CLOSED OAKVILLE NINTH LINE LANDFILL SITE

2020 SUPPLEMENTAL MONITORING REPORT

REGIONAL MUNICIPALITY OF HALTON

PROJECT NO.: 181-30000-00-106-1005

DATE: DECEMBER 22, 2020

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December 22, 2020

REGIONAL MUNICIPALITY OF HALTON
Public Works – Waste Management & Road Operations
1151 Bronte Road
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Attention: Mr. Andy De Jong, Landfill Technologist

Dear Mr. De Jong:

Subject: Closed Oakville Ninth Line Landfill Site
2020 Supplemental Monitoring Report

We are pleased to forward the 2020 Supplemental Monitoring Report for the Closed Oakville Ninth Line Landfill Site. This report presents the results of a supplemental monitoring program to further assess the potential influence of leachate produced at the landfill site on local groundwater and surface water.

The supplemental monitoring program in 2020 was completed to satisfy the recommendations provided by the Ministry of the Environment, Conservation and Parks (MECP), as outlined in the September 2019 Water Monitoring Action Plan.

It is recommended that the surface water sampling program be continued in 2021 as outlined in the Action Plan. The requirement and/or recommendation for further monitoring at the landfill site will be determined once the results for 2021 have been reviewed and assessed.

Thank you for the opportunity to work on this study. If there are any questions, please contact us.

Yours truly,

Stephen J. Taziar, P.Eng.
Senior Project Engineer

SJT/nah

WSP ref.: 181-30000-00-106-1005

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1 INTRODUCTION

1.1 BACKGROUND

1.1.1 WATER MONITORING ACTION PLAN

As part of the routine management of the Closed Oakville Ninth Line Landfill Site (Site) by the Regional Municipality of Halton, an Environmental Management Plan was prepared in April 2019, with a copy of the report being provided to the Ministry of Environment, Conservation and Parks (MECP). The MECP subsequently provided comments on the report which requested that additional water monitoring be completed at the Site to further assess the potential influence of leachate produced at the Site on local groundwater and surface water. A proposed supplemental monitoring program was outlined in a Water Monitoring Action Plan dated September 25, 2019, which was subsequently approved by the MECP via email on September 26, 2019, with no further comments or recommendations. The supplemental monitoring program in 2020 was completed to satisfy the tasks outlined in the approved Action Plan that were scheduled for 2020.

1.1.2 LOCAL SETTING

The Site is located on the west side of Ninth Line, approximately 1 kilometre south of Dundas Street. See Figure 1, Location Map, for location details. The legal description is Part of Lot 6, Concession 1 SDS, Town of Oakville.

The Site is bounded by the Crusaders Rugby Club to the south and the Ontario Hydro corridor to the north. The western portion of the Site is bounded by Joshua's Creek, as shown in Figure 2. A tributary also discharges to Joshua's Creek near the northwest corner of the Site. This tributary, which receives water from two stormwater ponds located northwest of the Site, discharges to Joshua's Creek on the opposite side of the stream from the refuse area.

The eastern portion of the landfilled area has been converted to a practice field for the Crusaders Rugby Club, as shown in Figure 2. The remaining portion of the landfilled area is vegetated with trees, shrubs, and grasses. The Crusaders Rugby Club area to the south of the Site, which does not contain refuse, currently consists of a rugby playing field (pitch) and a clubhouse.

It appears that the refuse was placed to fill part of the depression between Joshua's Creek and the Ninth Line, thus, the northern and western slopes of the landfill area are steep. The upper part of the landfill, in the area of the rugby practice field, is relatively flat with a slight slope to the west. The thickness of the refuse extends up to 9 metres, based on boreholes 99-1 and 99-2.

The Site, which has a landfilled area of approximately 2.7 ha, predates the current licensing system for landfill sites in Ontario. The landfill does not have an Environmental Compliance Approval (ECA) as operations concluded around 1962-1963, prior to the initialization of the approval system. According to MECP records, the landfill was in operation for approximately six years.

The Town of Oakville continues to own the approximate area of the rugby practice field and Infrastructure Ontario owns the remainder of the Site. The Regional Municipality of Halton is currently responsible for the environmental management of the landfill.

1.2 OBJECTIVES AND SCOPE

The principal objectives of the supplemental monitoring program for the Site were as follows:

- To assess the effects of the closed landfill site on local groundwater and surface water resources.
- To assess the potential user risks.
- To assess the characteristics of the landfill cover.

The program involved a data collection component, collation, and an analysis and interpretation component.

1.3 METHODOLOGY

The supplemental monitoring program for the Site was comprised of several tasks, which are summarized below.

- Review of existing reports.
- Groundwater sampling for chemistry.
- Leachate sampling for chemistry.
- Surface water sampling for chemistry.
- Landfill cover assessment.
- Interpretation and reporting.

A quality assurance and quality control (QA/QC) program was followed for each of the sampling tasks carried out by WSP. The program consisted of protocols and procedures for the purging of monitors, and the collection of groundwater, surface water, and leachate samples.

1.3.1 GROUNDWATER MONITORING

As outlined in the Action Plan for the site, treated and untreated water samples were to be obtained from the Clubhouse, along with a water sample from gas probe GP106, in fall 2019 and fall 2020. These locations are shown in the Site Plan, Figure 2.

The groundwater sampling at gas probe GP106 was completed on October 31, 2019. Sample collection at this location was also attempted on November 3, 2020 but the monitor had insufficient water for sampling. Since the water levels within the monitor are likely influenced by climatic conditions, it is recommended that future sampling of this monitor be attempted during the spring period, when water levels, and recovery times, are more suited to obtaining a sample.

At locations within the Clubhouse, the water well was sampled for treated and un-treated groundwater quality on October 31, 2019 and November 3, 2020. The samples were submitted to Bureau Veritas for analysis of inorganics, volatile organic compounds (VOCs), and metal parameters.

1.3.2 LEACHATE MONITORING

As outlined in the Action Plan for the site, leachate samples were to be obtained from refuse monitors 99-1 and 99-2 in fall 2019 and fall 2020. These monitors are located within the eastern portion of the refuse area within, and adjacent to, the rugby practice field, as shown in Figure 2.

The leachate samples were obtained from monitors 99-1 and 99-2 on October 31, 2019 and November 3, 2020. The samples were submitted to Bureau Veritas for analysis of inorganics, VOCs, and metal parameters.

1.3.3 SURFACE WATER SAMPLING

Stations SW1, SW2, SW4-SW9, SW11, and SW12 are established along the length of Joshua's Creek, adjacent to the landfilled area. Station SW10 is established along the north tributary, prior to the tributary discharging to Joshua's Creek; and station SW3 and SW13 are established along the ditch on the south side of the refuse area. The locations of the stations are shown in Figure 2.

As outlined in the Action Plan for the site, water samples were to be obtained at the surface water stations during the spring, summer, and fall in 2020 and 2021. Water sampling events were completed by WSP on April 24, August 31, and November 11, 2020.

It is noted that select stations were dry, or had insufficient water for sampling, during some events, which included:

- SW3: August, November
- SW10: November
- SW12: August

The samples were collected by placing the sample bottle beneath the water surface. Collected water samples were submitted to Bureau Veritas for analysis of inorganics and metal parameters. Field measurements were also obtained at the stations to determine flow rates.

1.3.4 LANDFILL COVER ASSESSMENT

As outlined in the Action Plan for the Site, a landfill cover assessment was completed in 2020. The assessment included a site inspection on August 5 and a drilling program on August 25. The site inspection was completed to identify potential areas of poor surface water drainage within the refuse area. The drilling program was completed to identify the thickness and type of soil material that is present on top of the refuse. Boreholes were drilled to approximate depths of 1.0 to 2.4 m, and the soils were logged in the field by a WSP field technician. The locations of the stations are shown in Figure 2.

1.3.5 INTERPRETATION AND REPORTING

Following the collation of the landfill database, analysis and interpretation of the data was completed. This component included the following items.

- Water quality compliance assessment
- Landfill cover assessment
- Establish trigger levels for increased monitoring
- Consideration of future monitoring

Results of the supplemental monitoring, with conclusions and recommendations, are presented in this report.

2 PHYSICAL SETTING

2.1 LOCAL GEOLOGY

Based on historical information, the interpreted on-site geological conditions are shown in the Schematic Sections, Figure 3. Sections A and B present the geological conditions along the length of the landfilled area, and a typical section through the central portion of the landfilled area. As shown in the figure, the landfilled area is interpreted to extend to the edge of Joshua's Creek.

The Site is situated on a deposit of low bulk hydraulic conductivity clayey silt till, known as Halton Till. The clayey silt till overlies shale bedrock of the Queenston Formation.

The thickness of the refuse over the clayey silt ranges from about 7 m at monitor 99-2 to 9 m at monitor 99-1. It is expected that the thickness of the refuse decreases in an easterly direction from Monitor 99-2 and in a westerly direction from Monitor 99-1. The depth to the bedrock has not been historically assessed for the Site, however, since bedrock is present within the Joshua's Creek bed, the thickness of the clayey silt unit overlying the bedrock is expected to be in the range of two to three metres.

2.2 SHALLOW GROUNDWATER FLOW

As part of the Action Plan, groundwater levels were obtained at the on-site gas probes during the latter portion of 2019 and through 2020. The levels are shown in Table A-5 and the hydrographs are presented in Figures A-1 to A-4, Appendix A. As shown in the figure, water levels are relatively comparable for the short term, through 2019 and 2020, with some seasonal variation, which is not unexpected. It is noted that water levels were not obtained at select locations in December 2019 due to frozen conditions.

An interpretation of the shallow groundwater configuration, based on the water level data for May 2020, is presented in Figure 2. The shallow groundwater table, which is a reflection of the local topography, slopes towards the west and towards Joshua's Creek. It is noted that, within the western portion of the refuse area, there appears to be a groundwater divide along the crown of the refuse area, which is a reflection of the topography. The shallow groundwater data suggests that the ditch located along the south edge of the refuse (south ditch), where the surrounding topography is generally lower, may serve as a slight hydraulic boundary for groundwater flow from the refuse area; although the overall groundwater flow is expected to be westerly, towards Joshua's Creek. The rate of groundwater movement through the refuse is estimated to be in the range of 0.9 m/a to 1.7 m/a, based on horizontal gradients of 0.017 and 0.033, respectively, a porosity of 0.3, and a hydraulic conductivity of $5x10^{-7}$ m/s. The till, which has a lower hydraulic conductivity than the refuse, acts as a relative barrier to the downward flow. Due to this difference in the hydraulic conductivity, it is expected that the shallow groundwater flow through the Site will discharge along the base of the slope and into Joshua's Creek, particularly during periods of higher groundwater levels.

The Region currently completes a spring inspection at this site on an annual basis, which includes the identification of potential seeps at the site. The inspections occur during the spring to permit easier identification of seeps while the vegetative growth is minimal, and when the wetter seasonal conditions are more likely to promote the occurrence of seeps. The Region intends to continue this protocol in the future.

2.3 SURFACE WATER FLOW SYSTEM

Joshua's Creek is situated around the western portion of the Site, as shown in Figure 2. A drainage ditch is located along the south boundary of the Site, just north of the pipeline easement. This drainage ditch

slopes toward the west and discharges surface runoff to Joshua's Creek. On the north side of the Site, surface drainage is also to the west, towards Joshua's Creek. A tributary also discharges to Joshua's Creek near the northwest corner of the Site. This tributary, which receives water from two stormwater ponds located northwest of the Site, discharges to Joshua's Creek on the opposite side of the stream from the refuse area. The location of the surface water monitoring stations used for this study are shown in Figure 2.

A summary of the surface water flow rates is presented in Table B-2, in Appendix B. As shown in the table, the flows during the April sampling event were higher compared to the flows exhibited during the summer and fall events. It is noted that several of the surface water stations exhibited no measurable flow, or were ponded, during the August and November events, although water samples were still obtained at these locations.

It is noted that, during the spring inspection of the Site in 2020, an area of erosion was identified along the streambank of Joshua's Creek and the north boundary of the landfill cover, approximately 20-25 metres upstream of surface water station SW2. This location was approximately 10 m east (upstream) of the gabion wall. Iron staining was also observed in the area of the erosion during the inspection at locations that were relatively small and localized. Additional inspections of this area were completed by WSP and Regional staff in 2020. There was no apparent change in the state of the erosion in 2020 and the staining was only periodically present.

As outlined in Section 3.3, the results for the sampling events completed in 2020 indicate that there is no measurable landfill influence on water quality within the area, and downstream, of the erosion. The Region has engaged WSP to assist with the planning, permitting and design of a solution for the stabilization and protection of the small section of streambank where erosion was observed. The planning and studies for the solution are currently underway. More frequent inspections of the area are being completed by Regional staff until the solution for the streambank has been implemented. Inspections by the Region of the streambank and the overall Site will continue during future spring inspection events.

3 STUDY RESULTS

3.1 LEACHATE QUALITY

The laboratory chemistry results for the inorganic and organic parameters at Monitors 99-1 and 99-2 are presented in Tables A-1 and A-2, of Appendix A, respectively. In general, the leachate general chemistry concentrations within the refuse are relatively low compared to typical landfill leachate. The low concentrations are attributed to the extended age of refuse within the landfilled area.

A summary of the concentration ranges for the inorganic indicator parameters in 2019 and 2020 is presented below. Units are in mg/L.

		LEACHATE CONCENTRATIONS (2019/2020)	
PARAMETER	**ODWS**	**99-1**	**99-2**
Chloride	250	100-110	75-90
Hardness	80 - 100	**660-680**	**660-760**
DOC/TOC	5	**51-53**	**38-51**
Iron	0.30	**36-38**	**35-50**
Manganese	0.05	**0.15-0.16**	**5.6-6.5**
TDS	500	**1200**	**880-1000**

Note: Bold values exceed the ODWS (Ontario Drinking Water Standards).

In general, the concentrations of the inorganic and metals for the sampling events in 2019 and 2020 were similar to, or lower than, the concentrations exhibited in 2018, including the elevated concentration of iron that was identified during the sampling event in 2018.

A summary of the detected concentration values for the organic parameters in 2019/2020 is presented below. All units are in µg/L.

		LEACHATE CONCENTRATIONS (2019/2020)	
PARAMETER	**ODWS**	**99-1**	**99-2**
1,2-Dichlorobenzene	3	1.1	<0.5
1,4-Dichlorobenzene	1	**5.6-5.8**	**1.4-1.6**
Acetone		<10	<10-13
Benzene	5	**6.4-11**	**91-120**
Chlorobenzene	30	3.8-3.9	1.6-2.4
Ethyl benzene	2.4	0.45-0.5	0.58-0.77
Hexane		<1.0	<1.0-1.4
m/p-Xylenes		0.3-0.49	77-190
o-Xylene		0.9-0.93	<0.20
Toluene	24	0.2-0.28	0.33-0.43
Xylenes: total	300	1.2-1.4	77-190

Note: Bold values exceed the ODWS (Ontario Drinking Water Standards).

The organic parameter concentrations during the sampling events in 2019 and 2020 were comparable to the values obtained during the sampling event in 2018; which are noticeably lower compared to the results for the 1999 sampling event.

The differences in the leachate characteristics between monitors 99-1 and 99-2 are attributed to the variability of the refuse.

There are no downgradient groundwater users, as groundwater flow is towards Joshua's Creek. The surrounding area, with the exception of the clubhouse, is serviced by a municipal water supply, and the adjoining properties (including the clubhouse) are generally upgradient or laterally gradient of the landfilled area.

3.2 GROUNDWATER QUALITY

The laboratory chemistry results for the inorganic and organic parameters at gas probe GP106 and the Clubhouse Well (CW) are presented in Tables A-3 and A-4, in Appendix A, respectively. In general, the parameter concentrations of the groundwater during the sampling events in 2019 and 2020 were comparable to historical results and satisfied the Ontario Drinking Water Standards (ODWS) except for the following:

- Chloride: CW-untreated
- Sulphate: CW-untreated, CW-treated
- Hardness: CW-untreated, CW-treated, GP106
- Uranium: CW-untreated, CW-treated
- Total dissolved solids: CW-untreated, CW-treated

The parameters listed are not health related and only affect the aesthetic quality of the water, with the exception of uranium. The detection of uranium is not uncommon within the Oakville area, and the presence of uranium within the samples collected at the CW is not attributed to the landfill site.

The groundwater quality at gas probe GP106 in 2019 was comparable to the results in 1999, with the exception of DOC which exceeded the ODWS in 2019, and manganese which did not exceed the ODWS in 2019, compared to the exceedances in 1999.

The elevated concentrations for sulphate, hardness, and total dissolved solids within the groundwater samples, compared to the ODWS, are attributed to the naturally poor water quality within the area and are not attributed to the landfill site.

The organic parameter concentrations for the CW and gas probe GP106 were generally below the reportable detection limit with the exception of 1,1-dichloroethane in the treated and untreated groundwater of the CW during the sampling event in 2020. The detection of this parameter in the CW is comparable to historical results for these locations.

It is understood, based on conversations with management staff at the clubhouse that bottled water is used for consumption within the building, and the water provided by the CW is not used for consumption.

3.3 SURFACE WATER QUALITY

The surface water laboratory results for 2020 and historical inorganic parameters are summarized in Table B-1, Appendix B. The concentration vs distance graphs of selected parameters for the sampling events in 2020 are included in Figures B-1 to B-5, Appendix B. The concentration vs distance graphs include chloride, sulphate, alkalinity, un-ionized ammonia, TOC, barium, boron, TDS, iron, and sodium. It is noted that the parameter results for the August event are not included in the graphs because of the lack of flow within the stream, resulting in several areas of ponding within the streambed.

Based on the two sampling events included in the figures, there were some distinguishable trends between adjacent surface water stations from the upstream location, SW1, through to the downstream location, SW4. These trends included:

- Water quality along the north side of the refuse area, between stations SW2 and SW7 and/or SW8, was generally comparable to the concentrations at upstream station SW1 for chloride, sulphate, alkalinity, TOC, barium, sodium, and TDS for the two sampling events, although some variations are exhibited on the graphs.
- Concentrations of several parameters, including chloride, sulphate, TOC, and TDS exhibit general decreasing trends between the upstream station, SW1, and the downstream station SW4.
- Concentrations of some parameters varied between stations SW8 and SW5, where the north tributary discharges to Joshua's Creek, during select events, including alkalinity, sodium, boron, and iron in November. It is noted that there was insufficient water within the north tributary to collect a suitable sample during the November event, however groundwater discharge from the north side of Joshua's Creek would continue to have an influence on water quality within Joshua's Creek.
- Concentrations for boron exhibit increasing trends between station SW8 and station SW4. This pattern was partially mirrored by the barium concentrations.

The patterns indicate that water quality within Joshua's Creek is influenced by discharge from the north tributary on occasion, and to a lesser extent, from the ditch located along the south boundary of the Site. It is noted that the influence from the north tributary was not as significant during the sampling events in 2020 compared to the historical trend, which may be attributed to the relatively low discharge rate from the tributary compared to the flow within Joshua's Creek during the events. Water quality along the north boundary of the Site, between SW2 and SW7 and/or SW8, is generally comparable to water quality at the upstream station SW1, with some variations. Water quality along the west boundary of the Site tends to be relatively similar between stations SW5 and SW4. Although there is likely a landfill influence on the surface water quality within Joshua's Creek, this influence is not as significant as other off-site sources and surficial run off, including the north tributary, at this time. Water quality within the south ditch, as represented by surface water stations SW3 and SW13 was generally similar to the water quality within the Joshua's Creek with some variations. It is noted that very low flows within the south ditch may result in concentration differences at those stations compared to the other surface water channels.

The surface water quality for the sampling events in 2020 generally complied with the Provincial Water Quality Objectives (PWQOs) with the exception of those parameters listed in Table 1. As shown in the table, aluminum, iron, and phosphorus exceeded the PWQO at a majority of the stations during the three events. It is also noted that the concentrations for iron and phosphorus are also significantly influenced by sediment content within the collected sample. Since PWQO exceedances occurred at reference locations SW1 and SW10, the PWQO exceedances along Joshua's Creek are due to the natural variability of the surface water quality, including upstream and off-site sources, and are not solely attributed to the landfill site.

4 LANDFILL COVER ASSESSMENT

The site inspection was completed to identify potential areas of poor surface water drainage on the landfill cover. The drilling program was completed to identify the thickness and type of soil material that is present on top of the refuse. Boreholes were drilled to approximate depths of 1.0 to 2.4 m, and the soils were logged in the field by a WSP field technician. The boreholes were advanced until refuse was encountered, where present; or, if sandy soils were present near surface, the boreholes were advanced until clayey soils were encountered. It was understood from discussions with Crusaders Rugby staff that fill had been brought onto the site to level the practice field, so it was likely that the original cover that was placed over the refuse had subsequently been covered with the fill. The locations of the boreholes are shown in Figure 4.

A summary of the field logs is provided in Table C-1, Appendix C. As shown in the field log summary, the cover material generally ranged between clayey silt to sandy silt at different locations of the cover, and the thickness of these soils varied across the cover. The cover within the rugby practice field area generally included a clayey silt layer of at least 0.6 m below the surficial fill. The cover for the remaining portion of the Site had at least one metre of clayey silt or sandy silt soils with the exception of TH13, on the western side of the site, where refuse was encountered 0.6 m below grade.

The drilling program and on-site inspection indicate that the cover for the Site is generally satisfactory based on the type and thickness of the covering soils. Topography and grading at the Site generally promote surface water runoff although relatively flat areas are present, particularly in the area of the rugby practice field.

5 DISCUSSION

5.1 WATER QUALITY

5.1.1 LEACHATE

Leachate is produced at the Site primarily from the percolation of precipitation through the refuse. The chemistry of the leachate depends on factors such as refuse composition and age, residence time, amount of infiltration, and flow pathways. Since 1995, a rugby practice field has been constructed within the eastern portion of the landfilled area. This area is relatively flat, which reduces surface water runoff, and promotes infiltration into the refuse. Some evaporation losses will occur during the summer.

In general, the general chemistry concentrations within the leachate produced at this site are relatively low compared to typical leachate, with most parameters satisfying the Ontario Drinking Water Standards. Several aesthetic guidelines are exceeded, including hardness, DOC, iron, manganese, and total dissolved solids. These parameters are not health related. The organic chemistry parameter concentrations were relatively elevated, with 1,4-dichlorobenzene and benzene being above the Ontario Drinking Water Standards. The significant chemical differences between the leachate samples at Monitors 99-1 and 99-2 are attributed to the varying composition of the refuse.

5.1.2 GROUNDWATER

The on-site shallow groundwater flow is towards Joshua's Creek. Groundwater flow through the clayey silt till is slow, compared to the flow in the refuse, due to a lower hydraulic conductivity in the till. It is this difference in the hydraulic conductivity why the shallow groundwater flow through the Site is expected to

discharge along the base of the slope and discharge into Joshua's Creek, particularly during periods of higher groundwater levels.

Groundwater quality within the CW and gas probe GP106 during the sampling events in 2019 and 2020 was generally comparable to the historical results. Select parameters exceeded the ODWS, including chloride, sulphate, hardness, uranium, and TDS. With the exception of uranium, these parameters are not health related and only affect the aesthetic quality of the water. The detection of uranium is not uncommon within the Oakville area, and the presence of uranium within the samples collected at the CW is not attributed to the landfill site. The elevated concentrations for sulphate, hardness, and total dissolved solids within the groundwater samples, compared to the ODWS, are attributed to the naturally poor water quality within the area and are not attributed to the landfill site.

It is noted that that bottled water is used for consumption within the Clubhouse and the water provided by the CW is not used for consumption.

5.1.3 SURFACE WATER

The water sampling results in 2020 continue to indicate that there is an influence on the surface water quality within Joshua's Creek by the north tributary discharge and other off-site sources. There is likely an additional influence from the landfill site, however this influence is considered to be negligible compared to the north tributary and other off-site sources at this time, based on the minor variances in water quality along Joshua's Creek. It is noted that the tributary catchment area is off-site towards the north, and the sources are unrelated to the landfill site.

It is noted that the supplemental monitoring of the current surface water stations is scheduled to continue in 2021 to continue assessing the potential influence of the landfill on the creek at different locations along the stream during different flow periods. The requirement for future monitoring beyond 2021 will be based on the results of the monitoring event in 2021.

