HOLBROOK LANDFILL

2023 WATER MONITORING REPORT

COUNTY OF OXFORD

PROJECT NO.: 111-53037-07
DATE: FEBRUARY 23, 2024

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February 23, 2024

Mr. Frank Gross, C.Tech
Manager of Transportation & Waste
County of Oxford
21 Reeve Street,
Woodstock, Ontario N4S 7Y3

Dear Sir:

Subject : **Holbrook Landfill, County of Oxford**
2023 Water Monitoring Report

We are pleased to provide one (1) digital copy of the 2023 Water Monitoring Report for the closed Holbrook Landfill.

The report contains a discussion of the results of the monitoring completed in 2023, including an assessment of compliance, and provides conclusions and recommendations. Technical data are appended.

The "Monitoring and Screening Checklist" with signed declaration, as per the Ministry of the Environment, Conservation and Parks (MECP) Technical Guidance Document – Monitoring and Reporting for Waste Disposal Sites is provided in Appendix G.

Yours truly,
WSP Canada Inc.

Albert Siertsema

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EXECUTIVE SUMMARY

The closed Holbrook Landfill (site) is located on Part of Lots 20 and 21, Concession III near the village of Holbrook in the Township of Norwich. The site is located north of Quaker Street (Norwich Road 3), and is bounded by agricultural land to the east and west, and Long Point Region Conservation Authority (LPRCA) wetlands to the north and south. It is understood that the landfill site originally started accepting waste around 1970, and was assumed by the County of Oxford in 1982. The landfill operated until July 1986, at which time it was capped and seeded as part of the staged development and closure of the site. The closed site is currently operated under Ministry of the Environment, Conservation and Parks (MECP) Amended Environmental Compliance Approval (ECA) No. A070702, dated March 6, 2018. The 2023 annual monitoring program was completed at the site in accordance with ECA requirements.

Groundwater movement in the shallow flow system across most of the site is inferred to be southwesterly towards the on-site creek, while shallow groundwater movement in the western portion of the site (west of the creek) is inferred to flow east towards the creek. However, the shallow flow system groundwater elevations indicate that a mound exists in the fill area, inducing a localized radial flow away from the fill area to the east and southeast. Thus, groundwater flow in the shallow flow system across the majority of the site is inferred to converge on the on-site stream, with a minor component of localized shallow groundwater flow from the fill area toward the east and southeast.

Groundwater movement in the deeper flow system is inferred to be in a generally south to southeasterly direction beneath the site. The horizontal hydraulic gradient across the site is low, with a grade change of less than 1 m from the north to southeast limits of the site.

There may have been some historical landfill impacts in a number of the shallow groundwater flow system wells adjacent to the northeast and particularly to the east and southeast of the landfill; however, most of these have abated such that there was no clear indication of leachate influence in the shallow observation wells at the downgradient property boundaries to the east/southeast at the site during 2023. The shallow groundwater quality complies with Guideline B-7 (as established by the MECP as a mechanism to assess the acceptable level of leachate impacts on the groundwater system), with the exception of hardness, chloride and alkalinity at observation well 26R, nitrate at well 44, and DOC at well 46. Concentrations of hardness are interpreted to be naturally elevated in the shallow flow system. The nitrate exceedance at well 44 is not likely to be the result of a landfill leachate impact as nitrate has not been detected within the leachate; the concentration is likely the result of agricultural activities that surround this well location. It is inferred that road salting and/or off-site sources are a contributing factor in the exceedances at observation well 26R. Based on the groundwater elevation and chemistry results at wells 45 and 46, the elevated concentrations and trigger exceedances in property boundary well 26R do not appear to be the result of shallow groundwater migrating from the landfill mound. Groundwater appears to flow north from the property boundary at 26R toward monitoring well 46. Meanwhile, most key parameter concentrations within monitoring wells 45 and 46 were well below the concentrations at 26R.

There was no clear indication of leachate influence in the deeper groundwater flow system at the property boundaries in 2023. The deep groundwater quality complies with Guideline B-7, with the exception of hardness and iron at wells 27, 37R and 38. Concentrations of hardness and iron are interpreted to be naturally elevated in the deep flow system.

None of the groundwater trigger criteria at the site were exceeded during 2023, with the exception of the chloride concentration at observation well 26R. Based on the groundwater elevation and chemistry results at wells 45 and 46, the elevated concentrations and trigger exceedances in property boundary well 26R do not appear to be the result of shallow groundwater migrating from the landfill mound.

Surface water quality in the wetland at the northeast site boundary, and the northern and southeast on-site retention ponds was not measurably affected by the landfill in 2023. Surface water quality at intermediate station C04 along the on-site stream and retention pond P02 in the central part of the site were inferred to be slightly influenced by the landfill. Surface water quality in the on-site stream leaving the site (station C01) has been affected by landfill influences from the upstream portions of the on-site stream, shallow groundwater discharge, and possibly road salting activities. However, the landfill influences in the surface water quality leaving the site are very weak, based on the monitoring results, with chloride values below the Canadian Environmental Quality Guideline (CEQG) water quality guideline for the protection of aquatic life. Surface water quality leaving the site at station C01 complies with the current trigger level boundary criteria.

No methane was detected during the 2023 monitoring event at any of the landfill gas monitoring probes, located adjacent to the east, northeast, and north of the landfill mound.

Based on the findings of the 2023 monitoring program, it is recommended that the monitoring program outlined within this report be continued at the site in 2024.

SIGNATURES

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1 INTRODUCTION

1.1 BACKGROUND

The closed Holbrook Landfill (site) is located on Part of Lots 20 and 21, Concession III near the village of Holbrook in the Township of Norwich. The site is located north of Quaker Street (Norwich Road 3), and is bounded by agricultural land to the east and west, and Long Point Region Conservation Authority (LPRCA) wetlands to the north and south. The general site location is shown on Figure 1.

It is understood that the landfill site was originally owned by Ingersoll Sanitation Ltd. and started accepting waste around 1970. The site was subsequently owned and operated by Superior Sanitation Services Inc. before the County of Oxford assumed the site in January 1982. The landfill operated until July 1986, at which time it was capped and seeded as part of the staged development and closure of the site. During County ownership from January 1982 until July 1986, the site received only domestic, commercial, and non-hazardous industrial solid waste.

The site operated under Provisional Certificate of Approval (CofA) No. A070702 issued on March 31, 1983 which permitted landfilling at the site until June 30, 1984. It is understood that the County subsequently obtained an extension of the CofA from June 1984, until the site was closed in 1986. A copy of the site CofA (Waste) is provided in Appendix A.

The County purchased the property to the east of the landfill for use as a buffer zone on August 15, 1990.

Following closure of the site, the County monitored the groundwater and surface water quality at the site, while the Ministry of the Environment, Conservation and Parks (MECP) monitored off-site domestic wells in the area. The monitoring data since closure was reviewed by Charlesworth & Associates in 1996 and a revised monitoring program was recommended. The MECP approved the revised monitoring program for the site, which has been undertaken by the County on an annual basis. The groundwater and surface water monitoring locations are shown on the Site Plan, Figure 2.

On September 8, 2016, the site CofA (Waste) was updated by the MECP to Amended Environmental Compliance Approval (ECA) No. A070702. The new approval incorporated the County owned buffer lands to the east of the landfill into a Contaminant Attenuation Zone (CAZ). As part of the new ECA, a closure plan was submitted to the MECP, which included a trigger mechanism and contingency plan as well as a new monitoring program. The closure plan was accepted by the MECP in Notice No. 1 of the ECA, dated March 6, 2018.

WSP Canada Inc. (WSP) was retained by the County to complete the 2023 annual monitoring program at the site.

1.2 SUPPLEMENTAL INVESTIGATIONS

1.2.1 WELL NETWORK UPGRADE PROGRAM 2013-2015

In 2012, GENIVAR (now called WSP) completed a site survey, well network inspection and hydrogeological assessment work program at the site (GENIVAR, 2013). The work program followed the recommendations provided in the 2010 Water Monitoring Report as well as the MECP review of the 2009 Water Monitoring Report, as outlined in their letter dated April 4, 2011.

Additional borehole logs, historic groundwater elevation data and geological cross-sections from this program have been incorporated into this report.

Based on the results of the well inspection and hydrogeological assessment program, it was recommended that the monitoring network at the site be upgraded. This work program would include the drilling and installation of new wells, decommissioning and replacement of existing wells and completion of a site survey, among other things. The well network upgrades were completed in a phased approach.

Phase I of the work program was completed in the summer of 2013 and included the decommissioning of well 17, drilling and installation of background wells 39 and 40, and the drilling and installation of leachate well 41. The locations of the installed wells are shown on the Site Plan, Figure 2. Wells 39, 40 and 41 were surveyed and incorporated into the annual monitoring program in 2014.

Phase II of the well network upgrade program was completed in the fall of 2014. This work program included the decommissioning of 15 wells, drilling and installation of 9 replacement wells, and installation of a single staff gauge. The locations of the installed wells and staff gauge are shown on the Site Plan, Figure 2. The replacement wells and new staff gauge were surveyed and incorporated into the 2015 annual monitoring program.

The remaining phase (Phase III) of the well network upgrade program was completed in the summer of 2015. This work program included the decommissioning of 16 wells, drilling and installation of 12 replacement wells, and the drilling and installation of 3 new monitoring wells. The locations of the installed wells are shown on the Site Plan, Figure 2. A full Site survey was completed following this final phase of the work program, in order to calculate groundwater elevations (in metres above sea level) at all the new and replacement monitoring wells. The wells were incorporated into a revised annual monitoring program in 2016, as outlined in Section 2.0.

1.2.2 SUPPLEMENTAL DRILLING AND SAMPLING PROGRAM 2019

In 2019, a supplemental drilling program was completed at the site to investigate exceedances noted at observation well 26R. Monitoring wells 45 and 46 were installed north of well 26R on August 15 and 16, 2019. The locations of the new wells are shown on the Site Plan (Figure 2) and the borehole logs are provided in Appendix B. A survey of the reference elevations for the new wells was completed by the County of Oxford. These wells were added to the annual monitoring program for supplemental groundwater elevation and quality information.

1.3 PHYSICAL SETTING

TOPOGRAPHY AND DRAINAGE

The elevation of the original ground surface at the site generally decreased in a southwesterly direction from the northeast portion of the site where the refuse was placed, towards a small creek in the southwest portion, then increased towards the western property boundary. Following the closure of the landfill site, the drainage configuration at the site was modified by the capped landfill, which is reportedly the highest elevation on the property, and by the subsequent landscaping which has created a pond in the southwest portion of the site.

The swampy area to the north of the property is part of the headwaters of Otter Creek which flows in a generally northeasterly direction.

The small creek situated within the site property originates to the northwest of the site and flows in a somewhat southerly direction to the southwestern part of the site before draining into a swampy area south of the road. This area is the headwaters of Branch Creek, which flows in a southeasterly direction away from the area.

GEOLOGIC SETTING

The description of the site geology provided herein is based on a review of published maps and reports, including findings from other investigations carried out in the general area, and historic intrusive investigations completed at the Holbrook landfill.

Cross-sections depicting the general stratigraphy across the site are provided on Figure 3 (Cross-section A-A′), Figure 4 (Cross-section B-B′) and Figure 5 (Cross-section C-C′). The locations of the cross-sections are shown on Figure 2.

The study area is situated within the Mount Elgin Ridges physiographic region of Southern Ontario (Chapman and Putnam, 1984). The ridges generally consist of moraines of brown clay or silty clay till with low areas covered with alluvial silt, sand and gravel.

The Holbrook landfill site is situated within an undrumlinized till plain. Three approximately northeast to southwest trending till moraines occur in the area. The Ingersoll Moraine is found to the west of the village of Holbrook and the St. Thomas Moraine occurs northeast and southwest of the landfill site. Additionally, the Norwich moraine occurs south of Newark and extends in a northeasterly direction to the north of Norwich. Several northwest to southeast trending drumlins occur immediately north of the village of Holbrook and represent the southeasterly extent of a large drumlin field which lies to the northwest.

The surficial deposits in the area are generally related to ice moving in a northwesterly direction out of the Erie basin. The soil generally consists of a clay loam of the Huron series with a silt loam of the Honeywood series occurring in the vicinity of the northern boundary of the site (Soil Survey of Oxford County, 1961).

Glaciofluvial outwash deposits occur in the northern part of the property (Barnett, 1976 and Cowan, 1975). These deposits consist primarily of sand, gravelly sand, and sandy gravel.

In the southern part of the property the surficial deposits are principally the Port Stanley Till, which is a silty to silty clay till and represents a glacial advance during the Port Bruce Stadial. The Port Stanley Till occurs at the surface of the Ingersoll, St. Thomas, and Norwich Moraines.

A bog deposit occurs adjacent to and south of the southern boundary of the property.

A large area of glaciolacustrine, shallow water, fine to medium and silty fine sand occurs to the northeast and east of the site. Glaciofluvial outwash sand and ice-contact stratified drift consisting primarily of sand were deposited to the northwest.

As noted above, the surficial overburden at the Site consists of a glaciofluvial outwash deposit (Upper Sand and Gravel Unit) in the northern area, and the Port Stanley Till (Upper Clayey Silt Unit) in the south. Beneath these uppermost soils is a clayey silt unit, which may or may not contain gravel (Lower Clayey Silt Unit) and is variable in thickness. This in turn is underlain by a laterally extensive sand and gravel formation (Lower Sand and Gravel Unit). The Lower Sand and Gravel Unit is reportedly underlain by a relatively thick gravelly silt till formation.

The overburden deposits at the site range from approximately 29 m to 46 m in thickness. In general, the surficial deposits increase in thickness from east to west.

The bedrock underlying the site consists of Middle Devonian limestone and dolostone of the Detroit River Group. None of the intrusive investigations at the site encountered bedrock.

HYDROGEOLOGIC SETTING

The local geologic units at the site are grouped into four (4) hydrostratigraphic units as summarized below, and as shown in the cross-section Figures 3, 4, and 5. Results of historic in-situ hydraulic conductivity testing completed at the site (James F. MacLaren Ltd., 1979 and MacLaren Engineers, 1982) are also provided.

<table>
<tr><th></th><th></th><th colspan="4">CALCULATED HYDRAULIC CONDUCTIVITY RESULTS (cm/s)</th></tr>
<tr><th>FLOW SYSTEM</th><th>HYDROSTRATIGRAPHY</th><th>Range</th><th colspan="3">Mean</th></tr>
<tr><td rowspan="4">Shallow Flow System</td><td rowspan="2">Upper Sand and Gravel Unit</td><td rowspan="2">$5.6\text{x}10^{-1}$ - $9.0\text{x}10^{-6}$</td><td>$2.9\text{x}10^{-1}$</td><td>-</td><td>$2.6\text{x}10^{-3}$</td></tr>
<tr><td>coarse sediments</td><td></td><td>fine sediments</td></tr>
<tr><td>Upper Clayey Silt Unit</td><td>$8.1\text{x}10^{-5}$ - $9.4\text{x}10^{-5}$</td><td colspan="3">$8.8\text{x}10^{-5}$</td></tr>
<tr><td>Lower Clayey Silt Unit
(confining / semi-confining layer)</td><td>$3.5\text{x}10^{-6}$ - $9.5\text{x}10^{-6}$</td><td colspan="3">$6.5\text{x}10^{-6}$</td></tr>
<tr><td rowspan="2">Deep Flow System</td><td rowspan="2">Lower Sand and Gravel Unit</td><td rowspan="2">$3.6\text{x}10^{-1}$ - $7.2\text{x}10^{-5}$</td><td>$3.6\text{x}10^{-1}$</td><td>-</td><td>$6.1\text{x}10^{-5}$</td></tr>
<tr><td>coarse sediments</td><td></td><td>fine sediments</td></tr>
</table>

Although each hydrostratigraphic unit is identified as part of a groundwater flow system, each flow system has a hydraulic influence on the others. Shallow groundwater flow directions are expected to follow the surface drainage patterns.

The Upper Sand and Gravel Unit and Upper Clayey Silt Unit are considered to represent the shallow groundwater flow system. The Lower Sand and Gravel Unit represents the deeper groundwater flow system at the site.

The Lower Clayey Silt Unit likely forms a confining or semi-confining layer restricting groundwater movement. The unit may be intermittently present as the lateral extent and thickness of the unit is unknown. The Lower Clayey Silt Unit has the capacity to transmit water laterally; however, groundwater movement through this unit is inferred to be slower and predominantly downward, as weak downward vertical hydraulic gradients between the shallow and deep flow systems in the vicinity of the landfill have been reported.

The Upper Sand and Gravel Unit and the Lower Sand and Gravel Unit have the greatest capacity to transmit groundwater. The Upper Clayey Silt Unit and the Lower Clayey Silt Unit consist of finer grained material and groundwater movement through the soils is expected to be slow, based on the hydraulic conductivity results shown above.

2 ANNUAL MONITORING PROGRAM

2.1 OBJECTIVES AND SCOPE

The principal objectives of the annual monitoring program at the Holbrook landfill site are as follows.

- To provide documentation of the monitoring program results and findings.
- To assess the current and potential impacts of the landfill site on overburden groundwater quality.
- To assess the current and potential impacts of the landfill site on surface water quality.
- To provide recommendations on future monitoring and remedial actions, if required.

The monitoring program includes a data collection component, and an analysis and interpretation component. This report documents the data collected as part of the 2023 annual monitoring program activities, and our interpretation of the results. Available historic data are also incorporated into the report.

2.2 ANNUAL MONITORING PROGRAM

The 2023 annual program at the site included groundwater and surface water monitoring. The groundwater monitoring program included on-site observation wells and a private domestic well. In 2023, groundwater level measurements, groundwater sampling of on-site wells and private domestic wells, and surface water sampling were completed by WSP following general monitoring protocols and procedures, provided in Table 2-1.

2.2.1 GROUNDWATER – ON-SITE OBSERVATION WELLS

The groundwater monitoring program completed in 2023 included the following items.

- Annual groundwater level measurements at thirty (30) observation well locations in May;
- Annual staff gauge measurement at one (1) staff gauge located in Branch Creek;
- Annual groundwater sample collection from eighteen (18) observation wells (seventeen (17) on-site wells and one (1) private domestic well) in May 2023; and
- Additional groundwater level measurements and groundwater sample collection in May 2023 at two wells installed in 2019 (45 and 46).

Table 2-1 Monitoring Protocols and Procedures

GROUNDWATER LEVEL MEASUREMENT	GROUNDWATER/LEACHATE SAMPLING	SURFACE WATER SAMPLING
▪ Monitor integrity is visually inspected (casing, lock, caps, etc.). ▪ Well cap is carefully removed to avoid introducing foreign material into monitor. ▪ A water level is measured using a clean electronic water level meter with a stainless steel probe and graduated cable. ▪ The water level measurement is referenced to a known geodetic elevation on the monitor and checked twice for confirmation. ▪ The water level is recorded in the dedicated project field book and checked against previous reading. ▪ If the water level is significantly greater than historic value, the level in the well is checked again. ▪ The water level depth probe and cable are rinsed with de-ionized water between wells. ▪ Water levels in each monitor are measured and recorded prior to purging.	▪ Each monitoring well is purged prior to sampling in order to remove stagnant water in the monitor and surrounding sand pack. ▪ Purging and sampling is carried out using the dedicated inertial lift pump and high density polyethylene tubing in place within the monitors. ▪ Well volumes are determined in the field based on the water level measurement. At least 3 well volumes are removed for moderate yield wells, or 1 to 2 well volumes for low yield wells (wells that dry out and are slow to recover). The volume of water purged is measured in a graduated container. ▪ Field parameters (pH, conductivity and temperature) are measured using calibrated instruments during purging to ensure that representative formation water is sampled. Purging is considered completed once the pH, conductivity, and temperature have stabilized. ▪ The groundwater sample is collected from the well as soon as there is a sufficient volume of liquid within the well, usually on the same day or on the following day, at the latest. ▪ Samples collected for metals analysis are field filtered using a high capacity in-line 0.45 micron disposable filter. The sample is collected directly from the filter discharge into the sample bottle. ▪ Water samples are collected directly into the laboratory provided bottles with the appropriate preservatives added. Sample bottles are marked, labelled, and sealed in the field. ▪ Samples are stored in coolers packed with ice, and delivered or couriered to the laboratory at the end of each day, under Chain of Custody procedures. ▪ Field notes including date, weather, the sampling data, time, staff, field parameters, visual observations, and number of bottles are marked on the Water Sampling Field Data sheets in the Project Field Book.	▪ Attempts are made to schedule surface water monitoring events to correspond to periods of anticipated flow whenever possible (i.e. 24 hrs after a significant precipitation event). ▪ Surface water samples at each location are collected prior to flow measurement. ▪ Monitoring is completed from downstream to upstream locations to avoid sediment disturbance which may influence sample integrity. ▪ Surface water samples are collected directly into the laboratory provided bottles that do not have preservatives. For bottles with preservatives added, standard grab sampling methods are used and then the water decanted into laboratory provided bottles with the appropriate preservatives. The sample container is pointed upstream and care is taken to avoid particulate and organic matter in the water. ▪ Sample bottles are marked, labelled and sealed in the field. ▪ Samples are stored in ice packed coolers, and delivered or couriered to the laboratory at the end of each day, under Chain of Custody procedures. ▪ Field parameters (pH, conductivity, temperature and dissolved oxygen) are measured from a separate beaker of water using calibrated instruments. ▪ When the flows are adequate, stream flow discharge is estimated based on the cross-sectional area of the stream, and the water velocity. ▪ A cross-sectional profile of the stream is determined by measuring the cross sectional width and depth of the wetted stream at various points. The velocity is estimated by measuring travel time between two profiles across the stream. ▪ Field notes including date, weather, time, sampling data, staff, field parameters, visual observations, and number of bottles are marked on the Water Sampling Field Data sheets in the Project Field Book.

The 2023 groundwater monitoring network at the site is outlined in the following table.

MONITORING NETWORK	DESIGNATION	
	Annual Water Levels	**Annual Groundwater Sampling**
Shallow Flow System	4R, 5R, 10R, 11R, 13R, 14R, 15A, 16AR, 18R, 19R, 24AR, 26R, 28R, 32R, 33R, 40, 41, 43, 44, 45, 46	11R, 16AR, 19R, 26R, 28R, 32R, 40, 41, 43, 44, 45, 46
Deep Flow System	16R, 21R, 24R, 25R, 27, 31, 35, 37R, 38, 39, 42	21R, 24R, 25R, 27, 37R, 38, 39, 42, D2

Notes:
- A number of shallow flow system observation wells may be screened across the upper flow system and the shallow confining layer.

Groundwater samples were submitted to SGS Canada Inc. in Lakefield, Ontario for analysis of the following parameters.

GENERAL PARAMETERS			
pH	Conductivity	Hardness	
MAJOR AND MINOR IONS			
Alkalinity	Chloride	Potassium	Sulphate
Calcium	Magnesium	Sodium	
NUTRIENTS AND ORGANICS			
Ammonia	Nitrite	DOC	
Nitrate	TKN		
DISSOLVED METALS			
Boron	Iron		
Chromium	Manganese		

Select wells (26R, 27, 32R, 37R, 38, 39, 40, 41, 42, 43, 44, 45, and 46) were also analyzed for the volatile organic compounds of vinyl chloride, benzene, and 1,4 dichlorobenzene in May 2023, as per the approved environmental monitoring program.

The groundwater sampling locations are shown on the Site Plan, Figure 2. Copies of available borehole logs for the observation wells are provided in Appendix B. Monitoring well details are provided in Table C-1, Appendix C. It is assumed that the observation well designations and borehole logs are consistent between those used in previous reports (Charlesworth & Associates, 2008 and MacLaren Engineers, 1982).

2.2.2 GROUNDWATER – PRIVATE DOMESTIC WELL

Since 1997, the County has sampled a private domestic well that is now referred to as the Pearce domestic well (D2), formerly the Roswell domestic well. Of the more than thirty (30) private domestic wells in the vicinity of the site, domestic well D2 was deemed the most likely to exhibit potential influences from landfill leachate, given the inferred flow regimes at the site. The location of domestic well D2 is shown on Figure 2.

The private domestic well groundwater monitoring program completed in 2023 included annual groundwater sampling at well D2 in May. Groundwater samples were submitted to SGS Canada Inc. in Lakefield, Ontario for analysis of the parameters previously noted for the groundwater monitoring program.

2.2.3 SURFACE WATER

Surface water monitoring was completed at the stations listed in the following table. The locations of the surface water monitoring stations are shown on Figure 2.

SURFACE WATER STATION	RELATIVE POSITION	SAMPLING FREQUENCY
C01	The on-site stream, south (downstream) of the landfill where the stream leaves the site property boundary via a culvert beneath Quaker Street. Station C01 is downstream of surface water stations C04 and C06.	Semi-annually (spring and fall)
C06	Collected from a swampy area, northwest (upstream) of the landfill where the on-site stream enters the site property.	
C04	The on-site stream, intermediate station southwest (downstream) of the landfill. Station C04 is downstream of stations C06 and P02.	Annually (spring)
P02	The on-site pond situated adjacent west (downstream) of the landfill. The pond is inferred to be the receiving body for shallow groundwater moving from beneath the landfill. Drainage from P02 enters the on-site stream between sampling points C04 and C06.	
P03	The on-site retention pond situated close to the landfill in the northern portion of the site.	
P01	The on-site retention pond situated in the southeast portion of the site.	
NE1	The swampy area situated in the northeast portion of the site, at the toe of the landfill.	

The semi-annual sample collection was completed on April 3 and October 12, 2023, and the annual sample collection was completed on April 3, 2023. The surface water monitoring protocols and procedures are presented in Table 2-1. The surface water samples were submitted to SGS Canada Inc. in Lakefield, Ontario for analysis of the parameters listed below.

GENERAL PARAMETERS

pH
Conductivity
Hardness

MAJOR AND MINOR IONS

Alkalinity
Calcium
Chloride
Magnesium
Potassium
Sodium
Sulphate

NUTRIENTS AND ORGANICS

Ammonia
Nitrate
Nitrite
Un-ionized Ammonia

DISSOLVED METALS

Boron
Chromium
Iron
Manganese

2.2.4 LANDFILL GAS

During 2023, landfill gas measurements were completed on an annual basis at standpipes SP3R, SP4R, and SP5. The locations of these standpipes are shown on Figure 2. The monitoring included the measurement of methane, carbon dioxide, oxygen, and balance gas concentrations, as well as water levels to determine whether or not the screened interval was partially flooded. Measurements and readings were completed on May 15, 2023.

3 GROUNDWATER LEVELS AND FLOW CONDITIONS

Groundwater levels are measured annually in the observation wells at the site prior to the sampling event. The groundwater level elevation data from May 2023 and the available historic water level elevation data for the site are provided in Table C-2 and graphically in Figures C-1 through C-15, Appendix C. A well survey to establish elevation and location was completed in 2012, and groundwater elevations have been calculated from the current and historic water levels measured at the site. New observation wells installed in 2013 were surveyed for location and elevation in 2014, while new and replacement wells installed in 2014/2015 were surveyed for location and elevation in 2015. The two wells installed in August 2019 were surveyed for location and elevation in 2019.

In 2023, groundwater elevations measured in the observation wells were typically within their respective historic ranges, with the exception of monitoring well 13R where the groundwater elevation in May 2023 was below the historic range for this well.

Groundwater level elevations measured in the observation wells mostly increased from May 2022 to May 2023, following the historic low elevations noted in many wells in 2021. Also, as noted historically, flowing conditions were observed in May 2023 at observation wells 26R, 27 and 45, meaning that the groundwater pressure was above both the ground surface and the top of the pipe. An extension was added to the top of the pipe in order to obtain a measurable groundwater elevation at these wells. The May 2023 groundwater elevations at observation wells 14R, 19R, 39, 40 and 46 were also at or above ground surface, but were below the top of pipe.

3.1 GROUNDWATER FLOW

Observation wells at the site have been grouped into the shallow groundwater flow system, deep groundwater flow system, or confining/semi-confining system.

The groundwater table is located in the Upper Sand and Gravel Unit and the Upper Clayey Silt Unit which represents the shallow flow system. The groundwater table elevations measured in May 2023 and the interpreted shallow water table contours are presented on Figure 6. In general, groundwater movement in the shallow flow system across most of the site is inferred to be southwesterly towards the on-site creek, while shallow groundwater movement in the western portion of the site (west of the creek) is inferred to flow east towards the creek. However, the shallow flow system groundwater elevations indicate that a mound exists in the fill area, inducing a localized radial flow away from the fill area to the east and southeast. In addition, monitors 45 and 46 indicate there is localized groundwater flow from the south of the site moving north towards the waste.

Hence, over the majority of the site, groundwater flow in the shallow flow system is inferred to converge on the creek, contributing to the flow of the creek. Also, given that the thickness of the Upper Sand and Gravel Unit in the northern part of the site thins toward the creek in the southwest, shallow groundwater below the landfill likely contributes to the creek. Further, the retention pond located in the central portion of the site likely acts as a discharge zone for the shallow groundwater. As such, any leachate influences observed in the shallow flow system across the majority of the site would likely impact the surface water quality. There may be a minor component of localized shallow groundwater flow from the fill area east, north and southeast toward the buffer property.

Based on historic borehole logs, the base of waste was at an elevation of approximately 279 mASL to 280 mASL; though there was an area of deeper waste, approximately 275 mASL, in the west central portion of the fill area (BH22) that was associated with a swampy depression. Previous observation wells in the waste disposal area are no longer present. In order to determine if groundwater (leachate) mounding is present at the site, leachate well 41 was incorporated into the 2014 annual monitoring program. Based on the May 2023 liquid level within well 41 (283.37 mASL), localized perched leachate mounding is likely present at the site. This mounding is attributed to areas of low hydraulic conductivity within the refuse, and has the potential to influence shallow groundwater quality adjacent to the disposal area or result in surface seeps.

Though some shallow flow system observation wells located adjacent to the north and northeast of the landfill are situated hydraulically upgradient of the landfill, it is possible that they have been historically influenced by localized landfill effects and as such, are not considered to be suitable background observation wells. Shallow flow system well 40 is more representative of upgradient conditions, and was incorporated into the 2014 annual monitoring program as a background observation well.

Groundwater elevations measured in the deeper flow system in May 2023 are presented in Figure 7. Groundwater flow in the deep flow system is inferred to be in a generally south to southeasterly direction under a very low horizontal hydraulic gradient. As shown on Figure 7, the difference in head across most of the site is less than 1 m, although there is a greater head of at least 1.9 m between the background wells in the northwest corner of the site and the downgradient wells.

Observation well 39 was installed in 2013 to serve as a background observation well for the deep flow system. However, the groundwater elevation measured in the well did not appear to correspond with the other deep flow system groundwater elevations on site. Well 39 was drilled to a similar depth as nearby deep flow system wells, but a significant layer of clayey silt was not encountered when drilling the borehole for observation well 39. Based on recommendations from the 2014 annual water monitoring report, a deeper observation well (42) was installed in the summer of 2015, which penetrated a confining to semi-confining layer of approximately 6.5 m of clayey silt. Observation well 42 was incorporated into the 2016 monitoring program as a deep flow system background observation well. Similar to observation well 39, the groundwater elevation measured in observation well 42 does not appear to correspond with the other deep flow system groundwater elevations on site, but rather corresponds to the shallow groundwater elevation at this location. It is inferred that the confining/semi-confining unit in the northwestern corner of the site may be discontinuous, as there is little to no difference in groundwater elevation between the shallow and deep flow systems.

As part of a further evaluation into the source of trigger exceedances at monitoring well 26R, shallow observation wells 45 and 46 were installed in August 2019, north of monitoring well 26R. Since first measuring groundwater levels from within boundary monitoring well 26R in 2016, artesian conditions have consistently been observed. Artesian conditions have also been observed at monitoring wells 45 and 46, since their installation. Based on groundwater elevations measured in 2020 through 2023, groundwater appears to flow north from the property boundary at 26R toward monitoring well 46, closer to the landfill mound. It should be noted that limited data is available for wells 45 and 46, as they were installed in August 2019. Continued monitoring will be required to confirm this conclusion.

Groundwater levels in the shallow flow system are generally higher than those in the deeper flow system at corresponding downgradient locations. As such, vertical hydraulic gradients are downward through the less permeable confining/semi-confining unit. The vertical linear velocity of groundwater downward through the confining/semi-confining layer was estimated to be in the order of 0.01 to 1.5 m/yr (MacLaren Engineers, 1982). By comparison, the horizontal linear groundwater velocity in the deeper flow system is estimated to be in the range of 12.7 to 45.7 m/yr (MacLaren Engineers, 1982). As such, the volume of flow through the deeper flow system is considerably greater than the vertical leakage of shallow groundwater downward through the confining/semi-confining unit.

For the purposes of assessing the groundwater quality, the downgradient observation wells were divided into groups based on their location in the inferred flow regimes, which is consistent with the previous reports at the site. This approach facilitates the assessment of groundwater quality within the two flow systems with respect to the inferred groundwater flow regimes and potential leachate impact.

4 GROUNDWATER QUALITY

The available groundwater chemical data for the site from 1979 to 2023 are provided in Appendix D. The groundwater chemical results for the shallow flow system and the deeper flow system are provided in Tables D-1 and D-2, respectively. The private domestic groundwater chemical results are provided in Table D-3. The tables also provide the applicable Ontario Drinking Water Quality Standards (2003, revised June 2006) (ODWQSs). Time versus concentration graphs for chloride, alkalinity, potassium, boron, iron, ammonia, and TKN are presented on Figures D-1 to D-35, Appendix D. The 2023 laboratory certificates of analysis are included in Appendix F.

The quality assurance/quality control (QA/QC) program for the monitoring program at the site included a field and a laboratory component. Standard field protocols were used to ensure consistency.

Laboratory reports were reviewed as part of the laboratory QA/QC program. Blind duplicate samples were collected from wells 26R and D2 in May 2023. Duplicate samples were similar to the original samples results with the calculated Relative Percent Difference (RPD) within the 20% guideline for acceptability or less than two times the laboratory reported method detection limit (MDL). Acceptable data quality control including laboratory blanks, spiked blanks, laboratory duplicates, and laboratory percent recoveries of analysis indicated that the detected constituent concentrations were accurate and reflected actual groundwater conditions at the time of sample collection and are acceptable for inclusion into the database.

4.1 LEACHATE CHEMISTRY

Leachate is produced from the infiltration of precipitation through the waste. Processes within the waste degrade the quality of the percolating water to create leachate. The chemical composition of leachate can vary within the waste cells depending on various factors such as refuse composition, age, hydraulic conductivity, residence time, and the leachate flow regime.

There is currently one leachate well (41) in the observation well network, located in the south portion of the landfill, for characterizing the leachate quality. This leachate well has been sampled since 2014. It is noted that older refuse is located in the north portion of the landfill and younger refuse is located in the south potion of landfill (James F.

MacLaren Ltd., 1979). As such, it is likely that the leachate strength in the north portion of the landfill is weaker than the leachate strength in the south portion of the landfill.

The 2023 leachate chemistry results are provided in Table 4-1. The groundwater chemistry ranges from the background shallow flow system and deeper flow system observations wells, along with the range of representative concentrations for municipal landfills in Ontario, are also summarized.

The 2023 leachate quality at the Site was generally below or within the lower portion of the range of representative concentrations for municipal landfills in Ontario (Freeze and Cherry, 1979 and the Ministry of the Environment, 1993). The leachate strength at the site is considered to be very weak, with chloride and sodium concentrations below their respective ODWQSs. Nonetheless, concentrations of most parameters in the leachate well were elevated relative to the background shallow and deep flow system groundwater. In particular, concentrations of chloride, alkalinity, potassium, boron, iron, ammonia, TKN, benzene, 1,4-dichlorobenze, and historic concentrations of vinyl chloride are notably elevated in the landfill leachate relative to the background groundwater quality, and serve as diagnostic leachate indicator parameters for the site.

The historic laboratory leachate quality data at leachate well 41 is provided in Table D-1, Appendix D. Time versus concentration graphs for the leachate indicator parameters of chloride, alkalinity, potassium, boron, iron, ammonia, and TKN are shown on Figures D-1 through D-7, Appendix D. Several leachate indicator parameter concentrations have decreased overall since 2016. Parameter concentrations at leachate well 41 in 2023 were generally within their respective historic ranges, with the exception of chloride, potassium, TKN and boron, which were below.

Table 4-1 2023 Background Groundwater Chemistry Relative to Landfill Leachate Chemistry

PARAMETER	ONTARIO DRINKING WATER QUALITY STANDARDS	PARAMETER CONCENTRATIONS			
		Leachate (well 41)	2023 Background Range		Typical Landfill Leachate (source)
			Shallow Flow System (well 40)	Deep Flow System (well 39 and 42)	
pH	6.5 - 8.5 OG	7.09	7.86	8.18 - 8.32	6 - 7 (2)
Conductivity	-	1970	767	404 - 743	
Hardness	80 – 100 OG	568	359	174 - 319	400 - 2,000 (2)
Chloride	250 AO	60	23	<1 - 37	20 - 2,500 (2)
Sulphate	500 AO	6	43	<2 - 47	<1 - 300 (2)
Alkalinity	30 – 500 OG	948	351	206 - 280	300 - 2,000 (2)
Calcium	-	168	111	36.4 - 89.4	100 - 1,000 (2)
Magnesium	-	36.2	19.7	20.1 - 23.4	100 - 1,500 (1)
Potassium	-	40.8	0.838	0.939 - 1.45	200 - 1,000 (1)
Sodium	200 AO	41.9	9.69	16.0 - 19.2	200 - 1,200 (1)
Ammonia	-	76.1	0.2	<0.1 - 0.4	5 - 1,000 (2)
TKN	-	70.6	<0.5	<0.5	1 - 100 (2)
Nitrate	10.0 MAC	<0.06	<0.06	<0.06 - 0.14	
Nitrite	1.0 MAC	<0.3	<0.03	<0.03	0.1 - 0.50 (2)
DOC	5 AO	41.0	6.3	1.4 - 1.7	

PARAMETER	ONTARIO DRINKING WATER QUALITY STANDARDS	PARAMETER CONCENTRATIONS			
		Leachate (well 41)	2023 Background Range		Typical Landfill Leachate (source)
			Shallow Flow System (well 40)	Deep Flow System (well 39 and 42)	
Boron	5.0 IMAC	1.28	0.019	0.025 - 0.048	0.5 - 10 (2)
Chromium	0.05 MAC	0.0029	0.00033	0.00009 - 0.00012	<0.01 - 0.5 (2)
Iron	0.3 AO	55.9	2.66	0.119 - 0.439	1 - 1,000 (1)
Manganese	0.05 AO	0.483	0.22	0.0112 - 0.141	0.01 - 100 (1)
Vinyl Chloride	1 MAC	2.0	<0.2	<0.2	
Benzene	1 MAC	12.2	<0.5	<0.5	
1,4 Dichlorobenzene	5 MAC 1 AO	13.3	<0.5	<0.5	

Notes:

All concentrations in mg/L except pH (unitless), conductivity (µS/cm), and VOCs vinyl chloride, benzene and 1,4-dichlorobenzene (µg/L)
Shading indicates concentration exceeds Ontario Drinking Water Quality Standard.
(1) Typical leachate characteristics data from Freeze & Cherry (1979).
(2) Typical leachate characteristics data from the Ministry of the Environment (1993).

4.2 GROUNDWATER CHEMISTRY

Background concentrations for groundwater were established in the 1980s, based on chemical results from upgradient domestic wells. However, the domestic wells used were screened in various aquifer units, and the background concentrations were not representative of either the shallow or deeper groundwater flow system.

During the time when the site was operating, shallow groundwater beneath the fill area was considered to be impacted based on the results from observation well 34, drilled through the refuse and screened in the underlying shallow aquifer. Observation well 34 was reportedly destroyed in 1984. Also, some of the wells adjacent to the northeast and east of the fill area showed evidence of leachate influences, likely from periodic leachate seeps. The reports at the time concluded that any contamination in the shallow flow system had not migrated off-site as the flow system likely discharged to the on-site stream. It is understood that the periodic leachate seeps would have been addressed through the site closure works and are no longer an issue.

Within the deeper flow system, leachate impacts in the groundwater were not observed during the site operation. Observation well 36, screened in the deeper aquifer below the waste, did not show any evidence of leachate influence. The well reportedly became non-functional after 1985; and was destroyed during historic landfilling activities.

Nineteen (19) overburden groundwater observation wells, one (1) leachate observation well, and one (1) private domestic well were sampled for general inorganic parameters as part of the 2023 monitoring program. Twelve (12) of the overburden groundwater observations wells and the one (1) leachate observation well were also sampled for select volatile organic compounds (VOCs). Based on the inferred shallow groundwater flow pattern and measured groundwater elevations, some observation wells located along the north and northeastern landfill boundary may have been situated hydraulically upgradient of the landfill. Given their proximity however, it is possible that they were influenced in the past by localized landfill effects and thus, they are not considered to be representative of background conditions in the shallow flow system. Similarly, there were no observation wells situated hydraulically upgradient of the landfill in the deeper groundwater flow system prior to 2013. Observation wells 39 and 40 were installed in mid-2013 to address these deficiencies and have since been included in the annual monitoring program. Observation well 42 was installed in 2015 and has been included in the annual monitoring program since 2016. These wells are considered to be representative of background conditions, as they are situated hydraulically upgradient of the inferred landfill mound.

4.2.1 GROUNDWATER QUALITY COMPARISON

A summary of the 2023 chemical results for the observation wells at the site, along with their respective historical ranges, is provided in Table 4-2. For assessment purposes, the observation wells were divided into the following groups based on their location in the inferred groundwater flow regime, as shown below.

FLOW SYSTEM	**OBSERVATION WELLS AND POSITIONS RELATIVE TO FILL AREA**	
Shallow Flow System	Background northwest	40
	Adjacent northeast	32R
	Adjacent east	11R
	East	44
	Adjacent west	19R
	Adjacent southeast	28R
	South	26R, 45, & 46
	Southeast	43
Deep Flow System	Background northwest	39 & 42
	Adjacent northeast	24R
	Adjacent east	25R
	East	38
	Adjacent west	21R
	South	27
	Southeast	37R & D2

Table 4-2: Historic Groundwater Quality Comparison

Observation Well Position Relative to the Landfill	Well	pH		Conductivity		Hardness		Chloride		Sulphate		Alkalinity		Calcium		Magnesium		Potassium		Sodium		Ammonia	
		Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results
Refuse																											
Landfill Mound	41	**6.46** - 7.79	7.09	1840 - 3670	1970	**501 - 685**	**568**	66.9 - **267**	60	<1.5 - 22.0	6	301 **- 1590**	**948**	121 - 199	168	38.6 - 61.3	36.2	50.2 - 132	40.8	54.1 - 151	41.9	72.8 - 195	76.1
Shallow Flow System																											
Background Northwest	40	7.24 - 8.15	7.86	658 - 782	767	**359 - 450**	**359**	16.5 - 29.0	23	34.5 - 51.0	43	328 - 369	351	106 - 142	111	20.1 - 25.3	19.7	0.89 - 1.15	0.838	10.5 - 13.4	9.69	0.16 - 0.22	0.2
Adjacent Northeast	32/32R	7.65 - 8.25	8.10	220 - 598	648	**148 - 351**	**303**	1.0 - 15.0	17	25.0 - 39.0	30	167 - 291	336	40.9 - 95.4	80.2	11.8 - 28.8	25.0	0.783 - 2.0	0.837	4.0 - 22.5	8.80	<0.02 - 0.06	<0.1
Adjacent East	11/11R	6.88 - 8.20	7.85	290 - 1650	1630	**120 - 825**	**689**	3.9 - 140	96	2.60 - 29.9	3	105 - **827**	**762**	36.4 - 202	170	6.5 - 78.1	64.2	0.75 - 6.33	2.96	3.9 - 71.2	54.0	0.72 - 5.74	1.4
East	44	7.58 - 8.22	7.98	667 - 840	701	**362 - 434**	**357**	12.3 - 20.0	17	37.7 - 61.0	43	262 - 302	289	87.4 - 112.0	94.1	30.5 - 37.4	29.7	1.26 - 1.39	1.15	6.21 - 7.60	5.98	<0.010 - 0.07	<0.1
Adjacent West	19R	7.43 - 8.27	8.15	385 - 504	446	**190 - 267**	**211**	1.55 - 4.19	<1	25.5 - 35.0	27	213 - 232	201	39.9 - 64.4	51.5	18.4 - 25.8	20.0	1.29 - 1.65	1.12	13.8 - 27.3	11.3	<0.010 - 0.16	<0.1
West	16AR	7.75 - 8.15	7.99	571 - 659	692	**276 - 355**	**287**	23.3 - 29.0	26	54.5 - 95.0	68	268 - 283	273	59.8 - 84.1	66.9	30.7 - 37.8	29.0	1.30 - 2.38	1.19	22.1 - 26.3	21.2	<0.02 - 0.045	<0.1
Adjacent Southeast	28/28R	7.30 - 8.29	8.35	380 - 662	592	**184 - 382**	**213**	1.6 - 7.0	6	25.9 - 75.0	66	150 - **789**	274	39.0 - 82.9	47.8	21.0 - 40.4	22.8	0.66 - 2.94	1.55	6.6 - 37.1	36.1	0.06 - 0.16	0.1
South	26/26R	7.21 - 8.13	7.91	595 - 2210	1320	**339 - 657**	**412**	15.8 - **319**	150	14.8 - 24.0	26	223 - **739**	451	85.8 - 172	103	25.6 - 65.3	37.3	1.10 - 3.20	1.87	8.11 - **208**	101	0.042 - 0.11	<0.1
	45	7.90 - 8.24	8.32	324 - 334	334	**143 - 222**	**149**	<1 - 3.00	<1	19.4 - 32.0	21	153 - 162	162	33.3 - 60.8	39.8	14.3 - 17.1	12.2	0.96 - 1.62	0.784	24.6 - 28.2	19.9	<0.1 - 0.131	0.2
	46	7.88 - 8.24	8.22	391 - 431	430	**247 - 276**	**233**	1 - 2.97	<1	14.8 - 37.0	25	198 - 230	245	63.4 - 74.0	63	20.3 - 22.3	18.4	1.02 - 1.10	1.02	2.18 - 4.35	1.92	<0.1 - 0.052	<0.1
Southeast	43	7.53 - 8.25	8.19	321 - 421	456	**110 - 144**	**108**	1.35 - 24.0	8	10.6 - 59.0	35	172 - 202	334	22.5 - 31.9	24.2	12.5 - 16.5	11.5	1.12 - 1.78	1.26	22.0 - 63.5	49.1	0.06 - 0.14	0.3
Deep Flow System																											
Background Northwest	39	7.52 - 8.18	8.18	666 - 773	743	**294 - 379**	**319**	33.9 - 44.0	37	41.9 - 55.0	47	275 - 315	280	76.3 - 107.0	89.4	23.5 - 28.3	23.4	1.55 - 1.83	1.45	20.0 - 23.7	19.2	0.04 - 0.11	<0.1
	42	7.42 - 8.22	8.32	347 - 422	404	**161 - 281**	**174**	0.51 - 2.12	<1	1.45 - 5.69	<2	211 - 269	206	28.2 - 45.8	36.4	20.6 - 29.0	20.1	1.06 - 1.45	0.939	18.0 - 21.8	16.0	0.29 - 0.42	0.4
Adjacent Northeast	24/24R	7.27 - 8.36	8.25	288 - 920	461	**130 - 404**	**199**	0.5 - 65.5	<1	13.4 - 41.2	15	141 - 348	202	28.3 - 118	49.7	14.9 - 26.4	18.2	0.48 - 2.59	0.869	10.9 - 32.4	9.06	0.013 - 0.42	0.4
Adjacent East	25/25R	6.93 - 8.32	8.24	270 - 1518	457	**133 - 500**	**182**	3.1 - 213	12	4.20 - 53.4	6	138 - 500	198	32.4 - 120	48.1	11.0 - 70.5	15.1	0.95 - 15.0	1.17	6.13 - **296**	14.6	0.060 - 0.20	<0.1
East	38	7.30 - 8.32	8.09	290 - 630	601	**173 - 330**	**262**	3.0 - 31.0	28	21.1 - 27.0	24	158 - 280	230	47.5 - 86.8	71.7	13.0 - 27.0	20.1	0.44 - 2.0	1.06	9.92 - 24.5	14.8	0.07 - 0.13	0.1
Adjacent West	21/21R	7.10 - 8.26	8.13	409 - 609	652	**210 - 440**	**294**	5.0 - 40.0	38	15.0 - 33.2	6	181 - 279	265	50.2 - 95.5	78.1	15.7 - 30.5	24.2	0.40 - 2.31	1.37	8.1 - 27.5	10.7	0.09 - 0.20	<0.1
South	27	7.00 - 8.14	8.08	400 - 905	745	**298 - 395**	**320**	10.0 - 62.7	38	29.5 - 42.1	31	236 - 340	310	75.0 - 110	91.3	22.0 - 30.3	22.4	1.23 - 5.32	1.28	12.1 - 33.6	14.2	<0.02 - 0.10	<0.1
Southeast	37/37R	7.10 - 8.32	7.90	394 - 655	689	**252 - 493**	**307**	10.0 - 38.0	34	35.8 - 44.5	36	217 - 290	267	62.9 - 101.0	85.2	22.9 - 34.6	22.9	<0.02 - 1.75	1.23	7.09 - 14.8	12.0	0.05 - 0.15	<0.1
	D2 *	7.30 - 8.38	8.21	398 - 888	753	<0.50* **- 430**	1.7	1.0 - 49.0	48	30.0 - 43.0	33	210 - 370	274	0.089* - 122	0.47*	<0.05 * - 31.6	0.123*	0.08* - 3.11	0.478*	11.0 - 207	146*	<0.010 - 0.12	<0.1

Notes:
- Concentrations are in mg/L with the exception of VOCs which are in µg/L, pH which is in SU, and conductivity which is in µS/cm.
- Bold and shading indicates exceedance of ODWQS.
- Blank indicates there is no historic data for thie specified parameter.
- Shaded parameters across title row have been identified as diagnostic indicator parameters.
- * Groundwater sample from domestic well D2 is inferred to be softened prior to collection; the results should be viewed with caution.

Table 4-2: Historic Groundwater Quality Comparison

Observation Well Position Relative to the Landfill	Well	TKN		Nitrate		Nitrite		DOC		Boron		Chromium		Iron		Manganese		Vinyl Chloride		Benzene		1,4 Dichlorobenzene	
		Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results	Historic Range	2023 Results
Refuse																							
Landfill Mound	41	84.3 - 212	70.6	<0.06 - <0.50	<0.06	<0.03 - <0.50	<0.3	**27.4 - 146**	**41.0**	1.63 - 4.85	1.28	<0.0050 - 0.011	0.0029	**43.6 - 63.7**	**55.9**	**0.179 - 0.486**	**0.483**	<0.50 - **1.2**	2.0	**<8.00 - 25**	**12.2**	**<4.00 - 71**	**13.3**
Shallow Flow System																							
Background Northwest	40	0.16 - 1.48	<0.5	<0.05 - 0.13	<0.06	<0.010 - <0.25	<0.03	**6.6 - 8.06**	**6.3**	0.019 - 0.036	0.019	<0.00050 - 0.005	0.00033	**2.79 - 9.96**	**2.66**	**0.211 - 0.931**	**0.22**	<0.17 - <0.68	<0.2	<0.20 - <0.80	<0.5	<0.20 - <0.50	<0.5
Adjacent Northeast	32/32R	<0.10 - 0.85	<0.5	<0.05 - 0.41	0.07	<0.010 - <0.05	<0.03	1.2 - 2.70	1.9	0.028 - 0.057	0.040	<0.00050 - <0.003	0.00012	<0.01 - **2.56**	0.254	0.020 - **0.380**	0.0212	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
Adjacent East	11/11R	2.38 - 6.95	2.1	<0.10 - 0.12	<0.06	<0.03 - <0.25	<0.03	**10.5 - 20.5**	**17.1**	0.203 - 0.264	0.199	<0.00050 - 0.008	0.00046	<0.02 - **8.96**	**1.26**	0.048 - **0.432**	**0.058**	**2.2 - 2.6**		<0.20 - 0.22		<0.10	
East	44	<0.10 - 0.46	<0.5	**15.4 - 27.4**	**19.3**	<0.010 - <0.25	<0.03	0.8 - 3.12	1.3	0.022 - 0.04	0.020	0.00078 - <0.003	0.00062	<0.01 - 0.034	<0.007	0.00124 - 0.003	0.00052	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
Adjacent West	19R	0.19 - 1.80	<0.5	<0.05 - 0.24	0.22	<0.010 - <0.050	<0.03	0.9 - 3.6	1.4	0.039 - 0.061	0.032	<0.00050 - <0.003	0.00027	<0.007 - **0.313**	0.019	0.00081 - **0.084**	0.00201	<0.17		<0.20		<0.10	
West	16AR	<0.10 - 1.13	<0.5	<0.05 - 0.140	0.08	<0.010 - <0.05	<0.03	1.3 - 2.62	1.0	0.032 - 0.045	0.029	<0.00050 - <0.003	0.00013	<0.01 - 0.178	0.008	0.0176 - 0.031	0.0176	-		-		-	
Adjacent Southeast	28/28R	0.15 - 0.43	<0.5	<0.020 - 0.18	0.25	<0.010 - <0.05	<0.03	1.1 - 2.9	1.6	0.073 - 0.090	0.101	<0.00050 - <0.003	0.00011	<0.01 - **1.66**	0.030	0.0177 - **0.627**	0.0151	<0.17		<0.20		<0.10	
South	26/26R	0.60 - 1.05	<0.5	<0.06 - <0.5	<0.06	<0.03 - <0.5	<0.03	**10.6 - 13.0**	**5.4**	1.41 - 1.85	0.77	<0.003 - 0.012	0.00035	0.19 - **2.19**	**1.46**	0.030 - **0.118**	0.033	<0.17 - <0.68	<0.2	<0.20 - <0.80	<0.5	<0.10 - <0.50	<0.5
	45	<0.5 - 0.22	<0.5	<0.020 - 0.17	0.07	<0.03 - 0.048	0.04	1.2 - 4.3	2.4	0.118 - 0.133	0.100	<0.00050 - 0.00039	0.00012	0.049 - **0.336**	0.028	0.0193 - 0.0375	0.0175	<0.2 - <0.50	<0.2	<0.50	<0.5	<0.50	<0.5
	46	<0.5 - 0.60	<0.5	<0.020 - 0.14	<0.06	<0.010 - <0.03	<0.03	2.1 - 3.1	**6.9**	0.013 - 0.020	0.010	<0.00050 - 0.0002	0.00015	**0.39** - **0.667**	0.154	0.0156 - 0.0181	0.0146	<0.2 - <0.50	<0.2	<0.50 - <1	<0.5	<0.50 - <1	<0.5
Southeast	43	0.20 - 0.60	<0.5	<0.05 - 0.20	<0.06	<0.05 - 0.022	0.09	1.6 - 2.51	2.9	0.13 - 0.166	0.128	<0.00050 - <0.003	0.00009	<0.010 - 0.145	0.018	0.009 - 0.0123	0.0122	<0.17 - <0.68	<0.2	<0.20 - <0.80	<0.5	<0.10 - <0.50	<0.5
Deep Flow System																							
Background Northwest	39	<0.10 - 0.36	<0.5	0.14 - 0.670	0.14	<0.05 - 0.054	<0.03	1.2 - 3.65	1.7	0.025 - 0.034	0.025	<0.00050 - 0.004	0.00012	0.183 - **0.398**	**0.439**	**0.131 - 0.182**	**0.141**	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
	42	0.29 - 1.09	<0.5	<0.020 - 0.031	<0.06	<0.010 - <0.05	<0.03	0.9 - 2.44	1.4	0.051 - 0.063	0.048	<0.00050 - <0.003	0.00009	0.038 - **1.77**	0.119	0.010 - **0.106**	0.0112	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
Adjacent Northeast	24/24R	0.25 - 0.75	<0.5	<0.05 - 2.48	<0.06	<0.010 - <0.05	<0.03	2.9 - 4.36	3.6	0.045 - 0.053	0.037	<0.00050 - <0.003	0.00014	<0.01 - **6.10**	**0.515**	<0.00050 - **0.100**	0.0162	<0.17		<0.20		<0.10	
Adjacent East	25/25R	0.12 - 0.35	<0.5	<0.020 - 0.22	<0.06	<0.010 - <0.05	<0.03	1.8 - **5.42**	2.5	0.047 - 0.069	0.042	<0.00050 - <0.003	0.00015	<0.01 - **1.90**	**0.796**	0.006 - **0.825**	0.0278	<0.17		<0.20		<0.10	
East	38	<0.10 - 0.22	<0.5	<0.020 - <0.06	<0.06	<0.010 - <0.05	<0.03	1.2 - 2.37	1.9	0.043 - 0.068	0.036	<0.00050 - <0.003	0.00011	<0.01 - **3.05**	**0.494**	<0.020 - **0.093**	**0.0518**	<0.17 - <0.2	0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
Adjacent West	21/21R	0.18 - 0.45	<0.5	<0.020 - <0.06	<0.06	<0.010 - <0.05	<0.03	1.1 - 2.36	2.1	0.046 - 0.066	0.067	<0.00050 - <0.003	0.00013	<0.01 - **1.28**	**1.19**	<0.020 - **0.250**	0.0354	<0.17		<0.20		<0.10	
South	27	<0.10 - 0.63	<0.5	<0.020 - <0.25	<0.06	<0.010 - <0.25	<0.03	1.0 - 2.99	1.3	0.083 - 0.266	0.069	<0.00050 - 0.005	0.00013	<0.04 - **1.09**	**0.926**	0.050 - **0.065**	**0.0673**	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
Southeast	37/37R	<0.10 - 0.37	<0.5	<0.020 - <0.25	<0.06	<0.010 - <0.25	<0.03	0.8 - 2.26	1.5	0.048 - 0.056	0.046	<0.00050 - 0.004	0.00011	0.02 - **3.27**	**0.738**	0.030 - **0.211**	0.0434	<0.17 - <0.50	<0.2	<0.20 - <0.50	<0.5	<0.10 - <0.50	<0.5
	D2 *	<0.05 - 0.50	<0.5	<0.020 - <0.25	<0.06	<0.010 - <0.25	<0.03	1.2 - 3.54	1.5	0.051 - 0.060	0.047	<0.00050 - 0.004	0.00015	<0.01 - **1.89**	0.021	<0.00050 - **0.054**	0.00061	<0.17		<0.20		<0.10	

Notes:
- Concentrations are in mg/L with the exception of VOCs which are in μg/L, pH which is in SU, and conductivity which is in μS/cm.
- Bold and shading indicates exceedance of ODWQS.
- Blank indicates there is no historic data for thie specified parameter.
- Shaded parameters across title row have been identified as diagnostic indicator parameters.
- * Groundwater sample from domestic well D2 is inferred to be softened prior to collection; the results should be viewed with caution.

SHALLOW GROUNDWATER FLOW SYSTEM

As observed in Table 4-2, the 2023 parameter concentrations in the shallow groundwater observation wells were typically within or below their respective historic concentration ranges for the wells. The following parameters were above the historic range for the specified well and former well, if applicable:

- Well 16AR – conductivity;
- Well 26R – sulphate;
- Well 28R – pH, nitrate and boron;
- Well 32R – conductivity, alkalinity and chloride; and
- Well 43 – conductivity, alkalinity, ammonia, nitrite and DOC.

Monitoring wells 45 and 46 were installed in 2019 and therefore these wells will not be included in the above summary until sufficient data is obtained for comparison. The elevated concentrations in replacement wells with respect to the historic range of results at the former wells may be the result of the slight variations in screen depth and location for the replacement monitoring wells.

Time versus concentration graphs for the leachate indicator parameters of chloride, alkalinity, potassium, boron, iron, ammonia, and TKN are shown on Figures D-8 through D-35, Appendix D.

Shallow flow system well 40 is representative of upgradient conditions, and was incorporated into the 2014 annual monitoring program as a background observation well. Concentrations of leachate indicator parameters have generally fluctuated with no increasing or decreasing trends, with the exception of a significant iron concentration spike that occurred in May 2017. The iron concentrations since 2017 have returned to the expected historic concentration range. Chloride concentrations may also be slowly increasing with time in well 40, however, only limited historical data is available for comparison.

Over the long-term, concentrations of general parameters and major and minor ions at observation wells 32 and 32R typically increased between the 1980s and mid to late 1990s. Since then however, concentrations have typically fluctuated with no overall pattern. As shown on the concentration versus time graphs for this well, leachate indicator parameter concentrations have fluctuated with no overall increasing trends, although it is noted that the chloride and alkalinity concentrations in 2023 were above their respective historic ranges. Chloride concentrations have been increasing since 2020; however, they still remain relatively low.

The sampling results for observation wells 11 and 11R, located adjacent to the east, show that concentrations of select general parameters and major and minor ions increased from the late 1970s to late 1980s, decreased until mid-1990s, and typically fluctuated with no overall trend since that time. One exception is alkalinity concentrations, which fluctuated with an overall increase from the late 1990s/early 2000s to 2015. Metals concentrations at well 11 have fluctuated over the long term with no overall trend. In 2016, observation well 11 was decommissioned and replaced by observation well 11R. When compared to recent results at former well 11, most parameters at replacement well 11R had appreciably elevated concentrations in 2016-2023. These concentrations indicate a residual landfill influence, directly adjacent to the east of the landfill mound. The higher concentrations at replacement well 11R do not necessarily indicate a change in groundwater conditions at the site, however, continued monitoring at observation well 11R is recommended.

Concentrations of leachate indicator parameters at observation wells 16AR, 19R, 43, and 44 have generally fluctuated with no discernable increasing or decreasing trends. Chloride concentrations at well 16AR decreased in

2023, following an increasing trend in recent years. Alkalinity and ammonia concentrations both increased to historical highs at well 43 in 2023, which will continue to be monitored.

At observation wells 28 and 28R, general parameter, major and minor ion, and metal concentrations have fluctuated over the long term with no overall increasing or decreasing trend. It is noted that there was a discernable increase in the potassium concentrations from 2012 to 2015, although this concentration has decreased from 2016 to 2019 at replacement well 28R and now appears to be stable.

Concentrations of several leachate indicator parameters (chloride, alkalinity, potassium, and iron) displayed increasing concentration trends with time from 1997 to 2012 at observation well 26. The condition of the well was determined to be deteriorating and was decommissioned and replaced with observation well 26R in 2015 to monitor downgradient groundwater conditions in the shallow flow system. This well was incorporated into the monitoring program and sampled in 2016. Parameter concentrations in replacement well 26R appear to be slightly decreasing with time, although they remain elevated compared to historical levels. Chloride concentrations displayed the most significant concentration increase over time between 2004 and 2016, however they have since been decreasing with time. In order to further investigate the groundwater conditions in the vicinity of observation well 26R, a supplemental drilling program was completed and two additional wells (45 and 46) were installed in August 2019. Groundwater samples have been collected from monitoring wells 45 and 46 annually since 2019 and submitted to the laboratory for analysis of the annual groundwater parameter package. It is noted that VOCs have not been detected in the samples collected from monitoring wells 45 and 46 since their installation. The parameter concentrations at monitoring wells 45 and 46 are significantly below the concentrations at 26R. In particular, chloride concentrations, which exceeded the trigger levels at well 26R, were well below the trigger levels at wells 45 and 46 in 2019 through 2023.

Based on the groundwater elevation and chemistry results at recently installed wells 45 and 46, the elevated concentrations and trigger exceedances in property boundary well 26R do not appear to be the result of shallow groundwater migrating from the landfill mound. Groundwater appears to flow north from the property boundary at 26R toward monitoring wells 45 and 46. Meanwhile, key parameter concentrations within monitoring wells 45 and 46 were generally similar or below the concentrations at 26R, with the exception of the ammonia concentration at well 45 in 2023, which was above the concentration of ammonia at 26R. Continued additional monitoring of wells 45 and 46 is recommended to confirm this conclusion.

It is suspected that road salting is a contributing factor in the increasing concentrations at well 26R, as both chloride and sodium concentrations were significantly greater at well 26R than within leachate well 41 in 2023, as well as in recent historical results. VOCs have not been detected in the samples collected at well 26R.

Groundwater quality at the adjacent and downgradient observation wells were generally similar to those observed in background well 40. The exceptions, which were discernably higher than historic background levels (greater than 50% higher), were concentrations of: conductivity, chloride, alkalinity, magnesium, potassium, sodium, ammonia, DOC and boron at observation well 11R; conductivity, chloride, sodium and boron at observation well 26R; sodium, nitrate and boron at observation well 28R, sodium and boron at observation well 43, boron at observation well 45; and nitrate at observation wells 19R and 44.

In general, the highest parameter concentrations in the shallow groundwater flow system at the site were typically observed in observation well 11R and included elevated concentrations of a number of general parameters and major ions. This was followed by concentrations at 26R. Conversely, parameter concentrations at shallow groundwater wells 16AR, 19R, 28R, 32R, 43, 44, 45, and 46 were typically similar to those observed in the background well.

In summary, there may have been some historical landfill impacts in a number of the shallow groundwater flow system wells adjacent to the northeast, and particularly adjacent to the east of the landfill; however, these impacts have generally abated such that there was no clear indication of leachate influence in the shallow observation wells further downgradient to the east/southeast at the site during 2023. The area adjacent to the east of the landfill, near 11R, should continue to be inspected to confirm that there are no leachate seeps. Potentially increasing parameter concentrations observed at observation well 11R may be landfill related, although most parameter concentrations appear to be decreasing in recent years. Off-site influenced groundwater appears to be contributing to the elevated concentrations at 26R, as supported by additional monitoring completed at wells 45 and 46. Continued additional monitoring should be undertaken at wells 45 and 46 to confirm this inference. Similar to well 11R, most leachate indicator parameter concentrations at well 26R appear to be decreasing in recent years.

DEEP GROUNDWATER FLOW SYSTEM

As observed in Table 4-2, the 2023 parameter concentrations in the deeper groundwater observation wells were typically within or below their respective historic concentration ranges for the wells, with some exceptions. The following parameters were above the historic range for the specified well and former well, if applicable:

- Well 21R – conductivity and boron;
- Well 27 – manganese;
- Well 37R – conductivity;
- Well 39 – iron; and
- Well 42 – pH.

The elevated concentrations in replacement wells with respect to the historic range of results at the former wells may be the result of the slight variations in screen depth and location for the replacement monitoring wells.

Time versus concentration graphs for the leachate indicator parameters of chloride, alkalinity, potassium, boron, iron, ammonia, and TKN are shown on Figures D-8 through D-35, Appendix D.

Deep flow system wells 39 and 42 are representative of upgradient conditions, and were incorporated into the 2014 and 2016 annual monitoring programs, respectively, as background observation wells. Concentrations of leachate indicator parameters have generally fluctuated with no increasing or decreasing trends.

It is observed in these graphs that the 2010 through 2023 iron concentrations in deep wells 21/21R, 24/24R, 25/25R, and 38 are marginally to appreciably elevated relative to the historic data in the respective wells. The reason for this trend is not clear, although it is inferred that the change in iron concentrations may be related to a change in laboratory analytical method; as a different laboratory was used after 2010.

The concentration versus time graphs for observation well 24/24R, located adjacent to the northeast, show that leachate indicator concentrations have fluctuated over the long term with no overall increasing or decreasing trends.

At observation well 25/25R, located adjacent to the east of the landfill, concentrations of most parameters fluctuated with an overall increase from 1999 to 2007, followed by an overall decrease from 2007 to 2015, and now appear to be generally stable.

To the east and southeast of the landfill, along the eastern limit of the buffer zone property (CAZ), the concentration versus time graphs for well 37/37R and well 38, show that leachate indicator parameter concentrations have fluctuated over the long term with no overall increasing or decreasing trends. The exceptions are the chloride concentrations, which have increased marginally in both wells since the early 2000s, but are still considered low and are far below the ODWQS. It is noted that chloride concentrations slightly decreased at wells 37R and 38 in 2023 compared to 2022.

To the west of the landfill area, at observation well 21/21R, most parameters have generally fluctuated over the long term with no overall trend, with the exception of iron and chloride concentrations which appear to be increasing over time. Chloride concentrations in the old well 21 fluctuated with an overall increase from 1999 to 2007, followed by an overall decrease from 2008 to 2014. Chloride concentrations in the replacement well 21R appear to be increasing since sampling began in 2015, although the concentration decreased in 2023 compared to 2022. The chloride concentrations at well 21R are still considered low and remain far below the ODWQS.

At observation well 27, located south of the landfill, most parameter concentrations fluctuated with no overall increasing trends prior to 1995. When monitoring of well 27 resumed again in 2012, most constituent concentrations appeared to slightly increase compared to prior to 1995, but concentration trends have remained stable.

Groundwater quality at the adjacent and downgradient observation wells were generally similar to those observed in background wells 39 and 42.

In general, the highest parameter concentrations in the deep groundwater flow system at the site were observed in background well 39 and observation well 27 (located along the southern property boundary). The 2023 parameter concentrations at well 27 do not show clear evidence of an adverse leachate influence, given the chloride concentration of just 38 mg/L and the absence of VOC detections. There is no conclusive evidence of a leachate influence on the deep groundwater quality at well 27 at this time.

Parameter concentrations at well 21/21R situated west of the landfill, and well 37/37R at the southeast corner of the buffer zone property (CAZ) were also marginally elevated relative to the other deeper flow system wells; but typically similar to, or below the parameter concentrations at well 39 in the northwest corner. As discussed previously, recent chloride concentrations in the replacement well 21R may be increasing, but still remain relatively low. Concentrations of other leachate indicators are generally fluctuating within historical ranges. Marginally increasing chloride concentrations were also observed at observation well 37/37R, but remain relatively low and well below the ODWQS for chloride. The increasing chloride concentrations may be indicative of the natural fluctuations in the deeper flow system or influences from road salting activities. As such, there is no conclusive evidence of a leachate influence on the deep groundwater quality at wells 21/21R and 37/37R at this time.

In summary, there was no clear evidence of a leachate influence in the deeper groundwater flow system along the northeast portion of the property boundary (well 24R), adjacent east to the landfill mound (well 25R), west of the landfill (well 21R) and south of the landfill (27). Continued monitoring is recommended to expand the chemical databases. Deeper groundwater quality at the east and southeast limits of the buffer zone property (wells 38 and 37R respectively) do not demonstrate a leachate influence.

4.2.2   DOMESTIC WELLS

As observed in Table 4-2, the 2023 parameter concentrations in domestic well D2 (Pearce) were within their respective historic concentration ranges. Domestic well D2 is believed to obtain its water from the deep flow system.

It is noted that domestic well D2 (Pearce) came under new ownership before the 2015 sampling event, with notable renovations happening at the home. Previous groundwater chemical results (2012-2013, 2016-2021) have strongly suggested that the water was treated (ie. softened) prior to sample collection. This was also the case in the 2023 sample.

The concentration versus time graphs for well D2 show that parameter concentrations have fluctuated over the long term with no overall increasing or decreasing trends at this location.

Parameter concentrations at domestic groundwater well D2 (Pearce) were generally similar to those observed at the other deep flow system wells. Anthropogenic sources, such as road salting, septic beds, home renovations, and/or the well distribution system may be responsible for some of the historically elevated concentrations at domestic well D2. Groundwater quality in the well does not show evidence of leachate influence, based on a comparison with background shallow groundwater quality.

4.2.3 TRILINEAR DIAGRAM

The natural variability in the overburden groundwater quality at the Site is illustrated on the trilinear diagram (Figure 8) using the May 2023 analytical results. The anion chemical results are presented on the triangular graph in the lower right, while the cation chemical results are presented on the triangular graph in the lower left. The anion and cation results are combined on the diamond shaped graph in the centre. Water with similar chemical signatures will plot together on the tri-linear plot.

Leachate chemistry from the Site is plotted in red on the trilinear plot, for reference purposes. Leachate chemistry from well 41 is bicarbonate enriched and sulphate deficient, with a slightly dominant calcium cation.

The shallow and deep flow system groundwater quality at the Site generally plots together on the trilinear diagram. As shown on Figure 8, groundwater is typically enriched with bicarbonate (anion), with a dominant calcium cation. An exception is the groundwater quality at domestic well D2, which is enriched with bicarbonate (anion) and sodium (cation), as a result of the water being treated (ie. softened) prior to sample collection.

The shallow and deep groundwater samples from the site plot consistently together near the left corner of the combined graph, with the exception of well 26R which was influenced by elevated chloride and sodium concentrations, and domestic well D2 which was influenced by elevated sodium concentrations. However, the water quality at these wells do not exhibit typical leachate quality influences. As mentioned in Section 4.2.1, observation well 26R is suspected to be influenced by road salting, as both chloride and sodium concentrations were greater at well 26R than within leachate well 41. As mentioned in Section 4.2.2, the groundwater quality at domestic well D2 suggests that the water was treated (ie. softened) prior to sample collection. Shallow groundwater in well 43 also plotted slightly separate from the other monitors due to the influence of slightly elevated sodium concentrations.

The leachate chemistry from the Site plots in the same general area as most groundwater wells, near the left corner of the combined graph. Typical municipal leachate would plot toward the lower left-central area of the combined graph. The location of the well 41 chemistry on the combined graph suggests a weak leachate strength.

In summary, the trilinear plot does not provide any indication of a discernible leachate impact to the shallow or deep groundwater flow systems.

4.2.4 ONTARIO DRINKING WATER QUALITY STANDARDS

The following parameters were detected at concentrations exceeding the Ontario Drinking Water Quality Standards (ODWQS) (MECP, June 2003) in samples collected from the shallow flow system and deeper flow system observation wells during 2023.

- Hardness at all wells sampled in 2023, except Domestic Well D2;
- Alkalinity at shallow flow system well 11R;
- Nitrate at shallow flow system well 44;
- DOC at shallow flow system wells 11R, 26R, 40 and 46;
- Iron at shallow flow system wells 11R, 26R and 40, and at deep flow system wells 21R, 24R, 25R, 27, 37R, 38 and 39; and
- Manganese at shallow flow system wells 11R and 40, and at deep flow system wells 27, 38 and 39.

Most parameters that exceeded the ODWQS within the shallow groundwater flow system and deep groundwater flow system have objectives or guidelines related to the aesthetic quality or operational treatment of the water and are not health related. The exception to this is nitrate, which has a maximum acceptable concentration limit. The nitrate exceedance observed at shallow flow system well 44 is not likely to be the result of a landfill leachate impact as nitrate has not been detected within the leachate, and only in very low concentrations in the shallow groundwater adjacent to the east side of the landfill mound. It is much more likely that this concentration is the result of agricultural activities that surround this well location. A supplemental sample was collected at observation well OW33R in May 2019, in order to better assess the landfill’s potential contribution of nitrate on the east side of the site. The nitrate concentration at well OW33R was 0.496 mg/L which is well below the ODWQS of 10.0 mg/L for nitrate, and significantly less than the concentrations observed at well 44 in recent years (15.4 – 27.4 mg/L from 2017-2023). Given that well 33R is directly adjacent to the landfill and the nitrate concentration was low, the elevated nitrate concentration at well 44 is unlikely to be landfill related.

Concentrations of hardness, iron, and manganese observed in the shallow and deep groundwater flow systems, and DOC in the shallow flow system, appear to naturally approach or exceed the ODWQS, since exceedances for these parameters have been observed at background wells. Alkalinity exceedances observed at shallow groundwater well 11/11R may indicate residual landfill influences.

4.2.5 GUIDELINE B-7 COMPLIANCE ASSESSMENT

Guideline B-7 was established by the MECP as a mechanism to assess the acceptable level of leachate impacts on the groundwater system. Guideline B-7 is applied to groundwater quality at the property boundary, and is intended to protect both existing and potential reasonable uses of the groundwater on adjacent properties. The Guideline states that, for non-health related parameters, the impact from the landfill should not raise the concentration by more than half the difference between the background concentration and the ODWQS.

SHALLOW FLOW SYSTEM

Groundwater movement in the shallow flow system across most of the site is inferred to converge on the on-site stream; though the groundwater elevations indicate that a mound exists in the fill area, inducing a localized radial flow away from the fill area to the east and southeast. Hence, there may be a minor component of localized shallow groundwater flow from the fill area east and southeast toward the buffer property.

MECP Guideline B-7 criteria were calculated to assess the significance of the landfill effects on the shallow groundwater flow system along the eastern property boundary. Guideline B-7 is normally applied at the property boundary, and is intended to protect both existing and potential reasonable uses of that groundwater on adjacent properties.

Guideline B-7 criteria were calculated for parameters that have ODWQS. The chemistry results measured in 2023 from shallow background monitoring well 40 were used as the reference concentration for the groundwater flow system.

Table 4-3 provides a comparison of the calculated Guideline B-7 criteria and downgradient wells on Site.

Table 4-3 2023 Guideline B-7 Compliance – Shallow Flow System

PARAMETER	REFERENCE QUALITY	ODWQS	GUIDELINE B-7	MONITORING WELL					
				26R	32R	43	44	45*	46*
Hardness	359	80-100	**359 †**	**412**	303	108	357	149	233
Chloride	23	250	**137**	**150**	17	8	17	<1	<1
Sulphate	43	500	**272**	26	30	35	43	21	25
Alkalinity	351	30-500	**426**	**451**	336	334	289	162	245
Sodium	9.69	200	**105**	101	8.80	49.1	5.98	19.9	1.92
Nitrate	<0.06	10.0	**2.52**	<0.06	0.07	<0.06	**19.3**	0.07	<0.06
Nitrite	<0.03	1.0	**0.26**	<0.03	<0.03	0.09	<0.03	0.04	<0.03
DOC	6.3	5	**6.3 †**	5.4	1.9	2.9	1.3	2.4	**6.9**
Boron	0.019	5.0	**1.26**	0.770	0.040	0.128	0.020	0.100	0.010
Chromium	0.00033	0.05	**0.013**	0.00035	0.00012	0.00009	0.00062	0.00012	0.00015
Iron	2.66	0.3	**2.66 †**	1.46	0.254	0.018	<0.007	0.028	0.154
Manganese	0.220	0.05	**0.220 †**	0.0334	0.0212	0.0122	0.00052	0.0175	0.0146
Vinyl Chloride (µg/L)	<0.2	1	**0.33**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzene (µg/L)	<0.50	1	**0.44**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4 Dichlorobenzene (µg/L)	<0.50	5 MAC	**1.44**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		1 AO	**0.63**						

Notes:
- All concentrations are mg/L unless otherwise noted.
- ODWQS - Ontario Drinking Water Quality Standards (June 2003)
- Shading indicates concentrations exceed Guideline B-7 criteria.
- Reference quality based on 2023 groundwater quality measured from background observation well 40.
- † When the reference concentration is greater than the ODWQS, the reference value is used as the Guideline B-7 Criterion.
- * Wells included for comparison purposes only, as GB-7 is actually assessed at the property boundary.

In summary, concentrations at the landfill property boundary complied with the Guideline B-7 (GB-7) criteria, with the exception of hardness, chloride and alkalinity at observation well 26R, nitrate at well 44, and DOC at well 46.

The hardness exceedance at observation well 26R is consistent with historic results and does not appear to be related to the landfill. Concentrations of hardness observed in the shallow flow system appear to naturally exceed the ODWQS, as exceedances for this parameter are observed at the background well.

As discussed previously, the nitrate exceedance observed at well 44 is not likely to be the result of a landfill leachate impact as nitrate has not been detected within the leachate, and only in very low concentrations in the shallow groundwater adjacent to the east side of the landfill mound. Furthermore, other leachate indicator parameters such as chloride, alkalinity, and VOCs are not elevated at well 44. A supplemental sample was collected at observation well OW33R in 2019, in order to better assess the landfill's contribution of nitrate on the east side of the site. The nitrate concentration was found to be low at well 33R (well below ODWQS and GB-7 Criteria), indicating the elevated nitrate concentration at well 44 is unlikely to be landfill related. The nitrate concentration is likely the result of agricultural activities that surround this well location.

It is suspected that road salting is a contributing factor in the exceedances at observation well 26R, as both chloride and sodium concentrations were greater at well 26R than within leachate well 41 in 2023, as well as in recent historical results. As discussed earlier, in order to further investigate the groundwater conditions in the vicinity of observation well 26R, a supplemental drilling program was completed and two additional wells (45 and 46) were installed in August 2019. Groundwater samples were collected from monitoring wells annually since 2019 and submitted to the laboratory for analysis of the annual groundwater parameter package. It is noted that VOCs were not detected in the samples collected from monitoring wells 45 and 46 in 2019 through 2023. Most parameter concentrations at monitoring wells 45 and 46 were significantly lower than the concentrations at 26R, and no concentrations exceeded the GB-7 Criteria in 2019 through 2023, with the exception of DOC in 2023 at well 46. Based on the groundwater elevation and chemistry results at wells 45 and 46, the elevated concentrations and trigger exceedances in property boundary well 26R do not appear to be the result of shallow groundwater migrating from the landfill mound. Based on historical data, groundwater appears to flow north from the property boundary at 26R toward monitoring wells 45 and 46. Continued additional monitoring of wells 45 and 46 is recommended to confirm this conclusion.

As limited historic databases are available for several of the parameters at observation wells 26R, 44 and 46, continued monitoring is recommended to confirm these Guideline B-7 exceedances.

DEEP GROUNDWATER FLOW SYSTEM

Groundwater flow in the deep flow system is inferred to be in a generally south to southeasterly direction under a low horizontal hydraulic gradient. MECP Guideline B-7 criteria were calculated to assess the significance of the landfill effects on the deep groundwater flow system. Guideline B-7 is applied at the property boundary, and is intended to protect both existing and potential reasonable uses of the groundwater on adjacent properties.

Guideline B-7 criteria were calculated for parameters that have ODWQS. The median chemistry results measured in 2023 from deep background monitoring wells 39 and 42 were used as the reference concentration for the deep flow system.

Table 4-4 provides a comparison of the calculated Guideline B-7 criteria and deep flow system downgradient wells on Site. Guideline B-7 is applied at the property boundary and is applicable to observation wells 27, 37R, and 38.

Table 4-4 **2023 Guideline B-7 Compliance – Deep Flow System**

PARAMETER	REFERENCE QUALITY	ODWQS	GUIDELINE B-7	MONITORING WELL		
				27	37R	38
Hardness	247	80-100	**247 †**	**320**	**307**	**262**
Chloride	18.8	250	**134**	38	34	28
Sulphate	24.0	500	**262**	31	36	24
Alkalinity	243	30-500	**372**	310	267	230
Sodium	17.6	200	**109**	14.2	12.0	14.8
Nitrate	0.09	10.0	**2.56**	<0.06	<0.06	<0.06
Nitrite	0.02	1.0	**0.26**	<0.03	<0.03	<0.03
DOC	1.6	5	**3.3**	1.3	1.5	1.9
Boron	0.037	5.0	**1.28**	0.069	0.046	0.036
Chromium	0.0001	0.05	**0.013**	0.00013	0.00011	0.0001
Iron	0.279	0.3	**0.29**	**0.926**	**0.738**	**0.494**
Manganese	0.076	0.05	**0.076 †**	0.06729	0.0434	0.0518
Vinyl Chloride (µg/L)	<0.20	1	**0.33**	<0.2	<0.2	0.2
Benzene (µg/L)	<0.50	1	**0.44**	<0.5	<0.5	<0.5
1,4 Dichlorobenzene (µg/L)	<0.50	5 MAC	**1.44**	<0.5	<0.5	<0.5
		1 AO	**0.63**			

Notes:
- All concentrations are mg/L unless otherwise noted.
- ODWQS - Ontario Drinking Water Quality Standards (June 2003)
- Shading indicates concentrations exceed Guideline B-7 criteria.
- Reference quality based on 2023 groundwater quality measured from background observation wells 39 and 42.
- † When the reference concentration is greater than the ODWQS, the reference value is used as the Guideline B-7 Criterion.

In summary, concentrations at the property boundary complied with the Guideline B-7 criteria, with the exception of hardness and iron at wells 27, 37R and 38. As stated in Section 4.2.4., concentrations of hardness and iron appear to be naturally elevated in the deep flow system. The hardness concentrations at observation wells 37R and 38 are actually below the 2023 background result at well 39 and the concentration at well 27 was only slightly above the concentration at well 39. As such, the site is considered to be in compliance at the downgradient property boundaries.

4.2.6 TRIGGER MECHANISM COMPLIANCE ASSESSMENT

On September 8, 2016, the site CofA (Waste) was updated by the MECP to Amended Environmental Compliance Approval (ECA) No. A070702. The new approval incorporated the County owned buffer lands to the east of the landfill into a Contaminant Attenuation Zone (CAZ). As part of the new ECA, a closure plan was submitted to the MECP on June 28, 2017, which included a trigger mechanism and contingency plan as well as a new monitoring program.

On October 24, 2017, the County received comments from the MECP regarding their review of the closure plan. One of the comments made by the MECP noted that some of the trigger parameters had been selected based on very few sets of analytical sets of data. The reviewer felt that the list of trigger parameters should be reviewed/revised after a few years to ensure that the parameters selected are meaningful.

A response to the MECP comments was provided by WSP on December 8, 2017, on behalf of the County. In the response, it was noted that trigger parameters for the groundwater trigger mechanism plan were selected based on the available data, as the historic monitoring program contained very few practical leachate indicator parameters. It was agreed that the trigger parameters will be reassessed after a few years to ensure that the selected parameters are meaningful. The closure plan and response were accepted by the MECP in Notice No. 1 of the ECA, dated March 6, 2018. It is proposed that the trigger criteria be considered finalized for 2024, as a minimum of eight data sets have now been collected for each parameter at the upgradient/background wells.

Table 4-5 outlines the current groundwater trigger concentrations and boundary criteria, with 2023 results for the selected boundary wells.

Table 4-5 2023 Groundwater Trigger Mechanism Compliance Assessment

PARAMETER	TRIGGER LEVEL	MONITORING WELL					
		Shallow Flow System			Deep Flow System		
		26R	43	44	27	37R	38
Chloride	134	**150**	8	17	38	34	28
Boron	1.3	0.770	0.128	0.020	0.069	0.046	0.036
Vinyl Chloride (µg/L)	0.4	<0.2	<0.2	<0.2	<0.2	<0.2	0.2
Benzene (µg/L)	0.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4 Dichlorobenzene (µg/L)	1.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Notes:
- All concentrations are mg/L unless otherwise noted.
- Shading indicates concentrations exceed proposed trigger boundary criteria.

The property boundary groundwater trigger criteria at the site were not exceeded during 2023, with the exception of the chloride concentration at observation well 26R. It is suspected that road salting and/or off-site sources are contributing factors in the chloride concentrations at observation well 26R, as chloride and sodium concentrations were greater at well 26R than within the leachate well 41 in 2023, as well as in recent historical results. It is also noted that VOCs have not been detected in the samples collected at well 26R. As discussed previously, based on the groundwater elevation and chemistry results at wells 45 and 46, the elevated concentrations and trigger exceedances in property boundary well 26R do not appear to be the result of shallow groundwater migrating from the landfill mound. Continued monitoring at well 45 and 46 will be required to continue to verify this conclusion.

5 SURFACE WATER QUALITY

The general surface water chemical results from the surface water stations are provided in Table E-1, Appendix E. The laboratory certificates of analysis are provided in Appendix F. Concentration versus time graphs for conductivity, hardness, alkalinity, calcium, chloride, magnesium, iron, and manganese are presented on Figures E-1 through E-21. Surface water samples are collected semi-annually from stations C01 and C06, and annually in April from stations C04, P01, P02, P03, and NE1. The surface water station locations are shown on Figure 2.

The QA/QC program for the monitoring program at the site included a field and a laboratory component. Standard field protocols were used to ensure consistency.

Laboratory reports were reviewed as part of the laboratory QA/QC program. Blind duplicate samples were collected from surface water station C01 in April and October 2023. In general, duplicate samples were similar to the original samples results with the calculated RPD within the 20% guideline for acceptability or less than two times the laboratory reported MDL, with the exception of chromium (157% RPD) and iron (128% RPD) in April. Acceptable data quality control including laboratory blanks, spiked blanks, laboratory duplicates, and laboratory percent recoveries of analysis indicated that the detected constituent concentrations were accurate and reflected actual surface water conditions at the time of sample collection and are acceptable for inclusion into the database.

5.1 SURFACE WATER QUALITY COMPARISON

I) WETLANDS ON NORTHEAST BOUNDARY (NE1)

Surface water station NE1 is situated in the wetland area north of the site, associated with the Otter Creek drainage system. Station NE1 is in the area of ponded water situated at the toe of the landfill, which receives runoff from the north and east side slopes of the landfill.

The 2023 chemistry results at surface water station NE1 were generally within their respective historic ranges. It is noted that there are no drainage channels within the low relief (swampy) area northeast of the landfill. Surface water run-off into the swampy area travels overland as sheet flow, usually forming ponds and eventually infiltrating into the soil. As such, stagnant water conditions usually exist at the time of sampling at station NE1. During stagnant conditions, chemical precipitates, evaporation and biological activity serve to change the water quality. Thus, the concentration results at NE1 are likely indicative of the swampy, stagnant conditions in the area, and are not representative of the natural water quality in flowing conditions.

As illustrated in Figures E-10 to E-12, alkalinity, hardness, conductivity, calcium and magnesium concentrations at NE1 fluctuated and increased from 2013 to 2022 and decreased in 2023. The remaining parameter concentrations at NE1 have fluctuated over time with no overall long-term increasing or decreasing trends.

Of the parameters tested, only the parameters pH, alkalinity, un-ionized ammonia, boron, chromium, and iron have PWQOs. The 2023 surface water chemistry at station NE1 complied with the PWQOs for the parameters tested, with the exception of iron which was above the PWQO. The 2023 iron concentration was within the historical range for this sampling location.

Based on the monitoring results, surface water quality in the northeast portion of the site was not measurably affected by the landfill site in 2023.

III) ON-SITE STREAM (C01, C04, AND C06) AND ADJACENT RETENTION POND (P02)

Surface water station C06 is located in a swampy area near the northwest corner of the site, inferred to be the headwaters of the on-site stream, and represents the upstream surface water quality conditions in the on-site stream. Station C04 is located downstream of C06 in the on-site stream, within the landfill property, while station C01 is located furthest downstream at the southern property boundary. The on-site stream exits the southern portion of the site via a culvert beneath Quaker Street.

Surface water station P02 is located on the retention pond situated in the central portion of the site, adjacent and west of the landfill. The pond receives surface water run-off from the western portion of the fill area, and also shallow groundwater moving from beneath the landfill. Drainage from the retention pond (P02) enters the on-site stream between surface water stations C06 and C04.

The 2023 chemistry results from the stations along the on-site stream were within or below their respective historic ranges with the exception of: ammonia and nitrate for station C01; turbidity (field), nitrate and chromium for station

C04; and sulphate and nitrate for station C06. Within the retention pond at station P02, several parameters in 2023 were above their respective historic ranges, including turbidity (field), nitrate, chromium and iron.

However, it is noted that the parameters turbidity (field), sulphate, potassium, sodium, ammonia, un-ionized ammonia, nitrate, nitrite, boron and chromium were first added to the sampling program in 2017/2018; and thus, only limited historic data is available for comparison.

The 2023 chemistry results from the on-site stream and pond P02 are shown on Table 5-1 in sequence of the flow direction, downstream from station C06.

Table 5-1 2023 Surface Water Chemistry – On-Site Stream and Pond P02

	C06	P02	C04	C01
pH	8.00	8.00	8.16	8.01 - 8.09
Conductivity	491	632	626	584 - 711
Hardness	220	256	288	261 - 273
Chloride	52	53	50	43 - 57
Sulphate	20	19	24	19 - 19
Alkalinity	176	260	243	211 - 271
Calcium	68.9	73.6	82.9	68.5 - 77.2
Magnesium	11.6	17.5	19.7	16.7 - 24.7
Potassium	1.88	9.31	8.53	6.22 - 8.83
Sodium	23	28.5	28.3	23.8 - 33.4
Ammonia	0.04	5.55	4.80	1.04 - 1.5
Un-ionized Ammonia	<0.001	0.016	0.035	0.006 - 0.007
Nitrate	4.57	2.28	1.83	0.68 - 5.88
Nitrite	0.04	0.040	<0.03	<0.03 - 0.050
Boron	0.023	0.235	0.287	0.184 - 0.292
Chromium	0.00013	0.00338	0.00275	0.00015 - <0.003
Iron	0.245	3.93	2.66	0.276 - 0.36
Manganese	0.00576	0.135	0.0445	0.0119 - 0.132

Notes: All concentrations in mg/L except pH (unitless) and conductivity (µS/cm).

As observed in Table 5-1, parameter concentrations typically increased between stations C06 and C04. The increase is likely related to the quality of surface water discharge from pond P02. Surface water quality concentrations generally remained similar between stations C04 and C01. The chemical results for station C01 were collected semi-annually, while the results from C04 were collected only annually (April). Based on a comparison of the April results alone, all parameter concentrations decreased between intermediate station C04 and downstream station C01;

however, parameter concentrations at downstream station C01 were generally higher or equivalent to those observed at upstream station C06. A comparison between upstream station C06 and downstream station C01 was not possible for October 2023, as C06 was dry during the sampling event.

As illustrated in Figures E-1 to E-9 for stations C01 to C06 and Figures E-16 to E-18 for pond P02, parameter concentrations have typically fluctuated over the long-term with no overall increasing or decreasing trends; though there are some exceptions. Chloride concentrations at stations C01, C04 and C06 increased between about 1998 and 2002, and have generally fluctuated with no overall trend since that time. Alkalinity and conductivity concentrations at C04 increased overall from the mid-1990s until approximately 2013 and now appear to have stabilized. Alkalinity, hardness, conductivity, and chloride concentrations at retention pond station P02 have fluctuated with an overall increasing trend from the mid-1990s to 2015 but decreased in 2016/2017 and now appear to be fluctuating around this level.

The increasing parameter concentrations observed in retention pond P02 from the mid-1990s to 2015 are likely attributable to landfill influences since the pond is inferred to receive shallow groundwater flow from beneath the landfill. Likewise, the increased chloride concentrations at surface water stations C01 and C04 are likely related, at least in part, to discharge of shallow groundwater from beneath the landfill. Station C06 is located along the western property boundary. It is unlikely that any shallow groundwater from beneath the landfill is reaching the stream at this point. Thus, the increasing chloride levels at C06 may be related to off-site influences, such as road salting along County Road 13. However, monitoring should be continued for confirmation.

Previous reports have suggested that the increasing chloride concentrations observed at downstream station C01 coincided with the increase of chloride concentrations observed at shallow groundwater observation well 26, which is under artesian conditions. Packer systems were installed in shallow observation well 26 and deep observation well 27 (also artesian) in the summer of 2009 to prevent the wells from flowing to the receiving surface water course. An appreciable decrease in chloride concentrations at downstream station C01 was not observed in the sampling results after the packers were installed. As a result of the artesian conditions observed at well 26/26R, shallow groundwater with elevated chloride concentrations (similar to those at 26/26R) may be discharging into the low lying forested area west of well 26/26R and possibly directly into Branch Creek, contributing to the chloride levels.

A comparison of the chloride concentrations at C01, C04, and pond P02 (Figures E-2, E-5 and E-17, Appendix E) indicates that they are likely related. Since 1998, chloride levels at C01 have ranged from 29.0 mg/L to 79.8 mg/L with an average of 52.2 mg/L, while levels at C04 have ranged from 33.0 mg/L to 63.3 mg/L with an average of 51.2 mg/L. The chloride concentrations at pond P02 have ranged from 10.0 mg/L to 71.0 mg/L with an average of 50.1 mg/L. It is also understood that the area in the vicinity of surface water station C01 (i.e., a culvert) occasionally floods above the road level during the spring freshet and/or periods of high rainfall. As such, flooding and road salting influences may also contribute to the elevated chloride concentrations observed at station C01.

Iron concentrations were elevated in the surface water in 2023 at stations C04 and P02 compared to respective historical data. Iron concentrations will continue to be monitored in the surface water for any potential trends.

The 2023 concentrations at on-site stream stations C01, C04, and C06 and retention pond station P02 generally complied with the PWQOs, with the following exceptions:

- The unionized ammonia concentration at station C04;
- Boron concentrations at stations C01 (October), C04 and P02; and
- Iron concentrations at stations C01 (October), C04 and P02.

In summary, weak landfill influences are likely observed in the surface water quality in retention pond P02, and in the on-site stream at intermediate station C04. The retention pond and on-site stream are inferred to receive shallow groundwater flow from beneath the landfill. At station C01, landfill influences from the upstream portions of the on-site stream, shallow groundwater discharge, and road salting practices have all likely contributed to the chloride levels at the station.

IV) NORTHERN ON-SITE RETENTION POND (P03)

Surface water station P03 is located on the retention pond situated in the northern portion of the site, near the fill area. The pond likely receives surface water run-off from portions of the north and northwest areas of the landfill area.

The 2023 chemistry results at retention pond P03 were within or below than their respective historic ranges. As illustrated in Figures E-19 to E-21, parameter concentrations have fluctuated over the long-term with spikes of elevated concentrations, but with no overall increasing or decreasing trends. The 2023 surface water concentrations at station P03 complied with the PWQO, with the exception of iron.

Based on the monitoring results, surface water quality in retention pond P03, in the northern portion of the site, was not measurably affected by the landfill site in 2023.

V) SOUTHEAST ON-SITE RETENTION POND (P01)

Surface water station P01 is located on the retention pond situated in the southeast portion of the site. The pond likely receives surface water run-off from portions of the south and southeast areas of the landfill area.

The 2023 chemistry results at retention pond P01 were within their respective historic ranges, with the exception of turbidity (field) and chromium, which were above their respective limited historic range. As illustrated in Figures E-13 to E-15, concentrations of most parameters have fluctuated over the long-term with no overall increasing trend. The 2023 surface water concentrations at station P01 complied with the PWQO, with the exception of iron.

Based on the monitoring results, surface water quality in retention pond P01, in the southeast portion of the site, was not measurably affected by the landfill site in 2023.

5.2 TRIGGER MECHANISM COMPLIANCE ASSESSMENT

On September 8, 2016, the site CofA (Waste) was updated by the MECP to Amended Environmental Compliance Approval (ECA) No. A070702. The approval incorporated the County owned buffer lands to the east of the landfill into a Contaminant Attenuation Zone (CAZ). As part of the ECA, a closure plan was submitted to the MECP on June 28, 2017, which included a trigger mechanism and contingency plan as well as a new monitoring program.

On October 24, 2017, the County received comments from the MECP regarding their review of the closure plan. One of the comments made by the MECP noted that the surface water monitoring data for the trigger parameters and the database is quite small. The reviewer felt that once a larger database of results is established, especially for unionized ammonia and boron, then the initial set of triggers should be re-assessed.

A response to the MECP comments was provided by WSP on December 8, 2017, on behalf of the County. In the response, it was agreed that once a larger database of results is established, the proposed triggers may need to be re-assessed. The closure plan and response were accepted by the MECP in Notice No. 1 of the ECA, dated March 6,

2018. It is proposed that the trigger criteria be considered finalized for 2024, as minimum of eight data sets have been collected for each parameter at background surface water station C06.

Table 5-2 outlines the current surface water trigger concentrations and boundary criteria, with 2023 results for the downstream surface water trigger location (C01).

Table 5-2 2023 Surface Water Trigger Mechanism Compliance Assessment

		SURFACE WATER STATION C01	
		Date (2023)	
PARAMETER	TRIGGER LEVEL	April 3	October 12
Chloride	120	43	57
Boron	1.5	0.184	0.292
Un-ionized Ammonia	0.02	0.007	0.006

Notes:
- All concentrations are mg/L unless otherwise noted.
- Shading indicates concentrations exceed proposed trigger criteria.

None of the surface water trigger criteria at the site were exceeded during 2023.

5.3 SUMMARY

Based on the monitoring results, the on-site stream surface water quality demonstrates a weak landfill influence through the central portion of the site (station C04). It should be noted that the landfill influence is marginal, with the 2023 chloride concentration at 50 mg/L.

At the downstream station C01, where the on-site stream leaves the property, surface water quality has demonstrated marginally elevated chloride levels for a number of years. The chloride levels may be attributed to landfill influences from the upstream portions of the on-site stream, from shallow groundwater discharge, and from road salting practices. The October 2023 boron and iron concentrations at downstream station C01 exceeded the PWQO.

Therefore, based on the monitoring results, surface water quality in the on-site stream leaving the site has been affected by landfill influences from the upstream portions of the on-site stream and in the shallow groundwater, and possibly from road salting activities. It is noted however, that the landfill influences in the surface water quality leaving the site are minor at most, with chloride concentrations ranging from 43 to 57 mg/L in 2023. The Canadian Environmental Quality Guideline (CEQG) for chloride for the protection of aquatic life is 120 mg/L. Surface water quality leaving the site at station C01 complies with the current trigger level boundary criteria.

6 LANDFILL GAS MONITORING RESULTS

Landfill gas concentrations were measured at standpipes SP3R, SP4R, and SP5 on May 15, 2023, as per the approved monitoring program. These standpipes are located adjacent to the east, northeast, and north of the landfill mound, respectively.

The following table summarizes the landfill gas monitoring results and water levels within the standpipes in 2023. The combustible gas concentrations were measured as a percent of the lower explosive limit (LEL) for methane, and are presented in the following table. The LEL for methane represents 5% gas by volume in air.

SAMPLING LOCATION	% LEL Methane	% CO_2	% O_2	% Balance Gas	Groundwater Elevation (masl)
SP3R	0.0	0.0	20.9	79.1	280.37
SP4R	0.0	0.0	20.9	79.1	279.49
SP5	0.0	0.0	20.9	79.1	279.50

Methane was not detected at any of the locations, suggesting that landfill gas is not migrating from the site. At SP3R and SP4R, the water level was above the screened portion of the well (flooded), while the water level at SP5 was within the screened interval of the well (partially flooded).

7 2024 MONITORING PROGRAM

The annual monitoring program, as detailed in the ECA, should be continued at the Holbrook Landfill site in 2024. The packers placed in shallow and deep groundwater wells 26R and 27 should be maintained to prevent discharge from the flowing wells from reaching the surface water drainage system.

Table 7-1 provides the recommended 2024 environmental monitoring program for the Site.

