

# Geology and Hydrogeology Assessment Report

**Brooks Road Landfill Capacity Expansion Environmental Screening** 

2270386 Ontario Limited

April 2, 2024

→ The Power of Commitment



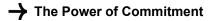
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# 1. Introduction

The Brooks Road Landfill Site (Site) is located at 160 Brooks Road, near Cayuga, Haldimand County, Ontario and is owned and operated by 2270386 Ontario Limited, herein referred to as Brooks Road Environmental (BRE, Owner, Proponent). The location of the Site is shown in Figure 1.1.

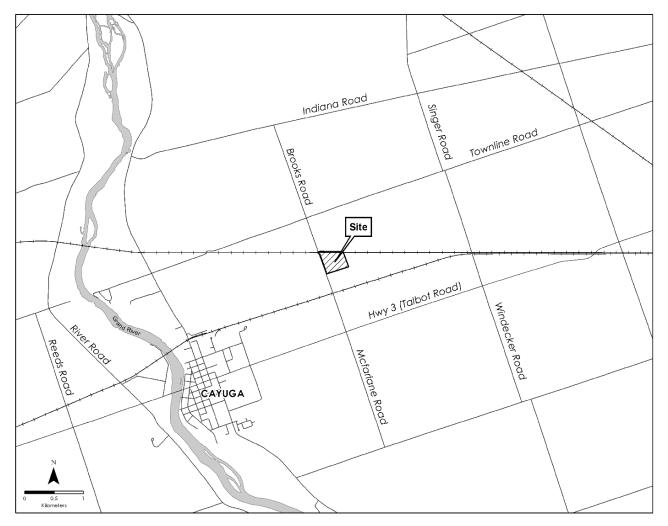


Figure 1.1 Location of the Proposed Undertaking

The Site, which operates under Environmental Compliance Approval (ECA) No. A110302 (Landfill ECA), has an approved annual fill rate of 250,000 tonnes per year and a total capacity of 1,045,065 cubic metres (m<sup>3</sup>) (including waste and cover). The Site also operates under an air and noise ECA No. 7323-C6EJUM (Air ECA) and industrial sewage works ECA No. 1122-BKUPSM (Industrial Sewage ECA). The Site has accepted waste (in one form or another) since 1959 and received a Certificate of Approval (CofA, now referred to as an ECA) in 1980, with amendments approved by the Ministry of the Environment (currently the Ministry of Environment, Conservation and Parks (MECP) in 1980, 2002, 2004, 2005, 2007, 2011, 2012, 2013, 2014, 2017, 2018, 2020, and 2021. Under the current ECA, the Site is licenced to receive post-diversion solid non-hazardous Industrial, Commercial & Institutional (IC&I) waste from across Ontario. The 14.3-hectare (ha) Site contains an approved fill area of 6 ha.

In 2018, BRE completed an Individual Environmental Assessment (EA) to increase the total approved capacity at the Site to allow for the continued receipt of post-diversion IC&I waste over a five-to-seven-year planning period and an amendment to the Site's rate of fill to provide for a maximum of 151,000 tonnes per year (known as the Brooks Road

Landfill Vertical Capacity Expansion EA). The Brooks Road Landfill Vertical Capacity Expansion EA was approved by the Minister of Environment, Conservation and Parks on January 15, 2019. The Site ECA was amended in 2021 to increase the annual rate of fill from 151,000 tonnes per year to a maximum of 250,000 tonnes per year, which is proportional to the daily maximum of 1,000 tonnes per day. The 2021 ECA amendment was subject to the Environmental Screening Process.

In order to meet the growing demand from waste generators and customers for a safe and reliable waste management facility for their post diversion solid non-hazardous Industrial, Commercial & Institutional waste (including impacted soils), Brooks Road Environmental is proposing to expand the capacity of the Brooks Road Landfill by approximately 219,400 m<sup>3</sup>, adding capacity equal to approximately two additional years. This expansion would be achieved through a combination of re-engineering the Site's final contours to expand the Site vertically in the expansion area (not to exceed current approved peak contours), as well as increasing the existing landfill footprint to expand the Site horizontally, as shown in **Figure 1.2**.

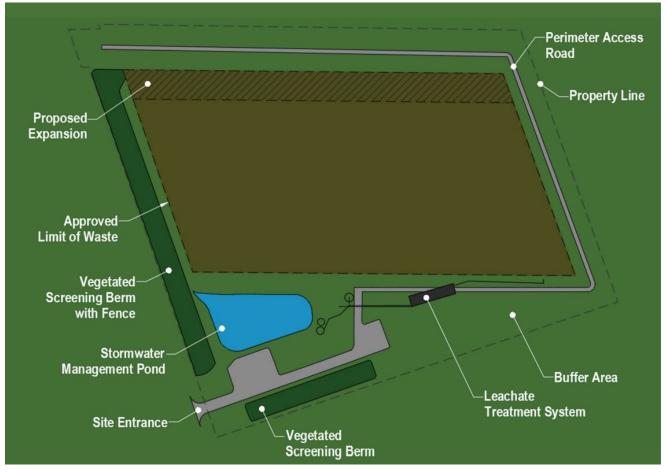


Figure 1.2 Proposed Capacity Expansion Concept

The proposed expansion would amend the approved ECA to allow for landfill volume expansion by approximately 219,400 m<sup>3</sup>, allowing for receipt of an approved maximum daily quantity (1,000 tonnes per day) throughout the year, maintaining the approved rate of 250,000 tonnes per year. The proposed change to the total landfill capacity requires additional landfill infrastructure and changes to the currently approved landfill volume, footprint, and final contours.

The proposed Brooks Road Landfill Site capacity expansion is subject to the Environmental Screening Process in accordance with Section 13 of Ontario Regulation 101/07 – Waste Management Projects Regulation of the Ontario *EA Act*, as follows:

A change to a landfilling site or dump is defined as a major commercial or business enterprise or activity and is designated as an undertaking to which the Act applies, if the changes meet the following criteria:

- 1. The total waste disposal volume of the landfilling site or dump after the change would exceed the total waste disposal volume that the landfilling site or dump was authorized to have under the Environmental Protection Act before the change by more than 100,000 cubic metres but by less than or equal to 375,000 cubic metres.
- 2. The increase in the total waste disposal volume of the landfilling site or dump would not exceed 25 per cent of the total waste disposal volume that the landfilling site or dump was authorized to have under the Environmental Protection Act before the change.
- 3. If a notice of completion under the Environmental Screening Process for Waste Management Projects has been submitted to the Ministry in respect of a previous change to the landfilling site or dump that meets the criteria in paragraphs 1 and 2, the day on which the notice of commencement is issued under the Environmental Screening Process for Waste Management Projects in respect of the change is at least 10 years after the day the notice of completion in respect of the previous change was submitted.

Section 13 of Ontario Regulation 101/07 – Waste Management Projects Regulation exempts this Project from Part II of the *EA Act*, subject to fulfilling the Environmental Screening process. The Screening will be conducted in accordance with the planning and design process outlined in MECP "*Guide to Environmental Assessment Requirements for Waste Management Projects.*" The Environmental Screening Process includes identifying and applying screening criteria to determine and describe potential environmental effects, public/external agency consultation, and the development of measures to mitigate identified environmental effects. The results of the Study will be documented in an Environmental Screening Report, which will be released for review to Stakeholders including Indigenous communities, the public, and government agencies. Upon completion of the Environmental Screening Process an application will be made to amend the existing ECA No. A110302.

GHD has prepared a Geology and Hydrogeology Assessment on behalf of BRE to support the proposed undertaking. This report documents the following as it relates to the geologic and hydrogeologic environment:

- Baseline/existing conditions (i.e., what exists in the absence of the proposed project)
- Potential effects on the environment, mitigation measures, and net effects
- Future monitoring requirements to be implemented

The Study Areas reviewed for the geology and hydrogeology assessment were as follows (see Figure 1.3):

- On-Site the 14.3 ha area within the existing, approved boundaries of the Site, as defined by ECA No. A110302, as amended
- Site-Vicinity the area within the vicinity of the Site extending approximately 1 km in all directions



# 2. Screening Criteria Checklist

At the beginning of the Environmental Screening, the Screening Criteria Checklist (provided as Schedule I, pp 67 – 69, to the "Guide to Environmental Assessment Requirements for Waste Management Projects") is to be completed based on the information provided in the Project Description. The Screening Criteria reflect the broad definition of "environment" contained in the Ontario Environmental Assessment Act

As noted in the Guide:

The Screening Criteria are presented in the form of a checklist with the option of a "Yes" or "No" response. Mitigation measures <u>are not</u> to be considered in concluding whether there is "No" potential environmental effect. That is, the proponent is required to answer "Yes" even if the proponent believes that a potential environmental effect could likely be mitigated. The reason for requiring a "Yes" is to ensure that mitigation measures are open to discussion and review. Another reason for this approach is that further discussion and review of a potential effect may reveal that there is no actual effect, in which case no mitigation is required.

Where a "Yes" has been identified, the proponent is to provide additional information in the Environmental Screening Report, explaining the potential effect(s), methods to mitigate or address the effect(s), any net effects that are anticipated and if so, their significance. Even where the proponent indicates that no environmental effects are anticipated, it is recommended that additional information is provided in the Environmental Screening Report in order to support the "no effects" conclusion".

Each criterion is based on a question which is prefaced with the phrase, "*Might the Project…*" Table 2.1 was completed as the first step of the Environmental Screening Process and is a summary of the criteria for the Geology and Hydrogeology discipline. Further descriptions of the criteria for which a "Yes" response was indicated in the Screening table are discussed in Section 4 of this report.

	Criterion	YES	NO	Additional Information
	Might the project			
1. 8	Surface and Groundwate	r		
1.2	Cause negative effects on groundwater quality, quantity, or movement?	х		The proposed landfill expansion would result in changes to the existing landfill footprint, cover design (daily, intermediate, final), final contours, and on-site operations and may cause negative effects on groundwater quality, quantity, or movement.
1.4	Cause negative effects on surface or groundwater from accidental spills or releases (e.g., leachate) to the environment?	х		The proposed landfill expansion would result in changes to the existing landfill footprint, cover design (daily, intermediate, final), final contours, and on-site operations and may cause negative effects on surface or groundwater from accidental spills or releases (e.g., leachate) to the environment.

### Table 2.1 Screening Criteria Checklist – Geology and Hydrogeology

# 3. Existing Conditions

The following subsections describe the existing conditions that are found within the On-Site and Site-Vicinity Study Areas of the proposed project.

# 3.1 Methodology

## 3.1.1 Available Secondary Source Information Collection and Review

Available secondary sources of information were collected and reviewed by the Geology and Hydrogeology Study Team to determine existing geology and hydrogeology conditions within the Study Areas. The following sources of secondary information were collected and reviewed:

### Site-Specific Reports

- GHD Limited. (April 2022). 2021 Annual Operations and Monitoring Report, Brooks Road Landfill Site, Haldimand County, Ontario.
- Conestoga-Rovers and Associates. (October 2002, Amended November 2003). Design and Operations Report, Edwards Landfill Site, Haldimand County, Ontario.
- Conestoga-Rovers and Associates. (October 2002). Hydrogeologic Performance Assessment Updated Design, Edwards Landfill Site, Haldimand County, Ontario.
- Conestoga-Rovers and Associates. (July 2010). Updated Site Decommissioning Plan, Edwards Landfill Site, Haldimand County, Ontario.
- Conestoga-Rovers and Associates. (July 2004). Well Survey and Limited Hydrogeological Assessment, Edwards Landfill Site, Haldimand County, Ontario.
- Conestoga-Rovers and Associates. (January 2014). Site Decommissioning Report, Brooks Road Landfill Site, Haldimand County, Ontario.
- GHD Ltd. (May 2016). Gypsum Mine Investigation Report, Haldimand County, Ontario.

### Government Information Available in the Public Domain

- Physiography mapping (classified as the Haldimand Clay Plain)
  - Chapman, L.S. and Putnam, D.F, 1984: The Physiography of Southern Ontario; Ontario Geological Survey, Special Volume 2, Ontario Ministry of Natural Resources., Third addition.
- Topography Mapping (regional topography and slope, and approximate site topography of 200 m above mean sea level (AMSL)).
  - National Topographic System, 1983: Dunnville, Ontario; Canada Centre for Mapping, Department of Energy, Mines & Resources, Information Current as of 1980, Map Sheet 30 L/13, Edition 6, scale 1:50,000.
- Soils mapping (classified as lacustrine silty clay)
  - Ontario Institute of Pedology, 1983: Soils of Haldimand-Norfolk Regional Municipality; Cartography Section, Land Resource Research Institute, Research Branch, Agriculture Canada, Soil Survey Report No. 57, Sheet 6, scale 1:25,000.
- Quaternary geology mapping (classified as glaciolacustrine clay and silt)
  - Feenstra, B.H., 1974: Quaternary Geology of the Dunnville Area, Southern Ontario; Ontario Division of Mines, Preliminary Map P.981, Geological Series, scale 1:50,000. Geology 1973.

- Bedrock topography mapping (bedrock topography approx. 182.5 m AMSL)
  - Feenstra, B.H., 1981: Bedrock Topography of the Dunnvile Area, Southern Ontario; Ontario Geological Survey, Preliminary Map P.2412, scale 1:50,000.
- Bedrock geology mapping (bedrock geology is comprised of argillaceous dolostone and evaporites of the Salina Formation)
  - Telford, P.G., and Tarrant, G.A., 1975: Paleozoic Geology of the Dunnvile Area, Southern Ontario; Ontario Division of Mines, Preliminary Map P.988, Geological Series, scale 1:50,000. Geology 1974.
- Karst geology report/mapping
  - Brunton, F.R. and Dodge, J.E.P. 2008: Karst of Southern Ontario and Manitoulin Island; Ontario Geological Survey, Groundwater Resources Study 5. ISBN 978-1-4249-8376-6 (ZIP FILE).
- Active and abandoned gas wells in proximity to the Site were also reviewed (source: Oil, Gas & Salt Resources Library, London, ON.

## 3.2 Description of Existing Conditions

The Site is situated on the Haldimand Clay Plain<sup>1</sup> approximately 2 km northeast of the Town of Cayuga. The Site is relatively flat. The regional topography is generally flat with a gentle slope to the south towards Lake Erie. The elevation of the Site is approximately 200 m AMSL<sup>2</sup>. A Site location map, which includes regional elevations, is included as Figure 3.1.

A review of soil surveys indicates that the surficial soils in the vicinity of the Site are classified as mainly lacustrine silty clay<sup>3</sup>. A review of the quaternary geology in the Site-Vicinity indicates that the area is generally underlain by glaciolacustrine clay and silt<sup>4</sup>. Published bedrock topography mapping indicates a bedrock elevation of approximately 182.5 m AMSL in the vicinity of the Site<sup>5</sup>. The bedrock geology in the vicinity and underlying the Site is comprised of argillaceous dolostone, shale, and evaporites of the Salina Formation<sup>6</sup>.

<sup>&</sup>lt;sup>1</sup> Chapman, L.S. and Putnam, D.F, 1984: The Physiography of Southern Ontario; Ontario Geological Survey, Special Volume 2, Ontario Ministry of Natural Resources., Third addition.

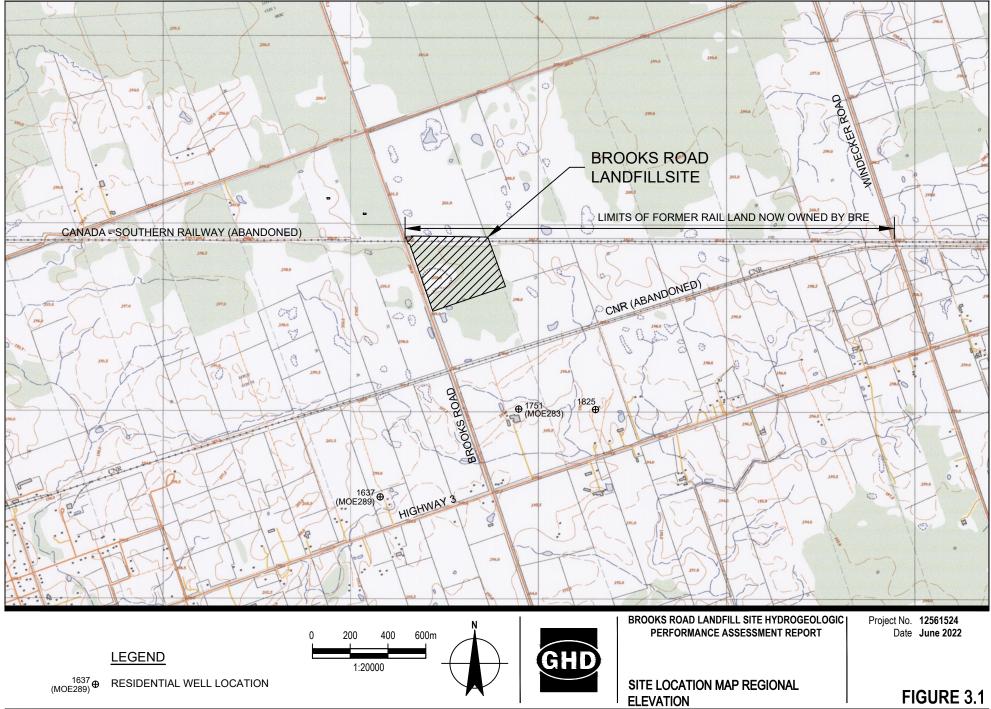
<sup>&</sup>lt;sup>2</sup> National Topographic System, 1983: Dunnville, Ontario; Canada Centre for Mapping, Department of Energy, Mines & Resources, Information Current as of 1980, Map Sheet 30 L/13, Edition 6, scale 1:50,000.

<sup>&</sup>lt;sup>3</sup> Ontario Institute of Pedology, 1983: Soils of Haldimand-Norfolk Regional Municipality; Cartography Section, Land Resource Research Institute, Research Branch, Agriculture Canada, Soil Survey Report No. 57, Sheet 6, scale 1:25,000.

<sup>&</sup>lt;sup>4</sup> Feenstra, B.H., 1974: Quaternary Geology of the Dunnvile Area, Southern Ontario; Ontario Division of Mines, Preliminary Map P.981, Geological Series, scale 1:50,000. Geology 1973.

<sup>&</sup>lt;sup>5</sup> Feenstra, B.H., 1981: Bedrock Topography of the Dunnvile Area, Southern Ontario; Ontario Geological Survey, Preliminary Map P.2412, scale 1:50,000.

<sup>&</sup>lt;sup>6</sup> Telford, P.G., and Tarrant, G.A., 1975: Paleozoic Geology of the Dunnvile Area, Southern Ontario; Ontario Division of Mines, Preliminary Map P.988, Geological Series, scale 1:50,000. Geology 1974.



Data Source: MINISTRY OF NATURAL RESOURCES SHEETS: 10 17 5900 47550 & 10 17 5950 47550

### Site Geology

The overburden geology is relatively uniform beneath the Site. In general, the Site is characterized by a thick (14 to 18 m) glaciolacustrine layer of stratified silty clay, silty clay till and varved clays, underlain by a thin (1 to 3 m) discontinuous layer of silty sand till with varying proportions of gravel and clay. The bedrock has been encountered at depths varying from 15.2 to 20.2 m below ground surface (BGS). A thin surficial deposit of topsoil is generally observed at the surface of the Site, with the exception of the southwestern portion.

The silty clay deposits are described as being locally fractured (weathered) from the surface down to depths varying from 3 to 5 m BGS and are characterized as a very stiff to hard with low plasticity. At depths more than 5 m, the silty clay deposits have little to no fracturing and the consistency of the units increase from stiff to very stiff.

Underlying the silty clay deposits, a thin discontinuous silty sand till with varying proportions of clay and gravel is encountered across the Site. The silty sand till ranges in thickness from 1 to 3 m and often contains cobbles and/or broken angular bedrock fragments. This deposit is usually well graded with fine to medium grained sand, minor silt and trace clay, and is described as dense to compact, grey, and saturated. The silty sand till rests directly over the bedrock.

Bedrock underlying the Site has been described as a fractured shale, dolostone and gypsum of the Salina Formation. The top of bedrock elevation ranges from 180.8 to 187.0 m AMSL and forms a small bedrock valley from northwest to southeast across the Site. The valley is characterized by a thicker silty sand till deposit. Regionally, the bedrock topography dips to the south.

### Site Hydrogeology

In general, the geologic units identified at the Site may be grouped into two main hydrogeologic units separated by the thick silty clay aquitard unit, as follows:

- i) An unconfined water table (shallow overburden) unit within shallow fractured silty clay (weathered) unit
- ii) Silty clay aquitard
- iii) A confined basal till overburden/shallow bedrock aquifer

These two hydrogeological units are separated by a thick (between 9 and 12 m) layer of stratified silty clay, silty clay till, and varved clays which form a continuous aquitard of very low hydraulic conductivity. Groundwater level data historically gathered from the shallow overburden unit and basal overburden/shallow bedrock aquifer indicate that the clay aquitard provides hydraulic separation between the two units. Differences in hydraulic head between the two units have varied between 9.5 to 15 m as historically measured at the location of nested wells. The vertical hydraulic gradient between the two hydrogeologic units is downward.

Based on historical groundwater level data, the shallow overburden unit is generally encountered at depths varying from 0.5 to 4 m BGS across the Site. The shallow overburden unit is an unconfined water table unit, which overlies the impermeable un-weathered silty clay unit. Based on the shallow overburden monitoring wells monitored in 2021, groundwater flow in this unit is generally towards the south towards Lake Erie.

Underlying the silty clay aquitard, a confined basal overburden/shallow bedrock aquifer has been observed within the lower portion of the silty sand till unit and the shallow fractured bedrock. Groundwater quality and water level data indicate that the lower silty sand till unit and the shallow fractured portion of the bedrock are hydraulically connected and geochemically similar. Therefore, these two geological units have been considered to form one aquifer.

Based on the groundwater data obtained to date, the basal overburden/shallow bedrock aquifer is generally encountered at depths varying from 14 to 17 m BGS. The groundwater flow pattern in this aquifer is in a south to southwest direction with a relatively flat horizontal hydraulic gradient.

### Natural Gas Deposits and Natural Gas Wells

A review of oil, gas and salt resource mapping in Ontario indicates that several active and plugged gas wells are located within the Site-Vicinity. No active/plugged gas wells were identified on the Site, however research indicates

that 23 current and former gas wells are located within the Site-Vicinity. A total of 16 gas wells have been identified as abandoned, of which 15 have been identified as plugged, and a total of seven gas wells that may be active, suspended, or abandoned are found within the Site-Vicinity. The gas wells all targeted the Haldimand Pool within the Clinton Group and were drilled to a total depth (true vertical depth) ranging from 207.6 to 229.5 m BGS at approximately the top of the Queenston Formation. A natural gas pipeline is also located approximately 400 m south of the Site. A list of the Ontario Oil and Gas Wells located within the Site-Vicinity is itemized in Table 3.1 and a reference Figure is attached as Figure 3.2.

Due to the depths of the natural gas wells, it is not anticipated that there would be any influence from the landfill on the natural gas wells.

#### Table 3.1

### List of Ontario Oil Gas Records within the Study Area Hydrogeology Assessment Brooks Road Landfill Brooks Road, Cayuga, Ontario

#### LICENCE

NUMBER WELL NAME

F019425 Pt. Colborne-Welland Gas Co. - J. Kozak #1, North Cayuga - 22 - INTR F019426 W.C. Patterson - Miss Doyle, North Cayuga - 22 - INTR F019435 P.C. Welland Gas Co - C. Bunn #1, North Cayuga - 23 - INTR F019436 Pt. Col-Welland Gas Co - C. Bunn #2, North Cayuga 1 - 23 - INTR F019437 Pt. C. -Welland Gas Co - C. Bunn #3, North Cayuga - 23 - INTR F019438 Dom Nat Gas Co - Wm Bunn #1, North Cayuga - 23 - INTR F019439 Haldimand Gas Synd - W.R. Slack #2, North Cayuga - 23 - INTR F019478 W.C. Patterson - W.A. Oster #1, North Cayuga - 24 - INTR F019479 W.C. Patterson - W.A. Oster #2, North Cayuga - 24 - INTR F019480 Union Gas Co of Canada - W.A. Oster #3, North Cayuga - 24 - INTR F019481 Pt Col.-Welland Gas Co - C. Bunn #4, North Cayuga - 24 - INTR F019482 Pt. Col - Welland Gas Co Ltd. - C. Bunn #5, North Cayuga - 24 - INTR F019509 W.C. Patterson - J. Badger, North Cayuga - 25 - INTR F019511 Pt. Col-Welland Gas & Oil Co - J. Ferguson #1, North Cayuga - 25 - INTR F019516 Dom Nat Gas Co - A.& W. Geddes #2, North Cayuga - 26 - INTR F019517 Dom Nat Gas Co - A.&W. Geddes #3, North Cayuga - 26 - INTR F019520 Dom Nat Gas Co - W.B. Hamilton #2, North Cayuga - 26 - INTR T002154 Haldimand Gas No. 477, North Cayuga - 22 - INTR T002163 Haldimand Gas No. 481, North Cayuga - 22 - INTR T002399 Haldimand Gas No. 489, North Cayuga - 23 - INTR T002428 Haldimand Gas No. 491, North Cayuga - 24 - INTR T002543 Haldimand Gas No. 494, North Cayuga - 25 - INTR T002590 Haldiamnd Gas No. 496, North Cayuga - 25 - INTR

#### Notes:

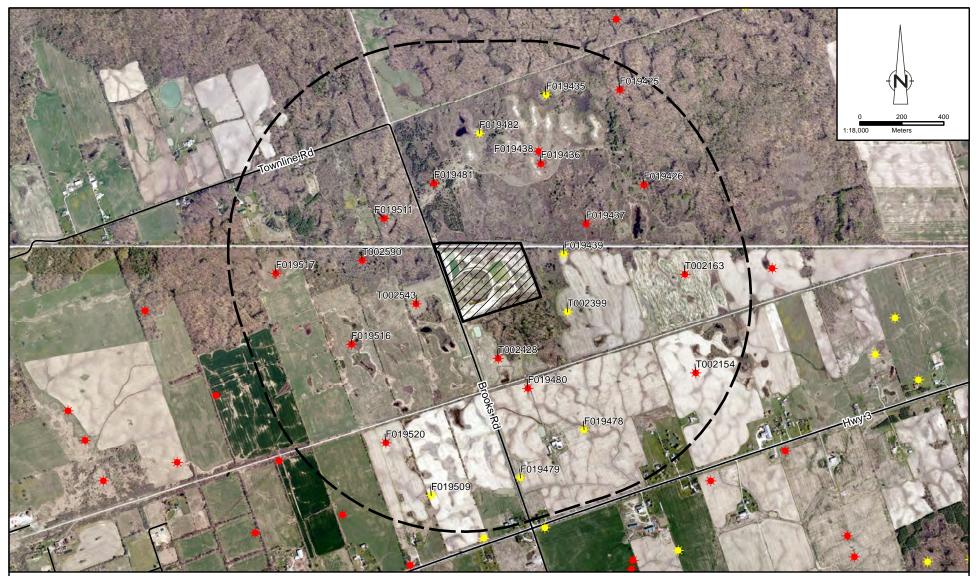
TVD Total Vertical Depth

TD Date Date total depth reached

#### OPERATOR

Port Colborne - Welland Natural Gas & Oil Co. Ltd. W. C. Patterson Gas Co. Ltd. Port Colborne - Welland Natural Gas & Oil Co. Ltd. Port Colborne - Welland Natural Gas & Oil Co. Ltd. Port Colborne - Welland Natural Gas & Oil Co. Ltd. Dominion Natural Gas Co., Ltd. Haldimand Natural Gas Syndicate W. C. Patterson Gas Co. Ltd. W. C. Patterson Gas Co. Ltd. Union Gas Limited Port Colborne - Welland Natural Gas & Oil Co. Ltd. Port Colborne - Welland Natural Gas & Oil Co. Ltd. W. C. Patterson Gas Co. Ltd. Port Colborne - Welland Natural Gas & Oil Co. Ltd. Dominion Natural Gas Co., Ltd. Dominion Natural Gas Co., Ltd. Dominion Natural Gas Co., Ltd. Haldimand Gas & Oil Wells Ltd.

WELL TYPE	WELL MODE	TVD	TD DATE	PLUG DATE
Gas Show	Abandoned Well	210.62	21-Nov-1947	21-Nov-1947
Dry Hole	Abandoned Well	214.58	26-Nov-1927	
Natural Gas Well	Unknown	207.57	30-Apr-1943	
Natural Gas Well	Abandoned Well	210.31	17-Jun-1943	3-Feb-1960
Natural Gas Well	Abandoned Well	229.51	28-Aug-1943	23-Jul-1954
Dry Hole	Abandoned Well	213.97	5-Apr-1928	9-Apr-1928
Natural Gas Well	Unknown	211.84	21-Dec-1957	
Natural Gas Well	Unknown	219.76		
Natural Gas Well	Unknown	224.33	31-Jan-1929	
Gas Show	Abandoned Well	217.93	28-Nov-1938	8-Nov-1938
Natural Gas Well	Abandoned Well	211.53	9-Oct-1943	30-Jun-1964
Natural Gas Well	Unknown	207.87	24-Nov-1943	
Natural Gas Well	Unknown	219.15	19-Mar-1929	
Gas Show	Abandoned Well	213.66	20-Jan-1948	20-Jan-1948
Natural Gas Well	Abandoned Well	213.66	4-Oct-1929	25-Aug-1964
Dry Hole	Abandoned Well	210.01	24-Oct-1929	25-Oct-1929
Natural Gas Well	Abandoned Well	215.80	20-May-1929	12-Mar-1935
Natural Gas Well	Abandoned Well	214.58	13-Dec-1965	24-Jul-1974
Natural Gas Well	Abandoned Well	214.27	1-Aug-1966	4-Aug-1971
Natural Gas Well	Unknown	213.66	13-Oct-1967	
Gas Show	Abandoned Well	215.80	7-May-1968	16-Jul-1968
Natural Gas Well	Abandoned Well	213.66	30-Aug-1968	10-Jun-1975
Natural Gas Well	Abandoned Well	210.62	24-Oct-1968	9-Jun-1975



Source: MNRF NRVIS, 2014. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2016; Haldimand County Official Plan Aerial: 2006 Grand River Conservation Authority Coordinate System: NAD 1983 UTM Zone 17N

Figure 3.2



OIL AND GAS WELL LOCATIONS GEOLOGY & HYDROGEOLOGY ASSESSMENT REPORT BROOKS ROAD LANDFILL 160 Brooks Road, Cayuga, Ontario

### **Mining Claims and Abandoned Mines**

A review of the Ministry of Northern Development and Mines (MNDM) information for abandoned mines and mining claims was completed. No mining claims were identified within the On-Site area, however one abandoned mine was identified within the Site-Vicinity to the northwest of the Site (AMIS File # 04888 / MDI # MDI30L13NW00003). The mine was reviewed in a CRA report entitled Well Survey and Limited Hydrogeological Assessment, dated July 2004 (2004 Report). The 2004 Report indicates two documents were reviewed: Gypsum in Ontario, C.R.Guillet, dated 1964, and Abandoned Mines Hazard Abatement Program, London District Site Examinations, prepared by Patrick Chance & Associates Consulting Geologists, dated 1994 (1994 Inspection). The information presented below was gathered from the above-referenced reports and has been revised with the most current information available including information from the Gypsum Mine Investigation Report prepared by GHD that provides an assessment of potential influences of the former Cayuga Gypsum Mine on groundwater at the landfill Site.

The former gypsum mine was operated by the Cayuga Gypsum Company Limited between 1942 and 1949. Gypsum was mined from a 0.9 m thick bed at a depth of 25.9 m BGS.

Mining operations were accomplished via two mine shafts. The first shaft was located approximately 112 m south of Townline Road and 350 m west of Brooks Road. The former shaft can reportedly be located by a 2.4 m deep depression, with a footprint of 3 by 4.6 m. The shaft was a vertical prospect shaft of unknown support and was back-filled with unknown materials. The 1994 Inspection did not document any evidence of subsidence, however the report recommended that a 50 m radius area of caution be observed in the vicinity of this shaft.

Based on the available historical documentation, approximately 10,300 tonnes of gypsum were reportedly removed from this prospect shaft during the operation of the mine. With a density of 2.3 t/m<sup>3</sup> and a thickness of 1 m, this would correspond to lateral workings with an aerial footprint of approximately 4,356 square metres (m<sup>2</sup>). In order to access the gypsum in the 1 m seam, it is likely that approximately 1-2 m of the overlying shale bedrock would also have been removed.

The second shaft was located approximately 305 m south of the first shaft. The 1994 inspection was reportedly unable to locate the second shaft. The second shaft was also a vertical prospect shaft of unknown support, and it is unknown if the shaft has been back-filled. It is not known how much gypsum was removed from this shaft.

Due to property access restrictions, an inspection of the former Cayuga Gypsum Mine could not be conducted.

During the operation of the mine from 1942 to 1949, dewatering operations would likely have been conducted to keep the mine shafts and associated galleries dry. As such, during the operation of the mine, the local groundwater flow would have been influenced by mine dewatering activities. Active removal of large quantities of groundwater from the bedrock would have resulted in inward hydraulic gradients. As such, the bedrock groundwater flow in the vicinity of the former mine would have been directed toward the active galleries during the operation of the mine.

Upon closure of the mine in 1949, the dewatering activities at the mine would have ceased and the associated mine shafts and galleries would have flooded within the first year of closure. The mine has now been abandoned for 67 years. Since the former galleries and shafts are flooded, no water deficit should be present between these former underground structures and the surrounding bedrock. Thus, essentially steady state conditions should exist, and the former underground structures will no longer have a hydraulic influence on the local bedrock aquifer.

In the unlikely event that the former mine shafts would not have been properly sealed following the closure of the mine, there could exist the potential for surface water and groundwater in the shallow overburden to enter the mine shafts and migrate to the underlying bedrock aquifer. If infiltration were occurring, the shafts would be acting as a sink to the overburden groundwater and a source of recharge to the local bedrock groundwater. This would result in a cone of depression in the overburden groundwater towards the former mine shafts and radial flow from the galleries in the bedrock groundwater. Under this scenario there could be a potential for bedrock groundwater flow being diverted away from the former galleries. However, based on the relatively small dimension of the former galleries (areal extent of approximately 4,356 m<sup>2</sup>) it is expected that any influence of these galleries on the bedrock aquifer would be localized to the immediate vicinity of the former galleries. Bedrock aquifer influence beyond the limits of the former Cayuga Gypsum Mine property is anticipated to be negligible.

The Gypsum Mine Investigation Report reviewed information related to historical mining operations including location and extent of mining activities, review of physical site conditions for evidence of historical mining operations, and an evaluation of hydraulic gradients within the available monitoring network to identify potential evidence of a hydraulic influence on horizontal or vertical gradients in the vicinity of the Site. The report concluded that there is no evidence of an influence related to the former Cayuga Gypsum Mine on the bedrock aquifer at the Landfill Site.

### **Other Data Sources**

A review of the Ontario Geological Survey Karst of Southern Ontario and Manitoulin Island report indicates that not potentially karst, inferred karst, or known karst bedrock has been identified within the study area<sup>7</sup>. Furthermore, the groundwater conditions are unfavourable for the dissolution of the bedrock and the Upper Silurian bedrock consists of generally argillaceous dolostone, shale, and evaporites (primarily gypsum), the latter of which precludes the formation of large-scale karst features. Furthermore, no sink holes or caving features have been identified in the study area.

# 4. Potential Effects, Mitigation Measures & Net Effects

A Project Description, which includes proposed engineering design figures, was prepared so that potential environmental effects and mitigation measures could be identified. The following subsections provide a general summary of the proposed undertaking.

# 4.1 Description of Project Components and Activities

The project for which the Environmental Screening Process is being undertaken is a proposed capacity expansion of 219,400 m<sup>3</sup> and involves a change to the final Site capacity, contours, and footprint. Some level of construction is required to implement the proposal. This would be a combination of re-engineering the Site's final contours to expand the Site vertically in the expansion area (not to exceed current approved peak contours), as well as increasing the existing landfill footprint to expand the Site horizontally. Modification to the northern perimeter access road and stormwater drainage ditch would be required to accommodate the proposed changes to the final Site contours. The former railway property would continue to provide buffer land for the Site. The Brooks Road Landfill will continue to operate within currently approved operating hours and current construction activities and daily operations will continue as usual. There are no changes to the annual fill rate limits (maximum 1,000 tonnes per day and 250,000 tonnes per year) proposed as part of this project.

A summary of the key elements of the proposed capacity expansion compared to the existing approved Site is provided in Table 4.1, below.

Design Component	Existing Landfill	Proposed Capacity Expansion
Volume (m <sup>3</sup> )	1,045,065	1,264,4651
Footprint Area (ha)	6.07	7.15
Peak Elevation (mAMSL) (top of final cover)	221.50	225.66
Peak Elevation – top of waste (mAMSL)	220.75	224.91

 Table 4.1
 Summary of Proposed Brooks Road Landfill Capacity Expansion Design vs Existing Landfill

<sup>&</sup>lt;sup>7</sup> Brunton, F.R. and Dodge, J.E.P. 2008: Karst of Southern Ontario and Manitoulin Island; Ontario Geological Survey, Groundwater Resources Study 5. ISBN 978-1-4249-8376-6 (ZIP FILE).

Design Component	Existing Landfill	Proposed Capacity Expansion
Crest of Slope Elevation (mAMSL)	221.0	225.30
Slopes (Top/Sides)	Top – 20:1 (5%) Sides – 4:1 (25%)	Top – 20:1 (5%) Sides – 4:1 (25%) New stage is 4:1 (25%) north side slope, extends to a new peak elevation (i.e., elevated 20:1 [5%] plateau), and the south side slope (25%) ties-in to existing approved top of waste plateau. All other sides remain the same.
Stormwater Pond	Permanent pool – 1,266 m <sup>3</sup> Total live storage – >5,502 m <sup>3</sup>	Pond capacity is sufficient for the proposed expansion based on existing Stormwater Management Plan.
Stormwater Drainage Ditch		Stormwater drainage ditch shifted by 30 m. East and west ditches will extend to maintain full perimeter ditch.
Perimeter Roads		Northern perimeter access road shifted by 29 m. East access road extended as appropriate. Access road will extend west, proposed to connect to Brooks Road as a secondary site access (locked during normal operation). A turnaround area will be provided in the northwest corner.
Maximum Daily Truck Traffic	25 to 50	25 to 50
Post-Closure Leachate Generation Rate	33 m³/day	39 m³/day
Capacity anticipated to be reached (year)	2024	2026

# 4.2 Methodology and Investigations

The assessment of effects associated with the proposed undertaking was carried out through a series of steps that are based, in part, on the description of existing conditions as well as the Project Description and Site Plan. The assessment of effects was also undertaken within the context of the previously completed Screening Criteria Checklist, as summarized in Section 2 of this report.

The assessment of effects was carried out by modelling the predicted effects of the landfill on the hydrogeologic regime under the scenario of the proposed expansion. The modelling took into consideration the existing conditions at the Site, the known hydrogeologic characteristics, as documented extensively in previous reports (including the most recent annual monitoring reports), and the proposed modifications to the Site design. Modelling was undertaken to estimate the quantitative and qualitative effects on the local hydrogeologic regime resulting from the lateral expansion of the waste footprint and landfilling of additional waste. The modelling takes into consideration the proposed design, including final cover, the liner system and the leachate collection system. The modelling considered scenarios that included worst-case mass loading to the underlying hydrogeologic regime (i.e., used maximum measured concentrations in leachate between 2017-2021 and considers the period when landfilling is near final capacity and maximum leachate generation volumes were reached).

Modelling included two scenarios. The first scenario involved 6 m of leachate mounding over the composite liner for 50 years, followed by complete failure of the HDPE liner. In this scenario, the leachate collection system and the HDPE liner were modelled with a service life of 50 years in order to maintain consistency with the previously modelled failure scenario. Following the 50-year service period, the HDPE liner was removed from the liner system and the

leachate head was maintained at 6 m above the base of the collection system. The second scenario modelled the effect of 6 m of head on the liner system with the HDPE liner entirely absent for the duration of the model.

Appendix A includes a report entitled Hydrogeologic Assessment – Landfill Expansion, Brooks Road Landfill (GHD, 2022) (Hydrogeologic Assessment Report). This report provides a full description of the hydrogeologic assessment of the proposed landfill expansion design, including descriptions of the methodology, existing conditions and predicted results of the expansion modelling. The results of the modelling demonstrate that the Site design features are sufficiently protective of the local hydrogeologic regime. The results of modelling indicate that concentrations of contaminants of concern entering the basal till aquifer will be reduced by an average factor of 4 prior to off-Site migration.

Groundwater quality is forecasted to be acceptable at the downgradient boundary with respect to the Ontario Drinking Water Standards (ODWS) and Site-specific Reasonable Use Concept (RUC) criteria.

# 4.3 Geology and Hydrogeology Net Effects

This Section provides an assessment of the potential negative environmental effects (i.e., those for which a "Yes" answer was given in the Screening Criteria Checklist) for those geology and hydrogeology criteria which might be affected by the project as identified in Section 2. The effects assessment describes how existing environmental conditions in the Study Areas would change as a result of the construction and operation of the proposed undertaking.

	Criterion	YES	NO	Additional Information
	Might the project			
1.2	Cause negative effects on groundwater quality, quantity, or movement?	Х		The proposed landfill expansion would result in changes to the existing landfill footprint, cover design (daily, intermediate, final), final contours, and on-site operations and may cause negative effects on groundwater quality, quantity, or movement.
1.4	Cause negative effects on surface or groundwater from accidental spills or releases (e.g., leachate) to the environment?	x		The proposed landfill expansion would result in changes to the existing landfill footprint, cover design (daily, intermediate, final), final contours, and on-site operations and may cause negative effects on surface or groundwater from accidental spills or releases (e.g., leachate) to the environment.

As described in Section 2, a "Yes" was applied to the following geology and hydrogeology criteria:

With respect to the above criteria/criterion, a description of the potential negative environmental effects, necessary mitigation measures and the resultant net effects on the environment are discussed. Studies conducted during the Environmental Screening Process showed that the anticipated effects will be much less than expected or will not occur at all. In all cases, impact management (mitigation) measures have been identified that, when applied, will eliminate the potential environmental effects, or reduce them to acceptable levels.

## 4.3.1 Potential Effects on Geology and Hydrogeology

The potential effects on the geology and hydrogeology environment are related primarily to the release of waste-related contaminants into the subsurface hydrogeologic regime. This release would occur as a result of leachate generated within the waste mound exiting the landfilled waste mass through the bottom or sides of the landfill and migrating into the shallow water table aquifer or the basal till/bedrock aquifer. Leachate-related impacts could travel downward from within the waste mass until reaching the basal till/bedrock aquifer. Once entering this aquifer, the impacts would travel laterally as advective flow in the direction of the natural horizontal hydraulic gradient (to the south).

## 4.3.2 Mitigation Measures

The mitigation measures implemented into the design to reduce or eliminate the potential effects on the geology and hydrogeology environment include:

- 1. The final cover system
- 2. The leachate collection system
- 3. The liner system

In addition to these engineered controls, the Site is also situated within a fine-grained (clay-rich) stratigraphic sequence with significant vertical thickness. This natural feature provides additional protection of the underlying aquifer as well as some beneficial attenuation capacity.

Section 6 of the Hydrogeologic Assessment Report provides a fulsome description of the modelling inputs, which includes the relevant design elements of engineered controls and the natural geologic setting. These elements in combination represent the measures which mitigate the potential effects of the proposed landfill expansion.

## 4.3.3 Net Effects

The net effects of the proposed landfill expansion on the geology and hydrogeology environment are the effects to this environment after the mitigation measures are applied. Accordingly, the results of the predictive modelling undertaken to estimate the magnitude of groundwater alteration resulting from the Project represent the net effects.

Section 6.5.3 of the Hydrogeologic Assessment Report describes the results of the predictive modelling. The primary receptor of concern with respect to the net effects is groundwater quality within the basal till/bedrock aquifer at the downgradient Site boundary. As described in Section 6.5.3 of the Hydrogeologic Assessment Report, water quality at the downgradient Site boundary within the basal till/bedrock aquifer is predicted to meet ODWS and Site-specific RUC criteria even at peak concentrations under the scenario of leachate collection system failure. On the basis of this predictive modelling, the proposed expansion is expected to result in only negligible or insignificant alterations to the geology and hydrogeology environment.

# 5. Monitoring Requirements and Additional Approvals

To ensure that the mitigation measures identified in Section 4 are functioning as envisioned, a strategy and schedule was developed for monitoring environmental effects. With these mitigation measures and monitoring requirements in mind, commitments have also been proposed for ensuring that they are carried out as part of the construction, operation, and maintenance of the proposed undertaking.

# 5.1 Monitoring Requirements

A comprehensive leachate and groundwater monitoring program (water levels and quality) is proposed. This proposed program includes a trigger level and contingency implementation plan in order to supplement the routine program and ensure appropriate responses are implemented in the event that water quality results indicate that an undesirable effect on groundwater quality is imminent.

The proposed routine monitoring program and trigger level and contingency implementation plan are outlined in detail in Section 7 of the Hydrogeologic Assessment Report.

# 5.2 Additional Approvals

No additional approvals are required in relation to the geology or hydrogeology environment.

# 6. Conclusion

On the basis of the net effects analysis performed, the proposed expansion is not anticipated to have an unacceptable impact on the geology and hydrogeology environment.

# Appendices

# Appendix A Hydrogeologic Assessment – Landfill

**Expansion, Brooks Road Landfill** 



# Hydrogeologic Assessment – Landfill Expansion Brooks Road Landfill

2270386 Ontario Limited

April 2, 2024





Project na	ame	Brooks Road Landfill Expansion					
Documen	t title	Hydrogeologic Asse	ssment – Landfill	Expansion   Broo	oks Road Landfill		
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- Appendix B Existing Environmental Compliance Approvals
- Appendix C MECP Water Well Records
- Appendix D Stratigraphic and Instrumentation Logs

# 1. Introduction

## 1.1 Purpose of this Report

GHD Ltd. (GHD) has prepared the following Hydrogeologic Performance Assessment Report on behalf of Brooks Road Environmental (BRE) c/o 2270386 Ontario Limited to support a landfill expansion project at the Brooks Road Landfill located at 160 Brooks Road, Cayuga, Ontario (herein referred to as the Site).

The objective of this Hydrogeologic Performance Assessment Report is to evaluate the anticipated environmental performance of the Site in terms of groundwater quality at the downgradient Site boundary following expansion of landfill area to the north of the existing approved waste footprint. This report is intended to satisfy the requirements of Ontario Regulation 232/98 and has been prepared in support of the Environmental Assessment and application to amend the Site's existing landfill Environmental Compliance Approval (ECA) No A110302.

The existing landfill was developed based on the Hydrogeologic Performance Assessment – Updated Design, Edwards Landfill Site prepared by GHD in 2002 and the Vertical Expansion Environmental Assessment approved in 2018. Given the proposed expansion will utilize an expanded waste footprint, an updated hydrogeologic assessment is required to satisfy the conditions in Section 8 of Ontario Regulation 232/98.

This Hydrogeologic Performance Assessment Report has been prepared to ensure that the geologic and hydrogeologic conditions are suitable for the proposed expansion. This report has been prepared utilizing the extensive hydrogeologic investigations previously conducted at the Site with a focus on ensuring that the proposed expansion design will not result in any adverse impact to off-Site groundwater and to verify existing groundwater monitoring and leachate contingency plans as amended to accommodate the expanded waste footprint continue to be effective in providing a good understanding of the geologic and hydrogeologic performance of the Site.

### Scope and limitations

This report: has been prepared by GHD for 2270386 Ontario Limited and may only be used and relied on by 2270386 Ontario Limited for the purpose agreed between GHD and 2270386 Ontario Limited as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than 2270386 Ontario Limited arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

### Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

# 1.2 Background

## 1.2.1 Site Location

The Site is an approved waste disposal site with an approved fill rate of 1,000 tonnes per day (250,000 tonnes per year) and current approved capacity of 1,045,065 cubic metre (m<sup>3</sup>) (including waste and daily cover).

The Site is located at 160 Brooks Road in Haldimand, Ontario, approximately 1 kilometre (km) north of Kings Highway No. 3 (Talbot Road). The Site is legally described as Part of Lot 24, Concession I-N.T.R., Haldimand County.

The total Site area is approximately 14.3 hectares (ha) (35.3 acres) of which 6 ha (15 acres) is currently approved for landfilling.

The regional Site location is presented on **Figure 1.1**. The local Site location is presented on **Figure 1.2**. Copies of the legal surveys for the Site are provided in **Appendix A**.

## 1.2.2 Regulatory Approvals

The following lists the Site's operating ECAs:

- Landfill ECA No. A110302 was issued on October 7, 1980 and was most recently amended on October 1, 2021.
- Industrial Sewage Works ECA No. 1122-BKUPSM was issued on February 3, 2020
- Air ECA No. 7323-C6EJUM was issued on September 24, 2021

Copies of the ECAs, and associated amendments, are included in Appendix B.

The following provides a description of the most recent ECAs issued for the Site.

An Environmental Assessment (EA) for a 400,000 m<sup>3</sup> vertical expansion was submitted on February 10, 2017. The EA was subject to a seven-week public and agency comment period, followed by a Ministry review and a public inspection of the Ministry Review, which concluded in August 2017. The Notice of Approval to Proceed with the Undertaking - EA Reference Number 13004 and EA File Number 03-08-02 (Notice of Approval) was signed by the Minister of the Environment, Conservation and Parks on January 15, 2019, was approved by cabinet on February 14, 2019, and received by BRE on March 13, 2019.

In April 2019, an ECA amendment application was submitted to the Ministry of the Environment, Conservation, and Parks (MECP) for Landfill ECA No. A110302 to implement the vertical expansion. On March 27, 2020, the Landfill ECA was amended. The environmental monitoring program for landfill gas (LFG), groundwater, surface water, and leachate were also updated in the amended Landfill ECA.

In September 2019, an ECA amendment application was submitted to the MECP to amend the Industrial Sewage Works ECA to increase the on-Site treatment rate, increase the treated effluent discharge rate and to operate the treatment system on a continual discharge basis. On February 3, 2020, the Industrial Sewage Works ECA was amended, resulting in Industrial Sewage ECA No. 1122-BKUPSM.

In June 2021, an ECA amendment application was submitted to the MECP to amend the Landfill ECA to increase the annual waste fill rate to 250,000 tonnes per year. On October 1, 2021, the Landfill ECA was amended. The Air ECA was also amended based on this submission.

## 1.2.3 Site History

Based on the information provided in the original 1971 application, the Site was approved under a Provisional Certificate of Approval (now called ECA) as a 15-acre (6.07 ha) landfill site with a daily fill rate of 10 tons (9.07 tonnes). The approved waste composition was 95 percent domestic (solid); 2 percent industrial (solid); 2.75 percent agricultural (solid); and 0.25 percent sewage sludge from the Caledonia Sewage Treatment Plant. The service area for the Site included the Province of Ontario.

Waste from various municipalities in the vicinity of the Site continued to be disposed at the Site on an ongoing basis from 1959 until 1977. After 1977, waste disposal activities were carried out on an intermittent basis. During the above period, waste disposed at the Site was placed in unlined trenches excavated into the native silty clay soils within the Site. After filling the trenches, waste was disposed directly on the ground surface and covered with a layer of the native soil. The waste stream included metal drums containing resin which had also been disposed at the Site.

Redevelopment of the landfill commenced with the construction of the Stage 1 engineered landfill cell and decommissioning and clean-up of the original landfill. Decommissioning of the original landfill commenced on September 4, 2012, and was completed on August 21, 2013 and satisfied Condition 30 of the Landfill ECA No. A110302 Notice 2. A total of 60,204 m<sup>3</sup> of non-hazardous solid waste and impacted soil was exhumed and transported to the newly constructed Stage 1 landfill cell for disposal. A total of 146.2 metric tons of non-hazardous solid waste, and 47.17 metric tons of suspect hazardous solid waste was exhumed and transported off Site for disposal. A total of five over-packed drums of solid non-hazardous waste were transported off Site for disposal. A total of 27,680 litres of a mixture of groundwater and leachate was pumped from the original landfill trenches and transported off Site for disposal.

The redevelopment of the Site included the construction of new lined landfill cells as follows:

- Stage 1 was completed in 2007
- Stage 2A was completed in 2013
- Stage 2B/3A was completed in 2013
- Stage 3B was completed in 2015

The vertical expansion will include Stages 5 through 8 and are being constructed on top of the Stage 1 through Stage 3B.

A stormwater management system and on-Site leachate treatment system (LTS) have been established on Site. Clean storm water and treated effluent are discharged to the Brooks Road roadside ditch and are regulated by ECA No. 1122-BKUPSM.

### 1.2.4 Previous Studies

Previous studies completed at the Site utilized in the preparation of this Hydrogeologic Performance Assessment Report include:

- 1. 2021 Operations and Monitoring Report, March 2022, prepared by GHD Ltd. for 2270386 Ontario Limited
  - a. GHD has complete routine monitoring and reporting between 2004-2017 and from 2017 onwards
- 2. 2020 Operations and Monitoring Report, March 2021, prepared by GHD Ltd. for 2270386 Ontario Limited
- 3. Leachate Trigger Level Plan, Brooks Road Landfill Site, Haldimand County, November 2019, prepared by GHD Ltd. for 2270386 Ontario Limited
- 4. 2019 Stormwater Contingency and Remedial Action Plan, Brooks Road Landfill Site, Haldimand County, prepared by GHD Ltd. for 2270386 Ontario Limited
- Design and Operations Report Vertical Expansion Brooks Road Landfill Site, April 2019, prepared by GHD Ltd. for 2270386 Ontario Limited
- 6. Gypsum Mine Investigation Report, Brooks Road Landfill Site, 160 Brooks Road, Haldimand County, Ontario, June 2016, prepared by GHD Ltd. for 2270386 Ontario Limited
- 7. Design and Operations Report Edwards Landfill Site, October 2002, prepared by Conestoga-Rovers & Associates Limited for Haldimand-Norfolk Sanitary Landfill Inc.
- 8. Hydrogeologic Performance Assessment Updated Design, Edwards Landfill Site, Haldimand County, Ontario, October 2002, prepared by Conestoga-Rovers & Associates Limited for Haldimand-Norfolk Sanitary Landfill Inc.

The following publicly available information has been considered in the preparation of this report:

- 1. Karst geology report/mapping: Brunton, F.R. and Dodge, J.E.P. 2008: Karst of Southern Ontario and Manitoulin Island; Ontario Geological Survey, Groundwater Resources Study 5. ISBN 978-1-4249-8376-6 (ZIP FILE).
- 2. Physiography mapping: Chapman, L.S. and Putnam, D.F, 1984: The Physiography of Southern Ontario; Ontario Geological Survey, Special Volume 2, Ontario Ministry of Natural Resources., Third addition.
- Topography Mapping: National Topographic System, 1983: Dunnville, Ontario; Canada Centre for Mapping, Department of Energy, Mines & Resources, Information Current as of 1980, Map Sheet 30 L/13, Edition 6, scale 1:50,000.
- 4. Soils mapping: Ontario Institute of Pedology, 1983: Soils of Haldimand-Norfolk Regional Municipality; Cartography Section, Land Resource Research Institute, Research Branch, Agriculture Canada, Soil Survey Report No. 57, Sheet 6, scale 1:25,000.
- 5. Bedrock topography mapping: Feenstra, B.H., 1981: Bedrock Topography of the Dunnvile Area, Southern Ontario; Ontario Geological Survey, Preliminary Map P.2412, scale 1:50,000.
- Bedrock geology mapping: Telford, P.G., and Tarrant, G.A., 1975: Paleozoic Geology of the Dunnvile Area, Southern Ontario; Ontario Division of Mines, Preliminary Map P.988, Geological Series, scale 1:50,000. Geology 1974.
- 7. Quaternary geology mapping: Feenstra, B.H., 1974: Quaternary Geology of the Dunnvile Area, Southern Ontario; Ontario Division of Mines, Preliminary Map P.981, Geological Series, scale 1:50,000. Geology 1973.

# 1.3 Report Organization

This Hydrogeologic Performance Assessment Report is organized into the following sections:

Section 1	Introduction
Section 2	Regional Physical Setting
Section 3	Site Physical Setting
Section 4	Natural gas, Mines, and Karst Consideration
Section 5	Residual Site Impact Assessment
Section 6	Hydrogeologic Assessment of the Proposed Landfill Expansion Design
Section 7	Proposed Monitoring and Reporting Programs
Section 8	Contingency Plans
Section 9	Summary and Conclusion

# 2. Regional Physical Setting

# 2.1 Description of Area

The Site is located in Part of Lot 24, Concession I-N.T.R., of the former North Cayuga Township, former Regional Municipality of Haldimand-Norfolk, and now Haldimand County.

The Site is located north-east of Cayuga on Brooks Road, approximately 1,000 metres (m) north of Kings Highway No. 3 (Talbot Road). The total Site area is approximately 14.3 hectares (ha) with a currently approved landfill area of 6 ha. The Site is located within a rural area with limited development of surrounding lands. The regional Site location is illustrated on **Figure 1.1**. The local Site location map is illustrated on **Figure 1.2**.

The Site is bounded to the north by a rural property consisting of undeveloped fields (i.e. long-term inactive agricultural crop production lands) and forested area. The Site was formerly bounded to the north by the Canada Southern Railway right-of-way locally referred to as the Michigan Central Railway and/or Conrail (Conrail) right-of-way; however, this portion of the railways was incorporated into the Site as part of the 2004 site expansion/development. It is understood that the southerly portion of the undeveloped fields north of the right-of-way was previously used for rail transfer of aggregate.

To the south, the Site is bounded by an rural property which forms part of a larger continuous agricultural land parcel which includes lands abutting the east portion of the Site and extending north to the aforementioned rail right-of-way. Agricultural lands extend further south from the Site to Highway 3 and are bisected by an abandoned Canadian National Railway (CNR) right-of-way. These lands are used primarily for passive livestock pasture purposes and consist of a combination of old fields and forested areas.

The Site is bounded to the west by Brooks Road. Brooks Road was previously used as a heavy load access route for rail transport of aggregate and by a former 1940s gypsum mine located in the area. On the west side of Brooks Road is an undeveloped rural property characterized primarily by dormant fields with occasional bush lots.

There are no buildings located on any of the adjacent properties to the Site. No municipal services (i.e., water, sanitary and storm sewers) are provided to the Site nor have any municipal services been extended to any of the adjacent properties.

# 2.2 Regional Setting

The following subsections provide a summary of the regional physical setting within which the Site is situated.

## 2.2.1 Physiography

The Site is located within the Haldimand Clay Plain which lies between the Niagara Escarpment and Lake Erie in this Region as mapped in "The Physiography of Southern Ontario", (Chapman and Putman, 1985). This physiographic setting is characterized by stratified clay deposited mainly during the deep-water stages of glacial lakes Whittlesey and Warren and clay till deposits from advances and retreats of the Ontario-Erie glacial lobe towards the end of the Wisconsinan age.

## 2.2.2 Regional Topography and Drainage

As shown on **Figure 1.2**, the Site sits in the south-west corner of a localized topographic high at 200 m above mean sea level (AMSL). This boundary skirts a poorly drained area which runs to the north and appears to be the source of a number of shallow streams. To the north and west, surface drainage is to the Grand River down the terraces of an ancient spillway; many of these small streams are tributaries of Pike Creek which flows through Cayuga before emptying into the Grand River. To the south, drainage is by a roadside ditch that drains to a creek which traverses the farm property immediately south of the Site. This creek is known as Norton Creek which flows 7 km to the Grand River south of Cayuga.

The boundary of the Grand River Watershed is found along the north and northeast boundary of the Site. The Site falls entirely within the Grand River Watershed; however, drainage just beyond the north and northeast of the Site, is by small streams to Oswego Creek which empties into the Welland River south of Port Davidson approximately 23 km east of the Site.

The area is also characterized by sloughs, which are wet throughout the year, indicating water table discharge zones or areas of surface water collection. The sloughs in this region are believed to be attributable to relatively flat terrain and poor drainage.

# 2.3 Regional Geology

## 2.3.1 Overburden Geology

The regional Quaternary geology is presented on Figure 2.1.

As shown on **Figure 2.1**, glaciolacustrine clay and silt extensively covers the region (unit 24 – darker purple on **Figure 2.1**). These deposits are quiet water deposits lain down towards the end of the Wisconsinan period when the area was covered by glacial lakes Whittlesey and Warren.

Other younger Wisconsinan deposits located east of the Site include coarser beach sand and gravel (unit 25) overlying the till that derived from nearshore or beach deposits.

The oldest unconsolidated Quaternary deposit in the region is the Late Wisconsinan Wentworth Till (unit 14 on **Figure 2.1**). This is a gravelly silt till that is exposed as drumlins through the overlying glaciolacustrine clay and silt. This deposit extends, beneath the glaciolacustrine deposits, from 9 km southeast of Cayuga towards the northwest across the region, while the southern limit is at the north face of the Onondaga escarpment. This till formation was deposited by the Ontario-Erie glacial lobe, which advanced locally over bedrock in a western and south-western direction across the region.

**Figure 2.1** also shows modern fluvial deposits of sand and gravel (unit 31) which has been deposited as a delta at the mouth of the river at the town of Dunnville.

## 2.3.2 Bedrock Geology

Bedrock geology in the region is illustrated on Figure 2.2.

As shown on **Figure 2.2**, the region is underlain by Paleozoic sedimentary rock formations: Dundee, Onondaga, Bois Blanc, Bertie, Salina, and Guelph (listed from southwest to northeast). Rock in these formations are Silurian to Devonian in age (~450 – 350 Mya) and consist of limestone and dolostone with shale and gypsum (evaporite) zones. **Figure 2.1** shows that bedrock outcrops occur west of the Site consisting mostly of Bois Blanc Formation and Onandaga Formation.

According to water well records in the region approximately 12 to 22 m of overburden overlies the bedrock. The bedrock in the water well records is often described as a grey, gravel fractured limestone or a limestone/shale. According to HPE Inc. (1992), the bedrock geology in the immediate area of the Site is dolostone, shale and gypsum of the Salina Formation.

The bedrock surface in the region appears regular in vicinity of the Site with elevations of the bedrock surface ranging between 174 and 186 mAMSL. Bedrock surface elevations appear to decrease on both sides as the Grand River is approached.

# 2.4 Regional Hydrogeology

Two principal groundwater systems are present in the vicinity of the Site: an upper water table unit and a basal till overburden/shallow bedrock aquifer. Regional groundwater flow within the shallow bedrock aquifer appears to be in a south-westerly direction towards the Grand River. South of the Grand River, groundwater flow appears to be in a north eastward direction indicating a strong river influence.

## 2.4.1 Groundwater Resource Usage

A domestic water well inventory was carried out in 1992 by HPE Inc. by conducting a house-to-house water well survey for all wells within a 1.5 km radius of the Site. The survey found that 69 percent of the surveyed wells were completed in the bedrock, 18 percent were completed in the gravel underlying clay deposits and 13 percent of the wells were completed in the thin sand and gravel deposit overlying the bedrock. Review of private well inventory and

completion of a 'road side' inspection of private properties surrounding the landfill by BRE staff, indicates that there has been only one additional residential home constructed in the area since the 1992 survey. A single home was constructed to the south of the Site off Talbot Road (Highway #3) between 2018 and 2020.

**Figure 2.3** illustrates the locations of water wells noted in the MECP's water well database (accessed June 2022). As shown in the figure three water supply wells are present within 500 m of the Site. Both water supply wells located north of the Site are completed within shallow bedrock (limestone, shale and gypsum) while the on-Site water supply well is completed in the basal till overburden. Details from MECP water wells within 500 m of the Site are summarized in **Table 2.1**.

**Figure 2.3** shows a number of water supply wells south of the Site (beyond 500 m). A review of the water well database shows that these wells are completed within the shallow bedrock aquifer (most wells are noted to be completed in limestone).

For reference, Appendix C includes copies of the water well records from the MECP database.

It should be noted that the home constructed off Talbot Road is not included in the MECP Water Well Database (as of February 29, 2024).

Well records indicate that the bedrock aquifer provides sufficient yield for private and commercial supply, however water in this aquifer is of poor quality.

Based on the data reviewed, no residential wells in the vicinity of the Site are located within the surficial deposit of native silty clay that form the water table unit. As such, the only aquifer in use in the vicinity of the Site is the basal till overburden/shallow bedrock aquifer, which is located at the base of the thick native silty clay and till deposits.

# 2.5 Climate

The Site is situated within a continental-type climatic zone. The closest Environment Canada weather station to the Site is the Hamilton A Station located approximately 50 km from Cayuga. According to Environment Canada meteorological data for the period 1959 to 1990, as recorded at the Hamilton A Station, mean daily temperatures typical of the Site range from -6.2°C in January to 17.9°C in July, with a yearly average of 7.6°C. For the 1981 to 2010 period, mean daily temperatures ranged from -5.5°C in January to 20.9°C in July.

Between 1959 and 1990, precipitation recorded as rainfall ranged from a minimum of 22.2 mm in January to a maximum of 84.7 mm in August with a yearly average of 743.3 mm total rainfall. Precipitation recorded as snow ranges from a minimum of 0.0 cm between June and September to a maximum of 41.8 cm in January with a yearly average of 152.4 cm total snowfall. The total average annual precipitation at the Hamilton A Station was reported at 890.4 mm.

Between 1981 and 2010 precipitation recorded as rainfall ranged between 28.2 mm in February and 100.7 mm in July. The average annual rainfall was reported as 791.7 mm. Precipitation recorded as snow ranged from a minimum of 0.0 mm between June and September and a maximum of 40.8 mm in January. The annual average snowfall between 1981 and 2010 is reported to be 156.5 mm.

The total annual average precipitation between 1981 and 2010 was reported to be 929.8 mm/year.

Between 2010 and 2021 precipitation recorded as rainfall ranged between 24.0 mm in February and 106.4. mm in October. The average annual rainfall was reported as 779.17 mm. Average precipitation recorded as snow ranged from a minimum of 0.0 mm between June and September and a maximum of 40.0 mm in January. Between 2010 and 2021 the total average annual precipitation was reported to be 902.4 mm.

A review of weather data records for other nearby weather stations (Dunville, Hagersville, and Simcoe) indicates a similar average annual precipitation and temperature ranges. As such, it is anticipated that the climate data presented at the Hamilton A Station accurately represents Site conditions.

# 3. Site Physical Setting

The geologic and hydrogeologic setting of the Site has been extensively studied through a number of field investigations completed to support previous landfill expansions and ongoing environmental monitoring. This data has been compiled to describe the physical setting of the Site and immediately surround lands.

## 3.1 Site Topography and Drainage

The Site is located within the Haldimand Clay Plain, which is characterized by level topography and relatively poor drainage. The stormwater management facility currently consists of perimeter ditching and a surface water management system pond (SWMS Pond). The function of the stormwater management system is to capture stormwater runoff from capped portions of the landfill and surrounding on-Site buffer zones and direct that stormwater to the SWMS Pond by way of perimeter ditching. Stormwater that has contact with waste (i.e., non-capped areas of the landfill) is directed to the leachate collection system within the landfill cell. The SWMS Pond operates as a continuously open pond with an outlet control structure. The location of the SWMS Pond is presented on **Figure 3.1**.

The roadside ditch along the east side of Brooks Road adjacent to the Site drains south through a culvert under the abandoned railway corridor and empties into a small, natural stream channel which is part of the head waters of Norton Creek. Other drainage from adjacent lands to the west of Brooks Road also flows in culverts under Brooks Road to provide surface runoff to Norton Creek. Other surface runoff contributions include ephemeral streams on lands south of the Site that enter Norton Creek via culverts under the abandoned railway corridor.

## 3.2 Site Geology

Examination of the stratigraphic logs generated from the extensive Site investigations completed by M&B Ltd., 1985; HPE Inc., 1992, and GHD 2001 to 2022 indicate that the overburden geology is relatively uniform beneath the Site. Soil and groundwater investigative locations completed at the Site are illustrated on **Figure 3.1**.

