

Section 4.0 Description of the Environment Potentially Affected by the Undertaking. 4-1

4.1	Environmental Components	4-1
4.2	Study Areas	4-1
4.3	Natural Environment Existing Conditions	4-4
4.3.1	Atmospheric Environment Existing Conditions	4-4
4.3.1.1	Air Quality & Odour Existing Conditions	4-4
4.3.1.2	Noise Existing Conditions	4-15
4.3.2	Geology & Hydrogeology Existing Conditions	4-24
4.3.3	Surface Water Resources Existing Conditions	4-37
4.3.4	Terrestrial & Aquatic Environment Existing Conditions	4-43
4.3.4.1	Topography and Hydrology	4-47
4.3.4.2	Significant Natural Features	4-50
4.3.4.3	Wetland Delineation	4-53
4.3.4.4	Vegetation	4-55
4.3.4.5	Aquatic Habitat and Species	4-66
4.3.4.6	Wildlife	4-69
4.4	Cultural Environment Existing Conditions	4-79
4.4.1	Cultural & Heritage Resources	4-79
4.4.2	Archaeological Resources	4-79
4.5	Built Environment Existing Conditions	4-80
4.5.1	Transportation Existing Conditions	4-80
4.5.2	Land Use Existing Conditions	4-87
4.5.3	Agriculture, Soils & Mining	4-92
4.5.4	Site Design & Operation	4-97
4.6	Socio-Economic Environment	4-99
4.6.1	Economic Existing Conditions	4-100
4.6.2	Social Existing Conditions	4-100
4.6.3	Aboriginal Community Interests	4-104

List of Figures

Figure 4.1	Study Areas	4-3
Figure 4.2	Atmospheric Environment Sensitive Receiver Locations	4-6
Figure 4.3	Wind Rose, Hamilton AP 2010 - 2014	4-8
Figure 4.4	Wind Class Frequency Distribution	4-9
Figure 4.5	Noise Contours – Existing Landfill Conditions	4-19
Figure 4.6	Road Traffic Sound Level Contours (Daytime)	4-22
Figure 4.7	Road Traffic Sound Level Contours (Nighttime)	4-23
Figure 4.8	Geology and Hydrogeology Site Location Map	4-26
Figure 4.9	Cross Section Plan	4-27
Figure 4.10	Geological Cross-Section A-A'	4-28
Figure 4.11	Geological Cross-Section B-B'	4-29

List of Figures

Figure 4.12	Oil and Gas Well Locations	4-33
Figure 4.13	MOECC Water Well Locations	4-34
Figure 4.14	Stormwater Management System.....	4-41
Figure 4.15	Surface Water Monitoring Locations.....	4-42
Figure 4.16	Terrestrial and Aquatic Environment Study Area	4-44
Figure 4.17	Physiography	4-49
Figure 4.18	Natural Areas of Concern.....	4-51
Figure 4.19	Provincially Significant Wetlands.....	4-52
Figure 4.20	Wetland Boundaries and Ecological Land Classification	4-54
Figure 4.21	Ecological Land Classification.....	4-56
Figure 4.22	Aquatic Habitat Features	4-68
Figure 4.23	Provincially Tracked Species	4-75
Figure 4.24	Transportation Study Area and Turning Movement Count Observation Areas.....	4-81
Figure 4.25	Existing Peak Hour Volumes	4-82
Figure 4.26	Study Area Land Use	4-90
Figure 4.27	Study Area Zoning.....	4-91
Figure 4.28	Local Study Area Farm Tax Rated Property Parcels.....	4-94
Figure 4.29	Local Study Area Soil Classification.....	4-95
Figure 4.30	Local Study Area Abandoned Mines	4-96
Figure 4.31	Existing Brooks Road Landfill Site & Approved Buffer Areas.....	4-98
Figure 4.32	Local Study Area Property Parcels and Residences	4-102
Figure 4.33	Local Study Area Viewshed	4-103

List of Tables

Table 4.1	Brooks Road Landfill Site Complaint Records from 2012 to June 2016	4-10
Table 4.2	Annual Particulate Matter 2.5µm Concentration from the Hamilton West MOECC Monitoring Station	4-14
Table 4.3	Terrestrial and Aquatic Environment Secondary Source Information Reviewed.....	4-45
Table 4.4	Terrestrial and Aquatic Environment Field Investigations	4-45
Table 4.5	Incidental Faunal Species Observations	4-69
Table 4.6	Species at Risk Summary.....	4-73
Table 4.7	Existing Conditions Peak Hour Volumes	4-83
Table 4.8	Existing Conditions Capacity Analysis at Peak Operations	4-86

Section 4.0 Description of the Environment Potentially Affected by the Undertaking

The approved ToR for this EA included a preliminary description of the existing environmental conditions at the Brooks Road Landfill Site (Section 10.0 of the approved ToR, July 2015). A commitment was made in the ToR that a more detailed description of the existing environment would be provided in the EA.

This section of the EA Report provides an overview of the existing environmental conditions associated with the Study Areas for the Brooks Road Landfill Site Vertical Capacity Expansion EA. Individual discipline assessment reports are provided in **Appendix E**.

4.1 Environmental Components

The environment, as defined by the *EA Act*, includes the natural, cultural, social, economic, and built environments, specifically:

- i. *air, land or water,*
- ii. *plant and animal life, including human life,*
- iii. *social, economic and cultural conditions that influence the life of humans or a community,*
- iv. *any building, structure, machine or other device or thing made by humans,*
- v. *any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities, or*
- vi. *any part or combination of the foregoing and the interrelationships between any two or more of them, in or of Ontario.*

4.2 Study Areas

As established in the approved ToR, the following two generic Study Areas were considered in preparation of the EA (see **Figure 4.1**):

- **Site Study Area**, including all lands (i.e., 14.3 ha) within the existing, approved boundaries of the Brooks Road Landfill Site, as defined by ECA No. A110302, dated July 21, 2014, as amended.
- **Local Study Area**, including all lands and waters within a 1 kilometre (km) radius of the Site Study Area boundaries.



The generic Study Areas identified above were presented in the approved ToR with the commitment that they would be modified during the EA, as appropriate, to suit the requirements of each individual environmental component.





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

figure 4.1
 STUDY AREAS
 BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
 BROOKS ROAD LANDFILL
 160 Brooks Road, Cayuga, Ontario



Legend

-  Site Study Area
-  Local Study Area (1km Radius)

4.3 Natural Environment Existing Conditions

4.3.1 Atmospheric Environment Existing Conditions

The Atmospheric Environment includes Air Quality, Odour, and Noise. Both the generic Site Study Area and Local Study Area established during the ToR are applicable for the Atmospheric Environment.

4.3.1.1 Air Quality & Odour Existing Conditions

Information on the Air Quality and Odour existing conditions within the Local Study Area was gathered from a combination of secondary source research and field investigations. The following sources of secondary information were collected and reviewed:

- Environment Canada Climate data (2010 to 2014)
- Ambient air quality data obtained from the Ministry of Environment and Climate Change (MOECC) (2009 to 2014)
- Existing Facility Emission Summary and Dispersion Modelling Report, prepared for Brooks Road Environmental by Conestoga-Rovers & Associates (September 14, 2015)
- Odour Monitoring Program, prepared for Brooks Road Environmental by Conestoga-Rovers & Associates (July 28, 2014)
- Odour Monitoring Program, prepared for Brooks Road Environmental by Conestoga-Rovers & Associates (November 3, 2014)
- Odour Monitoring Program, prepared for Brooks Road Environmental by GHD (December 9, 2016)

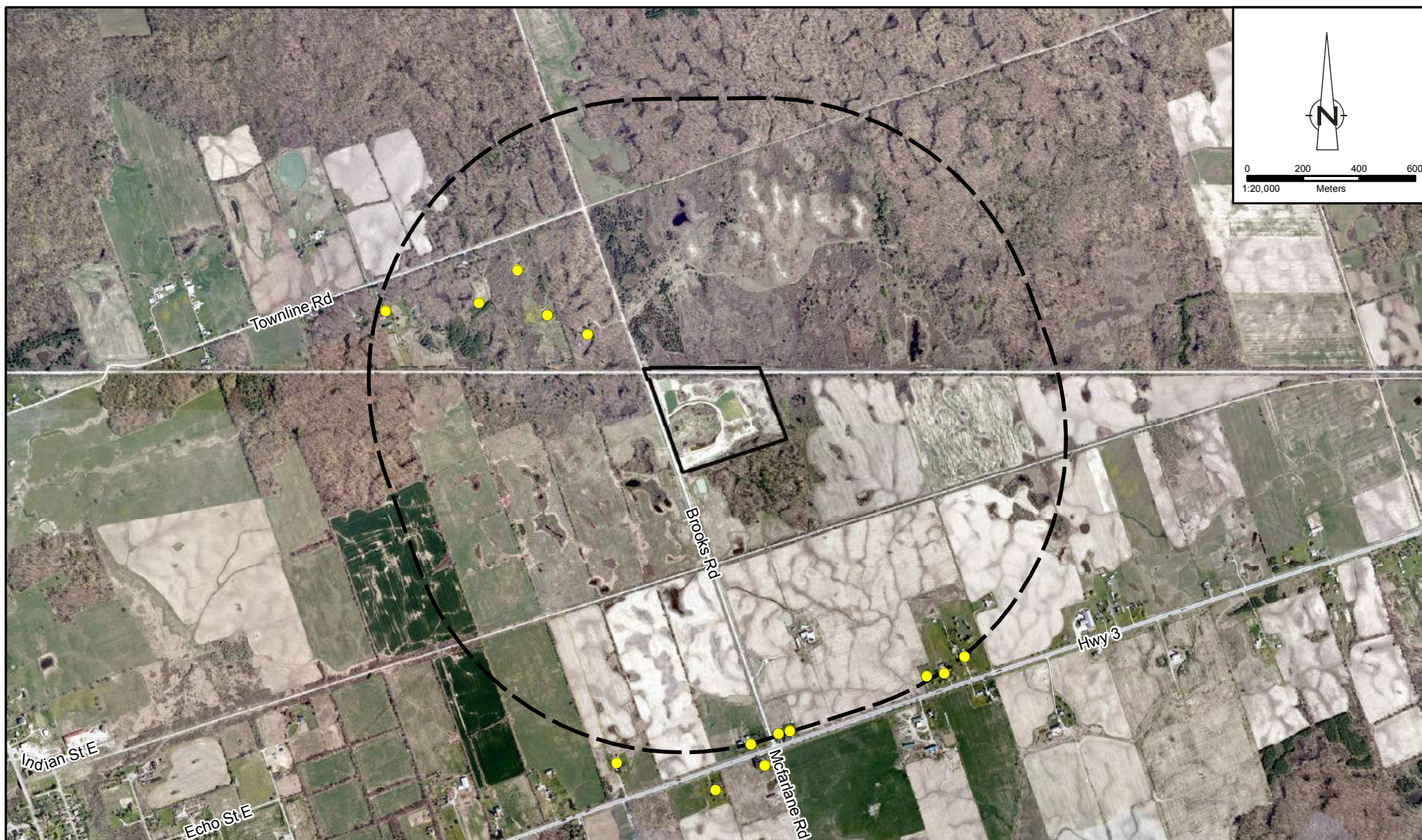
GHD completed a site visit on September 11, 2015 to review the Site and the conditions within the Local Study Area. The Facility is located just outside of Cayuga, Ontario on a remote road with the nearest residential dwelling approximately 232 m northwest of the existing property boundary. There are approximately fourteen existing one-storey (1.5 m above grade) and two-storey (4.5 m above grade) residential dwellings within the Local Study Area (see **Figure 4.2**). The landfill has a berm that runs along the west property-boundary, and a clay stockpile situated on the north end of the property. While the existing Brooks Road Landfill is currently in operation (i.e., accepting waste), it should be noted that landfilling operations at the Site have been slowing down in 2015, as the landfill continues to reach its current approved capacity.

On-site and off-site odour investigations were completed by GHD in 2014 and 2016. These studies indicated that there was no measurable odour off-site. GHD completed odour measurements during daytime and nighttime periods to try and observe odours in the



surrounding community. During all the odour monitoring events, no odours that could be attributed to the Site were detected off-site.

The GHD Team completed a walk-through of the Site, with focused observations at the location of the proposed vertical expansion and the leachate system. GHD did not identify any fugitive emissions during the walkthrough other than minor particulate emissions generated by small vehicles moving throughout the landfill. The GHD Team also observed the area surrounding the Site to confirm the locations of the nearest sensitive receptors to the Facility.



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

Legend

- Sensitive Receiver Location
- Local Study Area (1km Radius)
- Site Location

figure 4.2

ATMOSPHERIC ENVIRONMENT SENSITIVE RECEIVER LOCATIONS
BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
BROOKS ROAD LANDFILL
160 Brooks Road, Cayuga, Ontario



Hamilton Climate Station

The Hamilton Climate Station is a weather station located at Hamilton's John C. Munro International Airport (43.1N, 79.5W, elevation 237.7 m). The station has been operating since January 15, 1970 under World Meteorological Organization (WMO) ID 71263. The Hamilton Climate Station was selected as it is the closest representative station to the Facility that has hourly documented climate data since 2010. Data from this station is published online at Environment Canada's National Climate Data and Information Archive. Hourly data from the station was analyzed to determine prevalent atmospheric conditions that are considered representative of the Site.

Figure 4.3 presents a five-year wind rose for the Hamilton Climate Station for the period between 2010 and 2014 and **Figure 4.4** presents the wind class frequency distribution. The dominant wind directions, as shown on **Figure 4.3**, are from the southwest, and west.



Figure 4.3 Wind Rose, Hamilton AP 2010 - 2014

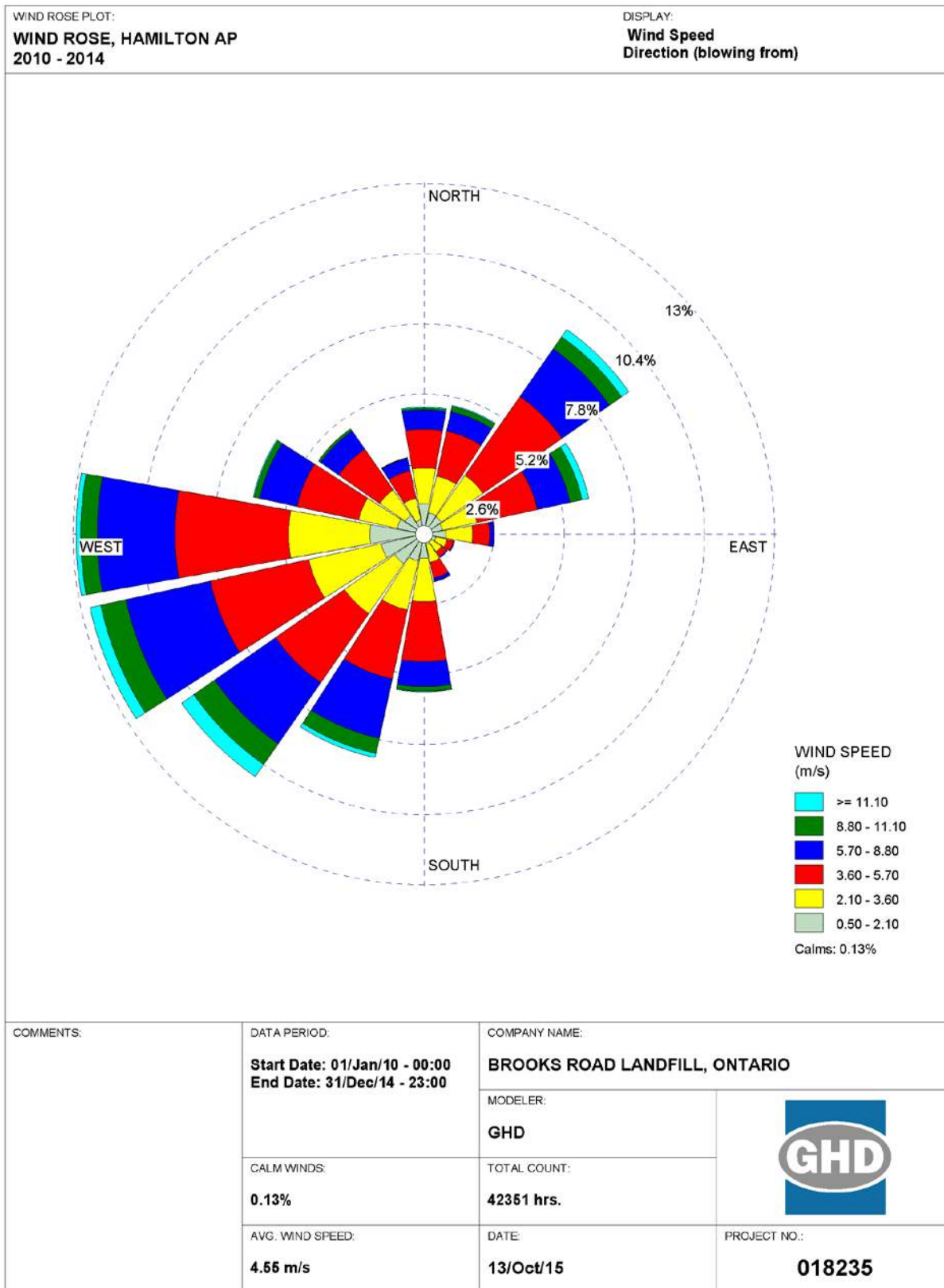
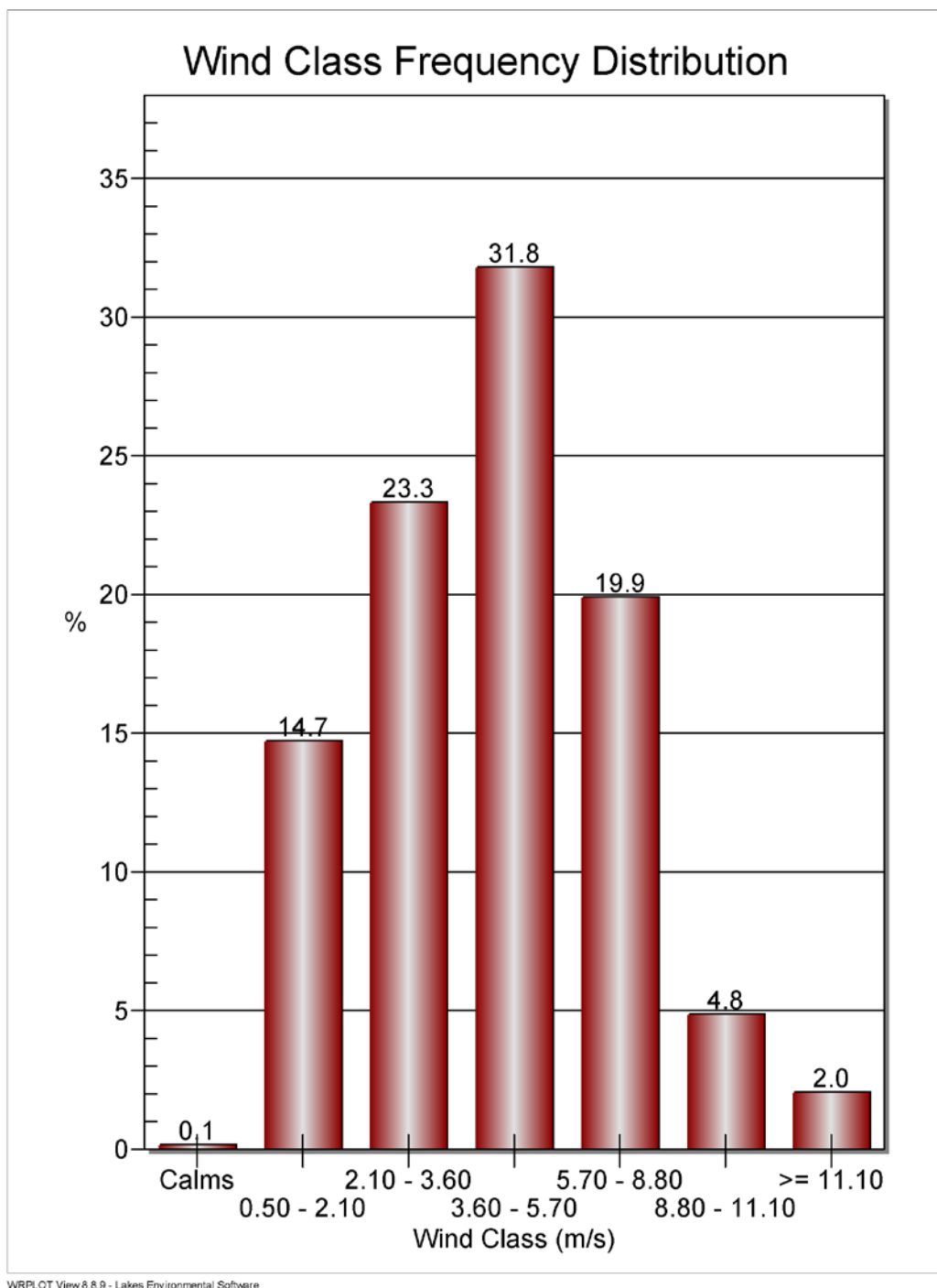




Figure 4.4 Wind Class Frequency Distribution



Complaint History

Brooks Road Environmental maintains a record of all environmental complaints received at the Site. Concerned residents or businesses can call Brooks Road Environmental, the Township of Cayuga, or the MOECC if a nuisance effect is perceived to have occurred because of the Brooks Road Facility. All complaints are recorded and investigated by Brooks Road Environmental. Each complaint is logged and, in many cases, Site staff will go to the location where the complaint was recorded and conduct on-site investigations. The date and time of the complaint are cross-referenced with data from the Facility in order to determine if any adjustments to operations need to be made at the Site. Each complaint received at the Facility is reported to the MOECC. Since 2014 Brooks Road has investigated each odour complaint that was logged. During this time Brooks Road Environmental and GHD have not confirmed that the odour complaints were related to Brooks Road Environmental operations.

Table 4.1 provides a summary of complaint records from either residents or businesses, as recorded by Brooks Road Environmental for the period from 2012 to June 2016.

Table 4.1 Brooks Road Landfill Site Complaint Records from 2012 to June 2016

Date	Documented to	Description
August 12, 2012	Landfill Site Staff	Mud on Road
December 13, 2012	Landfill Site Staff	Odour
December 3, 2013	Landfill Site Staff	Odour
December 4, 2013	Landfill Site Staff	Odour
February 4, 2014	MOECC	Odour
February 28, 2014	MOECC	Odour
May 5, 2014	MOECC	Odour
May 6, 2014	MOECC	Odour
July 12, 2014	MOECC	Odour
July 13, 2014	MOECC	Odour
July 14, 2014	MOECC	Odour
July 25, 2014	MOECC	Odour
July 28, 2014	MOECC	Odour
July 29, 2014	Richard Weldon	Odour
August 30, 2014	MOECC	Odour
September 8, 2014	MOECC	Odour
September 10, 2014	Paul Zizek	Odour
October 22, 2014	Paul Zizek	Odour
October 23, 2014	Paul Zizek	Odour
January 2, 2015	MOECC	Odour

Table 4.1 Brooks Road Landfill Site Complaint Records from 2012 to June 2016

Date	Documented to	Description
November 3, 2015	MOECC	Odour
April 5, 2016	MOECC	Odour
April 18, 2016	MOECC	Odour
May 2, 2016	MOECC	Odour
June 14, 2016	MOECC	Odour
June 22, 2016	Landfill Site Staff	Odour
June 23, 2016	Landfill Site Staff	Odour
August 23, 2016	Bill Sutton	Odour
September 6, 2016	Richard Weldon	Odour
September 14, 2016	MOECC	Odour
October 7, 2016	Richard Weldon	Odour
October 12, 2016	Richard Weldon	Odour
October 19, 2016	Richard Weldon	Odour
November 3, 2016	MOECC	Odour
November 6, 2016	MOECC	Odour
November 8, 2016	MOECC	Odour
November 15, 2016	MOECC	Odour
November 27, 2016	MOECC	Odour
December 11, 2016	MOECC and Richard Weldon	Odour

Existing Odour

Ontario does not have an odour standard; however, a value of 1 odour unit (OU) is sometimes used by the MOECC as a limit for odour impacts at sensitive receptors such as residences. The existing conditions odour studies indicate that odour levels at the nearest sensitive receptors do not exceed 1 OU (existing conditions odour studies are documented in **Appendix E-1**).