Table 7-1 2024 Environmental Monitoring Program

ACTIVITY	LOCATION	SAMPLING FREQUENCY	ANALYSIS / MEASUREMENT
Groundwater and Leachate Level Monitoring	**Shallow Flow System:** 4R, 5R, 10R, 11R, 13R, 14R, 15A, 16AR, 18R, 19R, 24AR, 26R, 28R, 32R, 33R, 40, 43, 44, 45, 46, SG1 **Deep Flow System:** 16R, 21R, 24R, 25R, 27, 31, 35, 37R, 38, 39, 42 **Leachate Well:** 41	Annual (May)	Water Level Measurement
Groundwater and Leachate Sampling	**Shallow Flow System:** 11R, 16AR, 19R, 26R, 28R, 32R, 40, 43, 44, 45, 46 **Deep Flow System:** 21R, 24R, 25R, 27, 37R, 38, 39, 42 **Private Wells:** D2 (Pearce) **Leachate Well:** 41	Annual (May)	**Field Parameters:** pH, conductivity, temperature **General Parameters:** pH, conductivity, hardness **Major and Minor Ions:** alkalinity, calcium, chloride, magnesium, potassium, sodium, sulphate **Nutrients and Organics:** ammonia, nitrate, nitrite, TKN, DOC **Dissolved Metals:** boron, chromium, iron, manganese
	Shallow Flow System: 32R, 26R, 40, 43, 44, 45, 46 **Deep Flow System:** 27, 37R, 38, 39, 42 **Leachate Well:** 41	Annual (May)	**Volatile Organic Compounds:** vinyl chloride, benzene, 1,4 dichlorobenzene

ACTIVITY	LOCATION	SAMPLING FREQUENCY	ANALYSIS / MEASUREMENT
Landfill Gas Monitoring	**Standpipes:** SP3R, SP4R, SP5	Annual	Methane, carbon dioxide, oxygen, balance gas, as well as water level
Surface Water Sampling	**Surface Water Station:** C01, C06	Semi-annual (spring and fall)	**Field Parameters:** pH, conductivity, temperature, turbidity **General Parameters:** pH, conductivity, hardness **Major and Minor Ions:** alkalinity, calcium, chloride, magnesium, potassium, sodium, sulphate **Nutrients and Organics:** ammonia, un-ionized ammonia, nitrate, nitrite **Total Metals:** boron, chromium, iron, manganese
	Surface Water Station: C04, P01, P02, P03, NE1	Annual (spring)	

8 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the 2023 monitoring program presented in this report, the following conclusions are provided.

- Groundwater movement in the shallow flow system across most of the site is inferred to be southwesterly towards the on-site creek, while shallow groundwater movement in the western portion of the site (west of the creek) is inferred to flow east towards the creek. However, the shallow flow system groundwater elevations indicate that a mound exists in the fill area, inducing a localized radial flow away from the fill area to the east and southeast. Thus, groundwater flow in the shallow flow system across the majority of the site is inferred to converge on the on-site stream, with a minor component of localized shallow groundwater flow from the fill area toward the east and southeast.
- The retention pond located in the central portion of the site (pond P02) likely receives shallow groundwater inflow from beneath the landfill.
- Groundwater movement in the deeper flow system is inferred to be in a generally south to southeasterly direction beneath the site. The horizontal hydraulic gradient across the site is low, with a grade change of less than 1 m from the north to southeast limits of the site.
- The leachate strength at the site is relatively weak, with chloride and sodium concentrations below their respective Ontario Drinking Water Quality Standards (ODWQSs).
- There may have been some historical landfill impacts in a number of the shallow groundwater flow system wells adjacent to the northeast and particularly to the east and southeast of the landfill; however, most of these have abated such that there was no clear indication of leachate influence in the shallow observation wells at the downgradient property boundaries to the east/southeast at the site during 2023. The shallow groundwater quality complies with Guideline B-7, with the exception of hardness, chloride and alkalinity at observation well 26R, nitrate at well 44, and DOC at well 46. Concentrations of hardness are interpreted to be naturally elevated in the shallow flow system. The nitrate exceedance at well 44 is not likely to be the result of a landfill leachate impact as nitrate has not been detected within the leachate, and only in very low concentrations in the shallow

groundwater adjacent to the east side of the landfill mound. Furthermore, other leachate indicator parameters such as chloride, alkalinity, and VOCs are not elevated at well 44. The nitrate concentration is likely the result of agricultural activities that surround this well location.

- It is suspected that road salting and/or off-site sources are a contributing factor in the exceedances at observation well 26R, as both chloride and sodium concentrations were greater at well 26R than within leachate well 41 in 2023, as well as in recent historical results. Based on the groundwater elevation and chemistry results at wells 45 and 46, the elevated concentrations and trigger exceedances in property boundary well 26R do not appear to be the result of shallow groundwater migrating from the landfill mound. Groundwater appears to flow north from the property boundary at 26R toward monitoring well 46. Meanwhile, most key parameter concentrations within monitoring wells 45 and 46 were well below the concentrations at well 26R. Continued additional monitoring of wells 45 and 46 is recommended to confirm this conclusion.
- There was no clear indication of leachate influence in the deeper groundwater flow system at the property boundaries in 2023. The deep groundwater quality complies with Guideline B-7, with the exception of hardness and iron at wells 27, 37R and 38. Concentrations of hardness and iron are interpreted to be naturally elevated in the deep flow system. The hardness concentrations at observation wells 37R and 38 were actually below the 2023 background result at well 39 and the concentration at well 27 was only slightly above the concentration at well 39. Thus, the site is considered to be in compliance at the downgradient property boundaries.
- None of the groundwater trigger criteria at the site were exceeded during 2023, with the exception of the chloride concentration at observation well 26R. It is suspected that road salting and/or off-site sources are contributing factors in the chloride concentrations at observation well 26R, as both chloride and sodium concentrations were greater at well 26R than within the leachate well 41 in 2023, as well as in recent historical results. It is also noted that VOCs have not been detected in the samples collected at well 26R. As discussed previously, based on the groundwater elevation and chemistry results at wells 45 and 46, the elevated concentrations and trigger exceedances in property boundary well 26R do not appear to be the result of shallow groundwater migrating from the landfill mound.
- Surface water quality in the wetland at the northeast site boundary, and the northern and southeast on-site retention ponds was not measurably affected by the landfill in 2023. Surface water quality at intermediate station C04 along the on-site stream and retention pond P02 in the central part of the site were inferred to be slightly influenced by the landfill.
- Surface water quality in the on-site stream leaving the site (station C01) has been affected by landfill influences from the upstream portions of the on-site stream, shallow groundwater discharge, and possibly road salting activities. However, the landfill influences in the surface water quality leaving the site are very weak, based on the monitoring results, with chloride values below the CEQG water quality guideline for the protection of aquatic life. Surface water quality leaving the site at station C01 complies with the current trigger level boundary criteria.
- No methane was detected during the 2023 monitoring event at any of the landfill gas monitoring probes, located adjacent to the east, northeast, and north of the landfill mound.

Based on the findings of the 2023 monitoring program, the following recommendations are provided for consideration.

- Monitoring should be continued at the site in 2024 with the recommended program presented in Section 7.0.
- The landfill slopes should continue to be inspected to confirm that there are no leachate seeps in the area.
- Supplemental groundwater samples should continue to be collected in 2024 at observation wells 45 and 46 to continue to evaluate/verify the source of the trigger exceedances at observation well 26R.

9 REFERENCES

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FIGURES

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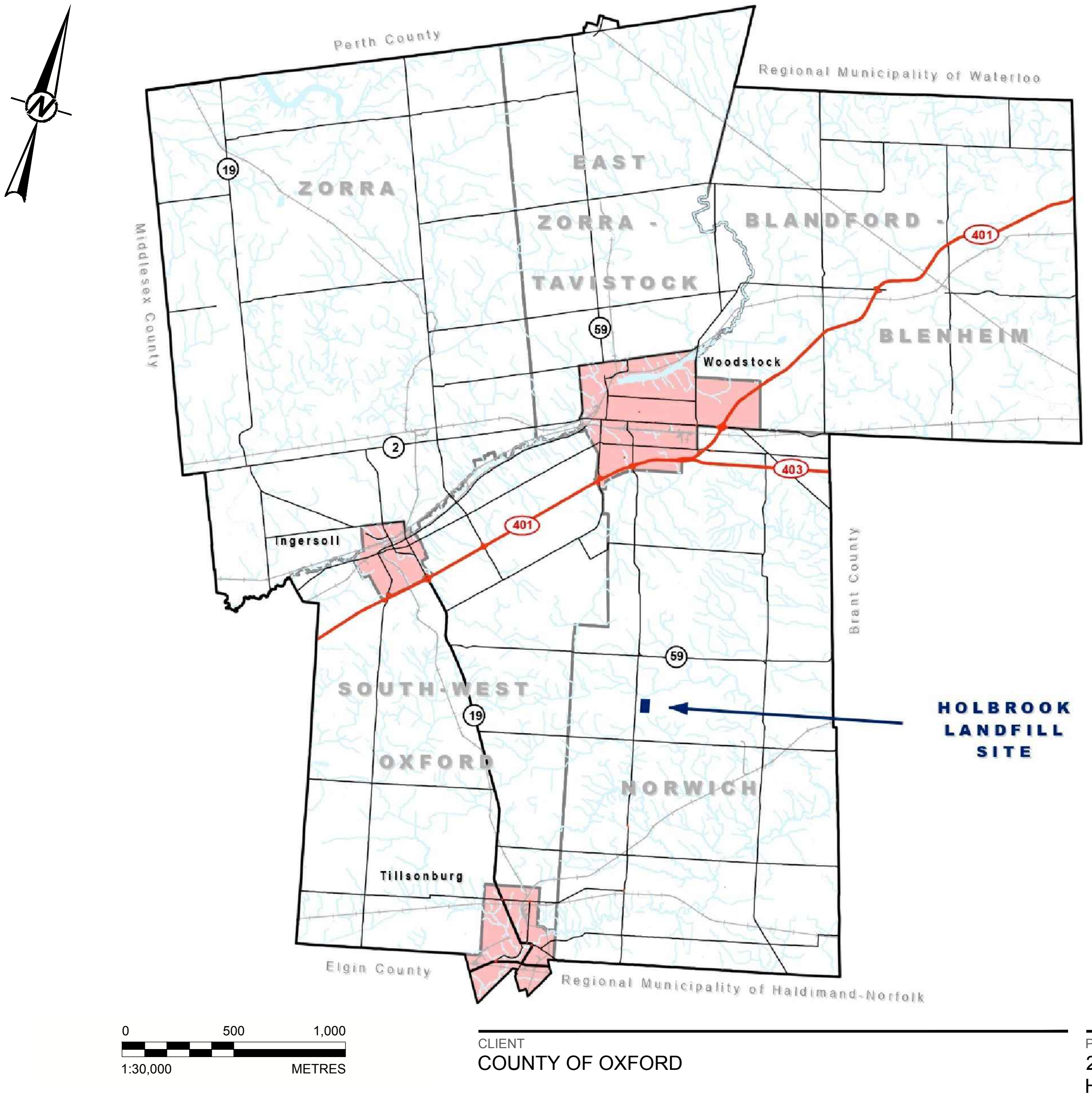

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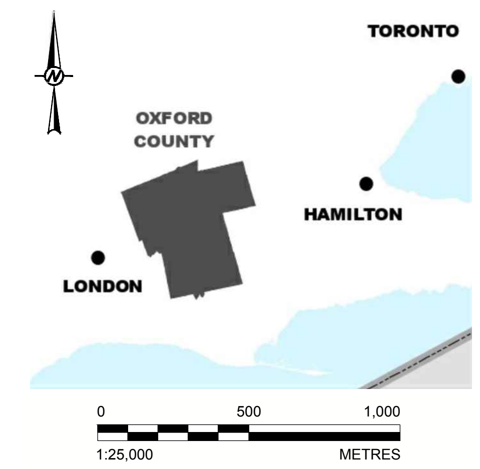

NOTE(S)

1. PROJECTION: NAD 83 UTM ZONE 17N.

CLIENT
COUNTY OF OXFORD

CONSULTANT

YYYY-MM-DD	2024-01
DESIGNED	
PREPARED	NV
REVIEWED	JM/AS
APPROVED	SH

PROJECT
2023 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
SITE LOCATION MAP

PROJECT NO.	CONTROL	REV.	FIGURE
111-53037-07	0001	A	1

LEGEND

- PROPERTY LINE (APPROXIMATE)
- 28R SHALLOW AQUIFER MONITORING WELL
- 21R DEEP AQUIFER MONITORING WELL
- 41 LEACHATE MONITORING WELL
- 20 HISTORIC MONITORING WELL (ASSUMED LOCATION)
- 23 DECOMMISSIONED MONITORING WELL
- SP3R STANDPIPES
- SG1 STAFF GAUGE
- D-2 DOMESTIC WELL
- P01 SURFACE WATER SAMPLING LOCATION
- SURFACE WATER FLOW DIRECTION
- A A' CROSS-SECTION LOCATION AND DESIGNATION

REFERENCE(S)

PARCEL FABRIC, PROPERTY BOUNDARIES AND ORTHOPHOTO PROVIDED BY OXFORD COUNTY, 2011.

0 100 200
1:4,000 METRES

CLIENT
COUNTY OF OXFORD

CONSULTANT
wsp

YYYY-MM-DD	2024-01
DESIGNED	
PREPARED	NV
REVIEWED	JM/AS
APPROVED	SH

PROJECT
2023 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
SITE PLAN

PROJECT NO.	CONTROL	REV.	FIGURE
111-53037-07	0001	A	2

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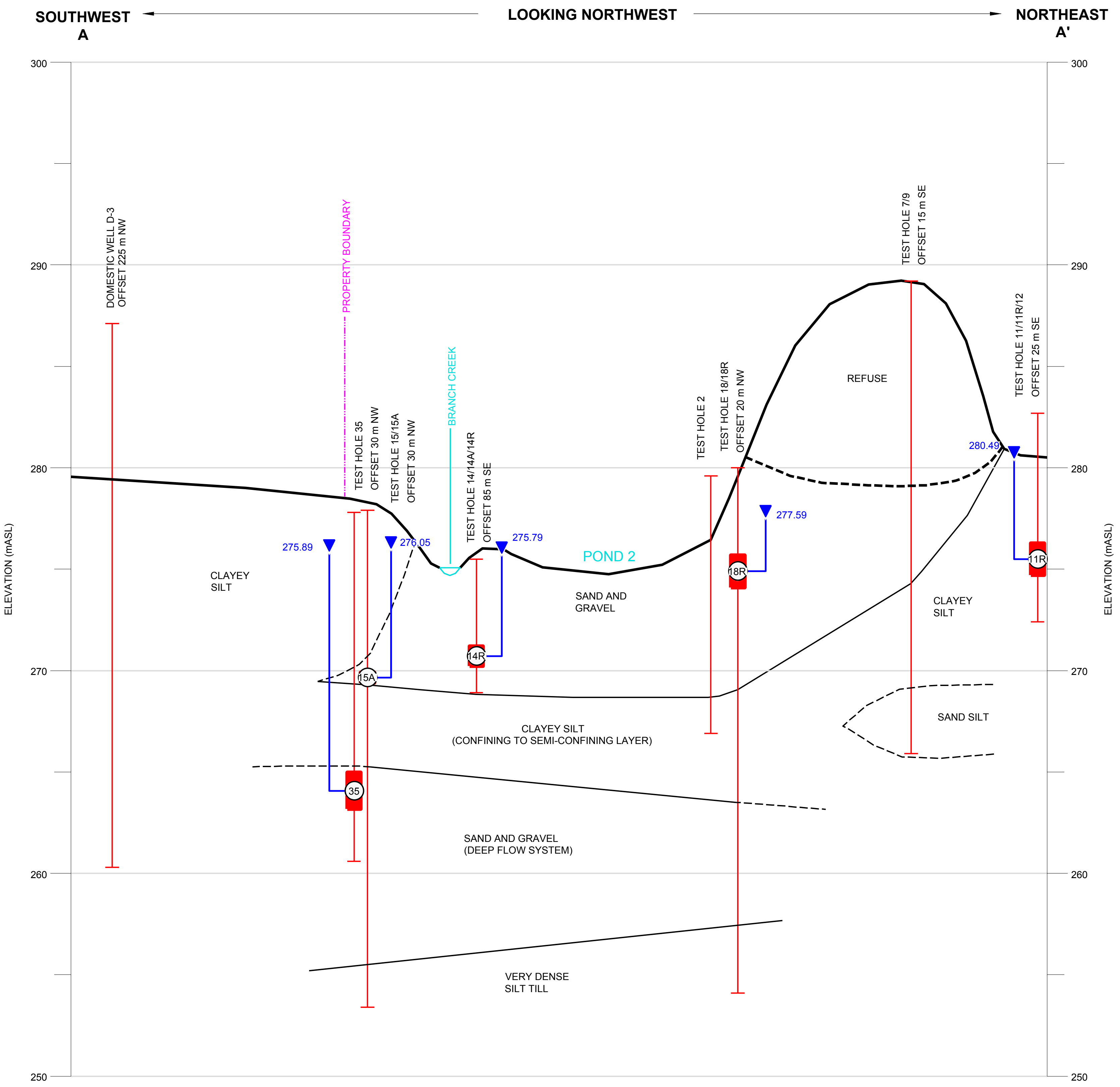

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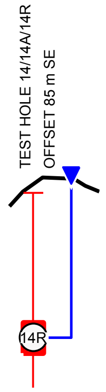


WELL DESIGNATION

GROUNDWATER ELEVATION (MAY 12, 2023)

GROUND SURFACE

SCREENED INTERVAL

SCREEN DESIGNATION

INFERRED STRATIGRAPHIC CONTACT

INFERRED ORIGINAL GROUND SURFACE

NOTE(S)

1. GEOLOGICAL SEQUENCES/CONTACTS HAVE BEEN INTERPOLATED AND MAY DIFFER FROM THAT DEPICTED.

REFERENCE(S)

1. GROUND SURFACE TOPOGRAPHY BASED ON INFORMATION PROVIDED IN "HYDROGEOLOGICAL INVESTIGATIONS, HOLBROOK SANITARY LANDFILL SITE, 1979-1982" BY MACLAREN ENGINEERS, OCTOBER 1982.
2. STRATIGRAPHY INTERPRETED FROM BOREHOLES LOGGED BY VARIOUS CONSULTANTS.

0 100 200
1:4,000 HORIZONTAL METRES

0 5 10
1:250 VERTICAL METRES

CLIENT
COUNTY OF OXFORD

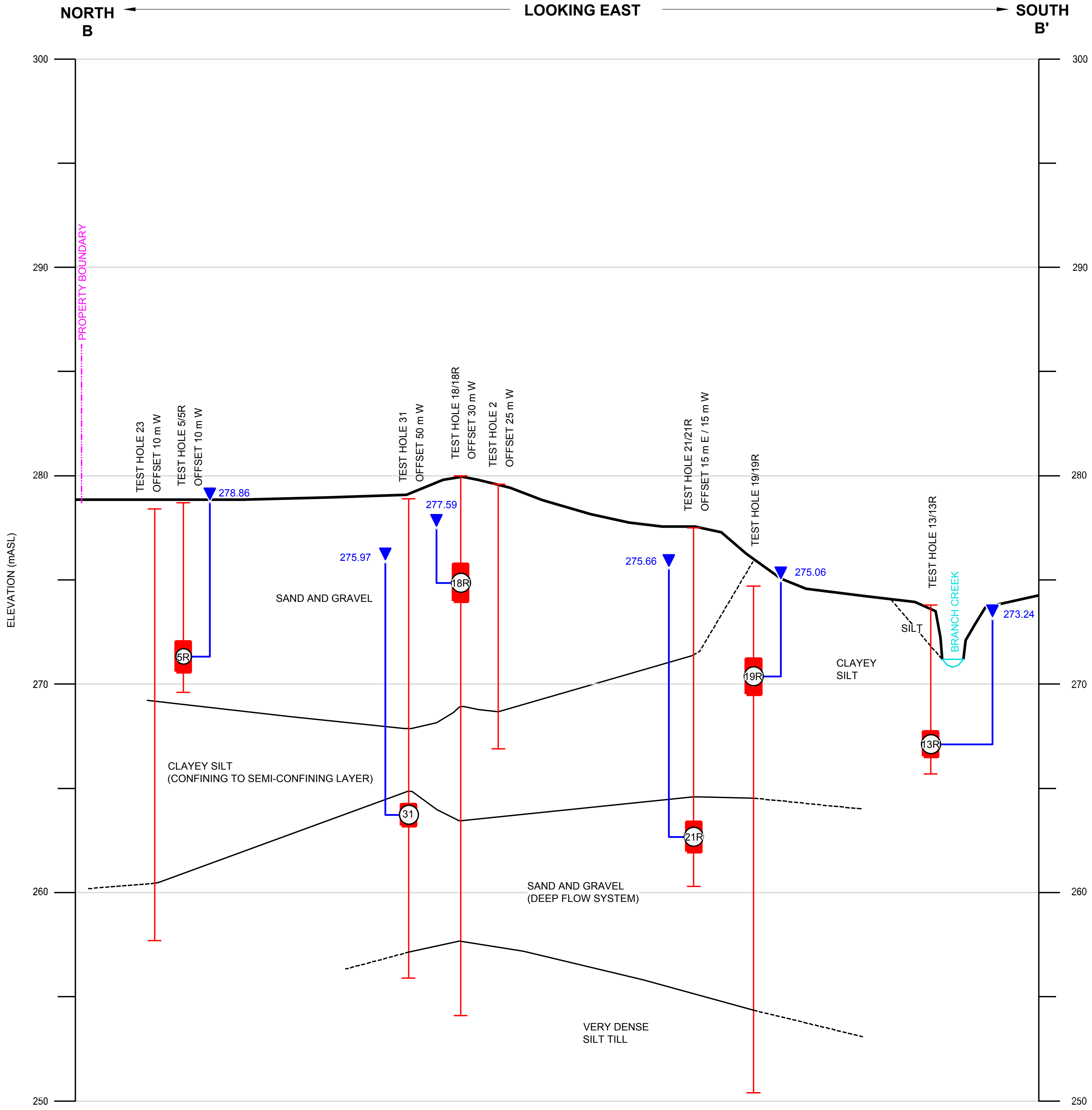
CONSULTANT

YYYY-MM-DD	2024-01
DESIGNED	
PREPARED	NV
REVIEWED	JM/AS
APPROVED	SH

PROJECT
2023 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
CROSS SECTION A-A'

PROJECT NO.	CONTROL	REV.	FIGURE
111-53037-07	0001	A	3



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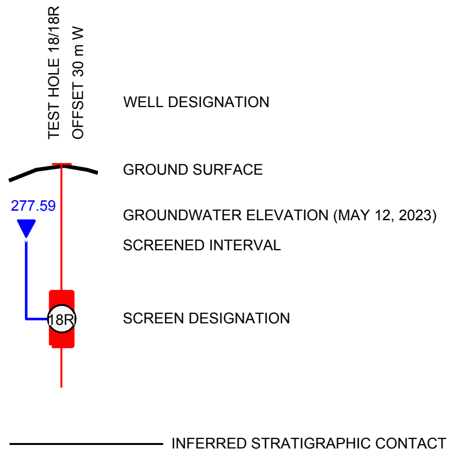

NOTE(S)

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REFERENCE(S)

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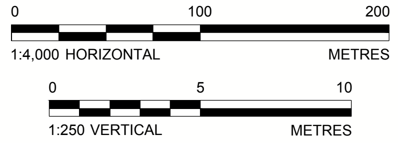


CLIENT
COUNTY OF OXFORD

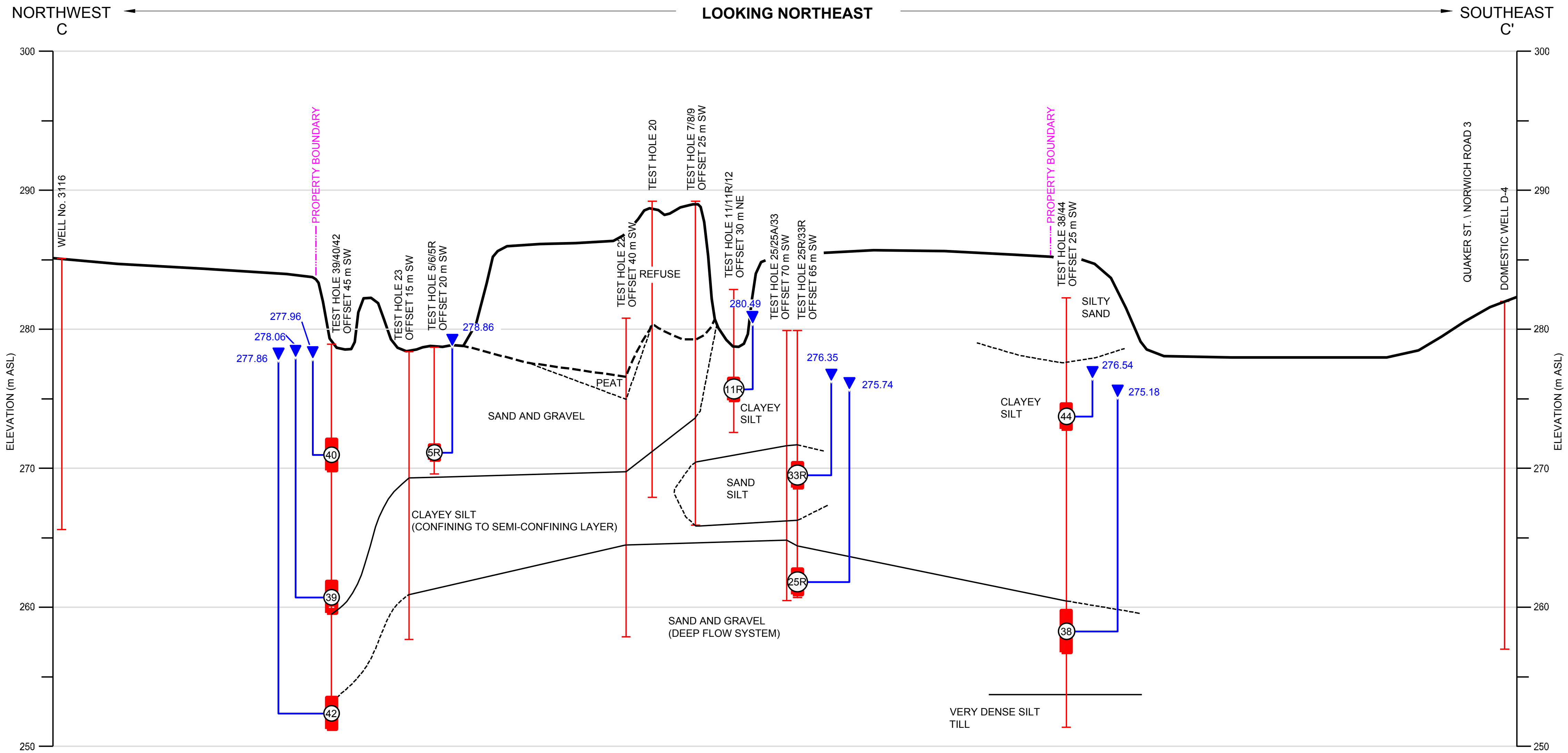
CONSULTANT

YYYY-MM-DD	2024-01
DESIGNED	
PREPARED	NV
REVIEWED	JM/AS
APPROVED	SH

PROJECT
2023 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
CROSS SECTION B-B'

PROJECT NO.	CONTROL	REV.	FIGURE
111-53037-07	0001	A	4



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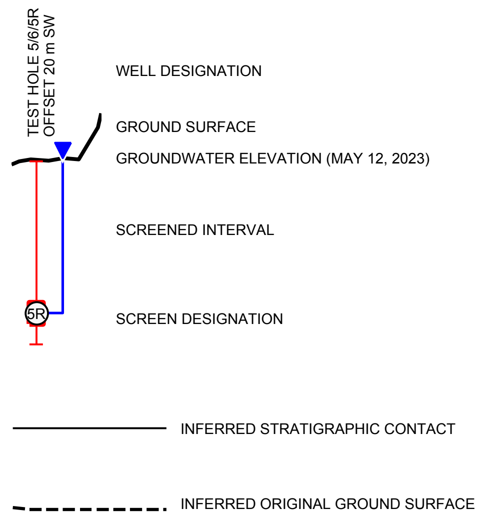

NOTE(S)

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REFERENCE(S)

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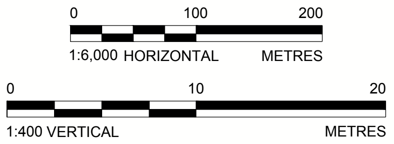


CLIENT
COUNTY OF OXFORD

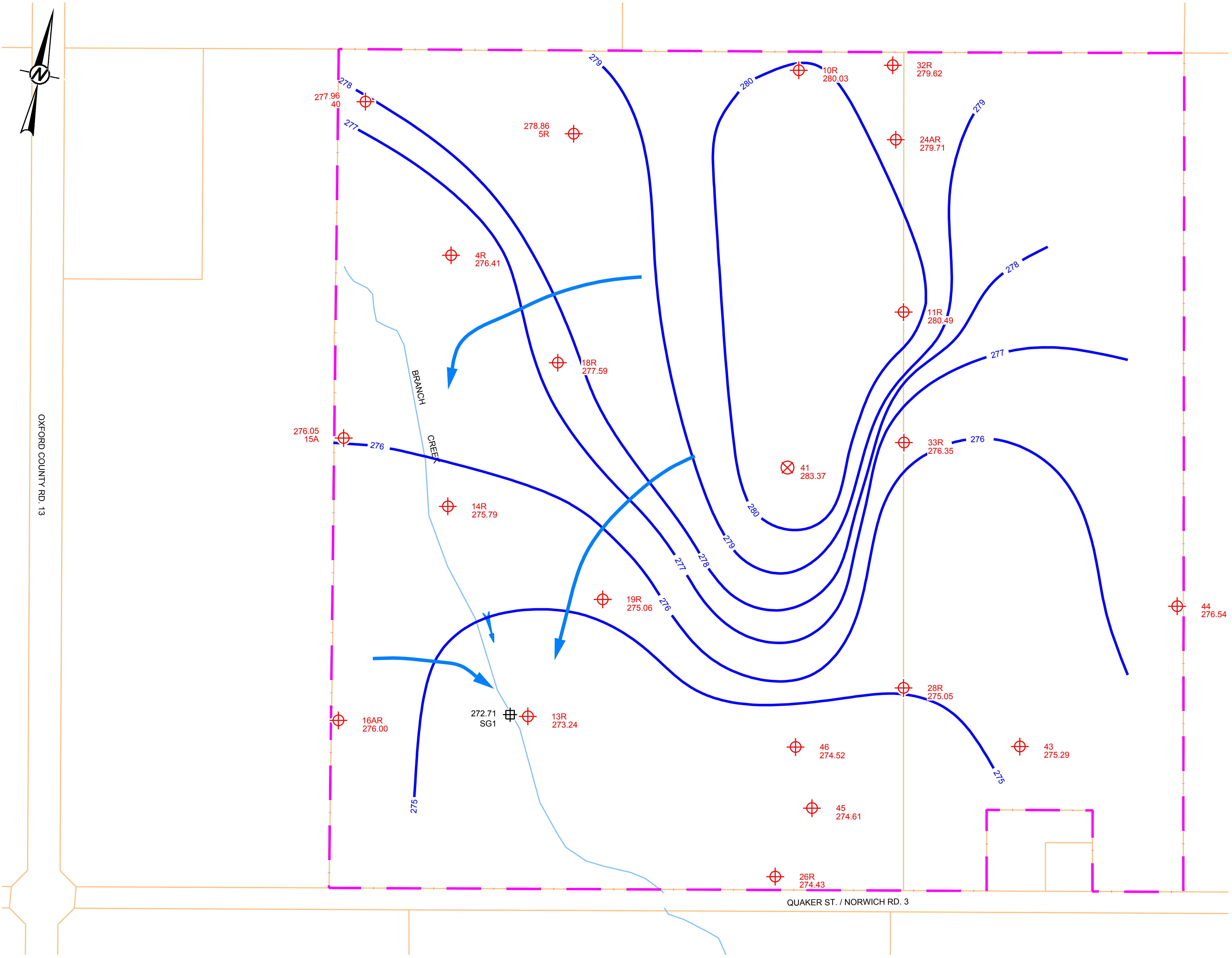
CONSULTANT

YYYY-MM-DD	2024-01
DESIGNED	
PREPARED	NV
REVIEWED	JM/AS
APPROVED	SH

PROJECT
2023 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
CROSS SECTION C-C'

PROJECT NO.	CONTROL	REV.	FIGURE
111-53037-07	0001	A	5



LEGEND

— —	PROPERTY LINE (APPROXIMATE)
⌖	SHALLOW AQUIFER MONITORING WELL
⊗	LEACHATE MONITORING WELL
⊞	STAFF GAUGE
283.37	GROUNDWATER ELEVATION FOR MAY 2023 (m ASL)
277	INFERRED GROUNDWATER CONTOUR (m ASL)
→	PROBABLE DIRECTION OF GROUNDWATER MOVEMENT

REFERENCE(S)

1. PARCEL FABRIC, PROPERTY BOUNDARIES AND ORTHOPHOTO PROVIDED BY OXFORD COUNTY, 2011.

0 100 200
1:4,000 METRES

CLIENT
COUNTY OF OXFORD

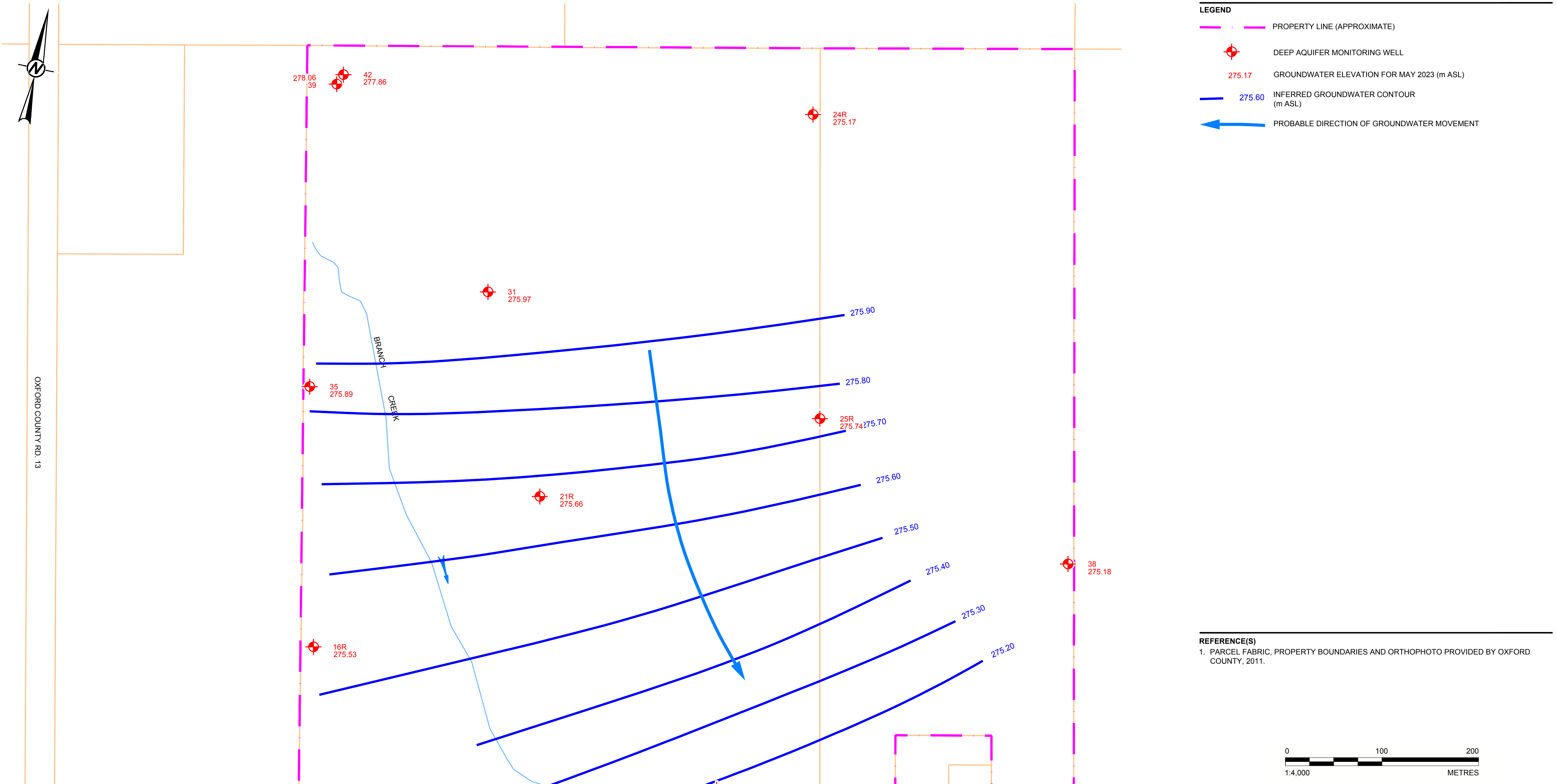
CONSULTANT

YYYY-MM-DD	2024-01
DESIGNED	
PREPARED	NV
REVIEWED	JM/AS
APPROVED	SH

PROJECT
2023 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
SHALLOW FLOW SYSTEM GROUNDWATER ELEVATIONS (MAY 2023)

PROJECT NO.	CONTROL	REV.	FIGURE
111-53037-07	0001	A	6



REFERENCE(S)

1. PARCEL FABRIC, PROPERTY BOUNDARIES AND ORTHOPHOTO PROVIDED BY OXFORD COUNTY, 2011.

CLIENT
COUNTY OF OXFORD

CONSULTANT

YYYY-MM-DD	2024-01
DESIGNED	
PREPARED	NV
REVIEWED	JM/AS
APPROVED	SH

PROJECT
2023 WATER MONITORING REPORT
HOLBROOK LANDFILL SITE
COUNTY OF OXFORD, ONTARIO

TITLE
DEEP FLOW SYSTEM GROUNDWATER ELEVATIONS
(MAY 2023)

PROJECT NO.	CONTROL	REV.	FIGURE
111-53037-07	0001	A	7

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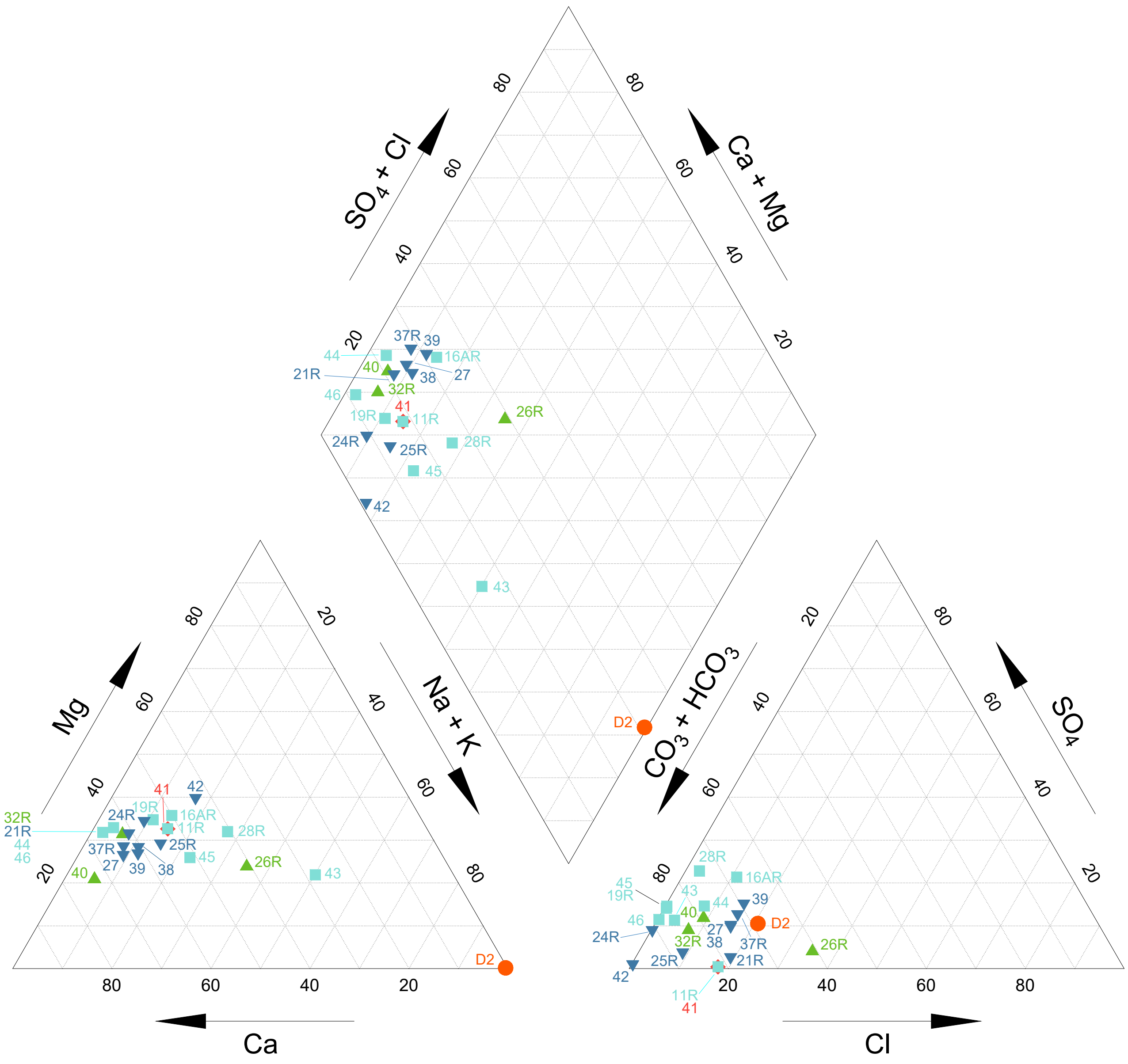

LEGEND

41 ◆ LEACHATE WELL

40 ▲ SHALLOW FLOW SYSTEM WELL

28R ■ SHALLOW FLOW SYSTEM / SHALLOW CONFINING LAYER WELL

25R ▼ DEEP FLOW SYSTEM WELL

D2 ● DOMESTIC WELL

TRILINEAR DIAGRAM - MAY 2023

2023 Water Monitoring Report
Holbrook Landfill Site
The County of Oxford

SCALE: AS SHOWN

DRAWN BY: CS

DATE: JANUARY 2024

PROJECT: 111-53037-07

FIGURE No: 8

H:\PROJECTS\2011\111-53037 HOLBROOK LANDFILL\07 2023\2022 AMR\111-53037-07-F8-TL.DWG

APPENDIX

A

CERTIFICATES OF APPROVAL

Ontario

Ministry
of the
Environment

Southwestern
Region

985 Adelaide Street South
London, Ontario.
N6E 1V3
(519) 681-3600

February 4, 1983

Mr. D. Pratt
County Engineer
County of Oxford
Box 397
Woodstock, Ontario

Dear Sir:

RE: Holbrook Landfill
Certificate A-07-07-02
Our File M & P 19-03

On January 31, 1983 Mr. J. Stinson, Environmental Officer, inspected the Holbrook landfill site. The site is inspected to determine the operating condition at that time.

The site was well operated with a small dumping face and an ample supply of cover material. A larger fence was constructed around the landfill area to contain the litter.

The site is well run and maintained. If additional information is required please contact this office.

Yours truly,

J. F. Janse, P. Eng.
District Officer
Municipal and Private Abatement

JFS:jc
4/1/3F

of the
Environment
Ontario

Provisional Certificate No.
A 070702

PROVISIONAL CERTIFICATE OF APPROVAL WASTE DISPOSAL SITE

Under the Environmental Protection Act and the regulations and subject to the limitations thereof, this Provisional Certificate of Approval is issued to:

County of Oxford,
P.O. Box 397,
415 Hunter Street,
Woodstock, Ontario.
N4S 7Y3

for the use and operation of a 10.12 hectare (25 acre) landfilling site within a total site area of 40.5 hectares (100 acres),

all in accordance with the following plans and specifications:

Located:
S.W. 1/4 Lot 20, and S.E. 1/4 Lot 21, Concession 3,
Township of Norwich,
County of Oxford.

which includes the use of the site only for the disposal of the following categories of waste (NOTE: Use of the site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval)

Domestic, commercial and non-hazardous solid industrial wastes.

and subject to the following conditions:

1. The use, operation and closure of the site shall be in accordance with the following documents:
   (1) Report prepared by MacLaren Engineers entitled "County of Oxford, Contingency Plan for Solid Waste Disposal", dated March 1982.
   (2) The terms of the Agreement between the Corporation of the County of Oxford and the Corporation of the Township of Norwich concerning the use, operation and closure of the site dated December 8, 1982.
   (3) Report prepared by MacLaren Engineers entitled "Hydrogeological Investigations - Summary Report - October 1982".

Dated this 31st day of March, 1983.

Director, Section 38
Environmental Protection Act

PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE

The following conditions are additional to the conditions shown on Provisional Certificate of Approval Number A 070702 dated March 31, 1983

(4) Application form signed by D.L. Pratt of the County of Oxford entitled "Application for a Certificate of Approval for a Waste Disposal Site (Landfill)" dated March 15, 1982.

2. Background water quality levels for the site are to be determined to the satisfaction of the Director of the Southwestern Region of the Ministry of the Environment.

3. Upon cessation of waste disposal operations at the site, the site is to be properly closed utilizing at least 2 feet of suitable final cover material, in a manner which establishes properly graded final slopes and to the satisfaction of the Director of the Southwestern Region of the Ministry of the Environment.

4. No waste is to be deposited at the site after June 30, 1984.

5. By June 30, 1983 suitable plans accomodating a minimum 5% slope in all of cell 1 and detailing the staged development and closure of the site are to be submitted to the Director of the Environmental Approvals and Project Engineering Branch and, following its approval, shall be implemented.

6. Where there is a conflict between a provision of documents (1),(3), or (4) listed in condition 1 and a provision of document (2) listed in condition 1, the provision in document (2) shall apply.

7. By June 30, 1983 a suitable surface water control plan is to be submitted to the Director of the Environmental Approvals and Project Engineering Branch and, following its approval, shall be implemented.

Ontario

MINISTRY OF THE ENVIRONMENT

NOTICE

TO:

County of Oxford,
P.O. Box 397,
415 Hunter Street,
Woodstock, Ontrio.
N4S 7Y3

You are hereby notified that Provisional Certificate of Approval No. A 070702 has been issued to you subject to the conditions outlined therein.

The reasons for the imposition of these conditions are as follows:

1. The reason for the imposition of condition no. 1 is to ensure that the use, operation and closure of the site is in accordance with the plans and documentation submitted for approval and approved by the Director of the Environmental Approvals and Project Engineering Branch and is carried out in an orderly and systematic manner and the landfilling operation will be in accordance with the provisions of the Environmental Protection Act and Regulation 309 (R.R. of Ontario 1980) pursuant to that Act. The use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

2. The reason for the imposition of condition no. 2 is that defining proper background water quality levels is an integral part of a monitoring program to establish that pollutant attenuation is taking place on site as intended and the use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

3. The reason for the imposition of condition no. 3 is to ensure that the site is operated and closed in an aesthetically acceptable manner and to control insects, rodents and infiltration and to ensure that the landfilling operation will be in accordance with the provisions of the Environmental Protection Act and Regulation 309 (R.R. of Ontario 1980) pursuant to that Act. The use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

4. The reason for the imposition of condition no. 4 is that the applicant has estimated, based on an anticipated rate of landfilling, that the site should reach its design capacity by June 30, 1984.

5. The reason for the imposition of condition no. 5 is that although a minimum 5% final slope is to be achieved in cell 1 and cell 2 of the site to control infiltration, the design plans and specifications contained in document (1) listed in condition 1 do not provide for a minimum 5% final slope in a portion of cell 1. Suitable plans and specifications are therefore necessary to ensure that the minimum 5% final slope is achieved in all portions of cell 1 and cell 2. The use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

6. The reason for the imposition of condition no.6 is to clarify the manner in which the site is to be orderly and systematically used, operated and closed in the event that there is conflict between the provisions of document (2) and the provisions of documents (1),(3) or (4). The use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

7. The reason for the imposition of condition no. 7 is that a suitable surface water control plan is an integral part of an operating and development report for a landfilling site which is needed to ensure that the use, operation and closure of the site is carried out in a proper manner and the landfilling operation will be in accordance with the provisions of the Environmental Protection Act and Regulation 309 (R.R. of Ontario 1980) pursuant to that Act. The use, operation and closure of the site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.

You may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board.

This Notice should be served upon:

The Secretary
Environmental Appeal Board
1 St. Clair Avenue West
5th Floor
Toronto, Ontario M4V 1K7

AND

The Director
Section 38, E.P.A.
Ministry of the Environment
135 St. Clair Ave. W.,
Toronto, Ontario M4V 1P5

Dated at Toronto this 31st day of March, 1983.

Director
Section 38, E.P.A.
Ministry of the Environment

Ontario

Environmental
Appeal Board

1 St. Clair Avenue Wes
Toronto, Ontario
M4V 1K7

FORM OF NOTICE OF APPEAL
EXPLANATORY NOTES

Appeals to the Environmental Appeal Board should be made in the attached form, which is intended to provide the Board and the respondent with specific details regarding the nature of the appeal.

The form has been structured to allow sufficient space for a typical appeal, and two copies of the form are attached in case the appellant wishes to insert the information on the form provided. A third copy is attached for retention by the appellant.

The form is not intended to be restricting or confining and if, in a particular case, it is found that insufficient space is available on the forms provided, the particulars may be attached on additional plain white sheets.

In some cases, appellants may prefer not to use the forms provided by the Board. The Board will accept Notices of Appeal submitted on the appellant's stationery, provided that the required format and particulars as indicated on the Board's form are present.

Ministry
of the
Environment
Ontario

Provisional Certificate No.
A 070702

PROVISIONAL CERT
WASTE DI

HOLBROOK CofA

Under the Environmental Protection A
limitations thereof, this Provisional Certificate of Approval is issued to:

County of Oxford,
P.O. Box 397,
415 Hunter Street,
Woodstock, Ontario.
N4S 7X3

THIS IS A TRUE COPY OF THE
ORIGINAL CERTIFICATE MAILED
ON June 28/84
(Signed)

for the use and operation of a 10.12 hectare (25 acre) landfilling site within a total site area of 10.5 hectares (100 acres)

all in accordance with the following plans and specifications:

Located: S.W. 1/4 Lot 20 and S.E. 1/4 Lot 21, Concession 3,
Township of Norwich,
County of Oxford.

which includes the use of the site only for the disposal of the following categories of waste (NOTE: Use of the site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval) domestic, commercial and non-hazardous solid industrial wastes.

and subject to the following conditions:

1. The use, operation and closure of the site shall be in accordance with the following documents:

   (1) Report prepared by MacLaren Engineers entitled "Support Document for Proposed 1984 Extension to the Holbrook Sanitary Landfill Site" dated April 1984.

   (2) Report prepared by MacLaren Engineers entitled "Additional Hydrogeological Investigations at the Holbrook Sanitary Landfill Site" dated October 1983.

Dated this 28th day of June, 19 84.

Director, Section 38
Environmental Protection Act

Ministry
of the
Environment
Ontario

PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE

The following conditions are additional to the conditions shown on Provisional Certificate of Approval Number A 070702 dated June 28, 1984

(3) The terms of the Agreement between the Corporation of the County of Oxford and the Corporation of the Township of Norwich concerning the use, operation and closure of the site dated May 29, 1984.

(4) Application form signed by D.L. Pratt of the County of Oxford entitled "Application for a Certificate of Approval for a Waste Disposal Site (Landfill)" dated April 10, 1984.

2. By August 31, 1984 a list of erosion control measures suitable to the Director of the Southwestern Region of the Ministry of the Environment (herein after referred to as "The Director") shall be submitted to him.

3. The erosion control measures submitted pursuant to condition no. 2 above shall be implemented in accordance with the approval of The Director.

4. The Site Plan, Figure no. 1 contained in the report entitled "Support Document for Proposed 1984 Extension to the Holbrook Sanitary Landfill Site" dated April, 1984 shall be modified in a manner approved by The Director to provide a minimum slope greater than 5%.

5. Where waste is to be placed on top of existing final cover, the existing final cover material must be removed prior thereto.

6. No waste is to be deposited at the site after June 30, 1986.

7. The surface water sampling program as outlined in Section 2 of the Agreement between the County of Oxford and the Township of Norwich dated May 29, 1984 shall be modified to include analysis for total phosphorus and ammonia in addition to the parameters listed in the Agreement.

Ontario

MINISTRY OF THE ENVIRONMENT

NOTICE

June 28/84.
JB

TO: County of Oxford,
P.O. Box 397,
415 Hunter Street,
Woodstock, Ontario. N4S 7Y3

You are hereby notified that Provisional Certificate of Approval No. A 070702 has been issued to you subject to the conditions outlined therein.

The reasons for the imposition of these conditions are as follows:

1. The reason for the imposition of condition no. 1 is to ensure that the use, operation and closure of the site is in accordance with the plans and documentation submitted for approval and approved by the Director of the Environmental Approvals and Project Engineering Branch and is carried out in an orderly and systematic manner and the landfilling operation will be in accordance with the provisions of the Environmental Protection Act and Regulation 309 (R.R.O. 1980) pursuant to that Act. The use, operation and closure of this site without such a condition may create a nuisance or may result in a hazard to the health or safety of any person.
2. The reason for the imposition of condition nos. 2 and 3 is to ensure that erosion is minimized on the side slopes of the landfilled area and the operation of the site without such condition may create a nuisance.
3. The reason for the imposition of condition no. 4 is to reduce the amount of infiltration that would result in leachate production.
4. The reason for the imposition of condition no. 5 is to promote the downward migration of leachate and to minimize leachate breakouts.
5. The reason for the imposition of condition no. 6 is that the applicant has agreed to not to extend the use of the site after June 30, 1986.
6. The reason for the imposition of condition no. 7 is that the added parameters mentioned therein are significant as indicators of the possible effect of landfills on aquatic life.

You may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board.

This Notice should be served upon:

The Secretary
Environmental Appeal Board
1 St. Clair Avenue West
5th Floor
Toronto, Ontario M4V 1K7

AND

The Director
Section 38, E.P.A.
Ministry of the Environment
135 St. Clair Ave. W.,
Toronto, Ontario M4V 1P5

Dated at Toronto this 28th day of June, 1984.

Director,
Section 38, E.P.A.,
Ministry of the Environment.

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A070702
Issue Date: September 8, 2016

County of Oxford
21 Reeve St Post Office Box No. 1614
Woodstock, Ontario
N4S 7Y3

Site Location: Holbrook Landfill - closed
Part of Lot 20 & 21, Concession 3
Norwich Township, County of Oxford

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, *R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:*

10.12 hectare landfilling site within a total site area of 40.5 hectares.

For the purpose of this environmental compliance approval, the following definitions apply:

"*Approval* " means this Environmental Compliance Approval and any Schedules to it, including the application and supporting documentation listed in Schedule "A";

"Director" means any Ministry employee appointed in writing by the Minister pursuant to section 5 of the EPA as a Director for the purposes of Part II.1 of the EPA;

"*District Manager*" means the District Manager of the local district office of the *Ministry* in which the *Site* is geographically located;

"*EPA* " means *Environmental Protection Act* , R.S.O. 1990, c. E. 19, as amended;

"Ministry" means the Ontario Ministry of the Environment and Climate Change;

"*Owner*" means any person that is responsible for the establishment or operation of the *Site* being approved by this *Approval,* and includes The County of Oxford and its successors and assigns;

"*Regional Director* " means the Regional Director of the local Regional Office of the *Ministry* in which the *Site* is located; and

"Regulation 232" means Ontario Regulation 232/98 (New Landfill Standards) made under the *EPA*, as amended from time to time;

"*Regulation 347* " means Ontario Regulation 347, R.R.O. 1990, made under the EPA, as amended;

"*Regulation 903"* means Regulation 903, R.R.O. 1990, made under the *OWRA,* as amended;

"*Site* " means the entire waste disposal site, including the buffer land at Parts of Lot 20 & 21, Concession 3, Township of Norwich, County of Oxford.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL

Compliance

1 The *Owner* and *Operator* shall ensure compliance with all the conditions of this *Approval* and shall ensure that any person authorized to carry out work on or operate any aspect of the *Site* is notified of this *Approval* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

2 Any person authorized to carry out work on or operate any aspect of the *Site* shall comply with the conditions of this *Approval* .

In Accordance

3 Except as otherwise provided by this *Approval,* the *Site* shall be designed, developed, built, operated and maintained in accordance with the documentation listed in the attached Schedule “A”.

Interpretation

4 Where there is a conflict between a provision of any document listed in Schedule "A" in this *Approval,* and the conditions of this *Approval,* the conditions in this *Approval* shall take precedence.

5 Where there is a conflict between the application and a provision in any document listed in Schedule "A", the application shall take precedence, unless it is clear that

the purpose of the document was to amend the application and that the *Ministry* approved the amendment.

6 Where there is a conflict between any two documents listed in Schedule "A", the document bearing the most recent date shall take precedence.

7 The conditions of this *Approval* are severable. If any condition of this *Approval,* or the application of any condition of this *Approval* to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this *Approval* shall not be affected thereby.

Other Legal Obligations

8 The issuance of, and compliance with, this *Approval* does not:
   - (a) relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or
   - (b) limit in any way the authority of the *Ministry* to require certain steps be taken or to require the *Owner* and *Operator* to furnish any further information related to compliance with this *Approval* .

Adverse Effect

9 The *Owner* shall take steps to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality resulting from the *Site,* including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

10 Despite an *Owner* or any other person fulfilling any obligations imposed by this *Approval* the person remains responsible for any contravention of any other condition of this *Approval* or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.

Change of Ownership

11 The *Owner* shall notify the *Director,* in writing, and forward a copy of the notification to the *District Manager,* within 30 days of the occurrence of any changes in the following information:
   - (a) the ownership of the *Site;*
   - (b) the *Operator* of the *Site;*
   - (c) the address of the *Owner or Operator;* and
   - (d) the partners, where the *Owner or Operator* is or at any time becomes a partnership and a copy of the most recent declaration filed under the *Business Names Act* , R. S. O. 1990, c. B.17, shall be included in the notification.

12 No portion of this *Site* shall be transferred or encumbered after closing of the *Site* unless the *Director* is notified in advance and sufficient financial assurance is deposited with the *Ministry* to ensure that these conditions will be carried out.

13 In the event of any change in ownership of the *Site,* other than change to a successor municipality, the *Owner* shall notify the successor of and provide the successor with a copy of this *Approval,* and the *Owner* shall provide a copy of the notification to the *District Manager* and the *Director.*

Certificate of Requirement/Registration on Title

Registration on Title Requirement

14 Prior to dealing with the property in any way, the *Owner* shall provide a copy of this *Approval* and any amendments, to any person who will acquire an interest in the property as a result of the dealing.

15 (a) Within sixty (60) calendar days from the date of issuance of this *Approval,* the *Owner* shall submit to the *Director* a completed Certificate of Requirement which shall include:

- (i) a plan of survey prepared, signed and sealed by an Ontario Land Surveyor, which shows the area of the *Site* where waste has been or is to be deposited at the *Site;*
- (ii) proof of ownership of the *Site;*
- (iii) a letter signed by a member of the Law Society of Upper Canada or other qualified legal practitioner acceptable to the *Director,* verifying the legal description provided in the Certificate of Requirement;
- (iv) the legal abstract of the property; and
- (v) any supporting documents including a registerable description of the *Site.*

(b) Within fifteen (15) calendar days of receiving a Certificate of Requirement authorized by the *Director,* the *Owner* shall:

- (i) register the Certificate of Requirement in the appropriate Land Registry Office on the title to the property; and
- (ii) submit to the *Director* and *District Manager,* written verification that the Certificate of Requirement has been registered on title.

Registration on Title Requirement - Contaminant Attenuation Zone (CAZ)

16. The Owner shall, within sixty (60) calendar days from the date of issuance of this Approval, submit to the *Director* documents confirming that a contaminant attenuation zone (CAZ) has been established, in either fee simple or by way of a groundwater easement.

17 Within thirty (30) calendar days from the date of establishing a contaminant attenuation zone (CAZ) (overburden and/or bedrock aquifers) in either fee simple or by way of a groundwater easement, the *Owner* shall submit to the *Director* a completed Certificate of Requirement which shall include:

(a) If rights are obtained in fee simple, the *Owner* shall provide:
  (i) documentation evidencing ownership of the CAZ obtained in compliance with *O.Reg. 232/98,* as amended;
  (ii) a completed Certificate of Requirement and supporting documents containing a registerable description of the CAZ; and
  (iii) a letter signed by a member of the Law Society of Upper Canada; or other qualified legal practitioner acceptable to the *Director,* verifying the legal description of the CAZ.

(b) within fifteen (15) calendar days of receiving a Certificate of Requirement signed or authorized by the *Director,* the Owner shall:
  (i) register the Certificate of Requirement in the appropriate Land Registry Office on the title to the property; and
  (ii) submit to the *Director* and the *District Manager,* written verification that the Certificate of Requirement has been registered on title.

(c) If rights are obtained by way of a groundwater easement, the Applicant shall:
  (i) provide a copy of the easement;
  (ii) provide a plan of survey signed and sealed by an Ontario Land Surveyor for the CAZ;
  (ii) submit proof of registration on title of the groundwater easement to the *Director;*

(d) The *Owner* shall not amend or remove or consent to the removal of the easement or CAZ from title without the prior written consent of the *Director.*

2. CLOSURE PLAN

1. By no later than July 15, 2017, the *Owner* shall submit to the *Director* for approval, with copies to the *District Manager,* a detailed *Site* closure plan pertaining to the termination of landfilling operations at this *Site,* post-closure inspection, maintenance and monitoring, and end use. The plan shall include but not be limited to the following information:

(a) a plan showing *Site* appearance after closure;
(b) a description of the proposed end use of the *Site;*

(c) a descriptions of the procedures for closure of the *Site,* including:
  (i) advance notification of the public of the *Landfill* closure;
  (ii) posting of a sign at the *Site* entrance indicating that the *Landfill* is closed and identifying any alternative waste disposal arrangements;
  (iii) completion, inspection and maintenance of the final cover and landscaping;
  (iv) *Site* security;
  (v) removal of unnecessary *Landfill* related structures, buildings and facilities;
  (vi) final construction of any control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas; and
  (vii) a schedule indicating the time period for implementing sub-conditions (i) to (vi) above.

(d) descriptions of the procedures for post-closure care of the *Landfill,* including:
  (i) operation, inspection and maintenance of the control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;
  (ii) record keeping and reporting; and
  (iii) complaint contact and response procedures;

(e) an assessment of the adequacy of and need to implement the contingency plans for leachate and methane gas; and

(f) an updated estimate of the contaminating life span of the *Site,* based on the results of the monitoring programs to date.

2 The *Site* shall be closed in accordance with the closure plan as approved by the *Director.*

3 The Site is hereby acknowledged to be closed for receipt of waste for disposal since 1986, and no waste management activities shall be carried out at the Site without approval of the Director.

3.0 LANDFILL MONITORING

Compliance

1 The *Site* shall be operated in such a way as to ensure compliance with the following:

(a) Reasonable Use Guideline B-7 for the protection of the groundwater at the *Site;* and

(b) Provincial Water Quality Objectives included in the July 1994 publication entitled *Water Management Policies, Guidelines, Provincial Water Quality Objectives,* as amended from time to time or limits set by the *Regional Director,* for the protection of the surface water at and off the *Site.*

(c) The *Owner* shall submit to the *Director* , Environmental Approvals Branch, Ministry of the Environment and Climate Change an application for approval to amend the *ECA* to address any non-compliance Guideline B-7, including if warranted an application to incorporate a contaminant attenuation zone into the approval, and including a proposed updated *EMP* . The application shall outline the options that were considered for bringing the *Site* into compliance with Guideline B-7 and the rationale for the preferred option, and include all necessary supporting documentation.

2 The *Owner* shall monitor surface water and ground water in accordance with documents in Schedule "A".

Annual Report

3 A written report on the development, operation and monitoring of the *Site,* shall be completed annually (the "Annual Report"). The Annual Report shall be submitted to the *District Manager,* by March 31st of the year following the period being reported upon.

4 The Annual Report shall include but not be limited to the following information:
- (a) the results and an interpretive analysis of the results of all leachate, groundwater, surface water and landfill gas monitoring, including an assessment of the need to amend the monitoring programs;
- (b) site plans showing the final contours of the *Site* and vegetative cover;
- (c) a discussion of any operational problems encountered at the *Site* and corrective action taken;
- (d) a report on the status of all monitoring wells and a statement as to compliance with *Regulation 903;*
- (e) any other information with respect to the *Site* which the *District Manager* may require from time to time; and
- (f) a summary and analysis of all hydraulic and geochemical monitoring results.

Groundwater Wells and Monitors

5 The *Owner* shall ensure that all groundwater monitoring wells which form part of the monitoring program are properly capped, locked and protected from damage.

6 Any groundwater monitoring well included in the on-going monitoring program that are damaged shall be assessed, repaired, replaced or decommissioned by the *Owner,* as required.

(a) The *Owner* shall repair or replace any monitoring well which is destroyed or in any way made to be inoperable for sampling such that no more than one regular sampling event is missed.

(b) All monitoring wells which are no longer required as part of the groundwater monitoring program, and have been approved by the *District*

Manager for abandonment, shall be decommissioned by the *Owner,* as required, in accordance with *Reg. 903,* that will prevent contamination through the abandoned well. A report on the decommissioning of the well shall be included in the Annual Report for the period during which the well was decommissioned.

Changes to the Monitoring Plan

7 The *Owner* may request to make changes to the monitoring program(s) to the *District Manager* in accordance with the recommendations of the annual report. The *Owner* shall make clear reference to the proposed changes in separate letter that shall accompany the annual report.

8 Within fourteen (14) days of receiving the written correspondence from the *District Manager* confirming that the *District Manager* is in agreement with the proposed changes to the environmental monitoring program, the *Owner* shall forward a letter identifying the proposed changes and a copy of the correspondences from the *District Manager* and all other correspondences and responses related to the changes to the monitoring program, to the *Director* requesting the *Approval* be amended to approve the proposed changes to the environmental monitoring plan prior to implementation.

9 In the event any other changes to the environmental monitoring program are proposed outside of the recommendation of the annual report, the *Owner* shall follow current ministry procedures for seeking approval for amending the *Approval.*

Trigger Mechanism and Contingency Plan

10 By no later than July 15, 2017*,* the *Owner* shall submit to the *Director,* for approval, and copies to the *District Manager,* details of a trigger mechanisms plan for surface water and groundwater quality monitoring for the purpose of initiating investigative activities into the cause of increased contaminant concentrations

11. By no later than July 15, 2017, the *Owner* shall submit to the *Director* for approval, and copies to the *District Manager,* details of a contingency plan to be implemented in the event that the surface water or groundwater quality exceeds any trigger mechanism.

12 In the event of a confirmed exceedance of a site-specific trigger level relating to leachate mounding or groundwater or surface water impacts due to leachate, the *Owner* shall immediately notify the *District Manager,* and an investigation into the cause and the need for implementation of remedial or contingency actions shall be carried out by the *Owner* in accordance with the approved trigger

mechanisms and associated contingency plans.

13 If monitoring results, investigative activities and/or trigger mechanisms indicate the need to implement contingency measures, the *Owner* shall ensure that the following steps are taken:

(a) The *Owner* shall notify the *District Manager,* in writing of the need to implement contingency measures, no later than 30 days after confirmation of the exceedances;
(b) Detailed plans, specifications and descriptions for the design, operation and maintenance of the contingency measures shall be prepared and submitted by the *Owner* to the *District Manager* for approval; and
(c) The contingency measures shall be implemented by the *Owner* upon approval by the *District Manager* .

14 The *Owner* shall ensure that any proposed changes to the site-specific trigger levels for leachate impacts to the surface water or groundwater, are approved in advance by the *Director* via an amendment to this *Approval.*

SCHEDULE "A"

1. Report prepared by Maclaren Engineers entitled " Support Document for Proposed 1984 extension to the Holbrook Sanitary landfill Site" dated April 1984.

2. Report prepared by MacLaren Engineers entitled " Additional Hydrogeological Investigation at the Holbrook Sanitary Landfill Site" dated October 1983.

3. The terms of the Agreement between the Corporation of the County of Oxford and the Corporation of the Township of Norwich concerning the use, operation and closure of the site dated May 29, 1984.

4. Application form signed by D.L. Pratt of the County of Oxford entitled " Application for a Certificate of Approval for a Waste Disposal Site (Landfill) " dated April 10, 1984.

5. Holbrook Landfill County of Oxford - 2012 Water Monitoring Report" prepared by Genivar Inc. dated May 2013

The reasons for the imposition of these terms and conditions are as follows:

GENERAL

- The reason for Conditions 1(1), (2), (4), (5), (6), (7), (8), (9) and (10) is to clarify the legal rights and responsibilities of the *Owner* under this *Approval* .

- The reasons for Condition 1(3) is to ensure that the *Site* is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the *Owner,* and not in a manner which the *Director* has not been asked to consider.

- The reasons for Condition 1(11) are to ensure that the *Site* is operated under the corporate name which appears on the application form submitted for this approval and to ensure that the *Director* is informed of any changes.

- The reasons for Condition 1(12) are to restrict potential transfer or encumbrance of the *Site* without the approval of the *Director* and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this *Approval* .

- The reason for Condition 1(13) is to ensure that the successor is aware of its legal responsibilities.

- The reason for Condition 1(14) and (15) are that the Part II.*1 Director* is an individual with authority pursuant to Section 197 of the Environmental Protection Act to require registration on title and provide any person with an interest in property before dealing with the property in any way to give a copy of the Approval to any person who will acquire an interest in the property as a result of the dealing.

CLOSURE PLAN

- The reasons for Condition 2 are to ensure that final closure of the *Site* is completed in an aesthetically pleasing manner, in accordance with Ministry standards, and to ensure the long-term protection of the health and safety of the public and the environment.

LANDFILL MONITORING

- Condition 3(1) is included to provide the groundwater and surface water limits to prevent water pollution at the *Site.*

- Conditions 3(2) is included to require the Owner to demonstrate that the *Site* is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.

- The reasons for Condition (3) and 3(4) are to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.

- Conditions 3(5), 3(6) and 3(7) are included to ensure the integrity of the groundwater monitoring network so that accurate monitoring results are achieved and the natural environment is protected.

- Reasons for conditions 3(8), 3(9) and 3(10) are included to streamline the approval of the changes to the monitoring plan.

- Reason for conditions 3(11) to 3 (14) inclusive are added to ensure the *Owner* has a plan with an organized set of procedures for identifying and responding to potential issues relating to groundwater and surface water contamination at the *Site's* compliance point.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). A070702 issued on March 31, 1983

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;

6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 8th day of September, 2016

Dale G. Gable

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

HV/
c: District Manager, MOECC London - District
Field Alert, County of Oxford

COUNTY OF OXFORD
RECEIVED

MAR 13 2018

REFER TO

File/ EDMS:

Ontario
Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

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AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A070702
Notice No. 1
Issue Date: March 6, 2018

County of Oxford
21 Reeve St
Post Office Box, No. 1614
Woodstock, Ontario
N4S 7Y3

Site Location: Holbrook Landfill - closed
Lot 20 & 21, Concession 3
Norwich Township, County of Oxford

You are hereby notified that I have amended Approval No. A070702 *issued on* September 8, 2016 *for* the post closure inspection, monitoring and maintenance of 10.2 hectare closed Holbrook Landfill site within a total site area of 62.31 hectares, *as follows:*

Definition of *"Site"* is revised as follows:

"Site" means the entire waste disposal site, including the buffer land and Contaminant Attenuation Zone located at Parts 1 and 2 of Lot 20 & 21, Concession 3, Township of Norwich, County of Oxford.

Conditions 2(1), 3(2), 3(10) and 3(11) are hereby revoked and replaced with the following:

2. CLOSURE PLAN

2. (1) Closure plan dated June 2017 and amended by letter report dated December 8, 2017 prepared by WSP and submitted to Bob Slivar, Senior Environmental Officer, London District Office, Ministry of the Environment and Climate Change, is hereby approved subject to the conditions of this *Approval.*

3.0 LANDFILL MONITORING

3. (2) The *Owner* shall monitor surface water and ground water in accordance with Schedules

"B" and "C".

Trigger Mechanism and Contingency Plan

3. (10) Trigger mechanisms shall be in accordance with Items 6 and 7 in Schedule "A".

3. (11) Contingency plan in the event of a confirmed exceedance of a site-specific trigger level relating to leachate mounding or groundwater or surface water impacts due to leachate shall be in accordance with Items 6 and 7 in Schedule "A".

Conditions 2(2) and 2(3) are added to the *Approval:*

2. (2) No person shall use, operate, establish, alter, enlarge or extend a waste disposal site except under and in accordance with an environmental compliance approval. As such the *Owner/Operator* shall obtain approval from the *Director* through an amendment to this *Approval* prior to any changes to the approved closure plan/facilities within the closed *Site.*

2. (3) Notwithstanding condition 2(1), the *Owner* shall submit to the *Director* for approval for any change to the current "natural open space with restricted public access". Supporting documentation to the application shall contain the following as a minimum:

(a) Detailed plan showing all the groundwater monitoring wells;
(b) A detailed site plan showing where any structures or pathways are located;

(c) Potential dangers related to methane gas is a concern to the *Ministry.* Decomposition of waste and producing methane can continue many years pass the closure of a landfill depending on factors within the landfill that expedite or slow down decomposition of An assessment of methane gas in the landfill as this will help the *Ministry* determine if the site is safe for public use; and
(d) Consultation with the interested parties (specially residents within 500 m) about the change in landuse and the proposal.

The following items are added to the Schedule "A":

SCHEDULE "A"

6. Report titled "Holbrook Landfill, Closure Plan" dated June 2017 prepared by WSP Canada Inc.

7. Letter report dated December 8, 2017 prepared by Albert Siertsema, P.Eng., Project Engineer, Environment and Dan Mohr, P.Eng., Assistant Vice President Environment, Ontario, submitted to Bob Slivar, Senior Environmental Officer, London District Office, Ministry of the Environment and Climate Change as a response to comments from Technical Support, Ministry of the Environment and Climate Change.

Schedule "B"
Surface Water Monitoring Program

ACTIVITY	LOCATION	SAMPLING FREQUENCY	ANALYSIS / MEASUREMENT
Surface Water Sampling	**Surface Water Station:** C01, C06	Semi-annual (spring and fall)	**Field Parameters:** pH, conductivity, temperature, turbidity **General Parameters:** pH, conductivity, hardness **Major and Minor Ions:** alkalinity, calcium, chloride, magnesium, potassium, sodium, sulphate **Nutrients and Organics:** ammonia, un-ionized ammonia, nitrate, nitrite **Dissolved Metals:** boron, chromium, iron, manganese
	Surface Water Station: C04, P01, P02, P03, NE1	Annual (spring)	**Field Parameters:** pH, conductivity, temperature, turbidity **General Parameters:** pH, conductivity, hardness **Major and Minor Ions:** alkalinity, calcium, chloride, magnesium, potassium, sodium, sulphate **Nutrients and Organics:** ammonia, un-ionized ammonia, nitrate, nitrite **Dissolved Metals:** boron, chromium, iron, manganese

Schedule "C"
Groundwater and Landfill Gas Monitoring Programs

ACTIVITY	LOCATION	SAMPLING FREQUENCY	ANALYSIS / MEASUREMENT
Groundwater and Leachate Level Monitoring	**Shallow Flow System:** 4R, 5R, 10R, 11R, 13R, 14R, 15A, 16AR, 18R, 19R, 24AR, 26R, 28R, 32R, 33R, 39, 40, 43, 44, SG1 **Deep Flow System:** 16R, 21R, 24R, 25R, 27, 31, 35, 37R, 38, 42 **Leachate Well: 41**	Annual (May)	Water Level Measurement
Groundwater and Leachate Sampling	**Shallow Flow System:** 11R, 16AR, 19R, 26R, 28R, 32R, 40, 43, 44 **Deep Flow System:** 21R, 24R, 25R, 27, 37R, 38, 39, 42 **Private Wells:** D2 (Pearce) **Leachate Well: 41**	Annual (May)	**Field Parameters:** pH, conductivity, temperature **General Parameters:** pH, conductivity, hardness **Major and Minor Ions:** alkalinity, calcium, chloride, magnesium, potassium, sodium, sulphate **Nutrients and Organics:** ammonia, nitrate, nitrite, TKN, DOC **Dissolved Metals:** boron, chromium, iron, manganese
	Shallow Flow System: 32R, 26R, 40, 43, 44 **Deep Flow System:** 27, 37R, 38, 39, 42 **Leachate Well: 41**	Annual (May)	**Volatile Organic Compounds:** vinyl chloride, benzene, 1,4 dichlorobenzene
Landfill Gas Monitoring	**Standpipes:** SP3R, SP4R, SP5	Annual	Methane, carbon dioxide, oxygen, balance gas, as well as water level

The reasons for this amendment to the *Approval* are as follows:

- Preamble is amended to clarify the approved total *Site* area which includes Contaminant Attenuation Zone.

- Condition 2(1) was revised to approve the closure plan for the *Site* to ensure the final closure of the *Site* is completed in an aesthetically pleasing manner, in accordance with *Ministry* standards, and to ensure the long-term protection of the health and safety of the public and the environment.

- Condition 3(2) is included to require the *Owner* to demonstrate that the *Site* is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken. This condition was revised to approve the revised groundwater and surface water monitoring program.

- Conditions 3(10) and 3(11) approved trigger mechanisms and contingency plans proposed for the *Site.* This provides a plan with an organized set of procedures for identifying and responding to potential issues relating to groundwater and surface water contamination at the *Site's* compliance point.

- Conditions 2(2) and 2(3) are added to ensure that the *Site* is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the *Owner,* and not in a manner which the *Director* has not been asked to consider.

This Notice shall constitute part of the approval issued under Approval No. A070702 dated September 8, 2016 as amended.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;

6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

* **Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 6th day of March, 2018

Dale D. Gable

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the *Environmental Protection Act*

RM/
c: District Manager, MOECC London - District
Dave Vermeeren, Waste Management Supervisor, County of Oxford

APPENDIX

B

BOREHOLE LOGS

GEOLOGICAL LOG

SCALE (ft)(m)	EL (m) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	279.6	GROUND SURFACE		1.37 m			
(ft) 5 (m) 1, 2, 3	0.0	Yellowish grey loose very fine sandy silt		CLAY	1 2	SS SS	9 6
10, 15, 20, 25 (m) 4, 5, 6, 7, 8	275.9 3.7	Grey compact layered silty fine to medium gravelly very fine to coarse sand		BACKFILL	3 4 5	SS SS SS	10 20 13
30, 35 (m) 9, 10		Grey interlayered compact fine sand and medium to coarse sand near base		AND	6 7	SS SS	14 15
40 (m) 11, 12	268.6 11.0	Grey clayey silt (grey silty sand with some clay from above)		CAVE	8	SS	17
45, 50 (m) 13, 14, 15	266.9 12.7	End of Hole					

TEST HOLE No. 2

SHEET 1 OF 1

NOTES

DATE DRILLED 1 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 2.5
(m below ground surface)

STATIC WATER LEVEL 2.9 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 276.7 Static Water Elevation (m GSD) (26 JUNE 1979) *

╪ Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

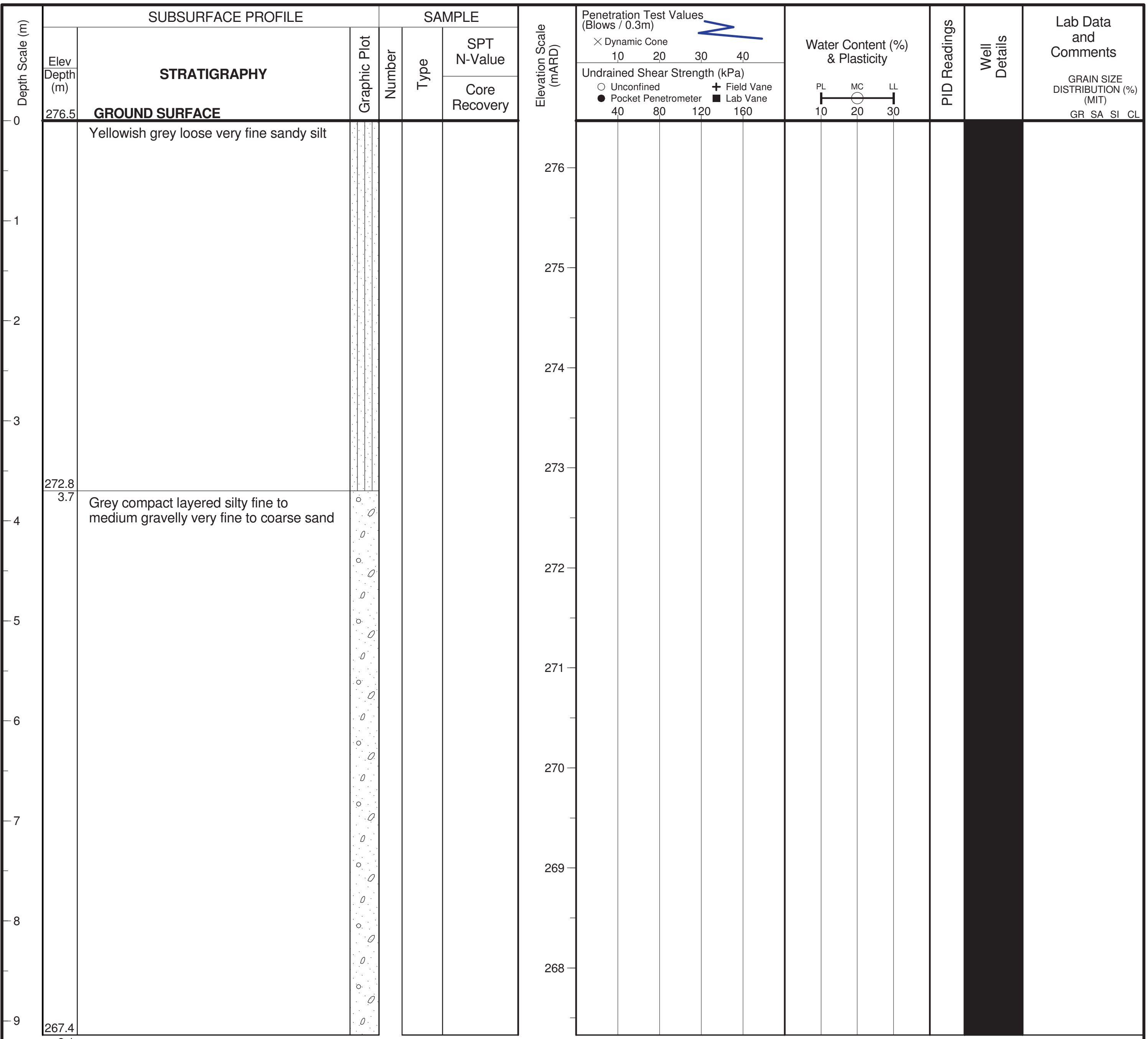
PROJECT NO. 11602-5

LOG OF BOREHOLE 2 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/30
supervisor | MEQ
reviewer | AMS



Elev Depth (m)	STRATIGRAPHY
276.5	**GROUND SURFACE**
	Yellowish grey loose very fine sandy silt
272.8 3.7	Grey compact layered silty fine to medium gravelly very fine to coarse sand
267.4 9.1	**END OF BOREHOLE**

Stratigraphy inferred from original borehole log for BH2 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

GEOLOGICAL LOG

TEST HOLE No. 4

SHEET 1 OF 1

SCALE (ft)(m)	EL (m) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	279.0	GROUND SURFACE		0.99 m			
	0.0	Brown fine gravelly clayey silt		CLAY BACKFILL	1	SS	6
				CAVE AND	2	SS	14
	275.0 4.0	Brown interlayered fine sandy silt to silty fine sand and fine to medium sand overlying dense fine gravelly very fine to very coarse sand near base			3	SS	--
					4	SS	31
	272.4 6.6	End of Hole					

(ft): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

(m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

NOTES

DATE DRILLED 1 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 3.8 (m below ground surface)

STATIC WATER LEVEL 2.4 * (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON

WA-WASH

▽ 276.6 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

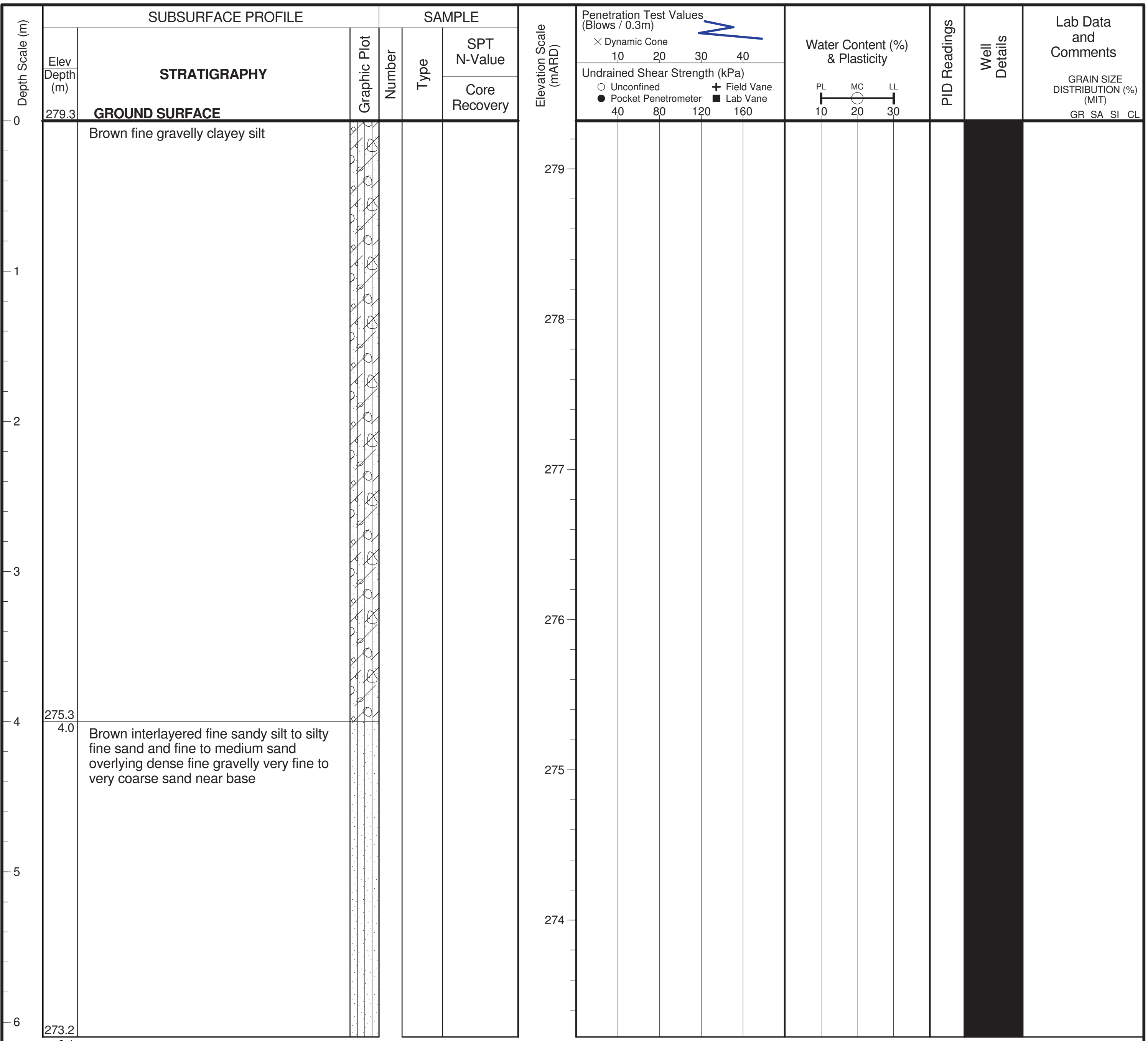
PROJECT NO. 11602-5

LOG OF BOREHOLE 4 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/24
supervisor | MEQ
reviewer | AMS



Elev Depth (m)	STRATIGRAPHY
279.3	**GROUND SURFACE**
	Brown fine gravelly clayey silt
275.3 4.0	Brown interlayered fine sandy silt to silty fine sand and fine to medium sand overlying dense fine gravelly very fine to very coarse sand near base
273.2 6.1	**END OF BOREHOLE**

Stratigraphy inferred from original borehole log for BH4 (MacLaren Engineers Inc., 1979).

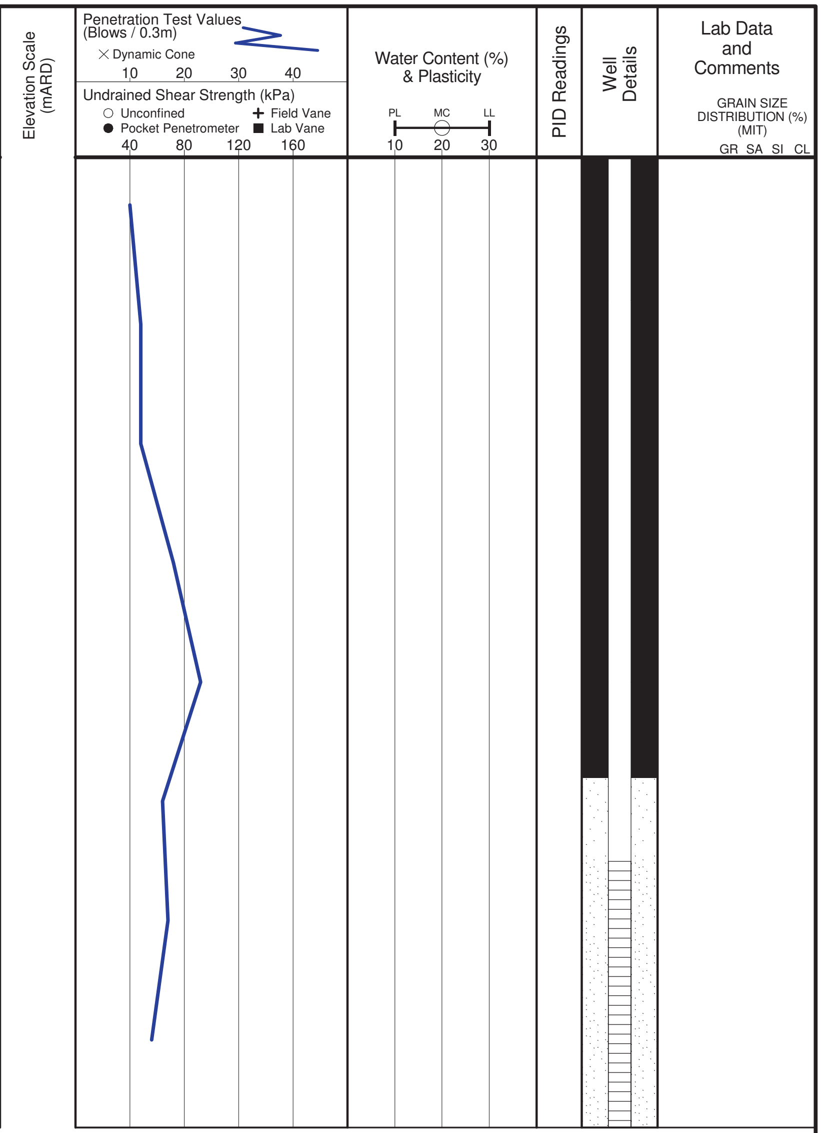
Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

LOG OF BOREHOLE 4R

project | Holbrook Landfill Site
project no. | 111-53037-00 132-00
client | Oxford County
rig type | CME 75, track-mounted
date started | 2014/09/24
location | Holbrook, ON
method | Hollow stem augers, 215 mm dia.
supervisor | MEQ
position |
coring | *n/a*
reviewer | AMS

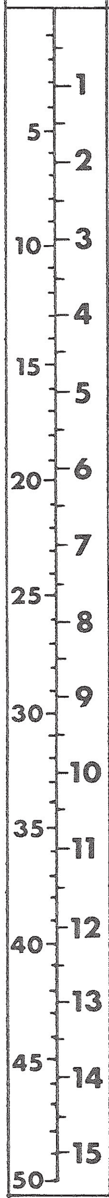
SUBSURFACE PROFILE			SAMPLE		
Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery
	GROUND SURFACE				
	Brown **TOPSOIL** and organics, some roots, some clayey silt, dry, loose.		1	SS	10
0.6	Orangey brown to brown fine **SAND AND GRAVEL**, some silt, moist to wet, compact.		2	SS	12
	Some roots and cobbles, red brown silty sand.		3	SS	12
			4	SS	18
			5	SS	23
3.8	Grey brown coarse **SAND AND GRAVEL**, trace fine sand, trace silt, saturated, compact.		6	SS	16
			7	SS	17
			8	SS	14
6.2	**END OF BOREHOLE**				

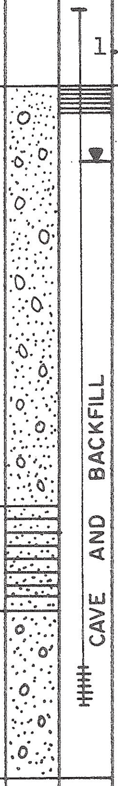


GEOLOGICAL LOG

TEST HOLE No. 5

SHEET 1 OF 1





EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
278.7	GROUND SURFACE			
0.0	Brown compact medium gravelly very fine to very coarse sand with layers of medium sand	1	SS	10
		2	SS	14
		3	SS	19
273.2 5.5	Brown compact fine sandy silt and very fine sand	4	SS	20
271.8 6.9	Brown dense fine gravelly coarse to very coarse sand	5	SS	38
269.6 9.1	End of Hole			

NOTES

DATE DRILLED 1 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 1.0
(m below ground surface)

STATIC WATER LEVEL 1.0 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 277.7 Static Water Elevation (m GSD) (26 JUNE 1979) *

╪ Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 5 Decommissioning

project | Holbrook Landfill Site

client | Oxford County

location | Holbrook, ON

project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted

method | Hollow stem augers, 215 mm dia.

coring | *n/a*

date started | 2014/09/23

supervisor | MEQ

reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Graphic Plot	SAMPLE Number	SAMPLE Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40; Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	279.2	**GROUND SURFACE**										
		Brown compact medium gravelly very fine to very coarse sand with layers of medium sand					279					
1							278					
2							277					
3							276					
4							275					
5							274					
	273.7 5.5	Brown compact fine sandy silt and very fine sand										
6							273					
	272.3 6.9	Brown dense fine gravelly coarse to very coarse sand										
7							272					
8	271.1 8.1											

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH5 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 5R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
position |

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

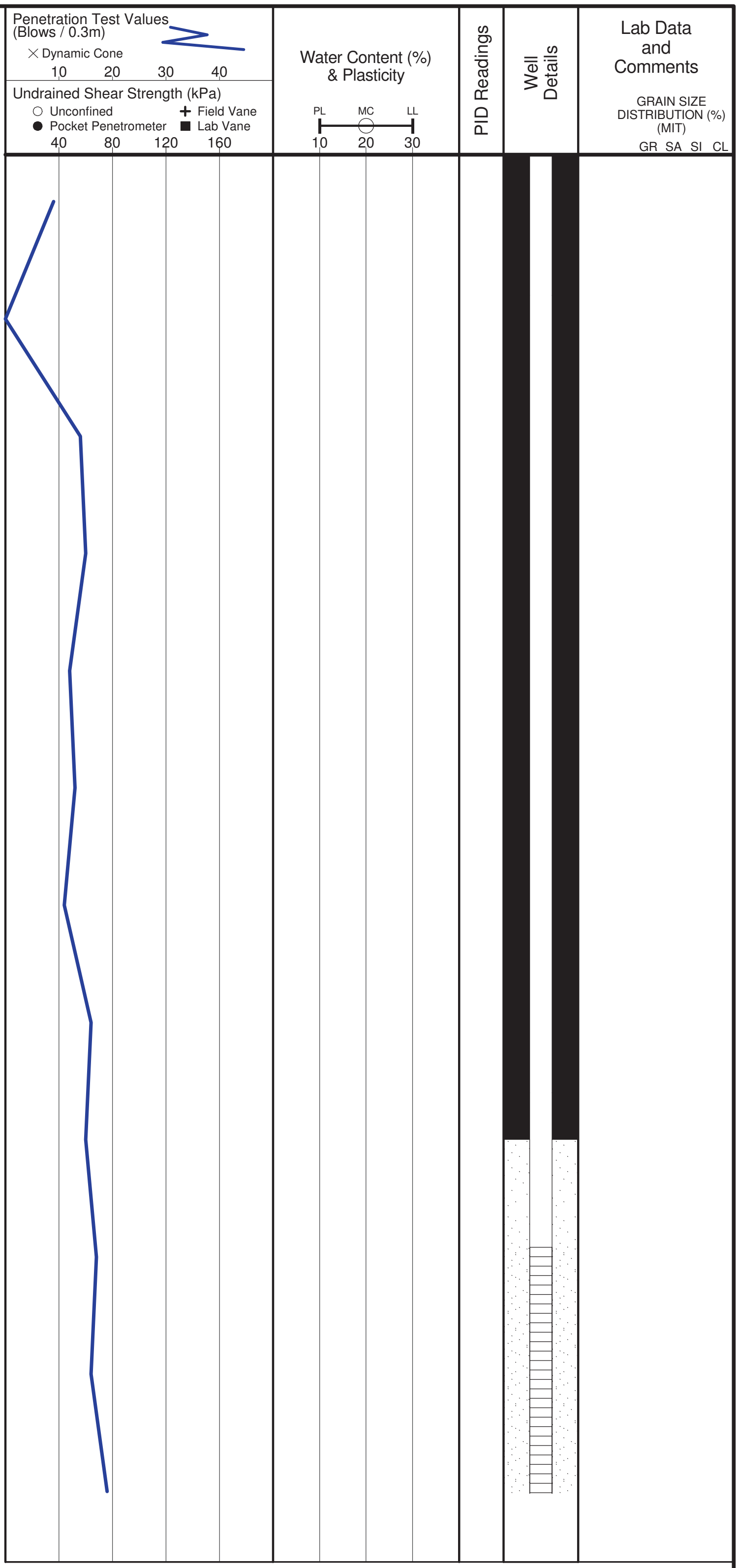
project no. | 111-53037-00 132-00
date started | 2014/09/24
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
	GROUND SURFACE
	Brown fine to coarse **SAND**, some medium gravel, some organics, dry to moist, very loose to loose.
1.1	Grey brown to orangey brown fine to coarse **SAND**, trace to some silt, some medium gravel, moist to wet, compact.
4.6	Grey brown fine to coarse **SAND AND GRAVEL**, trace to some silt, wet, compact.
7.6	Grey brown coarse **SAND AND GRAVEL**, some silt, saturated, compact.
9.1	**END OF BOREHOLE**

SAMPLE

Number	Type	SPT N-Value
1	SS	9
2	SS	0
3	SS	14
4	SS	15
5	SS	12
6	SS	13
7	SS	11
8	SS	16
9	SS	15
10	SS	17
11	SS	16
12	SS	19



library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

GEOLOGICAL LOG

TEST HOLE No. 6

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	278.7	GROUND SURFACE		0.73 m			
	0.0	Brown compact medium gravelly very fine to very coarse sand with layers of medium sand		CLAY CAVE AND BACKFILL			
	274.1 4.6	End of Hole					

SCALE (ft): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

SCALE (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

NOTES

DATE DRILLED 1 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 1.0
(m below ground surface)

STATIC WATER LEVEL 1.0 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 277.7 Static Water Elevation (mGSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 6 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/23
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	SUBSURFACE PROFILE Elev Depth (m)	STRATIGRAPHY	Graphic Plot	SAMPLE Number	Type	SPT N-Value Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	279.2	**GROUND SURFACE**										
		Brown compact to medium gravelly very fine to very coarse sand with layers of medium sand					279					
1							278					
2							277					
3							276					
	275.5 3.7											

END OF BOREHOLE

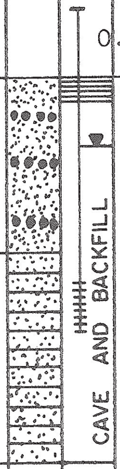
Stratigraphy inferred from original borehole log for BH6 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

GEOLOGICAL LOG

TEST HOLE No. 10

SHEET 1 OF 1



SCALE (ft)(m)	EL (m) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	280.0	GROUND SURFACE		0.95 m			
	0.0	Brown compact fine to medium sand with fine gravel layers		CLAY	1	SS	23
	277.7 2.3	Brown loose silty very fine sand		CAVE AND BACKFILL	2	SS	9
					3	SS	6
	275.0 5.0	End of Hole					

NOTES

DATE DRILLED 3 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 0.8
(m below ground surface)

STATIC WATER LEVEL 0.9 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 279.2 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 10 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/09
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE | SAMPLE: Number, Type, SPT N-Value, Core Recovery

Penetration Test Values (Blows / 0.3m): × Dynamic Cone 10 20 30 40
Undrained Shear Strength (kPa): ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160
Water Content (%) & Plasticity: PL MC LL 10 20 30
PID Readings
Well Details
Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Elevation Scale (mARD)
0	281.6	**GROUND SURFACE**	
		Brown compact fine to medium sand with fine gravel layers	281
1			
			280
2	279.3 2.3	Brown loose silty very fine sand	
			279
3	278.3 3.4		

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH10 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

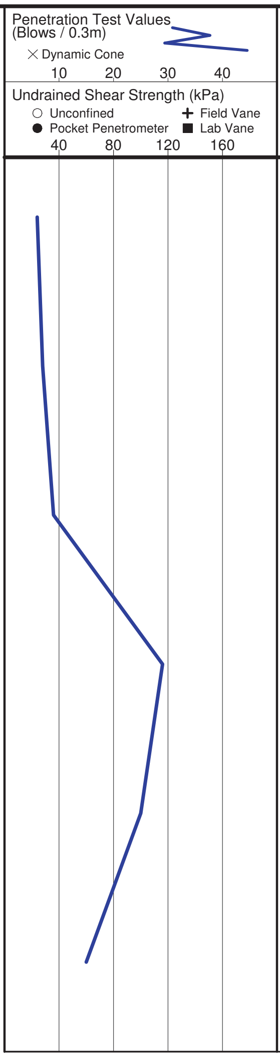
LOG OF BOREHOLE 10R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/09
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Number	Type	SPT N-Value
0		**GROUND SURFACE**			
		Dark brown **SANDY TOPSOIL**, dry to moist, loose.			
	0.3	Light brown fine to medium **SAND**, dry to moist, loose.	1	SS	6
1			2	SS	7
2			3	SS	9
	2.3	Light brown coarse **SAND** and fine to medium angular **GRAVEL**, wet, loose.	4	SS	29
3	2.7	Brown **SILTY SAND**, fine grained, wet to saturated, dilatent, compact.	5	SS	25
4			6	SS	15
	4.6	**END OF BOREHOLE**			



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

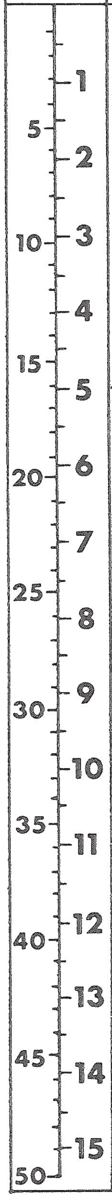
Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

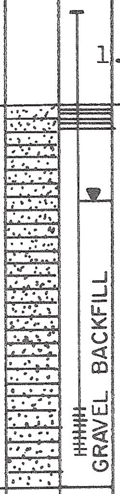
TEST HOLE No. 11

SHEET 1 OF 1

GEOLOGICAL LOG

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
					1.28	m	
	280.5	GROUND SURFACE					
	0.0	Brown clayey very fine sandy silt		CLAY			
					1	SS	9
				GRAVEL BACKFILL	2	SS	16
					3	SS	16
	275.5						
	5.0	End of Hole					





NOTES

DATE DRILLED 3 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 1.2
(m below ground surface)

STATIC WATER LEVEL 1.3 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 279.1 Static Water Elevation (m GSD) (26 JUNE 1979) *

╪ Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 11 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/15
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Graphic Plot	SAMPLE Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 / Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	280.8	**GROUND SURFACE**										
		Brown clayey very fine sandy silt										
							280					
1												
							279					
2												
							278					
3												
							277					
4												
	276.3 4.5											

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH11 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

LOG OF BOREHOLE 11R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

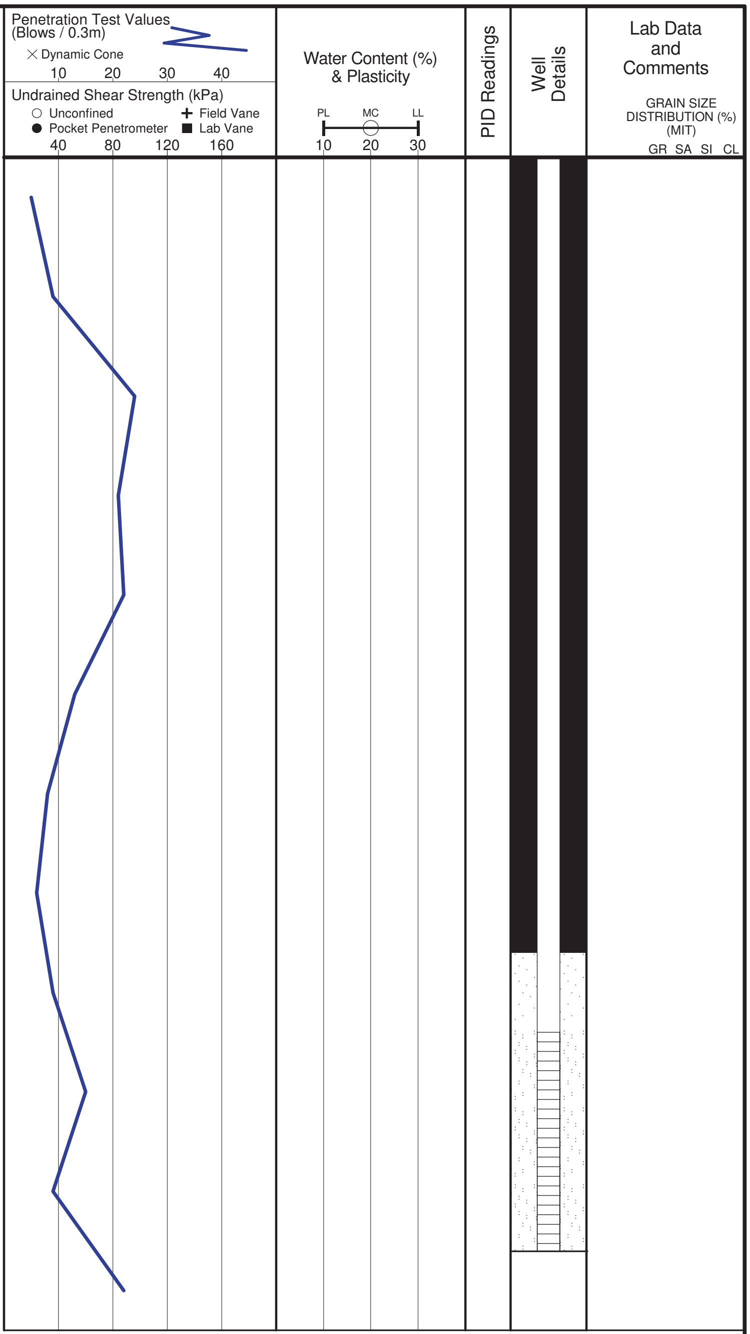
date started | 2015/07/24
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
	GROUND SURFACE
0	Dark brown **TOPSOIL**, some fine silty sand, rootlets, moist, loose.
0.3	Reddish brown fine to medium **SAND**, trace gravel, dry to moist, loose, compact below 1.5 m.
3.1	Reddish brown fine **SAND**, trace to some silt, trace fine gravel, wet, compact.
4.6	Reddish brown **SANDY SILT**, trace clay, wet, stiff.
5.3	Grey-brown **CLAYEY SILT**, some fine to medium sand, APL to WTPL, stiff.
6.9	Grey-brown **SANDY SILT**, trace clay, trace fine to medium gravel, wet, compact.
8.4	Grey **CLAYEY SILT**, some gravel, trace sand, DTPL, very stiff.
9.0	**END OF BOREHOLE**

SAMPLE

Number	Type	SPT N-Value
1	SS	5
2	SS	9
3	SS	24
4	SS	21
5	SS	22
6	SS	13
7	SS	8
8	SS	6
9	SS	9
10	SS	15
11	SS	9
12	SS	22



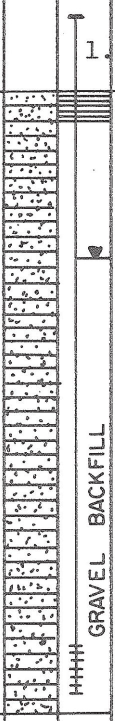
GEOLOGICAL LOG

TEST HOLE No. 12

SHEET 1 OF 1

SCALE (ft)	SCALE (m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
		280.5	GROUND SURFACE			
		0.0	Brown clayey very fine sandy silt			
	1					
5	2					
10	3					
	4					
15	5					
20	6			1	SS	--
	7					
25	8	272.4 / 8.1	End of Hole	2	SS	20
30	9					
	10					
35	11					
40	12					
	13					
45	14					
50	15					

STRAT. PLOT / PIEZOMETER



NOTES

DATE DRILLED 3 May 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 1.2
(m below ground surface)

STATIC WATER LEVEL 2.2 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 278.3 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 12 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/16
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE: STRATIGRAPHY	Graphic Plot	SAMPLE: Number	SAMPLE: Type	SAMPLE: SPT N-Value / Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40; Undrained Shear Strength (kPa) ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	280.7	**GROUND SURFACE**										
		Brown clayey very fine sandy silt					280					
1							279					
2							278					
3							277					
4							276					
5							275					
6							274					
7	272.9 7.8						273					

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH12 (MacLaren Engineers Inc., 1979).