In general, the Site is characterized by a thick (14 to 18 m) glaciolacustrine layer of stratified silty clay and clay, silty clay till, and varved clays (referred to collectively as the native silty clay), underlain by a thin (1 to 3 m) discontinuous layer of silty sand till with varying concentrations of gravel and clay. Bedrock is encountered at depths varying from 15 to 20 mBGS. A thin surficial deposit of topsoil is generally observed at the surface of the Site, except for the southwestern portion, where refuse associated with historical waste disposal activities was observed prior to the redevelopment of the Site in 2012.

The native silty clay deposits are described as being locally fractured (weathered) from the surface down to depths varying from 3 to 5 mBGS and are characterized as a very stiff to hard unit with low plasticity. At depths more than 5 m, the native silty clay deposits have little to no fracturing with a hardness described as stiff to very stiff.

Underlying the native silty clay deposits, a thin discontinuous silty sand till with varying concentration of clay and gravel is encountered across the Site. The silty sand till ranges in thickness from 1 to 3 m and often contains cobbles and/or broken angular bedrock fragments. This deposit is usually well graded/poorly sorted with fine to medium grained sand, minor silt and trace clay, and is described as dense to compact, grey, and saturated. The silty sand till is referred to as a basal till and exists directly over the bedrock.

Bedrock underlying the Site has been identified as a fractured shale, dolostone and gypsum of the Salina Formation. As illustrated on **Figure 3.2**, the top of bedrock elevation ranges from 180.8 to approximately 187.0 m above mean sea level (mAMSL). A small bedrock valley has been interpreted from northwest to southeast across the Site. The small depression is characterized by the thicker silty sand basal till deposit. A bedrock ridge is located on the northern bounds of the small valley with bedrock highs located in the northern portion of the Site.

To illustrate the main geological features of the Site, two cross-sections have been prepared. The locations of the cross-sections are shown on **Figure 3.3** and the cross-sections are presented on **Figures 3.4** and **Figure 3.5**. These cross-sections illustrate the general relationship of overburden thickness/stratigraphy and top of bedrock position.

Detailed descriptions of the geology encountered in boreholes advanced at the Site are presented in the Stratigraphic and Instrumentation logs presented in **Appendix D** (2013-onwards). For reference, the monitoring well and borehole completion details for all investigation locations are summarized on **Table 3.1**. **Table 3.2** provides a summary of the bedrock surface elevations across the Site.

## 3.2.1 Native Silty Clay Overburden Characteristics

Previous investigations have included laboratory analyses to characterize the overburden soil at the Site. As described above, overburden in the Region generally consists of silty clay glaciolacustrine deposits, silty clay till, or varved clay. Results of the extensive subsurface investigations at the Site concur with this. Thus, overburden soil characteristics are generally comparable across the Site and historic soil characterization analyses is inferred to be representative of the proposed expansion area to the north. Previous analyses have included grain size analyses, estimates of hydraulic conductivity based on Hazen's analysis, analyses for cation exchange capacity (CEC), fraction of organic carbon (FOC), and mineralogical assessments. In addition, geotechnical analyses have been completed on selected soil samples, including moisture content, bulk density and Atterburg limits (Design and Operations Report, CRA, October 2002). For references the geotechnical analyses have been included as **Appendix E**.

Given the consistency of overburden soils, the following characterizes the overburden at the Site and provides an overview of the analysis described in the 2002 Hydrogeologic Performance Assessment (CRA, 2002). Refer to the 2002 report for a more detailed discussion.

### **Grain Size**

Select grain size analyses results identified a stratified silty clay unit extending from the shallow overburden down to at least 10 metres below ground surface (mBGS), and silty sand till with trace gravel and clay in the deeper overburden (at depths in excess of 13 mBGS).

The grain size distribution obtained for the silty clay unit is consistent with prior results and indicated that the deposit is generally composed of 60 percent clay size particles. Based on the results of the grain size analyses carried out to date, the grain size distribution of the silty clay material encountered down to depth of 13 mBGS is very consistent. The material is therefore characterized as being relatively homogeneous.

## **Cation Exchange Capacity**

The cation exchange capacity (CEC) of a soil is a measure of the ability of the soil to remove cations (positively charged ions) from groundwater which migrates or travels through the soil. The CEC is dependent on the type and amount of clay present in the soil as clay minerals typically have a deficiency of cations and therefore, an ability to absorb (adsorb) cations from the groundwater. Leachate generated at landfill sites is typically elevated in cations. Thus, the CEC values are used to estimate the capability of soils, situated beneath or in the vicinity of landfill sites, to retard the vertical and lateral migration of leachate derived cations.

The results of the CEC analyses indicate that the CEC of the silty clay ranges from 287.1 to 288.4 meq/100 grams, while the CEC of the silty sand till in the deeper overburden was reported at 85.4 meq/100 grams. The CEC values for the Site indicate that the native silty clay observed in the shallow overburden has a high ability to retard cation migration, while the silty sand till located in the deep overburden has a moderate to high ability to retard cation migration.

## Fraction of Organic Carbon

The capability of soils to attenuate the migration of organic compounds is in part a function of the organic content of the soils. The results of past FOC analyses show that the FOC of the silty clay ranged from <0.03 to 0.615 percent, with an average value of about 0.3 percent. The FOC of the silty sand till was measured to 0.26 percent.

The FOC values of the samples analyzed indicate that the overburden material (native silty clay and the silty sand till) has a relatively low capability to attenuate the migration of organic compounds.

## 3.3 Site Hydrogeology

In general, the geologic units identified at the Site may be grouped into two main hydrogeologic units separated by the thick silty clay aquitard unit, as follows:

- i) An unconfined water table (shallow overburden) unit within shallow fractured portion of the native silty clay (weathered) unit
- ii) Native silty clay aquitard
- iii) A confined basal till overburden/shallow bedrock aquifer

The two hydrogeologic units (unconfined water table within the fractured native silty clay and the confined basal till overburden/shallow bedrock aquifer) are separated by a thick (between 9 and 15 m) layer of stratified silty clay, silty clay till, and varved clays which form an aquitard of very low hydraulic conductivity (native silty clay aquitard). Groundwater level data historically gathered from the shallow overburden unit and basal till overburden/shallow bedrock aquifer indicate that the presence of the silty clay aquitard results in hydraulic separation of the two units. A hydraulic head difference varying from 9.5 to 15 m has been historically measured at the location of nested wells.

## 3.3.1 Shallow Water Table Unit

The water table unit is contained within the fractured (weathered) silty clay unit. The hydraulic conductivity of the weathered portion of the silty clay unit has been estimated at approximately 2.3x10<sup>-6</sup> cm/s. Based on the groundwater data, the water table unit is generally encountered at depths varying from 0.5 to 4 mBGS. Horizontal hydraulic gradients within the water table are relatively flat, making determination of a precise or consistent flow direction difficult. Notwithstanding, groundwater flow within the water table unit has generally been interpreted to be to the south toward Lake Erie.

Based on the hydrogeologic characteristics of the water table unit, and assuming an overall effective porosity of 30 percent, horizontal linear groundwater velocities of between 0.02 to 0.24 m/year have been estimated.

For reference, the attached **Table 3.3**, includes a summary of the hydraulic conductivity testing results completed at the Site. **Table 3.3** is inclusive of the testing completed in the shallow water table unit, silty clay aquitard, and basal till overburden/shallow bedrock aquifer units (described below).

## 3.3.2 Native Silty Clay Aquitard

The native silty clay aquitard encountered beneath the water table unit consists of a stratified unweathered silty clay, silty clay till, and varved clay deposits, which are generally characterized as being stiff to hard with little to no fracturing. The fractured portion of the native silty clay aquitard extends to between 3 to 5 mBGS. Thus, the competent, unfractured, native silty clay aquitard varies in thickness from 9 to 15 m and is further defined by a low to medium plasticity as well as a very low hydraulic conductivity. In-situ field testing and laboratory analyses performed on the various units forming the silty clay aquitard have provided a hydraulic conductivity range of  $1 \times 10^{-6}$  to  $1.4 \times 10^{-8}$  cm/s. The vertical hydraulic conductivity was determined to be approximately  $1.4 \times 10^{-8}$  cm/s through laboratory testing of an undisturbed silty clay sample collected at a depth of 12.2 mBGS (HPE Inc., 1992).

Groundwater level data from the water table unit and basal till overburden/shallow bedrock aquifer indicate that the presence of the native silty clay aquitard results in hydraulic separation of the two units. Differences in piezometric head of greater than 10 m are frequently observed between the water table unit and deep basal till overburden/shallow bedrock aquifer as measured at various on-Site nested monitoring wells.

## 3.3.3 Basal Till Overburden/Shallow Bedrock Aquifer

Underlying the native silty clay aquitard, a confined basal till overburden/shallow bedrock aquifer exists within the lower portion of the silty sand till unit and the shallow fractured bedrock. Groundwater quality and water level data historically gathered from monitoring wells screened within the lower silty sand till unit exhibited similar hydrostatic levels and hydrochemical characteristics which are not substantially different from samples obtained from well nests screened solely with the shallow bedrock. Therefore, these two geological units have been generally considered to form one aquifer. The average hydraulic conductivity of the basal till overburden/shallow bedrock aquifer has been calculated to be approximately 1.4x10<sup>-4</sup> cm/s, based on in-situ field-testing.

The deep basal till overburden/shallow bedrock aquifer is encountered at depths varying from 14 to 18 mBGS. The groundwater flow pattern of this aquifer is overall towards the south or southwest. Horizontal hydraulic gradients within this unit are generally very flat, typically ranging between 0.0002 and 0.004 m/m.

Based on the hydrogeologic data, the horizontal linear groundwater velocity within the deep basal till overburden/shallow bedrock is estimated to be approximately 0.3 m/year toward the southwest.

The following figure provides a conceptual schematic illustration of the geologic and hydrogeologic setting of the Site.

15' -5m WEATHERED SILTY CLAY	<↓
30° — 9т <i>silty clay</i>	◄" ↓
10 -3m SAND AND GRAVEL	
BEDROCK	

Figure 3.6 Conceptual Site Geology and Hydrogeology

## 4. Natural Gas, Mines, and Karst Considerations

## 4.1 Natural Gas Deposits and Natural Gas Wells

A review of oil, gas and salt resource mapping in Ontario indicates that active and plugged gas wells are located within the vicinity of the Site. No active/plugged gas wells were identified on the Site, however research indicates that 23 current and former gas wells are located within the vicinity of the Site. A total of 16 gas wells have been identified

as abandoned, of which 15 have been identified as plugged, and a total of seven gas wells that may be active, suspended, or abandoned are found within the vicinity of the Site. The gas wells all targeted the Haldimand Pool within the Clinton Group and were drilled to a total depth (true vertical depth) ranging from 207.6 to 229.5 mBGS at approximately the top of the Queenston Formation. An east west trending natural gas pipeline is also located approximately 400 m south of the Site. A list of the Ontario Oil and Gas Wells located within the vicinity of the Site is itemized in **Table 4.1**. The locations of the oil and gas wells are illustrated on **Figure 3.7**.

Due to the depths of the natural gas wells, it is not anticipated that there would be any influence from the landfill on the natural gas wells.

## 4.2 Mining Claims and Abandoned Mines

A review of the Ministry of Northern Development and Mines (MNDM) information for abandoned mines and mining claims was completed. No mining claims were identified within the vicinity of the Site, however one abandoned mine was identified to the northwest of the Site (AMIS File # 04888 / MDI # MDI30L13NW00003). The mine was reviewed in a CRA report entitled Well Survey and Limited Hydrogeological Assessment, dated July 2004 (2004 Report). The 2004 Report indicates two documents were reviewed: Gypsum in Ontario, C.R. Guillet, dated 1964, and Abandoned Mines Hazard Abatement Program, London District Site Examinations, prepared by Patrick Chance & Associates Consulting Geologists, dated 1994 (1994 Inspection). The information presented below was gathered from the above-referenced reports and has been revised with the most current information available including information from the Gypsum Mine Investigation Report prepared by GHD in 2016 that provides an assessment of potential influences of the former Cayuga Gypsum Mine on groundwater at the landfill Site.

The former gypsum mine was operated by the Cayuga Gypsum Company Limited between 1942 and 1949. Gypsum was mined from a 0.9 m thick bed at a depth of 25.9 mBGS.

Mining operations were accomplished via two mine shafts. The first shaft was located approximately 112 m south of Townline Road and 350 m west of Brooks Road. The former shaft can reportedly be located by a 2.4 m deep depression, with a footprint of 3.0 by 4.6 m. The shaft was a vertical prospect shaft of unknown support and was back-filled with unknown materials. The 1994 Inspection did not document any evidence of subsidence; however, the report recommended that a 50 m radius area of caution be observed in the vicinity of this shaft.

Based on the available historical documentation, approximately 10,300 tonnes of gypsum was reportedly removed from this prospect shaft during the operation of the mine. With a density of 2.3 tonnes/m<sup>3</sup> and a thickness of 1 m, this would correspond to lateral workings with an aerial footprint of approximately 4,356 square metres (m<sup>2</sup>). In order to access the gypsum in the ~1 m seam, it is likely that approximately 1-2 m of the overlying shale bedrock would also have been removed.

The second shaft was located approximately 305 m south of the first shaft. The 1994 inspection was reportedly unable to locate the second shaft. The second shaft was also a vertical prospect shaft of unknown support and it is unknown if the shaft has been back-filled. It is not known how much gypsum was removed from this shaft.

Due to property access restrictions, an inspection of the former Cayuga Gypsum Mine could not be conducted.

During the operation of the mine from 1942 to 1949, dewatering operations would likely have been conducted to keep the mine shafts and associated galleries dry. As such, during the operation of the mine the local groundwater flow would have been influenced by mine dewatering activities. Active removal of large quantities of groundwater from the bedrock would have resulted in inward hydraulic gradients. As such, the bedrock groundwater flow in the vicinity of the former mine would have been directed towards the active galleries during operation of the mine.

Upon closure of the mine in 1949, the dewatering activities at the mine would have ceased and the associated mine shafts and galleries would have flooded within a short period of time after closure. The mine has now been abandoned for over 70 years. Since the former galleries and shafts are flooded, no water deficit should be present between these former underground structures and the surrounding bedrock. Thus, essentially steady state conditions should exist, and the former underground structures will no longer have a hydraulic influence on the local bedrock aquifer.

In the unlikely event that the former mine shafts would not have been properly sealed following closure of the mine, there could exist the potential for surface water and groundwater in the shallow overburden to enter the mine shafts and migrate to the underlying bedrock aquifer. If infiltration were occurring, the shafts would be acting as a sink to the overburden groundwater and a source of recharge to the local bedrock groundwater. This would result in a cone of depression in the overburden groundwater towards the former mine shafts and radial flow from the galleries in the bedrock groundwater. Under this scenario there could be a potential for bedrock groundwater flow being diverted away from the former galleries. However, based on the relatively small dimension of the former galleries (areal extent of approximately 4,356 m2) it is expected that any influence of these galleries on the bedrock aquifer would be localized to the immediate vicinity of the former galleries. Bedrock aquifer influence beyond the limits of the former Cayuga Gypsum Mine property is anticipated to be negligible.

The Gypsum Mine Investigation Report reviewed information related to historical mining operations including location and extent of mining activities, review of physical site conditions for evidence of historical mining operations, and an evaluation of hydraulic gradients within the available monitoring network to identify potential evidence of a hydraulic influence on horizontal or vertical gradients in the vicinity of the Site. The report concluded that there is no evidence of an influence related to the former Cayuga Gypsum Mine on the bedrock aquifer at the Site.

## 4.3 Karst

A review of the Ontario Geological Survey Karst of Southern Ontario and Manitoulin Island report indicates that no potentially karst, inferred karst, or known karst bedrock has been identified within the 1KM of the Site. Furthermore, the groundwater conditions are unfavourable for the dissolution of the bedrock and bedrock consists of generally argillaceous dolostone, shale, and evaporites (primarily gypsum), the latter of which precludes the formation of large-scale karst features. Furthermore, no sink holes or caving features have been identified with 1 km of the Site.

# 5. Residual Site Impact Assessment

The following sections have been updated from previous assessment of residual site impacts to focus on current leachate quality within the engineered landfill and current groundwater and surface water quality surrounding the lined landfill footprint.

## 5.1 Leachate and Groundwater Quality

Since the Site was redeveloped, leachate generated from within the lined waste cells is conveyed into the Leachate Collection System (LCS) and flows by gravity to a sump located in the southeast corner of the landfill base. The leachate is pumped from the sump to a storage tank for on-Site treatment and/or off-Site disposal.

Leachate quality has been monitored on an annual basis since 2011 to characterize leachate source contaminants and concentrations. Understanding the characteristics of leachate is important for identifying potential leachate impacts to groundwater and surface water outside the waste footprint,. Leachate samples are analyzed for general chemistry, metals, PAH, and VOCs. The following **Table 5.1** summarizes recent (2021) leachate concentrations in comparison to historical concentration ranges and the corresponding Ontario Drinking Water Standards (ODWS) where available:

Parameters	Units	2021 Results	Historical (2011-2021) Concentration Range	Comparative ODWS
Alkalinity	mg/L	820	820 – 3,700	30 – 500 (OG)
Chloride	mg/L	1,130	555 – 1,440	250 (AO)

Table 5.1	Leachate	Character
10010 0.1	Ecuonato	onuractor

Parameters	Units	2021 Results	Historical (2011-2021) Concentration Range	Comparative ODWS
DOC	mg/L	188	15.6 – 767	5 (AO)
Hardness	mg/L	1,640	1,560 – 2,310	80 – 100 (OG)
Sulphate	mg/L	287	26 – 1,490	500 (AO)
TDS	mg/L	4,120	2,980 – 5,800	500 (AO)
Aluminum	mg/L	<0.50	0.063 – 1.69	0.1 (OG)
Arsenic	mg/L	0.030	0.030 – 69	0.010 (MAC)
Boron	mg/L	10.0	4.97 – 16.1	5.0 (IMAC)
Chromium	mg/L	<0.050	0.016 – 0.058	0.050 (MAC)
Iron	mg/L	<1.0	<0.10 – 7.51	0.30 (AO)
Lead	mg/L	<0.0050	<0.00050 - 0.0088	0.01 (MAC)
Manganese	mg/L		0.249 - 3.04	0.05 (AO)
Sodium	mg/L	716	255 – 843	200 (AO)
Benzene	µg/L	3.40	<0.8 - 4.3	1 (MAC)
Ethylbenzene	µg/L	8.31	<1.00 – 11.5	2.4 (AO) / 140 (MAC)
Toluene	µg/L	1.06	1.06 – 41	60 (AO)
Benzo(a)pyrene	µg/L	<0.010	<0.010 - 0.085	0.01 (MAC)
Naphthalene	µg/L	8.12	2.1 – 11	
Phenanthrene	µg/L	0.411	0.217 – 4	

In general, the current landfill leachate is characterized by elevated conductivity, alkalinity, chloride, DOC, hardness, phenolics, phosphorus, TDS, arsenic, boron, and iron.

Benzene, cis-1,2-dichloroethene (cis-1,2-DCE), ethylbenzene, xylenes (m&p, o), toluene, 1-Methylnaphthalene / 2-Methylnaphthalene, acenaphthene, anthracene, fluoranthene, fluorene, naphthalene, and phenanthrene are also commonly detected in leachate at the Site.

## 5.2 Contaminants of Concern

Site-specific leachate contaminants of concern are listed below. Individual general chemistry and metals parameters have been identified based on elevated concentrations in leachate at the Site. The presence of organic parameters in leachate may be used in identifying potential leachate impacts to groundwater in general. Specific VOC and PAH parameters have been identified based on elevated concentrations in leachate and low drinking water standards in groundwater.

- General Chemistry: alkalinity, boron, chloride, DOC, hardness, sodium, TDS
- Metals: arsenic, boron, cadmium, iron;
- VOCs: particularly BTEX and vinyl chloride; and
- PAHs: Particularly benzo(a)pyrene, fluorene, naphthalene, phenanthrene

## 5.3 Groundwater Quality

Groundwater quality has been monitored in each of the hydrogeologic units on a semi-annual basis following the early 2000's modernization of the Site as described in the Design and Operations Report (CRA, October 2002) and the Hydrogeologic Performance Assessment (CRA, October 2002). Samples are typically analyzed for general chemistry, metals, PAH, and VOCs.

In 2015, GHD undertook a review of the available database of groundwater and leachate quality data for the Site in order to develop a Site-specific Trigger Level Program (TLP) and Contingency Response Plan (CRP). An updated Design and Operation report was submitted and approved in December 2018 which included the TLP and CRP. The purpose of the TLP is to provide timely identification of potential Site-related water quality impairment and in turn permit implementation of appropriate contingency measures to mitigate the potential for water quality non-compliance.

Groundwater at the Site is generally assessed by comparing spatial and temporal trends between leachate and upgradient and downgradient groundwater monitoring locations. Groundwater compliance at the Site is assessed by comparing Site boundary groundwater quality to Site-specific Reasonable Use Concept (RUC) criteria. The RUC criteria are calculated from generic ODWS and background concentrations. For the purposes of the TLP, 85 percent of the Site-specific RUC criteria have been used as trigger levels. Accordingly, the TLP is intended to provide advance warning of potential Site groundwater compliance issues.

Shallow overburden water quality is currently assessed using groundwater quality data collected from ten on-Site shallow overburden wells (MW1B-13, MW2B-07, OW1B-06, OW3B-13, OW5B-06, OW8B-06, OW9B-06, MW10B-18, MW11B-19, MW12B-19) and two off-Site shallow overburden wells (MW5B-09, MW6B-07). Basal till overburden/shallow bedrock water quality is also monitored semi-annually and water quality is assessed based on groundwater monitoring data collected from ten basal till overburden/shallow bedrock monitoring wells. Of these monitoring wells, ten are located throughout the Site (MW1A-13, MW2A-01, OW1A-06, OW3A-13, OW5A-06, OW8A-06, OW9A-06, MW10A-18, MW11A-19, MW12A-19), and two off-Site basal till overburden/shallow bedrock monitoring wells (MW5A-09, MW6A-07) which are located approximately 150 m south of the Site.

The locations of the Site's groundwater monitors are illustrated on Figure 3.1.

Natural background water quality within the on-Site shallow overburden unit is generally characterized by elevated levels of alkalinity, hardness, DOC, TDS, sulphate, and iron. The basal till overburden/shallow bedrock unit is characterized by naturally elevated levels of sulphate, hardness, TDS, iron, and manganese.

With the exception of OW8B-06, shallow groundwater monitors at and surrounding the Site have demonstrated water quality in compliance with the Site's TLP which is generally consistent with background water quality.

Elevated sodium, chloride and TDS (with chloride above the Site's RUC) are noted in the shallow overburden unit at on-Site monitoring well OW8B-06. Water quality impacts are interpreted to be due to the road-salt impacts as this well is located in close proximity to Brooks Road. Concentrations of benzo(a)pyrene (often above RUC limits) have also been noted in the groundwater sampled from the shallow overburden unit at on-Site monitoring well OW8B-06. Detectable PAHs, including benzo(a)pyrene at OW8B-06 are interpreted to be related to historic slag stockpiles in the vicinity of the Site and the use of road ballast along the Site entrance. The landfilled waste is not interpreted to be the source of detectable PAHs in groundwater at OW8B-06.

Similar to the shallow overburden, water quality results from the basal till overburden/shallow bedrock have shown no evidence of landfill related impacts as all monitoring results have been below trigger levels and have shown water quality comparable to background.

## 6. Hydrogeologic Assessment of Proposed Landfill Design

The following sections present a hydrogeologic assessment of the proposed landfill expansion design. The assessment has been undertaken to evaluate the expansion design with respect to its potential effect on downgradient receptors in terms of groundwater quality. Considerations included as part of this assessment include:

- Characteristics of the proposed landfill expansion design;
- Evaluation of the quality of the native silty clay deposits for use as a natural attenuation layer (thickness, homogeneity, and hydraulic conductivity);
- Assessment of existing leachate character;
- Receptors of concern;
- Vertical and horizontal contaminant migration; and
- Predictive modelling of future Site performance.

## 6.1 Landfill Design

The Brooks Road Landfill, including the proposed expansion, has been designed to ensure appropriate protection of the surrounding environmental. The landfill expansion will include an additional stage of landfilling, Stage 9, to the north of the existing approved landfill footprint. This expansion will provide an additional 219,400 m<sup>3</sup> of landfill capacity that will be filled following the Stage 5 through 8 of the vertical expansion.

The existing approved landfill footprint area is approximately 60,705 m<sup>2</sup> (6.07 ha). The Stage 9 expansion area includes an additional 10,230 m<sup>2</sup> (1.02 ha). If approved, the final landfill footprint will be 71,461 m<sup>2</sup> (7.15 ha).

Based on the final contours (refer to the accompanying Design and Operations Report, GHD, 2024), the expanded landfill footprint will include a minimum buffer width of 30 m between the east and west Site boundaries and the landfill footprint, 42 m between the north boundary, and a minimum 37 m between the south-eastern corner of the landfill footprint and the Site boundary.

The base design for the existing landfill stages has been maintained for the Stage 9 expansion area and includes: a woven geotextile overlying a drainage layer (for leachate collection), which will overlie a non-woven geotextile and a 60-mil thick, textured, high density polyethylene (HDPE) liner, which will, in turn, overlie a 750 mm thick engineered clay layer. The engineered clay will be placed and compacted using on-Site soil excavated from the silty clay aquitard during the construction of the landfill and will have a hydraulic conductivity equal to or lower than the native on-Site silty clay aquitard (i.e. 2x10<sup>-8</sup> cm/sec).

The base of the Stage 9 expansion will be consistent with the existing landfill base and will extend to a maximum depth of approximately 10 mBGS with a base bottom that will be excavated into the silty clay aquitard unit.

The landfill base is designed with a leachate collection system that overlays the composite HDPE/clay liner. The leachate collection system will consist of a stone layer placed over the base of the landfill at a minimum thickness of 0.3 m on the base side slopes and a minimum thickness of 0.5 m elsewhere. A non-woven geotextile will be installed between the stone layer and the underlying liner and the overlying waste. Leachate collection pipes will be made of HDPE and will be 200 mm in diameter with perforations 12 mm in diameter located along the length and around the circumference of the pipe.

The leachate collected by the leachate collection system will be removed from the sump being the low point in the collection system on a continuous basis through pumping. Leachate will be directed, via buried forcemain, to a storage tank for on-Site treatment and/or off-Site disposal.

# 6.2 Use of the Native Silty Clay Aquitard as a Landfill Base

The design of the landfill cells is based on the availability of low permeability material to ensure that the base of the landfill as well as the composite liner can conform to the design requirements.

The native silty clay aquitard, into which the landfill base has been installed, consists of a stratified unweathered silty clay, silty clay till, and varved clay deposits as described in Section 3.3.2. As described in Section 3.3.2, the native silty clay aquitard is of sufficient thickness, low hydraulic conductivity, and geotechnical character to provide a natural barrier that is protective of the basal till overburden/shallow bedrock aquifer.

The natural soil characteristics of the native silty clay aquitard; low to medium plasticity, low sensitivity and low activity indicate that the natural silty clay is not sensitive to disturbance and can be placed and compacted by equipment commonly used in earthworks projects. No significant difficulties were encountered during previous landfill cell construction operations at the Site and none are expected with the Stage 9 expansion.

Based on the hydrogeologic and geotechnical data, the natural silty clay to be excavated can be used to construct the clay liner and achieve the design hydraulic conductivity value of 2 x 10<sup>-8</sup> cm/s, provided a good bond is achieved between successive compacted layers. The silty clay used in the construction of the liner will be at moisture contents at or just above (plus 1 to plus 3 percent) the optimum moisture content as determined in the standard proctor test. The silty clay will be placed in lifts consistent with the size of sheepsfoot roller (not exceeding 200 mm in thickness) and uniformly compacted to a minimum of 98 percent of the standard proctor maximum density.

## 6.3 Leachate Characteristics

As defined in the ECA (Waste), the landfill has accepted solid non-hazardous Industrial, Commercial and Institutional waste (IC&I waste). The waste stream will not change for the expansion area and so the leachate character described in Section 5.1 is expected to be representative of future leachate generated across the landfill.

The leachate is characteristic of land clearing and construction and demolition waste landfills (C&D or IC&I landfills). Based on the nature of waste normally found in ICI landfills (wood, small amounts of steel, asphalt shingles, and construction debris) the quality of ICI leachate is generally much weaker in comparison to leachate from municipal landfill and also tends to have a lower organic content. As a general rule of thumb, ICI leachate is often established at less than half the strength of municipal waste landfill. Non-hazardous contaminated soil may contain a variety of contaminants depending on the source of the waste material. Common soil contaminants include metals, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and petroleum hydrocarbons (PHCs). The leachability of the contaminants in non-hazardous contaminated soil is low compared to hazardous waste that may contain elevated concentrations and potentially include free-product. Asbestos-Containing Material (ACM) does not affect the quality of the leachate in terms of impacts from the asbestos material, as asbestos does not have the leachability characteristic that distinguish hazardous chemicals. Once landfilled, ACM is an inert material.

## 6.4 Predictive Flow and Transport Modelling

To assess the potential degradation of on-Site and off-Site groundwater quality via leakage through the base of the landfill liner and the underlying native silty clay aquitard, a mathematical evaluation of the vertical and horizontal migration potential of various landfill indicator contaminants using standard groundwater modelling procedures adapted to the hydrogeological setting and the landfill design has been undertaken.

The objective of the models is to simulate the quality of the groundwater leaching into and then migrating within the deep basal till overburden/shallow bedrock aquifer underlying the base of the landfill. To simplify the model and to provide a security factor to the simulation results, no attenuation factors (such as chemical, and biological processes including, adsorption, biodegradation, cation and anion exchange, filtration, and precipitation) that commonly occur

between the clayey soils and the leachate constituents were incorporated into the simulation. As such the model is considered to be conservative, as it will overestimate the rate of contaminant movement.

The model used for the purposes of the vertical migration simulation is similar to the model used to test the hydrogeological feasibility of the design as part of the hydrogeologic performance assessment undertaken in support of the original Design and Operation (D&O) Plan (CRA, 2004) and the Leachate Trigger Level Plan (GHD, 2019) which have previously been approved for the Site.

The vertical migration of contaminants from the base of the landfill through the composite liner (composed of the HDPE liner and compacted clay) and the underlying native silty clay was simulated with a one-dimension advection-dispersion model. An adaptation of the 1DTRANSEN model, developed by Dr. N.R. Thomson, was selected as the vertical migration model for the Site for the following reasons:

- The model includes the dominant contaminant transport processes (advection and dispersion)
- The model is a flexible and allows for variation in source characterization and failure scenarios
- the model has been verified and validated
- the model was used as the basis for the original hydrogeologic assessment of liner performance and thus formed one of the bases for approval of the Site design

In order to provide a conservative assessment of the mobility of leachate derived contaminants at the Site, the landfill was modelled under 2 different scenarios. The first scenario involved 6 m of leachate mounding over the composite liner for 50 years, followed by complete failure of the HDPE liner. In this scenario, the leachate collection system and the HDPE liner were modelled with a service life of 50 years in order to maintain consistency with the previously modelled failure scenario. Following the 50-year service period, the HDPE liner was removed from the liner system and the leachate head was maintained at 6 m above the base of the collection system.

The second scenario modelled the effect of 6 m of head on the liner system with the HDPE liner entirely absent for the duration of the model.

GHD has completed the predictive modelling using leachate quality consistent with measured leachate concentrations from 2017-2021. Peak concentrations have been used to be conservative. Previous predictive modelling employed expected leachate characteristics using leachate quality from nearby landfills with similar waste streams (2002 Hydrogeologic Assessment (CRA, 2002) and the Leachate Trigger Level Plan (GHD, 2019). The following predictive model uses leachate quality reported at the Site since 2011. Indicator parameters were chosen based on comparing leachate quality to background groundwater quality in order to identify leachate constituents that are elevated in leachate but not in groundwater. Further, indicator parameters have been chosen to represent the major analyte categories (general chemistry, metals, VOCs, and PAHs). To conservatively assess the hydrogeologic performance of the landfill expansion and potential leakage through the landfill liner, peak or maximum concentrations reported in leachate have been used to represent leachate generated at the Site.

Table 6.1 below, presents a summary of input parameters for the vertical migration simulation scenarios.

Source Concentration					
Indicator Parameters	Initial Source	Decay Fur	nction <sup>(1)</sup>	Diffusion Coefficient	
	Concentration	T1	T2	x	(m²/year)
Chloride	1,130 (mg/L)	1.5	6	-0.065	0.06402
Boron	10.1 (mg/L)	1.5	6	-0.125	0.07030
Cadmium	0.0005 (mg/L)	1.5	6	-0.125	0.06402
Benzene	4.27 (μg/L)	1.5	6	-0.139	0.03237
Vinyl Chloride	0.76 (µg/L)	1.5	6	-0.069	0.03786

Table 6.1 Vertical Migration Model Input Parameters

Source Concentration						
Fluorene	0.544 (µg/L)	1.5		6	-0.069	0.02488
Phenanthrene	0.492 (µg/L)	1.5		6	-0.069	0.01395
Underlying the Leachate M	ound					
Material	Hydraulic Conducti	vity	A	Average Thickness		Porosity
HDPE Liner	1 x 10 <sup>-11</sup> cm/s		1.	5 mm		0.3
Compacted Clay liner	2 x 10 <sup>-8</sup> cm/s	2 x 10 <sup>-8</sup> cm/s		0.75 m		0.3
Native Silty Clay	2 x 10 <sup>-8</sup> cm/s	2 x 10 <sup>-8</sup> cm/s		5.6 m		0.3
Modeling Scenario						
Scenario	Time Frame	Time Frame		DPE Liner C	Condition	Leachate Head
1	From 0 to 50 years	From 0 to 50 years		HDPE Liner is good		6 m
	After 50 years		Н	HDPE Liner has failed		6 m
2	From 0 to 50 years	From 0 to 50 years		No HDPE Liner		6 m
	After 50 years		No	No HDPE Liner		6 m
Notes:	·					
Decay function were obtain	ned from Lu et al. (1981) a	and Rowe (199	4) – des	cribed below	Ν.	

The general decay function provided by Lu et al. (1981) and Rowe (1974) is presented below:

$$\frac{C(t)}{C(0)} = e^{-x(T1-T2)}$$

- C(t) Contaminant concentrations at time t (mg/L or µg/L)
- C(0) Initial source contaminant concentration (mg/L or µg/L)
- X Diffusion coefficient
- T1 and T2 Temporal boundary conditions: T1 is set to a 0-1.5 years to represent initial conditions; T2 is set to 1.5-6 years an assumed period of increasing concentrations as contaminants leach from the source material; after T2, concentrations exponentially decay

The results of the vertical model are presented in Table 6.2 below:

Table 6.2 1Dtransen Model Results

Scenario 1	6 m Leachate Head (before and after HDPE Liner fails (50 years before present)					
Indicator Parameters	Predicted Peak Concentration through base of Native Clay (1)	Predicted Time to Reach Peak Concentration (years) (1)	Predicted Vertical Groundwater Flux through base of Native Clay (m/year per unit area – m/year/m <sup>2</sup> )	Background Concentration in Aquifer	RUC (Trigger Level)	
Chloride (mg/L)	192.472	42.6	0.021024	15.7	133.0	
Boron (mg/L)	1.324	33.0	0.021024	0.527	1.65	
Benzene (µg/L)	0.397	52.4	0.021024	ND (0.5)	0.25	
Vinyl Chloride (µg/L)	0.107	56.2	0.021024	ND (0.5)	0.25	

Scenario 1	6 m Leachate Hea	d (before and after HDI	PE Liner fails (50 yea	rs before present)	
Fluorene (µg/L)	0.071	70.6	0.021024	ND (0.020)	30
Phenanthrene (µg/L)	0.063	93.0	0.021024	ND (0.020)	0.5
Scenario 2	6 m Leachate Head	I (No HDPE Liner)			
Chloride (mg/L)	192.472	42.5	0.021024	15.7	133.0
Boron (mg/L)	1.324	32.9	0.021024	0.527	1.65
Benzene (µg/L)	0.397	52.2	0.021024	ND (0.5)	0.25
Vinyl Chloride (µg/L)	0.107	55.8	0.021024	ND (0.5)	0.25
Fluorene (µg/L)	0.071	70.4	0.021024	ND (0.020)	30
Phenanthrene (µg/L)	0.063	92.8	0.021024	ND (0.020)	0.5

Notes:

BOLD - anticipated exceedance of the RUC (2017-2021)

Peak concentration and time required to reach peak concentration were obtained using 1DTRANSEN transport model Average Median concentrations from 2017-2021 from background monitoring wells MW1A-13, OW3A-13, and OW9A-06 have been used to calculate the RUC and average background concentrations presented above.

ND - Parameter not detected above Method Detection Limit (MDL).

Half of the MDL has been used in the RUC calculations

Time series graphs presenting the variation in concentrations of the source, as well as the projected concentration at the base of the native silty clay are presented in **Figures 6.1 and 6.2** for Scenarios 1 and Scenario 2.

Based on the results of the conservative vertical migration simulation scenarios using current leachate quality from the Site, the peak concentrations of chloride and benzene are predicted to marginally exceed the calculated Site-specific RUC criteria upon entering the basal till overburden/shallow bedrock aquifer.

As previously discussed, the projected quality of the groundwater leaching from the base of the native silty clay aquitard unit was modelled using a direct adaptation of the advection-dispersion equation with no input for soil/leachate interaction/degradation, which would further reduce the peak levels reported. The following section presents the results of the horizontal migration simulation. As is discussed in this section, additional attenuation of the peak concentrations will result from the combination of the minor quantities of vertical leakage entering the basal till overburden/shallow bedrock aquifer horizontal flux.

## 6.5 Horizontal Migration Simulation

Following vertical migration by advection and diffusion through the composite liner and native silty clay aquitard deposit, leachate impacted groundwater will eventually reach the basal till overburden/shallow bedrock aquifer at the concentrations and vertical flux presented in **Table 6.3**. From that point the attenuated leachate contaminants will be further attenuated by mixing with horizontal bulk groundwater flow of the basal till overburden/shallow bedrock aquifer beneath the landfill footprint.

Beyond the downgradient limit of the landfill footprint, the attenuated contaminants in the basal till overburden/shallow bedrock aquifer will further mix with downgradient infiltration recharge. The infiltration recharge downgradient of the landfill footprint will further attenuate by dilution any residual leachate derived parameters present in the groundwater prior to off-Site migration.

The contaminant attenuation model utilized to assess the predicted contaminant concentration at the Site boundary within the basal till overburden/shallow bedrock aquifer consisted of a simple mass balance model. A mass balance

model was selected as the preferred modeling approach for the horizontal simulation within the basal till overburden/shallow bedrock aquifer for the following reasons:

- This method is very conservative and uses only dilution for attenuation; and
- The hydrogeological setting of the Site is well understood.

The following subsection outlines the relationship between upgradient groundwater flux flowing into the Site and combining with the vertical flux of leachate impacted groundwater into the basal till overburden/shallow bedrock aquifer. This mass balance simulation provides a conservative estimate of the projected groundwater quality at the downgradient Property boundary. As previously indicated no other chemical, and biological attenuation processes that will occur were incorporated into the simulation.

## 6.5.1 Upgradient Groundwater Flux

The saturated thickness of the basal till overburden/shallow bedrock aquifer immediately upgradient of the proposed design landfill footprint is approximately 5 m based on the current groundwater levels and the geological data presented in the stratigraphic and instrumentation logs. Taking into account the saturated thickness of the aquifer, an estimate of the volume of groundwater (groundwater flux) migrating across the 2-dimensional plane on the upgradient side of the landfill footprint can be made from the following equation (Darcy's equation):

$$Q = KiA$$

where:

- Q: is the groundwater recharge (m<sup>3</sup>/s);
- K: is the hydraulic conductivity of the aquifer material (m/s);
- i: is the horizontal hydraulic gradient (m/m); and
- A: is the cross-sectional area across which groundwater flow is occurring (m<sup>2</sup>).

As previously noted, the hydraulic conductivity of the basal till overburden/shallow bedrock aquifer is approximately 1.4 x 10<sup>-4</sup> cm/s, while a horizontal hydraulic gradient of approximately 0.002 m/m has been calculated for the basal till overburden/shallow bedrock across the Site. Based on a unit width of 1 m, the anticipated upgradient recharge to the basal till overburden/shallow bedrock aquifer is calculated at 0.44 m<sup>3</sup>/year (per unit width). The upgradient width of the landfill is approximately 365 m which results in 161 m<sup>3</sup>/day of groundwater flux flowing beneath the landfill footprint. The groundwater quality (for indicator parameters) upgradient of the landfill footprint will be consistent with average groundwater quality established for the deep basal till overburden/shallow bedrock aquifer.

## 6.5.2 Leachate Derived Groundwater - Vertical Flux

An estimate of the projected leachate derived groundwater flux into the basal till overburden/shallow bedrock aquifer through the silty clay aquitard was presented in Section 6.4. The estimated vertical flux is based on the proposed final landfill footprint and conservative assumption that there would be 6 m of leachate head across the entire liner system. The results of the simulation indicated a vertical flux of leachate impacted groundwater entering the basal till overburden/shallow bedrock aquifer at a rate of 0.021 m/year per unit area (m/year/m<sup>2</sup>).

The total area of the landfill, including the proposed expansion footprint, is approximately 7.15 ha which results in a total leachate derived groundwater loading to the basal till overburden/shallow bedrock aquifer of 3.9 m<sup>3</sup>/day or approximately 3,900 L/day.

## 6.5.3 Projected Groundwater Quality at the Site Boundary

The simulated failure scenario groundwater quality in the basal till overburden/shallow bedrock aquifer at the downgradient boundary of the Site was evaluated through a mass balance approach, where the previously defined upgradient and leachate derived groundwater fluxes and their corresponding contaminant concentrations were inputted. The projected concentration at the property boundary was calculated as follows:

Concentration at Boundary = 
$$\frac{(Q_1C_1) + (Q_2C_2)}{Q_1 + Q_2}$$

where:

Q<sub>1:</sub> Vertical leachate derived groundwater flux entering the basal till overburden/shallow bedrock aquifer (L/day)

C1: Parameter concentration in leachate derived groundwater (mg/L)

Q<sub>2</sub> Upgradient groundwater recharge/flux into deep basil till overburden/shallow bedrock aquifer (L/day)

C2: Parameter concentration of upgradient recharge (mg/L)

The projected groundwater quality in the basal till overburden/shallow bedrock aquifer at the downgradient boundary of the Site is presented in **Table 6.3**.

A review of the results of the vertical migration simulation and the mass balance assessment of the horizontal migration within the basal till overburden/shallow bedrock aquifer indicates that concentrations leachate derived groundwater entering the aquifer will be reduced by an average factor of 4 prior to off-Site migration.

As shown in **Table 6.3**, groundwater quality is forecasted to be acceptable at the downgradient boundary with respect to the Site-specific RUC criteria and the ODWS (with the exception of benzene and vinyl chloride which are predicted to be at or below the laboratory reporting limits).

It is important to once again stress that the model utilized assumptions are very conservative for several reasons, including the following:

- A reduced native silty clay thickness has been included in the vertical model (5.6 m versus 9 m used in previous Site models). This assumes all landfill leakage will occur from the base of the landfill that will be excavated into the silty clay aquitard. This represents the shortest vertical travel time and least attenuation prior to reaching the basal till/shallow bedrock aquifer,
- Both the vertical and horizontal models include only dilution and dispersion (vertical model only). No additional attenuation factors such as chemical, and biological processes including, adsorption, biodegradation, cation and anion exchange, filtration, and precipitation have been incorporated into the mode. It is reasonable to assume that these processes would contribute additional attenuation not accounted for in the model.
- Peak or maximum concentrations reported in leachate over the past five years have been used to represent leachate generated at the Site,
- Where reported background concentrations were below the method detection limit, half of the MDL has been used to calculate the contaminant mass from upgradient flux while a value of 0.0 has been used to calculate the RUC, and finally
- Infiltration resulting from precipitation within the water table unit between the Landfill footprint and the western boundary of the Site, will contribute to the recharge of the deep basil till overburden/shallow bedrock aquifer, thus assisting in the further dilution of the leachate impacted groundwater prior to off-Site discharge. This has not been included as an additional attenuation mechanism.

Based on the modelling results obtained as part of the modelling exercises it is concluded that the proposed design of the Site will not result in any unacceptable degradation of the groundwater prior to off-Site migration.

# 7. Proposed Environmental Monitoring and Reporting Programs

Regular monitoring of the environment surrounding the landfill footprint is necessary to demonstrate that a landfilling site is performing as designed and the impacts on the environment are acceptable. Regular monitoring of the groundwater and surface water regimes allows for analysis of trends over time and ensures there is early warning of potential problems.

Based on the hydrogeologic setting of the Site and the proposed design of the landfill, the groundwater monitoring program needs to address groundwater quality in both the shallow water table unit and the deep basal till overburden/shallow bedrock aquifer. The deep basal till overburden/shallow bedrock aquifer is a primary receptor of concern as it has some potential to be utilized off-Site as a source of water supply. The current groundwater monitoring program developed for the Site is based on the requirements of O. Reg. 232/98, the landfilled waste, and the known leachate characteristics. As previously discussed, the Site's current environmental monitoring program is robust and sufficient to monitor water quality.

The proposed landfill footprint will expand approximately 30 m to the north. This will cover the current monitoring well nests MW1S/D-07 (located in the northwest) and OW9A/B-06 (located in the northeast). Prior to landfill construction each well nest will be suitably abandoned, via overdrilling, to ensure that the potential for contaminant migration is eliminated. In order to supplement the understanding of upgradient groundwater quality, GHD installed an additional two monitoring well nests on the northern Site boundary (MW13S/D-22 and MW14S/D-22). The approximate locations of MW13S/D-22 and MW14S/D-22 are illustrated on **Figure 3.1**.

The proposed long-term monitoring program for the Site in the context of the expansion is outlined in **Table 7.1**. This proposed monitoring program is equivalent to the current monitoring program undertaken at the Site, with the addition of the supplementary upgradient monitoring well nests installed in 2022 (MW13S/D-22 and MW14S/D-22). This monitoring program is largely consistent with the program outlined in the Site's current ECA. MW1S/D-07 and OW9A/B-06 will be removed from the program once construction on the proposed expansion begins.

Monitoring and operation progress reports will continue to be prepared for the Site and submitted to the District Office of the MECP prior to the March 31<sup>st</sup> deadline as outlined in the current ECA. Each annual report will include but not be limited to the details outlined in the current ECA (Section 12 (6) through (7)).

## 7.1 Trigger Level Monitoring Program and Contingency Response Plan

In 2015, GHD undertook a detailed review of the available database of groundwater and leachate quality data for the Site. The purpose of this review was to use this information to develop a Site-specific Trigger Level Program (TLP) and Contingency Response Plan (CRP). The TLP and CRP were included in the Updated D&O report which was submitted and approved in December 2018.

The purpose of the TLP is to provide timely identification of potential Site-related water quality impairment and in turn permit implementation of appropriate contingency measures to mitigate the potential for non-compliance.

Groundwater compliance at the Site is based on Site boundary groundwater quality and how it compares to Site-specific Reasonable Use Concept (RUC) criteria. The RUC criteria are calculated from generic ODWS and background concentrations. For the purposes of the TLP, 85 percent of the Site-specific RUC criteria are used as the trigger levels. Accordingly, the TLP is intended to provide advance warning of potential Site groundwater compliance issues.

The RUC criteria are re-calculated annually as groundwater quality data is added to the database. The RUC criteria used for this assessment were established using background water quality data collected from monitoring wells

located upgradient of the landfill. The RUC established for the shallow overburden unit is derived from background groundwater quality data gathered at MW1B-01/MW1B-07/MW1B-13, OW3B-85/OW3B-07/OW3B-13, and OW9B-92/OW9B-06. The RUC established for the basal till overburden/shallow bedrock unit were derived from background groundwater quality data gathered at MW1A-01/MW1A-07/MW1A-13, OW3A-85/OW3A-07/OW3A-13, and OW9A-06.

As illustrated on **Figure 3.1**, newly installed monitoring wells MW13S/D-22 and MW14S/D-22 are located on the upgradient side of the landfill. Water quality results from these wells will be incorporated into the RUC calculations for future monitoring events.

To be consistent with the existing TLP, the following parameters have been selected as trigger parameters for groundwater quality:

- General Chemistry: chloride
- Metals: boron, chromium, lead
- PAHs: naphthalene, phenanthrene, pyrene, benzo(a)pyrene
- VOCs: benzene, ethylbenzene, toluene

The TLP will continue to focus on monitoring locations located downgradient of the landfill footprint.

Shallow overburden wells will include locations along the western boundary of the Site (MW10B-18), the eastern portion of the Site (MW2B-07), and along the southern boundary of the Site (OW1B-06, OW8B-06, MW11B-19, and MW12B-19).

The basal overburden/shallow bedrock unit beneath the OLA is overlain by a clay aquitard of very low hydraulic conductivity, and thus the potential for water quality impact in this unit is minimal. The basal overburden/shallow bedrock monitoring wells will include monitors located in the southern portion of the Site (OW1A-06, OW8A-06, MW11A-19, MW12A-19), the eastern portion of the Site (MW2A-01), and the western property boundary (MW10A-18).

As stated above an approved CRP was submitted as part of the updated Design and Operation Report (GHD, 2018). This CRP will continue to be used following the expansion of the landfill footprint.

## 8. Summary and Conclusions

The Site is characterized by two relevant groundwater units (a water table unit and a confined basal till overburden/shallow bedrock aquifer) which are separated by a thick layer of stratified silty clay, silty clay till and varved clays which form an aquitard of very low hydraulic conductivity. The vertical hydraulic conductivity of the lower portions of the silty clay aquitard is estimated at 2x10<sup>-8</sup> cm/s.

The Site has previously been designed to take advantage of the very low permeability of the on-Site soils to ensure appropriate protection of the groundwater at the Site. The proposed expansion to the north will continue to take advantage of this natural Site feature. As additional protection for the environment, the proposed landfill design includes a base constructed of a single composite liner design consisting of a 1.5 mm thick high-density polyethylene (HDPE) liner overlying a 750 mm thick engineered clayey liner. The landfill base configuration will provide for a minimum of 3 m and an average of 5.6 m of native clay between the underside of the engineered clayey liner and the top of the silty sand till/sand and gravel layer overlying the bedrock. Leachate produced within the landfill will be collected in a leachate collection system installed above the HDPE liner and will be removed from the landfill mound on a continuous basis and treated on-Site prior to discharge.

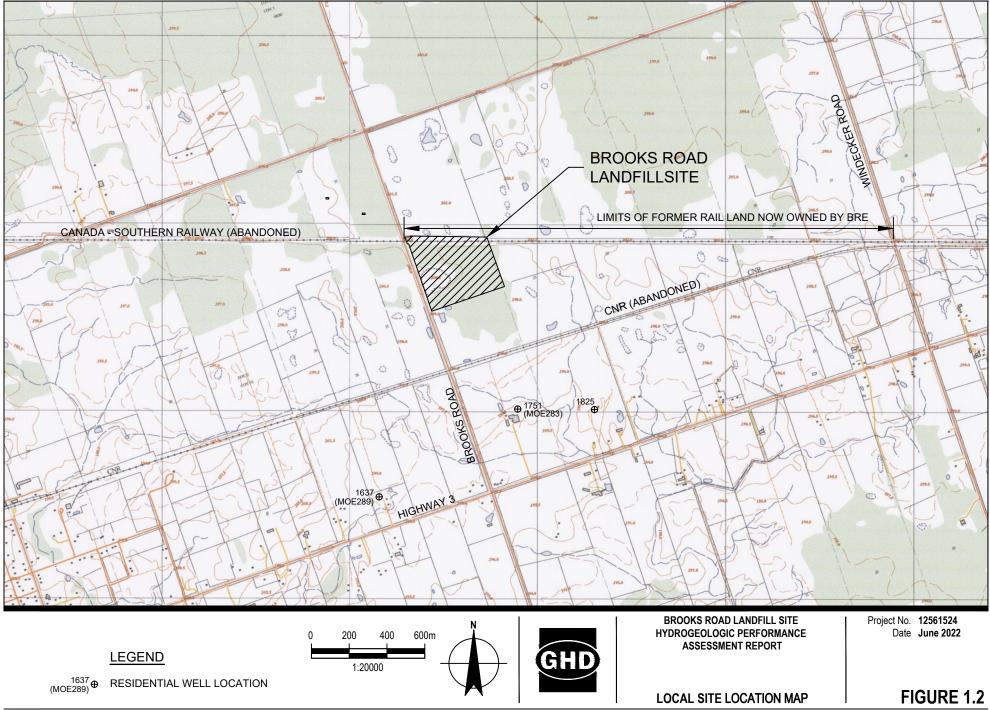
Based on the existing leachate and groundwater quality at the Site and the high level of protection provided by the engineered composite liner and the natural silty clay aquitard, no groundwater quality compliance issues are predicted to occur under the scenario of the proposed expansion.

The Site has robust environmental monitoring and trigger level programs which will continue following landfill expansion. In the event that water quality results suggest future non-compliance is a possibility, the Site contingency plan will be implemented. This contingency plan provides a suitable mechanism for ensuring appropriate mitigative measures are put in place to eliminate or offset potential off-Site adverse effects.

# Figures

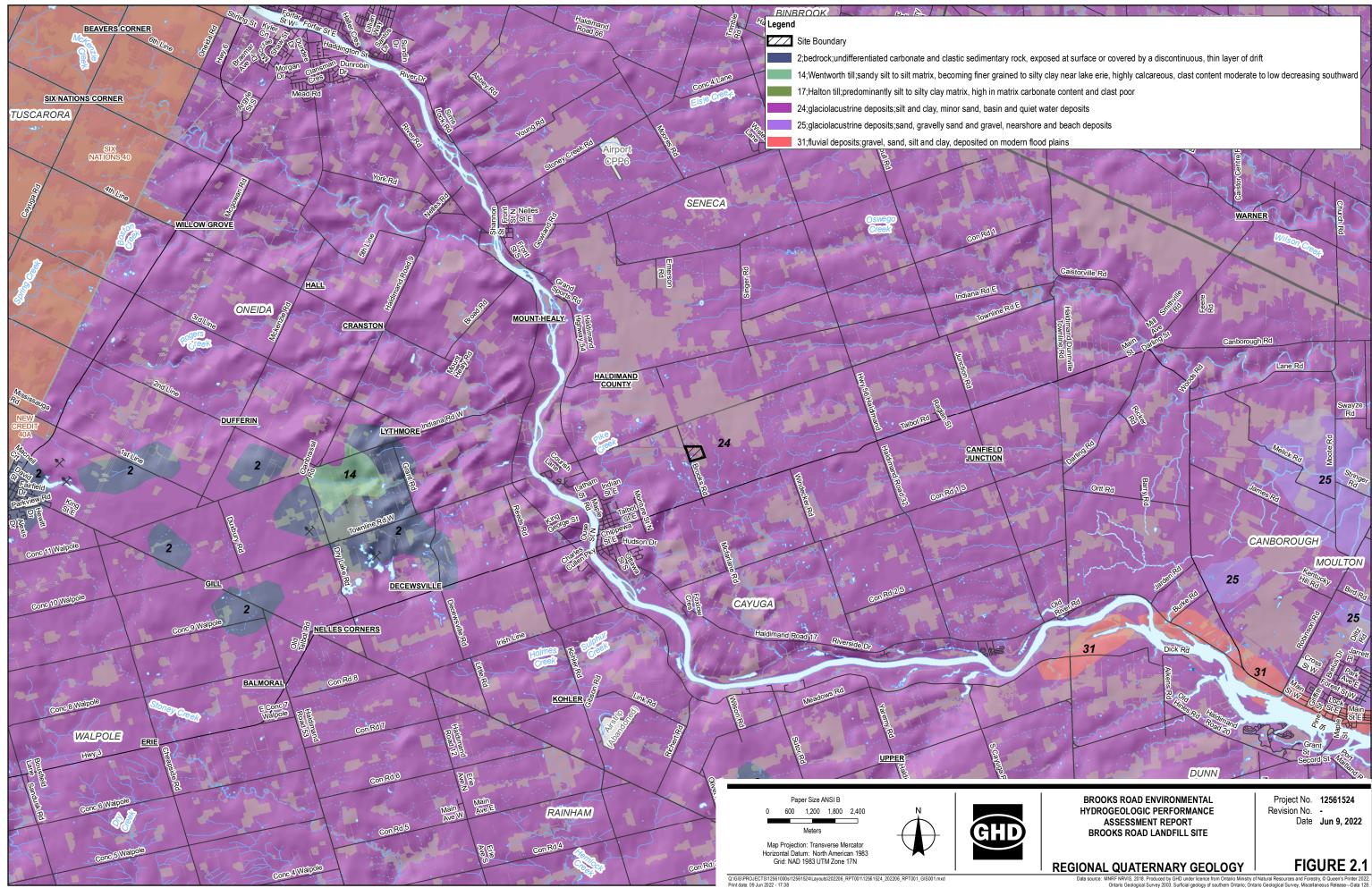


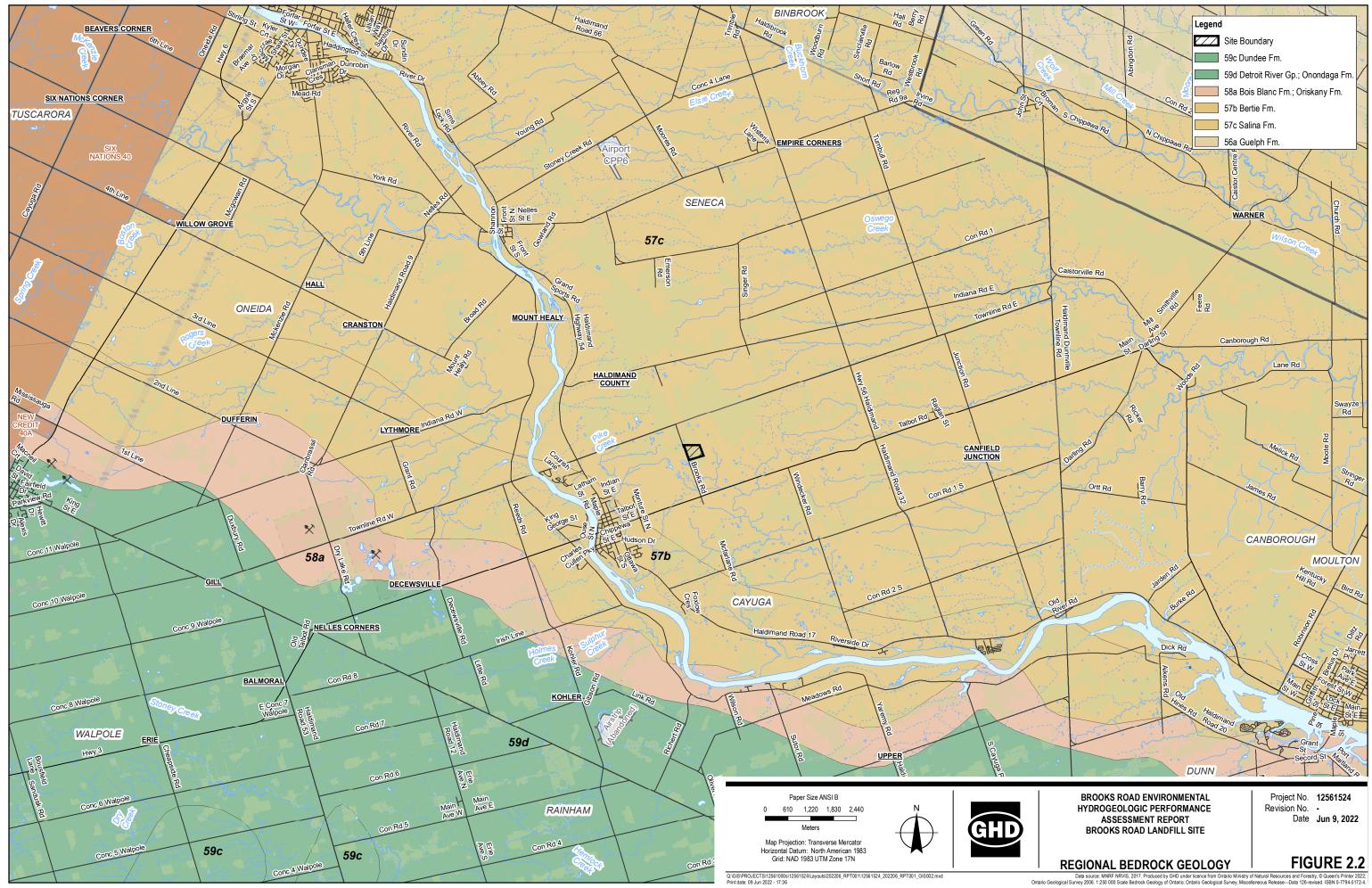
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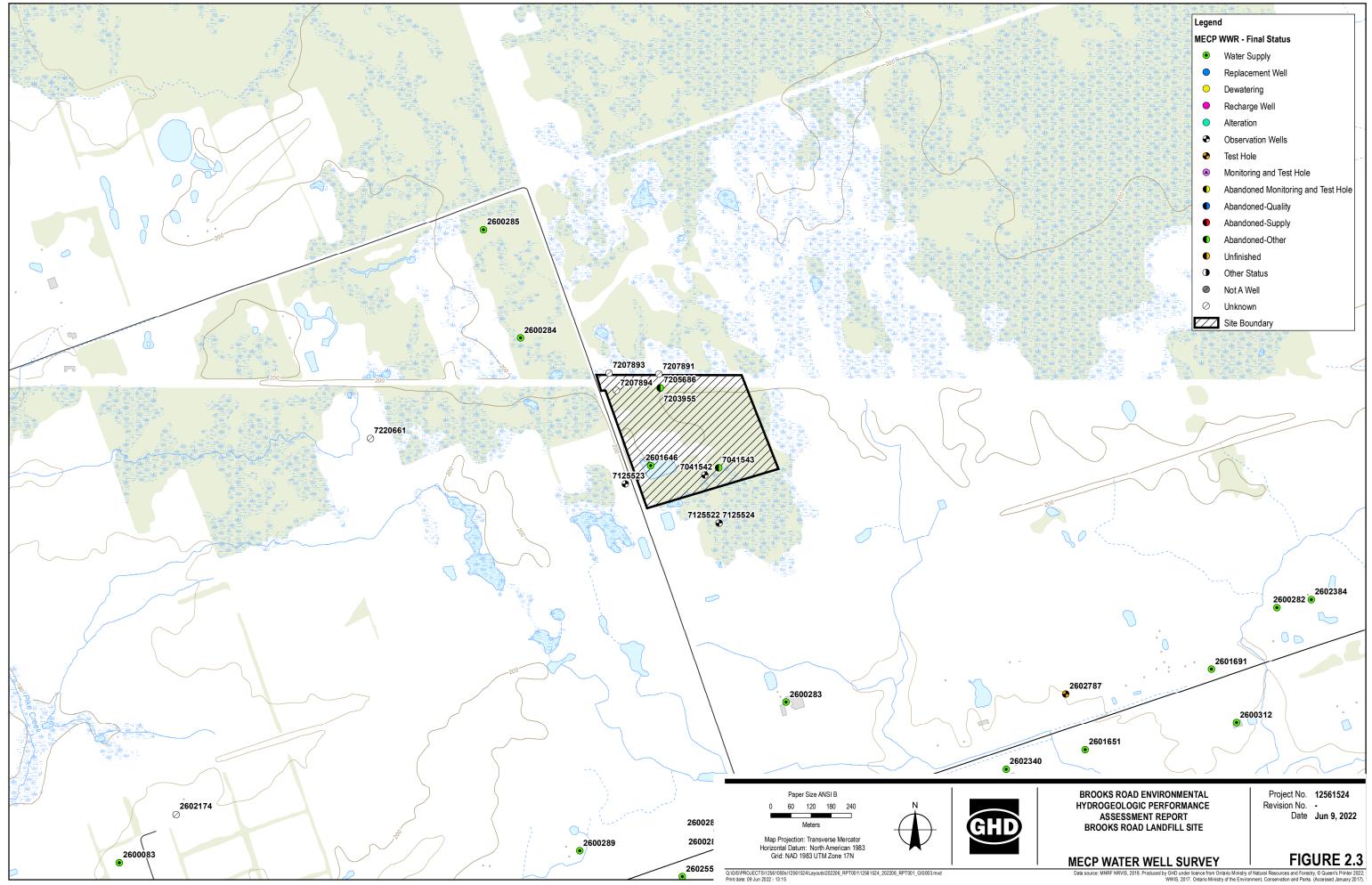


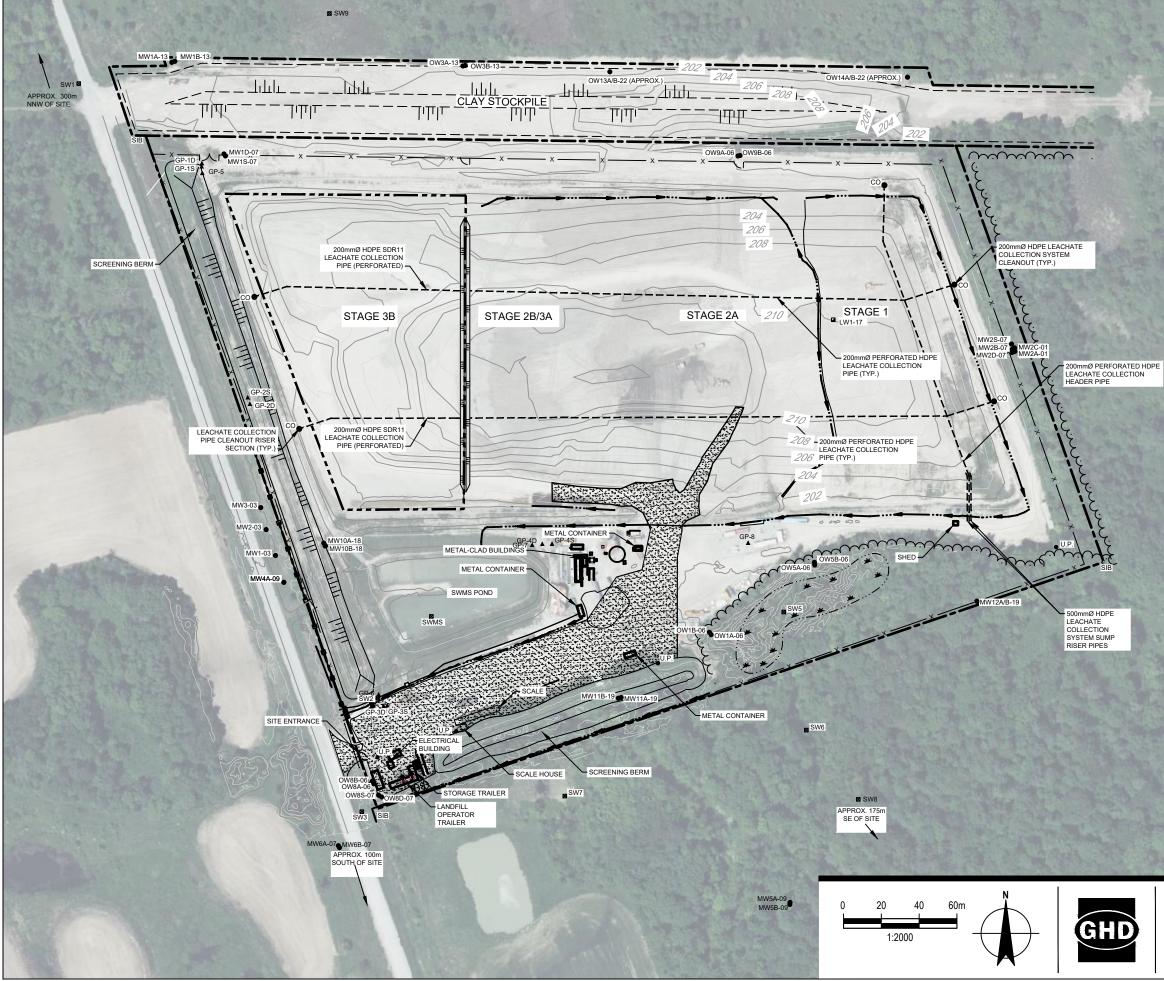
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Plot Date: 09 June 2022 8:21 AM

Data Source: MINISTRY OF NATURAL RESOURCES SHEETS: 10 17 5900 47550 & 10 17 5950 47550









Filename: \\ghdnet\ghdlCA\Waterloo\Projects\662\12561524\Digital\_Design\ACAD\Figures\RPT001\12561524-GHD-00-00-RPT-EN-D103\_WA-001.dwg
Plot Date: 09 June 2022 9:09 AM

	LEGEND:
	GROUND CONTOUR AT 1.0m INTERVAL
192.0	GROUND CONTOUR AT 2.0m INTERVAL
	PROPERTY LINE
x	FENCELINE
	CLAY STOCKPILE AREA
<u> </u>	SILT FENCE
	LEACHATE COLLECTION SYSTEM PIPING
<b>_</b>	DRAINAGE DITCH
	ACTIVE CELL
<u>  * * * *</u>	LOW AREA
	TEMPORARY DIVIDER BERM
	GRANULAR SURFACE / ACCESS ROADS
$\overline{m}$	TREELINE
• OW1B-06	OBSERVATION WELL
• MW2A-01	MONITORING WELL
SW6	SURFACE WATER MONITORING LOCATION
▲ GP-3S	GAS PROBE
●U.P.	UTILITY POLE
LW1-17	LEACHATE WELL
	CULVERT
-	CHECK DAM
■	CHECK DAM DOUBLE GATE

### NOTES:

SI.B.

