they are both much more soluble under reducing conditions than under oxidizing conditions.

The parameters that exceed the CSR DW (drinking water) limits in the May and November sampling rounds are summarized in Table 1.

Table 1: Drinking Water CSR Exceedances, 2019

Parameter	DW Standard	Upgradient	Within Landfill		Downgradient < 50m		Downgradient > 50 m	
		MW99-2	BH-1	BH-2	BH-4	BH-5	BH-3	BH-7
May 2019								
Chloride	250		450					
Cobalt	0.001	0.00251	0.00343		0.00152			
Lithium	0.008	0.0236	0.024	0.042	0.0326	0.0179	0.0169	0.0196
Manganese	1.5	7.92	4.96					
Uranium	0.02				0.0287			
November 2019								
Cobalt	0.001			0.00239	0.00142			
Lithium	0.008	0.0411	0.0126	0.0219	0.0317	0.0157	0.0165	0.0172
Manganese	1.5			8.58				
Uranium	0.02				0.0276			
DW = CSR Drinking Water Standard, all values in mg/L								

- The CSR-DW standard for chloride was exceeded in May 2019, at BH-1, one of the two monitors located within the landfill Site. There were no other exceedances at any of the upgradient or downgradient monitors.
- The CSR-DW standard for cobalt was exceeded in May at MW99-2, the upgradient monitor, as well as at BH-1, which is located within the landfill Site, and at BH-4, located downgradient, within 50 m from the Site boundary. In November, the standard was exceeded at BH-2, located within the landfill Site, and at BH-4, located downgradient, within 50 m of the Site boundary. Since the values of cobalt exceeded the standard at an upgradient location, it can be inferred that the landfill is not having a significant impact on cobalt levels in groundwater.
- Lithium exceeds the drinking water standard at all monitors for both the May and November results, including the background monitor (MW99-2); it is inferred that the lithium exceedances are associated with background concentrations. The CSR-DW standard for lithium was set in 2017, based on 2015 US EPA “Regional Screening Levels” for tap water; there had been no standard previously.
- The CSR-DW standard was exceeded for manganese in May at MW99-2, the upgradient monitor and at BH-1, one of the monitors located within the landfill Site boundary. In November, the limit was exceeded at BH-2, one of the monitors located within the landfill Site boundary. There were no exceedances of the limit for manganese at any of the downgradient locations.
- Uranium levels exceeded the CSR-DW standard in both May and November at BH-4, which is located downgradient of the landfill, within 50 m of the Site boundary. Uranium has been above the standard in the past. Uranium is not expected to be part of municipal waste, and thus this exceedance is likely not due to leaching from the landfill.

The results summarized above suggest that any impacts of the landfill on groundwater sufficient to cause exceedances of CRS-DW are confined to within the landfill footprint and a limited distance (i.e., 50 m) downgradient, with select parameter exceedances representative of background concentrations.

5.2.2 Monitoring Results Relative to Historical Data (Trend Analyses)

Analyses of some key parameters that may be indicative of impacts from landfill leachate are presented in this section. These parameters are: chloride, ammonia, nitrate plus nitrite, iron and manganese. Note that in cases where a result was below the analytical detection limit, the result was plotted as being equal to the detection limit.

The times series of values for the key parameters listed above are provided in Figure 6 for the groundwater monitors. The results are separated according to monitor location: up-gradient, within the landfill footprint, downgradient less than 50 m from the Site boundary and downgradient greater than 50 m from the Site boundary. A dotted vertical line is placed at 2010, the year that the landfill stopped receiving waste. The shapes used to represent monitors are the same as used in Figures 4 and 5, and are listed in order of the location class, from up-gradient to downgradient greater than 50 m from the Site boundary, and by descending elevation within the location class. If the concentration is above the current CSR-DW standard for a parameter the colour of the result is dark orange, if it is less than the current CSR-DW standard the result is green, and if there is no applicable CSR-DW standard then the result is blue.

As shown in Figure 6, the values of the selected parameters are relatively low in the up-gradient location, highest at the locations within the landfill, less in the downgradient locations less than 50 m from the Site boundary, and low in the downgradient locations greater than 50 m from the Site boundary, which have no exceedances for these key parameters. With the exception of nitrate, the concentrations of these indicators have been declining after the cessation of filling in 2010 in monitors within the landfill and monitors in downgradient locations less than 50 m from the Site boundary. It should be noted that the Site was partially covered after filling ceased, which may have limited infiltration and thereby further reduced leaching.

Individual discussion for each of these parameters follows.

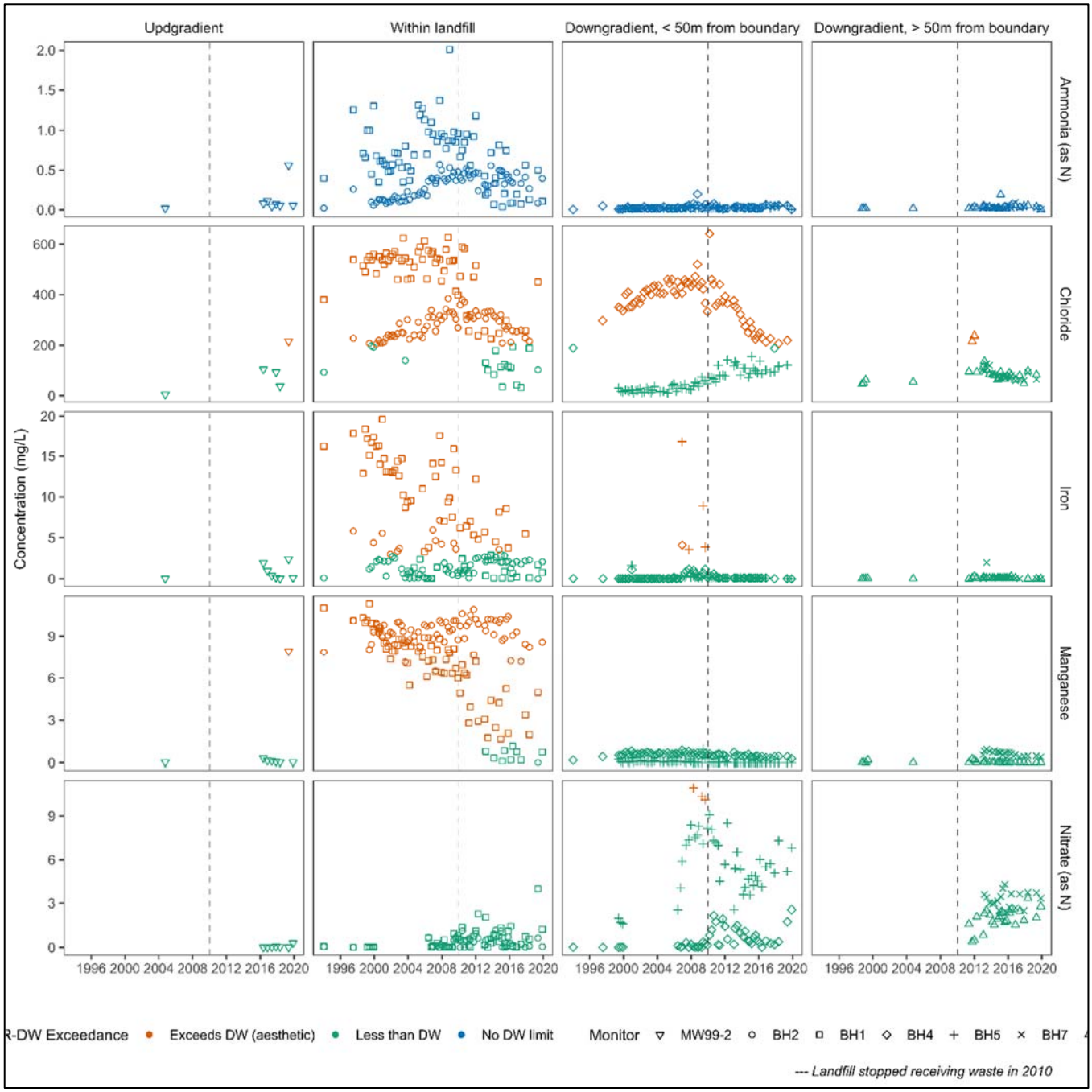


Figure 6: Values of Key Parameters Over Time

5.2.2.1 Chloride

Chloride concentrations can become elevated from leachate impacts; however, chloride occurs naturally in groundwater and there are other sources of this parameter, including road salt and septic influences. Higher concentrations of chloride in groundwater downgradient of a landfill do not definitively indicate an impact from the landfill. However, chloride can move through groundwater more quickly than some other parameters, which are subject to processes that slow their movement, and is therefore potentially an indicator that impacts from other parameters may appear at a later time.

Chloride levels are generally highest in the monitors located within the landfill (see Figure 6), and also elevated in the downgradient monitors within 50 m of the Site boundary, and lowest in the upgradient monitor and the downgradient monitors located more than 50 m from the Site boundary. Both monitors (BH1 and BH2) located within the landfill limits show a decline after filling ceased in 2010, as do levels in BH4, located downgradient, within 50 m of the Site boundary. The concentrations in BH5, located downgradient within 50 m of the Site boundary, showed a slow increase from before the cessation of filling in 2010 to a few years after, and in recent years has been roughly steady at a level well below the CSR-DW standard of 250 mg/L. These observations are consistent with there being some impact on chloride levels in groundwater, which have been decreasing since filling ceased in 2010, and also with increasing distance from the landfill.

The expectation is that with the cessation of landfilling, and with the closure works limiting infiltration, any elevation of chloride concentrations due to landfilling will gradually approach pre-landfill levels over time (assuming no other source impacts). The results so far are consistent with that expectation. In 2019, none of the downgradient monitors had chloride concentrations above the CSR-DW standard.

5.2.2.2 Ammonia and Nitrate

Decomposition of waste can lead to consumption of oxygen and therefore result in the anaerobic conditions that favour ammonia production. After closure of a landfill, it is expected that decomposition rates will decline over time as organic matter decomposes, and thus ammonia is expected to generally decline over time.

As the results presented in Figure 6 show, ammonia (which has no CSR-DW standard) concentrations are elevated at within landfill monitors (BH1 and BH2). Levels are low both upgradient and downgradient of the landfill. This is consistent with ammonia being released due to composition of organic matter under low oxygen conditions. Ammonia may be oxidized, at least in part, to nitrate. As shown in Figure 6, nitrate levels are relatively low at the monitors located within the landfill, and higher in down-gradient monitors, particularly those located within 50 m of the Site boundary. This pattern is consistent with ammonia being released from decomposition of waste and then being oxidized to nitrate downgradient from the landfill.

Ammonia levels in the monitors within the landfill have been generally declining since 2010. The trends in concentrations of nitrate after 2010 in downgradient monitors is less clear than for ammonia, but do not appear to be increasing.

It should be noted that there is no CSR-DW standard for ammonia, and also that nitrate levels have not exceeded the CSR-DW standard in any monitor from 2010 to the present.

5.2.2.3 Iron and Manganese

Iron and manganese can sometimes be direct indicators of landfill impacts, in that decomposition of waste can result in anaerobic conditions that tend to mobilize iron from naturally (and sometimes unnaturally) occurring sources. The solubility of iron, though, depends on other factors, such as pH. In 2019, iron levels were below the CSR-DW standard of 6.5 mg/L for all monitors.

Iron and manganese levels are clearly elevated in the monitors within the landfill, relative to other locations, especially after 2010. This pattern is consistent with iron and manganese being mobilized in the reducing conditions present in groundwater impacted by anaerobic conditions within the landfill, with levels being lower in more oxidizing conditions downgradient of the landfill. Manganese was above the CSR-DW at the upgradient monitor, MW99-2, in May of 2019. It is expected that this is due to reducing conditions present upgradient of the landfill. None of the monitors located downgradient of the Site had levels above CSR-DW standards for iron and manganese. Note that the manganese standard listed for CSR-DW applies only in relation to specified land uses; the standard does not apply to the Westside Landfill.

5.3 Landfill Gas Monitoring

A landfill gas management plan (LGMP) was developed in consultation with representatives of the MoE (Golder 2013). Modifications to refine and extend the program were proposed in the Closure Plan (Golder 2015), most of which have been put into action since they are consistent with the program outlined in the LGMP. Additional vapour monitors (VP15-01, VP15-02 and VP15-03) were installed in 2015, with two of these (VP15-01 and VP15-02) located near the edge of the area of filling along the eastern boundary to serve as additional “step-out monitors” to the existing VP07-02, to better assess methane levels near the property boundary. VP15-03 was located near BH102 to provide additional information on landfill gas composition variation with depth. In 2018, seven monitors that were located north of the Site boundary on the north side were removed as part of earthworks being completed on that property; the monitors removed included: VP07-11, VP07-12, VP07-13, VP07-17, VP07-18, VP07-19 and VP07-20.

The landfill gas monitoring at the Site has been conducted by RDCO staff since 2016, rather than using contractors as was previously the case. Results are provided to Golder on the same day that landfill gas monitoring is completed so that exceedances of criteria can be identified within 24 hours of the receipt of results, and additional actions as required in the LGMP (Golder 2013) and as extended in the Closure Plan (Golder 2015) could be initiated. In 2019, no additional actions were required based on the monitoring results.

The 2019 landfill gas monitoring events were completed in January, February, March, April, May, June, July, August, September, October, November and December. Note that the June, July, September and October rounds are partial rounds that include specified monitors. The results for 2019 are presented in Appendix C, Table C-2.

Methane results are the most critical at this Site since they pose the greatest potential risk in that methane is explosive over a range of concentrations that could be generated at a landfill. Methane was the main focus of the LGMP (Golder 2013) and was discussed further in the Closure Plan (Golder 2015). The results for methane are discussed further in the following Section. The other landfill gas results measured include carbon monoxide, hydrogen sulphide, carbon dioxide and oxygen; the results for these gases are discussed in Section 5.3.2.

5.3.1 Methane

The recommendations included in the *Landfill Gas Management Plan [LGMP]* (Golder 2013) and the Closure Plan (Golder 2015) were put into effect as of May 2013. Landfill gas measurements have been made by RDCO staff since 2016. The results of the monitoring events are submitted in digital form to a qualified professional for assessment within 24 hours in order to better meet the timelines for further action, if needed, outlined in the LGMP.

In the LGMP, action levels were set relative to the location of monitoring wells, which were classified as Inside-Boundary for monitoring wells within the landfill boundary that are no closer than 5 m to the landfill boundary, Near-Boundary for monitoring wells, which are within the landfill boundary and are within 5 m of the landfill boundary and Outside-Boundary for monitoring wells that are outside of the landfill boundary. The action level for Inside-Boundary monitoring wells is 25% LEL, while the action level for the Near-Boundary and Outside-Boundary monitoring wells is 10%. The exceedances of these actions levels within monitoring wells are summarized in Table 2, by location.

Table 2: Exceedances of Methane Action Levels, by Side

Location	Number of Exceedances of Methane Action Level by Side		
	Inner-Boundary (>25% LEL)	Near-Boundary (>10% LEL)	Outside-Boundary (>10% LEL)
East	3 (BH102)	0	0
North	0	0	0
South	0	-	-
West	0	0	0

"-" Indicates no associated monitoring wells.

As can be seen from Table 2, there were three exceedances at Inner-Boundary monitoring well BH102 on the east side of the landfill in 2019. There were no exceedances recorded at Near-Boundary or Outside-Boundary locations. The dates and locations of the exceedances are summarized in Table 3, along with associated carbon dioxide and oxygen readings.

Table 3: Exceedances of Action Levels, by Monitor

Monitor ID	Month	Action Level (%LEL)	Methane (%LEL)	CO2 (%)	O2 (%)
BH102 (IB)	Feb	25	>= 100	12.7	9.3
BH102 (IB)	Apr	25	>= 100	36.1	0.0
BH102 (IB)	May	25	>= 100	28.7	0.0

IB – Inside-Boundary

The prescribed action in the case of exceedances at a monitor is to check the instrument calibration and resample if there was a calibration issue. In cases where there is an associated "step-out" monitor, which is a monitor located further from the landfill in a direction approximately perpendicular to the closest landfill boundary, then readings are taken there and compared with the associated action level for that monitor. If the step-out monitor readings are less than the associated action level, then no additional action is required. If there is no associated step-out monitor or if levels in the step-out monitor exceed the associated action level, then the MoE needs to be notified and an action plan developed.

As noted, action levels were exceeded at only BH102 during 2019. There are three associated step-out monitors (i.e., VP07-02, VP15-01, VP15-02) associated with BH102, although RDCO have frequently encountered difficulty in collecting samples from VP15-02. VP07-11 had an associated step-out monitor, VP07-19. The exceedances of action levels in 2019 and the methane levels recorded in associated step-out monitors are summarized in Table 4.

As can be seen from the results recorded in Table 4, in every case of an exceedance of an action level, the methane levels in the associated step-out monitors were well below their associated action level.

Table 4: Summary of Exceedances and Step-Out Monitor Results

	Monitor	Associated Step-out Monitors	
Month	**BH102 (IB)**	**VP07-02 (NB)**	**VP15-01 (NB)**
Feb	**>100%**	0.10%	0.15%
Apr	**>100%**	0.01%	0.23%
May	**34%**	0%	0%

IB – Inside Boundary, NB – Near Boundary, OB – Outside Boundary

The maximum value of methane recorded by monitor and year is illustrated in Figure 7 for monitors included in the LGMP. Note that all of the “Outside-Boundary” monitors were removed in mid-2018 as part of development work on the property to the north of landfill. LGMP criteria have only been exceeded at BH102 in 2019.

Figure 7: Historical maximum methane levels, by monitor and year

5.3.2 Other Landfill Gases

The median, maximum and minimum values of gases other than methane measured in 2019 are summarized in Table 5.

Table 5: Summary of median, maximum and minimum values of "other" gas measurements in 2019

Gas	Median	Maximum	Minimum
CO (ppm)	0	0	0
H_2S (ppm)	0	0	0
O2 (%)	19.3	20.9	0
CO2 (%)	1.3	36.1	0

Carbon monoxide (CO) and hydrogen sulphide (H_2S) values were below the instrument detection limit for all measurement in 2019. This has been the case in most previous years.

Oxygen and carbon dioxide levels vary considerably between monitors, and also vary over time at a given monitor. Oxygen levels have historically varied from essentially atmospheric levels of just under 21% down to undetectable levels, which was the case in 2019.

Carbon dioxide has historically varied from the lower detection limit of the instrument up to a maximum of 37% in BH102. In 2019, the maximum carbon dioxide level was just over 36%, at BH102.

5.4 Groundwater Elevations

The groundwater levels recorded in 2019 are similar to those recorded in the past, as illustrated in Figure 8. The range of elevations at a given monitor are small compared with the differences between monitors, hence the pattern of groundwater flow beneath the landfill is expected to fairly consistent from year to year.

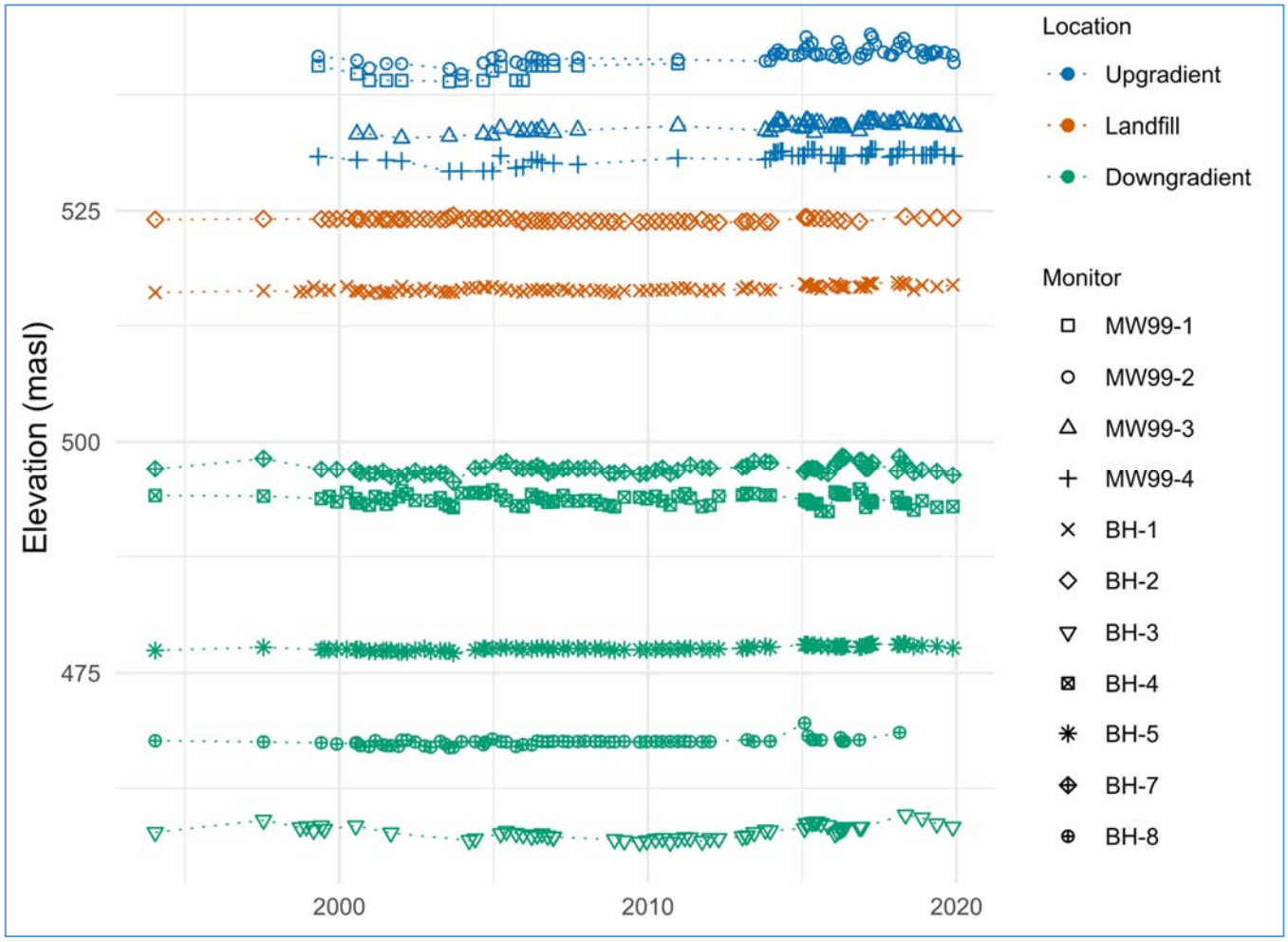


Figure 8: Historical groundwater elevations, by monitor

The approximate groundwater elevations and inferred contours were included in Figure 2. Based on historical groundwater elevation measurements, as well as the general topography of the area, the inferred groundwater flow is in a southeasterly direction at the Site, as shown on Figure 2. Groundwater results are sufficiently consistent that Figure 2 has not been updated with 2019 data; it would not make any appreciable difference to the shape of the groundwater contours or to the inferred flow direction.

6.0 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

The results of the Quality Assurance / Quality Control (QA/QC) program are provided in Appendix D, with QA/QC results presented in Table D-1. No issues that would adversely affect interpretation of the data or identifying exceedances of relevant standards were identified.

7.0 DISCUSSION OF GROUNDWATER AND LANDFILL GAS MONITORING

There are two main components to the current monitoring program, groundwater monitoring and landfill gas monitoring. The key results from each program component are summarized below.

7.1 Groundwater

As discussed in Section 0, groundwater quality for parameters selected as potential indicators of contamination (including chloride, ammonia, nitrate/nitrite, iron and manganese) appears to be generally improving in the downgradient monitors. The trend to lower values started around 2011, following cessation of waste disposal at Westside Landfill in 2010, and placement of cover soils over a significant portion of the formerly active area. This general decline is what would be expected.

With the addition of new CSR drinking water standards for some parameters in November 2017, there have been exceedances that did not previously have drinking water standards in the CSR; including cobalt and lithium in 2019. However, the levels in downgradient monitors are similar to those in upgradient monitors. There were exceedances in some monitors for chloride and uranium, but there is no evidence of any systematic increase in either of these parameters. As already noted, chloride levels in downgradient monitors are generally declining. Since there were no uranium exceedances in wells located within the landfill, and since sources of uranium are not generally expected to be disposed in landfills, it is unlikely that the landfill is the source of the uranium exceedance noted at BH-4.