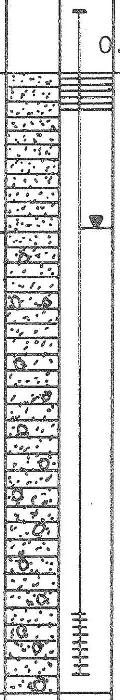
Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

GEOLOGICAL LOG

TEST HOLE No. 13

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	273.8	GROUND SURFACE		0.88 m			
	0.0	Brown mottled silt near surface overlying Brown compact silty very fine sand			CLAY		
					1	SS	24
	271.7 2.1	Grey/brown fine gravelly very fine sandy clayey silt					
					2	SS	15
					3	SS	18
					4	SS	16
					5	SS	15
	265.7 8.1						



(ft) 5 10 15 20 25 30 35 40 45 50

(m) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

NOTES

DATE DRILLED 13 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND -
(m below ground surface)

STATIC WATER LEVEL 2.2 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 271.6 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

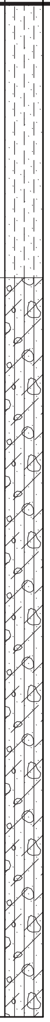
LOG OF BOREHOLE 13 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/25
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Graphic Plot	SAMPLE Number	Type	SPT N-Value Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	274.1	**GROUND SURFACE**										
		Brown mottled silt near surface overlying brown compact silty very fine sand.					274					
1							273					
2	272.0 2.1	Grey/brown fine gravelly very fine sandy clayey silt					272					
3							271					
4							270					
5							269					
6							268					
7							267					
	266.3 7.8											



END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH13 (MacLaren Engineers Inc., 1979).

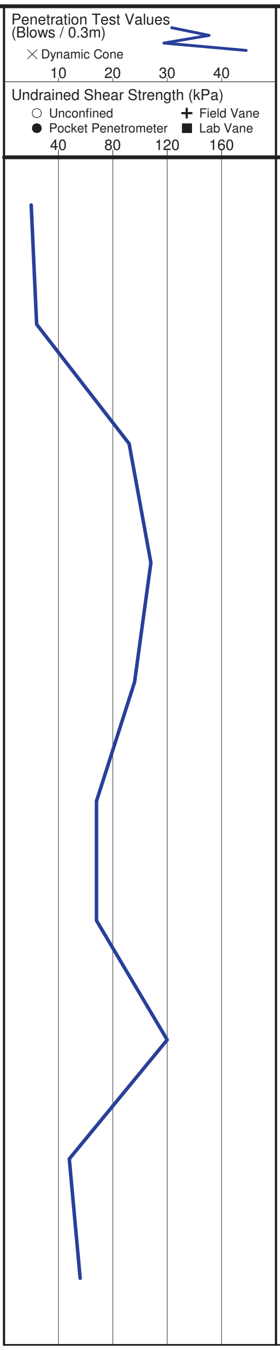
Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 13R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
position |

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

project no. | 111-53037-00 132-00
date started | 2014/09/25
supervisor | SCL
reviewer | AMS



Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Graphic Plot	SAMPLE Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0		**GROUND SURFACE**									
		Orangey brown **SILTY SAND**, trace rootlets and roots, some fine to coarse sand, trace gravel, moist, loose.		1	SS	5					
1				2	SS	6					
2	1.5	Orangey brown fine to medium **SAND**, some silt, some rounded gravel, moist to wet, compact.		3	SS	23					
				4	SS	27					
3		Increasing presence of coarse gravel and cobbles at 3 m.		5	SS	24					
4	3.8	Orangey brown **SANDY SILT**, becoming grey brown below 5 m, trace fine rounded gravel, dilatent, APL, very stiff.		6	SS	17					
5				7	SS	17					
6				8	SS	30					
	6.1	Grey **SILT**, some clay, trace to some fine sand, trace rounded gravel, weakly dilatent, APL to WTPL, stiff.		9	SS	12					
7				10	SS	14					
	7.6	**END OF BOREHOLE**									

GEOLOGICAL LOG

TEST HOLE No. 14

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	275.5	GROUND SURFACE			1.23 m		
1 5	0.0 273.7	Grey gravelly clayey fine sandy silt overlying grey compact silty fine sand			CLAY 1	SS	16
2 3 10 4	1.8 271.5	Grey fine gravelly clayey very fine to fine sandy silt			2	SS	9
15 5 6 20	4.0 268.9	Grey dense interlayered fine, medium and coarse sand, sandy gravel and gravelly sand. (Grey silty very fine sand at base).			3 4	SS SS	40 42
7 25 8 9 30 10 11 35 12 40 13 14 45 15 50	6.6	End of Hole					

NOTES

DATE DRILLED 13 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 0.8
(m below ground surface)

STATIC WATER LEVEL +0.7 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 276.2 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 14 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/17
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 / Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
	275.9	**GROUND SURFACE**									
0		Grey gravelly clayey fine sandy silt overlying grey compact silty fine sand				275					
1	274.3 1.6	Grey fine gravelly clayey very fine to fine sandy silt				274					
2						273					
3						272					
4	271.9 4.0	Grey dense interlayered fine, medium and coarse sand, sandy gravel and gravelly sand. (Grey silty very fine sand at base).				271					
	270.9 5.0										

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH14 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

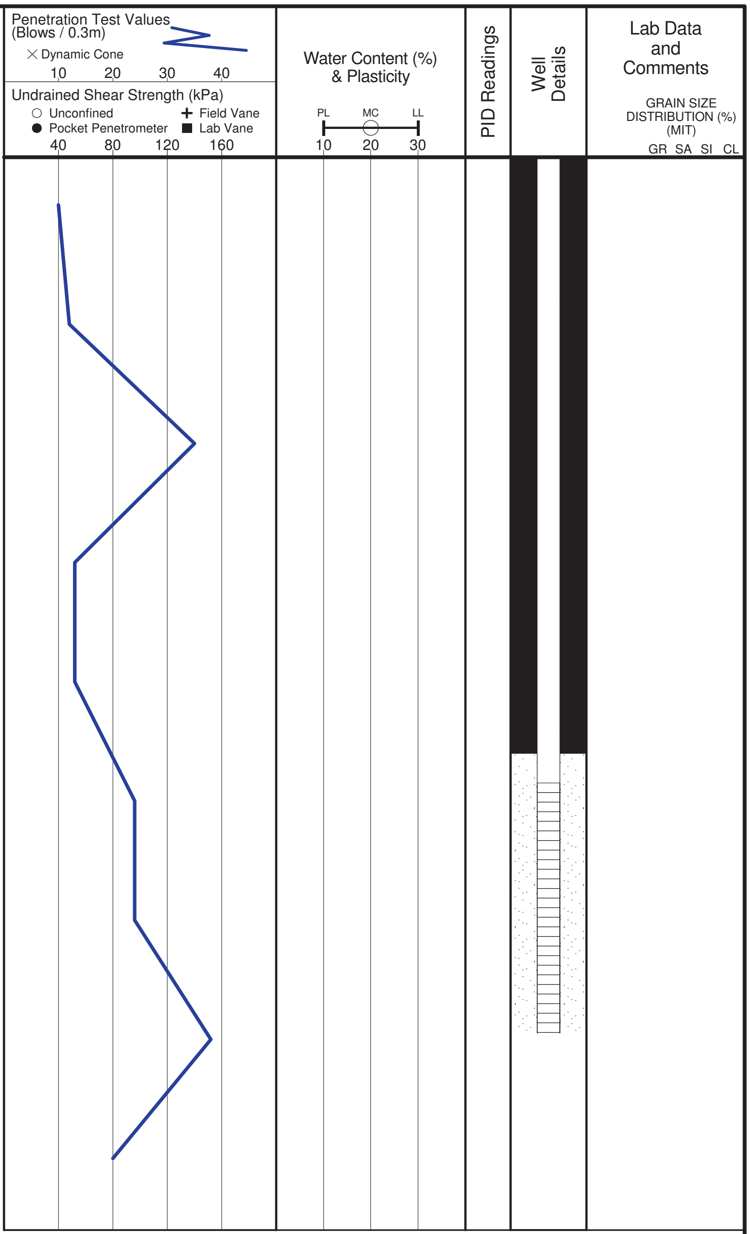
LOG OF BOREHOLE 14R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
position |

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

project no. | 111-53037-00 132-00
date started | 2014/09/17
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
		GROUND SURFACE			
0		Brown grey **CLAYEY SILT**, with orange striations, some sandy silt, trace medium gravel, trace organics, DTPL to APL, firm.	1	SS	10
1			2	SS	12
	1.5	Brown grey fine **SILTY SAND**, some medium gravel, wet, loose to compact.	3	SS	35
2			4	SS	13
	2.6	Grey **CLAYEY SILT**, trace fine gravel, trace sand, APL to WTPL, firm.			
3			5	SS	13
	3.8	Grey medium to coarse **SAND AND GRAVEL**, some sandy silt, trace clay, saturated, compact to dense.			
4			6	SS	24
5		Increasing presence of coarse gravel and cobbles at 5 m.	7	SS	24
			8	SS	38
6			9	SS	20
	6.9	**END OF BOREHOLE**			



GEOLOGICAL LOG

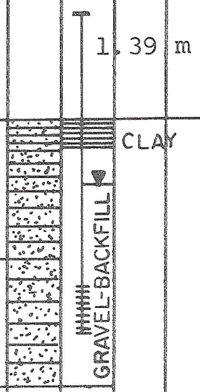
TEST HOLE No. 14A

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	275.5	GROUND SURFACE					
	0.0 273.7	Grey gravelly clayey fine sandy silt overlying grey compact silty fine sand					
	1.8 272.1	Grey fine gravelly clayey very fine to fine sandy silt					
	3.4	End of Hole					

(ft) 5 10 15 20 25 30 35 40 45 50

(m) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15



NOTES

DATE DRILLED 13 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 0.8
(m below ground surface)

STATIC WATER LEVEL 0.8 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER
Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 274.7 Static Water Elevation (m GSD) (26 JUNE 1979) *

╪ Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 14A Decommissioning

WSP

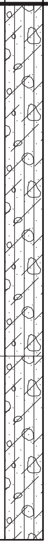
project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/17
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE | SAMPLE

Depth Scale (m) | Elev Depth (m) | **STRATIGRAPHY** | Graphic Plot | Number | Type | SPT N-Value / Core Recovery | Elevation Scale (mARD) | Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40; Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160 | Water Content (%) & Plasticity PL MC LL 10 20 30 | PID Readings | Well Details | Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL



Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Elevation Scale (mARD)
0	275.9	**GROUND SURFACE**	
		Grey gravelly clayey fine sandy silt overlying grey compact silty fine sand	
1			275
	274.1 1.8	Grey fine gravelly clayey very fine to fine sandy silt	
2			274
	273.2 2.7		

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH14A (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

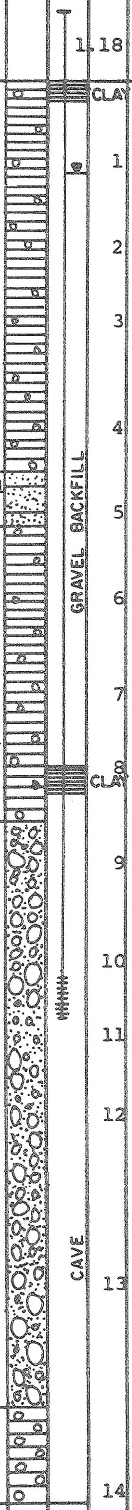
library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpi

GEOLOGICAL LOG

TEST HOLE No. 15

SHEET 1 OF 1

EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
277.9	GROUND SURFACE			
0.0	Brown gravelly clayey silt			
		1	SS	6
		2	SS	32
		3	SS	19
		4	SS	24
271.2 6.7	Brown compact interlayered silty fine sand, fine to medium sand and very fine sandy silt	5	SS	11
270.3 7.6	Brown gravelly clayey silt			
		6	SS	4
		7	SS	92
		8	SS	39
265.1 12.8	Brown compact to dense fine to very coarse sandy fine to medium gravel (minor silt)			
		9	SS	--
		10	SS	35
		11	SS	22
		12	SS	--
		13	SS	--
255.0 22.9	Brown very dense gravelly silt till			
		14	SS	70+
253.4 24.5	End of Hole			



NOTES

DATE DRILLED 13 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND —
(m below ground surface)

STATIC WATER LEVEL 1.6 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 276.3 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 15 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/22
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE | SAMPLE: Number, Type, SPT N-Value, Core Recovery | Elevation Scale (mARD) | Penetration Test Values (Blows / 0.3m): × Dynamic Cone 10 20 30 40 | Undrained Shear Strength (kPa): ○ Unconfined, ✚ Field Vane, ● Pocket Penetrometer, ■ Lab Vane 40 80 120 160 | Water Content (%) & Plasticity: PL MC LL 10 20 30 | PID Readings | Well Details | Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Elev Depth (m)	STRATIGRAPHY
278.3	**GROUND SURFACE**
	Brown gravelly clayey silt
271.6 6.7	Brown to compact interlayered silty fine sand, fine to medium sand and very fine sandy silt
270.7 7.6	Brown gravelly clayey silt
265.5 12.8	Brown compact to dense fine to very coarse sandy fine to medium gravel (minor silt)
262.3 16.0	**END OF BOREHOLE**

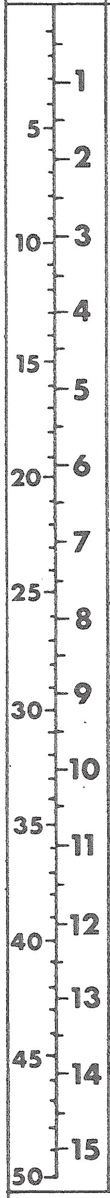
Stratigraphy inferred from original borehole log for BH15 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

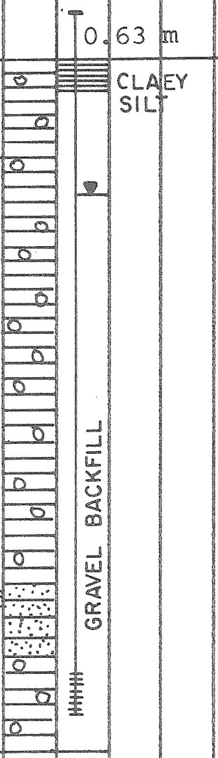
GEOLOGICAL LOG

TEST HOLE No. 15A

SHEET 1 OF 1



EL (mGSD) / DEPTH (m)	DESCRIPTION
278.1	GROUND SURFACE
0.0	Brown gravelly clayey silt
271.2 6.9	Brown compact interlayered silty fine sand, fine to medium sand and very fine sandy silt
270.3 7.8	Brown gravelly clayey silt
269.0 9.1	End of Hole



NOTES

DATE DRILLED 14 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND --
(m below ground surface)

STATIC WATER LEVEL 1.8 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS-SPLIT SPOON

WA-WASH

▽ 276.3 Static Water Elevation (m GSD) (26 JUNE 1979)*

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

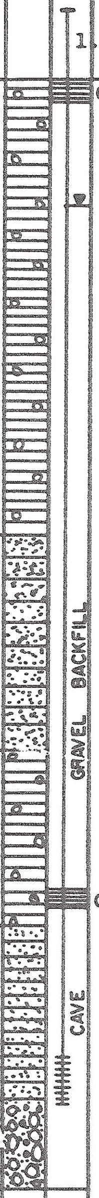
G.M.P.

PROJECT NO. 11602-5

GEOLOGICAL LOG

TEST HOLE No. 16

SHEET 1 OF 1



EL (mGSD)	DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
277.8		GROUND SURFACE			
	0.0	Brown gravelly clayey silt	1	SS	32
			2	SS	15
		(Brown fine sandy gravel layer at ~ 4.6 m BGS)	3	SS	12
			4	SS	14
270.8	7.0	Brown very loose to compact very fine sandy silt	5	SS	13
			6	SS	3
267.4	10.4	Brown gravelly clayey silt	7	SS	23
			8	SS	40
264.7	13.1	Brown very loose to compact silty very fine to fine sand	9	SS	3
			10	SS	21
262.0	15.8	Brown dense medium to coarse sand, fine to coarse sandy fine to medium gravel	11	SS	24+
260.6	17.2	End of Hole			

NOTES

DATE DRILLED 14 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND --
(m below ground surface)

STATIC WATER LEVEL 2.0 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER Trow

SAMPLE TYPE

SS - SPLIT SPOON

WA - WASH

▽ 275.9 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G. M. P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 16 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/18
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE | SAMPLE

Depth Scale (m) | Elev Depth (m) | **STRATIGRAPHY** | Graphic Plot | Number | Type | SPT N-Value / Core Recovery | Elevation Scale (mARD)

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined ✚ Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Elev Depth (m)	STRATIGRAPHY
278.2	**GROUND SURFACE**
	Brown gravelly clayey silt (Brown fine sandy gravel layer at ~ 4.6 m BGS)
271.2 7.0	Brown very loose to compact very fine sandy silt
267.8 10.4	Brown gravelly clayey silt
265.1 13.1	Brown very loose to compact silty very fine to fine sand
262.4 15.8	**END OF BOREHOLE**

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Elevation Scale (mARD): 278 277 276 275 274 273 272 271 270 269 268 267 266 265 264 263

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH16 (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 16R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
position |

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

project no. | 111-53037-00 132-00
date started | 2014/09/19
supervisor | MEQ
reviewer | AMS

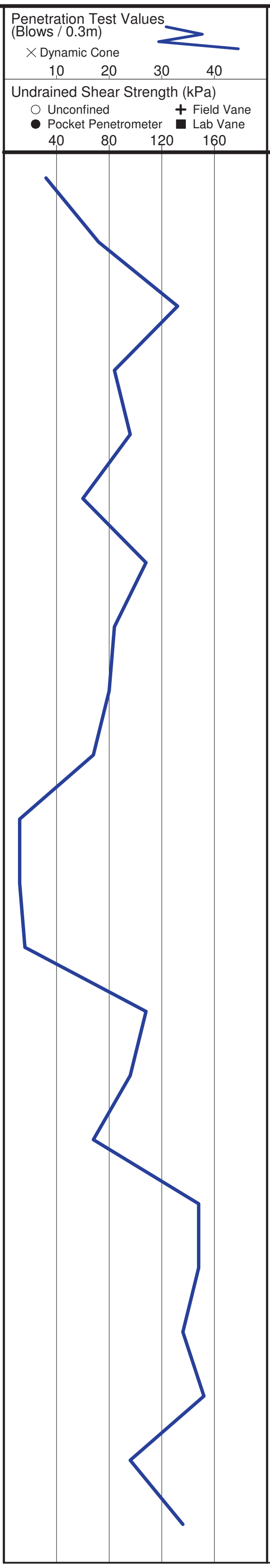
SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
	GROUND SURFACE
0	Brown **CLAYEY SILT**, some fine to medium gravel, trace sand, DTPL, stiff to very stiff. Abundant rootlets to 0.8 m depth.
2.3	Brown to grey **CLAYEY SILT**, some orange striations, trace fine sand, trace gravel, DTPL, stiff to very stiff.
4.9	Grey brown fine **SILTY GRAVEL AND SAND**, trace to some cobbles, wet, compact.
6.0	Grey **CLAYEY SILT**, trace fine silty sand, APL, stiff.
7.8	Grey fine **SANDY SILT**, trace clayey silt, trace fine gravel and coarse sand, WTPL, soft.
10.0	Grey **SANDY SILT TILL**, some medium gravel, some fine to coarse sand seams, APL, stiff to very stiff. Reddish brown from 11.0 m to 11.5 m depth. 150mm thick coarse gravelly sand seam at 12.9 m depth.
13.7	Grey fine **SAND**, some silt, trace fine gravel, wet, compact. 300mm thick coarse gravel seam at 16.5m depth.
16.8	**END OF BOREHOLE**

SAMPLE

Number	Type	SPT N-Value
1	SS	8
2	SS	18
3	SS	33
4	SS	21
5	SS	24
6	SS	15
7	SS	27
8	SS	21
9	SS	20
10	SS	17
11	SS	3
12	SS	3
13	SS	4
14	SS	27
15	SS	24
16	SS	17
17	SS	37
18	SS	37
19	SS	34
20	SS	38
21	SS	24
22	SS	34

Depth Scale (m) | Graphic Plot | Core Recovery | Elevation Scale (mARD)



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

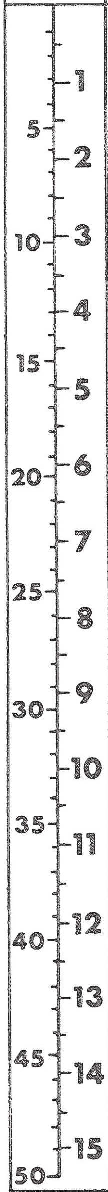
library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

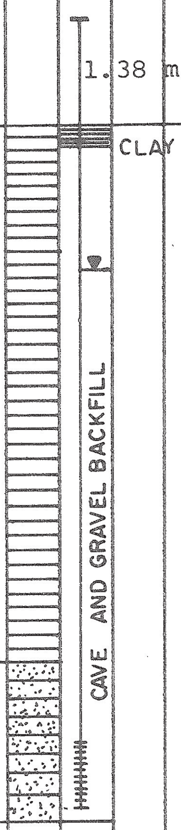
GEOLOGICAL LOG

TEST HOLE No. 16A

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	277.8	GROUND SURFACE					
	0.0	Brown gravelly clayey silt (Brown fine sandy gravel layer at ~ 4.6 m BGS)					
	270.8 7.0	Brown very loose to compact very fine sandy silt					
	268.7 9.1	End of Hole					





NOTES

DATE DRILLED 14 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND --
(m below ground surface)

STATIC WATER LEVEL 1.8*
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER
Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 276.0 Static Water Elevation (m GSD) (26 JUNE 1979) *

╪ Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 16A Decommissioning

WSP

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/18
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Graphic Plot	SAMPLE Number	SAMPLE Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 / Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	278.2	**GROUND SURFACE**										
		Brown gravelly clayey silt					278					
1							277					
2							276					
3							275					
4							274					
		(Brown fine sandy gravel layer at ~ 4.6 m BGS)										
5							273					
6							272					
7	271.2 7.0	Brown very loose to compact very fine sandy silt					271					
8							270					
	269.4 8.8	**END OF BOREHOLE**										

Stratigraphy inferred from original borehole log for BH16A (MacLaren Engineers Inc., 1979).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 16AR

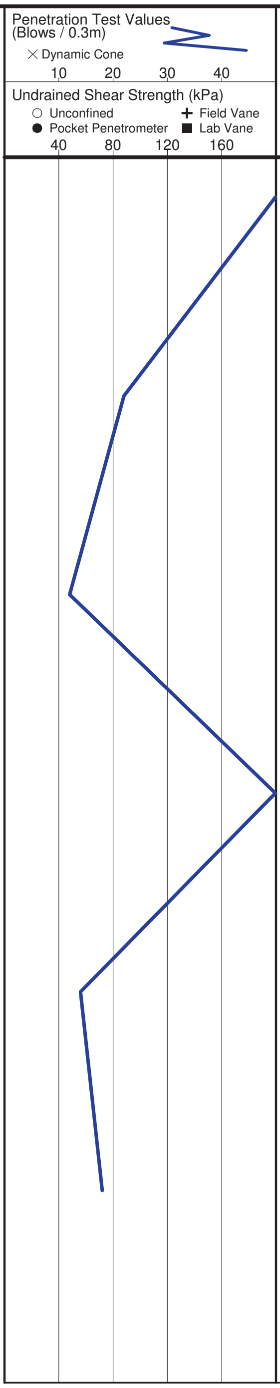
project | Holbrook Landfill Site
project no. | 111-53037-00 132-00
client | Oxford County
rig type | CME 75, track-mounted
date started | 2014/09/22
location | Holbrook, ON
method | Hollow stem augers, 215 mm dia.
supervisor | MEQ
position |
coring | *n/a*
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
0	**GROUND SURFACE**
	Brown **CLAYEY SILT**, some fine to medium gravel, trace sand, DTPL, stiff to very stiff. Abundant rootlets to 0.8 m depth.
2.3	Brown to grey **CLAYEY SILT**, some orange striations, trace fine sand, trace gravel, DTPL, stiff to very stiff.
4.9	Grey brown fine **SILTY GRAVEL AND SAND**, trace to some cobbles, wet, compact.
6.0	Grey **CLAYEY SILT**, trace fine silty sand, APL, stiff.
7.8	Grey fine **SANDY SILT**, trace clayey silt, trace fine gravel and coarse sand, WTPL, soft.
9.4	**END OF BOREHOLE** Stratigraphy inferred from adjacent borehole 16.

SAMPLE

Number	Type	SPT N-Value / Core Recovery
1	SS	55
2	SS	22
3	SS	12
4	SS	58
5	SS	14
6	SS	18



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

GEOLOGICAL LOG

TEST HOLE No. 17

SHEET 1 OF 1

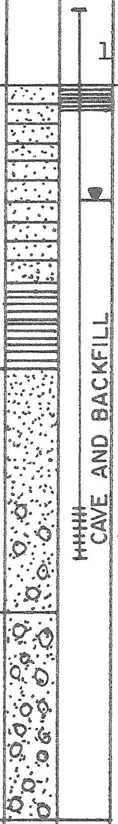
SCALE (ft)(m)

(ft) 5 10 15 20 25 30 35 40 45 50

(m) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
278.6	GROUND SURFACE			
0.0 274.9	Yellowish brown loose very fine sandy silt overlying brown clayey silt	1 2	SS SS	6 7
3.7 271.7	Brown interlayered compact fine to medium and medium to coarse sand overlying brown gravelly medium to coarse sand	3 4	SS SS	10 5
6.9 269.0	Brown fine to coarse sandy fine to medium gravel overlying fine to coarse sand near base	5 6	SS AU	-- --
9.6	End of Hole			

STRAT. PLOT | PIEZOMETER



NOTES

DATE DRILLED 29 June 1979

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND 1.2
(m below ground surface)

STATIC WATER LEVEL 1.5 *
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 0.5 (m)

TYPE OF PIEZOMETER
Trow

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 277.1 Static Water Elevation (m GSD) (26 JUNE 1979) *

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

BOREHOLE NO. BH17 DECOMMISSIONING

PROJECT NAME: HOLBROOK LANDFILL

PROJECT NO.: 111-53037-00 132-00

CLIENT: COUNTY OF OXFORD

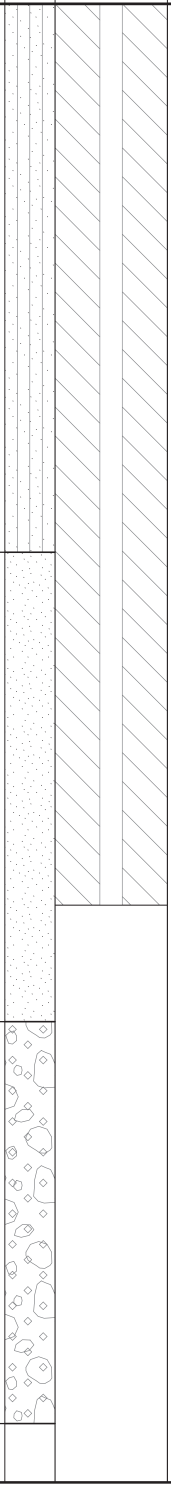
DATE COMPLETED: Jul 18, 2013

BOREHOLE TYPE: HOLLOW STEM AUGER

SUPERVISOR: TJB

GROUND ELEVATION: 278.6 mASL

REVIEWER: RFK

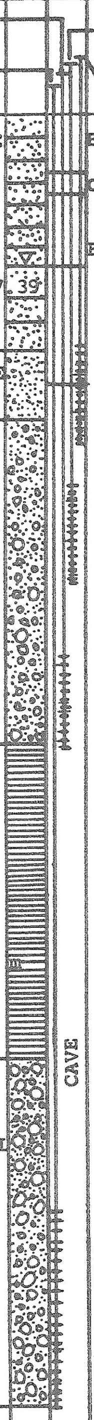


DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 SHEAR STRENGTH	WATER CONTENT % 10 20 30 WP WL	REMARKS
0.0	YELLOWISH BROWN LOOSE VERY FINE SANDY SILT OVERLYING BROWN CLAYEY SILT										STRATIGRAPHY INFERRED FROM ORIGINAL BOREHOLE LOG FOR BH17 (MacLaren Engineers Inc., 1979)
3.7	BROWN INTERLAYERED COMPACT FINE TO MEDIUM AND MEDIUM TO COARSE SAND OVERLYING BROWN GRAVELLY MEDIUM TO COARSE SAND										ORIGINAL BOREHOLE CAVED AND WAS BACKFILLED TO 6 m DEPTH BEFORE WELL INSTALLATION.
6.9	BROWN FINE TO COARSE SANDY FINE TO MEDIUM GRAVEL OVERLYING FINE TO COARSE SAND NEAR BASE										
9.6	END OF ORIGINAL BOREHOLE										
10.0											

GEOLOGICAL LOG

TEST HOLE No. 18

SHEET 1 OF 1



EL (mGSD) / DEPTH (m)	DESCRIPTION
280.0	GROUND SURFACE
0.0	BROWN COMPACT SILTY V. FINE SAND (CLAYEY FROM 0 - 1.1 m; MINOR CLAY & SOME F. GRAVEL AT 1.5 m)
276.0	
4.0	GREY V. LOOSE V.FINE - FINE SAND WITH SOME SILT
274.8	
5.2	GREY COMPACT C. SAND & F. GRAVEL (SOME SILT - M. SAND MATRIX & M. GRAVEL) COARSE SANDY F. GRAVELLY MED. SAND AT 9.1 m (SOME V.F. - FINE SAND MATRIX & M. GRAVEL)
269.2	
10.8	DK. GREY COMPACT CLAYEY SILT (MINOR V.F. SAND & OCCAS. C. SAND, F. GRAVEL) INTERLAYERED WITH ≤5 mm LAYERS OF GREY SILTY V. FINE SAND AT 13.5 m F.- MED. GRAVELLY CLAYEY SILT AT 15 m
263.7	
16.3	GREY V. DENSE SAND & GRAVEL (BOTH VARIABLE IN SIZE FROM FINE - COARSE) GREY C. SANDY F. GRAVELLY MED. SAND AT 16.8 m
257.7	
22.3	DK. GREY V. DENSE V. STONY SILT TILL (MINOR V. FINE SAND)
254.1	
25.9	END OF HOLE

SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
1	SS	14
2	SS	9
3	SS	0
4.	SS	48
5	SS	25
6	SS	11
7	SS	29
8	SS	20
9	SS	13
10	SS	42
11	SS	—
12	SS	100
13	SS	59
14	SS	150 +
15	SS	150 +

NOTES

DATE DRILLED 10,11,14 Sept 81

TYPE OF RIG CME 55

DRILLING METHOD HOLLOW STEM AUGERS

DEPTH WATER FOUND ~ 1.5
(m below ground surface)

STATIC WATER LEVEL 2.6 *
(m below ground surface)

PIPE DIAMETER 51,13* (mm)

LENGTH OF PIEZOMETER 15.3 (m)

TYPE OF PIEZOMETER SLOTTED & FIBERGLASS WRAPPED

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽277.39 Static Water Elevation (m GSD) (23 Sept 81)

Piezometer

T.H. No.	Static Water Elevation (m GSD)
* 18	277.39
18A	Blocked
18B	277.59
18C	276.10

MacLaren

MACLAREN ENGINEERS PLANNERS & SCIENTISTS INC

TEST HOLE RECORD

G.M.P.

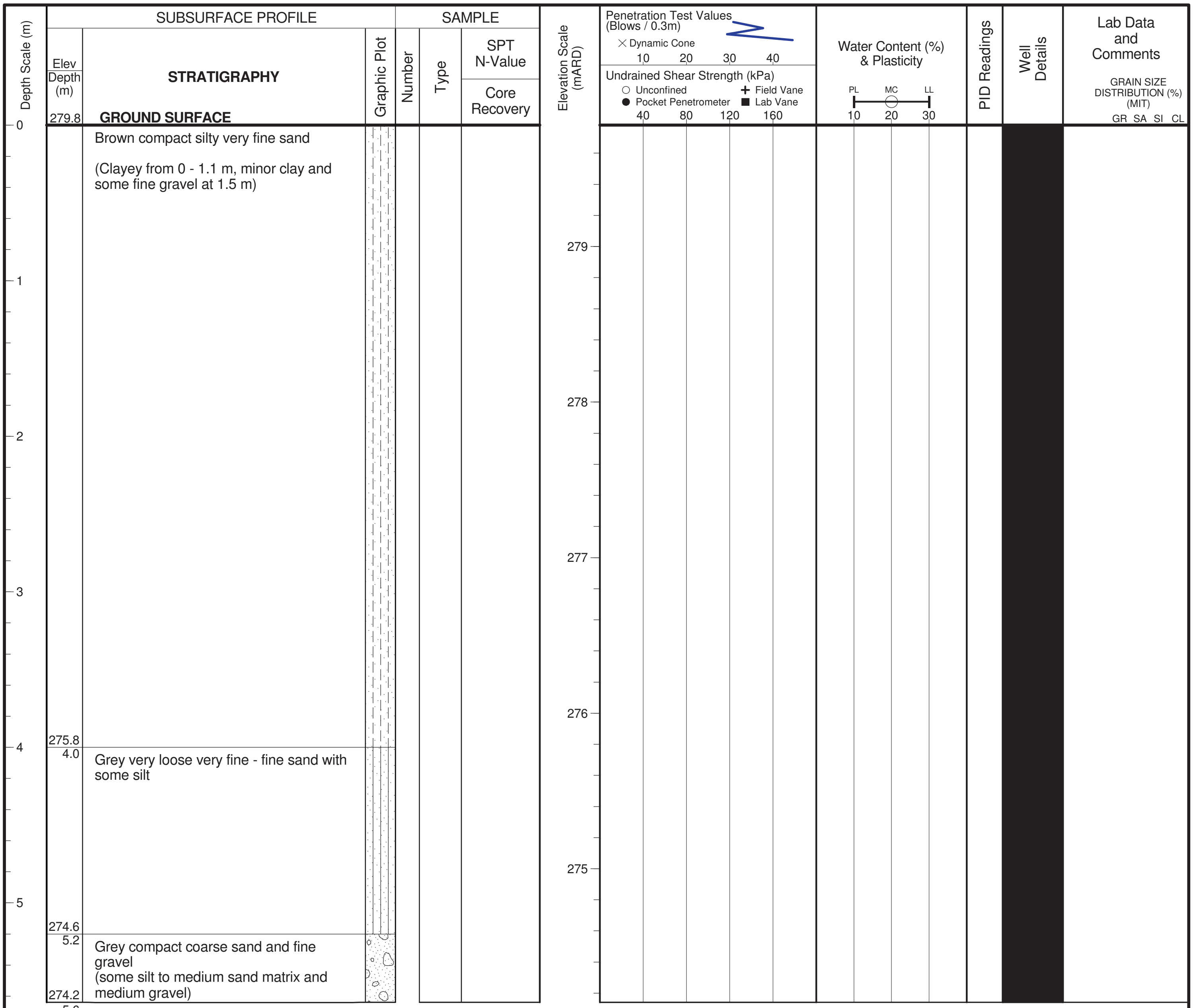
PROJECT NO. 11602-5

LOG OF BOREHOLE 18 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/16
supervisor | MEQ
reviewer | AMS



Elev Depth (m)	STRATIGRAPHY
279.8	**GROUND SURFACE**
	Brown compact silty very fine sand (Clayey from 0 - 1.1 m, minor clay and some fine gravel at 1.5 m)
275.8 4.0	Grey very loose very fine - fine sand with some silt
274.6 5.2	Grey compact coarse sand and fine gravel (some silt to medium sand matrix and medium gravel)
274.2 5.6	**END OF BOREHOLE**

Stratigraphy inferred from original borehole log for BH18 (MacLaren Engineers Inc., 1981).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 18R

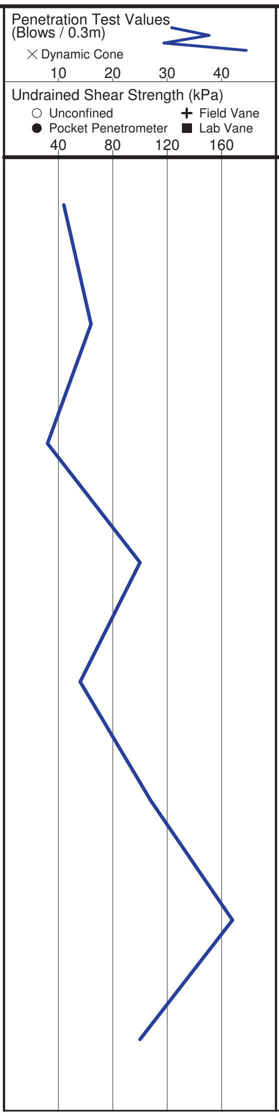
project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
position |

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

project no. | 111-53037-00 132-00
date started | 2014/09/16
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
0		GROUND SURFACE			
		Brown **SILTY SAND**, some organics, some fine sand, some fine to medium subrounded gravel, moist, loose.	1	SS	11
1			2	SS	16
	1.5	Grey brown fine **SILTY SAND**, some fine to medium gravel, trace clay, moist, loose.	3	SS	8
2			4	SS	25
3	3.3	Grey brown medium **SAND AND GRAVEL**, occassional subangular medium gravel, some silt, wet, compact.	5	SS	14
4			6	SS	27
5		Clayey silt seam at 4.7 m depth.	7	SS	42
			8	SS	25
6	6.1	**END OF BOREHOLE**			

Elevation Scale (mARD)



Water Content (%) & Plasticity
PL MC LL
10 20 30

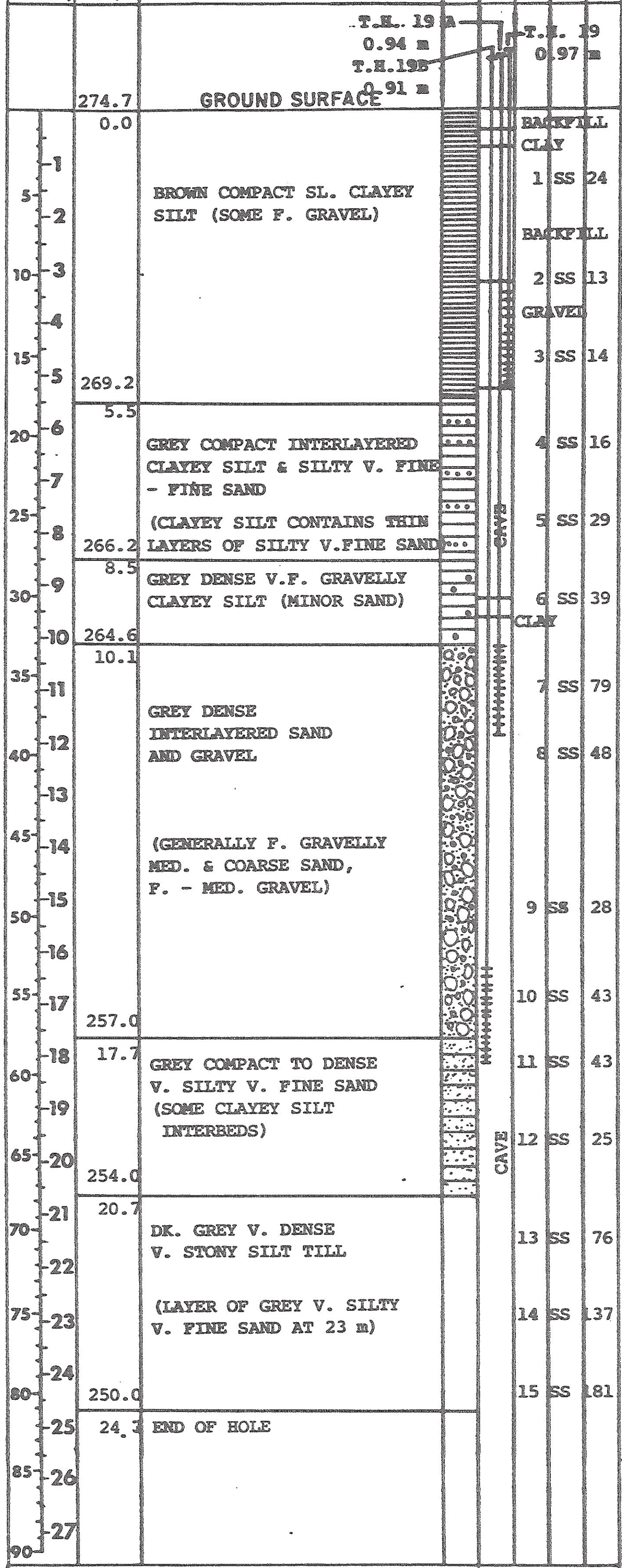
PID Readings

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

GEOLOGICAL LOG

TEST HOLE No. 19

SHEET 1 OF 1



EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
274.7	GROUND SURFACE			
0.0	BROWN COMPACT SL. CLAYEY SILT (SOME F. GRAVEL)	1	SS	24
		2	SS	13
269.2		3	SS	14
5.5	GREY COMPACT INTERLAYERED CLAYEY SILT & SILTY V. FINE - FINE SAND (CLAYEY SILT CONTAINS THIN LAYERS OF SILTY V.FINE SAND)	4	SS	16
266.2		5	SS	29
8.5	GREY DENSE V.F. GRAVELLY CLAYEY SILT (MINOR SAND)	6	SS	39
264.6				
10.1	GREY DENSE INTERLAYERED SAND AND GRAVEL (GENERALLY F. GRAVELLY MED. & COARSE SAND, F. - MED. GRAVEL)	7	SS	79 +
		8	SS	48
		9	SS	28
257.0		10	SS	43
17.7	GREY COMPACT TO DENSE V. SILTY V. FINE SAND (SOME CLAYEY SILT INTERBEDS)	11	SS	43
254.0		12	SS	25
20.7	DK. GREY V. DENSE V. STONY SILT TILL (LAYER OF GREY V. SILTY V. FINE SAND AT 23 m)	13	SS	76 +
		14	SS	137
250.0		15	SS	181
24.3	END OF HOLE			

NOTES

DATE DRILLED 14 - 16 Sept 81

TYPE OF RIG CME 55

DRILLING METHOD HOLLOW STEM AUGERS

DEPTH WATER FOUND ~ 5.5 (m below ground surface)

STATIC WATER LEVEL +0.85 * (m below ground surface)

PIPE DIAMETER 51.13 (mm)

LENGTH OF PIEZOMETER 1.5,1.6 m

TYPE OF PIEZOMETER SLOTTED & FIBERGLASS WRAPPED

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽275.55 Static Water Elevation (m GSD) (23 Sept 81)

Piezometer

T.H. NO.	Static Water Elevation (m GSD)
* 19	275.55
19A	275.65+
19B	275.61+

MacLaren

MacLAREN ENGINEERS PLANNERS & SCIENTISTS INC

TEST HOLE RECORD

G.M.P.

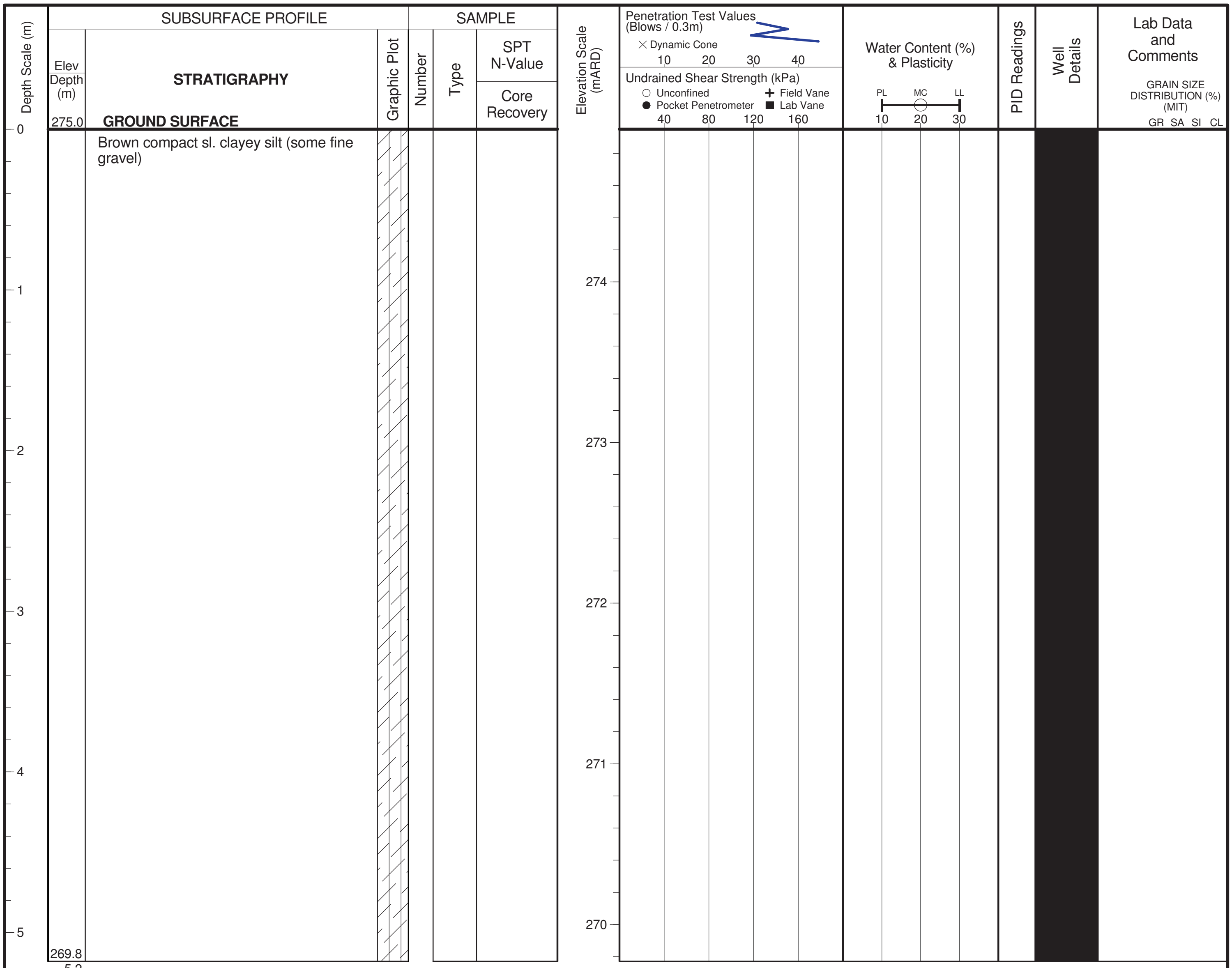
PROJECT NO. 11602-5

LOG OF BOREHOLE 19 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2014/09/26
supervisor | MEQ
reviewer | AMS



275.0 **GROUND SURFACE**

Brown compact sl. clayey silt (some fine gravel)

269.8
5.2

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH19 (MacLaren Engineers Inc., 1981).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

LOG OF BOREHOLE 19R

project | Holbrook Landfill Site

project no. | 111-53037-00 132-00

client | Oxford County

rig type | CME 75, track-mounted

date started | 2014/09/26

location | Holbrook, ON

method | Hollow stem augers, 215 mm dia.

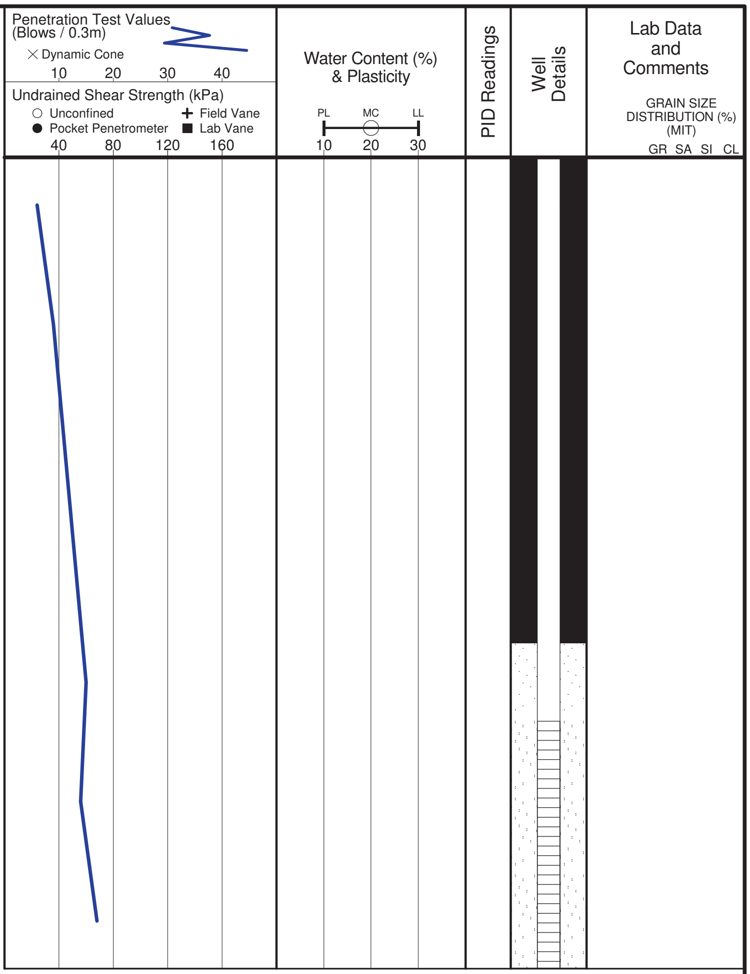
supervisor | SCL

position |

coring | *n/a*

reviewer | AMS

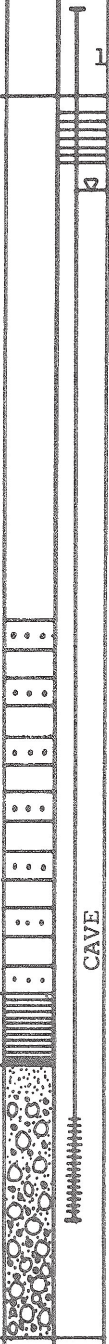
Depth Scale (m)	SUBSURFACE PROFILE: Elev Depth (m)	SUBSURFACE PROFILE: STRATIGRAPHY	SUBSURFACE PROFILE: Graphic Plot	SAMPLE: Number	SAMPLE: Type	SAMPLE: SPT N-Value / Core Recovery	Elevation Scale (mARD)
0		**GROUND SURFACE**					
		Dark brown **SILTY SAND TO SANDY SILT**, trace to some organics and rootlets, trace clay, moist, loose.		1	SS	6	
1	0.8	Orangey brown to grey brown **CLAYEY SILT**, trace to some fine gravel, trace cobble, APL, stiff.		2	SS	9	
				3	SS		
2		Becoming grey below 2 m depth.					
				4	SS	13	
3							
				5	SS	15	
4				6	SS	14	
5				7	SS	17	
	5.2	**END OF BOREHOLE**					



GEOLOGICAL LOG

TEST HOLE No. 21

SHEET 1 OF 1



SCALE (ft)(m)	EL (mGSD) DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER,	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	277.5	GROUND SURFACE		1.05 m			
	0.0	BROWN SL. CLAYEY SILT (GRAVELLY FROM 2 - 6 m) OVERLYING GREY COMPACT INTERLAYERED CLAYEY SILT (OCCAS. GRAVEL) & SILTY V. FINE SAND OF VARIABLE THICKNESS		BACKFILL CLAY			
					1	SS	22
					2	SS	23
		(SILTY V.FINE TO FINE SAND WITH SOME MED. SAND AT 10.7 & 12.2 m)			3	SS	7
	265.0			CAVE	4	SS	37
	12.5	GREY DENSE V. GRAVELLY CLAYEY SILT					
	264.1						
	13.4	GREY DENSE GRANULAR MED.- COARSE SAND OVERLYING F.- MED. SANDY GRAVEL WHICH CONTAINS SOME SILT & V.F. SAND			5	SS	44
	260.3				6	SS	66
	17.2	END OF HOLE					

SCALE (ft): 5 10 15 20 25 30 35 40 45 50 55 60 65 70

SCALE (m): 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

NOTES

DATE DRILLED 13 - 16 Oct./81

TYPE OF RIG CME 55

DRILLING METHOD Hollow Stem Augers, Casing

DEPTH WATER FOUND ~ 2.4 (m below ground surface)

STATIC WATER LEVEL 1.3 (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.2 (m)

TYPE OF PIEZOMETER SLOTTED AND FIBREGLASS WRAPPED

SAMPLE TYPE

SS-SPLIT SPOON

WA-WASH

▽ 276.22 Static Water Elevation (m GSD) (26 Oct./81)

Piezometer

MacLaren

MacLAREN ENGINEERS PLANNERS & SCIENTISTS INC

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 21 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/20
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY
277.8	**GROUND SURFACE**
	Brown clayey silt (gravelly from 2 - 6 m) overlying grey compact interlayered clayey silt (occassional gravel) & silty very fine sand of variable thickness (Silty very fine to fine sand with some medium sand at 10.7 & 12.2 m)
265.3 12.5	Grey dense very gravelly clayey silt
264.4 13.4	Grey dense granular medium to coarse sand overlying fine to medium sandy gravel which contains some silt & very fine sand
262.3 15.5	

END OF BOREHOLE

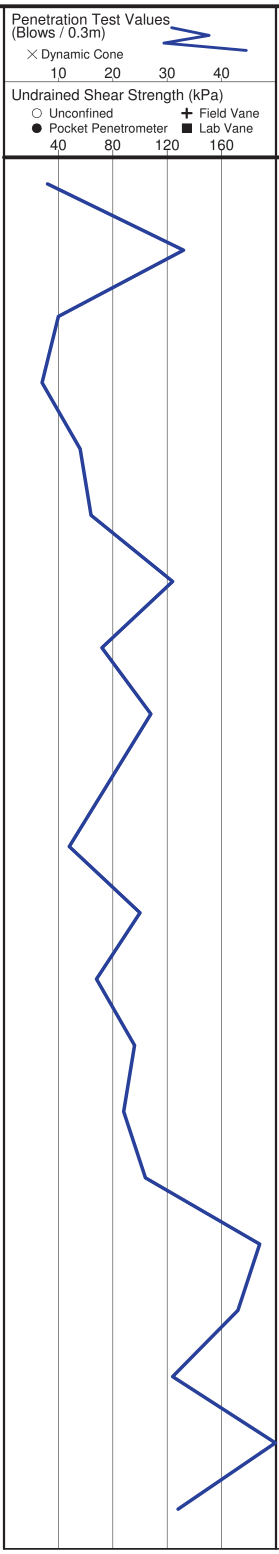
Stratigraphy inferred from original borehole log for BH21 (MacLaren Engineers Inc., 1981).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 21R

project | Holbrook Landfill Site
project no. | 111-53037-00 132-00
client | Oxford County
rig type | CME 75, track-mounted
date started | 2014/09/29
location | Holbrook, ON
method | Hollow stem augers, 215 mm dia.
supervisor | SCL
position |
coring | *n/a*
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value	Lab Data and Comments
	GROUND SURFACE				
0	Dark orangey brown **SILTY SAND**, trace rootlets, trace gravel, moist, loose to compact.	1	SS	8	
		2	SS	33	
1.5	Orangey brown **SANDY SILT**, some thin interlayered red brown fine to medium sand, trace clay, APL becoming WTPL, firm to stiff.	3	SS	10	
		4	SS	7	
3.4	Orangey brown fine to coarse **SILTY SAND AND GRAVEL**, saturated, compact to dense.	5	SS	14	
		6	SS	16	
		7	SS	31	
		8	SS	18	
		9	SS	27	
	Becoming siltier below 7.5 m depth.	10	SS		SS10 - no sample due to cobble/boulder
		11	SS	12	
8.2	Grey **CLAYEY SILT**, some fine rounded and subangular gravel, some fine sand, WTPL, stiff to very stiff.	12	SS	25	
		13	SS	17	
		14	SS	24	
10.7	Grey **SANDY SILT** with interlayered compact grey fine to coarse sand, trace clay, saturated, compact.	15	SS	22	
		16	SS	26	
12.2	Grey **SANDY GRAVEL**, fine to medium gravel, saturated, dense to very loose.	17	SS	47	
		18	SS	43	
		19	SS	31	
		20	SS	58	
		21	SS	32	
16.0	**END OF BOREHOLE**				



Water Content (%) & Plasticity: PL MC LL — 10 20 30

PID Readings

Well Details

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

GEOLOGICAL LOG

TEST HOLE No. 23

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	278.4	GROUND SURFACE		1.12 m			
	0.0	GREY COARSE SAND AND GRAVEL (SOME SILT AND FINE SAND)		CLAY			
10 / 3					1	SS	28
20 / 6					2	SS	39
30 / 9	269.0				3	SS	20
	9.4	GREY COMPACT CLAYEY SILT			4	SS	26
		GREY V. DENSE GRAVELLY CLAYEY SILT			5	SS	187+
					6	SS	166
				CAVE	7	SS	204
	260.7				8	SS	63
	17.7	GREY COARSE SANDY GRAVEL			9	SS	190
	257.7						
	20.7	END OF HOLE					

NOTES

DATE DRILLED 22,23 Oct./81

TYPE OF RIG CME 55

DRILLING METHOD HOLLOW STEM AUGERS

DEPTH WATER FOUND --
(m below ground surface)
STATIC WATER LEVEL +0.2
(m below ground surface)

PIPE DIAMETER 51 (mm)
LENGTH OF PIEZOMETER 2.1 (m)
TYPE OF PIEZOMETER SLOTTED AND NYLON SCREEN WRAPPED

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

278.66 ▽ Static Water Elevation (m GSD) (26 Oct./81)

Piezometer

MacLaren

MacLAREN ENGINEERS PLANNERS & SCIENTISTS INC

TEST HOLE RECORD

G.M.P.

PROJECT NO. 11602-5

LOG OF BOREHOLE 23 Decommissioning

WSP

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/09
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE | SAMPLE: Number, Type, SPT N-Value, Core Recovery | Elevation Scale (mARD) | Penetration Test Values (Blows / 0.3m): × Dynamic Cone 10 20 30 40; Undrained Shear Strength (kPa): ○ Unconfined, + Field Vane, ● Pocket Penetrometer, ■ Lab Vane 40 80 120 160 | Water Content (%) & Plasticity: PL MC LL 10 20 30 | PID Readings | Well Details | Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Elev Depth (m)	STRATIGRAPHY
278.9	**GROUND SURFACE**
278.9 0.0	Grey coarse sand and gravel (some silt and fine sand)
269.5 9.4	Grey compacy clayey silt
267.4 11.5	Grey very dense gravelly clayey silt
261.2 17.7	Grey coarse sandy gravel
258.5 20.4	**END OF BOREHOLE**

Stratigraphy inferred from original borehole log for BH23 (MacLaren Engineers Inc., 1981).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

GEOLOGICAL LOG

TEST HOLE No. 24

SHEET 1 OF 1

EL (mGSD) / DEPTH (m)	DESCRIPTION
279.2	GROUND SURFACE
0.0 – 275.3	Brown compact fine to coarse sand with trace gravel
3.9 – 266.0	Brown clayey silt; some fine to coarse sand layers several centimeters thick; trace gravel ~ 8.0 - 8.5 m = fine silty sand with trace gravel
13.2 – 264.6	Brown loose fine sand ?
14.6 – 263.0	Brown interlayered fine sand and clay
16.2 – 260.0	Brown silt with fine sand layers (trace of gravel appears near contact with gravel layer)
19.2 – 256.3	Dense sandy gravel (sand generally medium to coarse grained)
22.9	END OF HOLE

PIEZOMETER: 0.56 m

SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
1	SS	20
2	SS	18
3	SS	9
4	SS	7
5	SS	18
6	SS	9
7	SS	15
8	SS	32
9	SS	6
10	SS	103
11	SS	49
12	SS	70
13	SS	52
14	SS	37

NOTES

DATE DRILLED 11 Feb./82

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~1 (m below ground surface)

STATIC WATER LEVEL 4.0 (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1 (m)

TYPE OF PIEZOMETER Slotted ABS pipe and Nitex nylon screen wrapped

SAMPLE TYPE

SS - SPLIT SPOON

WA - WASH

▽ 275.97 Static Water Elevation (m GSD) (18 February 1982)

Piezometer

MacLaren

MacLAREN
ENGINEERS, PLANNERS
& SCIENTISTS

TEST HOLE RECORD

F H R

11602-5

LOG OF BOREHOLE 24 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/13
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY
279.7	**GROUND SURFACE**
	Brown compact fine to coarse sand with trace gravel
275.8 3.9	Brown clayey silt; some fine to coarse sand layers several centimeters thick; trace gravel ~8.0 - 8.5 m = fine silty sand with trace gravel
266.5 13.2	Brown loose fine sand
265.1 14.6	Brown interlayered fine sand and clay
263.5 16.2	Brown silt with fine sand layers (trace of gravel appears near contact with gravel layer)
260.5 19.2	Dense sandy gravel (sand generally medium to coarse grained)
259.3 20.4	**END OF BOREHOLE**

Stratigraphy inferred from original borehole log for BH24 (MacLaren Engineers Inc., 1982).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 24R

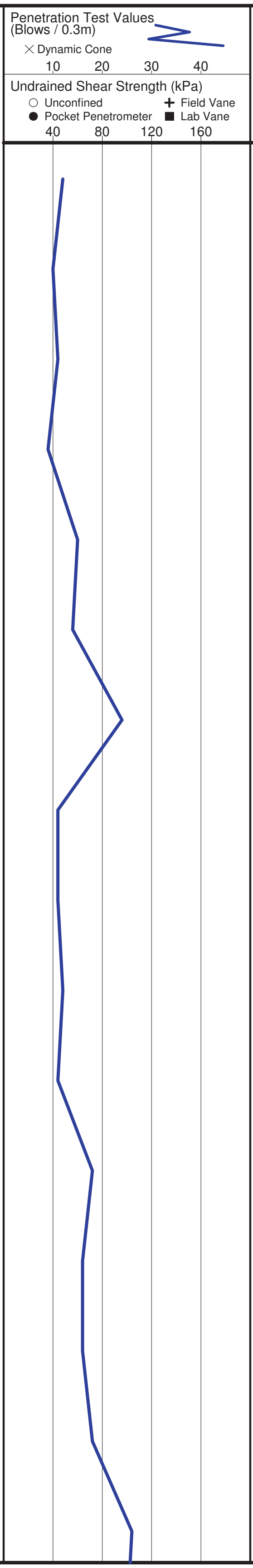
project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/14
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Number	Type	SPT N-Value
0		**GROUND SURFACE**			
		Brown fine to medium **SILTY SAND**, some fine gravel, trace organics, moist, compact.	1	SS	12
1		Black clayey organic peat layer at 1.2 m depth.	2	SS	10
	1.4	Grey fine to medium **SAND**, some silt, trace fine gravel, wet, compact.			
2			3	SS	11
			4	SS	9
3			5	SS	15
4			6	SS	14
			7	SS	24
5	4.9	Grey **CLAYEY SILT**, trace fine sand, APL to WTPL, stiff.			
			8	SS	11
6			9	SS	11
7			10	SS	12
		Fine gravel seams at 7.6 m depth.	11	SS	11
8			12	SS	18
9	9.1	Grey **SILTY SAND**, trace clay, wet, compact.	13	SS	16
10	9.9	Grey **CLAYEY SILT**, trace medium sand, trace fine gravel, APL to WTPL, very stiff.	14	SS	16
11			15	SS	18
			16	SS	26

Graphic Plot | Core Recovery | Elevation Scale (mASL)



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings | Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

(continued next page)

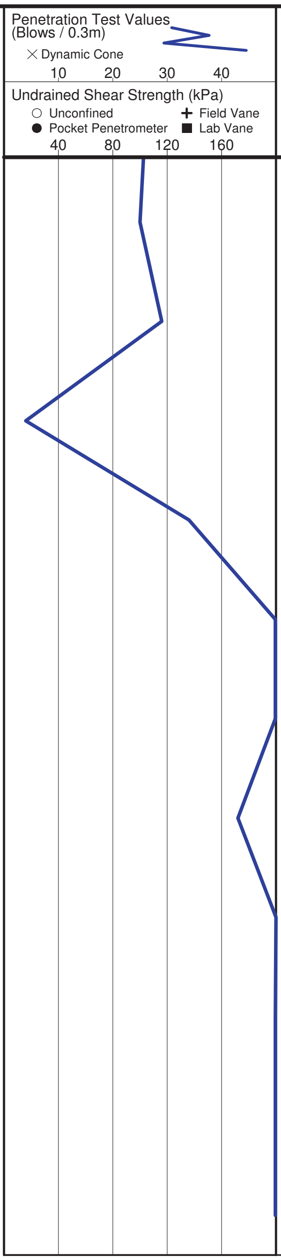
LOG OF BOREHOLE 24R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/14
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
12	*(continued)*	Grey **CLAYEY SILT**, trace medium sand, trace fine gravel, APL to WTPL, very stiff. *(continued)*	17	SS	25
13			18	SS	29
14	13.8	Grey medium to coarse **SAND**, trace silt, wet, loose.	19	SS	4
			20	SS	34
15	14.8	Grey **CLAYEY SILT**, trace medium to coarse sand and fine to medium gravel, APL, hard.	21	SS	51
16			22	SS	80
17			23	SS	43
18			24	SS	50
	18.3	Grey **SAND AND SILT**, trace clay, trace gravel, wet, very dense.	25	SS	80
19	19.1	Grey coarse **SAND** and fine to coarse **GRAVEL**, trace silt, wet, very dense.	26	SS	72
20			27	SS	59
	20.4	**END OF BOREHOLE**			



Elevation Scale (mASL)

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

GEOLOGICAL LOG

TEST HOLE No. 24A

SHEET 1 OF 1

SCALE (ft) (m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	279.2	GROUND SURFACE			1.08 m		
	0.0	Fine coarse brown sand with some gravel					
	275.3 3.9	Brown clayey silt with trace of gravel					
	274.6 4.6	END OF HOLE					

NOTES

DATE DRILLED 11 Feb./82

TYPE OF RIG CME 75

DRILLING METHOD Hollow stem augers

DEPTH WATER FOUND ~1
(m below ground surface)

STATIC WATER LEVEL 0.5
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1 (m)

TYPE OF PIEZOMETER Slotted ABS pipe and Nitex nylon screen wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 278.73 Static Water Elevation (m GSD) (18 February 1982)

Piezometer

MacLaren

MacLAREN ENGINEERS, PLANNERS & SCIENTISTS

TEST HOLE RECORD

E.H.R.

PROJECT NO. 11602-5

LOG OF BOREHOLE 24A Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/13
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Graphic Plot	SAMPLE Number	Type	SPT N-Value Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	279.7	**GROUND SURFACE**										
		Fine coarse brown sand with some gravel					279					
1												
2							278					
3							277					
							276					
4	275.8 3.9	Brown clayey silt with trace of gravel										
	275.4 4.3											

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH24A (MacLaren Engineers Inc., 1982).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

LOG OF BOREHOLE 24AR

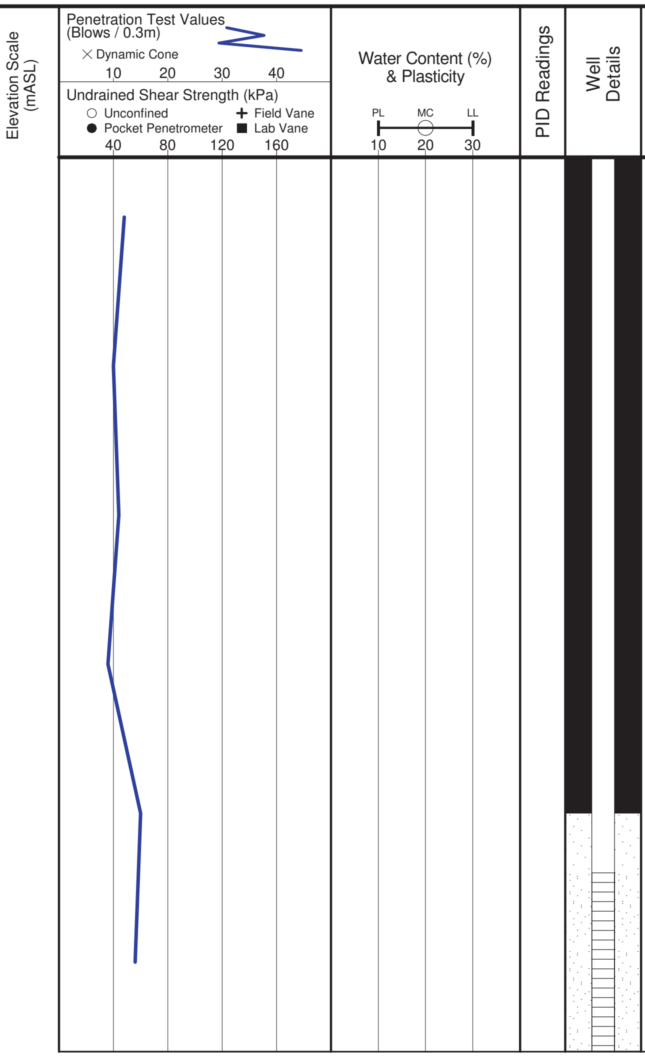
project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/13
supervisor | SM
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
0		**GROUND SURFACE**			
		Brown fine to medium **SILTY SAND**, some fine gravel, trace organics, moist, compact.	1	SS	12
1		Black clayey organic peat layer at 1.2 m depth.	2	SS	10
	1.4	Grey fine to medium **SAND**, some silt, trace fine gravel, wet, compact.	3	SS	11
2			4	SS	9
3			5	SS	15
4			6	SS	14
	4.6	**END OF BOREHOLE**			

Stratigraphy inferred from adjacent borehole 24R.



Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)

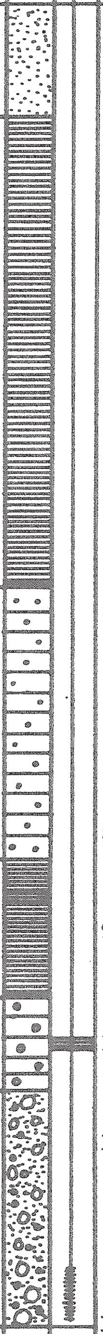
GR SA SI CL

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

GEOLOGICAL LOG

TEST HOLE No. 25

SHEET 1 OF 1



EL (mGSD) / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
279.9	GROUND SURFACE	0.61 m		
0.0 278.2	Brown compact medium to coarse sand	1	SS	15
1.7 271.4	Brown clayey silt with trace of sand and gravel	2 3 4 5	SS SS SS SS	14 23 18 23
8.5 267.4	Brown sandy silt with some thin layers of fine sand and a trace of gravel	6 7 8	SS SS SS	13 7 18
12.5 265.3	Brown silty clay with some gravel	9	SS	25
14.6 264.0	Brown gravelly silt with a trace of clay	10	SS	97
15.9 260.5	Brown sand and gravel	11 12	SS SS	48 -
19.4	END OF HOLE			

NOTES

DATE DRILLED 12 Feb./82

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND Surface
(m below ground surface)

STATIC WATER LEVEL 3.8
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1 (m)

TYPE OF PIEZOMETER Slotted ABS pipe and fibreglass wrapped

SAMPLE TYPE

SS - SPLIT SPOON
WA - WASH

▽ 276.07 Static Water Elevation (m GSD) (18 February 1982)

Piezometer

MacLaren

MacLAREN
ENGINEERS, PLANNERS
& SCIENTISTS

TEST HOLE RECORD

E.H.R.

PROJECT NO. 11602-5

LOG OF BOREHOLE 25 Decommissioning

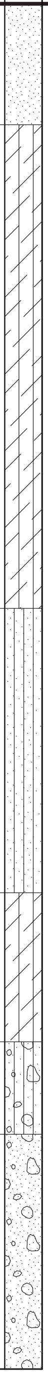
project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/17
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	SUBSURFACE PROFILE – STRATIGRAPHY	Number	Type	SPT N-Value Core Recovery
280.4	**GROUND SURFACE**			
	Brown compact medium to coarse sand			
278.7 1.7	Brown clayey silt with trace of sand and gravel			
271.9 8.5	Brown sandy silt with some thin layers of fine sand and a trace of gravel			
267.9 12.5	Brown silty clay with some gravel			
265.8 14.6	Brown gravelly silt with a trace of clay			
264.5 15.9	Brown sand and gravel			
261.2 19.2	**END OF BOREHOLE**			

Graphic Plot



Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19

Elevation Scale (mARD): 280, 279, 278, 277, 276, 275, 274, 273, 272, 271, 270, 269, 268, 267, 266, 265, 264, 263, 262

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined ✚ Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Stratigraphy inferred from original borehole log for BH25 (MacLaren Engineers Inc., 1982).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpi

LOG OF BOREHOLE 25R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

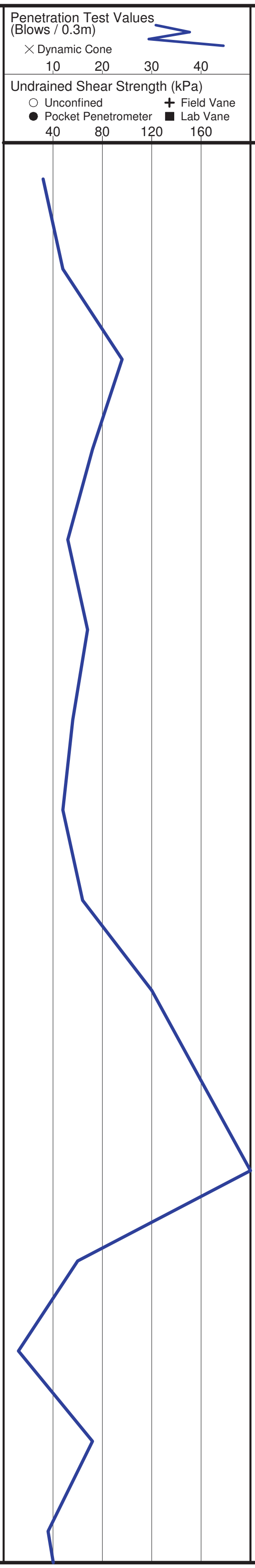
rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/22
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE		SAMPLE		
Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value Core Recovery
	GROUND SURFACE			
0	Dark brown **TOPSOIL**, some fine sand, rootlets, moist, loose.	1	SS	8
0.6	Reddish brown **CLAYEY SILT**, some fine to medium sand, trace clay, trace rootlets, moist, compact.	2	SS	12
		3	SS	24
2.3	Grey-brown **CLAYEY SILT**, trace fine to coarse sand, trace gravel, DTPL to APL, stiff to very stiff.	4	SS	18
		5	SS	13
		6	SS	17
		7	SS	14
		8	SS	12
		9	SS	16
		10	SS	30
		11	SS	40
		12	SS	50
9.3	Grey-brown fine **SILTY SAND**, trace clay, trace fine gravel, wet to saturated, compact.	13	SS	15
		14	SS	3
		15	SS	18
		16	SS	9

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

Elevation Scale (mASL)



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

(continued next page)

Sheet No. 1 of 2

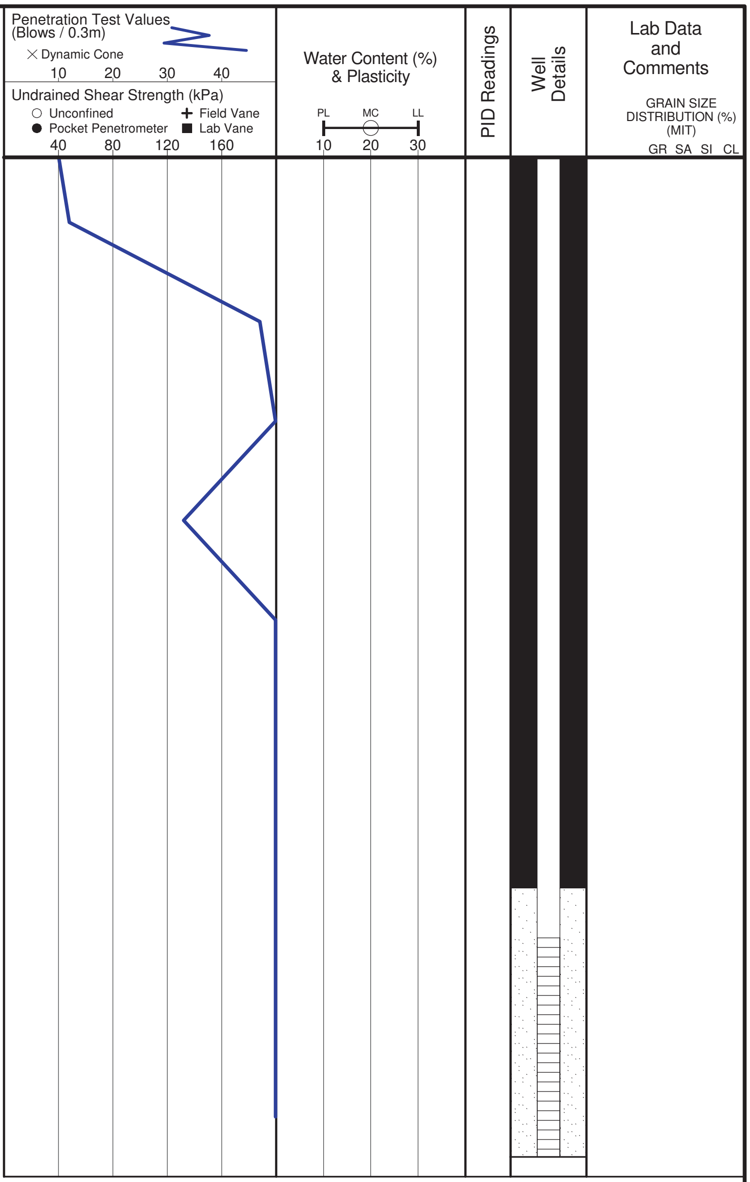
LOG OF BOREHOLE 25R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/22
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE – STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
12		*(continued)* Grey-brown fine **SILTY SAND**, trace clay, trace fine gravel, wet to saturated, compact. Rapidly dilatent below 12.2 m. *(continued)*	17	SS	12
13	13.0	Light grey **CLAYEY SILT AND GRAVEL**, some fine to coarse sand, DTPL, stiff.	18	SS	47
14			19	SS	74
	14.2	Grey-brown **SAND AND GRAVEL**, some silt, trace clay, saturated, compact.	20	SS	33
15	15.2	Grey-brown **CLAYEY SILT**, some gravel, some fine to coarse sand, APL, stiff to very stiff.	21	SS	81
16			22	SS	88
17			23	SS	63
			24	SS	53
18	18.0	Grey **SAND AND GRAVEL**, trace silt, wet, hard.	25	SS	83
19			26	SS	85
	19.8	**END OF BOREHOLE**			



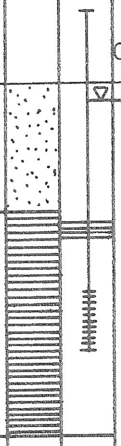
library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

GEOLOGICAL LOG

TEST HOLE No. 25A

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	279.9	GROUND SURFACE			0.98 m		
1	0.0	Brown compact medium to coarse sand					
5 2 10 3 4 15	278.2 1.7	Brown compact clayey silt slightly calcareous with trace of sand and gravel					
5 20 6 7 25 8 30 9 10 35 11 40 12 13 45 14 15 50	275.3 4.6	END OF HOLE					



NOTES

DATE DRILLED 12 Feb./82

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND Surface
(m below ground surface)

STATIC WATER LEVEL 0.2
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1 (m)

TYPE OF PIEZOMETER Slotted ABS pipe and fibreglass wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 279.85 Static Water Elevation (m GSD) (19 February 1982)

╪ Piezometer

MacLaren

MacLAREN
ENGINEERS, PLANNERS
& SCIENTISTS

TEST HOLE RECORD

E.H.R.

PROJECT NO. 11602-5

LOG OF BOREHOLE 25A Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/16
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Graphic Plot	SAMPLE Number	Type	SPT N-Value Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	280.4	**GROUND SURFACE**										
		Brown compact medium to coarse sand					280					
1							279					
	278.7 1.7	Brown compact clayey silt slightly calcareous with trace of sand and gravel										
2							278					
3							277					
	276.9 3.5											

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH25A (MacLaren Engineers Inc., 1982).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

GEOLOGICAL LOG

TEST HOLE No. 26

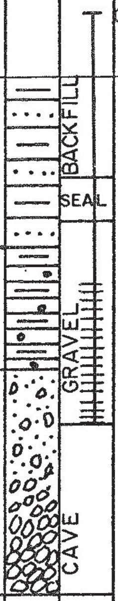
SHEET 1 OF 1

SCALE (ft)(m)

(ft): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

(m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

EL (mGSD) / DEPTH (m)	DESCRIPTION
271.8	GROUND SURFACE
0.0	Red brown to brown interlayered clayey and silty fine sand with minor gravel
269.6 / 2.1	Red brown to grey clayey silt, minor gravel
268.1 / 3.7	Fine-medium gravel; minor coarse sand; coarse gravel; minor silt, changing gradually to predominantly coarse gravel
265.2 / 6.6	END OF HOLE



SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
1	ss	8
2	ss	58
3	ss	24
4	ss	15
5	ss	14
6	ss	19
7	ss	21
8	ss	19

NOTES

DATE DRILLED Jan. 14,16, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND 3.7
(m below ground surface)

STATIC WATER LEVEL
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.8 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ Static Water Elevation (m GSD)

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

LOG OF BOREHOLE 26 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/08/06
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE: STRATIGRAPHY	SAMPLE: Number	SAMPLE: Type	SAMPLE: SPT N-Value / Core Recovery	Elevation Scale (mARD)
0	272.1	**GROUND SURFACE**				272
		Red brown to brown interlayered clayey and silty fine sand with minor gravel				
1						271
2	270.0 2.1	Red brown to grey clayey silt, minor gravel				270
3						269
	268.4 3.7	Fine-medium gravel; minor coarse sand; coarse gravel; minor silt, changing gradually to predominantly coarse gravel				
4						268
	267.6 4.5					

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH26 (MacLaren Engineers Inc., 1983).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

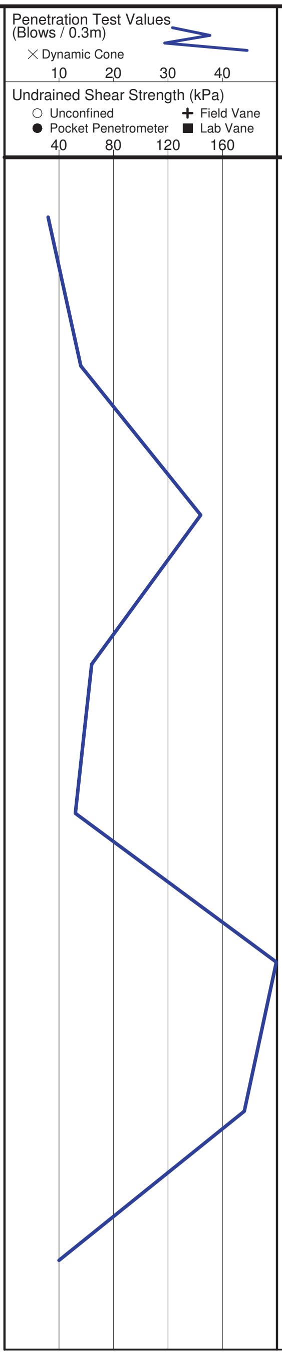
LOG OF BOREHOLE 26R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/08/07
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value
0	**GROUND SURFACE**			
	Brown **CLAYEY SILT**, some fine to coarse sand and subrounded gravel, trace roots, APL, firm.	1	SS	8
0.8	Reddish brown **CLAYEY SILT**, some fine to coarse sand, some fine to coarse subrounded gravel, APL, stiff to very stiff.	2	SS	14
		3	SS	36
2.3	Grey **CLAYEY SILT**, trace fine to coarse sand, trace to some fine to coarse gravel, APL, stiff to very stiff.	4	SS	16
		5	SS	13
		6	SS	51
		7	SS	44
5.3	Grey-brown coarse **SAND** and fine to coarse **GRAVEL**, some silt, saturated, loose.	8	SS	10
6.1	**END OF BOREHOLE**			



Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpi

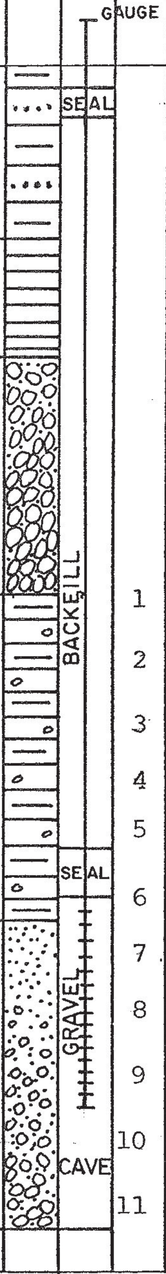
GEOLOGICAL LOG

TEST HOLE No. 27

SHEET 1 OF 1

SCALE (ft) (m): 5 ft – 1, 2 m; 10 ft – 3 m; 15 ft – 5 m; 20 ft – 6 m; 25 ft – 8 m; 30 ft – 9 m; 35 ft – 11 m; 40 ft – 12 m; 45 ft – 14 m; 50 ft – 15 m

EL (mGSD) / DEPTH (m)	DESCRIPTION
271.7	GROUND SURFACE
0.0	Red brown to brown interlayered clayey silt and silty fine sand with minor gravel
269.6 / 2.1	Red brown to grey clayey silt, minor gravel
268.0 / 3.7	Fine-medium gravel; minor coarse sand, coarse gravel and silt; changing gradually to predominantly coarse gravel
265.0 / 6.7	Dense grey clayey silt; minor fine-coarse sand, fine-coarse gravel, predominantly gravel layer at 8.5-9 m
260.7 / 11.0	Light brown silty fine-coarse sand changing gradually to grey fine to coarse gravel with minor sand
256.7 / 15.0	END OF HOLE



SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
1	ss	42
2	ss	55
3	ss	52
4	ss	37
5	ss	46
6	ss	48
7	ss	5
8	ss	34
9	ss	14
10	ss	18
11	ss	2

NOTES

DATE DRILLED Jan. 21,24, 1983

TYPE OF RIG CME 75

DRILLING METHOD Casing & Tricone

DEPTH WATER FOUND 3.7,11.0
(m below ground surface)
STATIC WATER LEVEL
(m below ground surface)

PIPE DIAMETER 51 (mm)
LENGTH OF PIEZOMETER 2.4 (m)
TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ Static Water Elevation (m GSD)

Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

GEOLOGICAL LOG

TEST HOLE No. 28

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	277.4	GROUND SURFACE		0.80m			
	0.0	Brown fine sand, minor silt and coarse gravel		BACKFILL	1	ss	8
					2	ss	19
				SEAL	3	ss	31
	275.3 2.1	Brown to dark brown compact-dense clayey silt, minor fine-coarse gravel		▽	4	ss	43
					5	ss	20
				BACKFILL	6	ss	23
					7	ss	21
					8	ss	45
				SEAL	9	ss	77
				GRAVEL	10	ss	80
	270.0 7.5	Light brown loose silty fine sand			11	ss	
					12	ss	18
				CAVE	13	ss	42
	267.8 9.6	END OF HOLE					

NOTES

DATE DRILLED Jan. 17, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 2.7
(m below ground surface)

STATIC WATER LEVEL 2.49
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.5 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 274.94 Static Water Elevation (m GSD) (05 April 1983)

Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

LOG OF BOREHOLE 28 Decommissioning

WSP

project | Holbrook Landfill Site

client | Oxford County

location | Holbrook, ON

project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted

method | Hollow stem augers, 215 mm dia.

coring | *n/a*

date started | 2015/07/20

supervisor | MEQ

reviewer | AMS

SUBSURFACE PROFILE — SAMPLE — Elevation Scale (mARD) — Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 — Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160 — Water Content (%) & Plasticity PL MC LL 10 20 30 — PID Readings — Well Details — Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Elev Depth (m)	STRATIGRAPHY
277.7	**GROUND SURFACE**
	Brown fine sand, minor silt and coarse gravel
275.6 2.1	Brown to dark brown compact to dense clayey silt, minor fine to coarse gravel
270.2 7.5	Light brown loose silty fine sand
268.6 9.1	**END OF BOREHOLE**

Stratigraphy inferred from original borehole log for BH28 (MacLaren Engineers Inc., 1983).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

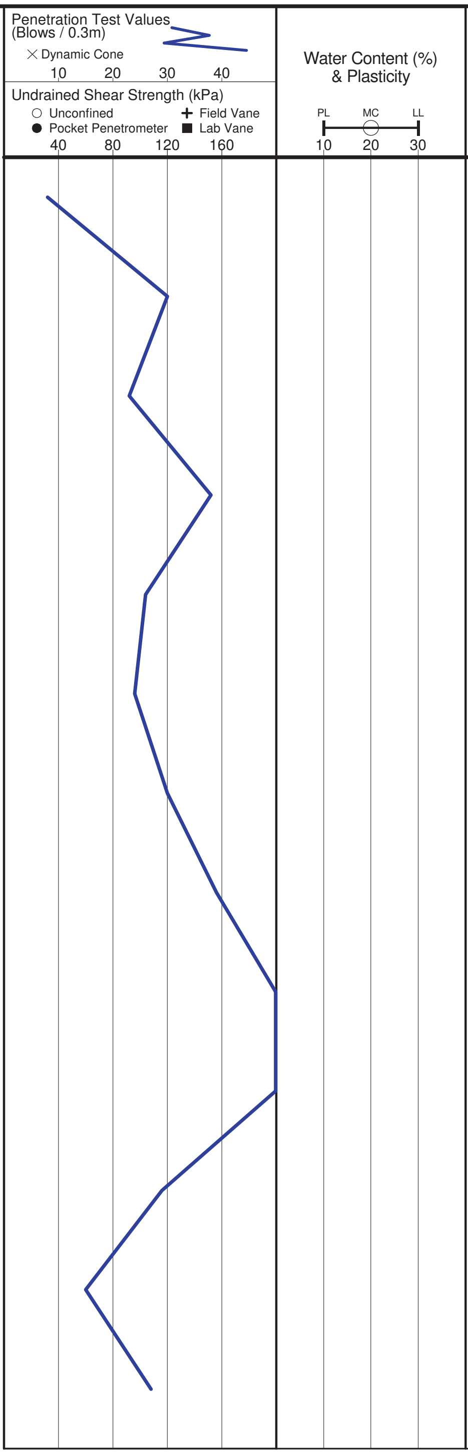
LOG OF BOREHOLE 28R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/21
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value	Core Recovery
	GROUND SURFACE				
	Dark brown **TOPSOIL**, trace fine gravel, rootlets, moist, loose.	1	SS	8	
0.6	Reddish brown medium **SAND**, some silt, some fine to coarse gravel, moist, compact.	2	SS	30	
		3	SS	23	
2.3	Brown **CLAYEY SILT**, trace fine to coarse sand, trace gravel, DTPL, very stiff.	4	SS	38	
3.1	Grey **CLAYEY SILT**, trace fine to coarse sand, trace to some gravel, DTPL to APL, very stiff to hard.	5	SS	26	
		6	SS	24	
		7	SS	30	
		8	SS	39	
		9	SS	>100	
		10	SS	72	
7.9	Grey-brown fine **SAND TO SILTY SAND**, saturated, compact.	11	SS	29	
		12	SS	15	
		13	SS	27	
9.9	**END OF BOREHOLE**				



PID Readings

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

GEOLOGICAL LOG

TEST HOLE No. 30

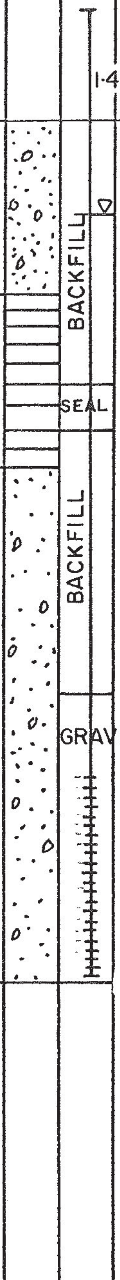
SHEET 1 OF 1

SCALE (ft) (m)

(ft): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

(m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

EL (mGSD) / DEPTH (m)	DESCRIPTION
278.9	GROUND SURFACE
0.0	Light brown fine-coarse sand, minor fine-coarse gravel, minor silt
276.8 2.1	Grey clayey silt, minor fine-coarse sand, fine-coarse gravel
274.5 4.4	Grey fine-coarse sand, fine gravel; minor silt, minor medium-coarse gravel
267.8 11.1	END OF HOLE



SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
1	ss	6
2	ss	11
3	ss	35
4	ss	18
5	ss	29
6	ss	20
7	ss	12
8	ss	25
9	ss	38

NOTES

DATE DRILLED Jan. 18,19, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND 2.4 (m below ground surface)

STATIC WATER LEVEL 1.41 (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 3.0 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽ 277.51 Static Water Elevation (m GSD) (05 April 1983)

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

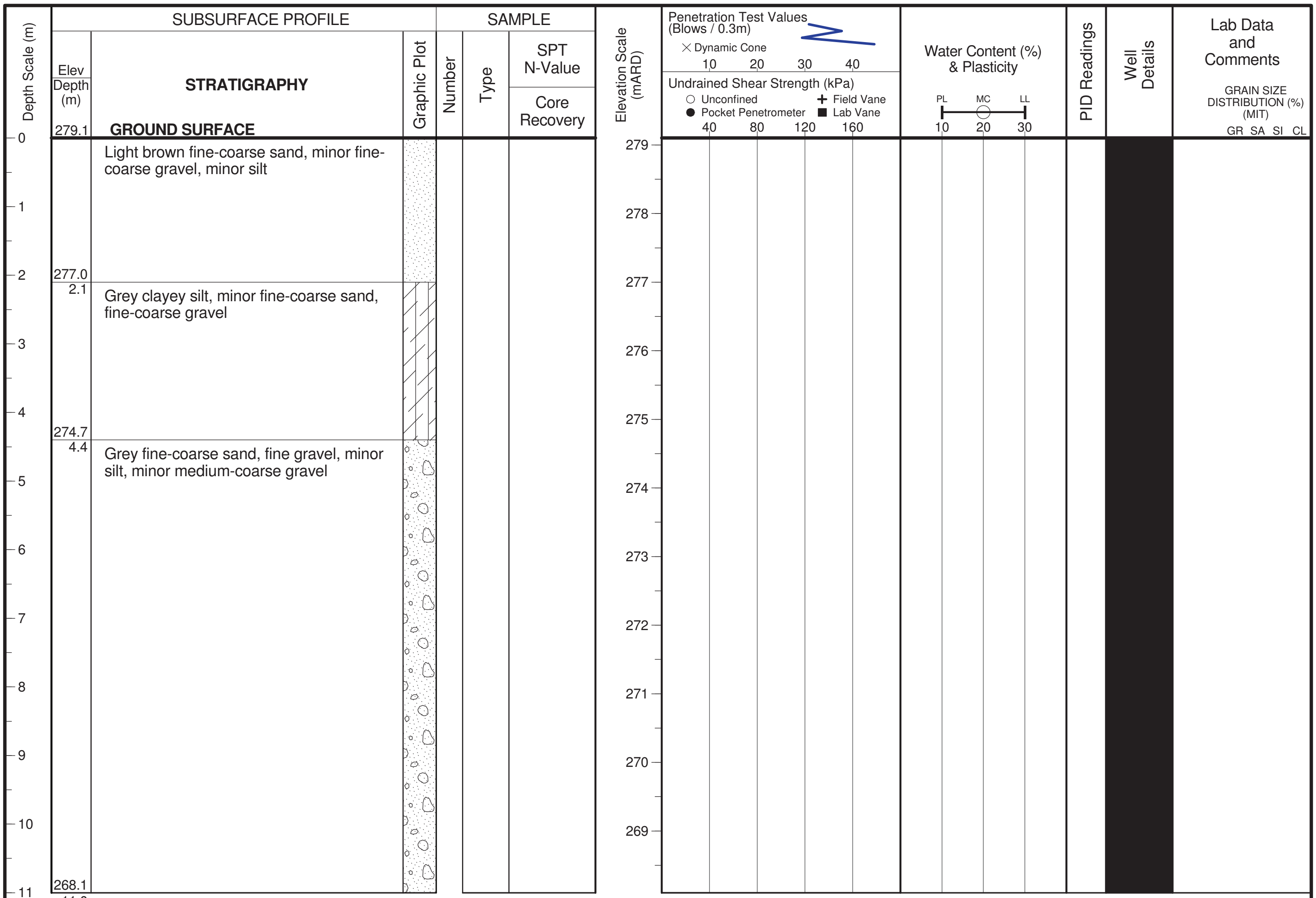
TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

LOG OF BOREHOLE 30 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*
rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*
date started | 2014/09/25
supervisor | MEQ
reviewer | AMS



Elev Depth (m)	STRATIGRAPHY
279.1	GROUND SURFACE
	Light brown fine-coarse sand, minor fine-coarse gravel, minor silt
277.0 2.1	Grey clayey silt, minor fine-coarse sand, fine-coarse gravel
274.7 4.4	Grey fine-coarse sand, fine gravel, minor silt, minor medium-coarse gravel
268.1 11.0	END OF BOREHOLE

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH30 (MacLaren Engineers Inc., 1983).