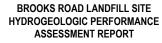
1. EXISTING GROUND CONTOURS AND TOPOGRAPHIC FEATURES SHOWN ARE BASED ON FIELD SURVEY DATA COMPLETED 2020.

STANDARD IRON BAR

- 2. SW4 LOCATED AT THE UPSTREAM END AT THE DOUBLE CULVERT BENEATH HWY No.3, APPROX. 550m EAST OF THE INTERSECTION OF BROOKS RD. AND HWY. No.3.
- 3. NORTH CLAY STOCKPILE SURVEY BY SPEIGHT, VAN NOSTRAND & GIBSON LTD. SURVEYED JULY-17-2013.
- 4. EXISTING CONDITIONS SURVEY, DRAWING NAME: 18235(SURVEY)2021-12-17 EXISTING CONDITIONS SURVEYED DECEMBER 16 2021 COMBINED WITH EXISTING CONDITIONS 2020 2019 2018

### BENCH MARK:

CUT CROSS AT BASE OF FENCE POST CORNER ON NORTH SIDE OF ENTRANCE. ELEVATION 199.56m AMSL

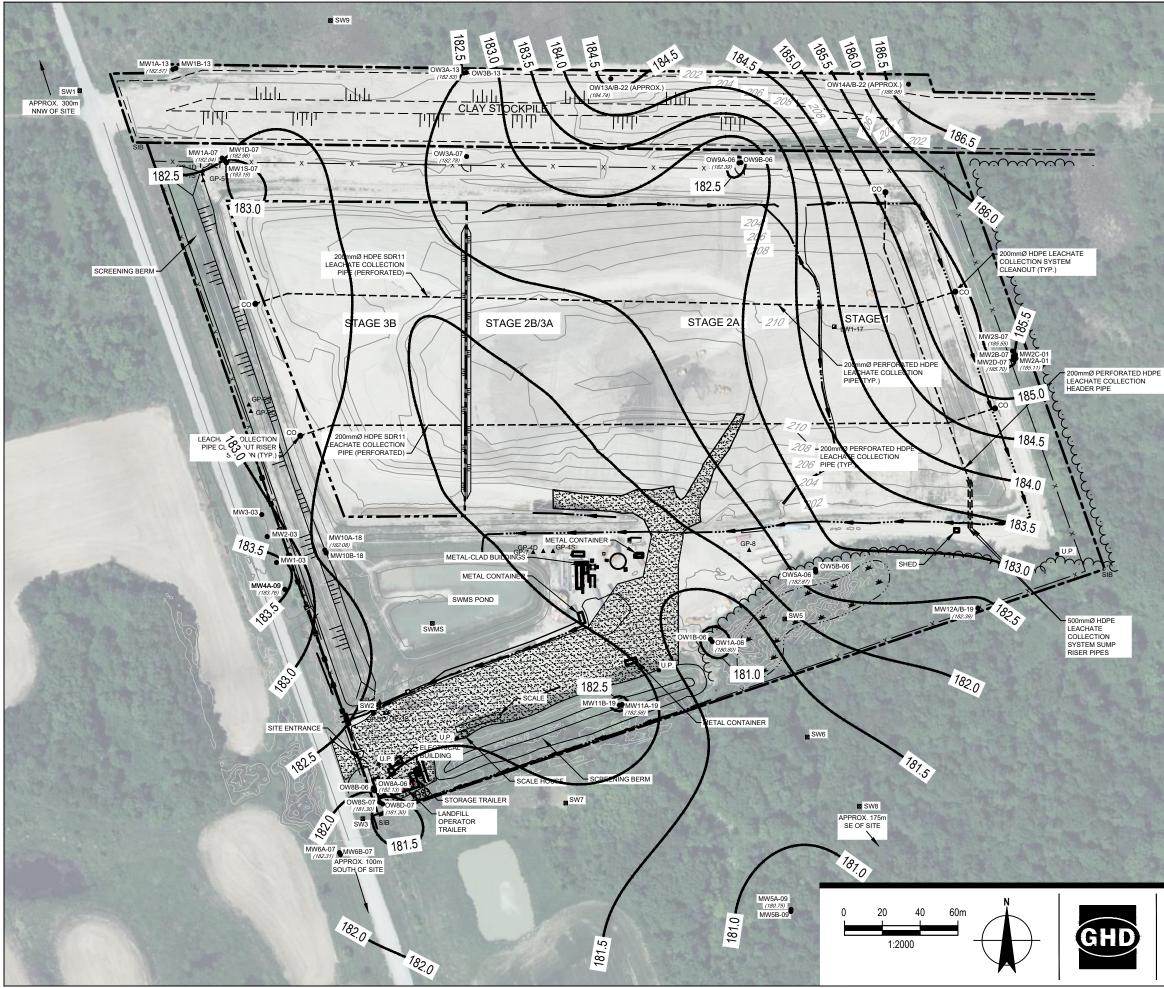


Project No. 12561524 Date June 2022

### 2022 EXISTING CONDITIONS

## FIGURE 3.1

Data Source: Image Source: Microsoft Product Screen Shot(s) Reprinted with permission from Microsoft Corporation, Accessed: 2022



Filename: \\ghdnet\ghdrEd\Waterloo\Projects\662\12561524\Digital\_Design\ACAD\Figures\RPT001\12561524-GHD-00-00-RPT-EN-D105\_WA-001.dwg Plot Date: 06 July 2022 4:25 PM

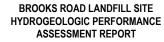
	LEGEND:
	GROUND CONTOUR AT 1.0m INTERVAL
192.0	GROUND CONTOUR AT 2.0m INTERVAL
	PROPERTY LINE
x	FENCELINE
	CLAY STOCKPILE AREA
	SILT FENCE
	LEACHATE COLLECTION SYSTEM PIPING
<b>_</b>	DRAINAGE DITCH
	ACTIVE CELL
<u> * * * *</u>	LOW AREA
	TEMPORARY DIVIDER BERM
	GRANULAR SURFACE / ACCESS ROADS
$\alpha$	TREELINE
• OWAB-06	OBSERVATION WELL
• OWAB-06 • MW2A-01	
• MW2A-01	MONITORING WELL
<ul> <li>MW2A-01</li> <li>SW6</li> </ul>	MONITORING WELL SURFACE WATER MONITORING LOCATION
● MW2A-01	MONITORING WELL SURFACE WATER MONITORING LOCATION GAS PROBE
● MW2A-01 ■ SW6 ▲ GP-3S ●U.P.	MONITORING WELL SURFACE WATER MONITORING LOCATION GAS PROBE UTILITY POLE
<ul> <li>MW2A-01</li> <li>SW6</li> <li>GP-3S</li> <li>U.P.</li> <li>LW1-17</li> </ul>	MONITORING WELL SURFACE WATER MONITORING LOCATION GAS PROBE UTILITY POLE LEACHATE WELL
<ul> <li>MW2A-01</li> <li>SW6</li> <li>GP-3S</li> <li>U.P.</li> <li>LW1-17</li> </ul>	MONITORING WELL SURFACE WATER MONITORING LOCATION GAS PROBE UTILITY POLE LEACHATE WELL CULVERT
<ul> <li>MW2A-01</li> <li>SW6</li> <li>GP-3S</li> <li>U.P.</li> <li>LW1-17</li> </ul>	MONITORING WELL SURFACE WATER MONITORING LOCATION GAS PROBE UTILITY POLE LEACHATE WELL CULVERT CHECK DAM
MW2A-01     SW6     GP-3S     U.P.     LW1-17      I     I     I     I     S.I.B.	MONITORING WELL SURFACE WATER MONITORING LOCATION GAS PROBE UTILITY POLE LEACHATE WELL CULVERT CHECK DAM DOUBLE GATE
<ul> <li>MW2A-01</li> <li>SW6</li> <li>▲ GP-3S</li> <li>U.P.</li> <li>LW1-17</li> </ul>	MONITORING WELL SURFACE WATER MONITORING LOCATION GAS PROBE UTILITY POLE LEACHATE WELL CULVERT CHECK DAM DOUBLE GATE SINGLE GATE
MW2A-01     SW6     GP-3S     U.P.     LW1-17      I     I     I     I     S.I.B.	MONITORING WELL SURFACE WATER MONITORING LOCATION GAS PROBE UTILITY POLE LEACHATE WELL CULVERT CHECK DAM DOUBLE GATE SINGLE GATE STANDARD IRON BAR

### NOTES:

- 1. EXISTING GROUND CONTOURS AND TOPOGRAPHIC FEATURES SHOWN ARE BASED ON FIELD SURVEY DATA COMPLETED 2020.
- SW4 LOCATED AT THE UPSTREAM END AT THE DOUBLE CULVERT BENEATH HWY No.3, APPROX. 550m EAST OF THE INTERSECTION OF BROOKS RD. AND HWY. No.3.
- NORTH CLAY STOCKPILE SURVEY BY SPEIGHT, VAN NOSTRAND & GIBSON LTD. SURVEYED JULY-17-2013.
- EXISTING CONDITIONS SURVEY, DRAWING NAME: 18235(SURVEY)2021-12-17 EXISTING CONDITIONS SURVEYED DECEMBER 16 2021 COMBINED WITH EXISTING CONDITIONS 2020 2019 2018

### BENCH MARK:

CUT CROSS AT BASE OF FENCE POST CORNER ON NORTH SIDE OF ENTRANCE. ELEVATION 199.56m AMSL

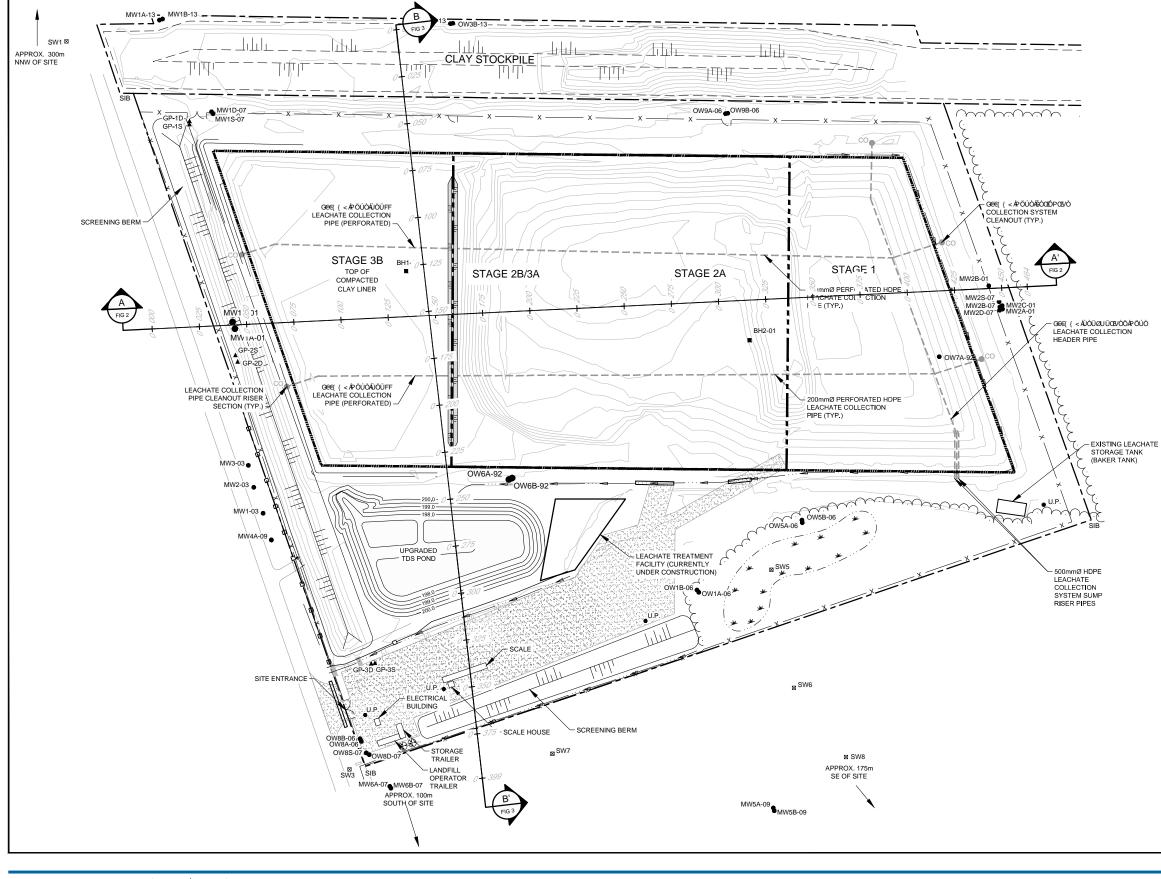


Project No. 12561524 Date July 2022

### **BEDROCK CONTOUR MAP**

## **FIGURE 3.2**

Data Source: Image Source: Microsoft Product Screen Shot(s) Reprinted with permission from Microsoft Corporation, Accessed: 2022





	<u>LEGEND:</u>
	GROUND CONTOUR AT 1.0m INTERVAL
	GROUND CONTOUR AT 2.0m INTERVAL
	PROPERTY LINE
x	FENCELINE
	CLAY STOCKPILE AREA
	SILT FENCE
	LEACHATE COLLECTION SYSTEM PIPING
<del>_</del>	DRAINAGE DITCH
	ACTIVE CELL 2014
<u>**_*</u> _**	LOW AREA
<u></u>	TEMPORARY DIVIDER BERM
	GRANULAR SURFACE / ACCESS ROADS
	TREELINE
• OW1B-06	OBSERVATION WELL
MW2A-01	MONITORING WELL
⊠ SW6	SURFACE WATER MONITORING LOCATION
▲ GP-3S	GAS PROBE
●U.P.	UTILITY POLE
	CULVERT
-	CHECK DAM
一人」	DOUBLE GATE
$\smallsetminus$	SINGLE GATE
S.I.B.	STANDARD IRON BAR

LEGEND:

### NOTES:

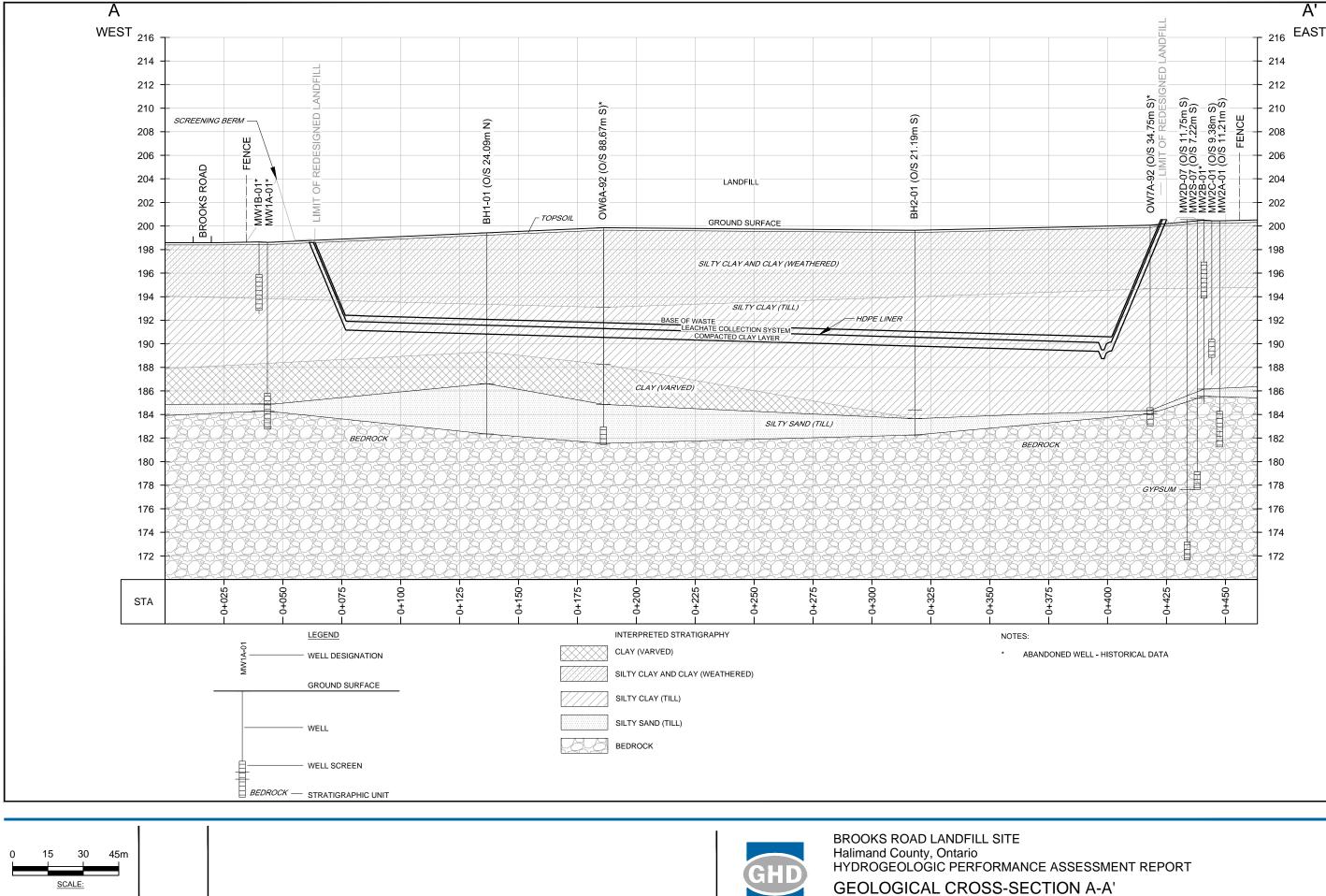
- EXISTING GROUND CONTOURS AND TOPOGRAPHIC FEATURES SHOWN ARE BASED ON FIELD SURVEY DATA COMPLETED MARCH 24, 1992 1. BY HENDERSON, PADDON ENVIRONMENTAL INC.
- 2. EXISTING GROUND CONTOURS AND TOPOGRAPHIC FEATURES SHOWN WERE UPDATED AUGUST 2007 BY CONESTOGA-ROVERS AND ASSOCIATES AND MAY 9, 2012 BY GENIVAR.
- SW4 LOCATED AT THE UPSTREAM END AT THE DOUBLE CULVERT BENEATH HWY No.3, APPROX. 550m EAST OF THE INTERSECTION OF BROOKS RD. AND HWY. No.3. 3.
- EXISTING GROUND CONTOURS AND TOPOGRAPHIC FEATURES SHOWN WERE UPDATED WITH AS-BUILT STAGES 2A, AND 2B/3A FINAL CONDITIONS RECEIVED FROM THIRD PARTY INDEPENDANT SURVEYOR MAR-5-2014. NORTH CLAY STOCKPILE SURVEY BY SPEIGHT VAN NORTBAND SURVEY BY SPEIGHT, VAN NOSTRAND & GIBSON LTD. SURVEYED JULY-17-2013.
- EXISTING WASTE CONTOURS UPDATED WITH JANUARY-28-2015 TOPOGRAPHIC SURVEY COMPLETED BY THIRD PARTY INDEPENDENT SURVEYOR. 5.

### BENCH MARK:

CUT CROSS AT BASE OF FENCE POST CORNER ON NORTH SIDE OF ENTRANCE. ELEVATION 199.56m AMSL

18235-20 Oct 12, 2016

## Figure 3.3

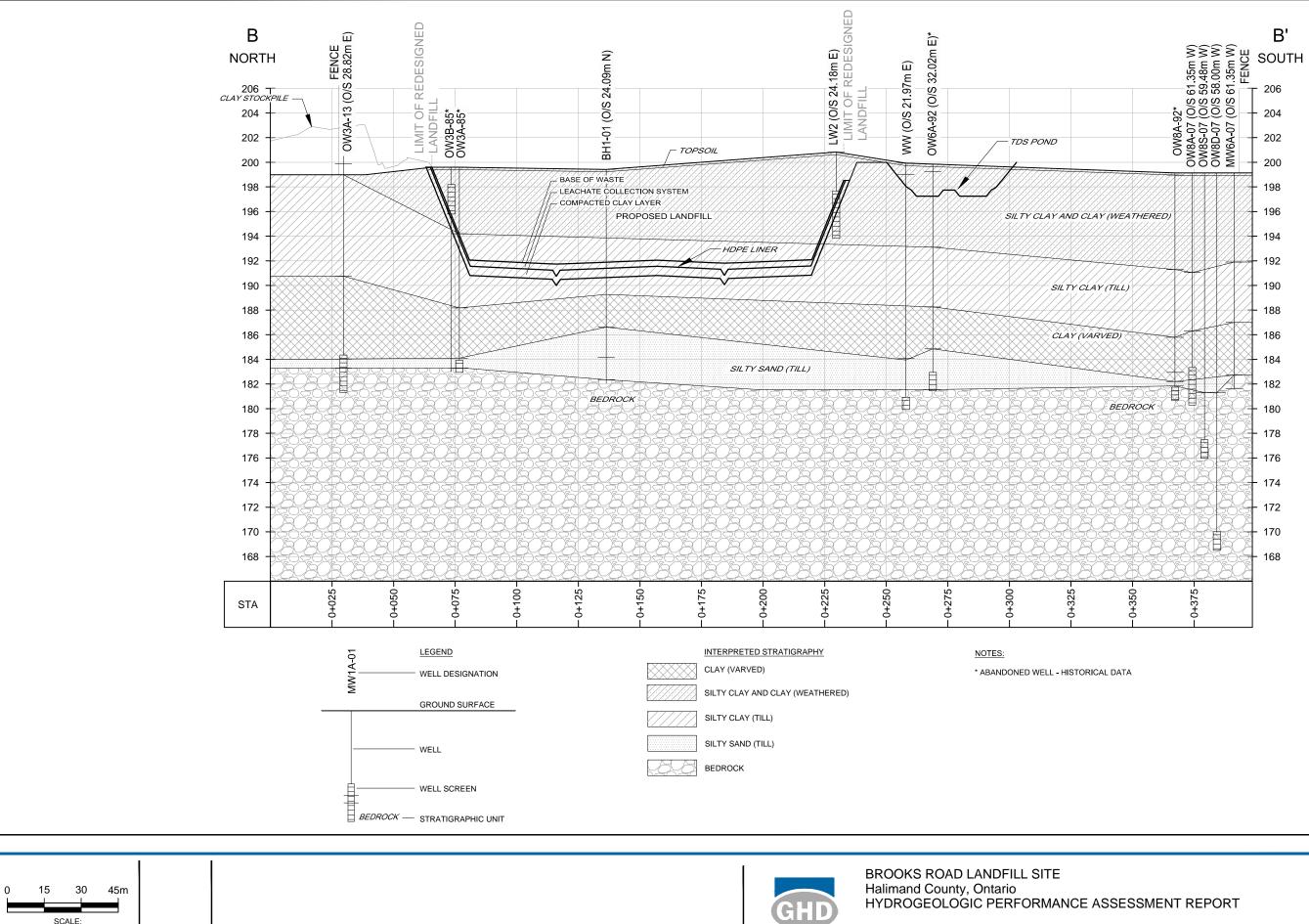


HORZ : 1:1500 VERT : 1:300

18235-20 Oct 12, 2016

Α'

Figure 3.4



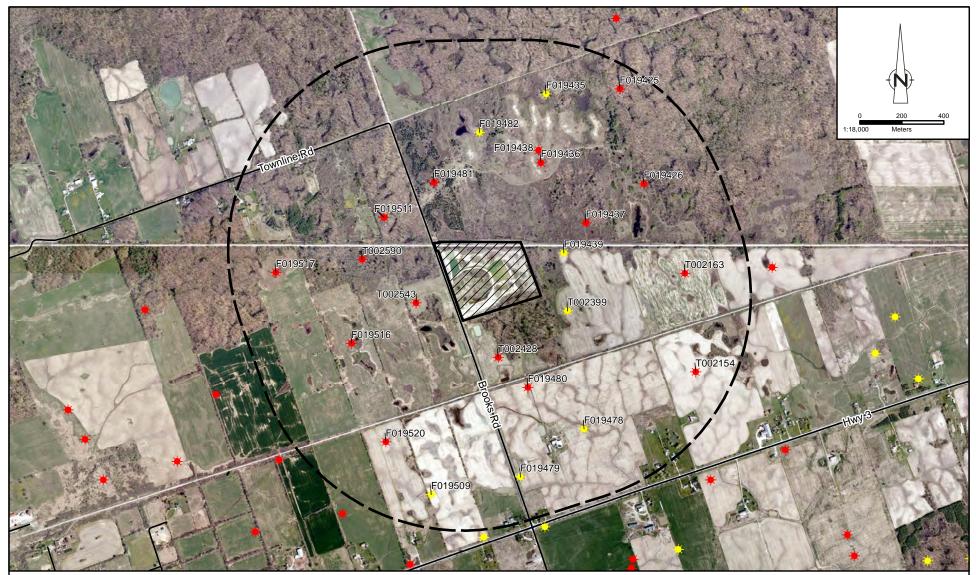
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SCALE: HORZ : 1:1500 VERT : 1:300

**GEOLOGICAL CROSS-SECTION B-B'** 

18235-20 Oct 12, 2016

Figure 3.5

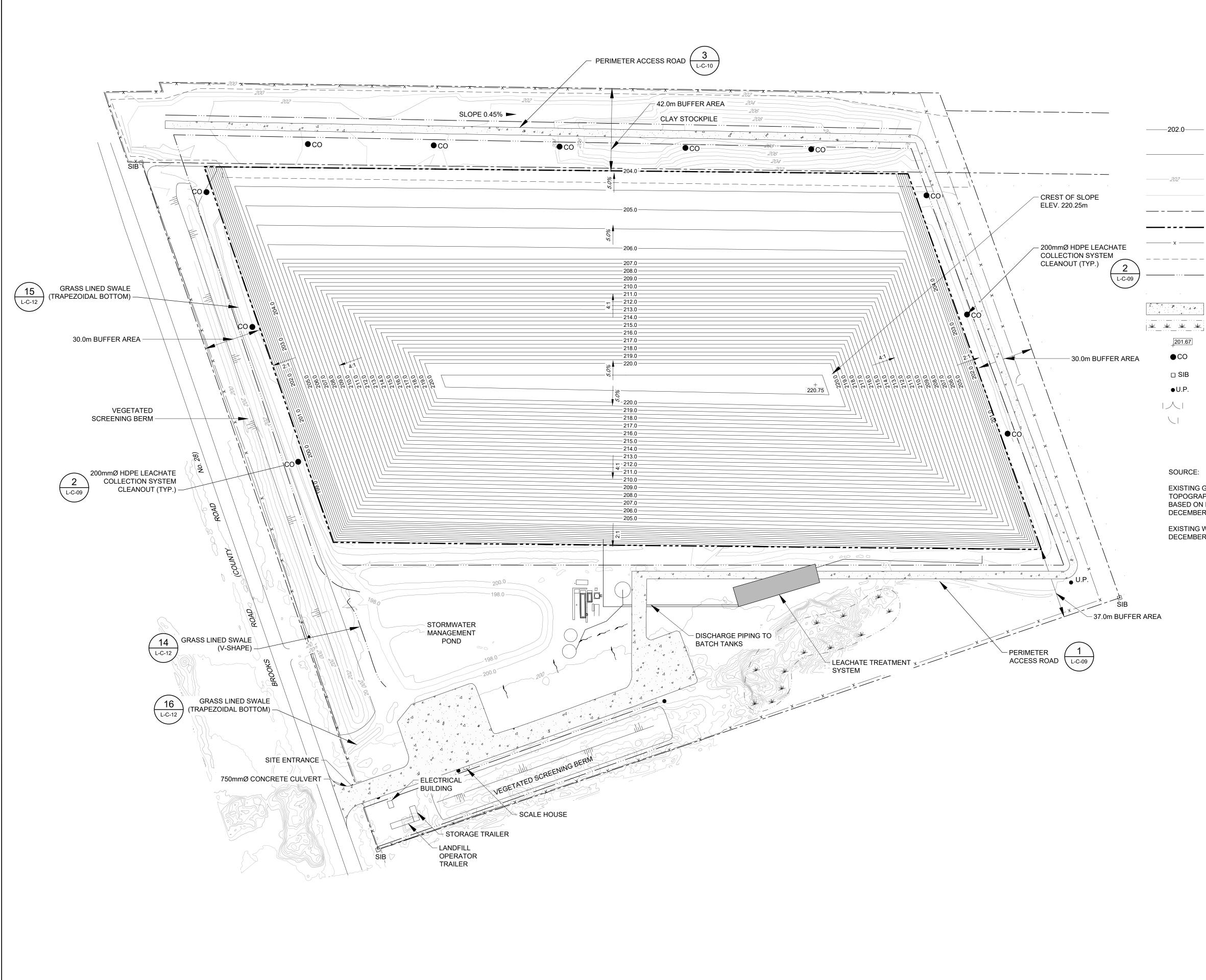


Source: MNRF NRVIS, 2014. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2016; Haldimand County Official Plan Aerial: 2006 Grand River Conservation Authority Coordinate System: NAD 1983 UTM Zone 17N

figure 3.7



OIL AND GAS WELL LOCATIONS GEOLOGY & HYDROGEOLOGY ASSESSMENT REPORT BROOKS ROAD LANDFILL 160 Brooks Road, Cayuga, Ontario







GHD Ltd. 455 Phillip Street Waterloo, Ontario N2L 3X2 Canada **T** 1 519 884 0510 **F** 1 519 884 0525

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> Bar is 25mm on original size sheet 0 25mm

### NO. ---NO. -. -NO. --NO. -• -NO. -- --No. Issue Checked Approved Date Designer R.LOVEDAY Author S.HOLLAND Drafting Check K.DHALIWAL Design K.DHALIWAL Check Manager R.LOVEDAY Project **R.LOVEDAY** Director

## **BROOKS ROAD LANDFILL SITE** HALDIMAND COUNTY, ONTARIO

Project

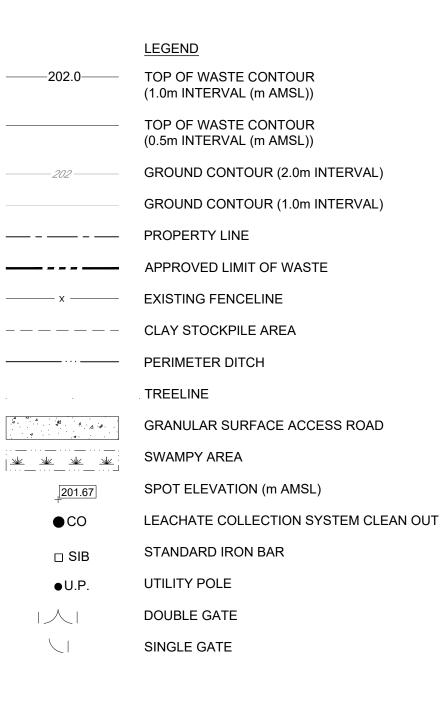
Client

## HYDROGEOLOGIC PERFORMANCE ASSESSMENT REPORT

Date	Scale
APRIL 22, 2022	1:1000
Project No.	

12561524 Title

FIGURE 6.1 TOP OF WASTE CONTOURS



SOURCE:

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●U.P.

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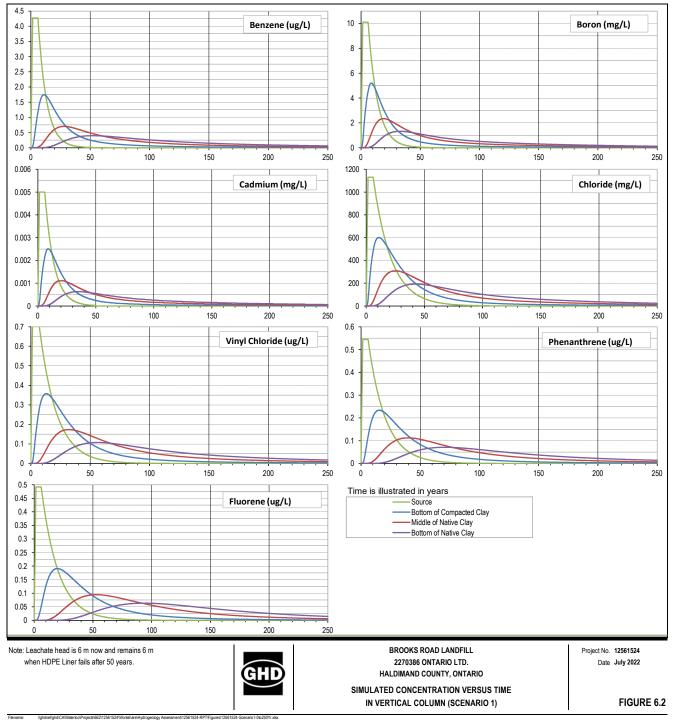
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EXISTING GROUND CONTOURS AND TOPOGRAPHIC FEATURES SHOWN ARE BASED ON FIELD SURVEY DATA COMPLETED DECEMBER 28, 2017 BY SVNG.

EXISTING WASTE CONTOURS SURVEYED DECEMBER 16, 2021 BY GHD

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# Tables

### Table 2.1

### MECP Water Well Summary Hydrogeologic Assessment - Landfill Expansion Brooks Road Landfill 2270386 Ontario Limited

Well No.	Township	Status	Installation Date	Tested Flow Rate (gpm)	UTM Easting	UTM Northing	Elevation (mAMSL)	Depth to Bedrock (ft)	Depth to Bedrock (m)	Bedrock elevation (mAMSL)	Drilled Depth (m)	Drilled elevation (mAMSL)	Static Level (ft)	Static Level (m)	Static Elevation (mAMSL)	Water Found at (ft)	Water found at (m)	Status
2600283	North Cayuga	Water Supply	2/16/1961	5	595862.4	4757184	196.60	48	14.63	181.97	60.0	136.60	48	14.6	182.0	60.0	18.3	fresh
2600284	North Cayuga	Water Supply	11/29/1947	-	595073.4	4758266	196.60	51	15.54	181.05	70.0	126.60	48	14.6	182.0	70.0	21.3	fresh
2600285	North Cayuga	Water Supply	12/11/1947	-	594963.4	4758588	198.12	49	14.94	183.18	70.0	128.12	49	14.9	183.2	67.0	20.4	fresh
2601646	North Cayuga	Water Supply	11/20/1973	10	595460.4	4757887	199.34	-	-	-	66.0	133.34	20	6.1	193.2	64.0	19.5	fresh
7041542	North Cayuga	Observation Wells	12/6/2006	-	595621	4757859	-	-	18.97	-	19.9	-	-	-	-	-	-	-
7041543	North Cayuga	Abandoned	12/6/2006	-	595662	4757881	-	-	5.15	-	19.0	-	-	-	-	-	-	-
7125522	North Cayuga	Observation Wells	6/23/2009	-	595663	4757716	-	-	-	-	6.1	-	-	-	-	-	-	-
7125523	North Cayuga	Observation Wells	6/23/2009	-	595385	4757833	-	-	-	-	53.5	-	-	-	-	-	-	-
7125524	North Cayuga	Observation Wells	6/23/2009	-	595663	4757716	-	-	-	-	58.0	-	-	-	-	-	-	-
7203955	North Cayuga	Abandoned	6/7/2013	-	595487	4758118	-	-	-	-	16.0	-	-	-	-	-	-	-
7205686	North Cayuga	Abandoned	6/7/2013	-	595488	4758119	-	-	-	-	5.0	-	-	-	-	-	-	-
7319670	North Cayuga	Test Hole	6/29/2018	-	595419	4757904	-	-	-	-	8.2	-	-	-	-	-	-	-
7319671	North Cayuga	Observation Wells	6/29/2018	-	595419	4757906	-	-	-	-	19.1	-	-	-	-	56.0	17.1	untested

### Table 3.1

Summary of Groundwater Elevations 2021 Operations and Monitoring Report Brooks Road Landfill Site Haldimand County, Ontario

Well No.	Survey	Northing	Eacting	Ground	Top of Riser Elevation	Stickup	Completion	Bottom of Borehole	<i>(m</i>	Screene 3GS)	d Interval	MSL)	Screened Media	Abandonment Date
wen no.	Dates	Northing (m)	Easting (m)	Elevation (mAMSL)	(mAMSL)	Stickup (m)	Date	Borenole (m)	(me from	to	(MA) from	to	Screened Media	Abanuonment Date
Shallow Overb	ourden													
OW1B-85	-	595606.953	4757870.701	199.23	199.96	0.73	9/12/1985	18	1.6	4.55	197.63	194.68	Clay	3-Nov-2006
OW2B-85	(2)	595429.391	4757892.585	199.83	200.55	0.72	9/12/1985	16.76	1.7	4.6	198.13	195.23	Silt, Clay	9-Oct-2001
OW3B-85	-	595468.553	4758080.732	199.43	200.31	0.88	9/13/1985	16.76	1.2	3.8	198.23	195.63	Clay, Shale	30-Nov-2006
OW4B-91	(3)	595402.449	4757916.627	201.33	202.00	0.67	4/17/1991	3.96	1.75	3.96	199.58	197.37	Clay	27-May-2007
OW5C-91	-		1757010 100	200.33	201.09	0.76	4/18/1991	4.57	1.7	5.63	198.63	194.70	Clay	27-Nov-2006
OW6B-92	(3)	595522.911	4757919.192	199.96	200.73	0.77	3/27/1992	6.1 5	5 4.56	6.1	195.40	193.86	Clay	26-May-2007
OW7B-92	(2) (3)	595749.031	4757985.204	200.01	200.82	0.81	3/30/1992	6.86	5.32	6.86	194.69	193.15	Clay	9-Oct-2001
OW8B-92	(3)	595502.139	4757809.561	199.29	199.79	0.50	4/1/1992	6.71	5.17	6.71	194.12	192.58	Clay	23-Apr-2007
OW9B-92 MW2C-01	(1)	595643.262	4758094.778 4758013.629	200.27	200.92 201.09	0.65 0.74	4/2/1992 10/16/2001	6.71 11.89	5.17	6.71 11.58	195.10	193.56 188.77	Clay Sitt Clay	29-Nov-2006
MW2B-01	(1)	595780.913 595773.743	4758023.990	200.35 200.35	201.09	0.74	10/5/2021	15.54	10.06 3.66	6.7	190.29 196.69	193.65	Silt, Clay Silt, Clay	23-May-2007
MW1B-01	-	595378.111	4757997.375	198.68	199.40	0.74	10/18/2001	6.1	2.75	5.79	195.93	193.05	Silt, Clay	3-May-2007
MW1-03	- (1)	595391.323	4757898.703	199.40	200.19	0.72	9/16/2003	5.79	1.22	5.79	198.18	192.69	Gravel, Silt, Clayey Silt	5-111ay-2007
MW2-03	(1)	595386.222	4757912.373	199.44	200.13	0.82	9/16/2003	5.79	1.22	5.79	198.22	193.65	Silt,Silt with Clay, Clayey Silt	
MW3-03	(1)	595383.216	4757923.973	199.30	200.20	0.90	9/16/2003	5.79	1.22	5.79	198.08	193.51	Silt, Clayey Silt	
OW8B-06		595444.147	4757780.062	198.29	199.33	1.04	11/21/2006	5.03	1.98	5.03	196.31	193.26	Clay, Clay with Silt	
	(3)										196.31		Clay with Silt	
OW1B-06 OW5B-06	(3)	595621.421 595676.497	4757861.063 4757898.797	199.47 198.72	200.35 199.67	0.88 0.94	11/23/2006 11/27/2006	5.33 4.72	2.29 1.6	5.33 4.65	197.18	194.14 194.07	Clay with Silt	
OW9B-06	(3)	595634.398	4758113.526	198.72	201.18	1.30	11/29/2006	4.72 5.79	2.74	4.65 5.79	197.12	194.07	Clay, Clay with Gravel	
OW3B-07	(4) (4)	595489.133	4758114.831	199.88	201.18	0.87	5/2/2007	3.96	0.91	3.6	197.14	194.09	Gravelly Silt Loam, Clay with Silt and Sand, Clay	7-Jun-2013
MW1B-07	(4)	595360.935	4758112.199	199.65	200.73	1.08	5/7/2007	4.27	1.22	4.27	198.43	195.38	Silt Loam, Silty Clay	27-Jun-2013
MW2B-07	(4)	595779.784	4758012.944	200.50	201.46	0.96	6/4/2007	3.96	0.91	3.96	199.59	196.54	Silt, Clay	27 0411 2010
MW6B-07	(6)	595462.136	4757654.108	198.65	199.43	0.78	11/20/2007	3.96	0.91	3.96	197.74	194.69	Clayey Silt and Sand, Clayey Silt	
MW5B-09	(6)	595663.795	4757744.794	198.65	199.51	0.86	6/22/2009	6.02	1.22	6.02	197.43	192.63	Clay and Silt with Sand, Clayey Silt	
OW3B-13	(7)	595488.361	4758159.297	200.50	201.22	0.72	6/7/2013	3.96	0.91	3.96	199.59	196.54	Clay with Silt	
MW1B-13	(7)	595334.711	4758159.539	199.70	200.50	0.79	6/17/2013	3.96	0.91	3.96	198.79	195.74	Silty Clay	
MW10B-18	(13)	595417.718	4757904.401	201.09	201.99	0.90	6/27/2018	8.08	5.03	8.08	196.06	193.01	Silty Clay, Clay	
MW12B-19	(14)	595764.307	4757880.692	199.70	200.55	0.84	8/26/2019	6.1	3.05	6.1	196.65	193.60	Clay	
MW11B-19	(14)	595573.643	4757825.553	203.02	203.69	0.67	8/29/2019	11.28	8.23	11.28	194.79	191.74	Clay	
MW13B-22	ns	595564.914	4758156.950	-	-	~0.6	4/19/2022	7.62	4.57	7.62	-	-	Clay	
MW14B-22	ns	595722.455	4758156.125	-	-	~0.6	4/21/2022	7.62	4.57	7.62	-	-	Clay	
Basal Overbur	den / Shallow	Bedrock												
OW1A-85		595606.953	4757870.701	199.23	199.92	0.69	9/12/1985	18	17.3	18	181.93	181.23	Gravel, Shale	3-Nov-2006
OW2A-85	(2)	595428.886	4757892.476	199.82	200.55	0.73	9/12/1985	16.76	15.6	16.76	184.22	183.06	Gravel, Shale	9-Oct-2001
OW3A-85	-	595468.522	4758080.781	199.43	200.24	0.81	9/13/1985	16.76	15.6	16.76	183.83	182.67	Clay, Shale	30-Nov-2006
OW5B-91	-	595680.805	4757917.933	200.33	200.93	0.60	4/17/1991	18.45	17.75	18.45	182.58	181.88	Clay, Gravel	27-Nov-2006
OW5A-91	-	595681.950	4757915.313	200.33	200.98	0.65	4/19/1991	21.03	20.2	21.03	180.13	179.30	Shale	27-Nov-2006
OW6A-92	-	595521.128	4757918.386	199.96	200.67	0.70	3/27/1992	18.44	16.9	18.44	183.06	181.52	Sand, Shale	26-May-2007
OW7A-92	(2)	595747.956	4757986.525	200.08	200.80	0.72	3/30/1992	16.99	15.45	16.99	184.63	183.09	Sand, Shale	9-Oct-2001
OW8A-92	-	595502.606	4757807.877	199.29	199.80	0.51	3/31/1992	18.49	16.95	18.49	182.34	180.80	Sand, Shale	24-Apr-2007
OW9A-92	-	595644.984	4758096.002	200.27	201.00	0.73	4/2/1992	15.82	14.1	15.82	186.17	184.45	Sand, Shale	29-Nov-2006
MW2A-01	(1)	595781.173	4758011.818	200.35	201.19	0.85	10/16/2001	19.2	16.15	19.2	184.20	181.15	Shale	
MW1A-01	-	595378.174	4757996.875	198.68	199.40	0.73	10/17/2001	15.85	12.8	15.85	185.88	182.83	Silt, Clay, Gravel, Shale	4-May-2007
OW8A-06	(3)	595444.871	4757778.658	198.29	199.33	1.05	11/21/2006	17.98	14.94	17.98	183.35	180.31	Clay, Gravelly Sand, Shale	
OW1A-06	(3)	595622.395	4757859.863	199.47	200.24	0.77	11/23/2006	19.35	16.31	19.35	183.16	180.12	Clay with Silt, Sand with Gravel with Fines, Shale	
OW5A-06	(3)	595676.669	4757897.435	198.72	199.72	1.00	11/27/2006	17.98	14.78	17.83	183.94	180.89	Clay, Sand with Gravel, Shale	
OW9A-06	(4)	595633.238	4758113.303	199.88	201.08	1.21	11/29/2006	19.05	16	19.05	183.88	180.83	Cobble with Boulder, Sand, Gravel, Shale	07 1 0010
MW1A-07	(4)	595359.739	4758112.291	199.72	200.72	1.00	5/7/2007	17.68	14.63	17.68	185.09	182.04	Clay, Silt, Sand and Gravel, Bedrock	27-Jun-2013
MW6A-07 MW5A-09	(6) (6)	595461.535 595663.346	4757655.105 4757746.298	198.57 198.53	199.39 199.39	0.81 0.86	11/20/2007 6/22/2009	17.37 17.78	14.33 14.73	17.37 17.78	184.24 183.80	181.20 180.75	Clay and Silt with Sand, Clayey Gravel with Sand, Clay and Silt, Sand and Gravel	
MW4A-09	(6) (6)	595395.907	4757884.615	198.55	200.15	0.80	6/23/2009	16	14.73	16	186.30	183.25	Clay and Silt, Gravel with Sand, Bedrock	
OW3A-13	(0)	595487.106	4758159.041	200.51	201.23	0.90	6/7/2013	19.2	16.15	19.2	186.30	181.31	Clay with Sand and Gravel	
OW4A-91	(2)	595404.518	4757908.903	200.85	201.23	1.06	6/7/2013	17.62	16.55	17.62	184.30	183.23	Clay	19-Oct-2001 / ~2005
MW1A-13	(7)	595333.078	4758158.933	199.64	200.42	0.78	6/27/2013	18.14	15.09	16.61	184.55	183.03	Silt with Sand	
MW10A-18	(13)	595416.842	4757905.591	201.13	202.04	0.91	6/27/2018	19.08	16.03	19.08	185.10	182.05	Clay, Silt/Sand, Bedrock	
MW12A-19	(14)	595762.712	4757879.316	199.76	200.60	0.84	8/26/2019	18.29	15.24	18.29	184.52	181.47	Silty Gravelly Sand, Dolostone	
MW11A-19	(14)	595575.180	4757825.979	203.00	203.76	0.76	8/29/2019	21.34	19.2	22.25	183.80	180.75	Clay, Silty Gravally Sand, Dolostone	
MW13A-22	ns	595564.914	4758156.950	-	-	~0.6	4/19/2022	17.98	14.94	17.98	-	-	Basal Till, Bedrock	
MW14A-22	ns	595722.455	4758156.125	-	-	~0.6	4/19/2022	16.76	13.72	16.76	-	-	Basal Till, Bedrock	

### Table 3.1

### Summary of Groundwater Elevations 2021 Operations and Monitoring Report Brooks Road Landfill Site Haldimand County, Ontario

Well No.	Survey Dates	Northing	Ground Top of Riser Completion Bottom of Screened Interval Easting Elevation Elevation Stickup Date Borehole (mBGS) (mAMS		MSL)	Screened Media	Abandonment Date							
<b>Residential</b> OW3A-07	(4)	595488.276	4758115.859	199.23	200.14	0.91	5/1/2007	16.46	14.48	17.53	184.75	181.70	Clay with Silt, Sandy Gravel, Bedrock	7-Jun-2013
Bedrock Wells (s	shallow and	deep)												
MW1D-07	(4)(15)	595361.315	4758110.831	199.72	201.21	1.49	5/14/2007	30.68	23.77	26.21	175.95	173.51	Dolostone-Shale Bedrock	
MW1S-07	(4)(15)	595362.099	4758109.785	199.65	201.11	1.46	5/17/2007	21.54	20.02	21.54	179.63	178.11	Dolostone-Shale Bedrock	
MW2D-07	(4)	595779.620	4758011.175	200.63	201.16	0.53	5/29/2007	28.96	27.43	28.96	173.20	171.67	Dolostone-Shale Bedrock	
MW2S-07	(4)	595779.271	4758015.691	200.49	201.13	0.64	6/1/2007	22.86	21.34	22.86	179.15	177.63	Dolostone-Shale Bedrock	
OW8D-07	(5)	595449.144	4757771.695	198.98	199.32	0.34	6/14/2007	30.48	28.96	30.48	170.02	168.50	Dolostone-Shale Bedrock	
OW8S-07	(5)	595447.532	4757772.604	198.98	199.67	0.69	6/19/2007	23.01	21.49	23.01	177.49	175.97	Dolostone-Shale Bedrock	
Leachate Well														
LW1-17	(10)	-	-	208.45	211.61	3.16	10/10/2017	14.63	3.96	14.63	204.49	193.82	Landfill Material	
LW1-92		595437.286	4757940.393	201.17	201.18	0.01	4/2/1992	10.82	7.74	10.82	193.43	190.35	Landfill Material	unknown
LW2-92		595508.886	4757951.155	200.63	201.45	0.82	4/3/1992	7.01	3.93	7.01	196.7	193.62	Landfill Material	unknown

### Notes:

All units in meters above mean sea level (m AMSL)

Metres Below Top Of Riser mBTOR

(1)	Surveyed on February 18	3, 2005
-----	-------------------------	---------

- Surveyed on May 1, 2001
- Surveyed on January 9, 2007 Surveyed on June 13, 2007
- (2) (3) (4) (5) (6) (7) (8) (10) (11) (12) (13) (14) (15) Surveyed on July 26, 2007
- Surveyed on March 31, 2010
- Surveyed on July 17, 2013
- Water level not considered reliable, monitoring well replaced
- Water level elevation obtained from others and considered unreliable
- Surveyed in February 2020
- Leachate well also measured by BRE on December 12, 2017 Monitoring Wells MW5A-09 and MW5B-09 were accessed and measured on December 27, 2017
- surveyed on July 26, 2018
- surveyed on December 17, 2019
- risers adjusted in August 2019
- NM Not Measured
- NS Not Surveyed
- Data Note Available -

#### Table 3.2

#### Bedrock Elevation Summary Hydrogeologic Assessment - Landfill Expansion Brooks Road Landfill 2270386 Ontario Limited

Well No.	Northing	Easting	Ground Elevation (mAMSL)	Top of Riser Elevation (mAMSL)		rock ation (mAMSL)
Basal Overb	urden / Shallow	Bedrock				
MW2A-01	595781.173	4758011.818	200.35	201.19	15.24	185.11
OW1A-06	595622.395	4757859.863	199.47	200.24	18.67	180.8
OW5A-06	595676.669	4757897.435	198.72	199.72	17.98	182.87
OW8A-06	595444.871	4757778.658	198.29	199.33	16.16	182.13
OW9A-06	595633.238	4758113.303	199.88	201.08	17.49	182.39
MW1A-07	595359.739	4758112.291	199.72	200.72	17.68	182.04
MW6A-07	595461.535	4757655.105	198.57	199.39	16.26	182.31
MW4A-09	595395.907	4757884.615	199.25	200.15	15.49	183.76
MW5A-09	595663.346	4757746.298	198.53	199.39	17.78	180.75
MW1A-13	595333.078	4758158.933	199.64	200.42	17.07	182.57
OW3A-13	595487.106	4758159.041	200.51	201.23	17.98	182.53
MW10A-18	595416.842	4757905.591	201.13	202.04	19.05	182.08
MW11A-19	595575.180	4757825.979	203.00	203.76	20.42	182.58
MW12A-19	595762.712	4757879.316	199.76	200.60	17.37	182.39
MW13A-22	595564.914	4758156.950	~201.5	-	16.764	184.74
MW14A-22	595722.455	4758156.125	~201	-	14.0208	186.98
Residential						
OW3A-07	595488.276	4758115.859	199.23	200.14	16.449	182.78
Bedrock Wel	ls (shallow and	l deep)				
MW1S-07	595362.099	4758109.785	199.65	201.11	16.46	183.19
MW2S-07	595779.271	4758015.691	200.49	201.13	14.94	185.55
MW1D-07	595361.315	4758110.831	199.72	201.21	16.76	182.96
MW2D-07	595779.620	4758011.175	200.63	201.16	14.93	185.7
OW8S-07	595447.532	4757772.604	198.98	199.67	17.68	181.30
OW8D-07	595449.144	4757771.695	198.98	199.32	17.68	181.30

#### Table 3.3

#### Summary of Hydraulic Conductivity Estimates Hydrogeologic Assessment - Landfill Expansion Brooks Road Landfill 2270386 Ontario Limited

Geologic Unit	Aquifer and Approximate Depth Interval	-	Hydraulic Conductivity Estimates (cm/sec) Horizontal Vertical			Source
Refuse	Water Table Aquifer (0 to 10 m bgs)	Estimate/ Range 1.2E-03 - 1.2E-02	Geometric Mean 6.60E-03		In-situ field testing	HPE, 1992
Silty Clay (weathered)	Water Table Unit (0 to 5 m bgs)	4.00E-08 2.00E-07 - 1.70E-05 2.20E-06 4.15E-05 1.29E-07 - 2.02E-07	2.30E-06 1.75E-07	1.43E-08	Grain size analysis In-situ field testing Pressure packer tests Horslev Grain size analysis Estimation	CRA HPE, 1992 van der Kamp, 1985 van der Kamp, 1985 HPE, 1992 HPE, 1992
Silty Clay (unweathered) (unfractured)	Silty Clay Aquitard (6 to 13 m bgs)	6.30E-08 - 1.20E-07 4.50E-07 1.43E-08	2.32E-07	1.37E-08 2.00E-08	Grain size analysis Single well response Laboratory test Laboratory test Other landfills in Haldimand Clay Plain	CRA CRA HPE, 1992 HPE, 1992 Jagger Hims Ltd
Silty Sand Till/ Shallow Bedrock	Basal Overburden/ Shallow Bedrock Aquifer (13 to 20 m bgs)	1.00E-05 - 1.00E-04 3.20E-05 7.39E-06 - 2.89E-03 1.00E-04	5.50E-05		Grain size analysis Grain size analysis Field testing Laboratory test	CRA CRA HPE, 1992 HPE, 1992

Note: 2.30E-06

-06 Selected hydraulic conductivity for the corresponding geological unit

#### Table 4.1

#### List of Ontario Oil Gas Records within the Study Area Hydrogeology Assessment Brooks Road Landfill Brooks Road, Cayuga, Ontario

#### LICENCE

NUMBER WELL NAME

F019425 Pt. Colborne-Welland Gas Co. - J. Kozak #1, North Cayuga - 22 - INTR F019426 W.C. Patterson - Miss Doyle, North Cayuga - 22 - INTR F019435 P.C. Welland Gas Co - C. Bunn #1, North Cayuga - 23 - INTR F019436 Pt. Col-Welland Gas Co - C. Bunn #2, North Cayuga 1 - 23 - INTR F019437 Pt. C. -Welland Gas Co - C. Bunn #3, North Cayuga - 23 - INTR F019438 Dom Nat Gas Co - Wm Bunn #1, North Cayuga - 23 - INTR F019439 Haldimand Gas Synd - W.R. Slack #2, North Cayuga - 23 - INTR F019478 W.C. Patterson - W.A. Oster #1, North Cayuga - 24 - INTR F019479 W.C. Patterson - W.A. Oster #2, North Cayuga - 24 - INTR F019480 Union Gas Co of Canada - W.A. Oster #3, North Cayuga - 24 - INTR F019481 Pt Col.-Welland Gas Co - C. Bunn #4, North Cayuga - 24 - INTR F019482 Pt. Col - Welland Gas Co Ltd. - C. Bunn #5, North Cayuga - 24 - INTR W.C. Patterson - J. Badger, North Cayuga - 25 - INTR F019509 F019511 Pt. Col-Welland Gas & Oil Co - J. Ferguson #1, North Cayuga - 25 - INTR F019516 Dom Nat Gas Co - A.& W. Geddes #2, North Cayuga - 26 - INTR F019517 Dom Nat Gas Co - A.&W. Geddes #3, North Cayuga - 26 - INTR F019520 Dom Nat Gas Co - W.B. Hamilton #2, North Cayuga - 26 - INTR T002154 Haldimand Gas No. 477, North Cayuga - 22 - INTR T002163 Haldimand Gas No. 481, North Cayuga - 22 - INTR T002399 Haldimand Gas No. 489, North Cayuga - 23 - INTR T002428 Haldimand Gas No. 491, North Cayuga - 24 - INTR T002543 Haldimand Gas No. 494, North Cayuga - 25 - INTR T002590 Haldiamnd Gas No. 496, North Cayuga - 25 - INTR

#### Notes:

TVDTotal Vertical DepthTD DateDate total depth reached

#### OPERATOR

Port Colborne - Welland Natural Gas & Oil Co. Ltd. W. C. Patterson Gas Co. Ltd. Port Colborne - Welland Natural Gas & Oil Co. Ltd. Port Colborne - Welland Natural Gas & Oil Co. Ltd. Port Colborne - Welland Natural Gas & Oil Co. Ltd. Dominion Natural Gas Co., Ltd. Haldimand Natural Gas Syndicate W. C. Patterson Gas Co. Ltd. W. C. Patterson Gas Co. Ltd. Union Gas Limited Port Colborne - Welland Natural Gas & Oil Co. Ltd. Port Colborne - Welland Natural Gas & Oil Co. Ltd. W. C. Patterson Gas Co. Ltd. Port Colborne - Welland Natural Gas & Oil Co. Ltd. Dominion Natural Gas Co., Ltd. Dominion Natural Gas Co., Ltd. Dominion Natural Gas Co., Ltd. Haldimand Gas & Oil Wells Ltd.

WELL TYPE	WELL MODE	TVD	TD DATE	PLUG DATE
Gas Show	Abandoned Well	210.62	21-Nov-1947	21-Nov-1947
Dry Hole	Abandoned Well	214.58	26-Nov-1927	
Natural Gas Well	Unknown	207.57	30-Apr-1943	
Natural Gas Well	Abandoned Well	210.31	17-Jun-1943	3-Feb-1960
Natural Gas Well	Abandoned Well	229.51	28-Aug-1943	23-Jul-1954
Dry Hole	Abandoned Well	213.97	5-Apr-1928	9-Apr-1928
Natural Gas Well	Unknown	211.84	21-Dec-1957	
Natural Gas Well	Unknown	219.76		
Natural Gas Well	Unknown	224.33	31-Jan-1929	
Gas Show	Abandoned Well	217.93	28-Nov-1938	8-Nov-1938
Natural Gas Well	Abandoned Well	211.53	9-Oct-1943	30-Jun-1964
Natural Gas Well	Unknown	207.87	24-Nov-1943	
Natural Gas Well	Unknown	219.15	19-Mar-1929	
Gas Show	Abandoned Well	213.66	20-Jan-1948	20-Jan-1948
Natural Gas Well	Abandoned Well	213.66	4-Oct-1929	25-Aug-1964
Dry Hole	Abandoned Well	210.01	24-Oct-1929	25-Oct-1929
Natural Gas Well	Abandoned Well	215.80	20-May-1929	12-Mar-1935
Natural Gas Well	Abandoned Well	214.58	13-Dec-1965	24-Jul-1974
Natural Gas Well	Abandoned Well	214.27	1-Aug-1966	4-Aug-1971
Natural Gas Well	Unknown	213.66	13-Oct-1967	
Gas Show	Abandoned Well	215.80	7-May-1968	16-Jul-1968
Natural Gas Well	Abandoned Well	213.66	30-Aug-1968	10-Jun-1975
Natural Gas Well	Abandoned Well	210.62	24-Oct-1968	9-Jun-1975

TO DATE

WELL MODE

DUUC DATE

#### Table 6.3

#### Horizontal Model Results Hydrogeologic Assessment - Landfill Expansion Brooks Road Landfill 2270386 Ontario Limited

		Average Median Basal Till		Contaminant Masses & Source Volumes Basal Till Overburden/Shallow Bedrock Aquifer Final Forecasted Groundwater				Basal Till Overburden/Shallow Bedrock Aquifer		Reduction in			
Parameters		Overburden/Shallow Bedrock (MW1A-13, OW3A-13, OW9A-06) <sup>(1)(4)</sup>	Leachate Concentrations (2017-2021) <sup>(2)</sup>	Predicted Peak Concentration through base of Native Clay <sup>(3)</sup>		Horizontal Flux into Landfill Footprint (440 L/day per unit width)	Vertical Infiltration of Contaminant Mass (Landfill->Shallow Aquifer->Aquitard-> Basil Till/Shallow Bedrock Aquifer (0.02 m/day per unit area)	Concentrations at the Downgradient Property Boundary Basal Till Overburden/Shallow Bedrock Aquifer	Concentrations (peak concentrations / final forecasted concentrations)	ODWS or <sup>-</sup> Values		Basal Till Overburden/Shallow Bedrock Aquifer RUC <sup>(6)</sup>	
			Maximum		Units	Upgradient Width = 365 m	Total Area = 71,461 m <sup>2</sup>						
					L/day	161,000	3,900						
						Contamina	ant Masses						
Chloride	mg/L	15.7	1130	192.5	mg/day	2,527,700	750,641	19.88	9.7	250	AO	133	
Boron	mg/L	0.527	10.1	1.32	mg/day	84,847	5,164	0.55	2.4	5	IMAC	1.65	
Fluorene	ug/L	ND(0.02)	0.544	0.07	ug/day	1,610	277	0.01	6.2	30	Table 2	30	
Phenanthrene	ug/L	ND(0.02)	0.492	0.06	ug/day	1,610	246	0.01	5.6	1.0	Table 2	0.5	
Benzene	ug/L	ND(0.5)	4.27	0.40	ug/day	40,250	1,548	0.25	1.6	0.001	MAC	0.25	
Vinyl chloride	ug/L	ND(0.5)	0.76	0.11	ug/day	40,250	417	0.25	0.4	0.001	MAC	0.25	

Notes:

(6)

 (1)
 (2)
 (3)
 (4)
 (5) Average median background concentrations are based on groundwater quality reported at wells MW1S-13, OW3A-13, and OW9A-06 between 2017 and 2021.

Maximum reported concentrations in leachate from 2017 and 2021 are used.

Taken from the vertical model

Where a parameter was analyzed for but was not detected at or above the Method Detection Limit, a value of 1/2 of the lowest MDL was assumed.

Ontario Drinking Water Standards (ODWS), June 2003; revised June 2006, as amended, prepared by the MECP. Where no ODWS criteria exists, the RUC values were developed using Table 2 of the Soil, Groundwater and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act, dated April 15, 2011. A value of zero was used to calculate the RUC for PAHs and VOCs.