7.2 Landfill Gas

Under the LGMP methane measurements are to be compared to criteria specific to the monitoring location, based on the location of the monitor relative to the property boundary. BH102 was the only monitor in 2019 where any methane exceeded the associated action level. Methane did not exceed the action level in the “step-out” monitors, associated with BH102. The methane readings in these step-out monitors were below the action levels outlined in the LGMP, such that no further action or reporting was required.

The concentrations of carbon monoxide and hydrogen sulphide were below the detection limit for readings in 2019. The levels of carbon dioxide and oxygen varied considerably from monitoring well to monitoring well and from reading to reading.

8.0 RECOMMENDATIONS

Recommendations for changes to the monitoring and inspection plan outlined in the Closure Plan were formally accepted by the MoE as of September 2017. No changes in the monitoring and inspection plan were anticipated until sufficient post-closure monitoring has been conducted to determine if the closure works affected methane (or other potentially problematic landfill gases) adversely. However, some landfill gas monitors located off Site on the north side of the landfill were removed in 2018, as discussed in Section 5.0 of this report.

Golder recommended in 2018 that the landfill gas monitoring program be reviewed and updated to take into consideration the removal of the decommissioned monitors. This review is in progress. It was also recommended in 2018 that data from the landfill gas monitors installed in 2015 near BH102 should be reviewed to determine if additional investigation or mitigation measures are required in the vicinity of BH102; this review is also in progress.

The landfill closure earthworks were completed in 2018, and the seeding and revegetation was completed in the first week of November 2018. Golder recommends that the landfill gas, water quality and water level monitoring requirements be reviewed after two years of post-closure monitoring has been completed. As such, it is recommended that the review takes place following the submission of the 2020 Monitoring Report.

9.0 LIMITATIONS AND USE OF REPORT

This report was prepared for the exclusive use of Regional District of the Central Okanagan. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it are the responsibility of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

The report, which includes all appendices and attachments, is based on data and information collected during the investigation conducted by Golder Associates Ltd.'s personnel. It provides a level of assurance commensurate with the level of study. The report is based solely on the Site conditions at the time of the Site investigation conducted in 2019, as described in this report.

In evaluating the Site, Golder has relied in good faith on information provided by the individuals and agencies noted in this report. We accept no responsibility for any deficiency, misstatements, or inaccuracies contained in this report as a result of omissions, misinterpretations of fraudulent acts of the persons or agencies interviewed.

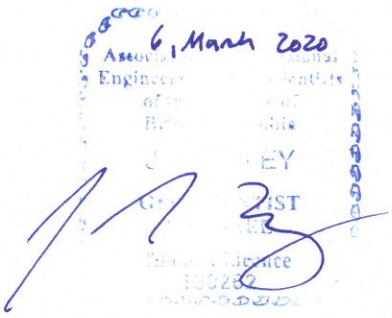
The assessment of environmental conditions and possible hazards at this Site has been made using the results of chemical analysis of discrete groundwater samples from a limited number of locations. The Site conditions between sampling locations have been inferred based on conditions observed at borehole, monitoring well, and test pit locations. Subsurface conditions may vary from these sample locations. Additional study, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of study. However, it is never possible, even with exhaustive sampling and testing, to dismiss the possibility that part of a Site may be contaminated and remain undetected.

This investigation was performed according to current professional standards and practices in the environmental field. If new information is discovered during future work, including excavations, borings, or other activities or studies, Golder should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

10.0 CLOSURE

We trust that this report provides you with the information that you require at this time. Should you require additional information or have any questions, please feel free to contact the undersigned at your earliest convenience.

Golder Associates Ltd.



Mackenzie Scherer
Junior Geoscientist

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Associate, Senior Hydrogeologist

GB/JF/lmk/cmc

https://golderassociates.sharepoint.com/sites/18793g/deliverables/final deliverables/1417953-007-r-rev0/1417953-007-r-rev0-2019 annrpt 06mar_20.docx

APPENDIX A

Westside Landfill Operational Certificate Letter

Environmental Management Act Approval of Closure Plan for Westside Landfill (Authorization 122217), 6 September 2017

POLLUTION
PREVENTION

Suite 201
3547 Skaha Lake Road
Penticton
British Columbia V2A 7K2
Telephone: (250) 490-8200
Fax: (250) 492-1314

BRITISH COLUMBIA

MINISTRY OF ENVIRONMENT,
LANDS AND PARKS

OPERATIONAL CERTIFICATE
PR 12217

Under the provisions of the Waste Management Act and in accordance with the Approved Regional District of Central Okanagan Solid Waste Management Plan,

Regional District of Central Okanagan

1450 KLO Road

Kelowna, British Columbia

V1W 3Z4

is authorized to manage recyclable materials and to discharge refuse to the ground at a landfill facility located approximately 2.5 km north of Westbank, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Waste Management Act* and may result in prosecution.

1 AUTHORIZED DISCHARGES

1.1 The discharge of refuse to which this Sub-Section is applicable is shown on the attached Site Plan A. The reference number for this discharge is E223888.

1.1.1. The maximum rate at which refuse may be discharged to the landfill is 20,000 tonnes per year.

1.1.2 The type of refuse which may be discharged is municipal solid waste and other wastes as authorized by the Regional Waste Manager.

1.1.3 The works authorized are a sanitary landfill and related appurtenances.

1.1.4 The location from which the discharge originates is generally the area on the west side of Okanagan Lake within the boundaries of the Regional District of Central Okanagan.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

Date Issued: May 28, 1997
Amendment Date:
(most recent)

1.1.5 The location of the approximate area of discharge is that Part of District Lot 3794 ODYD shown on Plan C11135 Except Plan KAP46607 as shown on Site Plan A.

2 GENERAL REQUIREMENTS

2.1 Maintenance of Works and Emergency Procedures

The holder of the Operational Certificate shall inspect the landfill, any related pollution control works and designated areas for managing recyclable or reusable materials regularly and maintain them in good working order. In the event of an emergency or condition beyond the control of the holder of the Operational Certificate which prevents continuing operation of the authorized method of pollution control, the holder of the Operational Certificate shall immediately notify the Regional Waste Manager and take appropriate remedial action.

2.2 Process Modifications

The holder of the Operational Certificate shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge.

2.3 Plans - New Works

Plans and specifications of any new works related to this facility shall be submitted to the Regional Waste Manager and his consent obtained before construction commences. The works shall be constructed in accordance with such plans. Review of the submitted plans and specifications is for the purpose of administration of the Operational Certificate and only implies that the works specified therein meet the appropriate guidelines, criteria or standards.

2.4 Operational and Closure Plan

2.4.1 An *Operational and Closure Plan*, prepared by a suitably qualified professional shall be submitted for authorization by the Regional Waste Manager, on or before July 31, 1997.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

2.4.2 The *Operational and Closure Plan* shall include the following:

- Anticipated total waste volumes and tonnage, and life of the landfill (ie: closure date);
- A topographic 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;
- Procedures for notifying the public about the closure and about alternative waste disposal facilities;
- Rodent and nuisance wildlife control procedures;
- Proposed end use of the property after closure;
- A plan for monitoring groundwater, surface water and landfill gas, erosion and settlement for a minimum post-closure period of 25 years;
- A plan and accompanying design for the collection, storage and treatment/use of landfill gas for a minimum of 25 years;
- A plan for operation of any required pollution abatement engineering works such as leachate collection and treatment systems, for a minimum post-closure period of 25 years;
- A schedule of reserve funds or security to be collected each year until closure; to cover estimated costs of closure, post-closure and a contingency for remediation;
- A screening plan, ie: vegetative or berm, designed by a landscape architect with particular focus on the east side of the landfill;
- A detailed fill plan for the east side of the landfill;
- A perimeter and electric bear control fencing design;
- Litter and odour control measures;
- Design of gas monitoring wells for lateral migration and the proposed gas monitoring program;
- Final cover design and a schedule to cover previously filled areas that are no longer going to receive waste, particularly on the east side of the landfill;
- Contingency plan & notification procedures in the event of an emergency;
- Training procedures for operators; and
- Any other site specific concerns as identified by the Regional Waste Manager.

2.4.3 Terms of reference for the Operational and Closure Plan are subject to authorization by the Regional Waste Manager.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

Date Issued: May 28, 1997
Amendment Date:

2.4.4 The Regional Waste Manager may request revisions to the *Operational and Closure Plan*. Terms of reference for the revisions to the *Operational and Closure Plan* are subject to authorization by the Regional Waste Manager.

2.4.5 Operation of this landfill is to be in substantial accordance with the authorized *Operational and Closure Plan*.

2.4.6 If there is an inconsistency between this Operational Certificate and the authorized *Operational and Closure Plan*, the Operational Certificate shall take precedence.

2.5 Ground and Surface Water Quality Impairment

2.5.1 Landfills must not be operated in a manner such that ground or surface water quality decreases beyond that allowed by the *Approved and Working Criteria for Water Quality* dated 1995 prepared by the Water Quality Branch of the Ministry of Environment, Lands and Parks at or beyond the landfill property boundary. The appropriate water quality criteria will be specified by the Regional Waste Manager after reviewing uses of the ground and surface water resources.

2.5.2 If excursions result to the specified water quality criteria, the Regional Waste Manager may require that leachate management control measures or works be undertaken. Terms of reference for any leachate management study and/or design work is subject to the authorization of the Regional Waste Manager.

2.6 Landfill Gas Management

2.6.1 An assessment of the emissions of non-methane organic compounds (NMOCs) is required for landfills exceeding a total capacity of 100,000 tonnes. If NMOCs are determined to exceed 150 tonnes/year, landfill gas recovery and management systems will be required to be designed, installed and operational within 3 years. If NMOCs are projected to be less than 150 tonnes/year for the operating life of the landfill, an assessment for the need of passive gas venting will be required. Terms of reference for any landfill gas study or design is subject to the authorization of the Regional Waste Manager.

2.6.2 The gas monitoring wells, designed by a suitably qualified professional, are to be installed on or before August 31, 1998.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

Date Issued: May 28, 1997
Amendment Date:
(most recent)

2.7 Property Boundary

The buffer zone between any municipal solid waste discharged after the issuance of this Operational Certificate and the property boundary is to be at least 50 metres of which the 15 metres closest to the property boundary must be reserved for natural or landscaped screening (berms or vegetative screens). Depending on adjacent land use and environmental factors, buffer zones of less than 50 metres but not less than 15 metres may be authorized by the Regional Waste Manager.

2.8 Other Facilities

The distance between the discharged municipal solid waste and the nearest residence, water supply intake, hotel, restaurant, food processing facility, school, church or public park is to be a minimum of 300 metres. Greater or lesser separation distances may be authorized where justified. For those landfills designed to collect and recover methane gas generated, the issue of potential on-site or off-site users of the energy should be addressed in siting the landfill, consistent with the preceding regarding public places. An exemption is granted to discharge municipal solid waste closer than 300 m to the existing residences located in the subdivision to the east of the landfill.

2.9 Natural Control Landfill

2.9.1 The bottommost solid waste cell is to be at least 1.2 metres above the seasonal high water table. Greater or lesser separation depths may be authorized based on soil permeability and the leachate renovation capability of the soil.

2.9.2 There is to be at least a 2 metres thick layer of low permeability soil with a hydraulic conductivity of 1 x 10-6 cm/s or less (i.e. silt or clay), below each of the bottommost waste cells. Lesser thicknesses or no layer of low permeability soil may be authorized based on the potential for leachate generation and the unsaturated depth, permeability and leachate renovation capability of the existing soil.

2.10 Water

The disposal of municipal solid waste into water is unacceptable. Surface water diversion to restrict storm water runoff from contacting the wastes is required.

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Assistant Regional Waste Manager

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2.11 Final Cover

Final cover for landfill sites is to consist of a minimum of 1 metre of low permeability (<1 x 10-5 cm/s) compacted soil plus a minimum of 0.15 metre of topsoil with authorized vegetation established. The depth of the topsoil layer should be related to the type of vegetation proposed (ie rooting depth). Soils of higher permeability may be authorized based on leachate generation potential at the landfill site. Final cover is to be constructed with slopes between 4% and 33% with appropriate run-on/run-off drainage controls and erosion controls. An assessment of the need for gas collection and recovery systems shall be made so that, in the event such systems are required, cover can be appropriately designed and constructed. Final cover is to be installed within 90 days of landfill closure or on any areas of the landfill which will not receive any more refuse within the next 12 months. Completed portions of the landfill are to progressively receive final cover during the active life of the landfill.

Additional layers of natural materials including earth and aggregate and/or synthetic materials may be necessary for inclusion in the final cover design due to site specific conditions and the presence of management systems for leachate and landfill gas.

2.12 Access Road

An appropriately constructed and maintained access road to, and a road system within the landfill site capable of supporting all vehicles hauling waste, are required during the operating life of the landfill.

2.13 Fencing and Access

2.13.1 Fencing is required to be installed around the perimeter of the landfill on or before April 1, 1998. The type and extent of fencing will depend on the existing natural vegetation and topographic features and is to be authorized by the Regional Waste Manager. All access points are to have locking gates.

2.13.2 Bears shall be prevented from accessing any and all putrescible refuse from April to November inclusive through the use of electric fencing. Electric fencing is to be installed on or before April 1, 1998 and maintained thereafter.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

2.13.3 The holder of the Operational Certificate is to conduct a public relations campaign 3 months prior to the installation of electric fencing. The purpose of the campaign is to inform the public of the impacts of installing electric fencing around the landfill. The Conservation Officer Service is to be consulted in the development of the public relations campaign.

2.13.4 Signage is to be attached to the electric fence at regular intervals with an appropriate safety warning indicating that the fence is electrified.

2.14 Design by Qualified Persons

All landfills are to be designed by persons qualified in landfill site selection, design and operation. All plans, specifications, and reports are to be sealed by a professional engineer or geoscientist licensed to practice in the province of British Columbia.

2.15 Prohibited Wastes

The co-disposal of the following wastes with the rest of the municipal solid waste is prohibited unless specifically authorized by the Regional Waste Manager:

- Special Wastes other than those specifically authorized in the *Special Waste Regulation*
- Bulk liquids and semisolid sludges which contain free liquid;
- Liquid or semisolid wastes including septage, black water, sewage treatment sludge, etc.;
- Automobiles, white goods, other large metallic objects and tires;
- Biomedical waste as defined in the document *Guidelines for the Management of Biomedical Waste in Canada* (CCME, February 1992); and
- Dead animals and slaughter house, fish hatchery and farming wastes or cannery wastes and byproducts.

Burial of these wastes in dedicated locations (i.e. avoiding co-disposal) at a landfill site may be authorized by the Regional Waste Manager only if there is no other viable alternative such as treatment/disposal, recycling, reprocessing or composting. The viability of alternatives is to be determined by the Regional Waste Manager based on submission of cost data by the holder of the Operational Certificate. For those cases in which the dedicated disposal of otherwise prohibited wastes is authorized, the specific on-site location of the disposal shall be recorded to allow ready access to the waste should corrective or further action pertaining to the management of these wastes be required by the Ministry at some time in the future.

2.16 Hydrocarbon Contaminated Soils

The deposit of hydrocarbon contaminated soils below the *Special Waste Regulation* criteria is authorized at this landfill subject to the following conditions:

- Soil contaminated with hydrocarbons shall be deposited in layers less than 0.3 meters; and

- Soil contaminated with hydrocarbons shall be deposited a minimum of 1.2 meters above the seasonal high groundwater level and a minimum of 2.0 meters below the final grade of the landfill to prevent the impact on groundwater and any future vegetation on the site.

2.17 Designated Areas

Maintain areas for the separation, handling and storage of recyclable or reusable materials where applicable.

When a separated recyclable material is a special waste it is to be stored and managed in accordance with the *Special Waste Regulation*.

Composting of yard waste is to be in accordance with the *Production and Use of Compost Regulation*.

2.18 Signs

A sign is to be posted at each entrance of the landfill with the following current information:

- Site name
- Owner and operator
- Contact phone number and address for owner and operator
- Phone number in case of emergency (such as fire)
- Hours of operation (if applicable)
- Materials/wastes accepted for landfill and recycling
- Materials/wastes banned
- Tipping fees (if applicable)

Additional signs which clearly indicate the directions to the active tipping face, public disposal area, recycling and waste separation areas, etc. should also be displayed.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

2.19 Supervision

Fulltime, trained operators on-site are required at this landfill during operating hours. The gates are to be locked to prevent unauthorized access during non-operating hours. Properly designed and maintained public waste disposal and/or recyclable material bins situated outside the main gate may be provided for after hours use. The operator is required to be familiar with the Operational Certificate, inspection records, the authorized *Operations and Closure Plan* and all annual reports.

2.20 Scavenging

Scavenging of waste is to be prevented. The salvaging of wastes should be encouraged by providing areas and facilities for separation of recyclable or reusable materials.

2.21 Dust Control

Dust created within the landfill property is to be controlled, using methods and materials acceptable to the Regional Waste Manager, such that it does not cause a public nuisance.

2.22 Waste Compaction and Covering

2.22.1 Wastes are to be spread in thin layers (0.6 m or less) on the working face and compacted. The working face area should be minimized as much as possible. A compacted layer of cover material of at least 0.15 metre of soil or functionally equivalent depth of other cover material, as authorized by the Regional Waste Manager, is to be placed on all exposed solid waste at the end of each day of operation. If the landfill should operate continuously 24 hours per day, 0.15 m of cover material is to be applied at a frequency authorized by the Regional Waste Manager. Under specific circumstances, such as during bear season, the Regional Waste Manager may specify more stringent cover requirements. During periods of extreme weather conditions, such as those that cause the ground to freeze, an exemption to the normal cover requirements may be authorized at a frequency authorized by the Regional Waste Manager.

2.22.2 An intermediate cover consisting of a compacted layer of at least 0.30 metre of soil or functionally equivalent depth of other cover material is to be placed where no additional solid waste has been deposited or will be deposited within a period of 30 days.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

2.23 Litter Control

Litter is to be controlled by compacting the waste, minimizing the working face area, applying cover, providing litter control fences and instituting a regular litter pickup and general good housekeeping program or any other measures required by the Regional Waste Manager.

2.24 Vectors

Vectors are to be controlled by the application of cover material at a specified frequency or by other control measures as required and authorized by the Regional Waste Manager.

2.25 Wildlife

The landfill is to 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. Further control measures, such as bear control fences, and bird control devices, may be specified by the Regional Waste Manager.

2.26 Fire Protection

Adequate fire fighting equipment is to be available to extinguish surface or underground fires. Recyclables and reusable materials are to be stored in such a manner to not constitute a fire hazard.

3 MONITORING AND REPORTING REQUIREMENTS

3.1 Municipal Solid Waste Measurement

3.1.1 Provide and maintain a weigh scale and record the weight of refuse discharged to the landfill over a 24-hour period.

3.1.2 Record the weight of recyclable and reusable materials not being discharged and that are being separated, stored or processed at the landfill over a 24-hour period.

3.1.3 Density tests are to be performed utilizing a known scaled volume of representative compacted refuse at a frequency of at least once per year and reported in kg per m3.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

3.2 Water Levels

Measure the water level and determine the elevation, on a quarterly basis, in monitoring wells BH1 (E224611), BH2 (E224612), BH4 (E224617), BH5 (E224618), BH6 (E224620), BH7 (E224621), BH8 (E224623) and Dobbin's Well (E224624) as shown on Site Plan B.

3.3 Water Quality

3.3.1 Install a suitable sampling facility and obtain a grab sample on a quarterly basis, of the groundwater, in monitoring wells BH1 (E224611), BH2 (E224612), BH4 (E224617), BH5 (E224618) and Dobbin's Well (E224624) as shown on Site Plan B.

3.3.2 Obtain analyses of the samples in section 3.3.1 for the following:

conductivity, total alkalinity ($CaCO_3$), chloride, sulphate, ammonia nitrogen, nitrate nitrogen, aluminum, antimony, arsenic, barium, beryllium, bismuth, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, phosphorous, potassium, selenium, strontium, thallium, tin, titanium, tungsten, vanadium, and zinc.

3.3.3 Obtain grab samples, every two years, of the groundwater in monitoring wells BH1 (E224611) and BH4 (E224617) as shown on Site Plan B.

3.3.4 Obtain analyses of the samples in section 3.3.3 for the following:

total dissolved solids, boron, total purgeable hydrocarbons, total extractable hydrocarbons, volatile organics (EPA 624) and acid and base/neutral extractable organics (EPA 625) , BOD, COD, and phenolics.

3.3.5 Obtain suitable grab samples, on an annual basis, of the groundwater in all domestic water wells being used for drinking water purposes within 1000m down-gradient of the landfill subject to obtaining permission from the water well owner.

3.3.6 Obtain analyses of the samples in section 3.3.5 for conductivity and chloride.

Date Issued: May 28, 1997
Amendment Date:

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

3.4 Vegetation Monitoring

Inspect vegetation during the growing season in the vicinity of the landfill at least once per year to determine if any environmental impacts are occurring.

3.5 Sampling and Analytical Requirements

3.5.1 The sampling and monitoring requirements specified above shall be carried out in accordance with the appropriate procedures listed in the table below. Alternative test methods may be used provided that the alternative test methods are authorized by the Regional Waste Manager prior to performing the actual source testing. Test methods for parameters not listed below require the consent of the Regional Waste Manager.

DISCHARGES TO AIR, AMBIENT AIR:		
Parameter	Source Testing Procedure	Analytical Procedure
Particulate Matter Rate of Discharge (flow rate) Gaseous emissions	Stationary Emission Testing Code - contained in British Columbia Field Sampling Manual for Continuous Monitoring plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 1996 Permittee Edition	A Laboratory Manual for the Chemical Analysis of Ambient Air, Emissions, Precipitation, Soil and Vegetation, 3rd edition, April, 1983, 253 pp.
LIQUID EFFLUENTS, SURFACE WATER, GROUND WATER, SOILS, SEDIMENTS, VEGETATIVE MATTER:		
Parameter	Source Testing Procedure	Analytical Procedure
Metals Nutrients Organics Toxicity	British Columbia Field Sampling Manual for Continuous Monitoring plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 1996 Permittee Edition	British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials, March, 1994, Permittee Edition

The above manuals are available from Queen's Printer Publications Centre, P.O. Box 9452, Stn. Prov. Govt, Victoria, BC, V8W 9V7 (1-800-663-6105 or (250) 387-4609). The above manuals are also available for inspection at all Pollution Prevention offices.

3.5.2 Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination and breakage.

3.5.3 Maintain the groundwater monitoring wells including provisions to ensure protection from damage due to vehicles or vandalism.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

Date Issued: May 28, 1997
Amendment Date:
(most recent)

3.5.4 Groundwater monitoring wells are to be covered with lockable caps, fitted with locks all keyed alike, and a key is to be provided to the Regional Waste Manager.

3.5.5 Three well bore volumes are to be pumped from each monitoring well prior to sample collection.

3.6 Changes to Sampling and Monitoring Program

On the basis of findings during routine inspections and any other information related to the effect of the discharge on the receiving environment, the Regional Waste Manager may allow reductions or require additional sampling and monitoring of the discharge and receiving environment.

3.7 Annual Report

An annual operations and monitoring report is to be submitted to the Regional Waste Manager within 60 days of the end of the calendar year. The first annual report is due on March 1, 1998. These reports are to contain at least the following information:

- Total volume and/or weight of waste discharged into the landfill for the year;
- Service population and waste discharge rate for the year (in tonnes per capita per year) and a trend analysis with a comparison to the 1990 baseline waste discharge rate of 1.20 tonnes per capita per year ;
- Authorized design volume;
- Remaining site life and capacity;
- Operational plan for next 12 months;
- Operation and maintenance expenditures;
- Monitoring data compilation, interpretation and trend analysis prepared by a suitably qualified professional regarding landfill gas, vegetation and leachate/water quality including a review of groundwater elevations and flow direction and a comparison made to the drinking water parameters found in the *Approved and Working Criteria for Water Quality* dated April 1995.;
- Amounts of leachate collected, treated and disposed;
- Any changes from authorized reports, plans and specifications;
- any changes to the contingency plan;
- Amount of landfill gas collected and its disposition;
- Review of the closure plan and associated estimated costs, including an update of the schedule of reserve funds or security to be collected each year until closure;. to cover estimated costs of closure, the 25 year post-closure period and a contingency for remediation; and
- Any other data relevant to this Operational Certificate

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

3.8 Format of Submission

Monitoring and/or reporting information shall be submitted in an electronic and/or printed format which is suitable for review by the public and/or other government agencies and is satisfactory to the Regional Waste Manager.