5.2 LANDFILL COVER ASSESSMENT

The drilling program and on-site inspection indicate that the cover for the Site is generally satisfactory based on the type and thickness of the covering soils. The underlying soils within the practice field area generally contained at least 0.6 m of clayey silt beneath the shallower fill. The cover within the remaining portion of the Site generally consisted of sandy silt or clayey silt that was at least 1 m thick with the exception of one test hole in the western area of the Site where refuse was encountered 0.6 below surface.

Topography and grading at the Site generally promote surface water runoff although relatively flat areas are present, particularly in the area of the rugby practice field. Infiltration into the underlying waste, and potential reduction of leachate generation, could be reduced if the grading within the rugby practice field area was enhanced and graded to promote more effective runoff. The cover enhancement (and associated grading) would be achieved by the import of additional suitable cover material. An additional cost benefit evaluation would be required to assess the potential effectiveness of this cover enhancement to determine if the reduction in potential leachate generation (if any) is cost effective.

5.3 TRIGGER LEVELS

As outlined in the Action Plan, trigger levels are to be established for the Site once the monitoring program has been completed. Since the surface water monitoring program is to be continued in 2021, as outlined in the Action Plan, establishing the trigger levels for future groundwater and surface water quality monitoring will be assessed in concert, and included as part of the 2021 Surface Water Monitoring Report.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The following conclusions are based on the findings presented in this report.

- Based on the water level data for 2019 and 2020, along with historical information, local groundwater flow is in a westerly direction towards Joshua's Creek.
- Leachate within the refuse is produced from the infiltration of precipitation and snowmelt. The chemical results in 2019 and 2020 were comparable to historical results. The general chemistry concentrations within the leachate are generally low, with select parameters being elevated compared to the Ontario Drinking Water Standards. Organic parameters generally satisfied the Ontario Drinking Water Standards with the exception of 1,4-dichlorobenzene and benzene.
- Groundwater quality within the CW and gas probe GP106 in 2019 and 2020 was comparable to historical results. Groundwater quality generally satisfied the ODWS with the exception of chloride, sulphate, hardness, uranium, and TDS at select locations. These parameters are not health related and only affect the aesthetic quality of the water, with the exception of uranium. The detection of uranium is not uncommon within the Oakville area, and the presence of uranium within the samples collected at the CW is not attributed to the landfill site. The elevated concentrations for sulphate, hardness, and total dissolved solids within the groundwater samples, compared to the ODWS, are attributed to the naturally poor water quality within the area and are not attributed to the Site.
- As water from the clubhouse well is not used for consumption, there are no groundwater users in the area which are affected by the Site.
- Surface water quality within the surface water channels adjacent to the Site in 2020 was comparable to historical results. Surface water quality generally satisfied the PWQO during the events in 2020 with the exception of aluminum, iron, and phosphorus during at least one event, which is comparable to historical results. Seasonal variations will be determined once a second year of seasonal sampling has been completed.
- The Site has no measurable adverse influence on the water quality within Joshua's Creek.
- Surface water quality in Joshua's Creek is affected by the tributary discharge in the area of SW5, along with other off-site influences. There is likely an additional influence from the Site, however, this influence is considered to be negligible, compared to the tributary and other off-site influences, at this time. The pathways for the surface water influence may include groundwater discharge from properties adjacent to the Creek and adjacent overland runoff.
- The landfill cover typically consists of sandy silt or clayey silt that is at least 1 m thick with the exception of one location on the west side of the site where the cover thickness was 0.6 m. The existing landfill cover should be generally effective for reducing infiltration into the underlying refuse, based on the type and thickness of the cover material. Localized areas of potentially poor drainage were identified, mainly incorporating the relatively flat area of the practice field.

6.2 RECOMMENDATIONS

We respectfully submit the following recommendations based on the study findings for your consideration.

- Surface water sampling should continue as scheduled for 2021, as part of the Action Plan for the Site.
- The results of the surface water sampling events in 2021 should be reviewed and assessed to determine if changes to the surface water monitoring program are warranted. The findings should be presented in the 2021 Surface Water Monitoring Report, as part of the Action Plan for the Site.
- Trigger levels for the site should be established once a review and assessment of the 2021 surface water monitoring program has been completed.
- Monitoring of the refuse monitors and groundwater sampling locations should continue to be completed approximately every five years as part of the Environmental Management Plan monitoring program for the Site.
- Since the water levels within gas probe GP106 are likely influenced by climatic conditions, it is recommended that future sampling of this monitor be attempted during the spring period, when water levels, and recovery times, are more suited to obtaining a sample.
- An evaluation of landfill cover enhancement options, including grading improvements, should be considered as part of the ongoing environmental management of the Site.

7 REFERENCES

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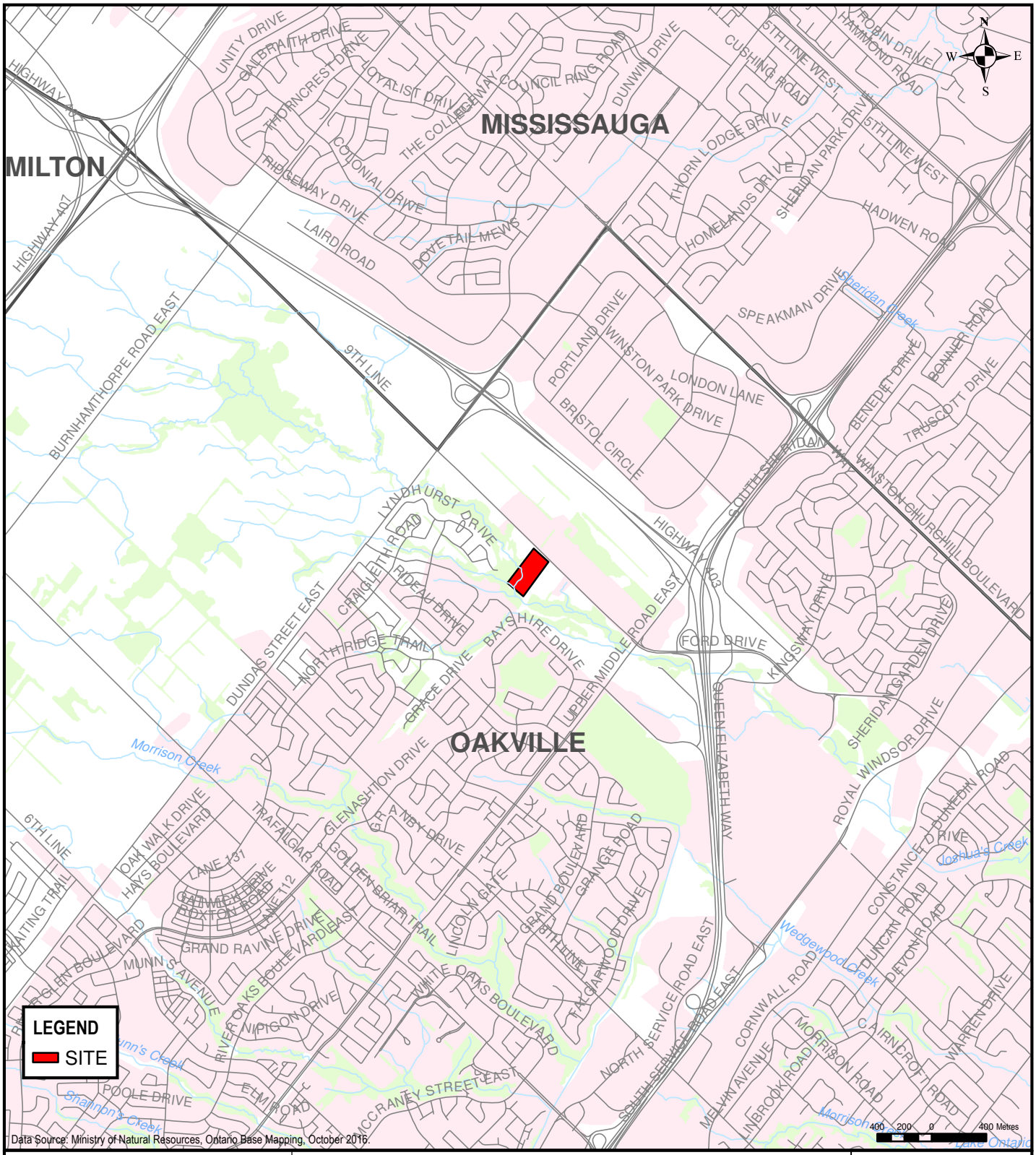
- MECP Memo – Groundwater Comments, July 22, 2019
- MECP Central Region Covering Letter, August 8, 2019
- Oakville Ninth Line Landfill Site Action Plan, WSP Canada Inc., September 2019

FIGURES



126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

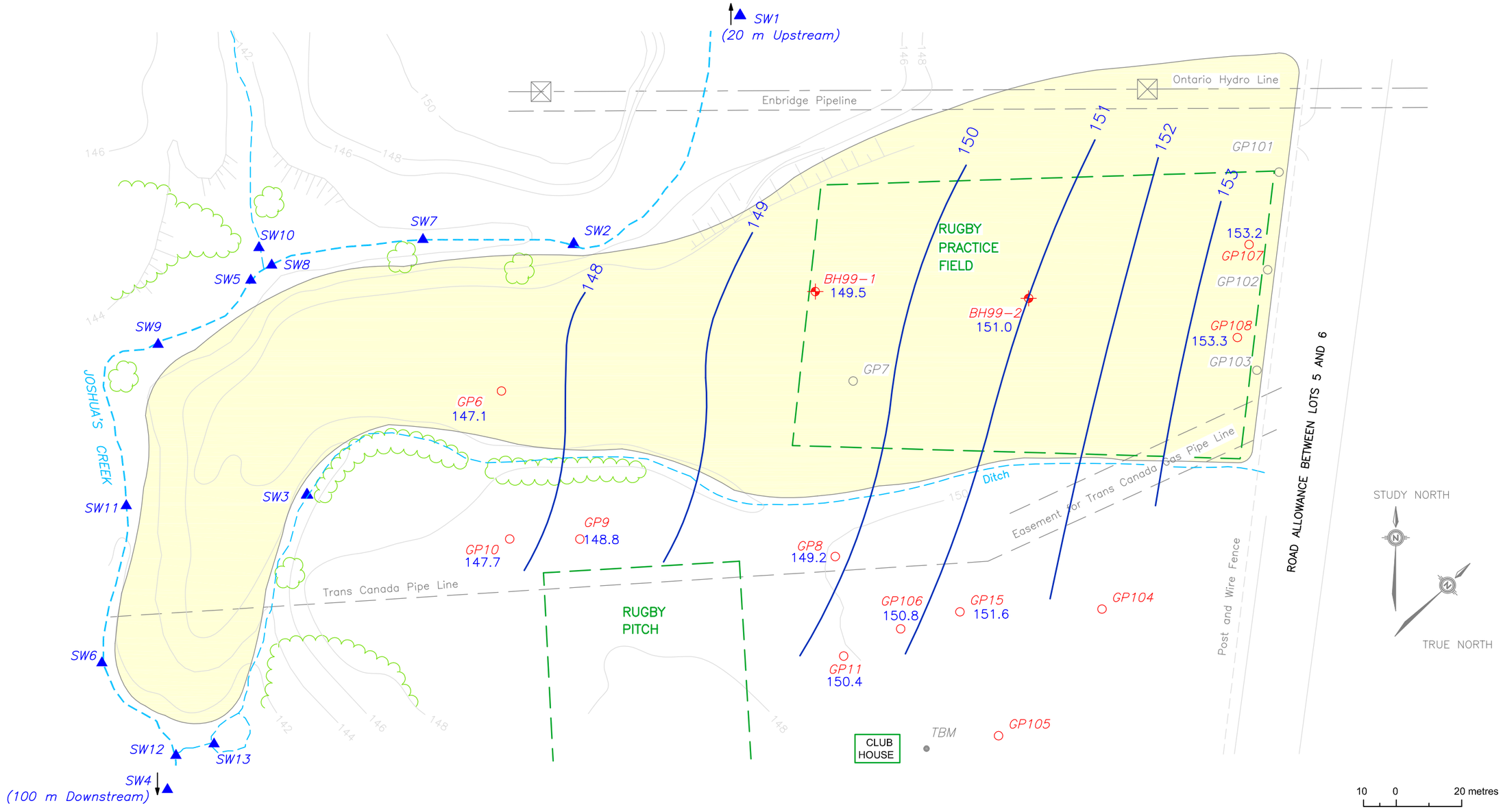
PROJECT:
CLOSED OAKVILLE NINTH LINE LANDFILL SITE
2020 SUPPLMENTAL MONITORING REPORT

TITLE:
LOCATION MAP

CLIENT:
REGIONAL MUNICIPALITY OF HALTON

SCALE:	1:40,000
DRAWN BY:	PLB
CHECKED BY:	SJT
PROJECT NO:	181-30000-00 106
DATE:	DECEMBER 2020
FIGURE NO:	1
REV.:	-

Document Path: T:\181-30000-001106\MXD\181-30000-00 106 Figure 1 Location Map.mxd



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LEGEND

- APPROXIMATE EXTENT OF RUGBY PRACTICE FIELD
- GP101 150.4 — EXISTING GAS PROBE LOCATION, DESIGNATION, AND WATER LEVEL ELEVATION
- GP104 — PREVIOUS GAS PROBE LOCATION AND DESIGNATION
- BH99-1 149.5 — LEACHATE MONITOR LOCATION, DESIGNATION, AND LEACHATE ELEVATION
- TBM — TEMPORARY BENCH MARK LOCATION (Top of green hydro box, approx. 150.3 m)
- SW1 — SURFACE WATER SAMPLING LOCATION AND DESIGNATION
- APPROXIMATE EXTENT OF REFUSE
- GROUNDWATER ELEVATIONS BASED ON MAY 2020 DATA

CLIENT:
REGIONAL MUNICIPALITY OF HALTON

CLIENT REF. #:

PROJECT:
CLOSED OAKVILLE NINTH LINE LANDFILL SITE
2020 SUPPLEMENTAL MONITORING REPORT

PROJECT NO: 181-30000-00 106	DATE: DEC. 2020
DESIGNED BY: SJT	
DRAWN BY: PLB	
CHECKED BY: SJT	
FIGURE NO: 2	SCALE: 1:1250

TITLE: **SITE PLAN**

DISCIPLINE: **ENVIRONMENT**

ISSUE:

DATE OF:

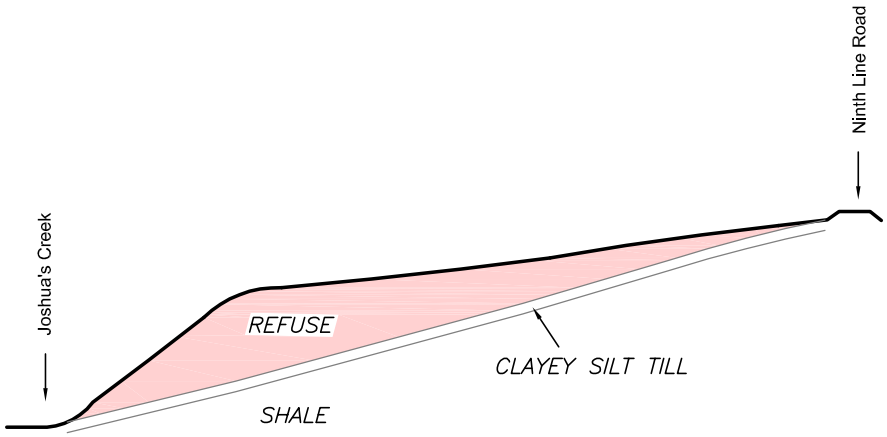
Ansi B-SCE, H:\Proj\18\30000-00\106 Oakville Ninth Line\1005\Grph\181-30000-00 106 Figure 2.dwg , 12/21/2020 12:08:26 PM

West

East

A

A'

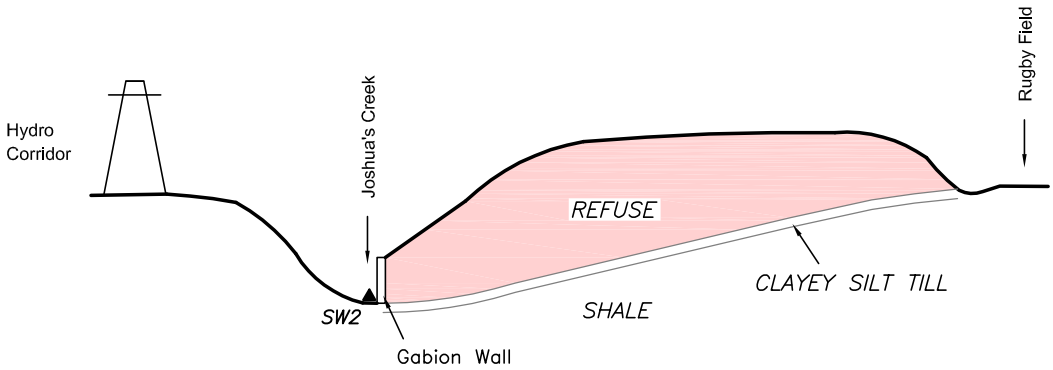


North

South

B

B'



Legend

REFUSE

SW2 ▲ SURFACE WATER STATION

GEOLOGIC CONTACT

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PROJECT:
CLOSED OAKVILLE NINTH LINE LANDFILL SITE
2020 SUPPLEMENTAL MONITORING REPORT

TITLE:
SCHEMATIC SECTIONS

CLIENT:
REGIONAL MUNICIPALITY OF HALTON

SCALE: NOT TO SCALE

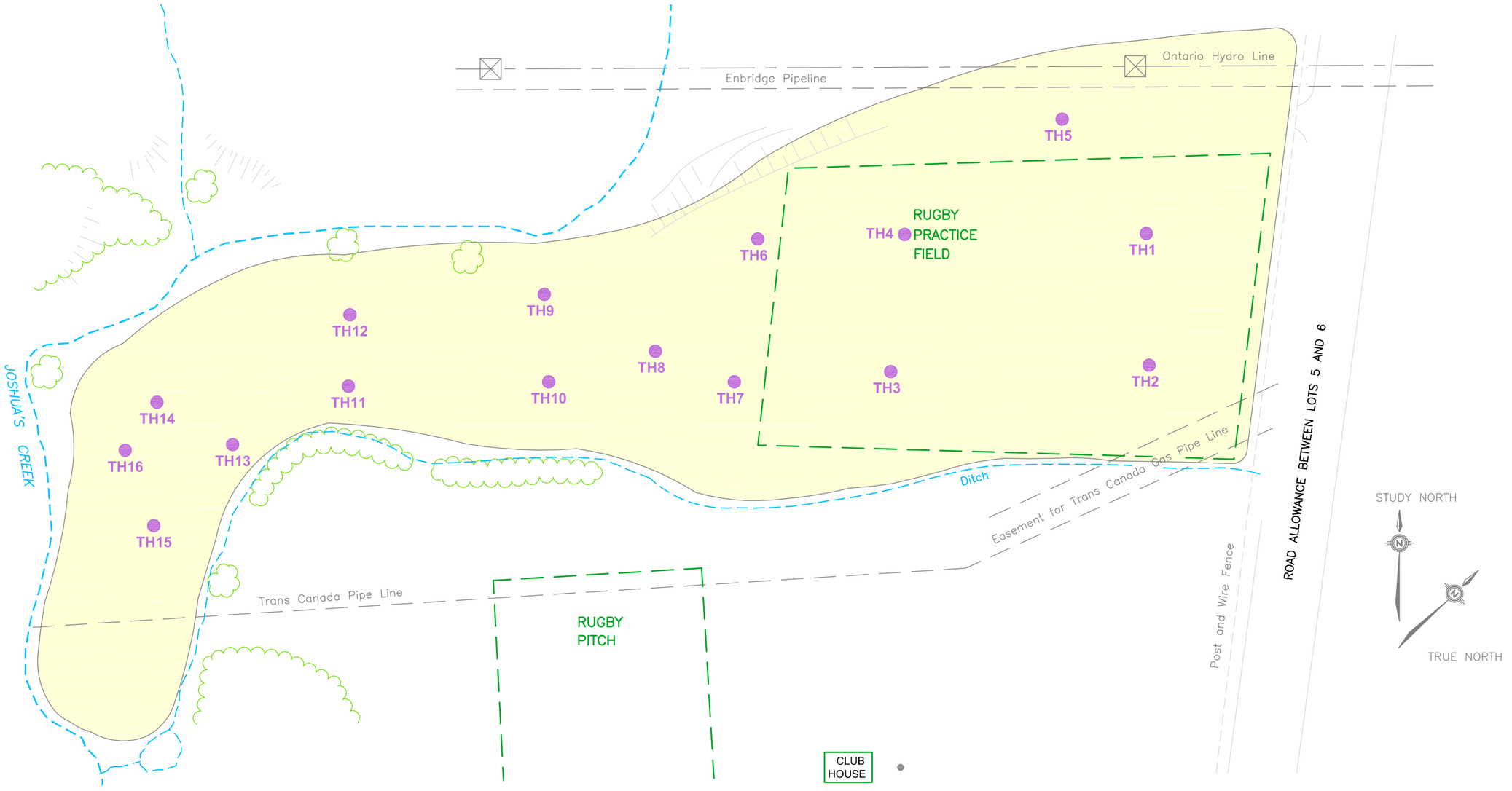
DRAWN BY: PLB

PROJECT NO: 181-30000-00 106

DATE: DECEMBER 2020

FIGURE NO: 3

REV. #.



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LEGEND

- APPROXIMATE EXTENT OF RUGBY PRACTICE FIELD
- APPROXIMATE EXTENT OF REFUSE
- TH15 — APPROXIMATE BOREHOLE LOCATION AND DESIGNATION
- TEMPORARY BENCH MARK LOCATION (Top of green hydro box, approx. 150.3 m)

CLIENT: REGIONAL MUNICIPALITY OF HALTON

CLIENT REF. #:

PROJECT: CLOSED OAKVILLE NINTH LINE LANDFILL SITE 2020 SUPPLEMENTAL MONITORING REPORT

PROJECT NO: 181-30000-00 106	DATE: DEC. 2020
DESIGNED BY: SJT	
DRAWN BY: PLB	
CHECKED BY: SJT	
FIGURE NO: 4	SCALE: 1:1250

TITLE: COVER ASSESSMENT BOREHOLE LOCATION

DISCIPLINE: ENVIRONMENT

ISSUE:

DATE OF:

Ansi B-SCE, H:\Proj\18\30000-00\106 Oakville Ninth Line\1005\Grph\181-30000-00 106 Figure 4.dwg , 12/21/2020 10:27:04 AM

TABLES

TABLE 1
SURFACE WATER PWQO EXCEEDANCES
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

			PARAMETER and PWQO				
LOCATION	**STATION**	**SAMPLING EVENT**	**ALUMINUM** (0.075 mg/L)	**BORON** (0.200 mg/L)	**IRON** (0.300 mg/L)	**PHOSPHORUS** (0.030 mg/L)	**COBALT** (0.0006 mg/L)
UPSTREAM	**SW1**	Apr-20	0.23		0.41		
		Aug-20	0.33		0.37		
		Nov-20	0.14			0.058	
ADJACENT TO REFUSE AREA	**SW2**	Apr-20	0.10				
		Aug-20	0.50		0.66		
		Nov-20	0.09			0.031	
	SW7	Apr-20	0.09				
		Aug-20	0.41		0.51		
		Nov-20	0.14				
	SW8	Apr-20	0.09				
		Aug-20	0.37		0.46		
		Nov-20	0.08				
	SW5	Apr-20	0.10				
		Aug-20	0.24				
		Nov-20	0.20				
	SW9	Apr-20	0.11				
		Aug-20	0.54		0.71		
		Nov-20	0.08			0.032	
	SW11	Apr-20	0.10				
		Aug-20	1.00		1.40		0.0007
		Nov-20	0.10	0.22		0.042	
	SW6	Apr-20	0.09				
		Aug-20	0.32		0.45		
		Nov-20	0.10	0.21			
DOWNSTREAM	**SW12**	Apr-20			0.60		
		Aug-20	-	-	-	-	-
		Nov-20	0.21		7.60	0.300	0.0011
	SW4	Apr-20	0.11		0.31		
		Aug-20	0.26		0.32		
		Nov-20	0.13		0.31	0.034	
NORTH TRIBUTARY	**SW10**	Apr-20	0.21		0.31		
		Aug-20	0.30		0.37		
		Nov-20	-	-	-	-	-
SOUTH DITCH	**SW3**	Apr-20			0.96		
		Aug-20	-	-	-	-	-
		Nov-20	-	-	-	-	-
	SW13	Apr-20	0.08				
		Aug-20	0.31		0.42		
		Nov-20		0.22			

NOTES: 1) PWQO - Provicial Water Quality Objectives (1999)
2) Blank indicates parameter concentration was within the PWQO.
3) "-" - Indicates parameter not analysed during the sampling event presented.