During landfill operations the primary odour sources were identified as the landfill leachate system and the landfill working face. These primary odour sources were confirmed by GHD in 2014 when two separate odour analyses were completed as the result of complaints made by neighbouring residents. However it should be noted that these odour sources were not confirmed to have been the source of the complaints.

Additional odour monitoring was completed by GHD at the Brooks Road Landfill Site in 2016 and also confirmed that the leachate system and working face were the primary localized odour sources, with the leachate system being the more significant contributor. Brooks Road Landfill

is currently installing a leachate treatment system that is designed to reduce the handling and storage of leachate and the potential for odour impacts.

The previous analyses indicated high odour levels near the leachate tank and lower odour levels near the working face. All of the off-site monitoring did not identify any odours associated with the Brooks Road Landfill operations at the sensitive receptors. With the leachate treatment system that is currently being installed the potential for odours from the Brooks Road Landfill operations should be significantly reduced.

Air Quality

The Facility is located approximately 2.8 km northeast of Cayuga and 25 km south of Hamilton and is surrounded by agricultural land. The closest residential building is approximately 232 m from the Site and there are no major industrial sources within the Study Area as indicated in **Figure 4.2**. The Facility has a berm that runs along the west side of the site and a clay stockpile located along the north side that would reduce the line of sight and fugitive particulate matter emissions when the landfill is in operation. All roads on-Site are unpaved and consist of either gravel or sand. Current fugitive emissions of road dust from the Site are minimal as the Site employs dust mitigation measures, such as reduced vehicle speed and roadway watering or covering using wood chips during dry periods, as-needed.

The Brooks Road Landfill Site is a fully integrated landfill that operates leachate processing equipment, a portable shredder and other small on-site equipment. While the existing Brooks Road Landfill is currently in operation (i.e., accepting waste), it should be noted that landfilling operations at the Site have been slowing down since 2015, as the landfill continues to reach its current approved capacity. At the time of the site visit the landfill shredder and other equipment were in operation and; therefore, minor particulate emissions were observed in the active working face of the landfill.

MOECC Air Monitoring Data

The MOECC has ambient air monitoring stations across Ontario that measure a variety of pollutant concentrations. Typically, the stations monitor criteria air contaminants, such as nitrogen oxides, carbon monoxide, sulphur dioxide, and particulate matter, with the exception of some specialized monitors that measure speciated volatile organic compounds (VOCs) and ammonia. There are no active monitoring stations within the Study Area, therefore, the monitor located in West Hamilton (29118), Ontario was chosen as the closest monitor to the Site.

The West Hamilton station monitors nitrogen oxides, ground-level ozone, and particulate matter 2.5 µm (PM_{2.5}). The West Hamilton station is located on Hamilton Mountain and is

expected to be influenced by the industry within the City of Hamilton. GHD proposes to focus on total suspended particulate (TSP), PM₁₀, and PM_{2.5} in the evaluation of the Alternative Methods as these fractions of particulate matter are the main contaminants that will be released at the Brooks Road Landfill Site (see **Indicator Compounds** below for further discussion).

Hourly readings and 24-hour average values are provided as part of the MOECC hourly results data set. The West Hamilton monitor is located in a predominantly urban area. Therefore, the PM_{2.5} concentrations around the Brooks Road Landfill Site are expected to be much lower compared to the monitoring station.

The hourly readings for PM_{2.5} from the West Hamilton station were averaged to obtain an annual average concentration, which is presented in **Table 4.2** along with the average over the six year period (2009 to 2014). A time frame of six years was chosen as it provides an accurate representation of the PM_{2.5} levels for West Hamilton that is influenced from the industrial activities in Hamilton but is not representative of the PM_{2.5} levels at the Brooks Road Landfill Site.

As shown in **Table 4.2**, the concentration for PM_{2.5} is below its respective Ambient Air Quality Criteria (AAQC) and Canada Ambient Air Quality Standard (CAAQS). The monitoring data indicates PM_{2.5} levels are slowly increasing over time. However, this is a result of an increase in industry in the vicinity of the West Hamilton monitoring station and is not expected to be the trend for the Brooks Road Landfill Site and its surrounding area. Based on the monitored data, the PM_{2.5} background concentrations in the vicinity of the Site are well below the respective AAQC and CAAQS. It is expected that the levels at the Brooks Road Landfill site are significantly lower as they are not influenced by the industrial and populated areas of Hamilton.

Based on the information from the West Hamilton meteorological station it is expected that the existing ambient particulate matter concentration at the site is negligible. However, cumulative effects have been assessed based on the 98th percentile data from the West Hamilton monitoring station. The 98th percentile data is used as it is referenced in the Ontario Ambient Air Quality Criteria as being the percentile that is required to meet the PM_{2.5} Canada Wide Standard.

Table 4.2 Annual Particulate Matter 2.5µm Concentration from the Hamilton West MOECC Monitoring Station

Year	2009	2010	2011	2012	2013	2014	Avg.	AAQC	CAAQS
Concentration (µg/m ³) ⁽¹⁾	7.42	6.74	6.99	7.59	9.55	9.94	8.04	30.00	30.00
Concentration (µg/m ³) ⁽²⁾	15.92	23.34	21.17	20.16	23.4	24.92	21.49	30.00	30.00

Notes:

1. Based on MOECC monitoring station located in West Hamilton
2. Based on MOECC monitoring station located in West Hamilton, 98 percentile values

Indicator Compounds

As identified above, TSP, PM10, and PM2.5 will be the focus of the assessment as they are the primary emissions of concern at the landfill. Potential TSP, PM10, and PM2.5 emissions from vehicle exhaust and break and tire wear for the small volume of daily traffic at the landfill was concluded to be insignificant, based on vehicle exhaust and brake and tire wear calculations using the Mobile6.2 Mobile Emission Factor Model and will not be included in the assessment.

Other tailpipe/combustion emissions, such as nitrogen oxides (NOx) and carbon monoxide (CO), can also be concluded to be insignificant based on the small volume of daily traffic at the landfill, and the significant distances to sensitive receptors. The potential concentrations of NOx and CO that a person might be expected to be exposed to near a municipal road would far exceed the concentrations of these compounds at the landfill boundary. Therefore, it may be concluded that NOx and CO emissions from the vehicles at the landfill are insignificant contributors to the background concentrations of these compounds.

Landfill gases, such as hydrogen sulfide (H2S) and vinyl chloride, can also be concluded to be insignificant based on the operations and type of material accepted at the landfill. As discussed further in **Section 5.1.1.6** and **Section 5.7.10**, a theoretical landfill gas generation rate was calculated, and, based on this calculation, it was determined that amount of landfill gas generation is anticipated to be insignificant from an overall site profile. Therefore, landfill gases will not be included in the assessment.

Odour Monitoring

Following numerous odour monitoring events completed in 2014 and 2016, the landfill working face and the landfill leachate system (i.e., collection piping, storage tank) were both identified as primary sources of odour. While relatively high odour levels associated with these features were identified on-Site, on-going monitoring has shown minimal odour impacts off-Site. Regardless, Brooks Road Environmental continues to address odours through the following means: daily odour monitoring; minimizing exposed waste through the application of cover material; reducing the amount of leachate through off-Site disposal; application of odour

control granules and liquid spray; upgrades to the on-Site leachate treatment facility; and community outreach to identify any impacts at neighbouring residences.

Minor odourous emissions were observed at the Site boundary during the site visit in 2015; however, no odourous emissions were identified off-Site. The odour monitoring programs were completed during meteorological conditions when odour complaints have typically been registered. Odour complaints have typically occurred in the late evening or early morning hours with low to no winds and during temperature inversions (hot during the day and cool during the night). During these programs no odours that were associated with the Brooks Road Landfill operations were detected at the sensitive receptors.

4.3.1.2 Noise Existing Conditions

Information on the existing conditions for Noise within the Study Areas was gathered from a combination of secondary source research, field investigations and agency consultation. The following available secondary sources of information were collected and reviewed to determine the existing conditions within the Study Areas:

- Review of Historic Complaints
- Review of current zoning plans, definitions and land use designations
- Field Observations and Investigations
- Review of local traffic data
- MOECC technical guidelines and standards
- September 2014 ECA Application

The Brooks Road Landfill has not received any noise complaints for the previous operations on-site based on information provided by Brooks Road Environmental Site operators as of September 2015.

The Comprehensive Zoning By-Law for Haldimand County identifies the Site as "MD – Disposal Industrial Zone," which is suitable for a municipal sanitary landfill site. The surrounding land uses are zoned Agricultural use.

The Study Area is rural in character and surrounded by agricultural fields. There are no existing industries within the Study Area other than the Facility that may contribute to the background noise levels.

A site visit was conducted on Friday September 11, 2015, and the following activities were completed by the Study Team:

- Updated sound level measurements were completed for the shredder unit
- Site observations confirmed the Acoustic Class of the Study Area
- Site observations confirmed the site layout and activities on-site

Off-site residential dwelling locations were reviewed and the height of structures for noise impact exposure analysis was determined.

As noted in **Section 4.3.1.1** and illustrated in **Figure 4.2**, above, the nearest residential dwelling is approximately 232 m northwest of the existing property boundary. There are approximately fourteen existing one-storey (1.5 m above grade) and two-storey (4.5 m above grade) residential dwellings within the Local Study Area.

Local Traffic Data

There are three roads located within the Study Area including:

1. Townline Road – is a two-lane dirt rural road with minimal local traffic only
2. Brooks Road – is a two-lane road with minimal local traffic and primarily used by Brooks Road Landfill
3. Highway 3 – is a two-lane road with significant 24-hour road traffic

Traffic data was obtained from the local traffic authority and the Ministry of Transportation (MTO). Townline Road and Brooks Road experience low traffic volumes based on site observations and also confirmed by the traffic authority. Highway 3 traffic volumes are elevated and subject of analysis.

MOECC Technical Guidelines and Standards

The acoustic character of the Study Area was defined in accordance with the MOECC guidelines NPC-300 "Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning," October 2013.

As stated in the guideline:

A "Class 1 Area" means an area with an acoustical environment typical of a major population centre, where the background noise is dominated by the urban hum.



"Class 2 Area" means an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 Areas, and in which a low ambient sound level, normally occurring only between 23:00 and 07:00 hours in Class 1 Areas, will typically be realized as early as 19:00 hours.

Other characteristics which may indicate the presence of a Class 2 Area include:

- Absence of urban hum between 19:00 and 23:00 hours
- Evening background sound level defined by natural environment and infrequent human activity
- No clearly audible sound from stationary sources other than from those under impact assessment

"Class 3 Area" means a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as the following:

- A small community with less than 1,000 population
- Agricultural area
- A rural recreational area such as a cottage or a resort area
- A wilderness area

The urban sound level limits are 5 dBA greater in comparison to the rural limits to account for the elevated background sound level or the urban hum due to road traffic or adjacent industrial/commercial activities.

Landfill activities and on-site operations are compared directly against a daytime one-hour Leq sound level limit of 55 dBA for landfill operations that are limited to 7 a.m. to 7 p.m. under the "Noise Guidelines for Landfill Sites" (N-1).

September 2014 ECA Amendment Application

The September 2014 ECA amendment application that was prepared for the shredder unit confirmed that the Study Area immediately surrounding the Site is Acoustic Class 3 and that the nearest residential dwelling is approximately 232 m from the property boundary. The ECA amendment application has been submitted and is currently under technical review by the MOECC.

Site Activities

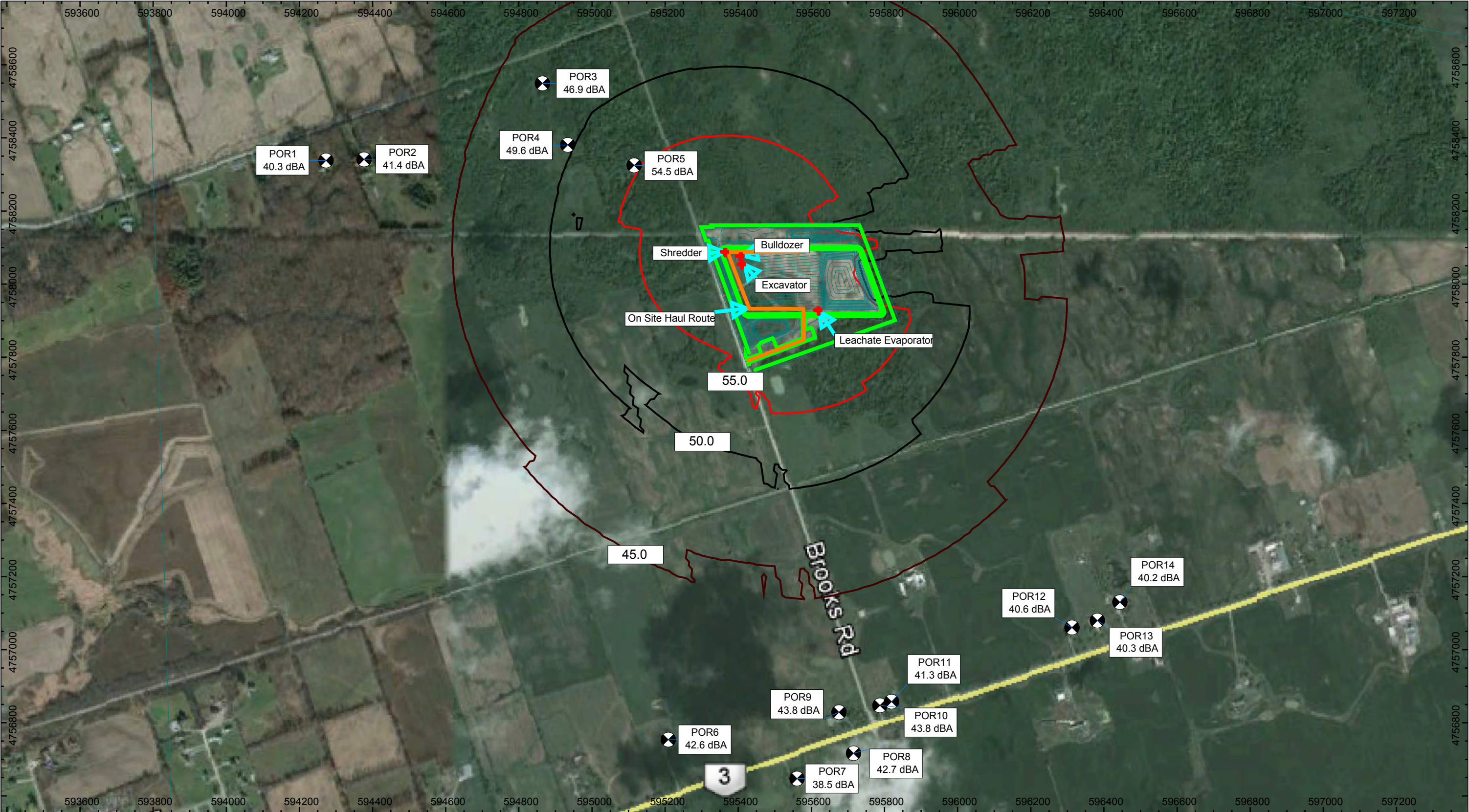
The significant environmental noise sources at the Landfill include:

- 1 x Leachate Treatment Plant (pumps and aerator equipment located inside heavy gauge sheet steel structure)
- 1 x Caterpillar D7 Bulldozer
- 1 x Caterpillar 826G Compactor
- 1 x Caterpillar 826C Compactor
- 1 x John Deer 225 Rock Truck
- 1 x Caterpillar 330 Excavator
- 1 x Hyundai 210 Excavator
- 1 x Buffel Doppstadt DW 3060 K Shredder (subject of September 2014 ECA Application)
- 1 x Primary Haul Route
- 1 x Primary Scale Route

These noise sources generate continuous steady state mechanical noise. There are no ground-borne vibration sources at the Facility as defined in NPC-207. These noise sources are input into an industry standard acoustic model that includes all significant on-site structures (buildings, equipment, storage tanks and silos).

Computer Aided Noise Abatement Acoustical Modeling Software (CADNA A), version 4.5, is based on the ISO 9613-2 standard "Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation." The CADNA model is the industry standard for environmental noise modeling in Ontario.

The existing worst-case Landfill noise contours are presented on **Figure 4.5**. The noise impacts predicted at the fourteen residential dwellings are below the 55 dBA noise limit defined in Guideline N-1.



- > 40 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB

BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION ENVIRONMENTAL ASSESSMENT
HALIDMAND COUNTY, ONTARIO

FIGURE 4.5
NOISE CONTOURS - EXISITING LANDFILL CONDITIONS

Off-Site Road Traffic Noise

MOECC's Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT) software is the approved road traffic model that is currently used in the province of Ontario to evaluate noise generated from road traffic. However, the model does not graphically generate contours and cannot be used to evaluate large areas and multiple road corridors simultaneously. ORNAMENT modeling predictions are also limited to noise predictions less than 500 m from the source and a minimum traffic volume of 40 vehicles per hour is required to evaluate an individual roadway.

Due to these model limitations, CADNA A was selected as the preferred modeling software for analysis of road traffic generated background noise existing conditions. In addition, the CADNA A modeling software is better suited to handle multiple noise sources and can generate contour plots with imported base maps.

Annual Average Daily Traffic (AADT) values are the only reported data for less travelled roads, which presents a problem when estimating daytime and nighttime background noise levels as the values do not provide a distribution for the two time periods. GHD used recommendations for traffic breakdown for provincial highways and regional roads as outlined in the ORNAMENT guidance document to address this issue. The most current road traffic volumes were obtained from Haldimand County and the MTO. The following AADT values were available for road segments within the Study Area:

- Highway 3 (MTO, 2010) – 3,450 vehicles / day
- Brooks Road (Haldimand County, 2011) – 114 vehicles / day

The existing noise conditions within the Study Area were quantified using the industry standard CADNA A software and the road traffic data provided by the regulatory authorities. The US Department of Transportation Federal Highway Administration Traffic Noise Model (TNM) calculation standard was used in CADNA A to quantify the noise levels.

Vehicular road traffic generates noise that consists of mechanical noise from the engine and brakes, friction noise created from wheel contacting the road surface, and aerodynamic wind noise. Traffic volume, speed, road composition, gradient and surface type will affect the overall traffic noise that can be generated. Proximity and line-of-sight to the road corridor are most consequential for quantifying the off-site noise exposure conditions.

The model calculates the predicted equivalent sound level (Leq) respective of the defined daytime (7 a.m. to 11 p.m.) and nighttime (11 p.m. to 7 a.m.) periods.



Figure 4.6 and **Figure 4.7** present the road traffic sound level contours within the Study Areas for the daytime and nighttime periods, respectively.

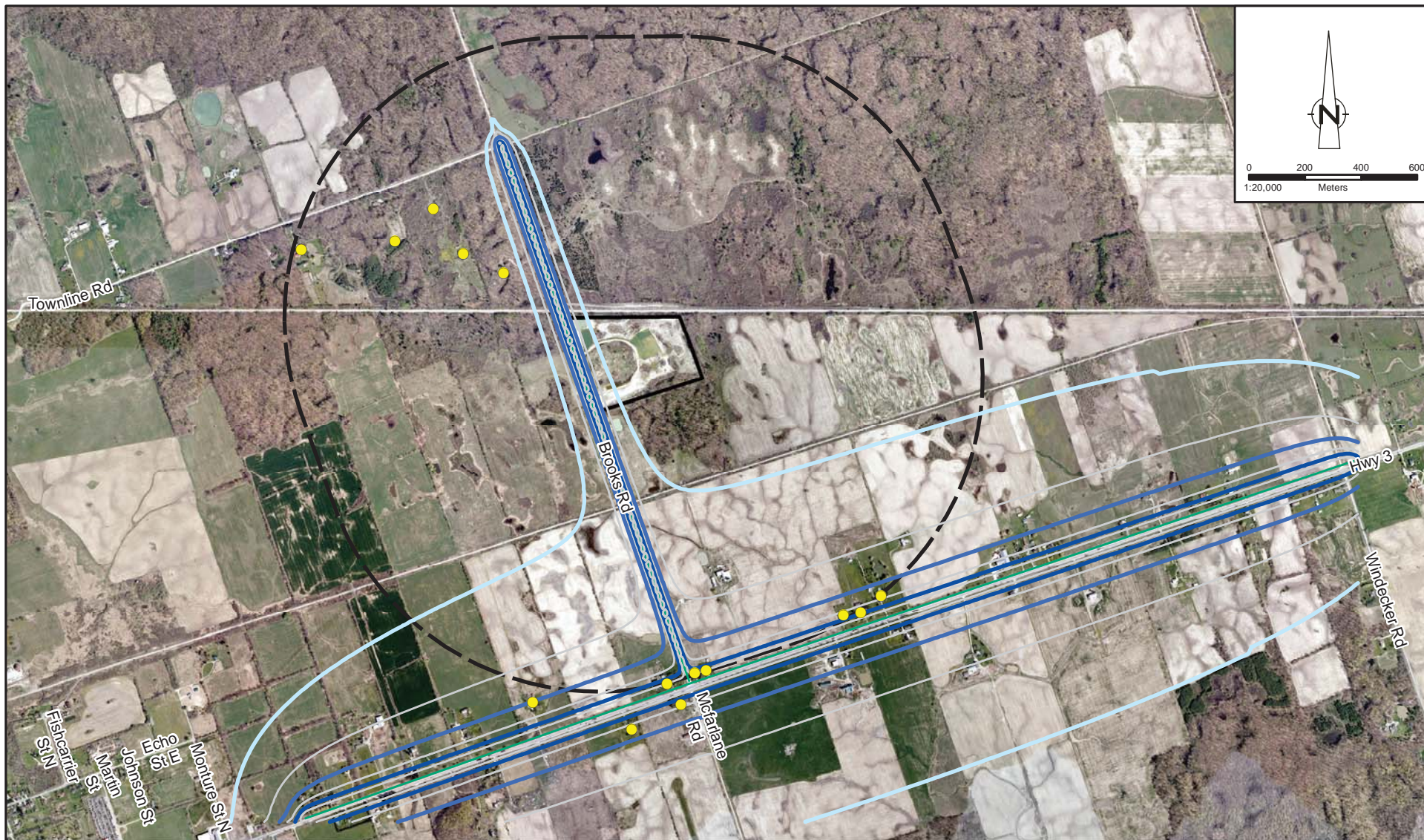
Off-Site Haul Routes

Highway 54 to Highway 3 is primarily used to reach Brooks Road and the off-site haul route will not change regardless of the preferred vertical expansion alternative. Any potential traffic increase to support the proposed increased landfill capacity will be evaluated using the noise model for both alternatives and based on the future road traffic data.

Summary of Noise Existing Conditions

The Facility is actually located in a mixed Acoustical Class 2 and Class 3 area, depending on the proximity of the sensitive receiver to the Highway 3 corridor. Acoustical Class 2 areas are defined by NPC-300 as an acoustic environment with elevated daytime noise levels. Acoustical Class 3 areas are defined by NPC-300 as rural areas with an acoustical environment that is dominated by natural sounds having little or no road traffic.