3.9 Financial Security

Provide a future financial security of the operations at and beyond closure by establishing a Closure Fund in a form acceptable to the Regional Waste Manager, such as upfront security or a fund financed on a charge per tonne of waste disposed basis. Such a fund would be analogous to the provincial Waste Management Trust Fund which the Minister may establish under Section 53 of the *Waste Management Act*. The ultimate amount of the financial security shall meet or exceed the currently estimated closure and post-closure costs as outlined in the closure plan plus a reasonable contingency for any remediation which may be required. For municipally owned landfills, the financial security can be built up over time according to a schedule authorized by the Regional Waste Manager.

3.10 Legal Survey

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 215.1 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.

3.11 Buildings and Structures

The construction of buildings and other structures on landfills containing putrescible wastes is not recommended for a minimum period of 25 years after closure due to concerns about combustible gas and excessive settlement. Such activity will only be considered and /or authorized after an investigation and report by qualified persons. The report is to be submitted for authorization to the Regional Waste Manager prior to initiating construction activities.

3.12 Operation of Gas Recovery and Management System

Where landfill gas recovery and management is required, operation of the system should be considered an integral part of overall landfill management. The system should be planned for from the early design stage of the landfill and arrangements made for its operation for a minimum 25 year life after closure.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

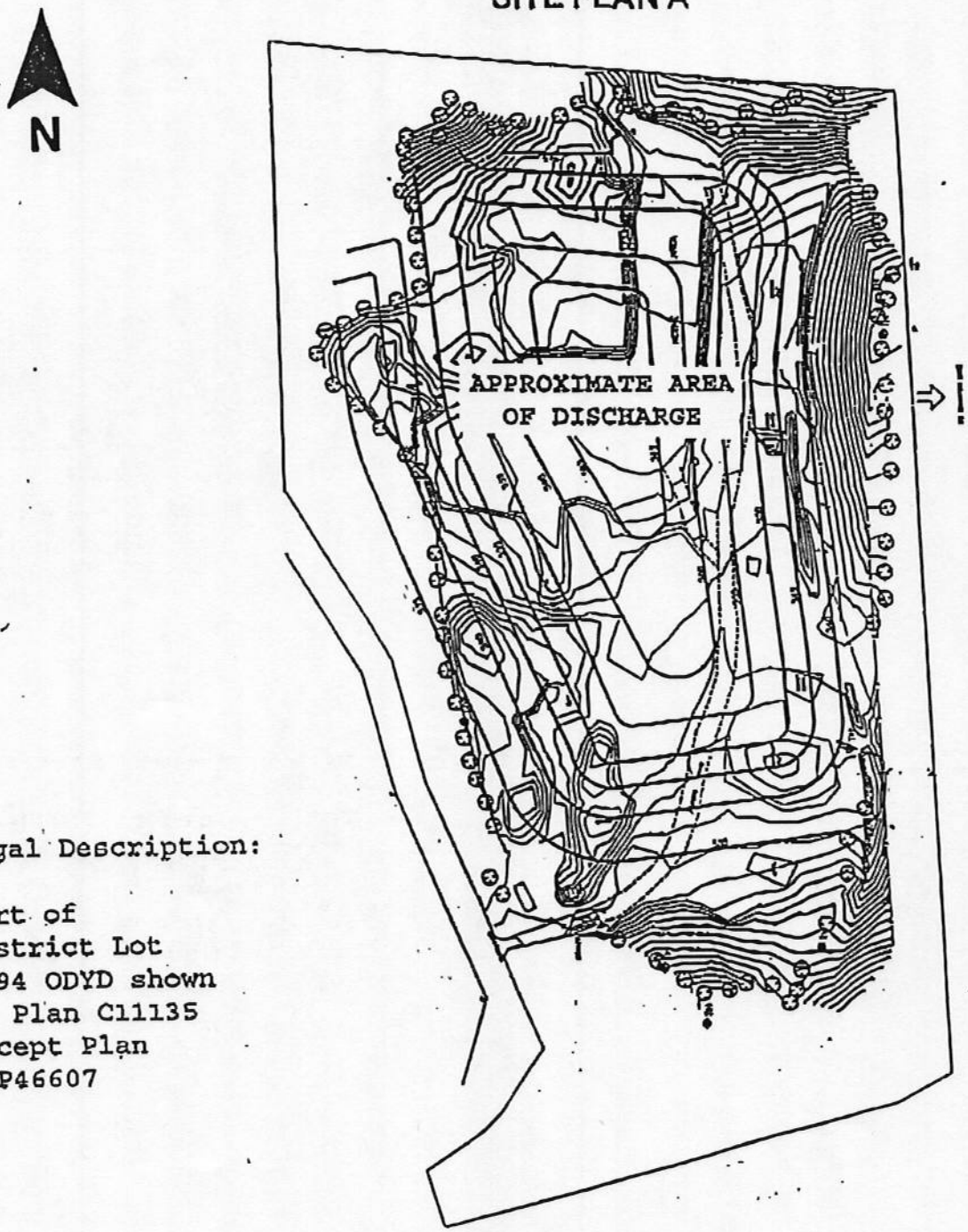
3.13 Operation of Other Control Systems

Operation of other environmental control systems for leachate and run-off as well as monitoring of leachate, groundwater and surface water must be continued during the entire post-closure period unless the early suspension of such operations or monitoring is authorized by the Regional Waste Manager.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

Date Issued: May 28, 1997
Amendment Date:
(most recent)

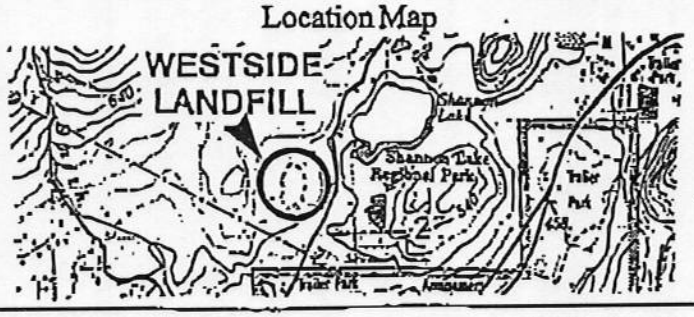
SITE PLAN A



Legal Description:

Part of
District Lot
3794 ODYD shown
on Plan C11135
Except Plan
KAP46607

Location Map

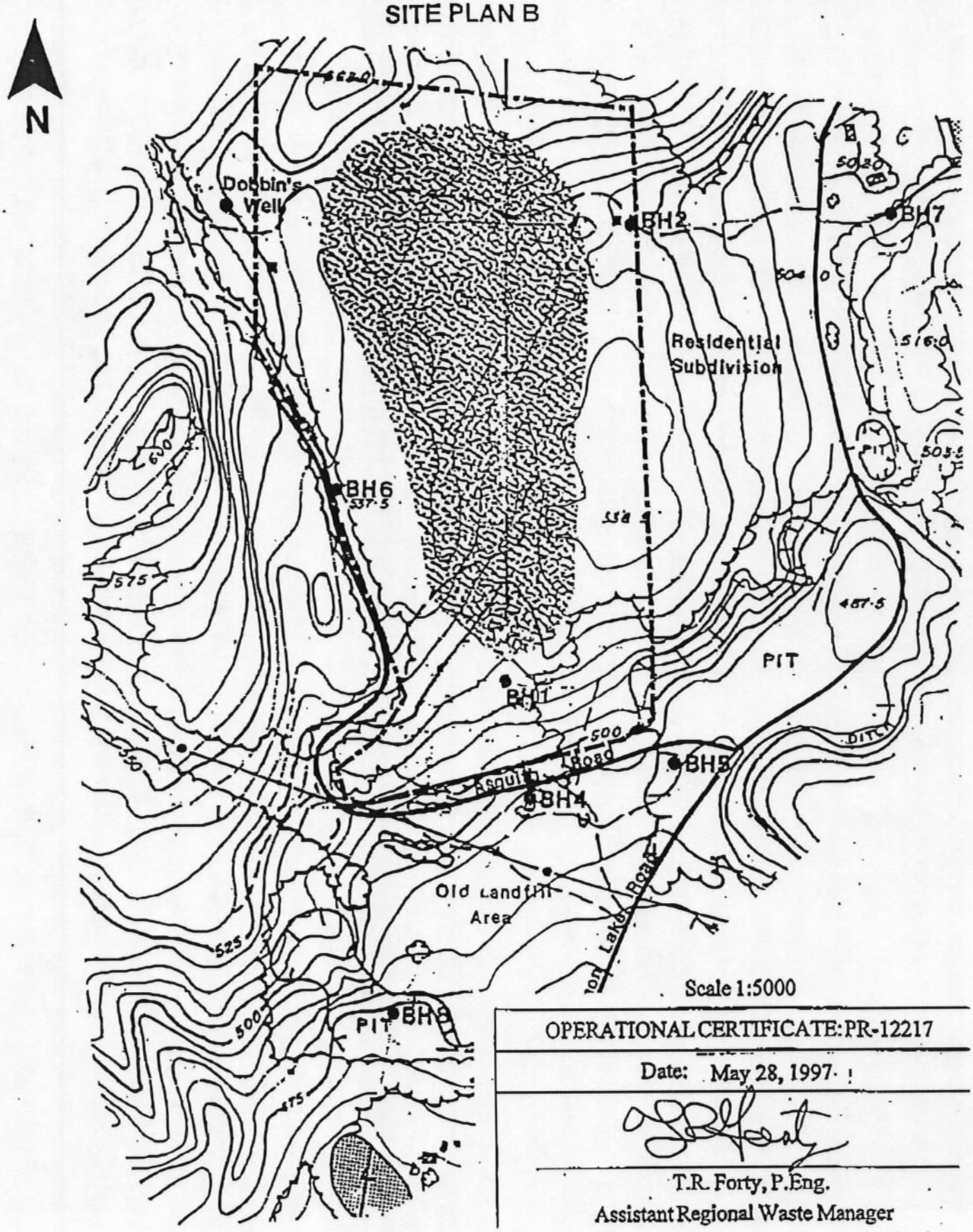


OPERATIONAL CERTIFICATE: PR-12217

Date: May 28, 1997

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

SITE PLAN B



Scale 1:5000

OPERATIONAL CERTIFICATE: PR-12217

Date: May 28, 1997

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

September 6, 2017 Authorization Number: 12217

VIA EMAIL: clarke.kruiswyk@cord.bc.ca

Clarke Kruiswyk
Environmental Services Analyst
Regional District of Central Okanagan
1450 KLO Road, Kelowna, BC, V1W 3Z4

Dear Mr. Clarke Kruiswyk:

Re: *Environmental Management Act* approval of Closure Plan for Westside Landfill (Authorization 122217).

Thank you for your email dated March 10, 2016 and submission of the Westside Landfill Closure Plan dated May 12, 2015 by Golder Associates (Report Number 1406505-003-R-Rev0-5000) (the "Closure Plan"). Ministry review of the Closure Plan indicates that it conforms with current ministry policy (Landfill Criteria, 2nd Edition – 2016), and with respect to final cover, it meets the intent of clause 2.11 (Final Cover) of Operational Certificate (OC) 12217. As such, the Closure Plan is hereby approved in accordance with clause 2.4 of the OC, and the detailed final cover requirements included in clause 2.11 are replaced by those contained in the Closure Plan.

The Ministry further acknowledges that OC 12217 should now be updated to reflect the closed status of the site. The Regional District of Central Okanagan is requested to submit an application to amend the current OC to remove requirements that are no longer relevant, and instead incorporate requirements related to ongoing closure and post-closure activities. For reference, the 2016 Landfill Criteria describe the ministry's expectations pertaining to post closure operation and maintenance including but not limited to those in sections 7.4 (Post Closure Operation and Maintenance), 7.4 (Contaminating Lifespan), 9.0 (Monitorimng Criteria), and 10.3.4 (Closure Plan).

Application instructions and forms are available on the Ministry's website at: http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/guidance-forms-and-fees.

If you have any questions, please contact Roshan D'Souza, Environmental Protection Officer at 250 354 6365 or email Roshan.Dsouza@gov.bc.ca.

Yours truly,

Luc Lachance, P.Eng.
For Director,
Environmental Management Act

APPENDIX B

CARO Laboratory - Certificates of Analysis (COA)

CERTIFICATE OF ANALYSIS

REPORTED TO	Regional District of Central Okanagan 1450 KLO Road KELOWNA, BC V1W 3Z4		
ATTENTION	Angela Lambrecht	**WORK ORDER**	9051271
PO NUMBER	60167	**RECEIVED / TEMP**	2019-05-14 11:00 / 7°C
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26
PROJECT INFO	1417953	**COC NUMBER**	000001

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 estclair@caro.ca

Authorized By:

Eilish St.Clair, B.Sc., C.I.T.
Client Service Representative

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BHA (9051271-01) | Matrix: Water | Sampled: 2019-05-14 09:45					
Anions					
Chloride	**214**	0.10	mg/L	2019-05-15	
Nitrate (as N)	< 0.100	0.010	mg/L	2019-05-15	RA1
Sulfate	**81.4**	1.0	mg/L	2019-05-15	
Calculated Parameters					
Hardness, Total (as CaCO3)	**1590**	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	**0.449**	0.0050	mg/L	2019-05-17	
Antimony, dissolved	**0.00023**	0.00020	mg/L	2019-05-17	
Arsenic, dissolved	**0.00251**	0.00050	mg/L	2019-05-17	
Barium, dissolved	**0.0104**	0.0050	mg/L	2019-05-17	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Boron, dissolved	**0.433**	0.0050	mg/L	2019-05-17	
Cadmium, dissolved	**0.000028**	0.000010	mg/L	2019-05-17	
Calcium, dissolved	**335**	0.20	mg/L	2019-05-17	
Chromium, dissolved	**0.00216**	0.00050	mg/L	2019-05-17	
Cobalt, dissolved	**0.00271**	0.00010	mg/L	2019-05-17	
Copper, dissolved	**0.00109**	0.00040	mg/L	2019-05-17	
Iron, dissolved	**2.30**	0.010	mg/L	2019-05-17	
Lead, dissolved	**0.00057**	0.00020	mg/L	2019-05-17	
Lithium, dissolved	**0.0236**	0.00010	mg/L	2019-05-17	
Magnesium, dissolved	**183**	0.010	mg/L	2019-05-17	
Manganese, dissolved	**7.81**	0.00020	mg/L	2019-05-17	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-05-19	
Molybdenum, dissolved	**0.00380**	0.00010	mg/L	2019-05-17	
Nickel, dissolved	**0.0202**	0.00040	mg/L	2019-05-17	
Phosphorus, dissolved	**0.181**	0.050	mg/L	2019-05-17	
Potassium, dissolved	**2.36**	0.10	mg/L	2019-05-17	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Silicon, dissolved	**26.7**	1.0	mg/L	2019-05-17	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-05-17	
Sodium, dissolved	**125**	0.10	mg/L	2019-05-17	
Strontium, dissolved	**3.38**	0.0010	mg/L	2019-05-17	
Sulfur, dissolved	**30.0**	3.0	mg/L	2019-05-17	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-05-17	
Thorium, dissolved	**0.00041**	0.00010	mg/L	2019-05-17	
Tin, dissolved	**0.00030**	0.00020	mg/L	2019-05-17	
Titanium, dissolved	**0.0127**	0.0050	mg/L	2019-05-17	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-05-17	
Uranium, dissolved	**0.00530**	0.000020	mg/L	2019-05-17	

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BHA (9051271-01) | Matrix: Water | Sampled: 2019-05-14 09:45, Continued					
Dissolved Metals, Continued					
Vanadium, dissolved	**0.0071**	0.0010	mg/L	2019-05-17	
Zinc, dissolved	**0.0047**	0.0040	mg/L	2019-05-17	
Zirconium, dissolved	**0.00569**	0.00010	mg/L	2019-05-17	
General Parameters					
Alkalinity, Total (as CaCO3)	**1590**	1.0	mg/L	2019-05-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Bicarbonate (as CaCO3)	**1590**	1.0	mg/L	2019-05-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Ammonia, Total (as N)	**0.483**	0.020	mg/L	2019-05-21	
Conductivity (EC)	**3060**	2.0	µS/cm	2019-05-21	
pH	**7.60**	0.10	pH units	2019-05-21	HT2
BH1 (9051271-02) | Matrix: Water | Sampled: 2019-05-14 10:20					
Anions					
Chloride	**450**	0.10	mg/L	2019-05-15	
Nitrate (as N)	**3.96**	0.010	mg/L	2019-05-15	
Sulfate	**128**	1.0	mg/L	2019-05-15	
BCMOE Aggregate Hydrocarbons					
EPHw10-19	**272**	250	µg/L	2019-05-17	
EPHw19-32	< 250	250	µg/L	2019-05-17	
LEPHw	**272**	250	µg/L	N/A	
HEPHw	< 250	250	µg/L	N/A	
Surrogate: 2-Methylnonane (EPH/F2-4)	*74*	*60-140*	%	*2019-05-17*	
Calculated Parameters					
Hardness, Total (as CaCO3)	**1260**	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	**0.0145**	0.0050	mg/L	2019-05-17	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Arsenic, dissolved	**0.00171**	0.00050	mg/L	2019-05-17	
Barium, dissolved	**0.0553**	0.0050	mg/L	2019-05-17	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Boron, dissolved	**0.918**	0.0050	mg/L	2019-05-17	
Cadmium, dissolved	**0.000117**	0.000010	mg/L	2019-05-17	
Calcium, dissolved	**308**	0.20	mg/L	2019-05-17	
Chromium, dissolved	**0.00079**	0.00050	mg/L	2019-05-17	
Cobalt, dissolved	**0.00343**	0.00010	mg/L	2019-05-17	

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH1 (9051271-02) | Matrix: Water | Sampled: 2019-05-14 10:20, Continued					
Dissolved Metals, Continued					
Copper, dissolved	**0.00279**	0.00040	mg/L	2019-05-17	
Iron, dissolved	**1.73**	0.010	mg/L	2019-05-17	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Lithium, dissolved	**0.0240**	0.00010	mg/L	2019-05-17	
Magnesium, dissolved	**119**	0.010	mg/L	2019-05-17	
Manganese, dissolved	**4.96**	0.00020	mg/L	2019-05-17	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-05-19	
Molybdenum, dissolved	**0.00203**	0.00010	mg/L	2019-05-17	
Nickel, dissolved	**0.0186**	0.00040	mg/L	2019-05-17	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-05-17	
Potassium, dissolved	**7.96**	0.10	mg/L	2019-05-17	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Silicon, dissolved	**17.2**	1.0	mg/L	2019-05-17	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-05-17	
Sodium, dissolved	**122**	0.10	mg/L	2019-05-17	
Strontium, dissolved	**2.33**	0.0010	mg/L	2019-05-17	
Sulfur, dissolved	**45.9**	3.0	mg/L	2019-05-17	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-05-17	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Tin, dissolved	**0.00032**	0.00020	mg/L	2019-05-17	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-05-17	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-05-17	
Uranium, dissolved	**0.00399**	0.000020	mg/L	2019-05-17	
Vanadium, dissolved	**0.0015**	0.0010	mg/L	2019-05-17	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-05-17	
Zirconium, dissolved	**0.00125**	0.00010	mg/L	2019-05-17	
General Parameters					
Alkalinity, Total (as CaCO3)	**750**	1.0	mg/L	2019-05-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Bicarbonate (as CaCO3)	**750**	1.0	mg/L	2019-05-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Ammonia, Total (as N)	**0.499**	0.020	mg/L	2019-05-21	
BOD, 5-day	< 6.0	2.0	mg/L	2019-05-22	
Chemical Oxygen Demand	**161**	20	mg/L	2019-05-21	
Conductivity (EC)	**2910**	2.0	µS/cm	2019-05-21	
pH	**7.75**	0.10	pH units	2019-05-21	HT2
Solids, Total Dissolved	**1870**	15	mg/L	2019-05-16	
Miscellaneous Subcontracted Parameters					

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH1 (9051271-02) | Matrix: Water | Sampled: 2019-05-14 10:20, Continued					
Miscellaneous Subcontracted Parameters, Continued					
Refer to Appendix	**Refer to Appendix**		-	2019-05-16	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2019-05-17	
Acenaphthylene	< 0.200	0.200	µg/L	2019-05-17	
Acridine	< 0.050	0.050	µg/L	2019-05-17	
Anthracene	< 0.010	0.010	µg/L	2019-05-17	
Benz(a)anthracene	< 0.010	0.010	µg/L	2019-05-17	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2019-05-17	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2019-05-17	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2019-05-17	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2019-05-17	
2-Chloronaphthalene	< 0.100	0.100	µg/L	2019-05-17	
Chrysene	< 0.050	0.050	µg/L	2019-05-17	
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L	2019-05-17	
Fluoranthene	< 0.030	0.030	µg/L	2019-05-17	
Fluorene	< 0.050	0.050	µg/L	2019-05-17	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2019-05-17	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2019-05-17	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2019-05-17	
Naphthalene	< 0.200	0.200	µg/L	2019-05-17	
Phenanthrene	< 0.100	0.100	µg/L	2019-05-17	
Pyrene	< 0.020	0.020	µg/L	2019-05-17	
Quinoline	< 0.050	0.050	µg/L	2019-05-17	
Surrogate: Acridine-d9	*69*	*50-140*	%	*2019-05-17*	
Surrogate: Naphthalene-d8	*93*	*50-140*	%	*2019-05-17*	
Surrogate: Perylene-d12	*66*	*50-140*	%	*2019-05-17*	
Volatile Organic Compounds (VOC)					
Benzene	< 0.5	0.5	µg/L	2019-05-22	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-05-22	
Bromoform	< 1.0	1.0	µg/L	2019-05-22	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-05-22	
Chlorobenzene	< 1.0	1.0	µg/L	2019-05-22	
Chloroethane	< 2.0	2.0	µg/L	2019-05-22	
Chloroform	< 1.0	1.0	µg/L	2019-05-22	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-05-22	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-05-22	
Dibromomethane	< 1.0	1.0	µg/L	2019-05-22	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-05-22	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-05-22	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-05-22	

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH1 (9051271-02) | Matrix: Water | Sampled: 2019-05-14 10:20, Continued					
Volatile Organic Compounds (VOC), Continued					
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-05-22	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-05-22	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-05-22	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-05-22	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-05-22	
Dichloromethane	< 3.0	3.0	µg/L	2019-05-22	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-05-22	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-05-22	
Ethylbenzene	< 1.0	1.0	µg/L	2019-05-22	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-05-22	
Styrene	< 1.0	1.0	µg/L	2019-05-22	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-05-22	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-05-22	
Toluene	< 1.0	1.0	µg/L	2019-05-22	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-05-22	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-05-22	
Trichloroethylene	< 1.0	1.0	µg/L	2019-05-22	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-05-22	
Vinyl chloride	< 1.0	1.0	µg/L	2019-05-22	
Xylenes (total)	< 2.0	2.0	µg/L	2019-05-22	
Surrogate: Toluene-d8	*109*	*70-130*	%	*2019-05-22*	
Surrogate: 4-Bromofluorobenzene	*107*	*70-130*	%	*2019-05-22*	
Surrogate: 1,4-Dichlorobenzene-d4	*114*	*70-130*	%	*2019-05-22*	
BH2 (9051271-03) | Matrix: Water | Sampled: 2019-05-14 09:40					
Anions					
Chloride	**103**	0.10	mg/L	2019-05-15	
Nitrate (as N)	**0.634**	0.010	mg/L	2019-05-15	
Sulfate	**21.0**	1.0	mg/L	2019-05-15	
Calculated Parameters					
Hardness, Total (as CaCO3)	**663**	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-05-17	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Arsenic, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Barium, dissolved	**0.0078**	0.0050	mg/L	2019-05-17	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Boron, dissolved	**0.0376**	0.0050	mg/L	2019-05-17	
Cadmium, dissolved	< 0.000010	0.000010	mg/L	2019-05-17	