APPENDIX

A LEACHATE AND GROUNDWATER CHEMICAL RESULTS

TABLE A-1
LEACHATE GENERAL CHEMICAL RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	ODWS	99-1			
			Nov-99	Oct-18	Oct-19	Nov-20
pH	**units**	**6.5-8.5**	6.84	7.03	7.17	7.17
Conductivity	**µS/cm**		2920	360	2200	2200
Chloride	**mg/L**	**250**	188	110	110	100
Phosphate-ortho	**mg/L**		<0.3	<0.20	<0.050	<0.10
Sulphate	**mg/L**	**500**	9.2	<20	<1.0	<1.0
Alkalinity	**mg/L**		1540	1000	1000	1000
Bicarbonate	**mg/L**		1540	1000	1000	1000
Carbonate	**mg/L**		1.0	1.0	1.4	1.4
Hardness	**mg/L**	**80-100**	770	590	680	660
Nitrate	**mg/L**	**10.0 ***	<0.2	<0.50	<0.10	<0.10
Nitrite	**mg/L**	**1.0 ***	<0.2	<0.05	<0.010	<0.010
Ammonia	**mg/L**		154	94	84	81
Dissolved Organic Carbon	**mg/L**	**5**	98	56	53	51
Aluminum	**mg/L**		<0.03	0.01	0.015	0.01
Antimony	**mg/L**			0.00	0.0012	0.0011
Arsenic	**mg/L**			0.02	0.016	0.0170
Barium	**mg/L**	**1.0 ***	1.06	0.74	0.74	0.71
Beryllium	**mg/L**		<0.0005	<0.0005	<0.00050	<0.0004
Bismuth	**mg/L**		<0.1			
Boron	**mg/L**	**5.0 ***	2.88	1.30	1.3	1.20
Cadmium	**mg/L**	**0.005 ***	<0.005	<0.0001	<0.00010	<0.00009
Calcium	**mg/L**		133	120	130	130
Chromium	**mg/L**	**0.05 ***	<0.005	<0.005	<0.0050	<0.005
Cobalt	**mg/L**		0.010	0.004	0.0031	0.004
Copper	**mg/L**	**1**	<0.003	<0.001	<0.0010	<0.0009
Iron	**mg/L**	**0.3**	0.19	37.00	36	38
Lead	**mg/L**	**0.01 ***	0.3000	<0.0005	<0.00050	0.0006
Magnesium	**mg/L**		107.0	71.0	90	82.0
Manganese	**mg/L**	**0.05**	0.30	0.13	0.15	0.16
Molybdenum	**mg/L**		0.11	<0.0005	<0.00050	<0.0005
Nickel	**mg/L**		0.04	0.00	0.0038	0.003
Phosphorus	**mg/L**		<0.1	0.7	0.67	0.6
Potassium	**mg/L**		77	42	36	36
Selenium	**mg/L**			<0.002	<0.0020	<0.002
Silica	**mg/L**		20.6	13.0		
Silicon	**mg/L**				12	12.0
Silver	**mg/L**		<0.003	<0.0001	<0.00010	<0.00009
Sodium	**mg/L**	**200**	183	69	68	64
Strontium	**mg/L**		1.74	0.90	0.99	0.96
Thallium	**mg/L**			<0.00005	<0.000050	<0.00005
Tin	**mg/L**		<0.05			
Titanium	**mg/L**		<0.005	<0.005	<0.0050	<0.005
Uranium	**mg/L**			<0.0001	<0.00010	<0.0001
Vanadium	**mg/L**		0.007	0.002	0.0018	0.002
Zinc	**mg/L**	**5**	<0.005	<0.005	<0.0050	<0.005
Total Dissolved Solids	**mg/L**	**500**	1840	1200	1200	1200

NOTES: 1) ODWO - Ontario Drinking Water Standards, 2006
2) * - Indicates health related Drinking Water Standard.

TABLE A-1
LEACHATE GENERAL CHEMICAL RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	ODWS	99-2			
			Nov-99	Oct-18	Oct-19	Nov-20
pH	**units**	**6.5-8.5**	7.03	7.37	7.06	7.07
Conductivity	**µS/cm**		2010	1500	1800	1500
Chloride	**mg/L**	**250**	187	83	90	75
Phosphate-ortho	**mg/L**		<0.3	<0.20	<0.10	0.2
Sulphate	**mg/L**	**500**	354.0	<20	<1.0	<1.0
Alkalinity	**mg/L**		620	830	830	720
Bicarbonate	**mg/L**		619	830	830	720
Carbonate	**mg/L**		<1	1.8	<1.0	<1.0
Hardness	**mg/L**	**80-100**	949	740	760	660
Nitrate	**mg/L**	**10.0 ***	<0.2	<0.10	<0.10	<0.10
Nitrite	**mg/L**	**1.0 ***	<0.2	0.06	<0.010	<0.010
Ammonia	**mg/L**		0.16	17.00	19	14
Dissolved Organic Carbon	**mg/L**	**5**	52	44	51	38
Aluminum	**mg/L**		<0.03	0.02	0.019	0.02
Antimony	**mg/L**			<0.0005	<0.00050	<0.0005
Arsenic	**mg/L**			0.01	0.0088	0.0039
Barium	**mg/L**	**1.0 ***	0.13	0.35	0.45	0.29
Beryllium	**mg/L**		<0.0005	<0.0005	<0.00050	<0.0004
Bismuth	**mg/L**		<0.1			
Boron	**mg/L**	**5.0 ***	1.10	0.75	0.81	0.51
Cadmium	**mg/L**	**0.005 ***	<0.005	<0.0001	<0.00010	<0.00009
Calcium	**mg/L**		230	220	220	200
Chromium	**mg/L**	**0.05 ***	<0.005	<0.005	<0.0050	<0.005
Cobalt	**mg/L**		<0.005	0.002	0.0022	0.002
Copper	**mg/L**	**1**	<0.003	0.002	0.0011	0.002
Iron	**mg/L**	**0.3**	0.01	45.00	50	35
Lead	**mg/L**	**0.01 ***	0.0030	<0.0005	<0.00050	0.0006
Magnesium	**mg/L**		91.3	49.0	54	40.0
Manganese	**mg/L**	**0.05**	1.73	6.80	6.5	5.60
Molybdenum	**mg/L**		<0.02	<0.0005	<0.00050	<0.0005
Nickel	**mg/L**		<0.02	0.00	0.0023	0.002
Phosphorus	**mg/L**		<0.1	0.2	0.96	1.1
Potassium	**mg/L**		12	18	20	22
Selenium	**mg/L**			<0.002	<0.0020	<0.002
Silica	**mg/L**		22.3	9.5		
Silicon	**mg/L**				8.7	8.4
Silver	**mg/L**		<0.003	<0.0001	<0.00010	<0.00009
Sodium	**mg/L**	**200**	150	55	60	41
Strontium	**mg/L**		0.65	0.86	0.89	0.79
Thallium	**mg/L**			<0.00005	<0.000050	<0.00005
Tin	**mg/L**		<0.05			
Titanium	**mg/L**		<0.005	<0.005	<0.0050	<0.005
Uranium	**mg/L**			0.001	0.00023	0.000
Vanadium	**mg/L**		0.005	0.003	0.0028	0.002
Zinc	**mg/L**	**5**	<0.005	<0.005	<0.0050	0.012
Total Dissolved Solids	**mg/L**	**500**	1420	1000	1000	880

NOTES: 1) ODWO - Ontario Drinking Water Standards, 2006
2) * - Indicates health related Drinking Water Standard.

TABLE A-2
LEACHATE ORGANIC CHEMIAL RESULTS
CLOSED NINTH LINE LANDFILL SITE

PARAMETER	ODWS	99-1				99-2			
		Oct-99	Oct-18	Oct-19	Nov-20	Oct-99	Oct-18	Oct-19	Nov-20
1,1,1,2-Tetrachloroethane		<8.0	<0.50	<0.50	<0.50	<200	<0.50	<0.50	<0.50
1,1,1-Trichloroethane		<8.0	<0.20	<0.20	<0.20	<200	<0.20	<0.20	<0.20
1,1,2,2-Tetrachloroethane		<8.0	<0.50	<0.50	<0.40	<200	<0.50	<0.50	<0.40
1,1,2-Trichloroethane		<8.0	<0.50	<0.50	<0.40	<200	<0.50	<0.50	<0.40
1,1-Dichloroethane		<8.0	<0.20	<0.20	<0.20	<200	<0.20	<0.20	<0.20
1,1-Dichloroethylene		<8.0	<0.20	<0.20	<0.20	<200	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	**3**	<8.0	0.96	1.1	1.1	<200	<0.50	<0.50	<0.40
1,2-Dichloroethane	**5 ****	<8.0	<0.50	<0.50	<0.49	<200	<0.50	<0.50	<0.49
1,2-Dichloropropane		<8.0	<0.20	<0.20	<0.20	<200	<0.20	<0.20	<0.20
1,3-Dichlorobenzene		<8.0	<0.50	<0.50	<0.40	<200	<0.50	<0.50	<0.40
1,3-Dichloropropylene			<0.50	<0.50	<0.50		<0.50	<0.50	<0.50
1,4-Dichlorobenzene	**1**	<8.0	3.6	5.8	5.6	<200	0.68	1.6	1.4
Acetone		<400	16	<10	<10	<10000	15	13	<10
Benzene	**5 ****	27.5	12	11	6.4	<100	83	120	91
Bromodichloromethane		<8.0	<0.50	<0.50	<0.50	<200	<0.50	<0.50	<0.50
Bromoform		<8.0	<1.0	<1.0	<1.0	<200	<1.0	<1.0	<1.0
Bromomethane		<20.0	<0.50	<0.50	<0.50	<500	<0.50	<0.50	<0.50
Carbon tetrachloride	**5 ****	<8.0	<0.20	<0.20	<0.19	<200	<0.20	<0.20	<0.19
Chlorobenzene	**30**	<8.0	3.1	3.9	3.8	<200	1.3	2.4	1.6
Chloroethane		<20.0				<500			
Chloroform		<8.0	<0.20	<0.20	<0.20	<200	<0.20	<0.20	<0.20
Chloromethane		<40.0				<1000			
cis-1,2-Dichloroethylene		<8.0	<0.50	<0.50	<0.50	<200	<0.50	<0.50	<0.50
cis-1,3-Dichloropropylene		<8.0	<0.30	<0.30	<0.30	<200	<0.30	<0.30	<0.30
Dibromochloromethane		<8.0	<0.50	<0.50	<0.50	<200	<0.50	<0.50	<0.50
Dichlorodifluoromethane			<1.0	<1.0	<1.0		<1.0	<1.0	<1.0
Dichloromethane	**50 ****	<40.0	<2.0	<2.0	<2.0	<1000	<2.0	<2.0	<2.0
Ethyl benzene	**2.4**	* 5.4	0.87	0.45	0.48	668	0.85	0.77	0.58
Ethylene dibromide		<8.0	<0.20	<0.20	<0.19	<200	<0.20	<0.20	<0.19
Hexane			<1.0	<1.0	<1.0		<1.0	1.4	<1.0
m/p-Xylenes	**300 *****	29.0	0.37	0.49	0.31	1950	130	77	190
Methyl butyl ketone		<200				<5000			
Methyl ethyl ketone		<200	<10	<10	<10	<5000	<10	<10	<10
Methyl isobutyl ketone		<200	<5.0	<5.0	<5.0	* 4480	<5.0	<5.0	<5.0
Methyl t-butyl ether		<8.0	<0.50	<0.50	<0.50	<200	<0.50	<0.50	<0.50
o-Xylene	**300 *****	* 6.2	0.60	0.93	0.9	453	<0.20	<0.20	<0.20
Styrene		<8.0	<0.50	<0.50	<0.40	<200	<0.50	<0.50	<0.40
Tetrachloroethylene		<8.0	<0.20	<0.20	<0.20	<200	<0.20	<0.20	<0.20
Toluene	**24**	<8.0	0.21	0.28	0.21	5470	0.34	0.33	0.43
trans-1,2-Dichloroethylene		<8.0	<0.50	<0.50	<0.50	<200	<0.50	<0.50	<0.50
trans-1,3-Dichloropropylene		<8.0	<0.40	<0.40	<0.40	<200	<0.40	<0.40	<0.40
Trichloroethylene	**50 ****	<8.0	<0.20	<0.20	<0.20	<200	<0.20	<0.20	<0.20
Trichlorofluoromethane		<20.0	<0.50	<0.50	<0.50	<500	<0.50	<0.50	<0.50
Vinyl chloride	**2 ****	<20.0	<0.20	<0.20	<0.20	<500	<0.20	<0.20	<0.20
Xylenes: total	**300**	35.2	0.97	1.4	1.2	2403	130	77	190

NOTES: 1) ODWS - Ontario Drinking Water Standards, 2006
2) Blank indicates parameter not analysed.
3) * - Indicates trace concentration detected below the Limit of Quantitation.
** - Indicates health related drinking water standard.
*** - Standard is total concentration of all xylenes.
4) Concentrations in µg/L.

TABLE A-3
GROUNDWATER GENERAL CHEMICAL RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	ODWS	GP106		CLUBHOUSE Treated			
			Sep-99	Oct-19	Nov-11	Oct-18	Oct-19	Nov-20
pH	**units**	**6.5-8.5**	8.06	7.88	8.07	7.54	7.72	7.59
Conductivity	**µS/cm**		1490	1100	2800	2800	2800	2600
Colour	**TCU**	**5**	8					
Chloride	**mg/L**	**250**	6	9.2	180	230	250	250
Phosphate-ortho	**mg/L**		<0.3	0.062	0.02	<0.010	<0.010	<0.010
Sulphate	**mg/L**	**500**	646.0	330	720	560	610	590
Alkalinity	**mg/L**		235	270	528	600	590	610
Bicarbonate	**mg/L**		232	260	522	600	580	610
Carbonate	**mg/L**		3.0	1.9	6	1.9	2.9	2.3
Hardness	**mg/L**	**80-100**	893	590	880	1200	1300	1300
Nitrate	**mg/L**	**10.0 ***	<0.2	1.30	0.2	<0.10	<0.10	<0.10
Nitrite	**mg/L**	**1.0 ***	<0.2	<0.010	<0.01	<0.010	<0.010	<0.010
Ammonia	**mg/L**		0.06	<0.050	<0.05	<0.050	<0.050	<0.050
Dissolved Organic Carbon	**mg/L**	**5.0**	4.9	9.0	2.6	2.5	2.4	2.4
Aluminum	**mg/L**		<0.05	0.013	<0.005	0.0065	<0.0050	<0.0049
Antimony	**mg/L**	**0.006**		<0.00050		<0.00050	<0.00050	<0.0005
Arsenic	**mg/L**	**0.025**		0.0011		<0.0010	<0.0010	<0.001
Barium	**mg/L**	**1.0 ***	0.039	0.028	0.003	0.0093	0.0090	0.0089
Beryllium	**mg/L**		<0.005	<0.00050	<0.0005	<0.00050	<0.00050	<0.0004
Bismuth	**mg/L**		<0.1					
Boron	**mg/L**	**5.0 ***	0.240	0.15	1.9	1.7	1.9	1.7
Cadmium	**mg/L**	**0.005 ***	<0.005	<0.00010	<0.0001	<0.00010	<0.00010	<0.00009
Calcium	**mg/L**		151.0	110	76	130	140	140
Chromium	**mg/L**	**0.05 ***	<0.01	<0.0050	<0.005	<0.0050	<0.0050	<0.005
Cobalt	**mg/L**		<0.01	<0.00050	<0.0005	<0.00050	<0.00050	<0.0005
Copper	**mg/L**	**1.0**	<0.01	0.0057	0.06	0.085	0.050	0.032
Iron	**mg/L**	**0.30**	<0.01	<0.10	<0.1	<0.10	<0.10	<0.1
Lead	**mg/L**	**0.01 ***	<0.001	<0.00050	0.0006	<0.00050	<0.00050	<0.0005
Magnesium	**mg/L**		125.0	74	170	200	230	230
Manganese	**mg/L**	**0.05**	0.090	0.022	0.004	0.0030	0.0066	0.0042
Mercury	**mg/L**	**0.001**						
Molybdenum	**mg/L**		<0.05	0.0023	0.0072	0.0060	0.0060	0.006
Nickel	**mg/L**		<0.05	0.0014	<0.001	0.0010	<0.0010	<0.001
Phosphorus	**mg/L**		<0.1	0.23	<0.1	<0.10	0.11	<0.1
Potassium	**mg/L**		9.7	6.4	32	36	36	35
Selenium	**mg/L**	**0.01**		<0.0020		<0.0020	<0.0020	<0.002
Silica	**mg/L**		10.7		3.6	4.0		
Silicon	**mg/L**			4.4			4.0	4.2
Silver	**mg/L**		<0.005	<0.00010	<0.0001	<0.00010	<0.00010	<0.00009
Sodium	**mg/L**	**200**	36.8	20	340	160	160	160
Strontium	**mg/L**		1.050	0.71	2.8	6.3	6.4	6
Thallium	**mg/L**			<0.000050		<0.000050	<0.000050	<0.00005
Tin	**mg/L**		<0.10					
Titanium	**mg/L**		<0.005	<0.0050	<0.005	<0.0050	<0.0050	<0.005
Tungsten	**mg/L**					<0.0010		
Uranium	**mg/L**	**0.02**		0.0060	0.045	0.039	0.040	0.042
Vanadium	**mg/L**		0.006	0.00065	<0.0005	<0.00050	<0.00050	<0.0005
Zinc	**mg/L**	**5.0**	<0.01	<0.0050	0.019	0.015	0.011	0.0097
Total Dissolved Solids	**mg/L**	**500**	1130	730	1840	1700	1800	1800

NOTES: 1) ODWS - Ontario Drinking Water Standards, 2006
2) * - Indicates health related Drinking Water Standard.

TABLE A-3
GROUNDWATER GENERAL CHEMICAL RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	ODWS	CLUBHOUSE Untreated			
			Jun-12	Oct-18	Oct-19	Nov-20
pH	**units**	**6.5-8.5**	7.01	7.83	7.79	7.87
Conductivity	**µS/cm**		830	2800	2800	2900
Colour	**TCU**	**5**				
Chloride	**mg/L**	**250**	160	240	250	260
Phosphate-ortho	**mg/L**		<0.010	<0.010	<0.010	<0.010
Sulphate	**mg/L**	**500**	800	570	600	610
Alkalinity	**mg/L**		530	590	590	600
Bicarbonate	**mg/L**		530	590	590	590
Carbonate	**mg/L**		<1.0	3.7	3.4	4.1
Hardness	**mg/L**	**80-100**	1200	980	1200	1300
Nitrate	**mg/L**	**10.0 ***	<0.10	<0.10	<0.10	<0.10
Nitrite	**mg/L**	**1.0 ***	<0.010	<0.010	<0.010	<0.010
Ammonia	**mg/L**		<0.050	<0.050	<0.050	<0.050
Dissolved Organic Carbon	**mg/L**	**5.0**	2.2	2.5	2.4	2.5
Aluminum	**mg/L**		<0.005	0.012	0.0086	<0.0049
Antimony	**mg/L**	**0.006**		<0.00050	<0.00050	<0.0005
Arsenic	**mg/L**	**0.025**		<0.0010	<0.0010	<0.001
Barium	**mg/L**	**1.0 ***	0.0073	0.011	0.0085	0.0091
Beryllium	**mg/L**		<0.0005	<0.00050	<0.00050	<0.0004
Bismuth	**mg/L**					
Boron	**mg/L**	**5.0 ***	1.7	1.6	1.9	1.8
Cadmium	**mg/L**	**0.005 ***	<0.0001	<0.00010	<0.00010	<0.00009
Calcium	**mg/L**		130	110	130	140
Chromium	**mg/L**	**0.05 ***	<0.005	<0.0050	<0.0050	<0.005
Cobalt	**mg/L**		<0.0005	<0.00050	<0.00050	<0.0005
Copper	**mg/L**	**1.0**	0.0022	0.10	0.042	0.029
Iron	**mg/L**	**0.30**	<0.1	<0.10	<0.10	<0.1
Lead	**mg/L**	**0.01 ***	<0.0005	0.0095	0.00076	<0.0005
Magnesium	**mg/L**		210	170	220	240
Manganese	**mg/L**	**0.05**	0.0025	0.0039	0.0064	0.0043
Mercury	**mg/L**	**0.001**				
Molybdenum	**mg/L**		0.0067	0.0051	0.0060	0.0059
Nickel	**mg/L**		<0.001	0.11	<0.0010	0.0071
Phosphorus	**mg/L**		<0.1	<0.10	0.11	<0.1
Potassium	**mg/L**		33	29	36	36
Selenium	**mg/L**	**0.01**		<0.0020	<0.0020	<0.002
Silica	**mg/L**		3.6	3.3		
Silicon	**mg/L**				4.0	4
Silver	**mg/L**		<0.0001	<0.00010	<0.00010	<0.00009
Sodium	**mg/L**	**200**	170	130	160	160
Strontium	**mg/L**		5.7	5.1	6.1	6.3
Thallium	**mg/L**			<0.000050	<0.000050	<0.00005
Tin	**mg/L**					
Titanium	**mg/L**		<0.005	<0.0050	<0.0050	<0.005
Tungsten	**mg/L**			<0.0010		
Uranium	**mg/L**	**0.02**	0.043	0.031	0.040	0.043
Vanadium	**mg/L**		<0.0005	<0.00050	<0.00050	<0.0005
Zinc	**mg/L**	**5.0**	0.008	0.43	0.040	0.073
Total Dissolved Solids	**mg/L**	**500**	1830	1600	1800	1800

NOTES: 1) ODWS - Ontario Drinking Water Standards, 2006
2) * - Indicates health related Drinking Water Standard.