The nine (9) residential dwellings located along Highway 3 are considered to be Class 2 receivers and the five (5) residential dwellings situated away from the corridor are considered to be Class 3 receivers. However, N-1 is the applicable regulatory Guideline for compliance assessment purposes for this Facility and the proposed Landfill expansion.



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

Legend



- Sensitive Receiver Location
- Local Study Area (1km Radius)
- Site Location
- 30 dBA
- 40 dBA
- 50 dBA

figure 4.6

ROAD TRAFFIC SOUND LEVEL CONTOURS (DAYTIME)
BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
BROOKS ROAD LANDFILL
160 Brooks Road, Cayuga, Ontario



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

Legend



- Sensitive Receiver Location
- Local Study Area (1km Radius)
- Site Location
- 30 dBA
- 40 dBA
- 50 dBA

figure 4.7

ROAD TRAFFIC SOUND LEVEL CONTOURS (NIGHTTIME)
BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
BROOKS ROAD LANDFILL
160 Brooks Road, Cayuga, Ontario

4.3.2 Geology & Hydrogeology Existing Conditions

For Geology and Hydrogeology both the generic Site Study Area and Local Study Area established during the ToR are applicable.

Information on the Geology and Hydrogeology existing conditions within the Study Areas was gathered from a combination of secondary source research and Site-specific reports including:

Site-Specific Reports

- Conestoga-Rovers and Associates. (May 2015). *2014 Annual Operations and Monitoring Report, Edwards 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 above mean seal level (AMSL))
 - Feenstra, B.H., 1981: Bedrock Topography of the Dunnville 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 Dunnville 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.

Active and abandoned gas wells in proximity to the Site were also reviewed (source: Oil, Gas & Salt Resources Library, London, ON).

The Site is situated on the Haldimand Clay Plain¹ approximately 2 km east 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 AMSL². A Site location map, which includes regional elevations, is included as **Figure 4.8**.

A review of soil surveys indicates that the surficial soils on-Site are classified as mainly lacustrine silty clay³. A review of the quaternary geology in the Local Study Area indicates that the area is generally underlain by glaciolacustrine clay and silt⁴. Published bedrock topography mapping indicates a bedrock elevation of approximately 182.5 m AMSL in the vicinity of the Site⁵. The bedrock geology in the vicinity and underlying the Site is comprised of argillaceous dolostone, shale, and evaporites of the Salina Formation⁶. The Site geology is depicted in geological cross sections across the Site in **Figure 4.9**, **Figure 4.10** and **Figure 4.11**.

¹ 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.

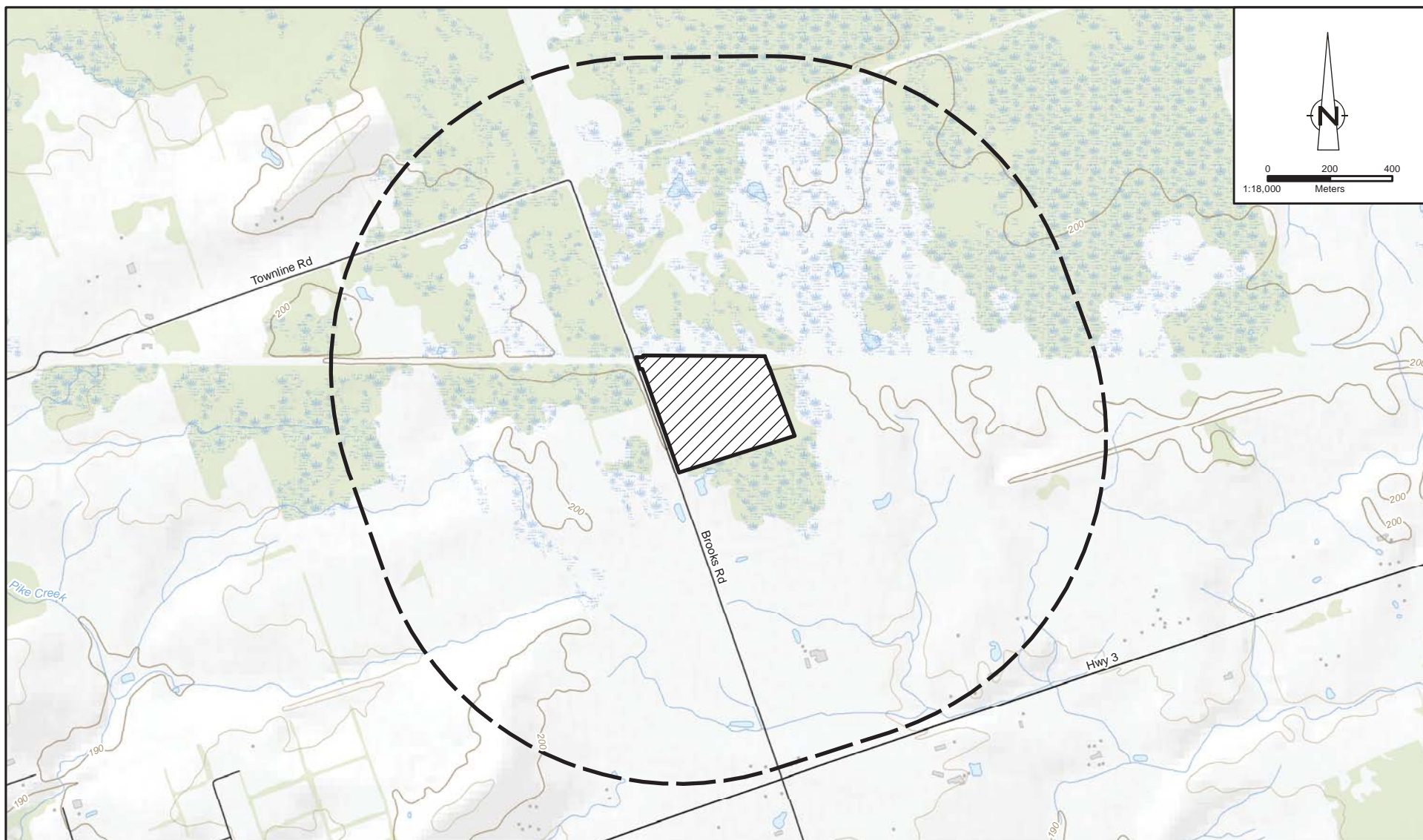
² National Topographic System, 1983: Dunnville, Ontario; Canada Centre for Mapping, Department of Energy, Mines & Resources, Information Current as of 1980, Map Sheet 30 L/13, Edition 6, scale 1:50,000.

³ 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.

⁴ 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.

⁵ Feenstra, B.H., 1981: Bedrock Topography of the Dunnville Area, Southern Ontario; Ontario Geological Survey, Preliminary Map P.2412, scale 1:50,000.

⁶ Telford, P.G., and Tarrant, G.A., 1975: Paleozoic Geology of the Dunnville Area, Southern Ontario; Ontario Division of Mines, Preliminary Map P.988, Geological Series, scale 1:50,000. Geology 1974.





Source: MNR/NRVIS, 2016. 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

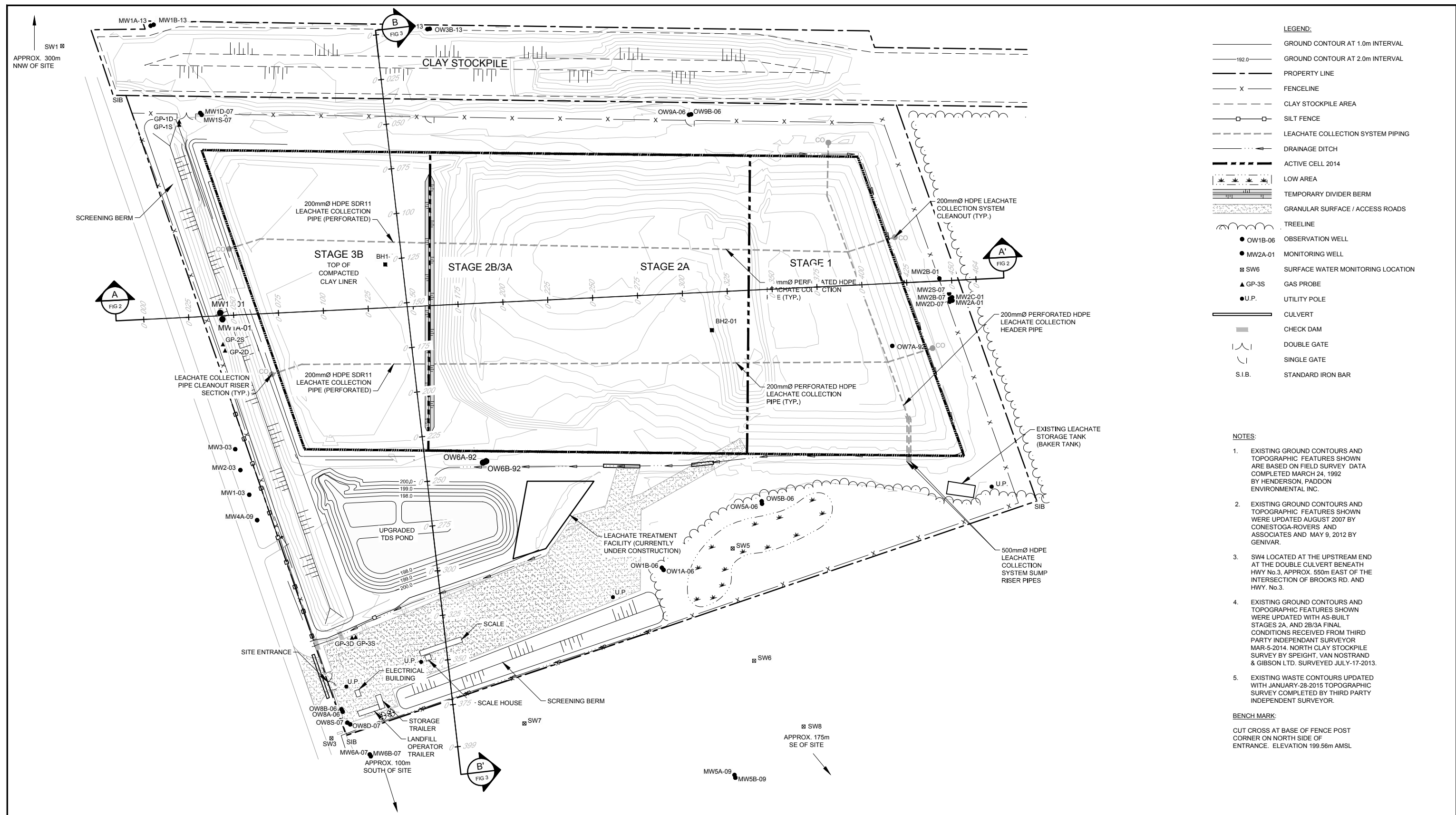
figure 4.8

GEOLOGY AND HYDROGEOLOGY SITE LOCATION MAP
BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
BROOKS ROAD LANDFILL
160 Brooks Road, Cayuga, Ontario



Legend

-  Site Location
-  Local Study Area (1km Radius)



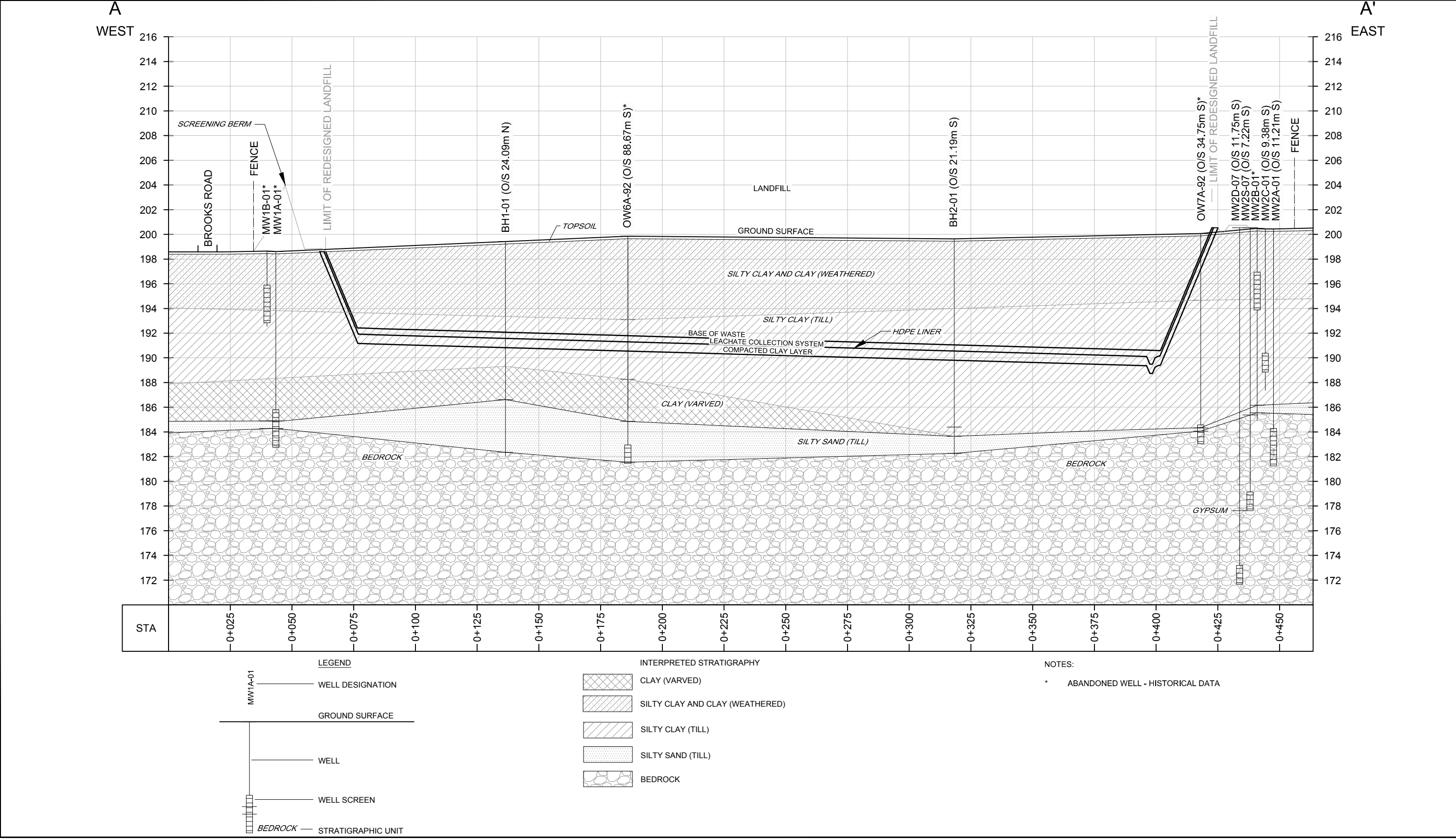
BROOKS ROAD LANDFILL SITE
Halimand County, Ontario

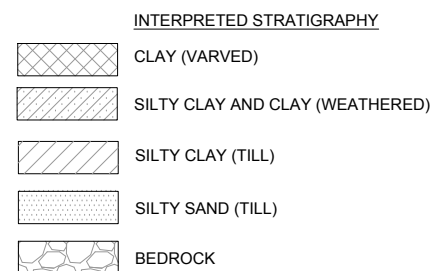
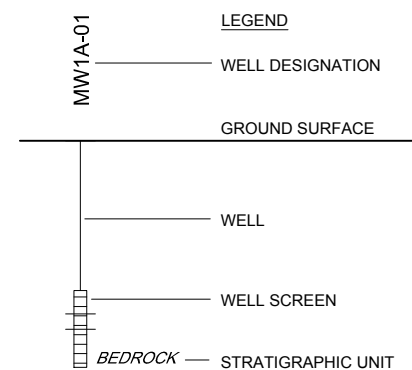
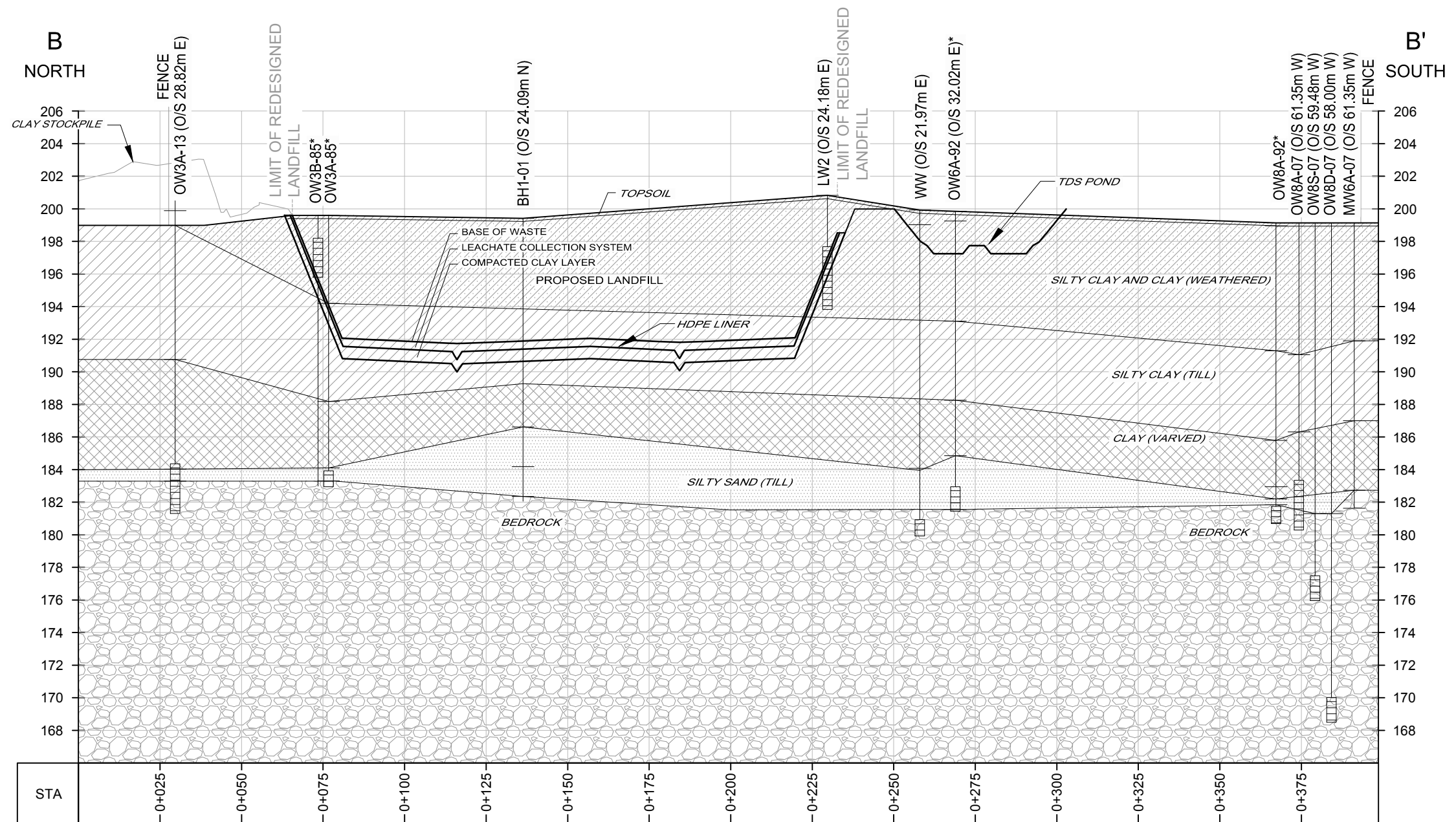


BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
CROSS SECTION PLAN

18235-20
Oct 12, 2016

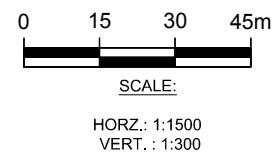
Figure 4.9





NOTES:

* ABANDONED WELL - HISTORICAL DATA



BROOKS ROAD LANDFILL SITE
Halimand County, Ontario

BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
GEOLOGICAL CROSS-SECTION B-B'

18235-20
Oct 12, 2016

Figure 4.11

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 very stiff to hard with low plasticity. At depths in excess of 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 180.80 to 185.73 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.

The base elevation of the landfill's compacted clay liner is at approximately 191 m AMSL at the west end of the Site and slopes at 5 percent grade towards the east to an elevation of approximately 189 m AMSL. The base of the landfill liner resides in the silty clay till stratigraphy, with varved clay, silty sand till, and bedrock underneath the silty clay till respectively. The thickness between the base of the landfill and bedrock ranges from 5 to 9 m.

Site Hydrogeology

In general, the geologic units identified at the Site may be grouped into two main hydrogeologic units, as follows:

- i) An unconfined water table (shallow overburden) unit within the shallow fractured silty clay unit
- ii) A confined basal 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 2014, groundwater flow in this unit is generally towards the southeast.

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 southerly 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 Local Study Area. No active/plugged gas wells were identified on the Site, however research indicates that 23 current and former gas wells are located within the Local Study Area. 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 Local Study Area. 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 (see **Figure 4.12**).



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.

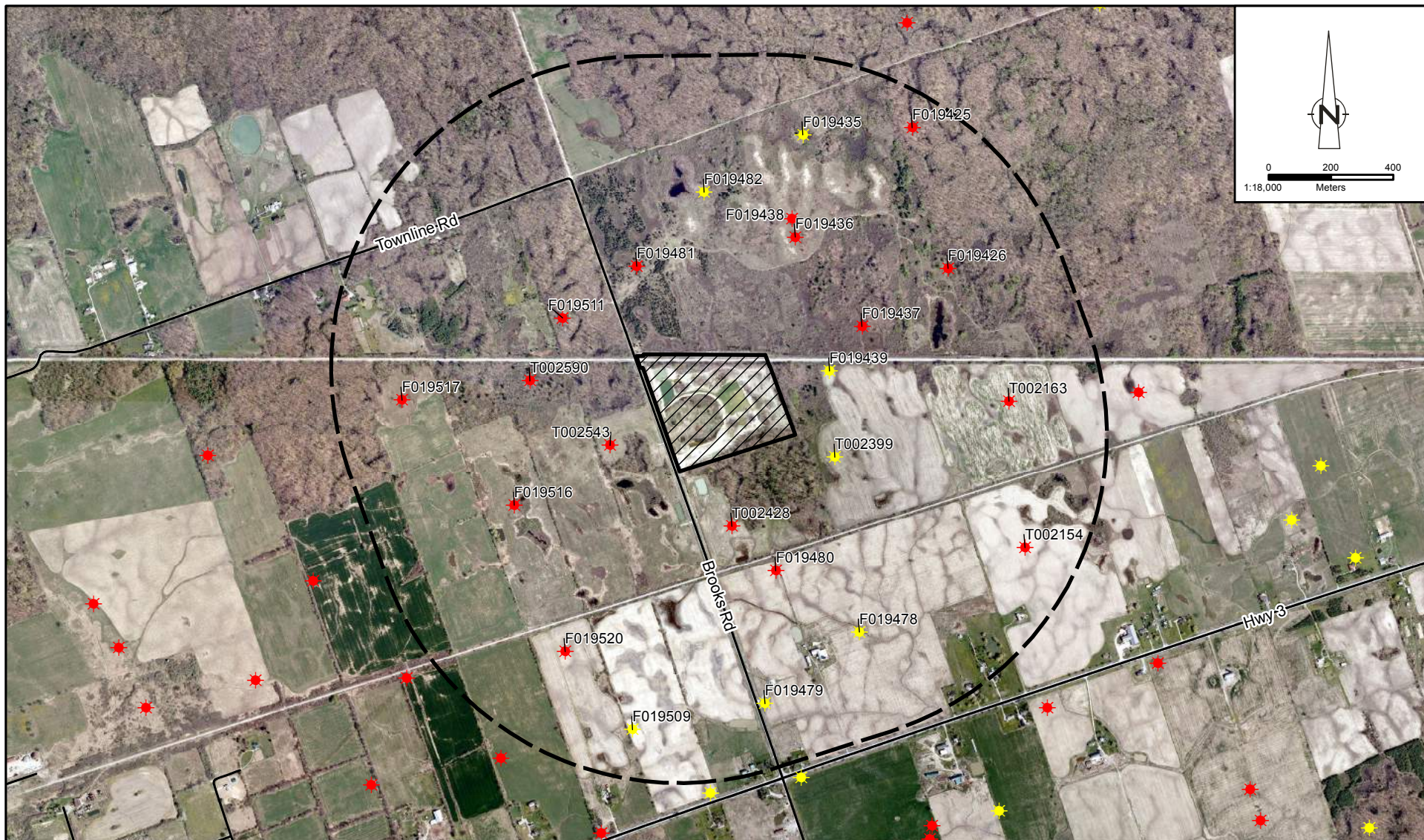
Water Wells

A review of water supply wells located in the vicinity of the Local Study Area was undertaken. The MOECC water well record database was utilized to plot the locations of existing and historical water wells within and near the Local Study Area. The results of the database review are illustrated on **Figure 4.13**.