RÚC Reasonable Use Criteria

Concentration exceeds ODWS and RUC. Bold

Average: 4

#### Table 7.1A

#### Proposed Monitoring Program Hydrogeologic Assessment - Landfill Expansion Brooks Road Landfill 2270386 Ontario Limited

	Location	March	Мау	August	November
	OW1A-06		В		A
	OW1B-06		В		A
	OW3A-13		В		A
	OW3B-13		В		A
	OW5A-06		В		A
	OW5B-06		В		А
	OW8A-06		В		А
	OW8B-06		В		А
	OW8D-07 (Gypsum Mine)		В		WL-only
	OW8S-07 (Gypsum Mine)		В		WL-only
	OW9A-06		В		A
	OW9B-06		В		А
	MW1-03		WL-only		WL-only
	MW1A-13		В		A
	MW1B-13		В		А
	MW1D-07 (Gypsum Mine)		В		WL-only
	MW1S-07 (Gypsum Mine)		В		WL-only
r <sup>(1)</sup>	MW2-03		WL-only		WL-only
ate	MW2A-01		В		A
Ňp	MW2B-07		В		А
nne	MW2C-01				
Groundwater <sup>(1)</sup>	MW2D-07 (Gypsum Mine)		В		WL-only
0	MW2S-07 (Gypsum Mine)		В		WL-only
	MW3-03		WL-only		WL-only
	MW4A-09		WL-only		WL-only
	MW5A-09		В		A
	MW5B-09		В		A
	MW6A-07		В		A
	MW6B-07		В		A
	MW10A-18		В		А
	MW10B-18		В		А
	MW11A-19		В		A
	MW11B-19		В		A
	MW12A-19		В		A
	MW12B-19		В		A
	MW13A-22		В		A
	MW13B-22		В		A
	MW14A-22		В		A
	MW14B-22		В		A
	SW1	C	В	С	В
-	SW2	С	В	С	В
r <sup>(2)</sup>	SW3	С	В	С	В
atei	SW4	С	В	С	В
Surface Water	SW5	С	В	С	В
ce	SW6	С	В	С	В
Irfa	SW7	С	В	С	В
Su	SW8	С	В	С	В
	SW9	С	В	С	В
	SWMS Pond <sup>3</sup>	D	D	D	D
	Leachate Collection System	WL-only	В	WL-only	WL-only
LW	LW1-17	WL-only	WL-only	WL-only	WL-only
C	Groundwater Duplicate		В		A
QA/QC	Surface Water Duplicate	С	В	С	В
QA	Field Blank	С	В	С	В
-		-	1	-	

Notes:

<sup>(1)</sup> Groundwater levels will be measured at all monitoring wells during the May and November sampling events

<sup>(2)</sup> Surface water levels and flows will be measured during all surface water sampling events at all surface water locations

<sup>(3)</sup> List E - Trigger Parameter samples are collected and reviewed prior to discharging water from the SWMS Pond

Refer to Table 2 for the list of parameters

List A - indicator parameters (groundwater)

List  $\ensuremath{\mathsf{B}}$  - inorganic chemistry, metals, PAHs, VOCs

List C - indicator parameters (surface water)

List D - TDS Pond Parameters

List E - Effluent Discharge Parameters

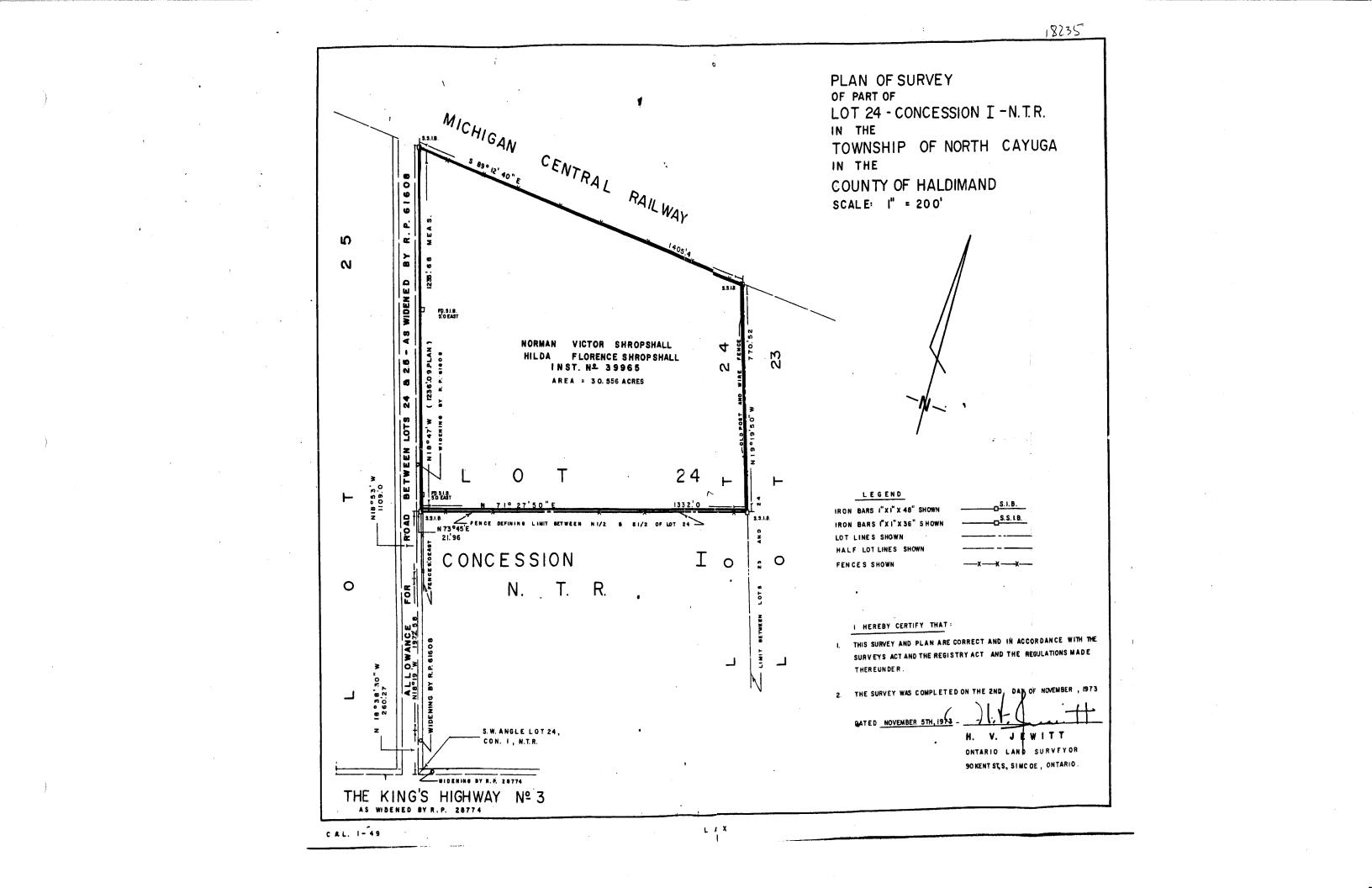
#### Table 7.1B

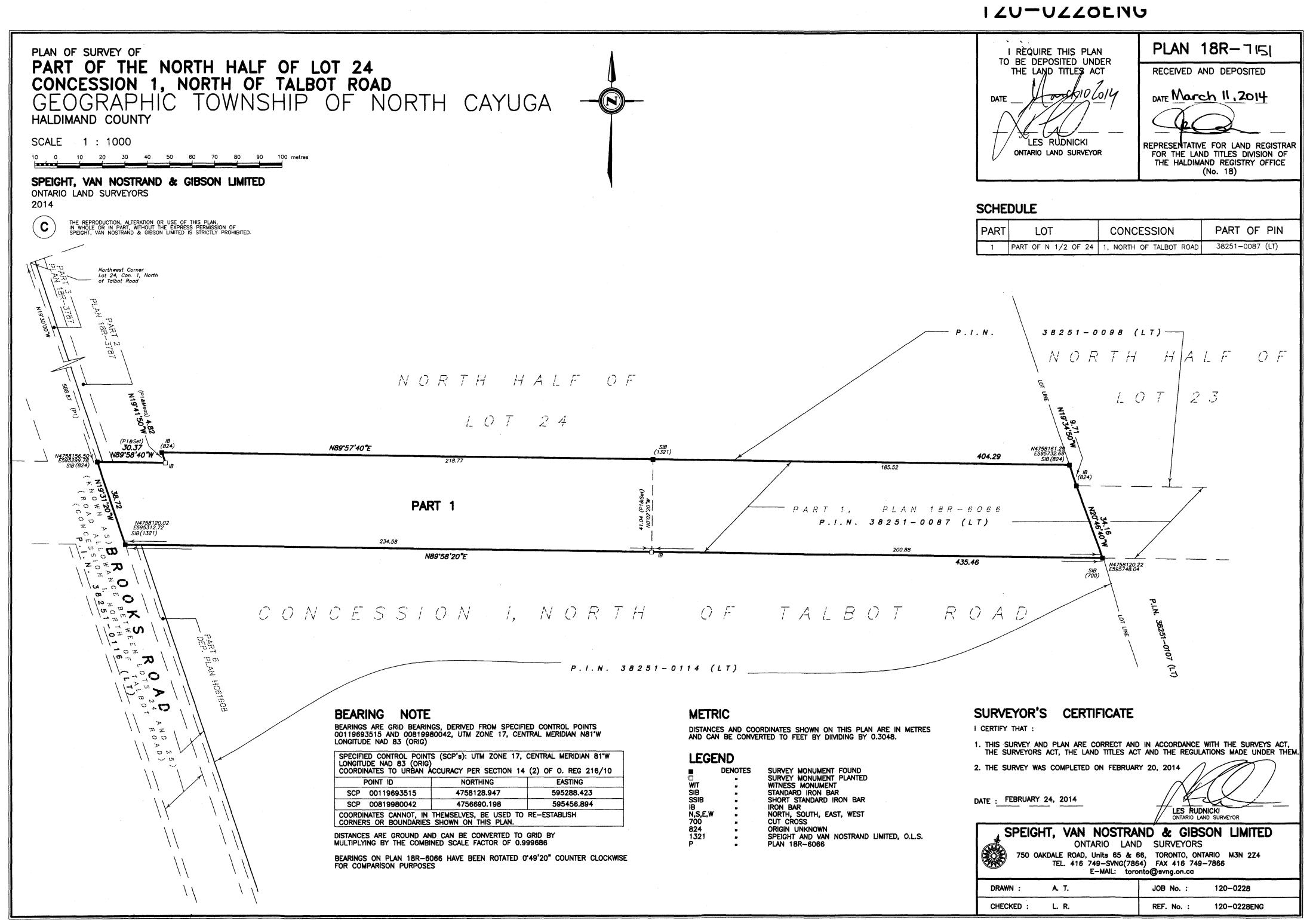
#### Proposed Monitoring Program Parameter Lists Hydrogeologic Assessment - Landfill Expansion Brooks Road Landfill 2270386 Ontario Limited

List (s)	Analytical Group	Analytical Parameters
A	Indicator Parameters (groundwater)	alkalinity, ammonia, barium, boron, calcium, chloride, conductivity, iron, magnesium, nitrate, pH, sodium, TDS, sulphate, COD, DOC, turbidity
В	Inorganic Chemistry	alkalinity, ammonia, hardness, nitrate, nitrite, TKN, chloride, sulfate, DOC, TDS, suspended solids, phenol, BOD <sub>5</sub> , COD, pH, total phosphorus, conductivity, turbidity
В	Metals	arsenic, barium, beryllium, boron, cadmium, total chromium, copper, iron, lead, magnesium, manganese, mercury, silver, sodium, zinc, vanadium, thallium, molybdenum, cobalt, nickel, potassium, calcium, aluminum
В	PAHs	naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(j)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, benzo(ghi)perylene
в	VOCs	chloromethane, vinyl chloride, bromomethane, chloroethane, trichlorofluoromethane, acetone, 1,1-dichloroethene, dichloromethane, trans-1,2- dichloroethene, methyl-t-butyl ether, 1,1-dichloroethane, methyl ethyl ketone, cis-1,2-dichloroethene, chloroform, 1,2-dichloroethane, 1,1,1- trichloroethane, carbon tetrachloride, benzene, 1,2-dichloropropane, trichloroethene, bromodichloromethane, cis-1,3-dichloropropene, methyl isobutyl ketone, trans-1,3-dichloropropene, 1,1,2-trichloroethane, toluene, 2-hexanone, dibromochloromethane, 1,2-dibromoethane, tetrachloroethene, 1,1,1,2- tetrachloroethane, chlorobenzene, ethylbenzene, m,p,o-xylenes, bromoform, styrene, 1,1,2,2-tetrachloroethane, 1,3-dichlorobenzene, 1,4- dichlorobenzene, 1,2-dichlorobenzene
С	Indicator Parameters (surface water)	alkalinity, ammonia, chloride, conductivity, iron, nitrate, nitrite, TKN, pH, total phosphorus, TDS, suspended solids, sulphate, BOD5, COD, phenol, turbidity, temperature (field), and dissolved oxygen (field)
D	PSWMS Pond Parameters	General Chemistry: alkalinity, conductivity, hardness, pH, chloride, sulphate, nitrite, nitrate, ammonia, TSS, TDS, COD, total phosphorus, TKN, BOD <sub>5</sub> , phenols Metals: arsenic, barium, boron, cadmium, chromium, copper, iron, lead, mercury, zinc Organics: ethylbenzene, naphthalene, benzo(a)pyrene Field Parameters: conductivity, dissolved oxygen, pH, temperature
E	PSWMS Pond Trigger Parameters	TSS, pH, un-ionized ammonia, iron, total phosphorus, zinc, boron, toluene, fluorene, napthalene Field Parameters: conductivity, dissolved oxygen, pH, temperature

# Appendices

## Appendix A Legal Site Survey





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### Appendix B Existing Environmental Compliance Approvals



**Content Copy Of Original** 

Ministry of the Environment, Conservation and Parks Ministère de l'Environnement, de la Protection de la nature et des Parcs

#### AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 7323-C6EJUM Issue Date: September 24, 2021

2270386 Ontario Limited 162 Cumberland Street Toronto, Ontario M5R 3N5

#### Site Location: Brooks Road Landfill Site 160 Brooks Rd North, Cayuga, Haldimand County, Ontario.

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:

- one (1) landfill site, having a capacity of 1,045,065 cubic metres (including waste and daily cover), a maximum fill rate of 250,000 tonnes per year and 1,000 tonnes per day;
- one (1) leachate treatment system, having a rated capacity of 200 cubic metres per day, complete with a leachate collection sump, a raw leachate primary settling tank, an aeration system and above-grade treated effluent storage tanks;

all in accordance with the supporting information listed in Schedule A.

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

- "Acoustic Assessment Report" means the report, prepared in accordance with Publication NPC-233 submitted in support of the application, that documents all sources of noise emissions and Noise Control Measures present at the Facility.
   "Acoustic Assessment Report" also means the Acoustic Assessment Report prepared by GHD, dated September 7, 2021 and signed by Michael Masschaele;
- 2. "Approval" means this Environmental Compliance Approval, including the application and supporting documentation listed above;
- 3. "Company" means 2270386 Ontario Limited, that is responsible for the construction or operation of the Facility and includes any successors and assigns;
- 4. "District Manager" means the District Manager of the appropriate local district office of the Ministry, where the Facility is geographically located;

- 5. "EPA" means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended;
- 6. "Equipment" means all the equipment, described in the Company's application, this Approval and in the supporting documentation submitted with the application, to the extent approved by this Approval;
- 7. "ESDM report" means the Emission Summary and Dispersion Modelling Report which was prepared in accordance with section 26 of O. Reg. 419/05 and the Procedure Document by GHD and dated June 11, 2021, submitted in support of the application, and includes any changes to the report made up to the date of issuance of this Approval;
- 8. "Facility" means the entire operation located on the property where the Equipment is located;
- 9. "Manual" means a document or a set of documents that provide written instructions to staff of the Company;
- 10. "Ministry" means the ministry of the government of Ontario responsible for the EPA and includes all officials, employees or other persons acting on its behalf;
- 11. "Noise Control Measures" means measures to reduce the noise emissions from the Facility and/or Equipment including, but not limited to, silencers, acoustic louvres, enclosures, absorptive treatment, plenums and barriers;
- 12. "Noise Guidelines for Landfill Sites" means the Ministry draft publication "Noise Guidelines for Landfill Sites", October 1998, as amended;
- 13. "Odour Management Plan" means the Odour Management Plan, Brooks Road Landfill Site, Haldimand County, prepared by GHD, dated June 11, 2021 that includes mitigation measures to minimize off-Site odour impacts, and if appropriate, a trigger mechanism and contingency plan;
- 14. "Publication NPC-233" means the Ministry Publication NPC-233, "Information to be Submitted for Approval of Stationary Sources of Sound", October, 1995;
- 15. "Publication NPC-300" means the Ministry Publication NPC-300, "Environmental Noise Guideline, Stationary and Transportation Sources Approval and Planning, Publication NPC-300", August 2013, as amended;
- 16. "Site" means the entire waste disposal site, including the buffer lands, at the Brooks Road Landfill Site, Lot 24, Concession 1 North, Haldimand County; and
- 17. "Truck(s)" means trucks carrying waste for disposal at the Facility.

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. OPERATION AND MAINTENANCE**

- The Company shall prepare, not later than three (3) months from the date of this Approval, implement and continue to update as necessary, a Manual outlining the operating procedures and maintenance programs for the Equipment/Facility, which shall specify as a minimum:
  - a. routine operating and maintenance procedures in accordance with good engineering practices;
  - b. emergency procedures;
  - c. frequency of inspections and scheduled preventative maintenance;
  - d. procedures to prevent upset conditions;
  - e. all appropriate measures to prevent/minimize fugitive particulate matter, noise and odorous emissions from all potential sources at the Site; and
  - f. procedures for record keeping activities relating to the operation and maintenance programs.
- 2. The Company shall ensure that the Facility/Equipment is properly operated and maintained at all times and in accordance with this Approval, the operating procedures and maintenance Manual, and the Odour Management Plan.

#### 2. ODOUR MANAGEMENT PLAN

- 1. The Company shall forthwith implement the Odour Management Plan and continue to review and update as necessary and in consultation with the District Manager as applicable.
- 2. If there is any odour complaint, or significant odour is detected during daily inspection, and the odour is confirmed to originate from the Site, mitigation measures shall be implemented immediately in accordance with the Odour Management Plan.
- 3. If odour causes adverse off-site impacts that are not mitigated through implementation of odour mitigation measures according to the Odour Management Plan, the Company shall, upon written notification from the District Manager, conduct an investigation into the cause as to why the impacts were not mitigated and submit to the District Manager within the time frame identified in the notice, an assessment of the issues and the need for implementation of contingency actions in accordance with the Odour Management Plan.
- 4. If the Ministry deems the odour mitigation measures taken as per Condition

2.3 to be unsuitable, insufficient or ineffective, the District Manager may direct the Company, in writing, to propose further measures to address the noted failure, upset or malfunction, which may include requiring a reduction in the receipt of waste, cessation of the receipt of waste, removal and disposal of waste from the waste diversion area, the removal of leachate from the Site as well as, making repairs or modifications to equipment or processes. Such measures shall be implemented by the Company upon approval by the District Manager.

- 5. If the cessation of the receipt of waste is required, as determined by Condition 2.4, no waste shall be received at the Site until the District Manager is satisfied that odour impacts have been adequately mitigated.
- 6. The Company shall prepare and maintain an annual summary of the actions taken and achievements made under the Odour Management Plan as of December 31 of the previous calendar year.

#### 3. NOISE

- 1. The Company shall, at all times, ensure that the noise emissions from the Facility comply with the limits set out in Ministry Publication NPC-300.
- 2. The Company shall, at all times, ensure that the noise emissions from the landfill site operations at the Facility comply with the limits set out in Ministry draft publication "Noise Guidelines for Landfill Sites".
- 3. The Company shall ensure that the operating times and numbers of Equipment are limited as detailed in Section 2 of the Acoustic Assessment Report.
- 4. The Company shall limit Truck arrivals and departures to a maximum of sixteen (16) trucks per sixty (60) minute period, restricted to the daytime hours from 7 a.m. to 7 p.m.

#### 4. COMPLAINTS RESPONSE PROCEDURE

- The Company shall develop in consultation with the District Manager, not later than three (3) months from the date of this Approval, implement and continue to update as necessary, a Complaint Response Protocol for dealing with and responding to environmental complaints as a result of operation of the Equipment/Facility approved by this Approval. The Complaint Response Protocol shall include:
  - a. procedures for recording the complaint;
  - b. procedures for investigating the complaint, including determining all possible causes of the complaint, and the necessary actions to appropriately deal with the cause of the subject matter of the complaint;

- c. procedures for taking the necessary actions to appropriately deal with the cause of the subject matter of the complaint in a timely and effective manner;
- d. a description of any measures taken to address the complaint, outcome of the actions taken and steps to be taken to avoid the recurrence of similar incidents;
- e. procedures for record keeping of activities relating to the complaints;
- f. procedures for notifying the District Manager of the complaint in a manner acceptable to the District Manager; and
- g. procedures for replying to the complainant.

#### 5. RECORD RETENTION

- 1. Any information requested by any employee in or agent of the Ministry concerning the Facility and its operation under this Approval, including, but not limited to, any records required to be kept by this Approval, shall be provided to the employee in or agent of the Ministry, upon request, in a timely manner. Unless otherwise specified in this Approval, the Company shall retain, for a minimum of five (5) years from the date of their creation all reports, records and information described in this Approval, including,
  - a. a copy of the ESDM Report;
  - b. a copy of the Odour Management Plan and activities pertaining to the implementation of the Odour Management Plan;
  - c. a copy of the Acoustic Assessment Report;
  - d. records of maintenance, repair and inspection of Equipment/Facility;
  - e. all records of any upset conditions associated with the operation of the Equipment/Facility;
  - f. all records on the environmental complaints, as required under condition 4.

#### SCHEDULE A

#### **Supporting Documentation**

- 1. Environmental Compliance Approval Application and all supporting information, dated June 1, 2021, signed by Richard Weldon and submitted by the Company;
- 2. Emission Summary and Dispersion Modelling Report, dated June 11, 2021 and prepared by GHD;

- 3. Odour Management Plan, dated June 11, 2021 and prepared by GHD;
- 4. Acoustic Assessment Report prepared by GHD, dated September 7, 2021 and signed by Michael Masschaele; and the additional information provided by Sam East of GHD in the email dated September 7, 2021 and Daniel Turner of GHD in the email dated September 10, 2021.

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

- 1. Condition No. 1 is included to emphasize that the Equipment/Facility must be maintained and operated according to a procedure that will result in compliance with the EPA, the Regulations and this Approval.
- 2. Condition No. 2 is included to ensure that the Equipment/Facility is operated in a manner that does not result in unacceptable odour emissions and mitigation measures are employed in event of an odour impact.
- 3. Condition No. 3 is included to provide the minimum performance requirements considered necessary to prevent an adverse effect resulting from the operation of the Equipment/Facility.
- 4. Condition Nos. 4 and 5 are included to require the Company to keep records and to provide information to the Ministry so that compliance with the EPA, the regulations and this Approval can be verified.

### Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 8922-9ZHR29 issued on October 8, 2015.

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 Director appointed for the purposes of Part
The Secretary*		II.1 of the Environmental Protection Act
Environmental Review Tribunal		Ministry of the Environment, Conservation and
655 Bay Street, Suite 1500	AND	Parks
Toronto, Ontario		135 St. Clair Avenue West, 1st Floor
M5G 1E5		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 24th day of September, 2021

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

. . . . . ..

QN/ c: District Manager, MECP Hamilton - District Daniel Turner, GHD



Ministry of the Environment, Conservation and Parks Ministère de l'Environnement, de la Protection de la nature et des Parcs

#### AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 1122-BKUPSM Issue Date: February 3, 2020

2270386 Ontario Limited 162 Cumberland St Toronto, Ontario M5R 3N5

Site Location: Brooks Road Landfill Site 160 Brooks Rd, Lot 24, Concession 1 North of Talbot Road County of Haldimand

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

A stormwater management facility and a leachate collection, treatment, and disposal system to service the Brooks Road Landfill Site (formerly Edwards Landfill Site), located in Part of Lot 24, Concession 1, North of Talbot Road, Haldimand County, discharging to a roadside ditch along the east side of Brooks Road, consisting of the following:

#### Leachate Treatment System

A leachate treatment system designed and installed for a Rated Capacity of 200 m<sup>3</sup>/day to service the Brooks Landfill Site, located at the south-central side of the landfill site, with an effluent discharge system to discharge effluent to a roadside ditch along Brooks Road with a Rated Capacity of 45 m<sup>3</sup> /day, with a Peak Daily Flow of 60 m<sup>3</sup>/day and such other removal of effluent from the Landfill Site in compliance with law, including Ontario Regulation 347, and consisting of the following:

- One (1) leachate collection sump located in the south-east corner of Stage One part of the landfill, equipped with one (1) 6.3 L/sec at 14 m TDH pump discharging through one (1) approximately 35 m long 76.2 mm diameter forcemain into the primary settling tank described below.
- One (1) 28 m<sup>3</sup> **Primary Settling Tank** receiving leachate from the existing leachate collection sump, equipped with baffle walls and one (1) 7 L/sec at 9.0 m TDH PST pump, three (3) level floats, and pH monitor, discharging through one (1) 500 micron opening strainer installed on the

feed line to an aeration system described below.

- One (1) **Aeration System** comprising of two (2) 114 m<sup>3</sup> capacity concrete tanks in series each aeration tank equipped with 1" lateral air diffusers, two (2) air blowers each with 910 m<sup>3</sup>/hr (530 cfm) capacity at 13 psi head loss, and the second aeration tank fitted with three (3) level floats, discharging via one (1) 66 m<sup>3</sup>/hr capacity at 106 m TDH feed pump to the Membrane Biofiltration Reactor (MBR) treatment system described below.
- One (1) 200 m³/day Rated Capacity **Membrane Biofiltration Reactor (MBR) Treatment System** consisting 8 mm diameter membranes housed in four (4) 200 mm diameter tubular modules installed in series and providing a filtration surface area of 36.7 m² per module, designed to operate at maximum pressure of 8 Bar (116 psi) at 40° C with a circulation velocity of 3 m/sec, providing a total filtration area of 146.8 m², equipped with one (1) 200 m³/hr capacity MBR recirculation pump to be used to recirculate activated sludge across the membranes, discharging to a UV disinfection system described below.
- Two (2) **UV Disinfection Units** operating in parallel, each unit capable of providing minimum UV dosage of 40 mJ/cm<sup>2</sup> at a flow of 114 L/min, discharging by gravity to an effluent transfer tank described below.
- Effluent discharge system consisting of:
  - One (1) 12.5 m<sup>3</sup> capacity **Effluent Transfer Tank** equipped with one (1) 7 L/sec at 11 m TDH capacity effluent pump and three (3) level floats, to be used as temporary storage tank to transfer effluent to the existing effluent discharge holding tanks described below.
  - Three (3) 150 m<sup>3</sup> capacity Effluent Discharge Holding Tanks.
  - Discharge piping from the **Effluent Discharge Holding Tanks** and flow measuring device for a Rated Capacity of 45 m<sup>3</sup>/day with a Peak Daily Flow of 60 m<sup>3</sup>/day, discharging to the roadside ditch.
  - Discharge piping from the **Effluent Discharge Holding Tanks** and control valve for loading of haulage units for lawful removal of effluent from the Site
- One (1) 12.5 m<sup>3</sup> capacity **Sludge Storage Tank**, providing approximately eight (8) days sludge storage capacity, equipped with one (1) 7 L/sec at 7 m TDH capacity sludge pump transferring sludge to the landfill for disposal.
- A chemical feed system consisting of:

#### Nitrification

• one (1) 9 L/hr at 44 psi capacity chemical metering pump dosing **magnesium hydroxide** from a dual wall storage tank to the aeration tank described above for alkalinity control.

#### Phosphorus Removal

• one (1) 9 L/hr at 44 psi capacity chemical metering pump dosing **alum** into the feed line of the aeration tank described above for phosphorus removal.

Acid Cleaning

• one (1) 24 L/hr at 145 psi capacity chemical metering pump dosing **citric acid** into the MBR feed piping during an acid cleaning of the membranes to remove calcified minerals.

**Oxidation Cleaning** 

• one (1) 78 L/hr at 145 psi capacity chemical metering pump dosing **sodium hypochlorite** into the MBR feed piping during a chlorine cleaning of the membranes to remove accumulated sludge.

Alkaline Cleaning

• one (1) 24 L/hr at 145 psi capacity chemical metering pump dosing **magnesium hydroxide** into the MBR feed piping during an alkaline cleaning of the membranes to remove accumulated fats, oil, and grease.

#### Leachate Collection System

• a leachate collection, transmission, and storage, designed to handle a maximum of 60 m<sup>3</sup>/day of leachate generated from the site, consisting of two (2) 75.7 L/min capacity leachate pumps and one (1) 50 mm diameter HDPE forcemain.

#### **Stormwater Management System**

A stormwater management facility to service the Brooks Road Landfill Site with a total drainage area of 14.91 ha and an approved landfill footprint of 6.07 ha, designed to provide quantity and quality control of stormwater runoff from storm events with up to 1:100 year return frequency, consisting of the following:

#### Stormwater Management System (SWMS)

A stormwater management system to provide quality and quantity control of stormwater runoff from the site during the active operation and post closure of the landfill site, consisting of the following:

- one (1) perimeter ditch running from the north-east corner of the landfill site along the east side and south side of the landfill foot print, having a 0.3 m bottom width, a minimum of 1.0 m depth, and 3H:1V side slopes on the road side, conveying collected stormwater runoff to a stormwater management pond described below.
- one (1) perimeter ditch running from the north-east corner of the landfill site along the north side and west side of the landfill foot print, having a 0.3 m bottom width, a minimum of 1.0 m depth, and 3H:1V side slopes on the road side, conveying collected stormwater runoff to a stormwater management pond described below.
- one (1) inlet structure including two (2) 600 mm diameter concrete culverts and an open swale covered with turf reinforcement mat discharging into a forebay described below.
- one (1) forebay with approximate length of 29 m, upstream width of 4 m and downstream width of 15 m, a permanent pool depth of 0.60 m, and side slopes of 4H:1V, equipped with a berm with top

elevation 197.85 m AMSL, discharging to a stormwater management pond described below.

- one (1) wet detention stormwater management pond (SWMS Pond) to be located on south west corner of the site providing a total storage capacity of 6,768 m<sup>3</sup> consisting of a permanent pool storage volume of 1,266 m<sup>3</sup> (at elevation 197.85 m AMSL) with a maximum depth of 0.60 m and an extended storage volume of 5,502 m<sup>3</sup> with an extended storage depth of 0.34 m (at elevation of 198.19 m AMSL).
- one (1) outlet structure consisting of one (1) 150 mm diameter perforated PVC pipe with an invert elevation of 197.85 m AMSL, equipped with 75 mm orifice plate, an outlet control valve, and one (1) 600 mm x 1200 mm concrete catch basin, discharging to a roadside ditch along the east side of Brooks Road.
- one (1) emergency by-pass structure consisting of a 2.0 meter wide rip-rap spillway at invert elevation of 199.10 m AMSL discharging to a roadside ditch along Brooks Road,

Including all controls and associated appurtenances,

all in accordance with the submitted supporting documents listed in Schedule A.

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

"Approval" means this entire document and any schedules attached to it, and the application;

"BOD5" (also known as TBOD5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand;

"CBOD5" means 5 day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in unfiltered sample;

"Daily Concentration" means the concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required;

"Director" means a person appointed by the Minister pursuant to section 5 of the EPA for purposes of Part II.1, EPA;

"District Manager" means the District Manager of the Hamilton District Office;

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

"Equivalent Equipment" means a substituted equipment or like-for-like equipment that meets the required quality and performance standards of a named equipment;

"Limited Operational Flexibility" (LOF) means any modifications that the Owner is permitted to make to the Works under this Approval;

"Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

"Monthly Average Concentration" means the arithmetic mean of all Daily Concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month;

"Monthly Average Daily Flow" means the cumulative total sewage flow to the sewage works during a calendar month divided by the number of days during which sewage was flowing to the sewage works that month;

"Notice of Modifications" means the form entitled "Notice of Modifications to Sewage Works";

"Owner" means 2270386 Ontario Limited and its successors and assignees;

"OWRA" means the Ontario Water Resources Act, R.S.O. 1990, c. O.40, as amended;

"Previous Works" means those portions of the sewage works previously constructed and approved under an Approval;

"Proposed Works" means the sewage works described in the Owner's application, this Approval, to the extent approved by this Approval;

"Rated Capacity" means the Monthly Average Daily Flow for which the Works are approved to handle;

"Works" means the sewage works described in the Owner's application, and this Approval, and includes Proposed Works, Previous Works, and modifications made under Limited Operational Flexibility.

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

#### **TERMS AND CONDITIONS**

#### I. GENERAL

#### 1. <u>GENERAL CONDITION</u>

- (1) The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works 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) Except as otherwise provided by these conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.
- (3) Where there is a conflict between a provision of any document in the schedule referred to in this Approval and the conditions of this Approval, the Conditions in this Approval shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.
- (4) Where there is a conflict between the documents listed in the Schedule submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.
- (5) The Conditions of this Approval are severable. If any Condition of this Approval, or the application of any requirement 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.

#### 2. <u>CHANGE OF OWNER</u>

- (1) The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:
  - (a) change of Owner or operating authority, or both.
  - (b) change of address of Owner or operating authority or address of new owner or operating authority.
  - (c) change of partners where the Owner or operating authority is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Partnerships Registration Act.

- (d) change of name of the corporation where the Owner or operator is or at any time becomes a corporation, and a copy of the most current "Initial Notice or Notice of Change" (Form 1, 2 or 3 of O. Reg. 189, R.R.O. 1980, as amended from time to time), filed under the Corporations Information Act shall be included in the notification to the District Manager.
- (2) In the event of any change in ownership of the works, the Owner shall notify in writing the succeeding owner of the existence of this Approval, and a copy of such notice shall be forwarded to the District Manager.
- (3) The Owner shall ensure that all communications made pursuant to this Condition will refer to this Approval's number.

#### **II. LEACHATE COLLECTION AND TREATMENT FACILITY**

#### 3. <u>LEACHATE MANAGEMENT</u>

- (1) Leachate generated at the landfill Site shall be collected, treated and disposed of using the on-site leachate treatment system
  - (a) Notwithstanding Condition 3(1), leachate generated at the landfill Site that is not treated using the on-site leachate treatment system shall be removed to an off-site facility that is approved by the Ministry to treat leachate generated at the landfill Site.
  - (b) In the event there is effluent from leachate that has been treated in the on-site leachate treatment system that cannot be disposed of to the roadside ditch, such effluent may be disposed of to an off-site facility provided such disposal is completed lawfully, including pursuant to Ontario Regulation 347.
- (2) Leachate generated at the Landfill Site that is not treated using the on-site leachate treatment system shall not be discharged to the natural environment at any time.

#### 4. OPERATIONS AND MAINTENANCE

- (1) Within six (6) months of the issuance date of this Approval, the Owner shall prepare and submit for approval to the Director and a copy to the District Manager a "Contingency and Remedial Action Plan for the Works (**On-site leachate treatment system**)" which shall provide detailed action plans that will be implemented during any event when the effluent limits set under Condition 6(1) are not met;
- (2) The Owner shall prepare an operations manual prior to the commencement of operation of the sewage works, that includes, but not necessarily limited to, the following information:
  - (a) operating procedures for routine operation of the works.
  - (b) inspection programs, including frequency of inspection, for the works and the methods or tests employed to detect when maintenance is necessary.

- (c) repair and maintenance programs, including the frequency of repair and maintenance for the works.
- (d) contingency plans and procedures for dealing with potential spill, bypasses and any other abnormal situations and for notifying the District Manager, and
- (e) complaint procedures for receiving and responding to public complaints.
- (3) The Owner shall maintain the operations manual up to date through revisions undertaken from time to time and retain a copy at the location of the sewage works. Upon request, the Owner shall make the manual available for inspection and copying by Ministry personnel.

#### 5. <u>EFFLUENT OBJECTIVES</u>

(1) The Owner shall use best efforts to design, construct and operate the works with the objective that the concentrations of the materials named below as effluent parameters are not exceeded in the effluent from the Works.

Table 1 - Effluent Objectives			
Effluent Parameter	Concentration Objective		
	(milligrams per litre unless otherwise indicated)		
CBOD5	5.0		
Total Suspended Solids (TSS)	5.0		
Total Ammonia Nitrogen (TAN)	1.0		
Total Phosphorus (TP)	0.2		
Zinc	0.03		
Phenols	0.005		
Ethylbenzene	0.008		

- (2) As a further effluent objective, the Owner shall use best efforts to maintain the pH of the effluent from the works within the range of 6.5 to 8.5, inclusive, at all times.
- (3) The Owner shall include in all reports submitted in accordance with Condition 12 a summary of the efforts made and results achieved under this Condition.

#### 6. <u>EFFLUENT LIMITS</u>

(1) The Owner shall design, construct and operate the works such that the concentrations of the materials named below as effluent parameters are not exceeded in the effluent from the works.

Table 2 - Effluent Limits				
Effluent Parameter	Concentration Limit			
	(milligrams per litre unless otherwise indicated)			
Column 1	Column 2			
CBOD5	10.0			
Total Suspended Solids (TSS)	10.0			
Total Ammonia as Nitrogen (TAN)	3.0			
Total Phosphorus (TP)	0.29			
Toxicity (Daphnia magna)	Non-acutely lethal			
Toxicity (Rainbow Trout)	Non-acutely lethal			
pH of the effluent maintained between 6.0 to 9.5, inclusive, at all times				

- (2) The Owner shall ensure that monitoring results for effluent discharge parameters outlined in Condition 9(3) meet the concentration limits set out in Column 2 of subsection (1).
- (3) For the purposes of determining compliance with and enforcing subsection (1):

- (a) The Concentration of a parameter named in Column 1 of subsection (1), sampled in accordance with Condition 9(3) shall not exceed the corresponding maximum concentration set out in Column 2 of subsection (1).
- (b) The pH of the effluent shall be maintained within the limits outlined in subsection (1), at all times.
- (4) In the event of any instance of non-compliance with the effluent limits stipulated under Condition 6(1), the Owner shall implement the "Contingency and Remedial Action Plan for the Works (**On-site leachate treatment system**)" prepared under Condition 3(1), and shall determine appropriate control measures to achieve effluent limits and the time lines for the implementation of identified control measures. The Owner shall submit the proposed control measures and implementation time lines for approval to the Director and a copy to the District Manager.
- (5) If compliance with effluent limits are not met within the time lines approved under Condition 6(4), the Owner shall discontinue effluent discharge from the Works and implement off-site disposal of leachate for proper treatment.
- (6) In the event that any of the control measures proposed under Condition 6(4) require the installation or an upgrade of the Works, the Owner shall submit an application to the Director for an amendment of this Approval.

#### 7. <u>EFFLUENT - VISUAL OBSERVATIONS</u>

(1) Notwithstanding any other condition in this Approval, the Owner shall ensure that the effluent from the works is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film, sheen or foam on the receiving waters.

#### 8. <u>SPECIAL CONDITION</u>

(1) The Owner shall operate the roadside ditch discharge system for the On-Site Leachate Treatment System at the approved Rated Capacity of 45 m<sup>3</sup>/day and Peak Daily Flow of 60 m<sup>3</sup>/day until an approval is issued by the Director to operate the roadside ditch discharge system at a higher rated capacity. To obtain approval for using the roadside ditch discharge system at a higher rated capacity, the Owner shall complete a detailed receiving surface water assimilative capacity study and submit the study report along with a proposal for effluent limits to the Ministry's Regional Technical Support Section for review and recommendation. Upon receiving review comments and recommendation of the effluent limits from the Technical Support Section, the Owner shall submit to the Director an application for amendment of this Approval and a detailed design brief for approval of the higher rated capacity for the roadside ditch discharge system.

#### 9. EFFLUENT MONITORING AND RECORDING

The Owner shall, upon commencement of operation of the sewage works, carry out the following monitoring program:

- (1) All samples and measurements taken for the purposes of this Approval are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.
- (2) Leachate grab samples shall be collected and analyzed at the following sampling point and at the sampling frequencies specified for each parameter listed:

Table 3 - Influent Leachate MonitoringSampling Point: Leachate Storage Tank					
Parameters Frequency Parameter Frequen					
CBOD5	Monthly	Chlorides	Quarterly		
Total Suspended Solids (TSS)	Monthly	Nitrate as Nitrogen	Quarterly		
Total Ammonia as Nitrogen (TAN)	Monthly	Arsenic	Quarterly		
Total Phosphorus (TP)	Monthly	Barium	Quarterly		
pH	Monthly	Boron	Quarterly		
Zinc	Monthly	Chromium	Quarterly		
Phenols	Monthly	Copper	Quarterly		
Ethylbenzene	Monthly	Iron	Quarterly		
		Lead	Quarterly		
		Benzo(a)pyrene	Quarterly		
		Naphtalene	Quarterly		
		Benzene	Quarterly		
		Toluene	Quarterly		

Table 4 - Effluent MonitoringSampling Point: Effluent Discharge PipeDischarge to Brooks Road Ditch				
Parameters	Sample Type	Frequency		
CBOD5	Grab	Monthly		
Total Suspended Solids (TSS)	Grab	Monthly		
Total Ammonia as Nitrogen (TAN)	Grab	Monthly		
Total Phosphorus (TP)	Grab	Monthly		
pH	Grab	Monthly		
Zinc	Grab	Monthly		
Phenols	Grab	Monthly		
Ethylbenzene	Grab	Monthly		
Chlorides	Grab	Quarterly		
Nitrate as Nitrogen	Grab	Quarterly		
Arsenic	Grab	Quarterly		
Barium	Grab	Quarterly		
Boron	Grab	Quarterly		
Chromium	Grab	Quarterly		
Copper	Grab	Quarterly		
Iron	Grab	Quarterly		
Lead	Grab	Quarterly		
Benzo(a)pyrene	Grab	Quarterly		
Naphtalene	Grab	Quarterly		
Benzene	Grab	Quarterly		
Toluene	Grab	Quarterly		
Acute Lethality Test (Rainbow Trout and Daphnia magna)	Grab	Quarterly		

(3) Effluent samples shall be collected and analyzed at the following sampling point, at the sampling frequencies and using the sample type specified for each parameter listed:

- (4) The methods and protocols for sampling, analysis, toxicity testing, and recording shall conform, in order of precedence, to the methods and protocols specified in the following:
  - (a) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater Version 2.0" (January 2016), PIBS 2724e02, as amended from time to time by more recently published editions.
  - (b) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition) as amended from time to time by more recently published editions, and
  - (c) the Environment Canada publications "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" (EPS 1/RM/13 Second Edition - December 2000)

and "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna" (EPS 1/RM/14 Second Edition - December 2000), as amended from time to time by more recently published editions.

- (5) The measurement frequencies specified in subsections (2) and (3) in respect of any parameter are minimum requirements which may, after one (1) year of monitoring in accordance with this Condition, be modified by the District Manager in writing from time to time.
- (6) The owner shall install and maintain (a) continuous flow measuring device(s) to measure the flow rate of the effluent discharged from the sewage works, with an accuracy to within plus or minus fifteen (15) per cent of the actual flow rate for the entire design range of the flow measuring device and record the flow rate at a daily frequency.
- (7) The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this Approval.

#### **III - STORMWATER MANAGEMENT FACILITY**

#### 10. MONITORING AND RECORDING

(1) The Owner shall, upon commencement of operation of the Works, carry out the following stormwater monitoring program. Stormwater grab samples shall be collected from the Stormwater Management System **(SWMS) Pond** at a **quarterly frequency** (Spring, Summer, Fall, and Winter) and analysed for the following parameters:

Table 5 - Stormwater Monitoring           Sampling Point: SWMS Pond					
General Parameters	Field Parameters				
Alkalinity	Arsenic	Conductivity			
Conductivity	Barium	Dissolved Oxygen			
Hardness	Boron	pH			
pH	Cadmium	Temperature			
Chloride	Chromium				
Sulphate	Copper				
Nitrate as Nitrogen	Iron				
Nitrite as Nitrogen	Lead				
Total Ammonia as Nitrogen (TAN)	Mercury				
Total Suspended Solids	Zinc				
Total Dissolved Solids					
Chemical Oxygen Demand	Organics				
Total Phosphorus	Benzo(a)pyrene				
Total Kjeldahl Nitrogen	Ethylbenzene				
Biological Oxygen Demand (BOD5)	Naphthalene				
Phenols					

- (2) The methods and protocols for sampling, analysis, toxicity testing, and recording shall conform, in order of precedence, to the methods and protocols specified in the following:
  - (a) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater Version 2.0" (January 2016), PIBS 2724e02, as amended from time to time by more recently published editions;
  - (b) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition) as amended from time to time by more recently published editions.

#### 11. OPERATION AND MAINTENANCE

- (1) The stormwater run-off generated from the active waste fill area shall be considered contaminated and treated as leachate. The Owner shall ensure that any precipitation falling unto active waste fill areas, not under interim cover, shall be directed to the leachate collection system.
- (2) The Owner shall exercise due diligence in ensuring that, at all times, the Works and the related equipment and appurtenances used to achieve compliance with this Approval are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the Works.
- (3) The Owner shall prepare an operations manual within six (6) months of Substantial Completion of the Works, that includes, but not necessarily limited to, the following information:
  - (a) operating procedures for routine operation of the Works.
  - (b) inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary for operational efficiency and environmental protection of the receiving body.
  - (c) repair and maintenance programs, including the frequency of repair and maintenance for the Works.
  - (d) contingency plans and procedures for dealing with potential spill, bypasses and any other abnormal situations and for notifying the District Manager, and
  - (e) complaint procedures for receiving and responding to public complaints.
- (4) The Owner shall maintain the operations manual current and retain a copy at the location of the Works or operational office of the Owner for the operational life of the Works. Upon request, the Owner shall make the manual available to Ministry staff.
- (5) The Owner shall undertake an inspection of the condition of the stormwater management ponds and ditches, at least once a year, and undertake any necessary cleaning and maintenance to prevent the

excessive build-up of sediment and/or decaying vegetation.

- (6) The Owner shall undertake an inspection and necessary maintenance of the SWMS pond and associated erosion controls including temporary berms, silt fences, rocks and straw bale check dams at least once a year to ensure that the Works are effectively protecting the environment.
- (7) The Owner shall maintain a logbook to record the results of the stormwater management pond inspections and any cleaning and maintenance operations undertaken and shall keep the logbook at the site or operational office of the Owner for inspection by the Ministry.

#### Stormwater Management System (SWMS)

- (8) Before the commencement of operation of the Works, the Owner shall prepare a "Stormwater Contingency and Remedial Action Plan" for the Works and provide a copy to the District Manager.
- (9) The Owner shall operate the Works in a **normally open position**. The Owner shall compare monitoring results obtained from the Works under Condition 10(1) with the trigger levels of the selected trigger parameters listed in Table 7 to identify any potential leachate impact to stormwater discharged from the ponds.

Table 7 - Trigger Parameters	
Parameter	Trigger Level (mg/L)
Un-ionized Ammonia	0.02
Arsenic	0.005
Boron	1.5
pH (unitless)	6.5 to 8.5

- (10) In the event that a monitoring result for any of the parameters listed in Table 7 exceeds its corresponding trigger level concentration, the Owner shall re-sample within two weeks period to confirm the trigger level concentration exceedance for that parameter.
- (11) In the event that the trigger level concentration exceedance of any parameter of concern is not confirmed after the second round of sampling conducted under Condition 11(10), then, normal stormwater monitoring shall be resumed.
- (12) In the event that the trigger level concentration exceedance of any parameter of concern is confirmed after the second round of sampling conducted under Condition 11(10), the Owner shall operate the Works in a **normally closed position** and notify the District Manager forthwith.
- (13) While operating the Works in a normally closed position, the Owner shall implement the "Stormwater Contingency and Remedial Action Plan" prepared under Condition 11(8) and collect a grab sample and analyze for the trigger parameters listed under Condition 11(9) at a weekly frequency preferably after a rainfall event.
- (14) The Owner shall resume operating the Works in a **normally open position** if monitoring results for all

trigger parameters from three (3) consecutive sampling events conducted under Condition 11(13) are less than their respective trigger level concentrations.

(15) Discharge of contaminated stormwater from the Works to storm sewer/surface water is prohibited, except where it is necessary to avoid loss of life, personal injury, danger to public health or severe property damage.

#### **IV - GENERAL**

#### 12. <u>REPORTING</u>

- (1) One week prior to the start up of the operation of the works, the Owner shall notify the District Manager (in writing) of the pending start up date.
- (2) The Owner shall report to the District Manager or designate, any exceedance of any parameter specified in Condition 6 orally, as soon as reasonably possible, and in writing within seven (7) days of the exceedance.
- (3) In addition to the obligations under Part X of the Environmental Protection Act, the Owner shall, within ten (10) working days of the occurrence of any reportable spill as defined on Ontario Regulation 675/98, bypass or loss of any product, by-product, intermediate product, oil, solvent, waste material or any other polluting substance into the environment, submit a full written report of the occurrence to the District Manager describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.
- (4) The Owner shall prepare and submit a performance report to the District Manager on an annual basis by April 30<sup>th</sup>. The first such report shall cover the first annual period following the commencement of operation of the works and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:
  - (a) a summary and interpretation of all monitoring data and a comparison to the effluent limits outlined in Condition 6, including an overview of the success and adequacy of the sewage works.
  - (b) a description of any operating problems encountered and corrective actions taken.
  - (c) a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the sewage works.
  - (d) a summary of any effluent quality assurance or control measures undertaken in the reporting period.
  - (e) a summary of the calibration and maintenance carried out on all effluent monitoring equipment, and
  - (f) a description of efforts made and results achieved in meeting the effluent objectives outlined in Condition 5.

#### 13. LIMITED OPERATIONAL FLEXIBILITY

- (1) The Owner may make modifications to the Works in accordance with the Terms and Conditions of this Approval and subject to the Ministry's "Limited Operational Flexibility Criteria for Modifications to Sewage Works", included under Schedule B of this Approval, as amended.
- (2) Sewage works under Limited Operational Flexibility shall adhere to the design guidelines contained within the Ministry's publication "Design Guidelines for Sewage Works 2008", as amended.
- (3) The Owner shall ensure at all times, that the Works, related equipment and appurtenances which are installed or used to achieve compliance are operated in accordance with all Terms and Conditions of this Approval.
- (4) For greater certainty, the following are <u>not</u> permitted as part of Limited Operational Flexibility:
  - (a) Modifications to the Works that result in an increase of the approved Rated Capacity of the Works.
  - (b) Modifications to the Works that may adversely affect the approved effluent quality criteria or the location of the discharge/outfall.
  - (c) Modifications to the treatment process technology of the Works, or modifications that involve construction of new reactors (tanks) or alter the treatment train process design.
  - (d) Modifications to the Works approved under s.9 of the EPA, and
  - (e) Modifications to the Works pursuant to an order issued by the Ministry.
- (5) Implementation of Limited Operational Flexibility is not intended to be used for piecemeal measures that result in major alterations or expansions.
- (6) If the implementation of Limited Operational Flexibility requires changes to be made to the Emergency Response, Spill Reporting and Contingency Plan, the Owner shall, provide a revised copy of this plan for approval to the local fire services authority prior to implementing Limited Operational Flexibility.
- (7) For greater certainty, any modification made under the Limited Operational Flexibility may only be carried out after other legal obligations have been complied with, including those arising from the *Environmental Protection Act, Niagara Escarpment Planning and Development Act, Oak Ridges Moraine Conservation Act, Lake Simcoe Protection Act* and *Greenbelt Act*.
- (8) At least thirty (30) days prior to implementing Limited Operational Flexibility, the Owner shall complete a Notice of Modifications describing any proposed modifications to the Works and submit it to the District Manager.
- (9) The Owner shall not proceed with implementation of Limited Operational Flexibility until the District Manager has provided written acceptance of the Notice of Modifications or a minimum of thirty (30) days have passed since the day the District Manager acknowledged the receipt of the Notice of Modifications.

#### Schedule A

- 1. Application for Approval of Industrial Sewage Works submitted by Mr. Richard Weldon, Managing Partner, 2270386 Ontario Inc., dated September 9, 2019 and supporting information prepared by GHD Consulting Engineers.
- 2. Letter from GHD to Mr. Paul Widmeyer, Ministry of Environment, Conservation and Parks, Re: Permanent Stormwater Management System ECA No. 4142-ASEKJ2 dated September 17, 2019.
- 3. Application for Environmental Compliance Approval amendment submitted by 2270386 Ontario Limited dated September 11, 2013 and design specifications and drawings Prepared by Conestoga-Rovers & Associates Ltd., Waterloo, Ontario.
- 4. Letter from Peter Kemp, B. Eng., Conestoga-Rovers & Associates Ltd., to Stefanos Habtom, P. Eng., dated May 31, 2014 in response to an additional information request dated April 10, 2014.
- 5. Application for Environmental Compliance Approval amendment submitted by 2270386 Ontario Limited dated May 15, 2015 and design specifications and drawings for the leachate treatment system prepared by KOESTER CANADA, Brantford, Ontario.
- 6. Revised Application for Environmental Compliance Approval amendment submitted by 2270386 Ontario Limited dated December 15, 2017 but received on January 8, 2018 and revised design specifications and drawings for the leachate treatment system prepared by KOESTER CANADA, Brantford, Ontario.

#### Schedule B

#### Limited Operational Flexibility Criteria for Modifications to Industrial Sewage Works

- 1. The modifications to sewage works approved under an Environmental Compliance Approval (Approval) that are permitted under the Limited Operational Flexibility (LOF), are outlined below and are subject to the LOF conditions in the Approval, and require the submission of the Notice of Modifications. If there is a conflict between the sewage works listed below and the Terms and Conditions in the Approval, the Terms and Conditions in the Approval shall take precedence.
  - 1.1 Sewage Pumping Stations
    - a. Alter pumping capacity by adding or replacing equipment where new equipment is located within an existing sewage treatment plant site or an existing sewage pumping station site, provided that the modifications do not result in an increase of the sewage treatment plant Rated Capacity and the existing flow process and/or treatment train are maintained, as applicable.
  - 1.2 Sewage Treatment Process
    - a. Installing additional chemical dosage equipment including replacing with alternative chemicals for pH adjustment or coagulants (non-toxic polymers) provided that there are no modifications of treatment processes or other modifications that may alter the intent of operations and may have negative impacts on the effluent quantity and quality.
    - b. Expanding the buffer zone between a sanitary sewage lagoon facility or land treatment area and adjacent uses provided that the buffer zone is entirely on the proponent's land.
    - c. Optimizing existing sanitary sewage lagoons with the purpose to increase efficiency of treatment operations provided that existing sewage treatment plant rated capacity is not exceeded and where no land acquisition is required.
    - d. Optimizing existing sewage treatment plant equipment with the purpose to increase the efficiency of the existing treatment operations, provided that there are no modifications to the works that result in an increase of the Rated Capacity, and may have adverse effects to the effluent quality or location of the discharge.
    - e. Replacement, refurbishment of previously approved equipment in whole or in part with Equivalent Equipment, like-for-like of different make and model, provided that the firm capacity, reliability, performance standard, level of quality and redundancy of the group of equipment is kept the same. For clarity purposes, the following equipment can be considered under this provision: screens, grit separators, blowers, aeration equipment, sludge thickeners, dewatering equipment, UV systems, chlorine contact equipment, bio-disks, and sludge digester systems.
  - 1.3 Sewage Treatment Plant Outfall
    - a. Replacement of discharge pipe with similar pipe size provided that the outfall location is not changed.

#### 1.4 Sanitary Sewers

a. Pipe relining and replacement with similar pipe size within the Sewage Treatment Plant site, where the nominal diameter is not greater than 1,200 mm.

#### 1.5 Pilot Systems

- a. Installation of pilot systems for new or existing technologies provided that:
  - i. any effluent from the pilot system is discharged to the inlet of the sewage treatment plant or hauled off-site for proper disposal,
  - ii. any effluent from the pilot system discharged to the inlet of the sewage treatment plant or sewage conveyance system does not significantly alter the composition/concentration of the influent sewage to be treated in the downstream process; and that it does not add any inhibiting substances to the downstream process, and
  - iii. the pilot system's duration does not exceed a maximum of two years; and a report with results is submitted to the Director and District Manager three months after completion of the pilot project.
- 2. Sewage works that are exempt from section 53 of the OWRA by O. Reg. 525/98 continue to be exempt and are not required to follow the notification process under this Limited Operational Flexibility.
- 3. Normal or emergency operational modifications, such as repairs, reconstructions, or other improvements that are part of maintenance activities, including cleaning, renovations to existing approved sewage works equipment, provided that the modification is made with Equivalent Equipment, are considered pre-approved.
- 4. The modifications noted in section (3) above are <u>not</u> required to follow the notification protocols under Limited Operational Flexibility, provided that the number of pieces and description of the equipment as described in the Approval does not change.



#### Notice of Modification to Sewage Works

RETAIN COPY OF COMPLETED FORM AS PART OF THE ECA AND SEND A COPY TO THE WATER SUPERVISOR (FOR MUNICIPAL) OR DISTRICT MANAGER (FOR NON-MUNICIPAL SYSTEMS)

<u></u>			
			imited Operational Flexibility
			ith "01" and consecutive numbers thereafter)
ECA Number	Issuance Date (mm/dd/yy)		Notice number (if applicable)
ECA Owner		Municipality	
(Attach a detailed description of the sewage		part of the Li	imited Operational Flexibility
Description shall include:			
<ol> <li>A detail description of the modifications ar type/model, material, process name, etc.)</li> </ol>		wage works (e.g. se	ewage work component, location, size, equipment
2. Confirmation that the anticipated environm	nental effects are negligib		
			re affected by the modifications as applicable, i.e.
submission of documentation is not requir	ea, but the listing of upda	alea accuments is (a	design brief, drawings, emergency plan, etc.)
Part 3 – Declaration by Prof	essional Engine	eer	
I hereby declare that I have verified the scop	e and technical aspects	of this modification a	and confirm that the design:
<ol> <li>Has been prepared or reviewed by a Prof</li> <li>Conforms with the Limited Operational Florence</li> </ol>		licensed to practice	in the Province of Ontario;
<ol> <li>Conforms with the Limited Operational Fig.</li> <li>Has been designed consistent with Minist</li> </ol>		dhering to engineer	ing standards, industry's best management
practices, and demonstrating ongoing cor	mpliance with s.53 of the	Ontario Water Reso	urces Act; and other appropriate regulations.
	ledge, information and be	ellet the information	contained in this form is complete and accurate.
Name (Print)			PEO License Number
Signature			Date (mm/dd/yy)
Name of Employer			
Part 4 – Declaration by Own	ier		
I hereby declare that:			
1. I am authorized by the Owner to complete			
<ol> <li>The Owner consents to the modification; a</li> <li>These modifications to the sowage works</li> </ol>		nco with the Limited	Operational Flexibility as described in the ECA.
4. The Owner has fulfilled all applicable requ			
I hereby declare that to the best of my knowl	edge, information and be	lief the information of	contained in this form is complete and accurate.
Name of Owner Representative (Print)	Owner representat		e's title (Print)
Owner Representative's Signature		Date (mm/dd/yy)	



Notice of Modifications Dec-2013.pdf

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

- 1. Condition 1 is imposed to ensure that the Works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.
- 2. Condition 2 is included to ensure that the Ministry records are kept accurate and current with respect to approved works and to ensure that subsequent Owners of the works are made aware of the Approval and continue to operate the works in compliance with it.
- 3. Condition 3 is imposed to ensure consistency between approvals granted by the Ministry.
- 4. Conditions 4 and 11 are included to ensure that a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the Owner and made available to the Ministry. Such a manual is an integral part of the operation of the works. Its compilation and use should assist the owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the owner's operation of the works.
- 5. Condition 5 is imposed to establish non-enforceable effluent quality objectives which the Owner is obligated to use best efforts to strive towards on an ongoing basis. These objectives are to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs and before the compliance limits of Condition 5 are exceeded.
- 6. Conditions 6 and 7 are imposed to ensure that the effluent discharged from the Works to the Brooks Road side ditch meets the Ministry's effluent quality requirements thus minimizing environmental impact on the receiver.
- 7. Condition 8 is included to ensure that treatment capacity for the leachate treatment system is established based on proper receiving surface water assimilative capacity assessment and effluent limits requirements.
- 8. Conditions 9 and 10 are included to require the Owner to demonstrate on a continual basis that the quality and quantity of the effluent from the approved Works is consistent with the (design objectives and) effluent limits specified in the Approval and that the approved works does not cause any impairment to the receiving watercourse.

- 9. Condition 12 is included to provide a performance record for future references and to ensure that the Ministry is made aware of problems as they arise, so that the Ministry can work with the Owner in resolving the problems in a timely manner.
- 10. Condition 13 is included to ensure that the Works are operated 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. These Conditions are also included to ensure that a Professional Engineer has reviewed the proposed modifications and attests that the modifications are in line with that of Limited Operational Flexibility, and provide assurance that the proposed modifications comply with the Ministry's requirements stipulated in the Terms and Conditions of this Approval, Ministry policies, guidelines, and industry engineering standards and best management practices.

# Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 4142-ASEKJ2 issued on January 29, 2018.

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	AND
Toronto, Ontario	
M5G 1E5	

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act Ministry of the Environment, Conservation and Parks 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 3rd day of February, 2020

Fariha Parnu.

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

HV/

c: District Manager, MECP Hamilton - District Greg Ferraro, GHD





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Ministry of the Environment, Conservation and Parks Ministère de l'Environnement, de la Protection de la nature et des Parcs

#### AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A110302 Issue Date: October 1, 2021

2270386 Ontario Limited 162 Cumberland St Toronto, Ontario M5R 3N5

Site Location: Brooks Road Landfill Site 160 Brooks Rd North Cayuga Haldimand County, N0A 1E0

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:

a waste disposal site (landfill) with a total site area of 14.3 hectares of which 6 hectares is approved for landfilling.

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

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

"Contaminating Life Span" means contaminating life span as defined in Ontario Regulation 232/98;

"Design and Operations Report" means the Design and Operations Report Vertical Expansion – Rev. 1, Brooks Road Landfill Site, Prepared by GHD, June 14, 2021 that was submitted in support of the Approval

"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; "Improvement Area" means the area of Brooks Road, between Highway #3 (also known as Talbot Road) and Townline Road;

"Ministry" means the Ontario Ministry of the Environment, Conservation and Parks; "NMA" means Nutrient Management Act, 2002, S.O. 2002, c. 4, as amended;

"Odour Management Plan" means a document which describes the measures to minimize odour emissions from the Site;

"Operator" means any person, other than the Owner's employees, authorized by the

Owner as having the charge, management or control of any aspect of the Site and includes its successors or assigns;

"Owner" means any person that is responsible for the establishment or operation of the Site being approved by this Approval, and includes 2270386 Ontario Limited and its successors and assigns;

"OWRA" means the Ontario Water Resources Act, R.S.O. 1990, c. O.40, as amended; "PA" means the Pesticides Act, R.S.O. 1990, c. P-11, as amended;

"Provincial Officer" means any person designated in writing by the Minister as a provincial officer pursuant to Section 5 of the OWRA, Section 5 of the EPA, Section 17 of the PA, Section 4 of the NMA, or Section 8 of the SDWA;

"Refrigerant Appliances" means household appliances which use, or may use refrigerants, and which include, but is not restricted to, refrigerators, freezers and air-conditioning systems;

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

"Regulation 232" means Ontario Regulation 232/98 - Landfilling Sites made under the EPA, as amended;

"Regulation 347" or "Reg. 347" means means Regulation 347, R.R.O. 1990, General - Waste Management, made under the EPA, as amended;

"Regulation 406" means means Regulation 406/19, R.S.O. 1990, On-site and Excess Soil Management, made under the EPA, as amended;

"Regulation 558" means Ontario Regulation 558/00 - General Waste Management, made under the EPA, as amended;

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

"SDWA" means Safe Drinking Water Act, 2002, S.O. 2002, c. 32, as amended; "Site" means the entire waste disposal site, including the buffer lands, at the Brooks Road Landfill Site, Lot 24, Concession 1 North, Haldimand County; and

"Trained Personnel" means personnel knowledgeable in the following through instruction and/or practice:

a. relevant waste management legislation, regulations and guidelines;

b. major environmental concerns pertaining to the waste to be handled;

c. occupational health and safety concerns pertaining to the processes and wastes to be handled;

d. management procedures including the use and operation of equipment for the processes and wastes to be handled;

e. emergency response procedures;

f. specific written procedures for the control of nuisance conditions;

g. specific written procedures for refusal of unacceptable waste loads; and

h. the requirements of this Approval.

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) This Approval revokes all previous Approvals and Notices of Amendment issued under Part V of the Environmental Protection Act for this Site. The approval given herein, including the terms and conditions set out, replaces all previously issued Approvals and related terms and conditions under Part V of the Act for this Site.
 (2) 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.
 (3) 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

(4) 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".

(5) 1. Construction and installation of aspects described in Schedule "A" must be completed within 5 years of the later of:

(a) the date this Approval is issued; or

(b) if there is a hearing or other litigation in respect of the issuance of this Approval, the date that this hearing or litigation is disposed of, including all appeals.

2. This Approval ceases to apply in respect of the aspects of the Site noted above that have not been constructed or installed before the later of the dates identified in Condition 1(5)1.

#### Interpretation

(6) 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.

(7) 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 the Ministry approved the amendment.

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

(9) 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**

(10) 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; and

(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

(11) The Owner and Operator shall take steps to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality resulting from the present, past and historical operations at the Site. Such steps may include accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

(12) Despite an Owner, Operator, 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.

(13) At no time shall the Owner or Operator allow the discharge of a contaminant that causes or is likely to cause an adverse effect.

#### **Change of Ownership**

(14) 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.

(15) No portion of this Site shall be transferred or encumbered prior to or 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.

(16) 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.

#### **Registration on Title Requirement**

(17) 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 acquires an interest in the property as a result of the dealing.

(18) (a) If not already completed, within ninety (90) 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 and 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) If not already completed, 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 the District Manager, written verification that the Certificate of Requirement has been registered on title.

#### **Registration on Title Requirement - Contaminant Attenuation Zone (CAZ)**

(19) 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 Regulation 232, 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, a 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 agreement for the easement;

(ii) provide a plan of survey signed and sealed by an Ontario Land Surveyor

for the CAZ; and

(iii) submit proof of registration on title of the groundwater easement to the Director and District Manager;

(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.

#### Inspections by the Ministry

(20) No person shall hinder or obstruct a Provincial Officer from carrying out any and all inspections authorized by the OWRA, the EPA, the PA, the SDWA or the NMA, of any place to which this Approval relates, and without limiting the foregoing:

(a) to enter upon the premises where the approved works are located, or the location where the records required by the conditions of this Approval are kept;

(b) to have access to, inspect, and copy any records required to be kept by the conditions of this Approval;

(c) to inspect the Site, related equipment and appurtenances;

(d) to inspect the practices, procedures, or operations required by the conditions of this Approval; and

(e) to sample and monitor for the purposes of assessing compliance with the terms and conditions of this Approval or the EPA, the OWRA, the PA, the SDWA or the NMA.

#### Information and Record Retention

(21) (a) Except as authorized in writing by the Director, all records required by this Approval shall be retained at the Site for a minimum of two (2) years from their date of creation.

(b) The Owner shall retain all documentation listed in Schedule "A" for as long as this Approval is valid.

(c) All information and logs required in Conditions 9(1), 10(1), 11(3), 11(4), 12(3), and 12(4) shall be kept at the Site until they are included in the Annual Report.

(d) The Owner shall retain employee training records as long as the employee is working at the Site.

(e) The Owner shall make all of the above documents available for inspection upon request of Ministry staff.

(22) The receipt of any information by the Ministry or the failure of the Ministry to prosecute any person or to require any person to take any action under this Approval or under any statute, regulation or other legal requirement, in relation to the information, shall not be construed as:

(a) an approval, waiver, or justification by the Ministry of any act or omission of any person that contravenes any term or condition of this Approval or any statute, regulation or other legal requirement; or

(b) acceptance by the Ministry of the information's completeness or accuracy.

(23) The Owner shall ensure that a copy of this Approval, in its entirety and including all its Notices of Amendment, and documentation listed in Schedule "A", are retained at the Site at all times.

(24) Any information related to this Approval and contained in Ministry files may be

made available to the public in accordance with the provisions of the Freedom of Information and Protection of Privacy Act, RSO 1990, CF-31.

#### 2. FINANCIAL ASSURANCE

(1) (a) Within twenty (20) days of issuance of this Notice, the Owner shall submit to the Director, Financial Assurance as defined in Section 131 of the Environmental Protection Act, in the amount of **\$8,371,282.00**. This Financial Assurance shall provide sufficient funds for the closure and post-closure care/monitoring of the Site.

(i) The total amount of financial assurance specified in Condition 2(1)(a) shall be updated by the Owner, as follows, by the specified dates:

i. October 1, 2021 - \$9,956,333.00
ii. October 1, 2022 - \$11,541,383.00
iii. October 1, 2023 - \$10,424,285.00
iv. October 1, 2024 - \$10,097,075.00

(b) Commencing on October 1, 2023 and on a three (3) year basis thereafter, the Owner shall provide to the Director a re-evaluation of the amount of the Financial Assurance to facilitate the actions required under Condition 2(1)(a). The re-evaluation shall include an assessment based on any new information relating to the environmental conditions of the Site and shall include the costs of additional monitoring and/or implementation of alternative measures required by the Director upon review of the annual reports. The Financial Assurance must be submitted to the Director within twenty (20) days of written acceptance of the re-evaluation by the Director;

(c) The amount of Financial Assurance is subject to review at any time by the Director and may be amended at his/her discretion. If any Financial Assurance is scheduled to expire or notice is received, indicating Financial Assurance will not be renewed, and satisfactory methods have not been made to replace the Financial Assurance at least sixty (60) days before the Financial Assurance terminates, the Owner shall forthwith replace the Financial Assurance with cash.

#### **3. SITE OPERATION**

#### Operation

(1) The Site shall be operated and maintained at all times including management and disposal of all waste, in accordance with the EPA, Regulation 347, Regulation 232, and the conditions of this Approval.

#### Service Area

(2) Waste categories of Industrial, Commercial and Institutional ("ICI waste"), generated from within the geographic boundaries of the Province of Ontario may be received for disposal at this Site.

#### Waste Types

(3) Only solid non-hazardous ICI waste, including contaminated soils, and processed

organic waste (e.g., dewatered sewage sludge from the Caledonia Sewage Treatment Plant), shall be received for disposal at this Site. No hazardous waste or liquid industrial waste, as defined in Reg. 347, as amended by Reg. 558/00, shall be disposed at this Site.

(4) The Owner shall develop and implement a program to inspect waste to ensure that the waste received at the Site is of a type approved for acceptance under this Approval.
(5) The Owner shall ensure that all loads of waste are properly inspected by Trained Personnel prior to acceptance at the Site and that the waste vehicles are directed to the appropriate areas for disposal or transfer of the waste. The Owner shall notify the District Manager, in writing, of load rejections at the Site within one (1) business day from their occurrence.

#### **Approved Waste Quantities**

(6) The maximum volumetric capacity for the Site including waste and daily cover shall not exceed 1,045,065 cubic metres.

(7) The Owner shall ensure that the waste received at the Site does not exceed:

(a) a total of 250,000 tonnes in any calendar year; and

(b) the daily maximum received at the site does not exceed 1,000 tonnes.

#### Waste Placement

(8) No waste shall be landfilled outside of the approved six (6) hectare footprint fill area. The site shall be developed, maintain established buffer areas, and adhere to final contours for waste and final cover material in accordance with the design drawings provided in Appendix L of the Design and Operations Report.

(a) The maximum elevation of the fill zone, including final cover, shall be 221.50 metres above mean sea level.

#### Signage

(9) A sign shall be installed and maintained at the main entrance/exit to the Site on which is legibly displayed the following information:

(a) the name of the Site and Owner;

(b) the number of the Approval;

(c) the name of the Operator;

- (d) the normal hours of operation;
- (e) the allowable and prohibited waste types;

(f) the telephone number to which complaints may be directed;

(g) a warning against unauthorized access;

(h) a twenty-four (24) hour emergency telephone number (if different from above); and (i) a warning against dumping outside the Site.

(10) All landfill signs shall be kept legible, in good repair, and cleaned when required.

Nuisance Control (Vermin, Vectors, Dust, Litter, Odour, Noise and Traffic)

(11) The Site shall be operated and maintained such that vermin, vectors, dust, litter, odour, noise and traffic do not create a nuisance.