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH2 (9051271-03) | Matrix: Water | Sampled: 2019-05-14 09:40, Continued					
Dissolved Metals, Continued					
Calcium, dissolved	**125**	0.20	mg/L	2019-05-17	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Cobalt, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Copper, dissolved	**0.00729**	0.00040	mg/L	2019-05-17	
Iron, dissolved	< 0.010	0.010	mg/L	2019-05-17	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Lithium, dissolved	**0.0420**	0.00010	mg/L	2019-05-17	
Magnesium, dissolved	**85.4**	0.010	mg/L	2019-05-17	
Manganese, dissolved	**0.00331**	0.00020	mg/L	2019-05-17	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-05-19	
Molybdenum, dissolved	**0.00042**	0.00010	mg/L	2019-05-17	
Nickel, dissolved	**0.00041**	0.00040	mg/L	2019-05-17	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-05-17	
Potassium, dissolved	**0.58**	0.10	mg/L	2019-05-17	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Silicon, dissolved	**7.2**	1.0	mg/L	2019-05-17	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-05-17	
Sodium, dissolved	**45.6**	0.10	mg/L	2019-05-17	
Strontium, dissolved	**1.80**	0.0010	mg/L	2019-05-17	
Sulfur, dissolved	**7.6**	3.0	mg/L	2019-05-17	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-05-17	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-05-17	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-05-17	
Uranium, dissolved	**0.00826**	0.000020	mg/L	2019-05-17	
Vanadium, dissolved	< 0.0010	0.0010	mg/L	2019-05-17	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-05-17	
Zirconium, dissolved	**0.00035**	0.00010	mg/L	2019-05-17	
General Parameters					
Alkalinity, Total (as CaCO3)	**656**	1.0	mg/L	2019-05-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Bicarbonate (as CaCO3)	**656**	1.0	mg/L	2019-05-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Ammonia, Total (as N)	**0.087**	0.020	mg/L	2019-05-21	
Conductivity (EC)	**1360**	2.0	µS/cm	2019-05-21	
pH	**7.92**	0.10	pH units	2019-05-21	HT2
BH3 (9051271-04) | Matrix: Water | Sampled: 2019-05-14 08:12					

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH3 (9051271-04) | Matrix: Water | Sampled: 2019-05-14 08:12, Continued					
Anions					
Chloride	**83.2**	0.10	mg/L	2019-05-15	
Nitrate (as N)	**2.04**	0.010	mg/L	2019-05-15	
Sulfate	**32.1**	1.0	mg/L	2019-05-15	
Calculated Parameters					
Hardness, Total (as CaCO3)	**358**	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-05-17	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Arsenic, dissolved	**0.00123**	0.00050	mg/L	2019-05-17	
Barium, dissolved	**0.0097**	0.0050	mg/L	2019-05-17	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Boron, dissolved	**0.0750**	0.0050	mg/L	2019-05-17	
Cadmium, dissolved	**0.000015**	0.000010	mg/L	2019-05-17	
Calcium, dissolved	**94.6**	0.20	mg/L	2019-05-17	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Cobalt, dissolved	**0.00011**	0.00010	mg/L	2019-05-17	
Copper, dissolved	**0.00104**	0.00040	mg/L	2019-05-17	
Iron, dissolved	< 0.010	0.010	mg/L	2019-05-17	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Lithium, dissolved	**0.0169**	0.00010	mg/L	2019-05-17	
Magnesium, dissolved	**29.5**	0.010	mg/L	2019-05-17	
Manganese, dissolved	**0.00036**	0.00020	mg/L	2019-05-17	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-05-19	
Molybdenum, dissolved	**0.00415**	0.00010	mg/L	2019-05-17	
Nickel, dissolved	**0.00137**	0.00040	mg/L	2019-05-17	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-05-17	
Potassium, dissolved	**3.54**	0.10	mg/L	2019-05-17	
Selenium, dissolved	**0.00053**	0.00050	mg/L	2019-05-17	
Silicon, dissolved	**12.3**	1.0	mg/L	2019-05-17	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-05-17	
Sodium, dissolved	**46.6**	0.10	mg/L	2019-05-17	
Strontium, dissolved	**0.634**	0.0010	mg/L	2019-05-17	
Sulfur, dissolved	**10.3**	3.0	mg/L	2019-05-17	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-05-17	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-05-17	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-05-17	
Uranium, dissolved	**0.00653**	0.000020	mg/L	2019-05-17	

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH3 (9051271-04) | Matrix: Water | Sampled: 2019-05-14 08:12, Continued					
Dissolved Metals, Continued					
Vanadium, dissolved	**0.0033**	0.0010	mg/L	2019-05-17	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-05-17	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
General Parameters					
Alkalinity, Total (as CaCO3)	**347**	1.0	mg/L	2019-05-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Bicarbonate (as CaCO3)	**347**	1.0	mg/L	2019-05-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Ammonia, Total (as N)	**0.040**	0.020	mg/L	2019-05-21	
Conductivity (EC)	**905**	2.0	µS/cm	2019-05-21	
pH	**7.89**	0.10	pH units	2019-05-21	HT2
BH4 (9051271-05) | Matrix: Water | Sampled: 2019-05-14 08:39					
Anions					
Chloride	**220**	0.10	mg/L	2019-05-15	
Nitrate (as N)	**1.75**	0.010	mg/L	2019-05-15	
Sulfate	**99.6**	1.0	mg/L	2019-05-15	
BCMOE Aggregate Hydrocarbons					
EPHw10-19	< 250	250	µg/L	2019-05-17	
EPHw19-32	< 250	250	µg/L	2019-05-17	
LEPHw	< 250	250	µg/L	N/A	
HEPHw	< 250	250	µg/L	N/A	
Surrogate: 2-Methylnonane (EPH/F2-4)	*72*	*60-140*	%	*2019-05-17*	
Calculated Parameters					
Hardness, Total (as CaCO3)	**876**	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-05-17	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Arsenic, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Barium, dissolved	**0.0341**	0.0050	mg/L	2019-05-17	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Boron, dissolved	**0.519**	0.0050	mg/L	2019-05-17	
Cadmium, dissolved	**0.000072**	0.000010	mg/L	2019-05-17	
Calcium, dissolved	**166**	0.20	mg/L	2019-05-17	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Cobalt, dissolved	**0.00152**	0.00010	mg/L	2019-05-17	

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH4 (9051271-05) | Matrix: Water | Sampled: 2019-05-14 08:39, Continued					
Dissolved Metals, Continued					
Copper, dissolved	**0.00212**	0.00040	mg/L	2019-05-17	
Iron, dissolved	< 0.010	0.010	mg/L	2019-05-17	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Lithium, dissolved	**0.0326**	0.00010	mg/L	2019-05-17	
Magnesium, dissolved	**112**	0.010	mg/L	2019-05-17	
Manganese, dissolved	**0.431**	0.00020	mg/L	2019-05-17	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-05-19	
Molybdenum, dissolved	**0.00578**	0.00010	mg/L	2019-05-17	
Nickel, dissolved	**0.0187**	0.00040	mg/L	2019-05-17	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-05-17	
Potassium, dissolved	**4.51**	0.10	mg/L	2019-05-17	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Silicon, dissolved	**11.1**	1.0	mg/L	2019-05-17	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-05-17	
Sodium, dissolved	**89.0**	0.10	mg/L	2019-05-17	
Strontium, dissolved	**1.92**	0.0010	mg/L	2019-05-17	
Sulfur, dissolved	**34.9**	3.0	mg/L	2019-05-17	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-05-17	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-05-17	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-05-17	
Uranium, dissolved	**0.0287**	0.000020	mg/L	2019-05-17	
Vanadium, dissolved	**0.0034**	0.0010	mg/L	2019-05-17	
Zinc, dissolved	**0.0058**	0.0040	mg/L	2019-05-17	
Zirconium, dissolved	**0.00058**	0.00010	mg/L	2019-05-17	
General Parameters					
Alkalinity, Total (as CaCO3)	**751**	1.0	mg/L	2019-05-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Bicarbonate (as CaCO3)	**751**	1.0	mg/L	2019-05-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Ammonia, Total (as N)	**0.056**	0.020	mg/L	2019-05-21	
BOD, 5-day	< 6.0	2.0	mg/L	2019-05-22	
Chemical Oxygen Demand	**40**	20	mg/L	2019-05-21	
Conductivity (EC)	**1970**	2.0	µS/cm	2019-05-21	
pH	**7.88**	0.10	pH units	2019-05-21	HT2
Solids, Total Dissolved	**1210**	15	mg/L	2019-05-16	
Miscellaneous Subcontracted Parameters					

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH4 (9051271-05) | Matrix: Water | Sampled: 2019-05-14 08:39, Continued					
Miscellaneous Subcontracted Parameters, Continued					
Refer to Appendix	**Refer to Appendix**		-	2019-05-16	
Polycyclic Aromatic Hydrocarbons (PAH)					
Acenaphthene	< 0.050	0.050	µg/L	2019-05-17	
Acenaphthylene	< 0.200	0.200	µg/L	2019-05-17	
Acridine	< 0.050	0.050	µg/L	2019-05-17	
Anthracene	< 0.010	0.010	µg/L	2019-05-17	
Benz(a)anthracene	< 0.010	0.010	µg/L	2019-05-17	
Benzo(a)pyrene	< 0.010	0.010	µg/L	2019-05-17	
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L	2019-05-17	
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L	2019-05-17	
Benzo(k)fluoranthene	< 0.050	0.050	µg/L	2019-05-17	
2-Chloronaphthalene	< 0.100	0.100	µg/L	2019-05-17	
Chrysene	< 0.050	0.050	µg/L	2019-05-17	
Dibenz(a,h)anthracene	**0.016**	0.010	µg/L	2019-05-17	
Fluoranthene	< 0.030	0.030	µg/L	2019-05-17	
Fluorene	< 0.050	0.050	µg/L	2019-05-17	
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L	2019-05-17	
1-Methylnaphthalene	< 0.100	0.100	µg/L	2019-05-17	
2-Methylnaphthalene	< 0.100	0.100	µg/L	2019-05-17	
Naphthalene	< 0.200	0.200	µg/L	2019-05-17	
Phenanthrene	< 0.100	0.100	µg/L	2019-05-17	
Pyrene	< 0.020	0.020	µg/L	2019-05-17	
Quinoline	< 0.050	0.050	µg/L	2019-05-17	
Surrogate: Acridine-d9	*62*	*50-140*	%	*2019-05-17*	
Surrogate: Naphthalene-d8	*103*	*50-140*	%	*2019-05-17*	
Surrogate: Perylene-d12	*65*	*50-140*	%	*2019-05-17*	
Volatile Organic Compounds (VOC)					
Benzene	< 0.5	0.5	µg/L	2019-05-22	
Bromodichloromethane	< 1.0	1.0	µg/L	2019-05-22	
Bromoform	< 1.0	1.0	µg/L	2019-05-22	
Carbon tetrachloride	< 0.5	0.5	µg/L	2019-05-22	
Chlorobenzene	< 1.0	1.0	µg/L	2019-05-22	
Chloroethane	< 2.0	2.0	µg/L	2019-05-22	
Chloroform	< 1.0	1.0	µg/L	2019-05-22	
Dibromochloromethane	< 1.0	1.0	µg/L	2019-05-22	
1,2-Dibromoethane	< 0.3	0.3	µg/L	2019-05-22	
Dibromomethane	< 1.0	1.0	µg/L	2019-05-22	
1,2-Dichlorobenzene	< 0.5	0.5	µg/L	2019-05-22	
1,3-Dichlorobenzene	< 1.0	1.0	µg/L	2019-05-22	
1,4-Dichlorobenzene	< 1.0	1.0	µg/L	2019-05-22	

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH4 (9051271-05) | Matrix: Water | Sampled: 2019-05-14 08:39, Continued					
Volatile Organic Compounds (VOC), Continued					
1,1-Dichloroethane	< 1.0	1.0	µg/L	2019-05-22	
1,2-Dichloroethane	< 1.0	1.0	µg/L	2019-05-22	
1,1-Dichloroethylene	< 1.0	1.0	µg/L	2019-05-22	
cis-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-05-22	
trans-1,2-Dichloroethylene	< 1.0	1.0	µg/L	2019-05-22	
Dichloromethane	< 3.0	3.0	µg/L	2019-05-22	
1,2-Dichloropropane	< 1.0	1.0	µg/L	2019-05-22	
1,3-Dichloropropene (cis + trans)	< 1.0	1.0	µg/L	2019-05-22	
Ethylbenzene	< 1.0	1.0	µg/L	2019-05-22	
Methyl tert-butyl ether	< 1.0	1.0	µg/L	2019-05-22	
Styrene	< 1.0	1.0	µg/L	2019-05-22	
1,1,2,2-Tetrachloroethane	< 0.5	0.5	µg/L	2019-05-22	
Tetrachloroethylene	< 1.0	1.0	µg/L	2019-05-22	
Toluene	< 1.0	1.0	µg/L	2019-05-22	
1,1,1-Trichloroethane	< 1.0	1.0	µg/L	2019-05-22	
1,1,2-Trichloroethane	< 1.0	1.0	µg/L	2019-05-22	
Trichloroethylene	< 1.0	1.0	µg/L	2019-05-22	
Trichlorofluoromethane	< 1.0	1.0	µg/L	2019-05-22	
Vinyl chloride	< 1.0	1.0	µg/L	2019-05-22	
Xylenes (total)	< 2.0	2.0	µg/L	2019-05-22	
Surrogate: Toluene-d8	*99*	*70-130*	%	*2019-05-22*	
Surrogate: 4-Bromofluorobenzene	*96*	*70-130*	%	*2019-05-22*	
Surrogate: 1,4-Dichlorobenzene-d4	*101*	*70-130*	%	*2019-05-22*	
BH5 (9051271-06) | Matrix: Water | Sampled: 2019-05-14 08:57					
Anions					
Chloride	**122**	0.10	mg/L	2019-05-15	
Nitrate (as N)	**5.17**	0.010	mg/L	2019-05-15	
Sulfate	**37.3**	1.0	mg/L	2019-05-15	
Calculated Parameters					
Hardness, Total (as CaCO3)	**324**	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-05-17	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Arsenic, dissolved	**0.00115**	0.00050	mg/L	2019-05-17	
Barium, dissolved	**0.0101**	0.0050	mg/L	2019-05-17	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Boron, dissolved	**0.0480**	0.0050	mg/L	2019-05-17	
Cadmium, dissolved	< 0.000010	0.000010	mg/L	2019-05-17	

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH5 (9051271-06) | Matrix: Water | Sampled: 2019-05-14 08:57, Continued					
Dissolved Metals, Continued					
Calcium, dissolved	**87.9**	0.20	mg/L	2019-05-17	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Cobalt, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Copper, dissolved	**0.00073**	0.00040	mg/L	2019-05-17	
Iron, dissolved	< 0.010	0.010	mg/L	2019-05-17	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Lithium, dissolved	**0.0179**	0.00010	mg/L	2019-05-17	
Magnesium, dissolved	**25.2**	0.010	mg/L	2019-05-17	
Manganese, dissolved	**0.00040**	0.00020	mg/L	2019-05-17	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-05-19	
Molybdenum, dissolved	**0.00625**	0.00010	mg/L	2019-05-17	
Nickel, dissolved	< 0.00040	0.00040	mg/L	2019-05-17	
Phosphorus, dissolved	< 0.050	0.050	mg/L	2019-05-17	
Potassium, dissolved	**2.32**	0.10	mg/L	2019-05-17	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Silicon, dissolved	**9.1**	1.0	mg/L	2019-05-17	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-05-17	
Sodium, dissolved	**45.3**	0.10	mg/L	2019-05-17	
Strontium, dissolved	**0.426**	0.0010	mg/L	2019-05-17	
Sulfur, dissolved	**11.6**	3.0	mg/L	2019-05-17	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-05-17	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-05-17	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-05-17	
Uranium, dissolved	**0.00554**	0.000020	mg/L	2019-05-17	
Vanadium, dissolved	**0.0051**	0.0010	mg/L	2019-05-17	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-05-17	
Zirconium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
General Parameters					
Alkalinity, Total (as CaCO3)	**241**	1.0	mg/L	2019-05-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Bicarbonate (as CaCO3)	**241**	1.0	mg/L	2019-05-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Ammonia, Total (as N)	**0.052**	0.020	mg/L	2019-05-21	
Conductivity (EC)	**884**	2.0	µS/cm	2019-05-21	
pH	**8.02**	0.10	pH units	2019-05-21	HT2
BH7 (9051271-07) | Matrix: Water | Sampled: 2019-05-14 09:17					

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH7 (9051271-07) | Matrix: Water | Sampled: 2019-05-14 09:17, Continued					
Anions					
Chloride	**64.8**	0.10	mg/L	2019-05-16	
Nitrate (as N)	**3.70**	0.010	mg/L	2019-05-16	
Sulfate	**41.2**	1.0	mg/L	2019-05-16	
Calculated Parameters					
Hardness, Total (as CaCO3)	**448**	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	< 0.0050	0.0050	mg/L	2019-05-17	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Arsenic, dissolved	**0.00187**	0.00050	mg/L	2019-05-17	
Barium, dissolved	**0.0200**	0.0050	mg/L	2019-05-17	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Boron, dissolved	**0.0544**	0.0050	mg/L	2019-05-17	
Cadmium, dissolved	**0.000128**	0.000010	mg/L	2019-05-17	
Calcium, dissolved	**113**	0.20	mg/L	2019-05-17	
Chromium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Cobalt, dissolved	**0.00068**	0.00010	mg/L	2019-05-17	
Copper, dissolved	**0.00246**	0.00040	mg/L	2019-05-17	
Iron, dissolved	< 0.010	0.010	mg/L	2019-05-17	
Lead, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Lithium, dissolved	**0.0196**	0.00010	mg/L	2019-05-17	
Magnesium, dissolved	**40.3**	0.010	mg/L	2019-05-17	
Manganese, dissolved	**0.479**	0.00020	mg/L	2019-05-17	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-05-19	
Molybdenum, dissolved	**0.00231**	0.00010	mg/L	2019-05-17	
Nickel, dissolved	**0.00495**	0.00040	mg/L	2019-05-17	
Phosphorus, dissolved	**0.060**	0.050	mg/L	2019-05-17	
Potassium, dissolved	**2.25**	0.10	mg/L	2019-05-17	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Silicon, dissolved	**13.5**	1.0	mg/L	2019-05-17	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-05-17	
Sodium, dissolved	**69.1**	0.10	mg/L	2019-05-17	
Strontium, dissolved	**0.732**	0.0010	mg/L	2019-05-17	
Sulfur, dissolved	**13.8**	3.0	mg/L	2019-05-17	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-05-17	
Thorium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Tin, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Titanium, dissolved	< 0.0050	0.0050	mg/L	2019-05-17	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-05-17	
Uranium, dissolved	**0.0114**	0.000020	mg/L	2019-05-17	

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
BH7 (9051271-07) | Matrix: Water | Sampled: 2019-05-14 09:17, Continued					
Dissolved Metals, Continued					
Vanadium, dissolved	**0.0118**	0.0010	mg/L	2019-05-17	
Zinc, dissolved	< 0.0040	0.0040	mg/L	2019-05-17	
Zirconium, dissolved	**0.00019**	0.00010	mg/L	2019-05-17	
General Parameters					
Alkalinity, Total (as CaCO3)	**483**	1.0	mg/L	2019-05-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Bicarbonate (as CaCO3)	**483**	1.0	mg/L	2019-05-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Ammonia, Total (as N)	**0.030**	0.020	mg/L	2019-05-21	
Conductivity (EC)	**1090**	2.0	µS/cm	2019-05-21	
pH	**7.76**	0.10	pH units	2019-05-21	HT2
MW99-2 (9051271-08) | Matrix: Water | Sampled: 2019-05-14 10:02					
Anions					
Chloride	**216**	0.10	mg/L	2019-05-16	
Nitrate (as N)	< 0.010	0.010	mg/L	2019-05-16	
Sulfate	**79.8**	1.0	mg/L	2019-05-16	
Calculated Parameters					
Hardness, Total (as CaCO3)	**1600**	0.500	mg/L	N/A	
Dissolved Metals					
Aluminum, dissolved	**0.517**	0.0050	mg/L	2019-05-17	
Antimony, dissolved	< 0.00020	0.00020	mg/L	2019-05-17	
Arsenic, dissolved	**0.00227**	0.00050	mg/L	2019-05-17	
Barium, dissolved	**0.0106**	0.0050	mg/L	2019-05-17	
Beryllium, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Bismuth, dissolved	< 0.00010	0.00010	mg/L	2019-05-17	
Boron, dissolved	**0.445**	0.0050	mg/L	2019-05-17	
Cadmium, dissolved	**0.000026**	0.000010	mg/L	2019-05-17	
Calcium, dissolved	**337**	0.20	mg/L	2019-05-17	
Chromium, dissolved	**0.00214**	0.00050	mg/L	2019-05-17	
Cobalt, dissolved	**0.00251**	0.00010	mg/L	2019-05-17	
Copper, dissolved	**0.00145**	0.00040	mg/L	2019-05-17	
Iron, dissolved	**2.41**	0.010	mg/L	2019-05-17	
Lead, dissolved	**0.00061**	0.00020	mg/L	2019-05-17	
Lithium, dissolved	**0.0236**	0.00010	mg/L	2019-05-17	
Magnesium, dissolved	**183**	0.010	mg/L	2019-05-17	
Manganese, dissolved	**7.92**	0.00020	mg/L	2019-05-17	
Mercury, dissolved	< 0.000010	0.000010	mg/L	2019-05-19	

TEST RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Analyzed	Qualifier
MW99-2 (9051271-08) | Matrix: Water | Sampled: 2019-05-14 10:02, Continued					
Dissolved Metals, Continued					
Molybdenum, dissolved	**0.00373**	0.00010	mg/L	2019-05-17	
Nickel, dissolved	**0.0199**	0.00040	mg/L	2019-05-17	
Phosphorus, dissolved	**0.195**	0.050	mg/L	2019-05-17	
Potassium, dissolved	**2.52**	0.10	mg/L	2019-05-17	
Selenium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Silicon, dissolved	**27.4**	1.0	mg/L	2019-05-17	
Silver, dissolved	< 0.000050	0.000050	mg/L	2019-05-17	
Sodium, dissolved	**126**	0.10	mg/L	2019-05-17	
Strontium, dissolved	**3.49**	0.0010	mg/L	2019-05-17	
Sulfur, dissolved	**30.6**	3.0	mg/L	2019-05-17	
Tellurium, dissolved	< 0.00050	0.00050	mg/L	2019-05-17	
Thallium, dissolved	< 0.000020	0.000020	mg/L	2019-05-17	
Thorium, dissolved	**0.00051**	0.00010	mg/L	2019-05-17	
Tin, dissolved	**0.00031**	0.00020	mg/L	2019-05-17	
Titanium, dissolved	**0.0250**	0.0050	mg/L	2019-05-17	
Tungsten, dissolved	< 0.0010	0.0010	mg/L	2019-05-17	
Uranium, dissolved	**0.00518**	0.000020	mg/L	2019-05-17	
Vanadium, dissolved	**0.0076**	0.0010	mg/L	2019-05-17	
Zinc, dissolved	**0.0056**	0.0040	mg/L	2019-05-17	
Zirconium, dissolved	**0.00575**	0.00010	mg/L	2019-05-17	
General Parameters					
Alkalinity, Total (as CaCO3)	**1620**	1.0	mg/L	2019-05-21	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Bicarbonate (as CaCO3)	**1620**	1.0	mg/L	2019-05-21	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L	2019-05-21	
Ammonia, Total (as N)	**0.561**	0.020	mg/L	2019-05-21	
Conductivity (EC)	**3080**	2.0	µS/cm	2019-05-21	
pH	**7.50**	0.10	pH units	2019-05-21	HT2

Sample Qualifiers:

HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
RA1	The Reporting Limit has been raised due to matrix interference.