As indicated in **Figure 4.13**, there are 24 water wells located in the vicinity of the Local Study Area, with 12 wells located within the Local Study Area (7 observation wells, 2 industrial supply wells, 1 commercial supply well and 1 livestock supply well). There are no domestic supply wells located within the Local Study Area, based on the MOECC water well record search.

Based on the information provided in the MOECC water well database, all active water supply wells identified on **Figure 4.13** (industrial, commercial, livestock and domestic wells) are completed within the bedrock aquifer.

In consideration of the distance between the Site and the domestic supply wells located outside of the Local Study Area, the presence of a thick fine-grained aquitard between the landfill and bedrock, and consistent hydraulic and geochemical data supporting the interpretation that the landfill is not a source of impact to the bedrock aquifer, these wells are not considered to be at risk from landfill-related water quality impairments in the current setting or in the context of a vertical expansion.



Source: MNR/NRVS, 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

Legend





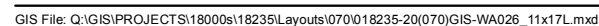
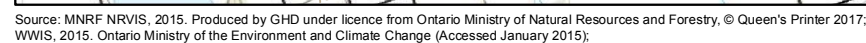
-  Site Location
-  Local Study Area (1km Radius)
-  Abandoned Gas Well
-  Status Unknown



figure 4.12

OIL AND GAS WELL LOCATIONS
BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION
BROOKS ROAD LANDFILL
160 Brooks Road, Cayuga, Ontario



018925-20
Jan 19, 2017

FIGURE 4.13

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 Site Study Area, however one abandoned mine was identified within the Local Study Area 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 was reportedly removed from this prospect shaft during the operation of the mine. With a density of 2.3 t/m^3 and a thickness of 1 m, this would correspond to lateral workings with an aerial footprint of approximately 4,356 square metres (m^2). 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 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 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 Landfill Site.

Other Data Sources

A review of the Ontario Geological Survey Karst of Southern Ontario and Manitoulin Island report indicates that no potential karst, inferred karst, or known karst bedrock has been identified within the study area⁷. 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.

4.3.3 Surface Water Resources Existing Conditions

For Surface Water both the generic Site Study Area and Local Study Area established during the ToR are applicable.

Information on the Surface Water Resources existing conditions within the Study Areas was gathered from a combination of primary and secondary source research as well as field investigations. The following available secondary sources of information were reviewed:

- 2015 Operations & Monitoring Report, Brooks Road Landfill, prepared by Conestoga-Rovers & Associates Ltd. , dated April 2016.
- Scoped Environmental Impact Study, Former Railway Corridor Lands, North of Brooks Road Landfill, Haldimand County, ON, dated December 2013.
- Stormwater Management Plan, prepared by Conestoga-Rovers & Associates Ltd., dated September 2013.
- Amended Environmental Compliance Approval Number 6869-9EAT28, for establishment of a stormwater management facility and a leachate collection, treatment, and disposal system, and issued by the Ministry of the Environment, dated November 12, 2014.
- Application for Amendment to Environmental Compliance Approval for Stormwater Management Plan, prepared by Conestoga-Rovers & Associates Ltd., dated September 11, 2013.
- Stage 3B and Final Stormwater Pond Construction Drawings, prepared by Conestoga-Rovers & Associates Ltd., dated May 2014.
- Amphibian monitoring, Edwards Landfill Monitoring Report, prepared by Natural Resource Solutions Inc., dated May 22, 2007.
- Application for Approval of Industrial Sewage Works – Ontario Water Resources Act, Surface Water Management Plan, prepared by Conestoga-Rovers & Associates, dated February 9, 2004.

⁷ 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).

- Natural Heritage Features Assessment, prepared by Natural Resource Solutions Inc., dated December 2004.
- Monitoring Program Review and Comments, issued by the Ministry of Natural Resources, in a letter dated May 28, 2007.
- Preliminary Surface Water Assessment, Edwards Landfill Site, prepared by Conestoga-Rovers & Associates, dated November 2001.

Regular surface water field investigations are completed four times annually. During the 2015 monitoring period, field investigations were conducted on March 19, 2015, May 23, 2015, August 4, 2015, and November 12, 2015.

The field investigations include monitoring of surface water quality and quantity, through water sampling and flow rate measurements. Additionally, any characteristic changes to drainage patterns, run-off, or features influencing site conditions are also identified.

The on-Site drainage patterns have changed considerably since the documentation from early 2001 to 2007. Surface water management appears to be a key control at the Site. The Site stormwater management practices currently operate under amended ECA No. 6869-9EAT28, issued in November 2014. The Site drainage network is being configured to the Post Closure Condition, illustrated on Figure 2 of the 2013 Stormwater Management Plan (included in **Appendix E-5**).

The Local Study Area includes slough forest, woodlot, agricultural, residential, and municipal properties. The on-Site topography is very flat with a slight 0.003 metre/metre (m/m) horizontal gradient to the south. The topography across the Local Study Area from north to south ranges from approximately 202 m AMSL to approximately 196 m AMSL.

As indicated in the 2013 Stormwater Management Plan, the stormwater management system for the Site was designed to provide water quality and water quantity control of surface water runoff. The design criteria is designed to attenuate peak flows up to the 100-year storm event. The drainage ditches were further sized, at a minimum, to accommodate the peak flow from a 3-hour duration, 25-year storm. The current design for the Site (implementation of which is currently in progress) includes two outfalls (Outfall 1 and Outfall 2) (see **Figure 4.14**). Outfall 1 is characterized as an undeveloped area of land on the south-east corner of the Site where no work or changes are being proposed. Precipitation that falls in Outfall 1 will be absorbed by the biota and/or conveyed off-Site to the South. Outfall 2 combines the remainder of the Site area, including run-off from the landfill cap. Prior to discharge, Outfall 2 surface water is collected in an extended detention wet stormwater management pond. The stormwater management pond has been designed with additional capacity for the proposed vertical expansion of the landfill.

The discharge point for Outfall 2 is to the Brooks Road ditch near the south-west corner of the Site.

The Local Study Area is located within the Haldimand Clay Plain which is characterized by level topography and relatively poor drainage. The Local Study Area is located within the jurisdiction of both the Grand River Conservation Authority and the Niagara Peninsula Conservation Authority with a visible watershed divide (see **Figure 4.15**). The former Canadian Southern Railway (CSR) has functioned as a topographic and hydrologic divide between the northernmost portion of the Site Study Area and the south of the Site Study Area since the former CSR railway was established. The Site ultimately discharges runoff to the roadside ditch along the east side of Brooks Road which drains in a southerly direction through a culvert under the Canadian National Railway rail bed and empties into a small apparently natural stream channel, which is the head waters of Norton Creek, and discharges directly to the Grand River, located approximately 7 km from the Site. The North Cayuga Swamp Wetland Complex is a provincially significant wetland (PSW) complex that is also present within the Site Study Area and throughout the Local Study Area in general.

As shown on **Figure 4.15**, the surface water monitoring network is currently comprised of eight monitoring locations, and consists of two background monitoring locations, two on-Site monitoring locations, and four downstream monitoring locations.

The background monitoring locations are typically characterized by concentrations of phosphorus, aluminum, and iron that have consistently been reported above the Provincial Water Quality Objectives (PWQO). Other parameters that have been occasionally detected at concentrations elevated above their respective PWQO's include: phenolics, chromium, cobalt, copper, vanadium, zinc, toluene, and some polycyclic aromatic hydrocarbons (PAH) parameters.

Recent water quality results obtained from on-Site surface water monitoring locations are generally consistent with background surface water monitoring locations. One of the on-Site surface water monitoring locations (SW5) has historically reported elevated lead and PAH concentrations. In addition, surface water quality results for SW3, located immediately downstream of the Site within the Brooks Road ditch, have consistently been reported to contain elevated concentrations of some PAH parameters. The elevated PAH results at SW3 have previously been interpreted to have resulted from poor handling of railway ballast materials.

The persistence of detectable concentrations of PAHs in surface water monitoring locations SW3 and SW5 is attributed to the historical stockpiling and use of railway ballast in the southern portion of the Site. Prior to 2007, a large stockpile of railway ballast was stored in



close proximity to the ponded area in which SW5 is located. The majority of the ballast has since been relocated to the engineered lined landfill cells; however, a portion of the material was used in the construction of the Site entrance roadway in the southwestern portion of the Site, located upstream of SW3. Detectable concentrations of PAHs have been persistent at these locations, including in recent (2015) monitoring results. It should be noted that downstream monitoring locations SW4 and SW6 did not contain detectable concentrations of PAHs in the 2015 monitoring period and is generally consistent with background water quality.



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

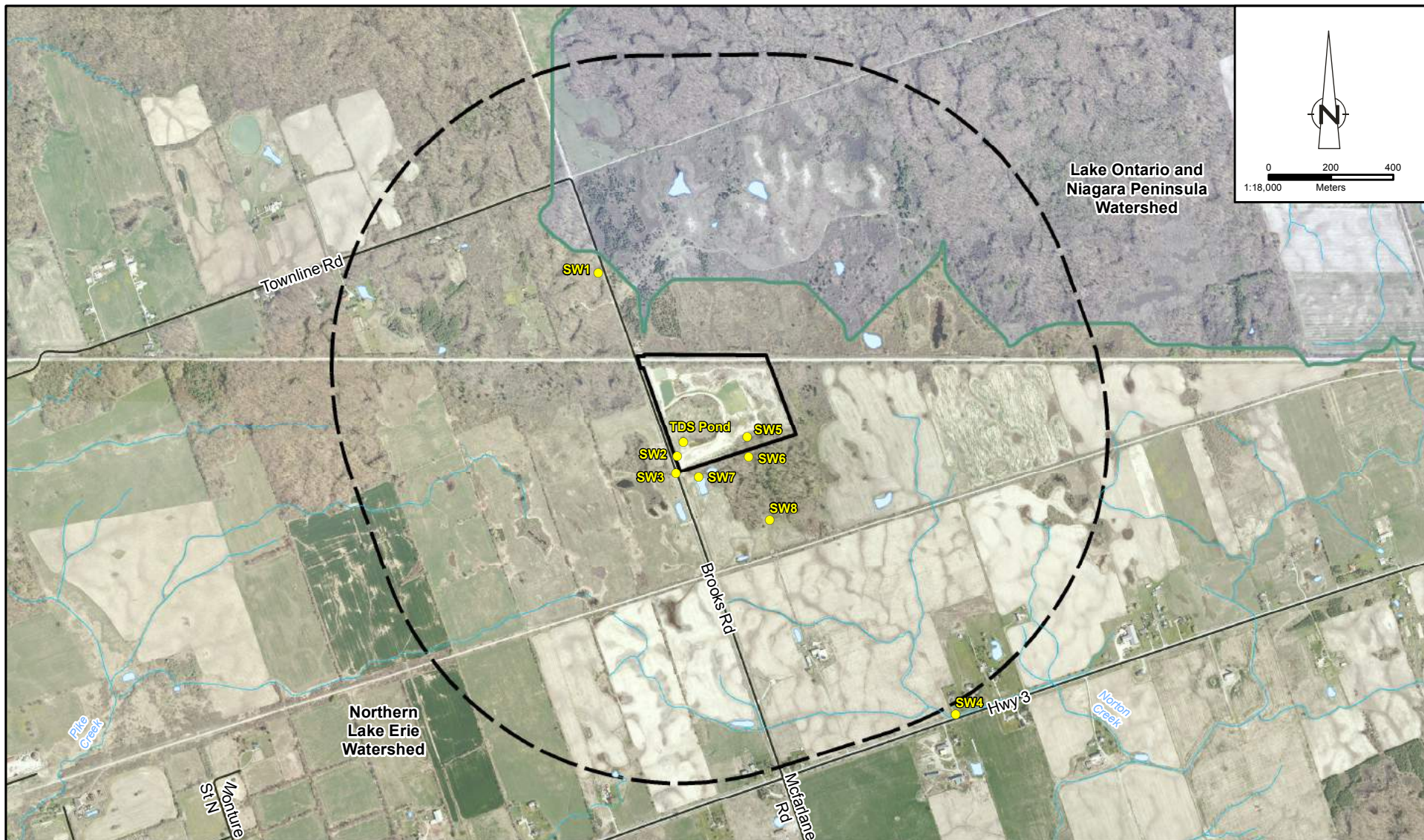
figure 4.14

STORMWATER MANAGEMENT SYSTEM
 BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
 BROOKS ROAD LANDFILL SITE
 160 Brooks Road, Cayuga, Ontario

Legend

- Outfall
- ▶ Ditch
- SWM Pond
- Catchment Boundaries
- Landfill Footprint
- ▶ Flow Direction





Source: MNR/NRVIS, 2014. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2017; Haldimand County Official Plan
 Aerial: 2006 Grand River Conservation Authority
 Coordinate System: NAD 1983 UTM Zone 17N

Legend



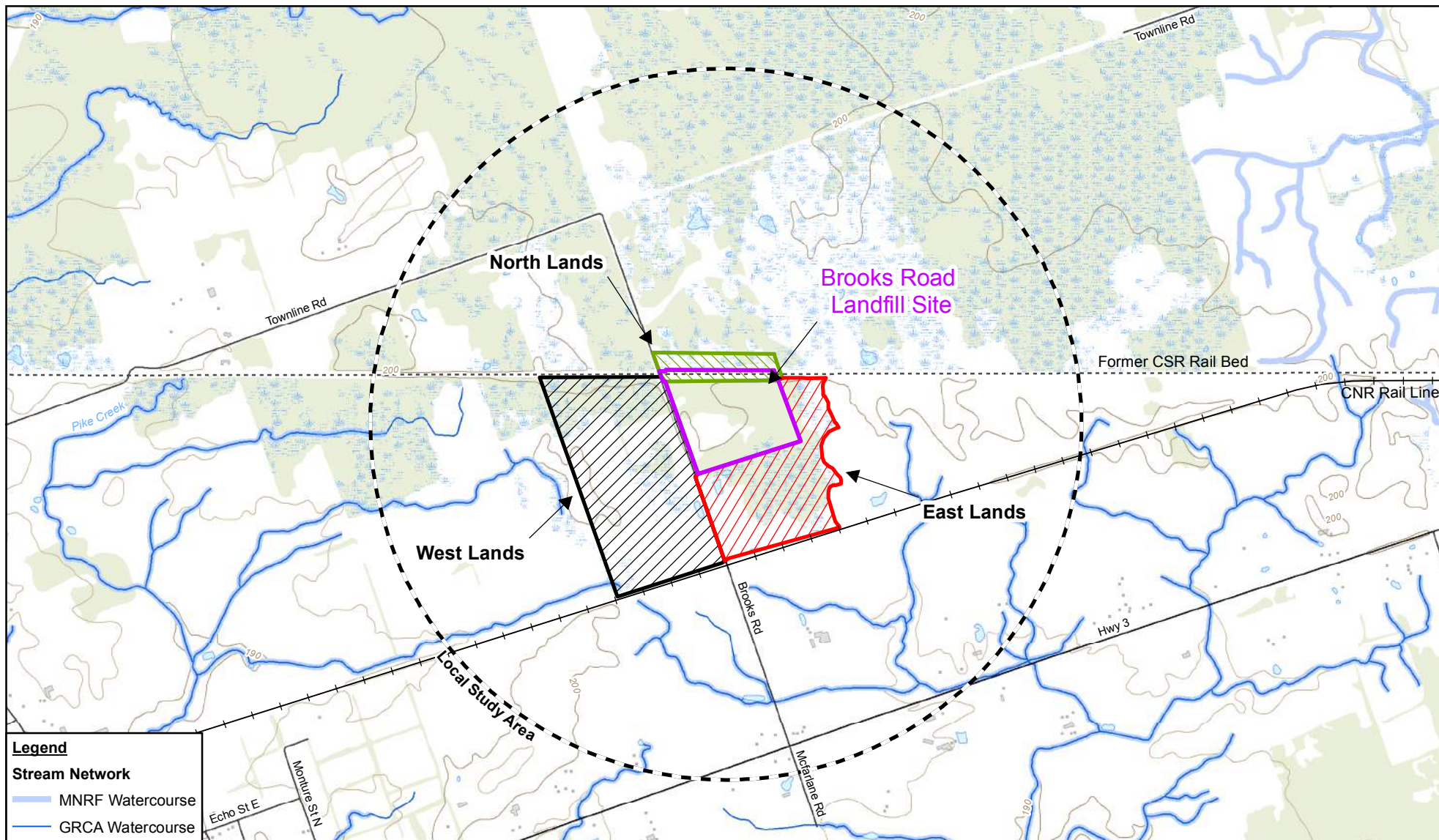
- Surface Water Monitoring Location
- Site Location
- Watercourse
- Local Study Area (1km Radius)
- Watershed

figure 4.15
 SURFACE WATER MONITORING LOCATIONS
 BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
 BROOKS ROAD LANDFILL SITE
 160 Brooks Road, Cayuga, Ontario



4.3.4 Terrestrial & Aquatic Environment Existing Conditions

For the Terrestrial and Aquatic Environment both the generic Site Study Area and Local Study Area established during the ToR are applicable and are depicted on **Figure 4.16** Field investigations generally focused primarily on the surrounding natural features in the Local Study Area and less on the Site Study Area (i.e., the Brooks Road Landfill Site), due to active disturbance and general lack of natural features within the landfill property. The area to the south and east of the Site Study Area (herein referred to as "East Lands") consists of undeveloped rural property consisting of a combination of agricultural fields and forested lands. On the west side of Brooks Road (herein referred to as "West Lands") is a rural property which is characterized by agricultural fields and small forested plots. To the north of the Site Study Area, there is a rural property consisting of limited agricultural fields and forested lands. As described further in **Section 4.3.4.2**, the North Cayuga Swamp Wetland Complex, a PSW complex, is present within the Site Study Area and the North Lands, West Lands, and East Lands.



Source: MNR NRVIS, 2015. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2016; Grand River Conservation Authority

0 200 400 600
Meters

Coordinate System:
NAD 1983 UTM Zone 17N



HALDIMAND COUNTY, ONTARIO
BROOKS ROAD LANDFILL SITE
VERTICAL CAPACITY EXPANSION ENVIRONMENTAL ASSESSMENT

TERRESTRIAL & AQUATIC ENVIRONMENT STUDY AREA

018235-20
Nov 10, 2016

FIGURE 4.16

Information on the Terrestrial and Aquatic Environment existing conditions within the Study Areas was gathered from a combination of secondary source research, field investigations and agency consultation. The available secondary sources of information that were collected and reviewed are outlined in **Table 4.3**.

Table 4.3 Terrestrial and Aquatic Environment Secondary Source Information Reviewed

Source	Information Reviewed
Ministry of Natural Resources and Forestry (MNR)	<ul style="list-style-type: none"> Species at Risk (SAR) Natural Heritage Features data layers from Land Information Ontario Aquatic Resource Area (ARA) Survey Points
Fisheries and Oceans Canada (DFO)	<ul style="list-style-type: none"> Species at Risk Fish and Mussel Maps (2015)
Grand River Conservation Authority (GRCA)	<ul style="list-style-type: none"> Fisheries Management Plan (2001) Wetlands map layer
Natural Resource Solutions Incorporated (NRSI)	<ul style="list-style-type: none"> Natural Heritage Features Assessment-Edwards Landfill Site (November, 2004)
Conestoga-Rovers and Associates (CRA)	<ul style="list-style-type: none"> Scoped Environmental Impact Study Former Railway Corridor Lands North of Brooks Road Landfill, Haldimand County, ON (December, 2013)
Ontario Reptile and Amphibian Atlas	<ul style="list-style-type: none"> Species records for Study Areas
eBird	<ul style="list-style-type: none"> Avian species records in vicinity of Study Areas
Government of Canada	<ul style="list-style-type: none"> The Atlas of Canada- Toporama

GHD staff conducted various site investigations between 2013 and 2016 to identify aquatic and terrestrial habitats and features present within the Study Areas. No wildlife species surveys were conducted in the Site Study Area due to active operation of the landfill site and limited suitable habitat; however, incidental observations were collected at all Site visits and are discussed in **Section 4.3.4.6**. Investigations were conducted in spring and summer 2013, spring and summer 2014, summer 2015, and fall 2016. Dates and locations of specific surveys are presented in **Table 4.4**.

Table 4.4 Terrestrial and Aquatic Environment Field Investigations

Field Investigation	Dates
Wetland Delineation, Ecological Land Classification (ELC), and/or Vegetation Inventory	<p>June 10, 2013; July 2, 2013; August 15, 2013; August 19, 2013 (North Lands)</p> <p>May 22, 2014; May 28, 2014; June 12, 2014; June 17, 2014; July 16, 2014; July 8, 2015 (East Lands)</p>

Field Investigation	Dates
	April 11, 2014; May 14, 2014 (West Lands)
Amphibian Surveys	April 11, 2014; May 12, 2014; June 9, 2014 (West Lands)
Breeding Bird Survey	July 8, 2015 (East Lands)
Aquatic Habitat Assessment	October 28, 2016
Incidental Species Observations	Collected on all site visits

Wetland Delineation and Ecological Land Classification

Wetlands delineations and ELC were conducted as per available protocols at the time of survey. Wetland delineations of the Study Areas were prepared following Ontario Wetland Evaluation System (OWES) methods (MNR, 1994; MNR, 2013), while ELC mapping of the Study Areas was prepared in accordance with Lee et al (1998). In accordance with the 2008 ELC revisions, the updated ELC categories were applied as appropriate. The vegetation inventory was compiled and refined by incidental observations recorded throughout all site visits.

Calling Amphibian Surveys

Amphibians were surveyed according to the Great Lakes Marsh Monitoring Protocol at 6 stations throughout the West Lands in spring 2014. At each station, all calling frogs and toads were recorded. Direction of call, distance of call, species and numbers of individuals were documented. When too many individuals of one species were calling, making it difficult to detect separate individuals and make an accurate estimate of their number, they were recorded as a chorus.

Breeding Bird Survey

Breeding bird surveys were conducted on July 8, 2015 in the East Lands. This was conducted during the breeding bird season when most birds are on their territories engaged in breeding activities. Surveys were conducted between 5:00 and 11:00 a.m. A point count methodology was utilized, where a point count location was surveyed for 5 minutes and all species seen and heard were recorded. Breeding evidence was recorded to determine if the species was a possible, probable or confirmed breeder following protocols of the Ontario Breeding Bird Atlas (Cadman et al., 2007).