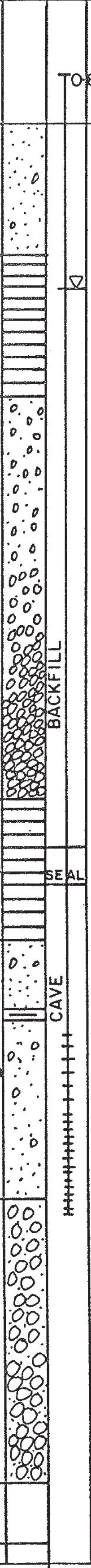
Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

GEOLOGICAL LOG

TEST HOLE No. 31

SHEET 1 OF 1

EL (mGSD) / DEPTH (m)	DESCRIPTION
278.9	GROUND SURFACE
0.0	Light brown fine-coarse sand, minor fine-coarse gravel, minor silt
276.8 / 2.1	Grey clayey silt, minor fine-coarse sand, fine-coarse gravel
274.5 / 4.4	Light brown-grey silty fine-coarse sand, fine-coarse gravel gradually becoming predominantly grey coarse gravel
267.9 / 11.0	Grey clayey silt, minor fine-coarse gravel at 11.0m minor silty fine sand at 13.0 m
265.6 / 13.3	Light brown-grey silty fine sand, minor coarse gravel, medium-coarse sand, significant silt at 14.5m, medium to coarse sand at 16.8 m
261.3 / 17.5	Fine-coarse gravel with medium sand; minor silt
256.8 / 22.1	Dense grey sandy till
255.9 / 23.0	END OF HOLE



SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
1	SS	16
2	SS	44
3	SS	17
4	SS	18
5	SS	9
6	SS	20
7	SS	13
8	SS	51
9	SS	68
10	SS	29
11	SS	46
12	SS	68
13	SS	
14	SS	63
15	SS	64
16	SS	76
17	SS	176

NOTES

DATE DRILLED Jan. 25,26, 1983 Feb. 03, 1983

TYPE OF RIG CME 75

DRILLING METHOD Solid Stem Augers Casing and Tricone

DEPTH WATER FOUND ______ (m below ground surface)

STATIC WATER LEVEL 2.63 (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 3.0 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS - SPLIT SPOON

WA - WASH

▽ 276.25 Static Water Elevation (05 April 1983)

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

GEOLOGICAL LOG

TEST HOLE No. 32

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	279.6	GROUND SURFACE		0.89m			
	0.0	Light brown fine-medium sand, minor fine-coarse gravel, sandy clayey silt layer at 2.5 m		BACK FILL	1 ▽	ss	7
1				SEAL	2	ss	14
5 2				GRAVEL MINOR CAVING	3	ss	28
10 3					4	ss	18
	276.0				5	ss	8
4	3.7	Grey loose clayey silt			6	ss	8
15 5	274.6				7	ss	5
	5.1	END OF HOLE					
20 6							
7							
25 8							
30 9							
10							
35 11							
40 12							
13							
45 14							
50 15							

NOTES

DATE DRILLED Jan. 19, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND ~ 0.6
(m below ground surface)

STATIC WATER LEVEL 0.65
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.8 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽278.96 Static Water Elevation (m GSD) (05 April 1983)

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

LOG OF BOREHOLE 32 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/10
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 / Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	280.1	**GROUND SURFACE**					280					
		Light brown fine to medium sand, minor fine to coarse gravel, sandy clayey silt layer at 2.5 m										
1							279					
2							278					
3							277					
	276.4 3.7	Grey loose clayey silt										
4							276					
	275.5 4.6	**END OF BOREHOLE**										

Stratigraphy inferred from original borehole log for BH32 (MacLaren Engineers Inc., 1983).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpi

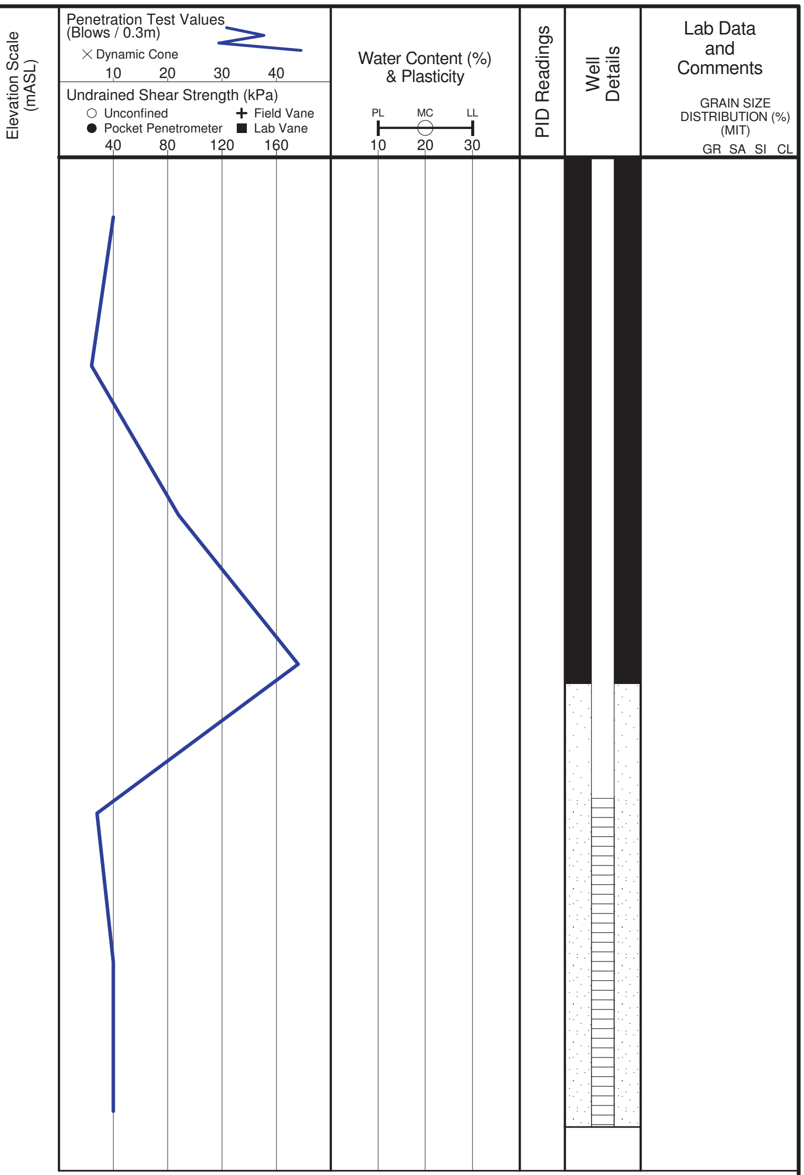
LOG OF BOREHOLE 32R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/10
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	SAMPLE Number	Type	SPT N-Value / Core Recovery
	GROUND SURFACE			
	Dark brown **TOPSOIL AND ORGANICS**, some fine gravel, dry, loose.	1	SS	10
0.6	Brown fine to coarse **SAND**, trace silt, wet, loose, weakly dilatant.	2	SS	6
1.5	Brown fine to coarse **SAND**, some medium gravel, trace to some silt, wet, compact to dense.	3	SS	22
		4	SS	44
		5	SS	7
3.4	Grey **SANDY SILT**, trace clay, wet, compact.			
		6	SS	10
4.6	Grey **SILT**, trace clay, some fine sand, APL, firm.	7	SS	10
5.2	**END OF BOREHOLE**			



GEOLOGICAL LOG

TEST HOLE No. 33

SHEET 1 OF 1.

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	279.9	GROUND SURFACE		0·76m			
	0.0	Black-grey clayey silt, minor medium gravel	▤	BACKFILL SEAL	1 2	ss ss	7 5
	276.5			▽			
	3.4	Loose brown silty fine sand	⁘		3	ss	9
	275.0						
	4.9	Brown-grey clayey silt; minor fine-coarse gravel, minor sand	▤	CAVE SEAL	4 5 6	ss ss ss	22 39 12
	270.8						
	9.1	Brown silty fine sand	⁘	CAVE	7 8	ss ss	11 12
	268.0						
	11.9	Brown clayey silt	▤		9	ss	37
	267.2						
	12.7	END OF HOLE					

(ft) 5 10 15 20 25 30 35 40 45 50

(m) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

NOTES

DATE DRILLED Jan. 19, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers

DEPTH WATER FOUND
(m below ground surface)

STATIC WATER LEVEL 3.12
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.8 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH

▽276.54 Static Water Elevation (m GSD) (05 April 1983)

╪ Piezometer

MacLaren

MacLAREN
ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

LOG OF BOREHOLE 33 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/16
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY
280.2	**GROUND SURFACE**
	Black-grey clayey silt, minor medium gravel
276.8 3.4	Loose brown silty fine sand
275.3 4.9	Brown-grey clayey silt; minor fine to coarse gravel, minor sand
271.1 9.1	Brown silty fine sand
268.3 11.9	Brown clayey silt
268.1 12.1	

END OF BOREHOLE

Stratigraphy inferred from original borehole log for BH33 (MacLaren Engineers Inc., 1983).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

SUBSURFACE PROFILE; SAMPLE: Graphic Plot, Number, Type, SPT N-Value, Core Recovery; Elevation Scale (mARD); Penetration Test Values (Blows / 0.3m): × Dynamic Cone 10 20 30 40; Undrained Shear Strength (kPa): ○ Unconfined, + Field Vane, ● Pocket Penetrometer, ■ Lab Vane 40 80 120 160; Water Content (%) & Plasticity: PL MC LL 10 20 30; PID Readings; Well Details; Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

LOG OF BOREHOLE 33R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

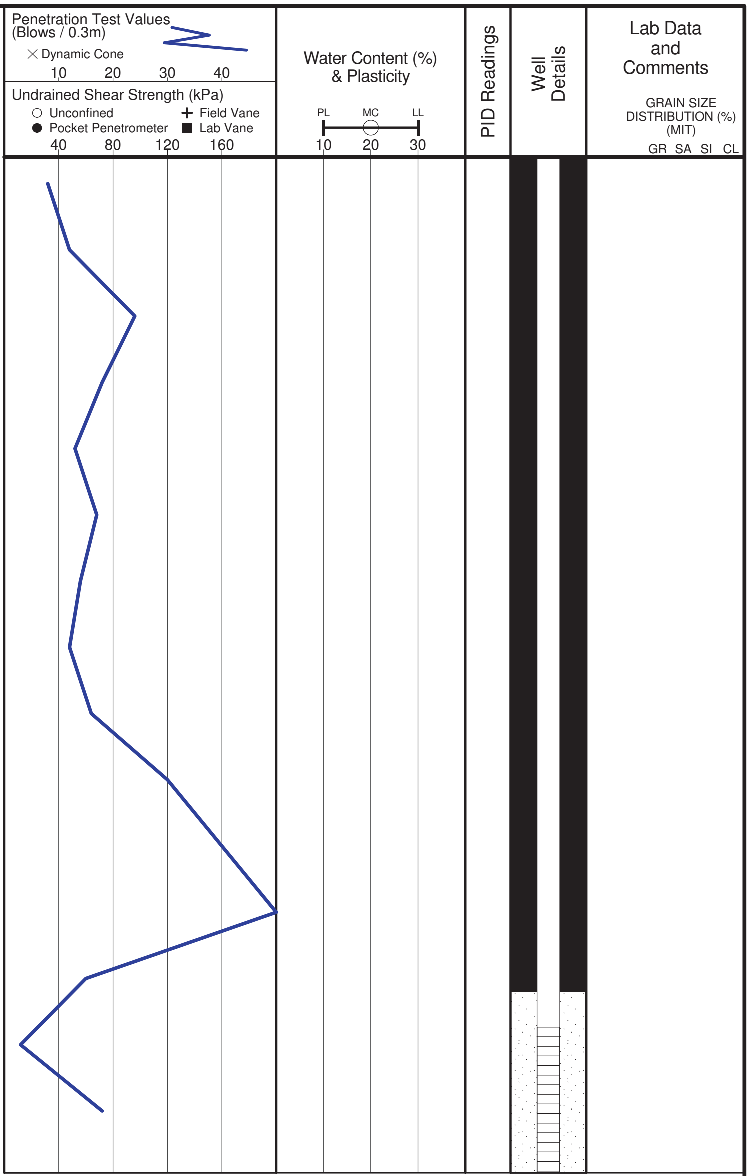
date started | 2015/07/23
supervisor | MEQ
reviewer | AMS

Elev Depth (m)	STRATIGRAPHY GROUND SURFACE	Number	Type	SPT N-Value Core Recovery	Elevation Scale (mASL)
	Dark brown **TOPSOIL**, some fine sand, rootlets, moist, loose.	1	SS	8	
0.6	Reddish brown **CLAYEY SILT**, some fine to medium sand, trace clay, trace rootlets, moist, compact.	2	SS	12	
		3	SS	24	
2.3	Grey-brown **CLAYEY SILT**, trace fine to coarse sand, trace gravel, DTPL to APL, stiff to very stiff.	4	SS	18	
		5	SS	13	
		6	SS	17	
		7	SS	14	
		8	SS	12	
		9	SS	16	
		10	SS	30	
		11	SS	40	
		12	SS	50	
9.3	Grey-brown fine **SILTY SAND**, trace clay, trace fine gravel, wet to saturated, compact.	13	SS	15	
		14	SS	3	
		15	SS	18	

11.7

END OF BOREHOLE

Stratigraphy inferred from adjacent borehole 25R.

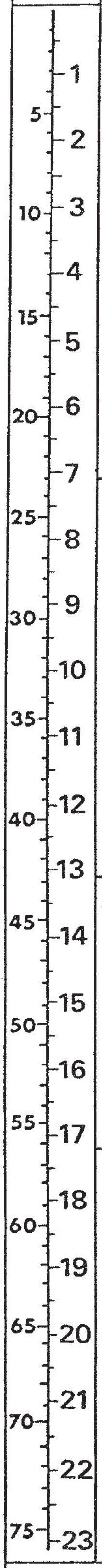


GEOLOGICAL LOG

TEST HOLE No. 35

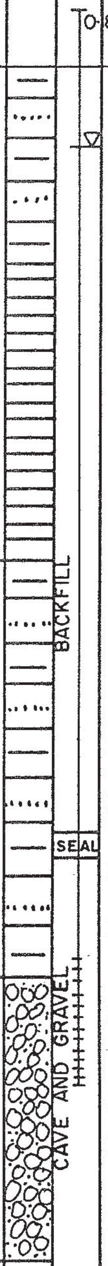
SHEET 1 OF 1

SCALE (ft) (m)



EL (mGSD) / DEPTH (m)	DESCRIPTION
277.8	GROUND SURFACE
0.0	Grey clayey silt, minor gravel interlayered with silty fine sand at 0.3 m
270.7 7.1	Brown-grey clayey silt with fine-coarse gravel interlayered with thin horizons of fine-coarse sand
264.7 13.1	Grey fine-coarse gravel with sand and minor silt
260.6 17.2	END OF HOLE

STRAT. PLOT / PIEZOMETER



SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
1	ss	3
2	ss	47
3	ss	30
4	ss	28
5	ss	9
6	ss	27
7	ss	17
8	ss	11
9	ss	73
10	ss	58
11	ss	34
12	ss	54
13	ss	27
14	ss	32
15	ss	33
16	ss	25

NOTES

DATE DRILLED Jan.26,27, 1983

TYPE OF RIG CME 75

DRILLING METHOD Hollow Stem Augers, Casing and Tricone

DEPTH WATER FOUND ______
(m below ground surface)

STATIC WATER LEVEL 1.21
(m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 1.8 (m)

TYPE OF PIEZOMETER Slotted and Nitex Screen Wrapped

SAMPLE TYPE

SS - SPLIT SPOON
WA - WASH
AU - AUGER

▽276.60 Static Water Elevation (mGSD) (05 April 1983)

Piezometer

TEST HOLE RECORD

DJR

MacLaren

MacLAREN ENGINEERS INC.

PROJECT NO. 11602-2

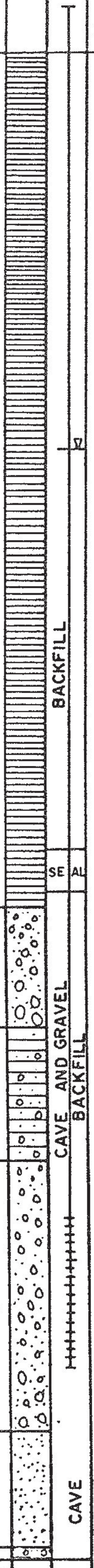
GEOLOGICAL LOG

TEST HOLE No. 37

SHEET 1 OF 1

EL (mGSD)	DEPTH (m)	DESCRIPTION
274.76		GROUND SURFACE
	0.0	Grey brown clayey silt, minor fine to coarse gravel, layer of silty fine sand at 4.6 m, trace minor fine to coarse sand from 10.6 - 12 m.
259.98	14.8	Fine gravel, some fine to coarse sand and medium to coarse gravel, minor silt
257.84	16.9	Brown grey clayey silt, minor fine to medium sand, fine to coarse gravel
255.55	19.2	Fine to medium gravel, some coarse gravel, minor fine to coarse sand, minor silt
250.99	23.8	Brown silty fine to coarse sand, minor fine to coarse gravel
249.00	25.8	Very dense hard clay till, minor fine to medium gravel sand, silt
248.79	26.0	END OF HOLE

SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
1.72 m		
	SS	18
	SS	18
	SS	30
	SS	32
	SS	38
	SS	47
	SS	55
	SS	31
	SS	39
	SS	26
	SS	134
	SS	64
	SS	21
	SS	11
	SS	7
	SS	73
	SS	600



NOTES

DATE DRILLED Feb. 11,14,15 1983

TYPE OF RIG CME 75

DRILLING METHOD Solid Stem Auger, Casing, Tricone

DEPTH WATER FOUND 4.6 (m below ground surface)

STATIC WATER LEVEL ______ (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 3.0 (m)

TYPE OF PIEZOMETER Slotted and Nitex screen wrapped

SAMPLE TYPE

- SS-SPLIT SPOON
- WA-WASH
- AU-AUGER

▽ Static Water Elevation (m GSD) 275.39 m

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

LOG OF BOREHOLE 37 Decommissioning

WSP

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/08/04
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
275.0	**GROUND SURFACE**
	Grey brown clayey silt, minor fine to coarse gravel, layer of silty fine sand at 4.6 m, trace minor fine to coarse sand from 10.6 - 12 m
260.2 14.8	Fine gravel, some fine to coarse sand and medium to coarse gravel, minor silt
258.1 16.9	Brown grey clayey silt, minor fine to medium sand, fine to coarse gravel
255.8 19.2	Fine to medium gravel, some coarse gravel, minor fine to coarse sand, minor silt
252.3 22.7	**END OF BOREHOLE**

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22

Elevation Scale (mARD): 274, 273, 272, 271, 270, 269, 268, 267, 266, 265, 264, 263, 262, 261, 260, 259, 258, 257, 256, 255, 254, 253

Graphic Plot | SAMPLE: Number | Type | SPT N-Value | Core Recovery

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined ✚ Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Stratigraphy inferred from original borehole log for BH37 (MacLaren Engineers Inc., 1983).

Monitoring well decommissioned by overdrilling to full borehole depth and sealing with bentonite.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

Sheet No. 1 of 1

LOG OF BOREHOLE 37R

project | Holbrook Landfill Site

client | Oxford County

location | Holbrook, Oxford County

project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted

method | Hollow stem augers, 215 mm dia.

coring | *n/a*

date started | 2015/08/05

supervisor | MEQ

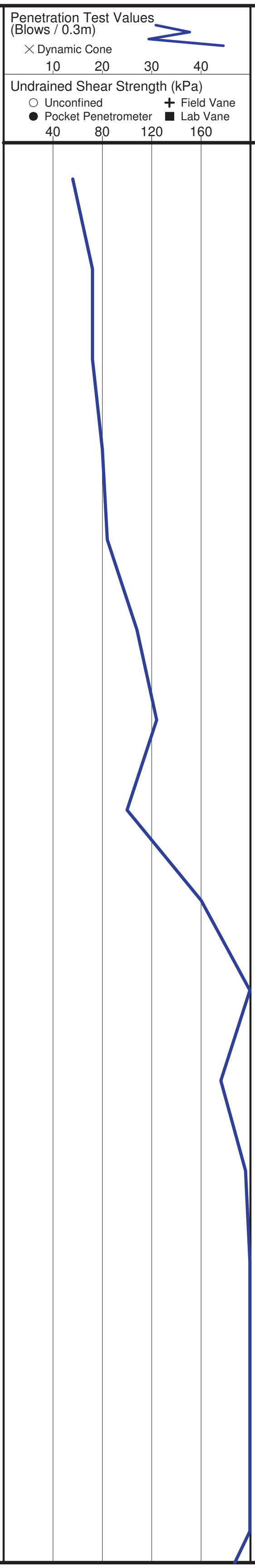
reviewer | AMS

SUBSURFACE PROFILE / SAMPLE

Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mASL)	Water Content (%) & Plasticity	PID Readings	Well Details	Lab Data and Comments
	GROUND SURFACE								
	Dark brown **SANDY TOPSOIL**, rootlets, dry, compact.	1	SS	14					
0.5	Brown coarse **SILTY SAND TO SANDLY SILT**, some fine to medium gravel, trace clay, trace organics, moist, compact.	2	SS	18					
1.5	Reddish brown **CLAYEY SILT**, some sand, trace fine gravel, APL, very stiff.	3	SS	18					
		4	SS	20					
2.7	Grey **CLAYEY SILT**, some fine to coarse sand to silty sand layers up to 10 cm, trace fine gravel, APL, very stiff to hard.	5	SS	21					
		6	SS	27					
		7	SS	31					
		8	SS	25					
		9	SS	40					
		10	SS	78					
7.6	Grey **CLAYEY SILT**, trace fine sand and gravel, DTPL to APL, hard.	11	SS	44					
		12	SS	49					
		13	SS	52					
		14	SS	52					
		15	SS	66					
		16	SS	51					

Water Content (%) & Plasticity: PL MC LL — 10 20 30

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) — GR SA SI CL



(continued next page)

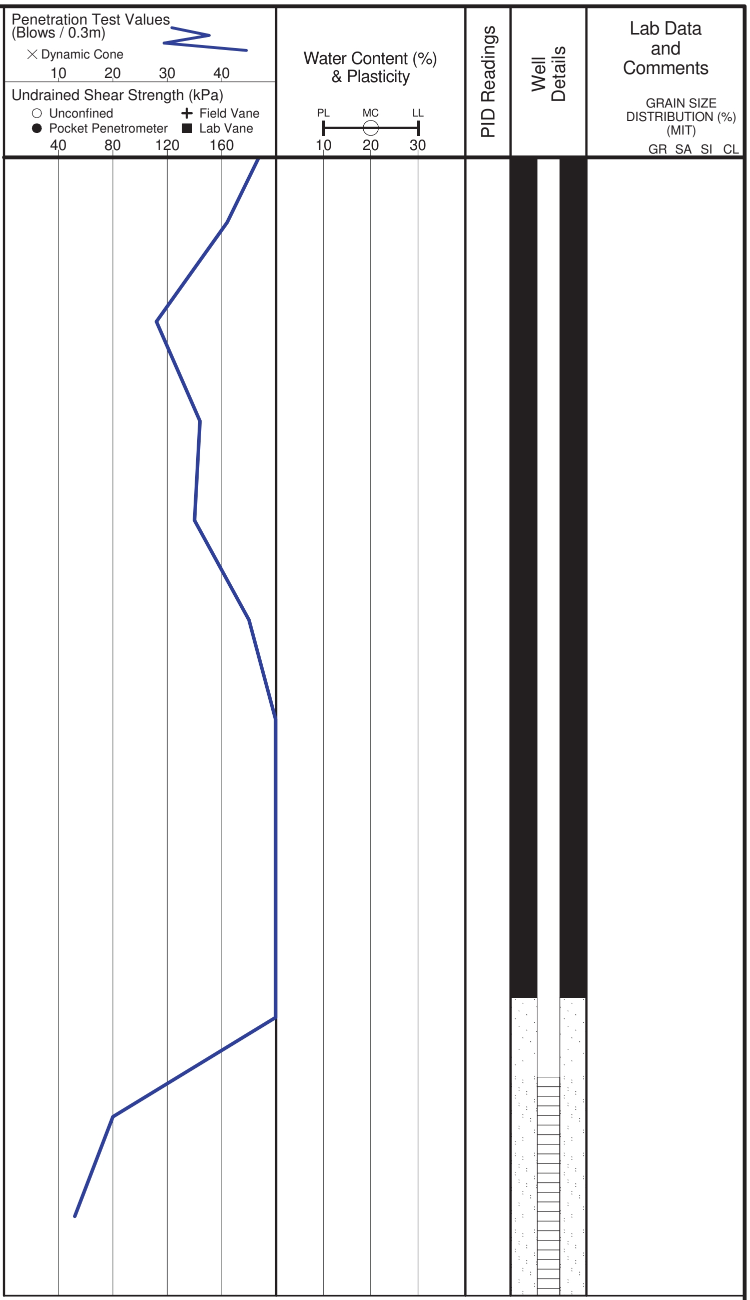
LOG OF BOREHOLE 37R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/08/05
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE		SAMPLE		
Elev Depth (m)	**STRATIGRAPHY** *(continued)*	Number	Type	SPT N-Value / Core Recovery
	Grey **CLAYEY SILT**, trace fine sand and gravel, DTPL to APL, hard. *(continued)*	17	SS	41
13.0	Grey-brown **SANDY SILT**, trace clay, WTPL, very stiff to hard.	18	SS	28
		19	SS	36
		20	SS	35
15.2	Grey coarse **SAND** and fine to medium **GRAVEL**, trace silt, wet, dense to very dense.	21	SS	45
		22	SS	69
16.8	Grey **CLAYEY SILT**, some fine to coarse gravel, WTPL, hard.	23	SS	77
		24	SS	73
		25	SS	93
18.9	Grey coarse **GRAVELLY SAND**, trace silt, wet, compact.	26	SS	20
		27	SS	13
20.7	**END OF BOREHOLE**			



Depth Scale (m): 12, 13, 14, 15, 16, 17, 18, 19, 20

Elevation Scale (mASL)

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

GEOLOGICAL LOG

TEST HOLE No. 38

SHEET 1 OF 1

SCALE (ft)(m)	EL (mGSD) / DEPTH (m)	DESCRIPTION	STRAT. PLOT	PIEZOMETER	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m
	282.27	GROUND SURFACE		1.33 m			
	0.0	Red brown silty fine to medium sand, fine to coarse gravel Red brown clayey silt, minor fine to coarse gravel				SS SS	25 21
	278.92 3.4	Light brown uniform fine sand		BACKFILL			
	277.57 4.7	Red brown to grey clayey silt, minor fine to coarse gravel, minor layer of silty fine to coarse sand at 7.6 m formation becoming more dense at 10.7 m		SEAL		SS SS SS SS SS SS SS SS	26 19 17 37 63 106 113
	267.77 14.5	Brown-grey brown clayey silt, minor fine to coarse gravel interlayered with brown silty fine sand and sandy silt Grey clayey silt, fine to coarse sand, fine to coarse gravel		CAVE		SS SS SS SS SS	23 92 26 57 104
	260.27 21.9	Grey fine to coarse gravel medium to coarse sand				SS SS SS SS	34 17 17 51
	253.77 28.5	Grey very dense sandy clayey silt till		CAVE		SS SS	250 220
	251.33 30.9	END OF HOLE					

SCALE (ft): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105

SCALE (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32

NOTES

DATE DRILLED Feb. 15,16,17 1983

TYPE OF RIG CME 75

DRILLING METHOD Solid Stem Augers, Casing and Tricone

DEPTH WATER FOUND ______ (m below ground surface)

STATIC WATER LEVEL ______ (m below ground surface)

PIPE DIAMETER 51 (mm)

LENGTH OF PIEZOMETER 3.0 (m)

TYPE OF PIEZOMETER Slotted and Nitex screen wrapped

SAMPLE TYPE

SS-SPLIT SPOON
WA-WASH
AU-AUGER

▽ Static Water Elevation (m GSD) 275.45 m

Piezometer

MacLaren

MacLAREN ENGINEERS INC.

TEST HOLE RECORD

DJR

PROJECT NO. 11602-2

BOREHOLE NO. BH39

PAGE 1 of 1

PROJECT NAME: HOLBROOK LANDFILL

PROJECT NO.: 111-53037-00 132-00

CLIENT: COUNTY OF OXFORD

DATE COMPLETED: Jul 18, 2013

BOREHOLE TYPE: 210 mm HOLLOW STEM AUGER

SUPERVISOR: TJB

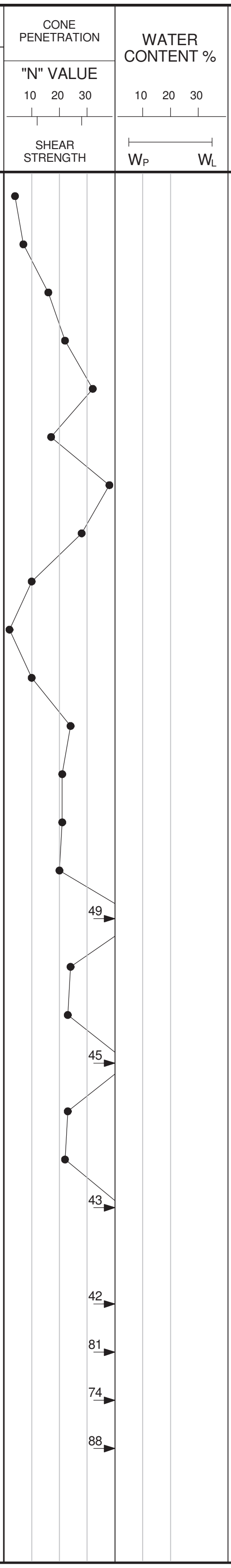
GROUND ELEVATION: TO BE DETERMINED

REVIEWER: KJF

DEPTH (m)	STRATIGRAPHIC DESCRIPTION
0.0 – 0.3	TOPSOIL: DARK BROWN TOPSOIL, SOME ORGANICS, WET, LOOSE.
0.3 – 4.6	SAND: GREY-BROWN MEDIUM TO FINE GRAINED SAND, TRACE TO SOME SILT, SOME MEDIUM TO COARSE GRAVEL BELOW 3.0 m, TRACE SILT, SATURATED, COMPACT.
4.6 – 6.1	CLAYEY SILT: GREY-BROWN CLAYEY SILT, TRACE GRAVEL, WTPL, STIFF.
6.1 – 8.4	SAND: GREY-BROWN FINE GRAINED SAND, TRACE SILT, WET TO SATURATED, VERY LOOSE TO LOOSE.
8.4 – 9.9	SAND AND GRAVEL: GREY-BROWN FINE TO MEDIUM GRAVEL AND FINE GRAINED SAND, TRACE TO SOME SILT, WET TO SATURATED, COMPACT.
9.9 – 12.2	SILTY SAND : GREY-BROWN SILTY FINE SAND, WET, COMPACT TO DENSE.
12.2 – 16.2	SAND: GREY-BROWN COARSE GRAINED SAND, SOME FINE TO MEDIUM GRAVEL, TRACE SILT, SATURATED, COMPACT.
16.2 – 17.5	SAND: GREY-BROWN MEDIUM TO FINE GRAINED SAND, TRACE SILT, WET, DENSE.
17.5 – 19.8	SAND AND GRAVEL: GREY-BROWN MEDIUM TO COARSE GRAINED SAND AND MEDIUM GRAVEL, TRACE CLAYEY SILT, TRACE FINE SAND, WET TO SATURATED, COMPACT.
19.8 – 20.4	SILTY CLAY: GREY SILTY CLAY, TRACE GRAVEL, APL TO WTPL, VERY DENSE.
20.4	BOREHOLE TERMINATED AT 20.4 m DEPTH IN SILTY CLAY.

STRATIGRAPHY / MONITOR DETAILS

TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)	REMARKS
SS1	4		7		
SS2	7		37		1 cm THICK ORGANIC LAYER AT 1.0 m DEPTH
SS3	16		33		
SS4	22		37		
SS5	32		60		
SS6	17		10		
SS7	38		2		
SS8	28		3		
SS9	10		47		
SS10	2		0		POOR RECOVERY IN SPOON
SS11	10		50		
SS12	24		20		
SS13	21		47		
SS14	21		60		
SS15	20		67		
SS16	49		70		
SS17	24		27		
SS18	23		33		
SS19	45		3		
SS20	23		43		
SS21	22		53		
SS22	43		40		
SS23	50		20		
SS24	42		40		
SS25	81		27		
SS26	74		43		
SS27	88		40		



BOREHOLE NO. BH40

PAGE 1 of 1

PROJECT NAME: HOLBROOK LANDFILL

PROJECT NO.: 111-53037-00 132-00

CLIENT: COUNTY OF OXFORD

DATE COMPLETED: Jul 22, 2013

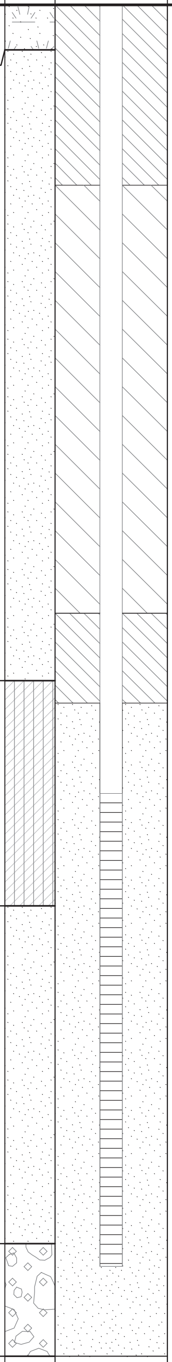
BOREHOLE TYPE: 210 mm HOLLOW STEM AUGER

SUPERVISOR: TJB

GROUND ELEVATION: TO BE DETERMINED

REVIEWER: KJF

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE					CONE PENETRATION "N" VALUE 10 20 30 SHEAR STRENGTH	WATER CONTENT % 10 20 30 W_P W_L	REMARKS
				TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)			
0.0	TOPSOIL: DARK BROWN TOPSOIL, SOME ORGANICS, WET, LOOSE.										STRATIGRAPHY BASED ON ADJACENT DEEP BOREHOLE 39.
0.3	SAND: GREY-BROWN MEDIUM TO FINE GRAINED SAND, TRACE TO SOME SILT, SOME MEDIUM TO COARSE GRAVEL BELOW 3.0 m, TRACE SILT, SATURATED, COMPACT.										1 cm THICK ORGANIC LAYER AT 1.0 m DEPTH
4.6	CLAYEY SILT: GREY-BROWN CLAYEY SILT, TRACE GRAVEL, WTPL, STIFF.										
6.1	SAND: GREY-BROWN FINE GRAINED SAND, TRACE SILT, WET TO SATURATED, VERY LOOSE TO LOOSE.										POOR RECOVERY IN SPOON
8.4	SAND AND GRAVEL: GREY-BROWN FINE TO MEDIUM GRAVEL AND FINE GRAINED SAND, TRACE TO SOME SILT, WET TO SATURATED, COMPACT.										
9.1	BOREHOLE TERMINATED AT 9.1 m DEPTH IN SAND AND GRAVEL.										



BOREHOLE NO. BH41

PAGE 1 of 1

PROJECT NAME: HOLBROOK LANDFILL

PROJECT NO.: 111-53037-00 132-00

CLIENT: COUNTY OF OXFORD

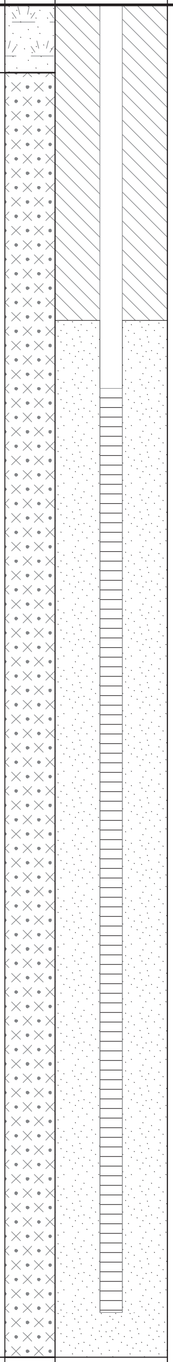
DATE COMPLETED: Jul 22, 2013

BOREHOLE TYPE: 210 mm HOLLOW STEM AUGER

SUPERVISOR: TJB

GROUND ELEVATION: TO BE DETERMINED

REVIEWER: RFK



DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 SHEAR STRENGTH	WATER CONTENT % 10 20 30 WP WL	REMARKS
0.0	TOPSOIL AND CLAY CAP										
0.5	WASTE										
	WASTE BECOMING WET										
	WASTE BECOMING SATURATED										
9.1	BOREHOLE TERMINATED AT 9.1 m DEPTH IN WASTE.										

LOG OF BOREHOLE 42

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/07
supervisor | MEQ
reviewer | AMS

Depth Scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

Penetration Test Values (Blows / 0.3m): × Dynamic Cone 10 20 30 40
Undrained Shear Strength (kPa): ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160
Water Content (%) & Plasticity: PL MC LL 10 20 30
Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

SUBSURFACE PROFILE		SAMPLE								
Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mASL)	Penetration Test Values	Water Content (%) & Plasticity	PID Readings	Well Details	Lab Data and Comments
	GROUND SURFACE									
	Dark brown **TOPSOIL**, some organics, wet, loose.									
0.3	Grey-brown medium to fine grained **SAND**, trace to some silt, some medium to coarse gravel below 3.0 m, trace silt, saturated, compact.									
4.6	Grey-brown **CLAYEY SILT**, trace gravel, WTPL, stiff.									
6.1	Grey-brown fine grained **SAND**, trace silt, wet to saturated, very loose to loose.									
8.4	Grey-brown fine to medium **GRAVEL** and fine grained **SAND**, trace to some silt, wet to saturated, compact.									
9.9	Grey-brown **SILTY FINE SAND**, wet, compact to dense.									
12.2	Grey-brown coarse grained **SAND**, some fine to medium gravel, trace silt, saturated, compact.									

(continued next page)

LOG OF BOREHOLE 42

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

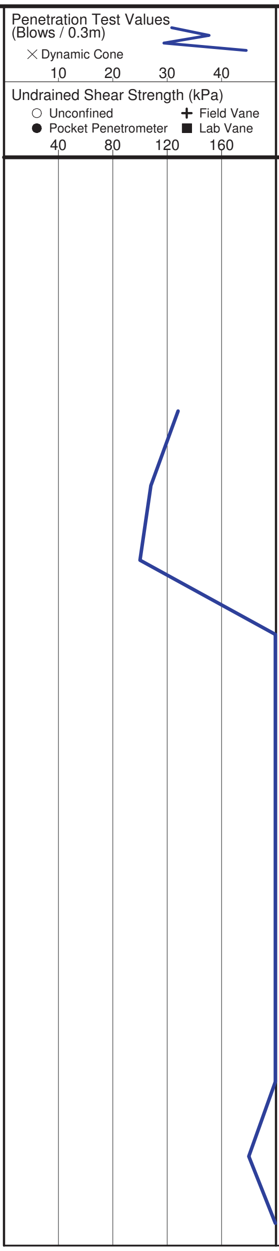
rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/07
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE *(continued)*

Elev Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value	Core Recovery
16.2	Grey-brown medium to fine grained **SAND**, trace silt, wet, dense.				
17.5	Grey-brown medium to coarse grained **SAND** and medium **GRAVEL**, trace clayey silt, trace fine sand, wet to saturated, compact.	1	SS	32	
19.1	Grey **CLAYEY SILT**, trace gravel, APL, very stiff.	2 3	SS SS	27 25	
20.4	Grey **CLAYEY SILT**, trace fine to coarse sand, increasing sand content with depth, DTPL to APL, hard.	4 5 6 7 8 9 10	SS SS SS SS SS SS SS	>100 >100 >100 >100 96 >100 >100	
25.9	Grey medium to coarse grained **SAND**, trace silt, wet, dense to very dense.	11 12	SS SS	45 80	
27.1	**END OF BOREHOLE**				

Stratigraphy to 18.3 m depth inferred from adjacent BH39.



LOG OF BOREHOLE 43

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/21
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
	GROUND SURFACE
0	Brown **SANDY TOPSOIL AND ORGANICS**, dry, loose.
0.5	Reddish brown **CLAYEY SILT**, trace fine sand, DTPL, hard.
3.4	Brown fine **SANDY SILT**, moist to wet, compact.
3.8	Grey **CLAYEY SILT**, some fine to coarse sand, some gravel, APL, stiff to hard.
6.7	Grey **CLAYEY SILT**, trace gravel, DTPL, hard.
9.0	Grey-brown **SILTY SAND**, trace fine gravel, saturated, compact.
11.3	**END OF BOREHOLE**

SAMPLE

Number	Type	SPT N-Value
1	SS	6
2	SS	39
3	SS	39
4	SS	36
5	SS	24
6	SS	34
7	SS	16
8	SS	11
9	SS	20
10	SS	40
11	SS	51
12	SS	52
13	SS	12
14	SS	16
15	SS	22

Depth Scale (m) 0–11

Core Recovery

Elevation Scale (mASL)

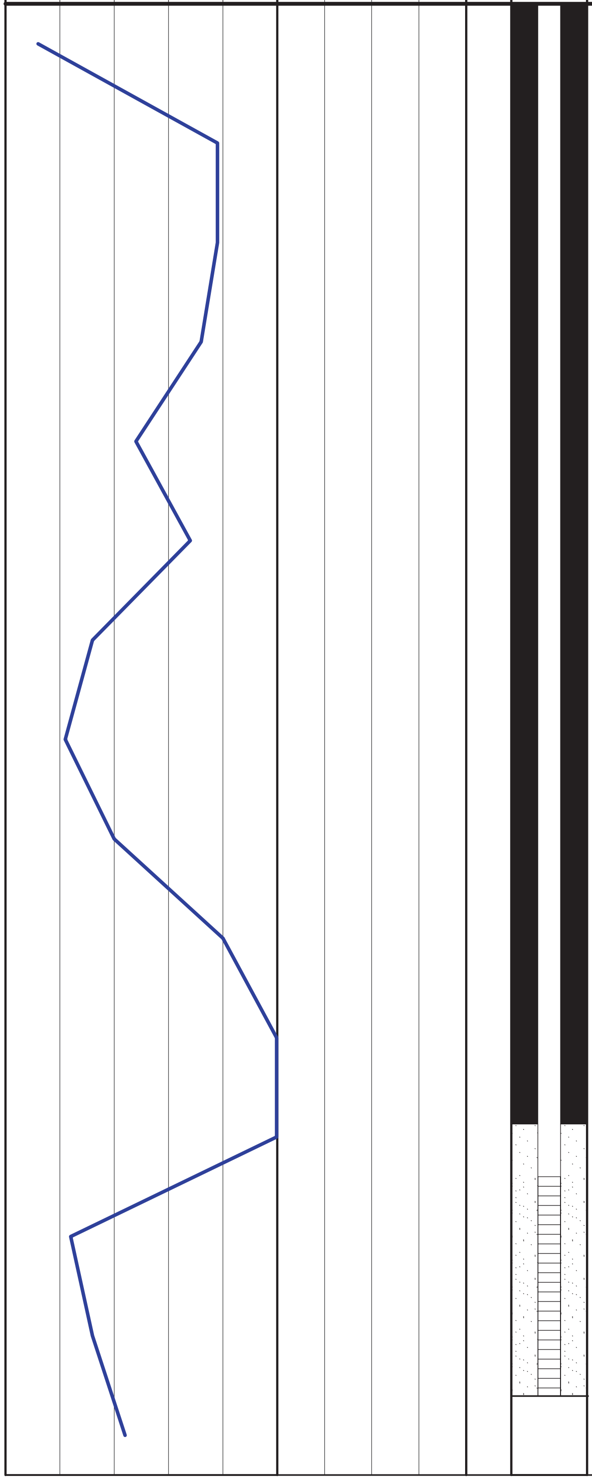
Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined ✚ Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL



LOG OF BOREHOLE 44

WSP

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/08/04
supervisor | MEQ
reviewer | AMS

Depth Scale (m)
0 1 2 3 4 5 6 7 8 9

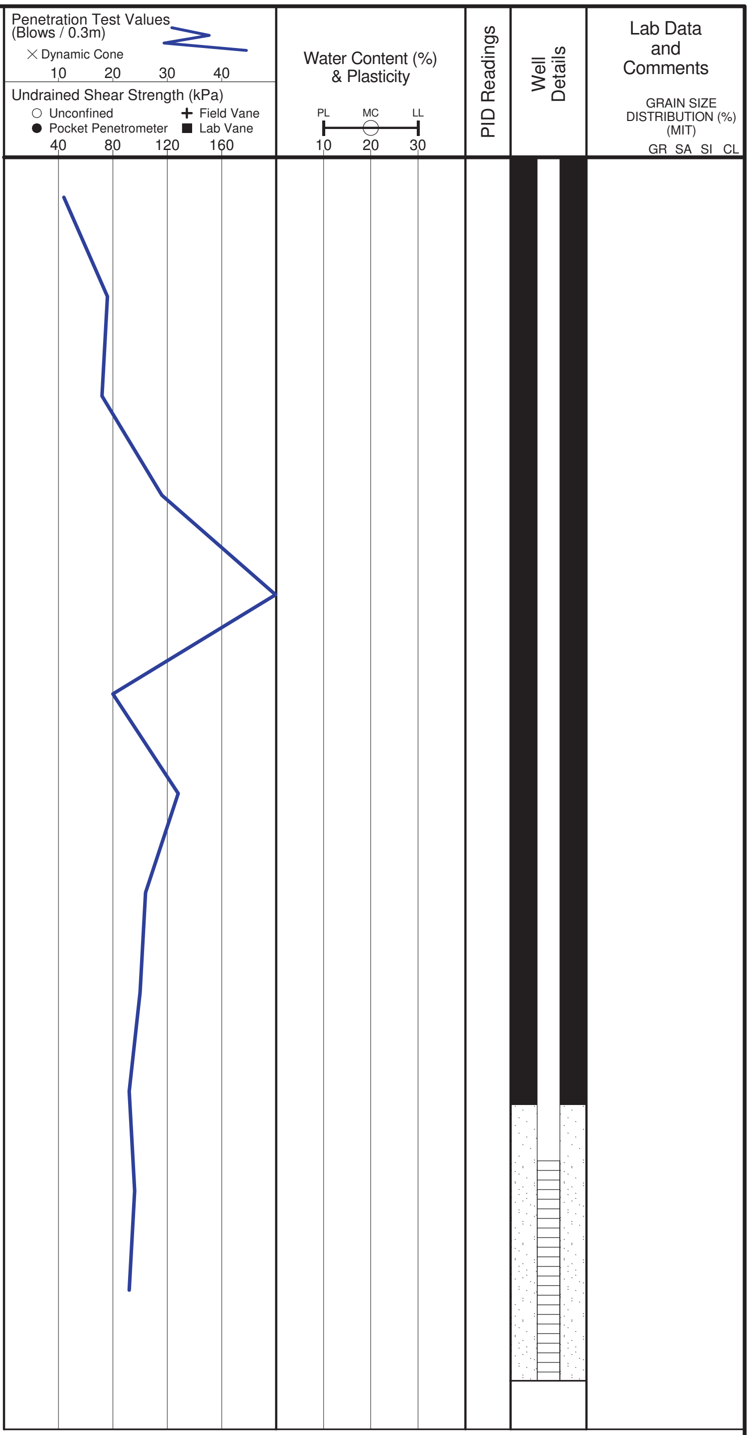
SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
	GROUND SURFACE
	Dark brown **TOPSOIL AND ORGANICS**, dry, loose.
0.3	Reddish brown fine **SAND**, trace fine gravel, dry, compact.
2.3	Brown fine to medium **SILTY SAND**, some fine to medium gravel, moist, dense to very dense.
3.8	Brown coarse **SAND**, some fine gravel, trace silt, moist to wet, compact.
5.2	Grey **CLAYEY SILT**, trace fine gravel and coarse sand, weakly dilatent, DTPL to APL, very stiff.
8.4	Brown coarse **SILTY SAND**, some fine gravel, wet, compact.
9.1	Grey **CLAYEY SILT**, trace fine gravel, APL to DTPL, stiff.
9.8	**END OF BOREHOLE**

SAMPLE

Number	Type	SPT N-Value	Core Recovery
1	SS	11	
2	SS	19	
3	SS	18	
4	SS	29	
5	SS	>100	
6	SS	20	
7	SS	32	
8	SS	26	
9	SS	25	
10	SS	23	
11	SS	24	
12	SS	23	
13	SS		

Elevation Scale (mASL)



library: genivar - library.glb **report:** gen log v1 **file:** bhlogs.gpj

LOG OF BOREHOLE BH45

project no. | 111-53037-03

project | Holbrook Landfill Site
client | County of Oxford
location | Holbrook, Ontario

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

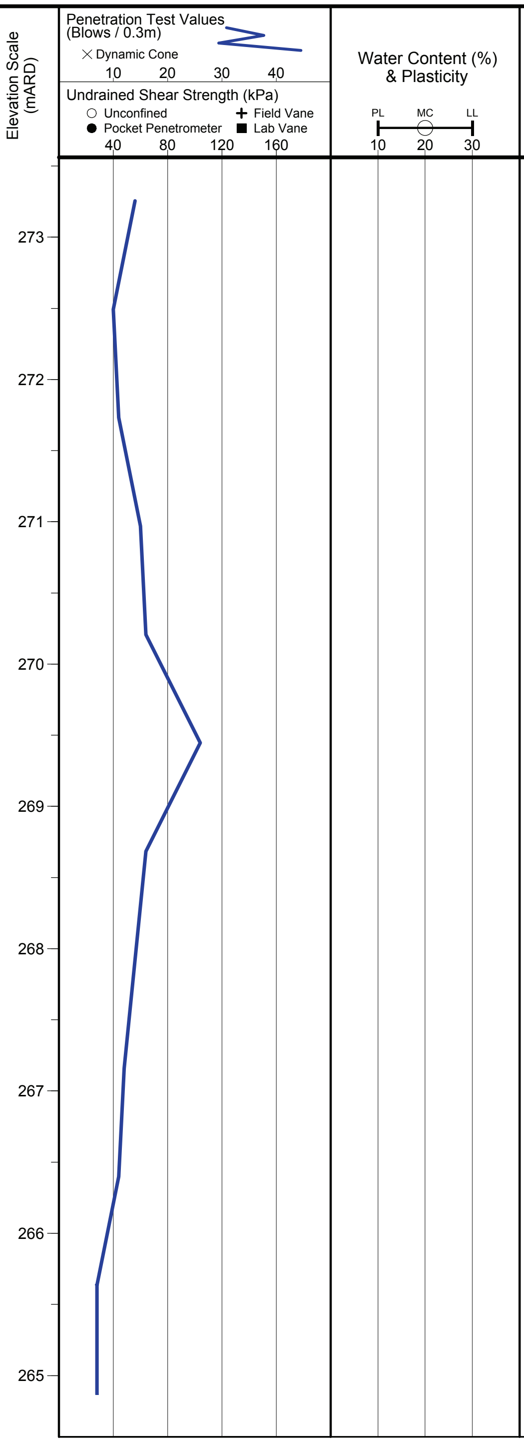
date started | 2019/08/15
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE

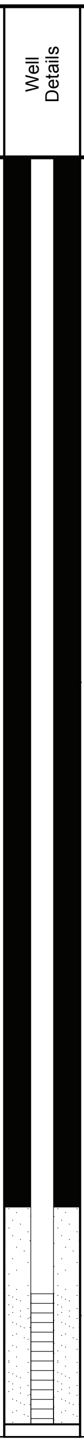
Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY
0	273.6	**GROUND SURFACE**
		Light brown **SANDY SILT**, some fine to coarse gravel, some organics and topsoil, trace clay, dry to moist, loose.
1	272.4 1.2	Reddish-brown medium to coarse **SILTY SAND**, trace coarse gravel, trace clay, moist, loose.
2	271.3 2.3	Reddish-brown **CLAYEY SILT**, some fine sand, some fine to medium gravel, APL, stiff.
3	270.7 2.9	Grey **CLAYEY SILT**, trace to some subangular gravel, trace fine to coarse sand, occasional cobble, APL, stiff to very stiff.
5	268.6 5.0	Grey medium to coarse **SILTY SAND**, some fine to coarse gravel, wet, loose to compact.
	268.0 5.6	Grey **CLAYEY SILT**, trace fine to coarse sand, APL, stiff to very stiff.
6	267.0 6.6	Grey-brown fine to medium **SILTY SAND**, saturated, loose to compact.
9	264.6 9.0	**END OF BOREHOLE**

SAMPLE

Number	Type	SPT N-Value
1	SS	14
2	SS	10
3	SS	11
4	SS	15
5	SS	16
6	SS	26
7	SS	16
8	SS	14
9	SS	12
10	SS	11
11	SS	7
12	SS	7



PID Readings



Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

library: genivar - library.glb **report:** gen log v1 **file:** 111-53037-03 bh logs.gpj

LOG OF BOREHOLE BH46

project no. | 111-53037-03

project | Holbrook Landfill Site
client | County of Oxford
location | Holbrook, Ontario

rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

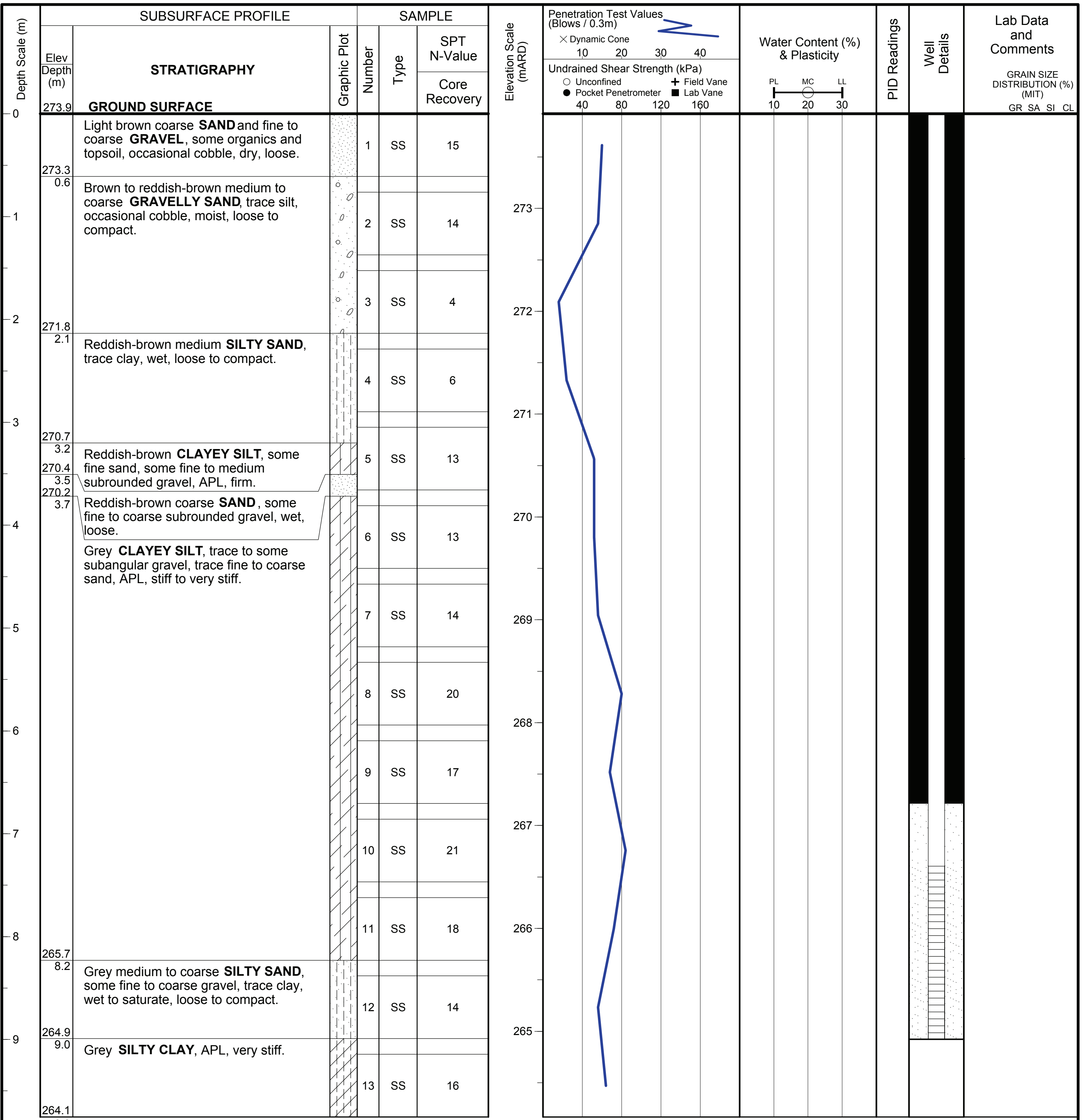
date started | 2019/08/15
supervisor | MEQ
reviewer | AMS

SUBSURFACE PROFILE

Elev Depth (m)	STRATIGRAPHY
273.9	**GROUND SURFACE**
	Light brown coarse **SAND** and fine to coarse **GRAVEL**, some organics and topsoil, occasional cobble, dry, loose.
273.3 0.6	Brown to reddish-brown medium to coarse **GRAVELLY SAND**, trace silt, occasional cobble, moist, loose to compact.
271.8 2.1	Reddish-brown medium **SILTY SAND**, trace clay, wet, loose to compact.
270.7 3.2	Reddish-brown **CLAYEY SILT**, some fine sand, some fine to medium subrounded gravel, APL, firm.
270.4 3.5	Reddish-brown coarse **SAND**, some fine to coarse subrounded gravel, wet, loose.
270.2 3.7	Grey **CLAYEY SILT**, trace to some subangular gravel, trace fine to coarse sand, APL, stiff to very stiff.
265.7 8.2	Grey medium to coarse **SILTY SAND**, some fine to coarse gravel, trace clay, wet to saturate, loose to compact.
264.9 9.0	Grey **SILTY CLAY**, APL, very stiff.
264.1 9.8	**END OF BOREHOLE**

SAMPLE

Number	Type	SPT N-Value / Core Recovery
1	SS	15
2	SS	14
3	SS	4
4	SS	6
5	SS	13
6	SS	13
7	SS	14
8	SS	20
9	SS	17
10	SS	21
11	SS	18
12	SS	14
13	SS	16



library: genivar - library.glb **report:** gen log v1 **file:** 111-53037-03 bh logs.gpj

LOG OF BOREHOLE 104 Decommissioning

project | Holbrook Landfill Site

client | Oxford County

location | Holbrook, ON

project no. | *111-53037-00 132-00*

rig type | CME 75, track-mounted

method | Hollow stem augers, 215 mm dia.

coring | *n/a*

date started | 2014/09/17

supervisor | MEQ

reviewer | AMS

Depth Scale (m)	SUBSURFACE PROFILE			SAMPLE			Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value Core Recovery						
0	279.8	**GROUND SURFACE**									■	
							279				■	
1											■	
							278				■	
2											■	
							277				■	
3											■	
							276				■	
4											■	
	275.4 4.4	**END OF BOREHOLE** No original borehole log information available.										

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

LOG OF BOREHOLE 301 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-00*
rig type | CME 75, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*
date started | 2014/09/26
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE STRATIGRAPHY	Graphic Plot	SAMPLE Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 / Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	278.1	**GROUND SURFACE**										
							278					
1												
							277					
2												
							276					
3												
							275					
4												
							274					
	273.3 4.8											

END OF BOREHOLE

No original borehole log information available.

library: genivar - library.glb **report:** gen log v1 **file:** bhlogs - decom.gpj

LOG OF BOREHOLE SP3 Decommissioning

project | Holbrook Landfill Site

client | Oxford County
rig type | Acker Soil-Max, track-mounted
date started | 2015/07/22

location | Holbrook, ON
method | Hollow stem augers, 215 mm dia.
supervisor | MEQ

project no. | *111-53037-00 132-02*
coring | *n/a*
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY (SUBSURFACE PROFILE)	Graphic Plot	Number (SAMPLE)	Type (SAMPLE)	SPT N-Value / Core Recovery (SAMPLE)	Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40; Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
0	280.4	**GROUND SURFACE**										
							280					
1												
	279.2 1.2	**END OF BOREHOLE** No original borehole log information available.										

library: genivar - library.glb report: gen log v1 file: bhlogs - decom.gpj

Sheet No. 1 of 1

LOG OF BOREHOLE SP3R

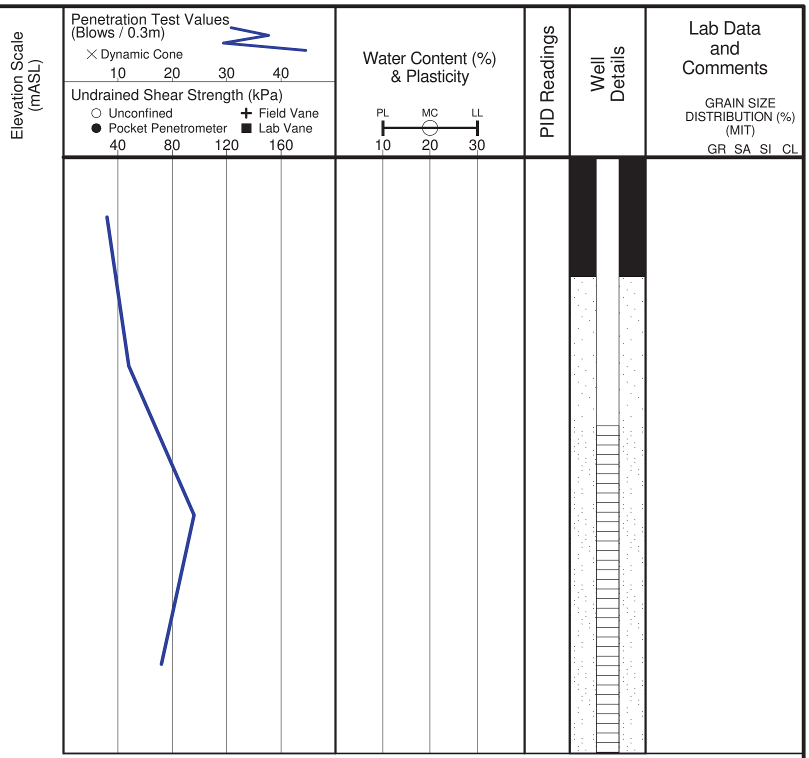
project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/24
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	SUBSURFACE PROFILE – STRATIGRAPHY	Sample Number	Type	SPT N-Value / Core Recovery
0		**GROUND SURFACE**			
		Dark brown **TOPSOIL**, some fine sand, rootlets, moist, loose.	1	SS	8
	0.6	Reddish brown **CLAYEY SILT**, some fine to medium sand, trace clay, trace rootlets, moist, compact.	2	SS	12
1					
			3	SS	24
2					
	2.3	Grey-brown **CLAYEY SILT**, trace fine to coarse sand, trace gravel, DTPL to APL, stiff to very stiff.	4	SS	18
3	3.1	**END OF BOREHOLE**			

Stratigraphy inferred from adjacent borehole 25R.



LOG OF BOREHOLE SP4 Decommissioning

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, ON
project no. | *111-53037-00 132-02*

rig type | Acker Soil-Max, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/10
supervisor | MEQ
reviewer | AMS

Depth Scale (m)	SUBSURFACE PROFILE			SAMPLE			Elevation Scale (mARD)	Penetration Test Values (Blows / 0.3m) × Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Water Content (%) & Plasticity PL MC LL 10 20 30	PID Readings	Well Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
	Elev Depth (m)	**STRATIGRAPHY**	Graphic Plot	Number	Type	SPT N-Value Core Recovery						
0	279.6	**GROUND SURFACE**										
							279					
1												
							278					
	277.7 1.9	**END OF BOREHOLE** No original borehole log information available.										

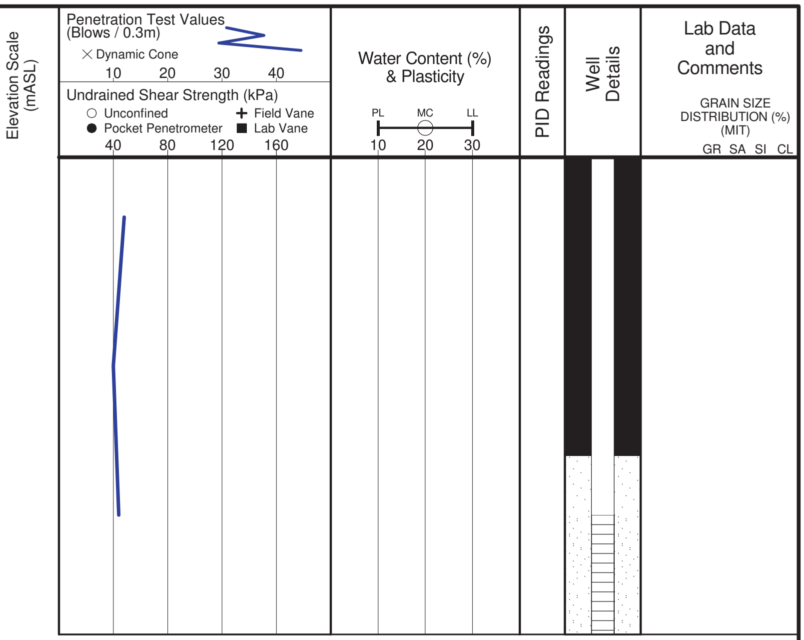
LOG OF BOREHOLE SP4R

project | Holbrook Landfill Site
client | Oxford County
location | Holbrook, Oxford County
project no. | *111-53037-00 132-02*

rig type | ACKER SOIL-MAX, track-mounted
method | Hollow stem augers, 215 mm dia.
coring | *n/a*

date started | 2015/07/13
supervisor | SM
reviewer | AMS

Depth Scale (m)	Elev Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery
0		**GROUND SURFACE**				
		Brown fine to medium **SILTY SAND**, some fine gravel, trace organics, moist, compact. Black clayey organic peat layer at 1.2 m depth.		1	SS	12
1				2	SS	10
	1.4	Grey fine to medium **SAND**, some silt, trace fine gravel, wet, compact.				
2				3	SS	11
	2.4	**END OF BOREHOLE** Stratigraphy inferred from adjacent borehole 24R.				



library: genivar - library.glb report: gen log v1 file: bhlogs.gpj

APPENDIX

C

GROUNDWATER ELEVATION DATA

Table C-1: Monitoring Well Details
Holbrook Landfill Site

Observation Well	Installation Date	Ground Surface Elevation (m ASL) $^{(1)}$	Measuring Point Elevation $^{(1)}$ (m ASL)	Stickup (m)	Riser Inside Diameter (mm)	Screen Length (m)	Screened Interval		Well Depth (mbTOP)	Flow System $^{(2)}$	Well Condition Status
							(m bgs)	(m ASL)			
2	01-May-79	276.47	277.57	1.10	51	0.50	8.64 - 9.14	270.96 - 270.46	10.51	SFS	Decommissioned in 2014
4	01-May-79	279.32	280.34	1.02	51	0.50	5.60 - 6.10	273.40 - 272.90	7.09	SFS	Decommissioned in 2014
4R	24-Sep-14	278.91	280.12	1.21	51	1.67	4.55 - 6.22	274.36 - 272.69	7.43	SFS	✓
5	01-May-79	279.15	280.12	0.97	51	0.50	7.60 - 8.10	271.10 - 270.60	9.13	SFS	Decommissioned in 2014
5R	24-Sep-14	279.26	280.46	1.20	51	1.68	7.06 - 8.74	272.20 - 270.52	9.94	SFS	✓
6	01-May-79	279.15	279.78	0.63	51	0.50	3.16 - 3.66	275.54 - 275.04	4.39	SFS	Decommissioned in 2014
10	03-May-79	281.63	282.48	0.85	51	0.50	2.85 - 3.35	277.15 - 276.65	4.30	SFS	Decommissioned in 2015
10R	09-Jul-15	281.52	282.55	1.04	51	1.67	2.90 - 4.57	278.62 - 276.95	5.61	SFS	✓
11	03-May-79	280.79	281.99	1.20	51	0.50	4.00 - 4.50	276.50 - 276.00	5.78	SFS	Decommissioned in 2015
11R	24-Jul-15	283.02	284.11	1.09	51	1.67	6.71 - 8.38	276.31 - 274.64	9.47	SFS/SCL	✓
12	03-May-79	280.69	281.85	1.16	51	0.50	7.27 - 7.77	273.23 - 272.73	8.78	SFS/SCL	Decommissioned in 2015
13	13-Jun-79	274.08	274.89	0.81	51	0.50	7.27 - 7.77	266.53 - 266.03	8.65	SFS/SCL	Decommissioned in 2014
13R	25-Sep-14	274.16	275.26	1.10	51	1.67	5.92 - 7.59	268.24 - 266.57	8.69	SFS/SCL	✓
14	13-Jun-79	275.85	277.40	1.55	51	0.50	4.50 - 5.00	271.00 - 270.50	6.23	SFS	Decommissioned in 2014
14R	17-Sep-14	275.69	276.65	0.97	51	1.68	3.96 - 5.64	271.73 - 270.05	6.61	SFS	✓
14A	13-Jun-79	275.94	277.47	1.53	51	0.50	2.24 - 2.74	273.26 - 272.76	4.13	SFS	Decommissioned in 2014
15	13-Jun-79	278.29	279.30	1.01	51	0.50	15.50 - 16.00	262.40 - 261.90	17.18	DFS	Decommissioned in 2014
15A	14-Jun-79	278.31	279.28	0.97	51	0.50	8.00 - 8.50	270.10 - 269.60	9.13	SFS/SCL	✓
16	14-Jun-79	278.19	279.24	1.05	51	0.50	15.35 - 15.85	262.45 - 261.95	17.02	DFS	Decommissioned in 2014
16R	19-Sep-14	277.98	279.23	1.26	51	1.67	14.05 - 15.72	263.93 - 262.26	16.98	DFS	✓
16A	14-Jun-79	278.19	279.50	1.31	51	0.50	8.34 - 8.84	269.46 - 268.96	10.22	SFS/SCL	Decommissioned in 2014
16AR	22-Sep-14	278.14	279.29	1.15	51	1.67	7.75 - 9.42	270.39 - 268.72	10.57	SFS/SCL	✓
17	29-Jun-79	278.84	279.43	0.59	51	0.50	5.60 - 6.10	273.00 - 272.50	7.14	SFS/SCL	Decommissioned in 2013
18	14-Sep-81	279.78	281.31	1.53	51	1.50	4.14 - 5.64	275.86 - 274.36	6.63	SFS/SCL	Decommissioned in 2014
18R	16-Sep-14	279.57	280.76	1.19	51	1.68	4.04 - 5.72	275.53 - 273.85	6.91	SFS	✓
19	14-Sep-81	274.95	276.05	1.10	51	1.50	3.68 - 5.18	271.02 - 269.52	6.15	SFS/SCL	Decommissioned in 2014
19R	26-Sep-14	274.89	276.11	1.21	51	1.65	3.58 - 5.23	271.31 - 269.66	6.44	SFS/SCL	✓
21	16-Oct-81	277.78	278.86	1.08	51	1.20	14.34 - 15.54	263.16 - 261.96	16.59	DFS	Decommissioned in 2015
21R	29-Sep-14	277.75	278.90	1.15	51	1.70	14.15 - 15.85	263.60 - 261.90	17.00	DFS	✓
23	23-Oct-81	278.94	280.15	1.21	51	2.10	18.32 - 20.42	260.08 - 257.98	21.54	DFS	Decommissioned in 2015
24	11-Feb-82	279.73	280.35	0.62	51	1.00	19.42 - 20.42	259.78 - 258.78	20.98	DFS	Decommissioned in 2015
24R	15-Jul-15	280.25	281.00	0.74	51	1.67	18.75 - 20.42	261.50 - 259.83	21.16	DFS	✓
24A	11-Feb-82	279.72	280.84	1.12	51	1.00	3.27 - 4.27	275.93 - 274.93	5.35	SCL	Decommissioned in 2015
24AR	13-Jul-15	279.95	281.11	1.15	51	0.91	3.66 - 4.57	276.29 - 275.38	5.72	SFS	✓
25	12-Feb-82	280.42	280.84	0.42	51	1.00	18.20 - 19.20	261.70 - 260.70	19.81	DFS	Decommissioned in 2015
25R	23-Jul-15	280.72	281.83	1.10	51	1.68	17.98 - 19.66	262.74 - 261.06	20.76	DFS	✓
25A	12-Feb-82	280.41	281.30	0.89	51	1.00	2.50 - 3.50	277.40 - 276.40	4.48	SFS/SCL	Decommissioned in 2015
26	16-Jan-83	272.07	272.21	0.14	51	1.80	2.70 - 4.50	269.10 - 267.30	4.50	SFS	Decommissioned in 2015
26R	07-Aug-15	272.03	272.91	0.88	51	0.61	5.49 - 6.10	266.54 - 265.93	6.98	SFS	Artesian
27	24-Jan-83	272.20	272.35	0.15	51	2.40	10.86 - 13.26	260.84 - 258.44	13.26	DFS	Artesian

Notes: · All elevations in metres above sea level

· (1) Elevations based on 2012 well network survey, with the exception of wells 4R, 5R, 10R, 11R, 13R, 14R, 15A, 16R, 16AR, 18R, 19R, 21R, 24R, 24AR, 25R, 26R, 27, 28R, 32R, 31, 33R, 35, 37R, 38, 39, 40, 41, 42, 43, 44, SP3R, SP4R, and SP5 which were surveyed in 2015.

· (2) Flow system estimated based on borehole log interpretation.

· SFS - Shallow Flow System

· SFS/SCL - Shallow Flow System / Shallow Confining Layer (possibly screened between two units)

· DFS - Deep Flow System

· ✓ Surface seal in good condition and well is capped.

Table C-1: Monitoring Well Details
Holbrook Landfill Site

Observation Well	Installation Date	Ground Surface Elevation (m ASL) (1)	Measuring Point Elevation (1) (m ASL)	Stickup (m)	Riser Inside Diameter (mm)	Screen Length (m)	Screened Interval		Well Depth (mbTOP)	Flow System (2)	Well Condition Status
							(m bgs)	(m ASL)			
28	17-Jan-83	277.65	278.52	0.87	51	1.50	7.64 - 9.14	269.76 - 268.26	9.94	SFS/SCL	Decommissioned in 2015
28R	21-Jul-15	277.72	278.78	1.06	51	1.68	8.23 - 9.91	269.49 - 267.81	10.97	SFS/SCL	✓
30	19-Jan-83	279.10	280.63	1.53	51	3.00	8.00 - 11.00	270.90 - 267.90	12.44	SFS/SCL	Decommissioned in 2014
31	03-Feb-83	279.14	280.06	0.92	51	3.00	14.68 - 17.68	264.22 - 261.22	18.49	DFS	✓
32	19-Jan-83	280.08	280.26	0.18	51	1.80	2.77 - 4.57	276.83 - 275.03	5.46	SFS	Decommissioned in 2015
32R	10-Jul-15	280.12	281.09	0.96	51	1.67	3.28 - 4.95	276.84 - 275.17	5.91	SFS	✓
33	19-Jan-83	280.23	280.78	0.55	51	1.80	10.30 - 12.10	269.60 - 267.80	12.86	SFS/SCL	Decommissioned in 2015
33R	23-Jul-15	280.67	281.85	1.18	51	1.67	10.01 - 11.68	270.66 - 268.99	12.86	SFS/SCL	✓
35	27-Jan-83	278.11	279.03	0.81	51	1.80	12.83 - 14.63	264.97 - 263.17	15.47	DFS	✓
37	15-Jan-83	274.97	276.41	1.44	51	3.00	19.71 - 22.71	255.05 - 252.05	24.43	DFS	Decommissioned in 2015
37R	06-Aug-15	275.15	276.24	1.09	51	1.68	19.05 - 20.73	256.10 - 254.42	21.82	DFS	✓
38	17-Feb-83	282.52	283.66	1.14	51	3.00	22.50 - 25.50	259.77 - 256.77	26.83	DFS	✓
39	18-Jul-13	278.03	278.94	0.91	51	3.05	16.00 - 19.05	262.12 - 259.07	19.84	DFS	✓
40	22-Jul-13	277.95	279.14	1.19	51	3.05	5.33 - 8.38	272.65 - 269.60	9.25	SFS	✓
41	22-Jul-13	286.53	287.63	1.09	51	6.10	2.59 - 8.69	284.14 - 278.04	9.68	LEACHATE	✓
42	08-Jul-15	278.02	279.05	1.03	51	1.68	25.37 - 27.05	252.65 - 250.97	28.08	DFS	✓
43	21-Jul-15	280.62	281.66	1.04	51	1.68	8.99 - 10.67	271.63 269.95	11.71	SFS/SCL	✓
44	04-Aug-15	282.26	283.36	1.10	51	1.67	7.70 - 9.37	274.56 - 272.89	10.47	SFS/SCL	✓
45	16-Aug-19	273.56	274.56	1.00	51	0.91	7.99 - 8.90	265.57 264.66	9.90	SFS/SCL	✓
46	15-Aug-19	273.92	274.88	0.96	51	1.67	7.29 - 8.96	266.63 - 264.96	9.92	SFS/SCL	✓
SP3		280.38	280.73	0.35	32					SFS	Decommissioned in 2015
SP3R	24-Jul-15	280.75	281.81	1.06	51	1.68	1.37 - 3.05	279.38 - 277.70	4.11	SFS	✓
SP4		279.57	279.82	0.25	32					SFS	Decommissioned in 2015
SP4R	13-Jul-15	279.93	280.86	0.93	51	0.61	1.83 - 2.44	278.10 - 277.49	3.37	SFS	✓
SP5		281.64	282.30	0.66	32				2.83	SFS	✓
104		279.80	281.91	2.11	51					SFS	Decommissioned in 2014
301		278.12	279.31	1.19	51					SFS	Decommissioned in 2014

Notes: · All elevations in metres above sea level
· (1) Elevations based on 2012 well network survey, with the exception of wells 4R, 5R, 10R, 11R, 13R, 14R, 15A, 16R, 16AR, 18R, 19R, 21R, 24R, 24AR, 25R, 26R, 27, 28R, 32R, 31, 33R, 35, 37R, 38, 39, 40, 41, 42, 43, 44, SP3R, SP4R, and SP5 which were surveyed in 2015.
· (2) Flow system estimated based on borehole log interpretation.

· SFS - Shallow Flow System
· SFS/SCL - Shallow Flow System / Shallow Confining Layer (possibly screened between two units)
· DFS - Deep Flow System
· ✓ Surface seal in good condition and well is capped.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	May-79	Jun-79	Oct-79	Mar-80	May-80	Sep-80	Feb-81	Oct-81	Oct-81	Jan-82	Jan-82	Jan-82	Feb-82	Feb-82	Apr-82
2	277.57	276.47	277.00	276.70	276.60	276.90	277.00	276.60	276.70			277.10		276.89		276.80	277.24
4	280.34	279.32	277.10	276.60	276.50	276.80	277.00	276.50	276.60		276.94	276.90		276.73		276.64	277.03
4R	280.12	278.91															
5	280.12	279.15	278.10	277.70	277.30	278.00	278.10	277.50	277.60		278.02	278.02		277.90		277.78	278.37
5R	280.46	279.26															
6	279.78	279.15	278.10	277.70	277.30	278.00	278.10	277.60	277.60		278.02	278.01		277.88		277.75	278.39
10	282.48	281.63	279.60	279.20	278.90	279.40	279.30	278.80	279.00		279.33	279.28		279.16		279.07	279.51
10R	282.55	281.52															
11	281.99	280.79	279.70	279.10	279.80	279.70	279.60	279.60	279.60		279.55	279.50		279.01		279.56	279.00
11R	284.11	283.02															
12	281.85	280.69	278.60	278.30	278.00	278.40	278.70	278.30	278.20		278.45	278.43		278.36		278.30	278.81
13	274.89	274.08		271.60	272.90	272.90	273.00	272.50	272.70		273.20	273.37		273.24		273.15	273.39
13R	275.26	274.16															
14	277.40	275.85		276.20	276.10	276.30	276.50	276.10	frozen		276.54	frozen		frozen		frozen	276.70
14R	276.65	275.69															
14A	277.47	275.94															
15	279.30	278.29		276.30	276.10	276.40	276.60	276.10	276.20	276.48	276.64	276.57	276.48	276.44	276.37	276.38	276.75
15A	279.28	278.31		276.30	276.20	276.40	276.60	276.10	276.20		276.60	276.54		276.40		276.31	276.64
16	279.24	278.19		275.90	275.70	276.00	276.20	275.70	275.80	276.08	276.25	276.19	276.11	276.05	275.95	275.95	276.31
16R	279.23	277.98															
16A	279.50	278.19		276.00	276.00	276.10	276.40	275.90	276.10		276.43	276.34		276.23		276.13	276.50
16AR	279.29	278.14															
17	279.43	278.84		277.10		277.20	277.40	276.80	277.00		277.40	277.33		277.17		277.07	277.52
18	281.31	279.78									277.56	277.42		277.21		277.13	277.60
18R	280.76	279.57															
19	276.05	274.95										frozen		frozen		frozen	
19R	276.11	274.89															
21	278.86	277.78									276.22	276.17	276.08	276.03	275.95	275.95	276.34
21R	278.90	277.75															
23	280.15	278.94									278.66	276.13	276.01	276.04	275.93	275.94	276.48
24	280.35	279.73													275.97	275.97	276.35
24R	280.35	279.73															
24A	280.84	279.72														278.73	278.92
24AR	281.11	279.95															
25	280.84	280.42													276.22	276.07	276.26
25R	281.83	280.72															
25A	281.30	280.41														279.85	279.49
26	272.21	272.07															

Notes: · All elevations in metres above sea level.
· Blank indicates data not available.
· 2001 through 2011 water level evelvations calculated using 2012 survey data.
· (1) Data based on field measurements during 2012 well network survey.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	May-79	Jun-79	Oct-79	Mar-80	May-80	Sep-80	Feb-81	Oct-81	Oct-81	Jan-82	Jan-82	Jan-82	Feb-82	Feb-82	Apr-82
26R	272.91	272.03															
27	272.35	272.20															
28	278.52	277.65															
28R	278.78	277.72															
30	280.63	279.10															
31	280.06	279.14															
32	280.26	280.08															
32R	281.09	280.12															
33	280.78	280.23															
33R	281.85	280.67															
35	279.03	278.11															
37	276.41	274.97															
37R	276.24	275.15															
38	283.66	282.52															
39	278.94	278.03															
40	279.14	277.95															
41	287.63	286.53															
42	279.05	278.02															
43	281.66	280.62															
44	283.36	282.26															
45	274.56	273.56															
46	274.88	273.92															
SP3	280.73	280.38															
SP3R	281.81	280.75															
SP4	279.82	279.57															
SP4R	280.86	279.93															
SP5	282.30	281.64															
104	281.91 (1)	279.80															
301	279.31	278.12															
SG1	273.41	272.49															

Notes: · All elevations in metres above sea level.
· Blank indicates data not available.
· 2001 through 2011 water level evelvations calculated using 2012 survey data.
· (1) Data based on field measurements during 2012 well network survey.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	Jun-82	Aug-82	Mar-83	Apr-83	Jun-83	Aug-83	Dec-83	Jun-01	Jun-02	Jun-03	Jun-04	Jun-05	Jun-06	May-07	Jun-08
2	277.57	276.47	277.14	276.62	277.17	277.09	277.07	277.13	276.57	275.60	273.52	275.61	275.68	275.64	275.70	275.63	275.67
4	280.34	279.32	276.90	276.44	276.93	276.89	276.92	277.27	276.65	276.05	276.18	276.11	276.74	276.19	276.19	276.07	276.05
4R	280.12	278.91															
5	280.12	279.15	278.07	277.48	278.21	278.20		278.46		278.90	278.94	278.96	278.92	278.90	278.86	278.77	278.90
5R	280.46	279.26															
6	279.78	279.15	278.09	277.41	278.23	278.23	278.29	278.44	277.83	277.82	277.82	278.08	278.81	278.32	278.28	278.02	278.19
10	282.48	281.63	279.28	278.78	279.33	279.31	279.27	279.56	279.51	279.68	280.26	279.83	280.15	279.77	279.72	279.65	279.71
10R	282.55	281.52															
11	281.99	280.79		277.98	279.79	279.88		277.54	279.83	280.23	280.51	280.32	280.20	280.11	280.48	279.70	280.30
11R	284.11	283.02															
12	281.85	280.69	278.64	277.53		278.57		278.45		278.63	278.75	278.57	279.17	278.91	278.83	278.75	278.84
13	274.89	274.08	273.37	272.80		273.44											
13R	275.26	274.16															
14	277.40	275.85	276.47	276.02		276.50		276.61		275.42	275.45	275.41	275.67	275.42	275.40	275.36	275.32
14R	276.65	275.69															
14A	277.47	275.94				275.18		275.19		275.47	275.47	275.56	275.35	275.23	275.69	275.96	275.32
15	279.30	278.29	276.60	276.17		276.59		276.73		275.48	275.53	275.46	275.79	275.52	275.51	275.45	275.44
15A	279.28	278.31	276.54	276.07	276.59	276.55	276.57	276.68	276.06	275.74	275.77	275.73	276.02	275.75	275.77	275.68	275.69
16	279.24	278.19	276.21	275.70	276.24	276.20	276.17	276.27	275.81	275.26	275.30	275.21	275.56	275.25	275.27	275.21	275.18
16R	279.23	277.98															
16A	279.50	278.19	276.37	275.81		276.48		276.48		275.66	275.68	275.60	275.71	275.65	275.70	275.58	275.50
16AR	279.29	278.14															
17	279.43	278.84	277.32	276.81		277.37		277.58								276.54	276.56
18	281.31	279.78	277.44	276.93		277.43		277.42		276.06	276.06	276.12	276.33	276.13	276.17	276.09	276.13
18R	280.76	279.57															
19	276.05	274.95		275.21		flowing		flowing		274.92	274.94	274.90	275.13	274.88	274.99	274.85	275.05
19R	276.11	274.89															
21	278.86	277.78	276.22	275.69	276.09	276.20	276.19	276.30	275.90	275.43	275.47	275.37	275.75	275.44	275.44	275.35	275.34
21R	278.90	277.75															
23	280.15	278.94	276.24	275.71	276.24	276.20	276.20		275.87	275.47	275.52	275.38	275.77	275.46	275.43	275.39	275.33
24	280.35	279.73	276.24	275.73	276.26	276.23	276.24	276.33	275.90	275.53	276.96	275.45	275.83	275.53	275.50	275.44	275.42
24R	280.35	279.73															
24A	280.84	279.72	278.90	278.52	278.98	278.93	278.81	279.13	279.17	279.30	279.56	279.33	279.61	279.26	278.88	279.14	279.24
24AR	281.11	279.95															
25	280.84	280.42	276.23	275.71	276.22	279.19	276.12	276.28	275.85	275.41	275.49	275.38	275.76	275.46	275.45	275.38	275.35
25R	281.83	280.72															
25A	281.30	280.41	279.60	279.54		279.66	279.53	279.70	279.76	280.03	280.08	280.13	280.14	280.10	280.14	280.07	280.16
26	272.21	272.07				flowing	275.40	276.33	274.84	flowing	flowing	flowing	flowing	flowing	flowing	flowing	flowing

Notes: · All elevations in metres above sea level.
· Blank indicates data not available.
· 2001 through 2011 water level evelvations calculated using 2012 survey data.
· (1) Data based on field measurements during 2012 well network survey.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	Jun-82	Aug-82	Mar-83	Apr-83	Jun-83	Aug-83	Dec-83	Jun-01	Jun-02	Jun-03	Jun-04	Jun-05	Jun-06	May-07	Jun-08
26R	272.91	272.03															
27	272.35	272.20				flowing	275.03	276.16	274.46	flowing	flowing	flowing	flowing	flowing	flowing	flowing	flowing
28	278.52	277.65			275.09	274.94	275.52	274.89	274.38	274.61	274.72	274.43	275.12	274.67	274.64	274.53	274.53
28R	278.78	277.72															
30	280.63	279.10				277.51	277.26	277.41	275.33	275.94	275.96	275.96	276.07	276.01	276.01	275.98	276.02
31	280.06	279.14				276.25	276.24	276.34	275.95	275.45	275.48	275.38	275.76	275.46	275.48	275.42	275.41
32	280.26	280.08				278.96	278.89	279.13	279.15	279.09	279.56	279.59	279.78	279.56	279.53	279.46	279.49
32R	281.09	280.12															
33	280.78	280.23			276.56	276.54	276.59	276.55	276.45	276.03	276.03	275.96	276.40	276.04	276.51	275.97	275.95
33R	281.85	280.67															
35	279.03	278.11				276.00	276.63	276.72	276.07	275.45	275.49	275.43	275.76	275.48	275.49	275.42	275.41
37	276.41	274.97				275.39	275.32	275.37	275.23	274.96	274.98	274.75	275.31	274.90	274.88	274.78	274.75
37R	276.24	275.15															
38	283.66	282.52				275.46	275.44	275.47	275.33	270.49	270.51	274.86	275.38	274.96	274.97	274.90	274.85
39	278.94	278.03															
40	279.14	277.95															
41	287.63	286.53															
42	279.05	278.02															
43	281.66	280.62															
44	283.36	282.26															
45	274.56	273.56															
46	274.88	273.92															
SP3	280.73	280.38								280.61	280.63	280.53	280.58	280.50	280.50	280.40	280.58
SP3R	281.81	280.75															
SP4	279.82	279.57								278.26	279.34	278.29	279.34	278.41	279.65	279.08	279.15
SP4R	280.86	279.93															
SP5	282.30	281.64								dry	278.51	279.98	280.24	279.85	279.85	279.95	279.77
104	281.91 (1)	279.80			280.06	280.06	279.42	279.40									
301	279.31	278.12				277.35	276.64	275.73									
SG1	273.41	272.49															

Notes:
- All elevations in metres above sea level.
- Blank indicates data not available.
- 2001 through 2011 water level evelvations calculated using 2012 survey data.
- (1) Data based on field measurements during 2012 well network survey.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	Jun-09	May-10	Jun-11	May-12	May-13	May-14	May-15	May-16	May-17	May-18	May-19	May-20	May-21	May-22	May-23
2	277.57	276.47	275.73	275.71	275.74	275.69	275.76	275.81	(2)								
4	280.34	279.32	276.36	276.24	276.48	276.03	276.39	276.39	(2)								
4R	280.12	278.91							276.16	276.43	277.14	276.84	277.06	276.66	276.26	276.34	276.41
5	280.12	279.15	278.99	278.98	278.97	278.89	278.98	278.07	(2)								
5R	280.46	279.26							278.11	278.55	278.93	279.01	279.07	278.88	278.20	278.77	278.86
6	279.78	279.15	279.78	278.17	278.67	277.92	278.70	278.73	(2)								
10	282.48	281.63	279.88	279.76	279.99	279.48	280.03	279.58	279.63	(2)							
10R	282.55	281.52								279.86	280.37	280.26	280.33	280.07	279.71	279.97	280.03
11	281.99	280.79	280.17	280.49	280.08	279.58	280.02	280.15	279.59	(2)							
11R	284.11	283.02								280.34	280.69	280.60	280.61	280.41	280.12	280.41	280.49
12	281.85	280.69	279.04	278.66	279.21	278.71	279.01	279.03	278.61	(2)							
13	274.89	274.08		273.11	272.86	272.67	272.89	272.82	(2)								
13R	275.26	274.16							273.42	273.59	274.06	273.96	274.14	273.89	273.65	273.63	273.24
14	277.40	275.85	275.45	275.39	275.49	275.36	275.43	275.51	(2)								
14R	276.65	275.69							275.47	275.68	276.05	275.94	275.97	275.81	275.63	275.73	275.79
14A	277.47	275.94	275.61	275.72	273.50	275.17	275.01	275.31	(2)								
15	279.30	278.29	274.60	275.53	275.67	275.47	275.62	275.69	(2)								
15A	279.28	278.31	275.85	275.78	275.90	275.68	275.82	275.89	275.69	275.91	276.33	276.20	276.24	276.06	275.85	275.97	276.05
16	279.24	278.19	275.35	275.26	275.41	275.17	275.37	275.46	(2)								
16R	279.23	277.98							275.22	275.43	275.82	275.70	275.77	275.56	275.33	275.48	275.53
16A	279.50	278.19	275.71	275.70	275.78	275.53	275.76	275.90	(2)								
16AR	279.29	278.14							275.64	275.89	276.26	276.15	276.23	276.03	275.80	275.94	276.00
17	279.43	278.84	276.90	276.73	277.01	<277.07	<277.63	(2)									
18	281.31	279.78	276.29	276.24	276.37	276.14	276.42	276.51	(2)								
18R	280.76	279.57							276.07	276.43	277.31	276.92	278.13	277.64	277.44	277.32	277.59
19	276.05	274.95	274.96	274.95	275.38	274.95	275.31	275.26	(2)								
19R	276.11	274.89							274.82	274.86	275.23	275.13	275.29	275.04	274.82	275.18	275.06
21	278.86	277.78	275.53	275.44	275.58	275.28	275.53	275.62	275.28	(2)							
21R	278.90	277.75							275.33	275.55	275.94	275.81	275.92	275.69	275.43	275.63	275.66
23	280.15	278.94	275.55	275.45	275.64	275.33	275.57	275.63	275.33	(2)							
24	280.35	279.73	275.62	275.53	275.68	275.37	275.62	275.71	275.37	(2)							
24R	280.35	279.73								275.05	275.44	275.31	275.41	275.19	274.93	275.13	275.17
24A	280.84	279.72	279.58	279.57	279.62	279.06	279.60	279.68	279.10	(2)							
24AR	281.11	279.95								279.35	279.81	279.79	279.77	279.64	279.39	279.59	279.71
25	280.84	280.42	275.64	275.45	275.60	275.31	275.54	275.37	(2)	(2)							
25R	281.83	280.72								275.63	276.02	275.90	275.97	275.85	275.53	275.69	275.74
25A	281.30	280.41	280.16	280.20	280.18	280.09	280.17	280.03	280.07	(2)							
26	272.21	272.07	flowing	flowing	flowing	flowing	275.09	275.22	275.06	(2)							

Notes: · All elevations in metres above sea level.

· Blank indicates data not available.

· 2001 through 2011 water level evelvations calculated using 2012 survey data.

· (1) Data based on field measurements during 2012 well network survey.

· (2) Well decommissioned.

Table C-2: Groundwater Level Elevations
Holbrook Landfill Site

Well Number	Measuring Point Elevation	Ground Elevation	Jun-09	May-10	Jun-11	May-12	May-13	May-14	May-15	May-16	May-17	May-18	May-19	May-20	May-21	May-22	May-23
26R	272.91	272.03								275.18	276.01	275.51	275.19	274.82	274.66	274.35	274.43
27	272.35	272.20	flowing	flowing	flowing	flowing	274.99	275.13	275.14	275.03	275.45	275.17	275.45	274.71	274.08	275.09	275.19
28	278.52	277.65	274.88	274.67	275.08	274.51	274.91	274.99	274.36	(2)							
28R	278.78	277.72								275.55	275.30	275.21	275.30	275.05	274.95	274.99	275.05
30	280.63	279.10	276.09	276.18	276.13	276.04	276.15	276.18	(2)								
31	280.06	279.14	275.60	275.53	275.67	275.41	275.66	275.73	275.58	275.82	276.17	276.06	276.16	275.96	275.74	275.81	275.97
32	280.26	280.08	279.65	279.56	279.70	279.28	279.71	279.77	279.43	(2)							
32R	281.09	280.12								279.52	279.81	279.78	279.78	279.67	279.44	279.59	279.62
33	280.78	280.23	275.98	276.00	276.26	275.93	276.18	276.22	275.88	(2)							
33R	281.85	280.67								276.22	276.55	276.48	276.57	276.28	276.20	276.31	276.35
35	279.03	278.11	275.57	275.50	275.63	275.44	275.59	275.66	275.55	275.76	276.16	276.03	276.09	275.90	275.70	275.82	275.89
37	276.41	274.97	275.01	274.97	275.01	274.55	274.95	275.07	275.22	(2)							
37R	276.24	275.15								274.99	275.40	275.19	275.38	275.15	275.04	275.08	275.04
38	283.66	282.52	275.12	274.99	275.10	274.65	275.05	275.50	274.82	275.04	275.46	275.26	275.43	275.23	275.16	275.12	275.18
39	278.94	278.03						278.02	277.43	277.67	278.47	278.18	278.44	277.94	277.51	277.94	278.06
40	279.14	277.95						277.65	277.36	277.65	278.44	278.11	278.36	278.16	277.44	277.84	277.96
41	287.63	286.53						283.29	282.58	283.33	283.68	283.73	283.65	283.45	283.38	283.25	283.37
42	279.05	278.02								277.64	278.20	278.00	278.17	277.78	277.45	277.79	277.86
43	281.66	280.62								275.09	275.47	275.38	275.52	275.31	275.26	275.15	275.29
44	283.36	282.26								276.68	276.90	276.92	277.21	276.42	276.37	276.38	276.54
45	274.56	273.56												274.66	274.29	274.47	274.61
46	274.88	273.92												274.52	274.18	273.97	274.52
SP3	280.73	280.38	280.73	280.71	280.12	280.09	280.08	280.13	280.12	(2)							
SP3R	281.81	280.75								280.25	280.50	280.48	280.49	280.46	280.44	280.48	280.37
SP4	279.82	279.57	279.42	279.42	279.46	279.03	279.46	279.51	279.04	(2)							
SP4R	280.86	279.93								279.10	279.56	279.54	279.56	279.42	279.16	279.34	279.49
SP5	282.30	281.64	280.55	279.68	279.51	279.54	280.13	279.59	279.64	279.97	279.55	279.52	279.58	279.60	279.48	279.58	279.50
104	281.91 (1)	279.80							(2)								
301	279.31	278.12				275.83			(2)								
SG1	273.41	272.49							272.67	272.61	272.67	272.63	272.64	272.61	272.62	272.66	272.71

Notes: · All elevations in metres above sea level.

· Blank indicates data not available.

· 2001 through 2011 water level evelvations calculated using 2012 survey data.

· (1) Data based on field measurements during 2012 well network survey.

· (2) Well decommissioned.