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analysis Description	Method Ref.	Technique	Location
Alkalinity in Water	SM 2320 B* (2017)	Titration with H2SO4	Kelowna
Ammonia, Total in Water	SM 4500-NH3 G* (2017)	Automated Colorimetry (Phenate)	Kelowna
Anions in Water	SM 4110 B (2017)	Ion Chromatography	Kelowna
Biochemical Oxygen Demand in Water	SM 5210 B (2017)	Dissolved Oxygen Meter	Kelowna
Chemical Oxygen Demand in Water	SM 5220 D* (2017)	Closed Reflux, Colorimetry	Kelowna
Conductivity in Water	SM 2510 B (2017)	Conductivity Meter	Kelowna
Dissolved Metals in Water	EPA 200.8 / EPA 6020B	0.45 µm Filtration / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	Richmond
EPH in Water	EPA 3511* / BCMOE EPHw	Hexane MicroExtraction (Base/Neutral) / Gas Chromatography (GC-FID)	Richmond
Hardness in Water	SM 2340 B (2017)	Calculation: 2.497 [diss Ca] + 4.118 [diss Mg]	N/A
HEPHw in Water	BCMOE LEPH/HEPH	Calculation	N/A
LEPHw in Water	BCMOE LEPH/HEPH	Calculation	N/A
Mercury, dissolved in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
pH in Water	SM 4500-H+ B (2017)	Electrometry	Kelowna
Polycyclic Aromatic Hydrocarbons in Water	EPA 3511* / EPA 8270D	Hexane MicroExtraction (Base/Neutral) / GC-MSD (SIM)	Richmond
Solids, Total Dissolved in Water	SM 2540 C* (2017)	Gravimetry (Dried at 103-105C)	Kelowna
Volatile Organic Compounds in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	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
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	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

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:estclair@caro.ca

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

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 B9E1250										
Blank (B9E1250-BLK1)				Prepared: 2019-05-15, Analyzed: 2019-05-15						
Chloride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Sulfate	< 1.0	1.0	mg/L							
Blank (B9E1250-BLK2)				Prepared: 2019-05-16, Analyzed: 2019-05-16						
Chloride	< 0.10	0.10	mg/L							
Nitrate (as N)	< 0.010	0.010	mg/L							
Sulfate	< 1.0	1.0	mg/L							
LCS (B9E1250-BS1)				Prepared: 2019-05-15, Analyzed: 2019-05-15						
Chloride	16.0	0.10	mg/L	16.0		100	90-110			
Nitrate (as N)	4.01	0.010	mg/L	4.00		100	93-108			
Sulfate	16.0	1.0	mg/L	16.0		100	91-109			
LCS (B9E1250-BS2)				Prepared: 2019-05-16, Analyzed: 2019-05-16						
Chloride	15.9	0.10	mg/L	16.0		100	90-110			
Nitrate (as N)	4.05	0.010	mg/L	4.00		101	93-108			
Sulfate	16.0	1.0	mg/L	16.0		100	91-109			
BCMOE Aggregate Hydrocarbons, Batch B9E1405										
Blank (B9E1405-BLK1)				Prepared: 2019-05-16, Analyzed: 2019-05-17						
EPHw10-19	< 250	250	µg/L							
EPHw19-32	< 250	250	µg/L							
Surrogate: 2-Methylnonane (EPH/F2-4)	*332*		*µg/L*	444		*75*	*60-140*			
LCS (B9E1405-BS2)				Prepared: 2019-05-16, Analyzed: 2019-05-17						
EPHw10-19	11200	250	µg/L	15400		72	70-130			
EPHw19-32	18400	250	µg/L	22100		83	70-130			
Surrogate: 2-Methylnonane (EPH/F2-4)	*358*		*µg/L*	444		*81*	*60-140*			
Dissolved Metals, Batch B9E1377										
Blank (B9E1377-BLK1)				Prepared: 2019-05-17, Analyzed: 2019-05-17						
Aluminum, dissolved	< 0.0050	0.0050	mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B9E1377, Continued										
Blank (B9E1377-BLK1), Continued				Prepared: 2019-05-17, Analyzed: 2019-05-17						
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							
Blank (B9E1377-BLK2)				Prepared: 2019-05-17, Analyzed: 2019-05-17						
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							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B9E1377, Continued										
Blank (B9E1377-BLK2), Continued				Prepared: 2019-05-17, Analyzed: 2019-05-17						
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 (B9E1377-BS1)				Prepared: 2019-05-17, Analyzed: 2019-05-17						
Aluminum, dissolved	0.0192	0.0050	mg/L	0.0200		96	80-120			
Antimony, dissolved	0.0191	0.00020	mg/L	0.0200		95	80-120			
Arsenic, dissolved	0.0188	0.00050	mg/L	0.0200		94	80-120			
Barium, dissolved	0.0186	0.0050	mg/L	0.0200		93	80-120			
Beryllium, dissolved	0.0194	0.00010	mg/L	0.0200		97	80-120			
Bismuth, dissolved	0.0203	0.00010	mg/L	0.0200		101	80-120			
Boron, dissolved	0.0202	0.0050	mg/L	0.0200		101	80-120			
Cadmium, dissolved	0.0193	0.000010	mg/L	0.0200		96	80-120			
Calcium, dissolved	1.82	0.20	mg/L	2.00		91	80-120			
Chromium, dissolved	0.0193	0.00050	mg/L	0.0200		96	80-120			
Cobalt, dissolved	0.0194	0.00010	mg/L	0.0200		97	80-120			
Copper, dissolved	0.0204	0.00040	mg/L	0.0200		102	80-120			
Iron, dissolved	1.80	0.010	mg/L	2.00		90	80-120			
Lead, dissolved	0.0199	0.00020	mg/L	0.0200		99	80-120			
Lithium, dissolved	0.0204	0.00010	mg/L	0.0200		102	80-120			
Magnesium, dissolved	1.86	0.010	mg/L	2.00		93	80-120			
Manganese, dissolved	0.0190	0.00020	mg/L	0.0200		95	80-120			
Molybdenum, dissolved	0.0187	0.00010	mg/L	0.0200		93	80-120			
Nickel, dissolved	0.0199	0.00040	mg/L	0.0200		100	80-120			
Phosphorus, dissolved	1.85	0.050	mg/L	2.00		92	80-120			
Potassium, dissolved	1.71	0.10	mg/L	2.00		85	80-120			
Selenium, dissolved	0.0198	0.00050	mg/L	0.0200		99	80-120			
Silicon, dissolved	1.7	1.0	mg/L	2.00		85	80-120			
Silver, dissolved	0.0197	0.000050	mg/L	0.0200		98	80-120			
Sodium, dissolved	1.84	0.10	mg/L	2.00		92	80-120			
Strontium, dissolved	0.0190	0.0010	mg/L	0.0200		95	80-120			
Sulfur, dissolved	4.2	3.0	mg/L	5.00		85	80-120			
Tellurium, dissolved	0.0185	0.00050	mg/L	0.0200		92	80-120			
Thallium, dissolved	0.0205	0.000020	mg/L	0.0200		103	80-120			
Thorium, dissolved	0.0191	0.00010	mg/L	0.0200		95	80-120			
Tin, dissolved	0.0194	0.00020	mg/L	0.0200		97	80-120			
Titanium, dissolved	0.0187	0.0050	mg/L	0.0200		94	80-120			
Tungsten, dissolved	0.0191	0.0010	mg/L	0.0200		95	80-120			
Uranium, dissolved	0.0207	0.000020	mg/L	0.0200		103	80-120			
Vanadium, dissolved	0.0190	0.0010	mg/L	0.0200		95	80-120			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Dissolved Metals, Batch B9E1377, Continued										
LCS (B9E1377-BS1), Continued				Prepared: 2019-05-17, Analyzed: 2019-05-17						
Zinc, dissolved	0.0212	0.0040	mg/L	0.0200		106	80-120			
Zirconium, dissolved	0.0205	0.00010	mg/L	0.0200		102	80-120			
Reference (B9E1377-SRM1)				Prepared: 2019-05-17, Analyzed: 2019-05-17						
Aluminum, dissolved	0.208	0.0050	mg/L	0.233		89	79-114			
Antimony, dissolved	0.0426	0.00020	mg/L	0.0430		99	89-123			
Arsenic, dissolved	0.423	0.00050	mg/L	0.438		97	87-113			
Barium, dissolved	2.88	0.0050	mg/L	3.35		86	85-114			
Beryllium, dissolved	0.208	0.00010	mg/L	0.213		98	79-122			
Boron, dissolved	1.59	0.0050	mg/L	1.74		91	79-117			
Cadmium, dissolved	0.214	0.000010	mg/L	0.224		95	89-112			
Calcium, dissolved	7.16	0.20	mg/L	7.69		93	85-120			
Chromium, dissolved	0.419	0.00050	mg/L	0.437		96	87-113			
Cobalt, dissolved	0.122	0.00010	mg/L	0.128		96	90-117			
Copper, dissolved	0.827	0.00040	mg/L	0.844		98	90-115			
Iron, dissolved	1.17	0.010	mg/L	1.29		91	86-112			
Lead, dissolved	0.109	0.00020	mg/L	0.112		97	90-113			
Lithium, dissolved	0.0983	0.00010	mg/L	0.104		95	77-127			
Magnesium, dissolved	6.13	0.010	mg/L	6.92		89	84-116			
Manganese, dissolved	0.315	0.00020	mg/L	0.345		91	85-113			
Molybdenum, dissolved	0.397	0.00010	mg/L	0.426		93	87-112			
Nickel, dissolved	0.827	0.00040	mg/L	0.840		98	90-114			
Phosphorus, dissolved	0.449	0.050	mg/L	0.495		91	74-119			
Potassium, dissolved	2.54	0.10	mg/L	3.19		80	78-119			
Selenium, dissolved	0.0349	0.00050	mg/L	0.0331		105	89-123			
Sodium, dissolved	16.5	0.10	mg/L	19.1		86	81-117			
Strontium, dissolved	0.875	0.0010	mg/L	0.916		95	82-111			
Thallium, dissolved	0.0394	0.000020	mg/L	0.0393		100	90-113			
Uranium, dissolved	0.239	0.000020	mg/L	0.266		90	87-113			
Vanadium, dissolved	0.814	0.0010	mg/L	0.869		94	85-110			
Zinc, dissolved	0.883	0.0040	mg/L	0.881		100	88-114			
Dissolved Metals, Batch B9E1588										
Blank (B9E1588-BLK1)				Prepared: 2019-05-19, Analyzed: 2019-05-19						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Blank (B9E1588-BLK2)				Prepared: 2019-05-19, Analyzed: 2019-05-19						
Mercury, dissolved	< 0.000010	0.000010	mg/L							
Duplicate (B9E1588-DUP2)			**Source: 9051271-06**	Prepared: 2019-05-19, Analyzed: 2019-05-19						
Mercury, dissolved	< 0.000010	0.000010	mg/L		< 0.000010				20	
Matrix Spike (B9E1588-MS2)			**Source: 9051271-07**	Prepared: 2019-05-19, Analyzed: 2019-05-19						
Mercury, dissolved	0.000203	0.000010	mg/L	0.000250	< 0.000010	81	70-130			
Reference (B9E1588-SRM1)				Prepared: 2019-05-19, Analyzed: 2019-05-19						
Mercury, dissolved	0.00413	0.000010	mg/L	0.00489		85	80-120			
Reference (B9E1588-SRM2)				Prepared: 2019-05-19, Analyzed: 2019-05-19						
Mercury, dissolved	0.00398	0.000010	mg/L	0.00489		81	80-120			
General Parameters, Batch B9E1280										

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9E1280, Continued										
Blank (B9E1280-BLK1)				Prepared: 2019-05-16, Analyzed: 2019-05-16						
Solids, Total Dissolved	< 15	15	mg/L							
LCS (B9E1280-BS1)				Prepared: 2019-05-16, Analyzed: 2019-05-16						
Solids, Total Dissolved	241	15	mg/L	240		100	85-115			
Duplicate (B9E1280-DUP1)		**Source: 9051271-02**		Prepared: 2019-05-16, Analyzed: 2019-05-16						
Solids, Total Dissolved	1820	15	mg/L		1870			3	16	
General Parameters, Batch B9E1521										
Blank (B9E1521-BLK1)				Prepared: 2019-05-17, Analyzed: 2019-05-22						
BOD, 5-day	< 2.0	2.0	mg/L							
LCS (B9E1521-BS1)				Prepared: 2019-05-17, Analyzed: 2019-05-22						
BOD, 5-day	185	2.0	mg/L	198		94	85-115			
General Parameters, Batch B9E1574										
Blank (B9E1574-BLK1)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B9E1574-BLK2)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B9E1574-BLK3)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B9E1574-BLK4)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
Blank (B9E1574-BLK5)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Ammonia, Total (as N)	< 0.020	0.020	mg/L							
LCS (B9E1574-BS1)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Ammonia, Total (as N)	1.02	0.020	mg/L	1.00		102	90-115			
LCS (B9E1574-BS2)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Ammonia, Total (as N)	0.980	0.020	mg/L	1.00		98	90-115			
LCS (B9E1574-BS3)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Ammonia, Total (as N)	1.09	0.020	mg/L	1.00		109	90-115			
LCS (B9E1574-BS4)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Ammonia, Total (as N)	1.05	0.020	mg/L	1.00		105	90-115			
LCS (B9E1574-BS5)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Ammonia, Total (as N)	1.11	0.020	mg/L	1.00		111	90-115			
General Parameters, Batch B9E1608										
Blank (B9E1608-BLK1)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9E1608, Continued										
Blank (B9E1608-BLK1), Continued				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Conductivity (EC)	< 2.0	2.0	µS/cm							
Blank (B9E1608-BLK2)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
Blank (B9E1608-BLK3)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Alkalinity, Total (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Bicarbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L							
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L							
Conductivity (EC)	< 2.0	2.0	µS/cm							
LCS (B9E1608-BS1)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Alkalinity, Total (as CaCO3)	104	1.0	mg/L	100		104	92-106			
LCS (B9E1608-BS2)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Alkalinity, Total (as CaCO3)	105	1.0	mg/L	100		105	92-106			
LCS (B9E1608-BS3)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Alkalinity, Total (as CaCO3)	103	1.0	mg/L	100		103	92-106			
LCS (B9E1608-BS4)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Conductivity (EC)	1390	2.0	µS/cm	1410		99	95-104			
LCS (B9E1608-BS5)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Conductivity (EC)	1380	2.0	µS/cm	1410		98	95-104			
LCS (B9E1608-BS6)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Conductivity (EC)	1400	2.0	µS/cm	1410		99	95-104			
Duplicate (B9E1608-DUP3)	**Source: 9051271-05**			Prepared: 2019-05-21, Analyzed: 2019-05-21						
Alkalinity, Total (as CaCO3)	762	1.0	mg/L		751			1	10	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	
Alkalinity, Bicarbonate (as CaCO3)	762	1.0	mg/L		751			1	10	
Alkalinity, Carbonate (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	1.0	mg/L		< 1.0				10	
Conductivity (EC)	1970	2.0	µS/cm		1970			< 1	5	
pH	7.92	0.10	pH units		7.88			< 1	4	
Reference (B9E1608-SRM1)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
pH	7.00	0.10	pH units	7.01		100	98-102			
Reference (B9E1608-SRM2)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
pH	6.99	0.10	pH units	7.01		100	98-102			
Reference (B9E1608-SRM3)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
pH	7.00	0.10	pH units	7.01		100	98-102			

General Parameters, Batch B9E1612

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B9E1612, Continued										
Blank (B9E1612-BLK1)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Chemical Oxygen Demand	< 20	20	mg/L							
LCS (B9E1612-BS1)				Prepared: 2019-05-21, Analyzed: 2019-05-21						
Chemical Oxygen Demand	514	20	mg/L	500		103	89-115			
Polycyclic Aromatic Hydrocarbons (PAH), Batch B9E1405										
Blank (B9E1405-BLK1)				Prepared: 2019-05-16, Analyzed: 2019-05-17						
Acenaphthene	< 0.050	0.050	µg/L							
Acenaphthylene	< 0.200	0.200	µg/L							
Acridine	< 0.050	0.050	µg/L							
Anthracene	< 0.010	0.010	µg/L							
Benz(a)anthracene	< 0.010	0.010	µg/L							
Benzo(a)pyrene	< 0.010	0.010	µg/L							
Benzo(b+j)fluoranthene	< 0.050	0.050	µg/L							
Benzo(g,h,i)perylene	< 0.050	0.050	µg/L							
Benzo(k)fluoranthene	< 0.050	0.050	µg/L							
2-Chloronaphthalene	< 0.100	0.100	µg/L							
Chrysene	< 0.050	0.050	µg/L							
Dibenz(a,h)anthracene	< 0.010	0.010	µg/L							
Fluoranthene	< 0.030	0.030	µg/L							
Fluorene	< 0.050	0.050	µg/L							
Indeno(1,2,3-cd)pyrene	< 0.050	0.050	µg/L							
1-Methylnaphthalene	< 0.100	0.100	µg/L							
2-Methylnaphthalene	< 0.100	0.100	µg/L							
Naphthalene	< 0.200	0.200	µg/L							
Phenanthrene	< 0.100	0.100	µg/L							
Pyrene	< 0.020	0.020	µg/L							
Quinoline	< 0.050	0.050	µg/L							
Surrogate: Acridine-d9	*2.92*		*µg/L*	4.38		*67*	*50-140*			
Surrogate: Naphthalene-d8	*4.69*		*µg/L*	4.47		*105*	*50-140*			
Surrogate: Perylene-d12	*4.46*		*µg/L*	4.47		*100*	*50-140*			
LCS (B9E1405-BS1)				Prepared: 2019-05-16, Analyzed: 2019-05-17						
Acenaphthene	4.01	0.050	µg/L	4.40		91	58-125			
Acenaphthylene	4.15	0.200	µg/L	4.40		94	54-128			
Acridine	3.76	0.050	µg/L	4.44		85	50-112			
Anthracene	4.19	0.010	µg/L	4.44		94	66-125			
Benz(a)anthracene	4.29	0.010	µg/L	4.44		96	59-123			
Benzo(a)pyrene	4.16	0.010	µg/L	4.40		95	62-116			
Benzo(b+j)fluoranthene	7.69	0.050	µg/L	8.89		86	69-121			
Benzo(g,h,i)perylene	4.21	0.050	µg/L	4.40		96	58-129			
Benzo(k)fluoranthene	4.30	0.050	µg/L	4.44		97	67-128			
2-Chloronaphthalene	3.62	0.100	µg/L	4.44		81	50-140			
Chrysene	4.17	0.050	µg/L	4.42		94	58-125			
Dibenz(a,h)anthracene	4.07	0.010	µg/L	4.42		92	58-126			
Fluoranthene	4.56	0.030	µg/L	4.36		105	67-133			
Fluorene	4.06	0.050	µg/L	4.40		92	55-122			
Indeno(1,2,3-cd)pyrene	4.26	0.050	µg/L	4.44		96	62-126			
1-Methylnaphthalene	3.72	0.100	µg/L	4.38		85	53-125			
2-Methylnaphthalene	3.73	0.100	µg/L	4.36		86	52-122			
Naphthalene	3.67	0.200	µg/L	4.44		83	50-130			
Phenanthrene	4.41	0.100	µg/L	4.40		100	67-127			
Pyrene	4.47	0.020	µg/L	4.44		101	68-133			
Quinoline	5.82	0.050	µg/L	4.44		131	51-140			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Polycyclic Aromatic Hydrocarbons (PAH), Batch B9E1405, Continued										
LCS (B9E1405-BS1), Continued				Prepared: 2019-05-16, Analyzed: 2019-05-17						
Surrogate: Acridine-d9	*2.65*		*µg/L*	4.38		*61*	*50-140*			
Surrogate: Naphthalene-d8	*3.63*		*µg/L*	4.47		*81*	*50-140*			
Surrogate: Perylene-d12	*3.91*		*µg/L*	4.47		*87*	*50-140*			
LCS Dup (B9E1405-BSD1)				Prepared: 2019-05-16, Analyzed: 2019-05-17						
Acenaphthene	4.38	0.050	µg/L	4.40		99	58-125	9	16	
Acenaphthylene	4.56	0.200	µg/L	4.40		104	54-128	9	16	
Acridine	3.83	0.050	µg/L	4.44		86	50-112	2	26	
Anthracene	4.52	0.010	µg/L	4.44		102	66-125	8	14	
Benz(a)anthracene	4.65	0.010	µg/L	4.44		105	59-123	8	23	
Benzo(a)pyrene	4.48	0.010	µg/L	4.40		102	62-116	8	16	
Benzo(b+j)fluoranthene	8.28	0.050	µg/L	8.89		93	69-121	7	14	
Benzo(g,h,i)perylene	4.57	0.050	µg/L	4.40		104	58-129	8	25	
Benzo(k)fluoranthene	4.67	0.050	µg/L	4.44		105	67-128	8	18	
2-Chloronaphthalene	4.00	0.100	µg/L	4.44		90	50-140	10	30	
Chrysene	4.52	0.050	µg/L	4.42		102	58-125	8	24	
Dibenz(a,h)anthracene	4.41	0.010	µg/L	4.42		100	58-126	8	23	
Fluoranthene	4.97	0.030	µg/L	4.36		114	67-133	8	18	
Fluorene	4.38	0.050	µg/L	4.40		100	55-122	8	16	
Indeno(1,2,3-cd)pyrene	4.62	0.050	µg/L	4.44		104	62-126	8	22	
1-Methylnaphthalene	4.18	0.100	µg/L	4.38		96	53-125	12	16	
2-Methylnaphthalene	4.22	0.100	µg/L	4.36		97	52-122	12	17	
Naphthalene	4.28	0.200	µg/L	4.44		96	50-130	15	18	
Phenanthrene	4.78	0.100	µg/L	4.40		109	67-127	8	14	
Pyrene	4.90	0.020	µg/L	4.44		110	68-133	9	18	
Quinoline	5.83	0.050	µg/L	4.44		131	51-140	< 1	12	
Surrogate: Acridine-d9	*2.64*		*µg/L*	4.38		*60*	*50-140*			
Surrogate: Naphthalene-d8	*4.13*		*µg/L*	4.47		*93*	*50-140*			
Surrogate: Perylene-d12	*4.22*		*µg/L*	4.47		*95*	*50-140*			
Volatile Organic Compounds (VOC), Batch B9E1496										
Blank (B9E1496-BLK1)				Prepared: 2019-05-18, Analyzed: 2019-05-18						
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							
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							

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Volatile Organic Compounds (VOC), Batch B9E1496, Continued										
Blank (B9E1496-BLK1), Continued				Prepared: 2019-05-18, Analyzed: 2019-05-18						
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	*20.0*		*µg/L*	26.2		*76*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*15.8*		*µg/L*	25.0		*63*	*70-130*			*S02*
Surrogate: 1,4-Dichlorobenzene-d4	*17.0*		*µg/L*	25.0		*68*	*70-130*			*S02*
LCS (B9E1496-BS1)				Prepared: 2019-05-18, Analyzed: 2019-05-18						
Benzene	20.5	0.5	µg/L	20.1		102	70-130			
Bromodichloromethane	20.6	1.0	µg/L	20.2		102	70-130			
Bromoform	23.7	1.0	µg/L	20.1		118	70-130			
Carbon tetrachloride	18.4	0.5	µg/L	20.1		92	70-130			
Chlorobenzene	22.2	1.0	µg/L	20.2		110	70-130			
Chloroethane	16.2	2.0	µg/L	20.0		81	60-140			
Chloroform	20.7	1.0	µg/L	20.1		103	70-130			
Dibromochloromethane	22.5	1.0	µg/L	20.2		111	70-130			
1,2-Dibromoethane	22.5	0.3	µg/L	20.1		112	70-130			
Dibromomethane	23.3	1.0	µg/L	20.1		116	70-130			
1,2-Dichlorobenzene	22.7	0.5	µg/L	20.1		113	70-130			
1,3-Dichlorobenzene	21.5	1.0	µg/L	20.1		107	70-130			
1,4-Dichlorobenzene	21.4	1.0	µg/L	20.1		107	70-130			
1,1-Dichloroethane	20.3	1.0	µg/L	20.1		101	70-130			
1,2-Dichloroethane	20.7	1.0	µg/L	20.1		103	70-130			
1,1-Dichloroethylene	16.0	1.0	µg/L	20.1		79	70-130			
cis-1,2-Dichloroethylene	20.0	1.0	µg/L	20.1		99	70-130			
trans-1,2-Dichloroethylene	18.8	1.0	µg/L	20.1		94	70-130			
Dichloromethane	19.5	3.0	µg/L	20.1		97	70-130			
1,2-Dichloropropane	20.2	1.0	µg/L	20.2		100	70-130			
1,3-Dichloropropene (cis + trans)	43.1	1.0	µg/L	40.0		108	70-130			
Ethylbenzene	20.3	1.0	µg/L	20.1		101	70-130			
Methyl tert-butyl ether	19.1	1.0	µg/L	20.0		95	70-130			
Styrene	22.9	1.0	µg/L	20.1		114	70-130			
1,1,2,2-Tetrachloroethane	19.0	0.5	µg/L	20.2		94	70-130			
Tetrachloroethylene	23.0	1.0	µg/L	20.1		114	70-130			
Toluene	22.2	1.0	µg/L	20.1		110	70-130			
1,1,1-Trichloroethane	19.8	1.0	µg/L	20.2		98	70-130			
1,1,2-Trichloroethane	22.7	1.0	µg/L	20.1		113	70-130			
Trichloroethylene	23.0	1.0	µg/L	20.1		114	70-130			
Trichlorofluoromethane	18.3	1.0	µg/L	20.0		91	60-140			
Vinyl chloride	17.6	1.0	µg/L	20.0		88	60-140			
Xylenes (total)	58.3	2.0	µg/L	60.1		97	70-130			
Surrogate: Toluene-d8	*25.7*		*µg/L*	26.2		*98*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*22.5*		*µg/L*	25.0		*90*	*70-130*			
Surrogate: 1,4-Dichlorobenzene-d4	*25.2*		*µg/L*	25.0		*101*	*70-130*			
Matrix Spike (B9E1496-MS1)	**Source: 9051271-02**			Prepared: 2019-05-18, Analyzed: 2019-05-18						
Benzene	21.8	0.5	µg/L	20.1	< 0.5	107	70-130			
Bromodichloromethane	22.5	1.0	µg/L	20.2	< 1.0	112	70-130			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Regional District of Central Okanagan	**WORK ORDER**	9051271
PROJECT	Westside Landfill	**REPORTED**	2019-05-22 16:26