Aquatic Habitat Assessment

A rapid habitat assessment was conducted along the roadside where property access was permitted on October 28, 2016, to determine the presence and type of fish habitat within the Local Study Area. Parameters collected included stream channel dimensions, flow



characteristics including evidence of groundwater discharge, substrates, instream/in-water cover opportunities, riparian and instream vegetation, and the presence of physical barriers to fish movement and disturbances (past and present). Surface water resources are further documented and considered as part of the Surface Water Resources Assessment Report (GHD, 2016).

Incidental Species Observations

Incidental species observations were recorded during all site visits, and are described in greater detail in **Section 4.3.4.6**.

Agency Consultation

The MNRF was consulted multiple times during recent projects in the Local Study Area to request available natural heritage information, SAR records, and relevant wildlife records. The Guelph District MNRF was contacted on July 17, 2013 and April 15, 2014, and a response was received on July 29, 2013 and April 29, 2014 respectively. The response letters from MNRF correspondence are provided in **Appendix E-3**.

The Grand River Conservation Authority (GRCA) and Niagara Peninsula Conservation Authority (NPCA) were also involved in the development and review of the ToR, and the Scoped Environmental Impact Study (EIS) of the North Lands in 2013. GRCA and NPCA also participated in a site walk with GHD ecologists to confirm wetland boundaries in the North Lands on July 5, 2013. GRCA conducted a site walk with GHD ecologists on June 12, 2014 to confirm the wetland boundaries in the East Lands. The investigations and findings of the EIS were reviewed and accepted by both the GRCA and NPCA.

4.3.4.1 Topography and Hydrology

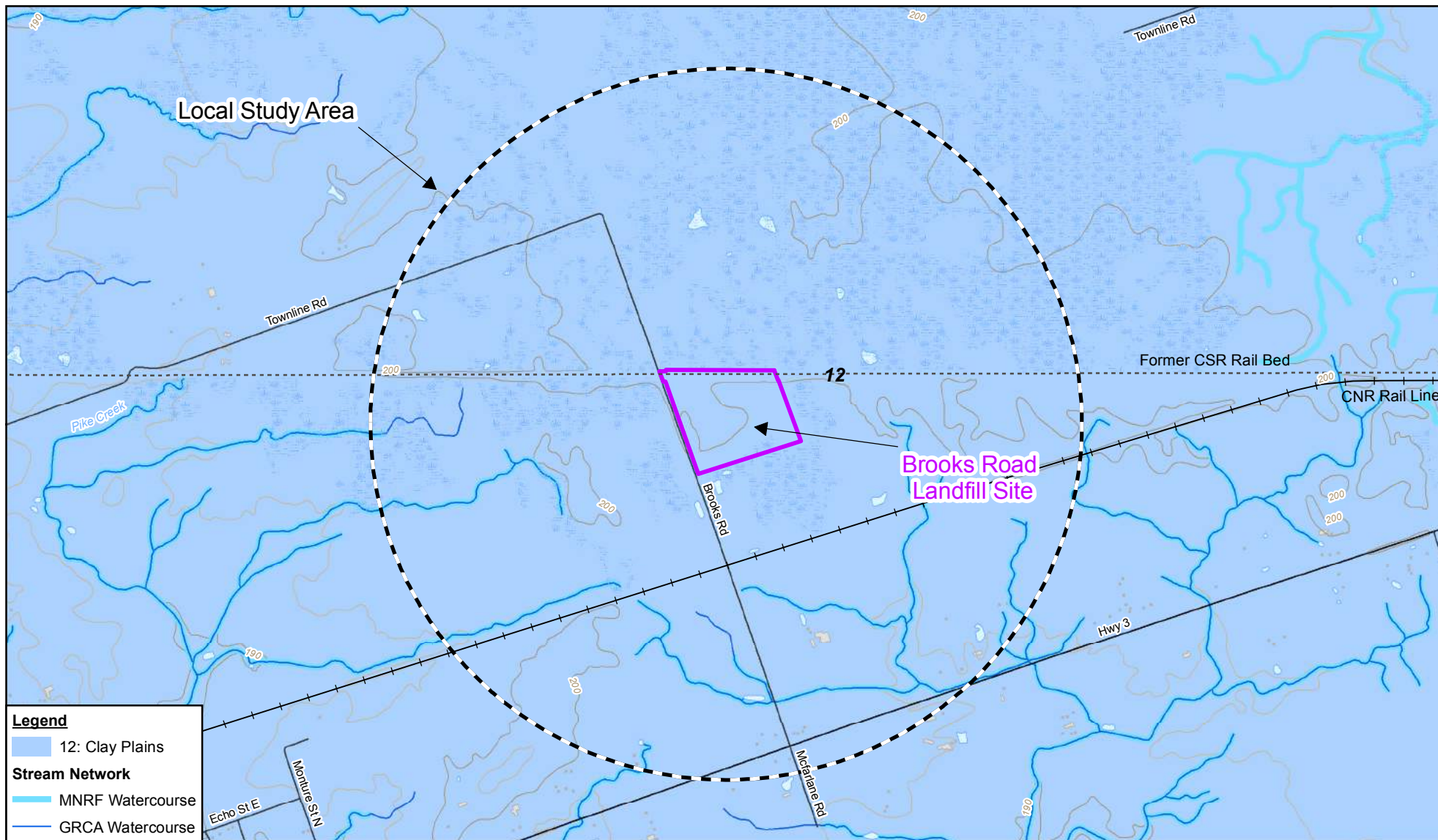
The Local Study Area is located within the Haldimand Clay Plain which is characterized by level topography and relatively poor drainage (**Figure 4.17**). The former CSR has functioned as a topographic and hydrologic divide between the northernmost portion of the Site Study Area and the area south of the Site Study Area since the former CSR railway was established in the 1870's.

The roadside ditch along the east side of Brooks Road, adjacent to the Site Study Area, drains south through a culvert under the Canadian National Railway (CNR) rail bed, and empties into a small stream channel which is part of the headwaters of Norton Creek. Drainage from adjacent lands to the west of Brooks Road also flows through culverts under Brooks Road augmenting 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 CNR rail bed. Norton



Creek eventually discharges into the Grand River, which is located approximately 3 km south of the Site.

Pike Creek is also shown on mapping to extend into the western portion of the Local Study Area. However, it is shown on the Atlas of Canada's Toporama mapping to be an intermittent watercourse in this area.



Source: MNRF NRVIS, 2015. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2016;

0 200 400 600
Meters

Coordinate System:
NAD 1983 UTM Zone 17N



HALDIMAND COUNTY, ONTARIO
BROOKS ROAD LANDFILL SITE
VERTICAL CAPACITY EXPANSION ENVIRONMENTAL ASSESSMENT

PHYSIOGRAPHY

018235-20
Nov 10, 2016

FIGURE 4.17

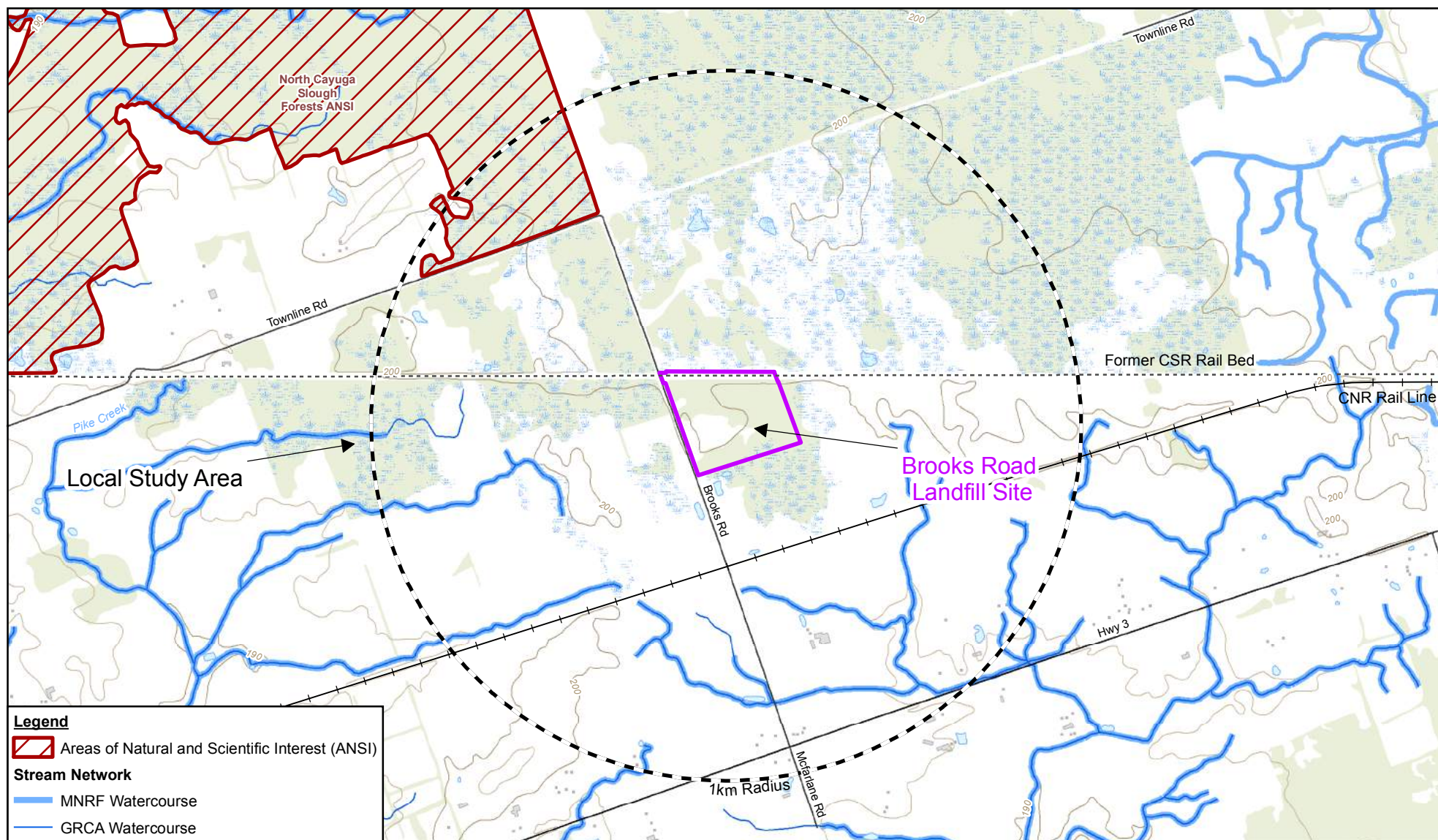


4.3.4.2 Significant Natural Features

The Site Study Area is bordered by natural landscape features of regional and/or provincial significance.

The North Cayuga Slough Forest is an Area of Natural and Scientific Interest (ANSI), located in the northwest portion of the Local Study Area and the Brooks Road/Townline Road intersection (**Figure 4.18**). This 1,214 hectare (ha) landscape feature is composed of a diverse complex of woodlands, vernal pools and sloughs which are bordered by swamps (GRCA, 1997). The sloughs are a result of the Beverly and Toledo silty clay plains and the Lincoln clay plains. Generally the area is dominated by imperfectly to poorly drained lacustrine silty clay and heavy clay. The upland areas are dominated by sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*) and red oak (*Quercus rubra*). Red maple (*A. rubrum*), swamp white oak (*Q. bicolor*) and black ash (*F. nigra*) typically dominate the low, wet basins. Field communities are characterized by hawthorns (*Crataegus spp.*), southern arrow wood (*Viburnum dentatum*) and narrow-leaved meadowsweet (*Spirea alba*), representing some of the many transitional environments between the distinct upland and low land areas. This area is of special importance due to its textbook clay-plain sediments and sand ridges which lead to the very distinct vegetation patterns. Previous studies have documented that 14 vegetation species and 4 bird species that are rare nationally, provincially and/or regionally occur in the area. This area is also home to a heronry (GRCA, 1997).

The North Cayuga Swamp Wetland Complex is a PSW complex that is also present within the Site Study Area and throughout the Local Study Area in general (**Figure 4.19**). The wetland boundary shown on **Figure 4.19** was verified by MNRF in 2010. This wetland complex is made up of numerous individual wetlands dominated by swamp with some marsh wetlands (MNR, 2010). The PSW extends to the northernmost portion of the Site Study Area and incorporates the wetland elements of the North Cayuga Slough Forest. The complex vegetation community is characterized by thicket swamps of narrow-leaved meadowsweet, buttonbush (*Cephalanthus occidentalis*), winterberry (*Ilex verticillata*), or speckled alder (*Alnus incana ssp. rugosa*) with red maple, gray dogwood (*Cornus foemina ssp. racemosa*), highbush blueberry (*Vaccinium corymbosum*), and willows (*Salix spp.*) as associates (NPCA, 2010). The soil is a clay, loam or silt composition.



Source: MNRF NRVIS, 2015. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2016;

0 200 400 600
Meters

Coordinate System:
NAD 1983 UTM Zone 17N

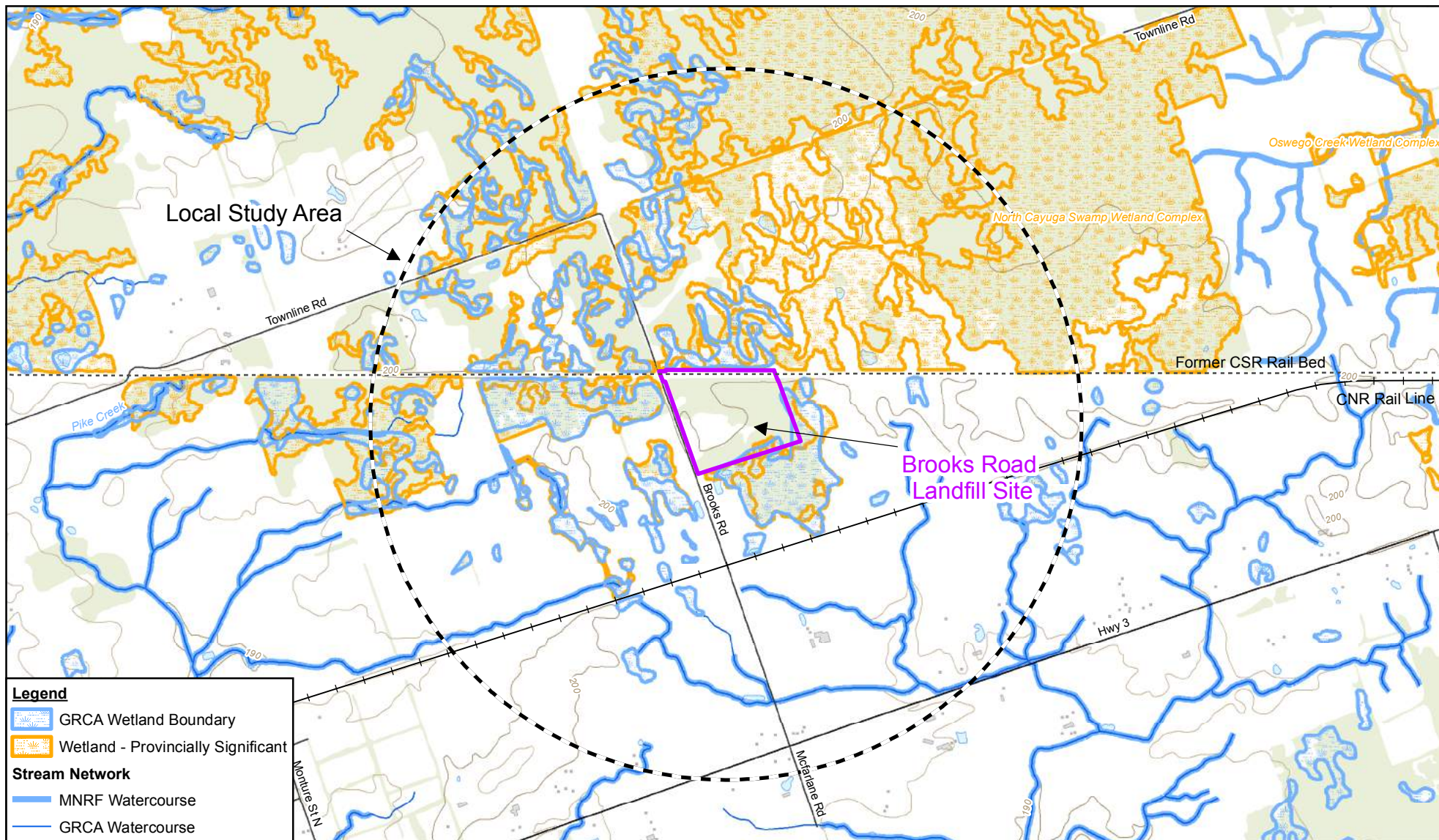


HALDIMAND COUNTY, ONTARIO
BROOKS ROAD LANDFILL SITE
VERTICAL CAPACITY EXPANSION ENVIRONMENTAL ASSESSMENT

NATURAL AREAS OF CONCERN

018235-20
Nov 10, 2016

FIGURE 4.18



Source: MNRF NRVIS, 2015. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2016; Grand River Conservation Authority

0 200 400 600
Meters

Coordinate System:
NAD 1983 UTM Zone 17N



HALDIMAND COUNTY, ONTARIO
BROOKS ROAD LANDFILL SITE
VERTICAL CAPACITY EXPANSION ENVIRONMENTAL ASSESSMENT

PROVINCIALY SIGNIFICANT WETLANDS

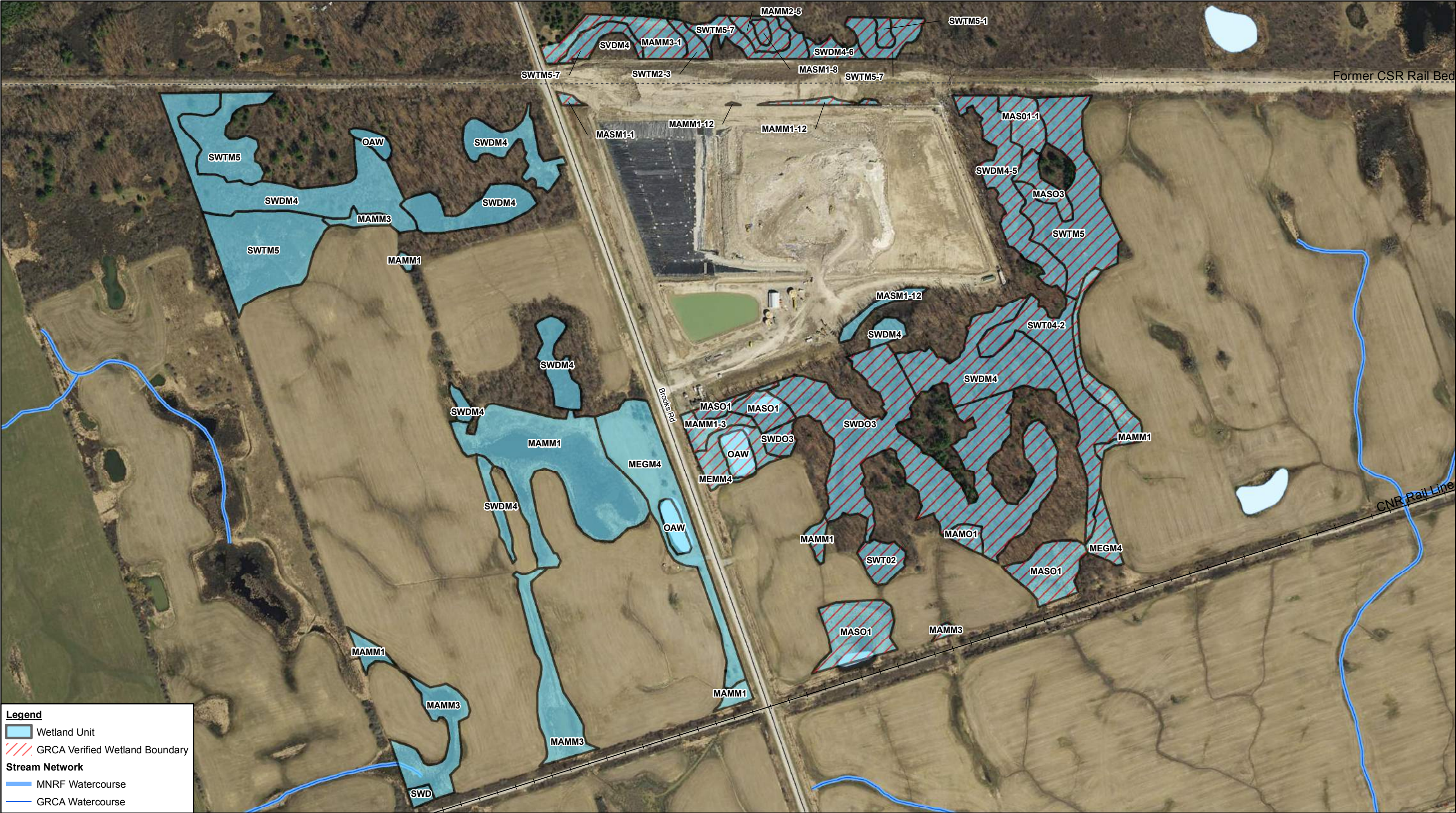
018235-20
Nov 10, 2016

FIGURE 4.19

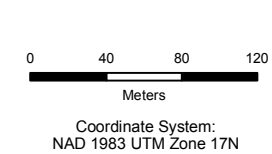


4.3.4.3 Wetland Delineation

GHD conducted a wetland delineation of the North, West, and East Lands within the Local Study Areas. The wetland delineation was completed over multiple site visits in 2013 and 2014 by an ecologist certified under the Ontario Wetland Evaluation System (OWES) protocol through the MNRF. The wetland delineation was prepared following Ontario Wetland Evaluation System (OWES) methods (MNR, 1994; MNR, 2013) and is presented on **Figure 4.20**. Vegetation, soil characteristics, hydrological features and topography were surveyed as part of this wetland delineation. Soil horizons were sampled at depth using a soil hand core auger to verify soil type and potential hydric soils. Boundaries were flagged for visual representation of the wetland boundary and future verification. In order to verify the wetland boundaries and site conditions, GRCA and NPCA representatives conducted a site walk of the North Lands with GHD ecologists on July 5, 2013, and on June 12, 2014 for the East Lands (GRCA only). Once complete, a surveyor using a Total Station GPS unit captured the wetland boundaries. This information was transposed to create **Figure 4.20**. Twenty-five wetland units were delineated within a 1 km radius of the landfill property. Ecological Land Classification (ELC) labels in **Figure 4.20** are described in **Section 4.3.4.4**.



Source: MNRF NRVIS, 2015. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2016;
Image Source: ESRI Basemap Imagery, Acquisition Date: 2010, Accessed 2016.



HALDIMAND COUNTY, ONTARIO
BROOKS ROAD LANDFILL SITE
VERTICAL CAPACITY EXPANSION ENVIRONMENTAL ASSESSMENT

WETLAND BOUNDARIES AND ECOLOGICAL LAND CLASSIFICATION

018235-20
Nov 10, 2016

FIGURE 4.20

4.3.4.4 Vegetation

GHD conducted a vegetation inventory and Ecological Land Classification (ELC) of select areas within the Local Study Areas which included the East, West and North Lands. The inventory and classification were refined over the course multiple site visits between 2013 and 2015.

A species of interest detected during field activities was pumpkin ash (*F. profunda*), which is ranked as an S2 provincially and is a regionally rare species in the Haldimand-Norfolk County. It is found in swampy areas with standing water for most of the year. A single specimen in poor condition was found along the south base of the abandoned rail line to the east of the landfill property.