TABLE A-4
GROUNDWATER ORGANIC CHEMICAL RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	ODWS	GP106		CLUBHOUSE Treated			
		Sep-99	Oct-19	Nov-11	Oct-18	Oct-19	Nov-20
1,1,1,2-Tetrachloroethane		<0.2	<0.50	<0.1	<0.50	<0.50	<0.50
1,1,1-Trichloroethane		<0.2	<0.20	<0.1	<0.20	<0.20	<0.20
1,1,2,2-Tetrachloroethane		<0.2	<0.50	<0.2	<0.50	<0.50	<0.40
1,1,2-Trichloroethane		<0.2	<0.50	<0.2	<0.50	<0.50	<0.40
1,1-Dichloroethane		<0.2	<0.20	0.4	0.30	0.39	0.36
1,1-Dichloroethylene		<0.2	<0.20	<0.1	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	**3**	<0.2	<0.50	<0.2	<0.50	<0.50	<0.40
1,2-Dichloroethane	**5 ****	<0.2	<0.50	<0.2	<0.50	<0.50	<0.49
1,2-Dichloropropane		<0.2	<0.20	<0.1	<0.20	<0.20	<0.20
1,3-Dichlorobenzene		<0.2	<0.50	<0.2	<0.50	<0.50	<0.40
1,3-Dichloropropylene			<0.50			<0.50	<0.50
1,4-Dichlorobenzene	**1**	<0.2	<0.50	<0.2	<0.50	<0.50	<0.40
Acetone		<10.0	<10	<10	<10	<10	<10
Benzene	**5 ****	0.2	<0.20	<0.1	<0.20	<0.20	<0.20
Bromodichloromethane		<0.2	<0.50	<0.1	<0.50	<0.50	<0.50
Bromoform		<0.2	<1.0	<0.2	<1.0	<1.0	<1.0
Bromomethane		<0.5	<0.50	<0.5	<0.50	<0.50	<0.50
Carbon tetrachloride	**5 ****	<0.2	<0.20	<0.1	<0.20	<0.20	<0.19
Chlorobenzene		<0.2	<0.20	<0.1	<0.20	<0.20	<0.20
Chloroethane		<0.5					
Chloroform		<0.2	<0.20	<0.1	<0.20	<0.20	<0.20
Chloromethane		<1.0					
cis-1,2-Dichloroethylene		<0.2	<0.50	<0.1	<0.50	<0.50	<0.50
cis-1,3-Dichloropropylene		<0.2	<0.30	<0.2	<0.30	<0.30	<0.30
Dibromochloromethane		<0.2	<0.50	<0.2	<0.50	<0.50	<0.50
Dichlorodifluoromethane			<1.0		<1.0	<1.0	<1.0
Dichloromethane	**50 ****	<1.0	<2.0	<0.5	<2.0	<2.0	<2.0
Ethyl benzene	**2.4**	<0.2	<0.20	<0.1	<0.20	<0.20	<0.20
Ethylene dibromide		<0.2	<0.20	<0.2	<0.20	<0.20	<0.19
Hexane			<1.0		<1.0	<1.0	<1.0
m/p-Xylenes		<0.2	<0.20	<0.1	<0.20	<0.20	<0.20
Methyl butyl ketone		<5.0					
Methyl ethyl ketone		<5.0	<10	<5	<10	<10	<10
Methyl isobutyl ketone		<5.0	<5.0	<5	<5.0	<5.0	<5.0
Methyl t-butyl ether		<0.2	<0.50	<0.2	<0.50	<0.50	<0.50
o-Xylene		<0.2	<0.20	<0.1	<0.20	<0.20	<0.20
Styrene		<0.2	<0.50	<0.2	<0.50	<0.50	<0.40
Tetrachloroethylene		<0.2	<0.20	<0.1	<0.20	<0.20	<0.20
Toluene	**24**	* 0.1	<0.20	<0.2	<0.20	<0.20	<0.20
trans-1,2-Dichloroethylene		<0.2	<0.50	<0.1	<0.50	<0.50	<0.50
trans-1,3-Dichloropropylene		<0.2	<0.40	<0.2	<0.40	<0.40	<0.40
Trichloroethylene	**50 ****	<0.2	<0.20	<0.1	<0.20	<0.20	<0.20
Trichlorofluoromethane		<0.5	<0.50	<0.2	<0.50	<0.50	<0.50
Vinyl chloride	**2 ****	<0.5	<0.20	<0.2	<0.20	<0.20	<0.20
Xylenes: total	**300**		<0.20		<0.20	<0.20	<0.20
F1 (C6-C10)					<25		
F1 (C6-C10) - BTEX					<25		

NOTES: 1) ODWS - Ontario Drinking Water Standards, 2006
2) Blank indicates parameter not analysed.
3) * - Indicates trace concentration detected below the Limit of Quantitation.
** - Indicates health related drinking water standard.
4) Concentrations in µg/L.

TABLE A-4
GROUNDWATER ORGANIC CHEMICAL RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	ODWS	CLUBHOUSE Untreated			
		Jun-12	Oct-18	Oct-19	Nov-20
1,1,1,2-Tetrachloroethane		<0.2	<0.50	<0.50	<0.50
1,1,1-Trichloroethane		<0.1	<0.20	<0.20	<0.20
1,1,2,2-Tetrachloroethane		<0.2	<0.50	<0.50	<0.40
1,1,2-Trichloroethane		<0.2	<0.50	<0.50	<0.40
1,1-Dichloroethane		0.39	0.22	0.39	0.23
1,1-Dichloroethylene		<0.1	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	**3**	<0.2	<0.50	<0.50	<0.40
1,2-Dichloroethane	**5 ****	<0.2	<0.50	<0.50	<0.49
1,2-Dichloropropane		<0.1	<0.20	<0.20	<0.20
1,3-Dichlorobenzene		<0.2	<0.50	<0.50	<0.40
1,3-Dichloropropylene				<0.50	<0.50
1,4-Dichlorobenzene	**1**	<0.2	<0.50	<0.50	<0.40
Acetone		<10	<10	<10	<10
Benzene	**5 ****	<0.1	<0.20	<0.20	<0.20
Bromodichloromethane		<0.1	<0.50	<0.50	<0.50
Bromoform		<0.2	<1.0	<1.0	<1.0
Bromomethane		<0.5	<0.50	<0.50	<0.50
Carbon tetrachloride	**5 ****	<0.1	<0.20	<0.20	<0.19
Chlorobenzene		<0.1	<0.20	<0.20	<0.20
Chloroethane					
Chloroform		<0.1	0.40	<0.20	<0.20
Chloromethane					
cis-1,2-Dichloroethylene		<0.1	<0.50	<0.50	<0.50
cis-1,3-Dichloropropylene		<0.2	<0.30	<0.30	<0.30
Dibromochloromethane		<0.2	<0.50	<0.50	<0.50
Dichlorodifluoromethane			<1.0	<1.0	<1.0
Dichloromethane	**50 ****	<0.5	<2.0	<2.0	<2.0
Ethyl benzene	**2.4**	<0.1	<0.20	<0.20	<0.20
Ethylene dibromide		<0.2	<0.20	<0.20	<0.19
Hexane			<1.0	<1.0	<1.0
m/p-Xylenes		<0.1	<0.20	<0.20	<0.20
Methyl butyl ketone					
Methyl ethyl ketone		<5	<10	<10	<10
Methyl isobutyl ketone		<5	<5.0	<5.0	<5.0
Methyl t-butyl ether		<0.2	<0.50	<0.50	<0.50
o-Xylene		<0.1	<0.20	<0.20	<0.20
Styrene		<0.2	<0.50	<0.50	<0.40
Tetrachloroethylene		<0.1	<0.20	<0.20	<0.20
Toluene	**24**	<0.2	<0.20	<0.20	<0.20
trans-1,2-Dichloroethylene		<0.1	<0.50	<0.50	<0.50
trans-1,3-Dichloropropylene		<0.2	<0.40	<0.40	<0.40
Trichloroethylene	**50 ****	<0.1	<0.20	<0.20	<0.20
Trichlorofluoromethane			<0.50	<0.50	<0.50
Vinyl chloride	**2 ****	<0.2	<0.20	<0.20	<0.20
Xylenes: total	**300**		<0.20	<0.20	<0.20
F1 (C6-C10)			<25		
F1 (C6-C10) - BTEX			<25		

NOTES: 1) ODWS - Ontario Drinking Water Standards, 2006
2) Blank indicates parameter not analysed.
3) * - Indicates trace concentration detected below the Limit of Quantitation.
** - Indicates health related drinking water standard.
4) Concentrations in µg/L.

TABLE A-5
WATER LEVEL ELEVATIONS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

MONITOR	T.O.P. ELEVATION (m)	WATER LEVEL ELEVATION (m)								
		Sep-99	Oct-18	Jun-19	Sep-19	Dec-19	May-20	Jul-20	Sep-20	Dec-20
GP6	150.64			146.62	145.98	146.67	147.12	146.93	146.81	146.78
GP8R	151.35			149.21	148.30	149.81	149.24	148.60	148.26	148.45
GP9R	150.28			148.35	Dry	145.87	148.79	146.72	Dry	Dry
GP10	148.57				146.40	Frozen	147.69	146.69	146.47	147.51
GP11	151.38				149.01	Frozen	150.43	149.23	148.45	149.47
GP15R	153.13			151.47	149.25	151.77	151.59	149.77	149.38	150.60
GP106	152.70	149.68	149.53	151.19	149.74	151.45	150.83	150.18	149.64	149.13
GP107	154.73			153.65	152.21	153.86	153.15	152.71	152.24	151.78
GP108	154.62			153.72	152.25	154.37	153.29	152.89	152.30	152.54
99-1	154.15	147.26	149.01	149.78	149.13	148.97	149.47	149.31	149.14	148.87
99-2	154.62	147.83	150.04	151.10	150.26	Frozen	150.96	150.64	150.32	150.17

NOTES: 1) Elevations based on an original assumed T.O.P. elevation of 153.57 m for GP101.
2) m - Metres
T.O.P - Top of Pipe

FIGURE A-1
GROUNDWATER HYDROGRAPH

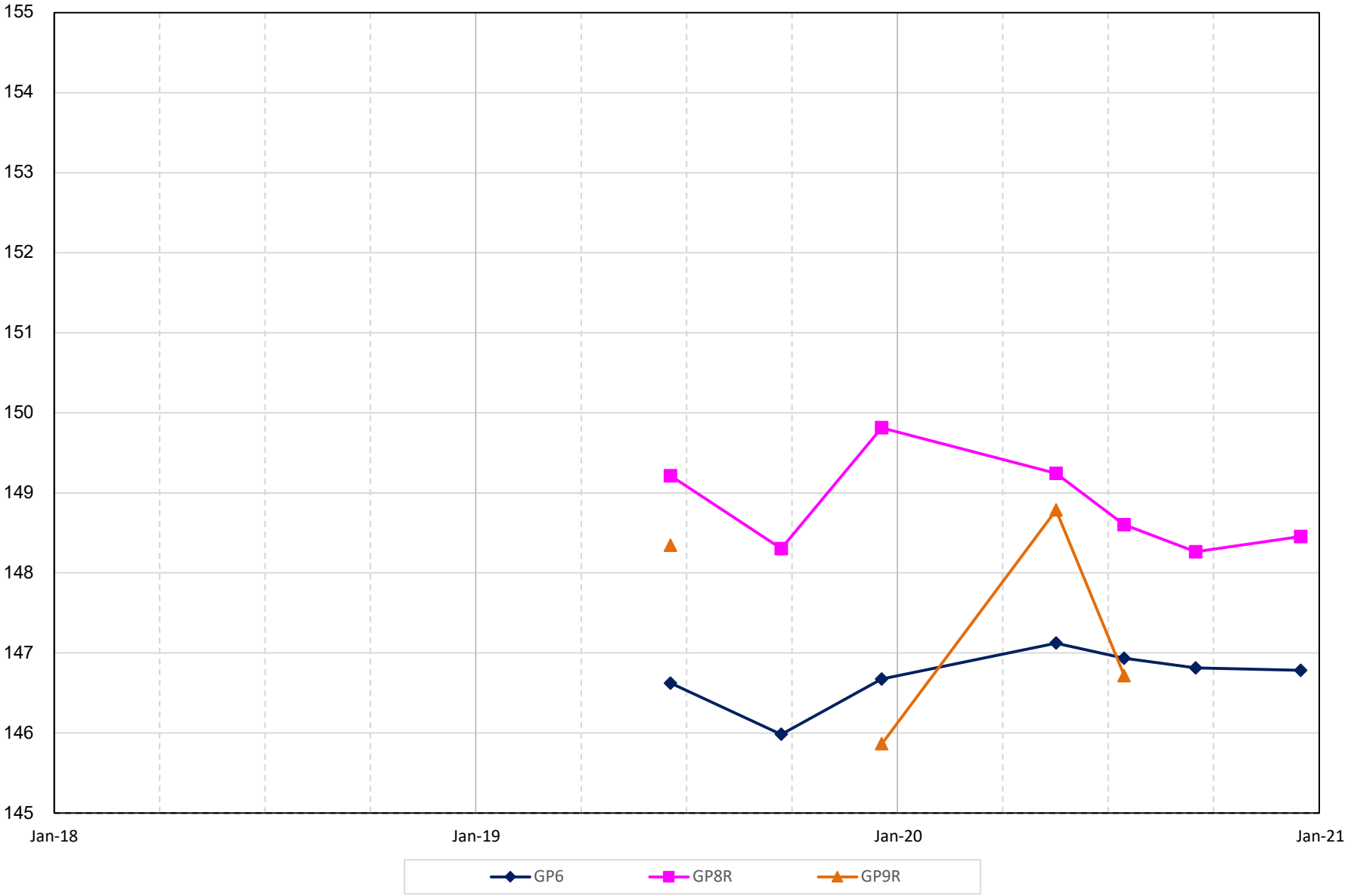


FIGURE A-2
GROUNDWATER HYDROGRAPH

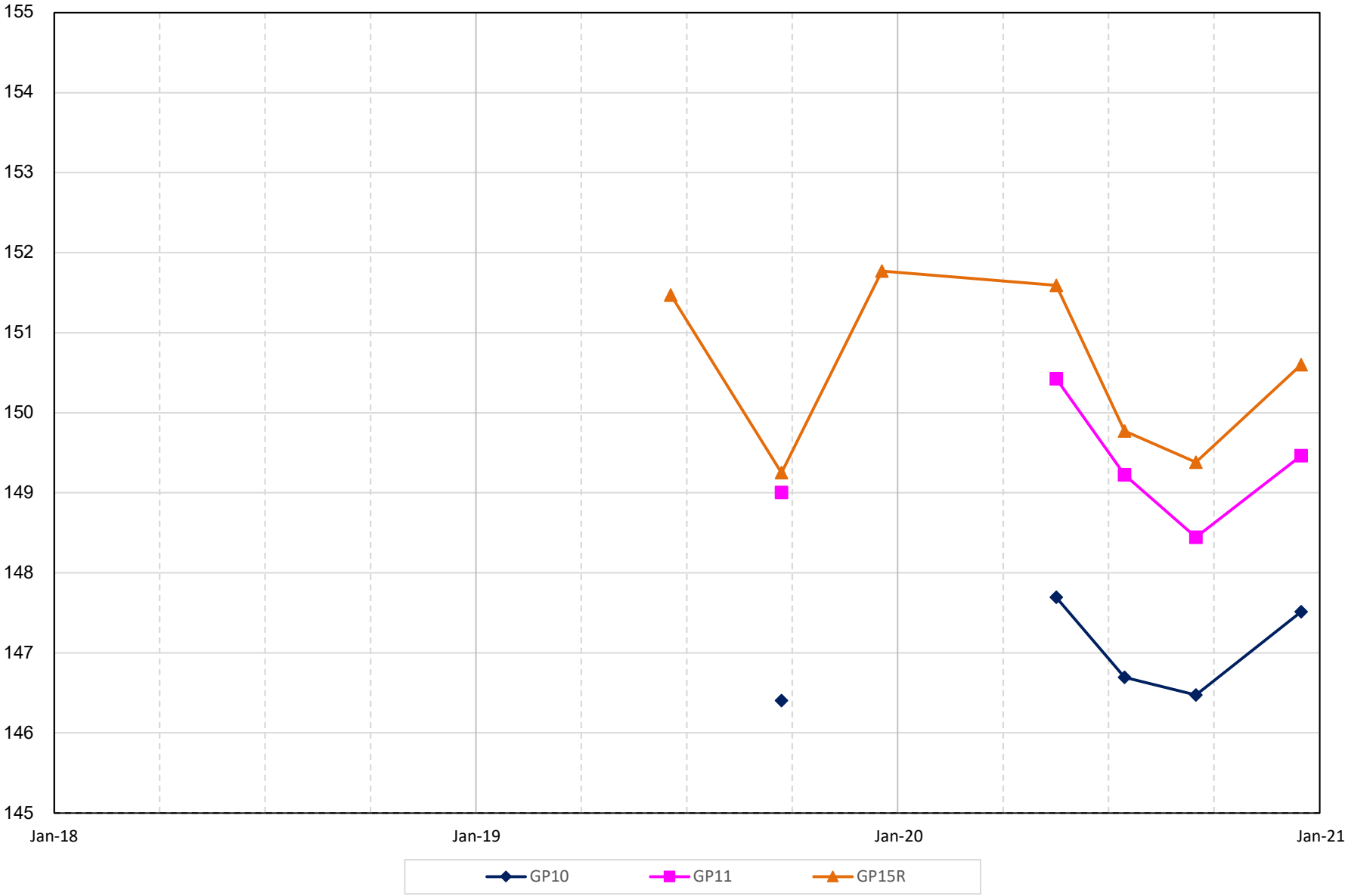


FIGURE A-3
GROUNDWATER HYDROGRAPH

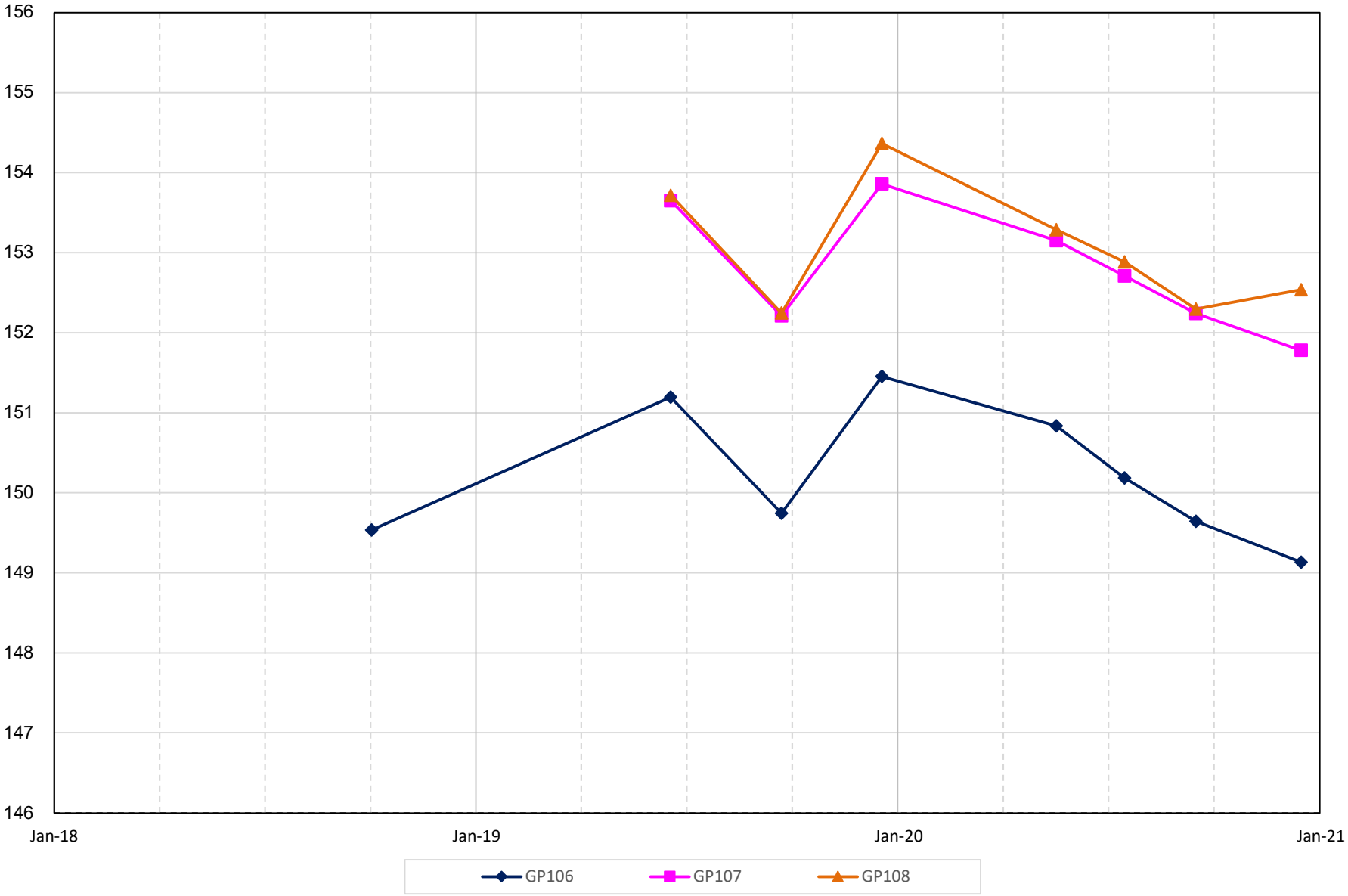
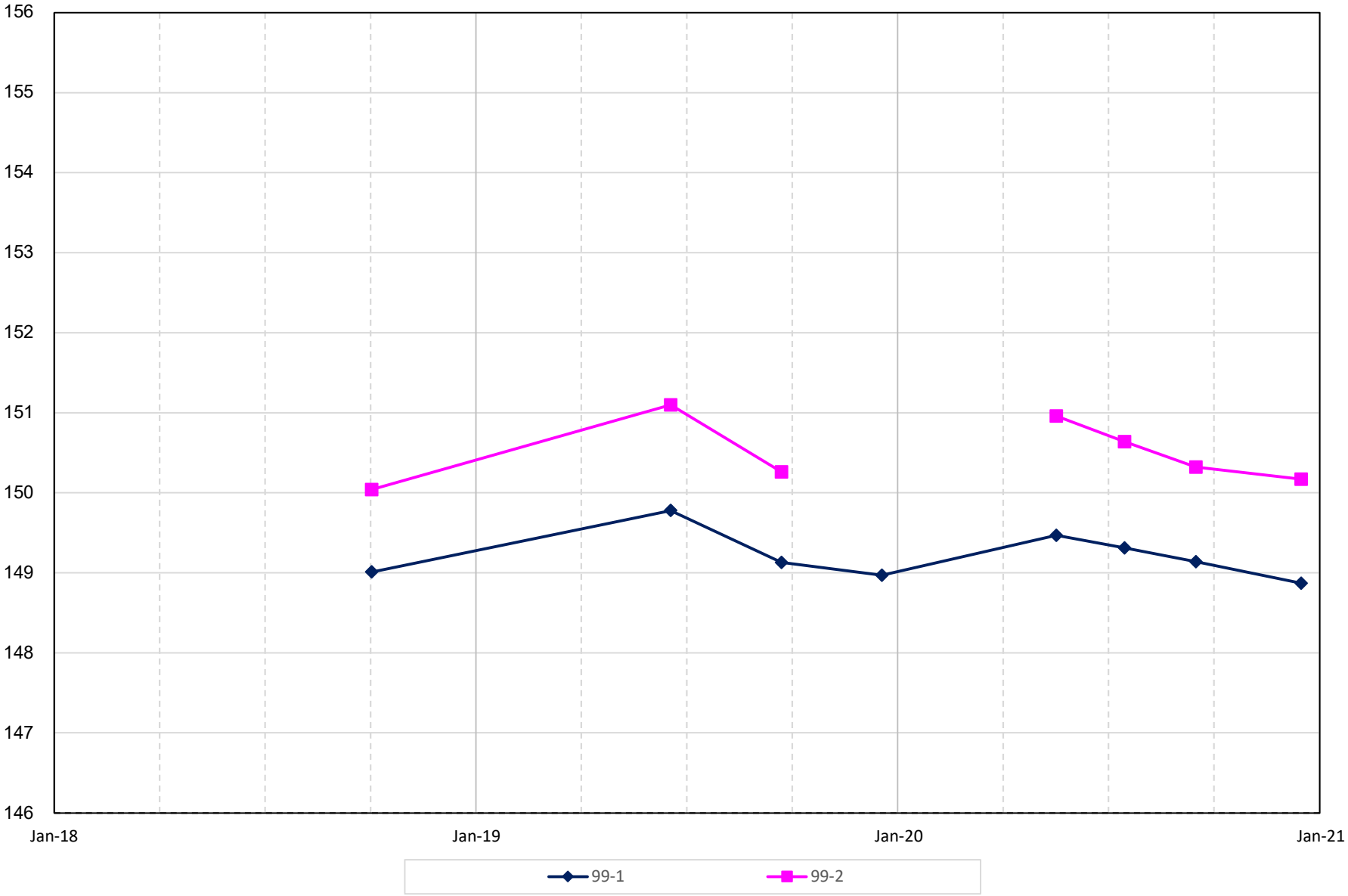