(12) The Owner/Operator shall install visual screening berms, in accordance with the Design and Operations Report and shall inspect and maintain them as required, during the operating life of the landfill Site.

(13) The Owner/Operator shall conduct inspections and ensure that appropriate controls are in place to prevent the acceptance of liquid industrial waste and hazardous waste and to prevent the acceptance of waste from outside the approved service area.

Records of violations by haulers or waste generators shall be maintained in the daily records for the Site operations. The Owner/Operator shall ensure that any waste refused for disposal leaves the Site immediately, and the District Manager is notified forthwith, of all waste load refusals at the Site related to requirements in this Certificate, including service area and waste types.

(14) The Owner/Operator shall ensure that the leachate collection system piping in the fill area and the connecting forcemain piping which leads to the leachate holding tank, shall be cleaned out at least once per year with a high pressure wash, and video inspections conducted, as necessary, to confirm that the pipes are clean and to determine the need for more frequent cleaning. Assessment of the need to amend the cleaning frequency shall be based on regular inspections of the leachate collection system and monitoring results.

(15) A thickness of at least 5 metres of compacted waste and cover material shall be maintained between any landfilled sludge (solid non-hazardous as per Reg. 347) and the granular leachate collection layer and leachate monitoring wells.

(16) The Owner/Operator shall take all reasonable steps to prevent off-site nuisance impacts, including visual impacts, transfer of waste, mud, or dust from the Site onto public roads due to landfill operations.

#### **Burning of Waste**

(17) Burning of waste at the Site is prohibited.

#### Scavenging

(18) Scavenging (as defined in Reg. 347) of deposited and/or stockpiled waste is prohibited at the Site. Controlled removal of recycleable/reusable material from the Site may only occur in a designated paved area on the Site, and shall be supervised by Trained Personnel.

#### **Hours of Operation**

(19) The permitted hours of operation for the site are from 6:00 a.m. to 6:00 p.m., Monday to Friday, and from 6:00 a.m. to 2:00 p.m. on Saturdays, for site preparation, site maintenance and daily cover activities. The operating hours for receipt of waste for disposal at the Site shall be from 7:00 a.m. to 5:00 p.m., Monday to Friday, and from 7:00 a.m. to 1:00 p.m., on Saturdays. No operations shall take place at the Site outside of the stated hours and the Site shall be closed on statutory holidays.

(20) The hours of operation may be amended from time to time to accommodate seasonal or unusual demand, based on prior consultation with the PLC and written concurrence from the District Manager.

#### **Site Security**

(21) No waste shall be received, landfilled or removed from the Site unless a site supervisor or other Trained Personnel are present to supervise the operations during operating hours. The Site shall be closed when a supervisor or Trained Personnel are not present to supervise operations at the Site.

(22) The Site shall be operated and maintained in a safe and secure manner. During non-operating hours, the Site entrance and exit gates shall be locked and the Site shall be secured against access by unauthorized persons.

#### **Cover Material**

(23) Alternative materials to soil may be used as weekly and interim cover material, based on an application with supporting information and applicable fee for a trial use or permanent use, submitted by the Owner to the Director, copied to the District Manager and as approved by the Director via an amendment to this Approval. The alternative material shall be non-hazardous according to Regulation 347 and will be expected to perform at least as well as soil in relation to the following functions:

(a) control of blowing litter, odours, dust, landfill gas, gulls, vectors, vermin and fires;

(b) provision for an aesthetic condition of the landfill during the active life of the Site;

(c) provision for vehicle access to the active tipping face; and

(d) compatibility with the design of the Site for groundwater protection, leachate management and landfill gas management.

(24) Daily, interim and final cover material shall be shall be applied as follows:

a. Daily Cover - At the end of each working day, the entire working face shall be compacted and covered with a minimum thickness of 150 mm of soil cover, compost, wood chips, or other approved daily cover material. Prior to placing waste at the start of the next operating day, the existing daily cover material shall be scarified or removed to the extent practical, to ensure vertical hydraulic connection is maintained between layers of waste and to promote percolation of leachate downwards to the leachate collection system.

b. Interim Cover - In areas where landfilling ceases temporarily for a period of 6 months or more, a minimum thickness of 300 mm of soil shall be placed as interim cover and graded to promote surface water runoff. The quality of soil for use as interim cover shall, as a minimum, meet the standards specified in Table 3 of Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act. Prior to the use of interim cover soil, representative samples shall be taken and analysed for metals, Volatile Organic Compounds (VOCs) and PAHs, to confirm the soil meets the above-mentioned standards.

c. Final Cover - Final cover shall be applied progressively as areas of the landfill reach final waste elevations within the fill area. Prior to placement of final cover, the Owner/Operator shall submit for the approval of the Director, a report detailing the specifications, including particle size distribution of the final cover soil which shall confirm the designed infiltration rate of 0.15 m/year, as well as the protocols for testing and acceptance for on-site and off-site final cover soils. All areas of final cover shall be graded and vegetated as soon as practically possible. The final soil cap shall be regularly inspected and maintained after the installation and during the post-closure period. Without limiting the above, the Owner/Operator shall ensure for a minimum of five years after completion of the cap that the Site shall be inspected at least on a quarterly basis to ensure that there is positive drainage along the cap and that during the frost free period of the first two years following completion, such inspections shall

be monthly. If any inspection indicates that there is an area of ponding or zero slope, the Owner/Operator shall take all steps necessary to provide positive drainage and rehabilitate the final cover as soon as practically possible.

d. All on-site and excess soil used for daily, interim, and final cover shall be managed in accordance with Regulation 406.

#### **Traffic Control**

(25) The Owner/Operator shall ensure that vehicles carrying waste or materials to and from the Site shall only enter the Site from Highway #3 and Brooks Road. At no time shall any vehicle carrying waste or materials to and from the Site travel along Townline Road to access the Site.

(26) The Owner/Operator shall be responsible for maintenance and remedial work to the Improvement Area. The Improvement Area shall be maintained to the following minimum requirements:

(a) 300 mm thick granular "A" layer of gravel, meeting all applicable Haldimand County and Ontario Provincial Standards Specification (OPSS) to the Improvement Area; and (b) Maintain asphalt on the entranceway/exit to the landfill and the parking area for the landfill Site, as well as 30 metres of the road approach on Brooks Road to the entranceway/exit to the Site, extending both north and south of the entranceway/exit, in base asphalt and top coat. The thickness of asphalt shall be a base coarse of 60 mm (HL8), and a surface coarse of 50 mm (HL3).

# 4. GROUNDWATER AND SURFACE WATER 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, or the Canadian Water Quality Guidelines published by the Canadian Council of Ministers of the Environment, 1999 for the protection of the surface water at and off the Site.

#### Surface Water and Groundwater

(2) The Owner shall monitor surface water and groundwater in accordance with the environmental monitoring program outlined in Schedule "B".

(3) A certified Professional Geoscientist or Engineer possessing appropriate hydrogeologic and hydrologic training and experience shall execute or directly supervise the execution of the environmental monitoring and reporting program.

#### **Groundwater Wells and Monitors**

(4) The Owner shall ensure that all groundwater monitoring wells which form part of the monitoring program are properly capped, locked and protected from damage and maintained in accordance with Regulation 903.

(5) Where landfilling is to proceed around monitoring wells, suitable extensions shall be added to the wells and the wells shall be properly re-secured.

(6) Any groundwater monitoring well included in the on-going monitoring program that

is 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 Director or the District Manager for abandonment, shall be decommissioned by the Owner, as required, in accordance with Regulation 903, to 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.

#### **Trigger Mechanisms and Contingency Plans**

(7) In the event of a confirmed exceedance of a site-specific trigger level relating to 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 provided in Appendix J of the Design and Operations Report.

(8) 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 seven (7) days after confirmation of the exceedances;

(b) within thirty (30) days from the date of confirming the need to implement contingency measures, 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 Director for approval; and

(c) the contingency measures shall be implemented by the Owner upon approval by the Director.

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

**Changes to the Monitoring Plan, Trigger Mechanism and Contingency Plan** (10) The Owner may request to make changes to the environmental monitoring program, Trigger Mechanism and Contingency Plan to the District Manager in accordance with the recommendations of the annual report. The Owner shall make clear reference to the proposed changes in a separate letter that shall accompany the annual report.

(11) 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.

(12) 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.

# 5. LEACHATE MANAGEMENT AND DISPOSAL

(1) Leachate generated at the landfill Site shall be collected, treated and disposed of using the on-site Leachate Treatment System, in accordance with the terms and conditions of the Industrial Sewage Works Approval No. 1122-BKUPSM dated February 3, 2020, as amended.

(a) Notwithstanding Condition 5(1), leachate generated at the landfill Site that is not treated using the on-site Leachate Treatment System shall be removed to an off-site facility that is approved by the Ministry to treat leachate generated at the landfill Site.
(2) Leachate generated at the landfill Site that is not treated using the on-site Leachate Treatment System shall not be discharged to the natural environment at any time.
(3) Any alternative proposal for leachate management and disposal must receive prior

written approval of the District Manager.

(4) The Owner shall reduce the level of leachate within the landfill to an elevation 191 metres above mean sea level (AMSL), which equates to an average leachate depth of no greater than 0.3 metres, by the earlier of:

(a) five (5) years from the issuance date of this ECA; or

(b) the date the landfill reaches capacity.

(5) In addition to the requirements of Condition 5(4), the interim annual leachate elevation levels and interim landfill capacity-based leachate elevations shall be adhered to pursuant to Schedules "C" and "D" respectively.

(a) The leachate elevation, as determined by the pressure transducer located in the leachate collection sump riser pipe shall be used to establish the landfill leachate elevation. The leachate elevation will be considered in compliance with the target leachate elevations if the measurement meets the elevations stated in Schedules "C" and "D" within fifteen (15) days of the compliance date.

(6) The Owner shall implement the leachate management contingency measures in the report titled "Leachate Removal Plan – Revision 2, Brooks Road Landfill Site,

Haldimand County, 2270386 Ontario Limited", prepared June 1, 2021, as amended, as necessary to meet the leachate elevations in Schedules "C" and "D".

(a) if the leachate elevations in Schedules "C" and "D" are not met within 105 days of the anniversary date of the issuance of this Approval the Owner shall cease accepting waste at the Site and immediately undertake the following actions until the leachate elevation is below the leachate elevation in Schedules "C" and "D":

(i) notify the District Manager;

(ii) increase trucking of raw leachate to an off-Site facility approved to accept leachate from the Site;

(iii) increase trucking of treated leachate from the on-Site leachate treatment system to an off-Site facility approved to accept treated leachate from the Site;

(iv) install interim cover to cells that have not reached final waste contours and to the working face;

(v) install final cover to cells that have reached final waste contours;

(vi) establish vegetation on installed cover material where appropriate and weather permitting; and

(vii) provide a plan to the District Manager regarding additional contingency measures deemed to be appropriate.

(b) landfilling activities may commence again when the compliance leachate elevation has been attained; and

(c) prior to amending the Leachate Removal Plan proposed amendments shall be submitted to the District Manager for approval.

(7) If the leachate elevation in the landfill reaches 199.0 metres AMSL, the Owner shall cease accepting waste at the Site and immediately undertake the following actions until the leachate elevation is below 199.0 metres AMSL:

(a) notify the District Manager;

(b) increase trucking of raw leachate to an off-Site facility approved to accept leachate from the Site;

(c) increase trucking of treated leachate from the on-Site leachate treatment system to an off-Site facility approved to accept treated leachate from the Site;

(d) install interim cover to cells that have not reached final waste contours and to the working face;

(e) install final cover to cells that have reached final waste contours;

(f) establish vegetation on installed cover material where appropriate and weather permitting; and

(g) provide a plan to the District Manager regarding additional contingency measures deemed to be appropriate.

(8) The Owner shall monitor leachate in accordance with the monitoring program outlined in Schedule "B".

#### 6. LANDFILL GAS MANAGEMENT

(1) The Owner/Operator shall ensure that all buildings and structures containing enclosed spaces at the Site, shall be situated, constructed and monitored in a manner which minimizes the potential for explosive hazards due to landfill gas. The Owner/Operator shall install and maintain in good working condition, methane detection and alarm equipment (with active venting or with an effective passive venting system to relieve any possible landfill gas accumulation) for all enclosed buildings at the Site. (2) The Owner/Operator shall ensure that site design plans, specifications and descriptions for the control of landfill gas are such that the subsurface migration of landfill gas meets the requirements of the Ministry's Landfill Standards Guideline, Section 4.10, including but not limited to the following:

(a) the concentration of methane gas below the ground surface at the Site boundary must be less than 2.5 per cent by volume;

(b) the concentration of methane gas in any on-Site building or enclosed structure, and in the area immediately outside the foundation or basement floor of the building or structure, if the building or structure is accessible to any person or contains electrical equipment or a potential source of ignition, must be less than 1.0 per cent by volume;
(c) sub-condition (b) does not apply to a leachate collection, storage or treatment facility or a landfill gas collection or treatment facility for which specific health and safety measures and procedures are in place relating to the risk of asphyxiation and the risk of explosion; and

(d) the concentration of methane gas from the Site in any off-Site building or enclosed structure, and in the area immediately outside the foundation or basement floor of the building or structure, must be less than 0.05 per cent by volume (i.e. not present).

(3) If the measured gas concentration at a gas probe exceeds the applicable limit listed in Condition 6(2) above, the District Manager shall be notified immediately. The gas concentrations shall be re-measured immediately and daily for a period of up to three
(3) consecutive days. If these readings confirm that the applicable limit has been exceeded, the Owner/Operator shall forthwith, implement appropriate control measures.

(4) The Owner shall monitor landfill gas in accordance with the monitoring program outlined in Schedule "B".

#### 7. STORMWATER MANAGEMENT

 (1) Stormwater runoff generated from the active waste fill area shall be treated by the Owner/Operator as leachate. The Owner/Operator shall ensure that any precipitation falling unto active waste fill areas, not under interim cover, shall be directed to the leachate collection system. If necessary, granular sumps shall be dug into the waste to facilitate drainage of contaminated stormwater towards the leachate collection system.
 (2) The Owner shall monitor the stormwater management pond in accordance with the monitoring program outlined in Schedule "B".

#### 8. EMPLOYEE TRAINING

(1) A training plan for all employees that operate any aspect of the Site shall be developed and implemented by the Owner or the Operator. Only Trained Personnel shall operate any aspect of the Site or carry out any activity required under this Approval.

(2) The Owner shall ensure that all site operations employees have been adequately trained and received on-going training with respect to the following, but not limited to:(a) terms, conditions and operating requirements of this Approval for the Site;

(b) the operation, inspection, and maintenance of the Site with respect to the approved design and operations documents;

(c) relevant waste management legislation and regulations;

(d) environmental concerns related to waste management at the Site;

(e) occupational Health and Safety concerns related to waste management at the Site; and

(f) emergency procedures and contingency plans in case of fire, spills, off-site impacts and any other emergency situations.

## 9. COMPLAINTS RESPONSE PROCEDURE

(1) If at any time the Owner receives complaints regarding the operation of the Site, the Owner shall respond to these complaints according to the following procedure:

(a) The Owner shall record and number each complaint, either electronically or in a log book, and shall include the following information: the nature of the complaint, the name, address and the telephone number of the complainant if the complainant will provide this information and the time and date of the complaint;

(b) The Owner, upon notification of the complaint, shall initiate appropriate steps to determine possible causes of the complaint, proceed to take the necessary actions to eliminate the cause of the complaint and forward a written reply to the complainant; and (c) The Owner shall complete and retain on-site a report written within one (1) week of the complaint date, listing the actions taken to resolve the complaint and recommendations, if any, for remedial measures, and managerial or operational

changes to reasonably avoid the recurrence of similar incidents.

#### **10. EMERGENCY AND SPILL RESPONSE**

(1) All Spills as defined in the EPA occurring at or from the Site shall be immediately reported to the **Ministry's Spills Action Centre at 1-800-268-6060** and shall be recorded in the log book. The Owner/Operator shall record for each Spill event the contaminant(s) spilled, the quantity or volume of contaminants spilled, the spatial distribution of the area impacted by the Spill, a root cause analysis of the events leading up to the Spill and a list of actions designed to prevent similar Spill events. (2) In addition, the Owner shall submit, to the District Manager a written report within three (3) business days of the Spill event, outlining the nature of the incident, remedial measures taken, handling of waste generated as a result of the emergency situation and the measures taken to prevent future occurrences at the Site.

(3) All wastes resulting from a Spill event shall be managed and disposed of in accordance with the EPA and Regulation 347.

(4) All equipment and materials required to handle the Spill event shall be:

(a) kept on hand at all times that waste landfilling and/or handling is undertaken at the Site; and

(b) adequately maintained and kept in good repair.

(5) The Owner shall ensure that the emergency response personnel are familiar with the use of such equipment and its location(s).

#### 11. PUBLIC LIAISON COMMITTEE (PLC)

(1) The Owner or Operator shall maintain and participate in a landfill PLC, which shall

function in accordance with the Terms of Reference for the PLC, as amended from time to time. Any amendment to the Terms of Reference must be approved by the District Manager. The PLC shall serve as a forum for dissemination, consultation, review and exchange of information regarding the operation of the landfill Site, including environmental monitoring, maintenance, complaint resolution, and new approvals or amendments to existing approvals related to the operation of this landfill Site.

(2) The Owner/Operator shall invite representation from the following groups to participate on the PLC:

(a) the County of Haldimand;

(b) Six Nations of the Grand River;

(c) landowners within a minimum 500 metre distance of the Site;

(d) residents of Haldimand County; and

(e) Lower Grand River Land Trust.

The number of representatives from each group shall be as specified in the Terms of Reference approved by the District Manager.

(3) Copies of all reports or other submissions required by the conditions of this Approval shall be made available to the PLC and the County of Haldimand, in accordance with the deadlines specified in the Conditions.

(4) The Owner or Operator shall provide to the PLC and the County of Haldimand, reasonable notice and opportunities to make comments regarding any proposed amendment to this Approval. The Owner or Operator shall forward to the Director for consideration any written comments received by the Owner or Operator and advise the Director of the essence of any verbal comments received by the Owner or Operator regarding the proposed amendment.

# 12. INSPECTIONS, RECORD KEEPING AND REPORTING

#### **Daily Inspections and Inspection Log**

(1) A visual inspection of the entire Site and all equipment on the Site shall be conducted each day the Site is open to ensure that:

(a) the Site is secure;

(b) the operation of the Site is not causing any nuisances;

(c) the operation of the Site is not causing any adverse effects on the environment or impairing water quality; and

(d) the Site is being operated in compliance with this Approval.

(2) Any deficiencies discovered as a result of the inspection shall be remedied immediately, including temporarily ceasing operations at the Site if needed .

(3) An electronic or written record of the inspections shall be maintained and shall include the following:

(a) the name and signature of person that conducted the inspection;

(b) the date and time of the inspection;

(c) the list of all deficiencies discovered during the inspections, including but not limited to:

(i) the presence of any leachate seeps;

(ii) the condition of the methane venting system;

(iii) poor drainage conditions and ponding of surface water; and

(iv) the presence of waste outside of the approved fill area;

(d) the recommendations for remedial action to address the identified deficiencies; and (e) the date, time and description of the remedial actions taken.

## **Daily Waste Log**

(4) A daily log shall be maintained in written or electronic format and shall include the following information:

(a) the type, date and estimated quantity (tonnes) of all waste, including non-landfilled waste received at the Site;

(b) the type, date and estimated quantity (tonnes) of cover material applied at the Site;

(c) the area of the Site in which waste disposal operations are taking place;

(d) a record of litter collection activities and the application of any dust suppressants;

(e) a record of all refusals of waste shipments, the reason(s) for refusal, and the origin of the waste, if known; and

(f) a description of any out-of-service period of any control, treatment, disposal or monitoring facilities, the reasons for the loss of service, and action taken to restore and maintain service.

#### **Other Information**

(5) Any information requested, by the Director, the District Manager or a Provincial Officer, concerning the Site and its operation under this Approval, including but not limited to any records required to be kept by this Approval shall be provided to the Ministry, upon request.

# **Annual Report**

(6) 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.

(7) 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) an assessment on the Site's compliance with Guideline B7;

(c) an assessment of the operation and performance of all engineered facilities, the need to amend the design or operation of the Site, and the adequacy of and need to implement the Ministry approved contingency plans;

(d) site plans showing the existing contours of the Site; areas of landfilling operation during the reporting period; areas of intended operation during the next reporting period; areas of excavation during the reporting period; the progress of final cover, vegetative cover, and any intermediate cover application; facilities existing, added or

removed during the reporting period; and site preparations and facilities planned for installation during the next reporting period;

(e) summaries of any actions taken for the odour management plan and compliance with the leachate removal plan;

(f) summaries of any actions taken for the compliance with the leachate removal plan;

(g) calculations of the volume of waste, daily and intermediate cover, and final cover deposited or placed at the Site during the reporting period and a calculation of the total volume of Site capacity used during the reporting period;

(h) a calculation of the remaining capacity of the Site or an estimate of the remaining Site life;

(i) summary of total annual quantity (tonnes) of waste received at the Site;

(j) a summary of any complaints received and the responses made;

(k) a summary of the information included in the logs required by Conditions 9(1), 10(1), 11(3), 11(4), 11(5), and 12(2);

(I) a summary of the daily waste log;

(m) a discussion of any operational problems encountered at the Site and corrective action taken;

(n) any changes to the Ministry approved Design and Operations Report and the Closure Plan that have been approved by the Director since the last Annual Report;

(o) a report on the status of all monitoring wells and a statement as to compliance with Regulation 903;

(p) a description and location of any leachate seeps identified during the daily inspection of the Site and the mitigative measures taken to address the presence of seeps;

(q) a summary of the daily inspections conducted over the monitoring period;

(r) any other information with respect to the Site which the District Manager may require from time to time;

(s) a copy of the most current ministry approved monitoring programs in table format;(t) compliance status with all conditions of the Approval and the approved Design and Operations Plan;

(u) a "Monitoring and Screening Checklist" completed and signed by a Qualified Professional; and

(v) items identified in Section 7.7 Annual Progress Report of the Design and Operations Report;

# 13. CLOSURE PLAN

(1) At least two (2) years prior to the anticipated date of closure of this Site, or when the Site reaches 90% capacity, whichever comes first, 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) Description 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 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 subconditions (i) to (vi) above.

(d) Description of the procedures for post-closure care of the Site, 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 landfill gas;

(f) An updated estimate of the contaminating life span of the Site, based on the results of the monitoring programs to date; and

(g) An update of the cost estimate for financial assurance and the amount which has been provided to the Director.

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

The following Schedule "A" forms part of this Approval

#### Schedule "A"

1. Application for an amendment to ECA No. A110302 for a vertical expansion. Signed by Richard Weldon, Managing Partner, 2270386 Ontario Limited. Dated April 26, 2019. The application includes all supporting documentation and consists of the following:

i. Design and Operations Report Vertical Expansion, Brooks Road Landfill Site, 2270386 Ontario Inc., Prepared by GHD, April 18, 2019;

ii. Appendix A - Provisional CofA No. A110302 and Amendments;

iii. Appendix B - Site Preparation Reports;

iv. Appendix C - Site Legal Surveys;

v. Appendix D - Geotechnical Assessment;

vi. Appendix E - HELP Model Outputs;

vii. Appendix F - Hydrologic Modeling;

vii. Appendix G - Surface Water Supporting Engineering Calculations;

viii. Appendix H - Landfill Gas Production and Air Dispersion Modeling Results;

ix. Appendix I - Fugitive Odour Best Management Practices Plan and BRE Odour Complaint Response Procedure;

ix. Appendix J - Trigger Level Program;

ix. Appendix K - Financial Assurance Plan; and

ix. Appendix L - Design and Operations Report Drawings.

2. Leachate Removal Plan, Brooks Road landfill Site Haldimand County, 2270386 Ontario Limited. Report No 90. Prepared by GHD, February 7, 2020.

3. Environmental Compliance Approval Application. Signed by Richard Weldon,

Managing Partner, 2270386 Ontario Limited. Dated June 1, 2021.

4. Design and Operations Report, Vertical Expansion – Rev. 1, Brooks Road Landfill Site, Haldimand County, 2270386 Ontario Limited. Prepared by GHD, Signed/stamped and dated June 14, 2021.

5. Leachate Removal Plan - Revision 2, Brooks Road Landfill Site, Haldimand County, 2270386 Ontario Limited. Prepared by GHD, June 1, 2021.

The following Schedule "B" forms part of this Approval

#### Schedule "B"

# Table B1: Groundwater, Surface Water, Leachate and Landfill Gas MonitoringPrograms

	Location	March	Мау	August	November
Groundwater	OW1A-06	-	В <sup>4</sup>	-	A <sup>3</sup>

1	OW1B-06	-	В	-	A
	OW3A-07	-	В	-	Α
	OW3B-07	-	В	-	Α
	OW5A-06	-	В	-	Α
	OW5B-07	_	В	_	A
	OW8A-06	_	В	_	A
	OW8B-06	_	В	-	A
	OW8D-07	_	В	_	WL - only 6
	(Gypsum				
	Mine) OW8S-07		B		
	(Gypsum Mine)	-	D	-	WL - only
	OW9A-06	-	В	-	A
	OW9B-06	-	В	-	A
	MW1-03	-	WL - only	-	WL - only
	MW1A-07	-	В	-	A
	MW1B-07	_	В	-	A
	MW1D-07 (Gypsum Mine)	-	В	-	WL - only
	MW1S-07 (Gypsum Mine)	-	В	-	WL - only
	MW2-03	-	WL - only	_	WL - only
	MW2A-01	_	B	_	A
	MW2B-07	_	В	_	A
	MW2D-07 (Gypsum Mine)	-	В	-	WL - only
	MW2S-07 (Gypsum Mine)	-	В	-	WL - only
	MW3-03	-	WL - only	-	WL - only
	MW4A-09	-	WL - only	-	WL - only
	MW5A-09	-	В	-	A
	MW5B-09	-	В	-	A
	MW6A-07	-	В	-	A
	MW6B-07	-	В	-	A
	MW10A-18	-	В	-	A

	MW10B-18	-	В	-	А
	MW11A	-	В	-	А
MW11B		-	В	-	А
	MW12A	-	В	-	А
	MW12B	-	В	-	А
Surface Water	SW1	C <sup>5</sup>	В	С	В
2	SW3	С	В	С	В
	SW4	С	В	С	В
	SW5	С	В	С	В
	SW6	С	В	С	В
	SW7	С	В	С	В
	SW8	С	В	С	В
	SW9	С	В	С	В
Leachate <sup>7</sup>	Leachate Collection System Sump Riser Pipe	See Note #7	В	-	-
	LW1-17		-	-	-
Landfill Gas <sup>8</sup>	GP-1A		See No	ote #8	
	GP-1B				
	GP-2A				
	GP-2B				
	GP-3A				
	GP-3B				
	GP-4A				
	GP-4B				
	GP-5				
	GP-6				
	GP-7				
	GP-8				
QA/QC	Groundwater Duplicate	-	В	-	A
	Surface Water Duplicate	С	В	С	В
	Field Blank	С	В	С	В

Notes:

1. Groundwater levels will be measured during May and November sampling events.

2. Surface water levels and flows will be measured for all sampling events.

3. A - Indicator parameters (groundwater): alkalinity, ammonia, barium, boron,

calcium, chloride, conductivity, iron, magnesium, nitrate, pH, sodium, TDS, sulphate, COD, and DOC.

4. **B** - **Metals:** aluminum, arsenic, barium, beryllium, boron, cadmium, total chromium, copper, iron, lead, magnesium, manganese, mercury, silver, sodium, zinc, vanadium, thallium, molybdenum, cobalt, nickel.

**B - PAHs:** naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene,

benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(j)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, benzo(ghi)perylene.

**B - VOCs:** chloromethane, vinyl chloride, bromomethane, chloroethane, trans-1,2trichlorofluoromethane, acetone, 1,1-dichloroethene, dichloromethane, trans-1,2dichloroethene, methyl-t-butyl ether, 1,1-dichloroethane, methyl ethyl ketone, cis-1,2dichloroethene, chloroform, 1,2-dichloroethane, 1,1,1-trichloroethane, carbon tetrachloride, benzene, 1,2-dichloropropane trichloroethene, bromodichloromethane, cis-1,3-dichloropropene, methyl isobutyl ketone, trans-1,3-dichloropropene, 1,1,2trichloroethane, toluene, 2-hexanone, dibromochloromethane, 1,2-dibromoethane, tetrachloroethene, 1,1,1,2-tetrachloroethane, chlorobenzene, ethylbenzene, m,p,oxylenes, bromoform, styrene, 1,1,2,2-tetrachloroethane, 1,3-dichlorobenzene, 1,4dichlorobenzene, 1,2-dichlorobenzene.

**B - Inorganic chemistry parameters:** alkalinity, ammonia, hardness, nitrate, nitrite, TKN, chloride, sulfates, DOC, TDS, suspended solids, phenol, BOD5, COD, pH, total phosphorus, potassium, conductivity, calcium.

5. **C** - Indicator parameters (surface water): alkalinity, ammonia, chloride, conductivity, iron, nitrate, nitrite, TKN, pH, total phosphorus, TDS, suspended solids, sulphate, BOD5, COD, phenol, temperature, and dissolved oxygen.

6. WL - only: water level or leachate level only.

Leachate: Leachate water levels shall be collected on a monthly basis at leachate monitoring well LW1-17 and the inclined leachate collection sump riser pipe, while an annual leachate chemistry sample is required to be collected in May from the collection sump. Compliance with the leachate level elevation shall be determined by the pressure transducer that is located in the leachate collection sump riser pipe.
 Landfill Gas: Sampling is to occur monthly from December 1 to April 30 and quarterly from May through November for % lower explosive limit methane

concentration of combustible gas, carbon dioxide, oxygen and balance gases, gas pressure, and water level.

The following Schedule "C" forms part of this Approval

#### Schedule "C"

Table C1: Target leachate elevations to reach leachate elevation 191 m AMSLbased on the date of March 27, 2020.

Date	Required	Estimated	Volume	Forecasted	LTS	Required
	Leachate	Leachate	Removed in	Leachate	Discharge to	Average
	Elevation	Volume in	Excess of	Generation	Ditch (m	Excess

	(m AMSL)	Landfill (m <sup>3</sup> )	Generation (m <sup>3</sup> )	Rate (m <sup>3</sup> /day)	<sup>3</sup> /day)	Leachate Removal (m <sup>3</sup> /day)
March 27, 2020	198.5	40,000	-	44	45	0
March 27, 2021	196	28,000	12,000	44	45	32
March 27, 2022	193.8	18,000	10,000	42	45	24
March 27, 2023	192.1	10,000	8,000	44	45	21
March 27, 2024	191.3	4,000	6,000	45	45	16
March 27, 2025	191	2,000	2,000	49	45	9.5
March 27, 2026	191	2,000	0	33	45	0

The following Schedule "D" forms part of this Approval

Schedule "D"

#### Table D1: Capacity-Based Target Leachate Elevations

Estimated Landfilled Volume (m <sup>3</sup> )	Required Leachate Elevation (m AMSL)
680,000	197.9
710,000	197.4
740,000	196.8
770,000	196.2
800,000	195.7
830,000	195.1
860,000	194.5
890,000	193.9
920,000	193.4
950,000	192.8
980,000	192.2
1,010,000	191.7
1,040,000	191.1
1,045,065	191.0

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

Conditions 1(1), 1(2), 1(4), 1(5), 1(6), 1(7), 1(8), 1(9), 1(10), 1(11), 1(13), 1(20), 1(21), 1(22), and 1(23) are to clarify the legal rights and responsibilities of the Owner and Operator under this Approval.

Conditions 1(3) and 7(4) are 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.

Condition 1(12) is 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.

Condition 1(14) is 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.

Condition 1(15) is to ensure that the successor is aware of its legal responsibilities. Conditions 1(16), 1(17) and 1(18) clarify 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.

Condition 1(19) is to ensure that appropriate Ministry staff has ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this Approval. This Condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the Act, the OWRA, the PA, the NMA and the SDWA.

Condition 1(24) clarifies what information may be subject to the Freedom of Information Act.

Condition 2(1) is to ensure that sufficient funds are available to the Ministry for closure and post-closure activities at the Site in the event that the Owner is unable or unwilling to do so.

Conditions 3(1), 3(11), 3(12), 3(13), 3(14), 3(15), 3(16), 12(1) and 12(2) are to ensure that the Site is operated, inspected and maintained in an environmentally acceptable manner and does not result in a hazard or nuisance to the natural environment or any person.

Conditions 3(2), 3(3), 3(4), and 3(5) are to specify the approved area from which waste may be accepted at the Site, and the types of waste that may be accepted for disposal at the Site based on the Owner's application and supporting documentation.

Conditions 3(6), 3(7), and 3(8) are to specify restrictions on the extent of landfilling and the maximum rates to be accepted for disposal at the Site based on the Owner's application and supporting documentation. These limits define the approved volumetric capacity of the site.

Conditions 3(9) and 3(10) are to ensure that users of the Site are fully aware of important information and restrictions related to Site operations and access under this Approval.

Condition 3(17) is to ensure open burning of municipal waste is unacceptable because of concerns with air emissions, smoke and other nuisance effects, and the potential fire hazard.

Condition 3(18) is to ensure that uncontrolled removal of material from waste at the Site is avoided. Scavenging of deposited waste can be detrimental to the public health and safety and cause damage to the natural environment.

Conditions 3(19) and 3(20) are to specify the hours of operation for the landfill site and a mechanism for amendment of the hours of operation, as required.

Conditions 3(21) and 3(22) are to ensure that the Site is supervised by properly trained staff in a manner which does not result in a hazard or nuisance to the natural

environment or any person and to ensure the controlled access and integrity of the Site by preventing unauthorized access when the Site is closed and no site attendant is on duty.

Condition 3(23) is to specify the approval requirements for use of alternative cover material at the Site.

Condition 3(24) is to ensure that daily and intermediate cover is used to control potential nuisance effects, to facilitate vehicle access on the site, and to ensure an acceptable site appearance is maintained. The proper closure of a landfill site requires the application of a final cover which is aesthetically pleasing, controls infiltration, and is suitable for the end use planned for the site.

Condition 3(25) is to ensure that potential truck traffic impacts on the immediate local community is limited to the existing main roads.

Condition 3(26) is to ensure that public road servicing the Site (described as "Improvement Area") meets the applicable standards. Condition 3(26) also ensures that the Improvement Area is maintained regularly as per agreement between the Owner/Operator of the Site and Haldimand County.

Condition 4(1) is to provide the groundwater and surface water limits to prevent water pollution at the Site

Conditions 4(2), 4(3), 5(2), 6(4), and 7(2) are 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.

Conditions 4(4), 4(5), and 4(6) are included to ensure the integrity of the groundwater monitoring network so that accurate monitoring results are achieved and the natural environment is protected.

Conditions 4(7), 4(8), and 4(9) 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. Conditions 4(10), 4(11), and 4(12) are included to streamline the approval of the changes to the monitoring plan.

Condition 5(1) is added to ensure that leachate generated at this Site is disposed of in an environmentally acceptable manner.

Conditions 6(1), 6(2), 6(3), and 6(5) are to ensure that off-site migration of landfill gas is monitored and all buildings at the Site are free of any landfill gas accumulation, which due to a methane gas component may be explosive and thus create a danger to any persons at the Site.

Condition 7(1) is added to ensure to ensure that both surface water and stormwater is managed in an environmentally acceptable manner.

Conditions 8(1) and 8(2) are to ensure that the Site is operated by properly trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person.

Condition 9(1) is added to ensure that any complaints regarding landfill operations at this Site are responded to in a timely and efficient manner.

Condition 10(1) is to ensure the Owner immediately responds to a spill.

Conditions 10(2), 10(3), 10(4), and 10(5) are to ensure that the Owner notifies the Ministry forthwith of any spills so that an appropriate response can be determined.

Conditions 11(1), 11(2), 11(3), and 11(4) are added to establish a forum for the exchange of information and public dialogue on activities carried out at the landfill Site.

Open communication with the public and local authorities is important in helping to maintain high standards for site operation and protection of the natural environment. Condition 12(3) is to ensure that detailed records of Site inspections are recorded and maintained for inspection and information purposes.

Condition 12(4) and 12(5) are added to ensure that accurate waste records are maintained to ensure compliance with the conditions in this Approval (such as fill rate, site capacity, record keeping, annual reporting, and financial assurance requirements), the EPA and its regulations.

Conditions 12(6) and 12(7) are added 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.

Condition 13(1) is added 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.

# Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). A110302 issued on March 27, 2020

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 Director appointed for the purposes of Part II.1
The Secretary*		of the Environmental Protection Act
Environmental Review Tribunal		Ministry of the Environment, Conservation and
655 Bay Street, Suite 1500	AND	Parks
Toronto, Ontario		135 St. Clair Avenue West, 1st Floor
M5G 1E5		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 1st day of October, 2021

Mohsen Keyvani, P.Eng. Director appointed for the purposes of Part II.1 of the *Environmental Protection Act*  Matthew Griffin Mike Masschaele - Air, GHD Limited

## Appendix C MECP Water Well Records

ť í	301	13 W			B
UTM 1/17 Z 51915181418 E				26 N	0 283
15 R 4171516191611 N				GROUND WAT	ER BRANCH
Flev 15 18 10 1 (014 15 1	V.	Turt		MAR 2	7 1961
The Ontari	o Water Resc	ources Comm	ission Act, 1957	- 1	WATER
	<b>TO W</b> 71		DECODI	1	COMPANISSION
			RECORI	<u>^</u>	, - tige A Posts
County or District HAL DINAN	D /	Township,	Village, Town or	City N. CA	4YUGA
		te com.	pleted /6 (day	FEB month	year)
		dress	CAY	UGA	
Casing and Screen Record	,,,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Pun	nping Test	<u></u>
Inside diameter of casing $6\frac{1}{4}$		Static le	vel 🆩	18	
Total length of casing $48$		Test-pur	mping rate	5	G.P.M.
Type of screen		Pumping	g level	48	
Length of screen		Duration	n of test pumping	g	4 <i>B</i> .
Depth to top of screen $\overline{}$ Diameter of finished hole $\overline{}$		Water c	lear or cloudy at	end of test	CLEAR
Diameter of finished hole 6 7		Recomm	nended pumping	rate 5	G.P.M.
		with	pumping level o	f 48	
Well Log		<u></u>	Wa	iter Record	
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)
TOP SOIL	6	2			
BROWN CLAY	2 48	48	60		FRESH
LINKSTONE CHKY	72				
				_	
			-		
			-		
	-				
	_				
	1	<u> </u>			<u> </u>
For what purpose(s) is the water to be used?			Loca	tion of Well	
BARN			.,	show distances of	
Is well on upland, in valley, or on hillside?			road and lot line	e. Indicate north	h by arrow.
UPLAND				b Y	$\uparrow$
Drilling Firm C17055 13Ros	2				rt h
Address RYCKMAN'S CON				H L	
Address p.C. p.C.			TU.	r o	
				N.	1
Licence Number Name of Driller <u>AIRTHUR</u>	Parc .			× <del>100</del>	O TY
			Hury,	+ 3 TAL	BOT 12D.
Address RYCKMAK'S CDI					
Date MARCH 7			7 5.		
(Signature of Licensed Drilling Contractor	) IC	"			

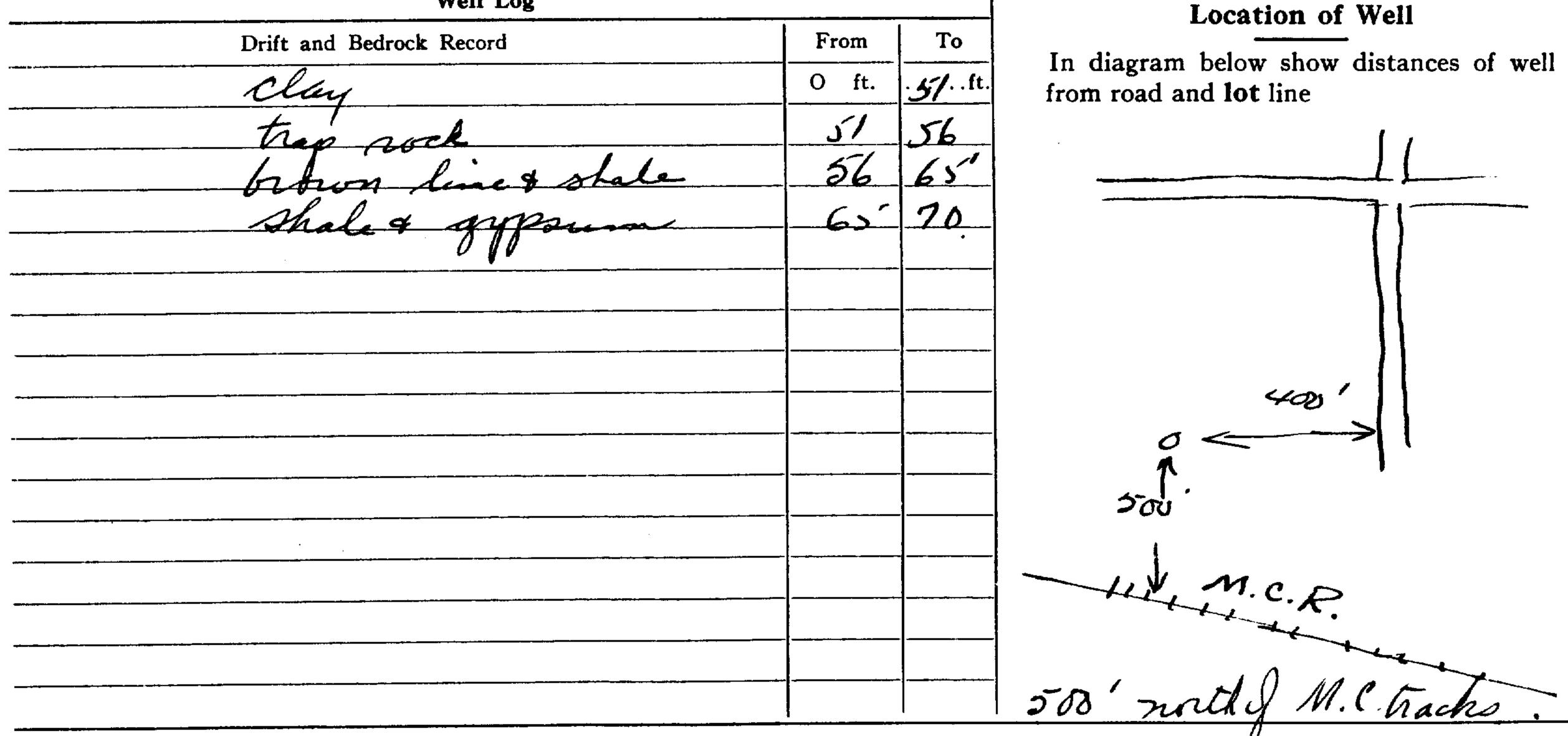
UTM 172 51915101519 E 19 R 141715 8101413 N Experies Act Basin Basin									
Pipe and Casing Record	Pumping Test								
	Date								

Length of screen	Duration of Test
Type of screen	Pumping Rate
Type of pump	Drawdown
Capacity of pump	Static level of completed well
Depth of pump setting	Is well a gravel-wall type?

Water Record								
Kind (fresh or mineral)	Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises					
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			22!					
Appearance (clear, cloudy, coloured)								
Appearance (clear, cloudy, coloured) For what purpose(s) is the water to be used?		· · · · · · · · · · · · · · · · · · ·	• 					
How far is well from possible source of contamination?								
What is source of contamination?								
Enclose a copy of any mineral analysis that has been made of water	·							

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1 11 - 1 - 2 - 2

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Situation: Is well on upland, in valley, or	on hillside?
Drilling Firm . C.A. Kicker	
Address Cantoro	
Recorded by	
Date	
	and a star a In the star and a star a
	CSS.S8

UTM $1/17^2$ $5/9/4/9/4/9 E$ 9/8 $4/7/5/8/3/6/5$ The We Basin $2/3$ Department of M Basin $2/3$ Matter V County or District. Maldimend. Tp. N. County or District. Maldimend. Tp. N. Casing diameter(s). $6.4.$ Length(s) of casing(s). $4.9$ Length of screen. Type of screen. Type of pump.	ell Drillers A Aines, Provin Vell Cayng Cayng cludin Date Developed C Duration of Pumping Ra Drawdown	nce of Or Rec (a	2 ntario Ord on/12 Lot 25 Acres Pumping Test	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·
Capacity of pump	Static level of	of complete	ed well		
Depth of pump setting	Is well a gra	vel-wall ty	/pe?	· · · · · · · · · · · · · · · · · · ·	
W	ater Record				
Kind (fresh or mineral)			Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
For what purpose(s) is the water to be used?	· · · · · · · · · · · · · · · · · · ·		· · · /		
Well Log			Loca	tion of Well	
Drift and Bedrock Record Clay Gravel Gravel handpan Gravel	From 0 ft. 28 32 49 65	To 78.ft. 32 49 65 68	In diagram below from road and lot 300' 300' 300'	iline	
Situation: Is well on upland, in valley, or on hillside Drilling Firm A. Cucker. Address	· · · · · · · · · · · · · · · · · · ·	Address	s 2 Number	<b>,</b> 	· · · · · · · · · · · · · · · · · · ·
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	Steel	Casing		(metres) Pumping rate -	Level	/ 1	-A
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Other specify	·	No Casing or Screer		ued, give reason.	40	40	
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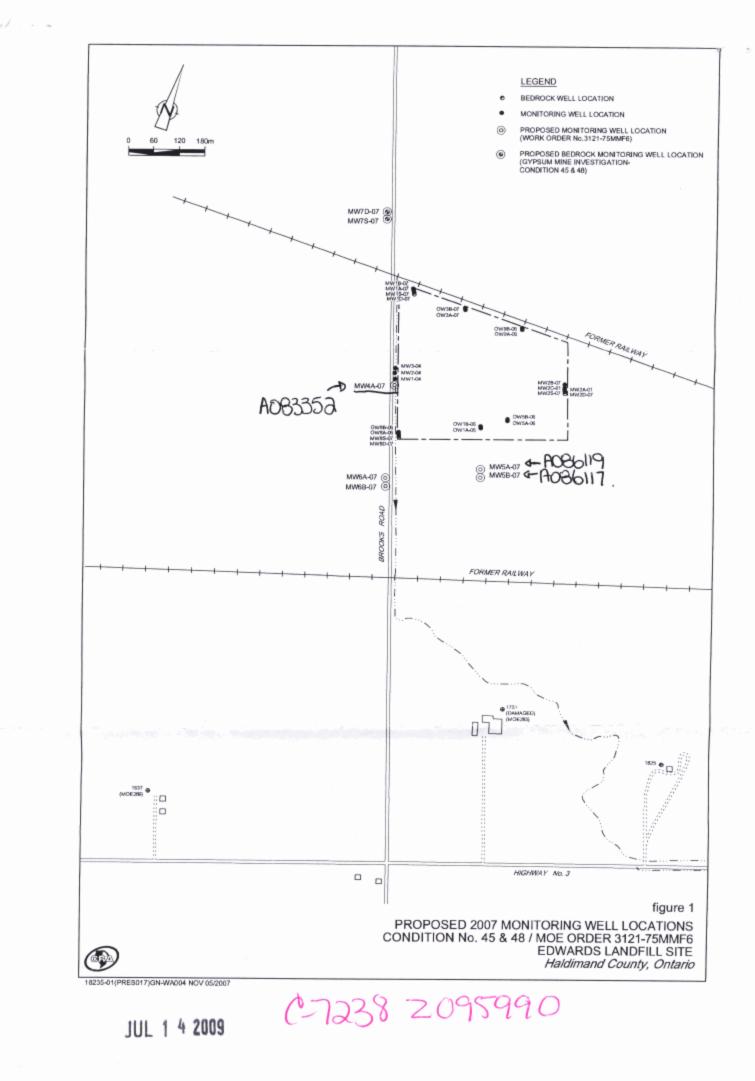
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Casin Casin			Pump intake set at - Static metres) Level	
Steel Fibreglass Plastic Concrete	6	5.00	Pumping rate - 1	1
Water Record Galvanized		16.97	Duration of pumping 2	/ 2
water lound     Kind of Water       at     Metres       Kind of Water     Steel       Fibreglass       Motion       Fresh     Sulphur	1 .		Final water level end	3
Gas / Salty Minerals Galvanized		<u>.</u>	Recommended pump	4
Gas Salt Minerals			ype. Shallow Deep Recommended pump 5	
Galvanized		c	lepthmetres	5
m Fresh Sulphur Screen Gas Salty Minerals Outside Steel Fibreglass Slot			Recommended pump 10 ate. (litres/min) 15	15 *
After test of well yield, water was	No. 5.37	7-01	f flowing give rate - 20 (litres/min) 25	20 25
Glear and sediment free Gaivanized	- 16.57	18.97	f pumping discontin- 30	30
	or Screen		40 50	40
			60	60
Plugging and Sealing Record         Annular space           Depth set at - Metres         Material and type (bentonite slurry, neat cement slurry) etc.	Abandonment Volume Placed	In diagram below sh	Location of Well now distances of well from road,	ot line, and building.
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		1 160	BROOKSI	22 mt/
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Rotary (reverse)     Boring     Driving     Water Use			62m +- 4	
Domestic Industrial Public Supply	Other		01111	
☐ Irrigation ☐ Municipal ☐ Cooling & air conditi Final Status of Well	oning	Audit No. 7 5	4397 Date Well Cor	
🗌 Water Supply 🔄 Recharge well 📄 Unfinished		Was the well owner	's information Date Delivered	2006 12 pl
Observation well     Abandoned, insufficient supply     Dewatering     Test Hole     Abandoned, poor quality     Replacement well		package delivered?		
Well Contractor/Technician Information           Name of Well Contractor         Value of the second seco	actor's Licence_No.	Data Source	Ministry Use Only Contractor	
Name of Well Contractor Drilling Huestighter Well Contractor High the Children Drilling Huestighter Well Contractor Business Address (street, name, number, cityletc.)	1202	Date Received 7 w	MY MM DD Date of Inspec	tion
140 Bathusst Dr. Waterloo		Date Received 3 21		
Lalerch Core -TE		Remarks	Well Record N	lumper
Signature of Technician/Contractor Date Submitt	-2989.			

actor's Copy 📋 Ministry's Copy 🕰 Well Owner's Copy

このにおいて、 記録のの意思を

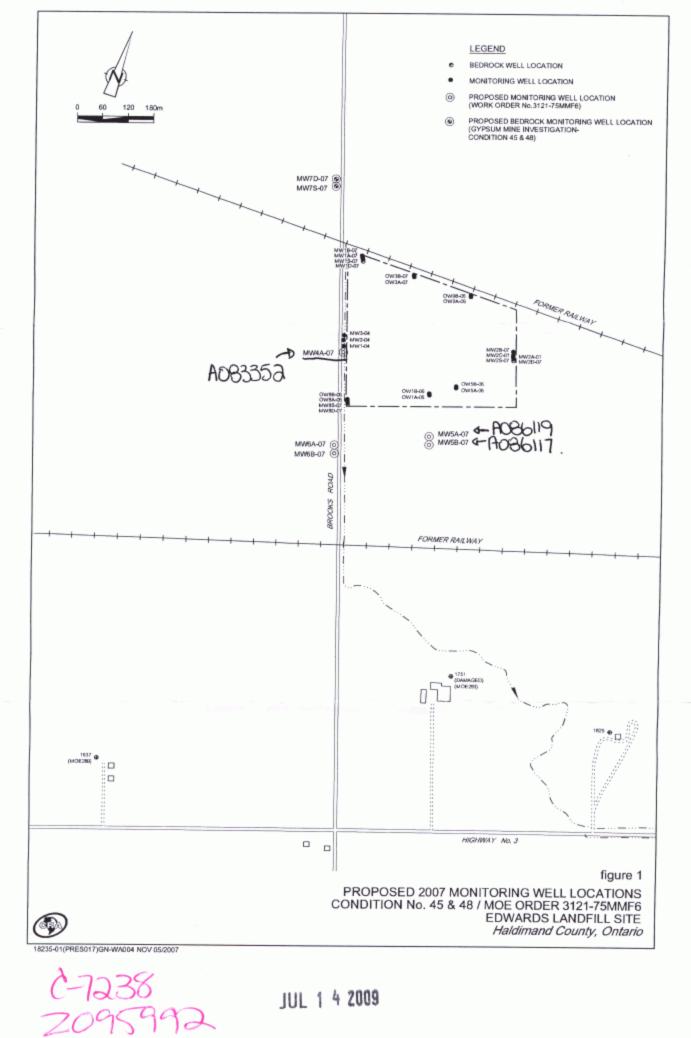
Cette formule est disponible en frança

Measurem		ry of nvironment Metric VImperial	Well T	A 0861	17 Below) Regulation	n 903 Ontari	Of-OIL Well R to Water Reso	ecord
Eirst Name	ner's Information	ast Name / Organizati	sinc.	lunicipality	E-mail Address Province Postal Code		U Well C	Constructed II Owner
4950 Well Loca	Longe Stree		$\mathcal{D}$	Toronto	ON MANG	K1		
Address of County/Dis	Well Location (Street Nur S ROAL CAL trict/Municipality HOOMOOC inates IZone, Easting	Northing	hr.	ity/Town/Village	3	Province Ontario Other	Postal	Code
NAD		6634757 als/Abandonment S	716 ealing Record	rd (see instructions on the	back of this form)			
General Co Brow		non Material	Oth	er Materials	General Description		From	h (m/ft) To
Depth Se From	et at ( <i>m/ft)</i> To	Annular Space Type of Sealant Used (Material and Type)		Volume Placed (m <sup>3</sup> /ft <sup>3</sup> )	Results of W After test of well yield, water was:	Draw D Time Wate	own Re ar Level Time	ecovery Water Level
0 4	4 Bentonia 20 Sand	k chips		0.02	Other, specify     If pumping discontinued, give reason:	Static Level	m/ft) (min)	(m/ft)
	- Qri				Pump intake set at (m/ft)	2	1	
Meth	nod of Construction		Well Us	e	Pumping rate (I/min / GPM)	3	3	
Cable To	ool Diamond	Page 1	Commer	rcial 🗌 Not used	Duration of pumping	4	4	
Rotary (F	Conventional) Jetting Reverse) Driving	Domestic	Municipa     Test Hol	e Monitoring	hrs + min	5	5	1. S.
Boring		Irrigation	Cooling	& Air Conditioning	Final water level end of pumping (m/ft,	10	10	
Other, sp	Construction R	_ Other, specify	/	Status of Well	If flowing give rate (Vmin / GPM)	15	15	
Inside Diameter	Open Hole OR Material		oth ( <i>m/ft</i> )	Water Supply	Recommended pump depth (m/ft)	20	20	
(cm/in)	(Galvanized, Fibreglass, Concrete, Plastic, Steel)	(cm/in) From	То	Replacement Well     Test Hole	Recommended pump rate	25	25	
2	Plastic	5chto 0	5	Recharge Well     Dewatering Well	(l/min / GPM)	30	30	
				Monitoring Hole	Well production (Vmin / GPM)	40	40	
				Alteration (Construction)	Disinfected?	50 60	50 60	
	Construction R	locord Coroon	No 13 13 194 44	Abandoned, Insufficient Supply	Yes No	/ell Location		
Outside Diameter	Material	Slot No. Dep	oth ( <i>m/ft</i> )	Abandoned, Poor Water Quality	Please provide a map below following			
(cm/in) 2	(Plastic, Galvanized, Steel)	10 5	10 20	Abandoned, other, specify Other, specify		~~~~		
(n Water foun	Water De	ecify ecify er:FreshUnteste	ed Dept From	h (m/ft) To L (Diameter (cm/in)	Please s attack	rd (	nap.	
Water foun	n/ft) Gas Other, spe nd at Depth Kind of Wate n/ft) Gas Other, spe	er: Fresh Unteste						
A 1	Well Contractor lame of Well Contractor Jark Drilling ddress (Street Number/Ne Lowis RJ	The	We	tion Il Contractor's Licence No. 7 2 3 8 nicipality JP/12070	Comments:			
Province 6N	Postal Code	Business E-mail A		First Name)	Well owner's Date Package Deliver	Audi		
519	8269340 ian's Licence No. Signature	England	M Contractor Dat		package     Y Y Y M M       delivered     Date Work Completed       Yes     000906	23 Rece	IUL 1 4 ;	0990 2009
0506E (12/20)	07)	-0		Ministry's Copy		0	Queen's Printer fo	r Ontario, 2007

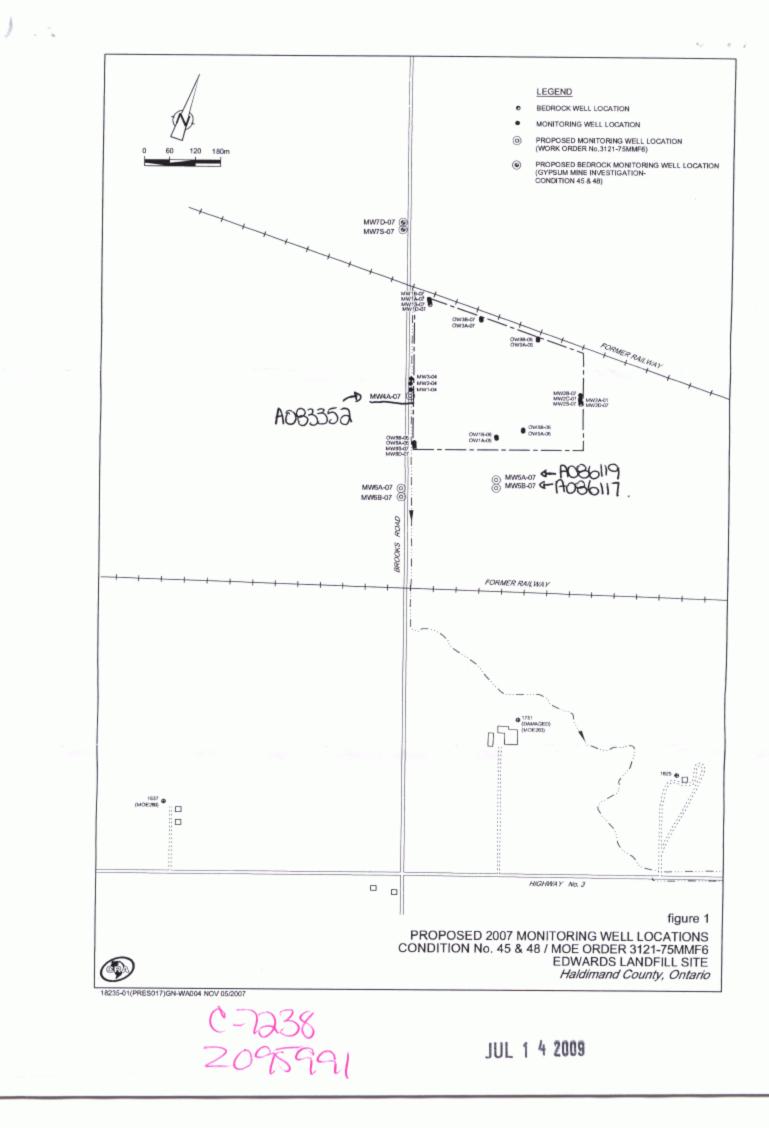


Por		vironment	Well Ta	A 0861	10 Regulation	903 Or		er Reso	ecord ources Act
Measureme	nts recorded in:	Metric Metric			13	7477777	Page_	1	
Well Own Eirst Name	er's Information	.ast Name / Organizat	ion		E-mail Address	1117361		Well C	Constructed
Bahm	Rosen of SE	Partners Inc				_		*	ll Owner
Mailing Addr	ress (Street Number/Nar		Mu	unicipality	Province Postal Code		elephone N	0. (inc. i	area code)
4450 Y	onge Street,	Juite 400		laguo.	ON Main6	KT	111111	158533	177111111
Well Local	tion Well Location (Street Nu	mber/Name)	To	wnship	Lot Out	C	oncession	111222	
Brooks	Road Ghu R	$had \partial 8$	FO	rmer North Cau	patup. 24			Destal	Code
County/Dist	rict/Municipality			ty/Town/Village		Province Onta		Postal	Code
UTM Coordir	Hadman	Northing	M	unicipal Plan and Sublo	Number	Other	110		
NAD	17545	385475-	7833						
Overburde	n and Bedrock Materi	als/Abandonment S	ealing Recor	d (see instructions on the	back of this form)			Dep	th ( <i>m/ft</i> )
General Co	lour Most Comr	mon Material	Othe	er Materials	General Description	1		From	To
Brow	n clay				hard			0	20
arcy	day			a she and a second second	Soft			50	53,5
5/									
		Annulas Crosso			Results of W	ell Yield	d Testing		
Depth Se	at at (m/ft)	Annular Space Type of Sealant Use	d	Volume Placed	After test of well yield, water was:	Dra	w Down		ecovery
From	То	(Material and Type)		(m³/ft³)	Clear and sand free Other, specify	Time (min)	Water Level (m/ft)	Time (min)	Water Level (m/ft)
D	40 Bent	on te grout	F	0.20	If pumping discontinued, give reason:	Static			
40	41 Rente	nike chips		0.01		Level		1	
41	53.5 san	the chips		0.05	Pump intake set at (m/ft)			<u> </u>	
	Ser July		. Sugar (St		Pump intake set at (mmy	2	i i i L'instr	2	
	and of Construction		Well Us	0	Pumping rate (Vmin / GPM)	3		3	
Cable To	ol Diamon	d Dublic	Commer		Duration of ourmains	4		4	
Rotary (0	Conventional) Used Jetting	Domestic	Municipa		Duration of pumping hrs + min	5		5	
Boring	Reverse) Driving	Livestock	Cooling	& Air Conditioning	Final water level end of pumping (m/ft	10		10	and the second
Air percu	ission	Industrial	<i>6</i> .			15		15	
Other, sp	Joury	Other, speci	/y	Status of Well	If flowing give rate (Vmin / GPM)		-		
Inside	Open Hole OR Material	Record - Casing Wall De	epth ( <i>m/ft</i> )	Water Supply	Recommended pump depth (m/ft)	20		20	
Diameter (cm/in)	(Galvanized, Fibreglass, Concrete, Plastic, Steel)	Thickness (cm/in) From	То	Replacement Well     Test Hole		25		25	
2	Mastic	5ch40 0	43.5	Recharge Well	Recommended pump rate (Vmin / GPM)	30		30	
~	1103112	50110 0	12.0	Dewatering Well     Observation and/or	Mall production (Imin ( CDM)	40		40	
				Monitoring Hole	Well production (I/min / GPM)	50		50	
2				(Construction)	Disinfected?	60		60	
				Abandoned, Insufficient Supply	Yes No		ation		
O toldo	Construction	Record - Screen	epth ( <i>m/ft</i> )	Abandoned, Poor Water Quality	Map of V Please provide a map below following			back.	
Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel	Slot No.		Abandoned, other,					
2	Plastic	10 43	522	specify					
a	Mastic	IO IS	~ _)	Other, specify		~~			
					Please Stack	E	$\sim$		
Water four	Water D nd at Depth Kind of Wat	and the state of the		th (m/ft) Diameter	PICO	$\sim$	na	/ ·	
	n/ft) Gas Other, s		From	To (cm/in)	Dette	12			
	nd at Depth Kind of Wat		ted	53,5 0	CIIC				
	n/ft) Gas Other, s		tod						
	nd at Depth Kind of Wat		aeu						
111111111		tor and Well Techni	ician Informa	tion	ī.				
	ame of Well Contractor		We	ell Contractor's Licence No.	1				
Andu	ark Drilling	dre		7 d 3 8	Comments:				
Business A	ddress (Street Number/		IVI.	Wellington					
Province	Postal Code	Business E-mail	Address	G. O. M					
GN		59	0	First Marra'	Well owner's Date Package Delive	red	Minis Audit No.	stry Us	se Only
	0) ( 1 ) / .	Name of Well Technicia England	an (Last Name, M	First Name)	delivered Y Y Y M M		Z	09	5992
Well Technic	Cian's Licence No. Signaty	re of Technician and/o		te Submitted	Yes Date Work Complete			11	2009
30	59 M	an	9	0040707		93	Received	s Printer	for Ontario, 2007





20	ntario Ministr	y of vironment		Wel' Ŧ	<b>N</b> 8	335	2 int Below)	Regulation	1 903 OI	OL- We ntario Wat	)  4    R er Reso	ecord
Measureme	ents recorded in: 🗌 M	letric 🚺 In	nperial		00	000				Page_	1	of $a$
Well Owr	ner's Information											
First Name	· Prom	ast Name / O	rganization				E-mail Addre	SS				Constructed
Dan Add	ress (Street Number/Nam		IBS	NC-	lunicipality		Province	Postal Code	Т	elephone N		
4950	Yone St St	ite 40	2		Toro	to	ON	Mang	K1			
Well Loca	ation				10, 5							
Address of	WellLocation (Street Nur	nber/Name)	2	T	ownship	hah C	una Tu	Lot	(	Concession		
County/Dist	S NO. CTY KO	$\infty $ or	>	1(	ity/Town/Vill		yug iu	JP.	Provinc	e e	Postal	Code
-	Haldfman	. /			-	Cau	GQU		Onta	rio		
UTM Coordi			thing	. /	lunicipal Pla	n and Sublo	t Number		Other			
NAD	8 3 1 7 5 9 50 en and Bedrock Materia		15 / I	716	rd (see instru	ictions on the	hack of this form]		NOR DOR	112121121	11111	
General Co			intent Sea		er Materials			eneral Description			Dep From	th ( <i>m/ft</i> ) To
Brow	1						hard				$\bigcirc$	35
DIOV/	. /						Soft				35	58
grey	Cay				1.11		2017			ALCONTA.		
					-							
								Desults of W	Vial	Testing		
Depth Se	et at ( <i>m/ft</i> )	Annular S Type of Seal	and the second se		Volume	Placed	After test of well y	Results of We ield, water was:		a resung aw Down	R	ecovery
From	To	(Material and				1/ft <sup>3</sup> )	Clear and sa	ind free				Water Level
0	46 Bent	onik	grout		0.0	23	Other, speci		(min) Static	(m/ft)	(min)	(m/ft)
46	58 Sand				0.0	6	If pumping discon	tinued, give reason:	Level			
10	- U -and				0.0				1		1	
						2 2 2 2	Pump intake set	at (m/ft)	2		2	
George - 13		1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -	Stranger St.			N. Care	Pumping rate (I/r	nin / GPMI	3		3	
APRAL PROPERTY	hod of Construction			Well Us			i unping rate (in		4		4	and a life of
Cable To	Conventional) Diamond	Don		Comme Municipa		Not used Dewatering	Duration of pump	- -				
Rotary (F	Reverse) Driving	Live		Test Ho		Monitoring	hrs +	min	5		5	
Boring	Digging	Irrig		Cooling	& Air Conditio	oning	Final water level e	end of pumping (m/ft)	10	n i m Bellinger	10	
Other, sp		Oth	er, specify _				If flowing give rat	e (l/min / GPM)	15	-	15	
	Construction R					of Well			20		20	
Inside Diameter	Open Hole OR Material (Galvanized, Fibreglass,	Wall Thickness	Depth		Water S	supply ement Well	Recommended	oump depth (m/ft)	25		25	
(cm/in)	Concrete, Plastic, Steel)	(cm/in)	From	To	Test Ho	de	Recommended p	oump rate	30		30	
2	Plastic	5640	0	48	Rechar	~	(Vmin / GPM)					
						ation and/or	Well production	(Vmin / GPM)	40		40	
					Alteratio	ing Hole on	Disinfected?		50		50	
					- (Constr	· · ·	Yes No		60		60	
a a start a st	Construction R	ecord - Scree	en	-	Insuffici	ent Supply oned, Poor		Map of W	ell Loc	ation		
Outside	Material		Depth	(m/ft)	Water 0	Quality	Please provide a	map below following	instructi	ons on the b	ack.	
Diameter (cm/in)	(Plastic, Galvanized, Steel)	Slot No.	From	То	Abando specify	oned, other,						
2	Plastic	10	48	5B								
		.0		0	Other, :	specify			$\sim$	>		
	Water De	taile		H	lole Diame	tor		PRASE ?	SEK	_	- 0	$\frown$
Water four	nd at Depth Kind of Wate		Untested	Dep	th ( <i>m/ft</i> )	Diameter	`	PROS	h	d	$\mathcal{M}$	p.
	n/ft)GasOther, spe			From	To	(cm/in)		atte	C	0		
	nd at Depth Kind of Wate		Untested	$\mathcal{O}$	58	8		On				
	n/ft) Gas Other, spe nd at Depth Kind of Wate		Untested									
	n/ft) Gas Other, spe		enteetee									
The second	Well Contracto	-	Technicia			151.144	i					
	ame of Well Contractor				ell Contractor's		11					
Aardu	ark Drilling I	<b>h</b> (		6	unicipality	38	Comments:					
	ddress (Street Number/Na	ine)			VIInato	2	Continionto.					
Province	C lewis Rd Postal Code	Business	E-mail Add		900							
ON	NIHIE						Well owner's D information	ate Package Deliver	ed		try Us	e Only
	one No. (inc. area code) Na	ame of Well T	echnician (L	.ast Name,	First Name)		package	YYYMM		Audit No.	095	5991
Well Technic	S 2 6 9 5 9 0 sian's Licence No. Signature	of Technicia	and/or Co	ntractor Da	te Submitted		Yes D	ate Work Completed				
50	59°N	Enl	1/		0090	7070	□ No	200906	93	Received	11	4 2009
0506E (12/20	(0.7)				Miniet	n'e Con	1			C Queen's	Printer f	or Ontario, 2007