Another species of interest that was detected in past field investigations conducted by others was black gum (*Nyssa sylvestre*). Black gum is found to grow in low, wet sites (MNRF, 2015). A small stand of black gum was found on site by NRSI in 2004 at the southeast corner of the landfill prior to clearing activities. The stand of black gum was identified by GHD on the landfill property during 2016 field investigations. The trees were found to be tagged and located in the direct vicinity of active landfilling activities, without any tree protection measures. Black gum is a provincially rare species (S3) in Ontario, but within Haldimand-Norfolk County black gum is considered common.

ELC mapping of the Study Area was prepared following Ecological Land Classification for Southern Ontario: A First Approximation (Lee et al., 1998), and is presented on **Figure 4.21**. To complete the classification, ELC certified ecologists conducted site visits to assess the landform and parent material, soil, and vegetation present on site. Through assessment of these characteristics, classification of the ecological communities was completed for the North, East, and South Lands. The balance of the Local Study Area (up to a 1 km radius from the Site) was assessed using aerial photography interpretation and knowledge of the area. Forty-four ecological land classification community classes are represented within the Study Area and include aquatic, swamp, marsh, meadow, thicket, forest, transportation and utilities, and cultural systems. Characteristics of each of the identified community types are provided in the following paragraphs. The vegetation inventory is presented in **Appendix E-3**.



Terrestrial:

AG: Agriculture

Agricultural fields are present throughout the Local Study Area and are actively farmed. At the time of survey, soy bean (*Glycine max*) crops were planted within all fields of the East and West Lands. Small wetland and drainage areas were present throughout the actively farmed agriculture fields.

CVI_1: Transportation

This area is composed of roadways, a decommissioned rail line from which rail ties have been removed, and an active rail line.

CVI_2: Disposal and Recycle

This is the Brooks Road Landfill Site, which is in active operation.

CVR_4: Rural Property

This is a rural property with residential and accessory structures.

CUL: Cultural

This classification is applied to the disturbed and actively managed areas of the clay stockpile. No vegetation is present.

CUL_V: Cultural Vegetated

The vegetation community of the vegetated portion of the clay stockpile is comprised of low growing upland herbaceous and occasional small shrub species. This young community is dominated by species such as pigweed (*Chenopodium album*), white sweet clover (*Melilotus alba*), bird's foot trefoil (*Lotus corniculatus*), and Queen Anne's lace (*Daucus carota*), many of which are non-native. Some remnant woody debris and stumps are present at the toe of the stockpile on Site property.

MEFM-1: Dry Fresh Forb Meadow

This pioneer open meadow borders the common reed graminoid meadow marsh (*MAMM1-12*), between the active landfill and the clay stockpile. Soil in this area is characterized by clay. The vegetation community is highly disturbed and slightly patchy as a result of its proximity to the active clay stockpile. The dominant vegetation layer is the understory and is characterized by bird's-foot trefoil (*Lotus corniculatus*). Additional layers include the sub-canopy and ground



layer, dominated by Queen Anne's lace (*Daucus carota*) and coltsfoot (*Tussilago farfara*) respectively.

MEGM4: *Fresh Moist Graminoid Meadow*

The fresh moist graminoid meadow is mainly characterized by mineral soil and low growing grass species. Garlic mustard (*Alliaria petiolata*), cow vetch (*Vicia cracca*), goldenrod (*Solidago spp.*), blueberry (*Vaccinium sp.*), bebb's sedge (*Carex bebbi*), reed canary grass (*Phalaris arundacea*), common teasel (*Dipsacus fullonum*), lesser burdock (*Arctium minus*), large-fruited bur-reed (*Sparganium eurycarpum*), wood sorrel (*Oxalis acetosella*) and other sedge, forb and grass species are present within this meadow, with Serviceberry (*Amelanchier spp.*), hawthorn (*Crataegus spp.*), and European buckthorn (*Rhamnus cathartica*) present along its periphery. A very small stream also runs through this unit.

MEMM4: *Fresh-Moist Mixed Meadow*

The fresh-moist mixed meadow is located in an upland area surrounding a pond excavated for agricultural use. The area has disturbed soils and is primarily composed of forb and graminoid species such as reed-canary grass, common milkweed (*Asclepias syriaca*), bird's-foot trefoil, Queen Anne's lace, asters (*Aster spp.*) and common chicory (*Cichorium intybus*). No trees or shrubs are present.

FOD: *Deciduous Forest*

This upland forest interior landscape is surrounded by slough wetlands and thicket. This area was determined by aerial photo interpretation. This forested landscape is similar to the surrounding forests in the local area and composed of red maple, shagbark hickory, sugar maple, balsam poplar, American beech, and ironwood.

FODM3-1: *Dry-Fresh Poplar Deciduous Forest*

The dry-fresh poplar deciduous forest is located along the edge of the existing waste disposal area. The topography is relatively flat with moist soil. Trembling aspen (*Populus tremuloides*) dominates the semi closed canopy of this community, with red maple, red oak and various shrub species also present within the unit. The sub-canopy, understory and ground layer are dominated by typical upland species such as riverbank grape (*Vitis riparia*), buckthorn (*Rhamnus spp.*), dogwood (*Cornus spp.*), pasture rose (*Rosa carolina*), goldenrod (*Solidago spp.*) and bedstraw (*Galium sp.*).



FODM9: *Fresh-Moist Oak- Maple-Hickory Deciduous Forest*

This forest type is located west of Brooks Road and in close proximity to swamps and is a dense deciduous community composed of shagbark hickory (*Carya ovata*), red maple, sugar maple, balsam poplar (*Populus balsamifera*), american beech (*Fagus grandifolia*), ironwood (*Ostrya virginiana*) and swamp white oak species. Due to the large area of this unit, ground vegetation varied throughout the area and included sensitive fern (*Onoclea sensibilis*), bracken fern (*Pteridium aquilinum*), spotted jewelweed (*Impatiens capensis*), Canada mayapple (*Podophyllum peltatum*), highbush cranberry (*Viburnum trilobum*), garlic mustard (*Alliaria petiolata*), trout lily (*Erythronium americanum*), Canada thistle (*Cirsium arvense*), black raspberry (*Rubus occidentalis*), woodland strawberry (*Fragaria vesca*), lesser burdock, and bedstraw.

FODM9-1: *Fresh- Moist Oak –Sugar Maple Deciduous Forest*

This upland forest interior landscape is surrounded by slough wetlands. Sugar maple, red maple, shagbark hickory, ironwood and swamp white oak compose the canopy of this forest. The understory is composed of fern species (*Polypodiidae spp.*), trout lily, mayapple, garlic mustard, spotted jewelweed, and Canada thistle.

FODM9-2: *Fresh-Moist Oak-Maple Deciduous Forest*

This forested area is dominated by mature white oak (*Quercus alba*), red oak (*Quercus rubra*), and sugar maple species. American beech (*Fagus grandifolia*) is present along the periphery bordering the adjacent wetland habitat. This is a forest-swamp interface and includes upland and wetland species, each found depending on specific moisture conditions. The sub-canopy composition is similar to the canopy through succession. Groundcover includes a variety of upland and wetland herbaceous plants with ferns, sedges and other herbaceous plants. \

FODM9-4: *Fresh-Moist Shagbark Hickory Deciduous Forest*

This low forested area is adjacent to one of the slough wetlands and is dominated by shagbark hickory with ironwood, white ash, red oak and red maple, white oak being present. The soil in this area is moist with a rolling topography. The groundcover includes goldenrod species, trout lily, running strawberry bush (*Euonymus obovatus*), ostrich fern (*Matteuccia struthiopteris*) and other herbaceous species.

FOMM1-2: *Fresh-Moist White Pine-Hardwood Mixed Forest*

This raised elevation area compared to the surrounding supports both coniferous and deciduous tree species and associated vegetation. The mineral soil is well drained and mature white pine (*Pinus strobus*), sugar maple and white ash are present within this unit. Trout lily, mayapple, garlic mustard and Canada thistle are also present.

TAGM1: *Fine Mineral Coniferous Plantation*

The fine mineral coniferous plantation is a mid-age treed community that reflects the surroundings and historic land use as a tree farm. The canopy is composed exclusively of blue spruce (*Picea pungens*). The dominance within the sub-canopy is roughly divided between blue spruce and gray dogwood. Additional upland species include common teasel (*Dipsacus fullonum*), goldenrod species, orchard grass (*Dactylis glomerata*), broadleaf plantain (*Plantago major*) and common cinquefoil (*Potentilla simplex*) in the understory and as ground cover.

THD: *Deciduous Thicket*

As a transitional community between terrestrial and wetland areas, this thicket is dominated by shrub species including gray dogwood, hawthorn species, red osier dogwood (*Cornus sericea*), poplar species (*Populus spp.*) and ironwood. Distribution of vegetated areas is patchy.

THDM2-4: *Gray Dogwood Deciduous Shrub Thicket*

This mid-age transitional community is present in multiple locations throughout the Study Area and is typically associated with the drier edges of wetlands. The area is similar to the fresh moist deciduous savannah community (*SVDM4*), but is characterized by a dominant shrub cover of gray dogwood. Other community species indicative of an upland environment include white ash, hawthorn and goldenrod.

THDM2-11: *Hawthorn Deciduous Shrub Thicket*

This flat area of mineral soil is located in close proximity to an agricultural field. Hawthorn species dominate this landscape. Very few trees are located within this thicket and other species present include gray dogwood, serviceberry and white pine.

THDM3: *Dry-Fresh Deciduous Hedgerow Thicket*

This area is located south of the site and is situated along a rail bed. It is surrounded by marsh and agricultural fields. It has a raised topography compared to the surrounding landscape and is comprised of hawthorn species, common apple (*Malus pumila*), European buckthorn, amongst others.

THM: *Mixed Thicket*

Located to the east of the landfill property, this upland thicket is adjacent to two wetlands. A few large mature white pines have established and hawthorn, gray dogwood and European buckthorn are present within the sub canopy.

Wetland:**MAMM1:** *Graminoid Mineral Meadow Marsh*

This unit has a broad range of vegetation composition in the shrub and ground vegetation layers. Within the wetland, narrow-leaved cattail (*Typha angustifolia*) and reed canary grass. Vegetation along the edge of this unit includes common teasel, common chicory, red clover (*Trifolium pratense*), cow parsnip (*Heraleum maximum*), goldenrod, bird's-foot trefoil, serviceberry, gray dogwood, reed-canary grass, and oxeye daisy (*Leucanthemum vulgare*).

MAMM1-3: *Reed –canary Grass Graminoid Mineral Meadow Marsh*

Located directly to the east of Brooks Road and on the south-west corner of the landfill property, this marsh is dominated by reed-canary grass and very little other vegetation except for a small pocket of narrow-leaved cattail located within a ditch.

MAMM1-12: *Common Reed Graminoid Meadow Marsh*

This early succession community is located between the North Lands clay stockpile and the active landfill Site, and appears to have developed as a result of earthworks activities associated with site management and stockpiling on poorly drained soils. Common reed grass (*Phragmites australis*) dominates this young anthropogenic wetland area. Horsetail (*Equisetum spp.*), canary reed grass and purple loosestrife (*Lythrum salicaria*) were also present in the understory and ground layer.

MAMM2-5: *Purple Loosestrife Forb Mineral Meadow Marsh*

Purple loosestrife, large-fruited bur-reed (*Sparganium eurycarpum*), buttonbush (*Cephalanthis occidentalis*) and wool grass (*Scirpus cyperinus*) create a dense understory in this community which surrounds the bur-reed mineral shallow marsh (MASM1-8). This community provides a transition between the bur-reed mineral shallow marsh and a meadowsweet mineral deciduous thicket swamp (SWTO5-7) present in the north Study Area.

MAMM3: *Mixed Mineral Meadow Marsh*

This marsh is located directly beside an agriculture field and receives surface water flow from the surrounding agriculture area due to its low elevation. Graminoid and forb species dominate, and the composition includes common reed grass, goldenrod, bird's-foot trefoil, common teasel, reed canary grass, Queen Anne's lace, and purple loosestrife. Narrow-leaved cattail, narrow leaved meadowsweet (*Spiraea alba*), and large-fruited bur-reed are also present within the understory layer.



MAMO1: *Graminoid Organic Shallow Marsh*

The graminoid organic shallow marsh comprises a small wetland area located adjacent to an agricultural field and on the edge of a forest habitat. Vegetation includes primarily emergent sedge and graminoid species with small willow shrubs located on the periphery of the wetland.

MASM1-1: *Cattail Mineral Shallow Marsh*

The cattail mineral shallow marsh is a small pioneer understory community. It is characterized by narrow-leaved cattail and common reed which are indicative of a disturbed area.

MASM1-8: *Bur-reed Mineral Shallow Marsh*

Large-fruited bur-reed exclusively dominates this community. Standing water was observed within the unit throughout the field investigations, however there was little to no evidence of submerged aquatic, or floating aquatic species indicating a marsh rather than an open water environment.

MASO1: *Graminoid Organic Shallow Marsh*

The graminoid organic shallow marsh is a large wetland area dominated by tall robust vegetation. Standing water was present during multiple field surveys. Species composition is dominated by reed-canary grass, broad leaved water plantain (*Alisma subcordatum*), duckweed (*Lemnoideae spp.*), pondweed (*Potamogeton sp.*) and also consists of Queen Anne's lace, purple loosestrife and vetch species (*Vicia spp.*).

MASO1-1: *Cattail Organic Shallow Marsh*

The cattail organic shallow marsh is a small community located at the base of the old railline to the east of the landfill property. The marsh is comprised of organic soils and is dominated by narrow leaved cattail. Willow shrubs (*Salix spp.*), and sedges (*Cyperaceae sp.*) were established around the periphery. This wetland is attached by a small channel which flows south to another wetland (MASO3).

MASO3: *Mixed Organic Shallow Marsh*

The mixed organic shallow marsh is comprised of organic soils and surface water with maximum depths over 0.5m in some areas. Within the wetland, narrow leaved cattail, reed canary grass, fowl manna grass (*Glyceria striata*), rice cut grass (*Leersia oryzoides*), water parsnip (*Sium suave*) and other sedge and grass species dominate. Along the edge of the wetland, willow shrubs, gray dogwood, sensitive fern, speckled alder (*Alnus incana spp. rugosa*), hawthorn and serviceberry are present. Willow trees and shrubs are present throughout the wetland.



SWD: *Deciduous Swamp*

This swamp is a diverse community comprised of many small tree stands containing deciduous tree species including red maple, shagbark hickory, trembling aspen (*Populus tremuloides*), ironwood, hawthorn species, and oak species (*Quercus spp.*). Shrub species include gray dogwood, red osier dogwood and serviceberry among others.

SWDM4: *Mineral Deciduous Swamp*

The mineral deciduous swamp is located within a forest community near agricultural fields. Aerial photographic interpretation was used to determine this habitat. Based on this interpretation, it is expected that this swamp is comprised of mineral soils and many deciduous tree species including red maple, American beech, shagbark hickory, trembling aspen, willow and sugar maple. Red-osier dogwood and gray dogwood are expected to be present in the shrub layer. Forb and graminoid species are expected to comprise the ground layer.

SWDM4-5: *Poplar Mineral Deciduous Swamp*

This habitat is found in multiple locations across the property, typically along the edge of the existing waste disposal facility. It is characterized as a transition between wetland and forest habitats. The majority of the canopy is located along the edge of the existing waste disposal property and is dominated by trembling aspen. Red maple, blue spruce, sugar maple, pin oak (*Quercus palustris*), white ash and red oak all compose the tree canopy. Many shrub species including red osier dogwood, hawthorn, black ash (*Fraxinus nigra*), and nannyberry (*Viburnum lentago*) are present within this unit. Spotted jewelweed, sensitive fern, narrow leaved meadowsweet and reed canary grass composes the dominant ground vegetation. Standing surface water and buttressed roots are present within the unit.

SWDO3: *Organic Deciduous Swamp* **SWD02:** *Maple Organic Deciduous Swamp*

Sloughs with deep organic soils are present in most areas of the maple organic deciduous swamp unit. The canopy layer is dominated by red maple, American beech, shagbark hickory, black ash and sugar maple. Small sporadic open water habitats are present and many wetland sedge, fern and aquatic species are present. These include sensitive fern, bracken fern (*Pteridium aquilinum*), sphagnum moss (*Spagnaceae spp.*), spotted jewelweed, duckweed species, black ash, false soloman's seal (*Maianthemum racemosum*), narrow leaved meadow sweet, etc.



SWT: Thicket Swamp

This swamp is a diverse community with small tree stands. It contains small patches of deciduous trees including trembling aspen, red maple, American beech and ironwood. Shrub species dominate the landscape and include gray dogwood, red osier dogwood, and serviceberry among others.

SWTM2: Dogwood Mineral Deciduous Thicket Swamp

The dogwood mineral deciduous thicket swamp is a mid-age community acting as a transition area between the similarly characterized meadowsweet mineral deciduous thicket swamp (SWTM5-7) and the large mineral deciduous swamp (SWDM4). It is located to the south east from the corner of the landfill property and is characterized by a robust understory dominated by gray dogwood.

SWTM2-3: Gray Dogwood Mineral Deciduous Thicket Swamp

The gray dogwood mineral deciduous thicket swamp represents a mid-age transition community between the similarly characterized meadowsweet mineral deciduous thicket swamp (SWTM5-7) and the large mixed mineral meadow marsh (MAMM3). It is characterized by a robust sub-canopy dominated by gray dogwood. Specimens of white spruce, green alder (*Alnus viridis*) and red maple form the canopy layer, while *Pleurocarpous spp.* moss species constitute the groundcover layer.

SWTM5: Mineral Deciduous Thicket Swamp

The mineral deciduous thicket swamp is present at multiple sites and is composed of primarily shrub species. Aerial photographic interpretation was used to determine this habitat in multiple areas but a field verified unit exists to the east of the landfill property. Species including gray dogwood, serviceberry, red osier dogwood, and hawthorn species are present within this unit. Ground vegetation includes narrow leaved meadowsweet, sedge, rush, grass and forb species. Small pockets of narrow leaved cattail (*Typha augustifolia*) and reed canary grass (*Phalaris arundinacea*) are also present.

SWTM5-1: Buttonbush Mineral Deciduous Thicket Swamp

The buttonbush mineral deciduous thicket swamp is surrounded by a large meadowsweet mineral deciduous thicket swamp (SWTM5-7). This community is comprised of thick sub-canopy of buttonbush and willow species. Purple loosestrife, water parsnip and common bur reed (*Sparganium eurycarpum*) were also present, indicating wetter conditions than the surrounding meadowsweet thicket swamp.



SWTM5-7: Meadowsweet Mineral Deciduous Thicket Swamp

The meadowsweet mineral deciduous thicket swamp is characterized by a robust understory composed of obligate and facultative species such as narrow leaved meadowsweet, gray dogwood, southern arrowwood (*Viburnum dentatum*), and purple loosestrife. Ground cover includes *Pleurocarpus spp.*, moss and fowl meadow grass (*Poa palustris*). The silty clay soil lacked horizons, but mottles were observed within the top 10 centimeters of the surface.

SWT02: Willow Organic Deciduous Thicket Swamp

The willow organic deciduous thicket shrub wetland is a small wetland with organic soil and an open water feature surrounded by willow tree and shrub species. This wetland overflows across a farmed field into a marsh wetland during the wet season. Other vegetation includes serviceberry, gray dogwood, duckweed and graminoid species.

SWT04-2: Gray Dogwood Organic Deciduous Thicket Swamp

The gray dogwood organic deciduous thicket swamp is a mid-age community present and is typically associated with wet low lying habitat. The swamp is characterized by organic soils, deciduous community vegetation and is driven by a dominant shrub cover of gray dogwood with a various species including sensitive fern, lily of the valley (*Convallaria majalis*), false soloman's seal, and narrow leaved meadowsweet, which are indicative of a wetland environment.

SWT05-7: Meadowsweet Organic Deciduous Thicket Swamp

The meadowsweet organic deciduous thicket swamp and covers a relatively large area of land. This community is characterized by a robust understory which was composed of obligate and facultative species such as narrow leaved meadowsweet and gray dogwood. Ground cover was often characterized by *Pleurocarpus spp.* moss.

SVDM4: Fresh Moist Deciduous Savannah

The fresh moist deciduous savannah is an upland community dominated by a gray dogwood with patchy canopy coverage of white ash, elm (*Ulmus spp.*) and red maple. The ground layer is dominated by timothy grass (*Phleum pretense*), goldenrod, common cinquefoil (*Potentilla simplex*) and deptford pink (*Dianthus armeria*).

OAW: Open Water

Small open water habitats are present on site located near agriculture fields. These open water habitats were historically created by farmers for irrigation of crops within the surrounding fields. These ponds are uniform in shape and have little aquatic vegetation present.

4.3.4.5 Aquatic Habitat and Species

Aquatic habitat features are shown on **Figure 4.22**. As noted above in **Section 4.3.4.1**, the ditch drainage system originating near the Site Study Area is part of the headwaters of the Norton Creek drainage system. The headwaters of Pike Creek are present in the western portion of the Local Study Area, and drain predominantly west and south into the Grand River. Within the Local Study Area, the drainage system consists of intermittent watercourses that provide contributing fish habitat with no direct fish use.

Ditch drainage along the east side of Brooks Road flows south along the ditch and flows under the abandoned CNR rail bed through a small corrugated steel pipe (CSP). Wetted widths through this reach range from approximately 1 – 1.5 m at the time of survey, with a bankfull width of approximately 2.5 m. The ditch was predominantly dry at the time of the fall survey, however, wetted depths in the small pockets of water throughout ranged from 2 – 10 cm with a bankfull depth of approximately 0.5 m. Substrates consisted of clay, detritus, and muck with some sand and silt. The entire reach was heavily vegetated with mainly cultural meadow species, dominated by grasses and cattails (wet indicator species) that choked the ditch with approximately 95% instream cover. There was nominal overhead cover with a lack of shrubs and trees.

Approximately 85 m downstream of the CNR CSP, the ditch continues southeast as a swale feature through an active agricultural field. It appears that the swale is actively farmed up to the confluence with Highway 3 and the adjacent drainage features from the west, creating a permanent barrier to any upstream fish movement.

The drainage feature continues along both sides of Highway 3 (north and south) through two large CSPs, flowing east for approximately 380 m. Wetted widths along the north side of Highway 3 were approximately 0.5 m at the time of survey, with a 1.5 m bankfull width. Wetted depths ranged from 2 – 10 cm in pockets through a predominantly dry ditch, except for the area immediately approaching the culvert that drains across Highway 3 to the south where water accumulated to approximately 15 cm in depth. Substrates were consistent with the ditch along Brooks Road and vegetated with similar cultural meadow and wet indicator species (grasses and cattails). Minimal overhead cover was present with a few sparse ash trees along the highway right-of-way.