Figure C-1
Groundwater Hydrograph - Adjacent Northeast
Holbrook Landfill Site - Shallow Aquifer

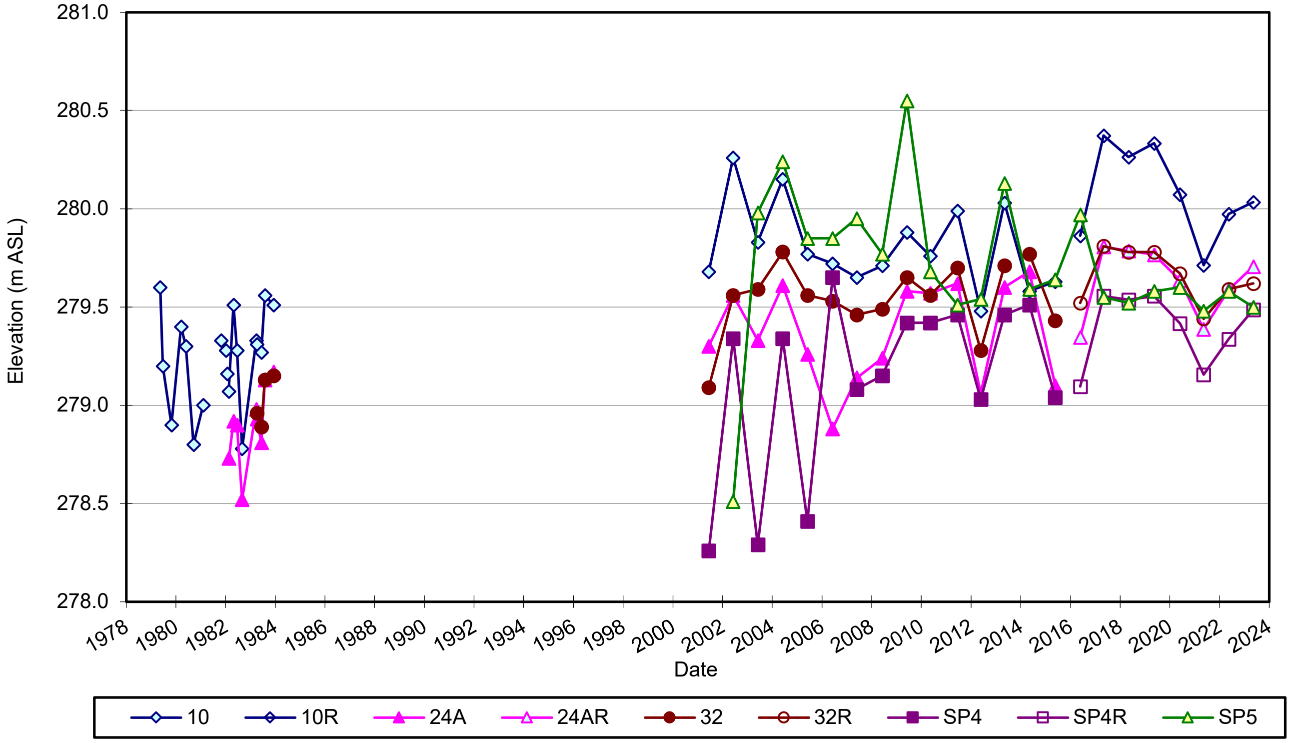


Figure C-2
Groundwater Hydrograph - Adjacent East
Holbrook Landfill Site - Shallow Aquifer

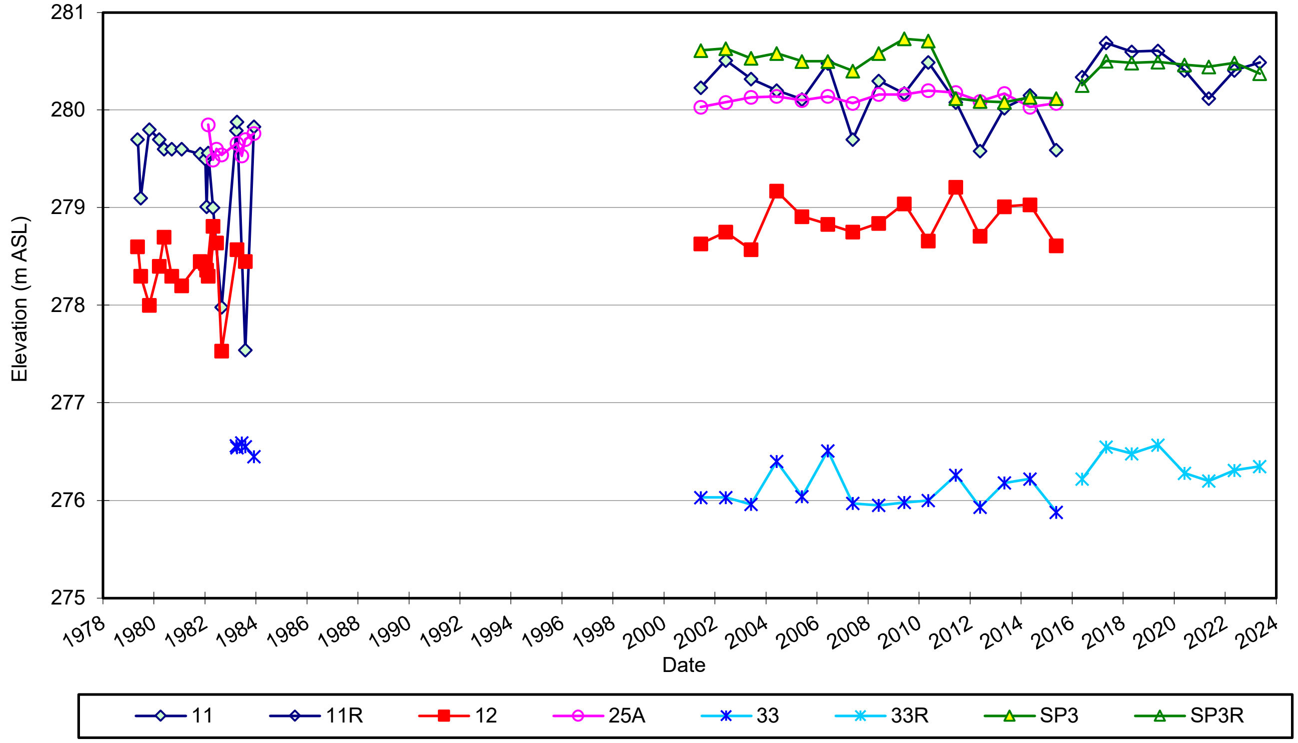


Figure C-3
Groundwater Hydrograph - Adjacent Southeast
Holbrook Landfill Site - Shallow Aquifer

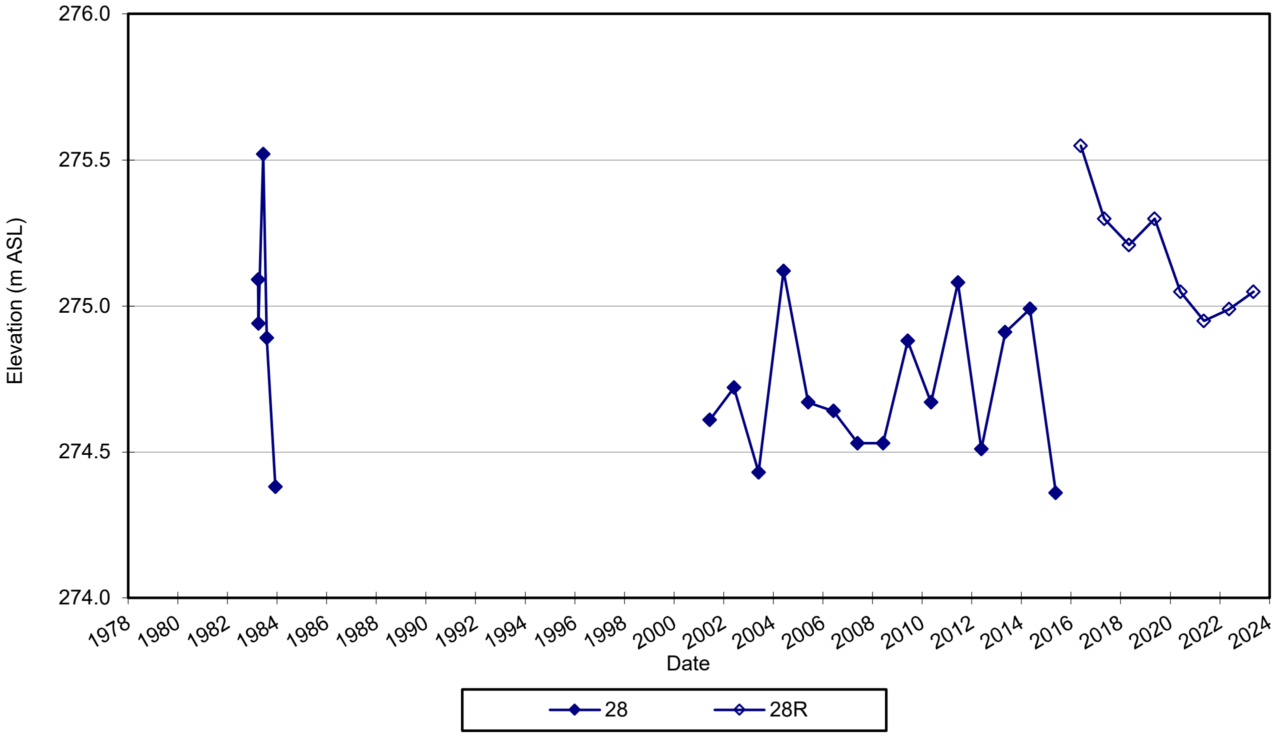


Figure C-4
Groundwater Hydrograph - Downgradient South & Cross-Gradient Southeast
Holbrook Landfill Site - Shallow Aquifer

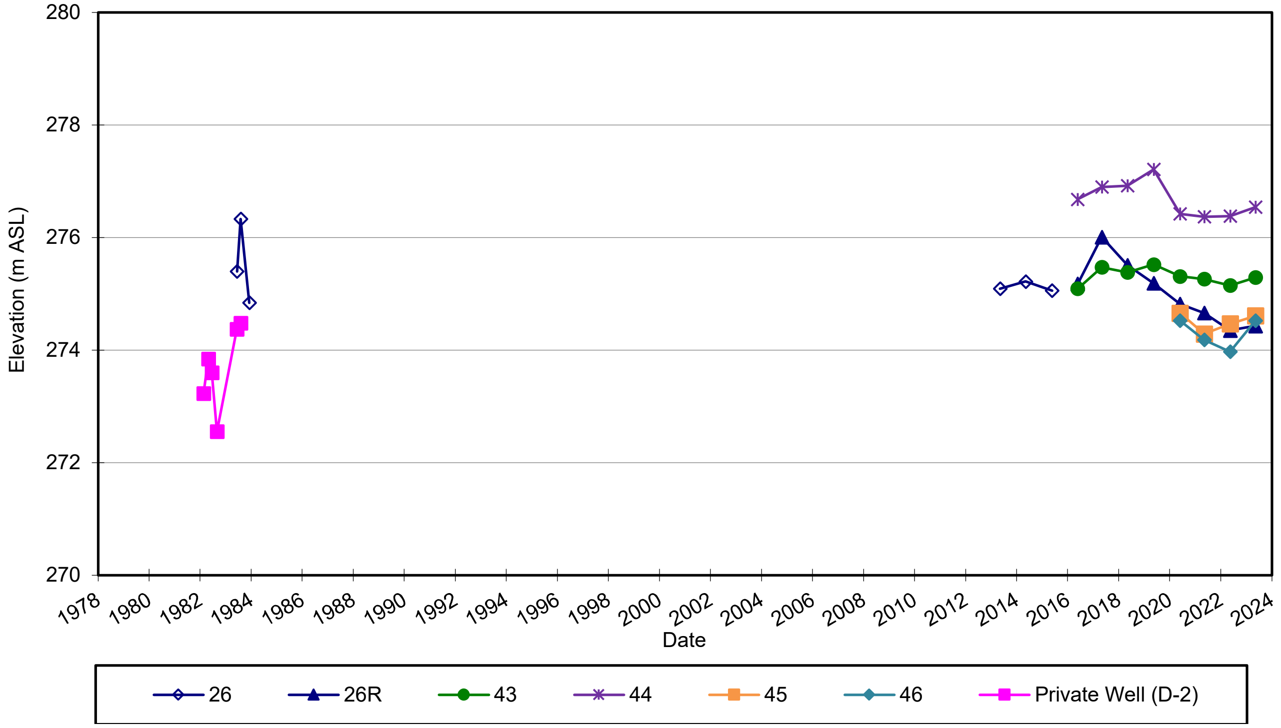


Figure C-5
Groundwater Hydrograph - Adjacent Northwest
Holbrook Landfill Site - Shallow Aquifer

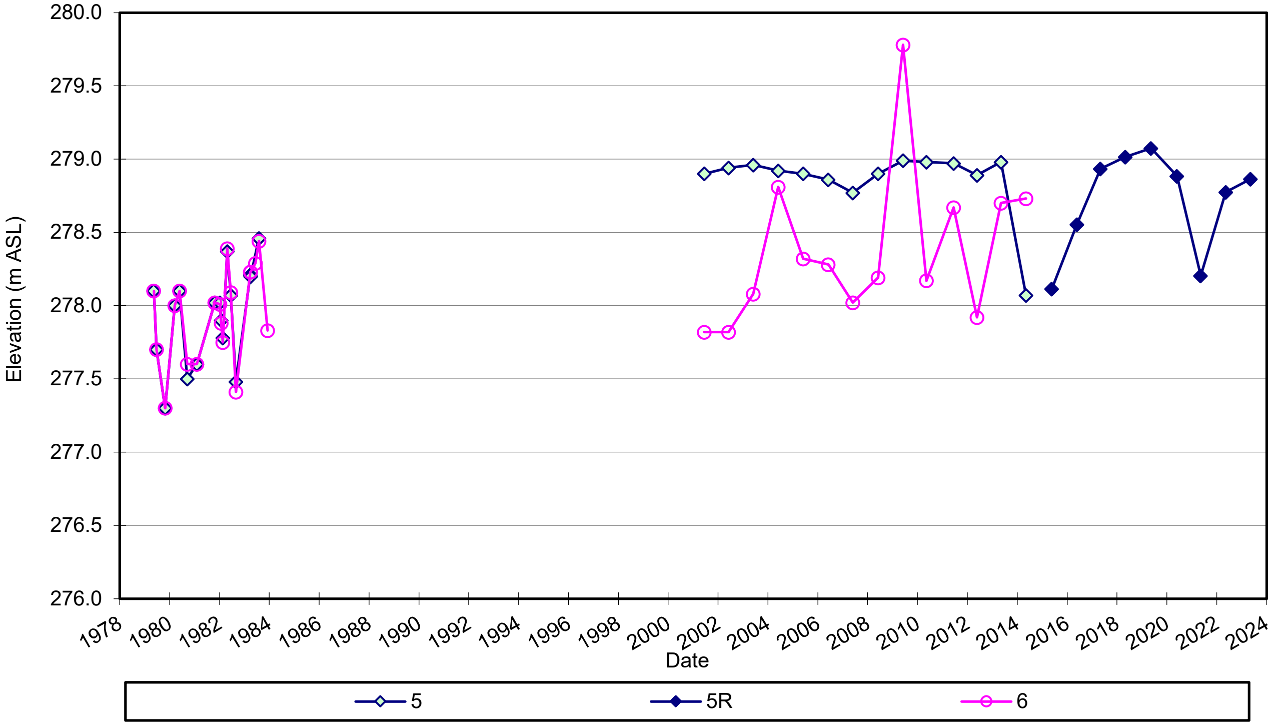


Figure C-6
Groundwater Hydrograph - Downgradient West
Holbrook Landfill Site - Shallow Aquifer

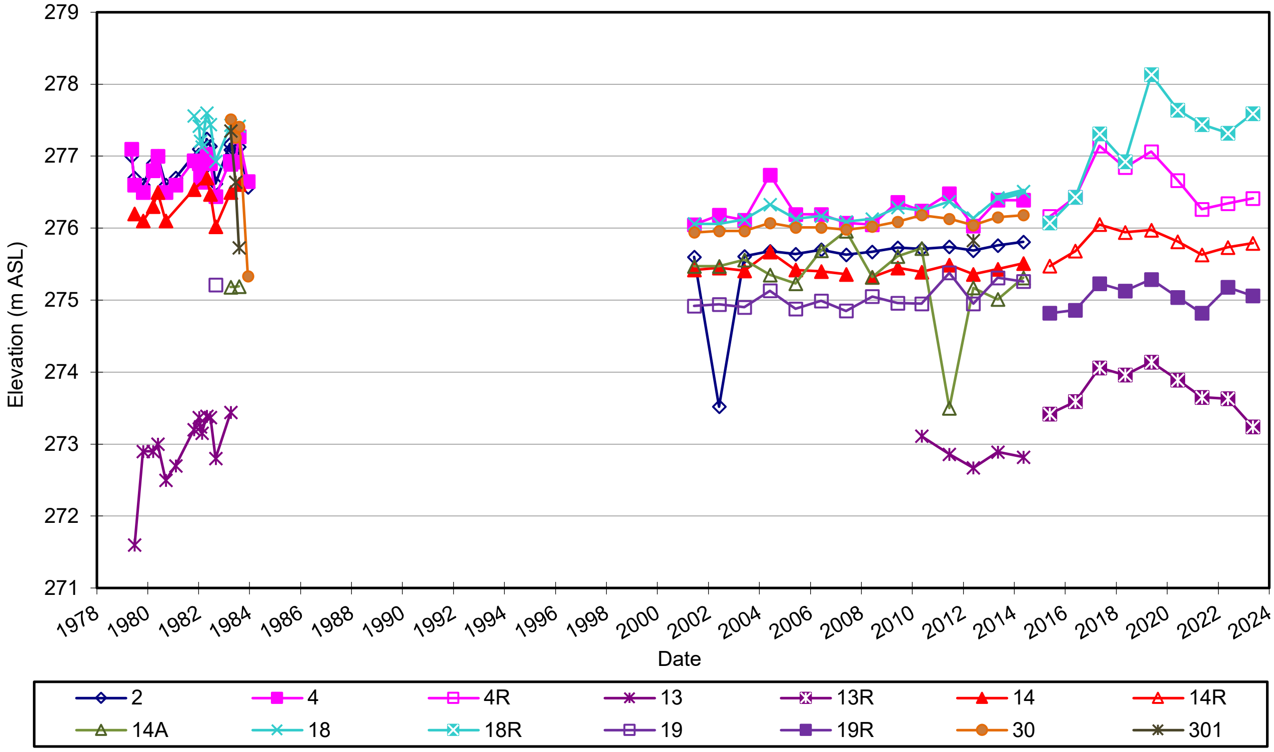


Figure C-7
Groundwater Hydrograph - Cross-Gradient/Upgradient West
Holbrook Landfill Site - Shallow Aquifer

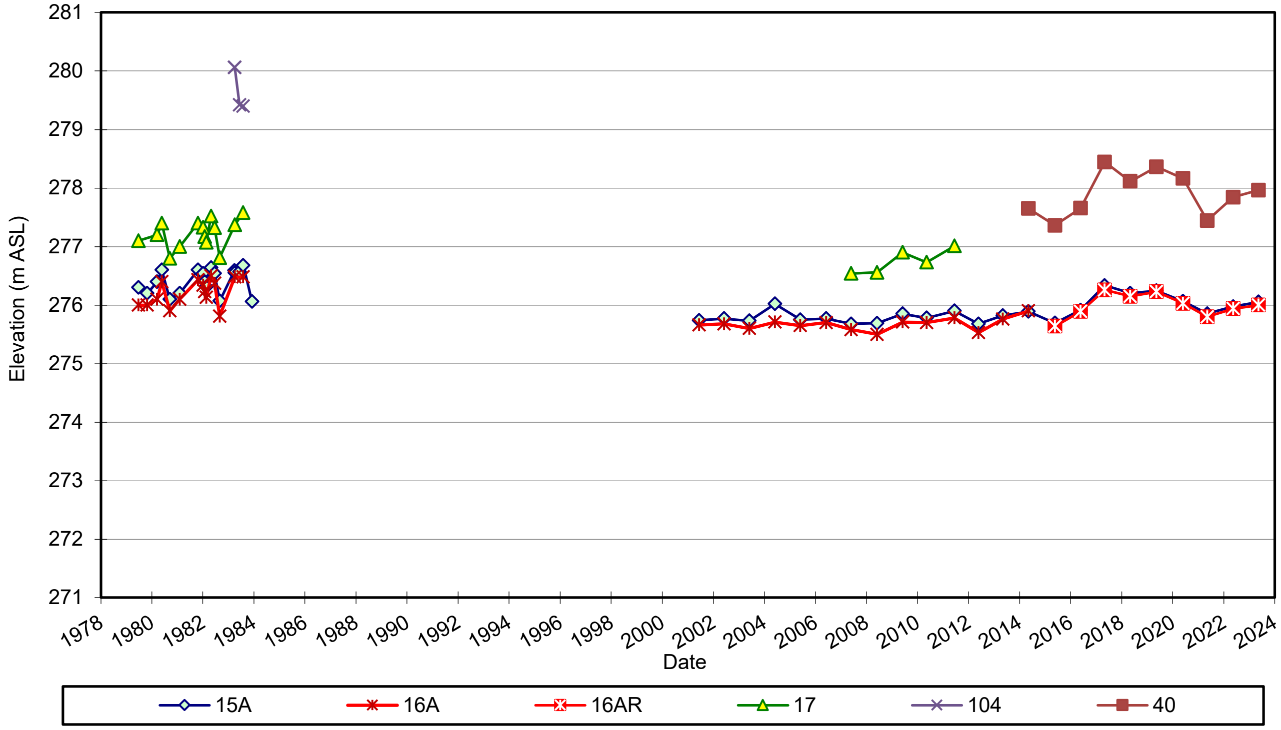


Figure C-8
Groundwater Hydrograph - Landfill Mound
Holbrook Landfill Site - Refuse

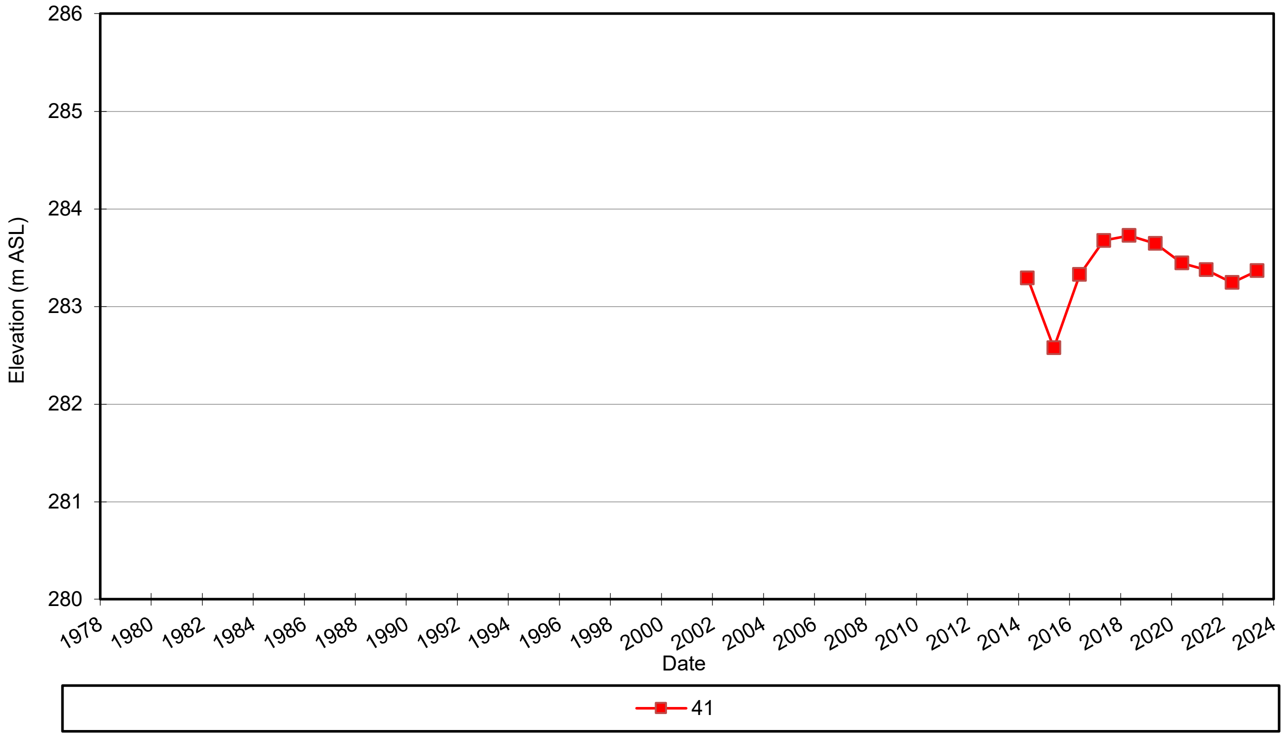


Figure C-9
Groundwater Hydrograph - Adjacent Northeast
Holbrook Landfill Site - Deep Aquifer

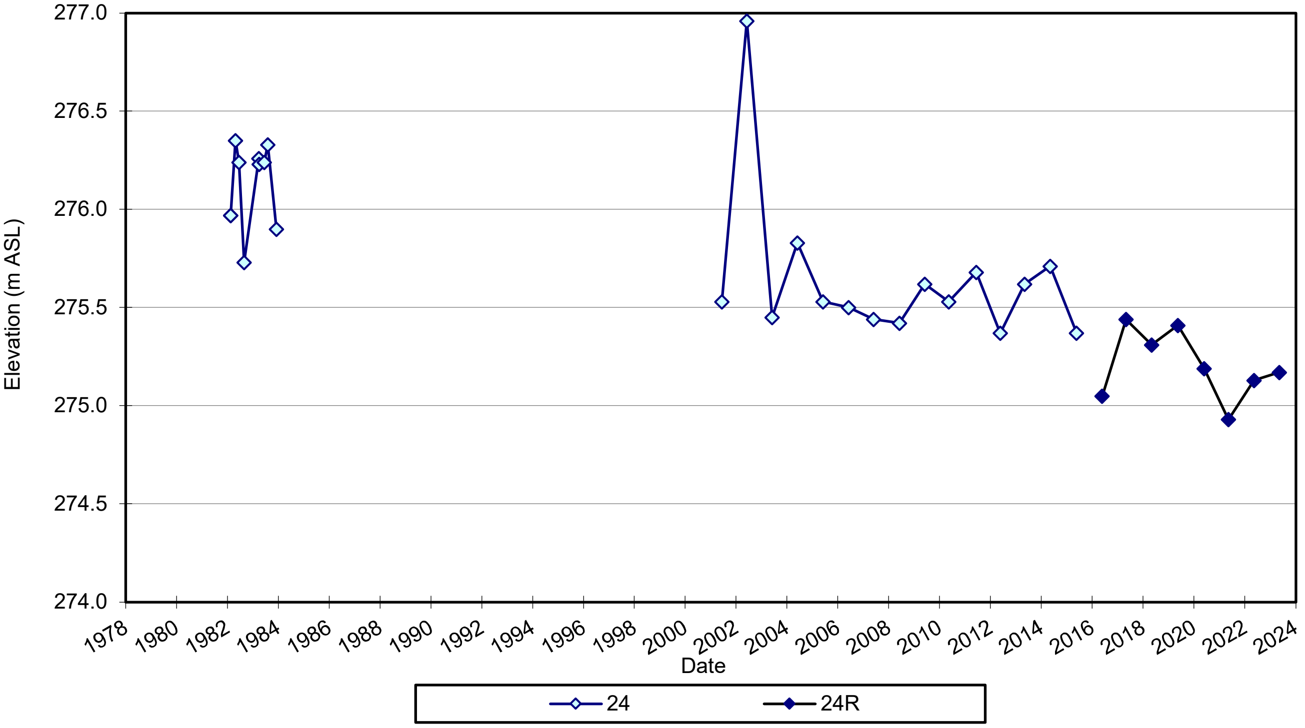


Figure C-10
Groundwater Hydrograph - Adjacent East
Holbrook Landfill Site - Deep Aquifer

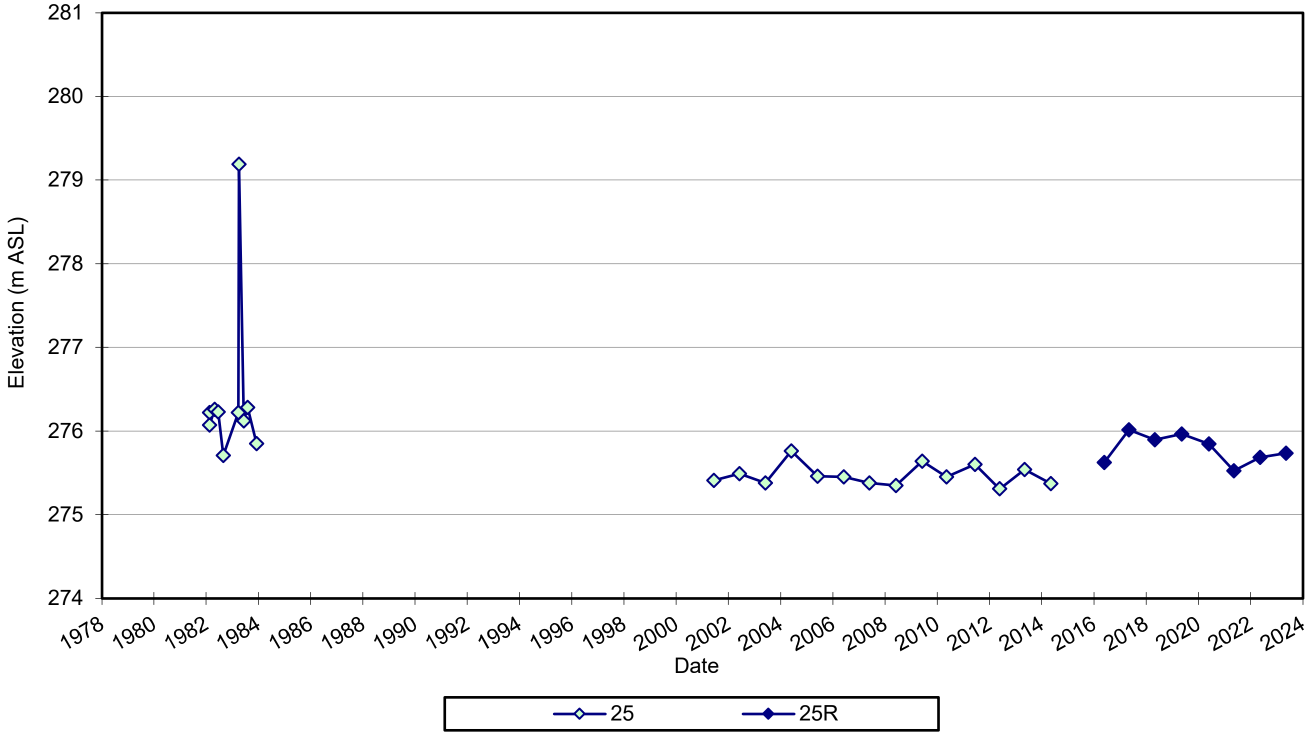


Figure C-11
Groundwater Hydrograph - Adjacent West
Holbrook Landfill Site - Deep Aquifer

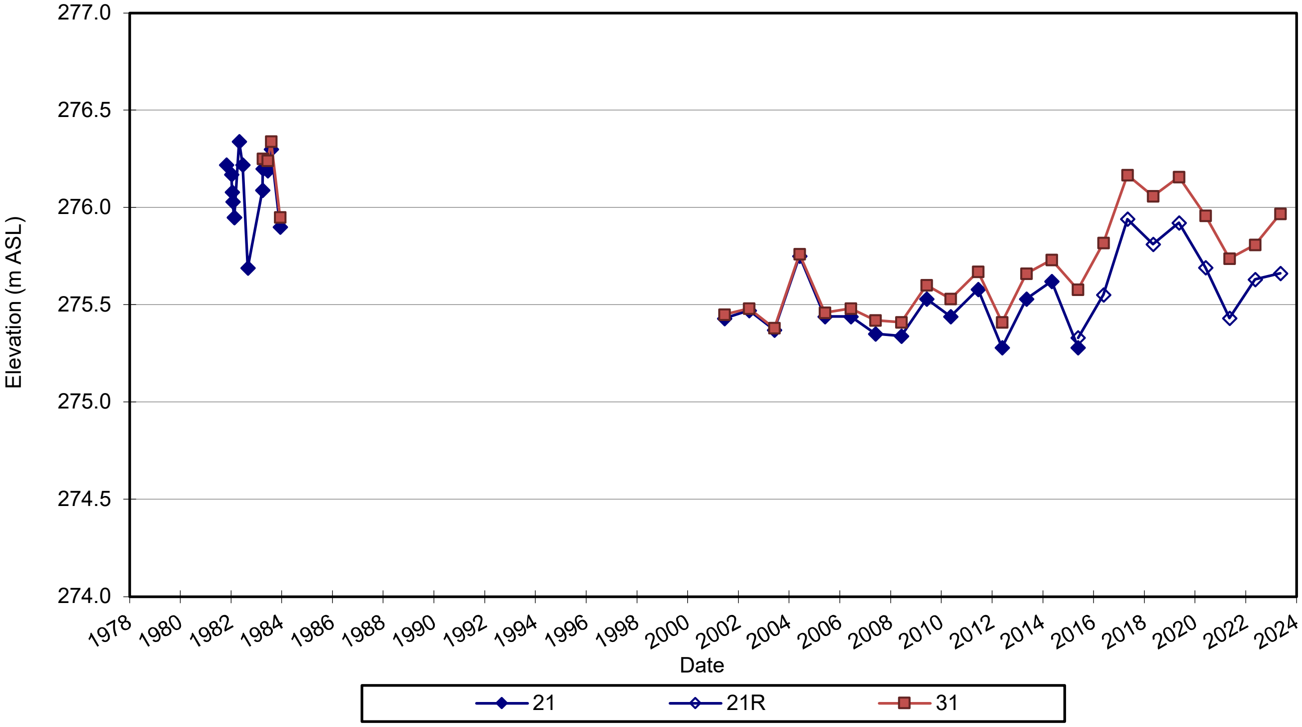


Figure C-12
Groundwater Hydrograph - Downgradient South
Holbrook Landfill Site - Deep Aquifer

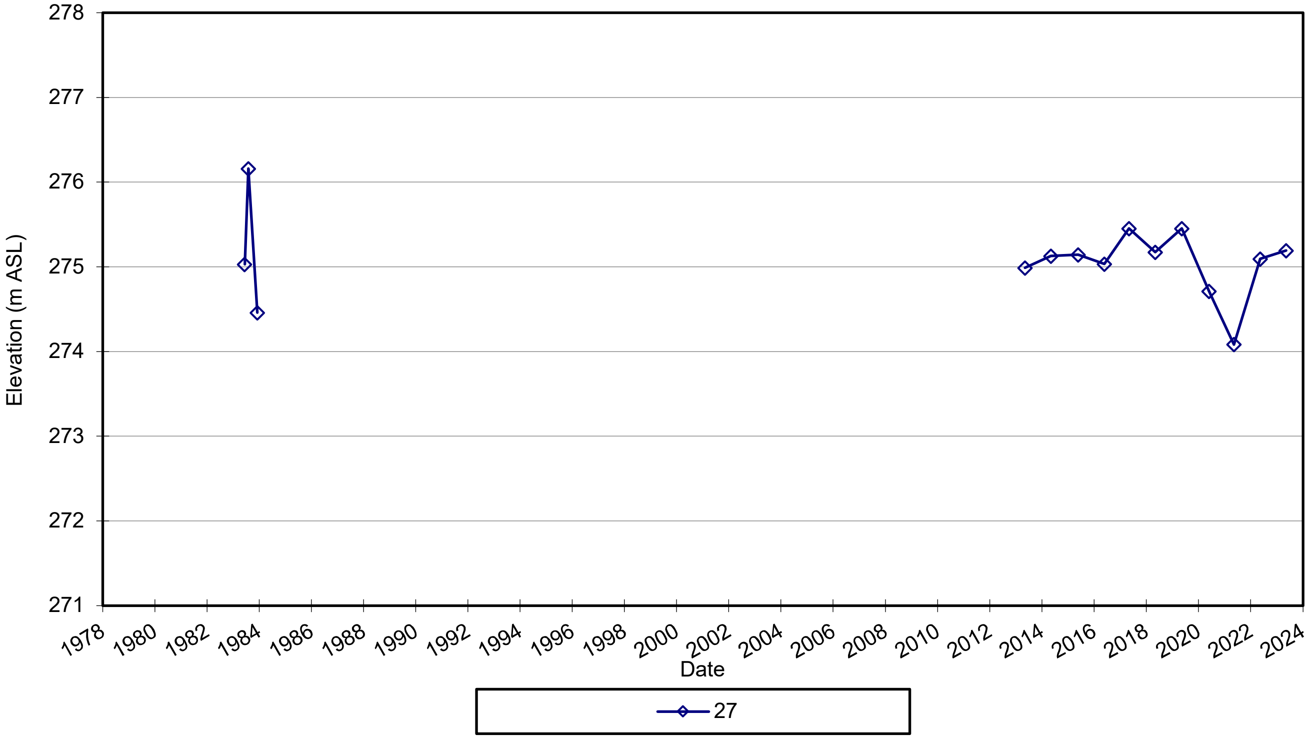


Figure C-13
Groundwater Hydrograph - Downgradient Southeast
Holbrook Landfill Site - Deep Aquifer

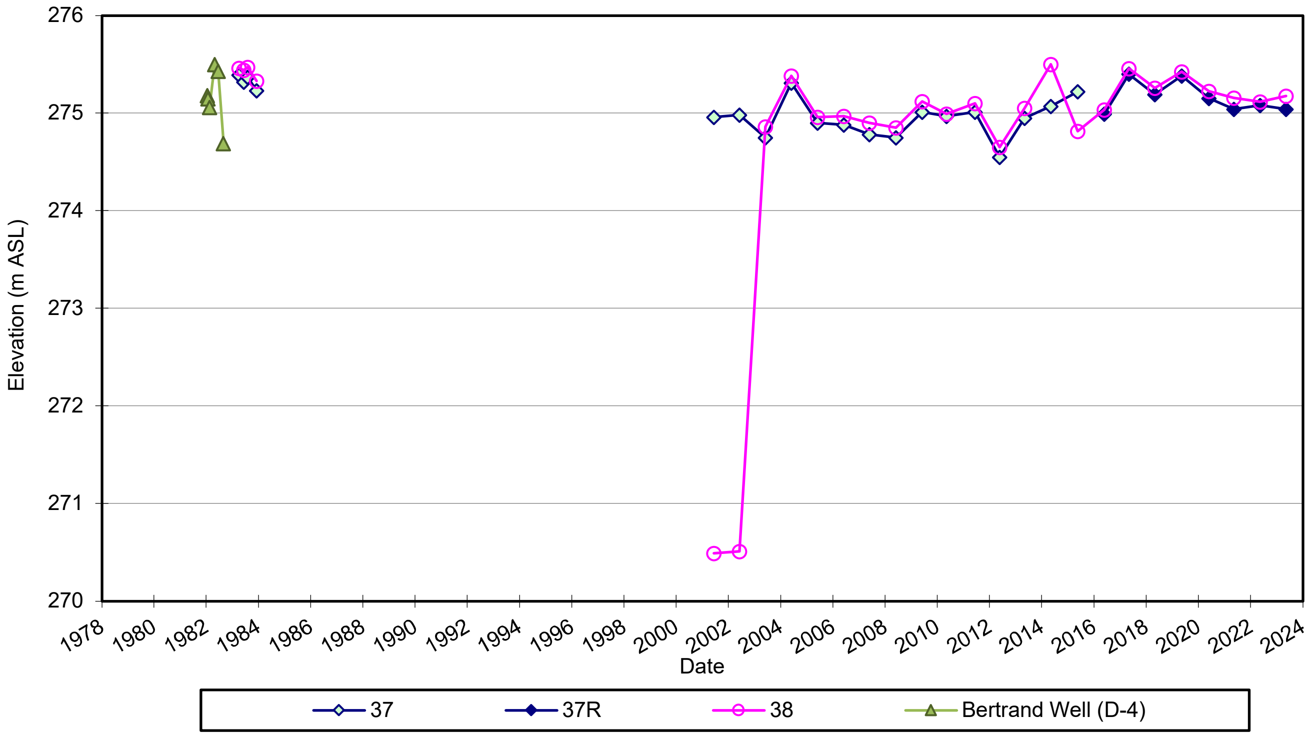


Figure C-14
Groundwater Hydrograph - Adjacent Northwest
Holbrook Landfill Site - Deep Aquifer

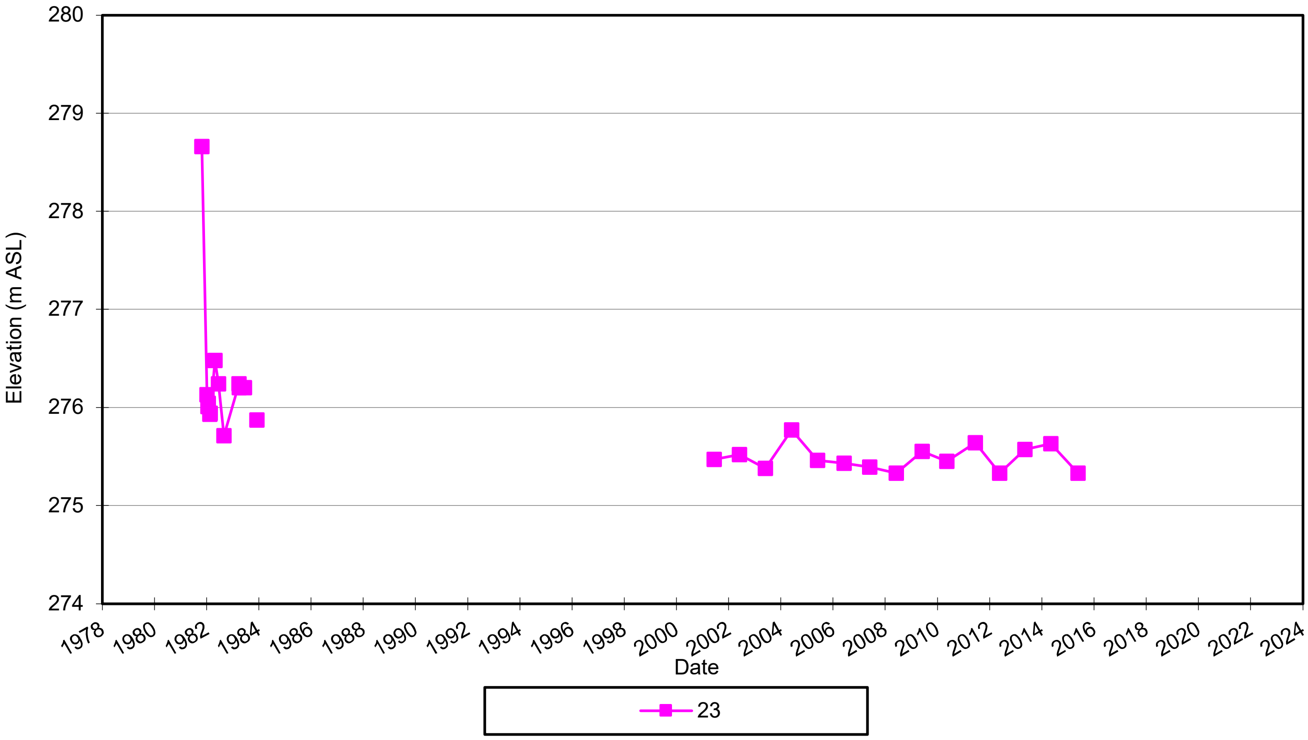
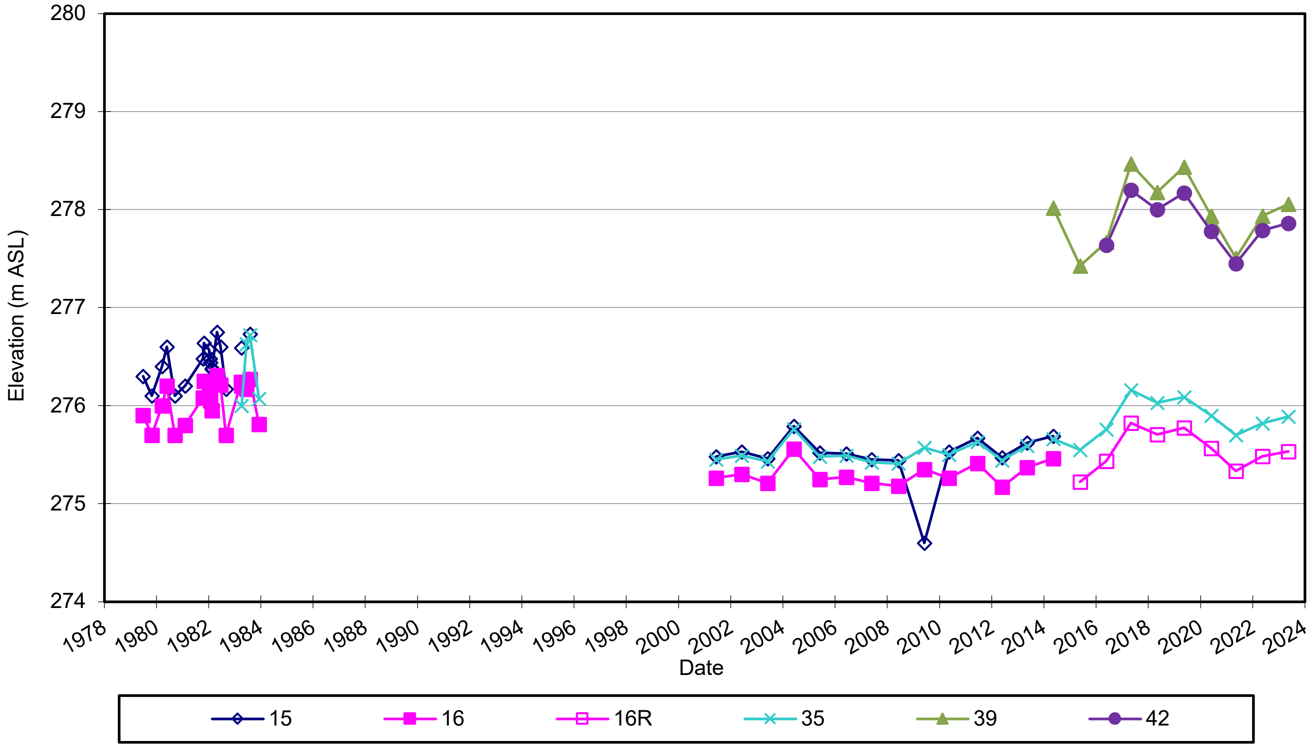


Figure C-15
Groundwater Hydrograph - Cross-Gradient West
Holbrook Landfill Site - Deep Aquifer



APPENDIX

D

GROUNDWATER CHEMISTRY

Notation	***Description***		
	all units in mg/L unless otherwise noted	EC	Electrical Conductivity
mg/L	milligrams per Litre	TKN	Total Kjeldahl Nitrogen
µg/L	micrograms per Litre	DOC	Dissolved Organic Carbon
SU	Scientific Units	T	Temperature
µS/cm	microSiemens per centimetre		
ºC	degrees Celsius		
ODWQS	Ontario Drinking Water Quality Standards (June 2003)		
MAC	Maximum Acceptable Concentration		
IMAC	Interim Maximum Acceptable Concentration		
AO	Aesthetic objective		
OG	Operational Guideline		
nc	no OWDWS criteria		
em	equipment malfunction - field parameter data not available		
DRY	sampling location dry at the time of sampling		
- or blank	parameter not analysed during sampling event		
< value	parameter not detected above associated laboratory reported detection limit		
*	estimated / anomalous value - result interpreted with caution or considered questionable		

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
11	16-May-79				7.9	290		5.0		105				
	27-Jun-79				7.9	310	168	3.9		150				
	30-Oct-79				7.6	670	348	9.5			79.5	36.2		
	20-Mar-80				7.7	630	335	13.5			77.5	34.4		
	27-May-80				8.2	432	225	10.0			52.5	22.8		
	18-Sep-80				7.5	630	334	11.5			76.0	35.0		
	6-Feb-81				7.7	690	367	17.5			83.0	38.8		
	28-Jan-82				7.7	600	396	12.0		260				
	29-Apr-82				7.5	620	396	14.0						
	2-Sep-82				7.8	640	340	13.5			80.5	33.6		
	30-Mar-83				7.3	610	390	19.0						
	13-Jun-83				7.3	390	456	26.0						
	14-Sep-83				7.3	700	424	24.0						
	7-Dec-83				7.7	730	570	25.0						
	1-May-84				7.2	920	504	33.0						
	6-Nov-84				6.9	1040	615	27.0		308	139	65.0		
	30-Apr-85				7.31	875	445	27.5		284	105	44.4		
	21-Oct-85				7.58	1020	519	27.0		156	125	50.0		
	30-Apr-86				7.23	434	270	14.5		208	67.5	24.6		
	14-Oct-86				7.31	805	420	18.0		324	102.0	40.0		
	20-Apr-87				7.33	845	452	20.5			110	43.0		
	6-Oct-87				7.43	750	373	17.8		349	92.9	34.2		
	10-May-88				7.29	1040	591	24.8		355	148	53.7		
	12-Oct-88				7.20	1040	671	29.0		556	163	64.0		
	23-Jan-89				7.07	1296	669	35.3		473	162	63.6		
	30-Oct-89				7.21	1320	712	29.0		546	176	66.0		
	7-May-90				7.46	1011	556	21.6		442	139	50.0		
	29-Oct-90				7.76	1030	542	19.5		503	140	46.6		
	6-May-91				7.44	949	488	20.6		462	122	44.4		

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
11	16-May-79												
	27-Jun-79					7.8			0.04				
	30-Oct-79								0.62				
	20-Mar-80								0.89				
	27-May-80								0.15				
	18-Sep-80								0.03				
	6-Feb-81								0.01				
	28-Jan-82					2.3			0.02				
	29-Apr-82					1.7							
	2-Sep-82					2.9							
	30-Mar-83					2.1							
	13-Jun-83					1.7							
	14-Sep-83					1.4							
	7-Dec-83					2.1							
	1-May-84					1.5							
	6-Nov-84					1.1			0.18				
	30-Apr-85					3.0			0.80				
	21-Oct-85					2.5			0.80				
	30-Apr-86					4.6			0.64				
	14-Oct-86					2.8			0.66				
	20-Apr-87					3.2			0.01				
	6-Oct-87					3.7			0.20				
	10-May-88					3.1			0.94				
	12-Oct-88					9.0			0.06				
	23-Jan-89								0.41				
	30-Oct-89					2.4			0.96				
	7-May-90								0.65				
	29-Oct-90					4.6			0.09				
	6-May-91								0.19				

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
11	26-May-92				7.36	843	454	17.3		376	118	38.5		
cont'd	6-Oct-92				7.55	745	398	15.0		332	104	33.7		
	3-May-93				7.26	897	438	12.0		465	107	41.1		
	26-Oct-93				7.26	991	502	14.4		487	128	44.0		
	25-Apr-94				7.70	877	474	11.6		432	123	39.8		
	25-Oct-94				7.38	782	416	11.0		359	112	32.7		
	16-May-95				7.37	820	440	9.9		355	114	37.5		
	15-Jun-97				7.60	714	415	7.6		386	112	32.9	2.40	7.8
	15-Jun-98				7.36	760	487	8.0		210	137	35.1	3.14	7.87
	15-Jun-99				7.27	885	527	13.0		308	154	34.7	3.27	9.35
	15-Jun-00				7.86	930	537	8.0		440	153	37.7	1.38	14.9
	15-Jun-01				7.32	993	547	10.0		565	160	35.7	0.75	17.5
	15-Jun-02				7.12	844	427	10.0		438	124	28.4	2.06	7.16
	15-Jun-03				7.34	868	509	15.0		450	147	34.5	1.40	11.2
	15-Jun-04				7.65	927	448	9.0		491	125	33.1	1.28	19.8
	15-Jun-05				8.05	796	575	9.9		517	160	40.2	2.5	9.5
	15-Jun-06				7.24	854	510	9.0		450	148	33.8	2.0	7.3
	29-May-07				6.88	933	390	6.0		530	118	22.9	3.0	6.3
	5-Jun-08				7.45	973	120	8.0		450	36.4	6.5	2.0	3.9
	4-Jun-09				7.38	889	305	5.4		477	91.5	18.7	2.7	4.44
	13-May-10	7.10	620	8.0	7.62	970	664	5.06		600	198	41.2	2.53	6.77
	15-Jun-11	7.33	776	11.8	7.81	922	579	5.14		565	175	34.5	2.31	5.88
	23-May-12	6.97	788	11.1	7.73	957	557	5.82		549	163	36.4	2.28	5.86
	9-May-13	2.34	1163	9.5	7.99	1060	634	16.7		502	186	41.1	2.22	7.06
	9-May-14	7.31	1079	8.2	7.92	1000	478	13.3		501	130	37.2	1.99	7.68
	27-May-15	6.98	573	14.3	7.60	997	448	9.53	29.9	522	121	35.5	2.00	8.02

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										μg/L	μg/L	μg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
11	26-May-92					4.1			0.41				
cont'd	6-Oct-92					5.0			0.14				
	3-May-93					3.3			0.85				
	26-Oct-93					4.2			0.08				
	25-Apr-94					3.6			1.03				
	25-Oct-94					3.7			0.29				
	16-May-95					3.8			0.64				
	15-Jun-97								0.15	0.110			
	15-Jun-98								1.17	0.170			
	15-Jun-99								0.08	0.180			
	15-Jun-00								1.29	0.410			
	15-Jun-01								<0.02	0.180			
	15-Jun-02								0.26	0.180			
	15-Jun-03								0.19	0.210			
	15-Jun-04								0.03	0.060			
	15-Jun-05								<0.05	0.058			
	15-Jun-06								0.06	0.161			
	29-May-07								0.27	0.203			
	5-Jun-08								1.74	0.048			
	4-Jun-09								0.273	0.094			
	13-May-10								0.216	0.178			
	15-Jun-11								0.291	0.148			
	23-May-12								0.550	0.227			
	9-May-13								0.636	0.313			
	9-May-14								1.30	0.432			
	27-May-15								0.169	0.078			

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
11R	25-May-16	7.00	1062	11.9	8.10	1440	664	76.4	7.34	735	163	62.5	4.92	45.1
	1-Nov-16	7.26	1415	12.2	7.78	1450	-	78.4	4.65	758	163	60.3	4.24	43.4
	4-May-17	7.31	1590	8.08	7.93	1650	724	85.7	4.32	776	178	67.9	5.67	53.9
	10-May-18	7.09	1350	10.23	7.74	1540	700	104	3.12	827	172	65.8	6.33	58.1
	17-May-19	7.24	1380	10.73	6.94	1430	825	102	3.4	753	202	78.1	5.62	60.5
	12-May-20	7.46	1300	9.61	7.19	1530	777	100	2.6	715	185	76.8	3.58	59.6
	12-May-21	7.21	1620	10.1	7.98	1550	761	120	4	715	194	66.8	3.09	54.7
	17-May-22	7.21	1450	10.2	7.76	1540	806	140	5	767	197	76.2	4.80	71.2
	15-May-23	7.07	1200	14.9	7.85	1630	689	96	3	762	170	64.2	2.96	54.0
16AR	10-May-18	7.87	557	9.43	7.84	605	276	23.3	54.5	277	59.8	30.7	2.38	23.3
	16-May-19	7.86	506	9.95	7.99	571	305	24.2	59.0	268	68.6	32.5	1.64	22.1
	11-May-20	7.90	577	8.10	7.75	635	297	23.8	56.4	273	67.7	31.0	1.30	22.2
	12-May-21	7.70	683	10.5	8.15	619	319	27	86	244	72.9	33.3	1.42	24.4
	16-May-22	7.94	661	11.2	8.13	659	365	29	95	283	84.1	37.8	1.43	26.3
	15-May-23	7.42	494	14.9	7.99	692	287	26	68	273	66.9	29.0	1.19	21.2
19R	1-Nov-16	8.33	494	11.5	8.01	466		4.19	26.6	223	39.9	18.4	1.65	27.3
	4-May-17	8.34	459	8.46	8.27	504	190	2.64	27.8	230	40.9	21.3	1.57	20.5
	10-May-18	8.28	447	9.65	7.43	432	191	1.96	27.7	232	41.1	21.4	1.42	17.2
	16-May-19	8.04	359	9.17	7.87	385	210	1.76	26.0	214	47.2	22.3	1.31	15.5
	11-May-20	8.15	389	7.74	7.98	424	207	1.55	25.5	213	48.7	20.6	1.29	13.8
	11-May-21	8.05	442	9.8	8.27	432	245	2	30	205	61.0	22.6	1.44	14.4
	16-May-22	8.35	430	12.0	8.15	428	267	2	35	214	64.4	25.8	1.37	16.3
	15-May-23	7.95	363	11.9	8.15	446	211	<1	27	201	51.5	20.0	1.12	11.3
26	15-Jun-97				8.04	606	343	15.8		276	93.3	26.8	1.1	8.6
	15-Jun-98				7.97	595	339	17.0		268	93.7	25.6	1.45	8.11
	15-Jun-99				7.97	729	400	46.0		223	107	32.3	1.43	27.6
	15-Jun-00				8.10	760	388	45.0		360	101	32.9	1.56	29.7
	15-Jun-01				7.64	821	442	51.0		357	117	36.5	1.36	30.8
	15-Jun-02				7.54	916	451	71.0		384	115	39.8	1.39	33.2
	15-Jun-03				7.59		501	85.0		419	129	43.5	1.35	36.6
	15-Jun-04				7.54	1110	503	30.0		261	129	44.0	1.64	63.9
	15-Jun-05				8.13	1360	568	192		468	160	49.3	2.1	80.0
	15-Jun-06				7.21	1540	610	237		470	155	54.3	2.0	93.5

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
11R	25-May-16								7.68	0.086			
	1-Nov-16	0.72	2.56	<0.25	<0.25	12.9	0.203	<0.003	6.36	0.068	2.2	<0.20	<0.10
	4-May-17	5.00	6.29	<0.25	<0.25	10.5	0.264	<0.003	8.70	0.072	2.6	0.22	<0.10
	10-May-18	5.74	6.95	<0.25	<0.25	19.7	0.272	0.008	7.81	0.063			
	17-May-19	3.96	5.08	<0.10	<0.050	20.5	0.258	0.00284	8.96	0.130			
	12-May-20	1.13	2.38	<0.10	<0.050	17.3	0.215	<0.00050	1.56	0.062			
	12-May-21	3.3	4.6	0.12	<0.03	16.9	0.204	0.00042	2.67	0.059			
	17-May-22	2.6	4.0	<0.06	<0.03	19.0	0.243	0.00051	3.99	0.060			
	15-May-23	1.4	2.1	<0.06	<0.03	17.1	0.199	0.00046	1.26	0.058			
16AR	10-May-18	<0.02	<0.10	<0.05	<0.05	1.3	0.045	<0.003	<0.010	0.026			
	16-May-19	0.045	0.36	0.073	<0.010	1.81	0.037	<0.00050	0.178	0.0311			
	11-May-20	0.046	1.13	0.087	<0.010	2.62	0.032	<0.00050	0.013	0.0176			
	12-May-21	<0.1	<0.5	0.09	<0.03	1.1	0.040	0.00013	0.03	0.0240			
	16-May-22	<0.1	<0.5	0.14	<0.03	1.3	0.038	0.00009	0.047	0.0217			
	15-May-23	<0.1	<0.5	0.08	<0.03	1.0	0.029	0.00013	0.008	0.0176			
19R	1-Nov-16	0.12	0.34	0.06	<0.05	1.9	0.061	<0.003	0.313	0.084	<0.17	<0.20	<0.10
	4-May-17	0.16	0.88	<0.05	<0.05	2.8	0.053	<0.003	<0.010	0.009	<0.17	<0.20	<0.10
	10-May-18	<0.02	0.19	0.13	<0.05	0.9	0.044	<0.003	<0.010	0.003			
	16-May-19	<0.010	1.8	0.105	<0.010	1.72	0.041	<0.00050	0.020	0.00272			
	11-May-20	0.034	0.19	0.223	<0.010	1.83	0.039	<0.00050	0.067	0.00081			
	11-May-21	<0.1	<0.5	0.23	<0.03	3.6	0.050	0.00017	<0.007	0.00020			
	16-May-22	<0.1	<0.5	0.24	<0.03	1.1	0.052	0.00019	<0.007	0.00010			
	15-May-23	<0.1	<0.5	0.22	<0.03	1.4	0.032	0.00027	0.019	0.00201			
26	15-Jun-97								0.38	0.060			
	15-Jun-98								0.19	0.060			
	15-Jun-99								0.48	0.030			
	15-Jun-00								0.61	0.030			
	15-Jun-01								0.58	0.040			
	15-Jun-02								0.67	0.040			
	15-Jun-03								0.77	0.050			
	15-Jun-04								0.92	0.060			
	15-Jun-05								1.40	0.078			
	15-Jun-06								1.15	0.078			

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
26	29-May-07				7.24	1600	580	235		510	143	54.0	2.0	120
cont'd	5-Jun-08				7.69	1730	570	260		550	145	51.5	2.0	126
	4-Jun-09				7.60	1810	599	242		555	148	55.9	2.7	149
26R	13-May-10	7.11	1650	10.2	7.81	1680	346	300		594	85.8	31.9	1.33	80.5
	15-Jun-11	7.35	1458	9.5	7.81	1650	639	300		581	158	59.3	3.05	171
	23-May-12	7.95	1465	10.0	7.81	1790	648	294		600	161	59.7	2.70	174
	1-Nov-16	7.40	1820	14.6	7.95	2030		319	17.3	705	133	65.3	3.20	208
	4-May-17	7.27	2050	8.79	8.08	2210	578	302	18.0	739	134	59.1	2.78	208
	11-May-18	6.99	1710	10.25	7.99	1840	580	286	17.1	702	136	58.4	2.75	202
	16-May-19	7.31	1470	11.43	7.41	1750	607	278	16.7	652	142	61.0	2.61	192
	11-May-20	7.15	1710	8.83	7.29	1770	601	265	14.8	658	151	54.1	2.51	182
	11-May-21	7.32	1823	9.2	8.08	1790	657	260	21	601	172	55.4	2.95	183
	17-May-22	7.35	1552	9.0	7.88	1590	609	240	24	586	150	56.9	2.52	186
	15-May-23	6.94	1030	11.9	7.91	1320	412	150	26	451	103	37.3	1.87	101
28	5-Apr-83				7.8	390	216	5.0		211	50.0	25.0		
	13-Jun-83				7.5	390	252	2.0		234	54.0	27.0		
	13-Sep-83				7.6	400	220	2.0						
	8-Dec-83				7.5	420	270	5.0						
	1-May-84				7.5	510	258	2.0						
	5-Nov-84				7.3	510	258	2.0		224	54.0	30.0		
	29-Apr-85				7.79	560	242	3.5		243	47.5	30.0		
	21-Oct-85				8.05	510	224	3.0		233	43.5	28.0		
	30-Apr-86				7.77	424	257	3.5		258	49.0	32.6		
	14-Oct-86				7.68	455	211	2.5		212	40.5	26.6		
	20-Apr-87				7.61	520	238	2.5		237	45.0	30.4		
	6-Oct-87				7.84	458	246	1.6		230	48.4	30.4		
	10-May-88				7.70	520	270	2.9		156	53.0	33.4		
	12-Oct-88				7.70	380	184	3.0		150	39.0	21.0		
	30-Oct-89				7.73	501	237	3.8		235	45.6	29.9		
	7-May-90				7.84	546	266	6.4		244	51.1	33.6		
	29-Oct-90				7.73	495	227	4.1		235	45.6	27.5		

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC 1 AO*
26	29-May-07								0.25	0.118			
cont'd	5-Jun-08								0.64	0.096			
	4-Jun-09								1.59	0.090			
26R	13-May-10								1.92	0.089			
	15-Jun-11								1.85	0.089			
	23-May-12								1.79	0.083			
	1-Nov-16	0.06	0.88	<0.25	<0.25	11.1	1.80	<0.003	2.16	0.050	<0.17	<0.20	<0.10
	4-May-17	0.11	1.05	<0.5	<0.5	13.0	1.85	<0.003	2.14	0.041	<0.17	<0.20	<0.10
	11-May-18	0.07	0.85	<0.5	<0.5	12.1	1.80	0.012	2.03	0.042	<0.68	<0.80	<0.40
	16-May-19	0.042	0.89	<0.10	<0.050	10.9	1.71	<0.0050	2.03	0.0409	<0.50	<0.50	<0.50
	11-May-20	0.048	0.86	<0.10	<0.050	10.6	1.73	<0.0050	2.06	0.0406	<0.50	<0.50	<0.50
	11-May-21	<0.1	0.6	<0.06	<0.03	9.8	1.41	0.00053	2.19	0.045	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	<0.06	<0.03	8.2	1.27	0.00057	1.96	0.039	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	<0.06	<0.03	5.4	0.77	0.00035	1.46	0.033	<0.2	<0.5	<0.5
28	5-Apr-83					13.4			0.35				
	13-Jun-83					6.5			0.57				
	13-Sep-83					3.2							
	8-Dec-83					1.8							
	1-May-84					1.5							
	5-Nov-84					0.6			<0.04				
	29-Apr-85					2.6			1.66				
	21-Oct-85					1.5			0.01				
	30-Apr-86					3.9			0.03				
	14-Oct-86					1.3			0.04				
	20-Apr-87					2.4			0.02				
	6-Oct-87					1.6			0.03				
	10-May-88					1.2			0.03				
	12-Oct-88					1.2			<.05				
	30-Oct-89					1.1			<0.01				
	7-May-90					0.8			<0.01				
	29-Oct-90					1.2			1.60				

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
28	6-May-91				7.76	469	221	3.6		225	45.2	26.2		
cont'd	4-Nov-91				7.94	435	207	2.7		195	41.1	25.2		
	26-May-92				7.66	457	227	2.3		215	45.0	27.8		
	6-Oct-92				7.83	551	295	5.9		255	58.9	35.9		
	3-May-93				7.69	553	280	3.5		789	55.0	35.4		
	26-Oct-93				7.79	535	260	2.7		292	51.3	31.9		
	25-Apr-94				7.81	542	282	3.5		275	57.4	33.5		
	25-Oct-94				7.88	523	262	4.0		264	54.9	30.4		
	16-May-95				7.94	529	274	3.1		255	56.7	32.2		
	15-Jun-97					382	210	1.8		185	47.2		1.4	6.6
	15-Jun-98					420	219	3.0		214	48.8		2.10	6.80
	15-Jun-99					497	232	3.0		240	51.5		2.01	8.62
	15-Jun-00					539	257	3.0		265	55.7		1.21	23.7
	15-Jun-01					582	347	3.0		301	78.1		0.81	14.5
	15-Jun-02					581	327	3.0		292	68.8		1.73	9.0
	15-Jun-03					662	382	5.0		308	80.7		1.18	13.1
	15-Jun-04					580	272	6.0		311	58.8		0.66	16.7
	15-Jun-05					529	334	3.23		261	71.2		1.9	11.0
	15-Jun-06					544	350	4.0		270	82.9		2.0	8.8
	29-May-07				7.35	597	300	4.0		290	64.2	35.1	2.0	10.7
	5-Jun-08				7.93	569	310	4.0		270	70.5	31.9	2.0	9.6
	4-Jun-09				7.98	588	309	2.7		297	68.2	33.7	1.9	8.24
	13-May-10	7.74	480	9.2	8.05	568	354	2.68		320	75.3	40.4	2.01	10.9
	15-Jun-11	8.03	451	10.7	8.11	516	287	2.44		272	60.1	33.2	1.90	12.1
	23-May-12	7.41	451	11.4	8.07	521	271	3.32		275	55.9	32.0	1.75	13.4
	9-May-13	7.92	613	9.7	8.23	581	302	3.16		262	61.5	36.1	1.95	13.8
	9-May-14	7.70	623	9.4	7.89	589	296	2.98		267	61.4	34.6	2.58	12.5
	27-May-15	7.95	380	14.6	8.00	593	282	3.49	31.0	280	59.6	32.3	2.94	12.1

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
28	6-May-91								0.01				
cont'd	4-Nov-91					2.0			0.15				
	26-May-92					1.7			<0.01				
	6-Oct-92					3.6			0.14				
	3-May-93					1.0			0.13				
	26-Oct-93					1.3			0.21				
	25-Apr-94					2.3			0.02				
	25-Oct-94					1.4			<0.01				
	16-May-95					1.3			0.04				
	15-Jun-97								<0.02	0.050			
	15-Jun-98								0.17	0.330			
	15-Jun-99								0.09	0.110			
	15-Jun-00								0.02	0.170			
	15-Jun-01								<0.02	0.100			
	15-Jun-02								0.06	0.100			
	15-Jun-03								0.11	0.070			
	15-Jun-04								0.02	0.190			
	15-Jun-05								<0.05	<0.02			
	15-Jun-06								0.06	0.627			
	29-May-07								<0.05	0.009			
	5-Jun-08								<0.05	0.572			
	4-Jun-09								<0.050	0.012			
	13-May-10								0.042	0.133			
	15-Jun-11								0.080	0.141			
	23-May-12								0.060	0.086			
	9-May-13								0.080	0.092			
	9-May-14								0.225	0.113			
	27-May-15								0.015	0.156			

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
28R	25-May-16	7.63	408	13.5	8.17	533	219	6.10	37.8	263	44.7	26.1	2.49	25.0
	1-Nov-16	8.39	535	12.0	8.05	541		4.50	30.7	272	46.2	24.5	2.00	25.6
	4-May-17	8.15	325	9.82	8.29	567	221	2.75	31.1	270	44.8	26.4	2.33	28.4
	10-May-18	7.85	313	9.76	8.01	517	222	3.06	32.6	284	45.6	26.3	2.04	28.2
	16-May-19	7.60	221	10.45	8.04	467	234	2.48	29.9	268	48.1	27.7	1.45	25.8
	12-May-20	8.19	406	9.15	7.95	516	242	2.51	25.9	270	51.0	27.8	1.72	23.9
	12-May-21	8.03	475	9.9	8.00	480	232	3	67	239	51.4	25.1	1.47	22.3
	17-May-22	8.03	277	10.2	8.24	525	281	7	75	281	62.8	30.2	1.69	37.1
	15-May-23	7.93	324	10.9	8.35	592	213	6	66	274	47.8	22.8	1.55	36.1
32	5-Apr-83				7.7	300	176			167	48.0	16.0		
	14-Jun-83				7.5	270	148			168	41.0	14.0		
	19-Aug-83				7.9	310								
	13-Sep-83				7.6	320	182							
	7-Dec-83				7.7	220	232							
	1-May-84				7.5	380	200							
	6-Nov-84				7.4	420	212			182	57.0	17.0		
	30-Apr-85				7.85	427	210	1.5		204	54.5	17.8		
	21-Oct-85				7.95	434	212	1.5			58.0	16.2		
	30-Apr-86				7.77	314	201	1.0		195	52.5	17.0		
	14-Oct-86				7.69	403	204	1.0		195	54.5	16.4		
	20-Apr-87				7.65	398	207	1.5		194	54.0	17.4		
	6-Oct-87				7.82	382	223	2.7		200	59.8	17.9		
	10-May-88				7.74	390	217	1.1		177	59.4	16.6		
	12-Oct-88				7.80	370	185	4.0		194	51.0	14.0		
	30-Oct-89				7.73	432	217	6.7		205	59.8	16.4		
	7-May-90				7.86	419	212	4.1		202	55.9	17.5		
	29-Oct-90				7.77	465	223	8.7		221	61.3	17.0		
	6-May-91				7.90	413	199	3.7		204	52.3	16.6		
	4-Nov-91				7.86	496	238	12.5		227	62.4	20.0		
	26-May-92				7.76	455	236	6.7		216	61.4	20.0		
	6-Oct-92				7.84	475	252	9.6		213	67.0	20.5		

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
28R	25-May-16								<0.010	0.023			
	1-Nov-16	0.11	0.25	<0.05	<0.05	2.9	0.074	<0.003	<0.010	0.023	<0.17	<0.20	<0.10
	4-May-17	0.10	0.33	<0.05	<0.05	1.6	0.09	<0.003	0.167	0.021	<0.17	<0.20	<0.10
	10-May-18	0.06	0.15	0.09	<0.05	1.1	0.08	<0.003	<0.010	0.018			
	16-May-19	0.16	51.9*	<0.020	<0.010	1.75	0.084	<0.00050	0.255	0.0194			
	12-May-20	0.10	0.43	<0.020	<0.010	1.96	0.073	<0.00050	0.055	0.0177			
	12-May-21	0.10	<0.5	<0.06	<0.03	2.0	0.085	0.00018	0.27	0.019			
	17-May-22	<0.1	<0.5	0.18	<0.03	2.2	0.089	0.00019	0.119	0.0194			
	15-May-23	0.1	<0.5	0.25	<0.03	1.6	0.101	0.00011	0.030	0.0151			
32	5-Apr-83					1.1			0.23				
	14-Jun-83					1.2			0.65				
	19-Aug-83												
	13-Sep-83					0.6							
	7-Dec-83					1.3							
	1-May-84					0.9							
	6-Nov-84					0.3			<0.04				
	30-Apr-85					1.3			2.56				
	21-Oct-85					3.7			0.18				
	30-Apr-86					2.5			0.01				
	14-Oct-86					1.3			0.02				
	20-Apr-87					2.3			0.03				
	6-Oct-87					2.0			0.01				
	10-May-88					1.2			0.03				
	12-Oct-88					1.4			<.05				
	30-Oct-89					1.3			0.01				
	7-May-90					0.6			0.01				
	29-Oct-90					1.3			0.02				
	6-May-91								0.09				
	4-Nov-91					2.5			0.10				
	26-May-92					2.1			<0.01				
	6-Oct-92					2.2			0.05				

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
32	3-May-93				7.75	440	222	6.3		228	58.0	18.6		
cont'd	26-Oct-93				7.88	509	250	11.7		252	67.0	20.1		
	25-Apr-94				8.05	451	242	7.4		235	64.3	19.7		
	25-Oct-94				7.89	498	246	8.8		237	65.6	19.9		
	16-May-95				7.86	472	240	7.5		250	62.9	20.0		
	15-Jun-97				8.17	437	235	5.3		191	59.3	21.1	0.70	7.40
	15-Jun-98				8.06	439	275	8.0		208	75.1	21.2	1.13	7.17
	15-Jun-99				7.57	530	311	8.0		228	83.4	24.9	0.84	8.46
	15-Jun-00				8.07	515	267	7.0		240	70.7	22.0	0.53	19.7
	15-Jun-01				7.80	518	312	7.0		250	83.4	25.1	0.42	22.5
	15-Jun-02				7.60	472	244	6.0		233	63.9	20.7	0.86	6.15
	15-Jun-03				7.84	509	288	7.0		264	75.6	24.1	0.38	9.15
	15-Jun-04				7.89	460	225	7.0		234	56.6	19.8	0.36	15.9
	15-Jun-05				8.25	433	256	6.8		216	66.8	21.6	0.8	8.3
	15-Jun-06				7.72	455	290	8.0		250	79.4	22.8	<1	6.7
	29-May-07				7.30	458	200	6.0		230	54.3	15.9	1.0	6.8
	5-Jun-08				7.99	457	150	7.0		230	40.9	11.8	2.0	6.3
	4-Jun-09				7.99	492	157	6.8		243	43.1	11.9	1.8	4.0
	13-May-10	8.08	430	7.8	7.86	536	335	10.6		274	88.6	27.6	0.98	7.72
	15-Jun-11	8.13	427	10.5	8.08	511	291	9.32		270	76.7	24.2	1.09	7.34
	23-May-12	6.66	430	9.0	7.93	543	291	9.39		266	76.4	24.3	1.11	7.35
	9-May-13	7.80	592	8.9	8.16	562	301	8.63		244	78.5	25.6	0.94	7.64
	9-May-14	7.99	569	7.0	8.13	527	273	8.15		231	69.9	23.9	0.94	7.36
	27-May-15	7.51	343	15.3	8.04	548	252	9.37	27.4	252	63.6	22.6	0.98	8.39
32R	25-May-16	7.80	235	11.3	8.09	558	274	10.9	33.2	271	70.5	23.7	1.01	7.9
	1-Nov-16	8.23	630	12.5	8.07	582		10.6	29.8	278	78	23.3	1.27	7.98
	4-May-17	7.92	535	7.27	8.19	598	275	8.74	31.3	271	70.5	24.1	1.22	8.13
	11-May-18	7.72	477	7.42	7.92	507	270	8.42	29.1	271	69.7	23.4	1.17	7.93
	16-May-19	8.10	421	10.02	7.87	508	293	9.87	37.1	284	76.4	24.9	0.808	7.80
	12-May-20	7.94	462	7.40	7.65	542	275	8.82	25.0	235	71.7	23.4	0.783	7.97

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC 1 AO*
32	3-May-93					1.2			0.08				
cont'd	26-Oct-93					2.7			0.01				
	25-Apr-94					2.4			0.03				
	25-Oct-94					4.3			0.21				
	16-May-95					1.8			0.13				
	15-Jun-97								0.02	0.110			
	15-Jun-98								0.07	0.380			
	15-Jun-99								0.10	0.020			
	15-Jun-00								<0.02	0.060			
	15-Jun-01								<0.02	0.120			
	15-Jun-02								0.12	0.070			
	15-Jun-03								0.10	0.050			
	15-Jun-04								0.04	0.050			
	15-Jun-05								0.09	0.033			
	15-Jun-06								0.97	0.083			
	29-May-07								0.17	0.073			
	5-Jun-08								0.06	0.040			
	4-Jun-09								<0.050	0.039			
	13-May-10								0.579	0.057			
	15-Jun-11								0.366	0.058			
	23-May-12								0.400	0.053			
	9-May-13								0.429	0.050			
	9-May-14								0.353	0.049			
	27-May-15								<0.010	0.032			
32R	25-May-16								0.267	0.04			
	1-Nov-16	<0.02	0.12	<0.05	<0.05	1.6	0.043	<0.003	0.099	0.049	<0.17	<0.20	<0.10
	4-May-17	0.04	0.28	0.06	<0.05	1.6	0.029	<0.003	0.156	0.036	<0.17	<0.20	<0.10
	11-May-18	0.04	<0.10	0.11	<0.05	1.2	0.032	<0.003	0.130	0.041	<0.17	<0.20	<0.10
	16-May-19	0.06	124*	<0.020	<0.010	1.99	0.030	<0.00050	0.170	0.0391	<0.50	<0.50	<0.50
	12-May-20	0.064	0.85	0.024	<0.010	2.43	0.028	<0.00050	0.258	0.0446	<0.50	<0.50	<0.50

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
32R	11-May-21	7.75	620	7.7	8.14	519	351	14	39	245	95.4	27.5	0.920	8.47
cont'd	16-May-22	7.73	573	8.8	8.08	582	335	15	33	291	87.0	28.8	0.816	9.88
	15-May-23	8.08	541	9.2	8.10	648	303	17	30	336	80.2	25.0	0.837	8.80
33R	16-May-19	8.35	381	11.19	8.02	437	195	3.76	29.4	244	50.1	16.9	4.24	30.7
40	9-May-14	7.18	786	9.5	8.05	728	381	16.5		348	113	24.0	1.15	10.7
	27-May-15	6.99	476	10.7	7.90	734	365	17.8	37.5	341	110	22.0	0.89	12.0
	24-May-16	7.22	556	10.2	8.07	722	384	16.7	41	349	115	23.5	0.97	11
	1-Nov-16	7.66	711	9.9	7.88	714		22.2	40.1	328	106	20.1	0.99	10.7
	4-May-17	7.45	719	9.07	8.15	782	364	18.8	38.4	346	109	22.3	1.13	11.1
	10-May-18	7.25	642	9.86	7.86	692	359	18.2	34.5	369	108	21.6	0.96	11.2
	16-May-19	7.45	589	10.11	7.24	658	385	20.3	37.8	345	116	23.4	0.951	11.3
	11-May-20	7.94	462	7.40	7.29	707	368	19.7	40.7	333	113	21.2	0.919	10.5
	11-May-21	7.50	758	8.7	8.15	722	450	20	45	337	142	23.2	1.02	10.4
	16-May-22	7.35	718	9.8	7.95	699	431	29	51	338	131	25.3	0.995	13.4
	15-May-23	7.54	637	9.9	7.86	767	359	23	43	351	111	19.7	0.838	9.69
41	9-May-14	6.41	2980	11.9	7.66	2590	501	166		1110	121	48.3	84.7	103
	27-May-15	6.81	1954	15.3	7.41	2840	614	167	2	1240	145	61.1	110	123
	25-May-16	6.75	2930	13.3	7.79	2600	587	156	1.8	1190	150	51.7	84.9	97.6
	1-Nov-16	6.80	3430	15.7	7.58	3670		267	3.8	1590	134	61.3	132	151
	4-May-17	6.76	2820	14.50	7.57	2210	569	83.3	2.61	1060	158	42.3	55.8	62.5
	10-May-18	6.60	2100	13.93	7.49	1870	546	66.9	3.5	1010	155	38.6	50.2	55.1
	16-May-19	6.38	1760	10.19	6.46	1840	633	75.2	<3.0	820	178	45.6	54.2	54.1
	12-May-20	6.52	1950	9.23	6.48	2160	626	74.0	<1.5	301	178	44.2	58.7	58.6
	12-May-21	6.77	2050	10.2	7.63	2160	685	80	22	1030	199	45.9	66.5	63.3
	17-May-22	6.92	2100	10.3	7.30	2010	663	72	7	1040	190	45.7	61.4	59.4
	15-May-23	6.87	2090	10.8	7.09	1970	568	60	6	948	168	36.2	40.8	41.9

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
32R	11-May-21	<0.1	<0.5	0.08	<0.03	2.7	0.043	0.0001	0.747	0.0389	<0.2	<0.5	<0.5
cont'd	16-May-22	<0.1	<0.5	0.41	<0.03	1.6	0.057	0.00009	0.082	0.0871	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	0.07	<0.03	1.9	0.040	0.00012	0.254	0.0212	<0.2	<0.5	<0.5
33R	16-May-19	0.085	2.44	0.496	<0.010	3.53	0.062	<0.00050	0.368	0.0279			
40	9-May-14								3.80	0.268			
	27-May-15								2.99	0.249			
	24-May-16								3.15	0.211			
	1-Nov-16	0.19	0.57	<0.25	<0.25	6.6	0.022	<0.003	2.96	0.212	<0.17	<0.20	<0.10
	4-May-17	0.16	0.65	<0.05	<0.05	7.3	0.024	0.005	9.96	0.931	<0.17	<0.20	<0.10
	10-May-18	0.20	0.60	<0.25	<0.25	6.8	0.020	0.004	2.79	0.219	<0.68	<0.80	<0.40
	16-May-19	0.224	1.48	<0.020	<0.010	7.06	0.019	<0.00050	2.80	0.225	<0.50	<0.50	<0.50
	11-May-20	0.187	0.79	0.021	<0.010	8.06	0.019	<0.00050	2.85	0.218	<0.50	<0.50	<0.50
	11-May-21	0.3	<0.5	<0.06	<0.03	6.8	0.036	0.00029	3.19	0.242	<0.2	<0.5	<0.5
	16-May-22	0.2	<0.5	0.08	<0.03	5.8	0.024	0.00045	2.94	0.238	<0.2	<0.5	<0.5
	15-May-23	0.2	<0.5	<0.06	<0.03	6.3	0.019	0.00033	2.66	0.22	<0.2	<0.5	<0.5
41	9-May-14								54.7	0.361			
	27-May-15								49.2	0.278			
	25-May-16								63.7	0.328			
	1-Nov-16	195	212	<0.5	<0.5	75.7	4.85	0.006	43.6	0.179	0.90	25	71
	4-May-17	87.0	86.5	<0.25	<0.25	35.0	1.70	0.004	60.5	0.436	1.2	19	21
	10-May-18	75.0	84.3	<0.5	<0.5	30.4	1.71	0.011	55.7	0.484	<6.80	<8.00	<4.00
	16-May-19	72.8	89.5	<0.20	<0.10	27.4	1.94	<0.0050	59.4	0.486	<0.50	17.5	14.5
	12-May-20	99.2	92.8	<0.10	<0.050	31.9	1.63	<0.0050	59.3	0.448	<0.50	15.4	12.1
	12-May-21	99.1	95.8	<0.06	<0.03	146	1.90	0.00306	60.6	0.391	0.5	18.8	17.9
	17-May-22	89.9	98.9	<0.06	<0.03	28.4	1.75	0.00247	59.4	0.392	0.4	15.5	15.9
	15-May-23	76.1	70.6	<0.06	<0.3	41.0	1.28	0.0029	55.9	0.483	2.0	12.2	13.3

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
43	25-May-16	8.03	225	11.7	8.11	348	125	2.57	16.2	175	23.4	16.2	1.67	23.1
	4-May-17	8.41	338	9.40	7.53	365	127	1.35	10.6	174	23.6	16.5	1.73	22.0
	11-May-18	8.38	285	9.90	7.71	331	122	2.53	12.4	184	22.5	16.1	1.78	23.9
	17-May-19	8.03	287	10.75	8.25	321	130	5.61	17.4	183	26.0	15.8	1.12	29.4
	12-May-20	8.59	356	10.36	8.13	421	117	14.6	25.2	202	23.9	13.9	1.29	49.0
	12-May-21	7.93	210	11.5	8.24	394	110	16	59	172	23.5	12.5	1.2	49.4
	17-May-22	8.20	177	13.0	8.18	418	144	24	34	187	31.9	15.5	1.27	63.5
	15-May-23	8.15	192	12.8	8.19	456	108	8	35	334	24.2	11.5	1.26	49.1
44	24-May-16	7.40	617	11.3	8.11	800	362	13.9	46.0	269	87.4	34.8	1.35	6.58
	5-May-17	7.81	788	9.00	8.22	840	385	12.3	45.8	262	96.0	35.3	1.37	6.21
	11-May-18	7.66	713	9.12	7.93	738	384	12.5	41.6	286	96.9	34.4	1.32	6.23
	17-May-19	7.78	626	10.63	7.62	708	395	13.8	42.0	274	98.7	35.9	1.26	6.35
	12-May-20	7.83	661	9.24	7.58	762	384	13.6	37.7	302	98.4	33.6	1.27	6.29
	12-May-21	7.89	750	10.3	7.98	667	342	16	61	229	86.8	30.5	1.39	7.22
	17-May-22	7.77	736	11.1	7.99	735	434	20	50	280	112	37.4	1.28	7.60
	15-May-23	7.35	617	11.6	7.98	701	357	17	43	289	94.1	29.7	1.15	5.98
45	28-Aug-19	8.20	310	13.89	8.24	385	146	3.23	36.1	171	34.0	14.8	2.27	32.5
	12-May-20	8.50	290	9.13	7.90	334	143	1.14	19.4	157	33.3	14.6	1.62	28.2
	11-May-21	8.15	350	8.8	8.24	328	184	<1	25	153	50.1	14.3	1.05	24.6
	16-May-22	8.10	338	10.9	8.23	324	222	3	32	162	41.6	17.1	0.963	28.0
	15-May-23	7.59	272	15.4	8.32	334	149	<1	21	162	39.8	12.2	0.784	19.9
46	28-Aug-19	8.01	208	12.95	7.99	471	245	4.55	24.9	236	62.2	21.9	2.01	15.9
	12-May-20	8.25	330	9.43	7.88	430	247	2.97	14.8	222	63.4	21.4	1.10	4.35
	11-May-21	8.18	385	10.4	8.20	391	262	2	33	198	71.4	20.3	1.02	2.36
	16-May-22	8.04	451	13.0	8.24	431	276	1	37	230	106	22.3	1.04	2.18
	15-May-23	8.09	376	13.1	8.22	430	233	<1	25	245	63	18.4	1.02	1.92

Note: refer to notation page for groundwater notation details

Table D-1: Groundwater Chemical Results - Shallow Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
43	25-May-16								0.039	0.010			
	4-May-17	0.06	0.36	<0.05	<0.05	2.2	0.153	<0.003	<0.010	0.009	<0.17	<0.20	<0.10
	11-May-18	0.14	0.20	<0.05	<0.05	2.0	0.14	<0.003	0.027	0.010	<0.68	<0.80	<0.40
	17-May-19	0.085	2.37 *	0.088	0.030	2.42	0.133	<0.00050	0.034	0.00864	<0.50	<0.50	<0.50
	12-May-20	0.063	0.20	0.151	0.022	2.51	0.166	<0.00050	0.145	0.01230	<0.50	<0.50	<0.50
	12-May-21	0.1	0.6	0.20	0.08	1.6	0.162	0.00012	0.01	<0.002	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	0.11	<0.03	1.7	0.145	0.00015	<0.007	0.00340	<0.2	<0.5	<0.5
	15-May-23	0.3	<0.5	<0.06	0.09	2.9	0.128	0.00009	0.018	0.0122	<0.2	<0.5	<0.5
44	24-May-16								<0.010	0.003			
	5-May-17	0.07	<0.10	27.4	<0.25	1.9	0.04	<0.003	<0.010	<0.002	<0.17	<0.20	<0.10
	11-May-18	<0.02	<0.10	27.4	<0.25	0.8	0.03	0.003	<0.010	<0.002	<0.17	<0.20	<0.10
	17-May-19	<0.010	0.46	24.1	<0.010	3.12	0.023	0.00078	0.010	0.00086	<0.50	<0.50	<0.50
	12-May-20	0.016	<0.15	20.7	<0.010	2.17	0.022	0.00092	0.034	0.00124	<0.50	<0.50	<0.50
	12-May-21	<0.1	<0.5	15.4	<0.03	1.2	0.032	0.00040	0.01	<0.002	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	19.1	<0.03	1.0	0.022	0.00078	0.007	0.00081	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	19.3	<0.03	1.3	0.020	0.00062	<0.007	0.00052	<0.2	<0.5	<0.5
45	28-Aug-19	0.137	18.4	<0.020	<0.010	2.48	0.127	<0.00050	0.020	0.0378	<0.50	<0.50	<0.50
	12-May-20	0.131	0.22	<0.020	0.048	4.30	0.133	<0.00050	0.050	0.0293	<0.50	<0.50	<0.50
	11-May-21	<0.1	<0.5	0.11	<0.03	1.8	0.118	0.00015	0.049	0.0193	<0.2	<0.5	<0.5
	16-May-22	0.1	<0.5	0.17	<0.03	1.2	0.133	0.00039	0.336	0.0375	<0.2	<0.5	<0.5
	15-May-23	0.2	<0.5	0.07	0.04	2.4	0.100	0.00012	0.028	0.0175	<0.2	<0.5	<0.5
46	28-Aug-19	0.072	9.3	<0.020	<0.010	5.62	0.016	<0.00050	0.509	0.0199	<0.50	<0.50	<0.50
	12-May-20	0.052	0.56	<0.020	<0.010	2.59	0.013	<0.00050	0.667	0.0181	<0.50	<0.50	<0.50
	11-May-21	<0.1	<0.5	<0.06	<0.03	3.1	0.015	0.00014	0.562	0.0177	<0.4	<1	<1
	16-May-22	<0.1	0.6	0.14	<0.03	2.1	0.020	0.0002	0.386	0.0156	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	<0.06	<0.03	6.9	0.010	0.00015	0.154	0.0146	<0.2	<0.5	<0.5

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
21	27-Oct-81				7.7	510		10.0						
	29-Oct-81				8.0	510		8.0						
	28-Jan-82				7.9	490	304	5.0		240				
	29-Apr-82				7.1	445	340	8.0						
	2-Sep-82				7.7	550	283	9.5			76.0	22.6		
	30-Mar-83				7.5	450	276	8.0						
	14-Jun-83				7.4	490	280	7.0						
	14-Sep-83				7.3	480	278	9.0						
	8-Dec-83				7.4	480	440	11.0						
	30-Apr-84				7.3	570	298	9.0						
	5-Nov-84				7.1	550	296	8.0		231	79.0	24.0		
	29-Apr-85				7.87	575	267	10.0		246	70.0	22.4		
	21-Oct-85				7.94	555	271	10.0		261	71.0	22.8		
	30-Apr-86				7.72	460	284	14.0		261	77.0	22.2		
	14-Oct-86				7.66	580	286	13.5		255	76.5	23.0		
	20-Apr-87				7.76	540	260	12.5			67.0	22.4		
	6-Oct-87				7.72	495	259	9.4		223	69.3	20.8		
	10-May-88				7.70	510	265	10.5		190	71.2	21.2		
	12-Oct-88				7.60	510	263	14.0		242	69.0	22.0		
	30-Oct-89				7.71	555	276	14.7		260	73.2	22.5		
	7-May-90				7.93	534	279	13.8		251	73.9	22.9		
	29-Oct-90				7.60	532	254	13.3		243	69.0	19.8		
	6-May-91				7.74	517	251	11.8		241	68.6	19.0		
	26-May-92				7.56	428	210	9.2		196	57.3	16.3		
	6-Oct-92				7.51	409	214	9.4		181	59.6	15.7		
	3-May-93				7.57	459	220	10.7		221	60.3	16.9		
	26-Oct-93				7.41	453	227	12.7		230	63.3	16.7		
	25-Apr-94				7.84	499	257	11.4		246	70.0	19.9		
	25-Oct-94				7.61	491	240	11.4		231	65.3	18.6		

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
21	27-Oct-81												
	29-Oct-81												
	28-Jan-82					2.1			<0.02				
	29-Apr-82					9.3							
	2-Sep-82					3.2							
	30-Mar-83					1.3							
	14-Jun-83					1.3							
	14-Sep-83					1.1							
	8-Dec-83					1.8							
	30-Apr-84					0.9							
	5-Nov-84					1.2			0.04				
	29-Apr-85					1.6			1.06				
	21-Oct-85					3.6			<0.01				
	30-Apr-86					2.4			0.07				
	14-Oct-86					2.3			<0.01				
	20-Apr-87					2.6			0.12				
	6-Oct-87					2.4			0.01				
	10-May-88					1.6			0.02				
	12-Oct-88					2.7			<.05				
	30-Oct-89					1.5			0.02				
	7-May-90					1.1			0.02				
	29-Oct-90					6.0			0.45				
	6-May-91								0.02				
	26-May-92					2.0			<0.01				
	6-Oct-92					2.5			0.02				
	3-May-93					1.6			0.02				
	26-Oct-93					2.5			0.04				
	25-Apr-94					2.2			0.01				
	25-Oct-94					1.9			0.33				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
21	16-May-95				7.64	502	257	11.1		257	69.9	19.9		
cont'd	15-Jun-97				8.10	555	316	13.5		253	85.2	25.0	1.20	
	15-Jun-98				7.58	441	250	10.0		200	69.7	18.5	2.31	
	15-Jun-99				7.84	498	294	12.0		200	84.0	20.5	1.81	
	15-Jun-00				8.20	517	275	12.0		248	75.1	21.3	0.56	
	15-Jun-01				7.70	514	300	13.0		231	82.1	23.1	0.45	
	15-Jun-02				7.64	559	294	15.0		257	78.2	24.0	1.41	
	15-Jun-03				7.78	536	298	16.0		265	80.3	23.7	1.57	
	15-Jun-04				7.84	565	271	17.0		262	71.6	22.3	0.40	
	15-Jun-05				8.19	542	308	17.4		253	83.7	24.1	1.9	
	15-Jun-06				7.53	526	320	20.0		260	92.6	22.2	2.0	
	29-May-07				7.24	544	260	17.0		260	68.6	21.9	2.0	8.1
	5-Jun-08				7.90	594	290	29.0		270	77.8	23.6	2.0	10.2
	4-Jun-09				7.95	566	282	18.3		248	76.6	22.1	1.9	8.12
	14-May-10	7.72	580	10.9	7.96	579	347	28.6		270	95.5	26.4	1.59	10.0
	15-Jun-11	7.89	468	11.1	8.06	562	312	27.0		261	86.7	23.1	1.48	10.0
	23-May-12	7.31	485	11.0	7.85	592	304	25.9		265	84.2	22.8	1.55	10.2
	9-May-13	7.71	650	9.5	8.14	601	324	25.4		237	88.2	25.1	1.59	10.7
	9-May-14	7.71	650	9.5	8.11	606	303	24.7		252	81.5	24.1	1.66	10.7
21R	25-May-16	7.52	408	11.9	8.26	536	210	20.1	33.2	237	50.2	20.6	1.92	27.5
	1-Nov-16	8.07	637	10.2	8.14	547		22.8	24.9	240	60.0	20.5	1.60	19.1
	4-May-17	7.94	555	9.96	8.22	602	238	23.4	27.4	253	59.4	21.7	1.61	23.0
	10-May-18	7.61	504	11.10	7.83	541	236	22.1	24.1	269	59.4	21.2	1.70	25.1
	16-May-19	7.73	477	10.28	7.70	517	268	25.3	20.9	261	67.4	24.2	1.51	21.9
	11-May-20	7.85	513	9.00	7.78	556	260	26.3	15.0	262	66.5	22.8	1.59	17.4
	11-May-21	7.66	630	9.8	8.22	609	312	36	14	266	83.6	25.2	1.63	15.0
	17-May-22	7.88	609	10.1	8.06	593	353	40	8	279	91.2	30.5	1.57	15.4
	15-May-23	7.91	530	11.5	8.13	652	294	38	6	265	78.1	24.2	1.37	10.7

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
21	16-May-95					1.6			0.03				
cont'd	15-Jun-97								<0.02	0.250			
	15-Jun-98								<0.02	<0.02			
	15-Jun-99								0.04	0.090			
	15-Jun-00								<0.02	0.030			
	15-Jun-01								<0.02	<0.02			
	15-Jun-02								<0.02	<0.02			
	15-Jun-03								<0.02	<0.02			
	15-Jun-04								<0.02	<0.02			
	15-Jun-05								0.06	<0.02			
	15-Jun-06								<0.05	0.009			
	29-May-07								<0.05	0.003			
	5-Jun-08								<0.05	0.147			
	4-Jun-09								<0.050	0.004			
	14-May-10								0.852	0.135			
	15-Jun-11								0.601	0.110			
	23-May-12								0.280	0.093			
	9-May-13								0.591	0.122			
	9-May-14								0.532	0.200			
21R	25-May-16								0.645	0.024			
	1-Nov-16	0.15	0.38	<0.05	<0.05	1.4	0.046	<0.003	0.814	0.032	<0.17	<0.20	<0.10
	4-May-17	0.20	0.34	<0.05	<0.05	1.1	0.047	<0.003	0.752	0.035	<0.17	<0.20	<0.10
	10-May-18	0.09	0.34	<0.05	<0.05	1.4	0.049	<0.003	0.741	0.036			
	16-May-19	0.093	0.45	<0.020	<0.010	1.97	0.050	0.00054	0.933	0.0382			
	11-May-20	0.105	0.18	<0.020	<0.010	2.36	0.046	<0.00050	0.905	0.0302			
	11-May-21	0.1	<0.5	<0.06	<0.03	1.7	0.066	0.00008	1.08	0.0449			
	17-May-22	0.1	<0.5	<0.06	<0.03	1.6	0.052	0.00016	1.28	0.0416			
	15-May-23	<0.1	<0.5	<0.06	<0.03	2.1	0.067	0.00013	1.19	0.0354			

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
24	19-Feb-82				8.1	430	215	15.0		180				
	29-Apr-82				7.8	345	212	2.0						
	30-Apr-82				8.1	377	182	1.6						
	4-May-82				8.1	372	177	1.5			36.0	21.0		
	2-Sep-82				7.3	372	179	0.5			37.5	20.8		
	30-Mar-83				7.7	340	196							
	13-Jun-83				7.7	860	200							
	13-Sep-83				7.7	350	188	1.0						
	7-Dec-83				7.7	330	235							
	1-May-84				7.7	390	188	1.0						
	6-Nov-84				7.4	385	172			188	39.0	18.0		
	30-Apr-85				7.27	920	404	65.5		348	118	26.4		
	21-Oct-85				8.02	382	182			218	40.0	19.8		
	30-Apr-86				7.75	304	167	2.0		204	37.5	17.8		
	15-Oct-86				7.40	350	188			206	44.0	19.0		
	20-Apr-87				7.61	383	177	1.0		206	38.5	19.6		
	6-Oct-87				7.69	371	185	1.4		202	40.1	20.6		
	10-May-88				7.46	348	152	4.3		141	34.6	15.9		
	12-Oct-88				7.40	340	137	4.0		174	30.0	15.0		
	30-Oct-89				7.47	366	143	3.5		197	31.7	15.5		
	7-May-90				7.64	369	149	3.3		198	34.2	15.3		
	29-Oct-90				7.45	366	143	3.0		196	32.4	15.0		
	6-May-91				7.53	357	146	1.3		195	32.5	15.6		
	4-Nov-91				7.95	390	176	1.1		197	37.3	20.0		
	26-May-92				7.67	394	189	0.5		214	41.0	20.9		
	6-Oct-92				7.79	391	202	0.9		199	44.7	21.9		
	3-May-93				7.75	379	171	1.6		216	37.8	18.6		
	26-Oct-93				7.96	383	181	2.2		226	41.6	18.8		
	25-Apr-94				7.65	342	147	2.4		190	34.3	14.9		

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
24	19-Feb-82					230			<0.05				
	29-Apr-82					14.0							
	30-Apr-82					14.3							
	4-May-82												
	2-Sep-82					8.9							
	30-Mar-83					8.8							
	13-Jun-83					3.3							
	13-Sep-83					4.1							
	7-Dec-83					3.2							
	1-May-84					5.4							
	6-Nov-84					2.6			<0.04				
	30-Apr-85					3.8			6.10				
	21-Oct-85					3.5			0.02				
	30-Apr-86					5.3			0.03				
	15-Oct-86					3.6			0.03				
	20-Apr-87					4.2			0.05				
	6-Oct-87					4.1			0.05				
	10-May-88					4.3			0.04				
	12-Oct-88					4.1			<.05				
	30-Oct-89					3.7			0.06				
	7-May-90					3.6			0.05				
	29-Oct-90					4.4			0.17				
	6-May-91								0.31				
	4-Nov-91					3.6			0.01				
	26-May-92					3.2			<0.01				
	6-Oct-92					3.6			0.07				
	3-May-93					3.6			0.03				
	26-Oct-93					3.8			0.45				
	25-Apr-94					4.6			0.26				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
24	25-Oct-94				7.98	401	186	1.2		219	40.3	20.6		
cont'd	16-May-95				7.97	390	192	1.2		214	42.9	20.6		
	15-Jun-97				8.09	369	187	2.1		202	42.4	19.8	1.20	13.4
	15-Jun-98				8.00	333	175	2.0		178	40.4	18.0	2.13	12.7
	15-Jun-99				8.16	382	203	1.0		199	46.9	20.8	0.99	11.3
	15-Jun-00				8.24	382	184	1.0		205	40.9	19.9	0.58	16.3
	15-Jun-01				7.96	373	221	1.0		201	51.2	22.5	0.48	15.0
	15-Jun-02				7.77	382	193	1.0		209	41.6	21.7	0.84	11.9
	15-Jun-03				7.89	383	203	1.0		213	44.9	22.0	0.78	12.8
	15-Jun-04				7.97	401	178	2.0		212	38.6	19.8	0.62	13.9
	15-Jun-05				8.36	384	207	1.7		211	45.7	22.5	1.1	13.0
	15-Jun-06				7.79	288	130	3.0		170	28.3	15.2	2.0	15.4
	29-May-07				7.60	375	230	2.0		200	57.8	20.5	2.0	11.2
	5-Jun-08				8.07	391	190	<2		200	44.8	20.0	2.0	12.6
	4-Jun-09				8.08	385	199	<2.0		207	46.2	20.3	1.8	11.0
	13-May-10	7.94	290	8.9	8.05	368	216	1.29		208	48.9	22.9	1.05	11.4
	15-Jun-11	8.03	315	10.6	8.16	364	195	1.39		204	43.9	20.7	1.00	10.9
	23-May-12	7.42	323	9.7	7.97	387	192	2.15		207	43.1	20.5	0.96	10.9
	23-May-12	7.42	323	9.7	8.05	390	194	2.1		207	43.5	20.7	1.0	10.9
	9-May-13	7.90	417	9.1	8.31	424	201	1.68		205	44.7	21.6	1.07	11.1
	9-May-14	7.73	422	9.2	8.23	396	192	1.78		197	42.1	21.0	1.03	10.9
	27-May-15	7.29	260	11.3	8.14	404	193	1.84	13.4	203	44.3	19.9	0.92	11.1
24R	25-May-16	7.77	401	12.3	7.68	500	184	10.8	41.2	220	35.3	23.2	2.59	32.4
	1-Nov-16	8.50	418	10.2	8.02	415	-	2.92	18.2	207	38.3	20.0	1.63	15.3
	4-May-17	8.10	417	8.67	8.31	460	186	2.64	14.2	209	38.8	21.7	1.87	12.4
	11-May-18	7.93	360	9.05	7.79	396	188	1.59	15.4	222	40.8	20.9	1.26	11.1
	16-May-19	7.52	335	9.68	7.97	366	205	1.58	14.1	215	46.5	21.7	1.07	11.2
	12-May-20	7.98	365	9.07	7.90	418	206	1.91	14.7	206	47.4	21.2	1.16	11.0