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Volatile Organic Compounds (VOC), Batch B9E1496, Continued										
Matrix Spike (B9E1496-MS1), Continued	**Source: 9051271-02**			Prepared: 2019-05-18, Analyzed: 2019-05-18						
Bromoform	26.0	1.0	µg/L	20.1	< 1.0	129	70-130			
Carbon tetrachloride	19.3	0.5	µg/L	20.1	< 0.5	96	70-130			
Chlorobenzene	23.3	1.0	µg/L	20.2	< 1.0	113	70-130			
Chloroethane	17.4	2.0	µg/L	20.0	< 2.0	85	60-140			
Chloroform	22.3	1.0	µg/L	20.1	< 1.0	111	70-130			
Dibromochloromethane	24.1	1.0	µg/L	20.2	< 1.0	119	70-130			
1,2-Dibromoethane	23.2	0.3	µg/L	20.1	< 0.3	116	70-130			
Dibromomethane	25.0	1.0	µg/L	20.1	< 1.0	124	70-130			
1,2-Dichlorobenzene	27.2	0.5	µg/L	20.1	< 0.5	135	70-130			SPK
1,3-Dichlorobenzene	24.0	1.0	µg/L	20.1	< 1.0	115	70-130			
1,4-Dichlorobenzene	25.5	1.0	µg/L	20.1	< 1.0	123	70-130			
1,1-Dichloroethane	22.1	1.0	µg/L	20.1	< 1.0	109	70-130			
1,2-Dichloroethane	22.2	1.0	µg/L	20.1	< 1.0	111	70-130			
1,1-Dichloroethylene	16.6	1.0	µg/L	20.1	< 1.0	83	70-130			
cis-1,2-Dichloroethylene	21.9	1.0	µg/L	20.1	< 1.0	108	70-130			
trans-1,2-Dichloroethylene	19.8	1.0	µg/L	20.1	< 1.0	99	70-130			
Dichloromethane	22.0	3.0	µg/L	20.1	< 3.0	107	70-130			
1,2-Dichloropropane	21.4	1.0	µg/L	20.2	< 1.0	106	70-130			
1,3-Dichloropropene (cis + trans)	44.4	1.0	µg/L	40.0	< 1.0	111	70-130			
Ethylbenzene	19.8	1.0	µg/L	20.1	< 1.0	98	70-130			
Methyl tert-butyl ether	19.1	1.0	µg/L	20.0	< 1.0	94	70-130			
Styrene	23.5	1.0	µg/L	20.1	< 1.0	117	70-130			
1,1,2,2-Tetrachloroethane	139	0.5	µg/L	20.2	< 0.5	688	70-130			MS2
Tetrachloroethylene	13.3	1.0	µg/L	20.1	< 1.0	66	70-130			SPK1
Toluene	21.6	1.0	µg/L	20.1	< 1.0	106	70-130			
1,1,1-Trichloroethane	20.5	1.0	µg/L	20.2	< 1.0	101	70-130			
1,1,2-Trichloroethane	24.5	1.0	µg/L	20.1	< 1.0	122	70-130			
Trichloroethylene	17.3	1.0	µg/L	20.1	< 1.0	86	70-130			
Trichlorofluoromethane	19.2	1.0	µg/L	20.0	< 1.0	96	60-140			
Vinyl chloride	18.6	1.0	µg/L	20.0	< 1.0	92	60-140			
Xylenes (total)	57.8	2.0	µg/L	60.1	< 2.0	96	70-130			
Surrogate: Toluene-d8	*24.8*		*µg/L*	26.2		*95*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*24.0*		*µg/L*	25.0		*96*	*70-130*			
Surrogate: 1,4-Dichlorobenzene-d4	*28.4*		*µg/L*	25.0		*114*	*70-130*			

QC Qualifiers:

MS2	The native sample concentration is greater than the spike concentration, hence the matrix spike limits do not apply.
S02	Surrogate recovery outside of control limits. Data accepted based on acceptable recovery of other surrogates.
SPK	The recovery of this analyte was outside of established control limits.
SPK1	The recovery of this analyte was outside of established control limits. The data was accepted based on performance of other batch QC.

CARO ANALYTICAL SERVICES (WATERLOO)
ATTN: SUBLET
#102 3677 Highway 97N
Kelowna BC V1X 5C3

Date Received: 16-MAY-19
Report Date: 22-MAY-19 14:25 (MT)
Version: FINAL

Client Phone: 250-765-9646

Certificate of Analysis

Lab Work Order #: L2274269
Project P.O. #: NOT SUBMITTED
Job Reference: WO# 9051271
C of C Numbers:
Legal Site Desc:

Ylynne Rosales
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2274269-1 9051271-02 Sampled By: CLIENT on 14-MAY-19 @ 10:20 Matrix: WATER							
Semi-Volatile Organics							
Acenaphthene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Acenaphthylene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Anthracene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Benzo(a)anthracene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Benzo(a)pyrene	<0.050		0.050	ug/L	16-MAY-19	21-MAY-19	R4639367
Benzo(b)fluoranthene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Benzo(ghi)perylene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Benzo(k)fluoranthene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Biphenyl	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
4-Bromophenyl phenyl ether	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Butylbenzyl phthalate	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Camphene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
4-Chloro-3-methylphenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
4-Chloroaniline	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Bis(2-chloroethoxy)methane	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Bis(2-chloroethyl)ether	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Bis(2-chloroisopropyl)ether	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
1-Chloronaphthalene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2-Chloronaphthalene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2-Chlorophenol	<0.30		0.30	ug/L	16-MAY-19	21-MAY-19	R4639367
4-Chlorophenyl phenyl ether	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Chrysene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
3&4-Methylphenol	0.76		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Cresols (total)	1.7		1.0	ug/L		21-MAY-19	
Dibenzo(a,h)anthracene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Dibenzofuran	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
1,2-Dichlorobenzene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
1,3-Dichlorobenzene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
1,4-Dichlorobenzene	0.77		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
3,3'-Dichlorobenzidine	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4-Dichlorophenol	<0.30		0.30	ug/L	16-MAY-19	21-MAY-19	R4639367
2,6-Dichlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Diethylphthalate	0.48		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Dimethylphthalate	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4-Dimethylphenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Di-n-butylphthalate	<1.0		1.0	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4-Dinitrophenol	<1.0		1.0	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4-Dinitrotoluene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2,6-Dinitrotoluene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Di-n-octylphthalate	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Diphenyl ether	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2274269-1 9051271-02 Sampled By: CLIENT on 14-MAY-19 @ 10:20 Matrix: WATER							
Semi-Volatile Organics							
Diphenylamine	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Bis(2-ethylhexyl)phthalate	<1.0		1.0	ug/L	16-MAY-19	21-MAY-19	R4639367
Fluoranthene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Fluorene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Hexachlorobenzene	<0.040		0.040	ug/L	16-MAY-19	21-MAY-19	R4639367
Hexachlorobutadiene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Hexachlorocyclopentadiene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Hexachloroethane	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Indeno(1,2,3-cd)pyrene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Indole	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Isophorone	<0.80	DLM	0.80	ug/L	16-MAY-19	21-MAY-19	R4639367
4,6-Dinitro-2-methylphenol	<2.0		2.0	ug/L	16-MAY-19	21-MAY-19	R4639367
1-Methylnaphthalene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2-Methylnaphthalene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2-Methylphenol	0.92		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Naphthalene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
5-Nitroacenaphthene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Nitrobenzene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2-Nitrophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
4-Nitrophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
N-Nitroso-di-n-propylamine	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Pentachlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Perylene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Phenanthrene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Phenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Pyrene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
2,3,4,5-Tetrachlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
2,3,4,6-Tetrachlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
2,3,5,6-Tetrachlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
1,2,3-Trichlorobenzene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
1,2,4-Trichlorobenzene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2,3,4-Trichlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
2,3,5-Trichlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4,5-Trichlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4,6-Trichlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Surrogate: 2-Fluorobiphenyl	98.4		40-130	%	16-MAY-19	21-MAY-19	R4639367
Surrogate: Nitrobenzene d5	98.4		40-130	%	16-MAY-19	21-MAY-19	R4639367
Surrogate: Phenol d5	51.4		30-130	%	16-MAY-19	21-MAY-19	R4639367
Surrogate: p-Terphenyl d14	96.2		40-130	%	16-MAY-19	21-MAY-19	R4639367
Surrogate: 2,4,6-Tribromophenol	114.0		40-130	%	16-MAY-19	21-MAY-19	R4639367
L2274269-2 9051271-05							

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2274269-2 9051271-05 Sampled By: CLIENT on 14-MAY-19 @ 08:39 Matrix: WATER							
Semi-Volatile Organics							
Acenaphthene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Acenaphthylene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Anthracene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Benzo(a)anthracene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Benzo(a)pyrene	<0.050		0.050	ug/L	16-MAY-19	21-MAY-19	R4639367
Benzo(b)fluoranthene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Benzo(ghi)perylene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Benzo(k)fluoranthene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Biphenyl	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
4-Bromophenyl phenyl ether	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Butylbenzyl phthalate	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Camphene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
4-Chloro-3-methylphenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
4-Chloroaniline	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Bis(2-chloroethoxy)methane	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Bis(2-chloroethyl)ether	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Bis(2-chloroisopropyl)ether	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
1-Chloronaphthalene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2-Chloronaphthalene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2-Chlorophenol	<0.30		0.30	ug/L	16-MAY-19	21-MAY-19	R4639367
4-Chlorophenyl phenyl ether	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Chrysene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
3&4-Methylphenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Cresols (total)	<1.0		1.0	ug/L		21-MAY-19	
Dibenzo(a,h)anthracene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Dibenzofuran	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
1,2-Dichlorobenzene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
1,3-Dichlorobenzene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
1,4-Dichlorobenzene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
3,3'-Dichlorobenzidine	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4-Dichlorophenol	<0.30		0.30	ug/L	16-MAY-19	21-MAY-19	R4639367
2,6-Dichlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Diethylphthalate	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Dimethylphthalate	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4-Dimethylphenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Di-n-butylphthalate	<1.0		1.0	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4-Dinitrophenol	<1.0		1.0	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4-Dinitrotoluene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2,6-Dinitrotoluene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Di-n-octylphthalate	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Diphenyl ether	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2274269-2 9051271-05 Sampled By: CLIENT on 14-MAY-19 @ 08:39 Matrix: WATER							
Semi-Volatile Organics							
Diphenylamine	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Bis(2-ethylhexyl)phthalate	<1.0		1.0	ug/L	16-MAY-19	21-MAY-19	R4639367
Fluoranthene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Fluorene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Hexachlorobenzene	<0.040		0.040	ug/L	16-MAY-19	21-MAY-19	R4639367
Hexachlorobutadiene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Hexachlorocyclopentadiene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Hexachloroethane	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Indeno(1,2,3-cd)pyrene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Indole	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Isophorone	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
4,6-Dinitro-2-methylphenol	<2.0		2.0	ug/L	16-MAY-19	21-MAY-19	R4639367
1-Methylnaphthalene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2-Methylnaphthalene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2-Methylphenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Naphthalene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
5-Nitroacenaphthene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Nitrobenzene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2-Nitrophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
4-Nitrophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
N-Nitroso-di-n-propylamine	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
Pentachlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Perylene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Phenanthrene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
Phenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Pyrene	<0.20		0.20	ug/L	16-MAY-19	21-MAY-19	R4639367
2,3,4,5-Tetrachlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
2,3,4,6-Tetrachlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
2,3,5,6-Tetrachlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
1,2,3-Trichlorobenzene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
1,2,4-Trichlorobenzene	<0.40		0.40	ug/L	16-MAY-19	21-MAY-19	R4639367
2,3,4-Trichlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
2,3,5-Trichlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4,5-Trichlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
2,4,6-Trichlorophenol	<0.50		0.50	ug/L	16-MAY-19	21-MAY-19	R4639367
Surrogate: 2-Fluorobiphenyl	95.0		40-130	%	16-MAY-19	21-MAY-19	R4639367
Surrogate: Nitrobenzene d5	95.2		40-130	%	16-MAY-19	21-MAY-19	R4639367
Surrogate: Phenol d5	54.8		30-130	%	16-MAY-19	21-MAY-19	R4639367
Surrogate: p-Terphenyl d14	102.1		40-130	%	16-MAY-19	21-MAY-19	R4639367
Surrogate: 2,4,6-Tribromophenol	112.5		40-130	%	16-MAY-19	21-MAY-19	R4639367

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

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
625-WT	Water	EPA 8270 Extractables	SW846 8270

Aqueous samples are extracted and extracts are analyzed on GC/MSD. Depending on the analytical GC/MS column used benzo(j)fluoranthene may chromatographically co-elute with benzo(b)fluoranthene or benzo(k)fluoranthene.

N-nitrosodiphenylamine is reported as diphenylamine. N-nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine. (EPA 8270D)

CRESOL-SUM-CALC-WT	Water	Total Cresols	CALCULATION

Total cresols represents the sum of o-cresol and m&p-cresol.

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

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

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

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2274269 Report Date: 22-MAY-19

Client: CARO ANALYTICAL SERVICES (WATERLOO)
#102 3677 Highway 97N
Kelowna BC V1X 5C3

Contact: SUBLET

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-WT	Water							
Batch R4639367								
WG3051566-2 LCS								
1-Chloronaphthalene			97.4		%		50-140	21-MAY-19
1-Methylnaphthalene			84.5		%		50-140	21-MAY-19
1,2-Dichlorobenzene			66.7		%		40-130	21-MAY-19
1,2,3-Trichlorobenzene			73.4		%		40-130	21-MAY-19
1,2,4-Trichlorobenzene			67.5		%		50-130	21-MAY-19
1,3-Dichlorobenzene			60.8		%		50-140	21-MAY-19
1,4-Dichlorobenzene			61.2		%		40-130	21-MAY-19
2-Chloronaphthalene			84.7		%		50-140	21-MAY-19
2-Chlorophenol			98.2		%		65-130	21-MAY-19
2-Methylnaphthalene			81.3		%		50-140	21-MAY-19
2-Methylphenol			88.1		%		50-130	21-MAY-19
2-Nitrophenol			133.9		%		50-140	21-MAY-19
2,3,4-Trichlorophenol			105.4		%		65-130	21-MAY-19
2,3,4,5-Tetrachlorophenol			102.0		%		50-130	21-MAY-19
2,3,4,6-Tetrachlorophenol			108.7		%		65-130	21-MAY-19
2,3,5-Trichlorophenol			107.7		%		65-130	21-MAY-19
2,3,5,6-Tetrachlorophenol			104.7		%		65-130	21-MAY-19
2,4-Dichlorophenol			107.8		%		65-130	21-MAY-19
2,4-Dimethylphenol			98.6		%		30-130	21-MAY-19
2,4-Dinitrophenol			74.7		%		40-140	21-MAY-19
2,4-Dinitrotoluene			112.6		%		50-140	21-MAY-19
2,4,5-Trichlorophenol			106.6		%		65-130	21-MAY-19
2,4,6-Trichlorophenol			106.4		%		65-130	21-MAY-19
2,6-Dichlorophenol			106.4		%		65-130	21-MAY-19
2,6-Dinitrotoluene			108.7		%		50-140	21-MAY-19
3,3'-Dichlorobenzidine			102.0		%		50-140	21-MAY-19
3&4-Methylphenol			87.8		%		50-140	21-MAY-19
4-Bromophenyl phenyl ether			104.1		%		50-140	21-MAY-19
4-Chloro-3-methylphenol			107.0		%		65-130	21-MAY-19
4-Chloroaniline			90.1		%		30-140	21-MAY-19
4-Chlorophenyl phenyl ether			99.2		%		50-140	21-MAY-19
4-Nitrophenol			71.8		%		40-140	21-MAY-19
4,6-Dinitro-2-methylphenol			100.8		%		40-140	21-MAY-19
5-Nitroacenaphthene			123.9		%		50-140	21-MAY-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-WT	Water							
Batch R4639367								
WG3051566-2 LCS								
Acenaphthene			99.7		%		50-140	21-MAY-19
Acenaphthylene			103.3		%		50-140	21-MAY-19
Anthracene			110.1		%		50-140	21-MAY-19
Benzo(a)anthracene			109.1		%		50-140	21-MAY-19
Benzo(a)pyrene			106.5		%		60-130	21-MAY-19
Benzo(b)fluoranthene			108.8		%		50-140	21-MAY-19
Benzo(ghi)perylene			115.7		%		50-140	21-MAY-19
Benzo(k)fluoranthene			106.4		%		50-140	21-MAY-19
Biphenyl			94.2		%		50-140	21-MAY-19
Bis(2-chloroethoxy)methane			110.5		%		50-140	21-MAY-19
Bis(2-chloroethyl)ether			97.4		%		50-140	21-MAY-19
Bis(2-chloroisopropyl)ether			98.4		%		50-140	21-MAY-19
Bis(2-ethylhexyl)phthalate			131.6		%		50-140	21-MAY-19
Butylbenzyl phthalate			125.2		%		50-140	21-MAY-19
Camphene			45.9		%		30-130	21-MAY-19
Chrysene			112.3		%		50-140	21-MAY-19
Di-n-butylphthalate			118.5		%		50-140	21-MAY-19
Di-n-octylphthalate			128.0		%		50-140	21-MAY-19
Dibenzo(a,h)anthracene			117.0		%		50-140	21-MAY-19
Dibenzofuran			101.1		%		50-140	21-MAY-19
Diethylphthalate			113.8		%		50-140	21-MAY-19
Dimethylphthalate			111.0		%		50-140	21-MAY-19
Diphenyl ether			96.3		%		50-140	21-MAY-19
Diphenylamine			106.3		%		50-140	21-MAY-19
Fluoranthene			123.5		%		50-140	21-MAY-19
Fluorene			108.4		%		50-140	21-MAY-19
Hexachlorobenzene			105.5		%		40-130	21-MAY-19
Hexachlorobutadiene			54.9		%		40-130	21-MAY-19
Hexachlorocyclopentadiene			58.4		%		40-130	21-MAY-19
Hexachloroethane			49.5		%		40-130	21-MAY-19
Indeno(1,2,3-cd)pyrene			122.3		%		50-140	21-MAY-19
Indole			105.8		%		50-140	21-MAY-19
Isophorone			118.4		%		50-140	21-MAY-19
N-Nitroso-di-n-propylamine			103.1		%		50-140	21-MAY-19

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-WT	Water							
Batch R4639367								
WG3051566-2 LCS								
Naphthalene			87.6		%		50-140	21-MAY-19
Nitrobenzene			105.0		%		50-140	21-MAY-19
Pentachlorophenol			95.4		%		65-130	21-MAY-19
Perylene			105.9		%		50-140	21-MAY-19
Phenanthrene			110.7		%		50-140	21-MAY-19
Phenol			58.8		%		30-130	21-MAY-19
Pyrene			120.2		%		50-140	21-MAY-19
WG3051566-1 MB								
1-Chloronaphthalene			<0.40		ug/L		0.4	21-MAY-19
1-Methylnaphthalene			<0.40		ug/L		0.4	21-MAY-19
1,2-Dichlorobenzene			<0.40		ug/L		0.4	21-MAY-19
1,2,3-Trichlorobenzene			<0.40		ug/L		0.4	21-MAY-19
1,2,4-Trichlorobenzene			<0.40		ug/L		0.4	21-MAY-19
1,3-Dichlorobenzene			<0.40		ug/L		0.4	21-MAY-19
1,4-Dichlorobenzene			<0.40		ug/L		0.4	21-MAY-19
2-Chloronaphthalene			<0.40		ug/L		0.4	21-MAY-19
2-Chlorophenol			<0.30		ug/L		0.3	21-MAY-19
2-Methylnaphthalene			<0.40		ug/L		0.4	21-MAY-19
2-Methylphenol			<0.50		ug/L		0.5	21-MAY-19
2-Nitrophenol			<0.50		ug/L		0.5	21-MAY-19
2,3,4-Trichlorophenol			<0.50		ug/L		0.5	21-MAY-19
2,3,4,5-Tetrachlorophenol			<0.50		ug/L		0.5	21-MAY-19
2,3,4,6-Tetrachlorophenol			<0.50		ug/L		0.5	21-MAY-19
2,3,5-Trichlorophenol			<0.50		ug/L		0.5	21-MAY-19
2,3,5,6-Tetrachlorophenol			<0.50		ug/L		0.5	21-MAY-19
2,4-Dichlorophenol			<0.30		ug/L		0.3	21-MAY-19
2,4-Dimethylphenol			<0.50		ug/L		0.5	21-MAY-19
2,4-Dinitrophenol			<1.0		ug/L		1	21-MAY-19
2,4-Dinitrotoluene			<0.40		ug/L		0.4	21-MAY-19
2,4,5-Trichlorophenol			<0.50		ug/L		0.5	21-MAY-19
2,4,6-Trichlorophenol			<0.50		ug/L		0.5	21-MAY-19
2,6-Dichlorophenol			<0.50		ug/L		0.5	21-MAY-19
2,6-Dinitrotoluene			<0.40		ug/L		0.4	21-MAY-19
3,3'-Dichlorobenzidine			<0.40		ug/L		0.4	21-MAY-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-WT	Water							
Batch	**R4639367**							
WG3051566-1	**MB**							
3&4-Methylphenol			<0.50		ug/L		0.5	21-MAY-19
4-Bromophenyl phenyl ether			<0.40		ug/L		0.4	21-MAY-19
4-Chloro-3-methylphenol			<0.50		ug/L		0.5	21-MAY-19
4-Chloroaniline			<0.40		ug/L		0.4	21-MAY-19
4-Chlorophenyl phenyl ether			<0.40		ug/L		0.4	21-MAY-19
4-Nitrophenol			<0.50		ug/L		0.5	21-MAY-19
4,6-Dinitro-2-methylphenol			<2.0		ug/L		2	21-MAY-19
5-Nitroacenaphthene			<0.40		ug/L		0.4	21-MAY-19
Acenaphthene			<0.20		ug/L		0.2	21-MAY-19
Acenaphthylene			<0.20		ug/L		0.2	21-MAY-19
Anthracene			<0.20		ug/L		0.2	21-MAY-19
Benzo(a)anthracene			<0.20		ug/L		0.2	21-MAY-19
Benzo(a)pyrene			<0.050		ug/L		0.05	21-MAY-19
Benzo(b)fluoranthene			<0.20		ug/L		0.2	21-MAY-19
Benzo(ghi)perylene			<0.20		ug/L		0.2	21-MAY-19
Benzo(k)fluoranthene			<0.20		ug/L		0.2	21-MAY-19
Biphenyl			<0.40		ug/L		0.4	21-MAY-19
Bis(2-chloroethoxy)methane			<0.40		ug/L		0.4	21-MAY-19
Bis(2-chloroethyl)ether			<0.40		ug/L		0.4	21-MAY-19
Bis(2-chloroisopropyl)ether			<0.40		ug/L		0.4	21-MAY-19
Bis(2-ethylhexyl)phthalate			<1.0		ug/L		1	21-MAY-19
Butylbenzyl phthalate			<0.40		ug/L		0.4	21-MAY-19
Camphene			<0.40		ug/L		0.4	21-MAY-19
Chrysene			<0.20		ug/L		0.2	21-MAY-19
Di-n-butylphthalate			<1.0		ug/L		1	21-MAY-19
Di-n-octylphthalate			<0.40		ug/L		0.4	21-MAY-19
Dibenzo(a,h)anthracene			<0.20		ug/L		0.2	21-MAY-19
Dibenzofuran			<0.20		ug/L		0.2	21-MAY-19
Diethylphthalate			<0.20		ug/L		0.2	21-MAY-19
Dimethylphthalate			<0.20		ug/L		0.2	21-MAY-19
Diphenyl ether			<0.40		ug/L		0.4	21-MAY-19
Diphenylamine			<0.40		ug/L		0.4	21-MAY-19
Fluoranthene			<0.20		ug/L		0.2	21-MAY-19
Fluorene			<0.20		ug/L		0.2	21-MAY-19