The ditch along the south side of the Highway 3 appears to have been recently dredged along the entire reach to the confluence with the north side of Highway 3. It is at this confluence, where the drainage flows south through a large concrete box culvert, that a large excavated pool (approximately 8 m x 4 m) has been dug and where standing water was present at the

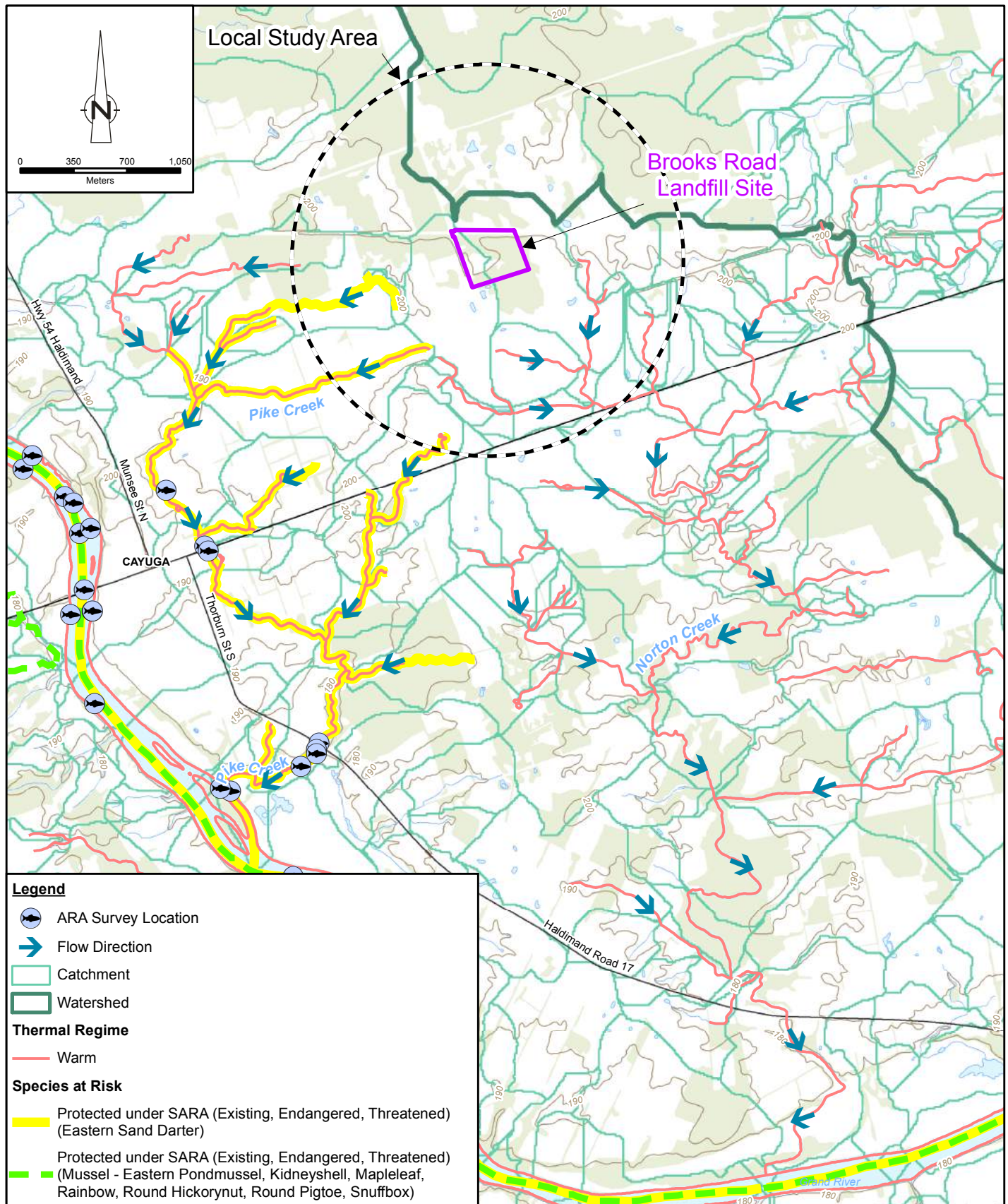


time of the survey. The drainage in this area is likely seasonally obstructed from a small berm created by the excavated area and may be a seasonal barrier to fish movement upstream.

The Norton Creek drainage system continues to flow generally south beyond the Local Study Area through agriculture fields and forested areas with no known barriers to fish movement. Further south at the crossings of Concession 1 Road S and Hwy 17, Norton Creek becomes a much larger system with apparent fish habitat (e.g., permanent watercourse feature, overhead and instream cover), and eventually discharges to the Grand River approximately 3 km south of the Site.

The GRCA Fisheries Management Plan (Wright & Imhof, 2001) indicates the presence of a warmwater fish community in the Grand River downstream of Cayuga. The Grand River fishery in this area includes species such as bullhead, carp, Channel catfish (*Ictalurus punctatus*), suckers, Rock bass (*Ambloplites rupestris*), crappie, Freshwater drum (*Aplodinotus grunniens*), sunfish species, American eel (*Anguilla rostrata*) and Bowfin (*Amia calva*) (Wright & Imhof, 2001).

ARA Survey Point data was reviewed to determine if there were applicable survey points in the vicinity of the Site and Local Study Areas to assess the potential for aquatic species presence; however, applicable survey locations were not found. Based on the warm water thermal regime of the identified watercourse features within the Local Study Area and the available habitat observed during the aquatic habitat assessment, these watercourses may host a warm water fish community where suitable habitat/access exists, as noted above.



HALDIMAND COUNTY, ONTARIO
BROOKS ROAD LANDFILL SITE
VERTICAL CAPACITY EXPANSION ENVIRONMENTAL ASSESSMENT

018235-20
Jan 19, 2017

AQUATIC HABITAT FEATURES

FIGURE 4.22

4.3.4.6 Wildlife

Wildlife observations were collected during each site visit in addition to breeding bird and amphibian surveys. A list of incidental faunal species observations can be found in **Table 4.5**. The results of these investigations are detailed below.

Table 4.5 Incidental Faunal Species Observations

Species		Provincial Status	Conservation Status	
Common Name	Scientific Name		SARO	SARA
Amphibians & Reptiles				
American bullfrog	<i>Lithobates catesbeianus</i>	S4		
American toad	<i>Anaxyrus americanus</i>	S5		
Blanding's turtle	<i>Emydoidea blandingii</i>	S3	Threatened	Threatened
Chorus frog	<i>Pseudacris triseriata</i>	S4		
Dekay's brownsnake	<i>Storeria dekayi</i>	S5		
Eastern garter snake	<i>Thamnophis sirtalis sirtalis</i>	S5		
Gray tree frog	<i>Hyla versicolor</i>	S5		
Green frog	<i>Lithobates clamitans</i>	S5		
Northern leopard frog	<i>Lithobates pipiens</i>	S5		
Snapping turtle	<i>Chelydra serpentine</i>	S3	Special Concern	Special Concern
Spring peeper	<i>Pseudacris crucifer</i>	S5		
Wood frog	<i>Lithobates sylvaticus</i>	S5		
Birds				
American crow	<i>Corvus brachyrhynchos</i>	S5B		
American goldfinch	<i>Spinus tristis</i>	S5		
American robin	<i>Turdus migratorius</i>	S5B		
Baltimore oriole	<i>Icterus galbula</i>	S4B		
Barn swallow	<i>Hirundo rustica</i>	S4B	Threatened	No Status
Black-capped chickadee	<i>Poecile atricapillus</i>	S5		
Blue jay	<i>Cyanocitta cristata</i>	S5		
Brown-headed cowbird	<i>Molothrus ater</i>	S4B		
Bufflehead	<i>Bucephala albeola</i>	S4		
Canada goose	<i>Branta canadensis</i>	S5		
Chestnut-sided warbler	<i>Setophaga pensylvanica</i>	S5B		
Chipping sparrow	<i>Spizella passerina</i>	S5B		
Common grackle	<i>Quiscalus quiscula</i>	S5B		

Table 4.5 Incidental Faunal Species Observations

Species		Provincial Status	Conservation Status	
Common Name	Scientific Name		SARO	SARA
Common yellowthroat	<i>Geothlypis trichas</i>	S5B		
Downy woodpecker	<i>Picoides pubescens</i>	S5		
Eastern screech-owl	<i>Megascops asio</i>	S4		
Eastern towhee	<i>Pipilo erythrophthalmus</i>	S4B		
Eastern wood-pewee	<i>Contopus virens</i>	S4B	Special Concern	No Status
Field sparrow	<i>Spizella pusilla</i>	S4B		
Gray catbird	<i>Dumetella carolinensis</i>	S4B		
Great blue heron	<i>Ardea herodias</i>	S4		
Great crested flycatcher	<i>Myiarchus crinitus</i>	S4B		
Gull	<i>Laridae sp.</i>	-		
Indigo bunting	<i>Passerina cyanea</i>	S4B		
Killdeer	<i>Charadrius vociferus</i>	S5B,S5N		
Least bittern	<i>Ixobrychus exilis</i>	S4B	Threatened	Threatened
Mallard	<i>Anas platyrhynchos</i>	S5		
Northern flicker	<i>Colaptes auratus</i>	S4B		
Red-winged blackbird	<i>Agelaius phoeniceus</i>	S4		
Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	S4B		
Ruby-throated hummingbird	<i>Archilochus colubris</i>	S5B		
Scarlet tanager	<i>Piranga olivacea</i>	S4B		
Song sparrow	<i>Melospiza melodia</i>	S5B		
Sora	<i>Porzana carolina</i>	S4B		
Swamp sparrow	<i>Melospiza georgiana</i>	S5B		
Tree swallow	<i>Tachycineta bicolor</i>	S4B		
Turkey vulture	<i>Cathartes aura</i>	S5B		
Warbling vireo	<i>Vireo gilvus</i>	S5B		
Wild turkey	<i>Meleagris gallopavo</i>	S5		
Wood thrush	<i>Hylocichla mustelina</i>	S4B	Special Concern	No Status
Yellow warbler	<i>Setophaga petechia</i>	S5B		
Insects				
Bluet sp.	<i>Enallagma sp.</i>	-		
Cherry-face meadowhawk	<i>Sympetrum internum</i>	S5		
Common whitetail	<i>Plathemis lydia</i>	S5		

Table 4.5 Incidental Faunal Species Observations

Species		Provincial Status	Conservation Status	
Common Name	Scientific Name		SARO	SARA
Great spangled fritillary	<i>Speyeria cybele</i>	S5		
Hummingbird clearwing moth	<i>Hemaris thysbe</i>	S5		
Painted lady	<i>Vanessa cardui</i>	S5		
Viceroy	<i>Limenitis archippus</i>	S5		
Mammals				
Chipmunk	<i>Sciuridae sp.</i>	-		
Coyote	<i>Canis latrans</i>	S5		
White-tailed deer	<i>Odocoileus virginianus</i>	S5		
Notes:				
Provincial Status Rank Definitions				
SARA: Species at Risk Act				
SARO: Species at Risk in Ontario				
S3: Rare to uncommon in Ontario; usually between 20 and 100 occurrences in the province				
S4: Common in Ontario; apparently secure with over 80 occurrences in the province				
S5: Demonstrably secure; species is widespread in Ontario				
- : Indicates no information available				
Rank qualifiers (e.g., S1B, S2N) are used for some migratory or transitory species to indicate different conservation statuses at specific times of the year, such as during the breeding (B) and non-breeding (N) seasons.				

Herpetofauna

Amphibians

Six calling amphibian stations were surveyed in the West Lands according to the Great Lakes Marsh Monitoring Protocol in spring 2014. All stations had detections of calling amphibians. The results of the amphibian surveys can be found in **Appendix E-3**.

The composition of species detected during the amphibian surveys is representative of the amphibian population in the adjacent areas, where suitable habitat exists. Incidental observations on the East Lands confirmed the presence of chorus frog (*Pseudacris triseriata*), spring peeper (*P. crucifer*), wood frog (*Lithobates sylvaticus*), American toad (*Anaxyrus americanus*), gray tree frog (*Hyla versicolor*), green frog (*L. clamitans*), and northern leopard frog (*L. pipiens*), while incidental observations in the North Lands confirmed the presence of chorus frog and green frog. Seven calling amphibian species were documented throughout the 2014 surveys. In total, eight species of amphibians were documented in the Local Study Area.



Reptiles

Reptile-specific field surveys were not conducted during field investigations. However, the Ontario Reptile and Amphibian Atlas was reviewed and incidental species observations were recorded at each site visit.

Reptile species identified in the Ontario Herpetofaunal Atlas as occurring within the Study Areas are:

- Blanding's turtle (*Emydoidea blandingii*)*
- Midland painted turtle (*Chrysemys picta marginata*)
- Snapping turtle (*Chelydra serpentina*)
- Northern map turtle (*Graptemys geographica*)
- Eastern newt (*Notophthalmus viridescens*)*
- Spotted salamander (*Ambystoma maculatum*)*
- Blue-spotted salamander (*Ambystoma laterale*)*
- Eastern red-backed salamander (*Plethodon cinereus*)*
- Jefferson/blue-spotted salamander hybrid*
- Jefferson/blue-spotted salamander complex
- Red-bellied snake (*Storeria occipitomaculata*)*
- Eastern ribbonsnake (*Thamnophis sauritus*)*
- Smooth greensnake (*Opheodrys vernalis*)*
- Eastern gartersnake (*Thamnophis sirtalis sirtalis*)
- Milksnake (*Lampropeltis triangulum*)
- Northern watersnake (*Nerodia sipedon sipedon*)*
- Dekay's brownsnake (*Storeria dekayi*)*

Note: * denotes historical sighting (pre-1990)

Blanding's turtle, snapping turtle, Dekay's brownsnake, and eastern gartersnake were observed during field investigations.

Birds

Breeding bird surveys were conducted on July 8, 2015 in the East Lands. A total of 27 species were detected during the surveys, 13 of which displayed evidence of breeding. A list of the species detected on July 8, 2015 along with evidence of breeding is provided in **Appendix E-3**.

In total, 38 species of birds have been observed in the Study Area by GHD ecologists. Four of these species are Species at Risk (SAR): barn swallow (*Hirundo rustica*), eastern wood-pewee (*Contopus virens*), least bittern (*Ixobrychus exilis*), and wood thrush (*Hylocichla mustelina*).

Although breeding bird surveys were not conducted within the Site Study Area, the species which have been utilizing the landfill site itself in some capacity include species known to frequent landfills such as turkey vultures (*Cathartes aura*) and gull (*Laridae sp.*) species.

Mammals

Mammal-specific field surveys were not conducted as part of the project, but incidental observations were recorded. During field investigations white-tailed deer (*Odocoileus virginianus*), chipmunk (*Sciuridae sp.*), and coyote (*Canis latrans*) were observed.

Species at Risk

Correspondence with MNRF provided numerous SAR with a documented presence within the Cayuga area. Provincially tracked species records for the Study Area are shown on **Figure 4.23**. A variety of SAR have been observed in the Study Area, identified by MNRF to have the potential occur in the vicinity, or have been identified on DFO mapping within the Local Study Area (**Table 4.6**). Incidental observations of all species, including any SAR encountered, were collected during field investigations and are detailed in **Table 4.5**. SAR sspecies-specific surveys were not completed for a number of reasons including:

- Natural areas on Site are very small and limited to a small section of the south boundary of the Site. This area provides little available habitat for any of the listed SAR based on its proximity to the Site operations, small size, and presence of a chain link fence at the Site boundary.
- Mitigation measures are currently in place to dissuade wildlife access/use of the landfill property include: chain link fence is present around the perimeter of the property which dissuades larger reptile and mammal access to the Site:
 - *Silt fence along the north perimeter of the property, a higher risk area for wildlife access to the Site based on the close proximity to the Provincially Significant Wetland to the north, is an effective deterrent for small reptiles, mammals, and amphibian access to the Site;*
 - *Daily landfilling activities (e.g. noise, human presence, heavy machinery) also provide deterrents for use of the Site by wildlife; and*
 - *Operational practices (i.e. daily cover) further act to deter wildlife use of the Site.*

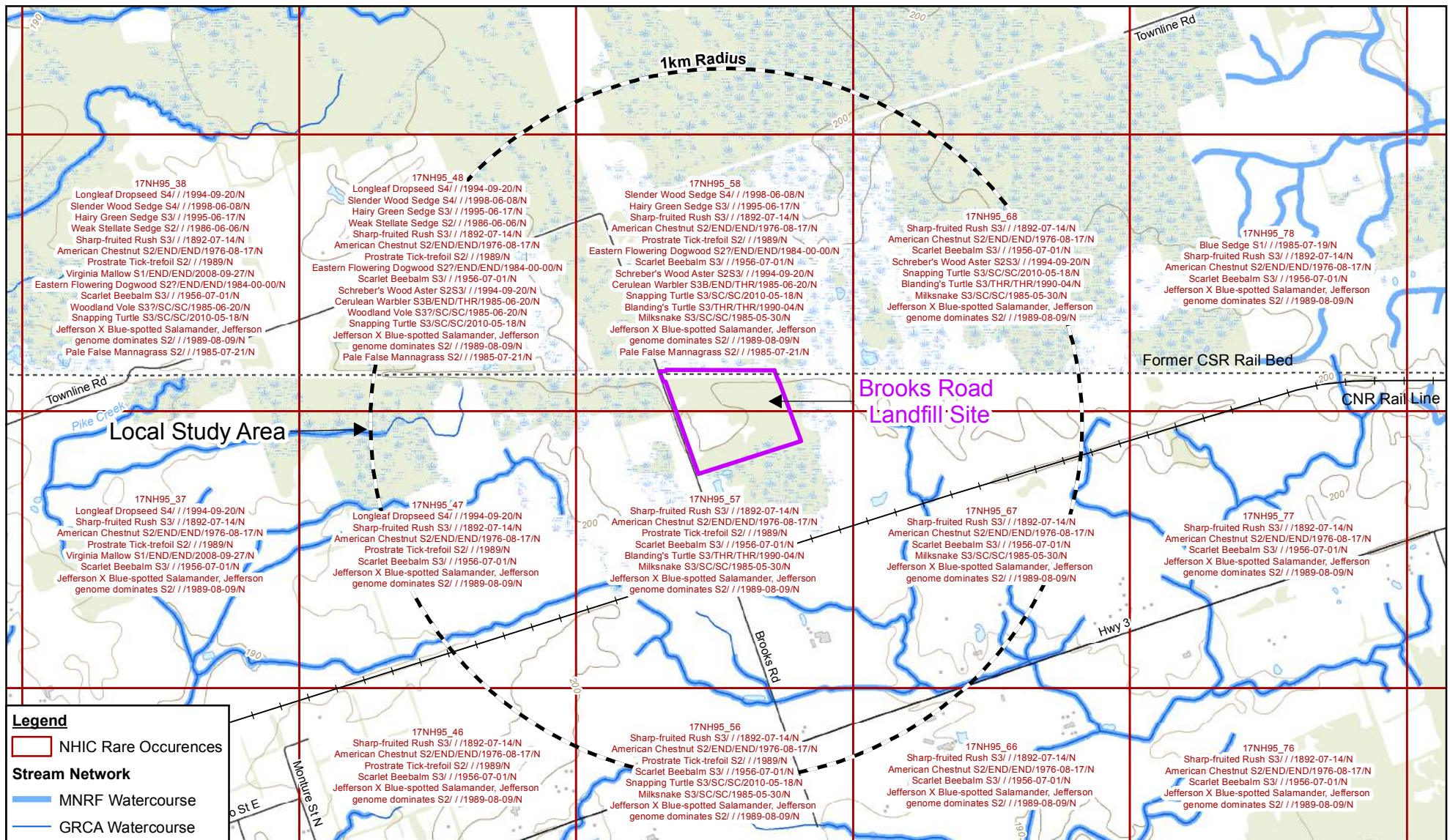
Table 4.6 Species at Risk Summary

Species		Observed on Site	Conservation Status	
Common Name	Scientific Name		Common Name	Scientific Name
Birds				
Barn swallow	<i>Hirundo rustica</i>	Yes	Barn swallow	<i>Hirundo rustica</i>



Table 4.6 Species at Risk Summary

<i>Species</i>		<i>Observed on Site</i>	<i>Conservation Status</i>	
<i>Common Name</i>	<i>Scientific Name</i>		<i>Common Name</i>	<i>Scientific Name</i>
Chimney swift	<i>Chaetura pelagica</i>	No	Chimney swift	<i>Chaetura pelagica</i>
Eastern wood-pewee	<i>Contopus virens</i>	Yes	Eastern wood-pewee	<i>Contopus virens</i>
Least bittern	<i>Ixobrychus exilis</i>	Yes	Least bittern	<i>Ixobrychus exilis</i>
Wood thrush	<i>Hylocichla mustelina</i>	Yes	Wood thrush	<i>Hylocichla mustelina</i>
Bobolink	<i>Dolichonyx oryzivorus</i>	No	Bobolink	<i>Dolichonyx oryzivorus</i>
Eastern meadowlark	<i>Sturnella magna</i>	No	Eastern meadowlark	<i>Sturnella magna</i>
Cerulean warbler	<i>Setophaga cerulea</i>	No	Cerulean warbler	<i>Setophaga cerulea</i>
Reptiles				
Blanding's turtle	<i>Emydoidea blandingii</i>	Yes	Blanding's turtle	<i>Emydoidea blandingii</i>
Snapping turtle	<i>Chelydra serpentine</i>	Yes	Snapping turtle	<i>Chelydra serpentine</i>
Milksnake	<i>Lampropeltis triangulum</i>	No	Milksnake	<i>Lampropeltis triangulum</i>
Eastern ribbonsnake	<i>Thamnophis sauritus</i>	No	Eastern ribbonsnake	<i>Thamnophis sauritus</i>
Plants				
Eastern flowering dogwood	<i>Cornus florida</i>	No	Eastern flowering dogwood	<i>Cornus florida</i>
Fish				
Eastern sand darter	<i>Ammocrypta pellucida</i>	No	Eastern sand darter	<i>Ammocrypta pellucida</i>



Source: MNRF NRVIS, 2015. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2016;

0 200 400 600
Meters

Coordinate System:
NAD 1983 UTM Zone 17N



HALDIMAND COUNTY, ONTARIO
BROOKS ROAD LANDFILL SITE
VERTICAL CAPACITY EXPANSION ENVIRONMENTAL ASSESSMENT

PROvincially TRACKED SPECIES

018235-20
Dec 1, 2016

FIGURE 4.23

Barn Swallow

Barn swallows (*Hirundo rustica*) are a provincially threatened species, with no status federally. They are typically found in agricultural areas, cities, and suburbs, and along highways (Rodewald, 2015). Barn swallows were observed throughout the Study Area on multiple occasions. Barn swallows are generally present in southwestern Ontario from early-April to late September (eBird, 2015).

Chimney Swift

Chimney swift (*Chaetura pelagica*) is a provincially and federally threatened species. They are mainly associated with urban and rural areas where there are chimneys available for nesting and resting (Rodewald, 2015). It is possible that there may be buildings with uncapped chimneys in the local Study Area that would provide nesting habitat, and the surrounding areas could be used as a foraging habitat. No chimney swifts were detected on any of the Site visits.

Eastern Wood-Pewee

The eastern wood-pewee (*Contopus virens*) is a provincially designated special concern species, with no status federally. They generally occur in deciduous forest and woodland, even breeding in smaller woodlots (Rodewald, 2015). They are generally present in southwestern Ontario from early May to late September (eBird, 2015). Eastern wood-pewee was detected multiple times within the Study Area.

Least Bittern

Least bittern (*Ixobrychus exilis*) is a threatened species both provincially and federally. They generally occur in freshwater marshes with tall emergent vegetation (Rodewald, 2015). The coo-coo-coo call of the least bittern was detected in the East Lands in the small cattail wetland east of Brooks Road on the southern portion of the Study Area on May 28, 2014. Least bittern are identified by the MNRF to occur in the Haldimand-Norfolk area. However, optimal breeding habitat is not available on the East Lands; least bittern prefer large marshes that have relatively stable water levels throughout the nesting period (Rodewald, 2015). The wetland area that the call was originating from was very small. The least bittern was not detected on subsequent site visits, indicating that this area was likely not used for breeding in 2014.