FIGURE A-3
GROUNDWATER HYDROGRAPH



APPENDIX

B SURFACE WATER CHEMICAL RESULTS

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	UPSTREAM												
			SW1												
		Objectives	Jun-86	Nov-86	Jun-94	Jun-00	Sep-00	Nov-01	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20
pH	**units**	**6.5-8.5**	8.00	8.52	5.90	8.08	7.86	8.09	8.27	7.90	8.03	8.21	8.3	7.98	8.14
Conductivity	**µS/cm**		1191	840	1690	1051	1190	1051	939	1900	870	1600	1700	680	2000
Turbidity	**NTU**				2	1	1	41.0		5.0	1.9	19.0	3.6	9.8	2.1
Chloride	**mg/L**		157	69	325	173	223	167	130	340	100	320	330	88	370
Phosphate-ortho	**mg/L**		<0.01	0.02	0.06	<1	<0.3	<1	0.01	0.01	<0.010	0.05	<0.010	0.11	0.01
Sulphate	**mg/L**		115.0	78.0	166.0	86.7	110.0	138	73	140	43	65	77	33	150
Alkalinity	**mg/L**		341	269	29	285	277	157	192	280	150	230	250	170	270
Bicarbonate	**mg/L**					345	275	189	188			230	240	170	270
Carbonate	**mg/L**					1	2	1	3			4	5	1.5	3.5
Hardness	**mg/L**		411	322	221	332	403	287	250	530	260	290	360	210	470
Nitrate	**mg/L**		<0.05	0.10	0.20	0.2	<0.2	0.7	0.7	<0.001	<0.10	<0.10	<0.10	0.36	<0.10
Nitrite	**mg/L**					<0.2	<0.2	<0.2	<0.01	<0.001	<0.01	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**				0.93										
Ammonia: total	**mg/L**		0.05	<0.05	<0.05	<0.03	<0.03	<0.03	<0.05	<0.001	<0.05	0.06	<0.050	0.11	<0.050
Ammonia: un-ionized	**µg/L**	**20**	1	<1	<1	<1	<1	<1	<0.97	<1	<2	2	<1	<1	<1
Total Organic Carbon	**mg/L**		5.2	6.3	8.5	6.2	7.9	8.7	7.8	4.8	3.4	11	6.4	5.9	6.8
Phenols	**µg/L**									<0.001					
Aluminum	**mg/L**	**0.075 ****	0.130	<0.001	0.025	0.024	<0.03	1.090	0.270	0.100	0.057	0.760	0.230	0.330	0.14
Antimony	**mg/L**				0.004	<0.0005		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**				0.002	<0.002		<0.002	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Barium	**mg/L**				0.045	0.051	0.047	0.050	0.036	0.087	0.033	0.051	0.048	0.028	0.072
Beryllium	**mg/L**	**1.100 *****			<0.005	<0.001	<0.0005	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004
Bismuth	**mg/L**					<0.001	<0.1	<0.001		<0.001					
Boron	**mg/L**	**0.200**			0.094	0.112	0.090	0.06	0.05	0.19	0.06	0.07	0.06	0.08	0.1
Cadmium	**mg/L**	**0.0002**	<0.003	<0.010	<0.0002	<0.0001	<0.005	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Calcium	**mg/L**		116.0	86.2	64.6	97.2	115.0	80	75	140	64	80	99	61	130
Chromium	**mg/L**	**1.100**	<0.010	<0.010	0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005	0.006	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**			<0.001	<0.0001	<0.005	0.0004	<0.0005	<0.01	<0.0005	0.0006	<0.0005	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	<0.010	<0.010	0.0100	0.0018	<0.003	0.0044	0.0030	<0.003	<0.001	0.0048	0.0021	0.0022	0.0018
Iron	**mg/L**	**0.300**			0.02	0.04	0.04	1.16	0.25	0.20	<0.1	1.20	0.41	0.37	0.19
Lead	**mg/L**	**0.025 ******			0.0002	<0.0005	<0.001	0.0009	<0.0005	<0.002	<0.0005	0.0012	<0.0005	<0.0005	<0.0005
Magnesium	**mg/L**		29.3	25.9	14.5	21.5	28.3	21.4	18.0	39.0	17.0	21.0	27.0	15.0	36
Manganese	**mg/L**		0.052	0.130	0.029	0.033	0.045	0.022	0.030	0.760	0.150	0.130	0.086	0.350	0.17
Molybdenum	**mg/L**				0.002	0.001	<0.02	0.001	0.001	<0.001	0.001	0.001	0.001	0.002	0.0014
Nickel	**mg/L**	**0.025**	<0.030	<0.010	0.003	<0.001	<0.02	0.001	<0.001	<0.0005	<0.001	0.002	0.001	0.001	<0.001
Phosphorus	**mg/L**	**0.030**				<0.05	<0.1	0.08	0.05	<0.1	0.015	0.09	0.029	0.13	0.058
Potassium	**mg/L**		5.7	4.0	4.2	4.4	5.0	5.4	3.6	6.0	2.8	5.1	3.4	4.4	5.6
Selenium	**mg/L**				<0.001	<0.002		<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**				3.8	1.39	3.30	3.93	3.10	2.90	1.10	4.00	1.20	2.80	2.3
Silver	**mg/L**	**0.0001**			<0.0001	<0.0001	<0.003	<0.0001	<0.0001	<0.5	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Sodium	**mg/L**		99.2	45.8	215.0	104.0	115.0	100	97	200	74	210	210	63	220
Strontium	**mg/L**				0.540	0.692	0.730	0.630	0.560	1.300	0.580	0.690	0.900	0.520	1.6
Thallium	**mg/L**	**0.0003**									<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**				<0.002	<0.001	<0.05	0.001		<0.002					
Titanium	**mg/L**					<0.005	<0.005	0.016	0.010	<0.005	<0.005	0.016	0.008	0.012	0.0051
Vanadium	**mg/L**	**0.007**			0.003	<0.0005	<0.005	0.0018	0.0006	<0.001	<0.0005	0.0019	0.0008	0.0014	<0.0005
Zinc	**mg/L**	**0.030**	<0.020	<0.010	0.010	<0.005	<0.005	0.009	<0.005	<0.004	<0.005	0.010	<0.005	<0.005	<0.005
Total Dissolved Solids	**mg/L**				872	659	765	606	508	1100		860	910	370	1100

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	ADJACENT TO REFUSE AREA										
			SW2										
		Objectives	Sep-99	Jun-00	Sep-00	Nov-01	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20
pH	**units**	**6.5-8.5**	8.28	8.15	8.03	8.02	8.27	8.10	7.98	8.19	8.3	7.97	8.14
Conductivity	**µS/cm**		1860	1053	1200	1067	937	2000	850	1500	1700	880	2000
Turbidity	**NTU**		12	1	2	39.0		5.5	1.9	8.5	3	7.1	2.2
Chloride	**mg/L**		180	170	224	167	130	370	130	300	330	140	380
Phosphate-ortho	**mg/L**		<0.3	<1	<0.3	<1	0.02	<0.001	0.014	0.055	<0.010	0.012	<0.010
Sulphate	**mg/L**		185.0	87.8	111.0	138	74	180	59	63	77	47	140
Alkalinity	**mg/L**		563	288	289	159	192	270	160	220	250	180	270
Bicarbonate	**mg/L**		553	349	286	191	189			220	240	180	270
Carbonate	**mg/L**		10.0	1	3	1	3			3	5	1.6	3.5
Hardness	**mg/L**		520	343	403	288	250	520	270	280	360	240	490
Nitrate	**mg/L**		0.60	0.2	<0.2	0.7	0.7	0.5	<0.10	0.1	<0.10	<0.10	<0.10
Nitrite	**mg/L**		<0.2	<0.2	<0.2	<0.2	<0.01	0.02	<0.01	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**												
Ammonia: total	**mg/L**		1.48	0.24	0.45	<0.03	<0.05	0.09	0.55	<0.050	0.1	0.18	0.15
Ammonia: un-ionized	**µg/L**	**20**	59	11	11	<1	<2	1	5	<1	2	<1	3
Total Organic Carbon	**mg/L**		20.7	6.8	8.6	8.4	7.8	7.7	4	10	6.6	6.2	6.5
Phenols	**µg/L**							0.0					
Aluminum	**mg/L**	**0.075 ****	0.070	0.032	<0.03	1.240	0.260	0.500	0.045	0.230	0.100	0.500	0.088
Antimony	**mg/L**			<0.0005		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**			<0.002		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Barium	**mg/L**		0.099	0.054	0.056	0.050	0.035	0.096	0.039	0.046	0.049	0.039	0.075
Beryllium	**mg/L**	**1.100 *****	<0.005	<0.001	<0.0005	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004
Bismuth	**mg/L**		<0.1	<0.001	<0.1	<0.001		<0.001					
Boron	**mg/L**	**0.200**	1.390	0.122	0.120	0.07	0.06	0.23	0.08	0.07	0.07	0.11	0.12
Cadmium	**mg/L**	**0.0002**	<0.005	<0.0001	<0.005	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Calcium	**mg/L**		98.2	99.8	113.0	80	75	130	64	79	96	63	140
Chromium	**mg/L**	**1.100**	<0.01	<0.005	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.01	<0.0001	<0.005	0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	<0.01	0.0018	<0.003	0.0047	0.0030	<0.003	<0.001	0.0035	0.0017	0.0023	0.0014
Iron	**mg/L**	**0.300**	0.22	0.11	0.37	1.30	0.24	0.86	0.27	0.40	0.23	0.66	0.18
Lead	**mg/L**	**0.025 ******	<0.001	<0.0005	<0.001	0.0010	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	0.0007	<0.0005
Magnesium	**mg/L**		66.8	22.7	29.2	21.3	18.0	42.0	17.0	19.0	27.0	17.0	38
Manganese	**mg/L**		0.900	0.052	0.102	0.028	0.028	0.410	0.200	0.060	0.090	0.320	0.18
Molybdenum	**mg/L**		<0.05	0.001	<0.02	0.001	0.001	<0.001	0.001	0.001	0.001	0.002	0.0014
Nickel	**mg/L**	**0.025**	<0.05	<0.001	<0.02	0.002	<0.001	<0.0005	<0.001	0.001	<0.001	0.001	<0.001
Phosphorus	**mg/L**	**0.030**	<0.1	<0.05	<0.1	0.09	0.05	0.10	0.016	0.092	0.023	0.070	0.031
Potassium	**mg/L**		22.4	4.8	5.0	5.4	3.6	8.0	3.2	4.9	3.4	4.1	5.8
Selenium	**mg/L**			<0.002		<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		0.7	1.24	2.40	4.23	3.00	1.90	1.20	3.30	1.10	1.70	2.3
Silver	**mg/L**	**0.0001**	<0.005	<0.0001	<0.003	<0.0001	<0.0001	<0.5	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Sodium	**mg/L**		236.0	104.0	116.0	99	95	220	68	210	210	89	230
Strontium	**mg/L**		1.410	0.695	0.743	0.649	0.550	1.400	0.550	0.650	0.890	0.630	1.6
Thallium	**mg/L**	**0.0003**							<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		<0.10	<0.001	<0.05	0.003		<0.002					
Titanium	**mg/L**		<0.005	<0.005	<0.005	0.017	0.009	0.010	<0.005	0.008	<0.005	0.010	<0.005
Vanadium	**mg/L**	**0.007**	<0.005	<0.0005	<0.005	0.0021	0.0007	<0.001	<0.0005	0.0009	0.0005	0.0017	<0.0005
Zinc	**mg/L**	**0.030**	<0.01	0.007	<0.005	0.009	<0.005	<0.004	<0.005	<0.005	<0.005	0.006	<0.005
Total Dissolved Solids	**mg/L**		1130	662	775	606	509	1100		820	910	480	1100

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	ADJACENT TO REFUSE AREA								
			SW3								
		Objectives	Jun-86	Nov-86	Jun-94	Jun-00	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20
pH	**units**	**6.5-8.5**	8.50	8.50	7.50	8.18	8.23	8.02	7.81	8	8.3
Conductivity	**µS/cm**		836	790	740	811	843	1800	1100	970	1100
Turbidity	**NTU**				33	7		8	23	20	5.4
Chloride	**mg/L**		122	72	68	57	46	220	110	98	84
Phosphate-ortho	**mg/L**		0.01	0.03	0.05	<1	ND	<0.001	<0.010	<0.010	<0.010
Sulphate	**mg/L**		64.0	66.5	69.0	67.9	75.0	260.0	30	82	88
Alkalinity	**mg/L**		192	264	154	353	291	380	370	300	360
Bicarbonate	**mg/L**					428	286			300	360
Carbonate	**mg/L**					1	5			3	6.6
Hardness	**mg/L**		371	311	217	358	340	710	400	350	450
Nitrate	**mg/L**		<0.05	0.50	0.67	2.0	0.5	0.5	<0.10	0.2	1.3
Nitrite	**mg/L**					<0.2	0.01	0.08	0.012	0.016	0.046
Total Kjeldahl Nitrogen	**mg/L**				1.24						
Ammonia: total	**mg/L**		0.05	<0.05	0.11	0.10	<0.05	0.17	0.49	0.18	0.12
Ammonia: un-ionized	**µg/L**	**20**	5	<3	1	4	<2	3	4	3	3
Total Organic Carbon	**mg/L**		5.2	5.7	6.6	5.7	7.2	6.8	6.2	6.7	4.6
Phenols	**µg/L**							<0.001			
Aluminum	**mg/L**	**0.075 ****	0.066	0.100	1.200	0.063	0.093	0.600	0.042	0.140	0.052
Antimony	**mg/L**				<0.002	<0.0005	<0.0005	<0.001	0.001	0.001	<0.0005
Arsenic	**mg/L**				0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	**mg/L**				0.050	0.078	0.110	0.210	0.110	0.090	0.088
Beryllium	**mg/L**	**1.100 *****			<0.005	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005
Bismuth	**mg/L**					<0.001		<0.001			
Boron	**mg/L**	**0.200**			0.140	0.224	0.150	0.260	0.120	0.110	0.17
Cadmium	**mg/L**	**0.0002**	0.003	0.001	<0.0002	<0.0001	0.000	<0.002	<0.0001	<0.0001	<0.0001
Calcium	**mg/L**		108.0	79.3	61.7	83.5	82.0	180.0	98.0	90.0	98
Chromium	**mg/L**	**1.100**	0.010	0.010	0.003	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**			0.001	<0.0001	<0.0005	<0.01	0.001	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	0.0100	0.0100	0.0100	0.0030	0.0030	<0.003	0.0011	0.0023	0.0017
Iron	**mg/L**	**0.300**			1.30	0.69	0.43	1.10	2.10	2.10	0.96
Lead	**mg/L**	**0.025 ******			0.0070	0.0023	0.0024	<0.002	0.0010	0.0029	0.00068
Magnesium	**mg/L**		24.9	27.4	15.2	36.1	39.0	68.0	28.0	31.0	50
Manganese	**mg/L**		0.220	0.120	0.056	0.093	0.100	0.450	1.100	0.220	0.12
Molybdenum	**mg/L**				<0.002	0.003	0.003	<0.001	0.001	0.002	0.0034
Nickel	**mg/L**	**0.025**	0.030	0.010	0.004	0.002	0.001	<0.0005	0.003	0.002	0.0015
Phosphorus	**mg/L**	**0.030**				<0.05	0.02	<0.1	0.014	0.025	0.025
Potassium	**mg/L**		5.7	4.4	7.4	9.7	15.0	18.0	6.3	5.4	7.3
Selenium	**mg/L**				<0.001	<0.002	<0.002	<0.004	<0.002	<0.002	<0.002
Silicon	**mg/L**				3.7	2.00	2.50	5.90	3.40	3.70	2.4
Silver	**mg/L**	**0.0001**			<0.0001	<0.0001	<0.0001	<0.5	<0.0001	<0.0001	<0.0001
Sodium	**mg/L**		70.1	42.4	53.5	37.4	36.0	140.0	79.0	72.0	60
Strontium	**mg/L**				0.033	1.520	1.500	2.200	1.000	2.100	3.2
Thallium	**mg/L**	**0.0003**							<0.00005	<0.00005	<0.00005
Tin	**mg/L**				<0.002	<0.001		<0.002			
Titanium	**mg/L**					<0.005	<0.005	0.010	<0.005	0.006	<0.005
Vanadium	**mg/L**	**0.007**			0.00	<0.0005	<0.0005	<0.001	<0.0005	0.001	<0.0005
Zinc	**mg/L**	**0.030**	0.020	0.010	0.033	0.015	0.012	0.210	0.009	0.010	0.0065
Total Dissolved Solids	**mg/L**				375	503	465	1100		580	620

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	DOWNSTREAM											
			SW4											
		Objectives	Jun-86	Nov-86	Jun-94	Jun-00	Sep-00	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20
pH	**units**	**6.5-8.5**	8.54	8.48	7.80	8.26	8.10	8.27	8.18	8	8.11	8.37	8.20	8.21
Conductivity	**µS/cm**		856	775	1160	1011	1180	919	1100	1200	1300	1500	970	1600
Turbidity	**NTU**				1	2	1.2		3.9	8.2	12	3.3	6.0	1.7
Chloride	**mg/L**		124	72	160	170	226	120	170	170	250	270	140	270
Phosphate-ortho	**mg/L**		0.01	0.05	0.05	<1	<0.3	0.02	0.02	<0.01	0.05	<0.010	0.022	<0.010
Sulphate	**mg/L**		61.0	66.2	78.0	65.5	83.2	71.0	88.0	87	61	75	79	110
Alkalinity	**mg/L**		208	179	177	287	307	198	200	220	210	260	200	260
Bicarbonate	**mg/L**					348	303	195			210	250	200	260
Carbonate	**mg/L**					1	4	3			3	6	3.0	3.9
Hardness	**mg/L**		401	311	267	380	448	260	390	410	270	380	320	410
Nitrate	**mg/L**		<0.05	0.45	0.56	0.5	0.3	1.2	0.4	0.8	0.49	0.48	0.45	0.46
Nitrite	**mg/L**					<0.2	<0.2	<0.01	<0.001	0.012	<0.010	0.011	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**				1.14									
Ammonia: total	**mg/L**		<0.05	0.05	0.05	0.18	<0.03	<0.05	<0.001	0.061	<0.050	0.088	<0.050	<0.050
Ammonia: un-ionized	**µg/L**	**20**	<5	3	1	10	<1	<2	<1	1	<1	2	<1	<1
Total Organic Carbon	**mg/L**		5.6	5.7	9.6	6.1	7.4	7.2	4.3	3.7	8.8	5.6	5.3	4.9
Phenols	**µg/L**								<0.001					
Aluminum	**mg/L**	**0.075 ****	0.072	<0.100	1.300	0.065	<0.03	0.210	0.200	0.220	0.340	0.110	0.260	0.13
Antimony	**mg/L**				0.005	<0.0005		<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**				0.002	<0.002		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Barium	**mg/L**				0.073	0.082	0.073	0.044	0.083	0.069	0.047	0.059	0.066	0.075
Beryllium	**mg/L**	**1.100 *****			<0.005	<0.001	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004
Bismuth	**mg/L**					<0.001	<0.1		<0.001					
Boron	**mg/L**	**0.200**			0.190	0.171	0.16	0.07	0.20	0.21	0.10	0.10	0.19	0.2
Cadmium	**mg/L**	**0.0002**	<0.003	<0.001	<0.0002	<0.0001	<0.005	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Calcium	**mg/L**		112.0	80.7	71.9	104.0	121	78	94	90	73	98	85	100
Chromium	**mg/L**	**1.100**	<0.010	<0.010	0.004	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**			0.001	<0.0001	<0.005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	<0.010	<0.010	0.0100	0.0026	<0.003	0.0030	<0.003	0.0022	0.0038	0.0020	0.0020	0.0019
Iron	**mg/L**	**0.300**			1.20	0.25	0.14	0.21	0.22	0.44	0.57	0.31	0.32	0.31
Lead	**mg/L**	**0.025 ******			0.0010	<0.0005	<0.001	<0.0005	<0.002	0.0008	0.0006	<0.0005	<0.0005	<0.0005
Magnesium	**mg/L**		29.5	26.6	21.3	28.9	35.7	20.0	37.0	29.0	19.0	31.0	29.0	33
Manganese	**mg/L**		0.081	0.012	0.055	0.058	0.039	0.034	0.080	0.220	0.068	0.084	0.065	0.18
Molybdenum	**mg/L**				0.003	0.001	<0.02	0.001	<0.001	0.002	0.002	0.002	0.002	0.002
Nickel	**mg/L**	**0.025**	<0.030	<0.010	0.004	0.001	<0.02	<0.001	<0.0005	0.001	0.002	<0.001	<0.001	0.0011
Phosphorus	**mg/L**	**0.030**				0.05	<0.1	0.0	<0.1	0.038	0.082	0.018	0.099	0.034
Potassium	**mg/L**		6.5	4.1	7.5	5.8	6	4	8	6	5	4	6	5.9
Selenium	**mg/L**				0.002	<0.002		<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**				4.9	1.12	2.4	3.1	2.4	2.3	3.2	1.1	2.9	2.1
Silver	**mg/L**	**0.0001**			<0.0001	<0.0001	<0.003	<0.0001	<0.5	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Sodium	**mg/L**		76.6	42.8	108.0	91.4	109.0	88.0	85.0	93.0	160.0	180.0	77.0	150
Strontium	**mg/L**				0.860	1.200	1.290	0.760	2.000	1.600	0.770	1.400	1.700	1.8
Thallium	**mg/L**	**0.0003**								<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**				<0.002	<0.001	<0.05		<0.002					
Titanium	**mg/L**					<0.005	<0.005	0.010	<0.005	0.008	0.008	0.009	0.006	<0.005
Vanadium	**mg/L**	**0.007**			0.00	<0.0005	<0.005	0.001	<0.001	0.001	0.001	0.001	0.002	0.00051
Zinc	**mg/L**	**0.030**	<0.020	<0.010	0.009	0.109	<0.005	<0.005	<0.004	0.005	0.007	<0.005	<0.005	<0.005
Total Dissolved Solids	**mg/L**				617	638	768	497	610		730	830	540	860

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	ADJACENT TO REFUSE AREA									
			SW5									
		Objectives	Jun-00	Sep-00	Nov-01	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20
pH	**units**	**6.5-8.5**	8.19	8.21	8.05	8.23	8.09	7.99	8.09	8.31	8.11	8.17
Conductivity	**µS/cm**		1098	1240	1073	902	1100	1200	1100	1700	860	1900
Turbidity	**NTU**		1	1	40.0		4.9	2	6.3	2.5	5.5	2.5
Chloride	**mg/L**		200	256	168	120	160	190	180	330	84	360
Phosphate-ortho	**mg/L**		<1	<0.3	<1	0.02	0.02	0.013	0.033	<0.010	0.039	<0.010
Sulphate	**mg/L**		72.8	84.5	139	73	85	92	64	78	120	150
Alkalinity	**mg/L**		285	316	162	194	190	190	200	250	190	260
Bicarbonate	**mg/L**		345	311	195	191			200	250	190	260
Carbonate	**mg/L**		1	5	1	3			2	5	2.3	3.6
Hardness	**mg/L**		390	464	308	270	380	380	270	370	320	460
Nitrate	**mg/L**		0.2	0.2	0.7	1.6	0.3	0.22	1.26	<0.10	0.98	0.11
Nitrite	**mg/L**		<0.2	<0.2	<0.2	<0.01	<0.001	0.015	0.026	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**											
Ammonia: total	**mg/L**		0.08	<0.03	<0.03	<0.05	0.06	0.1	0.06	0.1	<0.050	0.086
Ammonia: un-ionized	**µg/L**	**20**	4	<1	<1	<2	1	2	<1	2	<1	2
Total Organic Carbon	**mg/L**		5.6	7.4	8.2	5.2	4.5	4.3	6.6	6.4	4.8	6.4
Phenols	**µg/L**						<0.001					
Aluminum	**mg/L**	**0.075 ****	0.030	<0.03	1.190	0.310	0.300	0.044	0.220	0.100	0.240	0.2
Antimony	**mg/L**		<0.0005		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.002		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	**mg/L**		0.076	0.068	0.053	0.060	0.088	0.053	0.052	0.051	0.048	0.067
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004
Bismuth	**mg/L**		<0.001	<0.1	<0.001		<0.001					
Boron	**mg/L**	**0.200**	0.159	0.170	0.08	0.13	0.21	0.12	0.18	0.07	0.08	0.13
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.005	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Calcium	**mg/L**		108.0	123.0	85	83	91	87	73	98	83	120
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0001	<0.005	0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	0.0023	<0.003	0.0046	0.0040	<0.003	0.0013	0.0035	0.0019	0.0034	0.0018
Iron	**mg/L**	**0.300**	0.09	0.10	1.26	0.34	0.37	0.11	0.36	0.21	0.28	0.22
Lead	**mg/L**	**0.025 ******	<0.0005	<0.001	0.0010	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Magnesium	**mg/L**		29.0	38.3	23.1	23.0	37.0	26.0	20.0	28.0	27.0	34
Manganese	**mg/L**		0.027	0.028	0.027	0.046	0.080	0.070	0.047	0.090	0.076	0.12
Molybdenum	**mg/L**		0.001	<0.02	0.001	0.003	<0.001	0.001	0.002	0.001	0.002	0.0012
Nickel	**mg/L**	**0.025**	0.001	<0.02	0.002	<0.001	<0.0005	<0.001	0.001	0.001	0.001	<0.001
Phosphorus	**mg/L**	**0.030**	<0.05	<0.1	0.07	0.05	<0.1	0.02	0.07	0.018	0.062	0.029
Potassium	**mg/L**		4.9	6.0	5.8	6.0	8.0	4.7	5.4	3.6	5.5	5.5
Selenium	**mg/L**		<0.002		<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		1.00	3.10	4.19	3.30	2.70	1.70	3.10	1.00	3.40	2.2
Silver	**mg/L**	**0.0001**	<0.0001	<0.003	<0.0001	<0.0001	<0.5	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Sodium	**mg/L**		106.0	114.0	106	74	80	110	130	210	62	200
Strontium	**mg/L**		1.270	1.540	0.687	1.300	2.200	1.100	1.000	0.920	0.820	1.4
Thallium	**mg/L**	**0.0003**						<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		<0.001	<0.05	0.001		<0.002					
Titanium	**mg/L**		<0.005	<0.005	0.017	0.018	<0.005	<0.005	0.007	0.006	0.007	0.015
Vanadium	**mg/L**	**0.007**	<0.0005	<0.005	0.0022	0.0011	<0.001	<0.0005	0.0011	0.0006	0.0012	0.00059
Zinc	**mg/L**	**0.030**	0.015	<0.005	0.025	0.010	<0.004	<0.005	0.010	<0.005	0.005	<0.005
Total Dissolved Solids	**mg/L**		692	815	624	490	600		610	920	510	1100