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-WT	Water							
Batch R4639367								
WG3051566-1 MB								
Hexachlorobenzene			<0.040		ug/L		0.04	21-MAY-19
Hexachlorobutadiene			<0.20		ug/L		0.2	21-MAY-19
Hexachlorocyclopentadiene			<0.40		ug/L		0.4	21-MAY-19
Hexachloroethane			<0.40		ug/L		0.4	21-MAY-19
Indeno(1,2,3-cd)pyrene			<0.20		ug/L		0.2	21-MAY-19
Indole			<0.40		ug/L		0.4	21-MAY-19
Isophorone			<0.40		ug/L		0.4	21-MAY-19
N-Nitroso-di-n-propylamine			<0.40		ug/L		0.4	21-MAY-19
Naphthalene			<0.20		ug/L		0.2	21-MAY-19
Nitrobenzene			<0.40		ug/L		0.4	21-MAY-19
Pentachlorophenol			<0.50		ug/L		0.5	21-MAY-19
Perylene			<0.20		ug/L		0.2	21-MAY-19
Phenanthrene			<0.20		ug/L		0.2	21-MAY-19
Phenol			<0.50		ug/L		0.5	21-MAY-19
Pyrene			<0.20		ug/L		0.2	21-MAY-19
Surrogate: 2-Fluorobiphenyl			95.2		%		40-130	21-MAY-19
Surrogate: 2,4,6-Tribromophenol			95.4		%		40-130	21-MAY-19
Surrogate: Nitrobenzene d5			101.4		%		40-130	21-MAY-19
Surrogate: p-Terphenyl d14			121.2		%		40-130	21-MAY-19
Surrogate: Phenol d5			52.0		%		30-130	21-MAY-19

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CARO
ANALYTICAL SERVICES

SUBCONTRACT REQUEST (WO# 9051271)

SENDING LABORATORY:

CARO Analytical Services
#102 3677 Highway 97N
Kelowna, BC V1X 5C3
Phone: (250) 765-9646

Contact sublet@caro.ca

RECEIVING LABORATORY:

ALS Environmental - Waterloo
60 Northland Rd #1
Waterloo, ON N2V2B8
Phone: (51) 886-6910

REGULAR TAT

L2274269

Analysis / Method	Expires	Comments
CARO Sample ID: 9051271-02 | Matrix: Water | Sampled: 2019-05-14 10:20		
Container(s) Submitted: I = C29_1 L Glass (PCB/SVOC/Pest) J = C29_1 L Glass (PCB/SVOC/Pest)		
Miscellaneous Subcontracted Analysis [N/A]	2019-06-11	625-511-WT
CARO Sample ID: 9051271-05 | Matrix: Water | Sampled: 2019-05-14 08:39		
Container(s) Submitted: I = C29_1 L Glass (PCB/SVOC/Pest) J = C29_1 L Glass (PCB/SVOC/Pest)		
Miscellaneous Subcontracted Analysis [N/A]	2019-06-11	625-511-WT

DW 5/15/19
Released By Date

May 16/2019 9:00
Received By Date

9.2°C

L2274269-COFC

REGIONAL DISTRICT OF CENTRAL OKANAGAN
ATTN: Angela Lambrecht
1450 KLO Road
Kelowna BC V1W 3Z4

Date Received: 20-NOV-19
Report Date: 27-NOV-19 17:50 (MT)
Version: FINAL

Client Phone: 250-469-6124

Certificate of Analysis

Lab Work Order #: L2384937

Project P.O. #: 60247
Job Reference: WESTSIDE LANDFILL PROJECT # 1417953
C of C Numbers:
Legal Site Desc:

Hilary Woods
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2384937-1	L2384937-2	L2384937-3	L2384937-4	L2384937-5
Description	Grab	Grab	Grab	Grab	Grab
Sampled Date	19-NOV-19	19-NOV-19	19-NOV-19	19-NOV-19	19-NOV-19
Sampled Time	10:10	10:28	09:38	08:30	08:55
Client ID	BH A	BH 1	BH 2	BH 3	BH 4
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	1120	943	3010	1060	1920
Hardness (as CaCO3) (mg/L)	470	348	1710	435	869
pH (pH)	7.76	7.47	7.10	7.76	7.63
Total Dissolved Solids (mg/L)	625	584	2090	635	1120
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	481	301	1570	407	685
Ammonia, Total (as N) (mg/L)	0.0058	0.110	0.395	<0.0050	<0.0050
Chloride (Cl) (mg/L)	75.0	88.0	220	84.9	230
Nitrate (as N) (mg/L)	3.36	1.23	<0.050 DLDS	2.78	2.57
Sulfate (SO4) (mg/L)	36.8	69.0	87.4	46.7	94.8
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0017	0.0024	0.0240	<0.0010	0.0014
Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00034	<0.00020 DLA	<0.00010	<0.00010
Arsenic (As)-Dissolved (mg/L)	0.00192	0.00144	0.00635	0.00143	0.00042
Barium (Ba)-Dissolved (mg/L)	0.0199	0.0209	0.0110	0.0117	0.0400
Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00020 DLA	<0.00010	<0.00010
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.00010 DLA	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	0.053	0.371	0.462	0.099	0.423
Cadmium (Cd)-Dissolved (mg/L)	0.000112	0.0000501	<0.000010 DLA	0.0000178	0.0000604
Calcium (Ca)-Dissolved (mg/L)	118	93.4	359	114	165
Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	0.000085	<0.000010	0.000015
Chromium (Cr)-Dissolved (mg/L)	0.00021	0.00335	0.00170	0.00070	0.00024
Cobalt (Co)-Dissolved (mg/L)	0.00086	0.00061	0.00239	0.00013	0.00142
Copper (Cu)-Dissolved (mg/L)	0.00200	0.00611	0.00042	0.00089	0.00170
Iron (Fe)-Dissolved (mg/L)	0.012	0.796	2.09	0.011	<0.010
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.00010 DLA	<0.000050	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.0171	0.0126	0.0219	0.0165	0.0317
Magnesium (Mg)-Dissolved (mg/L)	42.8	27.8	197	36.6	111
Manganese (Mn)-Dissolved (mg/L)	0.400	0.746	8.58	0.00402	0.294
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.00198	0.00128	0.00408	0.00404	0.00595
Nickel (Ni)-Dissolved (mg/L)	0.00476	0.00478	0.0194	0.00149	0.0169
Phosphorus (P)-Dissolved (mg/L)	0.058	0.056	0.15	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)	2.57	8.31	2.60	4.29	5.29
Rubidium (Rb)-Dissolved (mg/L)	<0.00020	0.00069	0.00441	0.00060	0.00166
Selenium (Se)-Dissolved (mg/L)	0.000835	0.000223	0.00026	0.00101	0.000098
Silicon (Si)-Dissolved (mg/L)	14.2	13.4	27.1	12.9	12.2

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2384937-6	L2384937-7	L2384937-8		
	Description	Grab	Grab	Grab		
	Sampled Date	19-NOV-19	19-NOV-19	19-NOV-19		
	Sampled Time	09:15	10:08	10:55		
	Client ID	BH 5	BH 7	MW 99-2		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	961	1080	1390		
	Hardness (as CaCO3) (mg/L)	363	464	708		
	pH (pH)	8.12	7.54	7.74		
	Total Dissolved Solids (mg/L)	579	664	779		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	250	527	622		
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0063	0.0560		
	Chloride (Cl) (mg/L)	131	72.3	132		
	Nitrate (as N) (mg/L)	6.81	3.32	0.309		
	Sulfate (SO4) (mg/L)	31.0	33.9	15.0		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	0.0022	0.0011		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	0.00110	0.00183	0.00015		
	Barium (Ba)-Dissolved (mg/L)	0.0120	0.0193	0.00693		
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	0.038	0.053	0.017		
	Cadmium (Cd)-Dissolved (mg/L)	0.0000107	0.000118	0.0000113		
	Calcium (Ca)-Dissolved (mg/L)	97.4	116	125		
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	0.000183		
	Chromium (Cr)-Dissolved (mg/L)	0.00040	0.00020	0.00014		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00084	0.00036		
	Copper (Cu)-Dissolved (mg/L)	0.00065	0.00194	0.00222		
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.012	0.125		
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000056		
	Lithium (Li)-Dissolved (mg/L)	0.0157	0.0172	0.0411		
	Magnesium (Mg)-Dissolved (mg/L)	29.1	42.3	96.0		
	Manganese (Mn)-Dissolved (mg/L)	0.00268	0.401	0.0420		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	0.00633	0.00197	0.000277		
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00473	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)	2.68	2.53	0.478		
	Rubidium (Rb)-Dissolved (mg/L)	0.00062	<0.00020	0.00108		
	Selenium (Se)-Dissolved (mg/L)	0.000456	0.000749	<0.000050		
	Silicon (Si)-Dissolved (mg/L)	9.87	13.6	7.93		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2384937-1	L2384937-2	L2384937-3	L2384937-4	L2384937-5
Description	Grab	Grab	Grab	Grab	Grab
Sampled Date	19-NOV-19	19-NOV-19	19-NOV-19	19-NOV-19	19-NOV-19
Sampled Time	10:10	10:28	09:38	08:30	08:55
Client ID	BH A	BH 1	BH 2	BH 3	BH 4
Grouping / **Analyte**					
WATER					
Dissolved Metals Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000020 DLA	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	66.1	60.3	136	59.8	94.1
Strontium (Sr)-Dissolved (mg/L)	0.719	0.651	3.37	0.726	1.91
Sulfur (S)-Dissolved (mg/L)	14.3	27.7	39.5	18.8	37.1
Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00040 DLA	<0.00020	0.00025
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000020 DLA	<0.000010	0.000020
Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00020 DLA	<0.00010	<0.00010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00022	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	0.00122	<0.00030	<0.00030
Tungsten (W)-Dissolved (mg/L)	0.00026	<0.00010	<0.00020 DLA	<0.00010	<0.00010
Uranium (U)-Dissolved (mg/L)	0.0104	0.000782	0.00429	0.0101	0.0276
Vanadium (V)-Dissolved (mg/L)	0.0113	0.00172	0.0058	0.00372	0.00297
Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0020 DLA	<0.0010	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	0.00021	0.00036	0.00453	<0.00020	0.00044

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2384937-6	L2384937-7	L2384937-8		
	Description	Grab	Grab	Grab		
	Sampled Date	19-NOV-19	19-NOV-19	19-NOV-19		
	Sampled Time	09:15	10:08	10:55		
	Client ID	BH 5	BH 7	MW 99-2		
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	51.5	64.6	47.7		
	Strontium (Sr)-Dissolved (mg/L)	0.457	0.709	1.80		
	Sulfur (S)-Dissolved (mg/L)	12.5	13.8	6.76		
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Tungsten (W)-Dissolved (mg/L)	0.00033	0.00026	<0.00010		
	Uranium (U)-Dissolved (mg/L)	0.00535	0.0102	0.00662		
	Vanadium (V)-Dissolved (mg/L)	0.00472	0.0111	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0073		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00020	0.00020	0.00031		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2384937-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Boron (B)-Dissolved	MS-B	L2384937-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2384937-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2384937-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2384937-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2384937-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2384937-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2384937-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2384937-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2384937-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2384937-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Nitrate (as N)	MS-B	L2384937-2, -3, -4, -5, -6, -7, -8

Qualifiers for Individual Parameters Listed:

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

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

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

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

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

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

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

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

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

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

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

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

Reference Information

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

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

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

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

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

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

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2384937-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Regional District of Central Okanagan (RDCO)
Contact:	Angela Lambrecht
Phone:	250-718-9387
	Company address below will appear on the final report
Street:	1450 KLO Road
City/Province:	Kelowna, BC
Postal Code:	V1W 3Z4
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Regional District of Central Okanagan (RDCO)
Contact:	AP@CORD.BC.CA

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Angela.Lambrecht @rdco.com
Email 2	Greg.Beloin@rdco.com
Email 3	jacqueline_foley@golder.com

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	AP@CORD.BC.CA
Email 2	

Project Information	
ALS Account # / Quote #:	Q77508
Job #:	Westside Landfill Project # 1417953
PO / AFE:	60247
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact: Carla Fuginski **Sampler:** Angela Lambrec

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	metals in water - dissolved (Field Filtered)*	pH, Conductivity, Alkalinity	TDS	Hardness	chloride, sulfate	ammonia as N, nitrate as N	dissolved calcium and magnesium* (Field Filtered)	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
	BH A	19NOV19	10:10	Grab	R	R	R	R	R	R	R			5
	BH 1	"	10:38	"	R	R	R	R	R	R	R			5
	BH 2	"	9:38	"	R	R	R	R	R	R	R			5
	BH 3	"	8:30	"	R	R	R	R	R	R	R			5
	BH 4	"	8:55	"	R	R	R	R	R	R	R			5
	BH 5	"	9:15	"	R	R	R	R	R	R	R			5
	BH 7	"	10:08	"	R	R	R	R	R	R	R			5
	MW 99-2	"	10:55	"	R	R	R	R	R	R	R			5

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				4C			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	NOV 19/19	11:00				TG	20NOV19	8:30AM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

APPENDIX C

2019 Groundwater and Soil Gas Monitoring Result Tables

TABLE C-1

GROUNDWATER ELEVATIONS, WESTSIDE LANDFILL, WEST KELOWNA, BC

Monitor	Jan	Feb	Mar	Apr	May	Aug	Nov	Dec
BH-1					516.709		516.902	
BH-2					524.293		524.217	
BH-3					458.673		458.328	
BH-4					492.856		492.921	
BH-5					477.899		477.691	
BH-7					496.779		496.34	
MW99-2	541.92	542.01	541.84	542.17	542.095	542.04	541.76	540.965
MW99-3	534.396	534.361	534.406	534.516	534.466	534.316		534.106
MW99-4	531.027	531.047	531.062	531.602	531.662	531.047	530.927	530.932

TABLE C-2
SUMMARY OF SOIL GAS MONITORING RESULTS, WESTSIDE LANDFILL, WEST KELOWNA, BC

Date	Monitor	CH4 (ppm)	CO2 (%)	O2 (%)	CO (ppm)	H2S (ppm)	Notes
2019-01-08	VP12-01	45	2.8	18	0	0	NA
2019-01-08	VP07-14	NA	NA	NA	NA	NA	Water too high to sample
2019-01-08	BH103	100	3.7	17.4	0	0	NA
2019-01-08	VP07-01D	50	1.8	19.7	0	0	NA
2019-01-08	VP07-01S	20	0.7	20.7	0	0	NA
2019-01-08	BH102	3450	31	2.3	0	0	NA
2019-01-08	VP15-01	105	4.2	17.7	0	0	NA
2019-01-08	VP15-02	NA	NA	NA	NA	NA	purge back pressure
2019-01-08	VP15-03	15	0	20.9	0	0	NA
2019-01-08	VP07-02	55	1.9	18.4	0	0	NA
2019-01-08	VP07-15	300	11.2	11	0	0	NA
2019-01-08	BH101S	60	1.8	19	0	0	NA
2019-01-08	BH101D	195	7.3	14.8	0	0	NA
2019-01-08	VP07-03	30	0.5	20.2	0	0	NA
2019-01-08	VP07-16	100	3.3	18.4	0	0	NA
2019-01-08	VP11-09	75	1.5	18.7	0	0	NA
2019-01-08	VP11-10	5	0.5	19.3	0	0	NA
2019-01-08	MW07-1	15	0.4	20	0	0	NA
2019-01-08	VP11-01	45	0.9	19.1	0	0	NA
2019-01-08	VP11-02	0	1.5	19	0	0	NA
2019-01-08	VP07-05	0	2.8	16.9	0	0	NA
2019-01-08	VP07-08	30	0.5	18.7	0	0	NA
2019-01-08	VP07-09	75	0	18	0	0	NA
2019-01-08	VP11-05	155	4.9	15	0	0	NA
2019-01-08	MW99-4	200	6.8	15.8	0	0	NA
2019-01-08	MW99-3	70	1.6	20.6	0	0	NA
2019-01-08	MW99-2	90	2.4	18.8	0	0	NA
2019-01-08	VP11-04	80	1.5	19.2	0	0	NA
2019-01-08	VP11-08	0	0.8	19.8	0	0	NA
2019-01-08	VP11-07	50	1.7	18.9	0	0	NA
2019-01-08	VP11-06	25	0.9	19.6	0	0	NA
2019-02-25	VP12-01	NA	NA	NA	NA	NA	Snow covered, not found
2019-02-25	VP07-14	NA	NA	NA	NA	NA	Snow covered, not found
2019-02-25	BH103	230	5.1	14.5	0	0	NA
2019-02-25	VP07-01D	65	1.3	19.7	0	0	NA
2019-02-25	VP07-01S	40	0.6	20.9	0	0	NA
2019-02-25	BH102	50000	12.7	9.3	0	0	NA
2019-02-25	VP15-01	75	2.3	18.1	0	0	NA
2019-02-25	VP15-02	NA	NA	NA	NA	NA	purge back pressure
2019-02-25	VP15-03	3500	1.6	18.9	0	0	NA
2019-02-25	VP07-02	50	1.9	18.5	0	0	NA
2019-02-25	VP07-15	NA	3.7	17.6	NA	0	NA
2019-02-25	BH101S	230	1.6	18.9	0	0	NA
2019-02-25	BH101D	370	6.3	14.6	0	0	NA
2019-02-25	VP07-03	165	0.3	20.9	0	0	NA
2019-02-25	VP07-16	230	2.2	19	0	0	NA
2019-02-25	VP11-09	230	1.7	18.4	0	0	NA
2019-02-25	VP11-10	15	0.4	20.9	0	0	NA
2019-02-25	MW07-1	20	0.5	20.9	0	0	NA
2019-02-25	VP11-01	25	0.6	20.9	0	0	NA
2019-02-25	VP11-02	35	1	20.1	0	0	NA
2019-02-25	VP07-05	230	1.5	17.9	0	0	NA
2019-02-25	VP07-08	30	0.6	20.3	0	0	NA
2019-02-25	VP07-09	540	0.1	19.2	0	0	NA
2019-02-25	VP11-05	65	1.6	18.8	0	0	NA
2019-02-25	MW99-4	165	4.2	15.8	0	0	NA
2019-02-25	MW99-3	45	1.2	19.4	0	0	NA
2019-02-25	MW99-2	65	1.7	18.5	0	0	NA
2019-02-25	VP11-04	40	1.1	19	0	0	NA
2019-02-26	VP11-08	10	0.1	20.9	0	0	NA
2019-02-26	VP11-07	35	1.2	20.9	0	0	NA
2019-02-26	VP11-06	15	0.6	20.9	0	0	NA
2019-03-13	VP12-01	NA	NA	NA	NA	NA	Snow covered, not found
2019-03-13	VP07-14	NA	NA	NA	NA	NA	Snow covered, not found

SUMMARY OF SOIL GAS MONITORING RESULTS, WESTSIDE LANDFILL, WEST KELOWNA, BC

Date	Monitor	CH4 (ppm)	CO2 (%)	O2 (%)	CO (ppm)	H2S (ppm)	Notes
2019-03-13	BH103	135	3	16	0	0	NA
2019-03-13	VP07-01D	40	1.4	19	0	0	NA
2019-03-13	VP07-01S	70	3	19.7	0	0	NA
2019-03-13	BH102	11000	22	1.2	0	0	NA
2019-03-13	VP15-01	180	3.4	17.3	0	0	NA
2019-03-13	VP15-02	NA	NA	NA	NA	NA	purge back pressure
2019-03-13	VP15-03	30	0	20.9	0	0	NA
2019-03-13	VP07-02	130	1.6	18.8	0	0	NA
2019-03-13	VP07-15	110	3.7	16.9	0	0	NA
2019-03-13	BH101S	20	1.2	20.6	0	0	NA
2019-03-13	BH101D	190	5.4	15.7	0	0	NA
2019-03-13	VP07-03	15	0.3	20.9	0	0	NA
2019-03-13	VP07-16	85	1.8	19.8	0	0	NA
2019-03-13	VP11-09	70	1.6	19.4	0	0	NA
2019-03-15	VP11-10	15	0.3	20.9	0	0	NA
2019-03-15	MW07-1	10	0.4	20.9	0	0	NA
2019-03-15	VP11-01	20	1	20.4	0	0	NA
2019-03-15	VP11-02	40	0.9	20.2	0	0	NA
2019-03-15	VP07-05	10	0.1	20.9	0	0	NA
2019-03-15	VP07-08	20	0.5	20.2	0	0	NA
2019-03-15	VP07-09	980	0	19.9	0	0	NA
2019-03-13	VP11-05	85	1.6	18.8	0	0	NA
2019-03-13	MW99-4	175	3.5	16.9	0	0	NA
2019-03-15	MW99-3	35	1.1	19.5	0	0	NA
2019-03-15	MW99-2	70	1.7	18.7	0	0	NA
2019-03-15	VP11-04	10	1	19.5	0	0	NA
2019-03-15	VP11-08	10	0.7	20.5	0	0	NA
2019-03-15	VP11-07	20	1.2	19.7	0	0	NA
2019-03-15	VP11-06	0	0.5	20.9	0	0	NA
2019-04-15	VP12-01	95	2.7	17.7	0	0	NA
2019-04-15	VP07-14	NA	NA	NA	NA	NA	Water level too high to sample
2019-04-15	BH103	175	5.3	13.5	0	0	NA
2019-04-15	VP07-01D	0	0	20.9	0	0	NA
2019-04-15	VP07-01S	10	0.8	19.9	0	0	NA
2019-04-15	BH102	50000	36.1	0	0	0	NA
2019-04-15	VP15-01	115	4.4	16.5	0	0	NA
2019-04-15	VP15-02	NA	NA	NA	NA	NA	purge back pressure
2019-04-15	VP15-03	390	0	20.9	0	0	NA
2019-04-15	VP07-02	5	0.4	20	0	0	NA
2019-04-15	VP07-15	230	8.1	13	0	0	NA
2019-04-15	BH101S	25	2.9	17.2	0	0	NA
2019-04-15	BH101D	360	10.2	4.5	0	0	NA
2019-04-15	VP07-03	0	0.3	20.9	0	0	NA
2019-04-15	VP07-16	35	1.8	18.8	0	0	NA
2019-04-15	VP11-09	95	2.5	18.1	0	0	NA
2019-04-15	VP11-10	0	0.4	20.8	0	0	NA
2019-04-15	MW07-1	15	1	19.5	0	0	NA
2019-04-15	VP11-01	30	0.9	19.5	0	0	NA
2019-04-15	VP11-02	15	1.7	18.8	0	0	NA
2019-04-15	VP07-05	0	6.1	13.3	0	0	NA
2019-04-15	VP07-08	25	0.8	19.5	0	0	NA
2019-04-15	VP07-09	5	0.1	20	0	0	NA
2019-04-15	VP11-05	0	1.8	18.9	0	0	NA
2019-04-15	MW99-4	75	2.9	18.4	0	0	NA
2019-04-15	MW99-3	10	1.5	18.8	0	0	NA
2019-04-15	MW99-2	120	2	18.1	0	0	NA
2019-04-15	VP11-04	75	1.7	18.4	0	0	NA
2019-04-15	VP11-08	165	5.3	13.7	0	0	NA
2019-04-15	VP11-07	20	1.2	19.8	0	0	NA
2019-04-15	VP11-06	5	0.7	20.6	0	0	NA
2019-05-13	VP12-01	120	1.9	18.4	0	0	NA
2019-05-13	VP07-14	10	2.5	18.2	0	0	NA
2019-05-13	BH103	165	7.9	14	0	0	NA
2019-05-13	VP07-01D	0	1.2	18.6	0	0	NA