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
24	25-Oct-94					3.2			0.02				
cont'd	16-May-95					3.9			0.04				
	15-Jun-97								0.30	0.100			
	15-Jun-98								0.15	0.020			
	15-Jun-99								0.13	0.030			
	15-Jun-00								0.15	0.020			
	15-Jun-01								0.12	0.020			
	15-Jun-02								0.40	0.020			
	15-Jun-03								0.40	0.020			
	15-Jun-04								0.30	0.020			
	15-Jun-05								0.06	0.022			
	15-Jun-06								<0.05	0.033			
	29-May-07								0.27	0.077			
	5-Jun-08								<0.05	0.021			
	4-Jun-09								0.371	0.027			
	13-May-10								0.622	0.019			
	15-Jun-11								0.595	0.014			
	23-May-12								0.510	0.013			
	23-May-12								0.54	0.013			
	9-May-13								0.584	0.017			
	9-May-14								0.574	0.015			
	27-May-15								0.551	0.016			
24R	25-May-16								0.042	0.011			
	1-Nov-16	0.19	0.48	<0.05	<0.05	2.9	0.051	<0.003	0.17	0.012	<0.17	<0.20	<0.10
	4-May-17	0.42	0.59	<0.05	<0.05	3.3	0.046	<0.003	0.33	0.014	<0.17	<0.20	<0.10
	11-May-18	0.32	0.39	<0.05	<0.05	3.1	0.053	<0.003	0.368	0.014			
	16-May-19	0.333	0.75	0.031	<0.010	3.85	0.045	<0.00050	0.459	0.0148			
	12-May-20	0.013	0.25	0.296	<0.010	4.36	0.045	<0.00050	<0.010	<0.00050			

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
24R	11-May-21	7.77	432	8.8	8.29	410	238	2	12	208	59.5	21.8	1.18	11.5
cont'd	16-May-22	7.85	420	9.2	8.18	406	246	2	17	218	59.8	23.6	1.06	12.4
	15-May-23	8.25	356	9.9	8.25	461	199	<1	15	202	49.7	18.2	0.869	9.06
25	19-Feb-82				8.1	510	243	21.0		190				
	29-Apr-82				7.5	580	372	26.0						
	30-Apr-82				7.9	623	326	26.8						
	4-May-82				7.9	602	281	33.0			61.0	31.2		
	2-Sep-82				7.8	600	311	25.0			70.5	70.5		
	30-Mar-83				7.5	490	300	18.0						
	13-Jun-83				7.2	490	288	17.0						
	13-Sep-83				7.5	520	302	21.0						
	13-Dec-83				7.2	560	326	21.0						
	1-May-84				7.4	600	310	20.0						
	6-Nov-84				7.1	590	297	18.0		230	71.0	29.0		
	30-Apr-85				7.74	540	265	19.5		238	59.5	28.2		
	21-Oct-85				7.91	520	252	17.5		240	57.5	26.2		
	30-Apr-86				7.15	399	227	15.0		227	50.5	24.4		
	15-Oct-86				7.40	465	231	13.0		226	53.0	24.0		
	20-Apr-87				7.63	438	211	10.5		214	46.5	23.0		
	6-Oct-87				7.84	433	239	7.6		216	54.0	25.3		
	10-May-88				7.59	434	226	8.3		180	51.7	23.4		
	12-Oct-88				7.60	430	199	10.0		207	45.0	21.0		
	30-Oct-89				7.66	432	205	6.0		218	48.2	20.4		
	7-May-90				8.02	445	211	5.3		231	49.7	21.0		
	29-Oct-90				7.56	377	171	6.9		188	40.9	16.6		
	6-May-91				7.50	389	186	5.9		200	43.7	18.6		
	4-Nov-91				7.48	343	155	6.5		154	35.3	16.2		
	26-May-92				7.40	356	174	6.2		182	40.5	17.7		
	6-Oct-92				7.70	443	230	4.9		221	55.8	22.0		
	3-May-93				7.79	430	206	4.8		233	51.0	19.0		

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
24R	11-May-21	0.4	<0.5	2.48	<0.03	3.7	0.043	<0.00008	0.567	0.0168			
cont'd	16-May-22	0.4	<0.5	<0.06	0.03	3.2	0.044	0.00025	0.512	0.0158			
	15-May-23	0.4	<0.5	<0.06	<0.03	3.6	0.037	0.00014	0.515	0.0162			
25	19-Feb-82					100			<0.05				
	29-Apr-82					2.7							
	30-Apr-82					1.5							
	4-May-82												
	2-Sep-82					4.0							
	30-Mar-83					0.6							
	13-Jun-83					1.3							
	13-Sep-83					1.3							
	13-Dec-83					1.1							
	1-May-84					0.6							
	6-Nov-84					0.7			0.11				
	30-Apr-85					1.7			0.58				
	21-Oct-85					3.5			0.27				
	30-Apr-86					2.2			0.20				
	15-Oct-86					1.6			0.05				
	20-Apr-87					2.4			0.01				
	6-Oct-87					1.9			0.01				
	10-May-88					1.4			0.09				
	12-Oct-88					1.5			<0.05				
	30-Oct-89					1.1			0.06				
	7-May-90					0.7			0.01				
	29-Oct-90					2.3			0.54				
	6-May-91								0.08				
	4-Nov-91					3.1			0.10				
	26-May-92					2.0			<0.01				
	6-Oct-92					1.3			0.03				
	3-May-93					1.3			0.01				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
25	26-Oct-93				7.77	414	194	4.5		234	49.0	17.3		
cont'd	25-Apr-94				7.44	283	133	4.4		143	32.4	12.5		
	25-Oct-94				8.00	433	211	3.6		228	53.2	18.9		
	16-May-95				7.37	286	138	4.0		150	34.5	12.6		
	15-Jun-97				8.18	402	208	3.1		188	52.6	18.5	2.0	11.1
	15-Jun-98				8.16	370	197	4.0		200	50.6	17.1	2.33	9.76
	15-Jun-99				7.65	270	147	4.0		138	40.7	11.0	2.05	6.13
	15-Jun-00				8.13	442	222	7.0		225	59.1	18.1	1.06	25.3
	15-Jun-01				7.47	514	294	10.0		256	83.4	20.8	0.95	20.0
	15-Jun-02				7.15	537	279	14.0		264	76.1	21.5	2.09	12.6
	15-Jun-03				7.38	785	355	63.0		335	96.7	27.6	6.27	35.5
	15-Jun-04				7.26	634	253	37.0		299	69.0	19.6	2.62	296
	15-Jun-05				7.95	949	393	91.4		363	110	32.9	1.1	62.0
	15-Jun-06				6.99	687	370	53.0		300	109	23.4	5.0	29.3
	29-May-07				6.93	1518	500	213		500	120	47.9	15.0	88.0
	5-Jun-08				7.49	1040	370	107		390	95.4	31.9	11.0	60.8
	4-Jun-09				7.40	835	341	59.3		345	92.4	26.9	7.4	42.2
	13-May-10	7.47	540	10.0	8.00	547	314	28.1		261	85.3	24.5	2.44	15.4
	15-Jun-11	7.49	500	11.9	8.02	541	278	27.3		252	75.5	21.8	2.15	14.6
	23-May-12	6.93	520	12.0	7.87	616	290	34.5		269	77.3	23.5	3.89	22.0
	9-May-13	7.21	732	9.3	8.22	702	325	38.0		286	88.4	25.4	2.68	20.1
	9-May-14	6.92	1890	11.5	8.14	789	327	72.1		276	83.0	29.1	2.47	37.8
	27-May-15	7.02	2208	14.1	7.60 *	3640 *	910 *	571 *	2.8 *	1210 *	183 *	110 *	35.5 *	353 *
25R	25-May-16	7.70	331	12.5	7.97	418	172	7.00	12.7	212	41.7	16.4	1.62	16.5
	1-Nov-16	8.40	398	12.8	7.70	392	-	5.37	8.48	195	39.9	15.9	1.65	15.5
	4-May-17	8.02	404	10.53	8.10	444	184	6.60	8.31	212	45.1	17.3	1.55	12.6
	10-May-18	7.75	359	11.98	7.89	415	188	8.86	8.46	224	46.9	17.3	1.38	12.1
	17-May-19	7.88	353	12.49	7.86	408	218	12.8	10.0	218	56.1	19.0	1.31	12.5
	12-May-20	8.17	357	10.33	7.93	405	160	8.69	4.20	219	35.9	17.1	1.64	27.2

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
25	26-Oct-93					2.3			0.43				
cont'd	25-Apr-94					2.6			0.01				
	25-Oct-94					1.1			0.01				
	16-May-95					2.5			0.02				
	15-Jun-97								0.02	0.100			
	15-Jun-98								0.14	0.090			
	15-Jun-99								0.07	0.060			
	15-Jun-00								0.28	0.130			
	15-Jun-01								0.30	0.160			
	15-Jun-02								0.15	0.100			
	15-Jun-03								0.20	0.360			
	15-Jun-04								0.02	0.190			
	15-Jun-05								<0.05	0.150			
	15-Jun-06								0.12	0.165			
	29-May-07								0.07	0.825			
	5-Jun-08								<0.05	0.244			
	4-Jun-09								<0.050	0.184			
	13-May-10								1.90	0.074			
	15-Jun-11								1.78	0.053			
	23-May-12								1.71	0.068			
	9-May-13								1.79	0.110			
	9-May-14								1.39	0.082			
	27-May-15								15.6 *	1.58 *			
25R	25-May-16								0.384	0.026			
	1-Nov-16	0.18	0.18	<0.05	<0.05	1.9	0.069	<0.003	0.394	0.025	<0.17	<0.20	<0.10
	4-May-17	0.19	0.35	<0.05	<0.05	1.9	0.061	<0.003	0.350	0.025	<0.17	<0.20	<0.10
	10-May-18	0.12	0.12	<0.05	<0.05	1.8	0.057	<0.003	0.474	0.026			
	17-May-19	0.147	0.32	<0.020	<0.010	2.25	0.047	<0.00050	0.563	0.0258			
	12-May-20	0.060	<0.15	<0.020	<0.010	5.42	0.068	<0.00050	0.182	0.00549			

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
25R	12-May-21	7.83	444	12.0	8.32	427	206	13	9	206	53.8	17.4	1.30	13.1
cont'd	17-May-22	7..80	437	12.8	8.04	415	232	15	7	213	60.1	20.0	1.41	19.3
	15-May-23	7.76	359	13.4	8.24	457	182	12	6	198	48.1	15.1	1.17	14.6
27	5-Apr-83				7.2	500	318	10.0		265	89.0	26.0		
	15-Jun-83				7.3	550	312	12.0		258	75.0	22.0		
	4-Aug-83				7.3	400		13.0						
	19-Aug-83				7.7	545		12.0						
	3-Sep-83													
	13-Sep-83				7.3	550	328	12.0						
	7-Dec-83				7.3	510	344	13.0						
	30-Apr-84				7.3	630	342	13.0						
	5-Nov-84				7.1	630	335	12.0		257	93.0	25.0		
	29-Apr-85				7.56	650	333	14.5		272	91.5	25.2		
	21-Oct-85				7.76	620	338	14.5		266	92.0	26.2		
	30-Apr-86				7.53	484	323	15.5		272	89.0	24.4		
	15-Oct-86				7.00	620	329	12.0		278	92.0	24.0		
	20-Apr-87				7.43	635	318	15.5		275	87.0	24.4		
	6-Oct-87				7.65	615	357	15.5		283	98.3	27.0		
	10-May-88				7.52	645	358	19.1		236	99.7	26.5		
	12-Oct-88				7.60	610	326	20.0		272	91.0	24.0		
	30-Oct-89				7.62	646	335	19.7		288	92.8	25.0		
	7-May-90				7.84	631	324	19.1		285	88.7	24.7		
	29-Oct-90				7.85	643	327	19.4		286	91.1	24.1		
	6-May-91				7.66	624	330	17.9		281	91.6	24.5		
	4-Nov-91				7.75	644	298	19.5		274	77.6	25.3		
	26-May-92				7.58	642	330	17.8		268	88.7	26.3		
	6-Oct-92				7.70	645	348	19.9		273	94.1	27.3		
	3-May-93				7.54	632	311	17.9		297	83.4	24.8		
	26-Oct-93				7.71		299	20.2		309	80.0	24.1		
	25-Apr-94				7.85	644	339	18.2		304	92.9	25.8		

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
25R	12-May-21	0.2	<0.5	0.22	<0.03	2.3	0.057	0.00013	0.70	0.026			
cont'd	17-May-22	0.1	<0.5	<0.06	<0.03	2.2	0.061	0.00024	0.875	0.0246			
	15-May-23	<0.1	<0.5	<0.06	<0.03	2.5	0.042	0.00015	0.796	0.0278			
27	5-Apr-83					0.3			0.64				
	15-Jun-83					0.8			0.73				
	4-Aug-83												
	19-Aug-83												
	3-Sep-83												
	13-Sep-83					0.5							
	7-Dec-83					1.0							
	30-Apr-84					0.7							
	5-Nov-84					0.4			<0.04				
	29-Apr-85					0.8			0.76				
	21-Oct-85					1.2			0.62				
	30-Apr-86					1.9			0.62				
	15-Oct-86					1.3			0.83				
	20-Apr-87					2.0			0.68				
	6-Oct-87					1.5			0.61				
	10-May-88					1.1			0.71				
	12-Oct-88					0.5			0.57				
	30-Oct-89					0.9			0.63				
	7-May-90					0.6			0.65				
	29-Oct-90					1.1			0.79				
	6-May-91								0.72				
	4-Nov-91					1.5			0.59				
	26-May-92					1.4			0.43				
	6-Oct-92					1.2			0.53				
	3-May-93					0.8			0.65				
	26-Oct-93					2.4			0.71				
	25-Apr-94					1.8			0.80				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
27	25-Oct-94				7.71	644	335	18.3		271	92.4	25.2		
cont'd	16-May-95				7.57	628	318	17.2		273	85.5	25.2		
	24-Oct-12	7.35	568	9.5	8.14	620	341	37.2		285	93.7	26.1	1.27	14.4
	9-May-13	7.45	907	9.6	8.31	843	384	58.3		307	104	30.3	1.45	29.3
	9-May-14	7.63	659	9.5	8.08	778	360	49.5		301	96.7	28.7	1.40	24.0
	9-May-14	-	-	-	8.15	773	355	48.6		289	95.0	28.7	1.41	24.2
	27-May-15	7.72	410	12.5	7.97	684	308	35.2	40.8	272	83.1	24.3	1.31	12.5
	24-May-16	7.81	630	12.5	8.08	756	362	51.3	42.1	306	99.9	27.4	5.32	22.5
	1-Nov-16	8.22	736	13.1	7.87	677		38.9	38.1	278	89.1	22.7	1.23	12.1
	4-May-17	7.51	767	9.42	7.93	905	359	62.7	35.9	331	96.1	29.0	1.51	33.6
	11-May-18	7.34	698	11.35	7.79	761	350	55.0	31.8	340	95.8	26.8	1.40	28.6
	16-May-19	7.58	565	10.87	7.55	625	352	39.4	32.3	289	96.6	27.0	1.37	14.7
	11-May-20	7.97	676	8.98	7.67	659	329	38.3	29.5	293	93.4	23.2	1.35	13.9
	12-May-21	7.55	700	11.0	8.07	686	361	41	34	284	104	24.4	1.42	15.1
	17-May-22	7.55	713	9.8	8.05	688	395	41	36	305	110	29.1	1.50	18.7
	15-May-23	7.33	599	12.8	8.08	745	320	38	31	310	91.3	22.4	1.28	14.2
37	5-Apr-83				7.8	480	304	10.0		247	81.0	26.0		
	15-Jun-83				7.3	545	292	12.0		260	71.0	24.0		
	4-Aug-83				7.3	410		12.0						
	15-Aug-83													
	19-Aug-83				7.6	530		13.0						
	3-Sep-83													
	14-Sep-83				7.3	540	326	13.0						
	8-Dec-83				7.3	525	335	15.0						
	30-Apr-84				7.3	610	332	13.0						
	5-Nov-84				7.2	630	329	11.0		254	89.0	26.0		
	29-Apr-85				7.70	655	303	14.0		271	78.0	26.2		
	21-Oct-85				7.80	630	324	14.0		290	85.5	26.8		
	30-Apr-86				7.89	394	252	17.0		247	63.0	23.0		
	15-Oct-86				7.10	610	319	13.0		276	85.0	26.0		

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	**Date**	**Ammonia**	**TKN**	**Nitrate**	**Nitrite**	**DOC**	**Boron**	**Chromium**	**Iron**	**Manganese**	**Vinyl Chloride**	**Benzene**	**1,4 Dichlorobenzene**
	Units										**µg/L**	**µg/L**	**µg/L**
	ODWQS	**nc**	**nc**	**10.0 *MAC***	**1.0 *MAC***	**5 *AO***	**5.0 *IMAC***	**0.05 *MAC***	**0.3 *AO***	**0.05 *AO***	**1 *MAC***	**1 *MAC***	**5 *MAC* 1 *AO***
27	25-Oct-94					1.0			0.75				
cont'd	16-May-95					1.2			0.81				
	24-Oct-12								0.87	0.057			
	9-May-13								1.09	0.063			
	9-May-14								1.01	0.063			
	9-May-14								1.03	0.064			
	27-May-15								0.78	0.063			
	24-May-16								0.925	0.054			
	1-Nov-16	<0.02	<0.10	<0.25	<0.25	1.0	0.099	<0.003	0.718	0.050	<0.17	<0.20	<0.10
	4-May-17	0.10	0.26	<0.05	<0.05	2.4	0.225	<0.003	1.01	0.058	<0.17	<0.20	<0.10
	11-May-18	0.04	0.10	<0.25	<0.25	1.9	0.266	0.005	1.01	0.065	<0.17	<0.20	<0.10
	16-May-19	0.034	0.63	<0.020	<0.010	1.74	0.087	<0.00050	0.920	0.0586	<0.50	<0.50	<0.50
	11-May-20	0.044	<0.15	<0.020	<0.010	2.99	0.083	<0.00050	0.833	0.0564	<0.50	<0.50	<0.50
	12-May-21	<0.1	<0.5	<0.06	<0.03	1.2	0.084	0.00012	0.92	0.062	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	<0.06	<0.03	1.4	0.084	0.0001	1.00	0.0639	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	<0.06	<0.03	1.3	0.069	0.00013	0.926	0.0673	<0.2	<0.5	<0.5
37	5-Apr-83					10.6			0.10				
	15-Jun-83					1.9			0.21				
	4-Aug-83												
	15-Aug-83												
	19-Aug-83												
	3-Sep-83												
	14-Sep-83					0.6							
	8-Dec-83					1.2							
	30-Apr-84					0.6							
	5-Nov-84					0.5			<0.04				
	29-Apr-85					1.0			0.68				
	21-Oct-85					4.9			0.11				
	30-Apr-86					3.6			0.13				
	15-Oct-86					1.3			0.24				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
37	16-Oct-86													
cont'd	20-Apr-87				7.50	640	325	17.0		273	85.5	27.0		
	10-May-88				7.65	640	346	16.7		271	92.3	28.0		
	12-Oct-88				7.80	560	298	18.0		254	78.0	25.0		
	30-Oct-89				7.74	617	316	17.6		277	84.4	25.6		
	7-May-90				7.85	615	325	17.5		271	87.8	25.6		
	29-Oct-90				7.75	611	298	16.9		276	80.1	23.7		
	6-May-91				7.80	552	280	15.3		268	62.9	25.9		
	26-May-92				7.74	613	318	16.3		261	81.9	27.4		
	6-Oct-92				7.78	619	318	21.3		264	80.2	28.5		
	3-May-93				7.56	615	315	16.9		283	83.3	25.8		
	26-Oct-93				7.68	616	291	19.7		283	68.6	28.9		
	25-Apr-94				7.99	597	320	14.7		285	85.3	26.0		
	25-Oct-94				7.79	631	326	13.8		273	86.2	26.7		
	16-May-95				7.77	599	295	14.9		235	75.4	25.8		
	15-Jun-97				7.96	586	328	12.0		263	85.4	27.8	1.0	7.5
	15-Jun-98				8.02	542	306	12.0		260	80.9	25.3	1.24	7.09
	15-Jun-99				7.72	546	320	14.0		264	84.6	26.4	1.58	7.46
	15-Jun-00				8.14	535	281	10.0		280	74.1	23.2	0.32	8.48
	15-Jun-01				7.84	567	330	11.0		254	88.8	26.2	<0.02	13.8
	15-Jun-02				7.64	560	300	11.0		260	77.9	25.5	0.92	7.42
	15-Jun-03				7.79	533	303	11.0		268	80.3	25.0	0.87	7.56
	15-Jun-04				7.84	557	283	12.0		266	73.2	24.3	0.80	10.2
	15-Jun-05				8.24	523	317	12.1		278	83.5	26.3	1.2	9.2
	15-Jun-06				7.70	520	310	12.0		260	85.1	22.9	1.0	7.5
	29-May-07				7.48	553	270	13.0		270	68.8	23.0	1.0	7.9
	5-Jun-08				7.98	574	290	15.0		270	77.3	23.9	1.0	10.2
	4-Jun-09				8.03	589	327	15.9		265	88.3	25.9	1.5	8.9
	14-May-10	7.76	550	11.2	8.00	544	335	18.7		272	89.7	27.0	1.26	9.27

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
37	16-Oct-86								0.24				
cont'd	20-Apr-87					2.6			0.26				
	10-May-88					2.4			0.15				
	12-Oct-88					1.8			0.34				
	30-Oct-89					0.8			0.37				
	7-May-90					0.5			0.57				
	29-Oct-90					1.4			0.46				
	6-May-91								0.43				
	26-May-92					1.5			0.16				
	6-Oct-92					1.1			0.65				
	3-May-93					0.8			0.13				
	26-Oct-93					1.0			0.42				
	25-Apr-94					1.6			0.12				
	25-Oct-94					1.6			0.27				
	16-May-95					1.3			0.19				
	15-Jun-97								0.25	0.030			
	15-Jun-98								0.30	0.040			
	15-Jun-99								0.02	0.040			
	15-Jun-00								0.32	0.040			
	15-Jun-01								0.18	0.040			
	15-Jun-02								0.48	0.040			
	15-Jun-03								0.40	0.040			
	15-Jun-04								0.62	0.030			
	15-Jun-05								0.20	0.036			
	15-Jun-06								0.33	0.037			
	29-May-07								0.52	0.045			
	5-Jun-08								<0.05	0.045			
	4-Jun-09								0.427	0.049			
	14-May-10								0.571	0.039			

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
37	15-Jun-11	7.89	468	11.3	8.10	538	295	20.6		264	78.7	23.8	1.22	9.25
cont'd	23-May-12	7.49	477	11.5	8.08	575	294	20.4		264	78.5	23.8	1.20	9.34
	9-May-13	7.80	674	9.8	8.32	640	323	21.7		257	85.9	26.4	1.28	10.2
	9-May-14	7.61	658	10.0	8.14	612	310	22.8		250	81.8	25.7	1.22	9.92
	27-May-15	7.85	402	13.4	8.04	617	278	25.1	39.2	253	72.3	23.7	1.22	10.5
37R	24-May-16	7.33	491	11.2	8.15	611	317	24.9	44.5	265	83.9	26.0	1.54	11.3
	5-May-17	7.83	623	9.40	8.19	615	304	29.2	42.6	217	80.5	24.9	1.30	10.8
	11-May-18	7.68	556	10.25	7.94	605	306	28.4	39.3	280	81.3	24.9	1.31	11.1
	17-May-19	7.63	509	10.90	7.74	576	493	30.1	40.3	268	140*	34.6	1.75	11.4
	12-May-20	7.83	566	9.12	7.77	649	320	32.2	35.8	286	85.7	25.7	1.37	11.8
	12-May-21	7.78	690	10.1	8.05	596	316	35	41	238	87.1	24	1.29	12.0
	17-May-22	7.81	648	11.2	8.05	624	375	38	41	277	101	29.6	1.39	14.8
	15-May-23	7.41	546	11.6	7.90	689	307	34	36	267	85.2	22.9	1.23	12.0
38	5-Apr-83				7.5	500	314	12.0		266	83.0	27.0		
	15-Jun-83				7.3	540	284	12.0		270	59.0	24.0		
	4-Aug-83				7.6	290		15.0						
	15-Aug-83													
	19-Aug-83				7.7	540		13.0						
	3-Sep-83													
	14-Sep-83				7.3	530	318	11.0						
	19-Oct-83													
	8-Dec-83				7.5	520	330	15.0						
	30-Apr-84				7.4	590	314	13.0						
	5-Nov-84				7.3	600	318	12.0		250	86.0	25.0		
	29-Apr-85				7.70	630	302	14.5		263	78.5	25.6		
	21-Oct-85				7.87	600	306	14.0		280	80.5	25.4		
	30-Apr-86				7.62	493	315	15.5		267	83.5	25.8		
	15-Oct-86				7.30	355	173	8.0		164	48.0	13.0		
	16-Oct-86													
	20-Apr-87				7.45	377	180	9.5		175	47.5	14.8		

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
37	15-Jun-11								0.606	0.040			
cont'd	23-May-12								0.490	0.031			
	9-May-13								0.604	0.041			
	9-May-14								0.591	0.040			
	27-May-15								0.550	0.042			
37R	24-May-16								0.597	0.033			
	5-May-17	0.15	0.20	<0.25	<0.25	0.8	0.052	<0.003	0.660	0.039	<0.17	<0.20	<0.10
	11-May-18	0.05	<0.10	<0.05	<0.05	1.0	0.056	0.004	0.660	0.041	<0.17	<0.20	<0.10
	17-May-19	0.062	0.37	0.022	<0.010	2.26	0.048	0.0031	3.27	0.211	<0.50	<0.50	<0.50
	12-May-20	0.061	0.18	<0.020	<0.010	2.11	0.048	<0.00050	0.718	0.0427	<0.50	<0.50	<0.50
	12-May-21	<0.1	<0.5	<0.06	<0.03	<1.0	0.056	0.00009	0.72	0.041	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	<0.06	<0.03	1.1	0.047	<0.00008	0.816	0.0455	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	<0.06	<0.03	1.5	0.046	0.00011	0.738	0.0434	<0.2	<0.5	<0.5
38	5-Apr-83					0.8			0.27				
	15-Jun-83					1.5			0.19				
	4-Aug-83												
	15-Aug-83												
	19-Aug-83												
	3-Sep-83												
	14-Sep-83					0.5							
	19-Oct-83												
	8-Dec-83					1.1							
	30-Apr-84					0.7							
	5-Nov-84					0.3			<0.04				
	29-Apr-85					1.0			3.05				
	21-Oct-85					3.7			0.22				
	30-Apr-86					1.8			0.21				
	15-Oct-86					3.3			0.03				
	16-Oct-86								0.01				
	20-Apr-87					4.1			0.07				

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
38	10-May-88				7.53	430	227	10.9		158	61.3	17.9		
cont'd	12-Oct-88				7.60	410	203	14.0		200	55.0	16.0		
	30-Oct-89				7.77	525	257	14.5		254	65.4	22.7		
	7-May-90				7.81	528	271	14.4		256	68.8	24.1		
	29-Oct-90				7.83	527	252	14.5		251	64.5	22.1		
	6-May-91				7.88	515	254	13.5		256	64.4	22.6		
	26-May-92				7.70	507	241	6.9		242	66.6	21.7		
	6-Oct-92				7.80	506	259	8.1		229	68.5	21.3		
	3-May-93				7.66	491	242	6.5		248	64.2	19.8		
	26-Oct-93				7.75	482	240	7.3		252	59.4	22.1		
	25-Apr-94				8.00	480	249	5.5		245	66.3	20.1		
	25-Oct-94				7.91	486	243	5.7		235	64.1	20.0		
	16-May-95				7.84	465	239	5.0		232	63.6	19.5		
	15-Jun-97				8.06	453	232	3.5		215	60.8	19.5	1.0	10.4
	15-Jun-98				7.99	413	231	4.0		210	61.7	18.8	1.38	9.92
	15-Jun-99				8.03	414	262	4.0		196	74.9	18.3	1.05	10.5
	15-Jun-00				8.30	415	217	3.0		210	57.7	17.7	0.59	24.5
	15-Jun-01				7.92	426	237	3.0		208	64.0	18.7	0.44	17.2
	15-Jun-02				7.74	430	217	4.0		217	56.8	18.3	0.99	11.0
	15-Jun-03				7.90	433	221	5.0		228	59.0	17.9	0.57	12.0
	15-Jun-04				7.99	450	215	6.0		228	56.9	17.8	0.54	16.8
	15-Jun-05				8.31	455	234	7.0		232	62.8	18.7	1.1	13.0
	15-Jun-06				7.75	416	220	8.0		220	61.7	17.2	<1	10.8
	29-May-07				7.59	447	300	7.0		230	86.8	19.7	1.0	12.3
	5-Jun-08				8.01	471	240	9.0		220	65.3	18.8	2.0	15.1
	4-Jun-09				8.09	473	240	8.6		227	66.2	18.0	1.2	12.1
	13-May-10	7.94	390	9.4	8.00	445	258	11.1		224	69.7	20.5	1.13	12.3
	15-Jun-11	7.54	389	10.7	8.26	442	231	11.9		219	62.0	18.5	1.05	12.2
	15-Jun-11	7.54	389	10.7	8.13	429	228	11.1		218	61.4	18.2	1.1	11.8

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
38	10-May-88					3.0			0.02				
cont'd	12-Oct-88					2.2			<.05				
	30-Oct-89					1.1			0.15				
	7-May-90					1.5			0.04				
	29-Oct-90					1.6			0.02				
	6-May-91								<0.01				
	26-May-92					1.8			<0.01				
	6-Oct-92					1.5			0.60				
	3-May-93					0.7			0.02				
	26-Oct-93					2.5			0.41				
	25-Apr-94					2.1			<0.01				
	25-Oct-94					1.5			0.30				
	16-May-95					1.3			0.01				
	15-Jun-97								<0.02	0.050			
	15-Jun-98								<0.02	<0.02			
	15-Jun-99								0.03	0.060			
	15-Jun-00								<0.02	0.040			
	15-Jun-01								<0.02	0.050			
	15-Jun-02								<0.02	0.040			
	15-Jun-03								0.05	0.050			
	15-Jun-04								<0.02	0.050			
	15-Jun-05								0.07	0.056			
	15-Jun-06								0.08	0.076			
	29-May-07								<0.05	0.093			
	5-Jun-08								0.18	0.042			
	4-Jun-09								<0.050	0.051			
	13-May-10								0.499	0.042			
	15-Jun-11								0.529	0.041			
	15-Jun-11								0.55	0.042			

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
38	23-May-12	7.61	393	11.2	8.08	465	239	11.9		228	64.1	19.1	1.07	12.5
cont'd	9-May-13	7.88	541	9.8	8.32	500	248	12.7		212	65.7	20.5	1.14	12.8
	9-May-13	7.88	541	9.8	8.34	515	249	12.8		223	66.5	20.1	1.09	12.7
	9-May-14	7.89	525	10.3	8.09	493	237	13.3		216	62.9	19.5	1.04	12.4
	27-May-15	7.89	329	15.4	8.10	493	228	13.6	22.2	219	60.5	18.6	1.06	13.0
	24-May-16	7.62	405	11.1	8.15	497	245	16.2	25.6	230	64.8	20.1	1.13	13.9
	5-May-17	7.91	517	9.19	8.18	562	237	18.7	23.1	237	62.7	19.6	1.10	13.1
	11-May-18	7.80	481	9.00	7.91	514	242	20.8	23.0	260	64.7	19.6	1.08	13.6
	17-May-19	7.63	443	10.49	7.81	502	259	23.3	22.6	240	68.9	21.2	1.10	14.4
	12-May-20	8.00	474	9.72	7.80	551	264	23.0	21.1	234	70.4	21.3	1.15	14.9
	12-May-21	7.85	520	11.7	8.08	553	260	27	24	237	71.2	19.9	1.10	14.5
	17-May-22	7.51	573	11.3	7.98	542	310	31	27	252	83.1	24.8	1.20	18.4
	15-May-23	7.56	482	12.3	8.09	601	262	28	24	230	71.7	20.1	1.06	14.8
39	9-May-14	7.73	770	9.8	8.10	722	336	37.3		280	90.2	27.0	1.83	21.7
	27-May-15	7.41	463	12.0	8.01	716	294	37.8	45.1	281	76.3	25.2	1.73	21.8
	24-May-16	7.62	405	11.1	8.14	711	340	36.1	47.7	300	90.3	27.8	1.70	23.1
	1-Nov-16	7.94	711	9.8	8.06	703		39.8	44.7	289	86.8	23.5	1.55	20.0
	4-May-17	7.90	705	9.08	8.18	773	326	36.8	44.5	312	87.7	25.9	1.64	21.2
	10-May-18	7.45	635	9.95	7.93	680	324	33.9	41.9	315	88.5	25.0	1.65	21.0
	16-May-19	7.58	593	10.10	7.52	666	354	38.5	45.2	307	98.0	26.7	1.62	21.8
	11-May-20	7.71	643	7.78	7.67	703	331	37.2	44.2	303	93.1	24.0	1.61	20.3
	11-May-21	7.10	730	8.9	8.16	684	374	38	50	275	107	25.7	1.82	21.7
	16-May-22	7.29	704	9.9	8.08	710	379	44	55	300	105	28.3	1.62	23.7
	15-May-23	7.84	609	10.2	8.18	743	319	37	47	280	89.4	23.4	1.45	19.2

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
Well	Date	Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
38	23-May-12								0.450	0.038			
cont'd	9-May-13								0.555	0.049			
	9-May-13								0.530	0.044			
	9-May-14								0.579	0.043			
	27-May-15								0.439	0.042			
	24-May-16								0.456	0.039			
	5-May-17	0.13	0.22	<0.05	<0.05	1.3	0.048	<0.003	0.464	0.042	<0.17	<0.20	<0.10
	11-May-18	0.07	<0.10	<0.05	<0.05	1.2	0.048	<0.003	0.494	0.046	<0.17	<0.20	<0.10
	17-May-19	0.089	<0.15	<0.020	<0.010	2.10	0.043	<0.00050	0.554	0.0442	<0.50	<0.50	<0.50
	12-May-20	0.089	<0.15	<0.020	<0.010	2.37	0.044	<0.00050	0.592	0.0473	<0.50	<0.50	<0.50
	12-May-21	<0.1	<0.5	<0.06	<0.03	1.3	0.068	<0.00008	0.56	0.047	<0.2	<0.5	<0.5
	17-May-22	<0.1	<0.5	<0.06	<0.03	1.8	0.05	0.00010	0.634	0.0503	0.2	<0.5	<0.5
	15-May-23	0.1	<0.5	<0.06	<0.03	1.9	0.036	0.00011	0.494	0.0518	0.2	<0.5	<0.5
39	9-May-14								0.183	0.156			
	27-May-15								0.236	0.182			
	24-May-16								0.259	0.133			
	1-Nov-16	0.04	<0.10	<0.25	<0.25	1.2	0.025	<0.003	0.271	0.131	<0.17	<0.20	<0.10
	4-May-17	0.11	0.36	0.14	<0.05	1.2	0.026	<0.003	0.268	0.145	<0.17	<0.20	<0.10
	10-May-18	0.05	0.27	<0.25	<0.25	1.2	0.026	0.004	0.249	0.143	<0.17	<0.20	<0.10
	16-May-19	0.082	0.36	0.494	0.054	3.65	0.029	<0.00050	0.195	0.149	<0.50	<0.50	<0.50
	11-May-20	0.057	0.33	0.67	0.048	2.00	0.027	<0.00050	0.239	0.16	<0.50	<0.50	<0.50
	11-May-21	<0.1	<0.5	0.39	0.04	2.0	0.034	0.00008	0.316	0.165	<0.2	<0.5	<0.5
	16-May-22	<0.1	<0.5	0.26	0.04	1.2	0.034	0.00016	0.398	0.141	<0.2	<0.5	<0.5
	15-May-23	<0.1	<0.5	0.14	<0.03	1.7	0.025	0.00012	0.439	0.141	<0.2	<0.5	<0.5

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

		Field Parameters			General Parameters			Major and Minor Ions						
Well	Date	pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	ºC	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
42	24-May-16	7.73	770	9.8	8.20	394	177	2.12	5.50	217	31.3	24.0	1.45	21.3
	1-Nov-16	8.59	425	10.1	7.92	389		1.09	3.64	211	29.2	20.6	1.17	18.3
	4-May-17	8.38	387	8.91	8.21	422	163	0.60	5.69	217	28.2	22.6	1.19	18.8
	10-May-18	8.13	382	9.13	7.42	379	161	0.81	4.20	228	28.2	21.9	1.18	18.7
	16-May-19	8.06	314	10.25	8.06	347	281	0.51	1.61	220	64.6*	29.0	1.33	18.0
	11-May-20	8.37	361	8.00	8.02	379	173	0.57	1.45	269	34.4	21.1	1.06	18.0
	11-May-21	7.60	400	9.1	8.22	386	198	<1	2	213	42.3	22.5	1.21	19.2
	16-May-22	7.52	398	10.7	8.21	381	221	<1	2	221	45.8	26.0	1.16	21.8
	15-May-23	8.06	338	10.4	8.32	404	174	<1	<2	206	36.4	20.1	0.939	16.0

Note: refer to notation page for groundwater notation details

Table D-2: Groundwater Chemical Results - Deep Flow System

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										µg/L	µg/L	µg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* *1 AO*
42	24-May-16								0.038	0.011			
	1-Nov-16	0.34	0.32	<0.05	<0.05	1.2	0.051	<0.003	0.070	0.012	<0.17	<0.20	<0.10
	4-May-17	0.42	0.51	<0.05	<0.05	0.9	0.056	<0.003	0.059	0.010	<0.17	<0.20	<0.10
	10-May-18	0.29	0.29	<0.05	<0.05	1.2	0.063	<0.003	0.088	0.011	<0.17	<0.20	<0.10
	16-May-19	0.307	1.09	<0.020	<0.010	2.44	0.053	0.00218	1.77	0.106	<0.50	<0.50	<0.50
	11-May-20	0.301	0.49	0.031	<0.010	1.92	0.052	<0.00050	0.173	0.010	<0.50	<0.50	<0.50
	11-May-21	0.4	<0.5	<0.06	<0.03	1.5	0.048	0.00017	0.177	0.011	<0.2	<0.5	<0.5
	16-May-22	0.4	<0.5	<0.06	<0.03	1.1	0.052	<0.00008	0.180	0.0107	<0.2	<0.5	<0.5
	15-May-23	0.4	<0.5	<0.06	<0.03	1.4	0.048	0.00009	0.119	0.0112	<0.2	<0.5	<0.5

Note: refer to notation page for groundwater notation details

Table D-3: Groundwater Chemical Results - Private Wells

Well	Date	Field Parameters			General Parameters			Major and Minor Ions						
		pH	EC	T	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium
	Units	SU	µS/cm	°C	SU	µS/cm								
	ODWQS	6.5 - 8.5 *OG*	nc	15 *AO*	6.5 - 8.5 *OG*	nc	80-100 *OG*	250 *AO*	500 *AO*	30 - 500 *OG*	nc	nc	nc	200 *AO*
D2	27-Feb-79				8.33	515	220	15.0			53.5	21.0	1.1	24.0
(Roswell)	16-Jul-79				7.35		208	10.5		210	49.0	20.8	0.95	21.4
	24-Apr-80				7.82	790	356	39.5		288	97.0	27.6	1.85	31.8
	30-Sep-80				7.83	585	256	16.5		244	65.0	22.6	1.2	26.2
	17-Jun-81				7.84	615	284	26.0		243	75.0	23.4		28.5
	14-May-82				7.75	587	256	24.5		237	67.0	21.4	1.0	29.0
	13-Jul-82				7.60	525	226	15.0		224	57.5	20.0		
	15-Jun-97				8.04	636	294	27.9		279	77.7	24.4	1.80	36.1
	15-Jun-99				7.44	709	326	35.0		300	88.9	25.2	1.92	37.4
	15-Jun-00				8.36	770	336	47.0		320	95.3	23.8	3.11	42.7
	15-Jun-01				7.74	625	320	23.0		257	85.2	26.1	1.36	32.2
	15-Jun-02				7.90	398	200	1.0		216	42.9	22.5	1.05	12.4
	15-Jun-03				7.74	666	323	32.0		304	84.9	26.9	1.32	32.4
	15-Jun-04				7.81	854	347	37.0		364	101.0	23.0	1.92	51.5
	15-Jun-05				8.27	668	321	28.7		295	83.7	27.0	1.5	34.0
	15-Jun-06				7.30	749	360	42.0		330	101.0	26.3	2.0	35.7
	29-May-07				7.41	888	430	44.0		370	122.0	31.6	2.0	41.4
	5-Jun-08				7.87	853	360	39.0		340	99.2	27.4	2.0	37.2
	4-Jun-09				7.99	665	292	24.0		275	76.7	24.5	1.5	33.5
	14-May-10	7.75	610	20.1	8.09	541	280	20.5		242	72.4	24.1	1.36	25.9
	23-May-12	8.48	547	15.0	8.23	663	<10	24.8		274	0.07	<0.05	0.16	163
	15-May-13	7.64	-	18.6	8.02	653	<10	28.7		243	0.99	0.41	0.61	149
D2	27-May-15	7.64	421	17.1	8.17	641	306	29.1	42.0	259	82.3	24.3	1.24	11.0
(Pearce)	25-May-16	8.32	519	11.3	8.38	698	1.7	34.2	43.0	285	0.48	0.11	0.43	152
	9-May-17	8.25	750	8.90	8.17	756	4.4	31.8	38.5	286	1.05	0.42	1.01	150
	11-May-18	7.50	667	16.80	8.14	684	1.0	30.8	33.1	305	0.29	0.06	1.30	160
	17-May-19	8.14	549	14.70	8.17	641	<0.50	35.4	32.5	285	0.134	<0.050	0.17	159
	12-May-20	8.46	604	12.73	8.15	702	<0.50	34.4	30.0	279	0.089	<0.050	0.08	168
	12-May-21	8.38	730	15.9	8.19	689	2.2	37	35	278	0.50	0.236	0.824	160
	17-May-22	8.20	720	16.5	8.22	697	1.0	49	40	294	0.28	0.083	0.116	207
	15-May-23	8.12	610	15.8	8.21	753	1.7	48	33	274	0.47	0.123	0.478	146

Note: refer to notation page for groundwater notation details

Table D-3: Groundwater Chemical Results - Private Wells

Well	Date	Nutrients and Organic Indicators					Metals				Volatile Organic Compounds		
		Ammonia	TKN	Nitrate	Nitrite	DOC	Boron	Chromium	Iron	Manganese	Vinyl Chloride	Benzene	1,4 Dichlorobenzene
	Units										μg/L	μg/L	μg/L
	ODWQS	nc	nc	10.0 *MAC*	1.0 *MAC*	5 *AO*	5.0 *IMAC*	0.05 *MAC*	0.3 *AO*	0.05 *AO*	1 *MAC*	1 *MAC*	5 *MAC* 1 *AO*
D2	27-Feb-79								0.08				
(Roswell)	16-Jul-79								0.09				
	24-Apr-80								0.14	0.020			
	30-Sep-80								0.08	0.020			
	17-Jun-81								0.01	0.007			
	14-May-82								0.08				
	13-Jul-82								0.04				
	15-Jun-97								<0.02	<0.01			
	15-Jun-99								0.04	<0.02			
	15-Jun-00								0.09	<0.02			
	15-Jun-01								<0.02	<0.02			
	15-Jun-02								0.51	<0.02			
	15-Jun-03								0.02	<0.02			
	15-Jun-04								<0.02	<0.02			
	15-Jun-05								0.09	0.004			
	15-Jun-06								<0.05	0.002			
	29-May-07								<0.05	0.025			
	5-Jun-08								<0.05	0.002			
	4-Jun-09								<0.050	0.0036			
	14-May-10								<0.010	<0.002			
	23-May-12								<0.01	0.002			
	15-May-13								0.033	0.006			
D2	27-May-15								1.89	0.054			
(Pearce)	25-May-16								<0.010	<0.002			
	9-May-17	0.12	<0.05	<0.25	<0.25	1.7	0.051	<0.003	<0.010	<0.002	<0.17	<0.20	<0.10
	11-May-18	<0.02	<0.10	<0.25	<0.25	1.4	0.060	0.004	<0.010	0.005			
	17-May-19	<0.010	<0.15	<0.020	<0.010	2.19	0.053	<0.00050	<0.010	<0.00050			
	12-May-20	<0.010	0.25	<0.020	<0.010	3.54	0.052	<0.00050	0.017	<0.00050			
	12-May-21	<0.1	0.5	<0.06	<0.03	1.2	0.051	0.00033	0.09	<0.002			
	17-May-22	<0.1	<0.5	<0.06	<0.03	1.1	0.053	0.00012	0.025	0.00035			
	15-May-23	<0.1	<0.5	<0.06	<0.03	1.5	0.047	0.00015	0.021	0.00061			