Ministry of the Environment Measurements recorded in:	Well Tag No. (Place Sticker and NO tag Recovered.		Well Record on 903 Ontario Water Resources Act Page_/ of _/
Well Owner's Information         First Name       Last Name / Organization         Byooks Read En       Byooks Read En         Mailing Address (Street Number/Name)       160 Brooks Rd. R.R. #5         Well Location       Well Location		E-mail Address 1386 Ontario Limitea Province Postal Cod ON NOA   1	
Address of Well Location (Street Number/Name) <u>IGO Brooks Ad</u> . County/District/Municipality UTM Coordinates Zone Easting Northing NAD 8 3 1 7 5 9 9 5 4 5 7 4 7 5 8	Township City/Town/Village Coryuga Municipal Plan and Sublot	Number	Concession       Province     Postal Code       Ontario                     Other
NAD       8       3       1       7       5       4       5       1       7       5       8         Overburden and Bedrock Materials/Abandonment Se       General Colour       Most Common Material       Most Common Material		ack of this form) General Descriptio Bentonite Great	n Depth (m/ft) From To IGm Om
Annular Space       Depth Set at (m/ft)       From     To       (Material and Type)	(m³/ft³)	Results of W         After test of well yield, water was:         Clear and sand free         Other, specify         Other, specify         f pumping discontinued, give reason:	ell Yield Testing Time Water Level Time Water Level (min) (m/tt) (min) (m/tt) Static Level 1 1 1
Method of Construction         Cable Tool       Diamond         Cable Tool       Diamond         Rotary (Conventional)       Jetting         Rotary (Reverse)       Driving         Boring       Digging         Air percussion       Industrial	Well Use     F       Commercial     Not used       Municipal     Dewatering       Test Hole     Monitoring       Cooling & Air Conditioning     F	Pump intake set at ( <i>m/ft</i> ) Pumping rate ( <i>llmin I GPM</i> ) Duration of pumpinghrs +min Final water level end of pumping ( <i>m/ft</i> )	2     2       3     3       4     4       5     5       10     10
Construction Record - Casing	Status of Well         h (m/ft)       Water Supply         To       Replacement Well         To       Test Hole         Recharge Well       Dewatering Well         Observation and/or Monitoring Hole       V	f flowing give rate ( <i>IImin I GPM</i> ) Recommended pump depth ( <i>m/ft</i> ) Recommended pump rate <i>Imin I GPM</i> ) Nell production ( <i>IImin I GPM</i> ) Disinfected?	15       15         20       20         25       25         30       30         40       40         50       50
Diameter (cm/in)     (Plastic, Galvanized, Steel)     Slot No.     From	To Abandoned, other, specify Decement Synbrod	Yes No Map of W Please provide a map below following proper for figm 2/Um 40	
Water Details         Water found at Depth       Kind of Water:       Fresh       Untested         (m/ft)       Gas       Other, specify	From To (cm/in) / Gm 4/10. 2 //m 0 pm 9."	Brooks Kd	isperty line
Business Name of Well Contractor Pahi/k $Pri/ha$ $Inc$ . Business Address (Street Number/Name) (525 Northam Dr Province Postal Code WT $F$ $H$ $V$ $I$ $T$ $Z$ $J$ $a$ Sonce $PriBus. Telephone No. (inc. area code)Bus. Telephone No. (inc. area code)Signature of Technician and/or CoZ$ $Q$ $T$ $BS$ $J$ $V$	Well Contractor's Licence No. 7 2 1 5 Municipality Mr 551 552 chip G. File drilling - Chim ast Name/First Name)	Property       iomments:     Image: Communication ackage       /ell owner's formation ackage     Date Package Delivere       jelivered     Yes       Ives     Date Work Completed       No     Image: One of the second	

Ontario Ministry of the Environment	Well Tag No. (Place Sticker a	Desculatio	on 903 Ontario V		Record
Measurements recorded in: 🕅 Metric 🗌 Imperial	No Tag Recove	ired.	Pag	8	of
Well Owner's Information					
First Name Last Name / Organization	mental c/0 2270386	E-mail Address			Constructed
Mailing Address (Street Number/Name)	Municipality	Province Postal Code	e Telephor	ie No. (inc.	
Heo Brooks Rd. R.R.#5	Cayuga	ON NOAI	ED		
Well Location		Lot	Concess	ion	
Address of Well Location (Street Number/Name)	Township	LO	Concess		
County/District/Municipality	City/Town/Village		Province	Postal	Code
UTM Coordinates Zone , Easting , Northing	Cayuga Municipal Plan and Subl	of Number	Ontario Other		
UTM Coordinates Zone Easting Northing NAD 8 3 1 7 5 9 5 4 8 8 4 7 5 8 1					
Overburden and Bedrock Materials/Abandonment Sea		e back of this form)			
General Colour Most Common Material	Other Materials	General Descriptio	n	Dep From	th ( <i>mlft</i> ) To
		Bentonite G	raut	5mai	Om
		* * *	8		
			ALCONTROL V		
			10-11-11-11-11-11-11-11-11-11-11-11-11-1		
Annular Space		Results of W	ell Yield Testin	a	
Depth Set at ( <i>m/ft</i> ) Type of Sealant Used	Volume Placed	After test of well yield, water was:	Draw Down	Re	ecovery
From To (Material and Type)	(m³/ft³)	Clear and sand free	Time Water Le	vel  Time   ' ( <i>min</i> )	Water Level (m/ft)
		If pumping discontinued, give reason:	Static		
			1	1	
		Pump intake set at (m/ft)	2	2	
Method of Construction	Well Use	Pumping rate (Ilmin I GPM)	3	3	
	Commercial Not used Municipal Dewatering	Duration of pumping	4	4	
Rotary (Reverse)     Driving     Livestock	Test Hole Monitoring	hrs + min	5	5	
Boring     Digging     Irrigation       Air percussion     Industrial	Cooling & Air Conditioning	Final water level end of pumping (m/ft)	10	10	
Other, specify     Other, specify		If flowing give rate (I/min / GPM)	15	15	
Construction Record - Casing	Status of Well		20	20	
Inside Open Hole OR Material Wall Depth ( Diameter (Galvanized, Fibreglass, Thickness (cm/in) Concrete Placitic Steel) (cm/in) From	m/ft) Uater Supply To Replacement Well	Recommended pump depth (m/ft)	25	25	
(cm/in) Concrete, Plastic, Šteel) (cm/in) <sup>From</sup>	Test Hole	Recommended pump rate	30		
	Recharge Well     Dewatering Well	(Ilmin I GPM)		30	
	Observation and/or Monitoring Hole	Well production (Ilmin / GPM)	40	40	
	Alteration	Disinfected?	50	50	
	(Construction)	Yes No	60	60	
Construction Record - Screen	Insufficient Supply		ell Location		
Outside Material Depth (r Diameter (Plastic, Galvanized, Steel) Slot No. From	m/ft) Water Quality To X Abandoned, other,	Please provide a map below following	instructions on the	) back.	
(min) (Fissie, Gavernized, Geen) From	Decommissioned			1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	-
	Other, specify	55m			T
		- 209m - +			
Water Details. Water found at Depth Kind of Water: Fresh Untested	Hole Diameter Depth ( <i>m</i> / <i>ft</i> ) Diameter	$\sim$			
( <i>m/ft</i> ) Gas Other, specify	From To (cm/in)				
Water found at Depth Kind of Water: Fresh Untested		2			
( <i>mlft</i> ) Gas Other, specify Water found at Depth Kind of Water: Fresh Untested		2			
( <i>m/ft</i> ) Gas Other, specify		Bracks			
Well Contractor and Well Technician I	nformation	prope	ty bande		
Business Name of Well Contractor	Well Contractor's Licence No.		{	1	
Business Address (Street Number/Name)	7 2 1 5 Municipality	Comménts:	. 15		
6525 Northam Dr	Mississavage	A Decommissioned w	ell.		
Province Postal Code Business E-mail Address		<u></u> ν	of to scale	2	
ONT 44 VIJJ2 Mikee profile	arilling.com	Well owner's Date Package Delivered	and an international particular part	stry Use (	Only
Bus. Telephone No. ( <i>inc. area code</i> ) Name of Well Technician (Las 411665064444 Slocki, K	Name, First Name)	package     Y     Y     M       delivered     Y     Y     Y     M	D D Audit No.	070	<u></u>
Well Technician's Licence No. Signature of Technician and/or Contr	actor Date Submitted	Pate Work Completed		672	US
<b>3 7 6 7</b>	20130726	□ No 2013060	7 Receiping	344	2013
0506E (2007/12) © Queen's Printer for Ontario 2007	Ministry's Copy				

Onta	r O and Climate Change	II Tag No. (Place Sticker ar Tag#:A 235(	nd/or Print Below) <b>) 5 9</b>	Regulation	903 Ontario W	ater Res	-
Measurements r					Pag	<u> </u>	_ of
Well Owner's First Name	Information Last Name / Organization		E-mail Address				Constructed
Broom	3 Rd. ENVIRONMENT	TAL				by We	ell Owner
	Street Number/Name)	Municipality CAYUGA	Province	Postal Code			area code)
Vell Location	.ooks Rd.	CATUGH		NON	EUORD	102	7368
Address of Well L	ocation (Street Number/Name)	Township		Lot	Concessi	on	
	BROOKS Rd.				<u></u>	·····	
County/District/M	unicipality	City/Town/Village			Province Ontario	Postal MØV	
UTM Coordinates	Zone , Easting Northing	Municipal Plan and Sublo	t Number		Other		100
NAD   8   3		4					
	d Bedrock Materials/Abandonment Sealing	Record (see instructions on the Other Materials	1			Den	oth ( <i>m/<u>ft</u>)</i>
General Colour	Most Common Material			eral Description	771	From	
OKA9	SILT CIA	1 GRAER	UNT?	SINT T	nu	0	
<u>a</u> llow C	Nom						
			1			•	
			<u> </u>				
			1			,	
				***			
	Annular Space				ell Yield Testin	COMPACT OF	
Depth Set at ( <i>n</i> From ∣ T	n/ft) Type of Sealant Used fo (Material and Type)	Volume Placed (m³/ft³)	After test of well yield		Draw Down		ecovery Water Level
03	CONCRETE	1.0	Other, specify		(min) (m/ft)	(min)	(m/ft)
2 15	- BONTONITE GA		If pumping discontinu	ued, give reason:	Static Level		
<u> </u>	Berereree	<u>, , , , , , , , , , , , , , , , , , , </u>			1	1	
			Pump intake set at (/	m∕ft)	2	2	
			Pumping rate (Vmip)	EPA A	3	3	
Method o	ande de la constante en la constant de la constant	ell Use	The angle of the second		4	4	· · · · · · · · · · · · · · · · · · ·
Cable Tool	Lund Lund	ommercial 🔲 Not used Iunicipal 🗌 Dewatering	Duration of pumping		5	5	
Botary (Reverse Boring		est Hole	Final water level end	min of pumping (m/#			
Air percussion	🗌 Industrial	ooning a Air oonaniosiing		or barubing (unit	10	10	
Other, specify	Other, <i>specify</i>		If flowing give rate (1/	min / GPM)	15	15	
	Construction Record - Casing en Hole OR Material Wall Depth (m/fit)	Status of Well	Recommended pum	n denth (m/ft)	20	20	
Diameter (Gal	Ivanized Fibreolass Thickness	o Replacement Well			25	25	
2.0	RUC 540 0 1-		Recommended pum (I/min / GPM)	p rate	30	30	
<u></u>	100 010	Devetering Well	· · · · · · · · · · · · · · · · · · ·		40	40	
		Monitoring Hole	Well production (Vmir	1 / GPM)	50	50	
		Alteration (Construction)	Disinfected?		60	60	
		Abandoned, Insufficient Supply	Yes No		<u> </u>		21.000.000.000.000.000.000.000.000.000
Outside	Construction Record - Screen Material Depth (m/ft)	Abandoned, Poor Water Quality	Please provide a m		ell Location	n the back	<u>.</u>
Diamotor	Slot No.	Abandoned, other,			5		
	PUL 10 17 2	specify		51-1-	ATTA	146	Ð
2.2		Other, specify			ATTA M.		
			O	HORA	ų.		
Water found at D	Vepth Kind of Water: Fresh Untested	Hole Diameter Depth (m/ft) Diameter					
	Gas Uther, specify	rom To (cm/in)					
	epth Kind of Water: Fresh Untested	0 27 8"					
	Gas Other, <i>specify</i>						
	]Gas Other, <i>specify</i>						
	Well Contractor and Well Technician Info		2 2				
Business Name of NO W		Well Contractor's Licence No.	Not and the second s				
Business Address	S (Street Number/Name) CHANLES ST. WEST	Municipality	Comments:				
<u>133 ST.</u>	CHANLES ST. WEST	Breshn	via management				
Province	Postal Code Business E-mail Address		Well owner's Date	Package Deliver	ed I mare	istry Use	e Only
	. (inc. area code) Name of Well Technician (Last N	lame, First Name)	information		Audit No		
51989	36935 Nou 12	LOBENT	delivered Date	V Y Y M M Work Completed	DD	bara S	Not a not toge
Well Technician's Li	icence No. Signature of Technician and/or Contract		∐ Yes	,	S-26	⊃1420	118
0506E (2014/11)	- yer a wy	2018083P Ministry's Copy		1806		and a fear first and the fear	or Ontario, 2014
•	/	manar à a marth					'



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C-6370 Z-293405 SEP 1 4 2018

Gougle Maps 160 Brooks Rd

Ontario	/		g No. (Place Sticker an Tag#:A235	-	Regulation	903 Ontario	Well Ro	ources Act
Measurements record				058		P	'age	of <u>2</u>
Well Owner's Info	· · · · · · · · · · · · · · · · · · ·	janization		E-mail Address			Well C	onstructed
BROOK	SRA EVUI Mumber/Name)	ronmon	TAL		Destal Osda	1	1 -	Il Owner
Mailing Address (Stree 160 Broc	et Number/Name)		CAUCA-	Province	Postal Code		one No. (inc. 6 8 40 Z-	
Well Location	<u>in sing</u> .		<u></u>					
	on (Street Number/Name)		Township		Lot	Conce	ssion	
County/District/Municip			City/Town/Village			Province	Postal	
	· · · · · · · · · · · · · · · · · · ·		CAYUGA	······		Ontario	NOP	AIED
UTM Coordinates Zon NAD 8 3 1	159541945		Municipal Plan and Sublo	t Number		Other		
1 . J . L	drock Materials/Abandon		ord (see instructions on the	e back of this form)				
General Colour	Most Common Material	0	ther Materials	Gene	eral Description		Depti From	h ( <i>m/ft</i> ) To
GRAY	SINT	Char	GAMEN	-	WT TIL	L	0	56'
GRAY	SILT			516	T		56'	62.5
	· · · · · · · · · · · · · · · · · · ·							
		· · · · ·					·····	
	a na na na ana ana ana ana ana ana ana							
			*****					
	Annular S	pace			Results of We	ell Yield Test	ting	
Depth Set at ( <i>m/ft)</i> From   To	Type of Seala (Material and		Volume Placed (m <sup>3</sup> /ft <sup>3</sup> )	After test of well yield		Draw Do Time Water		covery Water Level
	· · · · · · · · · · · · · · · · · · ·	31 /	1,0	Other, specify_		(min) (m	v/ft) (min)	(m/ft)
3 47'	Conca. Bentinito	- C 1 2 1-	_	If pumping discontinu	ed, give reason:	Static Level		
-5 77	BRIONITO	6/201	13.0			1	1	
				Pump intake set at (n	VTE) X / A	2	2	
				Pumping rate (Vmin / (	/ /A	- 3	3	
Method of Co		Well U			Grwy Ł	4	4	
Cable Tool Rotary (Conventional	Diamond Diamond Public	-	Lunn .	Duration of pumping		5	5	
Rotary (Reverse)	Driving Lives		ole Monitoring g & Air Conditioning	hrs + Final water level end	min of numping (m/#)			
Air percussion	🗌 Indus	trial	g a Air Obhalashing		or bambing (www		10	
Other, specify		; specify	Status of Well	If flowing give rate (I/n	nin / GPM)	15	15	
Inside Open Ho	Instruction Record - Casir	Depth ( <i>m/ft</i> )	Water Supply	Recommended pump	o depih <i>(m/ft</i> )	20	20	
Diameter (Galvaniz (cm/in) Concrete	ed, Fibreglass, Thickness , Plastic, Steel) <i>(cm/in)</i>	From To	Replacement Well	Ξ	,	25	25	
20 0	16 540	0 52.5	Recharge Well	Recommended pump (I/min / GPM)	o rate	30	30	
			Dewatering Well     Observation and/or	Well production (Vmin		40	40	
·			Monitoring Hole	Weil production (Prim	/ Grwj	50	50	
			(Construction)	Disinfected?		60	60	
	onstruction Record - Scree		Abandoned, Insufficient Supply		Man of W	ell Location		
Outside	Aataria)	Depth ( <i>m/ft</i> )	Abandoned, Poor Water Quality	Please provide a ma				•
Diameter (cm/in) (Plastic, Ga	alvanized, Steel) Slot No.	From To	Abandoned, other,		-			
2.2 Pú	16 10 9	52.5 62.5		S	CE M	ATT	Alty	9
			Other, specify		лль			
<u>_</u>	Water Details		Hole Diameter		100	1-2		
-	Kind of Water: Fresh	Untested De From	pth ( <i>m/ft</i> ) Diameter To ( <i>cm/in</i> )					
<u>56</u> (m/ft) ⊡Gas Water found at Depth	ind of Water:	~ ~	62.5 8"					
(m/ft) 🔲 Gas	Other, specify							
	Kind of Water: Fresh	Untested						
***	Vell Contractor and Well T							
Business Name of We	I Contractor	۷	Vell Contractor's Licence No.					
NOU DAI	WING MC	-	6370					
Business Address (Str 273 St. CM	reet Number/Name) 1.4NLCS 5T. W	GT N	lunicipality BUCSHAU	Comments:				
Province F	Postal Code Business E	E-mail Address						
	10 131 100	halaize (I - 1 - 1		information	Package Deliver	ed Audit	Ministry Use	Only
Bus. Telephone No. (inc.	í	chnician (Last Name	e, First Name) 36707	package   y   y   delivered   y   y		DD	-63.	5404
Well Technician's Licence	No. Signature of Technician	and/or Contractor D	ate Submitted		Work Completed		SEP 14	2018
0506E (2014/11)	- jor 4.1		20184839	20	18 06		ved tueen's Printer for	Ontorio 2014
	/	/	Ministry's Copy			ωQ	USEN S FINILER TOP	- Unanu, 2014



SEP 1 4 2018

UTM $1/7$ Z $51913181617^{E}$ $5 R 41751648484^{N}$ Ontario Water Resource Elev. $5 R 0.6130$ WATER WELL Basin 23 Con Lot Da	L RECC	Act DRD own a city (day	WATER RESC DIVISIO 20EC Nº ONTARIO RESOURCES CO	196 196	) ( a.
	ress Coy	juga O	or off	ul.	····•
Casing and Screen Record		Pumping	Test		
Inside diameter of casing 5 in . Total length of casing 40 ft. Type of screen Length of screen Depth to top of screen Diameter of finished hole 5 in .	Static level Test-pumping ra Pumping level Duration of test p Water clear or cle Recommended p with pump settin	te oumping oudy at end of t oumping rate	9 ft. j.hr. est cle	G.P.	м.
Well Log			Г <sup>*</sup>	r Record	
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of wate (fresh, salty sulphur)	
blue clay. blue clay of chirty gravet. gray lime	0 12 30 38	12 30 #038 41	414	fresh.	
For what purpose(s) is the water to be used? household. Is well on upland, in valley, or on hillside? uppload. Drilling or Boring Firm James Wickeld-	In diagra road and	Location m below show lot line. Ind	of Well distances of we icate north by	ell from arrow	 • • •
Address. Caledonia Ont. Address. Caledonia Ont. Licence Number 1235 Name of Driller or Borer Jones Wickell- Address Box B13 Caledonia Date Oct 21 18614 (Signifure of Licensed Drilling or Boring Contractor)	N/LA 200		<del>L. L.L</del>	· Krond .	ture -
Form 7 15M-60-4138			CSS.S8		-
OWRC COPY	OB DEIA	1 #		۱	

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	30L 13W The W partment of M	ONTARIO Cell Drillers A lines, Province	GEOL DEPAR	L 1 1951	20 N?	282
	ter V		Rec			
Hal.	dimant	· · · · · · · · · · · · · · · · · · ·	-	or City	h Cayu	ya
		and the	r Eity) S.a.	inga		
Date Completed. (day) (month)	(year)	Well (excludin	ig pump)	···· l···· f·· (b···		· · · · · · · · · ·
Pipe and Casing Record				Pumping Test		
Casing diameter (s)	el	Date Static level Pumping leve Pumping rate Duration of t	.030 15.0 19,00 est <b>1</b> .4	ft down gal HN		······································
Is well a gravel-wall type?				or bowls to ground	1 level	//
Autor		ater Record			777.3.6	No. of Feet
Kind (fresh or mineral). Multure Quality (hard, soft, contains iron, sulphur	etc)	· · · · <b>·</b> · · · · · · · · · · · · · ·		Depth(s)       to Water       Horizon(s)	Kind of Water	Water Rises
Appearance (clear, cloudy, coloured) For what purpose(s) is the water to be us	Clou	dy k			slephus	1:8 fr
How far is well from possible source of co What is the source of contamination? Enclose a copy of any mineral analysis th	<del></del>					
Well Lo					ation of Well	/
Overburden and Bedrock Recor	:d	From	To			
lala	¥	0 ft.	90	-	below show dista oad and lot lin	
	р		10		h by arrow.	1
a des						
					Px het	and the second
			-		a Via	
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			_	•		<b></b>
Situation: Is well on upland, in valley,		hill	sic	C .		
Situation: Is well on upland, in valley, Drilling Firm	or on nillsider.	pros				
Address.	· · · · · · · · · · · · · · · · · ·	6 · · · <i>A</i> · · · ·		·	· · · · · · · · · · · · · · · · · · ·	
Name of Driller, A.	aug.l.	IU .		sf.un	mill	BH
Date J. May	<i>O</i>		Licenc	e Number	w faid	
FORM		~	and the second sec	Signature	of Licensee	
			C	•		

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E 30113W UTA 11/2 51915161412 E RECEIVED No 19 R 4171516151719 N JAN DI ARIO Elev.  $|9| | \mathbb{R} |0| | 0| 3| 5|$ The Water-well Drillers Act, JSARTMENT OF MILES Basin 1 2 3 Department of Min ater-Well Record on loT County or dimind. Township, Village, Town or CHty Morth Czyuga 25 r Territorial District. in Village, Town or City)..... 55 (month) (day) (year) Pipe and Casing Record **Pumping Test** Casing diameter(s) ..... Static level ..... Pumping rate ..... Length(s) ..... Type of screen ..... Pumping level Length of screen ..... Duration of test ..... Well Log Water Record Depth(s) at which Kind of water From No. of feet То Overburden and Bedrock Record (fresh, salty, or sulphur) ft. ft. water(s) water rises found 2 lino 118 ス For what purpose(s) is the water to be used? Location of Well \*\*\*\* In diagram below show distances of well from Is water clear or cloudy? road and lot line. Indicate north by arrow. Is well on upland, in valley, or on hillside?..... Drilling firm E. H. R. C. Ker. V Som Name of Driller Manes Accher ..... Licence Number. I certify that the foregoing statements of fact are true. James A. Richer Signature of Licensee Date.....

E 301 13 M RECEIVED 0 UTM 117 2 5195161417 E JAN OT 1223 26 Nº 0 R 4171516151719 N GEOLINGINE REAMENT Elev. 9 R 0635 The Water-well Drillers Act, 1954 Basin 12141 **Department** of Mines Water-Well Record County or Territorial District // dim 21 dim Township, Village, Town or City n Village, Town or City)..... Address ..... (day) (month) (year) Pipe and Casing Record **Pumping Test** Casing diameter(s) ........ Static level ..... Length(s) ..... Pumping rate ..... Type of screen ..... Pumping level Duration of test Length of screen ..... Well Log Water Record Depth(s) Kind of water at which water (s) From No. of feet то Overburden and Bedrock Record (fresh, salty or sulphur) ft. ft. water rises found 32 O 3 Z 37 For what purpose(s) is the water to be used? Location of Well \_\_\_\_\_ In diagram below show distances of well from Is water clear or cloudy?..... road and lot line. Indicate north by arrow. Is well on upland, in valley, or on hillside?..... ..... Drilling firm E. A. Kicker Y Son ...... ..... Licence Number I certify that the foregoing statements of fact are true. James a. Ricken) Signature of Licensee Date.....

Form 5

F 301 13W Nº 3 RECEIVED UTM 117 2 51915161417 E 19 R 4171516151719 N JAN CA Elev. | 0 | R | 0 | 6 .3 .5 |GEOLOGICAL BRANCH The Water-well Drillers Act, 1952ARTMENT OF AU 28 **Department** of Mines Water-Well Record County or Territorial District. Haldin and Township, Village, Town or City n Village, Town or City)..... (month) (day) (year) Pipe and Casing Record **Pumping Test** Casing diameter (s) Length(s) 57'Pumping rate 200 G. P.H. Pumping level Type of screen ..... Length of screen ..... Duration of test ..... Well Log Water Record Depth(s) at which Kind of water From то No. of feet Overburden and Bedrock Record (fresh, salty, vater (s) ft. ft. water rises or sulphur) found Clay & sto 37 3  $\mathcal{S}$ ·owa / 37 95 3/ Fresh For what purpose(s) is the water to be used? Location of Well E . (77 In diagram below show distances of well from road and lot line. Indicate north by arrow. Is well on upland, in valley, or on hillside?..... up 13 a.d. Drilling firm F. R. Kecket & Som ······ I certify that the foregoing statements of fact are true. Signature of Licensee Date.....

E	13W	<u> </u>	100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100		Ŕ				
UTM 1/17 2 519151213	15 E	K		4		NO 920			
19 R 41715161511		K			26 N	Nº 289			
Elev. $ Q _{R}  O_{1}(0 40) $		ON	TARIO		RIGAL PRANCH MENT OF MULES	$\sim \sqrt{2}$			
		ter-well D		t, 1 <del>95</del> 4	na han sharan shiri a shirin a kasiya <del>Ma</del> na Ma <mark>nanana</mark> ka sa	- V			
Talkat AL AL -		)epartmen				<u> </u>			
Con. T	Nater	-We	ell E	Recor	d				
Lot 26 County or Territorial District	Fallins				Mart	Czyugz			
County of Territorial District.	/ <del>.</del> ./.9./././././././	. <i></i> 10W	nship, Villag	ze. Town or 6	lity				
			Address		ity)	S P (			
(day)	(month)	(year)		ľ	0				
Pipe and Casing	<i>v</i>				Pumping Test				
Casing diameter(s)			Statio 1	aval 5F	: /				
Casing diameter(s)	2		Pumpin	g rate	00 G. P.	<i>I</i> <b>f</b> .			
Type of screen			Pumpin	g level	5				
Length of screen			Duration	n of test					
Well Log				Water Record					
Overburden and Bedrock Record	Overburden and Bedrock Becord From To			Depth(s) at which	No. of feet	Kind of water			
	ft.	ft.		water(s) found	water rises	(fresh, salty, or sulphur)			
- Clay	0 32	37							
proun lime + shale	42	42		101	49'	Luch			
			·····						
For what purpose(s) is the water t	o be used?			T	ation of Well				
farm			In di		show distances of	well from			
Is water clear or cloudy?,					Indicate north				
Drilling firm <u>E. A. Rec</u>									
Address			1	• 4 •					
Name of Driller	Richer		1	<b>`</b>	9	· .			
Address			3.	, , , , , , , , , , , , , , , , , , , ,	323				
Licence Number	•••••••••••••••••••••••••••••••••••		A.	x Tomi	Ve -y				
I certify that the fo	pregoing	6 k Pl	)	Herry	2				
statements of fact a			С	١					
Date James a. R.	icher,								
0 Sigr	ature of Licensee	1							

UTM $1/17$ $519171/1816$ E $15 \times 14171516191010$ The Ontario Water Reso Elev. $157$ $601451$ WATER WELL Basin $1003$ $111111111111111111111111111111111111$	urces Comm L RI	ECC	Act <b>) R D</b> wm or City A	26 Not Driventes Commiss	CAYUGA 1966
Con / SOUTH Lot 2/ NORTH MALF D		```			year)
Contract Several Record			Pumping		
Casing and Screen Record	Static leve				
Inside diameter of casing 5"	Static leve	51 <i>i</i>	. 16		G.P.M.
Total length of casing $H3'-7''$	Test-pum	ping rat	te	Γ	
Type of screen					
Length of screen	Duration	of test p	umping 3	O MIN,	
Depth to top of screen	Water cle	ar or clc	oudy at end of	test CLEI	3 7 1 11 65
Diameter of finished hole 5''	Recomme	ended p	umping rate	UPTO	<b>2</b> O G.P.M.
Diameter of minimed note					w ground surface
Well Log	<u> </u>				Record
Overburden and Bedrock Record	Fr	om t.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
BROWN CLAY		0	20		
BREY "	2	0	41		
BROWIN LIME	H	·1	7 5	69	FRESH
For what purpose(s) is the water to be used?			Location	of Weil	
FAR MIs well on upland, in valley, or on hillside? $UPLAND$ Drilling or Boring Firm $J. IS. NAUMAN$ Address $FISHERVILLE$ ONT $ONT$ Licence Number $1072$ Name of Driller or Borer $J.R. NAUMAN$ Address $FISHERVILLE$ ONTDate $JUNE$ $IISMERVILLE$ $IISUERVILLE$ $IISMERVILLE$ $IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII$		A/ 0/	lot line. Ind	10'7	arrow. $Lo^{T}(9)   Lo^{T}(1)^{T}$ $STR^{-}$
OWRC COPY				C	SS. <b>S8</b>

Basin da l	o Water Reso	ELL F	nission Act, 1957 RECORI Village, Town or	City N · C	PET ANISTON		
		te com	pleted	month	year)		
Casing and Screen Record			Pun	nping Test	<u> </u>		
Inside diameter of casing $6^{\frac{1}{4}}$ Total length of casing $4^{11}$ Type of screen Length of screen Depth to top of screen Diameter of finished hole $6^{\frac{1}{4}}$			Static level $40^{'}$ Test-pumping rate $5^{'}$ Test-pumping rate $5^{'}$ Pumping level $40^{'}$ Duration of test pumping $1 HR$ Water clear or cloudy at end of test $CLEHR$ Recommended pumping rate $5^{'}$ G.P.M.with pumping level of				
Well Log			Wa	iter Record			
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)		
TOP SDIL BROWN CLAY LIMESTONE GREY		2 4/ 50	50		FRESH		
For what purpose(s) is the water to be used BARM Is well on upland, in valley, or on hillside? UPLAND Drilling Firm $CROSS$ $BRC$ Address $RYCKMANS$ C Licence Number Name of Driller $ARTHUR$ (Address $RYCKMANS$ CO Date $MARCH$ (Signature of Licensed Drilling Contractor)	S ORNER 2IPOSS IRNER 961	·· · · · · · · · · · · · · · · · · · ·	In diagram below	etion of Well $\lambda$ show distances of k. Indicate north $\lambda$ $\lambda$ $\lambda$ $\lambda$ $\lambda$ $\lambda$ $\lambda$ $\lambda$			
Form 5				C85.5	R		

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Basin 0	Water Resour R WE	LL R	ssion Act, 1957 ECORI	) <sub>City</sub> /	$\frac{9}{2}$		
		te compl	leted (day	month	year)		
Casing and Screen Record			Pun	nping Test			
Inside diameter of casing 6/4 Total length of casing 4/1 Type of screen Length of screen Depth to top of screen Diameter of finished hole 6/4			Static level $40^{\prime}$ Test-pumping rate $5^{\prime}$ Pumping level $40^{\prime}$ Duration of test pumping $14R$ .Water clear or cloudy at end of test $EIEAR$ Recommended pumping rate $5^{\prime}$ G.P.M. $40^{\prime}$				
Well Log	<u> </u>		ter Record				
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)		
TOP SOIL BROWN CLAY GREY LIMESTONE		2 41 50	5~0				
For what purpose(s) is the water to be used? BARM. Is well on upland, in valley, or on hillside? Drilling Firm CROSS BROSS. Address Ryckman Licence Number Name of Driller A. CROSS Address Date MAJ2 761 Address Date MAJ2 761 Address Date MAJ2 761 Address Date MAJ2 761 Address	<u>2</u> 25.		n diagram below				

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	AM WA		Ontario Water	Resources Act		RD	304/13	,t-
ONTARIO	1. PRINT ONLY IN	SPACES PROVIDED		260164		002		22 23 24
COUNTY OR DISTRICT	2. CHECK 🔀 CORI	RECT BOX WHERE APPLICABLE TOWNSHIP, BOROUGH,	CITY, TOWN, VILLAGE	3	3 CON., BLOCK, TR	ACT, SURVEY, ETC	c.	125 <sup>21</sup>
			CAYU H I	<i>QA</i>	NA	DA	TE COMPLETED	053 1 473
		1 <u>6</u>	A C	ELEVATION	RC. BASIN COL	DE	15, 1977	277
L 2601648	17 5957	05 4756	510 4	652	4 23 S (SEE INSTRUCT			
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER	MATERIALS		GENERAL DESCR		FROM	TO
		TOP	Soil				0	5
		BROWA	, ch	10 V			5	20.
		DIOUR						
		TBLUE	- cL	Ay			20	44.
		IME	510	NE			44	84.
		A 1141.						
31 000	5 02 00	20605 0	044305	0084 15				
			G & OPEN HOLE		SIZE(S) OF OP (SLOT NO.)	ENING 31	65 -33 DIAMETER 34-38	75 80 B LENGTH 39-40
WATER FOUND	KIND OF WATER	INSIDE DIAM. MATERI INCHES	WALL	DEPTH - FEET FROM TO		D TYPE	INCHES DEPTH TO TO OF SCREEN	)P 41-44 80
	FRESH 3 SULPHUR SALTY 4 MINERAL	14 19-11 1 STEEL	NIZED	0 44	<i>б</i> 1		& SEALING RE	
2 [	☐ FRESH <sup>3</sup> ☐ SULPHUR □ SALTY <sup>4</sup> ☐ MINERAL	17-18 1 CL STEEL	HOLE	0044	DEPTH SET AT			
2	FRESH 3 SULPHUR SALTY 4 MINERAL	3 CONCE	RETE	44	10-13	22-25		
2	FRESH 3 SULPHUR SALTY 4 MINERAL FRESH 3 SULPHUR	24-25 1 _ STEEL 2 _ GALVA	26 ANIZED	27-30	18-21 26-29	30-33 80		
2	SALTY 4 MINERAL				LOCA	ATION O	F WELL	556
71 PUMPING TEST M	2 BAILER 01	05 GPM 0.	3, 15-16,00 17- HOUR MI 1 2 PUMPING	NS IN DI	······································	OW DISTANCES	S OF WELL FROM ROA	AD AND
	PUMPING	ACTED 1 ALE VILLE	2 RECOVERY					100 1
₽0 <i>30</i>	EET 075 FEET 04 0	FEEDSO FEET DU	075		LL S			R L
IF FLOWING. GIVE RATE	GFM	FEET 1	CLEAR 2 CLOUE		est d	FT	q A LI	K /
StALL	OW DEEP SETTING	PUMP	8805 / "	175	FFT	Sout	LOF	Ch I
FINAL	54 1 WATER SUP	PLY 5 🗍 ABANDON	ED. INSUFFICIENT SUPPI ED. POOR QUALITY		3 H4	JY,	1ot	11
STATUS		7 UNFINISH		íonI	N	lot	25	5
	55-56 1 DOMESTIC 2 STOCK	5 COMMERCIAL 6 MUNICIPAL			4	20	400	U
WATER USE		L. COOLING OR	AIR CONDITIONING 9 🗌 NOT USED	444	×		WELLA	
	57 1 CABLE TOO	6	BORING DIAMOND		1 ~ 3		175	
METHO OF DRILLIN		REV <b>ERSE) 8</b>	JETTING DRIVING		Cont	7		
		SSIQ	LICENCE NUMBER	DRILLERS REM	58 CONT	TACTOR - 59-60 1618	2 DATE RECEIVED 7	<b>174</b> 68 8
HOLO ADDRESS	VEST 10	NSTABLE	1618	NO DATE OF 1	NSPECTION	INSPECTOR	1,	7
	RILLER OR BORER	PE MOT.						PKC
LN LN	Acm.						ەد چۈل	WI
Ch.	nest Const	ONMENT COPY	MO. Wes YR				•	FORM 7 07-0
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	WATE	ER W	ELL	. RE			2713	)t
	I. PRINT ONLY IN SPACES PROVID CHECK 🗵 CORRECT BOX WHEF			01651-		002		22 23 24
OUNTY OR DISTRICT		P. BOROUGH. CITY, TOWN	AYJYA	9 4	CON., BLOCK, TR.	rk.		022
		R #	1 0	AYU	19A		Y 30 MOM	273 yr. 73
2601651 17	290121		вс. <b>4</b>	638	4 23	JUN	15, 1977	277
·····		ERBURDEN AND	. <u> </u>	MATERIALS			DEPT	H - FEET
	ON MATERIAL	OTHER MATERIAL	s		GENERAL DESCR		FROM	<u> </u>
			,					
3.	Rown Co	LAY				<u></u>	5-	20
B	LUE CL.	A 4	<u> </u>				20	38.
<b></b>					• .		7	1.0
	LUE S	LALE			1		38	50
		,					P	*
					· /			
31 0005 02	0020605	003830		050317				
					54 SIZE (S) OF OPEN (SLOT NO.)	ING 31-33	65 DIAMETER 34-38	75 LENGTH 39-
41 WATER REG		MATERIAL THIC		H - FEET	A (SLOT NO.)	ТҮРЕ	INCHES DEPTH TO TO OF SCREEN	
2 SALTY	3 SULPHUR 14	1 STEEL 12 2 GALVANIZED	88 0	0030.	<u>ه</u>			FEET
15-18 1 G FRESH 2 SALTY 20-23 1 G FRESH		3 CONCRETE 4 OPEN HOLE 1 STEEL 19		20-23	DEPTH SET AT - F	FET		EMENT GROUT,
2 🗋 SALTY	4 ☐ MINERAL 3 ☐ SULPHUR 29	2 🗌 GALVANIZED 3 🗍 CONCRETE 4 TOOPEN HOLE	30	00 <b>50</b> 27-30	10-13	14-17		
2 🗌 SALTY 30-33 1 🗍 FRESH	4 MINERAL 3 SULPHUR 34 80	1    STEEL 26 2    GALVANIZED 3    CONCRETE		2//30	26-29	30-33 80		
2 SALTY	10 PUMPING RATE	4 OPEN HOLE	11	I	LOCA	TION OF	WELL 96	56
1 D PUMP 2 BAIL STATIC WATER LE LEVEL BUDO	F WATER LEVELS DURI	GPM. 03, 15-16 HOURS 1 → PUM NG 2 □ RECO	PING	IN DIAG LOT LI		V DISTANCES O ORTH BY ARROY	F WELL FROM ROAI	DAND
	22-24 15 MINUTES 30 MINUT 26-28	TS 45 MINUTES	60 MINUTES 35-37			$\searrow$		
OZD FEET 70	38-41 PUNP INTAKE SET AT	WATER AT END OF TE	ST 42		X		(7 _	
RECOMMENDED PUMP TYPE		FEET PUMP GODS	46-49		167 10	3 10+		т.,
50-53	GPM./FT. SPECIFIC CAPA	CITY			0	22	6 miles	~
	OBSERVATION WELL 6	] ABANDONED, INSUFFICI ] ABANDONED, POOR QUA ] UNFINISHED		Is	A A		е – <b>х</b>	$\langle \! \rangle$
55-56 1 0	DOMESTIC 5 CC	IMMERCIAL						_ \
WATER 3	IRRIGATION 7 7 PU	IBLIC SUPPLY OLING OR AIR CONDITION 9 D NOT USE		1 Con	S. WEA		400 Sout	
	OTHER       CABLE TOOL*	6 🔲 BORING		WE	16 40	0 -1	-	-
	ROTARY (CONVENTIONAL) ROTARY (REVERSE) ROTARY (ALR)	7 🗋 DIAMOND 8 🛄 JETTING 9 🔲 DRIVING					EA 81 Rd. #	
		LICENC			58 CONTRACT	OR 59-62	1 7 0 1 7 c	63-68
ADDRESS ADDRESS MOUNT	ST (SNS	STALLE IL	018	DATE OF INSPEC		INSPECTOR	<u> </u>	~
NAME OF DRILLER OR BO	HOPE MO	TEL O				1		PKP
SIGNATURE OF CONTRACT	Ponstable	SUBMISSION DATE	ac	OFFICE	/		CSS.S8	WI
Lunes (	THE ENVIRONM						the second s	FORM 7 07

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	۲Δ/۸/		<b>VEL</b>	L RE	ECO	RD	301	-113f
Ontario	1. PRINT ONLY IN SPACES	PROVIDED		260169		6,0,02		<u>Q,</u>
COUNTY OR DISTRICT	2. CHECK 🛛 CORRECT BO	WNSHIP, BOROUGH, CITY, T	~	3	9 CON., BLOCK. Worth.	TRACT. SURVEY, ETC		LOT 25.97
		RH	CAYU	yA.	A A		TE COMPLETED	DAVE ZA
		IG IG	, RC.		RC. BASIN C	ODE	15, 1977	1A
- 2601691 1	17 597112 LUG U	4757059 r ovenbunden /		652	4 23 S (SEE INSTRUC			
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATE	RIALS		GENERAL DESC	CRIPTION	FROM	H - FEET
	TOP Soil						0	5-
	BROWN	OLAY					5	30.
							30.	50
	BUUE	(LAY					20.	00.
· ·	GRAUEL						50	64.
	157 W C 1						64	86
	LIME	STON	E				01	
	az 1 0azo60	st     basa	205	0064 11	1 008	6 15		
						11,1,1,1		78 80
41 WATER		SIDE		ECORD	SIZE(S) OF OF (SLOT NO.)		3 DIAMETER 34-38	FEET
AT - FEET		AM. MATERIA CHES 10-11 1 STEEL 12	THICKNESS INCHES FRO	D 64		ND TYPE	DEPTH TO TO OF SCREEN	FEET
15-18 1 🗆 FF	RESH 3 D SULPHUR 19	2 GALVANIZED 3 CONCRETE 4 OPEN HOLE		0064	61 DEPTH SET AT	CEST		EMENT GROUT
2 🗆 SA	RESH 3 SULPHUR 24 ALTY 4 MINERAL	CONCRETE		0086	FROM 10-13	TO MATE 14-17	ERIAL AND TYPE LEAD	PACKER, ETC.)
2 🗆 S/	ALTY 4 MINERAL	4 20 OPEN HOLE 24-25 1 🗋 STEEL 26 2 🗌 GALVANIZED		27-30	18-21	22-25		
30-33 1 [] FF 2 [] S/	RESH 3 🗍 SULPHUR 34 00 Alty 4 🗌 Mineral	S CONCRETE						(* - <b>4</b>
71 PUMPING TEST METHOD	BAILER DOID	and the second	17-18 MINS	IN DIA			WELL 97	
STATIC LEVEL US		S DURING 2	PUMPING RECOVERY 60 MINUTES 34 35-37	LOT L	INE. INDICATE	ILE	EASTO OF #	F #28
+ 0 + 0 D	70 FEET 0.50 FEET 0. 38-41 PUMP INTAKE SET AT		EET 070 .FEET	100	FT	North	oF Ħ	3Hwy
S IF FLOWING. GIVE RATE RECOMMENDED PUMP T	GPM YPE RECOMMENDED	FEET 1 CLEAR	2 🗌 CLOUDY 45-49					
€	DEEP SETTING 08		<b>0/0</b> . дрм.	TA	EdwAR STAT	ds		
FINAL	1 WATER SUPPLY 2 DESERVATION WELL	<ul> <li>g ABANDONED, INSU</li> <li>g ABANDONED, POOR</li> </ul>			STAT	1014		)e
STATUS OF WELL	I D TEST HOLE	7 🗍 UNFINISHED		h			1	ر. لد
WATER	2 DI STOCK 3 DIRRIGATION 25 7	COMMERCIAL MUNICIPAL PUBLIC SUPPLY		R T				3
USE <b>O</b> I	O OTHER				-WELL	֥	······································	7
METHOD OF	1 CABLE TOOL 2 CROTARY (CONVENTION 3 ROTARY (REVERSE)	6 🗌 BORING AL) 7 🗍 DIAMOND 8 🗍 JETTING		#3	3 Hay	•71	nices	• 2
DRILLING	4 C ROTARY (AIR) 5 AIR PERCUSSION	9 🗍 DRIVING		DRILLERS REMAR				
ADDRESS		STALLE	ICENCE NUMBER	DATA SOURCE DATE OF INSP	SE CONTRA		2 5 1 0	74
10 Der	371 CA	UN 9A	PD.	ы S		INSPECTOR	7/	
NAME OF DRILLER	OR BORER	SUBMISSION DATE	ICENCE NUMBER				1	P KD
SIGNATURE OF CO	L Anstall		MAY YR.74	U U			C\$\$.\$8	WI FORM 7 07-09
MINISTRY	OF THE ENVIRO	ONMENT COP	Y		·····			

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Ont		ironment	SPACES PROVIDED		26021	• • • • • • • •	
COUN	TY OR DISTRICT	2. CHECK 🛛 COR	TOWNSHIP, BOROUGH.	CITY, TOWN, VILLAGE		CON. BLOCK TRACT. SURVEY.	15 22 23 24
	1 dina.	0 M d		Cayuga Box 3B2	Caulue		DATE COMPLETED 41-53 DAY 18 NO 7 YR 85
			NG NG		ELEVATION	RC BASIN CODE	
			OG OF OVERBURD			S (SEE INSTRUCTIONS)	
GEN	ERAL COLOUR	MOST COMMON MATERIAL	1	MATERIALS		GENERAL DESCRIPTION	DEPTH · FEET FROM TO
		TOPSOIL					<u> </u>
			, ,				3 18
₿	ROWN	CLAY					
B	LISE	CLAV					18 47
							114 1 1
C.	rey_	LIME BOCK	, 				4760
			,				
31		<u> </u>					
32							55 75 80 31-33 DIAMETER 34-38 LENGTH 39-40
41 WA1	TER FOUND		51 CASING		RECORD	Z (SLOT NO )	INCHES FEET
F		FRESH (3 ] SULPHUR 14	INCHES		om to	MATERIAL AND TYPE	DEPTH TO TOP 41-44 30 OF SCREEN FEET
F	15-10 1	☐ FRESH <sup>3</sup> ☐ SULPHUR <sup>19</sup> □ SALTY <sup>4</sup> ☐ MINERAL	6 7 2 ☐ GALVANI 1 □ CONCRET 4 □ OPEN HO			DEPTH SET AT - EFET	S & SEALING RECORD
	2	□ FRESH <sup>3</sup> □ SULPHUR <sup>24</sup> □ SALTY <sup>4</sup> □ MINERAL	17-18   ] STEEL 2 ] GALVANI 3 ] CONCRET	ZED	20-23	FROM TO M	ATERIAL AND TYPE LEAD PACKER, ETC.)
	2	FRESH 3 SULPHUR 29		26	27-30	18-21 22-25	
	30-33 I , 2	<ul> <li>Å FRESH 3 □ SULPHUR</li> <li>SALTY 4 □ MINERAL</li> </ul>	3 CONCRET 4 OPEN HC	re		26-29 30-33 40	
71	PUMPING TEST M	ETHOD 10 PUMPING R	ATE II-14 DURATION	OF PUMPING 15-16 17-18 HOURS		LOCATION O	
E	STATIC LEVEL	PUMPING	LEVELS DURING	PUMPING C RECOVERY		GRAM BELOW SHOW DISTANCE	
G' TEST	1-4	ET 5 7 FEET -"	FEET FEET	32-34 35 57 FEET FEET	- L	38.0m	
PUMPING	IF FLOWING, GIVE RATE	38-41 PUMP (NTA) GPM	FEET 1 🔀	LEAR 2 CLOUDY	Ę		3 m
	પ્ ⊟ SHALLO	PUMP	DED 43-45 RECOMME FEET RATE		18 V.	1	* 150m
	10-91	34 1 WATER SUPPLY	ABANDONED.	INSUFFICIENT SUPPLY		DE	
	FINAL STATUS OF WELL	2 OBSERVATION W 3 TEST HOLE	VELL 6 🗋 ABANDONED. 7 🗋 UNFINISHED				
		SS-SE I DOMESTIC	S COMMERCIAL	<b>1</b>			$\sim$
	WATER USE	3   IRRIGATION 4   INDUSTRIAL   OTHER	7 D PUBLIC SUPPLY COOLING OR AIR 9	CONDITIONING	ECUI		A
-		57 1 🗙 CABLE TOOL	• 🗌 BOR	ING	1 2 2 2 3 1	ST ST	
	METHOD OF DRILLING	3 🗍 ROTARY (REVER	RSE) 🖡 🗍 JETT 9 🗍 DRIV	TIN'S S	J I	·	#3HWY
		S AIR PERCUSSIO	N	LICENCE NUMBER	DATA	58 CONTRACTOR 59-62	DATE REPET OF Q'3/10
ACTOR	1	in Va	re-C	2805	NO GATE OF INSPE	2805	010000
100		LLER OR BORER	and t	LICENCE NUMBER			man An
CONTI	SIGNATURE OF		SUBMISSION D	TE Man D 81	OFFICE		
M	INISTRY (	Un AM	MENT COPY	NO. YR. YR.			FORM NO. 0506-4-77 FORM 7
IV						a a se service en service se service se se se service se	~ · · · · · · · ·

Ministry			o Water Resources	
of the Environment	WAT			RECORD
		2602 <b>340</b>	126002	
COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE		10 14 ON . BLOCK, TRACT, SURVEY ET	<u> </u>
HALA NOPEAL	Nogth CAYI	rca	<b>A</b>	ATE COMPLETED 40-53
	20 R.R.*	1 NORTH	CIIIMUII	$\frac{30}{11} \times 11$
1 Z W 10 18				
	OG OF OVERBURDEN AND BEDRO		EE INSTRUCTIONS)	DEPTH - FEET
GENERAL COLOUR MOST COMNON MATERIAL	OTHER MATERIALS	GEI	NERAL DESCRIPTION	FROM TO
BROWN	CLAY			0 39
11	BROWN LIME			39 61
GREY	BROWN LIME & SHAN	LE		61 75
	<u>}</u>			
			<del>╷╷╷╷╷╷╷╷╷</del> ┊	╛└ <u>╷╷╷╎</u> ┊╷╎╷╿╷╿╵╽
41 WATER RECORD	51 CASING & OPEN HOLE I		SIZE(\$) OF OPENING 31-1 (SLOT NO )	
WATER FOUND AT - FEET KIND OF WATER	INSIDE WATERIAL HICKNESS	DEPTH - FEET	MATERIAL AND TYPE	INCHES         FEET           DEPTH TO TOP         41-44         30
10-13 1 0 FRESH 3 USULPHUR 2 SALTY 6 MINERALS 6 GAS	10-11 1 Detreel 2 D GALVANIZED	13-16 0		OF SCREEN
15-18 1 FRESH 3 SULPHUR 19 2 SALTY 6 GAS	D2 3□ CONCRETE 4□ OPEN HOLE 5□ PLASTIC			SEALING RECORD
20-23 1FRESH 3SULPHUR 24 2SALTY 6GAS	17-18 1 GSTEEL 2 GALVANIZED 3 GONCRETE	· · · · · · · · · · · · · · · · · · ·	ROM 10	RIAL AND TYPE ICEMENT GROUT LEAD PACKER, ETC )
25-24 1 FRESH 3 SULPHUR 29 4 MINERALS	4 D € PEN HOLE     5 □ PLASTIC     24-23     1 □ STEEL     26	27-30	D <sup>11</sup> 40 64	OUTED WITH
30-33 1 FRESH 3 SULPHUR 34	C GALVANIZED 3 G CONCRETE 4 □ OPEN HOLE		26-29 30-33 80	CLAY
2 SALTY 6 GAS	5 - PLASTIC	JJJ 	LOCATION OF	WELL
71 1 PUMP 2 BAILER	GPM         15-16         17-18           HOURS         HOURS         MINS		BELOW SHOW DISTANCES O	F WELL FROM ROAD AND
LEVEL PUMPING	LEVELS DURING         2         RECOVERY           S         30 MINUTES         45 MINUTES         60 MINUTES		INDICATE NORTH BY ARRO	w.
IF JO JO HS	48 <sup>10-30</sup> 53 <sup>10-30</sup> 58 <sup>30-37</sup>		HWAY #3	
IF FLOWING JA-41 PUMP INTAK GIVE RATE GPM GPM RECOMMENDED PUMP TYPE RECOMMENDED PUMP TYPE PUMP	E SET AT WATER AT END OF TEST 42		<b>1</b> 2	-07 23
RECOMMENDED PUNP TYPE RECOMMEND PUMP SHALLOW CM DEEP SETTING			140'	
\$0.53		1	<i>[1]</i>	
FINAL 2 OBSERVATION W STATUS	<ul> <li>B ABANDONED, INSUFFICIENT SUPPLY</li> <li>C ABANDONED POOR QUALITY</li> </ul>		Но	USE
	7 UNFINISHED 9 D DEWATERING	<u>ک</u>	50	,
SS-36 I DM ESTIC 2 □ STOCK WATER 3 □ IRRIGATION	S COMMERCIAL G MUNICIPAL 7 D PUBLIC SUPPLY	NOKTH	_	
	COOLING OR AIR CONDITIONING     Survey      Interview	2		
57 1 CABLE TOOL	• 🗌 BORING			
METHOD 2 ROTARY (CONVE OF 3 ROTARY (REVER CONSTRUCTION 4 DF ROTARY (AIR)				38982
		DRILLERS REMARKS		
ELGIN MITCHEL	ESONS WELL CONTRACTOR'S LICENCE NUMBER	DATA SOURCE O DATE OF INSPECTION	3604	OCT 2 4 1989
ADDRESS RR #5 Sime		DATE OF INSPECTION	INSPECTOR	
ROGER, MITCH	JELL TOURS		I	
ROGER MITCH BOGER MITCH	SUBMISSION DATE	OFFICE		CSS.ES
				FORM NO. 0506 (11/86) FORM 9

	istry	•				Vater Resource		¥2 <sup>21</sup>	
of the Env	ne ironment		WA	TER	WE		<b>RE</b>	50	RD
Ontario	I. PRINT ONLY IN	SPACES PROVIDED	F [1]	26023	84	26002		N	
COUNTY OR DISTRICT		TOWNSHIP. BOROUGH.		GE		- North	ETC		20
		- /	152	Macdone	Pue	Miss	DATE COMPLET		+"90
		41NG		RC. ELEVATION		7958515540	a' I		
		OG OF OVERBURD		ROCK MATERIA	LS (SEE IN	31			47
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER	MATERIALS		GENERA	L DESCRIPTION		DEPTH FROM	· FEET
Br	Clay							0	30 56
Grey	Clay	D. A.	lun atra					<u>-30</u> 56	57
Grey	Grenevel 4	Broken 1	-Imes Im					<u> </u>	
								·	
							·.		
					_				
31								<u>       </u> 	
1 Z 10		51 CASING	& OPEN HO			4 • OF OPENING 3 NO }	65 1-33 DIAMETER	34-38	75 80
WATER FOUND AT - FEET	KIND OF WATER	INSIDE DIAM MATERIAL INCHES	WALL THICKNESS INCHES	DEPTH - FEET FROM TO		RIAL AND TYPE	DE	INCHES PTH TO TOP SCREEN	FEET 41-44 30
56 24	ARESH 3 SULPHUR SALTY 4 MINERALS 6 GAS	6 19:11 1 DOTEEL 2 GALVANIZI 3 CONCRETE	12 188	0 56	S				FEET
2	Image: Salty 6       Gas	4 DOPEN HOL DPLASTIC	.E 19	56 57	61		ATERIAL AND TY	CEM	ENT GROUT
2	□ FRESH 3 □ SULPHUR 24 4 □ MINERALS 5 ALTY 6 □ GAS 78	2 GALVANIZ 3 GONCRETE 4 GOPEN HOL 5 PLASTIC	E		FROM 10-	10			ACKER. EIC /
2	□ FRESH 3 □ SULPHUR 29 4 □ MINERALS 5 ALTY 6 □ GAS	24-25 1 STEEL 2 GALVANIZ	26 ED	27-30	18-				
	☐ FRESH 3 □SULPHUR 34 4 □MINERALS □ SALTY 6 □GAS	0 3 □ CONCRETI 4 □ OPEN HOL 5 □ PLASTIC	E		26-:	29 30-33 80			
71 PUMPING TEST M	1 - 1	TE 11-14 DURATION	15-16 1	7-18 MINS	L	OCATION O	FWELL		
STATIC	WATER LEVEL 25 END OF WATER PUMPING	LEVELS DURING	PUMPING	IN DI		OW SHOW DISTANCES		OM ROAD	AND
151 42 "	45 45		(-32-34 41)	ES			$\pi T$		
U FELOWING GIVE RATE	38-41 PUMP INTAKI	E SET AT WATER AT	LEAR 2 CLOU	" We/	<u>/</u>			#	6 11
	A PUMP	ED 43-45 RECOMME PUMPING	NDED 4					-	~
0-53	DW DEEP SETTING	John FEET RATE		450'		1 the	•		
FINAL	34 SWATER SUPPLY 2 OBSERVATION W	ELL 6 🗌 ABANDONED	INSUFFICIENT SUPP	····		//	Yyyy A		
OF WELL		7 UNFINISHED	· . 	- K	4/10 >	1	4.	MAY .	N
WATER	SS-S6 1 DOMESTIC 2 STOCK 3 IRRIGATION	S 🗌 COMMERCIAL S 🗋 MUNICIPAL 7 🔲 PUBLIC SUPPLY		I stan	nile		"3		マ
USE	4 DINDUSTRIAL	COOLING OR AIR	CONDITIONING NOT USED			~ Wind	ecker		
METHOD	57 CABLE TOOL	6 🗍 80R NTIONAL) 7 🗍 DIAN				1 Wind	Rena	2	
OF	3 C ROTARY (REVERS	SE) 8 🗍 JETT 9 🗍 DRIV	ring 'Ing	e de la companya de la				58	3110
NAME OF WEL			WELL CONTRACT			ONTRACTOR 59-62	ATE RECEIVED		63-68 80
ADDRESS	Walles		SUP	SOURCE	ECTION	5417	0CT 1	8 195	
HACT RACT	#2 Strey	Creek	WELL TECHNICH						
A SIGNATURE OF	DE TECHNICIAN / CONTRACTOR	SUBMISSION D	LICENCE NUMBE		ŧ				70
	mg 1 M	alle DAY	YR	- OF				CSS	
MINISTRY	Y OF THE ENVIRON	MENT COPY					FORM	л NU. 0506	(11/86) FORM 9

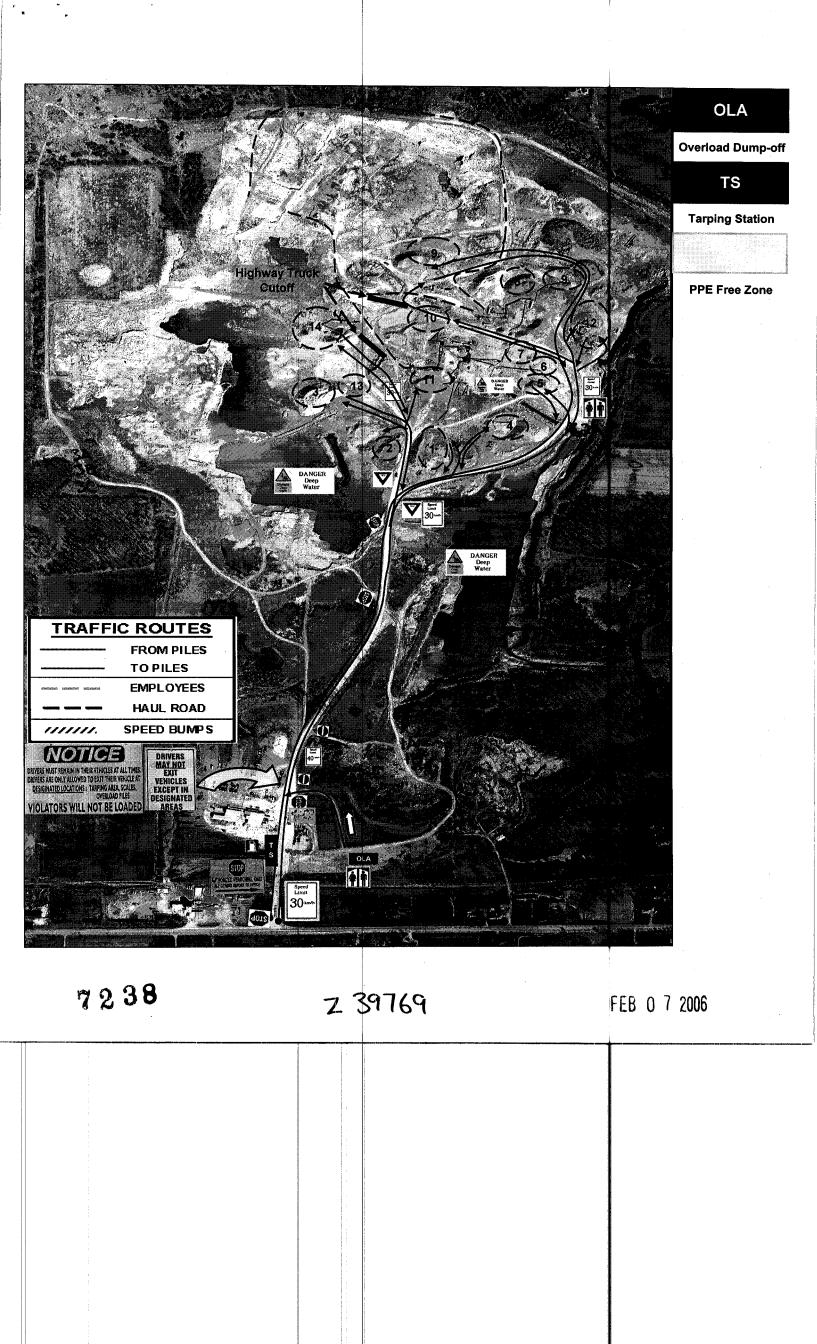
Ministry of Environment and Energy		Th	e Ontario Water Resources Act WATER WELL RECORD
Print only in spaces provided. Mark correct box with a checkmark, where app HALDIMAND	blicable.	2602550	Municipality 26.002 10 14 Con. T.R. S. 1 01 15 22 23 24
County or District	Address		Con block tract survey, etc. Lot $25^{2027}$ $T T R S$ $25^{2027}$ Date 19 6 98
21	Northing	Reference in the second	day month year
		DROCK MATERIALS (see instru	Denth - feet
General colour Most common material	Other materials	Gene	rai description From To
BLACK TOPSOIL BROWN CLAY			0 2 2 15
BLUE CLAY	GRAVIEL	· · ·	15 38
BROWN BROKEN LIM			38 43
BROWN LIMIESTONIE			43 126
31			
10 14 15 21 41 WATER RECORD 51			55
at - feet Kind of water dia inc	m Material thickness hes inches	From To Materia	al and type Depth at top of screen 30
	$\begin{array}{c c} 10-11 & \textbf{J} & \text{Steel} & 12 \\ \hline & 2 & \Box & \text{Galvanized} \\ 3 & \Box & \text{Concrete} \\ 4 & \Box & \text{Open hole} \end{array} \xrightarrow{2} 444$	0 43 S	di-44 feet
2 Galty 6 Gas	4 □ Open hole     5 □ Plastic	61	PLUGGING & SEALING RECORD
20-23 ) □ Fresh 3 □ Sulphur 24 4 □ Minerals 2 □ Saity 6 □ Gas ,	Galvanized     Galvanized     Goncrete     Goncrete     Gonchole	Depth set a	
25-28         1         Fresh         3         Sulphur         29           2         I         Salty         4         Minerals           5         I         Gas	5 □ Plastic	27 30 30-13 8 30-13 8 30-13 8 -21	10" <sup>1</sup> /8 HOLE PLUG
30-33 ,  Fresh 3 Sulphur 34 60 2 Salph	2 □ Galvanized 3 □ Concrete 4 □ Open hole 5 □ Plastic	26-29	30.33 80
Pumping test method 10 Pumping rate /			OCATION OF WELL
71 Pump 2 Bailer 2 Statis lavel Water level 25 Water lavels during	GPM Duration of pumping GPM Hours Mins	]	w distances of well from road and lot line.
19-21 22-24 15 minutes 30 min 26-28 26-28	utes 45 minutes 60 minutes		ື່ <b>1</b>
$\begin{array}{ c c c c c } \hline \textbf{H} & \textbf{H}$	5     125     125     125       feet     125     feet     125       Water at end of test     42	-	
If flowing give rate     38-41     Pump intake set at       GPM     1.2.5       Recommended pump type     Recommended pump type			
Shallow Deep 125	feet QPM	CAYDLA	A 1666
STATUS OF WELL	fficient supply 🧿 🗌 Unfinished		2 miles
2 Observation well 6 Abandoned, poor 7 Test hole 7 Abandoned (Othe	quality 10 Replacement well	+3HW4	1003
Recharge well     s Dewatering  WATER USE 53-56			ft. L
t ⊡ Dornestic 5 ⊡ Commercial 2 □ Stock 6 □ Municipal	g □ Not used 10 □ Other		1 Honse
3 ☐ Irrigation 7 ☐ Public supply 4 ☐ Industrial 8 ☐ Cooling & air con	ditioning		
METHOD OF CONSTRUCTION 57	9 🛛 Driving	]  ''	
2       Rotary (conventional)       6       Boring         3       Rotary (reverse)       7       Diamond         4       Rotary (air)       8       Jetting	10 □ Digging 11 □ Other		178560
	Well Contractor's Licence No	Data 58 Contract	
Name of Well Contractor		source 5	<b>201</b>
Address SHERMAN ST	SIMLOE		Inspector
Name of Well Technician	Well Technician's Licence No T-0528	Remarks	CSS. S9
Signature of Technician/Contrector	Submission date day mo yr	N N N N N N N N N N N N N N N N N N N	