SUMMARY OF SOIL GAS MONITORING RESULTS, WESTSIDE LANDFILL, WEST KELOWNA, BC

Date	Monitor	CH4 (ppm)	CO2 (%)	O2 (%)	CO (ppm)	H2S (ppm)	Notes
2019-05-13	VP07-01S	0	0.9	19.7	0	0	NA
2019-05-13	BH102	17000	28.7	0	0	0	NA
2019-05-13	VP15-01	0	2.6	19	0	0	NA
2019-05-13	VP15-02	NA	NA	NA	NA	NA	purge back pressure/No sample
2019-05-13	VP15-03	NA	NA	NA	NA	NA	purge back pressure/No sample
2019-05-13	VP07-02	0	1.8	19.3	0	0	NA
2019-05-13	VP07-15	175	5.2	16.4	0	0	NA
2019-05-13	BH101S	85	2.5	18.6	0	0	NA
2019-05-13	BH101D	0	17.1	1.5	0	0	NA
2019-05-13	VP07-03	0	1.1	20	0	0	NA
2019-05-13	VP07-16	135	3.5	17.1	0	0	NA
2019-05-13	VP11-09	0	1.8	19	0	0	NA
2019-05-13	VP11-10	120	0.2	20.7	0	0	NA
2019-05-13	MW07-1	50	1.6	18.7	0	0	NA
2019-05-13	VP11-01	95	0.9	20	0	0	NA
2019-05-13	VP11-02	35	1.8	18.8	0	0	NA
2019-05-13	VP07-05	250	7.5	14.1	0	0	NA
2019-05-13	VP07-08	10	1.2	19.3	0	0	NA
2019-05-13	VP07-09	20	0.2	20	0	0	NA
2019-05-13	VP11-05	0	1.3	20	0	0	NA
2019-05-13	MW99-4	75	1.9	19	0	0	NA
2019-05-13	MW99-3	15	1.9	17.9	0	0	NA
2019-05-13	MW99-2	75	2.3	18.4	0	0	NA
2019-05-13	VP11-04	30	1.9	18.4	0	0	NA
2019-05-13	VP11-08	200	8.4	11.6	0	0	NA
2019-05-13	VP11-07	0	1.4	19.6	0	0	NA
2019-05-13	VP11-06	10	1	20.2	0	0	NA
2019-05-14	BH-1	NA	NA	NA	NA	NA	NA
2019-05-14	BH-3	NA	NA	NA	NA	NA	NA
2019-05-14	BH-4	NA	NA	NA	NA	NA	NA
2019-05-14	BH-5	NA	NA	NA	NA	NA	NA
2019-05-14	BH-7	NA	NA	NA	NA	NA	NA
2019-05-14	BH-2	NA	NA	NA	NA	NA	Corrected by GB from field notes on October 21, 2017
2019-06-10	BH103	175	4.4	17.9	0	0	NA
2019-06-10	BH102	220	9.7	13.6	0	0	NA
2019-06-10	VP15-01	40	1.8	19.9	0	0	NA
2019-06-10	VP15-02	NA	NA	NA	NA	NA	purge back pressure/No sample
2019-06-10	VP11-09	75	1.4	20.2	0	0	NA
2019-06-10	VP11-08	190	7.3	14.3	0	0	NA
2019-06-10	VP11-07	10	1.6	20	0	0	NA
2019-06-10	VP11-06	0	1.2	20.5	0	0	NA
2019-07-08	BH103	0	3.2	17.4	0	0	NA
2019-07-08	BH102	195	5.5	14.9	0	0	NA
2019-07-08	VP15-01	90	1.8	18.3	0	0	Slight back pressure
2019-07-08	VP15-02	NA	NA	NA	NA	NA	No Sample - purge back pressure - something covering screens
2019-07-08	VP15-03	35	0.2	20.9	0	0	NA
2019-07-08	VP11-09	15	1.3	19.4	0	0	NA
2019-07-08	VP11-08	250	7.7	12.2	0	0	NA
2019-07-08	VP11-07	35	1.3	19.8	0	0	NA
2019-07-08	VP11-06	20	1.1	20	0	0	NA
2019-08-12	VP12-01	0	1.4	19.5	0	0	NA
2019-08-12	VP07-14	120	2.7	18.7	0	0	NA
2019-08-12	BH103	100	1.9	19	0	0	NA
2019-08-12	VP07-01D	60	1.5	19.2	0	0	NA
2019-08-12	VP07-01S	20	0.6	20.3	0	0	NA
2019-08-12	BH102	45	1.8	18.8	0	0	NA
2019-08-12	VP15-01	30	1.2	19.3	0	0	NA
2019-08-12	VP15-02	NA	NA	NA	NA	NA	purge back pressure
2019-08-12	VP15-03	10	0	20.9	0	0	NA
2019-08-12	VP07-02	30	1.4	19.2	0	0	NA
2019-08-12	VP07-15	45	1.9	18.6	0	0	NA
2019-08-12	BH101S	90	3.6	17.5	0	0	NA
2019-08-12	BH101D	450	17.1	8.9	0	0	NA
2019-08-12	VP07-03	15	0.6	19.9	0	0	NA

SUMMARY OF SOIL GAS MONITORING RESULTS, WESTSIDE LANDFILL, WEST KELOWNA, BC

Date	Monitor	CH4 (ppm)	CO2 (%)	O2 (%)	CO (ppm)	H2S (ppm)	Notes
2019-08-12	VP07-16	75	2.4	18	0	0	NA
2019-08-12	VP11-09	0	0.6	19.9	0	0	NA
2019-08-12	VP11-10	15	0.4	20	0	0	NA
2019-08-12	MW07-1	40	1.5	18.8	0	0	NA
2019-08-12	VP11-01	0	0.3	20.3	0	0	NA
2019-08-12	VP11-02	5	1.3	19	0	0	NA
2019-08-12	VP07-05	60	2.5	18	0	0	NA
2019-08-12	VP07-08	0	1.2	19.5	0	0	NA
2019-08-12	VP07-09	10	0.4	17.4	0	0	NA
2019-08-12	VP11-05	145	1.2	19.5	0	0	NA
2019-08-12	MW99-4	40	1.9	18.9	0	0	NA
2019-08-12	MW99-3	10	1.6	19	0	0	NA
2019-08-12	MW99-2	15	1.6	19.6	0	0	NA
2019-08-12	VP11-04	0	1.3	19.4	0	0	NA
2019-08-12	VP11-08	410	9	11.4	0	0	NA
2019-08-12	VP11-07	0	1.3	19.3	0	0	NA
2019-08-12	VP11-06	0	0.8	19.9	0	0	NA
2019-09-11	BH103	0	1.8	18.6	0	0	NA
2019-09-11	BH102	55	1.7	18.2	0	0	NA
2019-09-11	VP15-01	15	1.2	18.9	0	0	NA
2019-09-11	VP15-02	NA	NA	NA	NA	NA	purge back pressure - something covering screens
2019-09-11	VP15-03	0	0	20.5	0	0	NA
2019-09-11	VP11-09	0	0.8	19.3	0	0	NA
2019-09-11	VP11-08	230	5.3	14.2	0	0	NA
2019-09-11	VP11-07	0	1	19.3	0	0	NA
2019-09-11	VP11-06	0	1	19.3	0	0	NA
2019-10-08	BH103	0	1.7	19.2	0	0	NA
2019-10-08	BH102	0	3.3	17.3	0	0	NA
2019-10-08	VP15-01	5	0.3	19.9	0	0	NA
2019-10-08	VP15-02	NA	NA	NA	NA	NA	purge back pressure - something covering screens
2019-10-08	VP15-03	0	0	20.9	0	0	NA
2019-10-08	VP11-09	15	0.8	20	0	0	NA
2019-10-08	VP11-08	130	2.3	17.8	0	0	NA
2019-10-08	VP11-07	40	1.3	19.2	0	0	NA
2019-10-08	VP11-06	0	1.1	19.4	0	0	NA
2019-11-18	VP12-01	0	0.6	20.6	0	0	NA
2019-11-18	VP07-14	65	1.5	19.2	0	0	No water
2019-11-18	BH103	60	1.3	19.2	0	0	NA
2019-11-18	VP07-01D	65	1.4	19.2	0	0	NA
2019-11-18	VP07-01S	10	0.3	20.3	0	0	NA
2019-11-18	BH102	60	1.3	18.9	0	0	NA
2019-11-18	VP15-01	50	2.6	19.5	0	0	No water
2019-11-18	VP15-02	NA	NA	NA	NA	NA	purge back pressure/No sample
2019-11-18	VP15-03	55	0.1	20.9	0	0	No water
2019-11-18	VP07-02	50	1	19.8	0	0	NA
2019-11-18	VP07-15	70	1.5	19.1	0	0	NA
2019-11-18	BH101S	140	3.6	17.3	0	0	NA
2019-11-18	BH101D	65	1.3	19.1	0	0	NA
2019-11-18	VP07-03	50	0.8	19.8	0	0	NA
2019-11-18	VP07-16	100	1.9	18.7	0	0	NA
2019-11-18	VP11-09	50	0.5	20.1	0	0	NA
2019-11-18	VP11-10	0	0.2	20.9	0	0	NA
2019-11-18	MW07-1	20	0.6	20.8	0	0	NA
2019-11-18	VP11-01	0	0.3	20.9	0	0	NA
2019-11-18	VP11-02	25	0.7	19.5	0	0	NA
2019-11-18	VP07-05	25	0.9	20.3	0	0	NA
2019-11-18	VP07-08	15	0.5	20.3	0	0	NA
2019-11-18	VP07-09	90	0.3	15.3	0	0	NA
2019-11-18	VP11-05	95	3.3	17.3	0	0	NA
2019-11-18	MW99-4	115	3.3	16.8	0	0	NA
2019-11-18	MW99-3	25	0.9	19.5	0	0	No water
2019-11-18	MW99-2	50	1.2	19.3	0	0	NA
2019-11-18	VP11-04	25	0.9	19.3	0	0	NA
2019-11-18	VP11-08	40	1.3	19.7	0	0	NA

TABLE C-2
SUMMARY OF SOIL GAS MONITORING RESULTS, WESTSIDE LANDFILL, WEST KELOWNA, BC

Date	Monitor	CH4 (ppm)	CO2 (%)	O2 (%)	CO (ppm)	H2S (ppm)	Notes
2019-11-18	VP11-07	20	1.1	20.1	0	0	NA
2019-11-18	VP11-06	30	0.7	20.6	0	0	NA
2019-11-19	BH-1	NA	NA	NA	NA	NA	Date added by G.Barrett
2019-11-19	BH-2	NA	NA	NA	NA	NA	Date added by G.Barrett
2019-11-19	BH-3	NA	NA	NA	NA	NA	Date added by G.Barrett
2019-11-19	BH-4	NA	NA	NA	NA	NA	Date added by G.Barrett
2019-11-19	BH-5	NA	NA	NA	NA	NA	Date added by G.Barrett
2019-11-19	BH-7	NA	NA	NA	NA	NA	Date added by G.Barrett
2019-11-19	BH-8	NA	NA	NA	NA	NA	Date added by G.Barrett
2019-12-02	VP12-01	0	0.6	20.9	0	0	NA
2019-12-02	VP07-14	40	1.5	19.9	0	0	No water
2019-12-02	BH103	50	1.2	19.3	0	0	NA
2019-12-02	VP07-01D	50	1.1	20.3	0	0	NA
2019-12-02	VP07-01S	20	0.5	20.9	0	0	NA
2019-12-02	BH102	60	1.8	18.9	0	0	NA
2019-12-02	VP15-01	55	1.2	19.9	0	0	No water
2019-12-02	VP15-02	NA	NA	NA	NA	NA	purge back pressure/No sample
2019-12-02	VP15-03	15	0	20.9	0	0	No water
2019-12-02	VP07-02	40	0.9	20.5	0	0	NA
2019-12-02	VP07-15	60	1.7	19.7	0	0	NA
2019-12-02	BH101S	80	2	19	0	0	NA
2019-12-02	BH101D	290	9.8	13.7	0	0	NA
2019-12-02	VP07-03	15	0.4	20.9	0	0	NA
2019-12-02	VP07-16	60	1.9	19.4	0	0	NA
2019-12-02	VP11-09	15	0.5	20.7	0	0	NA
2019-12-02	VP11-10	0	0.2	20.9	0	0	NA
2019-12-02	MW07-1	35	1	20.7	0	0	NA
2019-12-02	VP11-01	20	0.3	20.9	0	0	NA
2019-12-02	VP11-02	50	0.8	20.5	0	0	NA
2019-12-02	VP07-05	0	0.1	20.9	0	0	NA
2019-12-02	VP07-08	25	0.4	20.2	0	0	NA
2019-12-02	VP07-09	55	0.3	17.3	0	0	NA
2019-12-02	VP11-05	105	3.5	18.2	0	0	NA
2019-12-02	MW99-4	170	4	16.3	0	0	NA
2019-12-02	MW99-3	35	0.7	20.9	0	0	NA
2019-12-02	MW99-2	55	1.1	20.9	0	0	NA
2019-12-02	VP11-04	30	0.8	20.7	0	0	NA
2019-12-02	VP11-08	10	0.5	20.9	0	0	NA
2019-12-02	VP11-07	30	1.1	20.2	0	0	NA
2019-12-02	VP11-06	15	0.8	20.7	0	0	NA

APPENDIX D

QA/QC Results, Westside Landfill
West Kelowna, BC

1.0 Methods

The following discussion includes a brief summary of the Quality Assurance and Quality Control (QA/QC) procedures established for the field groundwater sampling program and for review of the data, as well as the QA/QC measures implemented by the analytical laboratory. The Regional District of Central Okanagan was responsible for collection and submission of groundwater samples for analysis, and for following appropriate protocols.

The Quality Assurance (QA) measures established for the field program included:

Submission of blind field duplicate samples for a minimum of 10% of the samples analyzed. A blind field duplicate sample is a second sample from a specific monitoring location that is submitted to the analytical lab without identifying the location to the laboratory.

The relative percent difference (RPD) between field duplicate sample results was used to assess duplicate sample data. The RPD is a measure of the variability between two outcomes from the same procedure or process and is calculated by

$$absolute\left(\frac{(x_1 - x_2)}{average(x_1, x_2)}\right) \times 100$$

where x_1 is the original sample result and x_2 is the blind field duplicate result.

In general, the RPD should not be more than 20% for inorganics in groundwater. If analytical results are within five times the reported analytical detection limit (RADL, or RDL) for the parameter, then calculation of the RPD is not a valid means of assessing laboratory bias.

The following criteria were considered acceptable for laboratory QA/QC samples:

- Analytical blanks should be below the detection limits used for the specific analysis.
- Laboratory duplicates should fall within the Data Quality Objectives set by the laboratory.
- Analytical results for the reference materials or spiked standards should be within the target specified by the laboratory.

Reports from the lab are internally reviewed prior to submission. If internal QA/QC problems are encountered, the field samples and internal QA/QC samples are re-analysed. No samples were re-analysed for this field investigation. The results are included in the analytical laboratory reports, provided in Appendix C.

Paired Groundwater Analysis

A total of two duplicate water samples were collected during the 2019 monitoring program, one for each sampling event, satisfying the requirement of at least 10% duplicate samples. In May, a duplicate sample was collected from MW99-2 and in November, a duplicate sample was collected from BH-7. The RPD was calculated for all results where the average value of the duplicates for a given parameter was greater than or equal to five times the detection limit. Only nitrate (as N) exceeded the recommended 20% RPD limit for the duplicate pair collected in May 2019. Since nitrate (as N) concentrations of both the sample and the duplicate were less than the applicable drinking water standard, no re-sampling is required. The results for the sample and duplicate are presented in Figures D-1 and D-2, for the May and November results, respectively.

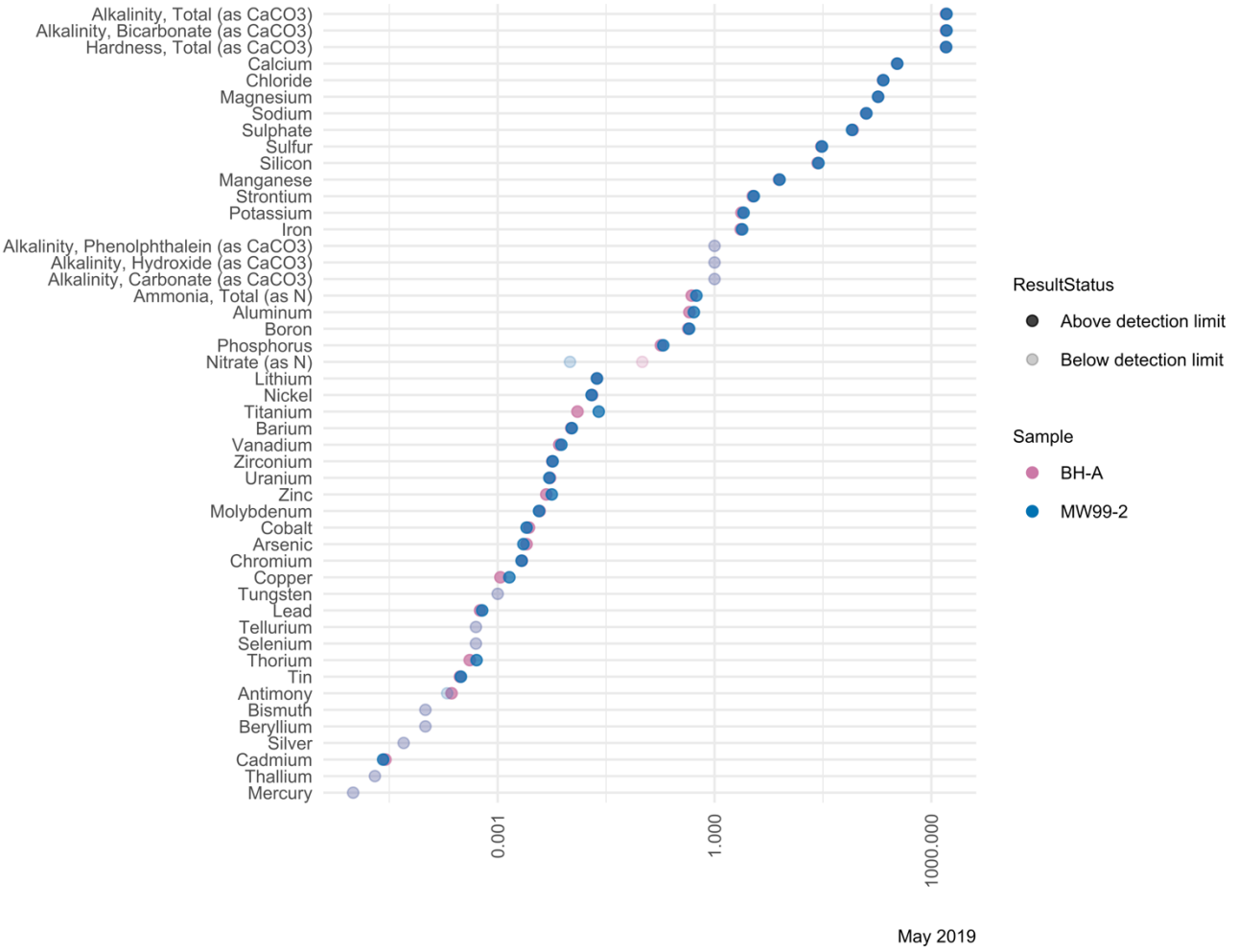


Figure D-1 - May 2019 Results

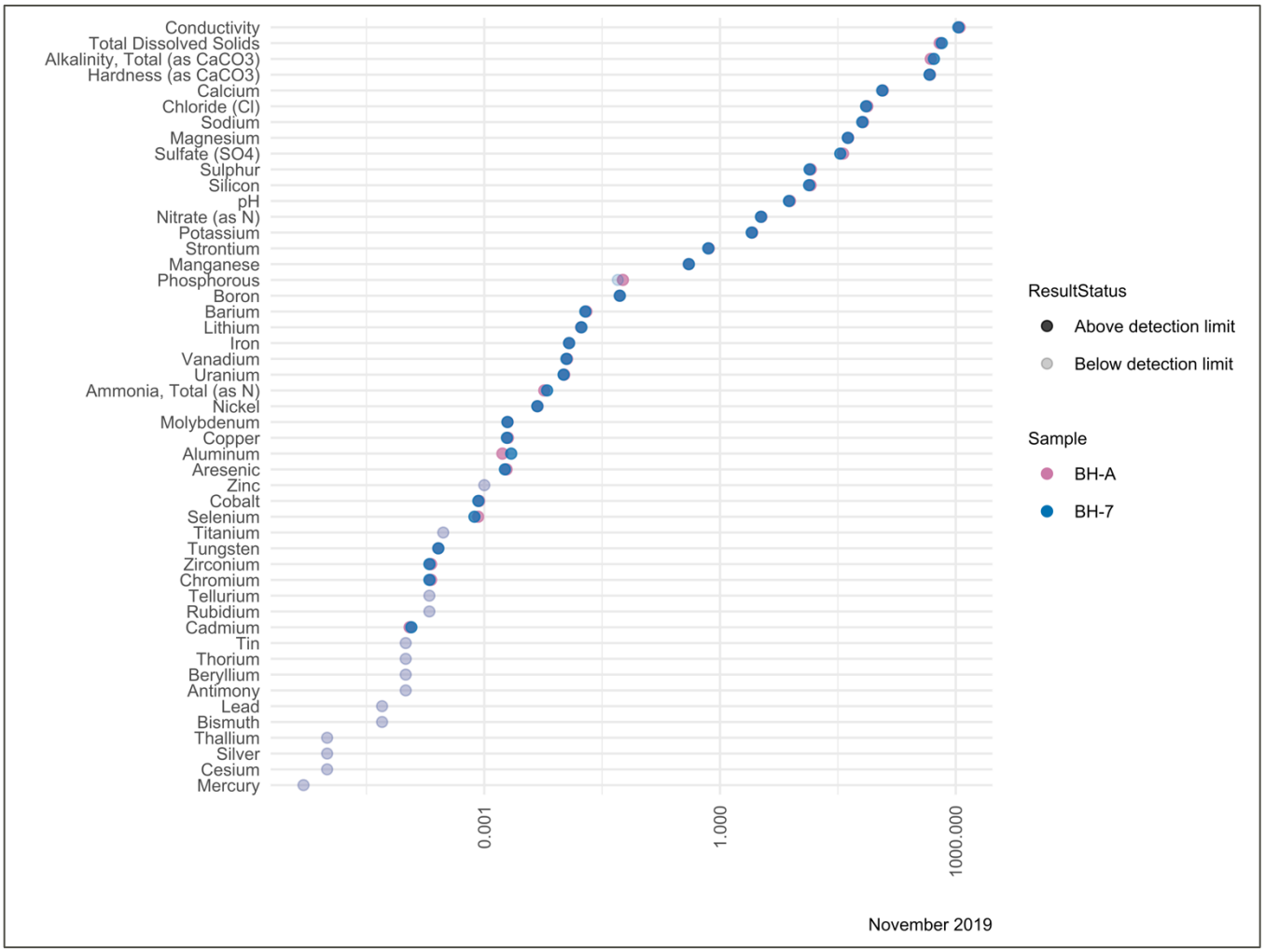


Figure D-2 - November 2019 Results

Laboratory Quality Control

The results of the internal laboratory QC testing are provided in the laboratory reports included in Appendix B.

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