Note: refer to notation page for groundwater notation details

FIGURE D-1
TIME-CONCENTRATION GRAPH - CHLORIDE
HOLBROOK LANDFILL - LEACHATE

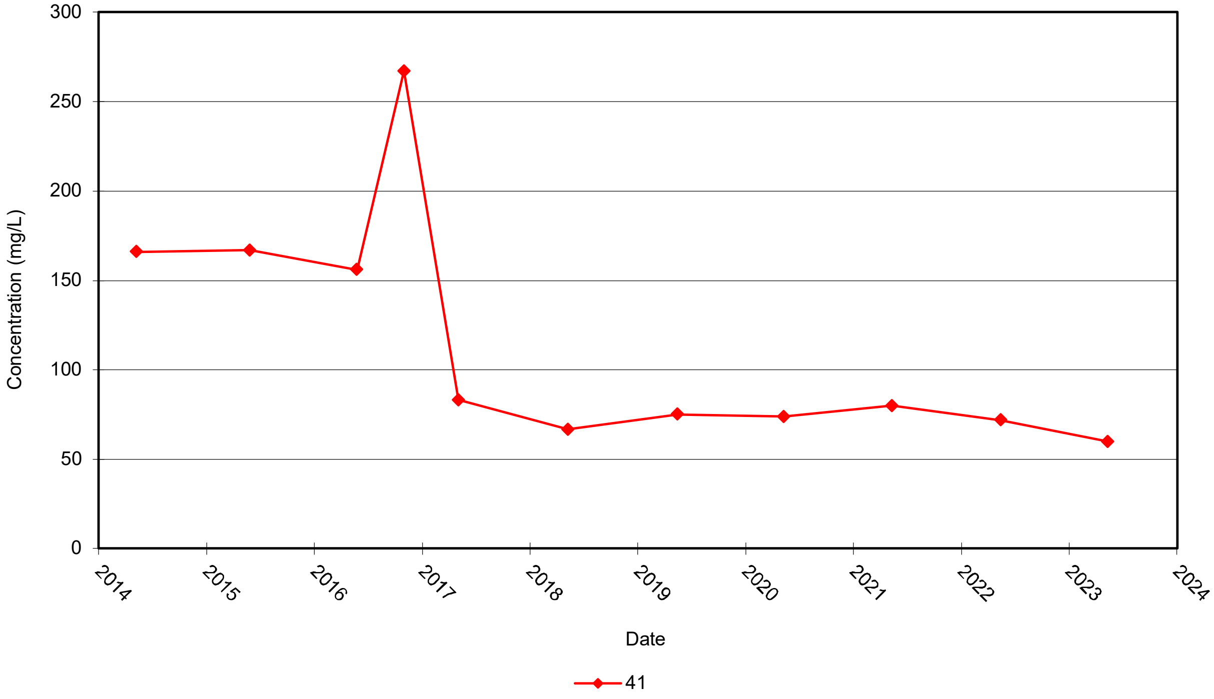


FIGURE D-2
TIME-CONCENTRATION GRAPH - ALKALINITY
HOLBROOK LANDFILL - LEACHATE

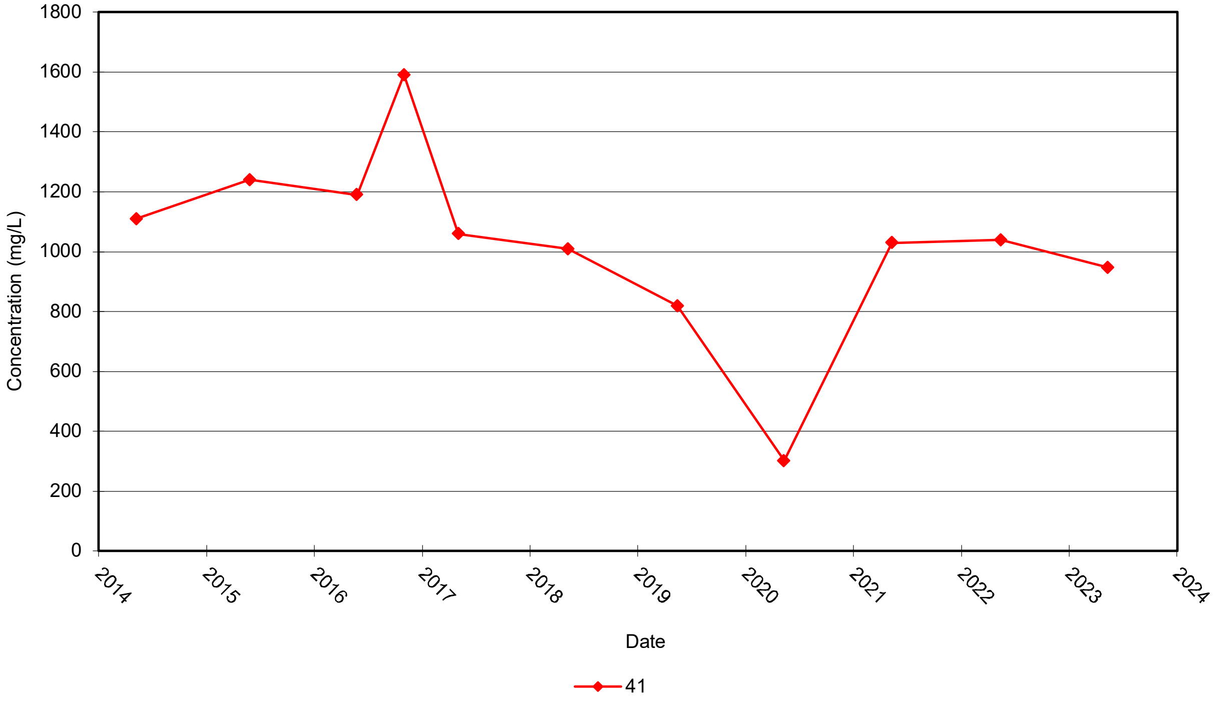


FIGURE D-3
TIME-CONCENTRATION GRAPH - POTASSIUM
HOLBROOK LANDFILL - LEACHATE

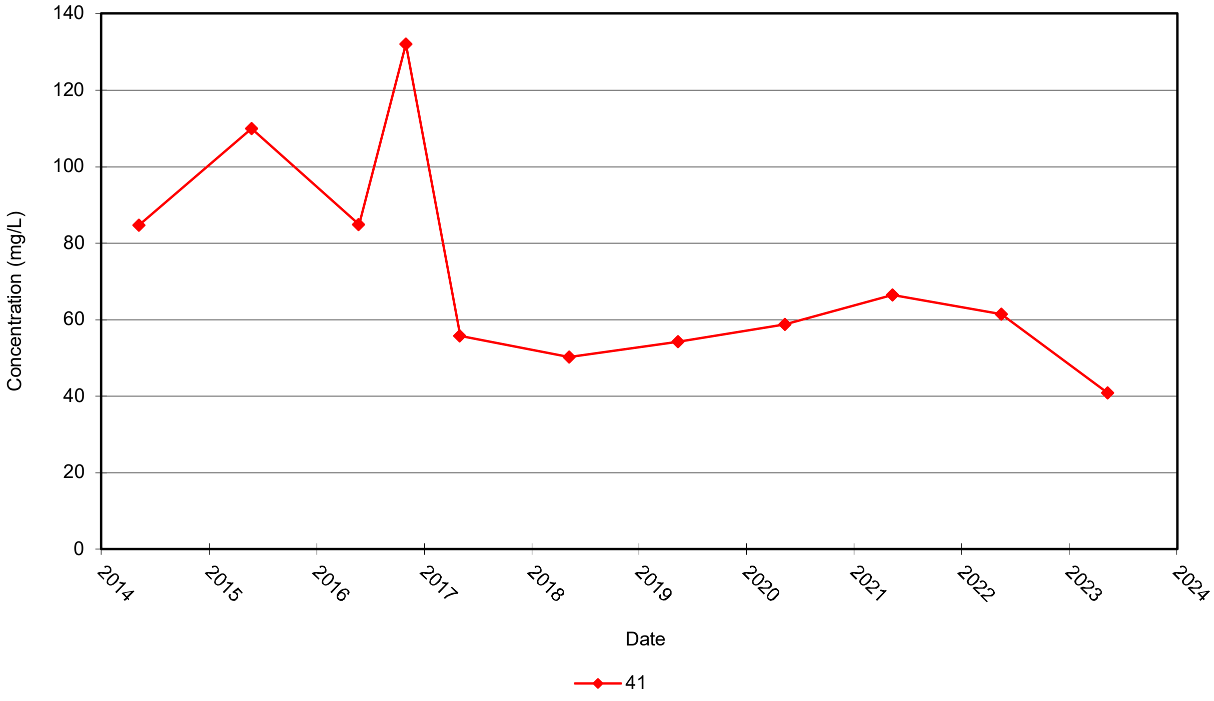


FIGURE D-4
TIME-CONCENTRATION GRAPH - BORON
HOLBROOK LANDFILL - LEACHATE

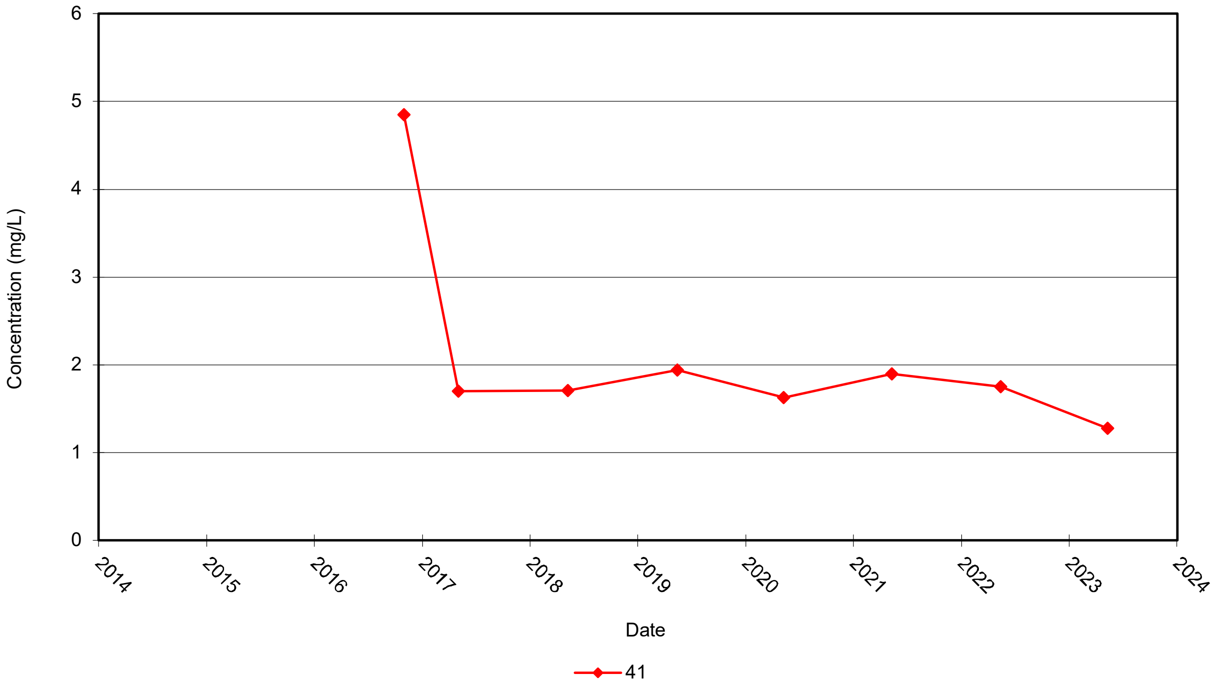


FIGURE D-5
TIME-CONCENTRATION GRAPH - IRON
HOLBROOK LANDFILL - LEACHATE

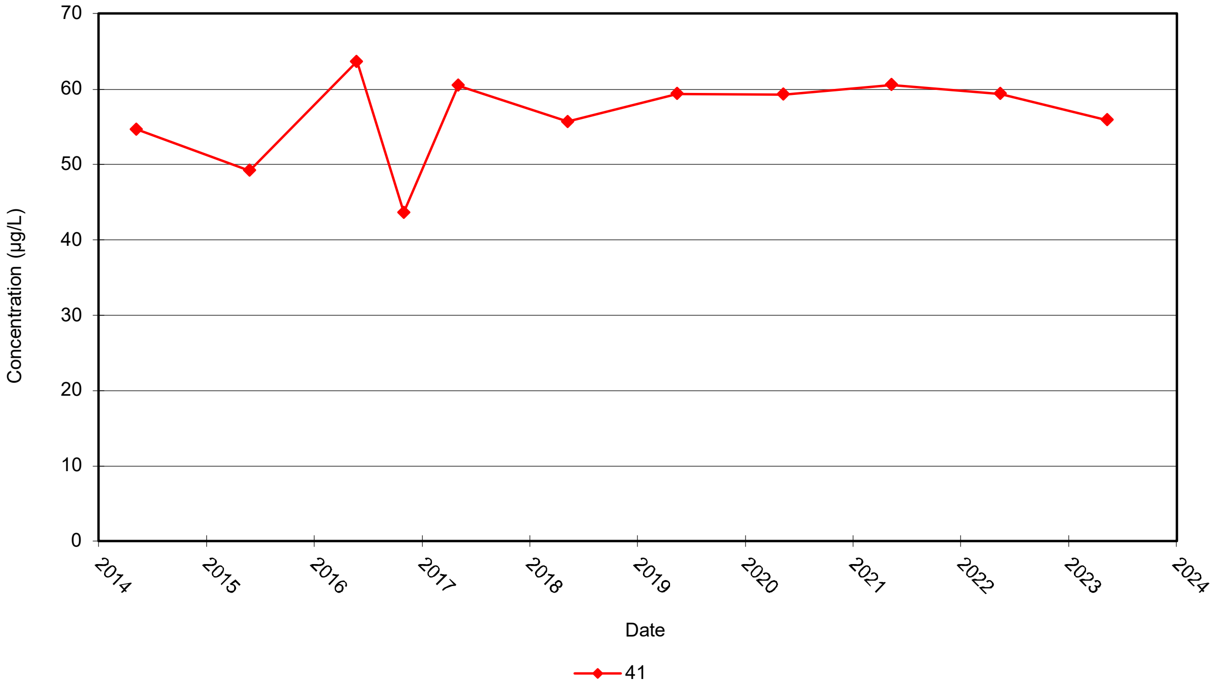


FIGURE D-6
TIME-CONCENTRATION GRAPH - AMMONIA
HOLBROOK LANDFILL - LEACHATE

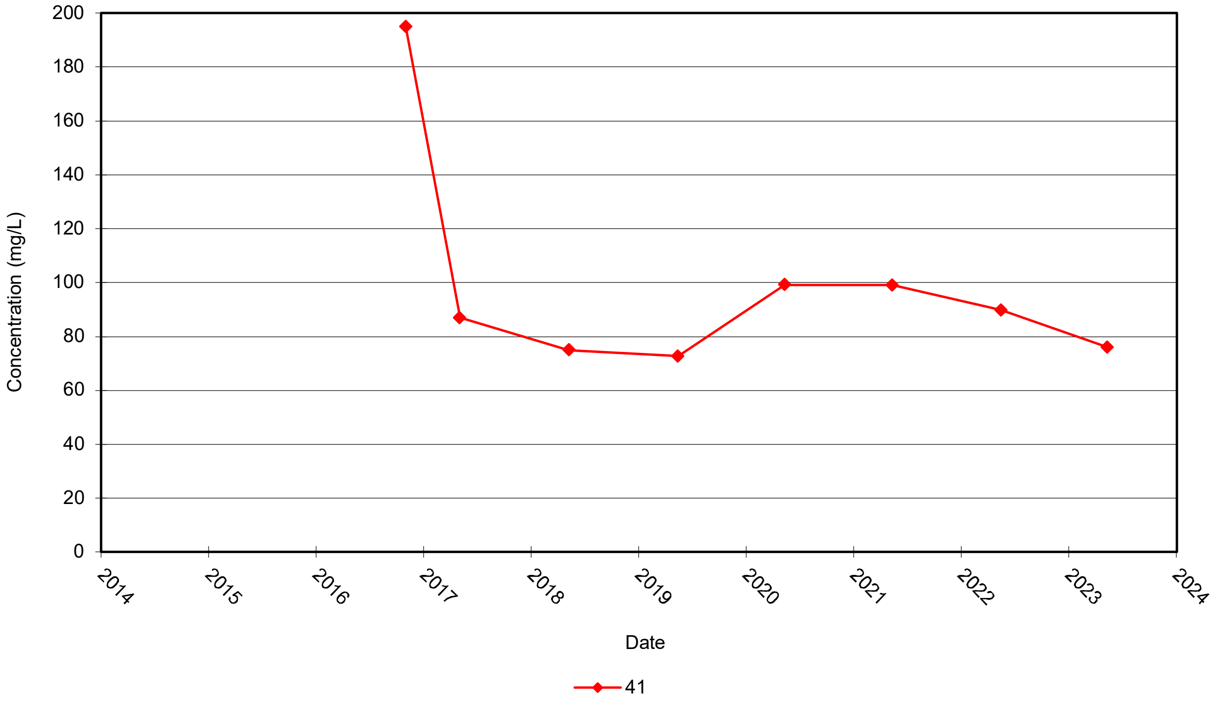


FIGURE D-7
TIME-CONCENTRATION GRAPH - TKN
HOLBROOK LANDFILL - LEACHATE

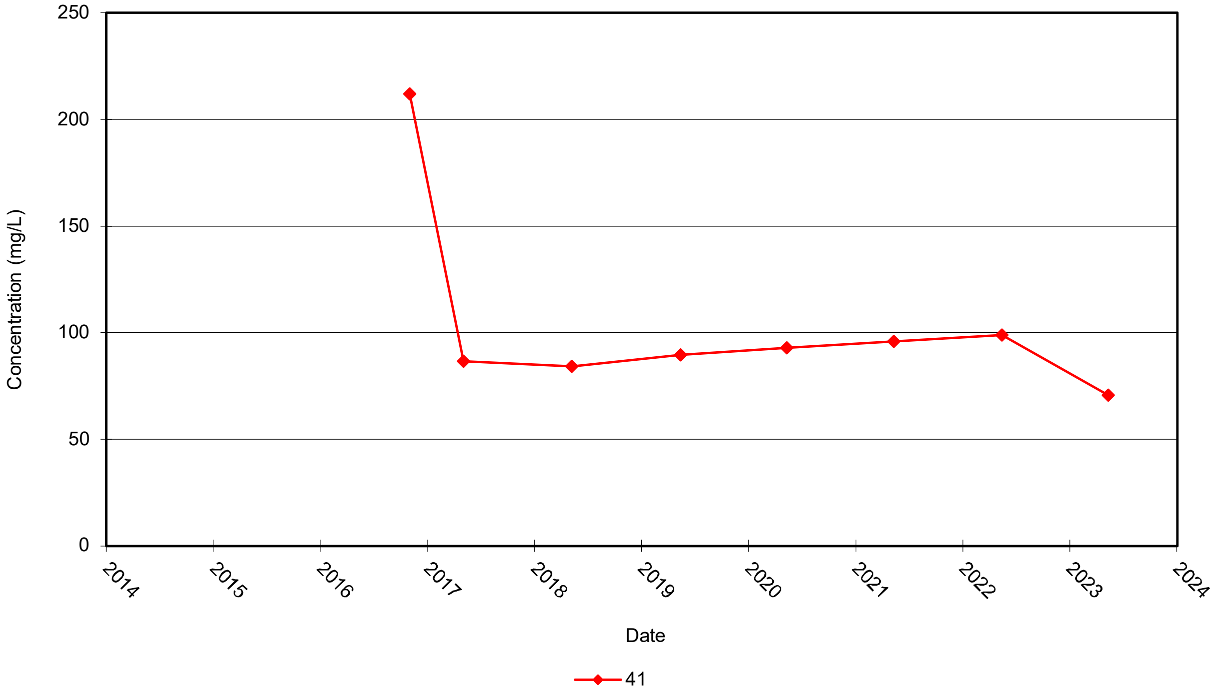


FIGURE D-8
TIME-CONCENTRATION GRAPH - CHLORIDE
HOLBROOK LANDFILL - NORTH SIDE

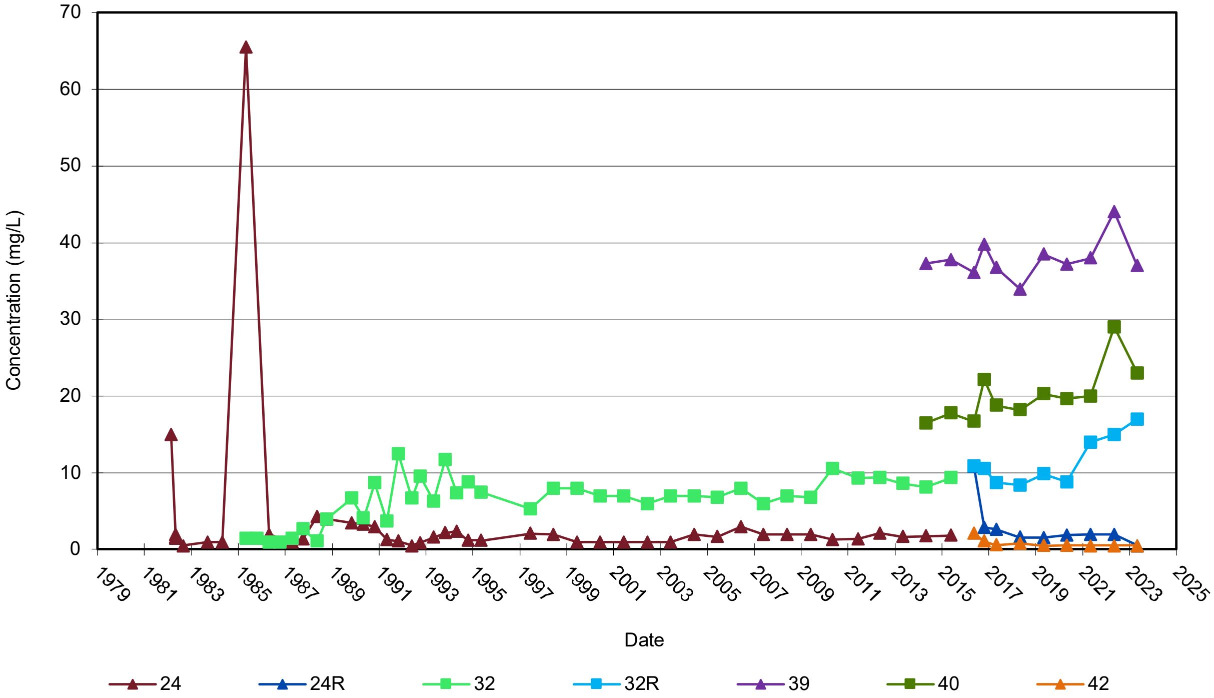


FIGURE D-9
TIME-CONCENTRATION GRAPH - CHLORIDE
HOLBROOK LANDFILL - SOUTH SIDE

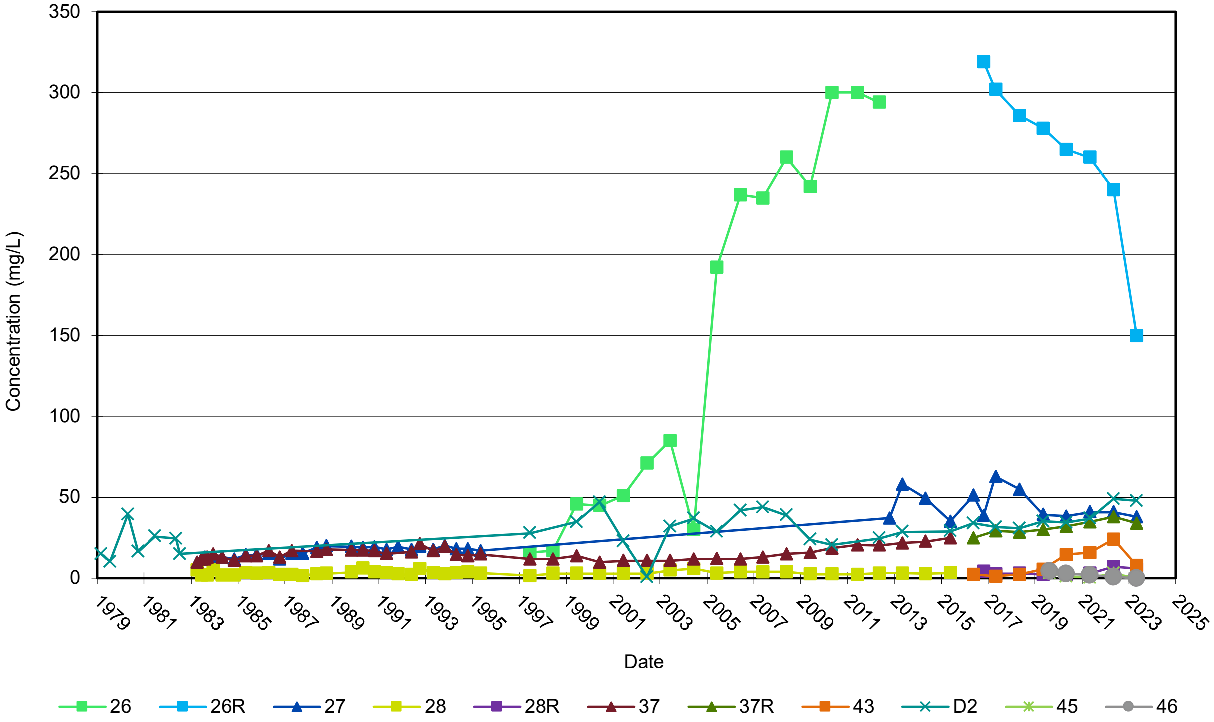


FIGURE D-10
TIME-CONCENTRATION GRAPH - CHLORIDE
HOLBROOK LANDFILL - EAST SIDE

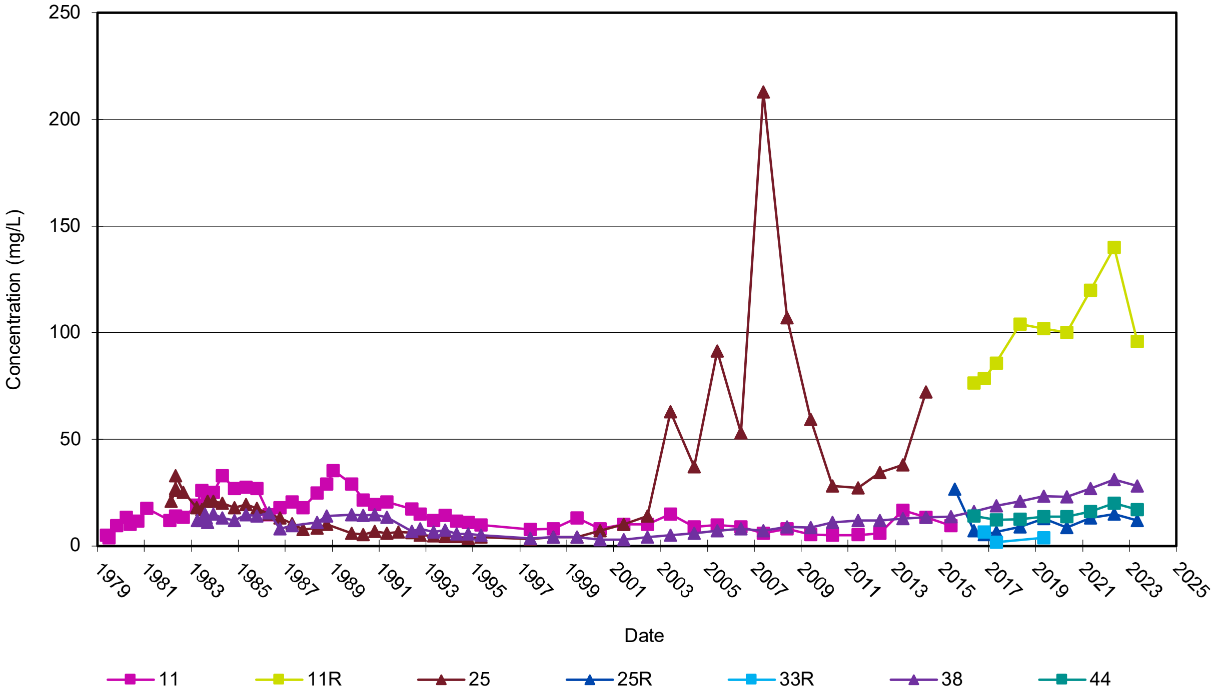


FIGURE D-11
TIME-CONCENTRATION GRAPH - CHLORIDE
HOLBROOK LANDFILL - WEST SIDE

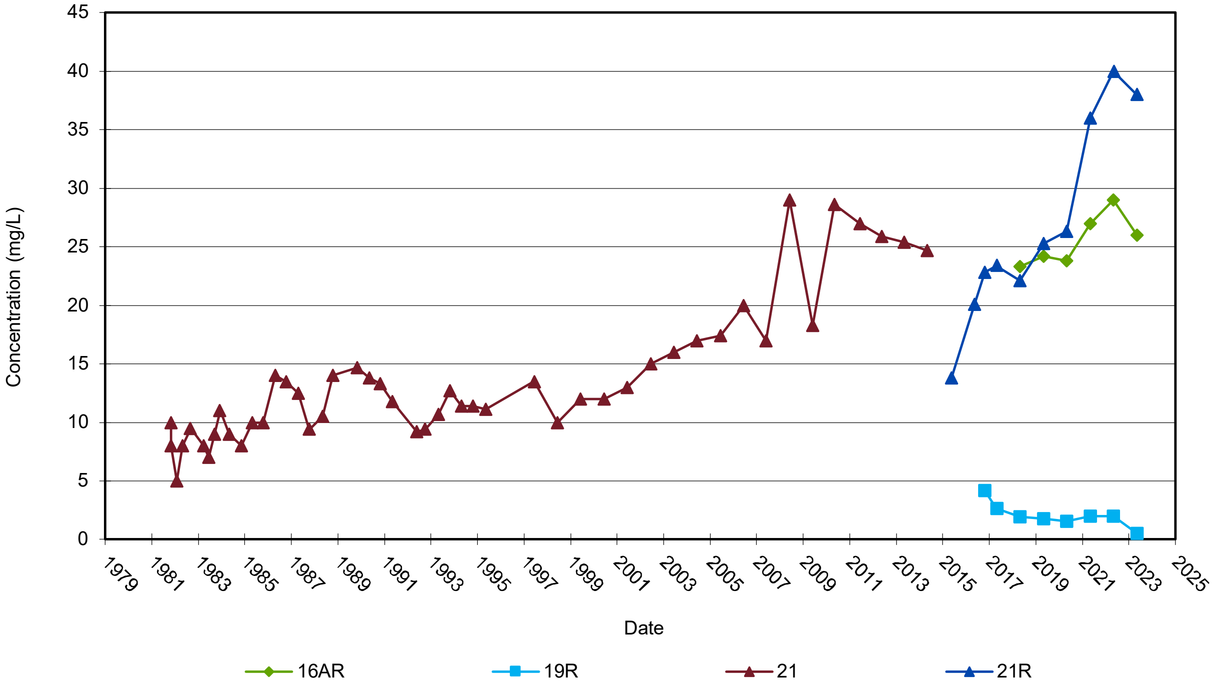


FIGURE D-12
TIME-CONCENTRATION GRAPH - ALKALINITY
HOLBROOK LANDFILL - NORTH SIDE

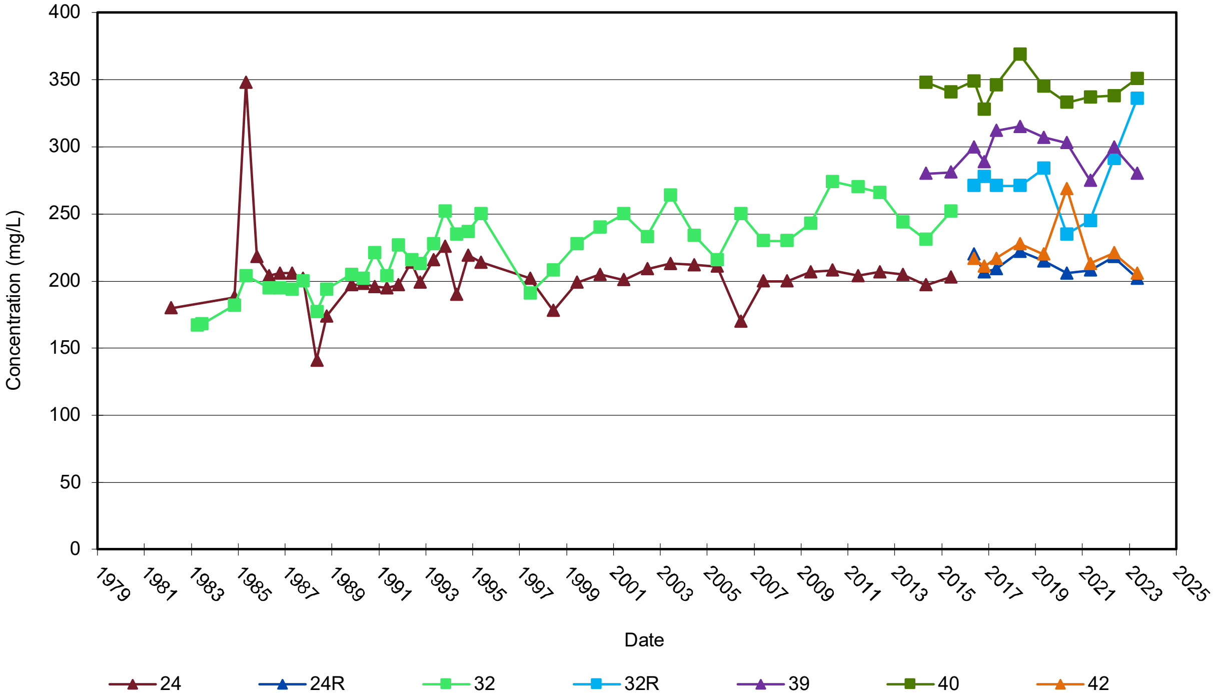


FIGURE D-13
TIME-CONCENTRATION GRAPH - ALKALINITY
HOLBROOK LANDFILL - SOUTH SIDE

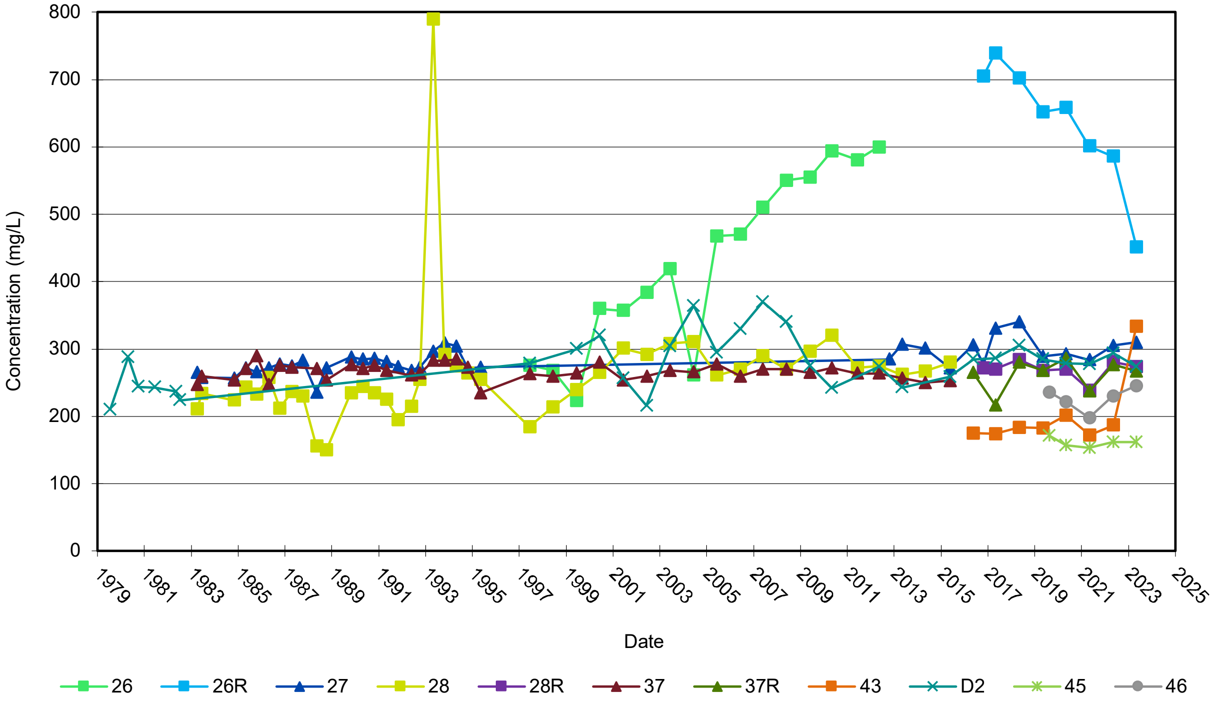


FIGURE D-14
TIME-CONCENTRATION GRAPH - ALKALINITY
HOLBROOK LANDFILL - EAST SIDE

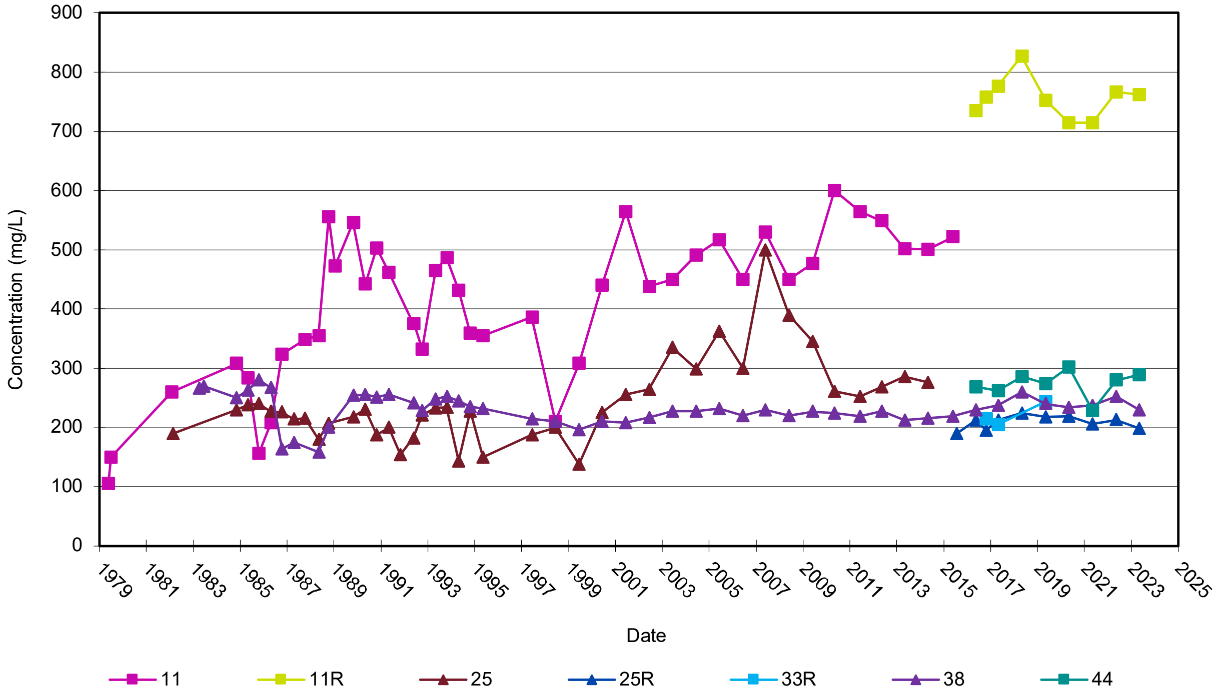


FIGURE D-15
TIME-CONCENTRATION GRAPH - ALKALINITY
HOLBROOK LANDFILL - WEST SIDE

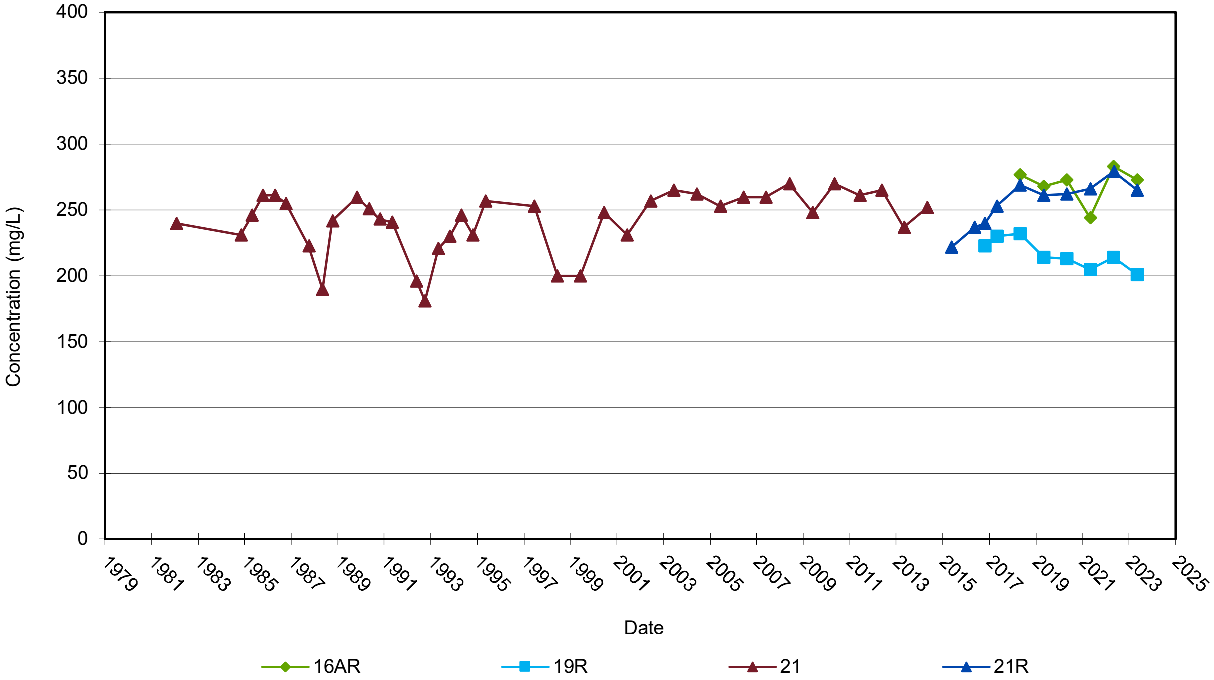


FIGURE D-16
TIME-CONCENTRATION GRAPH - POTASSIUM
HOLBROOK LANDFILL - NORTH SIDE

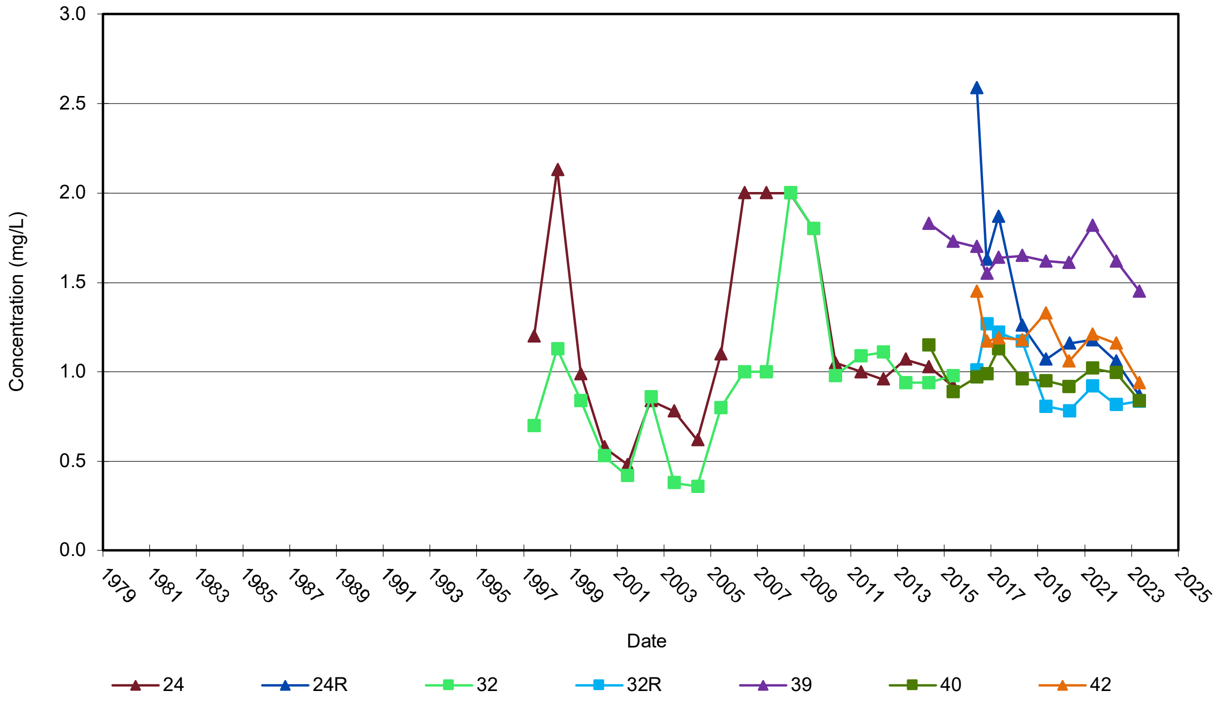


FIGURE D-17
TIME-CONCENTRATION GRAPH - POTASSIUM
HOLBROOK LANDFILL - SOUTH SIDE

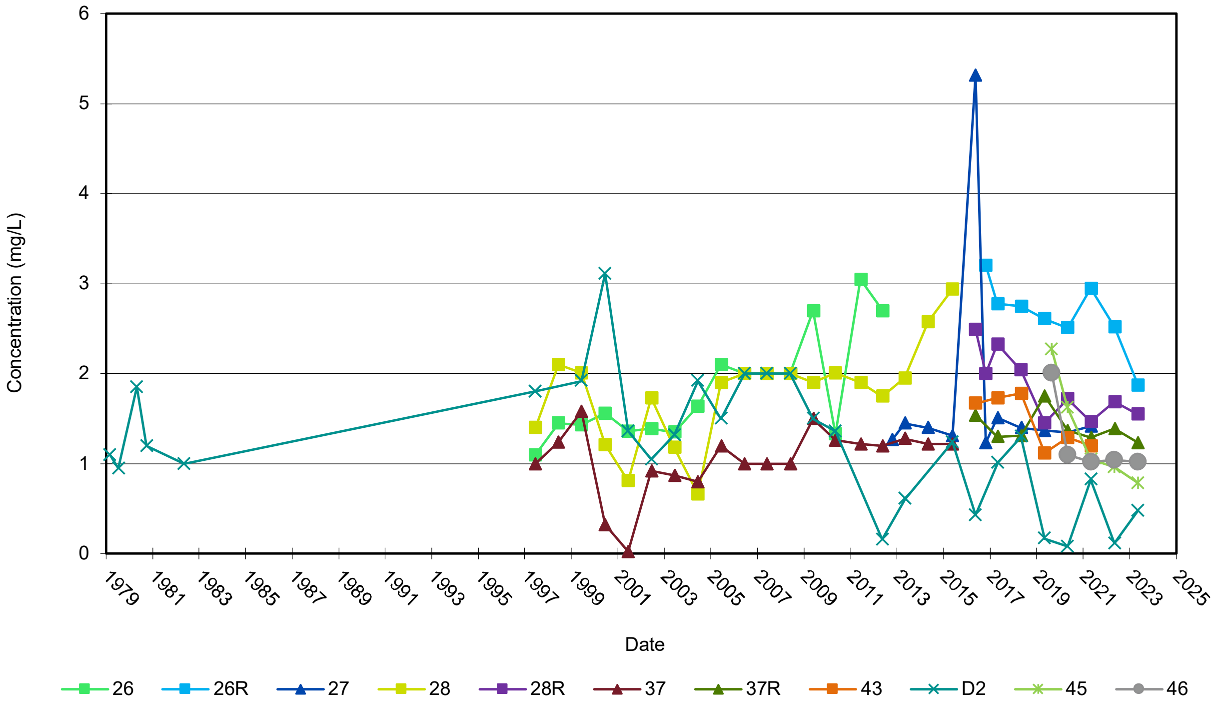


FIGURE D-18
TIME-CONCENTRATION GRAPH - POTASSIUM
HOLBROOK LANDFILL - EAST SIDE

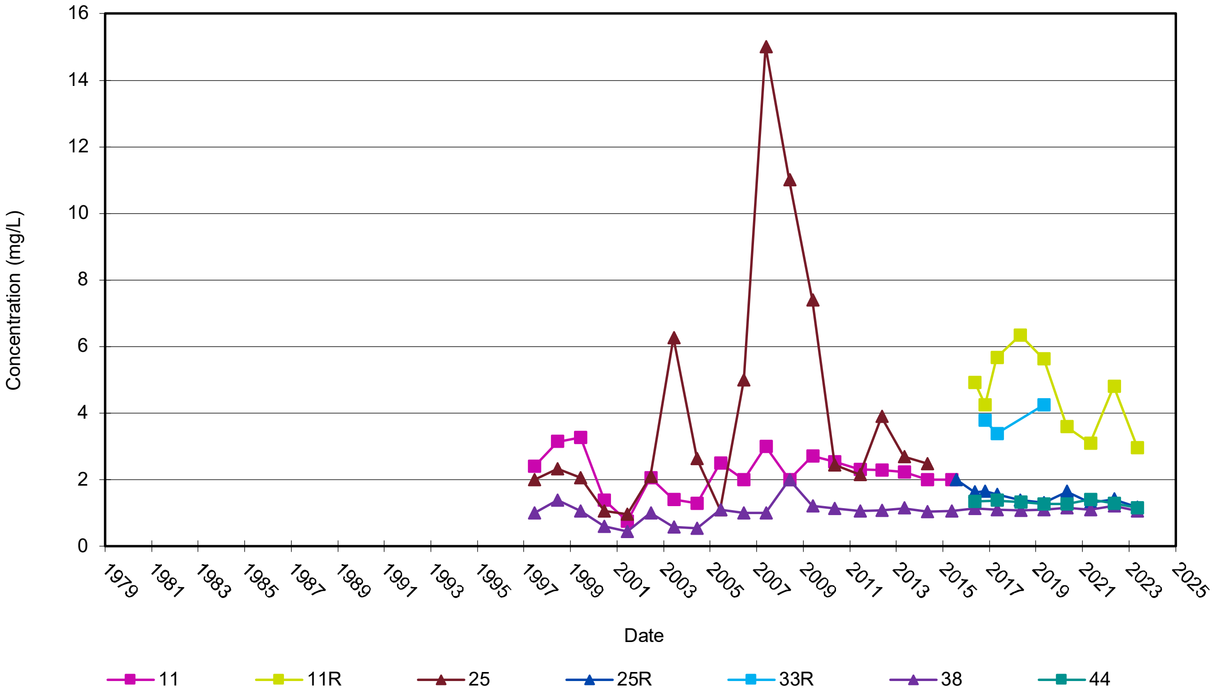


FIGURE D-19
TIME-CONCENTRATION GRAPH - POTASSIUM
HOLBROOK LANDFILL - WEST SIDE

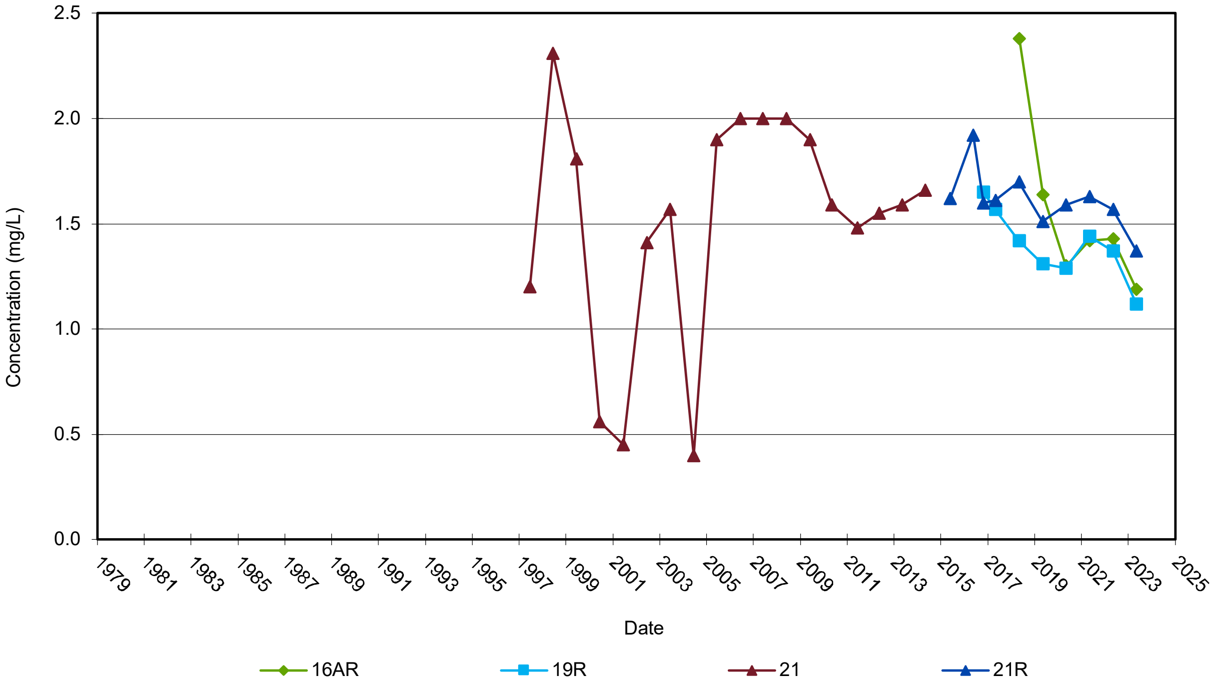


FIGURE D-20
TIME-CONCENTRATION GRAPH - BORON
HOLBROOK LANDFILL - NORTH SIDE

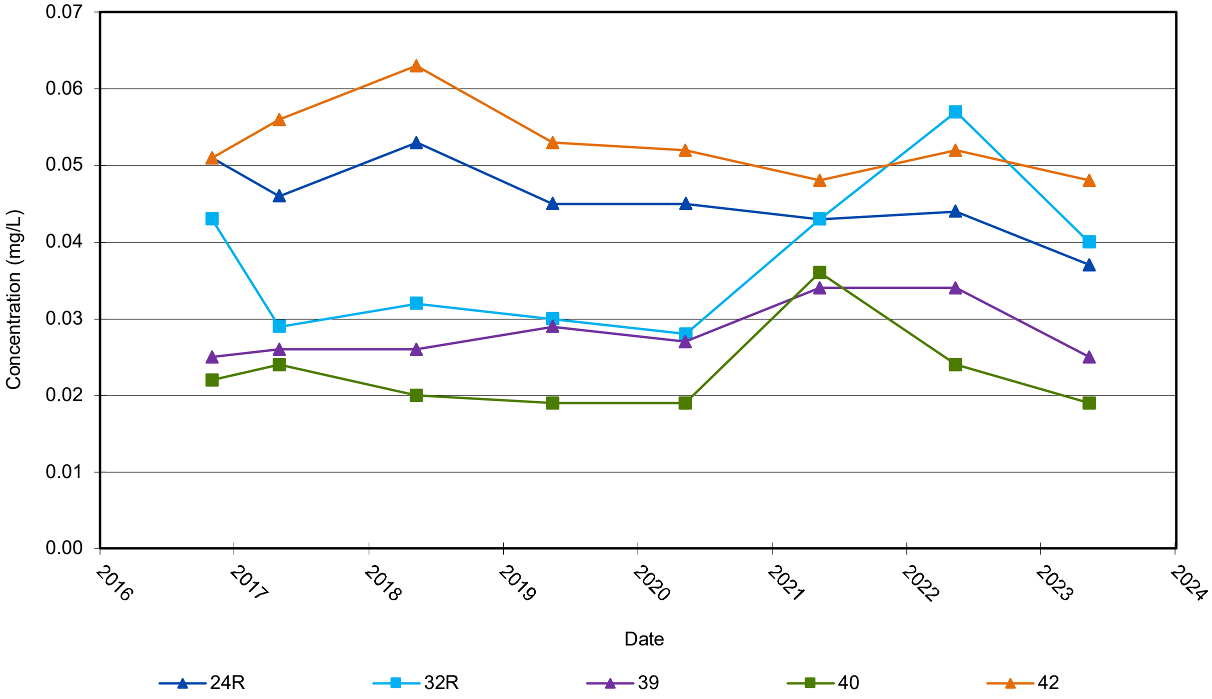


FIGURE D-21
TIME-CONCENTRATION GRAPH - BORON
HOLBROOK LANDFILL - SOUTH SIDE

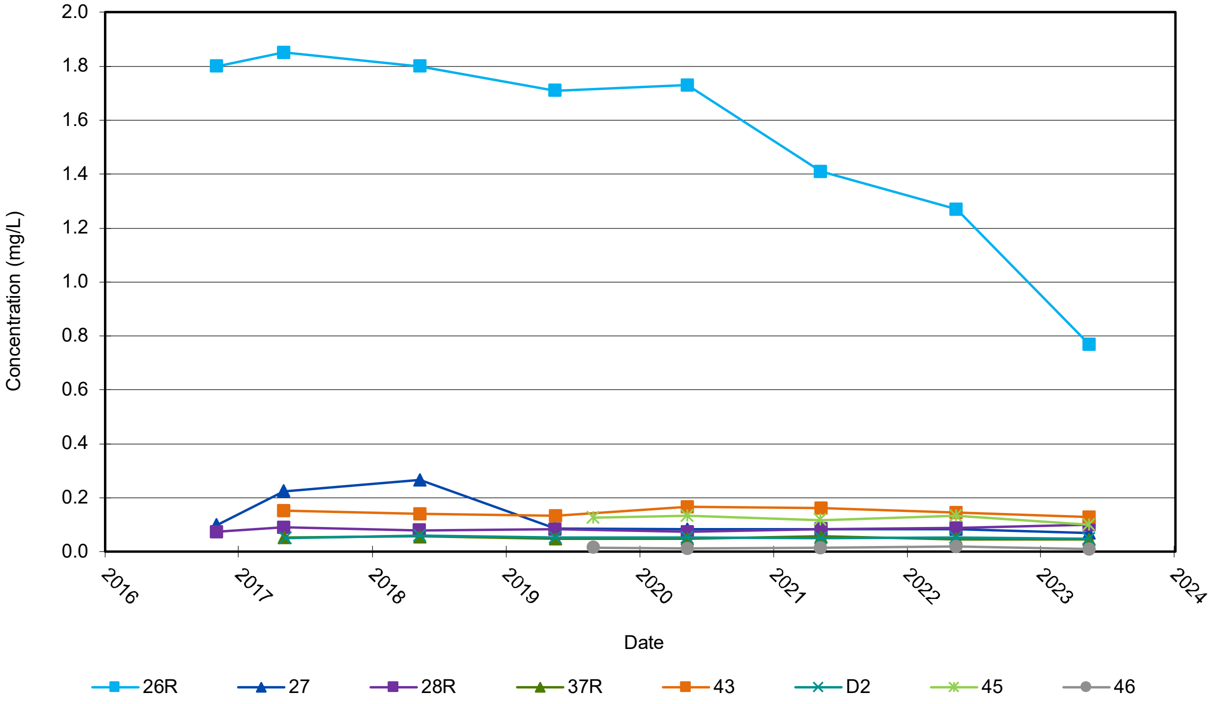


FIGURE D-22
TIME-CONCENTRATION GRAPH - BORON
HOLBROOK LANDFILL - EAST SIDE

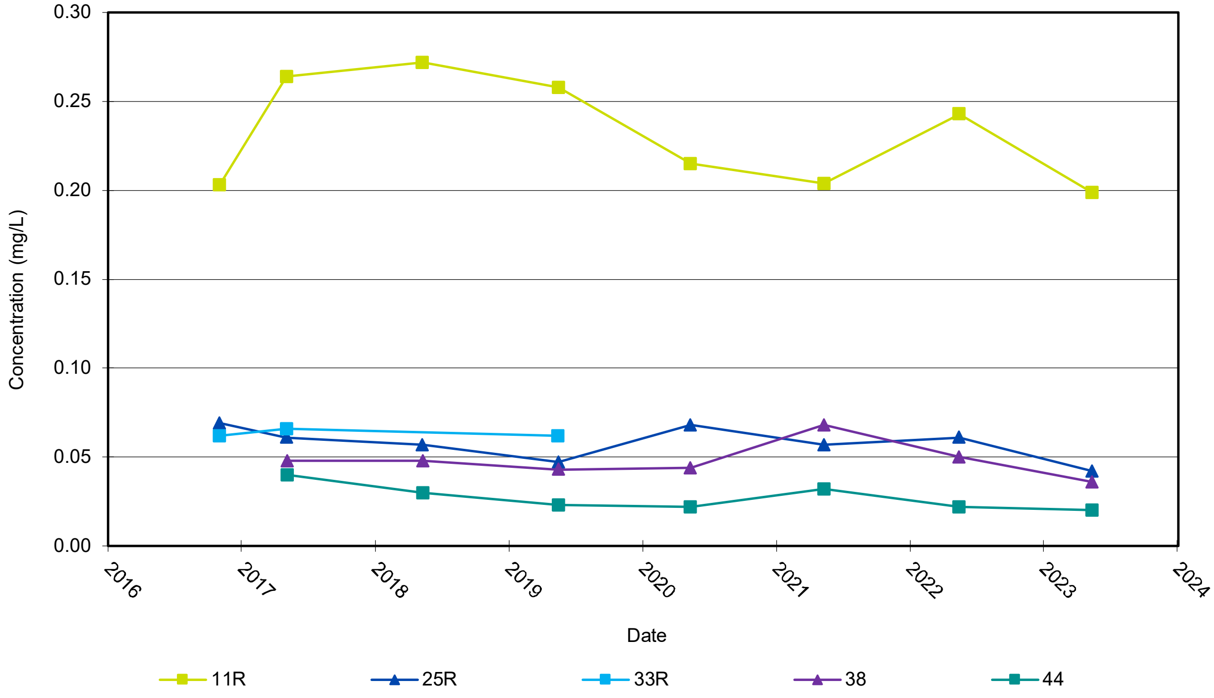


FIGURE D-23
TIME-CONCENTRATION GRAPH - BORON
HOLBROOK LANDFILL - WEST SIDE

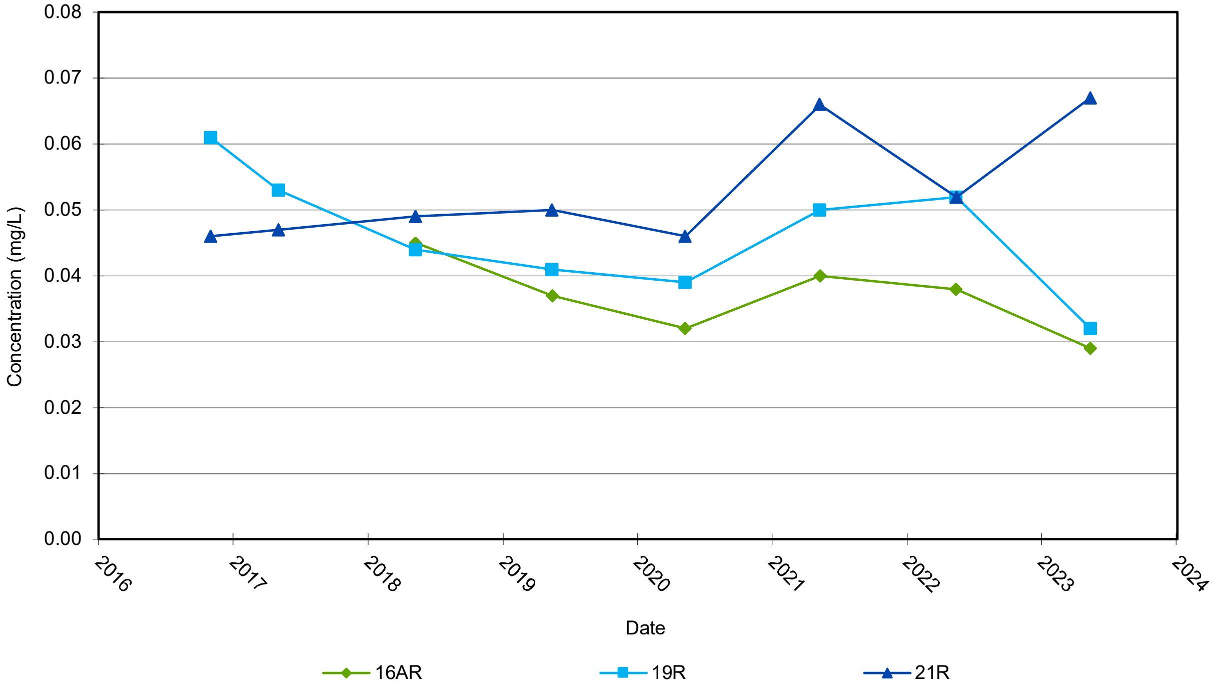


FIGURE D-24
TIME-CONCENTRATION GRAPH - IRON
HOLBROOK LANDFILL - NORTH SIDE

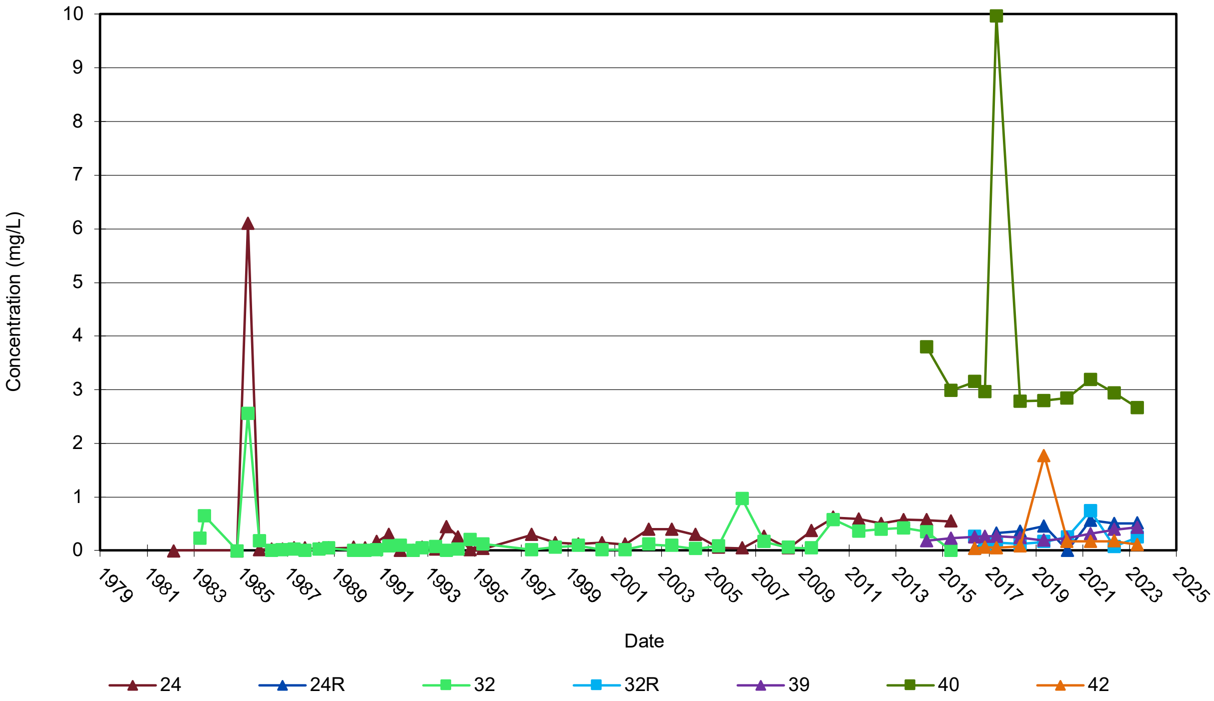


FIGURE D-25
TIME-CONCENTRATION GRAPH - IRON
HOLBROOK LANDFILL - SOUTH SIDE

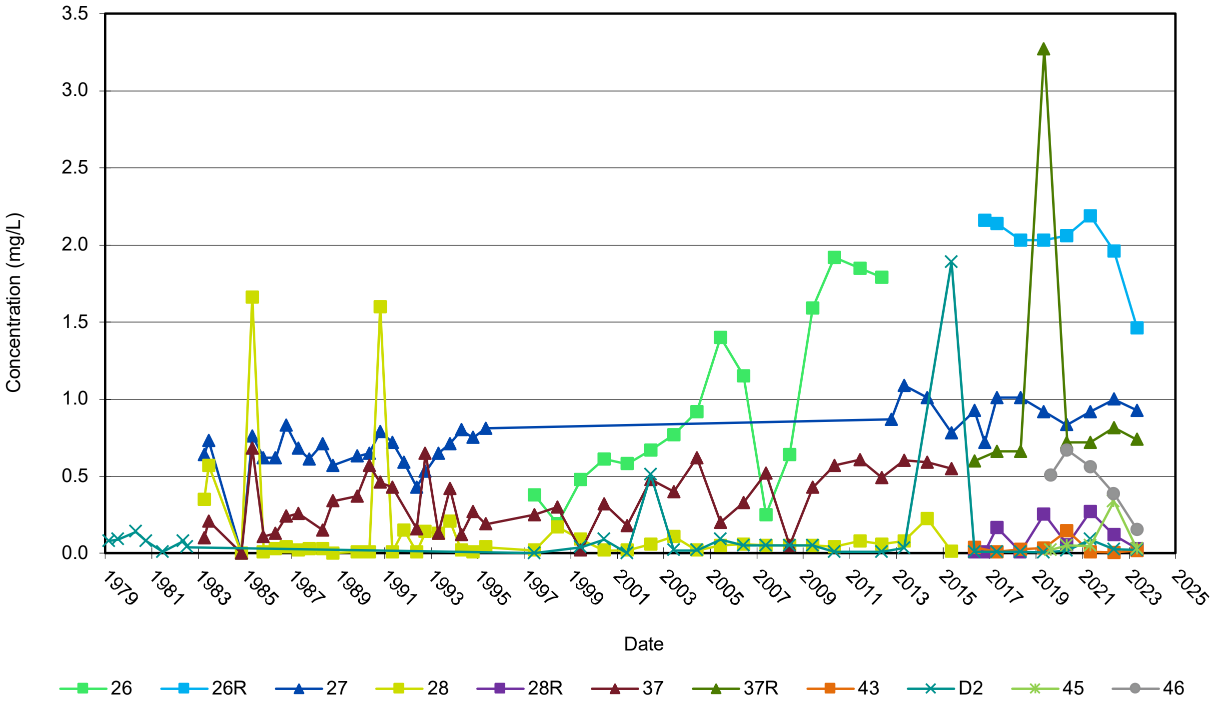


FIGURE D-26
TIME-CONCENTRATION GRAPH - IRON
HOLBROOK LANDFILL - EAST SIDE

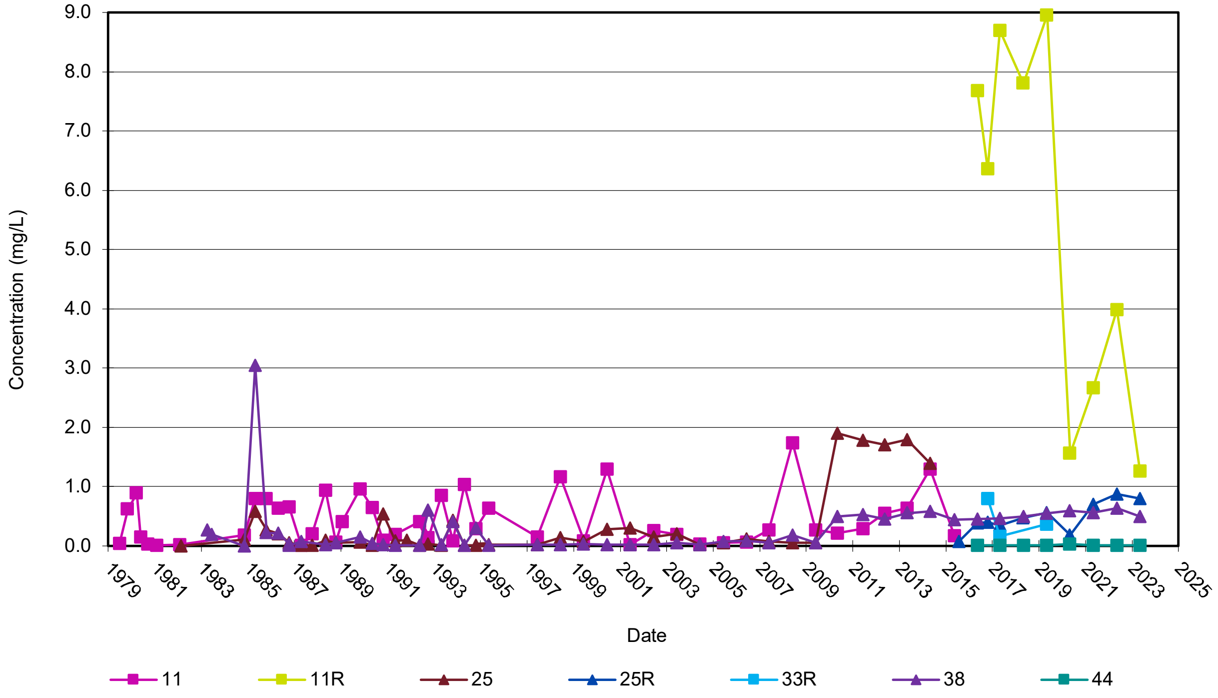


FIGURE D-27
TIME-CONCENTRATION GRAPH - IRON
HOLBROOK LANDFILL - WEST SIDE

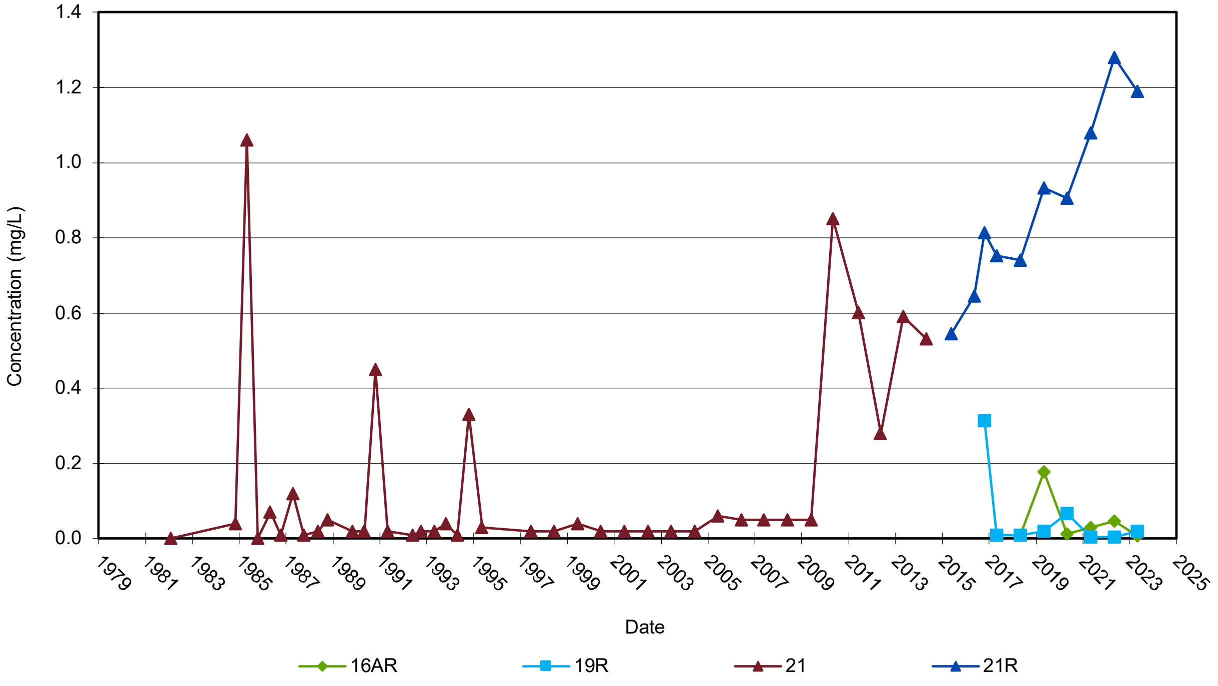


FIGURE D-28
TIME-CONCENTRATION GRAPH - AMMONIA
HOLBROOK LANDFILL - NORTH SIDE

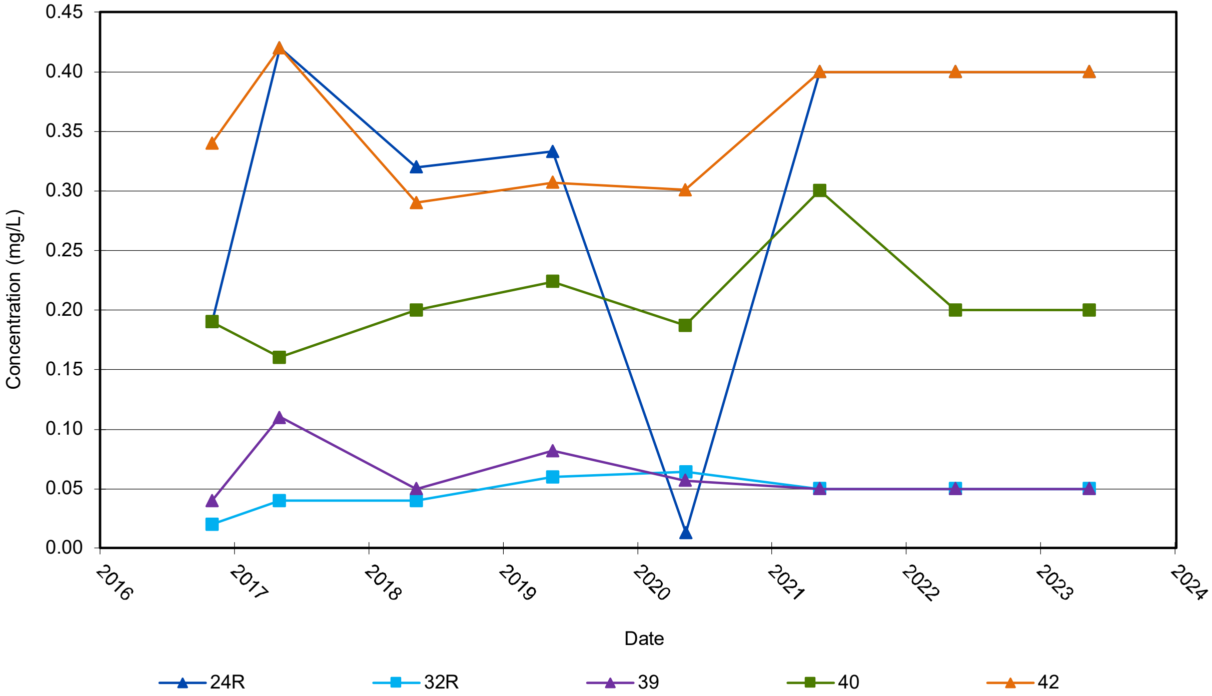


FIGURE D-29
TIME-CONCENTRATION GRAPH - AMMONIA
HOLBROOK LANDFILL - SOUTH SIDE

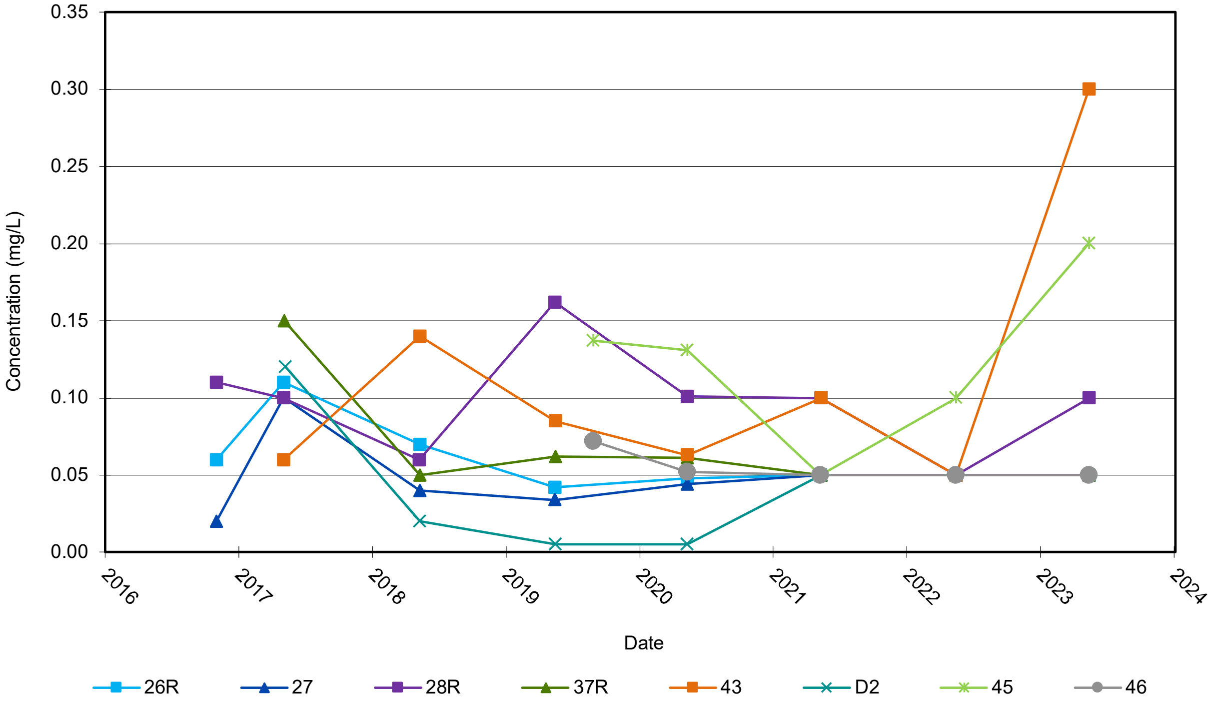


FIGURE D-30
TIME-CONCENTRATION GRAPH - AMMONIA
HOLBROOK LANDFILL - EAST SIDE

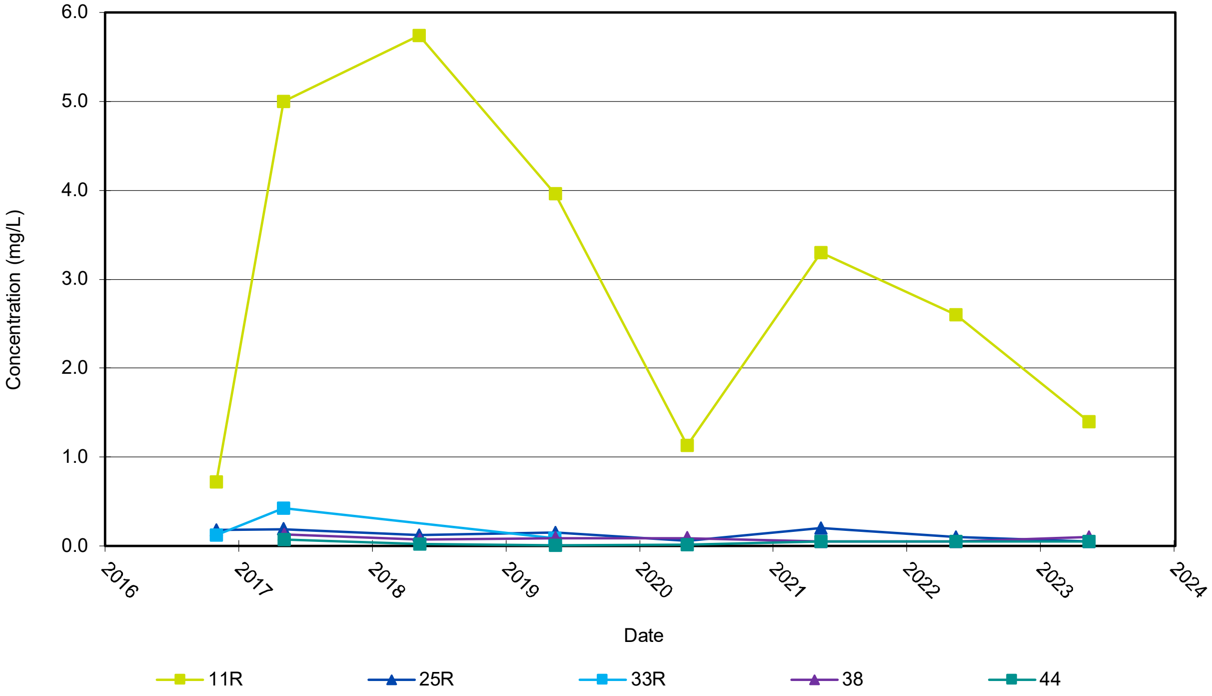


FIGURE D-31
TIME-CONCENTRATION GRAPH - AMMONIA
HOLBROOK LANDFILL - WEST SIDE

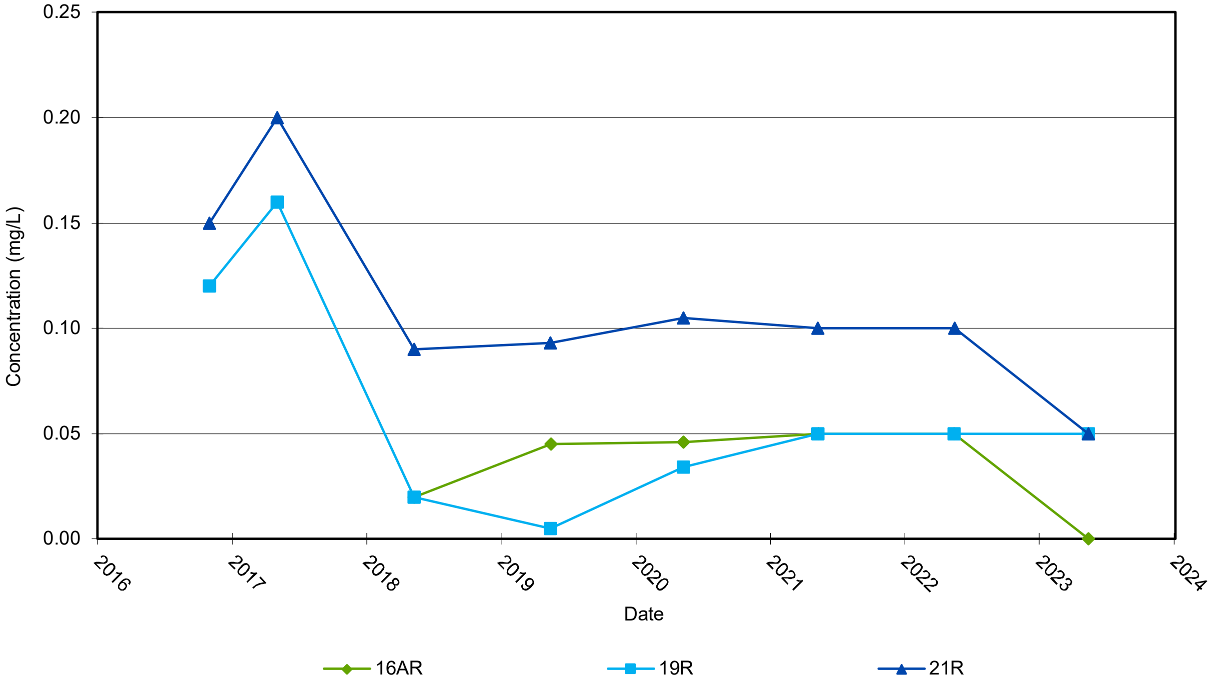


FIGURE D-32
TIME-CONCENTRATION GRAPH - TKN
HOLBROOK LANDFILL - NORTH SIDE

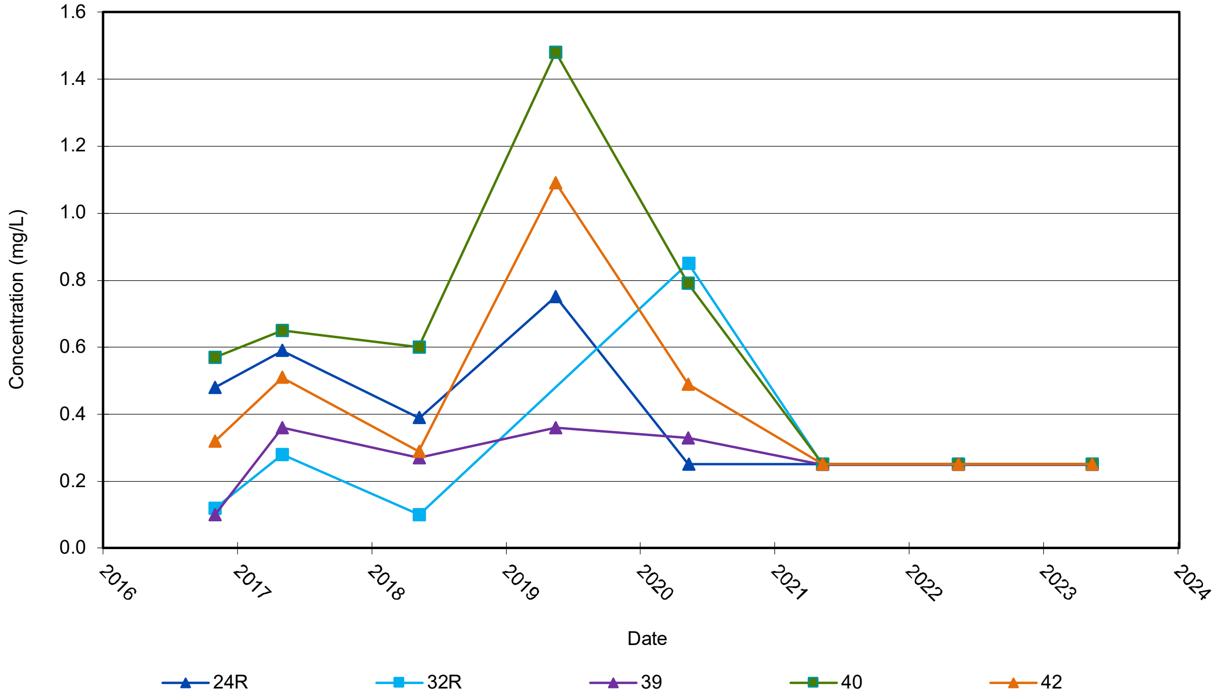


FIGURE D-33
TIME-CONCENTRATION GRAPH - TKN
HOLBROOK LANDFILL - SOUTH SIDE

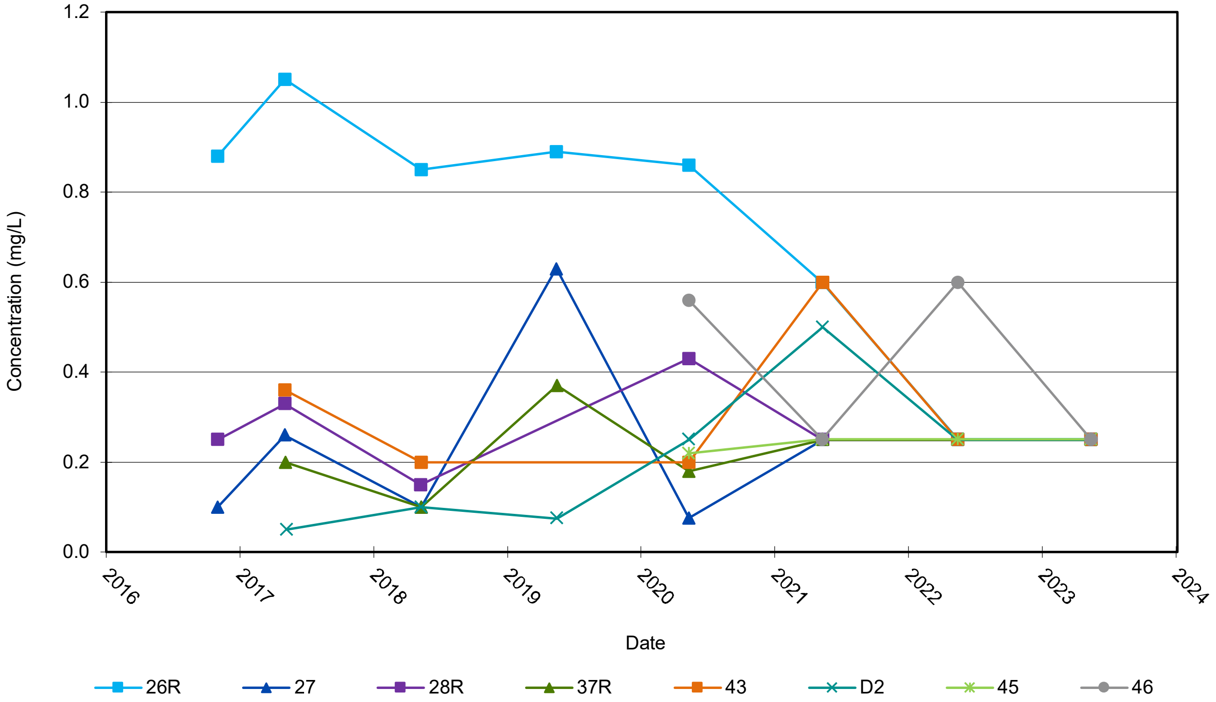


FIGURE D-34
TIME-CONCENTRATION GRAPH - TKN
HOLBROOK LANDFILL - EAST SIDE

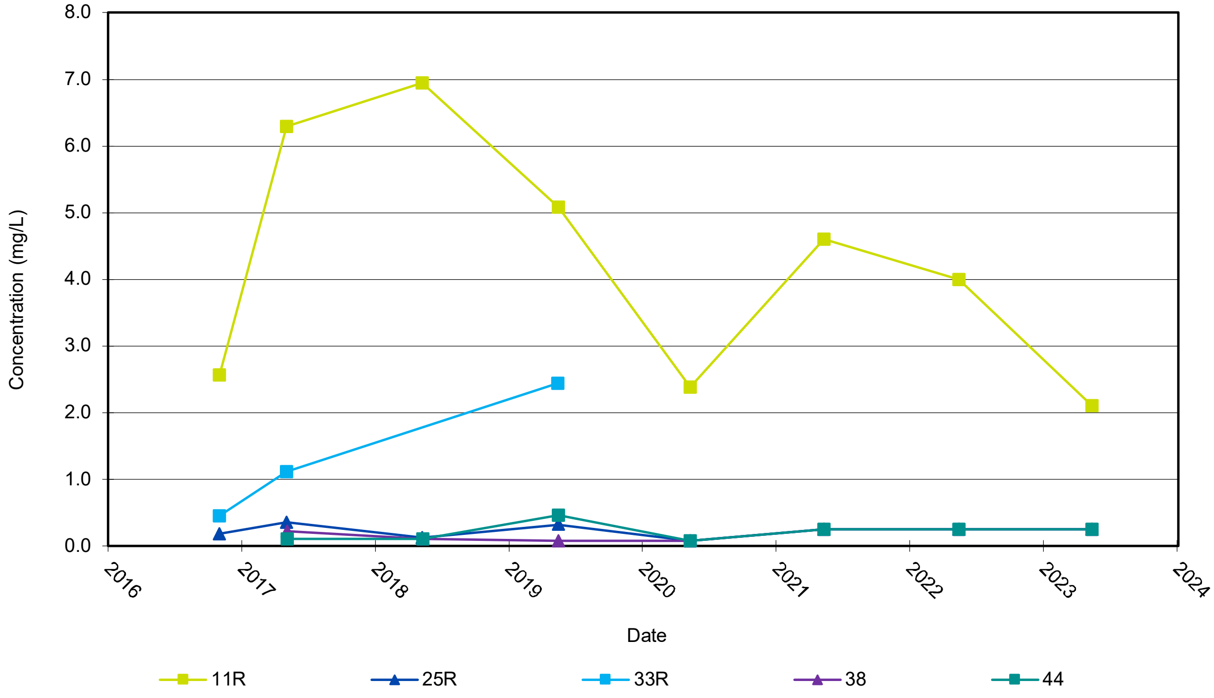
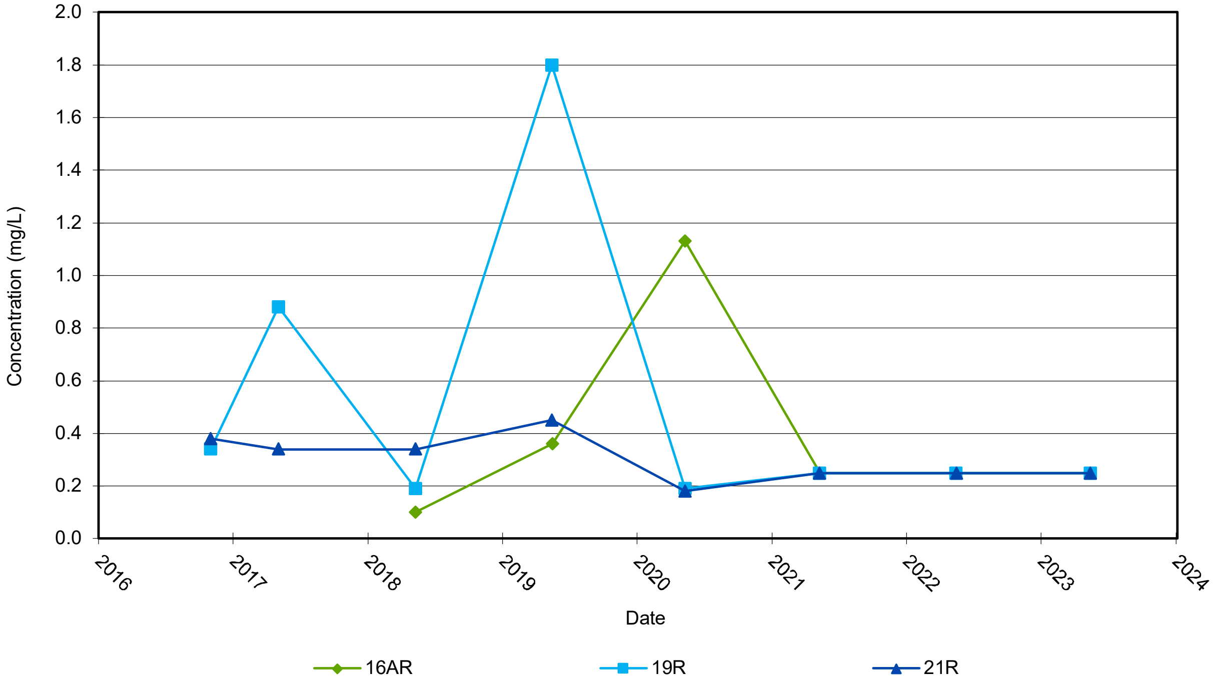


FIGURE D-35
TIME-CONCENTRATION GRAPH - TKN
HOLBROOK LANDFILL - WEST SIDE



APPENDIX

E

SURFACE WATER CHEMISTRY

Notation	*Description*		
	all units in mg/L unless otherwise noted	EC	Electrical Conductivity
mg/L	milligrams per Litre	ºC	degrees Celsius
µg/L	micrograms per Litre	µS/cm	microSiemens per centimetre
SU	Scientific Units	T	Temperature
PWQO	Provincial Water Quality Objectives (July 1994)		
i	interim PWQO		
nc	no PWQO criteria		
a	**alkalinity** should not decrease by more than 25% of the natural concentration:		
	calculated on an event specific basis from background station CO6 when sampled		
em	equipment malfunction - field parameter data not available		
DRY	sampling location dry at the time of sampling		
- or blank	parameter not analysed during sampling event		
< value	parameter not detected above associated laboratory reported detection limit		
*	estimated value / result interpreted with caution or considered questionable		

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	30-Mar-83					7.30	380	222	12.0														
	18-Apr-83					7.30	380	222	12.0														
	15-Jun-83					7.30	620	324	2.0														
	20-Jul-83					7.45	670	356	21.0		328	108.0	20.8										
	13-Sep-83					7.20	580	328	26.0														
	14-Nov-83					8.24	640	342	21.8		305	95.0	25.5									0.39	
	8-Dec-83					7.30	510	316	19.0														
	30-Apr-84					7.30	600	318	18.0														
	15-Jun-84					7.94	720	342	22.0		331	96.0	24.8									0.42	
	8-Aug-84					7.92	553	288	17.8		251	83.0	19.5									0.22	
	10-Aug-84					7.48	700	346	23.5		336	100.0	23.4									0.65	
	18-Sep-84					7.65	660	348	21.5		315	99.5	24.0									0.32	
	18-Dec-84					7.88	618	309	22.0		293	86.0	22.8									0.20	
	24-Jun-85					7.77	660	321	22.0		317	89.0	23.8									0.30	
	7-Oct-85					7.57	710	338	18.5		300	97.0	23.2									1.45	
	18-Dec-85					7.51	690	346	22.0		290	98.0	24.4									0.80	
	12-Mar-86					7.46	468	228	18.5		200	68.0	14.0									0.84	
	10-Jun-86					7.81	635	314	20.5		302	90.0	21.6									0.44	
	18-Sep-86					7.60	615	291	23.5		260	80.0	22.0									0.24	
	15-Dec-86					7.56	625	311	21.5		274	85.5	23.6									0.74	
	6-Mar-87					7.81	630	321	20.5		275	90.5	23.0									0.20	
	12-Jun-87					7.61	660	316	25.0		304	86.0	24.4									0.65	
	14-Sep-87					7.52	615	303	28.0			82.0	23.8									0.60	
	14-Dec-87					7.60	595	288	22.8		234	81.6	20.4									0.26	
	7-Mar-88					7.36	625	314	19.9		273	88.1	22.6									0.54	
	6-Sep-88					7.49	550	258	24.0		243	66.2	22.5									0.38	
	12-Dec-88					7.31	733	373	26.0		314	102.0	28.5									0.25	

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	14-Mar-89					7.66	610	288	20.7		260	80.3	21.2									0.24	
cont'd	14-Mar-89					7.66	610	288	20.7		260	80.3	21.2									0.24	
	13-Jun-89					7.52	498	232	22.0			57.9	21.1									0.38	
	11-Sep-89					7.42	559	311	28.2		256	85.0	24.0									2.40	
	11-Dec-89					7.65	667	335	26.8		280	89.3	27.2									0.61	
	5-Mar-90					7.39	598	291	20.5		272	83.3	20.1									0.41	
	21-Jun-90					7.92	508	252	24.0		231	63.1	22.9									0.23	
	17-Sep-90					7.43	531	273	26.0		237	73.3	21.9									0.44	
	2-Dec-90					8.24	568	272	21.0		246	74.2	21.1									0.06	
	11-Mar-91					7.77	619	307	23.0		271	87.3	21.6									0.09	
	17-Jun-91					7.69	493	213	28.3		201	48.6	22.3									0.54	
	9-Sep-91					7.62	494	218	28.4		183	48.0	23.8									0.58	
	3-Dec-91					7.81	515	253	20.3		221	69.3	19.4									0.09	
	24-Mar-92					7.61	618	303	23.3		273	82.1	23.8									0.26	
	16-Jun-92					7.78	486	223	29.7		166	44.2	27.4									0.75	
	15-Sep-92					7.74	511	244	24.2		212	59.3	23.3									0.53	
	7-Dec-92					7.75	632	349	23.3		285	99.3	24.4									0.44	
	23-Mar-93					7.82	629	338	22.4		272	96.5	23.6									0.47	
	15-Jun-93					7.69	446	204	25.0		198	46.3	21.3									0.56	
	7-Sep-93					7.61	533	274	30.5		227	65.4	26.9									0.76	
	7-Dec-93					8.44	621	325	22.9		243	89.1	24.7									0.19	
	21-Mar-94					7.59	667	373	24.1		296	105.0	26.6									0.28	
	21-Jun-94					7.68	522	253	31.3		248	58.0	26.3									0.98	
	6-Dec-94					7.83	618	321	21.8		268	85.8	25.9									0.19	
	28-Mar-95					7.83	613	316	25.5		252	86.7	24.2									0.21	
	26-Jun-95					7.70	529	251	31.0		208	61.5	23.6									0.64	
	16-May-97					8.42	611	307	27.1		268	84.3	23.4									0.22	0.030

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	°C	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	16-Oct-97					8.05	630	383	33.0		270	112.0	25.0									0.12	0.040
cont'd	16-Dec-97					7.71	588	253	32.0		238	63.2	23.2									0.66	0.130
	16-May-98					8.40	583	281	33.0		276	74.1	23.2									0.37	0.100
	16-Oct-98					8.15	869	325	51.0		236	81.2	29.7									0.36	0.110
	16-Dec-98					8.33	594	273	44.0		216	65.0	27.0									1.72	0.370
	16-May-99					7.90	670	344	32.0		270	97.4	24.4									0.16	0.070
	16-Jul-99					8.04	561	278	40.0		232	65.6	27.7									1.19	0.370
	16-Oct-99					7.87	888	325	48.0		220	84.3	27.8									1.36	0.180
	16-Dec-99					7.75	666	396	61.9		102	113.0	27.7									2.04	0.720
	16-May-00					7.95	595	329	29.0		262	94.5	22.6									0.16	0.050
	16-Jul-00					7.57	592	317	30.0		260	87.4	24.1									1.08	0.530
	16-Oct-00					7.88	637	335	40.0		261	87.2	28.4									0.26	0.070
	16-Dec-00					7.81	610	352	34.0		281	100.0	24.8									0.50	0.240
	16-May-01					7.69	643	341	37.0		276	96.6	24.3									0.08	0.020
	16-Jul-01					8.24	591	311	45.0		227	78.7	27.8									0.32	0.090
	16-Oct-01					8.05	624	337	43.0		265	85.8	29.7									0.21	0.090
	16-May-02					7.98	717	384	43.0		303	106.0	29.0									0.29	0.090
	16-Jul-02					8.42	667	297	48.0		277	75.1	26.6									0.68	0.410
	16-Oct-02					7.97	713	368	57.0		276	98.1	30.0									1.68	0.410
	16-May-03					8.06	634	288	46.0		233	80.2	21.4									0.27	0.130
	16-Jul-03					7.81	628	344	49.0		254	87.7	30.4									2.73	0.980
	16-Dec-03					7.74	629	316	56.0		266	84.7	25.4									0.63	0.240
	16-May-04					7.96	652	327	50.0		242	87.2	29.1									1.61	0.310
	16-Jul-04					7.68	641	332	49.0		268	85.4	28.8									1.01	0.360
	16-Oct-04					8.15	657	338	48.0		262	90.0	27.6									0.24	0.034
	16-Dec-04					8.12	682	310	57.0		236	73.7	30.6									1.42	0.300
	16-May-05					8.20	700	321	47.4		279	88.4	24.4									0.20	0.043

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	°C	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	16-Jul-05					8.16	646	335	56.9		245	73.8	36.5									2.10	0.540
cont'd	16-Oct-05					8.19	632	330	46.0		235	94.0	24.0									0.53	0.240
	16-Dec-05					8.05	702	267	55.0		253	67.6	23.8									0.46	0.099
	16-May-06					7.83	636	340	45.0		280	89.1	27.4									0.48	0.650
	16-Jul-06					7.75	619	320	57.0		250	78.6	29.6									1.02	0.264
	16-Oct-06					7.60	628	330	42.0		280	99.7	19.6									0.80	0.170
	16-Dec-06					7.60	607	260	60.0		280	63.9	23.4									0.70	0.170
	19-Apr-07					7.77	750	350	49.0		310	91.7	28.8									0.29	0.053
	28-Jun-07					7.68	624	320	61.0		210	64.2	37.6									3.97	0.748
	22-Nov-07					8.09	747	300	79.0		220	81.8	23.9									0.29	0.042
	15-Apr-08					8.10	687	320	50.0		270	84.0	26.0									0.13	0.020
	28-Jun-08					8.00	656	280	58.0		250	65.0	29.0									0.92	0.590
	11-Aug-08					8.00	620	290	45.0		270	77.0	24.0									2.80	2.320
	16-Apr-09					8.03	722	321	52.0		289	93.8	21.1									0.12	0.020
	1-May-09					8.06	554	279	32.7		240	82.9	17.5									0.38	0.059
	1-Oct-09					8.04	672	381	52.0		247	97.3	33.6									1.41	0.422
	1-Dec-09					8.14	762	386	49.2		308	106.0	29.4									1.60	0.336
	15-Mar-10	7.80	610	2.3		8.11	637	298	40.9		261	83.8	21.5									0.20	0.092
	10-May-10	7.92	670	15.2		8.40	572	312	47.3		274	82.7	25.7									0.25	0.059
	14-Jul-10	7.17	540	26		7.69	650	266	59.8		252	61.5	27.4									1.02	0.353
	4-Oct-10	7.65	780	12.1		8.12	666	317	57.1		286	83.9	26.0									0.37	0.160
	11-Apr-11	8.03	645	13.7		8.37	731	329	53.2		288	93.0	23.4									0.07	0.032
	15-Jun-11	7.49	601	20.2		8.10	642	314	46.7		294	86.1	24.1									0.70	0.460
	6-Aug-11	7.32	615	23.3		8.05	589	232	75.4		208	49.3	26.5									0.40	0.140
	24-Oct-11	6.77	525	9.7		7.92	543	272	45.3		242	77.1	19.3									0.18	0.058
	8-Mar-12	7.61	589	6.1		8.26	715	282	50.1		279	78.5	20.9									0.11	0.031
	23-May-12	7.35	551	23.1		8.05	651	253	66.1		251	54.8	28.3									0.47	0.094

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	13-Aug-12	6.98	558	21.3		7.94	603	232	69.6		207	44.1	29.6									0.67	0.236
cont'd	24-Oct-12	6.76	600	11.9		8.24	692	303	68.5		283	74.4	28.4									0.56	0.183
	9-Apr-13	8.32	826	5.8		8.03	754	293	45.8		298	82.7	20.9									0.20	0.069
	9-May-13	7.94	855	23.6		8.39	828	301	58.6		316	74.2	28.2									0.44	0.149
	7-Aug-13	8.10	707	23		7.48	703	236	66.5		240	52.4	25.5									0.17	0.063
	31-Oct-13	8.18	647	11.2		8.25	595	271	35.7		234	76.9	19.3									0.25	0.044
	28-Mar-14	7.99	807	2		8.05	641	294	43.1		281	81.7	21.8									0.21	0.144
	9-May-14	7.71	724	20.1		8.00	693	299	45.1		265	80.8	23.5									0.30	0.118
	12-Aug-14	8.23	668	21.8		8.09	658	244	53.4		249	56.8	24.9									0.451	0.204
	20-Oct-14	7.90	700	11.2		7.96	799	341	51.1		316	91.6	27.3									0.22	0.061
	6-Apr-15	6.00	610	4.4		7.97	731	322	47.7		307	89.8	23.8									0.15	0.070
	28-May-15	7.56	494	26.3		8.21	740	275	63.4		275	66.5	26.5									0.37	0.201
	26-Aug-15	8.02	720	19.8		8.40	746	268	69.5		262	60.0	28.8									0.75	0.545
	29-Oct-15	7.76	740	8.8		8.17	727	297	60.8		252	79.7	23.9									0.15	0.047
	10-Mar-16	7.76	550	7.6		7.72	695	285	48.1		275	80.1	20.6									0.08	0.089
	25-May-16	7.94	556	13.9		8.20	773	277	69.1		297	67.3	26.5									0.42	0.180
	18-Aug-16	7.52	641	21.6		8.17	873	316	72.8		251	78.1	29.3									0.32	0.127
	17-Oct-16	7.28	1310	17.2		8.10	1290	556	78.4		316	161	37.4									2.66	1.92
	1-Nov-16	7.52	1112	7.10		8.03	1120		79.8	216	308	143	31.8	5.85	40.5	0.23	0.001	<0.25	<0.25	0.573	<0.003	1.12	0.445
	7-Mar-17	7.72	652	3.19		8.19	644	239	43.5		237	66.3	17.8									0.092	0.012
	4-May-17	7.94	700	8.75		8.31	755	290	44.6	17.8	294	81.5	20.9	6.16	27.4	0.21	0.003	1.59	<0.10	0.292	<0.003	<0.010	0.023
	2-Aug-17	7.87	633	20.93		8.18	761	297	66.1		305	72.4	28.2									0.34	0.178
	17-Oct-17	7.11	619	12.49		8.04	766	309	71.8		304	79.9	26.6									0.644	0.395
	2-Apr-18	7.96	707	5.90	8.3	8.01	667	289	55.2	23.5	286	80.1	21.6	7.28	29.9	0.66	0.008	2.79	<0.10	0.325	<0.003	0.027	0.020
	18-Oct-18	8.05	712	6.41	25.2	8.12	743	320	62.1	10.9	348	84.6	26.3	7.92	34.7	0.42	0.006	0.51	<0.10	0.262	<0.003	0.63	0.393
	15-Apr-19	7.78	591	3.91	0.0	7.99	580	256	36.0	14.0	248	72.2	18.4	6.03	24.2	0.203	0.001	2.13	0.017	0.198	0.0019	0.118	0.016
	8-Oct-19	7.99	620	12.29	8.0	7.77	715	306	59.1	13.7	298	72.4	30.4	8.36	38.7	0.281	0.006	0.486	0.020	0.310	<0.0050	0.34	0.189

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO1	8-Apr-20	7.75	614	9.52	2.0	8.23	692	308	48.1	14.1	297	83.5	24.1	8.00	31.2	0.142	0.001	2.12	0.03	0.307	<0.00050	0.099	0.0284
cont'd	15-Oct-20	7.96	624	13.72	2.0	8.10	752	334	60.7	5.99	320	86.3	28.9	7.61	36.8	0.849	0.019	0.103	0.044	0.350	<0.0050	1.62	0.760
	12-Apr-21	7.74	624	14.13	1.0	8.07	677	319	49	15	269	91.4	22.1	8.98	31.8	0.2	0.003	1.03	<0.03	0.397	0.00053	0.15	0.055
	7-Oct-21	7.65	638	17.42	2.0	7.96	728	322	52	12	300	89.1	24.1	7.93	29.2	0.5	0.007	0.35	0.030	0.301	0.00022	0.58	0.511
	6-Apr-22	7.79	664	6.66	9.5	8.02	678	341	54	22	284	95.3	25.2	8.48	33.6	0.5	0.004	2.13	<0.03	0.332	<0.00008	0.12	0.0590
	18-Oct-22	7.84	691	9.24	5.0	8.26	737	296	61	22	274	70.8	28.9	10.6	40.7	0.8	0.010	0.57	<0.03	0.359	<0.00008	0.55	0.276
	3-Apr-23	7.68	656	6.08	17.4	8.09	584	261	43	19	211	77.2	16.7	6.22	23.8	1.04	0.007	5.88	<0.03	0.184	0.00015	0.276	0.0119
	12-Oct-23	7.27	632	12.04	25.2	8.01	711	273	57	19	271	68.5	24.7	8.83	33.4	1.5	0.006	0.68	0.050	0.292	<0.003	0.36	0.132
CO4	20-Mar-80					7.70	490	253	16.0			74.5	16.2									1.34	
	27-May-80					8.00	690	353	25.0			100.0	25.0									0.21	
	17-Sep-80					7.80	745	376	30.5			105.0	27.6									0.08	
	25-Sep-81					7.60	625		26.0														
	2-Oct-81					7.40	595	330	26.0														
	3-Oct-81						635		23.0														
	2-Feb-82					8.00	640	388	25.0		305											0.02	
	4-May-82					7.90	480	344	20.0														
	2-Sep-82					8.00	780	397	32.0			112.0	28.4										
	3-Sep-82					8.00	780	397	32.0			112.0	28.4										
	30-Mar-83					7.80	460	294	16.0														
	18-Apr-83					7.80	460	294	16.0														
	15-Jun-83					7.80	700	400															
	20-Jul-83					7.84	620	329	37.0		302	92.0	24.0										
	14-Sep-83					7.70	610	364	20.0														
	8-Dec-83					7.70	350	200	16.0														
	12-Dec-83					7.70	350	200	16.0														
	30-Apr-84					7.70	670	354	20.0														

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO4	18-Sep-84					7.91	720	212	23.0		356	41.0	26.6									8.15	
cont'd	24-Jun-85					7.82	690	329	22.5		310	89.5	25.6									0.30	
	18-Dec-85					7.50	735	374	22.5		308	105.0	25.2									0.10	
	18-Sep-86					8.12	560	256	22.5		212	65.5	22.4									0.21	
	6-Mar-87					7.84	635	324	19.5		275	91.5	23.0									0.26	
	14-Sep-87					7.53	550	265	27.0			63.0	26.2									0.84	
	7-Mar-88					7.66	695	368	21.8		294	104.4	26.0									0.19	
	12-Dec-88					7.07	1144	748	22.7		457	233.5	40.0									10.40	
	5-Mar-90					7.72	701	347	25.6		318	99.6	23.8									0.01	
	21-Jun-90					7.76	485	234	25.0		199	54.3	23.8									0.96	
	2-Dec-90					8.58	604	280	22.1		264	74.4	22.8									0.13	
	11-Mar-91					7.89	623	303	23.7		270	87.3	20.6									0.22	
	9-Sep-91					7.84	454	198	28.6		150	39.0	24.4									0.60	
	24-Mar-92					7.94	666	328	29.0		209	87.7	26.3									0.18	
	16-Jun-92					8.08	462	213	30.7		145	38.6	28.2									0.38	
	7-Dec-92					7.97	682	343	27.5		302	96.4	24.8									0.13	
	23-Mar-93					7.77	679	370	22.0		306	104.0	26.3									0.26	
	7-Sep-93					7.86	486	234	28.4		188	51.2	25.7									0.44	
	21-Mar-94					7.55	699	381	25.0		306	108.0	26.6									0.26	
	21-Jun-94					7.84	511	240	32.6		219	51.8	26.8									0.77	
	6-Dec-94					8.09	636	304	28.6		230	77.4	26.1									0.18	
	28-Mar-95					8.08	664	306	31.7		231	86.7	26.6									0.34	
	15-Jun-97					8.27	552	324	28.0		268	86.5	26.3									0.30	0.060
	15-Jun-98					8.05	601	298	33.0		275	78.1	25.1									0.41	0.230
	15-Jun-99					8.10	677	348	41.0		300	95.2	26.8									0.42	0.070
	15-Jun-00					8.22	635	371	42.0		236	102.0	28.2									0.44	0.130
	15-Jun-01					7.76	669	353	42.0		289	99.9	25.2									0.40	0.080

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO4	15-Jun-02					8.05	749	392	47.0		317	108.0	29.6									0.48	0.210
cont'd	15-Jun-03					8.11	748	370	53.0		295	94.7	32.4									0.68	0.110
	15-Jun-04					8.12	721	337	52.1		294	89.7	26.7									0.70	0.102
	15-Jun-05					8.20	738	335	51.9		298	91.7	25.8									0.40	0.090
	15-Jun-06					7.90	693	340	53.0		290	87.9	30.1									1.10	0.279
	19-Apr-07					7.85	790	380	52.0		330	101.0	30.3									0.56	0.072
	15-Apr-08					8.10	740	350	49.0		310	92.0	29.0									0.47	0.040
	16-Apr-09					8.18	747	316	61.2		306	89.1	22.8									0.52	0.071
	10-May-10	8.16	680	14.8		8.17	530	306	54.3		280	77.9	27.1									0.40	0.058
	11-Apr-11	7.95	723	14.8		8.32	791	345	55.9		322	97.4	24.8									0.35	0.060
	8-Mar-12	7.79	632	7.0		8.34	776	312	50.0		329	87.6	22.7									0.31	0.041
	9-Apr-13	8.39	924	8.7		8.13	879	328	56.8		349	92.4	23.6									0.47	0.110
	28-Mar-14	7.98	896	2.7		8.15	822	329	48.2		339	92.2	23.9									0.20	0.209
	6-Apr-15	7.68	655	8.0		8.15	788	339	52.3		338	94.8	24.9									0.42	0.116
	10-Mar-16	7.50	640	9.6		8.20	859	332	63.3		337	92.3	24.7									0.08	0.042
	7-Mar-17	7.88	782	5.95		8.24	778	283	48.9		306	78.1	21.3									0.422	0.166
	2-Apr-18	8.12	819	8.81	10.7	8.09	765	315	58.1	24.8	338	85.5	24.7	9.49	35.2	5.54	0.121	0.96	<0.25	0.421	<0.003	0.172	0.045
	15-Apr-19	7.97	725	5.78	0.0	8.02	718	304	47.9	21.7	297	83.3	23.4	7.96	30.0	4.20	0.051	0.841	0.019	0.317	<0.00050	0.263	0.0577
	8-Apr-20	7.95	682	11.17	10.1	8.26	768	332	54.1	18.5	328	88.3	27.0	9.37	35.4	4.73	0.084	0.748	0.034	0.374	<0.00050	0.309	0.0593
	12-Apr-21	7.89	683	16.33	1.0	8.11	737	320	52	30	285	86.9	25.0	9.95	33.4	5.3	0.121	0.43	0.04	0.417	0.00045	0.34	0.103
	6-Apr-22	8.36	766	9.42	17.7	8.27	803	382	62	25	338	107	28.2	9.79	38.1	6.2	0.242	0.78	<0.03	0.389	0.00040	0.29	0.0776
	3-Apr-23	7.71	654	6.83	24.9	8.16	626	288	50	24	243	82.9	19.7	8.53	28.3	4.80	0.035	1.83	<0.03	0.287	0.00275	2.66	0.0445
CO6	20-Jul-83					7.27	660	294	16.0		308	87.5	18.2										
	15-Jun-84					7.21	340	175	2.0		158	52.0	11.0									3.00	
	18-Dec-85					7.45	705	287	14.5		308	85.5	17.8									33.80	
	12-Mar-86					7.13	432	202	17.5		175	61.5	11.6									7.80	

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO6	14-Dec-87					7.59	650	328	16.7		79	102.8	17.2									0.12	
cont'd	7-Dec-93					4.50	586	300	13.4		111	92.5	16.8									0.45	
	15-Jun-97																						
	15-Jun-98																						
	15-Jun-99					7.69	617	348	15.0		237	107.0	19.6									0.71	0.120
	15-Jun-00					7.95	488	280	18.0		200	87.3	15.0									0.29	0.040
	15-Jun-01					7.72	545	297	38.0		242	92.9	15.9									0.07	0.020
	15-Jun-02					7.93	586	322	39.0		239	100.0	17.6									0.26	0.060
	15-Jun-03					7.86	622	321	49.0		220	97.6	18.7									0.18	0.080
	15-Jun-04					7.92	491	257	30.7		221	87.2	15.2									0.17	0.022
	15-Jun-05					8.15	518	241	29.9		213	74.8	13.1									<0.1	<0.005
	15-Jun-06					7.72	482	290	30.0		230	89.8	16.6									0.23	0.029
	19-Apr-07					7.58	572	290	35.0		250	86.6	16.9									0.18	0.018
	15-Apr-08					8.00	487	230	38.0		180	69.0	14.0									0.10	
	16-Apr-09					7.87	593	266	54.7		232	87.0	11.9									0.12	0.007
	10-May-10	7.55	590	12.4		8.31	657	338	26.7		289	105.0	18.3									3.00	0.323
	11-Apr-11	7.75	511	11.5		8.23	571	255	48.1		214	80.2	13.2									<0.01	0.003
	11-Apr-11	7.75	511	11.5		8.29	575	247	48.4		207	78.1	12.6									<0.01	0.003
	8-Mar-12	7.57	414	4.7		8.21	514	214	30.2		210	66.9	11.5									0.01	0.005
	9-Apr-13	8.25	541	4.9		7.77	480	196	27.1		194	61.5	10.3									<0.01	<0.002
	28-Mar-14	7.96	605	0.4		8.11	548	238	32.7		229	72.9	13.5									0.21	0.058
	6-Apr-15	8.03	412	5.0		7.91	523	253	33.2		222	78.9	13.5									<0.01	0.008
	10-Mar-16	7.56	355	8.0		7.96	465	233	19.6		207	72.3	12.7									<0.01	0.005
	7-Mar-17	7.67	556	4.89		8.01	559	204	58.1		171	63.2	11.2									0.013	0.010
	4-May-17	8.15	625	8.53		8.32	657	249	47.2	11.9	243	77.6	13.4	1.21	24.1	0.12	0.003	0.20	<0.10	0.015	<0.003	<0.010	0.008
	2-Apr-18	7.43	566	8.25	12.3	7.85	508	234	44.6	15.9	208	72.9	12.6	1.23	18.2	<0.02	<0.001	1.00	<0.10	0.018	<0.003	<0.010	0.002
	18-Oct-18	D	R	Y																			

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
CO6	15-Apr-19	7.84	521	3.92	0.0	7.80	509	226	45.9	8.25	201	68.4	13.3	1.49	25.1	0.049	<0.001	1.12	0.015	0.011	<0.00050	0.225	0.0149
cont'd	8-Oct-19	D	R	Y																			
	8-Apr-20	7.97	567	8.75	2.0	8.07	604	274	45.4	7.52	259	82.8	16.2	1.47	26.4	0.027	<0.001	0.192	<0.010	0.014	<0.00050	0.078	0.0114
	15-Oct-20	D	R	Y																			
	12-Apr-21	7.64	511	13.84	0.0	8.05	549	280	30	14	237	89.5	13.9	1.82	13.2	<0.1	<0.001	0.11	<0.03	0.026	0.00041	0.11	0.0334
	7-Oct-21	7.55	662	10.37	22.8	8.05	754	382	41	<2	342	122	18.8	2.19	22.6	<0.1	<0.001	0.76	<0.03	0.034	0.00072	0.60	0.243
	6-Apr-22	7.69	558	6.86	10.4	8.13	592	298	52	15	253	91.5	16.9	1.27	27.8	<0.1	<0.001	0.22	<0.03	0.040	0.00032	0.05	0.0342
	18-Oct-22	D	R	Y																			
	3-Apr-23	7.48	573	5.13	7.6	8.00	491	220	52	20	176	68.9	11.6	1.88	23	0.04	<0.001	4.57	0.04	0.023	0.00013	0.245	0.00576
	12-Oct-23	D	R	Y																			
NE1	20-Jul-83					7.44	330	169	4.5		156	54.0	8.2										
	18-Sep-84					8.00	425	163	24.0		153	53.0	7.4									<0.04	
	24-Jun-85					7.64	510	167	31.5		210	44.5	13.6									1.10	
	18-Dec-85					7.57	580	242	22.0		236	79.5	10.6									0.60	
	18-Sep-86					8.30	227	96	5.0		89	31.5	4.2									1.85	
	6-Mar-87					8.03	309	142	7.0		128	46.5	6.2									0.44	
	7-Mar-88					7.65	254	128	4.3		89	42.5	5.2									2.30	
	12-Dec-88					7.28	506	230	13.6		211	75.8	9.9									0.50	
	5-Mar-90					7.05	241	120	2.9		105	41.5	4.0									0.09	
	21-Jun-90					8.12	553	266	15.2		283	87.9	11.2									1.14	
	2-Dec-90					8.20	605	260	22.4		261	86.2	10.9									0.05	
	11-Mar-91					6.68	646	32	0.9		25	10.4	1.5									0.06	
	24-Mar-92					7.39	336	165	9.7		105	52.4	8.3									0.02	
	16-Jun-92					7.75	699	316	20.1		329	98.9	16.6									1.14	
	7-Dec-92					7.30	425	208	9.3		212	68.9	8.6									0.40	
	23-Mar-93					6.80	1047	507	21.8		513	170.0	19.8									30.60	
	21-Mar-94					7.12	234	117	4.9		109	40.8	3.6									0.11	

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	°C	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
NE1	21-Jun-94					7.62	604	287	15.1		245	93.9	12.8									2.23	
cont'd	28-Mar-95					7.44	367	181	7.4		173	60.3	7.3									0.15	
	15-Jun-97					8.31	565	314	13.0		321	103.0	13.7									0.28	0.030
	15-Jun-98					7.60	639	344	18.0		278	112.0	18.0									1.41	0.440
	15-Jun-99					8.17	798	413	26.0		346	140.0	26.0									0.18	<0.02
	15-Jun-00					7.64	703	428	15.0		300	144.0	15.0									0.55	0.080
	15-Jun-01					7.21	437	256	7.0		224	86.1	7.0									0.22	0.030
	15-Jun-02					7.72	795	399	28.0		385	130.0	28.0									0.56	0.250
	15-Jun-03					7.72	659	361	23.0		311	118.0	23.0									0.35	0.270
	15-Jun-04					7.97	657	357	21.2		337	102.0	21.2									0.92	0.034
	15-Jun-05					8.16	730	318	33.4		334	99.3	33.4									0.10	0.029
	15-Jun-06					7.55	637	370	14.0		340	121.0	14.0									0.78	0.053
	19-Apr-07					7.25	642	340	13.0		320	110.0	16.1									0.34	0.023
	15-Apr-08					7.60	380	210	4.0		180	67.0	10.0									0.09	0.010
	16-Apr-09					7.63	717	341	19.0		350	115.0	13.0									0.21	0.014
	10-May-10	7.69	630	11.8		8.02	599	308	25.9		314	98.0	15.4									0.66	0.082
	11-Apr-11	7.78	421	13.1		8.15	491	241	14.7		221	81.2	9.35									0.01	0.028
	8-Mar-12	7.84	126	6.7		7.84	258	113	5.18		123	38.1	4.22									0.12	0.069
	9-Apr-13	8.29	227	5.6		7.75	240	104	5.09		112	34.2	4.40									0.02	0.048
	28-Mar-14	7.97	378	1.8		7.90	306	150	4.76		153	47.9	7.30									0.38	0.196
	6-Apr-15	8.30	220	10		7.69	260	120	8.30		115	38.9	5.48									<0.01	0.048
	10-Mar-16	7.71	267	8.9		7.77	399	152	21.7		156	47.9	7.88									<0.01	0.035
	7-Mar-17	7.52	593	5.3		8.05	585	237	14.3		255	77.9	10.2									<0.010	0.088
	2-Apr-18	7.64	465	9.56	8.5	7.89	429	232	4.29	8.75	239	77.3	9.40	2.50	2.82	0.40	0.003	0.88	<0.10	0.046	<0.003	0.016	0.069
	15-Apr-19	8.16	585	5.18	0.0	7.55	480	244	6.75	5.33	237	79.7	10.9	3.81	5.74	1.67	0.030	3.53	0.035	0.054	<0.00050	0.071	0.00734
	8-Apr-20	8.09	493	9.35	2.8	7.85	618	323	6.29	5.50	326	106	14.0	3.60	5.35	1.91	0.041	2.50	0.069	0.060	<0.00050	0.039	0.0233
	12-Apr-21	7.67	590	14.82	2.0	8.02	639	318	30	4	296	104	13.9	10.1	17.3	1.2	0.015	<0.06	<0.03	0.143	0.00031	0.73	0.103
	6-Apr-22	8.11	607	8.77	17.0	7.73	656	391	7	5	371	132	14.8	4.35	4.58	2.4	0.051	0.32	<0.03	0.077	0.00029	0.33	0.0566
	3-Apr-23	6.71	453	5.41	20.9	7.79	279	178	3	8	162	60.0	6.82	1.88	1.93	0.07	<0.001	0.65	<0.03	0.026	0.00024	0.353	0.0145

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	°C	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
PO1	18-Sep-84					8.30	365	179	9.0		133	52.0	12.0									<0.04	
	24-Jun-85					8.21	350	150	14.0		146	29.5	18.4									2.00	
	18-Dec-85					7.47	715	338	27.5		283	96.5	23.4									0.46	
	18-Sep-86					8.26	279	122	7.5		113	33.0	9.6									0.18	
	6-Mar-87					7.87	454	233	7.5		208	66.5	16.2									0.78	
	14-Sep-87					9.00	262	116	3.5			21.5	15.0									0.46	
	7-Mar-88					7.71	192	97	4.1		72	30.9	4.8									0.80	
	12-Dec-88					7.77	538	255	10.8		231	72.6	17.9									0.37	
	13-Jun-89					8.20	429	187	23.0			36.3	23.4									0.14	
	11-Sep-89					7.78	335	191	10.3		142	46.0	18.4									1.75	
	5-Mar-90					7.66	471	235	10.6		203	66.5	16.6									0.38	
	21-Jun-90					8.32	405	207	8.9		182	56.4	15.9									1.05	
	2-Dec-90					8.56	436	212	11.6		195	60.9	14.4									0.24	
	11-Mar-91					7.58	378	186	6.7		169	55.6	11.4									0.63	
	9-Sep-91					7.64	359	163	7.1		155	41.4	14.5									0.73	
	24-Mar-92					8.18	408	208	7.8		178	57.7	15.5									0.22	
	16-Jun-92					8.78	259	132	6.4		95	22.2	18.6									2.35	
	7-Dec-92					8.20	427	226	4.5		216	61.2	17.8									0.35	
	23-Mar-93					7.33	336	134	11.7		133	42.9	6.5									3.46	
	7-Sep-93					7.73	343	169	7.9		155	35.1	19.8									1.87	
	21-Mar-94					7.36	339	175	6.3		148	53.2	10.3									1.94	
	21-Jun-94					7.50	312	156	2.4		156	36.5	15.8									<0.01	
	6-Dec-94					7.98	310	157	4.8		147	38.7	14.7									1.36	
	28-Mar-95					8.69	261	136	2.6		121	30.6	14.5									0.62	
	15-Jun-97					8.45	350	195	8.2		182	50.8	16.6									1.01	0.170
	15-Jun-98					8.42	323	189	10.0		168	45.1	18.6									1.91	0.100
	15-Jun-99					8.21	410	217	6.0		178	81.2	15.5									0.29	0.030

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
PO1	15-Jun-00					8.28	532	316	18.0		210	92.9	20.4									0.11	0.040
cont'd	15-Jun-01					7.88	524	256	21.0		246	72.4	18.2									0.29	0.060
	15-Jun-02					8.06	560	284	18.0		259	79.2	21.0									0.57	0.040
	15-Jun-03					8.05	560	315	21.0		227	88.3	22.9									0.07	0.020
	15-Jun-04					8.01	432	222	18.9		181	57.0	18.7									0.31	0.061
	15-Jun-05					8.15	496	231	16.2		190	63.0	17.9									0.22	0.070
	15-Jun-06					7.97	414	210	24.0		180	50.6	21.4									0.58	0.056
	19-Apr-07					8.13	378	180	13.0		170	39.4	20.1									0.30	0.013
	15-Apr-08					8.20	443	200	16.0		180	51.0	18.0									0.16	0.010
	16-Apr-09					8.16	478	197	26.9		197	53.0	15.6									0.10	0.009
	10-May-10	8.36	390	14.7		8.34	534	208	12.7		258	51.1	19.6									0.30	0.029
	11-Apr-11	8.12	450	17.7		8.39	491	226	13.0		223	65.6	15.1									0.06	0.020
	8-Mar-12	7.93	416	7.1		8.34	592	234	24.8		261	66.5	16.4									0.14	0.012
	9-Apr-13	8.46	471	8.4		8.00	421	192	5.72		199	53.3	14.2									0.07	0.011
	28-Mar-14	8.41	215	1.9		8.02	237	115	1.26		120	37.7	5.03									0.08	0.004
	6-Apr-15	6.50	420	7.4		7.91	488	268	4.21		254	83.0	14.8									0.06	0.025
	10-Mar-16	7.64	540	10.1		8.05	522	238	14.9		237	70.8	14.8									<0.01	0.018
	7-Mar-17	7.76	457	5.2		8.19	459	208	6.35		212	63.5	12.1									0.123	0.021
	2-Apr-18	8.07	495	6.33	9.9	8.08	455	222	14.1	9.18	232	63.8	15.3	6.92	10.5	0.21	0.003	1.87	<0.10	0.118	<0.003	0.104	0.010
	15-Apr-19	7.85	476	6.5	5.0	7.76	422	186	9.45	4.16	212	56.5	10.9	3.17	3.45	0.078	0.001	1.25	0.016	0.038	<0.00050	0.208	0.0183
	8-Apr-20	8.12	421	11.55	10.4	8.22	472	238	11.4	6.85	235	65.6	17.9	7.57	9.71	0.061	0.002	1.78	0.036	0.135	<0.00050	0.216	0.0318
	12-Apr-21	8.12	363	16.03	0.0	8.12	366	326	9	8	175	88.5	25.6	10.5	34.3	<0.1	<0.004	0.72	<0.03	0.45	0.00036	0.34	0.102
	6-Apr-22	8.26	431	9.62	16.5	8.2	456	249	10	8	234	71.5	17.1	4.37	6.11	<0.1	<0.003	0.34	<0.03	0.085	0.00017	0.17	0.0201
	3-Apr-23	7.65	440	5.28	30.0	8.02	330	215	12	6	208	65.3	12.6	4.49	5.04	0.06	<0.001	1.33	<0.03	0.076	0.00154	1.45	0.0376

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

Well	Date	Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
		pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	°C	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
PO2	15-Jun-84					7.67	780	369	24.5		331	104.0	26.4									0.18	
	18-Dec-84					7.73	670	251	21.0		271	59.0	25.0									0.48	
	7-Oct-85					8.02	605	275	20.5		218	70.5	24.0									0.10	
	12-Mar-86					8.12	120	39	6.0		40	12.5	1.8									2.52	
	10-Jun-86					7.97	670	328	23.0		282	89.0	25.6									0.19	
	15-Dec-86					7.37	640	302	20.5		285	83.0	23.0									0.17	
	12-Jun-87					7.91	615	284	26.0		252	69.0	27.0									0.45	
	14-Dec-87					8.04	645	319	22.4		263	89.6	23.1									0.25	
	6-Sep-88					7.94	505	234	24.0		198	54.9	23.6									0.18	
	14-Mar-89					7.54	680	321	23.3		290	89.1	23.9									0.23	
	11-Dec-89					7.86	689	349	24.8		297	95.3	27.0									0.07	
	11-Jun-90					8.52	453	216	25.2		173	46.3	24.3									0.21	
	17-Sep-90					7.98	474	213	25.7		183	47.9	22.6									0.13	
	17-Jun-91					8.20	440	181	27.6		160	34.7	22.9									0.16	
	3-Dec-91					8.17	571	279	26.1		229	71.2	24.6									0.16	
	15-Sep-92					8.16	487	228	26.7		188	52.3	23.6									0.20	
	15-Jun-93					8.27	390	173	25.6		152	32.7	22.1									0.20	
	7-Dec-93					8.09	605	338	26.0		222	91.2	26.8									0.20	
	26-Jun-95					8.27	468	209	32.0		170	41.9	25.2									0.20	
	15-Jun-97					8.34	567	327	29.2		269	87.8	26.2									0.41	0.110
	15-Jun-98					8.28	599	300	34.0		256	79.3	24.8									0.42	0.210
	15-Jun-99					8.03	712	364	40.0		313	99.9	27.7									0.38	0.100
	15-Jun-00					8.61	377	203	10.0		174	48.9	19.6									0.54	0.040
	15-Jun-01					7.67	678	376	44.0		292	107.0	26.5									0.42	0.090
	15-Jun-02					8.01	770	387	48.0		321	107.0	29.0									0.45	0.200
	15-Jun-03					8.13	731	389	50.0		286	103.0	31.9									0.90	0.090
	15-Jun-04					7.89	521	321	27.2		289	94.7	18.7									0.51	0.100

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
PO2	15-Jun-05					8.10	745	333	49.9		301	91.4	25.5									0.40	0.090
cont'd	15-Jun-06					7.59	481	310	22.0		240	97.0	17.5									0.59	0.115
	19-Apr-07					7.84	777	380	52.0		330	102.0	31.3									0.55	0.061
	15-Apr-08					8.10	741	360	49.0		310	95.0	30.0									0.42	0.050
	16-Apr-09					8.20	763	305	57.4		296	85.8	22.1									0.34	0.014
	10-May-10	7.88	760	18.1		8.25	374	327	51.6		195	87.4	26.5									0.29	0.067
	11-Apr-11	7.70	780	14.4		8.27	863	363	64.1		343	102	26.4									0.22	0.055
	8-Mar-12	7.58	8.28	8		8.37	861	325	65.3		348	89.1	25.0									0.44	0.050
	9-Apr-13	8.42	928	8.9		8.05	885	333	58.3		349	93.7	24.0									0.54	0.149
	28-Mar-14	7.63	948	2.6		8.10	876	342	55.8		365	94.9	25.4									0.32	0.233
	28-Mar-14	7.63	948	2.6		8.15	882	341	54.6		366	95.0	25.2									0.37	0.219
	6-Apr-15	7.30	720	9.1		7.93	898	372	65.4		372	102	28.4									0.91	0.127
	10-Mar-16	7.52	519	10.4		8.12	691	321	35.8		308	97.5	18.8									<0.01	0.084
	7-Mar-17	7.84	844	6.98		8.21	819	282	56.4		322	75.7	22.5									0.170	0.023
	2-Apr-18	8.13	784	7.88	26.2	8.06	795	323	60.2	23.8	357	86.5	25.9	10.5	37.4	8.47	0.176	0.29	<0.25	0.453	<0.003	0.210	0.023
	15-Apr-19	7.60	807	6.40	0.0	7.90	774	319	57.0	18.8	335	84.6	26.1	9.56	36.9	6.93	0.038	0.414	0.017	0.386	0.00150	0.375	0.0556
	8-Apr-20	7.92	715	11.81	2.0	8.18	795	334	57.2	17.2	341	87.1	28.2	10.3	37.5	6.56	0.115	0.256	0.014	0.383	<0.00050	0.472	0.0844
	12-Apr-21	7.77	736	17.66	2.0	8.13	799	316	63	20	306	83.0	26.3	11.8	37.9	7.5	0.144	0.27	<0.03	0.435	0.00035	0.36	0.104
	6-Apr-22	7.56	889	8.51	15.6	8.10	864	402	71	26	373	110	31.0	12.3	45.5	9.7	0.058	0.32	<0.03	0.443	0.00023	0.56	0.0833
	3-Apr-23	7.34	714	5.94	68.7	8.00	632	256	53	19	260	73.6	17.5	9.31	28.5	5.55	0.016	2.28	0.040	0.235	0.00338	3.93	0.135

Note: refer to notation page for surface water notation details

Table E-1: Surface Water Chemical Results

		Field Parameters				General Parameters			Major and Minor Ions							Nutrients and Organic Indicators				Metals			
Well	Date	pH	EC	T	Turbidity	pH	EC	Total Hardness	Chloride	Sulphate	Alkalinity	Calcium	Magnesium	Potassium	Sodium	Ammonia	Un-ionized Ammonia	Nitrate	Nitrite	Boron	Chromium	Iron	Manganese
	Units	SU	µS/cm	ºC	NTU	SU	µS/cm																
	PQWO	6.5-8.5	nc	nc	Narrative	6.5-8.5	nc	nc	nc	nc	*a*	nc	nc	nc	nc	nc	0.02	nc	nc	0.2 *i*	0.0089	0.3	nc
PO3	15-Jun-84					7.57	495	209	21.5		198	63.0	12.6									1.30	
	18-Dec-84					7.64	730	297	55.0		181	87.0	19.2									0.35	
	12-Mar-86					7.54	423	132	30.0		122	41.0	7.2									4.70	
	15-Dec-86					7.52	273	136	12.0		106	45.0	5.6									0.68	
	14-Dec-87					8.01	328	150	12.6		101	49.9	6.1									1.18	
	6-Sep-88					7.78	680	162	8.3		87	52.6	7.3									22.8	
	14-Mar-89					7.60	208	94	5.8		65	30.5	4.2									1.02	
	3-Dec-91					7.64	468	204	24.7		175	63.5	11.0									0.63	
	15-Sep-92					7.68	412	197	6.1		199	63.9	9.1									1.60	
	7-Dec-92					8.02	631	307	24.3		246	96.9	15.8									0.20	
	15-Jun-00					8.23	635	358	43.0		234	98.4	27.3									0.37	0.110
	15-Jun-04					7.91	531	331	7.2		302	106.0	18.7									0.27	0.062
	15-Jun-05					8.21	597	330	6.8		307	102.0	18.4									<0.1	0.042
	15-Jun-06					7.84	512	350	10.0		300	103.0	21.4									0.31	0.086
	19-Apr-07					7.72	548	300	7.0		300	87.4	19.2									0.26	0.018
	15-Apr-08					8.10	493	250	10.0		240	76.0	15.0									0.15	0.020
	16-Apr-09					8.12	637	327	19.0		315	101.0	18.1									0.068	0.023
	11-Apr-11	7.86	397	14.9		8.31	448	207	11.1		208	64.6	11.1									<0.01	0.006
	8-Mar-12	8.16	97	2.5		8.10	264	95	10.9		110	28.9	5.6									0.016	0.004
	7-Mar-17	8.04	525	4.68		8.14	543	200	17.4		233	62.3	10.8									0.053	0.003
	2-Apr-18	7.90	686	8.97	13.4	8.00	575	244	27.8	6.56	274	75.7	13.3	13.4	21.3	1.92	0.026	3.50	<0.10	0.417	<0.003	<0.010	0.002
	15-Apr-19	7.99	558	2.87	0.0	7.85	531	233	19.3	3.12	258	70.9	13.7	14.0	18.5	2.95	0.030	2.71	0.017	0.368	<0.00050	0.053	0.00629
	8-Apr-20	8.13	583	9.54	2.4	8.11	657	337	14.8	17.6	329	102	20.2	12.4	14.9	0.176	0.004	1.98	0.032	0.525	<0.00050	0.113	0.0242
	12-Apr-21	D	R	Y																			
	6-Apr-22	7.94	555	8.01	12.0	8.09	593	369	9	34	301	111	22.2	6.92	5.72	<0.1	<0.001	<0.06	<0.03	0.389	0.00035	0.02	0.00215
	3-Apr-23	7.22	341	5.60	9.9	7.93	252	138	10	8	138	43.4	7.23	8.55	7.28	0.60	0.001	1.30	<0.03	0.190	0.00046	0.698	0.0240

Note: refer to notation page for surface water notation details

Figure E-1
Concentration Versus Time - Surface Water Station CO1
Holbrook Landfill Site - Surface Water

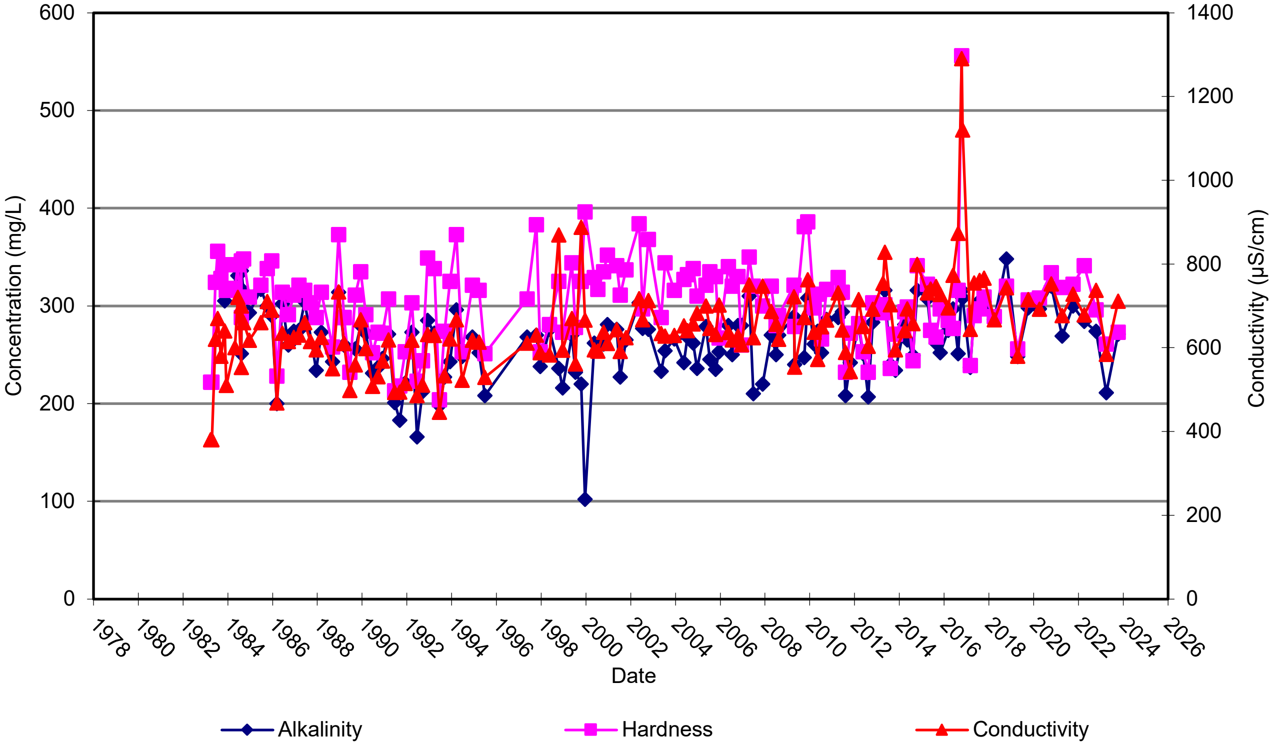


Figure E-2
Concentration Versus Time - Surface Water Station CO1
Holbrook Landfill Site - Surface Water

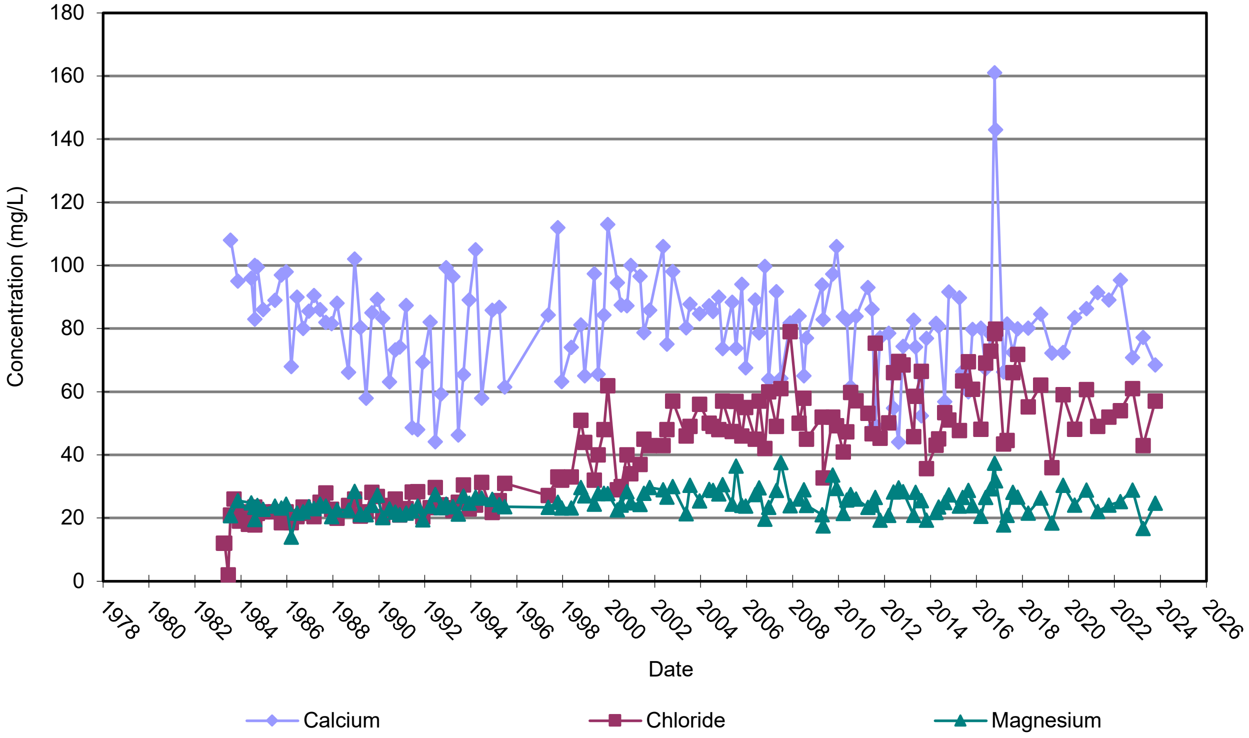


Figure E-3
Concentration Versus Time - Surface Water Station CO1
Holbrook Landfill Site - Surface Water

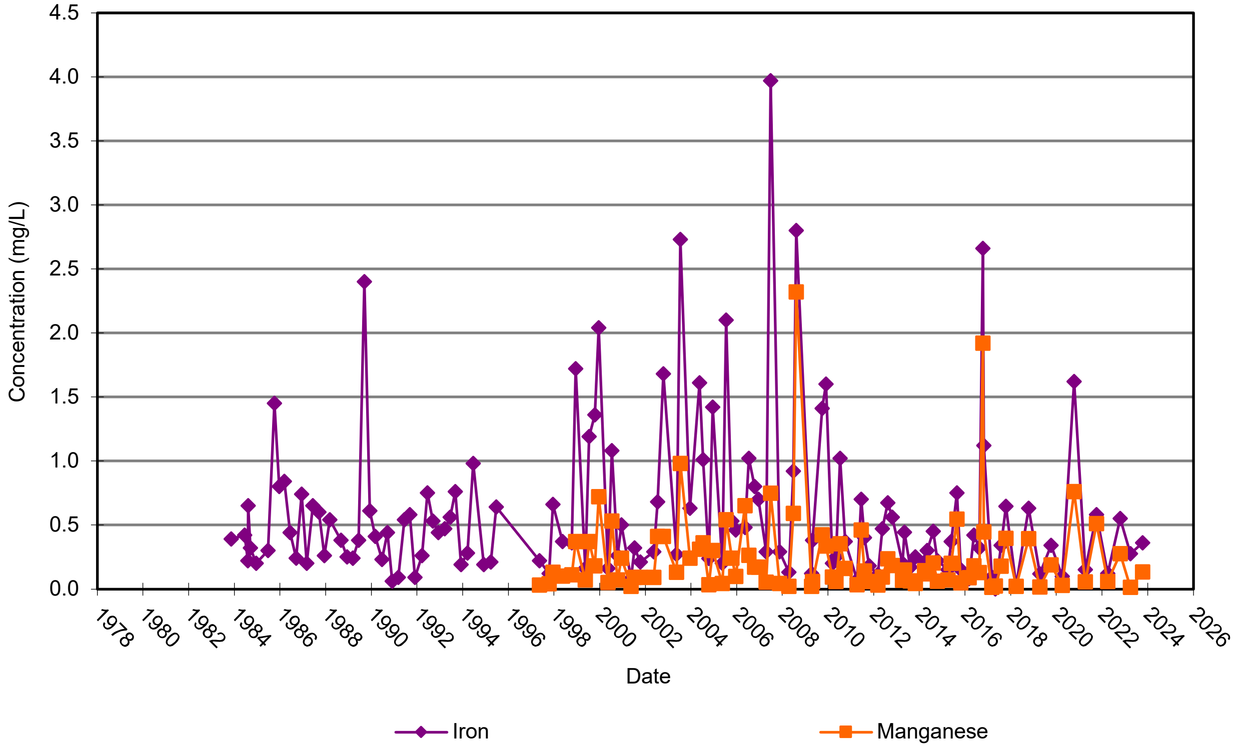


Figure E-4
Concentration Versus Time - Surface Water Station CO4
Holbrook Landfill Site - Surface Water

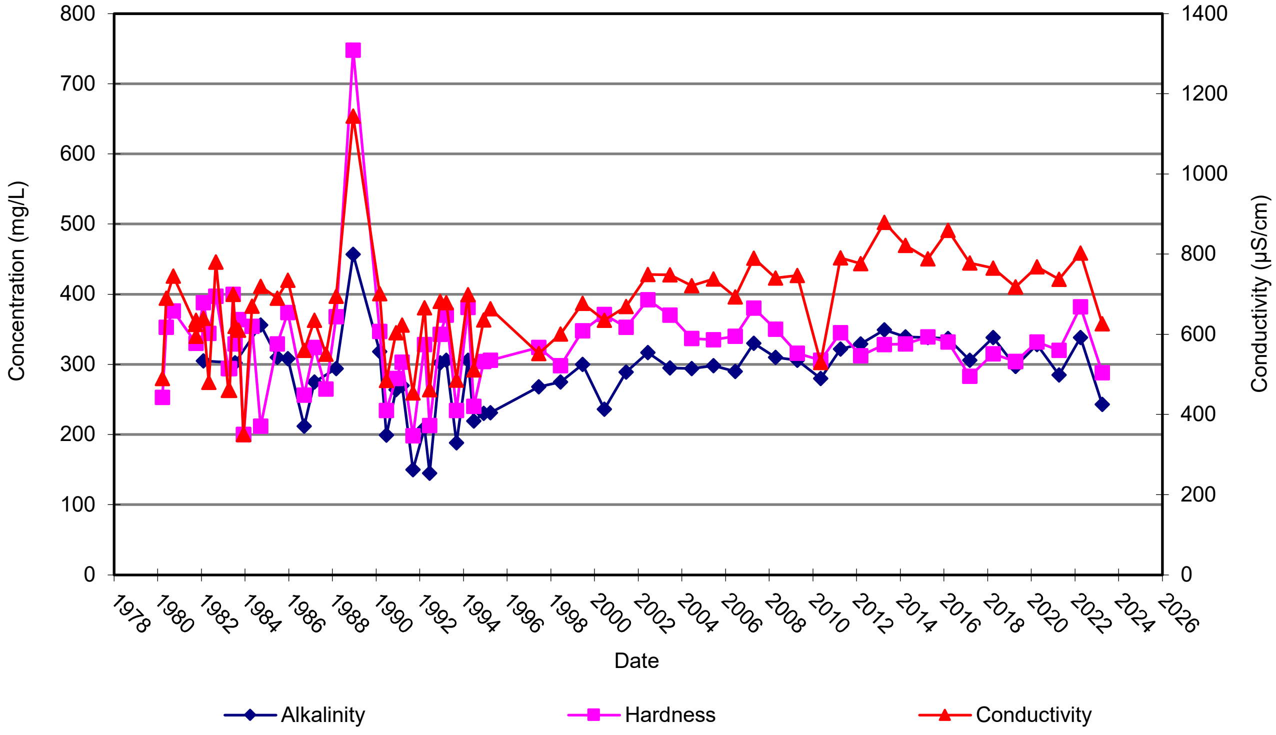


Figure E-5
Concentration Versus Time - Surface Water Station CO4
Holbrook Landfill Site - Surface Water

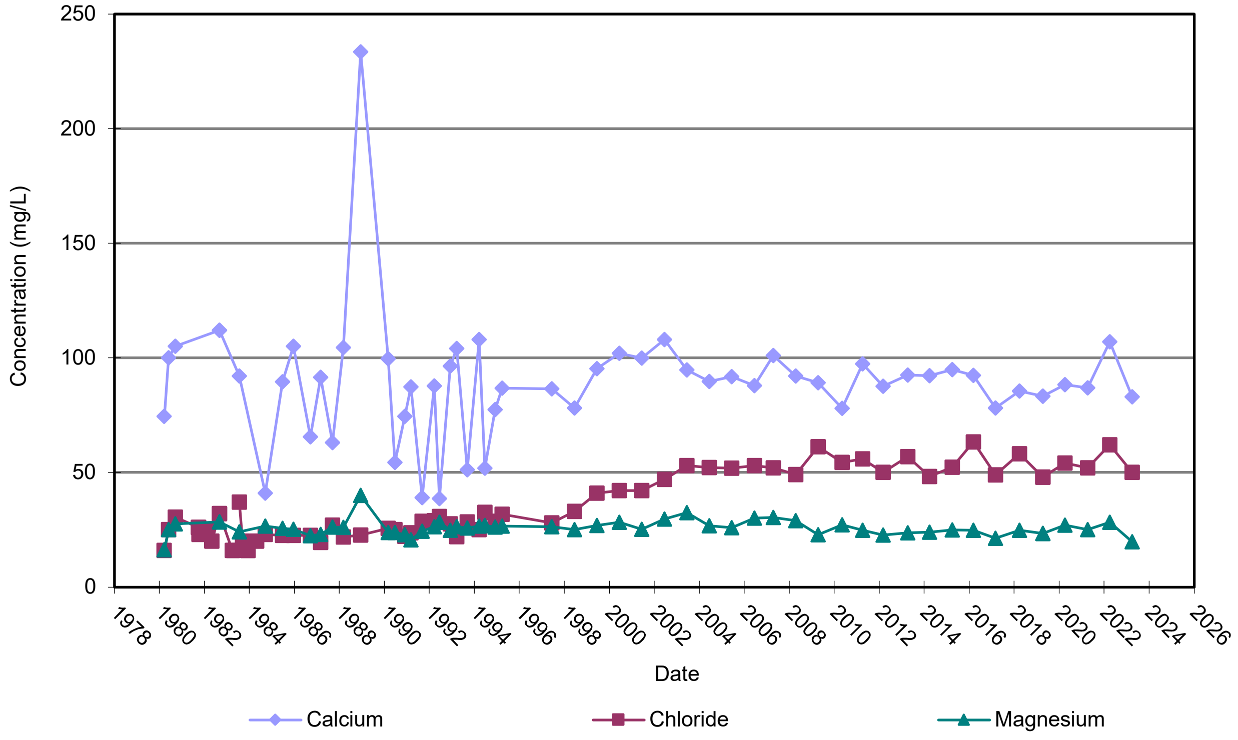


Figure E-6
Concentration Versus Time - Surface Water Station CO4
Holbrook Landfill Site - Surface Water