2 - MINISTRY OF ENVIRONMENT & ENERGY COPY -----

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<b>8</b> 0	ntaric	D ti	/linistry o ne Enviro	f	Well T	g N	A	)3182	print number below)	Regulat	on 90:	3 Onte	We ario Wate	II R	ecord
Instruction	s for Com	nletin	a Form		1	+0	31	8LI							/ /
	-	-	-	only Thi	s docun	nent is	a ner	manent les		_J Please retain fo				Jage _	01
<ul> <li>All Secti</li> </ul>	ons must d	oe com	pletea in	full to avo	id delav	's in pr	tocess	ina. Furthe	r instructions ar	nd evolgenations		aldelic	on the h	ack of	this form.
	ns regardiné re measure	y com	pleting th	is applicati	on can	be dire	ected	to the Wate	er Well Manage	ment Coordina	tor at	416-2	235-6203		
Please p	print clearly	in blue	or black	ink only.				· ·	· ·	Minis	ry Use	e Only	/		
Well Owner	r's Informa	ation a	and Loc	ation of V	Vell Infe	ormat	ion	MUN	C	ON				LOT	
	<b>S</b> .4	(1		~ C ~					ţ.	l.	1				
RR#/Street Nu	imber/Name	rga.	Qua	11 Y			l	City/Town/	/illage	Site/	Compa	rtmen	t/Block/Tr	act et	
GPS Reading	NAD	7		<u></u>		( <u>1</u>		< د	ay uga						
	8 3	Zone		Juni I.	. 1	thing		Unit Make/		e of Operation: 🗯		ifferentia rentiate	ated ed, specify	] Avera	aged
Log of Over	rburden ar	nd Be	drock M					h					a, opeoiny		
General Colour	Most cor				Other Ma	aterials			Genera	al Description			Dep Fro		Metres , To
GREY	Lini	570	NE										C		15.25
				· · .											
					······································			· · · · ·		a a provi					· · ·
	<u> </u>				3								-		· · · ·
		÷.													
		<u>Е</u>					k		<u> </u>	- <u>.</u>	44, -				
Hole	Diameter						-	<u> </u>		1 <u>r </u>					·
	etres Diam	neter	/		Cons	1	on Rec	1		-			ell Yield		
	To Centim		Inside /	Mater	ial		all ness	Depth	Metres	Pumping test m			w Down Vater Level		ecovery Water Level
1 15	25 15		centimetres				netres	From	То	During installing a		min	Metres	min	Metres
						Casiı	ng		- <b>I</b>	Pump intake se (metres)		Static Level			
				Steel	Fibreglass				,	Pumping rate - (litres/min)		1		1	
Wata	Record		5	Plastic _		Sch	40	+1	10.6	Duration of pur	ping				
Water found at <u>4</u> Metres	Kind of Wa					-				hrs +	min	2		2	
1 . 1		phur		Steel	Fibreglass Concrete			×. 		Final water leve	end	3		3	
Gas		nerals		Galvanized					-	of pumping	netres				
Other:			t	Steel	Fibreglass					Recommended	`. <b>`</b> F	_4		<u></u> 4	
		phur nerals		Plastic	Concrete				5 15	Shallow Recommended		5	-	5	÷ .
Other:	· · · · · · · · ·	<u>.                                    </u>		Galvanized		.x.	<u>.</u>	1		(A	netres	1			i i
		phur erals				Scr	en	· · ·		Recommended rate.	· · ·	10	-	10	1997 <b>(</b> . 19
Other:			Outside diam	Steel	-	Slot	No.			(litres/min If flowing give re		15 20		15 20	
After test of well			14	Galvanized						(litres/min		25		25	
Clear and se		I	0.1	Galvallized		10		10.6	12.12	If pumping disco ued, give reason	ntin-	30		30	
Other, specif	у				No C	asing	or Scr	een	<u> </u>	_	ŀ	40 50		40 50	
Chlorinated	Yes 🗌 No			Open hole	4.							60		50 60	
	Plugging ar	nd Sea	lina Reco	rd D	Annula	r space		bandonment			tion o				
Depth set at - Me	etres Material a			lurry, neat cen			Volur	ne Placed	In diagram belov	v show distances of				nd bui	lding.
	0		-		-		(cubi	c metres)	Indicate north by	arrow.					
08		1		ilwry	+Chm										
8 ÍS	.25 5;	lica	Sad												
·····	- P		<u> </u>		<u>.</u>			<b></b>		ée	~~				-
			thed of	Constructio											
Cable Tool	R	otary (ai			amond			Digging	, .						
Rotary (conve	ntional) 🔲 A	ir percus	,		etting			Other							
Rotary (revers	ie) 🗌 B	oring	10/-4-	1	riving	st	-								
Domestic	) [].	ndustrial	vvate	r Use	ublic Supp	slv.		] Other 🧷	a af a		• 1				
Stock	c	ommerc			ot used								п.		
Irrigation	M	lunicipal			ooling & a	ir condit	oning		Audit No. <b>7</b>	39769	Date	Well C		Y	12 23
Water Supply	Recha	irge well		us of Well □ ∪	nfinisheđ		Aband	oned, (Other)	Was the well on	vner's information	Date	Delive	red v	<u>S</u>	12 Z S
Observation w	/ell 🔲 Aband	loned, in	sufficient su	ipply 🔲 De	ewatering	- <b>L</b>			package delivere		Vo				02 01
Test Hole			oor quality	hnician In	eplacemer					Minist	y Use	Only	e		
Name of Well Co			40101/180	anarçıdır. M			actor's	Licence No.	Data Source			tractor	ה יצי		
Hendy	int V	h	<b>\</b>				72	7B			72	6	200	2	
Business Address	s (street name, CUNS	number Ra	· A* /	bu ala	20-	A / 2			Date Received	7***2006***   1	) Date	of Insp	pection YY	(YY I	MM DD
Name of Well Tec	chnician (last n			rinep	$n \gamma_{w}$	ell Tech	nician's	Licence No.	Remarks		Well	Recor	d Number		
Kich.	~rs	Ba	<u>^</u>			2 te Submit	55.0	<u>†                                    </u>					4 - <sup>10</sup>		
Signature of Tech							YYYY	∕ MM⇒ DD							
0506E (09/03)		$\sim$	Cont	ractor's Cop	y 🗌 Mi	inistry's	Сору	Well Ow	ner's Copy	d	ette fo	rmule	est dispor	nible e	on français
							1								



# Appendix D Stratigraphic and Instrumentation Logs



Page 1 of 2

PROJECT NAME: EDWARDS LANDFILL PROJECT NUMBER: 18235 CLIENT: HALDIMAND-NORFOLK LOCATION: CAYUGA, ONTARIO

HOLE DESIGNATION: MW2A-01 DATE COMPLETED: October 16, 2001 DRILLING METHOD: 108mm ID HSA, and AIR ROTARY FIELD PERSONNEL: P. SMART

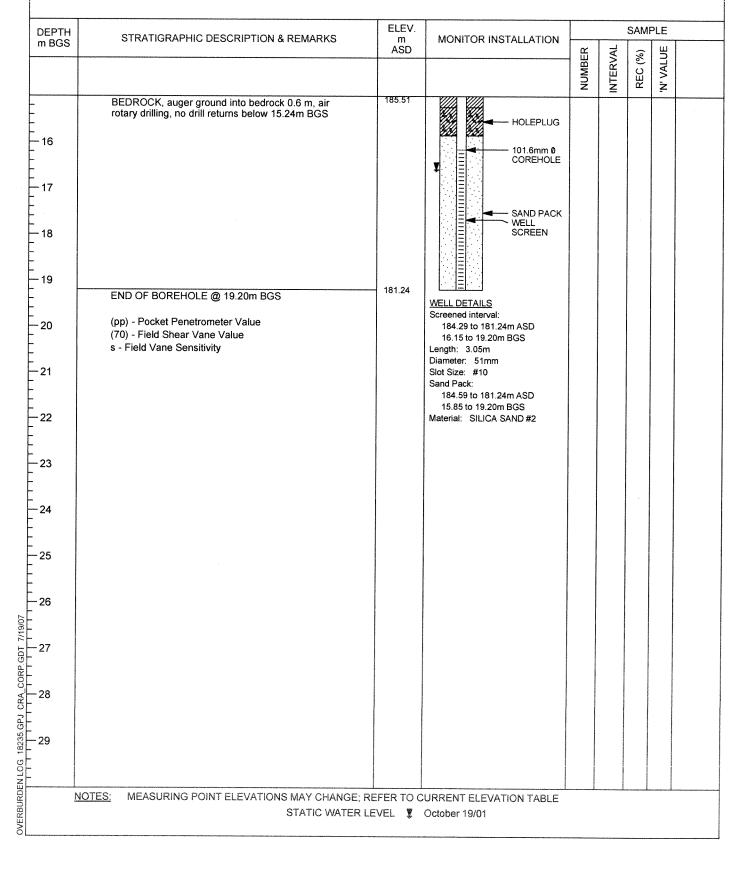
TOP OF RISER	m ASD				10	IШ	1
GROUND SURFACE	201.13 200.44		NUMBER	INTERVAL	REC (%)	'N' VALUE	
See MW2B-01 log description			<u> </u>		1		<u> </u>
		HOLEFLUG					
		203.2mm Ø					
		Dorentitie					
		BENTONITE GROUT					
CL-SILIY CLAY, very stiff, brown silty laminations.	188.25						
grey, moist			1		100	11	I
				·			
			2	$\times$	100	40	
SILI AND SAND (TILL), trace clay, fine to medium	185.96						
	FER TO (	URRENT ELEVATION TABLE					
	SILT AND SAND (TILL), trace clay, fine to medium sand, trace coarse sand with gravel DTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	SILT AND SAND (TILL), trace clay, fine to medium       185.96         sand, trace coarse sand with gravel       185.96	CL-SILTY CLAY, very stiff, brown silty laminations, grey, moist       188.25         SILT AND SAND (TILL), trace clay, fine to medium sand, trace coarse sand with gravel       185.96	CL-SILTY CLAY, very stiff, brown silty laminations, grey, moist	CL-SILTY CLAY, very stiff, brown silty laminations, grey, moist SILT AND SAND (TILL), trace clay, fine to medium sand, trace coarse sand with gravel JTES_MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE	CL-SILTY CLAY, very stiff, brown sity laminations, grey, moist SILT AND SAND (11L1), trace clay, fine to medium and, trace clarge sand with gravel JES_MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE	CL-SILTY CLAY, very stiff, brown silty laminations, grey, moist SiLT AND SAND (TILL), trace city, fine to medium and, trace coatse stand with gravel UTES. MEASURING POINT ELEVATIONS MAY CHANCE; REFER TO CURRENT ELEVATION TABLE



Page 2 of 2

PROJECT NAME: EDWARDS LANDFILL PROJECT NUMBER: 18235 CLIENT: HALDIMAND-NORFOLK LOCATION: CAYUGA, ONTARIO

HOLE DESIGNATION: MW2A-01 DATE COMPLETED: October 16, 2001 DRILLING METHOD: 108mm ID HSA, and AIR ROTARY FIELD PERSONNEL: P. SMART

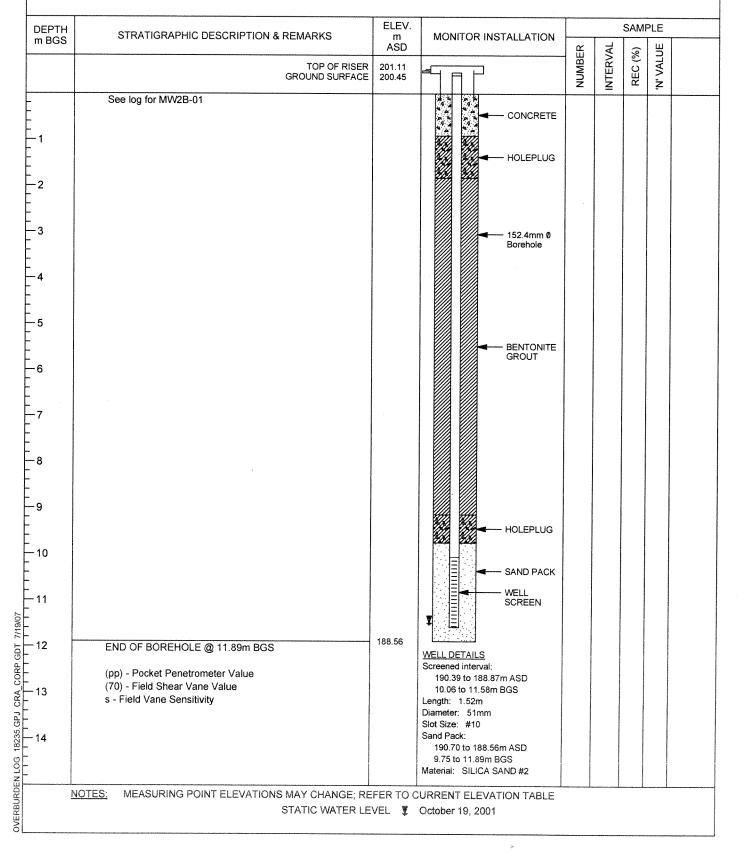




Page 1 of 1

PROJECT NAME: EDWARDS LANDFILL PROJECT NUMBER: 18235 CLIENT: HALDIMAND-NORFOLK LOCATION: CAYUGA, ONTARIO

HOLE DESIGNATION: MW2C-01 DATE COMPLETED: October 16, 2001 DRILLING METHOD: 152mm Ø SOLID STEM AUGER FIELD PERSONNEL: P. SMART





#### STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: OFF-SITE INVESTIGATION

PROJECT NUMBER: 18617

CLIENT: HALDIMAND-NORFOLK SANITARY LANDFILL INC. LOCATION: EDWARDS LANDFILL SITE, HALDIMAND COUNTY HOLE DESIGNATION: MW 1-03

DATE COMPLETED: September 16, 2003

DRILLING METHOD: 50 mm Geoprobe/ 108 mm ID HSA FIELD PERSONNEL: D. Gray

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	Monitoring Well		<u> </u>	SAM		
	TOP OF RISER	AMSL 200.219		NUMBER	INTERVAL	REC (%)	N' VALUE	OIL
	GROUND SURFACE	199.4		Ŋ	INTE	REC	N' V	α.
	ML-SILT (TOPSOIL) - little fine sand, trace	199.25	Concrete Seal					
- 0.5	clay, low plasticity, dark brown, moist, rootlets GP-GRAVEL (FILL) - little fine sand, trace silt, medium grained, poorly graded, grey, moist	198.94	Enternational Concrete Seal	1	P/S	30		0.1
-1.0	medicini granicu, poorty gradeu, grey, moist							
- 1.5	ML-SILT - with to little clay, trace fine sand, low plasticity, brown, moist, oxidized, mottled, some fracturing visible	197.98	203 mm 0					
- 2.0			Borenoie	2	P/S	100		0.3
-2.5 -3.0			203 mm ê Borenale     So mm ê Sch 40 PVC, Slot 10 Well Screen     Screen     No. 2 Silica Sand Pack     ¥					
- 3.5	- with day, medium to low plasticity, varving visible, no visible mottling or oxidation at		50 mm 0 Sch	3	P/S	100		1.
	3.35m BGS	195 44	40 PVC, Slot 10 Well Screen					
-4.0	ML-CLAYEY SILT - trace fine sand, low plasticity, grey, moist, varving visible, some slight oxidation	133 44		4	P/S	100		0.3
-4.5	- medium plasticity, more competent, no varving visible at 4.72m BGS							
-5.5	- very moist at 4.88m BGS		¥ -■ No. 2 Silica Sand Pack	5	P/S	100		1.0
5.5	END OF BOREHOLE @ 5.79m BGS	193.61						
-6.0	n en esta par partico de la manufación de la sola de la construcción de la manufación de la manufación de la m		WELL DETAILS Screened interval: 198.18 to 193.61m AMSL					
- 6.5			1.22 to 5.79m BGS Length: 4.57m Diameter 51mm Slot Size: 10					
-7.0			Material: Sch 40 PVC Seal: 198.79 to 198.33m AMSL					
-7.5			0.61 to 1.0/m BGS Material: Bentonite Gravel Sand Pack:					
-8.0			198.33 to 193.61m AMSL 1.07 to 5.79m BGS Material: No. 2 Silica Sand					
-8.5								
1	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO	URRENT ELEVATION TABLE					



Page 1 of 1

PROJECT NAME: OFF-SITE INVESTIGATION

PROJECT NUMBER: 18617

CLIENT: HALDIMAND-NORFOLK SANITARY LANDFILL INC.

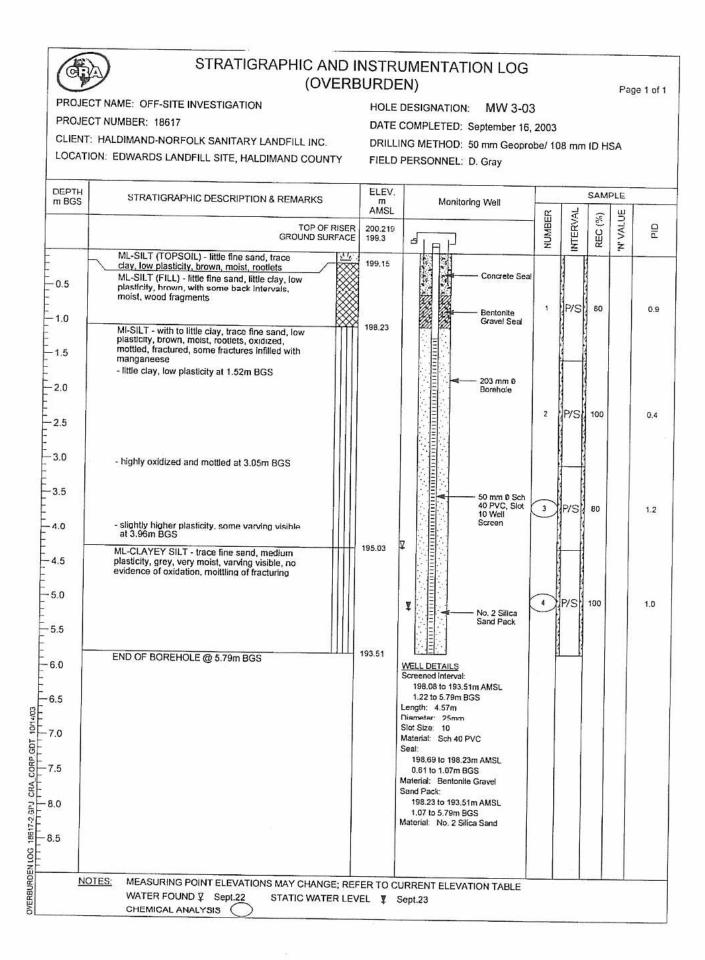
LOCATION: EDWARDS LANDFILL SITE, HALDIMAND COUNTY

HOLE DESIGNATION: MW 2-03

DATE COMPLETED: September 16, 2003

DRILLING METHOD: 50 mm Geoprobe/ 108 mm ID HSA FIELD PERSONNEL: D. Gray

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	Monitoring Well	-	17 85	SAM		
	TOP OF RISER GROUND SURFACE	AMSL 200.280 199.4		NUMBER	NTERVAL	REC (%)	N' VALUE	DID
		199.4		ž	Ξ	R	ż	
0.5	ML-SILT (TOPSOIL) - little fine sand, trace clay, low plasticity, brown, moist, rootlets ML-SILT (FILL) - little clay, little to trace fine sand, trace gravel, low to medium plasticity, dark brown, moist, oxidized, wood fragments	199.25	Bentonite Gravel Seal	1	P/S	80		1.7
1.0	- medium plasticity at 1.22m BGS							
1.5 - 2.0	ML-SILT - with clay, trace fine sand, low plasticity, brown, moist, oxidized, mottled, rootlets, visible fracturing, some fractures infilled with manganeese	197.88	203 mm 0 Borenole	2	P/S	100		0.9
2.5								
3.0			50 mm © Sch	3	P/S	100		0.6
4.0	- medium plasticity, moist, some oxidation at	195.51	50 mm € Sch 40 PVC, Slot 10 Well Screen					
4.5	ML-CLAYEY SILT - trace fine sand, low to medium plasticity, grey, moist, varving visible, some slight oxidation visible - moist to very moist, more competent, no visible varving at 4.57m BGS				P/S	60		2.4
5.0			V No. 2 Silica Sand Pack	5	P/S	100		1.1
6.0	END OF BOREHOLE @ 5.79m BGS	193.61	WELL DETAILS Screened interval: 198.18 to 193.61m AMSL					
6.5			1.22 to 5.79m BGS Length: 4.57m Diameter: 51mm					
7.0	<i>a</i>		Siot Size: 10 Material: Sch 40 PVC Seal: 198.79 to 198.33m AMSL					
7.5			U.51 to 1.0/m BGS Material: Bentonite Gravel Sand Pack: 198.33 to 193.61m AMSL					
8.0			1.07 to 5.79m BGS Material: No. 2 Silica Sand					
8.5								
1	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE WATER FOUND ♀ Sept.22 STATIC WATER LE							



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Page 1 of 1

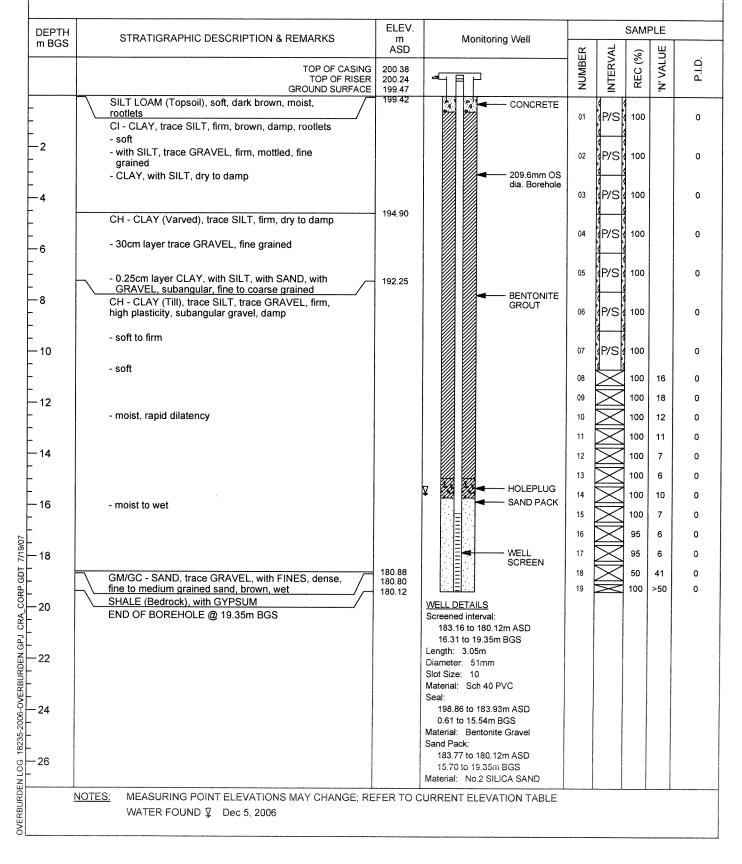
PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSL

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW1A-06 DATE COMPLETED: November 23, 2006 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader





Page 1 of 1

PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSL

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW1B-06 DATE COMPLETED: November 23, 2006 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

D	EPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	Monitoring Well			SAM	PLE	
	1 BGS		ASD		ШШ	VAL	(%)	ПE	
		TOP OF CASING TOP OF RISER GROUND SURFACE	200.37 200.35 199.47		NUMBER	INTERVAL	REC (%)	'N' VALUE	
		- Please Refer to Stratigraphy Log OW1A-06.		CONCRETE					
			- -	V HOLEPLUG					
- - - - -	6	END OF BOREHOLE @ 5.33m BGS		WELL DETAILS Screened interval: 197.18 to 194.14m ASD 2.29 to 5.33m BGS					
	3			Length: 3.05m Diameter: 51mm Slot Size: 10 Material: Sch 40 PVC Seal: 196.86 to 197.49m ASD 0.61 to 1.98m BGS					
	12			Material: Bentonite Gravel Sand Pack: 197.49 to 194.14m ASD 1.98 to 5.33m BGS Material: No.2 SILICA SAND					
	14								
	6								
	8								
	20								
	22							a de la constanción d	
	24								
	6								
	<u>1</u> <u>1</u>	I NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE WATER FOUND 및 Dec 5, 2006	FER TO C	CURRENT ELEVATION TABLE		I		l	



Page 1 of 1

PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSL

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW8A-06 DATE COMPLETED: November 21, 2006 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	Monitoring Well			SAMF	۶LE	
m BGS		ASD		ER	/AL	(%)	Ч	
	TOP OF CASING TOP OF RISER GROUND SURFACE	199.40 199.33 198.29	╺┐ <u></u> ╕	NUMBER	INTERVAL	REC (	'N' VALUE	P.I.D.
-	CH - CLAY (Disturbed), firm, high plasticity, brown, damp to moist			01	P/S	100		0
-2 - -	CH - CLAY (Native), firm, high plasticity, brown, trace grey colour, damp	196.46	209.6mm OS	02	P/S	100		0
- - 4 -			dia. Borehole	03	P/S	100		0
- - 6	- possible 9cm long fracture CH - CLAY (Varved), trace SILT, firm, brown, damp	192.95		04	P/S	100		0
	- 2.5cm layer of trace SAND, fine grained, grey - CLAY, trace GRAVEL	191.06	BENTONITE GROUT	05	P/S	100		0
	CH - CLAY (Till), trace SILT, trace SAND, trace GRAVEL, firm, fine grained subangular gravel, coarse grained sand, damp - possible 12.5cm long fracture			06	P/S	95		0
- 10 	<ul> <li>7.6cm layer of trace SAND and GRAVEL, fine grained</li> <li>2.5cm layer of GRAVEL, fine grained</li> </ul>			07	P/S	100		0
- 	- piece of GRAVEL, coarse grained, subangular     - 7.6cm layer of trace SAND and GRAVEL, medium     grained sand, fine grained gravel, sand is yellow in     colour, gravel is subangular	186.32		08	P/S	100		0
- - 	- soft, moist - piece of GRAVEL, coarse grained, subangular CH - CLAY (Varved), soft, moist - very soft, rapid dilatency		HOLEPLUG	09	P/S	100		0
_ 16 	- possible fractures noted at two of the varves - piece of GRAVEL (Granite), coarse grained GM/GP - GRAVELLY SAND, trace FINES, compact,	182.28 182.13		10 11	XX	75 50	11 40	0 0
20/61/2 	poorly graded, brown     SHALE (Bedrock), brown     END OF BOREHOLE @ 17.98m BGS	181.13	WELL DETAILS	12		100	>50	0
A CORP GDT 7/1907			Screened interval: 183.35 to 180.30m ASD 14.94 to 17.98m BGS					
చ్			Length: 3.05m Diameter: 51mm Slot Size: 10 Material: Sch 40 PVC					
22 - 22			Seal: 197.68 to 184.27m ASD 0.61 to 14.02m BGS					
222-2006-004-180-180-190-190-190-190-190-190-190-190-190-19			Material: Bentonite Gravel Sand Pack: 183.96 to 180.30m ASD 14.33 to 17.98m BGS		-			
			Material: No.2 SILICA SAND					
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE WATER FOUND ♀ Dec 11, 2006	FER TO (	L CURRENT ELEVATION TABLE	l				



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSL

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW5A-06 DATE COMPLETED: November 27, 2006 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	Monitoring Well		SAM	PLE	
m BGS		ASD		H E	(%)	'N' VALUE	Ċ
	TOP OF CASING TOP OF RISER GROUND SURFACE	199.84 199.72 198.72		NUMBER	REC (	'N' VAL	P.I.D.
	CL/CI - CLAY and SILT, firm, low to moderate plasticity, brown, damp, rootlets	197.50	CONCRETE	01 P/	'S 100		0
-2	CI - Clay with SILT, firm, moderate plasticity, brown, damp			02 <b>P</b>	'S 95		o
-4	CH - CLAY (Varved), soft, high plasticity, brown, moist	195.68	209.6mm OS dia. Borehole	03 (P/	/S 100		0
	- trace SILT, trace SAND, trace GRAVEL			04 P/	'S 100		0
6 	<ul> <li>- 30cm gap in varving</li> <li>- 5cm layer of CLAY and GRAVEL, trace SAND, fine to coarse grained gravel, reddish colour</li> </ul>		209.6mm OS dia. Borehole     BENTONITE GROUT	05 (P/	'S 90		0
	<ul> <li>piece of coarse grained gravel</li> <li>CH - CLAY (Till), trace SILT, trace SAND, trace</li> <li>GRAVEL, soft, high plasticity, brown, moist</li> </ul>			06 P/	'S 100		0
- 				07 (P/	S 100		0
- - 12				08 P/	S 100		0
- - - - 14	- piece of subangular coarse grained gravel		HOLEPLUG		100 100 100 100	5 7	0 0 0
- 	GC - SAND and GRAVEL, with CLAY, dense, fine grained subangular gravel, brown, wet SHALE (Weathered Bedrock), brown, wet - SHALE (Bedrock), with GYPSUM	182.95 182.87	WELL SCREEN	13 14 15	100 25 33	7 23	0 0 0
18	END OF BOREHOLE @ 17.98m BGS	180.59	WELL DETAILS Screened interval:	16	50	30	0
- - -			183.94 to 180.89m ASD 14.78 to 17.83m BGS Length: 3.05m Diameter: 51mm Slot Size: 10				
22			Material: Sch 40 PVC Seal: 198.11 to 184.70m ASD 0.61 to 14.02m BGS Material: Bentonite Gravel				
- 22			Sand Pack: 184.55 to 180.89m ASD 14.17 to 17.83m BGS Material: No.2 SILICA SAND				
-26							
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE WATER FOUND I Dec 5, 2006	FER TO (	CURRENT ELEVATION TABLE				



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSL

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LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW5B-06 DATE COMPLETED: November 27, 2006 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

	DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	Monitoring Well			SAMF	PLE	
	m BGS		ASD		Ш	VAL	(%	Ч	
		TOP OF CASING TOP OF RISER GROUND SURFACE	199.83 199.67 198.72		NUMBER	INTERVAL	REC (%)	'N' VALUE	
1		- Please Refer to Stratigraphy Log OW5A-06.		CONCRETE					
	- 2	. с		SAND PACK					
	-6	END OF BOREHOLE @ 4.72m BGS		★ : : : : : : : : : : : : : : : : :					
	- 8 - 10			Slot Size: 10 Material: Sch 40 PVC Seal: 198.11 to 197.43m ASD 0.61 to 1.30m BGS Material: Bentonite Gravel Sand Pack: 197.43 to 194.08m ASD					
	- 12			1.30 to 4.65m BGS Material: No.2 SILICA SAND					
	- 14								:
	- 16								
	18								
_1	20								
	-22								
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	24								
	26								
		NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE WATER FOUND ♀ Dec 11, 2006	FER TO C	CURRENT ELEVATION TABLE					



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSL

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW8B-06 DATE COMPLETED: November 21, 2006 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH   m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	Monitoring Well		1	SAMPLE SAMPLE			
	TOP OF CASING TOP OF RISER	ASD 199.44 199.33		NUMBER	INTERVAL	REC (%)	'N' VALUE		
	GROUND SURFACE - Please Refer to Stratigraphy Log OW8A-06.	198.29	CONCRETE	2	<u> </u>				
-2			HOLEPLUG						
-4			VELL SCREEN 209.6mm OS						
-6	END OF BOREHOLE @ 5.03m BGS		WELL DETAILS Screened interval: 196.30 to 193.26m ASD						
-8			1.98 to 5.03m BGS Length: 3.05m Diameter: 51mm Slot Size: 10						
- 10			Material: Sch 40 PVC Seal: 197.68 to 195.54m ASD 0.61 to 2.74m BGS						
- 12			Material: Bentonite Gravel Sand Pack: 196.61 to 193.26m ASD 1.68 to 5.03m BGS Material: No.2 SILICA SAND						
- 14			Malerial NO.2 SILICA SAND						
- 16									
- 18									
-20									
-22									
24									
26									
<u>NO</u>	TES: MEASURING POINT ELEVATIONS MAY CHANGE; REI WATER FOUND ↓ Dec 11, 2006	FER TO C	URRENT ELEVATION TABLE						



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSL

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW9A-06 DATE COMPLETED: November 29, 2006 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPT		ELEV.				SAMF	PLE	
m BG	STRATIGRAPHIC DESCRIPTION & REMARKS	m ASD	Monitoring Well	К	'AL	(%)	ПE	
	TOP OF RISER GROUND SURFACE	201.08 200.07		NUMBER	INTERVAL	REC (9	'N' VALUE	P.I.D.
-	SILT LOAM (Topsoil), with CLAY, trace SAND, trace GRAVEL, roots, very soft, dark brown, damp CI - CLAY (Native), with SILT, firm, moderate	199.84	CONCRETE	01	P/S	100		0
2	plasticity, brown, trace grey colour, dry to damp - roots - soft to firm, damp			02	P/S	100		0
	- wet		209.6mm OS dia. Borehole	03	P/S	100		0
-	CH - CLAY, soft to firm, high plasticity, slow dilatency, dry to damp	195.50				90		0
6	- possible 7.6cm long fractures, moist to wet - soft, damp to moist	194.43		<u>, (11</u>	P/S	90		0
-	CH - CLAY (Till), trace GRAVEL, soft, fine grained, subangular, damp to moist	192.45		05	P/S	90		0
	CH - CLAY (Varved), soft, high plasticity, damp to moist - trace GRAVEL, fine grained, subangular		GROUT	06	P/S	90		0
- 10	<ul> <li>trace SILT, oxidised, redish brown colour</li> <li>CLAY, trace GRAVEL, not varved</li> </ul>			07		100	19	0
-	<ul> <li>piece of GRAVEL, subrounded, vertical deposition</li> <li>piece of GRAVEL, subrounded, vertical deposition</li> <li>CLAY, varved, high plasticity, rapid dilatency</li> </ul>			09 10	$\stackrel{\scriptscriptstyle \wedge}{\asymp}$	100 100	7 7	0 0
- 12	- Piece of COBBLE, subangular, ~10cm diameter			11	$\ge$	100	9	0
-	- 2.5cm layer of trace SAND - trace SILT, trace SAND, firm/compact, damp, subangular gravel	186.96			$\ge$	33	50	0
14	CH - CLAY (Till), with GRAVEL, firm, damp			14	$\times$	60	28	0
- - 16	COBBLE/BOULDER, dry, limestone/dolomite	184.83	↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓     ↓ </td <td>16 17</td> <td></td> <td>20 20</td> <td>&gt;50 &gt;50</td> <td>0 0</td>	16 17		20 20	>50 >50	0 0
		182.54		18		25	>50	0
CORP.GDT 3/3/10 	SM/SC - SAND (Alluvium), trace FINES, loose to compact, coarse grained, dark grey, wet, parent material is predominantly Shale GM/GC - GRAVEL (Alluvium), trace FINES, trace	182.51 182.39 181.93	SCREEN	19	$\times$	50	>50	0
CRA	SAND, loose to compact, fine grained, dark grey, wet, parent material is predominantly Shale SHALE (Bedrock) END OF BOREHOLE @ 19.05m BGS		WELL DETAILS Screened interval: 184.07 to 181.02m ASD 16.00 to 19.05m BGS					
CRDEN.GPJ - 22 - 22			Length: 3.05m Diameter: 51mm Slot Size: 10 Material: Sch 40 PVC					
18235-2006-OVERBURDEN.GPJ			Seal: 199.46 to 184.68m ASD 0.61 to 15.39m BGS Material: Bentonite Gravel Sand Pack: 184.68 to 181.02m ASD					
90-26			15.39 to 19.05m BGS Material: No.2 SILICA SAND					
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; R WATER FOUND 및 Dec 5, 2006	EFER TO	CURRENT ELEVATION TABLE					



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSL

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW9B-06 DATE COMPLETED: November 29, 2006 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

	DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	Monitoring Well			SAMF	PLE	
	m BGS		m ASD		ËR	VAL	(%)	Ξn	
		TOP OF RISER GROUND SURFACE	201.18 200.07		NUMBER	INTERVAL	REC (%)	'N' VALUE	
-		- Please Refer to Stratigraphy Log OW9A-06.		CONCRETE					
F	0			HOLEPLUG					
F	-2			SAND PACK					
F				209.6mm OS dia. Borehole					
E	- 4			dia. Borehole WELL SCREEN					
F	-6	END OF BOREHOLE @ 5.79m BGS							
F				WELL DETAILS Screened interval: 197.33 to 194.28m ASD					
Ę	-8			2.74 to 5.79m BGS Length: 3.05m					
F				Diameter: 51mm Slot Size: 10					
F	-10			Material: Sch 40 PVC Seal:					
F				199.46 to 197.63m ASD 0.61 to 2.44m BGS Material: Bentonite Gravel					
F	-12			Sand Pack: 197.63 to 194.28m ASD					
F				2.44 to 5.79m BGS Material: No.2 SILICA SAND					
Ę	-14								
F									
F	-16								
F									
3/3/10	- 18								
CORP.GDT 3/3/10									
COR	-20								
DEN.GF	-22								
06-0VE	-24								
235-20									
0G 18	-26								
SDEN L		NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RI		CURRENT ELEVATION TABLE					
OVERBURDEN LOG 18235-2006-OVERBURDEN.GPJ CRA		WATER FOUND ¥ Dec 5, 2006							
SL									



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	Monitoring Well			SAMF		
	TOP OF CASING TOP OF RISER GROUND SURFACE	AMSL 200.22 200.15 199.72		NUMBER	INTERVAL	REC (%)	'N' VALUE	
-0.5	Please refer to Overburden Stratigraphy Log MW1A-07.							
- 1.0								
- 1.5								
-2.0								
-2.5								
-3.0								
-3.5								
-4.0								
-4.5								
- 5.0								
- 5.5								
-6.0			260mm Ø BOREHOLE					
-6.5								
-7.0								
-7.5								
- 7.5 - 8.0 - 8.5 - 9.0			PORTLAND BENTONITE					
-8.5			BENTONITE					
-9.5								
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO C	URRENT ELEVATION TABLE		I	1		

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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	Monitoring Well			SAM		
m BGS		AMSL		NUMBER	INTERVAL	REC (%)	'N' VALUE	
- 10.5 - 11.0 - 11.5 - 12.0 - 12.5 - 13.0 - 13.5 - 14.0 - 14.5 - 15.0 - 15.5 - 16.0 - 16.5 - 16.0 - 16.5 - 17.0 - 17.5 - 18.0 - 18.5 - 19.0 - 19.5	END OF OVERBURDEN HOLE @ 16.76m BGS		BENTONITE PORTLAND 51mm Ø SCH 40 PVC RISER 102mm Ø STEEL CASING					



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	Monitoring Well	RUN NUMBER	CORE RECOVERY %	RQD %	
17.0	Weathered Bedrock - Dolomitic Shale, gravel sized fragments, light and dark grey in colour, fine texture, moderately to highly weathered - iron oxidization present	- 182.96 - 182.65					
17.5	DOLOSTONE-SHALE BEDROCK (SALINA FORMATION), dolostone shale, light grey/dark grey, thin horizontal laminations to wavy beds, fine grained						
18.0	and micro-crystalline, argillaceous, slightly weathered; occasional to frequent gypsum beds/nodules, occasional selenite crystals						
· 18.5 · 19.0	<ul> <li>fracture, slightly weathered, suspect open aperture</li> <li>suspect horizontal fractures with very close aperture; suspect vertical fractures randomly interesecting bedding planes from 17.45 to 17.53</li> </ul>						
- 19.5	m.bgs - fracture, moderately weathered, iron oxizidization present						
- 20.0	<ul> <li>gypsum bed (21.5cm), white, micro-crystalline, minor inclusions of dark grey shale</li> </ul>		96mm Ø COREHOL	E			
- 20.5				4	99	99	
-21.0							
-21.5				5	100	100	
-22.0							
-22.5			BENTONIT GRAVEL	Е			
-23.5			GRAVEL	6	100	100	
-24.0	- gypsum bed (37cm), white, micro-crystalline, <5% dolomitic-shale			CA			
- 24.5							
-25.0			51mm Ø SCH 40 PV SCREEN	7 7	94	94	
-25.5							
-26.0							
<u> </u>	IOTES: MEASURING POINT ELEVATIONS MAY CHANGE; R	EFER TO C	URRENT ELEVATION TABLE	Ξ	1	LI	

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PROJECT NAME: EDWARDS LANDFILL PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	Monitoring Well	RUN NUMBER	CORE RECOVERY %	RQD %	
27.0				8	98	98	
- 27.5 - 28.0 - 28.5 - 29.0			BENTONITE GRAVEL	9	78	78	
- 29.5	- gypsum bed (5.1cm)			10	98	98	
- 30.5	- gypsum bed (2.5cm)	100.01					
- 31.0	END OF BOREHOLE @ 30.68m BGS	169.04	WELL DETAILS Screened interval:				
- 31.5			175.95 to 173.51m AMSL 23.77 to 26.21m BGS Length: 2.44m Diameter: 51mm				
- 32.0			Slot Size: 10 Material: Sch 40 PVC Seal:				
- 32.5			173.51 to 169.04m AMSL 26.21 to 30.68m BGS Material: Bentonite Gravel Sand Pack:				
- 33.0			176.25 to 173.51m AMSL 23.47 to 26.21m BGS Material: No.2 SILICA SAND				
- 33.5 - 34.0			Seal: 177.17 to 176.25m AMSL 22.56 to 23.47m BGS Material: Bentonite Gravel				
- 34.5			 Seal: 199.11 to 177.17m AMSL				
- 35.0			0.61 to 22.56m BGS Material: Cement-Bentonite Grout				
- 35.5							
- 35.0 - 35.5 - 36.0							
 <u>NC</u>	TES: MEASURING POINT ELEVATIONS MAY CHANGE;	REFER TO C	URRENT ELEVATION TABLE				



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	Monitoring Well	2		SAM		
	TOP OF CASING TOP OF RISER GROUND SURFACE	200.21 200.14 199.65		NUMBER	INTERVAL	REC (%)	'N' VALUE	
0.5	Please refer to Overburden Stratigraphy Log MW1A-07.							
· 1.0								
1.5								
2.0								
2.5								
3.0								
3.5								
4.0								
4.5								
5.0								
5.5								
6.0			260mm Ø BOREHOLE					
6.5 7.0								
8.0								
8.5			PORTLAND BENTONITE					
9.0								
7.5 8.0 8.5 9.0 9.5			A TO2mm Ø STEEL CASING					
			BENTONITE					
1	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO C	URRENT ELEVATION TABLE					

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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	Monitoring Well			SAM	-LE	
m BGS		M AMSL		NUMBER	INTERVAL	REC (%)	'N' VALUE	
- 10.5 - 11.0 - 11.5			PORTLANE REAL RE					
- 12.0 - 12.5			51mm Ø SC 40 PVC RISER	н				
- 13.0								
- 13.5								
- 14.0								
14.5								
15.0								
15.5								
16.0								
- 16.5	END OF OVERBURDEN HOLE @ 16.46m BGS							
17.5								
- 18.0								
- 18.5								
- 19.0								
- 17.5 - 18.0 - 18.5 - 19.0 - 19.5								
<u></u> <u>NC</u>	DTES: MEASURING POINT ELEVATIONS MAY CHANGE; F	REFER TO C	URRENT ELEVATION TABLE		<u> </u>	1		



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PROJECT NAME: EDWARDS LANDFILL PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

16.5 Please refer to Bedrock Stratigraphy Log MW1D-07.		RUN NUMBER	CORE RECOVERY %	RQD %	
183.19					
- 17.0 - 17.5	11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 118711 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871 11871	1	70	51	
- 18.5	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 19				
19.5		2	100	100	
	96mm Ø COREHOLE NO.2 SILICA SAND				
20.5 21.0	51mm Ø SCH 40 PVC SCREEN	3	100	100	
21.5 END OF BOREHOLE @ 21.54m BGS 178.11					
	creened interval: 179.63 to 178.11m AMSL 20.02 to 21.54m BGS				
Dia       L       Slo       Mai	ength: 1.52m iameter: 51mm lot Size: 20 aterial: Sch 40 PVC				
-23.5	199.65 to 179.99m AMSL 0.00 to 19.66m BGS aterial: Cement-Bentonite Grout				
24.0	and Pack: 181.21 to 178.11m AMSL 18.44 to 21.54m BGS aterial: No.2 SILICA SAND				
24.5					
25.0					
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURF	RENT ELEVATION TABLE				



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	LEV. m Monitoring Well MSL			SAM		
	TOP OF CASING TOP OF RISER GROUND SURFACE	201.21 201.16 200.63		NUMBER	INTERVAL	REC (%)	'N' VALUE	
0.5	Please refer to Overburden Stratigraphy Log MW2A-07.							
1.0								
1.5								
2.0								
2.5								
- 3.0								
-3.5								
4.0								
4.5								
5.0								
6.0								
6.5			260mm Ø BOREHOLE					
-7.0								
-7.5			PORTLAND BENTONITE					
- 8.0								
8.5								
9.0			102mm Ø					
• 7.5 • 8.0 • 8.5 • 9.0 • 9.5			STEEL CASING					
 N	OTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO C	URRENT ELEVATION TABLE					

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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	Monitoring Well			SAM	PLE	
m BGS		M AMSL		NUMBER	INTERVAL	REC (%)	'N' VALUE	
				INN	INTE	R	/. 	
- 10.5								
- 11.0								
- 11.5								
- 12.0								
- 12.5								
- 13.0			BENTONITE PORTLAND					
- 13.5			51mm Ø SCH 40 PVC RISER					
_								
- 14.0								
- 14.5								
- 15.0	END OF OVERBURDEN HOLE @ 14.94m BGS	-						
- 15.5								
- 16.0								
- 16.5								
- 17.0								
- 17.5								
- 18.0								
- 19 5								
- 17.0 - 17.5 - 18.0 - 18.5 - 19.0 - 19.5								
- 19.0								
- 19.5								
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; R	EFER TO C	URRENT ELEVATION TABLE					



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH n BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	Monitoring Well	RUN NUMBER	CORE RECOVERY %	RQD %	
- 15.0	DOLOSTONE-SHALE BEDROCK (SALINA FORMATION), dolomite shale, light grey/dark grey,	185.70		1	64	50	
- 15.5 - 16.0	thin horizontal laminations to wavy beds, fine grained and microcrystalline, argillaceous, gypsiferous, slightly weathered in upper 3 metres, no gypsum apparent in upper 0.7 metres; occasional to frequent gypsum beds/nodules, occasional selenite crystals - highly fractured		187118711871 1871187118711 1871187118711	2	23	0	
- 16.5							
- 17.0							
- 17.5	<ul> <li>fracture, moderately weathered, oxizidization present</li> <li>fracture, moderately weathered, 10 degree angle,</li> </ul>		HINKIIK HINKIIK	3	100	44	
- 18.0	apparent oxidization - 5.08cm of conglomerate, mudstone gravel size particles interbedded within dolomitic-shale for the decision of the state of			4	84	45	
- 18.5	- fractured zone inferred (27cm), weathered sub-angular gravel						
- 19.0	- fracture inferred						
- 19.5	- gypsum bed (7.5cm), minor shale inclusions			5	100	89	
- 20.0	<ul> <li>gypsum/selenite bed (2.5cm), micro to fine crystalline structure; fracture inferred, slight weathering</li> </ul>		Ø6mmØ COREHOLE	•			
- 20.5	<ul> <li>fracture inferred</li> <li>gypsum (~75%), intermixed with dolomitic-shale, 11.5cm zone</li> </ul>						
-21.0				6	100	86	
- 21.5	- fracture, moderately weathered						
- 22.0	- gypsum bed (6.4cm), minor shale inclusions			7	100	100	
-22.5							
- 23.0	- gypsum bed (19cm), minor shale inclusions						
- 23.5				8	100	100	
-24.0							
	- gypsum (60-70%), 7.6cm zone						



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PROJECT NAME: EDWARDS LANDFILL PROJECT NUMBER: 18235 CLIENT: HNSLI LOCATION: 160 Brooks Rd., Haldimand County, Ontario

EPTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	Monitoring Well	RUN NUMBER	CORE RECOVERY %	RQD %	
25.0				9	100	100	
25.5			BENTONITE GRAVEL				
26.0	- fracture - fracture						
26.5 27.0	- gypsum bed (23cm), minor shale inclusions		NO.2 SILICA SAND	10	100	100	
27.5	- gypsum (~50%), 8.9cm zone		SAND				
28.0	- gypsum bed (91.5cm), minor shale inclusions		SCH 40 PVC SCREEN	11	100	100	
28.5							
29.0	END OF BOREHOLE @ 28.96m BGS	171.68	WELL DETAILS Screened interval:				
29.5			173.20 to 171.68m AMSL 27.43 to 28.96m BGS Length: 1.52m				
30.0			Diameter: 51mm Slot Size: 10 Material: Sch 40 PVC				
30.5			Seal: 175.33 to 174.42m AMSL 25.30 to 26.21m BGS Material: Bentonite Gravel				
31.5			Sand Pack: 174.42 to 171.68m AMSL 26.21 to 28.96m BGS				
32.0			Material: No.2 SILICA SAND  Seal:				
32.5			200.63 to 174.95m AMSL 0.00 to 25.68m BGS Material: Cement-Bentonite Grout				
33.0							
33.5							
33.0 33.5 34.0							
	DTES: MEASURING POINT ELEVATIONS MAY CHANGE;	REFER TO C	URRENT ELEVATION TABLE				



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

EPTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	Monitoring Well	-	-	SAMF		
	TOP OF CASING TOP OF RISER	AMSL 201.20 201.13		NUMBER	INTERVAL	REC (%)	'N' VALUE	
	GROUND SURFACE	200.49		Z	Ľ		Z	
	Please refer to Overburden Stratigraphy Log							
).5	MW2A-01.							
.0								
.5								
.5								
.0								
2.5								
0.0								
.5								
.0								
.5								
5.0								
5.0								
5.5								
6.0								
			260mm Ø BOREHOLE					
6.5								
<b>7</b> .0								
7.5								
3.0								
o.o								
9.0			102mm Ø					
9.5			STEEL					
7.0 7.5 3.0 3.5 9.0 9.5								
	DTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE							

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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	Monitoring Well		-	SAM	<u>г</u>	
		M AMSL		NUMBER	INTERVAL	REC (%)	'N' VALUE	
- 10.5 - 11.0 - 11.5 - 12.0 - 12.5 - 13.0 - 13.5 - 14.0 - 14.5 - 14.0 - 14.5 - 15.5 - 16.0 - 16.5 - 17.0 - 17.5 - 18.0 - 18.5 - 19.0 - 19.5	END OF OVERBURDEN HOLE @ 14.94m BGS		PORTLAND 51mm Ø SCH 40 PVC RISER					



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PROJECT NAME: EDWARDS LANDFILL PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	Monitoring Well	RUN NUMBER	CORE RECOVERY %	RQD %	
				R N	RECO	RG	
15.0	Please refer to Bedrock Stratigraphy Log MW2D-07.	185.55					
 15.5							
16.0							
16.5							
17.0							
- 17.5							
18.0							
18.5							
19.0							
19.5			96mm Ø				
20.0			OREHOLE				
20.5							
21.0							
21.5			NO.2 SILICA SAND				
22.0			SCH 40 PVC				
s - 22.5		177.63					
23.0 22-	END OF BOREHOLE @ 22.86m BGS		WELL DETAILS Screened interval:				
23.0			179.15 to 177.63m AMSL 21.34 to 22.86m BGS Length: 1.52m				
24.0			Diameter: 51mm Slot Size: 20 Material: Sch 40 PVC				
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	EFER TO C	Seal: URRENT ELEVATION TABLE	I			



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	Monitoring Well	RUN NUMBER	CORE RECOVERY %	RQD %	
				NUN R NUN	RECOC	RG	
25.0			200.49 to 180.68m AMSL 0.00 to 19.81m BGS Material: Bentonite Gravel Sand Pack:				
25.5			180.68 to 179.15m AMSL 19.81 to 21.34m BGS Material: No.2 SILICA SAND				
26.0							
26.5							
27.0							
27.5							
28.5							
29.0							
29.5 							
30.0 							
30.5							
= 31.0							
101-11-12-0							
0 32.0 							
BEDROCK LOG 18235-2007-BEDROCK GPJ CRA CORP GDT 4/15/16 32.0 33.0 33.5 33.0 33.5 33.0 33.0 33.0 33							
06 182							
EDROCK I	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO C	URRENT ELEVATION TABLE				
8							



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW2B-07 DATE COMPLETED: June 4, 2007 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	Monitoring Well		<u> </u>	SAM	1 1	·····
	TOP OF CASING TOP OF RISER GROUND SURFACE	ASD 201.51 201.41 200.50		NUMBER	INTERVAL	REC (%)	'N' VALUE	
-1 -2 -3	- Please Refer to Stratigraphy Log MW2A-01.		CONCRETE 51mm Ø SCH 40 PVC RISER PIPE BENTONITE GRAVEL 108mm Ø Borehole #2 Silica Sand 51mm Ø SCH 40 PVC WELL SCREEN					
-4	END OF BOREHOLE @ 3.96m BGS		WELL DETAILS Screened interval: 199.58 to 196.53m ASD 0.91 to 3.96m BGS					
-6			Length: 3.05m Diameter: 51mm Slot Size: 10 Material: Sch 40 PVC Seal: 200.19 to 199.73m ASD 0.30 to 0.76m BGS					
-7			Material: Bentonite Gravel Sand Pack: 199.73 to 196.53m ASD 0.76 to 3.96m BGS Material: No.2 SILICA SAND					
9							-	
10								
11								
12								
13								
14						ing a second	Kerembani mananangi birda dada manananan	
I <u>NC</u>	DTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO C	URRENT ELEVATION TABLE		1			



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW3A-07 DATE COMPLETED: May 1, 2007 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	Monitoring Well			SAM	PLE	+
	TOP OF CASING	ASD 200.13		NUMBER	NTERVAL	REC (%)	N' VALUE	P.I.D.
	TOP OF RISER GROUND SURFACE	200.09 199.18		R	Į Į	R	ż	
	FILL - CLAY, with SILT (Disturbed), firm, high plasticity, grey/orange smearing, damp to moist - trace gravel, soft	198.87		01	$\bowtie$	41.5	5	0
1	OL/PT - GRAVELLY SILT LOAM, trace SAND (NATIVE), soft, dark brown, moist, fine grained subangular gravel	197.96		02	$\bowtie$	89.5	6	0
2	CI - CLAY, with SILT, trace SAND, soft, moderate			03 04	$\bigotimes$	58.5 0	8	0
	plasticity, grey, moist - 5cm layer, trace sand and gravel, very soft, dark grey, wet		CONCRETE	05	$\bigotimes$	58.5	14	0
3	<ul> <li>firm, moserate plasticity, moderate dilatency</li> <li>no mottling</li> </ul>		← 108mm Ø Borehole	06	$\square$	66.5	16	0
4	<ul> <li>possible 5cm long fracture, moist</li> <li>CH - CLAY, trace SILT (Varved), firm, high plasticity, slow dilatency, reddish brown/grey, damp;</li> </ul>	195.52		07		62.5	15	0
	silty varies consisting of alternating coloured bands of grey and reddish brown - soft to firm				$\left \right\rangle$			
5	- 1.25cm piece of gravel, subangular, grey			08	$\left  \right\rangle$	62.5	15	0
6	CH - CLAV trace SAND and CDAVEL (Till) from	193.05		09	$\square$	79	3	0
7	CH - CLAY, trace SAND and GRAVEL (Till), firm, high plasticity, very slow dilatency, grey, damp; coarse grained sand, fine grained subangular gravels with a predominantly vertical deposition		BENTONITE	10	$\square$	100	8	0
7	graveis with a predominantly vehical deposition			11	Х	8.5	15	0
3			\$1mm Ø SCH 40 PVC RISER PIPE	12	$\square$	98	20	0
э	<ul> <li>piece of subangular gravel/cobble &gt;5cm, broken by split spoon</li> </ul>			13	$\boxtimes$	33.5	8	0
				14	$\mathbf{X}$	108.5	8	0
10				15	$\mathbf{X}$	116.5	6	0
11				16	$\overline{\mathbf{A}}$	108.5	8	0
	- trace silt, soft, moist			17	$\left  \right\rangle$	116.5	9	0
12	CH - CLAY, trace SILT (Varved), soft, high plasticity, slow dilatency, reddish brown/grey, damp	186.99	BENTONITE GRAVEL	18	$ \Rightarrow $	112.5	7	0
13	to moist; silty varves consisting of alternating coloured bands of grey and reddish brown				$\ominus$			
				19		100	6	0
4				20	Å	110.5	14	0
	- 0.25cm piece of subangular gravel		#2 Silica Sand	21	$\times$	114.5	6	0



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	Monitoring Well			SAMF	PLE	
m BGS		m AMSL		н	VAL	(%)	Щ	
	TOP OF CASING TOP OF RISER GROUND SURFACE	199.38 199.32 198.98		NUMBER	INTERVAL	REC (%)	'N' VALUE	
0.5	Please refer to Overburden Stratigraphy Log OW8A-07.							
1.0								
1.5								
2.0								
2.5								
  5.0								
6.0			260mm Ø BOREHOLE					
6.5			BOREHOLE					
7.0								
-7.5								
8.0								
9.0			PORTLAND BENTONITE 102mm Ø STEEL CASING					
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO C	URRENT ELEVATION TABLE	1	1			I



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	Monitoring Well			SAM		
m BGS		AMSL		NUMBER	INTERVAL	REC (%)	'N' VALUE	
- 10.5 - 11.0 - 11.5 - 12.0 - 12.5 - 13.0 - 13.5 - 14.0 - 14.5 - 14.0 - 14.5 - 15.0 - 15.5 - 16.0 - 16.5 - 17.0 - 17.5 - 18.0 - 18.5 - 19.0 - 19.5	END OF OVERBURDEN HOLE @ 17.68m BGS		BENTONITE PORTLAND 51mm Ø SCH 40 PVC RISER					



#### STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

Page 3 of 4

PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW8D-07 DATE COMPLETED: June 14, 2007 DRILLING METHOD: 6 1/4" HSA/HQ CORING FIELD PERSONNEL: J.Leader/B.lotzov

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	Monitoring Well	RUN NUMBER	CORE RECOVERY %	RQD %	
17.5							
18.0	DOLOSTONE-SHALE BEDROCK (SALINA FORMATION), dolostone shale, light grey/dark grey, thin horizontal laminations to wavy beds, fine grained and micro-crystalline, argillaceous, gypsiferous,	— 181.30	2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	8	0	
18.5 19.0	slightly weathered in upper 3 metres, no gypsum apparent in the first 0.7 metres; occasional to frequent gypsum beds/nodules, occasional selenite crystals; highly fractured to 18.5 m.bgs - mudstone conglomerate bed (40.6cm), gravel size particles interbedded within dolomitic-shale		11111111111111111111111111111111111111	2	91	65	
19.5			96mm Ø				
20.0	<ul> <li>gypsum bed (15.2cm), medium to coarse crystalline, irregular upper and lower contacts</li> </ul>		COREHOLI	=			
20.5	<ul> <li>gypsum bed (14cm)</li> <li>gypsum (70-80%), fine to medium crystalline structure, shale inclusions, 21.6cm zone</li> </ul>			3	83	83	
21.5	- gypsum (70%), micro to medium crystalline structure, 45.7cm zone						
22.0	<ul> <li>suspect fractured zone (12.8cm), 5 fractures inferred along mudstone beds</li> </ul>			4	100	93	
22.5							
23.0			- 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11				
24.0				5	100	95	
24.5	- fracture		1997 1997 1997				
25.0	- vuggy, partially filled with gypsum, 8.9cm zone			6	100	100	
25.5	<ul> <li>vuggy, partially filled with selenite crystals, horizontal, 14cm zone</li> </ul>						
26.0	- vuggy						
26.5			1987 [1987] 1987 [1987]	7	100	100	
<u></u> <u>NC</u>	DTES: MEASURING POINT ELEVATIONS MAY CHANGE;	REFER TO C	URRENT ELEVATION TABLE		<u>I</u>	<u> </u>	



#### STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW8D-07 DATE COMPLETED: June 14, 2007 DRILLING METHOD: 6 1/4" HSA/HQ CORING FIELD PERSONNEL: J.Leader/B.lotzov

EPTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	Monitoring Well	RUN NUMBER	CORE RECOVERY %	RQD %
27.5	- gypsum bed (25.5cm), medium to coarse					
28.0 28.5	crystalline structure - gypsum bed (8.9cm), medium crystalline structure			8	100	100
29.0 29.5	<ul> <li>gypsum bed (78.7cm), wavy upper contact, occasional mudstone seam, medium crystalline structure</li> </ul>		NO.2 SILICA SAND		400	100
30.0	- gypsum (90%) interbedded with dolostone, 10.2cm zone		SCREEN	9	100	100
30.5	END OF BOREHOLE @ 30.48m BGS	168.50	WELL DETAILS Screened interval:			
31.0			170.02 to 168.50m AMSL 28.96 to 30.48m BGS Length: 1.52m			
31.5			Diameter: 51mm Slot Size: 20 Material: Sch 40 PVC			
32.0 32.5			Seal: 198.98 to 170.94m AMSL 0.00 to 28.04m BGS Material: Bentonite Grout Seal			
33.0			Sand Pack: 170.94 to 168.50m AMSL 28.04 to 30.48m BGS			
33.5			Material: No.2 SILICA SAND			
34.0						
34.5						
35.0						
35.5						
36.0						
36.5						
<u>N</u> (	OTES: MEASURING POINT ELEVATIONS MAY CHANGE; I	REFER TO C			I	



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW8S-07 DATE COMPLETED: June 19, 2007 DRILLING METHOD: 6 1/4" HSA/HQ CORING FIELD PERSONNEL: J.Leader

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	Monitoring Well			SAM		
	TOP OF CASING TOP OF RISER	AMSL 199.83 199.67		NUMBER	INTERVAL	REC (%)	'N' VALUE	
	GROUND SURFACE	198.98			=		-	
0.5	Please refer to Overburden Stratigraphy Log OW8A-06.							
1.0								
1.5								
2.0								
2.5								
3.0								
3.5								
4.0								
4.5								
5.0								
5.5								
6.0			260mm Ø					
6.5			260mm Ø BOREHOLE					
7.0								
7.5								
8.0								
8.5								
9.0			PORTLAND BENTONITE					
			I02mm Ø STEEL CASING					
9.5								
I N	DTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO C				1		

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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW8S-07 DATE COMPLETED: June 19, 2007 DRILLING METHOD: 6 1/4" HSA/HQ CORING FIELD PERSONNEL: J.Leader

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	Monitoring Well			SAM		
m BGS		M AMSL		NUMBER	INTERVAL	REC (%)	'N' VALUE	
- 10.5 - 11.0 - 11.5 - 12.0 - 12.5 - 13.0 - 13.5 - 14.0 - 14.5 - 14.0 - 14.5 - 15.0 - 15.5 - 16.0 - 16.5 - 17.0 - 17.5 - 18.0 - 18.5 - 19.0 - 19.5	END OF OVERBURDEN HOLE @ 17.68m BGS		BENTONITE PORTLAND					



#### STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

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PROJECT NAME: EDWARDS LANDFILL PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW8S-07 DATE COMPLETED: June 19, 2007 DRILLING METHOD: 6 1/4" HSA/HQ CORING FIELD PERSONNEL: J.Leader

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	AMSL		RUN NUMBER	CORE RECOVERY %	RQD %	
17.5 18.0 18.5	Please refer to Bedrock Stratigraphy Log OW8D-07.	— 181.30					
<ol> <li>19.0</li> <li>19.5</li> <li>20.0</li> <li>20.5</li> <li>21.0</li> <li>21.5</li> <li>22.0</li> <li>22.5</li> <li>23.0</li> <li>23.5</li> <li>24.0</li> <li>24.5</li> </ol>	END OF BOREHOLE @ 23.01m BGS	— 175.97	WELL DETAILS         Screened interval:         177.49 to 175.97m AMSL         21.49 to 23.01m BGS         Length:       1.52m         Diameter:       51mm         Size:       20         Material:       Sch 40 PVC         Screened interval:       177.49 to 175.97m         21.49 to 23.01m       BGS         Length:       1.52m         Diameter:       51mm         Societal:       Sch 40 PVC				
25.0			198.98 to 177.80m AMSL 0.00 to 21.18m BGS Material: Bentonite Grout Seal Sand Pack: 177.80 to 175.97m AMSL 21.18 to 23.01m BGS Material: No.2 SILICA SAND				
26.0							
25.5 26.0 26.5	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; R	EFER TO C	URRENT ELEVATION TABLE				
-							



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW1A-07 DATE COMPLETED: May 7, 2007 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m ASD	Monitoring Well		1	SAMF	T	
	TOP OF CASING TOP OF RISER GROUND SURFACE	200.80 200.67 199.67		NUMBER	INTERVAL	REC (%)	'N' VALUE	
	FILL - CLAY, trace SILT (Disturbed), soft to firm, high plasticity, brown, damp			01	$\boxtimes$	29.2	4	C
-1	OL/PT - SILT LOAM, trace CLAY, trace SAND, trace GRAVEL (NATIVE), soft, moderate plasticity, black, moist	198.76 198.15		02	$\boxtimes$	39.6	2	C
-2	CL - SILTY CLAY, firm to stiff, low plasticity, brown with grey streaking/mottling, damp; suspect mechanical fracture due to drilling			03	$\mathbb{A}$	45.8	8	С
- 3	- silt, with clay, stiff - no apparent streaking/mottling - stiff to very stiff, damp		108mm Ø Borehole	04	$\bigotimes$	85.4	8	C
-4				05 06	$\bigcirc$	106.3 47.9	25 26	c
-5	CH - CLAY, trace SILT (Varved), firm, high plasticity, slow dilatency, reddish brown/grey, damp;	195.10	108mm Ø Borehole	07	$\bigcirc$	108.3	16	C
-6	silty varves consisting of alternating coloured bands of grey and reddish brown - 0.25cm piece of fine grained, subangular gravel, vertical deposition			08	$\square$	110.4	8	C
	<ul> <li>- 33cm layer/zone of clay with silt, moderate plasticity, repid dilatency</li> </ul>	100 75		09	$\boxtimes$	120.8	11	0
-7	CH - CLAY, trace SILT, trace GRAVEL (Till), stiff to very stiff, moderate plasticity, grey, damp; fine grained gravel	192.75	BENTONITE AND CONCRETE GROUT	10	$\square$	70.8	17	0
-8	- 10cm layer of fine grained gravel, moist - greyish brown in colour		1 51mm Ø SCH 40 PVC RISER PIPE	11	X	97.9	14	0
9			BENTONITE AND GROUT 51mm Ø SCH 40 PVC RISER PIPE	12	$\left \right\rangle$	110.4 25	12 9	0
10	- soft			14	$\bigcirc$	87.5	6	0
-11	- 5cm layer of clay and gravel, trace silt			15	$\overline{\mathbb{X}}$	112.5	10	0
12	CH - CLAY, trace SILT (Varved), soft, high plasticity, moderate dilatency, reddish brown/grey, wet; silty varves consisting of alternating coloured	188.24		16	$\square$	125	8	0
.12	bands of grey and reddish brown - piece of gravel/cobble >5cm, broken by split spoon			17	$\boxtimes$	100	8	0
13	- 2.5cm piece of subangular gravel			18	X	104.2	9	0
14			GRAVEL	19	X	108.3	5	0
				20	X	106.3	8	0

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Page 2 of 2

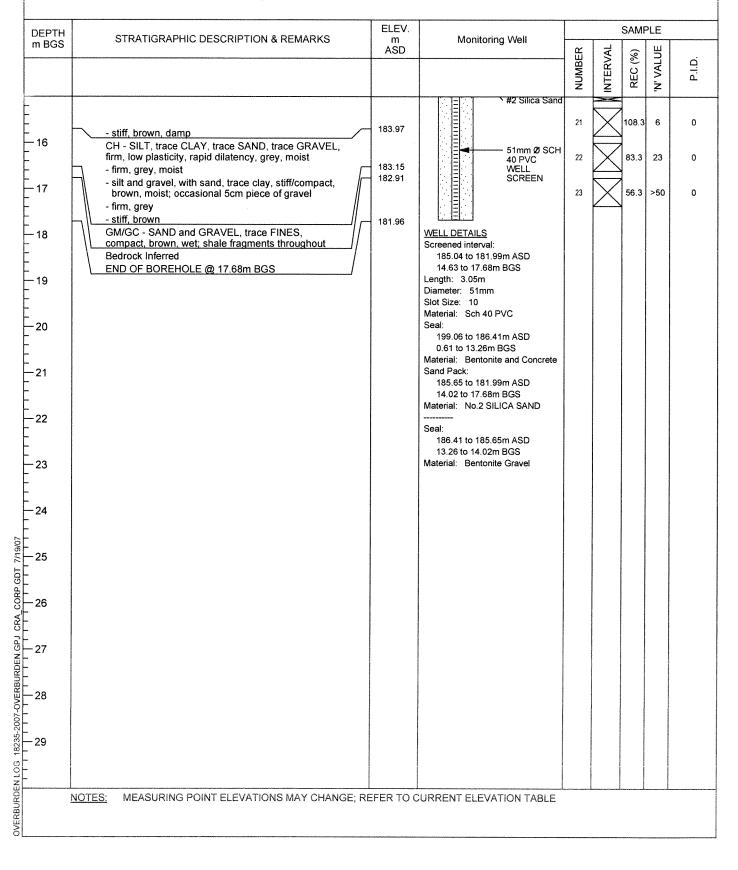
PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW1A-07 DATE COMPLETED: May 7, 2007 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader





Page 1 of 1

PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW1B-07 DATE COMPLETED: May 7, 2007 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

EPTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	Monitoring Well		r	SAMI	<u> </u>
		ASD 200.76	4 4 1 1 1	NUMBER	INTERVAL	REC (%)	N' VALUE
	TOP OF RISER GROUND SURFACE	200.68 199.60		٦٢	<u>I</u>	RE	Ż
	- Please Refer to Stratigraphy Log MW1A-07.		51mm Ø SCH 40 PVC RISER PIPE				
			BENTONITE GRAVEL 108mm Ø Borehole #2 Silica Sand 51mm Ø SCH 40 PVC WELL SCREEN				
	END OF BOREHOLE @ 4.27m BGS						
			Screened interval: 198.38 to 195.33m ASD 1.22 to 4.27m BGS Length: 3.05m				
			Diameter: 51mm Slot Size: 10 Material: Sch 40 PVC Seal:				
			199.30 to 198.69m ASD 0.30 to 0.91m BGS Material: Bentonite Gravel Sand Pack:				
			198.69 to 195.33m ASD 0.91 to 4.27m BGS Material: No.2 SILICA SAND				
0							
1							
2							
3							
4						<b>HAR A MARKAN</b> A KAN KAN KAN KAN KAN KAN KAN KAN KAN KA	nan antonio ant
<u></u> <u>N</u>	IOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO C	URRENT ELEVATION TABLE				



Page 1 of 2

PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW6A-07 DATE COMPLETED: November 20, 2007 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well		SAMPL		
111 BG3			Concrete	NUMBER	REC (%)	'N' VALUE	
-0.5	SILT with GRAVEL (FILL), firm, brown, dry; rootlets			01		19	0
- 1.0	CL-ML - CLAYEY SILT, trace SAND, stiff, slight plasticity, brown, very damp to dry	0.76		02	38	38	0
- 1.5 - 2.0	- clay with silt, trace sand, stiff, brown and grey		CONCRETE	03	56	26	0
-2.5		2.74		04	35	28	0
- 3.0 - 3.5	MH - CLAYEY SILT (VARVED), stiff, moderate to high plasticity, slow dilatency, brown and grey, damp		← 108mm Ø Borehole	05	67	20	0
-4.0			■ 108mm Ø Borehole ■ 51mm Ø SCH 40 PVC RISER PIPE	06	38	21	0
- 4.5 - 5.0	- trace gravel, firm, sub-rounded gravel, high plasticity, brown			07	63	25	0
-5.5				08	56	18	0
6.0				09	60	17	0
6.5 7.0 7.5	CH - SILTY CLAY (TILL), trace GRAVEL, firm-stiff,	7.09	BENTONITE AND CONCRETE GROUT	10	58	19	0
-7.5	sub-rounded graveÌ, high plasticity, slow dilatency, brownish grey, damp - soft-firm, damp-moist				52	26	0
8.5				12	67	20	0
9.0					73	17	0
10.0				14	65	17	0
<u>N</u>	IOTES: MEASURING POINT ELEVATIONS MAY CHANGE; STATIC WATER						

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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW6A-07 DATE COMPLETED: November 20, 2007 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well		1	SAMF		
				NUMBER	INTERVAL	REC (%)	'N' VALUE	
- 11.0				15			NA	0
- 11.5				16	$\square$	92	22	0
- 12.0 - 12.5	CH-MH -CLAY and SILT, trace SAND, trace GRAVEL, soft-firm, moderate dilatency, grey, damp to moist	- 11.99		17		100	19	0
- 13.0							10	
- 13.5			BENTONITE GRAVEL	18	$\left \right\rangle$	100	16	0
- 14.0			✓ #1 Silica Sand	19		100	13	0
14.5 15.0			↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	20		96	11	0
15.5	GM - CLAYEY GRAVEL, with SAND, compact,	- 15.57		21		100	16	0
16.0	poorly graded, subangular, fine to medium grained sand, coarse grained gravel, moist to wet sand and gravel, trace fines, dense, subangular,	- 16.26	51mm Ø SCH 40 PVC WELL SCREEN	22		54	>50	0
16.5	wet; some shale and gypsum present           BEDROCK - Shale with Gypsum, dark grey				$\square$			
- 17.0 - 17.5	END OF BOREHOLE @ 17.37m BGS	- 17.37						
- 18.0			Screened interval: 14.33 to 17.37m BGS Length: 3.05m					
- 18.5			Diameter: 51mm Slot Size: 10 Material: Sch 40 PVC Seal:					
- 18.5 - 19.0 - 19.5 - 20.0			12.50 to 13.11m BGS Material: Bentonite Gravel Sand Pack:					
- 19.5 - 20.0			13.72 to 17.37m BGS Material: No.1 SILICA SAND  Seal:					
-20.5			0.61 to 13.11m BGS Material: Bentonite Grout					
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; F STATIC WATER L							

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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW6B-07 DATE COMPLETED: November 20, 2007 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH	Monitoring Well			SAMF	PLE	
m BGS		m BGS		NUMBER	INTERVAL	REC (%)	'N' VALUE	
-0.5 -0.5 -1.0 -1.5 -2.0 -2.5 -3.0 -3.5 -4.0 -4.5 -5.5 -6.0 -6.5 -7.0 -7.5 -8.0 -8.5 -9.0 -9.5	Please Refer to Stratigraphy Log MW6A-07.	3.96	CONCRETE BENTONITE GRAVEL 51mm Ø SCH 40 PVC RISER PIPE #1 Silica Sand 108mm Ø Borehole 51mm Ø SCH 40 PVC WELL SCREEN WELL DETAILS Screened interval: 0.91 to 3.96m BGS Length: 3.05m Diameter: 51mm Slot Size: 10 Material: Sch 40 PVC Seal: 0.30 to 0.76m BGS Material: Bentonite Gravel Sand Pack: 0.76 to 3.96m BGS Material: No.1 SILICA SAND	NUMBER	INTERVAL	REC (%)		
9.5 10.0								
 	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; R STATIC WATER LI							

	(OVERB		DESIGNATION: OW3A-07				Fag	e 2 of 2
	CT NUMBER: 18235		COMPLETED: May 1, 2007					
	: HNSLI		NG METHOD: 108mm ID HSA					
	ON: 160 Brooks Rd., Haldimand County, Ontario		PERSONNEL: J.Leader					
00/11	Ch. Too Brooks Ne., Haldinand County, Ontano		PERSONNEL. J.Leader					
EPTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	Monitoring Well		T	SAMF		
		ASD		NUMBER	INTERVAL	REC (%)	N' VALUE	P.I.D.
				NUN	INTE	REC	,N' 'N	<u>d</u>
	<ul> <li>- 6.4cm layer of silty clay, moderate plasticity, moderate dilatency</li> </ul>				$\overline{}$			
	<ul> <li>- 0.25cm piece of subangular gravel</li> <li>- 0.5cm piece of subangular gravel, vertical</li> </ul>			22	$ \Delta$	110.5	12	0
6	deposition /	183.12	51mm Ø SCH 40 PVC	23	$\bigtriangledown$	37.5	>50	0
f	GM/GC - SANDY GRAVEL, with FINES, compact,	182.78 182.72	WELL SCREEN		$\succ$			Ū
7	well graded, brown, wet; fine to coarse sand, fine subangular gravel, shale fragments throughout							
	Bedrock Inferred							
8	END OF BOREHOLE @ 16.46m BGS		WELL DETAILS Screened interval:					
			184.70 to 181.65m ASD					
			14.48 to 17.53m BGS Length: 3.05m					
9			Diameter: 51mm Slot Size: 10					
			Material: Sch 40 PVC Seal:					
20			198.57 to 186.07m ASD					
			0.61 to 13.11m BGS Material: Bentonite and Concrete					
21			Sand Pack: 185.31 to 181.65m ASD					
			13.87 to 17.53m BGS					
			Material: No.2 SILICA SAND					
22			Seal: 186.07 to 185.31m ASD					
			13.11 to 13.87m BGS Material: Bentonite Gravel					
3			Material. Deritorite Graver					
4			·					
5								
6								
7								
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۰								
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							manimum factorization	
L	 NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO C						
<u>11</u>	TELES INCLOSUNTO FORT LEVITIONO MATORANOE, RE		CONCERN LEEVATION TABLE					



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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: OW3B-07 DATE COMPLETED: May 2, 2007 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m ASD	Monitoring Well	ъ	r	SAMF		
	TOP OF CASING TOP OF RISER GROUND SURFACE	200.11 199.99 199.12		NUMBER	INTERVAL	REC (%)	'N' VALUE	
-1 -2 -3	- Please Refer to Stratigraphy Log OW3A-07.		CONCRETE 51mm Ø SCH 40 PVC RISER PIPE BENTONITE GRAVEL 108mm Ø Borehole #2 Silica Sand 51mm Ø SCH 40 PVC WELL SCREEN					
-4 -5 -6 -7	END OF BOREHOLE @ 3.96m BGS		WELL DETAILS Screened interval: 198.21 to 195.16m ASD 0.91 to 3.96m BGS Length: 3.05m Diameter: 51mm Slot Size: 10 Material: Sch 40 PVC Seal: 198.51 to 198.21m ASD 0.61 to 0.91m BGS Material: Bentonite Gravel Sand Pack:					
-8 -9			198.21 to 195.16m ASD 0.91 to 3.96m BGS Material: No.2 SILICA SAND					
- 10								
- 11								
- 12								
- 13								
-14								
<u><u></u><u></u></u>	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	EFER TO (	CURRENT ELEVATION TABLE		L		d	



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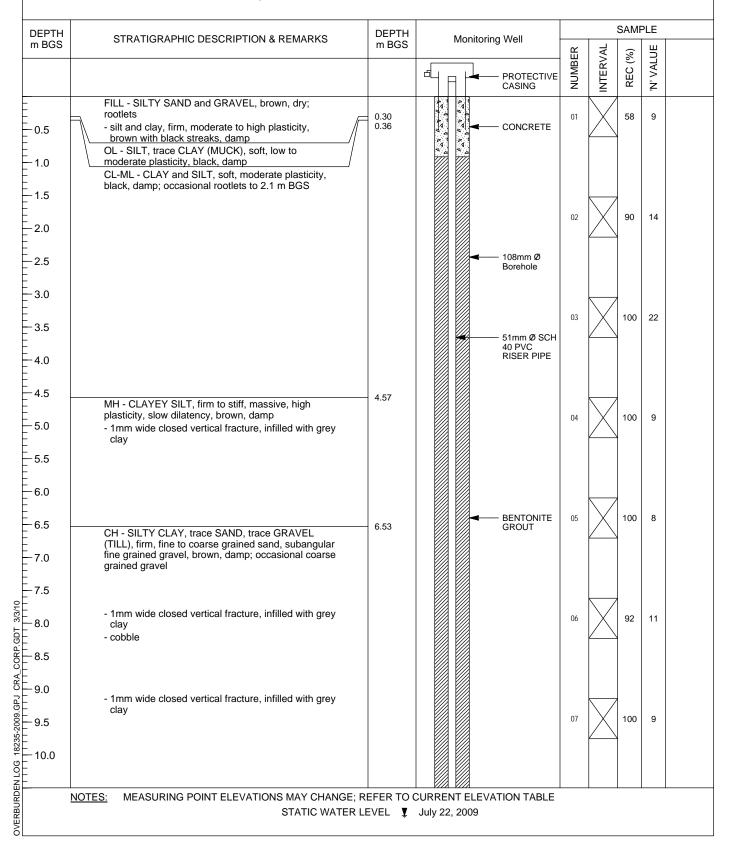
PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW4A-09 DATE COMPLETED: June 23, 2009 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader





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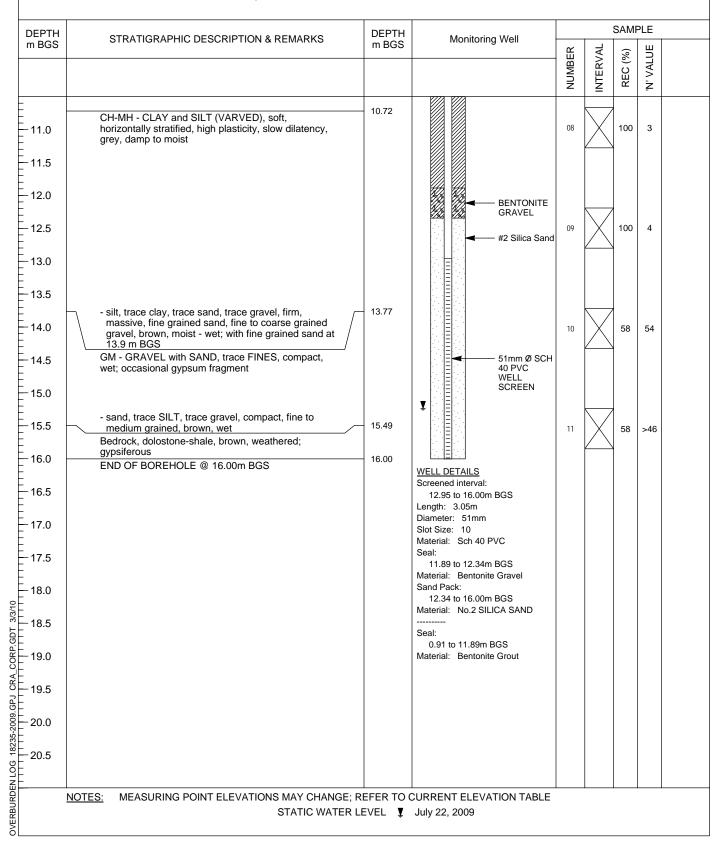
PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW4A-09 DATE COMPLETED: June 23, 2009 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader





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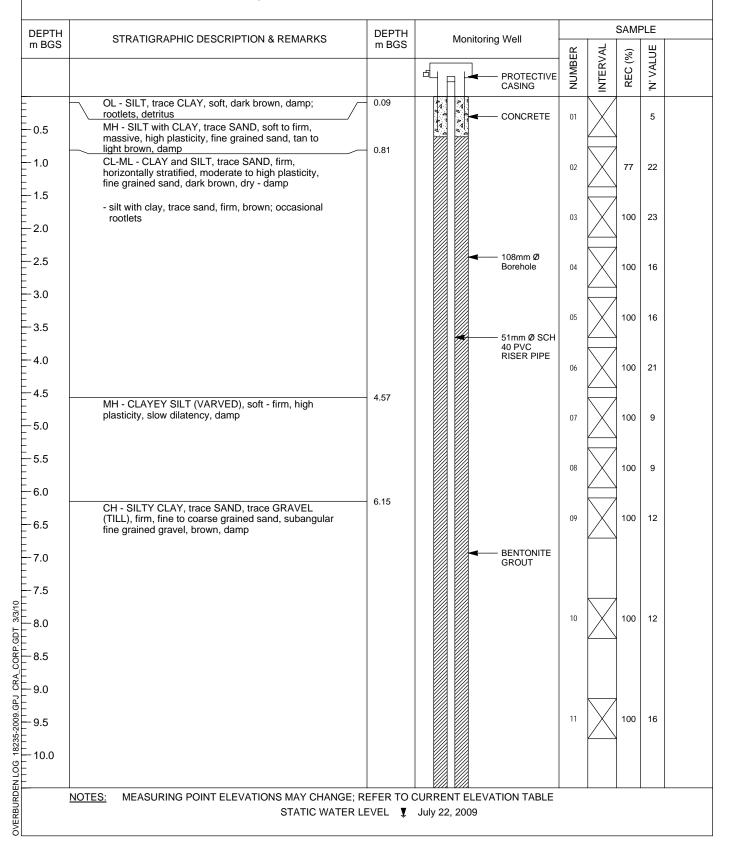
PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW5A-09 DATE COMPLETED: June 22, 2009 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader





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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW5A-09 DATE COMPLETED: June 22, 2009 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH	Monitoring Well			SAM	PLE
n BGS		m BGS		NUMBER	INTERVAL	REC (%)	'N' VALUE
11.0 11.5	- becoming grey in colour, damp - moist			12		100	8
12.0 12.5				13		33	13
13.0 13.5	MH-CH - CLAY and SILT (VARVED), soft - firm,	13.72	BENTONITE GRAVEL			7	
· 14.0 · 14.5	high plasticity, moderate dilatency, alternating reddish brown and grey layers, damp - moist			14	$\mid$	100	6
15.0	- wet		↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓			7	
16.0	- silt with sand and gravel, trace clay, firm/compact, fine to coarse grained, subangular, grey, wet; occasional gypsum fragment GM - SAND and GRAVEL, trace FINES, compact, grey, wet	15.54	↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	15	$\square$	100	7
- 16.5	groy, not		40 PVC WELL SCREEN			7	
- 17.0 - 17.5	<ul> <li>gravel with sand, trace fines, compact, brown, wet</li> <li>silt with sand and gravel, trace clay, firm/compact, well graded, fine to coarse grained, grey, wet</li> </ul>			16	$\square$	75	32
- 18.0	- refusal on assumed bedrock END OF BOREHOLE @ 17.78m BGS	17.78	WELL DETAILS Screened interval:	17	$\times$	56	>100
- 18.5			14.73 to 17.78m BGS Length: 3.05m Diameter: 51mm Slot Size: 10				
- 19.0 - 19.5			Material: Sch 40 PVC Seal: 0.61 to 13.26m BGS				
			Material: Bentonite and Concrete Sand Pack: 14.02 to 17.68m BGS Material: No.2 SILICA SAND				
- 20.0 - 20.5			Seal: 13.26 to 14.02m BGS Material: Bentonite Grout				

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PROJECT NAME: EDWARDS LANDFILL

PROJECT NUMBER: 18235

CLIENT: HNSLI

LOCATION: 160 Brooks Rd., Haldimand County, Ontario

HOLE DESIGNATION: MW5B-09 DATE COMPLETED: June 22, 2009 DRILLING METHOD: 108mm ID HSA FIELD PERSONNEL: J.Leader

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well			SAM	<u> </u>
				NUMBER	INTERVAL	REC (%)	'N' VALUE
0.5	Please Refer to Stratigraphy Log MW5A-09.		CONCRETE				
1.0			<b>      ≪</b> ─── 108mm Ø				
2.0			51mm Ø SCH 40 PVC RISER PIPE				
2.5							
3.0							
3.5			- 51mm Ø SCH 40 PVC RISER PIPE #2 Silica Sand - 51mm Ø SCH 40 PVC WELL SCREEN				
4.5			SCREEN				
5.0							
5.5							
6.0	END OF BOREHOLE @ 6.02m BGS	6.02	WELL DETAILS Screened interval:				
7.0			1.22 to 6.02m BGS Length: 4.8m Diameter: 51mm Slot Size: 10				
7.5			Material: Sch 40 PVC Seal: 0.30 to 0.91m BGS				
8.0			Material: Bentonite Gravel Sand Pack: 0.91 to 6.02m BGS Material: No.2 SILICA SAND				
8.5							
9.0							
10.0							
<u></u> <u>NC</u>	OTES: MEASURING POINT ELEVATIONS MAY CHANGE;	REFER TO (	URRENT ELEVATION TABLE			<u> </u>	
-8.0 -9.0 -9.5 -10.0	OTES: MEASURING POINT ELEVATIONS MAY CHANGE;	REFER TO (	CURRENT ELEVATION TABLE				

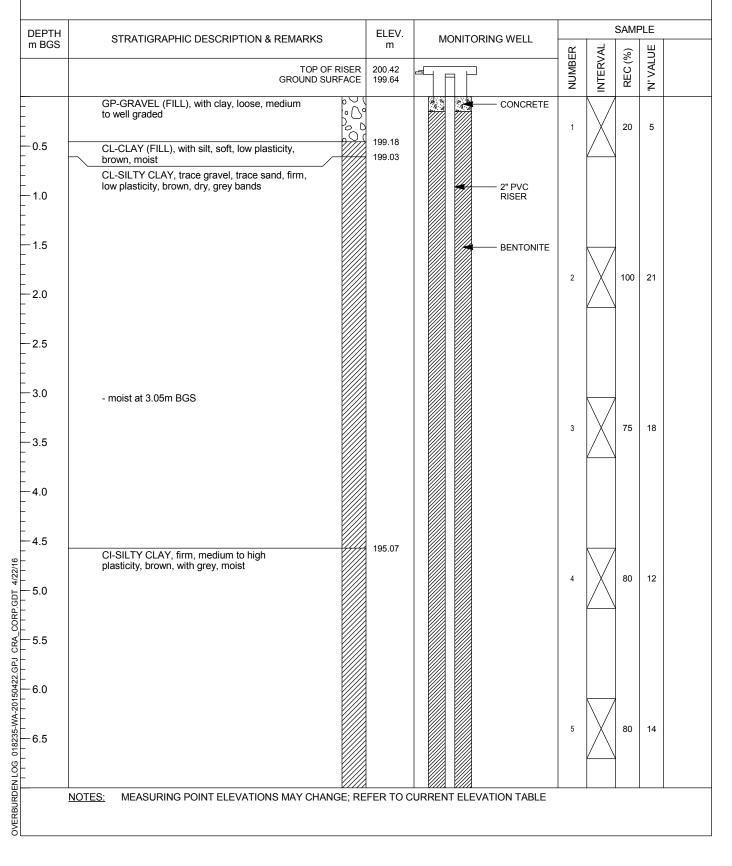


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PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235

CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: CAYUGA, HALDIMAND COUNTY, ON





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PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235 CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: CAYUGA, HALDIMAND COUNTY, ON

EPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	MONITORING WELL		PLE			
BGS		 m		NUMBER	INTERVAL	REC (%)	'N' VALUE	
3.0	- trace gravel 3cm Ø at 7.62m BGS			6		100	19	
9.5 9.0 9.5				7		75	17	
10.0 10.5 11.0	CI-GRAVELLY CLAY, with silt, soft, medium plasticity, brown, wet	188.67		8		70	33	
11.5 12.0 12.5	CH-CLAY, trace silt, soft, high plasticity, grey, moist	187.45		9		80	11	
13.0 13.5								

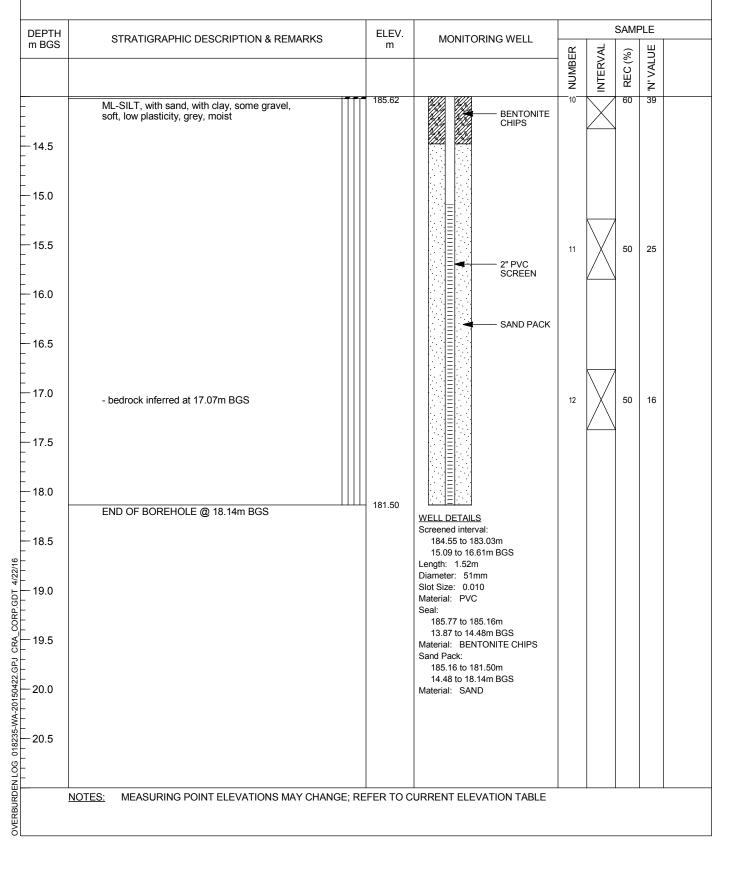


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PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235

CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: CAYUGA, HALDIMAND COUNTY, ON





#### STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235

CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: CAYUGA, HALDIMAND COUNTY, ON

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	MONITORING WELL		SAMF		PLE	
m BGS		m		ER	VAL	(%)	Ы	
	TOP OF RISER GROUND SURFACE	200.50 199.70		NUMBER	INTERVAL	REC (%)	'N' VALUE	
-	GP-GRAVEL (FILL), with clay, loose, medium		CONCRETE 2" PVC WELL CASING					
0.5	CL-CLAY (FILL), with silt, soft, low plasticity, brown, moist	199.24 199.09	CASING					
 1.0	CL-SILTY CLAY, trace gravel, trace sand, firm, low plasticity, brown, dry, grey bands							
- - 			2" PVC WELL SCREEN					
-2.0			2" PVC WELL SCREEN SAND PACK					
2.5 								
	- moist at 3.05m BGS							
- 4.0 	END OF BOREHOLE @ 3.96m BGS	195.74	WELL DETAILS       Screened interval:					
⊈4.5 4.5			198.79 to 195.74m 0.91 to 3.96m BGS Length: 3.05m Diameter: 51mm					
1 5.0			Slot Size: 0.010 Material: PVC Seal: 199.55 to 198.94m 0.15 to 0.76m BGS					
657 CG9 1			Material: BENTONITE Sand Pack: 198.94 to 195.74m 0.76 to 3.96m BGS					
0.9			Material: SAND					
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO C	URRENT ELEVATION TABLE					
OVER								



#### STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 4

PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235

CLIENT: C/O 2270386 ONTARIO LIMITED LOCATION: CAYUGA, HALDIMAND COUNTY, ON

DE	ЕРТН		ELEV.			SAMF		SAN		SAM		PLE	
m	BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	m		н	/AL	(%	ПE					
		TOP OF RISEF GROUND SURFACE	201.22 200.51		NUMBER	INTERVAL	REC (%)	'N' VALUE					
			200.01		ž	Ľ z	ĸ	Ż					
F		CL-CLAY (FILL), with silt, firm, medium to high plasticity, brown to grey, moist	200.36			$\mathbb{N}/$							
F		TOPSOIL	'X	CONCRETE	1	X	40	11					
-0	.5	GP/CL-GRAVEL AND CLAY, intermixed, dense, well graded, grey, dry	199.90										
F		CL-CLAY, with silt, very firm, high plasticity,	100.00										
<u>–</u> 1	0	brown to grey, moist to wet		2" PVC WELL CASING									
F .	.0												
F													
-1	.5			BENTONITE GROUT									
F				GROUT		$\left \right\rangle$							
F					2	ΙÅ.	100	7					
F	.0												
E													
-2	.5												
F													
F													
-3	.0												
F					3	$ \vee $	90	20					
-3	.5					$  \wedge$							
F						$\vdash$							
F.													
-4	.0												
F													
-4	.5		195.94										
₽		CL-CLAY, trace silt, trace gravel, very firm, high plasticity, grey with brown and reddish	195.94										
		brown streaks, moist			4	X	60	14					
- 5	.0	- silt with sand seam from 4.88 to 5.18m BGS				$ / \setminus$							
5⊢ ≴⊢5	.5												
5- 5-													
5 <u>−</u> 6	.0		194.41			Ļ,							
		CL-CLAY, with silt, trace gravel, very firm, high plasticity, brown to grey, with reddish streaks,				$\left \right\rangle$							
}– 6	.5	moist			5	X	95	11					
						$\angle $							
		NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; R	A EFER TO C			1							
5													

#### STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235

CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: CAYUGA, HALDIMAND COUNTY, ON

	щ
8.0       6       50       1         8.5       9.0       7       0       1         9.5       10.0       CL-CLAY, trace silt, trace gravel, firm, very high plasticity, grey, moist       190.76       190.76       1	'N' VALUE
8.0       -8.5         9.0       -9.5         -9.5       -7         -10.0       CL-CLAY, trace silt, trace gravel, firm, very high plasticity, grey, moist	
9.5 - 0 1 - 10.0 - 10.0 - 10.0	17
9.3     CL-CLAY, trace silt, trace gravel, firm, very high plasticity, grey, moist     190.76	
	19
	11
	10
12.0 12.5 13.0 13.5 - clay, with sand and gravel from 13.72 to 14.33m BGS NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE	
14.33m BGS	
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE	

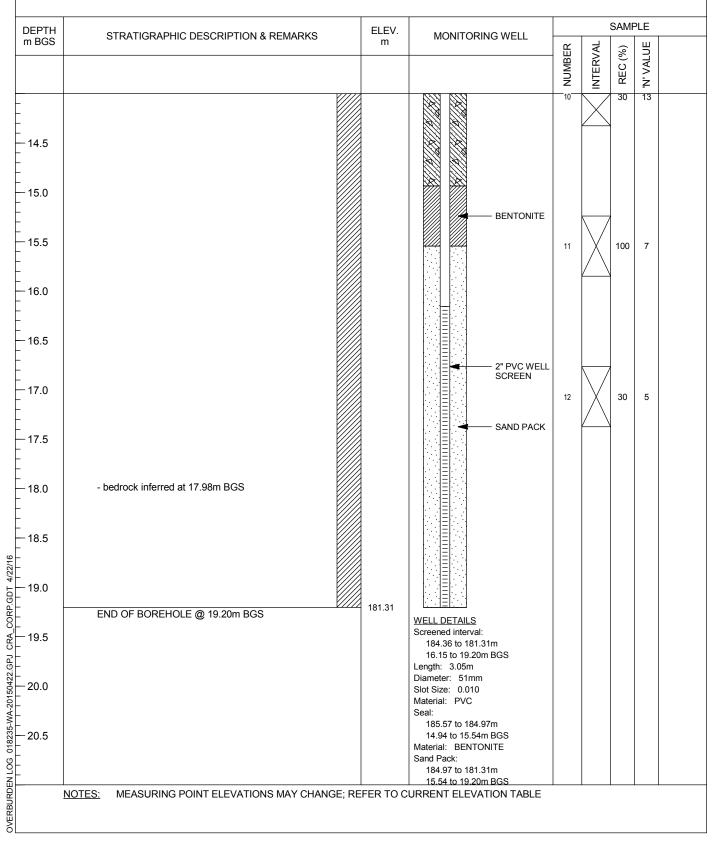


Page 3 of 4

PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235

CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: CAYUGA, HALDIMAND COUNTY, ON





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PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235 CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: CAYUGA, HALDIMAND COUNTY, ON

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS			SAMPLE					
m BGS		m		NUMBER	INTERVAL	REC (%)	'N' VALUE		
-			Material: SAND				-		
- 									
- 									
- 22.5									
- 23.5 									
- 24.0 									
- 24.5 - - -									
- 									
- 25.5 - - -									
- 26.0 - -									
- 									
- 27.0									
27.5 									
<u> </u>	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	EFER TO C	URRENT ELEVATION TABLE	<u> </u>		1	I		



Page 1 of 1

PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235

CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: CAYUGA, HALDIMAND COUNTY, ON

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.						SAMF	PLE	<u> </u>		
m BGS		m			VAL	(%)	ПE					
	TOP OF RISER GROUND SURFACE	201.22 200.50		NUMBER	INTERVAL	REC (%)	'N' VALUE					
_	CL-CLAY (FILL), with silt, firm, medium to high plasticity, brown to grey, moist	200.35	CONCRETE 2" PVC WELL CASING									
_ ! _	TOPSOIL	•	2" PVC WELL CASING									
0.5	GP/CL-GRAVEL AND CLAY, intermixed, dense, well graded, grey, dry	199.89										
	CL-CLAY, with silt, very firm, high plasticity, brown to grey, moist to wet											
1.0 												
1.5			2" PVC WELL SCREEN									
_    -												
-			SAND PACK									
_ 2.5												
_ ! _												
- 3.0												
- !												
-3.5												
_ ! _												
	END OF BOREHOLE @ 3.96m BGS	196.54										
			WELL DETAILS Screened interval:									
			199.59 to 196.54m 0.91 to 3.96m BGS									
- 4.5 -			Length: 3.05m Diameter: 51mm									
-    -			Slot Size: 0.010 Material: PVC									
- 5.0			Seal: 200.35 to 199.74m									
			0.15 to 0.76m BGS Material: BENTONITE									
5.5			Sand Pack: 199.74 to 196.54m									
_    -			0.76 to 3.96m BGS									
6.0			Material: SAND									
65												
6.5 												
_    -												
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	EFER TO C	URRENT ELEVATION TABLE	1	ļ			<u> </u>				
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#### STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

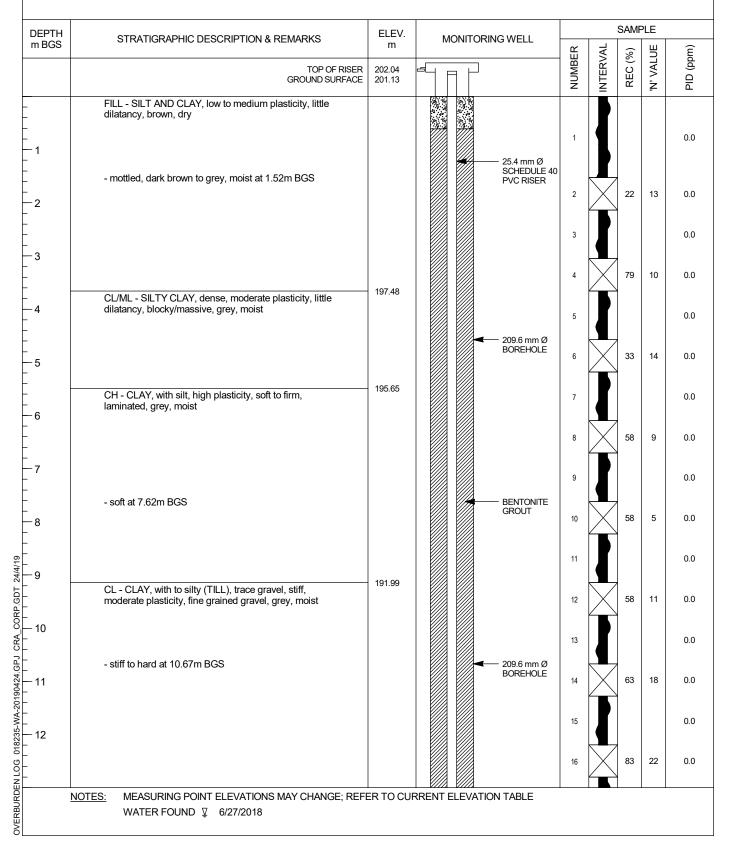
PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235 CLIENT: C/O 2270386 ONTARIO LIMITED LOCATION: HALDIMAND COUNTY, ON HOLE DESIGNATION: LW1-17 DATE COMPLETED: 10 October 2017 DRILLING METHOD: 4-1/4" ID HSA FIELD PERSONNEL: A. Mailloux

DECRM       STRATIGRAPHIC DESCRIPTION & REMARKS       LELV       LEACHATE WELL         TOP OF RISER GROUND SURFACE       209.35 208.45       209.35       209.35       209.35         LANDFILL COVER - CLAY, soft to firm, brown changing to black and dark grey, no refuse observed       206.93       206.93       206.93         LANDFILLED MATERIAL - CLAY, dark grey to black       206.93       206.93       206.93       206.93         LANDFILLED MATERIAL - CLAY, dark grey to black       206.93       206.93       206.93       206.93         -4       - black clay, firm, wood debris, plastic, small pieces of brick, sulphur odour at 4.27m BGS       206.93       206.93       206.93         -6       -       -       -       -       -       -         -8       - brick, plastics at 6.71m BGS       -       -       -       -         -8       - hydrogen sulphide reading of 17.0 ppm inside augers at 7.62m BGS       -       -       -       -	N'' VALUE
LANDFILL COVER - CLAY, soft to firm, brown changing to black and dark grey; no refuse observed       206.93         -2       LANDFILLED MATERIAL - CLAY, dark grey to black       206.93         -4       - black clay, firm, wood debris, plastic, small pieces of brick, sulphur odour at 4.27m BGS       BENTONITE CHIPS         -6       -       -         - brick, plastics at 6.71m BGS       - brick, plastics at 6.71m BGS	N' VA
changing to black and dark grey; no refuse observed       206.93       2"       2"         2       LANDFILLED MATERIAL - CLAY, dark grey to black       206.93       206.93       80 PVC         RISER       BENTONITE       BENTONITE       CHIPS       BENTONITE         -4       - black clay, firm, wood debris, plastic, small pieces of brick, sulphur odour at 4.27m BGS       8.1/4"       BOREHOLE         -6       -       -       Pea Gravel       -         - brick, plastics at 6.71m BGS       -       -       -         - hydrogen sulphide reading of 17.0 ppm inside       -       -       -	
-2       ANDFILLED MATERIAL - CLAY, dark grey to black       BORC         -2       BENTONITE         -4       - black clay, firm, wood debris, plastic, small pieces         of brick, sulphur odour at 4.27m BGS         -6         - brick, plastics at 6.71m BGS         - brick, plastics at 6.71m BGS         - hydrogen sulphide reading of 17.0 ppm inside	
<ul> <li>black clay, firm, wood debris, plastic, small pieces of brick, sulphur odour at 4.27m BGS</li> <li>6</li> <li>- brick, plastics at 6.71m BGS</li> <li>- brick, plastics at 6.71m BGS</li> <li>- hydrogen sulphide reading of 17.0 ppm inside</li> </ul>	
- hydrogen sulphide reading of 17.0 ppm inside	
- 10 - 10 - 10 - 12 - 12 - 12 - 12 - 12 - 12 - 12 - 12 - 10 - 10	
- wood, black at 13.11m BGS	
- 14 - wet at 14.02m BGS	
Image: Index of the second	
Slot Size: 0.010         Material: SCH 80 PVC         Seal:         208.45 to 205.45m         0.00 to 3.00m BGS         Material: BENTONITE CHIPS         Sand Pack:         205.45 to 193.82m         3.00 to 14.63m BGS	
Material:       Pea Gravel         NOTES:       MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE         WATER FOUND ♀       10/10/2017         STATIC WATER LEVEL ♥       12/19/2017	<u> </u>

#### STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 2

PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235 CLIENT: C/O 2270386 ONTARIO LIMITED LOCATION: HALDIMAND COUNTY, ON HOLE DESIGNATION: MW10A-18 DATE COMPLETED: 27 June 2018 DRILLING METHOD: 4-1/4 ID HSA FIELD PERSONNEL: A. Mollenhuis



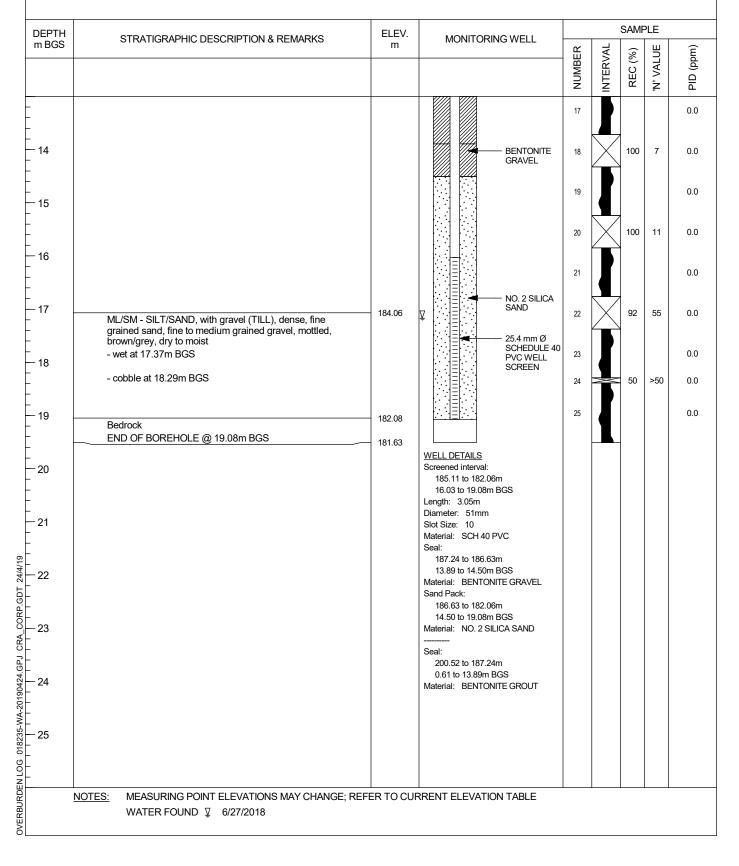
#### STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235 CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: HALDIMAND COUNTY, ON

HOLE DESIGNATION: MW10A-18 DATE COMPLETED: 27 June 2018 DRILLING METHOD: 4-1/4 ID HSA FIELD PERSONNEL: A. Mollenhuis



#### STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

Page 1 of 1

PROJECT NAME: BROOKS ROAD LANDFILL SITE PROJECT NUMBER: 018235 CLIENT: C/O 2270386 ONTARIO LIMITED

CLIENT: C/O 22/0380 ONTARIO LIMITED

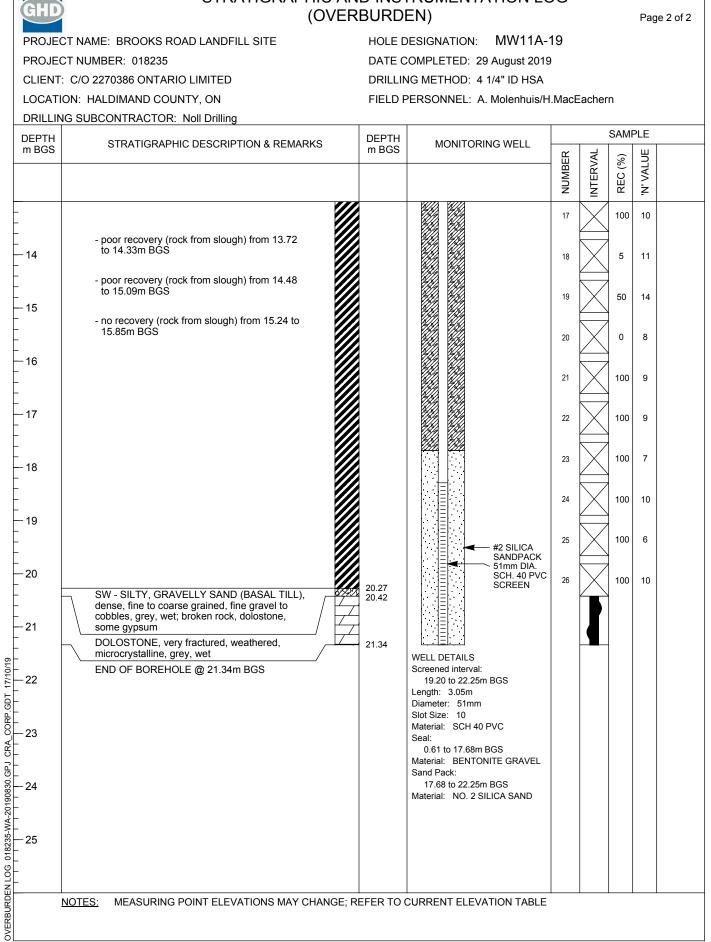
LOCATION: HALDIMAND COUNTY, ON

HOLE DESIGNATION: MW10B-18 DATE COMPLETED: 27 June 2018 DRILLING METHOD: 4-1/4 ID HSA FIELD PERSONNEL: A. Mollenhuis

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL			SAMF		
	TOP OF RISER GROUND SURFACE	201.99 201.09		NUMBER	INTERVAL	REC (%)	'N' VALUE	
- 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12	For stratigraphic description please refer to MW 10A-18 log.	193.01	209.6 mm Ø         BOREHOLE         25.4 mm Ø         SCHEDULE 40         PVC RISER         BENTONITE         GRAVEL         VELL DETAILS         Screened interval:         196.06 to 193.01m         Store         Sched to 196.06m         O.61 to 5.03m BGS         Material:         SCH 40 PVC         Seal:         200.48 to 196.06m         0.61 to 5.03m BGS         Material:         SO State:         196.06 to 193.01m         5.03 to 8.08m BGS         Material:         Sol Size:         10         Material:         Sol Size:         No. 2 SILICA SAND					
<u>N</u> (	OTES: MEASURING POINT ELEVATIONS MAY CHANGE; REF	ER TO CUF	RRENT ELEVATION TABLE					

GHD	STRATIGRAPHIC AN (OVEF	nd ins <sup>.</sup> Rburd		ЭG			Page 1 of 2
PROJEC	CT NAME: BROOKS ROAD LANDFILL SITE	HOLE [	DESIGNATION: MW11A-	19			
PROJEC	CT NUMBER: 018235	DATE COMPLETED: 29 August 2019					
CLIENT	C/O 2270386 ONTARIO LIMITED	DRILLI	NG METHOD: 4 1/4" ID HSA				
LOCATI	ON: HALDIMAND COUNTY, ON	FIELD	PERSONNEL: A. Molenhuis/H	H.MacE	Eacher	n	
DRILLIN	IG SUBCONTRACTOR: Noll Drilling	1					
DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS				SAMF	
				BER	2VAI	(%)	ALUE
				NUMBER	INTERVAL	REC	N' VALUE
	FILL - clayey silt, stiff, medium plasticity, grey,	8			_		-
-	moist	8					
—1		Š.			$\bigtriangledown$		
-		X		1	$\square$	0	14
-	- clay, trace sand and gravel, very loose, high plasticity, blackish grey, moist at 1.52m BGS	X			$\bigtriangledown$		
-2	,	8		2	$\square$	10	4
-		8			$\bigtriangledown$		
-		×.		3	$\square$	15	5
-3		X					
-	- clay, silty, medium plasticity, loose at 3.35m BGS	X		4	$\square$	80	4
	- wood debris, bottom of fill at 3.66m BGS	3.81					
-	ML - SILT, trace clay, compact, no to low plasticity, grey and brown, moist			5		10	15
-							
-5				6	X	60	12
-							
-				7	X	10	26
-6					$\square$		
-				8	X	85	29
- 7	CH - CLAY, silty to with silt, very stiff, high	6.86					
- '	plasticity, varved, mottled grey/brown, moist; breaks on sub mm silt seams			9	X	50	24
-	breaks on sub min sitt seams		203mm Ø		$\square$		
- 8			BOREHOLE	10	X	50	17
-							
-				11	$ \times $	90	22
-9					$\square$		
-	<ul> <li>grey seam, odour present; likely slough at 9.30m BGS</li> </ul>		51mm DIA.	12	$ \times $	95	21
- 10			SCH. 40 PVC RISER PIPE	:	$\square$		
- 10				13		80	13
-	- grey at 10.67m BGS				$\square$		
11	gioj al lotorini boo		GROUT	14		90	13
-	- poor recovery (rock from slough) from 11.43				$\bowtie$		
	to 12.04m BGS	3		15	$\square$	35	9
- 12	no to trace silt at 12 10m PCS				$ \leftarrow $		
-	- no to trace silt at 12.19m BGS			16	$\square$	75	11
-					$\mid \land \mid$	-	
I	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; F	REFER TO					

OVERBURDEN LOG 018235-WA-20190830.GPJ CRA\_CORP.GDT 17/10/19



## STRATIGRAPHIC AND INSTRUMENTATION LOG

GHD	STRATIGRAPHIC AN OVER			DG			Pag	e 1 of 1
PROJEC	T NAME: BROOKS ROAD LANDFILL SITE	HOLE DESIGNATION: MW11B-19						
PROJEC	CT NUMBER: 018235	DATE COMPLETED: 29 August 2019						
CLIENT:	C/O 2270386 ONTARIO LIMITED	DRILLING METHOD: 4 1/4" ID HSA						
LOCATI	ON: HALDIMAND COUNTY, ON	FIELD PERSONNEL: A. Molenhuis/H.MacEachern						
DRILLIN	G SUBCONTRACTOR: Noll Drilling							
DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	MONITORING WELL				IPLE	
		111 000		BER	SVAL	(%)	IUE	
				NUMBER	INTERVAL	REC (%)	'N' VALUE	
	See MW11A-19				<u> </u>	-	-	
_								
-								
-2								
			BENTONITE GRAVEL					
-3			■ 203mm Ø BOREHOLE					
-								
-4			51mm DIA.					
			SCH. 40 PVC RISER PIPE					
-								
-				1				
6								
_								
-7								
-								
_								
-9			= = #2 SILICA					
-			SANDPACK					
₽ - 10			#2 SILICA SANDPACK 51mm DIA SCH. 40 PVC SCREEN					
			SCREEN					
·····································		- 11.28						
	END OF BOREHOLE @ 11.28m BGS		WELL DETAILS					
2 12			Screened interval: 8.23 to 11.28m BGS					
0.GP			Length: 3.05m Diameter: 51mm					
<sup>206</sup> 13			Slot Size: 10 Material: SCH 40 PVC					
VA-20			Seal:					
235-V			0.61 to 6.71m BGS Material: BENTONITE GRAVEL					
			Sand Pack: 6.71 to 11.28m BGS					
OVERBURDEN LOG 018235-WA-20190830.GPJ CRA_CORP.GDT 17/10/19			Material: NO. 2 SILICA SAND					
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; F	REFER TO	L CURRENT ELEVATION TABLE	1				
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#### STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: BROOKS ROAD LANDFILL SITE

PROJECT NUMBER: 018235

CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: HALDIMAND COUNTY, ON

DRILLING SUBCONTRACTOR: Noll Drilling

HOLE DESIGNATION: MW12A-19 DATE COMPLETED: 26 August 2019 DRILLING METHOD: 4 1/4" ID HSA FIELD PERSONNEL: A. Molenhuis/H.MacEachern

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH	MONITORING WELL			SAMI	PLE	
m BGS		m BGS		NUMBER	<b>ZVAL</b>	(%)	'N' VALUE	
				MUN	INTERVAL	REC (%)	1 'N'	
_	Topsoil							
-	CH - CLAY, with to silty, with sand, compact, high plasticity, varved, light brown, dry; trace	0.61						
1  _	rootlets	1.07		1	$\mid$	100	19	
F	CH - CLAY, with to silty, compact, high plasticity, brownish grey, varved, dry - grey, dry to moist at 1.52m BGS			2	$\bigtriangledown$	50	24	
2					$\square$			
Ē	- with to trace silt, grey, moist at 2.44m BGS			3	$ \times$	100	15	
-3				4		50	17	
	- no to trace silt, occasional medium sand and			4	$\square$	50	17	
-4	very fine gravel at 3.81m BGS			5	$\left \right>$	100	14	
			203mm Ø BOREHOLE				40	
				6	$\mid \wedge \mid$	75	10	
E				7	$\square$	100	11	
-6								
F	- with silt seam at 6.49m BGS - trace to no silt at 6.71m BGS			8	$\mid$	90	14	
-7				9	$\bigtriangledown$	25	28	
-			51mm DIA.					
8			SCH. 40 PVC RISER PIPE	10	$\mid$	50	18	
<u>_</u>	- grey, saturated with little water at 8.53m BGS			11	$\bigtriangledown$	100	19	
9					$\square$		10	
				12	$\left \right>$	50	19	
2- 								
				13	$\mid $	100	20	
b∟ 22 − 11			GROUT	14	$\square$	50	16	
	- wet at 11.43m BGS							
2 2 2 2 2 12				15	$\mid$	100	14	
				16	$\bigtriangledown$	100	/	
					$\square$		,	L
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; R	EFER TO	CURRENT ELEVATION TABLE					

PROJE	CT NAME: BROOKS ROAD LANDFILL SITE	HOLE D	ESIGNATION: MW12A-	19				
PROJE	NUMBER: 018235 DATE COMPLETED: 26 August 2019							
CLIENT	: C/O 2270386 ONTARIO LIMITED	DRILLIN	IG METHOD: 4 1/4" ID HSA					
LOCATI	ON: HALDIMAND COUNTY, ON	FIELD F	PERSONNEL: A. Molenhuis/H	.MacE	Eacher	n		
DRILLIN	IG SUBCONTRACTOR: Noll Drilling							
DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH	MONITORING WELL			SAMF	PLE	
m BGS	STRATIGNALTIC DESCRIPTION & REMARKS	m BGS	MONITORING WELL	۲. ۲	AL	(%	Щ	
				NUMBER	INTERVAL	REC (%)	VALUE	
				۲	I I	RE	ż	
-				17	$\bigtriangledown$	100	5	
-					$\nearrow$			
				18	$\bigtriangledown$	100	3	
					$\square$	100	Ĵ	
-					$\bigtriangledown$			
- 15	- 2.5cm cobble, dark grey, angular at 14.84m	14.78		19	$\bigtriangleup$	100	24	
-	SW - SILTY, GRAVELLY SAND (BASAL TILL),				$\bigtriangledown$			
-	dense, fine to coarse grained, fine gravel to cobbles, grey, wet; broken rock, dolostone,			20	ert	100	17	
— 16	some gypsum - poor recovery (rock in spoon) from 15.24 to		#2 SILICA SANDPACK					
F	15.85m BGS		#2 SILICA SANDPACK 51mm DIA. SCH. 40 PVC SCREEN	21	$ \times$	50	20	
-	- weathered rock, with clay and silt at 16.76m		51mm DIA.					
— 17 -	BGS		SCH. 40 PVC	22	$ \times $	0	56	
_	DOLOSTONE, very fractured, weathered,	17.37						
- 18	microcrystalline, grey, wet							
- 10		18.29			<u> </u>			
-	END OF BOREHOLE @ 18.29m BGS		WELL DETAILS					
			Screened interval: 15.24 to 18.29m BGS					
-			Length: 3.05m Diameter: 51mm					
_			Slot Size: 10 Material: SCH 40 PVC					
- 20			Seal:					
-			0.61 to 13.72m BGS Material: BENTONITE GRAVEL					
-			Sand Pack: 13.72 to 18.29m BGS					
-21			Material: NO. 2 SILICA SAND					
10/1								
22 								
CRA_CORP.GDT 17/10/19								
°C – 23								
CRA								
GPJ								
0.02 62 62 62 62 62 62 62 62 62 62 62 62 62								
2019(								
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<sup>5</sup> 23 <sup>2</sup>								
0 2 2								
URDE	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; R	EFER TO (	CURRENT ELEVATION TABLE		•			
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Page 2 of 2

GHD	(OVER	BURD	EN)				Page	e 1 of 1
PROJE CLIENT LOCAT	CT NAME: BROOKS ROAD LANDFILL SITE CT NUMBER: 018235 C/O 2270386 ONTARIO LIMITED ION: HALDIMAND COUNTY, ON	HOLE DESIGNATION: MW12B-19 DATE COMPLETED: 26 August 2019 DRILLING METHOD: 4 1/4" ID HSA FIELD PERSONNEL: A. Molenhuis/H.MacEachern						
	NG SUBCONTRACTOR: Noll Drilling	DEDTU				SAM	PLE	
DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	MONITORING WELL	BER				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	
	END OF BOREHOLE @ 6.10m BGS	6.10	WELL DETAILS         Screed interval:         3.05 to 6.100 BGS         Length:         3.05 to 7.100 BGS         Length:         Screened interval:         3.05 to 7.100 BGS         Length:         0.61 to 2.44m BGS         Material:         BENTONITE GRAVEL         Sand Pack:         2.44 to 6.100 BGS         Material:       NO. 2 SILICA SAND	1				
OVERBUR	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; F	EFER TO	JURRENT ELEVATION TABLE					

STRATIGRAPHIC AND INSTRUMENTATION LOG

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018235-WA-202276.GPJ

OVERBURDEN LOG

#### STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

HOLE DESIGNATION:

DATE COMPLETED: 19 April 2022

DRILLING METHOD: 4 1/4" ID HSA

FIELD PERSONNEL: B. Khan

Page 1 of 2

MW13A-22

PROJECT NAME: BROOKS ROAD LANDFILL SITE

PROJECT NUMBER: 12561524

CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: HALDIMAND COUNTY, ON

DRILLING SUBCONTRACTOR:: Aardvark Drilling Inc.

SAMPLE DEPTH STRATIGRAPHIC DESCRIPTION & REMARKS DEPTH MONITORING WELL m BGS NUMBER NTERVAL (%) REC -----T FILL - CLAYEY SILT, trace sand and gravel and asphalt, fine grained sand, medium to coarse CONCRETE 40 4 1 grained gravel, low to medium plasticity, soft, greysih brown, moist 0.76 ASPHALT, crushed till 12 2 60 1.37 FILL - SILT, with to trace clay and sand, trace asphalt, fine grained sand, medium to coarse 3 70 6 grained gravel, low plasticity, firm to stiff, brown (trace grayish), moist - stiff to very stiff, moist at 2.29m BGS 18 80 4 - asphalt not present, moist, greyish mottling at 3 05m BGS 5 90 27 24 6 80 BENTONITE GRAVEL 7 90 20 5.33 CL/ML - CLAYEY SILT, with to trace sand, fine grained sand, low plasticity, firm to stiff, greyish 8 90 10 brown with orange mottling, moist to very moist - increased clay content, soft to firm, very moist at 6.10m BGS 9 90 12 6.86 CL - CLAY, with silt, trace sand, trace gravel, fine grained sand, coarse grained gravel, low 10 90 11 plasticity, firm to stiff, greyish brown, moist to 51mm, PVC very moist RISER 10 15 11 - trace silt, no sand, no gravel, moderate to high plasticity, soft to firm, grey with trace brown, very moist at 8.38m BGS 12 12 90 - 9 - very moist to wet at 9.14m BGS 10 13 90 - soft to firm, orange mottling, very moist at - 10 9.91m BGS 14 90 7 - very moist to wet at 10.67m BGS BENTONITE 100 9 15 - 11 GROUT - soft to very soft, very moist to wet at 11.43m BGS 16 100 8 · 12 - soft, high plasticity, grey, very moist to wet at 12.19m BGS 100 9 17

MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE NOTES:

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Page 2 of 2

PROJECT NAME: BROOKS ROAD LANDFILL SITE

PROJECT NUMBER: 12561524

CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: HALDIMAND COUNTY, ON

HOLE DESIGNATION: MW13A-22 DATE COMPLETED: 19 April 2022 DRILLING METHOD: 4 1/4" ID HSA FIELD PERSONNEL: B. Khan

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS		DEPTH	MONITORING WELL	SAMPLE				
n BGS					NUMBER	INTERVAL	REC (%)		
					18	$\square$	100	8	
14	- soft, oxidation striations, wet at 13.72m BGS				19	$\square$	100	6	
	- trace boulder and rock fragments at 14.33m BGS				20		100	6	
15	CL - CLAY (BASAL TILL?), with to cobbly, with		15.24				00	. 50	
16	to sandy, soft, grey, wet				21	$\square$	60	>50	
			16.76	51mm, 10-slot, PVC SCREEN	22		60	>50	
17	BEDROCK - limestone fragments				23	$\mid$	60	>50	
18 -	END OF BOREHOLE @ 17.98m BGS		17.98		24	$\square$	5	>50	
	END OF BOREHOLE (() 17.9011 BGS			WELL DETAILS Screened interval: 14.94 to 17.98m BGS					
19				Length: 3.05m Diameter: 51mm Slot Size: 10					
20				Material: PVC Seal: 8.53 to 13.41m BGS					
				Material: BENTONITE GROUT Sand Pack: 13.41 to 17.98m BGS					
21				Material: SILICA SANDPACK  Seal:					
22				0.00 to 8.53m BGS Material: BENTONITE GRAVEL					
23									
24									
25									
NC	DTES: MEASURING POINT ELEVATIONS MAY CHAN	GE; REFE	ER TO CUP	RRENT ELEVATION TABLE					1

GHD	STRATIGRAPHIC AND IN (OVERB						Page 1 of 1
PROJEC	T NAME: BROOKS ROAD LANDFILL SITE		DESIGNATION: MW13B-2	22			-
	CT NUMBER: 12561524		COMPLETED: 19 April 2022				
CLIENT:	C/O 2270386 ONTARIO LIMITED		NG METHOD: 4 1/4" ID HSA				
LOCATIO	ON: HALDIMAND COUNTY, ON	FIELD F	PERSONNEL: B. Khan				
DRILLIN	IG SUBCONTRACTOR:: Aardvark Drilling Inc.						
DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH	MONITORING WELL			SAMF	PLE
m BGS				В	VAL	(%)	
				NUMBER	INTERVAL	REC (	
				ž	Ż	2	
	Please refer to MW13A-22						
- 1			BENTONITE GRAVEL		B		
-							
-			51mm, PVC				
-2			RISER				
-3					Ь		
E				1			
F							
-5							
-							
-6							
			51mm, 10-slot, PVC SCREEN				
-7							
		7.00					
F	END OF BOREHOLE @ 7.62m BGS	7.62	WELL DETAILS				
- 8			Screened interval: 4.57 to 7.62m BGS				
-			Length: 3.05m				
9			Diameter: 51mm Slot Size: 10				
<u>-</u>			Material: PVC Seal:				
6/2/2			0.00 to 3.96m BGS Material: BENTONITE GRAVEL				
ਰ <u>ੋ</u> – 10			Sand Pack:				
븅			3.96 to 7.62m BGS Material: SILICA SANDPACK				
11 - 12							
1 T							
∧ £812							
018.							
OVERBURDEN LOG 018235-WA-202276.GPJ GHD Corp 6/7/22 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1							
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFI	ER TO CHI	RRENT ELEVATION TARI F				
RBUF							
OVE							

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Page 1 of 2

PROJECT NAME: BROOKS ROAD LANDFILL SITE

PROJECT NUMBER: 12561524

CLIENT: C/O 2270386 ONTARIO LIMITED

LOCATION: HALDIMAND COUNTY, ON

DRILLING SUBCONTRACTOR:: Aardvark Drilling Inc.

HOLE DESIGNATION: MW14A-22 DATE COMPLETED: 20 April 2022 DRILLING METHOD: 4 1/4" ID HSA FIELD PERSONNEL: B. Khan

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH	MONITORING WELL			SAMF	PLE	
m BGS	STRATIGRAFHIC DESCRIPTION & REWARKS	DEFIN		BER	VAL	(%)		
				NUMBER	INTERVAL	REC (%)		
- - -	FILL - CLAYEY SILT, with to trace sand , trace gravel, trace asphalt, fine grained sand, medium to coarse grained gravel, low plasticity, firm, greyish brown, moist	0.76		1		10	9	
- 1 -	CL/ML - CLAYEY SILT, with to trace sand , trace gravel, fine grained sand, fine grained gravel, low plasticity, firm, greyish brown, moist	0.76		2	$\square$	70	10	
2	- CLAY AND SILT at 1.52m BGS			3	$\ge$	60	18	
-	- CLAYEY SILT, brown at 2.29m BGS			4	$\mathbf{X}$	80	21	
3 	- firm, brown with orange mottling at 3.05m BGS		BENTONITE GRAVEL	5	$\mathbf{X}$	100	13	
- 4 -	- increased moisture, greyish mottling at 3.81m BGS			6	$\mathbf{X}$	100	10	
- - - 5	- CLAY AND SILT at 4.57m BGS			7	$\square$	40	13	
	- SILTY CLAY, trace gravel, trace sand at 5.33m BGS			8	$\square$	80	23	
6  	CL - SILTY CLAY, with to trace sand, with to trace gravel, fine grained sand, medium grained gravel, low to medium plasticity, firm, brownish	6.10		9	$\square$	70	15	
-7	grey, moist - moist to very moist at 6.86m BGS		51mm, PVC RISER	10	$\mathbf{i}$	20	10	
- - - - 8	- becomes CLAY, trace silt, no sand, no gravel at 7.62m BGS			11	$\propto$	80	9	
-	- very moist to wet, some orange mottling present at 8.38m BGS			12	$\square$	80	8	
6/7/22 1 1 1 6	- moderate to high plasticity, very moist, grey at 9.14m BGS		BENTONITE GROUT	13	$\bigotimes$	100	10	
	- wet at 9.91m BGS			14	$\square$	90	7	
11	- high plasticity, wet patches at 10.67m BGS			15	$\overline{\times}$	90	12	
5-WA-2022				16		100	7	
OVERBURDEN LOG 018235-WA-202276.GPJ GHD Corp 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	- soft to firm, partially saturated at 12.19m BGS			17		100	8	
RBUR	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FERIOCU	KKENT ELEVATION TABLE					
OVE OVE								

GHD	STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)						Page	2 of 2
PROJE	CT NAME: BROOKS ROAD LANDFILL SITE		DESIGNATION: MW14A-2	2				
	CT NUMBER: 12561524		COMPLETED: 20 April 2022					
	F: C/O 2270386 ONTARIO LIMITED		NG METHOD: 4 1/4" ID HSA					
	ION: HALDIMAND COUNTY, ON		PERSONNEL: B. Khan					
	NG SUBCONTRACTOR:: Aardvark Drilling Inc.							
DEPTH		DEPTH				SAMF	ĽΕ	
m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH	MONITORING WELL	ER	/AL	%)		
				NUMBER	INTERVAL	REC (%)		
- 14 - 14 - 15 - 16 - 16	ML - SANDY SILT (BASAL TILL), with rock fragments (cobbles), medium to coarse grained sand, coarse grained rock fragments, low plasticity, soft, brown, moist to very moist         BEDROCK - shaley dolostone         Z         Z         Z         Z         Z         Z         Z         Z	12.95 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14.02 14	SANDPACK	18		100	14	
- - - - - - -	END OF BOREHOLE @ 16.76m BGS	16.76	Image: Image					
- 18 - - - - - 19			Slot Size: 10 Material: PVC Seal: 6.10 to 12.19m BGS Material: BENTONITE GROUT					
- 19			Sand Pack: 12.19 to 16.76m BGS Material: SILICA SANDPACK					
20			 Seal: 0.00 to 6.10m BGS					
- - 21			Material: BENTONITE GRAVEL					
22								
1 1								
<sup>/9</sup> 23								
C C C C C C C C C C C C C C C C C C C								
202276.GF								
OVERBURDEN LOG 018235-WA-202276.GPJ GHD Corp 6/7/22 Corp								
OVERBURDEN	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; R	EFER TO CU	RRENT ELEVATION TABLE		<u> </u>			

GHD	(OVE	RBURDE					Page 1	l of 1
PROJEC	T NAME: BROOKS ROAD LANDFILL SITE	HOLE D	ESIGNATION: MW14B-2	22				
PROJEC	CT NUMBER: 12561524	DATE C	OMPLETED: 21 April 2022					
CLIENT:	C/O 2270386 ONTARIO LIMITED	DRILLIN	IG METHOD: 4 1/4" ID HSA					
LOCATIO	ON: HALDIMAND COUNTY, ON	FIELD F	ERSONNEL: B. Khan					
DRILLIN	IG SUBCONTRACTOR:: Aardvark Drilling Inc.							
DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH				SAMPLE		
m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH	MONITORING WELL	ĸ	'AL	(%		
				NUMBER	INTERVAL	REC (°		
			CONCRETE S1mm, PVC RISER BENTONITE GRAVEL BENTONITE GRAVEL SANDPACK S1mm, 10-slot, PVC SCREEN WELL DETAILS Screened interval: 4.57 to 7.62m BGS Length: 3.05m Diameter: 51mm Slot Size: 10 Material: PVC Seal: 0.00 to 3.96m BGS Material: BENTONITE GRAVEL Sand Pack: 3.96 to 7.62m BGS Material: SILICA SANDPACK	2				
- - - 12 -								
-								
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE;	KEFER TO CUP	KRENT ELEVATION TABLE					

## STRATIGRAPHIC AND INSTRUMENTATION LOG



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