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	ADJACENT TO REFUSE AREA							
			SW6							
		Objectives	Jun-00	Sep-00	Nov-11	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20
pH	**units**	**6.5-8.5**	8.08	8.00	8.28	8.15	8.21	8.33	8.14	8.22
Conductivity	**µS/cm**		1045	1180	926	1200	1300	1600	930	1600
Turbidity	**NTU**		2	2.2		1.1	12	2.5	6.5	2.7
Chloride	**mg/L**		178	219	120	180	250	290	130	270
Phosphate-ortho	**mg/L**		<1	<0.3	0.01	0.02	0.046	<0.010	0.022	<0.010
Sulphate	**mg/L**		65.2	81.2	71.0	89	65	79	84	110
Alkalinity	**mg/L**		296	318	197	230	210	250	210	270
Bicarbonate	**mg/L**		359	315	193		210	240	210	260
Carbonate	**mg/L**		1	3	3		3	5	2.7	4.1
Hardness	**mg/L**		362	447	260	430	270	380	330	440
Nitrate	**mg/L**		0.4	0.3	1.2	0.99	0.53	0.43	0.56	0.53
Nitrite	**mg/L**		<0.2	<0.2	<0.01	0.013	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**									
Ammonia: total	**mg/L**		0.31	0.16	<0.05	0.075	<0.050	0.13	0.070	0.087
Ammonia: un-ionized	**µg/L**	**20**	11	4	<1	1	<1	3	<1	2
Total Organic Carbon	**mg/L**		6.1	7.2	7.3	3.5	8.5	5.7	4.5	4.7
Phenols	**µg/L**									
Aluminum	**mg/L**	**0.075 ****	0.022	<0.03	0.230	0.063	0.390	0.086	0.320	0.1
Antimony	**mg/L**		<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.002		<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Barium	**mg/L**		0.081	0.079	0.043	0.074	0.049	0.056	0.070	0.08
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004
Bismuth	**mg/L**		<0.001	<0.1						
Boron	**mg/L**	**0.200**	0.166	0.17	0.08	0.23	0.11	0.09	0.18	0.21
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Calcium	**mg/L**		99.6	119	80	98	74	98	83	110
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0001	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	0.0023	<0.003	0.0040	0.0016	0.0040	0.0018	0.0020	0.0015
Iron	**mg/L**	**0.300**	0.22	0.32	0.23	0.22	0.67	0.29	0.45	0.24
Lead	**mg/L**	**0.025 ******	<0.0005	<0.001	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	<0.0005
Magnesium	**mg/L**		27.4	36.4	21.0	32.0	19.0	29.0	31.0	35
Manganese	**mg/L**		0.082	0.170	0.030	0.082	0.075	0.076	0.120	0.15
Molybdenum	**mg/L**		0.001	<0.02	0.001	0.002	0.002	0.001	0.002	0.0
Nickel	**mg/L**	**0.025**	<0.001	<0.02	0.001	0.001	0.002	<0.001	0.001	0.0011
Phosphorus	**mg/L**	**0.030**	<0.05	<0.1	0.0	0.018	0.097	0.017	0.060	0.027
Potassium	**mg/L**		5.1	6	4	6	5	4	6	6.2
Selenium	**mg/L**		<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		0.90	2.7	3.1	2.3	3.3	1.0	3.1	2.6
Silver	**mg/L**	**0.0001**	<0.0001	<0.003	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Sodium	**mg/L**		90.7	105	92	100	160	180	77	160
Strontium	**mg/L**		1.170	1.330	0.780	1.800	0.780	1.200	1.600	1.9
Thallium	**mg/L**	**0.0003**				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		<0.001	<0.05						
Titanium	**mg/L**		<0.005	<0.005	0.006	0.005	0.011	<0.005	0.007	0.0075
Vanadium	**mg/L**	**0.007**	<0.0005	<0.005	0.001	0.001	0.002	0.001	0.002	0.00058
Zinc	**mg/L**	**0.030**	<0.005	<0.005	0.013	<0.005	0.008	<0.005	<0.005	<0.005
Total Dissolved Solids	**mg/L**		644	762	499		720	860	550	880

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	ADJACENT TO REFUSE AREA							
			SW7							
		Objectives	Nov-01	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20
pH	**units**	**6.5-8.5**	8.05	8.27	8.19	8.02	8.22	8.38	8.06	8.15
Conductivity	**µS/cm**		1061	943	1900	840	1500	1800	980	2000
Turbidity	**NTU**		38.0		7.6	1.7	8.2	2.6	6.1	2.3
Chloride	**mg/L**		164	130	330	130	310	330	140	360
Phosphate-ortho	**mg/L**		<1	0.02	0.04	<0.01	0.06	<0.010	<0.010	<0.010
Sulphate	**mg/L**		139	73.0	180.0	58	63	77	55	150
Alkalinity	**mg/L**		159	193	250	160	220	250	210	270
Bicarbonate	**mg/L**		191	190			220	250	210	270
Carbonate	**mg/L**		1	3			3	6	2.2	3.5
Hardness	**mg/L**		308	250	580	260	280	380	270	470
Nitrate	**mg/L**		0.6	0.7	0.9	0.19	0.2	<0.10	0.52	<0.10
Nitrite	**mg/L**		<0.2	<0.01	<0.001	0.024	<0.010	<0.010	0.019	<0.010
Total Kjeldahl Nitrogen	**mg/L**									
Ammonia: total	**mg/L**		<0.03	<0.05	<0.001	0.31	0.063	0.12	0.26	0.16
Ammonia: un-ionized	**µg/L**	**20**	<1	<2	<1	3	1	3	<1	4
Total Organic Carbon	**mg/L**		9.8	7.8	5.1	3.9	10	6.6	7.0	6.8
Phenols	**µg/L**				<0.001					
Aluminum	**mg/L**	**0.075 ****	1.200	0.290	0.200	0.047	0.230	0.091	0.410	0.14
Antimony	**mg/L**		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	0.001	<0.0005
Arsenic	**mg/L**		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Barium	**mg/L**		0.052	0.036	0.110	0.040	0.046	0.049	0.051	0.073
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004
Bismuth	**mg/L**		<0.001		<0.001					
Boron	**mg/L**	**0.200**	0.07	0.06	0.24	0.08	0.07	0.07	0.18	0.11
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Calcium	**mg/L**		85	79	140	64	77	100	73	130
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	0.001	<0.0005
Copper	**mg/L**	**0.005**	0.0047	0.0030	<0.003	<0.001	0.0035	0.0023	0.0027	0.0015
Iron	**mg/L**	**0.300**	1.24	0.26	0.24	0.17	0.38	0.23	0.51	0.23
Lead	**mg/L**	**0.025 ******	0.0010	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	0.0015	<0.0005
Magnesium	**mg/L**		23.3	19.0	52.0	17.0	19.0	27.0	21.0	35
Manganese	**mg/L**		0.024	0.030	0.030	0.150	0.053	0.088	0.330	0.17
Molybdenum	**mg/L**		0.001	0.001	<0.001	0.001	0.001	0.001	0.002	0.0013
Nickel	**mg/L**	**0.025**	0.002	<0.001	<0.0005	<0.001	0.001	<0.001	0.001	<0.001
Phosphorus	**mg/L**	**0.030**	0.10	0.0	<0.1	0.013	0.094	0.018	0.042	0.03
Potassium	**mg/L**		5.7	4	9	3	5	4	6	5.5
Selenium	**mg/L**		<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		4.26	3.2	3.7	1.1	3.2	1.0	2.2	2.2
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.5	0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Sodium	**mg/L**		107	100	180	71	200	210	100	220
Strontium	**mg/L**		0.683	0.580	2.400	0.580	0.690	0.900	0.790	1.4
Thallium	**mg/L**	**0.0003**				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		<0.001		<0.002					
Titanium	**mg/L**		0.017	0.007	<0.005	<0.005	0.008	<0.005	0.015	<0.005
Vanadium	**mg/L**	**0.007**	0.0021	0.001	<0.001	<0.0005	0.001	0.001	0.002	0.00053
Zinc	**mg/L**	**0.030**	0.012	<0.005	<0.004	<0.005	<0.005	<0.005	0.005	<0.005
Total Dissolved Solids	**mg/L**		620	508	1100		830	920	530	1100

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	ADJACENT TO REFUSE AREA							
			SW8							
		Objectives	Nov-01	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20
pH	**units**	**6.5-8.5**	8.08	8.28	8.09	8.06	8.22	8.29	7.97	8.13
Conductivity	**µS/cm**		1070	925	1100	800	1500	1700	1000	2000
Turbidity	**NTU**		41.0		6.0	2.2	8.4	2.7	5.3	2.7
Chloride	**mg/L**		168	120	170	110	310	330	170	370
Phosphate-ortho	**mg/L**		<1	0.02	0.02	<0.01	0.06	<0.010	<0.010	<0.010
Sulphate	**mg/L**		137	72.0	89.0	55	64	79	61	150
Alkalinity	**mg/L**		160	197	190	150	220	250	170	270
Bicarbonate	**mg/L**		193	194			220	250	170	260
Carbonate	**mg/L**		1	3			3	5	1.5	3.3
Hardness	**mg/L**		298	260	380	250	280	370	260	470
Nitrate	**mg/L**		0.7	1.1	0.4	0.2	0.2	<0.10	0.18	0.1
Nitrite	**mg/L**		<0.2	<0.01	<0.001	0.024	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**									
Ammonia: total	**mg/L**		<0.03	<0.05	0.07	0.15	<0.050	0.097	0.15	0.098
Ammonia: un-ionized	**µg/L**	**20**	<1	<1	2	2	<1	2	<1	2
Total Organic Carbon	**mg/L**		8.5	7.5	4.7	3.8	9.5	6.6	6.7	6.5
Phenols	**µg/L**				<0.001					
Aluminum	**mg/L**	**0.075 ****	1.150	0.260	0.200	0.051	0.230	0.091	0.370	0.081
Antimony	**mg/L**		<0.0005	0.001	<0.001	<0.0005	<0.0005	<0.0005	0.001	<0.0005
Arsenic	**mg/L**		<0.002	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Barium	**mg/L**		0.051	0.041	0.087	0.034	0.045	0.050	0.047	0.068
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004
Bismuth	**mg/L**		<0.001		<0.001					
Boron	**mg/L**	**0.200**	0.07	0.06	0.20	0.08	0.07	0.07	0.12	0.11
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Calcium	**mg/L**		83	78	92	58	77	100	73	120
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	0.0046	0.0030	<0.003	<0.001	0.0034	0.0017	0.0021	0.0014
Iron	**mg/L**	**0.300**	1.20	0.27	0.32	0.13	0.39	0.22	0.46	0.16
Lead	**mg/L**	**0.025 ******	0.0010	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	0.0009	<0.0005
Magnesium	**mg/L**		21.8	20.0	37.0	16.0	19.0	28.0	21.0	35
Manganese	**mg/L**		0.026	0.029	0.070	0.074	0.057	0.089	0.450	0.1
Molybdenum	**mg/L**		0.001	0.001	<0.001	0.001	0.001	0.001	0.002	0.0
Nickel	**mg/L**	**0.025**	0.002	<0.001	<0.0005	<0.001	0.002	<0.001	0.001	<0.001
Phosphorus	**mg/L**	**0.030**	0.09	0.0	<0.1	0.015	0.09	0.018	0.075	0.022
Potassium	**mg/L**		5.5	4	8	3	5	4	5	5.5
Selenium	**mg/L**		<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		4.10	3.1	2.6	1.0	3.2	1.0	2.0	2
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.5	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Sodium	**mg/L**		97	92	82	66	200	210	120	210
Strontium	**mg/L**		0.657	0.670	2.100	0.550	0.690	0.910	0.860	1.4
Thallium	**mg/L**	**0.0003**				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		0.001		<0.002					
Titanium	**mg/L**		0.016	0.008	<0.005	<0.005	0.009	<0.005	0.008	<0.005
Vanadium	**mg/L**	**0.007**	0.0021	0.001	<0.001	<0.0005	0.001	0.001	0.002	<0.0005
Zinc	**mg/L**	**0.030**	0.053	<0.005	<0.004	<0.005	<0.005	<0.005	0.006	<0.005
Total Dissolved Solids	**mg/L**		609	503	610		830	920	560	1100

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	ADJACENT TO REFUSE AREA							
			SW9							
		Objectives	Nov-01	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20	Nov-20
pH	**units**	**6.5-8.5**	8.11	8.28	8.10	8.14	8.19	8.33	8.12	8.15
Conductivity	**µS/cm**		1084	925	1100	1200	1300	1700	980	1700
Turbidity	**NTU**		37.0		5.5	1.2	7.5	2.6	6.4	2.3
Chloride	**mg/L**		174	120	170	180	240	320	140	300
Phosphate-ortho	**mg/L**		<1	0.01	0.02	0.017	0.045	<0.010	0.022	<0.010
Sulphate	**mg/L**		135	72.0	85.0	91	64	78	77	120
Alkalinity	**mg/L**		169	193	200	230	210	250	210	270
Bicarbonate	**mg/L**		204	190			200	250	210	260
Carbonate	**mg/L**		1	3			3	5	2.6	3.5
Hardness	**mg/L**		293	260	380	410	270	380	330	450
Nitrate	**mg/L**		0.7	1.1	0.4	1.02	0.63	0.32	0.56	0.5
Nitrite	**mg/L**		<0.2	<0.01	<0.001	<0.01	0.01	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**									
Ammonia: total	**mg/L**		<0.03	<0.05	0.08	0.077	0.053	0.12	0.075	0.13
Ammonia: un-ionized	**µg/L**	**20**	<1	<1	1	1	1	3	<1	3
Total Organic Carbon	**mg/L**		8.0	7.6	4.6	3.3	8	6.3	4.5	5.3
Phenols	**µg/L**				<0.001					
Aluminum	**mg/L**	**0.075 ****	1.060	0.220	0.200	0.035	0.230	0.110	0.540	0.076
Antimony	**mg/L**		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Barium	**mg/L**		0.052	0.038	0.085	0.070	0.046	0.052	0.074	0.075
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004	<0.0004
Bismuth	**mg/L**		<0.001		<0.001					
Boron	**mg/L**	**0.200**	0.08	0.06	0.21	0.22	0.12	0.08	0.19	0.18
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Calcium	**mg/L**		81	74	91	93	72	97	85	110
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	0.0043	0.0020	<0.003	0.0012	0.0040	0.0018	0.0025	0.0015
Iron	**mg/L**	**0.300**	1.17	0.25	0.33	0.12	0.39	0.23	0.71	0.18
Lead	**mg/L**	**0.025 ******	0.0009	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	0.0007	<0.0005
Magnesium	**mg/L**		22.3	19.0	37.0	31.0	18.0	28.0	31.0	33
Manganese	**mg/L**		0.024	0.025	0.080	0.053	0.050	0.071	0.130	0.13
Molybdenum	**mg/L**		0.001	0.001	<0.001	0.002	0.002	0.001	0.002	0.0018
Nickel	**mg/L**	**0.025**	0.002	<0.001	<0.0005	<0.001	0.001	<0.001	0.001	<0.001
Phosphorus	**mg/L**	**0.030**	0.07	0.0	<0.1	0.026	0.082	0.021	0.071	0.032
Potassium	**mg/L**		5.4	4	8	6	5	4	6	5.6
Selenium	**mg/L**		<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		3.89	2.9	2.6	2.4	3.0	1.0	3.7	2.3
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.5	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009
Sodium	**mg/L**		99	87	78	96	160	190	77	170
Strontium	**mg/L**		0.739	0.640	2.100	1.900	0.790	1.100	1.700	1.6
Thallium	**mg/L**	**0.0003**				<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		<0.001		<0.002					
Titanium	**mg/L**		0.017	0.006	<0.005	<0.005	0.006	0.005	0.016	<0.005
Vanadium	**mg/L**	**0.007**	0.0019	<0.0005	<0.001	<0.0005	0.001	0.001	0.002	<0.0005
Zinc	**mg/L**	**0.030**	0.008	<0.005	<0.004	<0.005	0.006	<0.005	0.007	<0.005
Total Dissolved Solids	**mg/L**		617	507	590		710	890	550	930

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	TRIBUTARY SW10						
		Objectives	Nov-01	Nov-11	Aug-14	Nov-16	Oct-18	Apr-20	Aug-20
pH	**units**	**6.5-8.5**	8.20	8.23	8.06	8.15	8.03	8.4	8.14
Conductivity	**µS/cm**		1348	890	1100	2300	1100	1300	820
Turbidity	**NTU**		3.5		8.4	1.4	2.5	1.7	4.0
Chloride	**mg/L**		266	110	150	430	170	210	66
Phosphate-ortho	**mg/L**		<1	0.02	0.02	0.027	0.027	<0.010	0.043
Sulphate	**mg/L**		95	72.0	77.0	180	68	71	130
Alkalinity	**mg/L**		229	196	190	300	200	260	190
Bicarbonate	**mg/L**		277	193			200	260	190
Carbonate	**mg/L**		1	3			2	6	2.5
Hardness	**mg/L**		396	290	380	690	290	430	320
Nitrate	**mg/L**		0.5	1.8	0.3	0.33	1.82	2.04	1.22
Nitrite	**mg/L**		<0.2	0.02	<0.001	<0.01	0.03	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**								
Ammonia: total	**mg/L**		<0.03	<0.05	<0.001	<0.05	0.07	<0.050	0.061
Ammonia: un-ionized	**µg/L**	**20**	<1	<2	<1	<2	1	<1	<1
Total Organic Carbon	**mg/L**		6.0	4.5	4.5	5.7	4.5	3.9	4.9
Phenols	**µg/L**				<0.001				
Aluminum	**mg/L**	**0.075 ****	0.074	0.150	0.300	0.056	0.130	0.210	0.3
Antimony	**mg/L**		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	**mg/L**		0.089	0.068	0.087	0.096	0.060	0.070	0.049
Beryllium	**mg/L**	**1.100 *****	<0.001	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0004
Bismuth	**mg/L**		<0.001		<0.001				
Boron	**mg/L**	**0.200**	0.20	0.16	0.21	0.23	0.23	0.13	0.078
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.00009
Calcium	**mg/L**		103	82	87	150	75	100	81
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0001	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	0.0030	0.0030	<0.003	0.0018	0.0040	0.0018	0.0037
Iron	**mg/L**	**0.300**	0.05	0.15	0.37	<0.1	0.21	0.31	0.37
Lead	**mg/L**	**0.025 ******	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	<0.0005
Magnesium	**mg/L**		33.5	25.0	35.0	50.0	20.0	37.0	26
Manganese	**mg/L**		<0.005	0.036	0.060	0.045	0.030	0.026	0.034
Molybdenum	**mg/L**		0.001	0.004	<0.001	0.002	0.003	0.001	0.0016
Nickel	**mg/L**	**0.025**	<0.001	<0.001	<0.0005	0.002	0.001	<0.001	0.0011
Phosphorus	**mg/L**	**0.030**	<0.05	0.0	<0.1	0.036	0.048	0.023	0.076
Potassium	**mg/L**		4.8	7	8	8	6	4	5.5
Selenium	**mg/L**		<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		2.58	3.1	2.6	3.1	3.0	0.7	3.5
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.5	<0.0001	<0.0001	<0.0001	<0.00009
Sodium	**mg/L**		123	66	73	220	100	120	49
Strontium	**mg/L**		1.810	1.700	2.200	2.700	1.300	2.000	0.8
Thallium	**mg/L**	**0.0003**				<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**		0.002		<0.002				
Titanium	**mg/L**		<0.005	<0.005	<0.005	<0.005	0.006	0.009	0.0059
Vanadium	**mg/L**	**0.007**	<0.0005	0.001	<0.001	<0.0005	0.001	0.001	0.0014
Zinc	**mg/L**	**0.030**	<0.005	0.013	<0.004	<0.005	0.010	<0.005	0.006
Total Dissolved Solids	**mg/L**		763	487	570		590	720	500

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	ADJACENT TO REFUSE AREA						
			SW11				SW12		
		Objectives	Oct-18	Apr-20	Aug-20	Nov-20	Oct-18	Apr-20	Nov-20
pH	**units**	**6.5-8.5**	8.21	8.32	8.13	8.11	8.15	8.33	7.92
Conductivity	**µS/cm**		1300	1600	970	1600	1000	1100	1400
Turbidity	**NTU**		7.4	2.3	6.9	2.5	4.8	3.7	11
Chloride	**mg/L**		240	300	130	280	110	82	160
Phosphate-ortho	**mg/L**		0.05	<0.010	0.023	<0.010	<0.010	<0.010	<0.010
Sulphate	**mg/L**		63	76	82	120	74	89	95
Alkalinity	**mg/L**		210	250	210	260	330	360	360
Bicarbonate	**mg/L**		210	240	200	260	320	360	350
Carbonate	**mg/L**		3.1	4.8	2.6	3.2	4.3	7.2	2.8
Hardness	**mg/L**		270	370	330	430	380	460	450
Nitrate	**mg/L**		0.54	0.43	0.59	0.55	0.23	1.27	<0.10
Nitrite	**mg/L**		0.015	<0.010	<0.010	<0.010	<0.010	0.045	<0.010
Total Kjeldahl Nitrogen	**mg/L**								
Ammonia: total	**mg/L**		<0.050	0.12	0.083	0.10	<0.050	0.07	<0.050
Ammonia: un-ionized	**µg/L**	**20**	<1	3	<1	2	<1	2	<1
Total Organic Carbon	**mg/L**		8.5	5.6	5.1	5.2	6.6	4.5	11
Phenols	**µg/L**								
Aluminum	**mg/L**	**0.075 ****	0.230	0.099	1.000	0.097	0.160	0.024	0.210
Antimony	**mg/L**		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.005
Barium	**mg/L**		0.046	0.057	0.075	0.079	0.082	0.081	0.270
Beryllium	**mg/L**	**1.100 *****	<0.0005	<0.0005	<0.0004	<0.0004	<0.0005	<0.0005	<0.0004
Bismuth	**mg/L**								
Boron	**mg/L**	**0.200**	0.11	0.09	0.18	0.22	0.13	0.16	0.17
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.00009	<0.00009	<0.0001	<0.0001	<0.00009
Calcium	**mg/L**		72	97	83	110	96	99	120
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	<0.0005	0.001
Copper	**mg/L**	**0.005**	0.0033	0.0018	0.0034	0.0016	0.0023	0.0016	0.0011
Iron	**mg/L**	**0.300**	0.37	0.21	1.40	0.20	0.71	0.60	7.60
Lead	**mg/L**	**0.025 ******	<0.0005	<0.0005	0.0013	<0.0005	0.0024	<0.0005	0.0021
Magnesium	**mg/L**		18.0	30.0	29.0	34.0	31.0	47.0	34.0
Manganese	**mg/L**		0.049	0.076	0.270	0.130	0.610	0.160	5.000
Molybdenum	**mg/L**		0.002	0.001	0.002	0.002	0.002	0.003	0.001
Nickel	**mg/L**	**0.025**	0.002	<0.001	0.002	<0.001	0.002	0.001	0.002
Phosphorus	**mg/L**	**0.030**	0.077	0.016	0.10	0.042	0.034	0.018	0.3
Potassium	**mg/L**		4.9	3.9	6.1	6.0	5.9	6.9	6
Selenium	**mg/L**		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		3.10	1.00	4.10	2.50	3.50	2.20	3.4
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.00009	<0.00009	<0.0001	<0.0001	<0.00009
Sodium	**mg/L**		160	180	73	150	78	58	110
Strontium	**mg/L**		0.770	1.300	1.600	1.900	1.800	3.100	1.600
Thallium	**mg/L**	**0.0003**	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**								
Titanium	**mg/L**		0.006	0.006	0.018	<0.005	<0.005	<0.005	0.006
Vanadium	**mg/L**	**0.007**	0.0010	0.0006	0.0028	0.0005	0.0006	<0.0005	0.001
Zinc	**mg/L**	**0.030**	0.006	<0.005	0.012	<0.005	0.005	<0.005	0.007
Total Dissolved Solids	**mg/L**		710	860	550	890	620	630	760

NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-1
SURFACE WATER GENERAL CHEMISTRY RESULTS
CLOSED OAKVILLE NINTH LINE LANDFILL SITE

PARAMETER	UNITS	PWQO	DOWNSTREAM			
			SW13			
		Objectives	Oct-18	Apr-20	Aug-20	Nov-20
pH	**units**	**6.5-8.5**	8.22	8.34	8.16	8.21
Conductivity	**µS/cm**		1300	1500	970	1600
Turbidity	**NTU**		8.4	2.6	6.0	1.9
Chloride	**mg/L**		250	280	140	260
Phosphate-ortho	**mg/L**		0.048	<0.010	0.024	<0.010
Sulphate	**mg/L**		61	77	81	120
Alkalinity	**mg/L**		210	260	210	270
Bicarbonate	**mg/L**		210	250	200	260
Carbonate	**mg/L**		3.3	5.1	2.8	4
Hardness	**mg/L**		280	380	330	420
Nitrate	**mg/L**		0.5	0.49	0.56	0.5
Nitrite	**mg/L**		<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	**mg/L**					
Ammonia: total	**mg/L**		<0.050	0.14	<0.050	<0.050
Ammonia: un-ionized	**µg/L**	**20**	<1	3	<1	<1
Total Organic Carbon	**mg/L**		8.6	5.7	4.5	4.6
Phenols	**µg/L**					
Aluminum	**mg/L**	**0.075 ****	0.28	0.078	0.31	0.05
Antimony	**mg/L**		<0.0005	<0.0005	<0.0005	<0.0005
Arsenic	**mg/L**		<0.001	<0.001	0.0012	<0.001
Barium	**mg/L**		0.047	0.059	0.062	0.074
Beryllium	**mg/L**	**1.100 *****	<0.0005	<0.0005	<0.0004	<0.0004
Bismuth	**mg/L**					
Boron	**mg/L**	**0.200**	0.11	0.099	0.18	0.22
Cadmium	**mg/L**	**0.0002**	<0.0001	<0.0001	<0.00009	<0.00009
Calcium	**mg/L**		77	100	82	110
Chromium	**mg/L**	**1.100**	<0.005	<0.005	<0.005	<0.005
Cobalt	**mg/L**	**0.0006**	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**mg/L**	**0.005**	0.0037	0.0019	0.0023	0.0015
Iron	**mg/L**	**0.300**	0.47	0.23	0.42	0.13
Lead	**mg/L**	**0.025 ******	0.0005	<0.0005	0.00051	<0.0005
Magnesium	**mg/L**		19	31	29	34
Manganese	**mg/L**		0.054	0.076	0.078	0.086
Molybdenum	**mg/L**		0.0016	0.0014	0.0023	0.002
Nickel	**mg/L**	**0.025**	0.0017	<0.001	0.0013	<0.001
Phosphorus	**mg/L**	**0.030**	0.086	0.017	0.062	0.023
Potassium	**mg/L**		5	4.1	5.9	6.1
Selenium	**mg/L**		<0.002	<0.002	<0.002	<0.002
Silicon	**mg/L**		3.3	1	3.1	2.3
Silver	**mg/L**	**0.0001**	<0.0001	<0.0001	<0.00009	<0.00009
Sodium	**mg/L**		170	170	75	160
Strontium	**mg/L**		0.8	1.4	1.5	1.9
Thallium	**mg/L**	**0.0003**	<0.00005	<0.00005	<0.00005	<0.00005
Tin	**mg/L**					
Titanium	**mg/L**		0.0079	<0.005	0.0067	<0.005
Vanadium	**mg/L**	**0.007**	0.0011	0.00055	0.0013	<0.0005
Zinc	**mg/L**	**0.030**	0.006	<0.005	0.01	<0.005
Total Dissolved Solids	**mg/L**		730	830	550	870

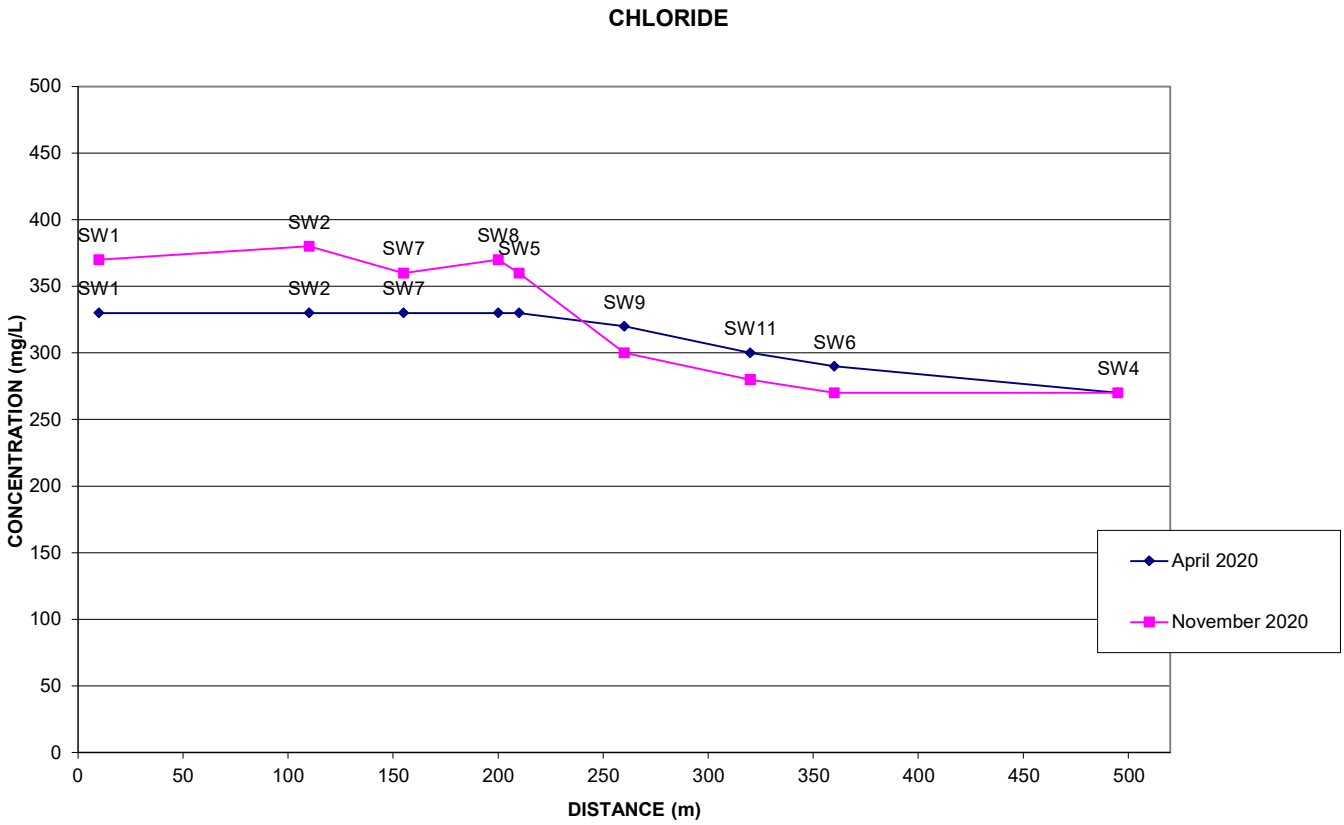
NOTES: 1) PWQO - Provincial Water Quality Objectives
2) ** - PWQO value based on pH range of 6.5 to 9.0.
*** - PWQO value based on hardness >75 mg/L.
**** - PWQO value based on alkalinity >80 mg/L.
3) Un-ionized ammonia concentration based on a surface water temperature of 12 ºC for November, 18 ºC for June, prior to 2000.

TABLE B-2
SURFACE WATER FLOW RATES
OAKVILLE NINTH LINE LANDFILL SITE

WATERSHED	MONITORING STATION	Flow Rate (L/s)		
		Apr 2020	Aug 2020	Nov 2020
UPSTREAM	SW1	10.9	SP	5.9
ADJACENT TO REFUSE AREA	SW2	17.2	SP	5.3
	SW7	7.2	SP	4.1
	SW8	13.0	SP	4.3
	SW5	19.3	SP	NMF
	SW9	24.1	SP	6.3
	SW11	29.9	5.2	5.9
	SW6	29.8	12.2	11.4
DOWNSTREAM	SW12	11.0	Dry	NMF
	SW4	16.1	7.2	7.6
NORTH TRIBUTARY	SW10	3.5	0.5	Dry
SOUTH DITCH	SW3	3.1	Dry	Dry
	SW13	23.1	1.7	5.4

NOTES: 1) NMF - No measurable flow, but sample obtained
2) SP - Separated, ponded area - no continuous flow in channel, but sampled obtained.
3) Dry - Location had insufficient water for sampling

FIGURE B-1
SURFACE WATER STATIONS - CONCENTRATION vs DISTANCE GRAPHS



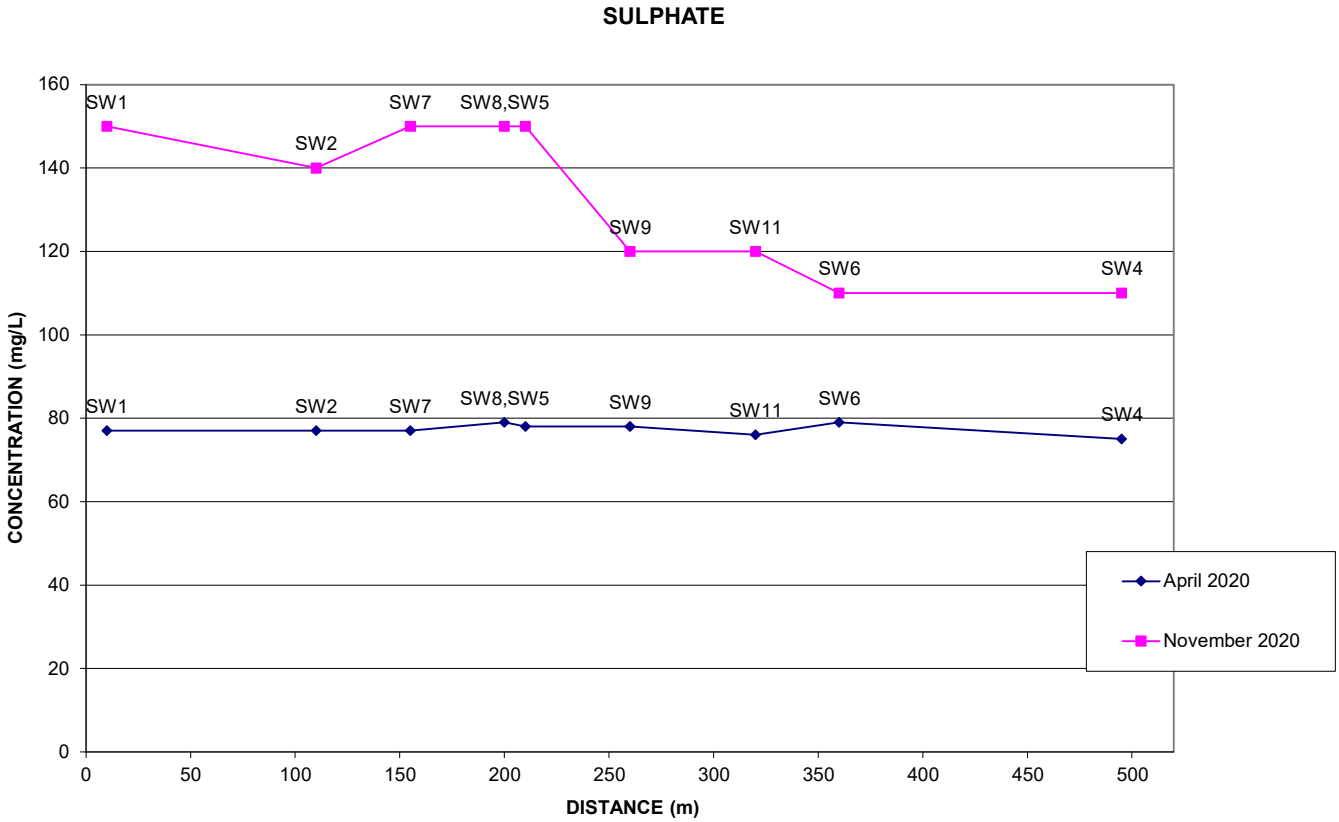
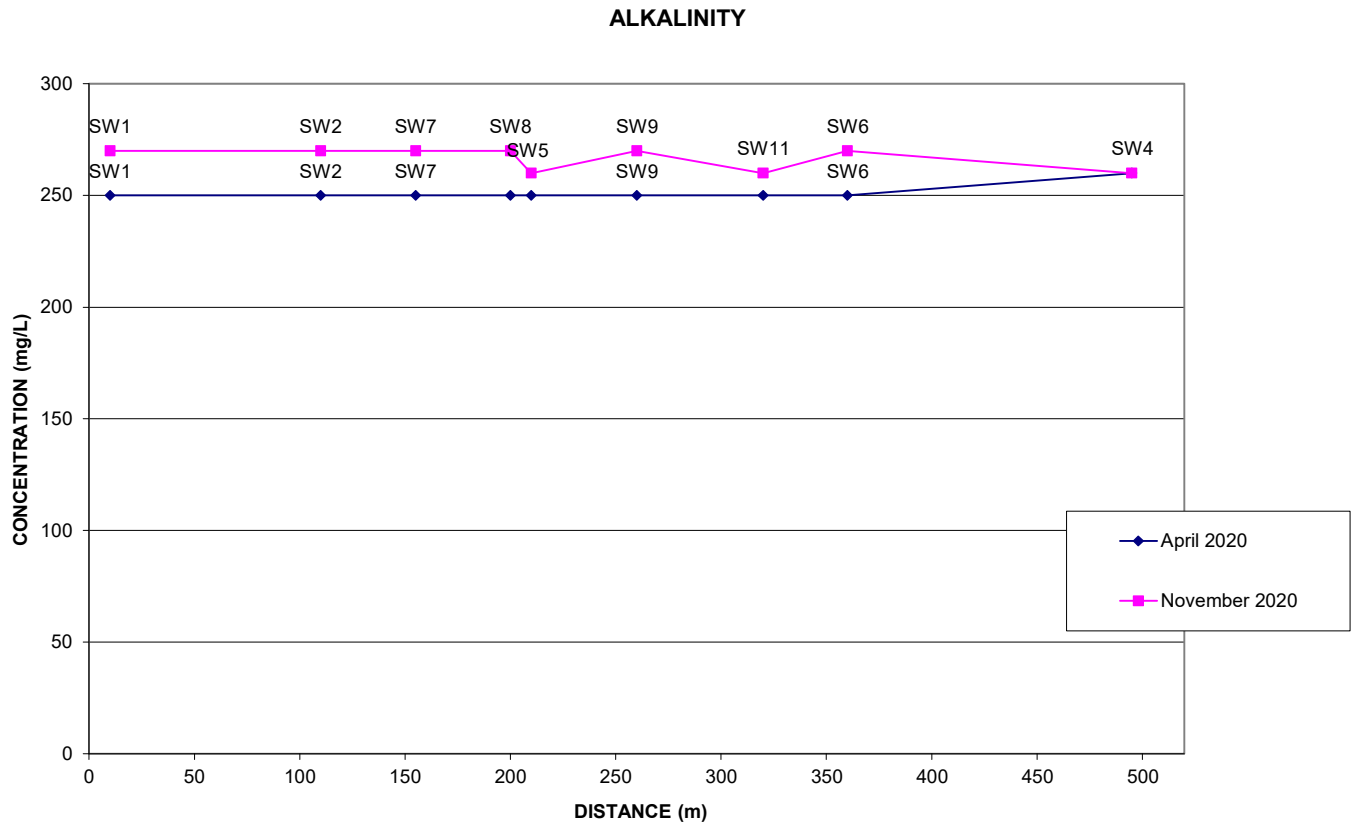


FIGURE B-2
SURFACE WATER STATIONS - CONCENTRATION vs DISTANCE GRAPHS



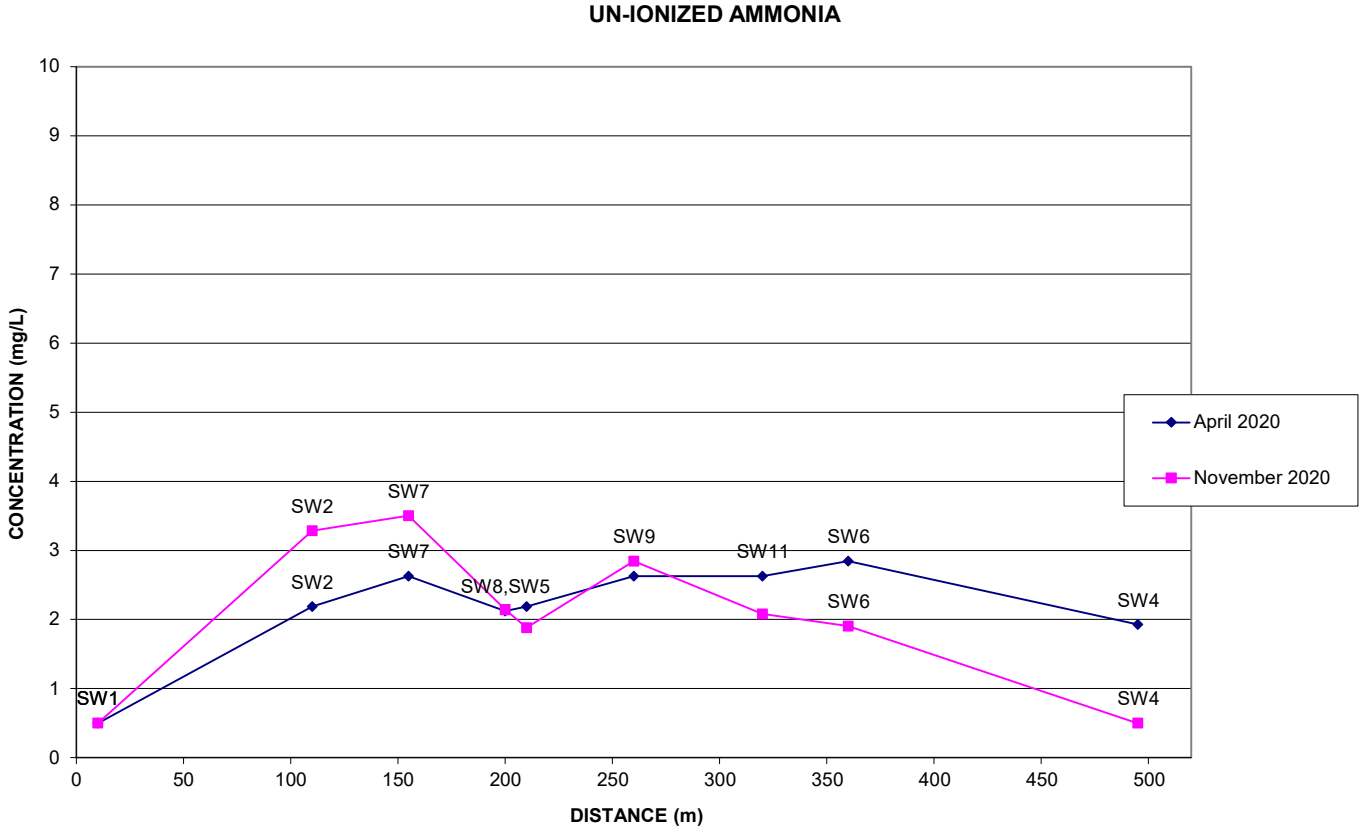
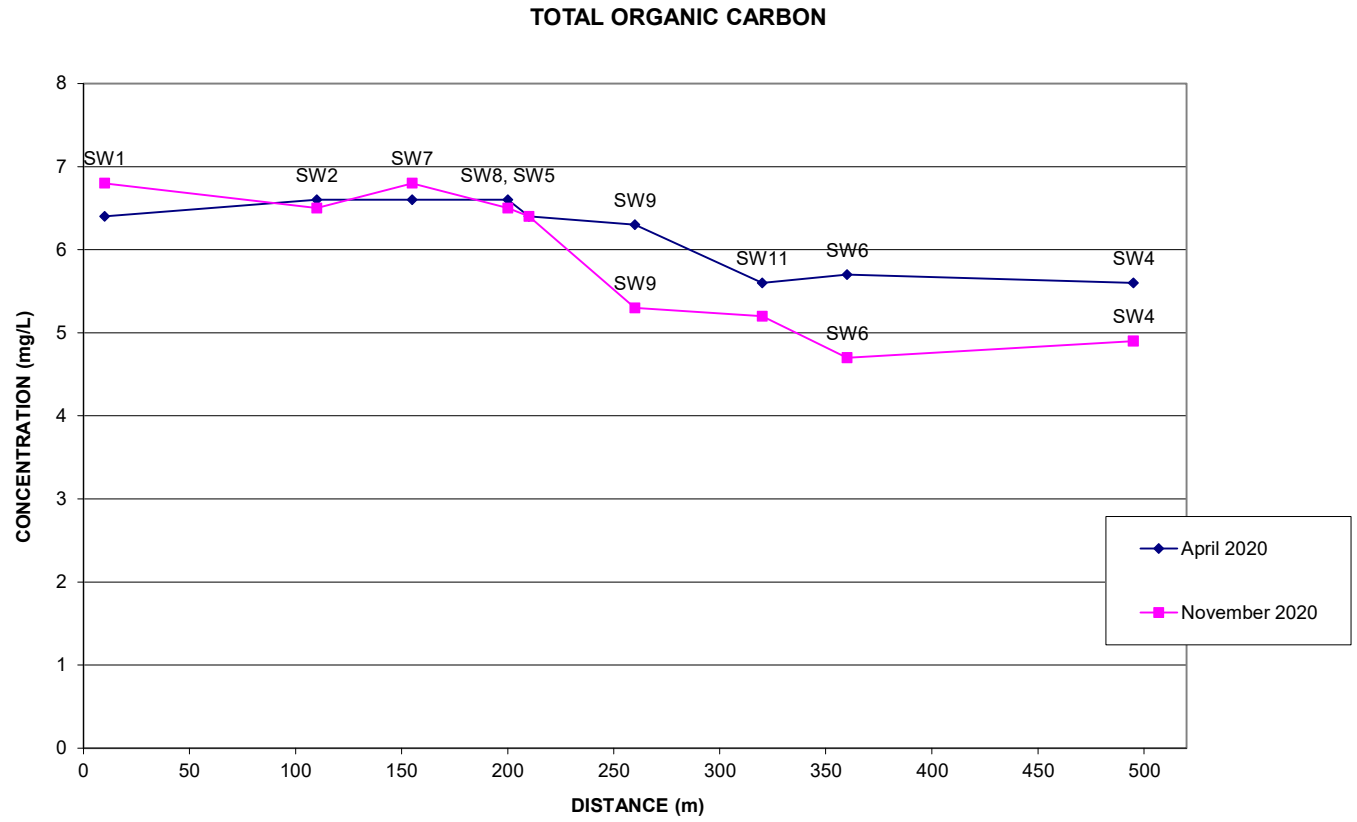