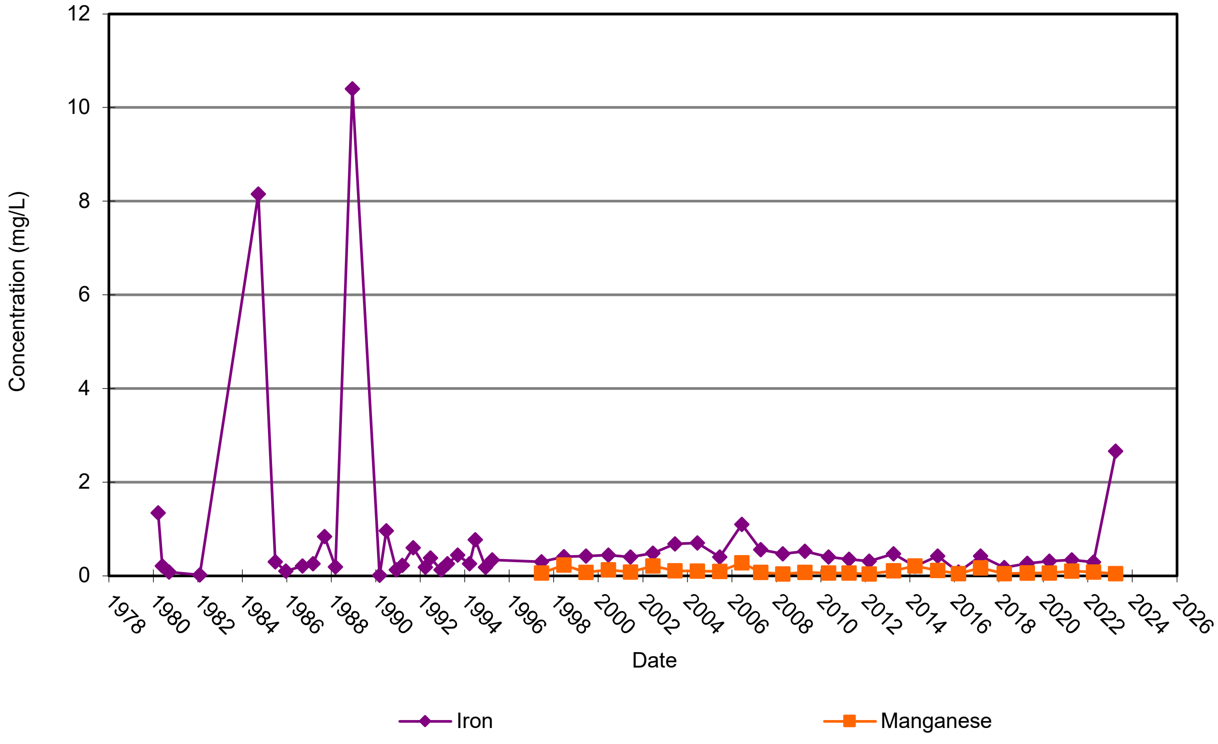


Figure E-7
Concentration Versus Time - Surface Water Station CO6
Holbrook Landfill Site - Surface Water

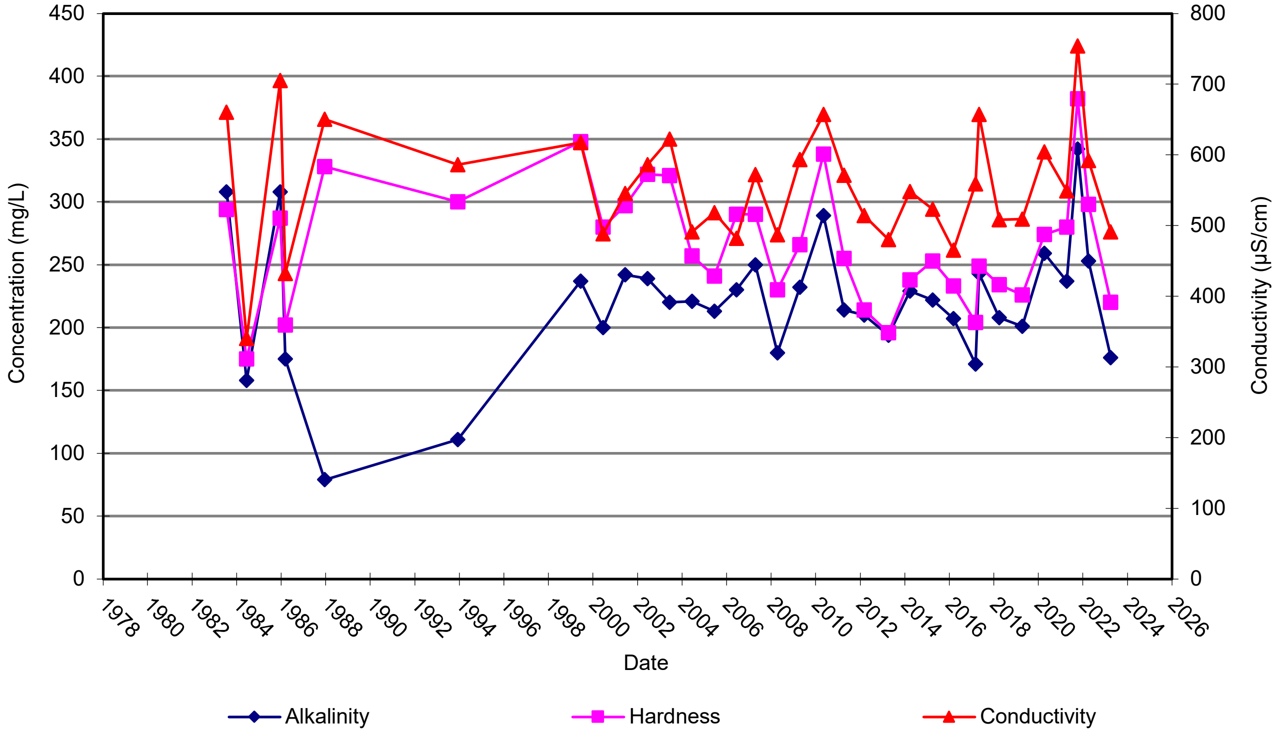


Figure E-8
Concentration Versus Time - Surface Water Station CO6
Holbrook Landfill Site - Surface Water

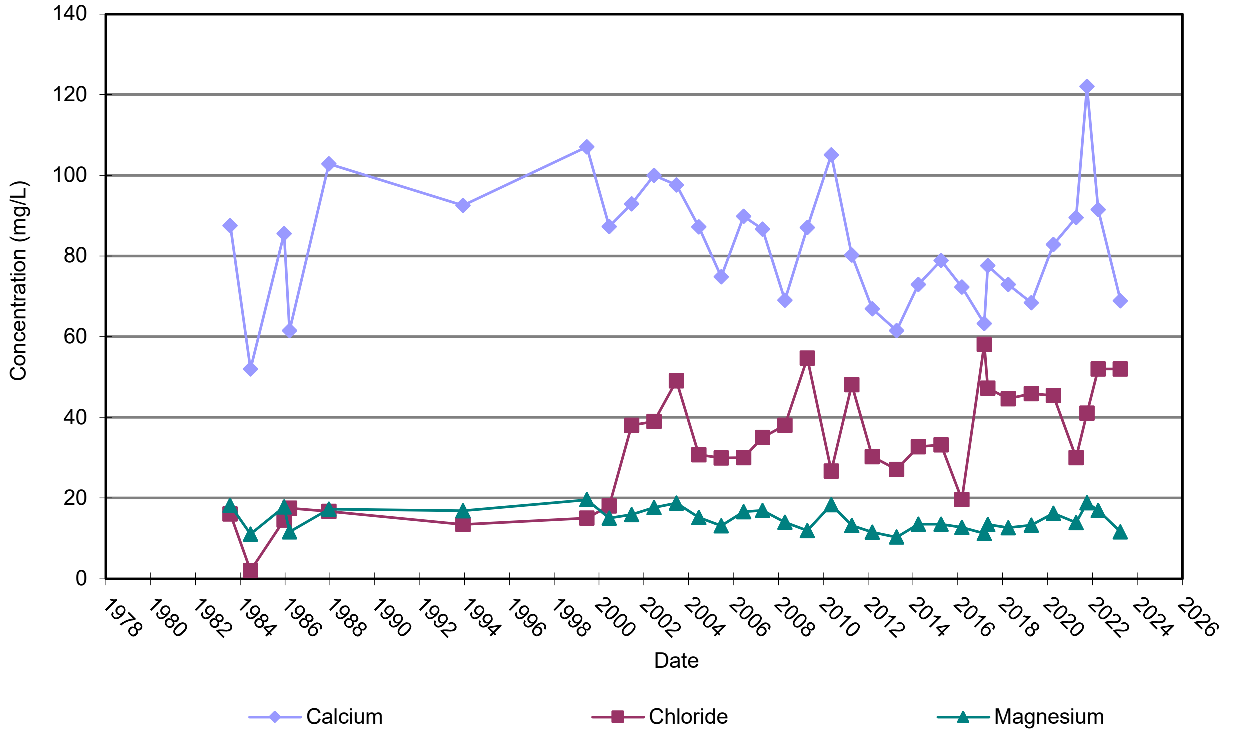


Figure E-9
Concentration Versus Time - Surface Water Station CO6
Holbrook Landfill Site - Surface Water

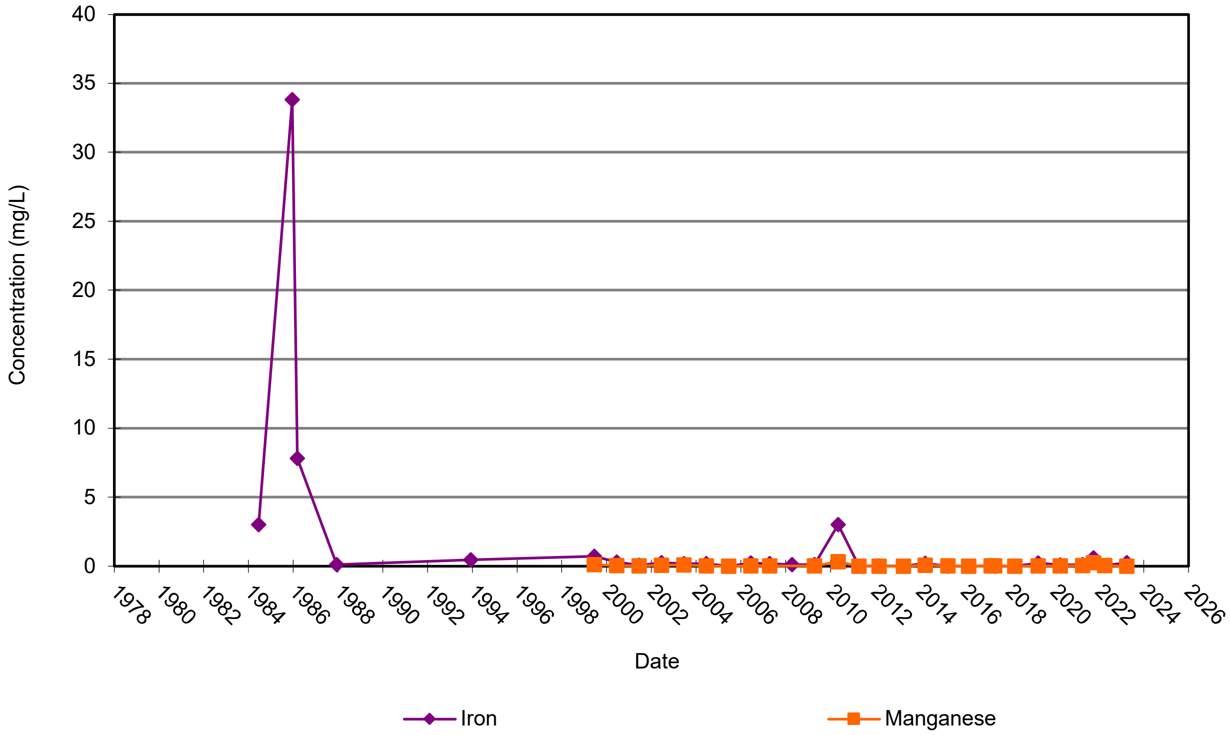


Figure E-10
Concentration Versus Time - Surface Water Station NE1
Holbrook Landfill Site - Surface Water

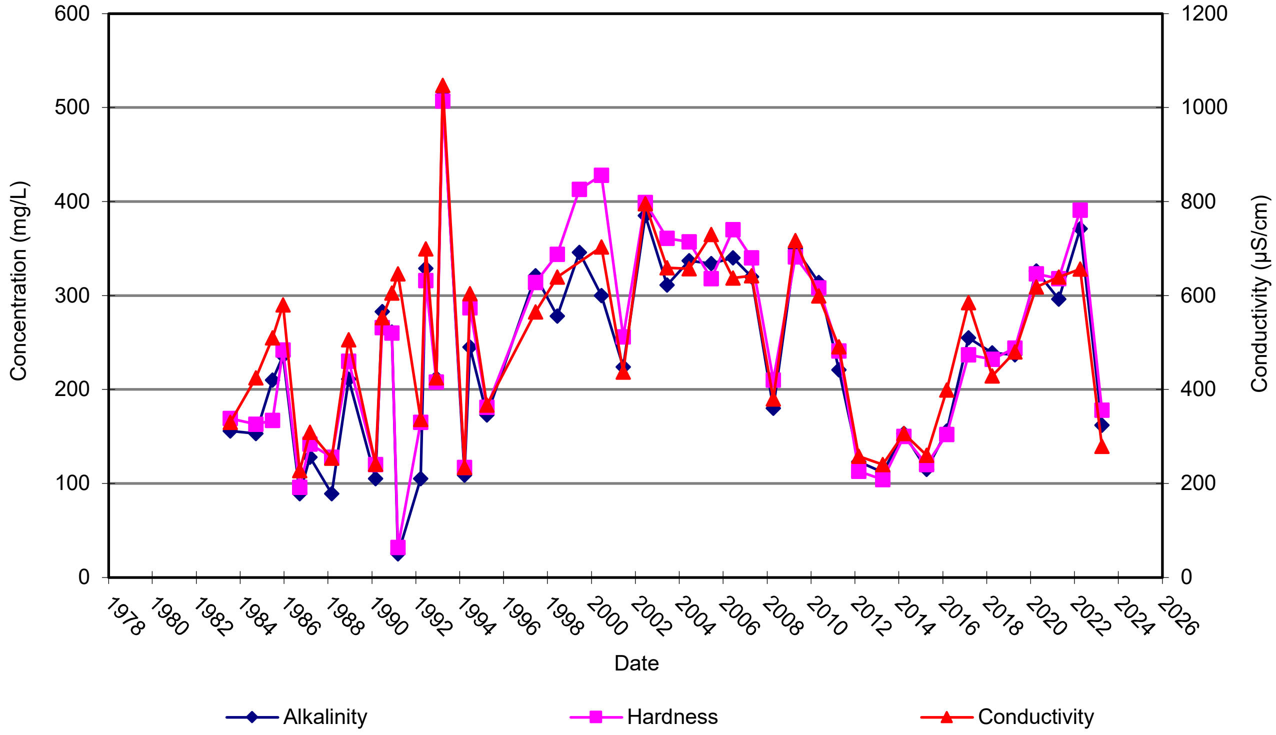


Figure E-11
Concentration Versus Time - Surface Water Station NE1
Holbrook Landfill Site - Surface Water

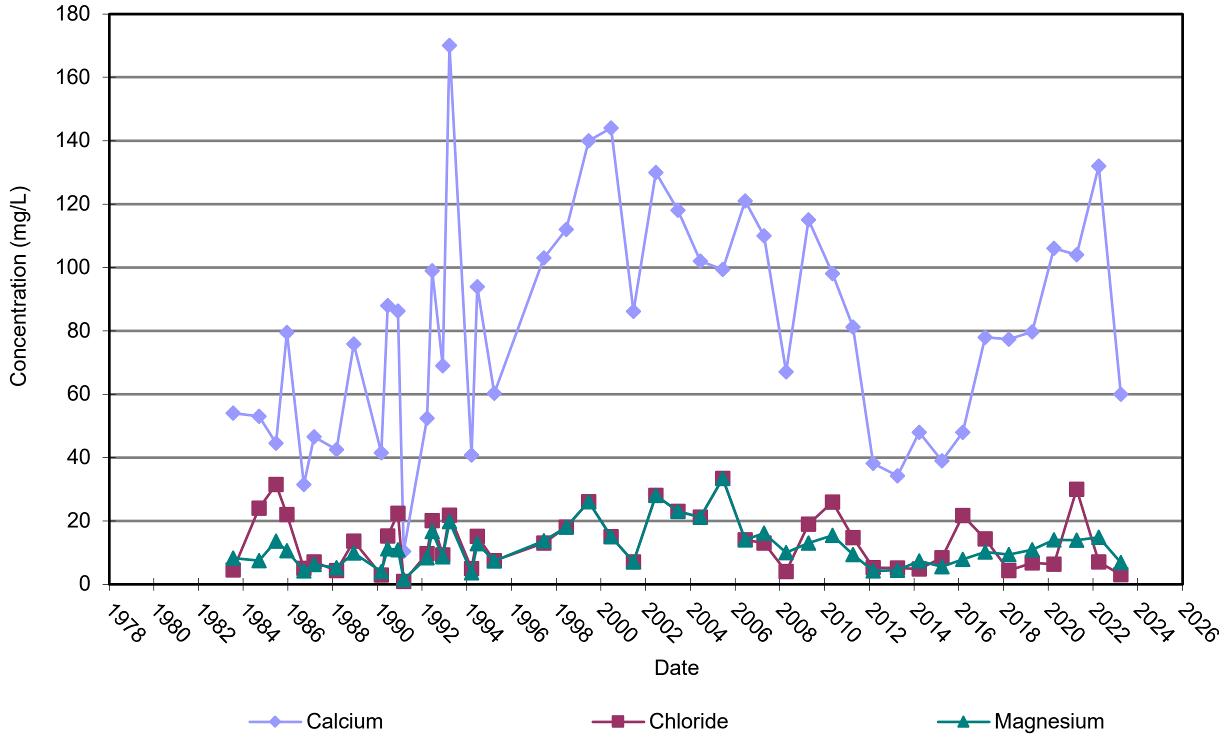


Figure E-12
Concentration Versus Time - Surface Water Station NE1
Holbrook Landfill Site - Surface Water

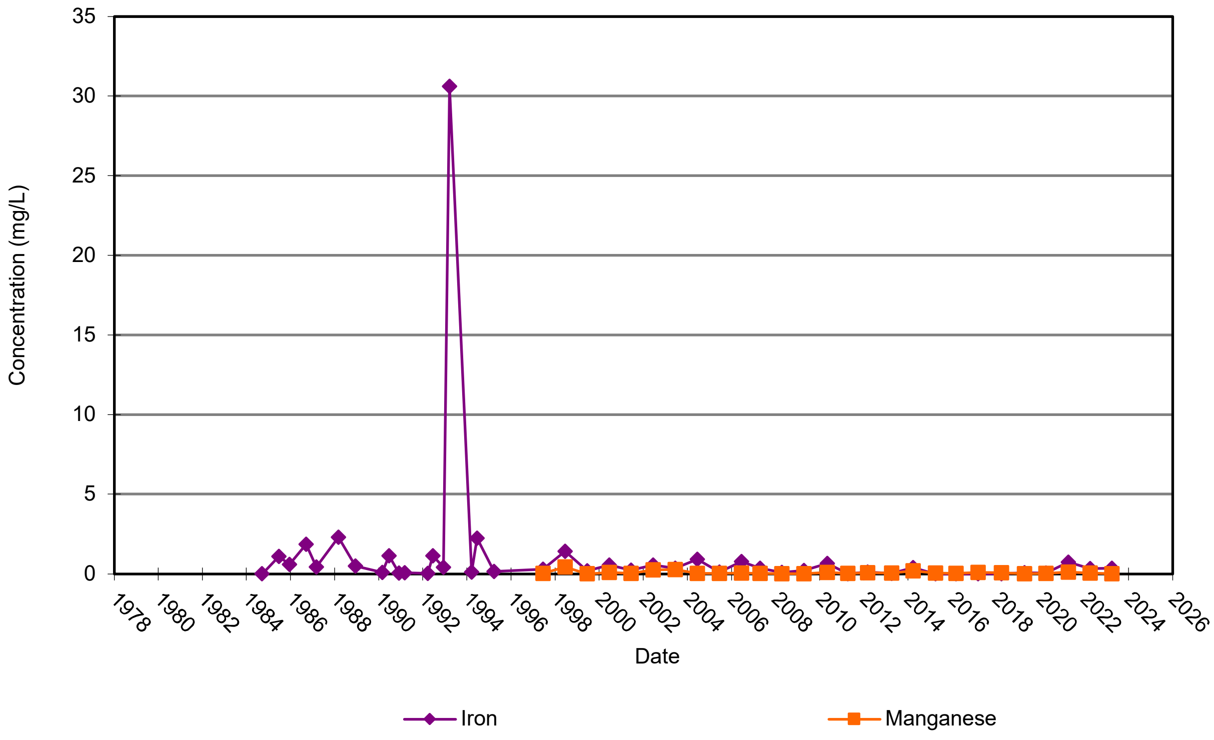


Figure E-13
Concentration Versus Time - Surface Water Station PO1
Holbrook Landfill Site - Surface Water

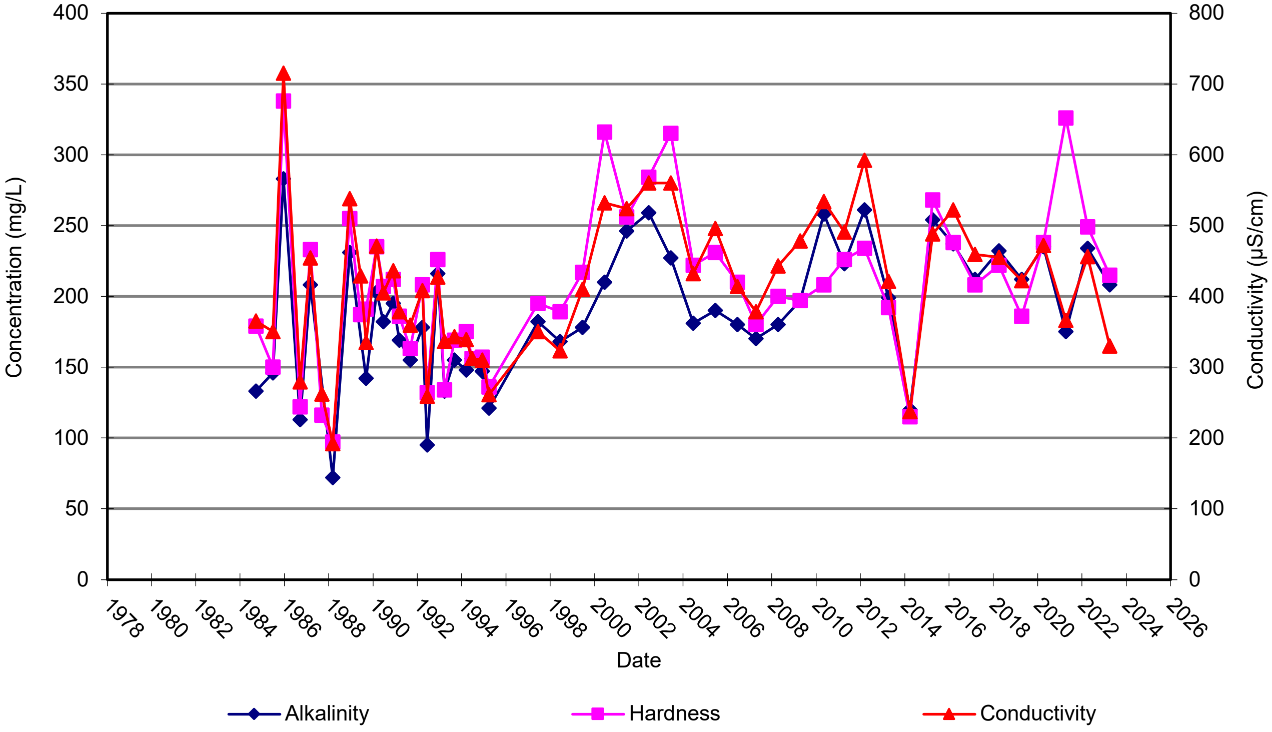


Figure E-14
Concentration Versus Time - Surface Water Station PO1
Holbrook Landfill Site - Surface Water

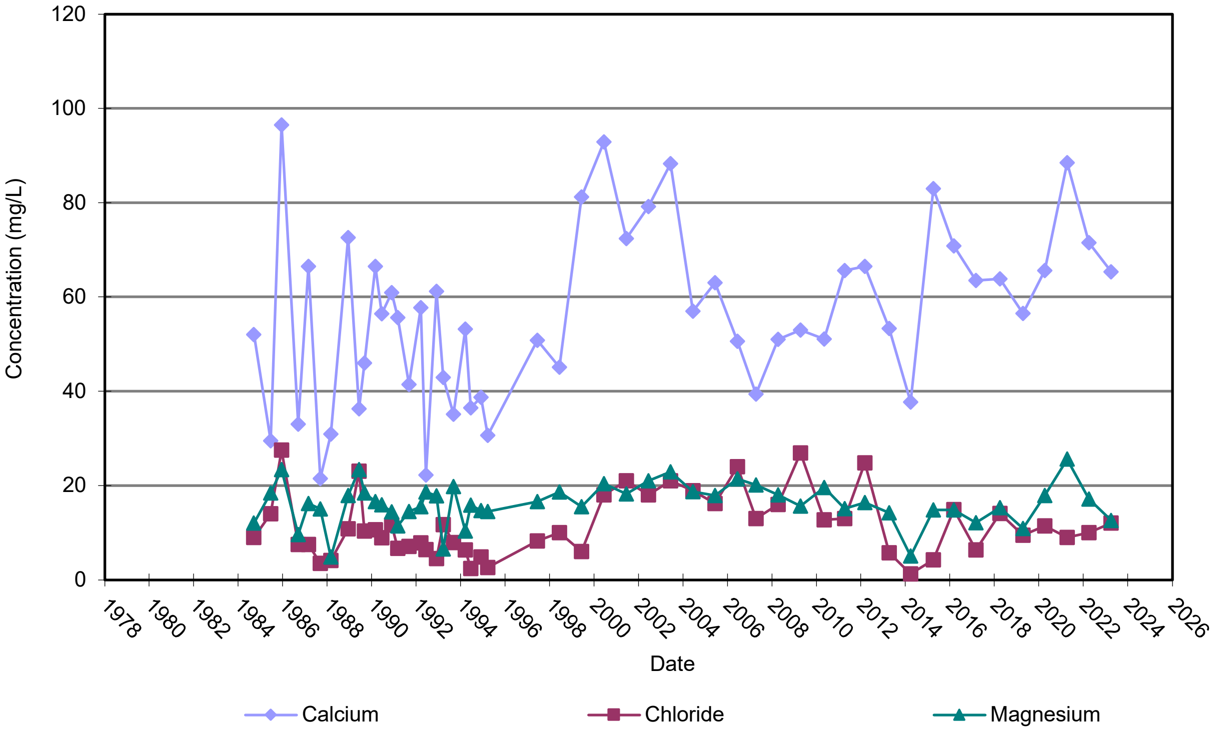


Figure E-15
Concentration Versus Time - Surface Water Station PO1
Holbrook Landfill Site - Surface Water

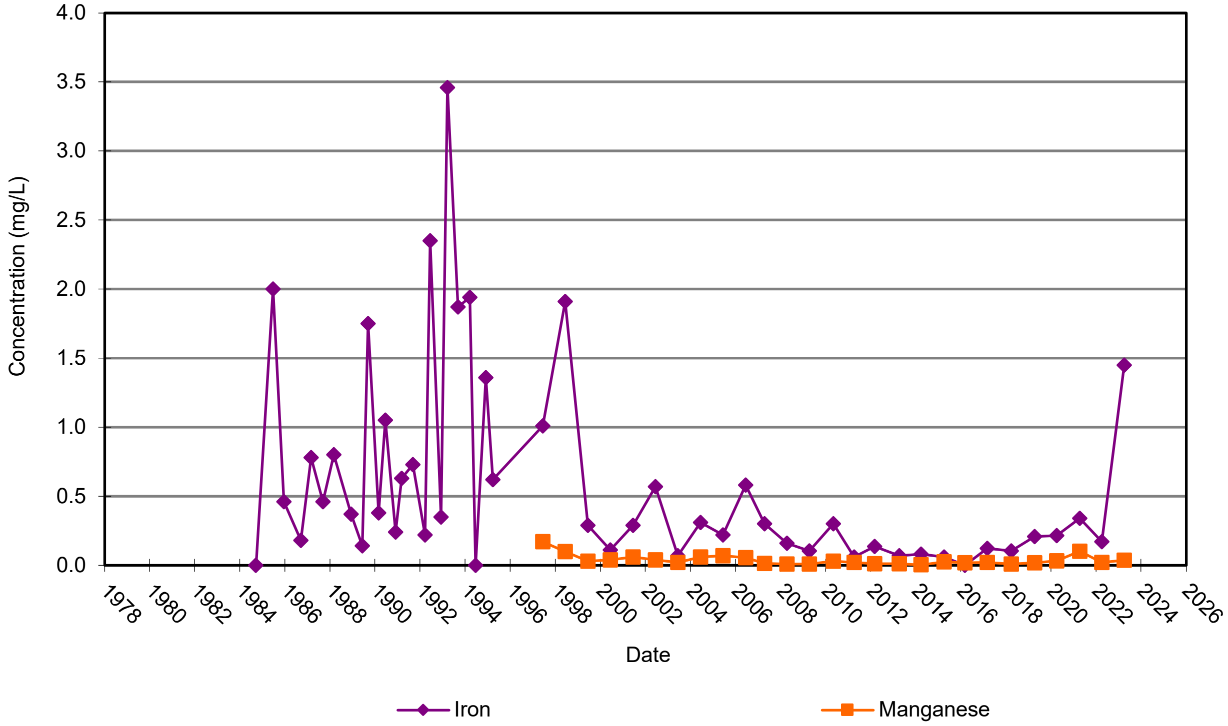


Figure E-16
Concentration Versus Time - Surface Water Station PO2
Holbrook Landfill Site - Surface Water

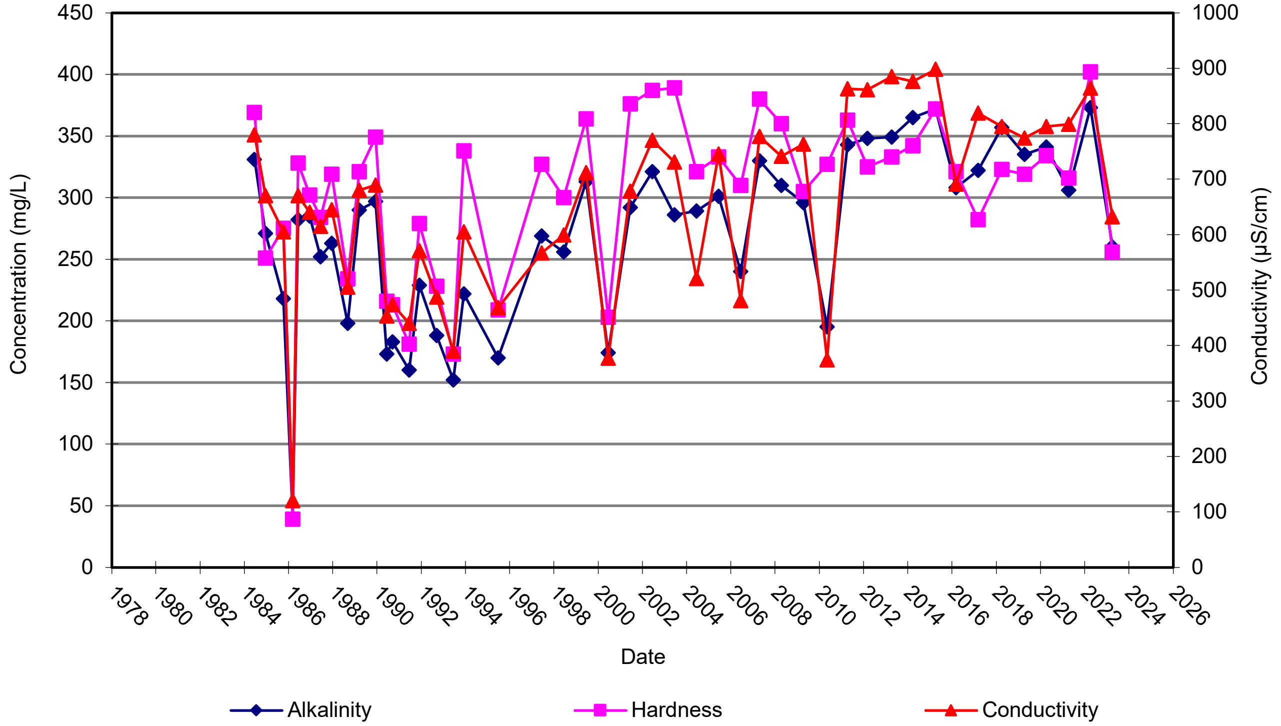


Figure E-17
Concentration Versus Time - Surface Water Station PO2
Holbrook Landfill Site - Surface Water

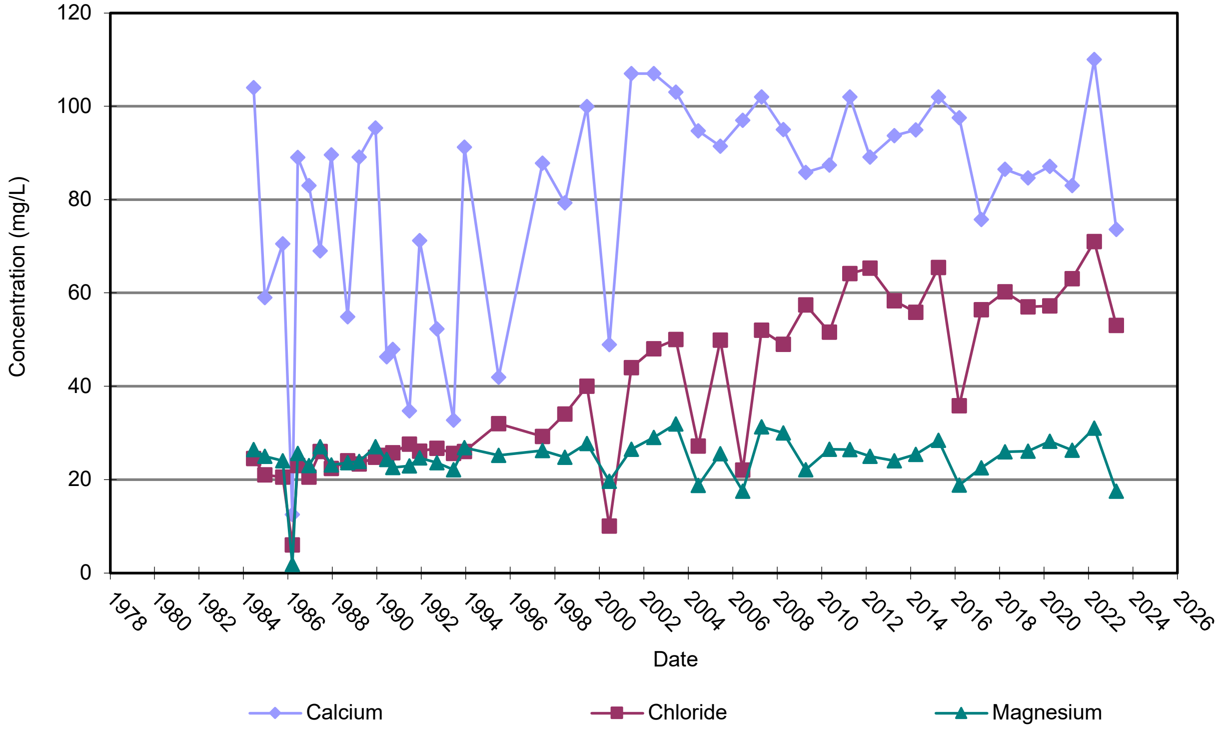


Figure E-18
Concentration Versus Time - Surface Water Station PO2
Holbrook Landfill Site - Surface Water

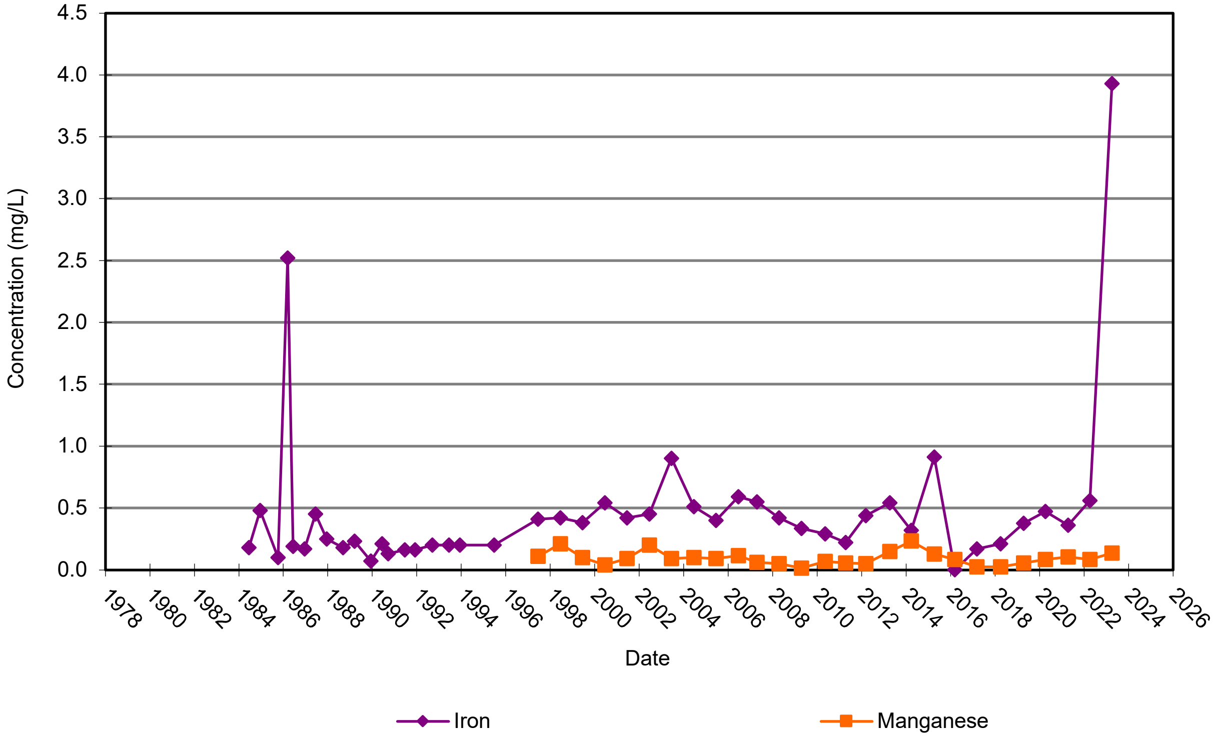


Figure E-19
Concentration Versus Time - Surface Water Station PO3
Holbrook Landfill Site - Surface Water

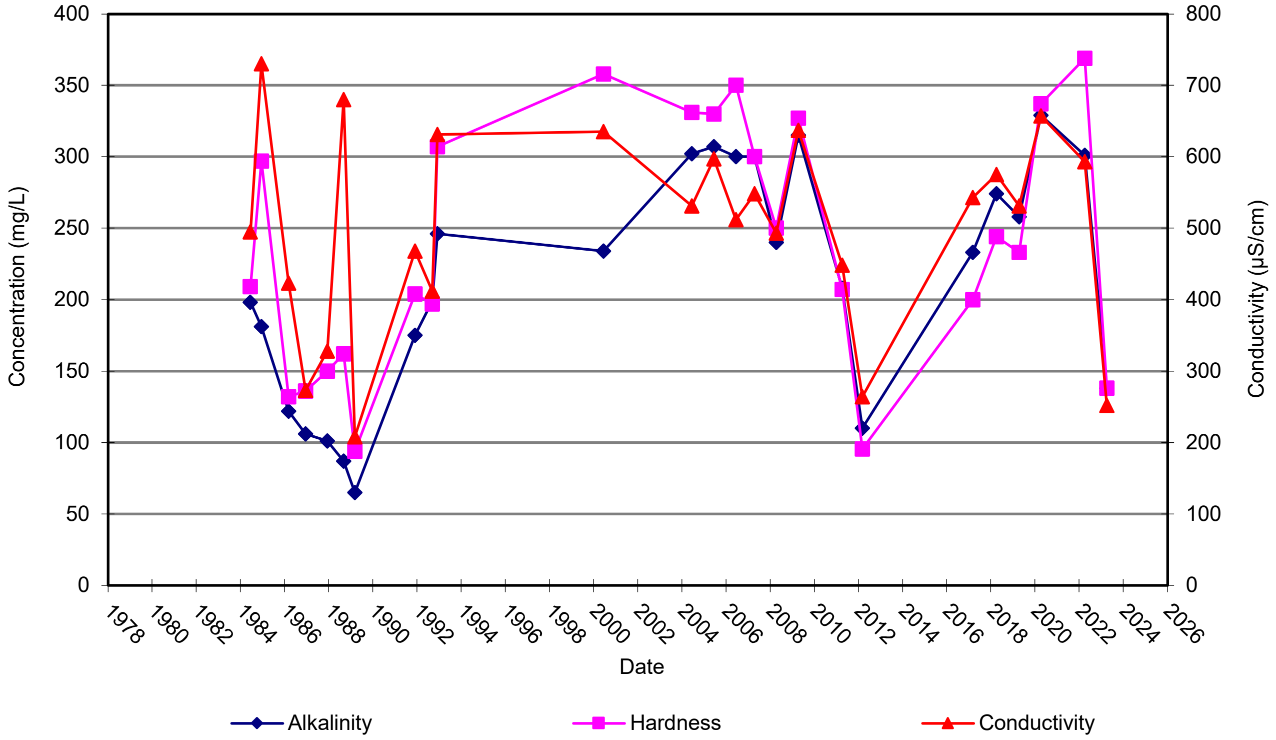


Figure E-20
Concentration Versus Time - Surface Water Station PO3
Holbrook Landfill Site - Surface Water

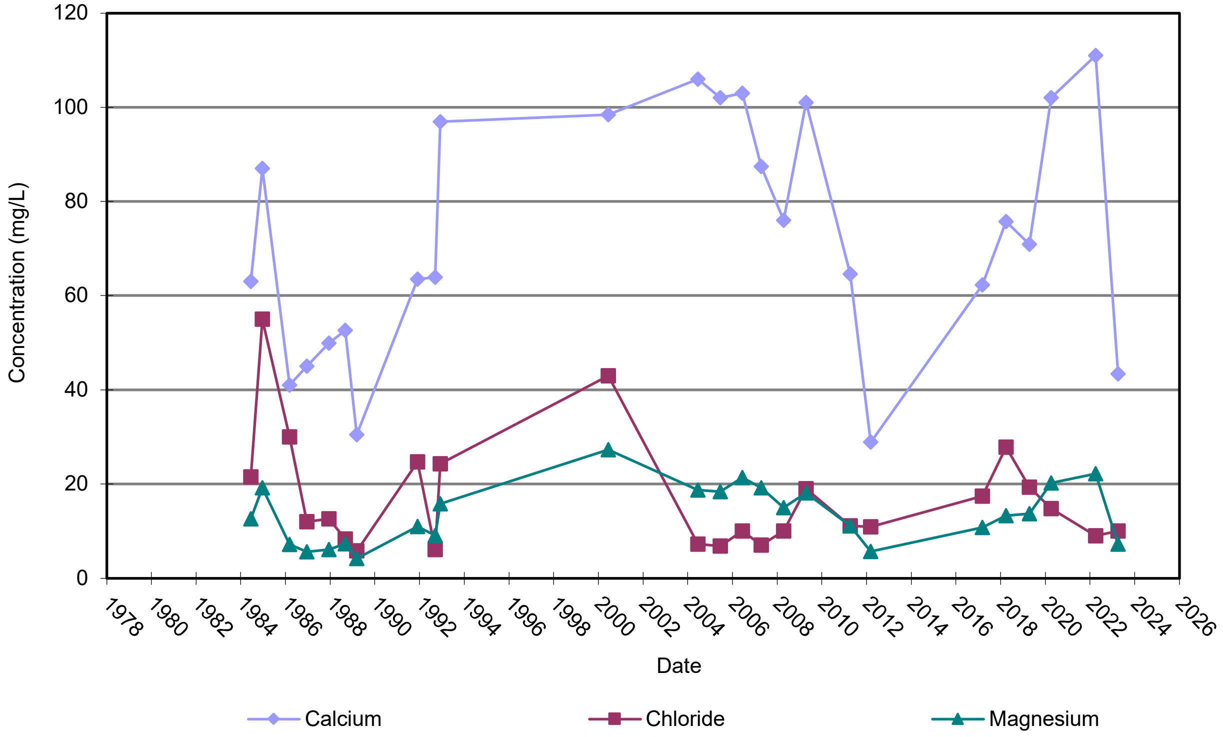
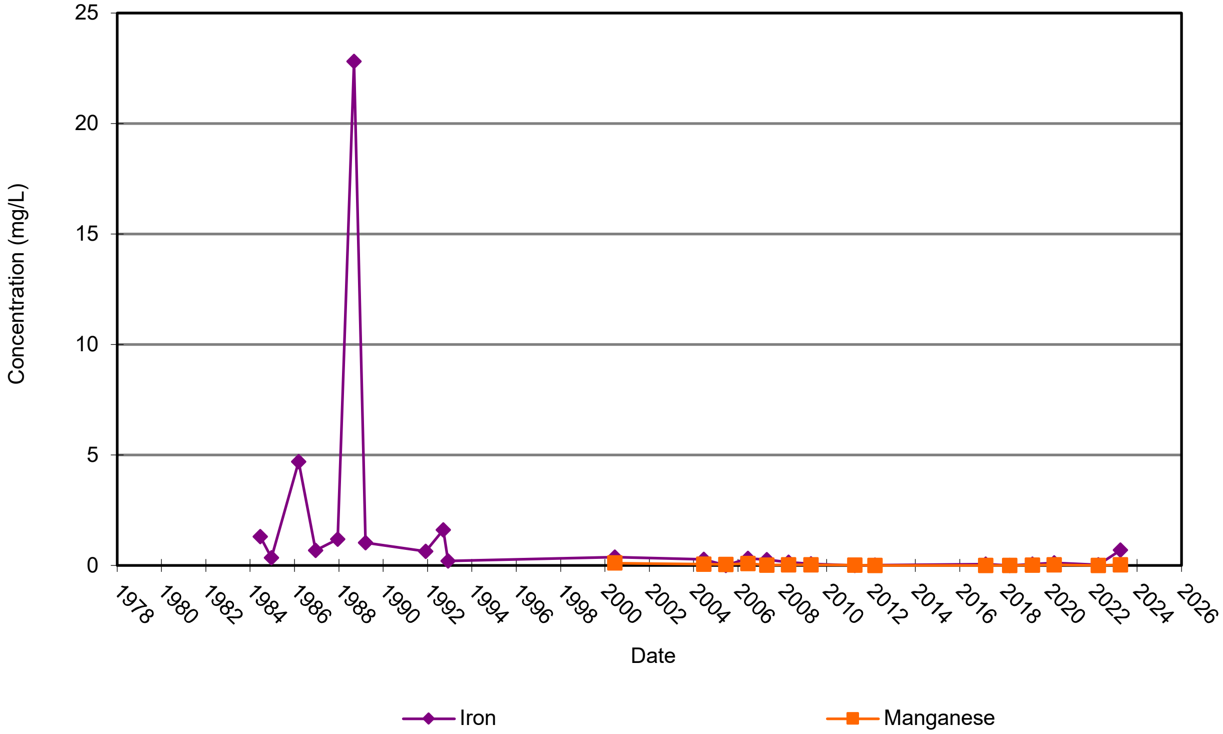


Figure E-21
Concentration Versus Time - Surface Water Station PO3
Holbrook Landfill Site - Surface Water



APPENDIX

F

LABORATORY CERTIFICATES OF ANALYSIS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 111-53037-07-100-1003, Holbrook Landfill Site - SW

12-April-2023

WSP Canada Inc.
Attn : Albert Siertsema

55 King Street, Suite 700
St. Catharines, ON
L2R 3H5, Canada

Phone: 905-687-1771 x 240
Fax:

Date Rec. : 04 April 2023
LR Report: **CA40025-APR23**
Reference: PO#:111-53037-07-100-1003, Albert Siertsema

Copy: 1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**3: Analysis Completed Date**	**6: CO1**	**7: CO4**	**8: CO6**	**9: PO1**	**10: PO2**
Sample Date & Time		03-Apr-23 11:15	03-Apr-23 10:40	03-Apr-23 10:00	03-Apr-23 11:00	03-Apr-23 10:15
Temp Upon Receipt [@ London Lab °C]	***	***	***	***	***	***
Temp Upon Receipt [@ Lakefield Lab °C]	***	***	***	***	***	***
Alkalinity [mg/L as CaCO3]	06-Apr-23	211	243	176	208	260
pH [No unit]	06-Apr-23	8.09	8.16	8.00	8.02	8.00
Temperature @ pH [°C]	06-Apr-23	18.6	18.6	18.3	18.4	18.4
Conductivity [uS/cm]	06-Apr-23	584	626	491	330	632
NH3+NH4 [as N mg/L]	06-Apr-23	1.04	4.80	0.04	0.06	5.55
Unionized NH3 [mg/L as N]	06-Apr-23	0.044	0.236	0.001	0.002	0.189
SO4 [mg/L]	11-Apr-23	19	24	20	6	19
Cl [mg/L]	11-Apr-23	43	50	52	12	53
NO2 [as N mg/L]	12-Apr-23	< 0.03	< 0.03	0.04	< 0.03	0.04
NO3 [as N mg/L]	12-Apr-23	5.88	1.83	4.57	1.33	2.28
NO2+NO3 [as N mg/L]	12-Apr-23	5.88	1.83	4.60	1.33	2.31
Hardness [mg/L as CaCO3]	11-Apr-23	261	288	220	215	256

Analysis	**3: Analysis Completed Date**	**6: CO1**	**7: CO4**	**8: CO6**	**9: PO1**	**10: PO2**
B (tot) [mg/L]	11-Apr-23	0.184	0.287	0.023	0.076	0.235
Ca (tot) [mg/L]	11-Apr-23	77.2	82.9	68.9	65.3	73.6
Cr (tot) [mg/L]	11-Apr-23	0.00015	0.00275	0.00013	0.00154	0.00338
Fe (tot) [mg/L]	11-Apr-23	0.276	2.66	0.245	1.45	3.93
K (tot) [mg/L]	11-Apr-23	6.22	8.53	1.88	4.49	9.31
Mg (tot) [mg/L]	11-Apr-23	16.7	19.7	11.6	12.6	17.5
Mn (tot) [mg/L]	11-Apr-23	0.0119	0.0445	0.00576	0.0376	0.135
Na (tot) [mg/L]	11-Apr-23	23.8	28.3	23.0	5.04	28.5

Analysis	**11: PO3**	**12: NE1**	**13: SWDUP**
Sample Date & Time	03-Apr-23 09:30	03-Apr-23 09:00	03-Apr-23
Temp Upon Receipt [@ London Lab °C]	***	***	***
Temp Upon Receipt [@ Lakefield Lab °C]	***	***	***
Alkalinity [mg/L as CaCO3]	138	162	214
pH [No unit]	7.93	7.79	8.11
Temperature @ pH [°C]	18.4	18.2	18.6
Conductivity [uS/cm]	252	279	579
NH3+NH4 [as N mg/L]	0.60	0.07	1.08
Unionized NH3 [mg/L as N]	0.017	0.001	0.047
SO4 [mg/L]	8	8	19
Cl [mg/L]	10	3	48
NO2 [as N mg/L]	< 0.03	< 0.03	< 0.03
NO3 [as N mg/L]	1.30	0.65	5.89
NO2+NO3 [as N mg/L]	1.30	0.65	5.89
Hardness [mg/L as CaCO3]	138	178	256
B (tot) [mg/L]	0.190	0.026	0.180

Analysis	**11: PO3**	**12: NE1**	**13: SWDUP**
Ca (tot) [mg/L]	43.4	60.0	75.6
Cr (tot) [mg/L]	0.00046	0.00024	0.00125
Fe (tot) [mg/L]	0.698	0.353	1.25
K (tot) [mg/L]	8.55	1.88	5.95
Mg (tot) [mg/L]	7.23	6.82	16.3
Mn (tot) [mg/L]	0.0240	0.0145	0.0173
Na (tot) [mg/L]	7.28	1.93	23.8

Temperature of Sample upon Receipt: 3 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: n/a

Method Descriptions

Parameter	Description	SGS Method Code
Alkalinity	Alkalinity by Titration	ME-CA-[ENV]EWL-LAK-AN-006
Ammonia+Ammonium (N)	NH3+NH4 by Skalar - drinking water to MDL	ME-CA-[ENV]SFA-LAK-AN-007
Boron (total)	B by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Calcium (total)	Ca by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Chloride	Chloride by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026
Chromium (total)	Cr by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Conductivity	Conductivity by Conductivity Meter	ME-CA-[ENV]EWL-LAK-AN-006
Hardness	Hardness (CaCO3) by ICP-MS	ME-CA-[ENV]SPE-LAK-AN-006
Iron (total)	Fe by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Magnesium (total)	Mg by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Manganese (total)	Mn by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Nitrate (as N)	Nitrate by Dionex - solution	ME-CA-[ENV]IC-LAK-AN-001
Nitrate + Nitrite (as N)	Total Nitrate/Nitrite by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001
Nitrite (as N)	Nitrite by Dionex - solution	ME-CA-[ENV]IC-LAK-AN-001

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Parameter	Description	SGS Method Code
pH	pH - solution	ME-CA-[ENV]EWL-LAK-AN-006
Potassium (total)	K by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Sodium (total)	Na by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Sulphate	Sulphate by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026
Temperature @ pH	Temperature at time of pH	
Unionized Ammonia	Unionized Ammonia - calculation from NH3+NH4	ME-CA-[ENV]SFA-LAK-AN-007

Jill Campbell

Jill Campbell, B.Sc.,GISAS
Project Specialist,
Environment, Health & Safety

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0048-APR23													
Alkalinity	2	mg/L as Ca	< 2			2	20	100	80	120	NA		
Ammonia by SFA - QCBatchID: SKA0043-APR23													
Ammonia+Ammonium (N)	0.04	mg/L	<0.04			ND	10	100	90	110	100	75	125
Anions by discrete analyzer - QCBatchID: DIO5018-APR23													
Chloride	1	mg/L	<1			14	20	108	80	120	89	75	125
Sulphate	2	mg/L	<2			1	20	108	80	120	109	75	125
Anions by IC - QCBatchID: DIO0099-APR23													
Nitrate (as N)	0.06	mg/L	<0.06			1	20	100	90	110	102	75	125
Nitrate + Nitrite (as N)	0.06	mg/L	<0.06			NA		NA			NA		
Nitrite (as N)	0.03	mg/L	<0.03			ND	20	98	90	110	99	75	125
Conductivity - QCBatchID: EWL0048-APR23													
Conductivity	2	uS/cm	< 2			2	20	100	90	110	NA		
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0026-APR23													
Boron (total)	0.002	mg/L	<0.002			5	20	101	90	110	94	70	130
Calcium (total)	0.01	mg/L	<0.01			0	20	100	90	110	102	70	130
Chromium (total)	0.00008	mg/L	<0.00008			ND	20	108	90	110	103	70	130
Iron (total)	0.007	mg/L	<0.007			2	20	104	90	110	125	70	130
Magnesium (total)	0.001	mg/L	<0.001			2	20	105	90	110	100	70	130
Manganese (total)	0.00001	mg/L	<0.00001			2	20	105	90	110	105	70	130
Potassium (total)	0.009	mg/L	<0.009			1	20	100	90	110	104	70	130
Sodium (total)	0.01	mg/L	<0.01			1	20	104	90	110	102	70	130
pH - QCBatchID: EWL0048-APR23													
pH	0.05	No unit	NA			0		100			NA		

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 111-53037-07-100-1003,
Holbrook Landfill Site - GW
Monitoring Wells

30-May-2023

WSP Canada Inc.
Attn : Albert Siertsema

55 King Street, Suite 700, St. Catharines
Canada, L2R 3H5
Phone: 905-687-1771 x 240, Fax:

Date Rec. : 17 May 2023
LR Report: **CA15173-MAY23**
Reference: PO#:111-53037-07-100-1003, Albert Siertsema

Copy: 1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Completed Date**	**4: Analysis Completed Time**	**5: RL**	**6: 43**
Sample Date & Time						15-May-23 14:45
Temp Upon Receipt [°C]	***	***	***	***	***	***
pH [No unit]	18-May-23	08:14	19-May-23	12:03	0.05	8.19
Conductivity [uS/cm]	19-May-23	13:24	19-May-23	15:16	2	456
Alkalinity [mg/L as CaCO3]	18-May-23	08:14	19-May-23	12:03	2	334
DOC [mg/L]	19-May-23	16:02	30-May-23	12:51	1.0	2.9
Cl [mg/L]	24-May-23	11:20	26-May-23	08:52	1	8
SO4 [mg/L]	24-May-23	11:18	26-May-23	08:52	2	35
TKN [as N mg/L]	18-May-23	17:52	23-May-23	14:23	0.5	< 0.5
NO2 [as N mg/L]	19-May-23	16:39	29-May-23	14:20	0.03	0.09
NO3 [as N mg/L]	19-May-23	16:39	29-May-23	14:20	0.06	< 0.06
NO2+NO3 [as N mg/L]	19-May-23	16:39	29-May-23	14:20	0.06	0.09
NH3+NH4 [as N mg/L]	18-May-23	15:21	24-May-23	09:52	0.1	0.3
Ca (diss) [mg/L]	18-May-23	20:18	26-May-23	23:34	0.01	24.2
Mg (diss) [mg/L]	18-May-23	20:18	26-May-23	23:34	0.001	11.5
Na (diss) [mg/L]	18-May-23	20:18	26-May-23	23:34	0.01	49.1
K (diss) [mg/L]	18-May-23	20:18	26-May-23	23:34	0.009	1.26
Hardness [mg/L as CaCO3]	18-May-23	20:18	26-May-23	23:34	0.05	108
B (diss) [mg/L]	18-May-23	20:18	26-May-23	23:34	0.002	0.128
Cr (diss) [mg/L]	18-May-23	20:18	26-May-23	23:34	8e-005	0.00009
Fe (diss) [mg/L]	18-May-23	20:18	26-May-23	23:34	0.007	0.018
Mn (diss) [mg/L]	18-May-23	20:18	26-May-23	23:34	1e-005	0.0122
Vinyl Chloride [mg/L]	20-May-23	08:59	25-May-23	13:43	0.2	< 0.0002
Benzene [mg/L]	20-May-23	08:59	25-May-23	13:43	0.5	< 0.0005
1,4-Dichlorobenzene [mg/L]	20-May-23	08:59	25-May-23	13:43	0.5	< 0.0005

Analysis	7: 19R	8: 25R	9: 41	10: 21R	11: 11R
Sample Date & Time	15-May-23 12:15	15-May-23 14:30	15-May-23 12:45	15-May-23 12:30	15-May-23 14:15
Temp Upon Receipt [°C]	***	***	***	***	***
pH [No unit]	8.15	8.24	7.09	8.13	7.85
Conductivity [uS/cm]	446	457	1970	652	1630
Alkalinity [mg/L as CaCO3]	201	198	948	265	762
DOC [mg/L]	1.4	2.5	41.0	2.1	17.1
Cl [mg/L]	< 1	12	60	38	96
SO4 [mg/L]	27	6	6	6	3
TKN [as N mg/L]	< 0.5	< 0.5	70.6	< 0.5	2.1
NO2 [as N mg/L]	< 0.03	< 0.03	< 0.3	< 0.03	< 0.03
NO3 [as N mg/L]	0.22	< 0.06	< 0.06	< 0.06	< 0.06
NO2+NO3 [as N mg/L]	0.22	< 0.06	< 0.3	< 0.06	< 0.06
NH3+NH4 [as N mg/L]	< 0.1	< 0.1	76.1	< 0.1	1.4
Ca (diss) [mg/L]	51.5	48.1	168	78.1	170
Mg (diss) [mg/L]	20.0	15.1	36.2	24.2	64.2
Na (diss) [mg/L]	11.3	14.6	41.9	10.7	54.0
K (diss) [mg/L]	1.12	1.17	40.8	1.37	2.96
Hardness [mg/L as CaCO3]	211	182	568	294	689
B (diss) [mg/L]	0.032	0.042	1.28	0.067	0.199
Cr (diss) [mg/L]	0.00027	0.00015	0.00290	0.00013	0.00046
Fe (diss) [mg/L]	0.019	0.796	55.9	1.19	1.26
Mn (diss) [mg/L]	0.00201	0.0278	0.483	0.0354	0.0582
Vinyl Chloride [mg/L]	---	---	0.0002	---	---
Benzene [mg/L]	---	---	0.0122	---	---
1,4-Dichlorobenzene [mg/L]	---	---	0.0133	---	---

Analysis	12: 42	13: 40	14: 24R	15: GWDUP1	16: 28R
Sample Date & Time	15-May-23 09:30	15-May-23 10:15	15-May-23 10:40	15-May-23	15-May-23 15:15
Temp Upon Receipt [°C]	***	***	***	***	***
pH [No unit]	8.32	7.86	8.25	7.68	8.35
Conductivity [uS/cm]	404	767	461	1340	592
Alkalinity [mg/L as CaCO3]	206	351	202	461	274
DOC [mg/L]	1.4	6.3	3.6	5.4	1.6
Cl [mg/L]	< 1	23	< 1	160	6
SO4 [mg/L]	< 2	43	15	25	66
TKN [as N mg/L]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
NO2 [as N mg/L]	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
NO3 [as N mg/L]	< 0.06	< 0.06	< 0.06	< 0.06	0.25
NO2+NO3 [as N mg/L]	< 0.06	< 0.06	< 0.06	< 0.06	0.25

Analysis	**12: 42**	**13: 40**	**14: 24R**	**15: GWDUP1**	**16: 28R**
NH3+NH4 [as N mg/L]	0.4	0.2	0.4	< 0.1	0.1
Ca (diss) [mg/L]	36.4	111	49.7	103	47.8
Mg (diss) [mg/L]	20.1	19.7	18.2	36.6	22.8
Na (diss) [mg/L]	16.0	9.69	9.06	98.8	36.1
K (diss) [mg/L]	0.939	0.838	0.869	1.93	1.55
Hardness [mg/L as CaCO3]	174	359	199	409	213
B (diss) [mg/L]	0.048	0.019	0.037	0.762	0.101
Cr (diss) [mg/L]	0.00009	0.00033	0.00014	0.00035	0.00011
Fe (diss) [mg/L]	0.119	2.66	0.515	1.43	0.030
Mn (diss) [mg/L]	0.0112	0.220	0.0162	0.0334	0.0151
Vinyl Chloride [mg/L]	< 0.0002	< 0.0002	---	---	---
Benzene [mg/L]	< 0.0005	< 0.0005	---	---	---
1,4-Dichlorobenzene [mg/L]	< 0.0005	< 0.0005	---	---	---

Analysis	**17: D2**
Sample Date & Time	15-May-23 16:30
Temp Upon Receipt [°C]	***
pH [No unit]	8.21
Conductivity [uS/cm]	753
Alkalinity [mg/L as CaCO3]	274
DOC [mg/L]	1.5
Cl [mg/L]	48
SO4 [mg/L]	33
TKN [as N mg/L]	< 0.5
NO2 [as N mg/L]	< 0.03
NO3 [as N mg/L]	< 0.06
NO2+NO3 [as N mg/L]	< 0.06
NH3+NH4 [as N mg/L]	< 0.1
Ca (diss) [mg/L]	0.47
Mg (diss) [mg/L]	0.123
Na (diss) [mg/L]	146
K (diss) [mg/L]	0.478
Hardness [mg/L as CaCO3]	1.7
B (diss) [mg/L]	0.047
Cr (diss) [mg/L]	0.00015
Fe (diss) [mg/L]	0.021
Mn (diss) [mg/L]	0.00061
Vinyl Chloride [mg/L]	---
Benzene [mg/L]	---

Analysis	17: D2
1,4-Dichlorobenzene [mg/L]	---

Temperature of Sample upon Receipt: 8 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

NO2 RL raised for sample #9 due to sample matrix

Method Descriptions

Units	Description	SGS Method Code
mg/L	VOC wtr	ME-CA-[ENV]GC-LAK-AN-004
mg/L as CaCO3	Alkalinity by Titration	ME-CA-[ENV]EWL-LAK-AN-006
as N mg/L	NH3+NH4 by Skalar - solution	ME-CA-[ENV]SFA-LAK-AN-007
mg/L	VOC wtr - BTEX	ME-CA-[ENV]GC-LAK-AN-004
mg/L	B by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
mg/L	Ca by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
mg/L	Chloride by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026
mg/L	Cr by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
uS/cm	Conductivity by Conductivity Meter	ME-CA-[ENV]EWL-LAK-AN-006
mg/L	DOC by Combustion/Oxidation	ME-CA-[ENV]EWL-LAK-AN-023
mg/L as CaCO3	Hardness (CaCO3) by ICP-MS dissolved	ME-CA-[ENV]SPE-LAK-AN-006
mg/L	Fe by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
mg/L	Mg by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
mg/L	Mn by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
mg/L	Nitrate by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001
mg/L	Total Nitrate/Nitrite by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001
mg/L	Nitrite by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001
No unit	pH - solution	ME-CA-[ENV]EWL-LAK-AN-006
mg/L	K by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
mg/L	Na by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
mg/L	Sulphate by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026
as N mg/L	Tot. kjeldahl Nitrogen by Skalar	ME-CA-[ENV]SFA-LAK-AN-002
mg/L	VOC wtr	ME-CA-[ENV]GC-LAK-AN-004

Maarit Wolfe, Hon.B.Sc
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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Quality Control Report

Organic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Volatile Organics - QCBatchID: GCM0334-MAY23													
1,4-Dichlorobenzene	0.0005	mg/L	<0.0005			ND	30	101	60	130	92	50	140
Benzene	0.0005	mg/L	<0.0005			ND	30	102	60	130	91	50	140
Vinyl Chloride	0.0002	mg/L	<0.0002			ND	30	106	50	140	91	50	140
Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0463-MAY23													
Alkalinity	2	mg/L as Ca	< 2			0	20	98	80	120	NA		
Ammonia by SFA - QCBatchID: SKA0207-MAY23													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			ND	10	99	90	110	103	75	125
Ammonia by SFA - QCBatchID: SKA0215-MAY23													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			ND	10	100	90	110	98	75	125
Ammonia by SFA - QCBatchID: SKA0235-MAY23													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			ND	10	100	90	110	83	75	125
Anions by discrete analyzer - QCBatchID: DIO5104-MAY23													
Chloride	1	mg/L	<1			ND	20	94	80	120	98	75	125
Sulphate	2	mg/L	<2			ND	20	104	80	120	103	75	125
Anions by discrete analyzer - QCBatchID: DIO5112-MAY23													
Chloride	1	mg/L	<1			ND	20	97	80	120	101	75	125
Sulphate	2	mg/L	<2			ND	20	103	80	120	102	75	125
Anions by IC - QCBatchID: DIO0505-MAY23													
Nitrate (as N)	0.06	mg/L	<0.06			ND	20	102	90	110	105	75	125
Nitrate + Nitrite (as N)	0.06	mg/L	<0.06			NA		NA			NA		
Nitrite (as N)	0.03	mg/L	<0.03			ND	20	98	90	110	102	75	125
Anions by IC - QCBatchID: DIO0512-MAY23													
Nitrate (as N)	0.06	mg/L	<0.06			ND	20	102	90	110	102	75	125
Nitrate + Nitrite (as N)	0.06	mg/L	<0.06			NA		NA			NA		
Nitrite (as N)	0.03	mg/L	<0.03			ND	20	100	90	110	103	75	125
Anions by IC - QCBatchID: DIO0539-MAY23													
Nitrite (as N)	0.03	mg/L	<0.03			ND	20	99	90	110	99	75	125
Carbon by Combustion/Oxidation - QCBatchID: EWL0522-MAY23													
Dissolved Organic Carbon	1.0	mg/L	<1.0			ND	20	102	90	110	94	75	125
Carbon by Combustion/Oxidation - QCBatchID: EWL0587-MAY23													

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Dissolved Organic Carbon	1.0	mg/L	<1.0			ND	20	101	90	110	95	75	125
Carbon by Combustion/Oxidation - QCBatchID: EWL0617-MAY23													
Dissolved Organic Carbon	1.0	mg/L	<1.0			ND	20	101	90	110	96	75	125
Carbon by Combustion/Oxidation - QCBatchID: EWL0652-MAY23													
Dissolved Organic Carbon	1.0	mg/L	<1.0			0	20	100	90	110	98	75	125
Conductivity - QCBatchID: EWL0512-MAY23													
Conductivity	2	uS/cm	<2			0	20	100	90	110	NA		
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0143-MAY23													
Boron (dissolved)	0.002	mg/L	<0.002			2	20	107	90	110	97	70	130
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0151-MAY23													
Boron (dissolved)	0.002	mg/L	<0.002			1	20	104	90	110	95	70	130
Calcium (dissolved)	0.01	mg/L	<0.01			0	20	99	90	110	98	70	130
Chromium (dissolved)	0.00008	mg/L	<0.00008			ND	20	104	90	110	100	70	130
Iron (dissolved)	0.007	mg/L	<0.007			ND	20	101	90	110	100	70	130
Magnesium (dissolved)	0.001	mg/L	<0.001			5	20	104	90	110	99	70	130
Manganese (dissolved)	0.00001	mg/L	<0.00001			1	20	107	90	110	107	70	130
Potassium (dissolved)	0.009	mg/L	<0.009			1	20	101	90	110	97	70	130
Sodium (dissolved)	0.01	mg/L	<0.01			3	20	98	90	110	96	70	130
pH - QCBatchID: EWL0463-MAY23													
pH	0.05	No unit	NA			0		100			NA		
Total Nitrogen - QCBatchID: SKA0204-MAY23													
Total Kjeldahl Nitrogen	0.5	as N mg/L	<0.5			ND	10	96	90	110	99	75	125
Total Nitrogen - QCBatchID: SKA0220-MAY23													
Total Kjeldahl Nitrogen	0.5	as N mg/L	<0.5			ND	10	97	90	110	102	75	125

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 111-53037-07-100-1003, Holbrook Landfill Site - GW Monitoring Wells

31-May-2023

WSP Canada Inc.
Attn : Albert Siertsema

55 King Street, Suite 700, St. Catharines
Canada, L2R 3H5
Phone: 905-687-1771 x 240, Fax:

Date Rec. : 17 May 2023
LR Report: **CA15174-MAY23**
Reference: PO#:111-53037-07-100-1003, Albert Siertsema

Copy: 1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**1: Analysis Start Date**	**3: Analysis Completed Date**	**5: RL**	**6: 27**	**7: 45**	**8: 16AR**	**9: 26R**	**10: 37R**
Sample Date & Time				15-May-23 16:15	15-May-23 15:30	15-May-23 11:45	15-May-23 15:45	15-May-23 17:00
Temp Upon Receipt [°C]	***	***	***	***	***	***	***	***
pH [No unit]	18-May-23	19-May-23	0.05	8.08	8.32	7.99	7.91	7.90
Conductivity [uS/cm]	19-May-23	19-May-23	2	745	---	692	1320	689
Conductivity [uS/cm]	30-May-23	30-May-23		---	334	---	---	---
Alkalinity [mg/L as CaCO3]	18-May-23	19-May-23	2	310	162	273	451	267
DOC [mg/L]	18-May-23	25-May-23	1.0	1.3	2.4	1.0	5.4	1.5
Cl [mg/L]	24-May-23	26-May-23	1	38	< 1	26	150	34
SO4 [mg/L]	24-May-23	26-May-23	2	31	21	68	26	36
TKN [as N mg/L]	18-May-23	20-May-23	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
NO2 [as N mg/L]	19-May-23	29-May-23	0.03	< 0.03	0.04	< 0.03	< 0.03	< 0.03
NO3 [as N mg/L]	19-May-23	29-May-23	0.06	< 0.06	0.07	0.08	< 0.06	< 0.06
NO2+NO3 [as N mg/L]	19-May-23	29-May-23	0.06	< 0.06	0.11	0.08	< 0.06	< 0.06
NH3+NH4 [as N mg/L]	18-May-23	19-May-23	0.1	< 0.1	0.2	< 0.1	< 0.1	< 0.1
Ca (diss) [mg/L]	18-May-23	26-May-23	0.01	91.3	39.8	66.9	103	85.2

OnLine LIMS

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Analysis	**1: Analysis Start Date**	**3: Analysis Completed Date**	**5: RL**	**6: 27**	**7: 45**	**8: 16AR**	**9: 26R**	**10: 37R**
Mg (diss) [mg/L]	18-May-23	26-May-23	0.001	22.4	12.2	29.0	37.3	22.9
Na (diss) [mg/L]	18-May-23	26-May-23	0.01	14.2	19.9	21.2	101	12.0
K (diss) [mg/L]	18-May-23	26-May-23	0.009	1.28	0.784	1.19	1.87	1.23
Hardness [mg/L as CaCO3]	18-May-23	26-May-23	0.05	320	149	287	412	307
B (diss) [mg/L]	18-May-23	26-May-23	0.002	0.069	0.100	0.029	0.770	0.046
Cr (diss) [mg/L]	18-May-23	26-May-23	8e-005	0.00013	0.00012	0.00013	0.00035	0.00011
Fe (diss) [mg/L]	18-May-23	26-May-23	0.007	0.926	0.028	0.008	1.46	0.738
Mn (diss) [mg/L]	18-May-23	26-May-23	1e-005	0.06729	0.0175	0.0176	0.0334	0.0434
Vinyl Chloride [mg/L]	23-May-23	26-May-23	0.2	< 0.0002	< 0.0002	---	< 0.0002	< 0.0002
Benzene [mg/L]	23-May-23	26-May-23	0.5	< 0.0005	< 0.0005	---	< 0.0005	< 0.0005
1,4-Dichlorobenzene [mg/L]	23-May-23	26-May-23	0.5	< 0.0005	< 0.0005	---	< 0.0005	< 0.0005

Analysis	**11: GW DUP2**	**12: 39**	**13: 38**	**14: 32R**	**15: 44**	**16: 46**	**17: Trip Blank 1**	**18: Trip Blank 2**
Sample Date & Time	15-May-23	15-May-23 09:50	15-May-23 17:30	15-May-23 11:00	15-May-23 17:45	15-May-23 13:15	15-May-23	15-May-23
Temp Upon Receipt [°C]	***	***	***	***	***	***	***	***
pH [No unit]	8.26	8.18	8.09	8.10	7.98	8.22	---	---
Conductivity [uS/cm]	748	743	601	648	---	---	---	---
Conductivity [uS/cm]	---	---	---	---	701	430	---	---
Alkalinity [mg/L as CaCO3]	280	280	230	336	289	245	---	---
DOC [mg/L]	2.5	1.7	1.9	1.9	1.3	6.9	---	---
Cl [mg/L]	48	37	28	17	17	< 1	---	---
SO4 [mg/L]	33	47	24	30	43	25	---	---
TKN [as N mg/L]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	---	---
NO2 [as N mg/L]	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	---	---
NO3 [as N mg/L]	< 0.06	0.14	< 0.06	0.07	19.3	< 0.06	---	---
NO2+NO3 [as N mg/L]	< 0.06	0.14	< 0.06	0.07	19.3	< 0.06	---	---

OnLine LIMS

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Analysis	**11: GW DUP2**	**12: 39**	**13: 38**	**14: 32R**	**15: 44**	**16: 46**	**17: Trip Blank 1**	**18: Trip Blank 2**
NH3+NH4 [as N mg/L]	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1	---	---
Ca (diss) [mg/L]	0.45	89.4	71.7	80.2	94.1	63.0	---	---
Mg (diss) [mg/L]	0.115	23.4	20.1	25.0	29.7	18.4	---	---
Na (diss) [mg/L]	145	19.2	14.8	8.80	5.98	1.92	---	---
K (diss) [mg/L]	0.478	1.45	1.06	0.837	1.15	1.02	---	---
Hardness [mg/L as CaCO3]	1.6	319	262	303	357	233	---	---
B (diss) [mg/L]	0.044	0.025	0.036	0.040	0.020	0.010	---	---
Cr (diss) [mg/L]	0.00013	0.00012	0.00011	0.00012	0.00062	0.00015	---	---
Fe (diss) [mg/L]	0.025	0.439	0.494	0.254	< 0.007	0.154	---	---
Mn (diss) [mg/L]	0.00050	0.141	0.0518	0.0212	0.00052	0.0146	---	---
Vinyl Chloride [mg/L]	---	< 0.0002	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Benzene [mg/L]	---	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,4-Dichlorobenzene [mg/L]	---	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Temperature of Sample upon Receipt: 8 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Method Descriptions

Parameter	Description	SGS Method Code
1,4-Dichlorobenzene	VOC wtr	ME-CA-[ENV]GC-LAK-AN-004
Alkalinity	Alkalinity by Titration	ME-CA-[ENV]EWL-LAK-AN-006
Ammonia+Ammonium (N)	NH3+NH4 by Skalar - solution	ME-CA-[ENV]SFA-LAK-AN-007
Benzene	VOC wtr - BTEX	ME-CA-[ENV]GC-LAK-AN-004
Boron (dissolved)	B by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
Calcium (dissolved)	Ca by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
Chloride	Chloride by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026
Chromium (dissolved)	Cr by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
Conductivity	Conductivity by Conductivity Meter	ME-CA-[ENV]EWL-LAK-AN-006
Conductivity	Conductivity by Conductivity Meter	ME-CA-[ENV]EWL-LAK-AN-006

Parameter	Description	SGS Method Code
Dissolved Organic Carbon	DOC by Combustion/Oxidation	ME-CA-[ENV]EWL-LAK-AN-023
Hardness (dissolved)	Hardness (CaCO3) by ICP-MS dissolved	ME-CA-[ENV]SPE-LAK-AN-006
Iron (dissolved)	Fe by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
Magnesium (dissolved)	Mg by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
Manganese (dissolved)	Mn by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
Nitrate (as N)	Nitrate by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001
Nitrate + Nitrite (as N)	Total Nitrate/Nitrite by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001
Nitrite (as N)	Nitrite by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001
pH	pH - solution	ME-CA-[ENV]EWL-LAK-AN-006
Potassium (dissolved)	K by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
Sodium (dissolved)	Na by ICP-MS solution (dissolved)	ME-CA-[ENV]SPE-LAK-AN-006
Sulphate	Sulphate by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026
Total Kjeldahl Nitrogen	Tot. kjeldahl Nitrogen by Skalar	ME-CA-[ENV]SFA-LAK-AN-002
Vinyl Chloride	VOC wtr	ME-CA-[ENV]GC-LAK-AN-004

Jill Campbell

Jill Campbell, B.Sc.,GISAS
Project Specialist,
Environment, Health & Safety

Quality Control Report

Organic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Volatile Organics - QCBatchID: GCM0356-MAY23													
1,4-Dichlorobenzene	0.0005	mg/L	<0.0005			ND	30	96	60	130	90	50	140
Benzene	0.0005	mg/L	<0.0005			ND	30	105	60	130	97	50	140
Vinyl Chloride	0.0002	mg/L	<0.0002			ND	30	96	50	140	93	50	140

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0463-MAY23													
Alkalinity	2	mg/L as Ca	< 2			0	20	98	80	120	NA		
Ammonia by SFA - QCBatchID: SKA0201-MAY23													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			1	10	98	90	110	95	75	125
Anions by discrete analyzer - QCBatchID: DIO5104-MAY23													
Chloride	1	mg/L	<1			ND	20	94	80	120	98	75	125
Sulphate	2	mg/L	<2			ND	20	104	80	120	103	75	125
Anions by discrete analyzer - QCBatchID: DIO5112-MAY23													
Chloride	1	mg/L	<1			ND	20	97	80	120	101	75	125
Sulphate	2	mg/L	<2			ND	20	103	80	120	102	75	125
Anions by IC - QCBatchID: DIO0505-MAY23													
Nitrate (as N)	0.06	mg/L	<0.06			ND	20	102	90	110	105	75	125
Nitrate + Nitrite (as N)	0.06	mg/L	<0.06			NA		NA			NA		
Nitrite (as N)	0.03	mg/L	<0.03			ND	20	98	90	110	102	75	125
Anions by IC - QCBatchID: DIO0507-MAY23													
Nitrate (as N)	0.06	mg/L	<0.06			0	20	102	90	110	86	75	125
Nitrate + Nitrite (as N)	0.06	mg/L	<0.06			NA		NA			NA		
Nitrite (as N)	0.03	mg/L	<0.03			20	20	101	90	110	100	75	125
Anions by IC - QCBatchID: DIO0513-MAY23													
Nitrate (as N)	0.06	mg/L	<0.06			0	20	104	90	110	86	75	125
Nitrate + Nitrite (as N)	0.06	mg/L	<0.06			NA		NA			NA		
Nitrite (as N)	0.03	mg/L	<0.03			1	20	102	90	110	102	75	125
Carbon by Combustion/Oxidation - QCBatchID: EWL0470-MAY23													
Dissolved Organic Carbon	1.0	mg/L	<1.0			ND	20	101	90	110	95	75	125
Carbon by Combustion/Oxidation - QCBatchID: EWL0522-MAY23													
Dissolved Organic Carbon	1.0	mg/L	<1.0			ND	20	102	90	110	94	75	125
Carbon by Combustion/Oxidation - QCBatchID: EWL0587-MAY23													

OnLine LIMS

0003350265

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Results relate only to the sample tested. Data reported represents the sample submitted to SGS. Reproduction of this analytical report in full or in part is prohibited without prior written approval. Please refer to SGS General Conditions of Services located at https://www.sgs.ca/en/terms-and-conditions (Printed copies are available upon request.)
Test method information available upon request. “Temperature Upon Receipt” is representative of the whole shipment and may not reflect the temperature of individual samples.
SGS Canada Inc. Environment-Health & Safety statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

Inorganic Analysis

Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Dissolved Organic Carbon	1.0	mg/L	<1.0			ND	20	101	90	110	95	75	125
Conductivity - QCBatchID: EWL0512-MAY23													
Conductivity	2	uS/cm	<2			0	20	100	90	110	NA		
Conductivity - QCBatchID: EWL0728-MAY23													
Conductivity	2	uS/cm	< 2			0	20	100	90	110	NA		
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0151-MAY23													
Boron (dissolved)	0.002	mg/L	<0.002			1	20	104	90	110	95	70	130
Calcium (dissolved)	0.01	mg/L	<0.01			0	20	99	90	110	98	70	130
Chromium (dissolved)	0.00008	mg/L	<0.00008			ND	20	104	90	110	100	70	130
Iron (dissolved)	0.007	mg/L	<0.007			ND	20	101	90	110	100	70	130
Magnesium (dissolved)	0.001	mg/L	<0.001			5	20	104	90	110	99	70	130
Manganese (dissolved)	0.00001	mg/L	<0.00001			1	20	107	90	110	107	70	130
Potassium (dissolved)	0.009	mg/L	<0.009			1	20	101	90	110	97	70	130
Sodium (dissolved)	0.01	mg/L	<0.01			3	20	98	90	110	96	70	130
pH - QCBatchID: EWL0463-MAY23													
pH	0.05	No unit	NA			0		100			NA		
Total Nitrogen - QCBatchID: SKA0204-MAY23													
Total Kjeldahl Nitrogen	0.5	as N mg/L	<0.5			ND	10	96	90	110	99	75	125

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 111-53037-07-100-1003,
Holbrook Landfill site SW

01-November-2023

WSP Canada Inc.
Attn : Albert Siertsema

55 King Street, Suite 700, St. Catharines
Canada, L2R 3H5
Phone: 905-687-1771 x 240, Fax:

Date Rec. : 13 October 2023
LR Report: **CA14456-OCT23**
Reference: PO#:CA-WSP-111-53037-07-100-1003, Craig Leger

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Completed Date**	**4: Analysis Completed Time**	**5: RL**	**6: Client Limits**	**7: C01**	**8: SWDUP**
Sample Date & Time							12-Oct-23 10:30	12-Oct-23
Temp Upon Receipt [°C]	***	***	***	***	***	***	***	***
pH [No unit]	16-Oct-23	12:49	18-Oct-23	10:28	0.05		8.01	7.84
Temperature @ pH [°C]	16-Oct-23	12:49	18-Oct-23	10:28		---	21.3	20.0
Conductivity [uS/cm]	16-Oct-23	16:02	18-Oct-23	10:28	2	---	711	719
Alkalinity [mg/L as CaCO3]	16-Oct-23	12:49	18-Oct-23	10:28	2	---	271	274
Cl [mg/L]	24-Oct-23	18:13	25-Oct-23	12:44	1	---	57	57
SO4 [mg/L]	24-Oct-23	18:10	25-Oct-23	12:44	2	---	19	19
NO3 [as N mg/L]	18-Oct-23	17:30	19-Oct-23	19:58	0.06	---	0.68	0.67
NO2 [as N mg/L]	18-Oct-23	17:30	19-Oct-23	19:58	0.03	---	0.05	0.06
NH3+NH4 [as N mg/L]	17-Oct-23	19:45	18-Oct-23	14:12	0.1	---	1.5	1.5
Unionized NH3 [mg/L as N]	17-Oct-23	19:45	18-Oct-23	14:13		---	0.064	0.040
Ca (tot) [mg/L]	17-Oct-23	16:45	01-Nov-23	11:42	---	---	68.5	69.8
Mg (tot) [mg/L]	17-Oct-23	16:45	01-Nov-23	11:42	---	---	24.7	25.1
Na (tot) [mg/L]	17-Oct-23	16:45	01-Nov-23	11:42	---	---	33.4	34.0
K (tot) [mg/L]	17-Oct-23	16:45	01-Nov-23	11:42	---	---	8.83	9.00
Hardness [mg/L as CaCO3]	17-Oct-23	16:45	01-Nov-23	11:42	---	---	273	277
B (tot) [mg/L]	17-Oct-23	16:45	01-Nov-23	11:42	0.002	---	0.292	0.300
Cr (tot) [mg/L]	17-Oct-23	16:45	01-Nov-23	11:42	0.003	0.003	< 0.003	< 0.003
Fe (tot) [mg/L]	17-Oct-23	16:45	01-Nov-23	11:42	---	0.01	0.36	0.36
Mn (tot) [mg/L]	17-Oct-23	16:45	01-Nov-23	11:42	0.002	0.002	0.132	0.139

PWQO - Provincial Water Quality Objectives
Limits based on MOE PIBS 3303E publication July 1994 reprinted February 1999
a PWQO limit based on pH >6.5-9.0 (at pH 4.5-5.5 PWQO = 15ug/L, pH >5.5-6.5 PWQO 10% above background levels in geological area.
b PWQO limit based on Hardness <75 mg/L (For Hardness >75 mg/L PWQO = 1100 ug/L)
c PWQO limit based on Hardness 0-100 mg/L(For Hardness >100 mg/L PWQO = 0.5 ug/L)
d PWQO limit based on Cr VI (PWQO limit for Cr III = 8.9 ug/L)
e PWQO limit based on Hardness 0-20 (For Hardness >20 mg/L PWQO = 5 ug/L)
f PWQO limit based on Hardness <30 (For Hardness 30-80 PWQO = 3 ug/L, & >80 PWQO=5)

Temperature of Sample upon Receipt: 7 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: n/a

OnLine LIMS

0003519198

Method Descriptions

Parameter	Description	SGS Method Code
Alkalinity	Alkalinity by Titration	ME-CA-[ENV]EWL-LAK-AN-006
Ammonia+Ammonium (N)	NH3+NH4 by Skalar - solution	ME-CA-[ENV]SFA-LAK-AN-007
Boron (total)	B by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Calcium (total)	Ca by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Chloride	Chloride by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026
Chromium (total)	Cr by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Conductivity	Conductivity by Conductivity Meter	ME-CA-[ENV]EWL-LAK-AN-006
Hardness	Hardness (CaCO3) by ICP-MS	ME-CA-[ENV]SPE-LAK-AN-006
Iron (total)	Fe by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Magnesium (total)	Mg by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Manganese (total)	Mn by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Nitrate (as N)	Nitrate by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001
Nitrite (as N)	Nitrite by Ion Chromatography	ME-CA-[ENV]IC-LAK-AN-001
pH	pH - solution	ME-CA-[ENV]EWL-LAK-AN-006
Potassium (total)	K by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Sodium (total)	Na by ICP-MS solution	ME-CA-[ENV]SPE-LAK-AN-006
Sulphate	Sulphate by discrete colourmetric analysis	ME-CA-[ENV]EWL-LAK-AN-026
Temperature @ pH	Temperature at time of pH	
Unionized Ammonia	Unionized Ammonia - calculation from NH3+NH4	ME-CA-[ENV]SFA-LAK-AN-007

Brad Moore Hon. B.Sc
Project Specialist,
Environment, Health & Safety

Quality Control Report

Inorganic Analysis													
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material		
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
							%		Low	High		Low	High
Alkalinity - QCBatchID: EWL0347-OCT23													
Alkalinity	2	mg/L as Ca	< 2			4	20	91	80	120	NA		
Alkalinity - QCBatchID: EWL0356-OCT23													
Alkalinity	2	mg/L as Ca	2			1	20	102	80	120	NA		
Ammonia by SFA - QCBatchID: SKA0145-OCT23													
Ammonia+Ammonium (N)	0.1	as N mg/L	<0.1			ND	10	100	90	110	95	75	125
Anions by discrete analyzer - QCBatchID: DIO5077-OCT23													
Chloride	1	mg/L	<1			ND	20	101	80	120	102	75	125
Sulphate	2	mg/L	<2			ND	20	104	80	120	105	75	125
Anions by IC - QCBatchID: DIO0484-OCT23													
Nitrate (as N)	0.06	mg/L	<0.06			1	20	100	90	110	98	75	125
Nitrite (as N)	0.03	mg/L	<0.03			ND	20	99	90	110	102	75	125
Conductivity - QCBatchID: EWL0356-OCT23													
Conductivity	2	uS/cm	< 2			0	20	99	90	110	NA		
Metals in aqueous samples - ICP-MS - QCBatchID: EMS0138-OCT23													
Boron (total)	0.002	mg/L	<0.002			3	20	102	90	110	101	70	130
Calcium (total)	0.01	mg/L	<0.01			0	20	104	90	110	106	70	130
Chromium (total)	0.003	mg/L	<0.00008			7	20	100	90	110	101	70	130
Iron (total)	0.01	mg/L	<0.007			0	20	104	90	110	100	70	130
Magnesium (total)	0.001	mg/L	<0.001			0	20	104	90	110	96	70	130
Manganese (total)	0.002	mg/L	<0.00001			3	20	100	90	110	93	70	130
Potassium (total)	0.009	mg/L	<0.009			1	20	102	90	110	101	70	130
Sodium (total)	0.01	mg/L	<0.01			0	20	105	90	110	99	70	130
pH - QCBatchID: EWL0347-OCT23													
pH	0.05	No unit	NA			0		100			NA		
pH - QCBatchID: EWL0356-OCT23													
pH	0.05	No unit	NA			0		101			NA		

OnLine LIMS

0003519198

APPENDIX

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MONITORING AND SCREENING CHECKLIST

Appendix D-Monitoring and Screening Checklist
General Information and Instructions

General Information: The checklist is to be completed, and submitted with the Monitoring Report.
Instructions: A complete checklist consists of:
(a) a completed and signed checklist, including any additional pages of information which can be attached as needed to provide further details where indicated.
(b) completed contact information for the Competent Environmental Practitioner (CEP)
(c) self-declaration that CEP(s) meet(s) the qualifications as set out below and in Section 1.2 of the Technical Guidance Document.

Definition of Groundwater CEP:
For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:
(a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
(b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..
Definition of Surface water CEP:
A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

The type of scientific work that a CEP performs must be consistent with that person's education and experience. If an individual has appropriate training and credentials in both groundwater and surface water and is responsible for both areas of expertise, the CEP may then complete and validate both sections of the checklist.

Monitoring Report and Site Information

Waste Disposal Site (WDS) Name	Holbrook Landfill Site
Location (e.g. street address, lot, concession)	Part of Lots 20 and 21, Concession III, Township of Norwich
GPS Location (taken within the property boundary at front gate/ front entry)	NAD 83, Zone 17, N 4759736 E 525949
Municipality	Township of Norwich
Client and/or Site Owner	County of Oxford
Monitoring Period (Year)	2023
This Monitoring Report is being submitted under the following:	
Environmental Compliance Approval (ECA) Number (formerly "Certificate of Approval" (C of A)) :	Amended ECA No. A070702 - dated September 8, 2016 Notice No. 1 - dated March 6, 2018
Director's Order No.:	
Provincial Officer's Order No.:	

Other:			
Report Submission Frequency	● **Annual** ○ **Other**		
The site is: **(Operation Status)**	○ **Open** ○ **Inactive** ● **Closed**		
Is there an active waste transfer station at the site?	○ **Yes** ● **No**		
Does this WDS have a Closure Plan?	○ **Not yet submitted** ○ **Submitted and under review** ● **Submitted and approved**		
Total Approved Capacity		*Units*	Tonnes
Maximum Approved Fill Rate		*Units*	
Total Waste Received within Monitoring Period (Year)		*Units*	Tonnes
Total Waste Received within Monitoring Period (Year) *Describe the methodology used to determine this quantity*			
Estimated Remaining Capacity		*Units*	Cubic Metres
Estimated Remaining Capacity *Describe the methodology used to determine this quantity*			
Estimated Remaining Capacity *Date Last Determined*			
Non-Hazardous Approved Waste Types	☐ Domestic ☐ Industrial, Commercial & Institutional (IC&I) ☐ Source Separated Organics (Green Bin) ☐ Tires	☐ Contaminated Soil ☐ Wood Waste ☐ Blue Box Material ☐ Processed Organics ☐ Leaf and Yard Waste	☐ Food Processing/Preparation Operations Waste ☐ Hauled Sewage Other:
Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial *(separate waste classes by comma)*			

Year Site Opened *(enter the Calendar Year only)*	1970	**Current** **ECA Issue Date**	9/8/2016

Is your Site required to submit Financial Assurance?	○ **Yes** ● **No**
Describe how your WDS is designed.	● Natural Attenuation only ○ Fully engineered Facility ○ Partially engineered Facility
Does your Site have an approved Contaminant Attenuation Zone?	● **Yes** ○ **No**
If closed, specify ECA, control or authorizing document closure date:	Select Date
Has the nature of the operations at the site changed during this monitoring period?	○ **Yes** ● **No**
If yes, provide details:	

Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i.e. exceeded the LEL for methane)	○ Yes ● No

Groundwater WDS Verification:

Based on all available information about the site and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:	● **Yes** ○ **No**	
2) All groundwater, leachate and landfill gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by ECA or other relevant authorizing/ control document(s):	● **Yes** ○ **No** ○ **Not Applicable**	If no, list exceptions below or attach information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**
All groundwater sampling and monitoring was successfully completed as required.		

3) a) Some or all groundwater, leachate and landfill gas sampling and monitoring requirements have been established or defined outside of a ministry ECA, authorizing, or control document.	○ **Yes** ● **No** ○ **Not Applicable**

b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:	○ **Yes** ○ **No** ● **Not Applicable**	If no, list exceptions below or attach additional information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

4) All field work for groundwater investigations was done in accordance with Standard Operating Procedures (SOP) as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	● **Yes** ○ **No**	Field work for groundwater monitoring was completed in accordance with standard operating procedures. The field QA/QC program included blind duplicate field duplicates; however, travel spiked blanks were not part of the field QA/QC program. The laboratory QA/QC control program was extensive and included method blanks, duplicates, spiked blanks, matrix spikes, and surrogate recovery.
Sampling and Monitoring Program Results/WDS Conditions and Assessment:		
5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.	● **Yes** ○ **No**	
6) The site meets compliance and assessment criteria.	○ **Yes** ● **No**	Please see Sections 4.2.4, 4.2.5, and 4.2.6 of the 2023 Water Monitoring Report.
7) The site continues to perform as anticipated. There have been no unusual trends/changes in measured leachate and groundwater levels or concentrations.	● **Yes** ○ **No**	

1) Is one or more of the following risk reduction practices in place at the site: ***(a)* There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/ treatment; or** ***(b)* There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or** ***(c)* The site meets the following two conditions (typically achieved after 15 years or longer of site operation):** ***i.*The site has developed stable leachate mound(s) and stable leachate plume geometry/ concentrations; and** ***ii.*Seasonal and annual water levels and water quality fluctuations are well understood.**	● **Yes** ○ **No**	**Note which practice(s):**	☐ **(a)** ☐ **(b)** ☒ **(c)**
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	● **Yes** ○ **No** ○ **Not Applicable**	Please see Section 4.2.6 of the 2023 Water Monitoring Report.	

Groundwater CEP Declaration:

I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

● **No changes to the monitoring program are recommended** ○ **The following change(s) to the monitoring program is/ are recommended:**	
● **No Changes to site design and operation are recommended** ○ **The following change(s) to the site design and operation is/are recommended:**	
Name:	Albert Siertsema
Seal:	Add Image LICENSED PROFESSIONAL ENGINEER Feb. 23, 2024 A. M. SIERTSEMA 100168317 PROVINCE OF ONTARIO

Signature:		**Date:**	23-Feb-2024
CEP Contact Information:	Albert Siertsema		
Company:	WSP Canada Inc.		
Address:	1821 Provincial Rd, Suite 100, Windsor, ON N8W 5V7		
Telephone No.:	519-383-0366	Fax No. :	
E-mail Address:	albert.siertsema@wsp.com		
Co-signers for additional expertise provided:			
Signature:		**Date:**	
Signature:		**Date:**	

Surface Water WDS Verification:

Provide the name of surface water body/bodies potentially receiving the WDS effluent and the approximate distance to the waterbody (including the nearest surface water body/bodies to the site):

Name (s)	Branch Creek

Distance(s)	Crosses Site, +/- 150 m from the fill area

Based on all available information and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	● **Yes** ○ **No**	If no, identify issues (Type Here):
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the ECA or relevant authorizing/control document(s) (if applicable):	● **Yes** ○ **No** ○ **Not applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry ECA or authorizing/control document.	○ **Yes** ● **No** ○ **Not Applicable**	
b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:	○ **Yes** ○ **No** ● **Not Applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date

4) All field work for surface water investigations was done in accordance with SOP, including internal/external QA/QC requirements, as established/outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	● Yes ○ No	Field work for groundwater monitoring was completed in accordance with standard operating procedures. The field QA/QC program included blind duplicate field duplicates; however, travel spiked blanks were not part of the field QA/QC program. The laboratory QA/QC control program was extensive and included method blanks, duplicates, spiked blanks, matrix spikes, and surrogate recovery.

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The receiving water body meets surface water-related compliance criteria and assessment criteria: i.e., there are no exceedances of criteria, based on MOE legislation, regulations, Water Management Policies, Guidelines and Provincial Water Quality Objectives and other assessment criteria (e.g., CWQGs, APVs), as noted in Table A or Table B in the Technical Guidance Document (Section 4.6):	○ Yes ● No

If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table on the following page or provide details in an attachment:

Parameter	Compliance or Assessment Criteria or Background	Amount by which Compliance or Assessment Criteria or Background Exceeded
e.g. Nickel	e.g. ECA limit, PWQO, background	e.g. X% above PWQO
Please refer to Section 5.0 of the 2023 Water Monitoring Report		
6) In my opinion, any exceedances listed in Question 5 are the result of non-WDS related influences (such as background, road salting, sampling site conditions)?	○ **Yes** ● **No**	Weak landfill influences are likely observed in the surface water quality in retention pond P02, and in the on-site stream at intermediate station C04. The retention pond and the on-site stream are inferred to receive shallow groundwater flow from beneath the landfill. At station C01, which monitors surface water quality leaving the site, landfill influences from upstream portions of the on-site stream, shallow groundwater discharge, and possibly road salting practices have likely affected the surface water quality at the station.

7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.	● **Yes** ○ **No**	
8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g. , PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):	● Yes ○ No ○ Not Known ○ Not Applicable	The retention pond and on-site stream are inferred to receive shallow groundwater flow from beneath the landfill. As such, weak leachate impacts are observed in the on-site stream.
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	○ **Yes** ● **No** ○ **Not Applicable**	

Surface Water CEP Declaration:

I, the undersigned hereby declare that I am a Competent Environmental Practitioner as defined in Appendix D under Instructions, holding the necessary level of experience and education to design surface water monitoring and sampling programs, conduct appropriate surface water investigations and interpret the related data as it pertains to the site for this monitoring period.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended) and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature or will be rectified for future monitoring events. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

● **No Changes to the monitoring program are recommended** ○ **The following change(s) to the monitoring program is/are recommended:**	
● **No changes to the site design and operation are recommended** ○ **The following change(s) to the site design and operation is/ are recommended:**	

CEP Signature	
Relevant Discipline	Geological Engineer
Date:	23-Feb-2024
CEP Contact Information:	Albert Siertsema
Company:	WSP Canada Inc.
Address:	1821 Provincial Rd, Suite 100, Windsor, ON N8W 5V7
Telephone No.:	519-383-0366
Fax No. :	
E-mail Address:	albert.siertsema@wsp.com

Save As

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