FIGURE B-3
SURFACE WATER STATIONS - CONCENTRATION vs DISTANCE GRAPHS



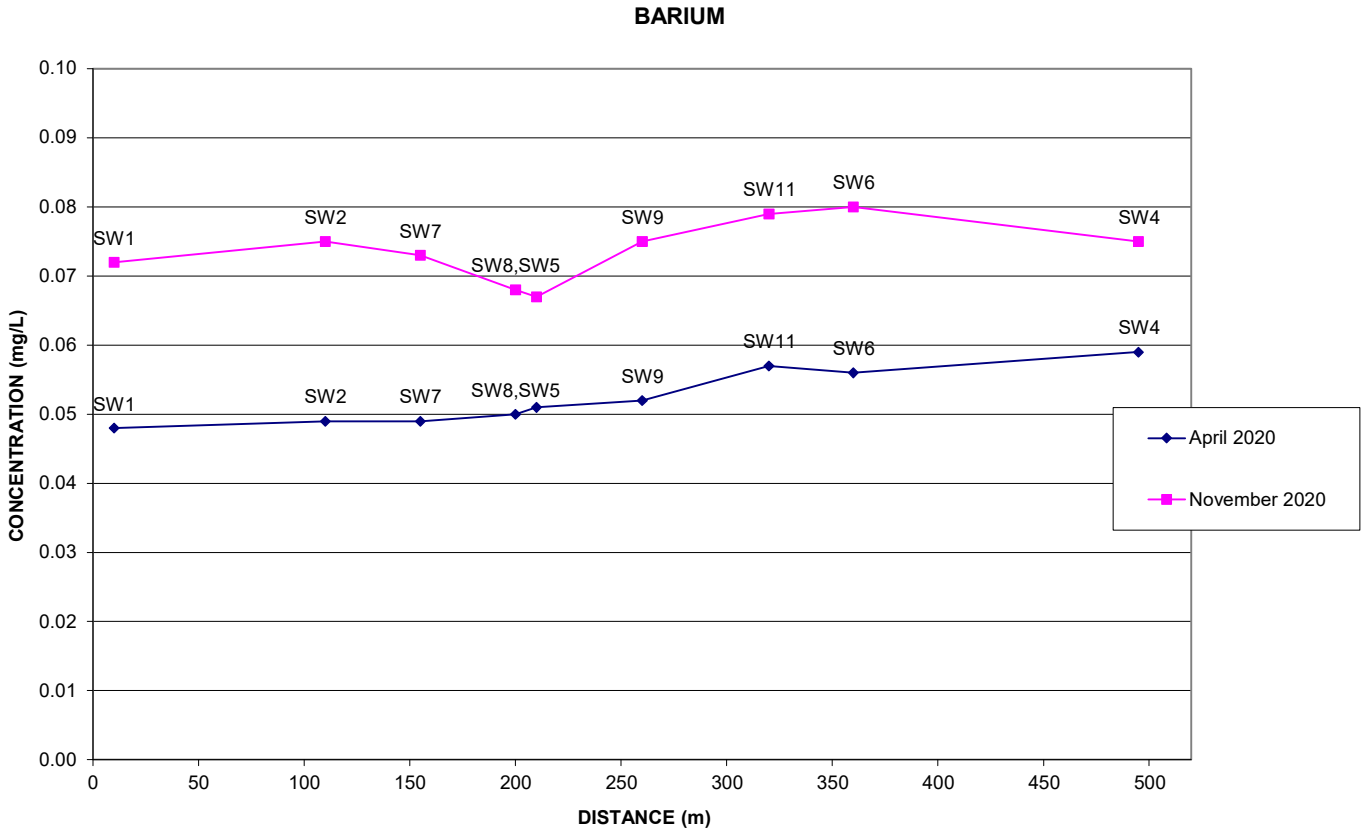
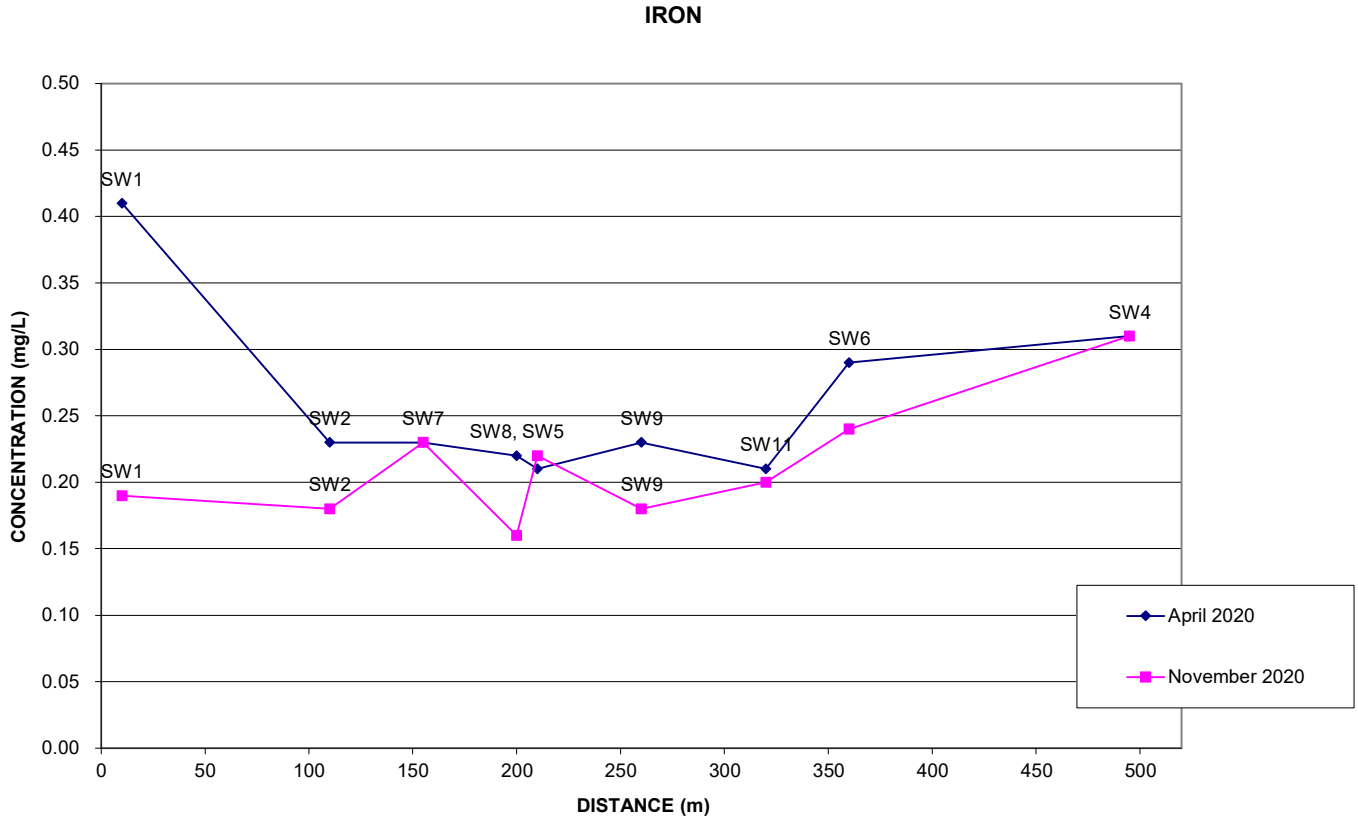


FIGURE B-4
SURFACE WATER STATIONS - CONCENTRATION vs DISTANCE GRAPHS



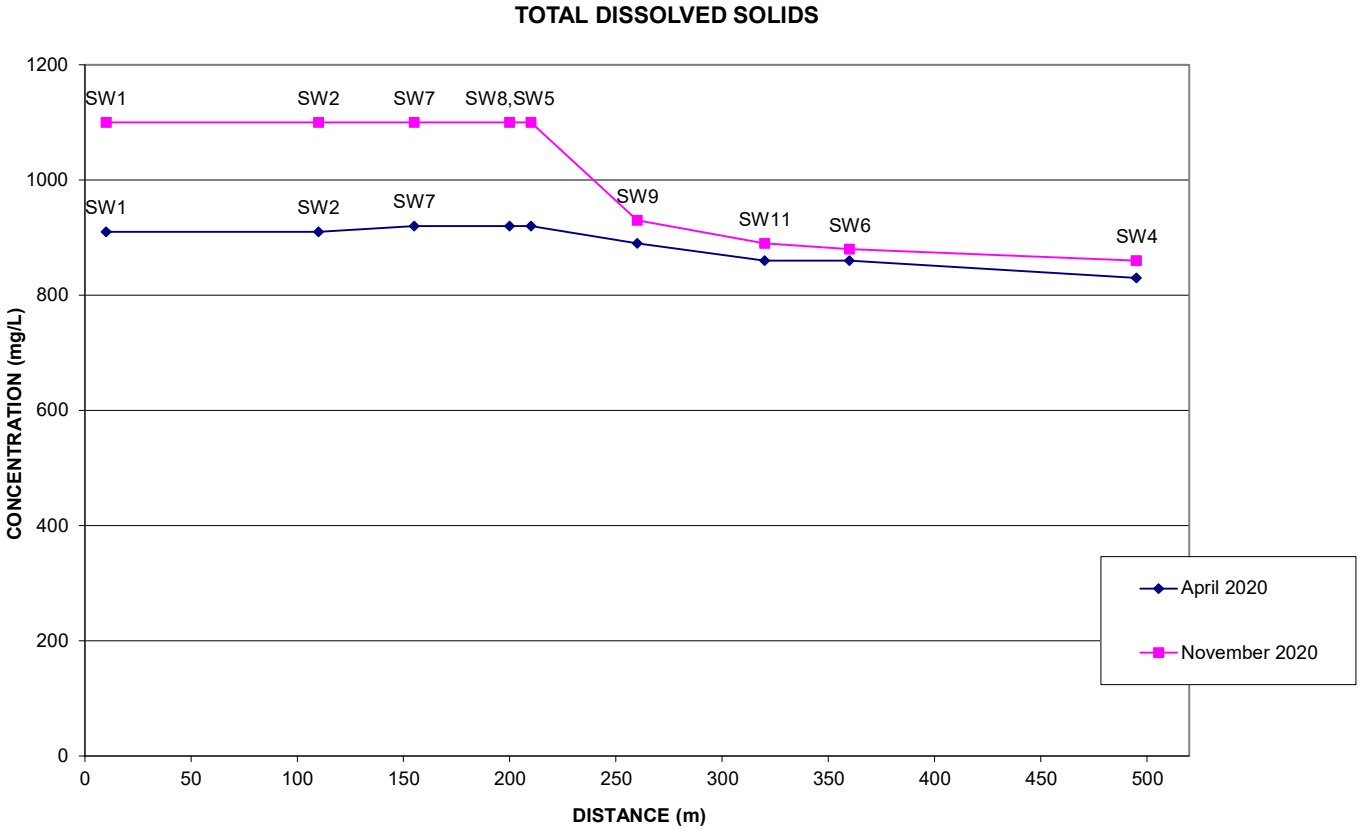
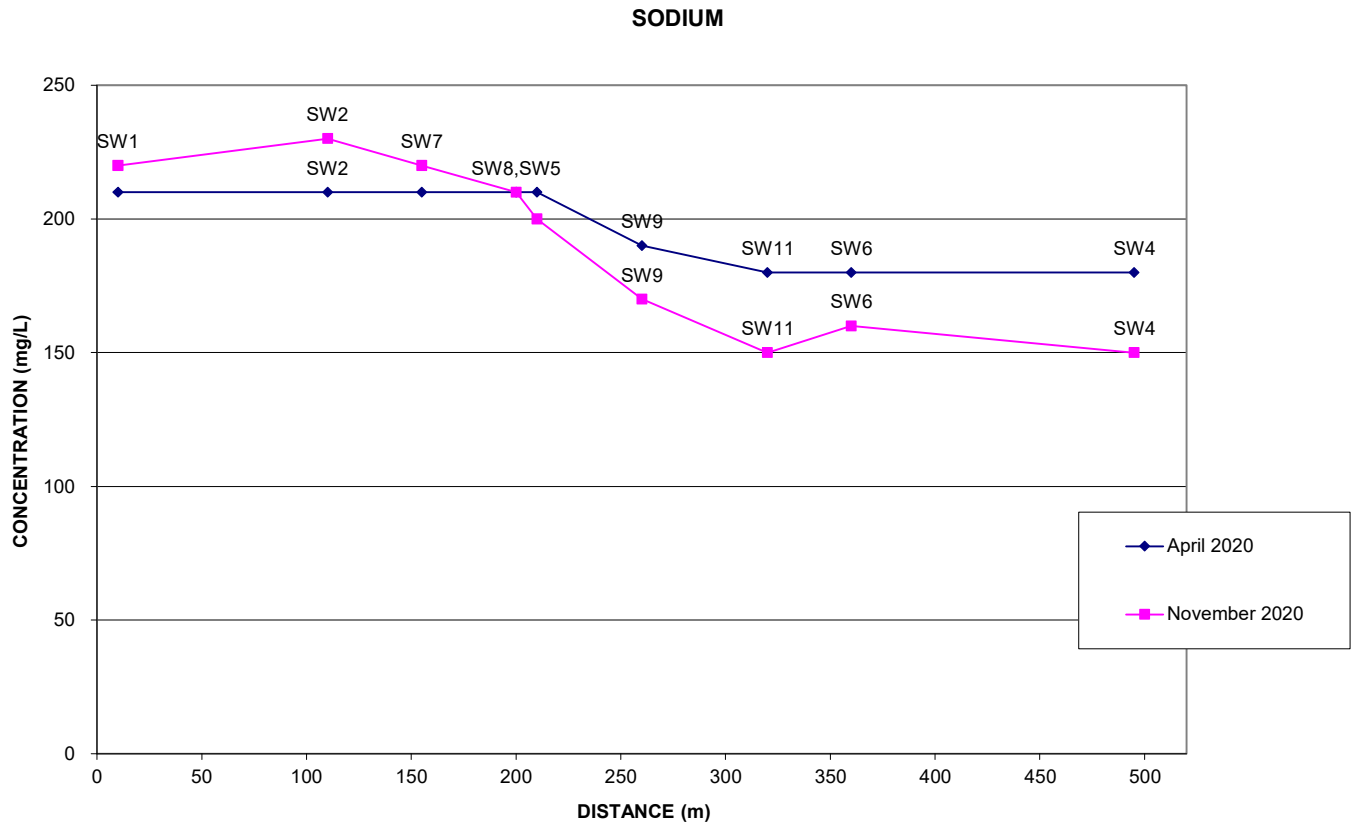
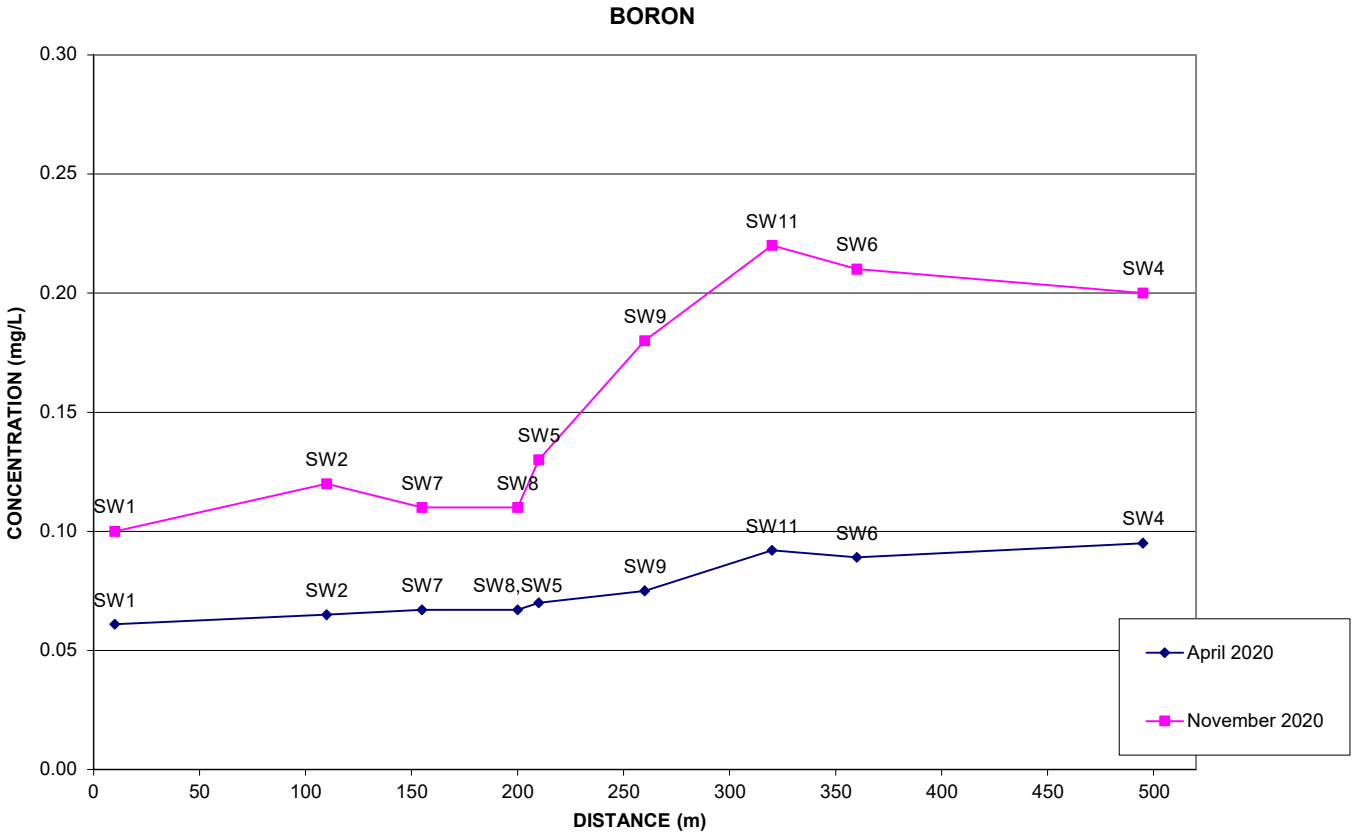


FIGURE B-5
SURFACE WATER STATIONS - CONCENTRATION vs DISTANCE GRAPHS





APPENDIX

C LANDFILL COVER ASSESSMENT

TABLE C-1
TEST HOLE LOGS **August 25, 2020**
CLOSED OKVILLE NINTH LINE LANDFILL SITE

INTERVAL (m)	DESCRIPTION
TH1	
0.00 - 0.13	Topsoil
0.13 - 0.33	Fill: sand, trace gravel, trace silt and clay, trace small cobbles
0.33 - 0.91	Gravelly silt: dark brown to grey, some small cobbles, firm, dry
TH2	
0.00 - 0.15	Topsoil: brown, loose, dry
0.15 - 0.43	Fill: sand, trace small cobbles, loose, dry
0.43 - 1.22	Clayey silt: brown to grey, trace small cobbles, soft to firm, DTPL
TH3	
0.00 - 0.13	Topsoil: loose, dry
0.13 - 0.28	Fill: reddish brown gravelly sand, some small cobbles, loose, dry
0.28 - 1.22	Clayey silt: brown to grey, some reddish hue, some small cobbles, firm to soft, DTPL - 0.4 m layer of small cobbles at 0.9 m
TH4	
0.00 - 0.13	Topsoil: brown, loose, dry
0.13 - 0.30	Sand: brown, some small cobbles
0.30 - 0.74	Clayey silt: reddish brown to grey, trace cobbles, firm, DTPL
0.74 - 1.04	Clayey silt: grey, some small cobbles, soft, DTPL
TH5	
0.00 - 0.13	Topsoil: brown, loose, dry
0.13 - 0.38	Sand: brown, some grave, some small cobbles, loose, dry
0.38 - 0.76	Sandy silt: brown, trace small cobbles, loose to compact, dry - some small zones of sand
0.76 - 1.35	Clayey silt: grey to brown, some small cobbles, firm

TABLE C-1
TEST HOLE LOGS **August 25, 2020**
CLOSED OKVILLE NINTH LINE LANDFILL SITE

INTERVAL (m)	DESCRIPTION
TH6	
0.00 - 0.08	Topsoil: brown, loose, dry
0.08 - 0.91	Silty sand: some gravel, some small cobbles, poorly graded - some small zones of silt
0.91 - 1.52	Silty sand: light brown, trace small cobbles, loose
1.52 - 1.96	Silty sand: reddish brown, some gravel, some small cobbles
1.96 - 2.44	Sandy silt: reddish brown to grey, compact to loose, dry - small piece of plastic observed
TH7	
0.00 - 0.08	Topsoil: brown, loose, dry
0.08 - 0.61	Sand: brown, some gravel, some small cobbles, trace medium cobbles, loose, dry
0.61 - 1.02	Sandy silt: dark brown to grey, trace small cobbles, trace medium cobbles, compact, dry
TH8	
0.00 - 0.08	Topsoil: brown, loose, dry
0.08 - 0.61	Sand and gravel: some medium to small cobbles
0.61 - 1.07	Sandy silt and gravel: some small cobbles
1.07 - 1.83	Sand: some gravel, some cobbles - trace pieces of glass
1.83 - 2.44	Silt: reddish brown to grey, some small cobbles, some gravel, compact, dry
TH9	
0.00 - 0.05	Topsoil: brown, loose, dry
0.05 - 0.61	Sand and gravel: brown, some small cobbles, race medium cobbles, loose, dry
0.61 - 1.35	Sand and gravel: brown, some cobbles, loose, dry
1.35 - 2.57	Clayey silt: reddish brown to grey, trace small cobbles, soft to firm, DTPL - zone of dark brown sand at 1.8 m

TABLE C-1
TEST HOLE LOGS **August 25, 2020**
CLOSED OKVILLE NINTH LINE LANDFILL SITE

INTERVAL (m)	DESCRIPTION
TH10	
0.00 - 0.05	Topsoil: brown, loose, dry
0.05 - 1.22	Sand and gravel: brown, some small cobbles, trace medium cobbles, loose, dry
1.22 - 2.18	Clayey silt: reddish brown to grey, trace small cobbles, trace medium cobbles, soft to firm, DTPL
TH11	
0.00 - 0.08	Topsoil: brown, loose, dry
0.08 - 0.91	Silty sand: reddish brown to grey, some medium to small cobbles, some gravel, compact, dry - small zones of silt within interval - small piece of paper-based refuse at 0.6 m - 0.9 m
0.91 - 1.52	*- no sample recovered*
1.52 - 2.13	Sandy silt: reddish brown to grey, some small cobbles, compact, dry
TH12	
0.00 - 0.05	Topsoil: brown, loose, dry
0.05 - 2.13	Sand and gravel: reddish brown. Some medium to small cobbles, loose to compact - some refuse at bottom of sample (2.1 m)
TH13	
0.00 - 0.05	Topsoil: brown, loose, dry
0.05 - 0.30	Sand and silt: reddish brown, some gravel, some small cobbles, dry - small zones of silt within interval
0.30 - 0.61	Clayey silt: grey to brown, soft
0.61 - 0.91	Refuse: plastic
TH14	
0.00 - 0.05	Topsoil: brown, loose, dry
0.05 - 2.13	Sand and silt: reddish brown, some gravel, some medium to small cobbles, dry - refusal at 2.13 m - moved to new location

TABLE C-1
TEST HOLE LOGS **August 25, 2020**
CLOSED OKVILLE NINTH LINE LANDFILL SITE

INTERVAL (m)	DESCRIPTION
TH15	
0.00 - 0.05	Topsoil: brown, loose, dry
0.05 - 0.30	Sand and gravel: brown, loose, dry
0.30 - 0.79	Silt: brown to grey, trace medium to small cobbles, compact, dry
TH16	
0.00 - 0.05	Topsoil: brown, loose, dry
0.05 - 1.83	Sand and silt: reddish brown, some gravel, some cobbles, dry - some paint chips/debris at 1.5 m
1.83 - 2.21	Silt and sand: reddish brown to grey, trace cobbles, compact, dry