Wood Thrush

Wood thrush (*Hylocichla mustelina*) is a provincially designated special concern species, with no status federally. Wood thrush is an area-sensitive species and is more likely to occur in larger-area forests (Rodewald, 2015). Wood thrushes were detected on several of the Site

visits. Wood thrushes are generally present in this area from early May to late September (eBird, 2015).

Bobolink

The bobolink (*Dolichonyx oryzivorus*) is a provincially threatened bird, with no status federally, that has the potential to occur in the Study Area. They generally occur in hayfields and uncut pastures in agricultural areas (Rodewald, 2015). MNRF have advised that records of bobolink exist in the Study Area. Bobolink are migratory birds that are generally present in southwestern Ontario from mid-May to mid-August (eBird, 2015). No bobolink were detected during any of the Site visits. Suitable habitat currently does not exist for bobolink in the Study Areas as the majority of agricultural land present is currently being used primarily for monoculture crops such as soybeans.

Eastern Meadowlark

The eastern meadowlark (*Sturnella magna*) is a provincially threatened bird, with no status federally, that has the potential to occur in the Study Area. They generally occur in farm fields and grasslands, often in agricultural areas (Rodewald, 2015). Eastern meadowlarks are migratory in this part of their range and are generally present in southwestern Ontario from late March to mid-October (eBird, 2015). MNRF have advised that records of eastern meadowlark exist in the Study Area, although none were detected during any of the Site visits. Suitable habitat currently does not exist for eastern meadowlark in the Study Areas as the majority of agricultural land present is currently being used primarily for monoculture crops such as soybeans.

Cerulean Warbler

Cerulean warbler (*Setophaga cerulea*) is a provincially threatened and federally special concern species that MNRF has identified that has the potential to occur in the Study Area. This species was not detected during any of the Site visits, however, it has been documented during the breeding season <5km from the Site (eBird, 2015). Potentially suitable habitat (larger tracts of mature deciduous forest) exists within the local Study Area.

Blanding's Turtle

Blanding's turtle (*Emydoidea blandingii*) is a provincially and federally threatened species. They generally occur in shallow water, usually in large wetlands and shallow lakes with lots of water plants (MNRF, 2015a). A blanding's turtle was observed on Brooks Road in the vicinity of the entrance of the landfill, on June 12, 2014 during the site walk with GRCA.



Snapping Turtle

Snapping turtle (*Chelydra serpentina*), a provincially and federally special concern species, has the potential to be found in the Study Area according to MNRF and the Ontario Reptile and Amphibian Atlas. Snapping turtles prefer habitat characterized by slow-moving water with a soft mud bottom and dense aquatic vegetation (MNRF, 2015b). A snapping turtle was observed during 2013 field investigations.

Milksnake

The milksnake (*Lampropeltis triangulum*) is a provincially and federally special concern species. MNRF has identified the potential for milksnake in the Study Area, and this species was observed as part of the Ontario Reptile and Amphibian Atlas in 2011 as occurring in the area. The milksnake can be found in a wide variety of habitats. Important features of good milksnake habitat are proximity to water, and suitable locations for basking and egg-laying (MNRF, 2015c). Basking habitat is likely limited in the immediately adjacent area. Milksnake were not observed during field investigations.

Eastern Ribbonsnake

Eastern ribbonsnake (*Thamnophis sauritus*) are a provincially and federally designated special concern species. MNRF has identified the potential for eastern ribbonsnake; however, according to the Ontario Reptile and Amphibian Atlas, it has not been detected in the area since 1985. They are usually found close to water, especially in marshes, where they hunt for frogs and small fish (MNRF, 2015d). Habitat may be available on or in the vicinity of the Site, but no eastern ribbonsnake were detected during any of the field investigations.

Eastern Flowering Dogwood

Eastern flowering dogwood (*Cornus florida*) is a provincially and federally endangered species. MNRF has identified the potential for the presence of this species. It generally grows in deciduous and mixed forests, in the drier areas of its habitat, although it is occasionally found in slightly moist environments (MNRF, 2015e). Eastern flowering dogwood was not detected by during any of the site investigations.

Eastern Sand Darter

The eastern sand darter (*Ammocrypta pellucida*) is a provincially endangered and federally threatened fish. The eastern sand darter prefers shallow habitats in lakes, streams, and rivers with clean, sandy bottoms (MNRF, 2015f). This species was identified on DFO Fish and Mussel

mapping as having the potential to occur in Pike Creek, in the western portion of the Local Study Area. Surveys for habitat potential for the eastern sand darter within the Local Study Area were not conducted as part of field investigations.

4.4 Cultural Environment Existing Conditions

For the Cultural Environment only the Local Study Area is applicable. Available secondary sources of information were collected and reviewed to determine Archaeological and Cultural Heritage existing conditions within the Local Study Area. The following sources of secondary information were collected and reviewed:

- Heritage Haldimand Designated Properties Inventory

4.4.1 Cultural & Heritage Resources

Following a review of the Heritage Haldimand Designated Properties Inventory (2015) it was concluded that there are no heritage properties located within the Local Study Area. The completed "Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes: A Checklist for the Non-Specialist" contained in **Appendix E-6** identifies the Site as having no potential for cultural heritage resources, with the exception of the response to Part B, 4.c (i.e., *is [the Site] in a Canadian Heritage River watershed?*). The Brooks Road Landfill Site is within the Grand River watershed, which is considered to be a Canadian Heritage River watershed and, therefore, the checklist indicates that there is potential for cultural heritage resources on the property. However, given that the entire Site has been disturbed, it can be confirmed that there is no potential for cultural heritage resources On-Site.

4.4.2 Archaeological Resources

The entire Brooks Road Landfill Site has been subjected to recent, extensive and intensive disturbance and it is therefore considered that the Site does not have any archaeological potential. While there may be areas within the Local Study Area that have archaeological potential, as these areas will not be disturbed by the proposed vertical expansion, it was concluded that an assessment of the archaeological potential within the Local Study Area was not necessary. The completed "Criteria for Evaluating Archaeological Potential: A Checklist for the Non-Specialist" provided in **Appendix E-6** confirms that the Site does not possess archaeological potential.

4.5 Built Environment Existing Conditions

4.5.1 Transportation Existing Conditions

For Transportation, only the Local Study Area is applicable with turning movement counts conducted at the intersection of Highway 3 and Brooks Road and at the existing Brooks Road Landfill Site driveway during the weekday a.m., mid-day and p.m. peak periods and Saturday mid-day peak periods (see **Figure 4.24**). These counts were completed on Saturday, December 5, 2015 and on Monday, December 7, 2015. Haldimand County Annual Average Daily Traffic (AADT) data, 2005 and Haldimand County Annual AADT data, 2011 were also collected and reviewed and discussions with Haldimand County staff took place in December 2015 to confirm AADT data.

Road Network

The following two major roads provide access to the existing Brooks Road Landfill Site:

- **Highway 3 (Talbot Road)** – within the vicinity of Brooks Road, Highway 3 (Talbot Road) is a two lane road with a posted speed limit of 80 km per hour (km/h). The intersection of Highway 3 and Brooks Road is stop controlled on Brooks Road with both eastbound and westbound right turn taper on Highway 3.
- **Brooks Road** – Brooks Road is a two lane road that extends from Highway 3 (Talbot Road) in the south and terminates at Indiana Road to the north. The speed limit on this road is 50 km/h. Brooks Road is paved from Highway 3 to just north of the Brooks Road Landfill Site driveway access where it changes to a gravel road for the remaining length to Indiana Road.



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

figure 4.24

Legend

● Turning Movement Count Observation Area

□ Site Location

□ Local Study Area (1km Radius)

TRANSPORTATION STUDY AREA AND TURNING MOVEMENT COUNT OBSERVATION AREAS
 BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
 BROOKS ROAD LANDFILL

160 Brooks Road, Cayuga, Ontario



Traffic Data

The 2005 AADT on Brooks Road, approximately 500 m north of Highway 3, was 144 two-way trips. In 2011, the AADT was slightly lower at 114 two-way trips. Discussions with Haldimand County staff confirmed that the split is approximately 50/50 between north and south volumes. Weekday a.m., mid-day and p.m. peak hour as well as the Saturday peak hour volumes based on the turning movement counts conducted are summarized in **Figure 4.25 and Table 4.7**. Traffic on Brooks Road is predominately truck traffic specific to the landfill operation, traffic on Highway 3 is a mix of both commuter and truck traffic.

Figure 4.25 Existing Peak Hour Volumes

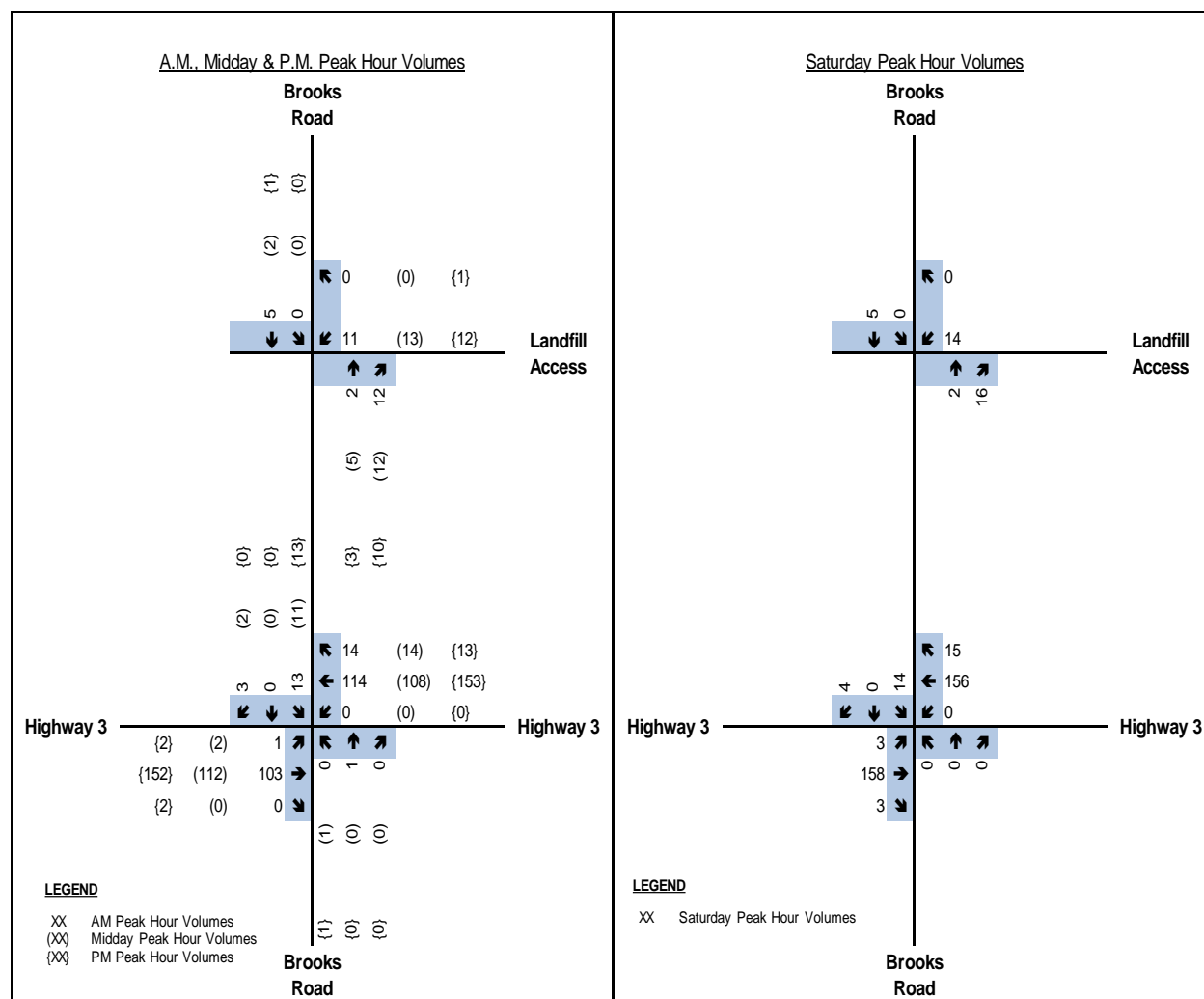


Table 4.7 Existing Conditions Peak Hour Volumes

Intersection	Direction	Existing Peak Hour Volumes (# of vehicles)			
		A.M.	Mid-day	P.M.	Sat.
Brooks Road & Brooks Road Landfill Site access	↓ through-traffic southbound along Brooks Rd	5	2	1	5
	↘ left turn from Brooks Rd southbound into Site	0	0	0	0
	↗ right turn from Site to Brooks Rd northbound	0	0	1	0
	↙ left turn from Site to Brooks Rd southbound	11	13	12	14
	↑ through-traffic northbound along Brooks Rd	2	5	3	2
	↗ right turn from Brooks Rd northbound into Site	12	12	10	16
Brooks Road & Highway 3	↙ right turn from Brooks Rd southbound to Hwy 3 westbound	3	2	0	4
	↓ through-traffic southbound along Brooks Rd	0	0	0	0
	↘ left turn from Brooks Rd southbound to Hwy 3 eastbound	13	11	13	14
	↗ left turn from Hwy 3 eastbound to Brooks Rd northbound	1	2	2	3
	→ through-traffic eastbound along Hwy 3	103	112	152	158
	↘ right turn from Hwy 3 eastbound to Brooks Rd southbound	0	0	2	3
	↗ right turn from Hwy 3 westbound to Brooks Rd northbound	14	14	13	15
	← through-traffic westbound along Hwy 3	114	108	153	156
	↙ left turn from Hwy 3 westbound to Brooks Rd southbound	0	0	0	0
	↗ left turn from Brooks Rd northbound to Hwy 3 westbound	0	1	1	0
	↑ through-traffic northbound along Brooks Rd	1	0	0	0
	↗ right turn from Brooks Rd northbound to Hwy 3 eastbound	0	0	0	0

Landfill Operations

The Brooks Road Landfill Site is permitted to accept waste during the week and on Saturdays. The Site is capable of handling 300 to 500 tonnes of material per day based on the following five different truck configurations:

- Walking floor – can handle 25 to 40 metric tonnes per load
- Roll-off – can handle 0.5 to 10 metric tonnes per load
- Front End – can handle 3 to 12 metric tonnes per load
- Tri-axle – can handle 14 to 22 metric tonnes per load
- Dump trailer – can handle 34 to 42 metric tonnes per load

The maximum daily truck traffic at the landfill, assuming delivery of 500 tonnes of material per day, is 8 to 12 walking floor trucks, 1 to 2 front end trucks and 1 to 3 roll-offs for a total of 17 inbound and 17 outbound trucks plus another one or two trips for staff. This number can increase slightly if there are certain soil jobs on the site as the walking floor trucks are replaced with dump trailers and tri-axle trucks.

The turning movement counts conducted at the Site driveway show the following total volume of trucks entering and exiting the landfill during the peak hours:

- Weekday am peak hour – 12 inbound and 11 outbound
- Weekday mid-day peak hour – 12 inbound and 13 outbound
- Weekday pm peak hour – 10 inbound and 13 outbound
- Saturday mid-day peak hour – 16 inbound and 14 outbound

The traffic volumes confirm that the peak operating times for the landfill occur during both the weekday and Saturday mid-day peak hours when the maximum volumes of inbound and outbound traffic were observed.

Coincidentally, a review of the existing traffic counts confirms that the volume of inbound and outbound traffic from the landfill during the two survey dates was considerably higher than the typically expected volumes provided by the operator. It was confirmed that during the two survey dates, there was a transfer of clean clay to another property that resulted in approximately 75 additional loads throughout both days. The traffic counts conducted on December 5 and 7, 2016 therefore exceed the expected volumes during peak truck traffic periods during the spring and summer construction season.

As a result, the analysis includes additional traffic that is not typical and will result in slightly reduced capacity at both the Site driveway on Brooks Road and at the intersection of Brooks Road and Highway 3.

While the existing Brooks Road Landfill is currently in operation (i.e., accepting waste), it should be noted that landfilling operations at the Site are slowing down, as the landfill continues to reach its current approved capacity.

Capacity Analysis

As a measure of the capacity on the adjacent road network surrounding the Brooks Road Landfill at peak operations (i.e., 500 tonnes of material per day), both the Site access on Brooks Road and the stop controlled intersection of Brooks Road and Highway 3 were analyzed using the peak operations vehicle turning movement volumes for the weekday a.m., mid-day, p.m. and Saturday peak hours. A summary of the capacity analysis using Synchro version 8 is summarized in the **Table 4.8**.

The first numbers in each cell refer to the Volume-to-Capacity Ratio (v/c ratio), which represents the sufficiency of an intersection to accommodate the vehicular demand. A v/c ratio less than 0.85 indicates that there is generally adequate capacity available and vehicles are not expected to experience significant queues and/or delays. As the v/c ratio approaches 1.0, traffic flow may become unstable, and delay and queuing conditions may occur. Once the demand exceeds the capacity (i.e., a v/c ratio greater than 1.0), traffic flow is considered unstable and excessive delay and queuing is expected. The information contained in the bullets is the Level of Service (LOS) for each intersection. LOS represents the delay (i.e., the additional travel time experienced) at an intersection and ranges from A (0 to 10 second delay) to F (greater than 50 second delay). The number included after the LOS level indicates the delay in seconds.

Table 4.8 Existing Conditions Capacity Analysis at Peak Operations

Intersection	Movement Volume –to-Capacity (v/c ratio) Level of Service (LOS) delay			
	A.M. Peak	Mid-Day Peak	P.M. Peak	Sat Peak
Brooks Road & Brooks Road Landfill Site access	WBLR ¹ 0.01 • LOS A, 9 Sec.	WBLR 0.01 • LOS A, 9 Sec.	WBLR 0.01 • LOS A, 9 Sec.	WBLR 0.02 • LOS A, 9 Sec.
Brooks Road & Highway 3	EBLTR ² 0.00 • LOS A 1 Sec. NBLTR ³ 0.00 • LOS B 11 Sec. SBLTR ⁴ 0.02 • LOS A 10 Sec.	EBLTR 0.00 • LOS A 1 Sec. NBLTR 0.00 • LOS B 11 Sec. SBLTR 0.02 • LOS A 10 Sec.	EBLTR 0.00 • LOS A 1 Sec. NBLTR 0.00 • LOS B 11 Sec. SBLTR 0.02 • LOS B 11 Sec.	EBLTR 0.00 • LOS A 1 Sec. NBLTR 0.00 • LOS A 0 Sec. SBLTR 0.03 • LOS B 11 Sec.

Notes:

1. Westbound left/right shared turn lane
2. Eastbound left/through/right shared turn lane
3. Northbound left/through/right shared turn lane
4. Southbound left/through/right shared turn lane

The movements at both study intersections currently operate with levels of service "B" or better during the weekday a.m., mid-day, p.m. and Saturday mid-day peak hours.

The analysis of existing conditions under peak operations confirms no current capacity constraints at either study intersection despite the higher than normal traffic volumes accounted for due to the movement of clean clay off-site.

Safety Analysis

Collision Analysis

A review of available data shows that there is no indication that either Highway 3 in the vicinity of Brooks Road or Brooks Road north to the site has experienced significantly higher collision frequency than the historical average accident rate along Highway 3 in Haldimand County.

Sight Line Analysis

The site entrance in its current location satisfies the sight distance requirements for trucks approaching and departing from the site. Brooks Road is fairly straight with little deviation in the horizontal or vertical alignment. Existing sight distances are in excess of 350 m both to the north and south of the driveway access which exceeds the required sight distance, based on the Transportation Association of Canada's (TAC) standard of 85 m for stopping sight distance for a posted speed limit of 50 km/h (60 km/h design speed).

Airport Operations

There are no airports or aerodromes within the Local Study Area. The nearest airports and airfields are as follows: York Aeroclub (a private airfield used for soaring, approximately 7.5 km north of the Site); John C. Munro Hamilton International Airport (approximately 26 km north of the Site); and Niagara District Airport (65 km to the northeast of the Site).

4.5.2 Land Use Existing Conditions

For Land Use both the generic Site Study Area and Local Study Area established during the ToR are applicable.

Information on the Land Use existing conditions within the Study Areas was gathered from a combination of secondary sources and field investigations. The following available secondary sources of information were reviewed:

- Most recent aerial photos available of the Study Area
- Haldimand County Official Plan, 2009
- Comprehensive Zoning By-Law 1-H 86 for the Town of Haldimand, 1987 (as amended January 2015)

In order to catalogue the number of residences within the Local Study Area, a Site visit was undertaken on Friday, September 11, 2015. During this visit all residences within the Local Study Area were recorded on an aerial map.

Site Study Area

Haldimand County Official Plan (2009) identifies the Brooks Road Landfill Site as "Active Waste Disposal" (see **Figure 4.26**). The Comprehensive Zoning By-Law for the Town of Haldimand identifies the Site as "MD – Disposal Industrial Zone," which is suitable for a municipal sanitary landfill site (see **Figure 4.27**).

Local Study Area

Haldimand County Official Plan (2009) identifies the areas east and west of the Site as well as the area in the extreme south of the Local Study Area as agricultural lands. Areas immediately south and north of the Site are identified as Provincially Significant Wetland (PSW) (see **Figure 4.26**).

Land within the Local Study Area is identified in the Town of Haldimand Comprehensive Zoning By-Law as "A – Agricultural" (see **Figure 4.27**).

Land use and compatibility are described in the MOECC's Guideline D-1⁸ and its supplementary documents. While the guideline applies only to proposed land use changes, the definitions contained therein are useful in any land use discussion of. Guideline D-1 considers "certain outdoor recreational uses deemed by a municipality or other level of government to be sensitive (e.g., trailer park, picnic area, etc.)." No such existing static recreational resources are located within the Local Study Area; however, Brooks Road as well as the abandoned railway to south of the Site (parallel to Highway 3) are shown in the Official Plan as "Identified Trail Locations" and in the Haldimand County Trails Master Plan (2009) as "Proposed Special Use Routes" (Brooks Road as a "Proposed Signed Route" and the abandoned railway as a Proposed Multi-Use Trail") for implementation in the short-term (0 to 5 years from the publication date) (see **Figure 4.26**). There is presently no indication of the implementation of the proposed trails along either of these routes. Other off-site sensitive land uses generally include places where people sleep (i.e., dwellings), churches, and cemeteries. There are no residential dwellings immediately adjacent to the Site; however, there are 11 residential dwellings located within the Local Study Area – five to the northwest and six along Talbot Road to the south of the Site. Two of these residential dwellings are located within 500 m of the landfill footprint. No churches or cemeteries are located within the Local Study Area.

Restrictions and controls on land use in the vicinity of operating and non-operating landfills are described in the MOECC's Guideline D-4⁹. The Ministry will normally recommend against proposals for sensitive land use adjacent to operating landfills. No land use may take place within 30 metres of the perimeter of a fill area and, as such, all landfills must have an on-site operational/maintenance buffer area identified in their ECA. Under Guideline D-4, it is the responsibility of operators and/or owners of operating landfills to comply with the Environmental Protection Act and Ontario Regulation (O. Reg.) 347 (Waste Management) requirements for the control of adverse effects caused by these facilities. The onus is on both the land use development proponent to implement and monitor proper control measures associated with new, sensitive developments and the local municipal authority to ensure the implementation and monitoring of said control measures.

The Provincial Policy Statement (PPS 2014)¹⁰ is the statement of the government's policies on land use planning. It applies province-wide and provides clear policy direction on land use planning to promote strong communities, a strong economy, and a clean and healthy environment. It includes policies on key issues that affect our communities, such as:

- Efficient use and management of land and infrastructure

⁸ D-1 Land Use and Compatibility. MOECC, 1995.

⁹ D-4 Land Use On or Near Landfills and Dumps. MOECC, 1994.

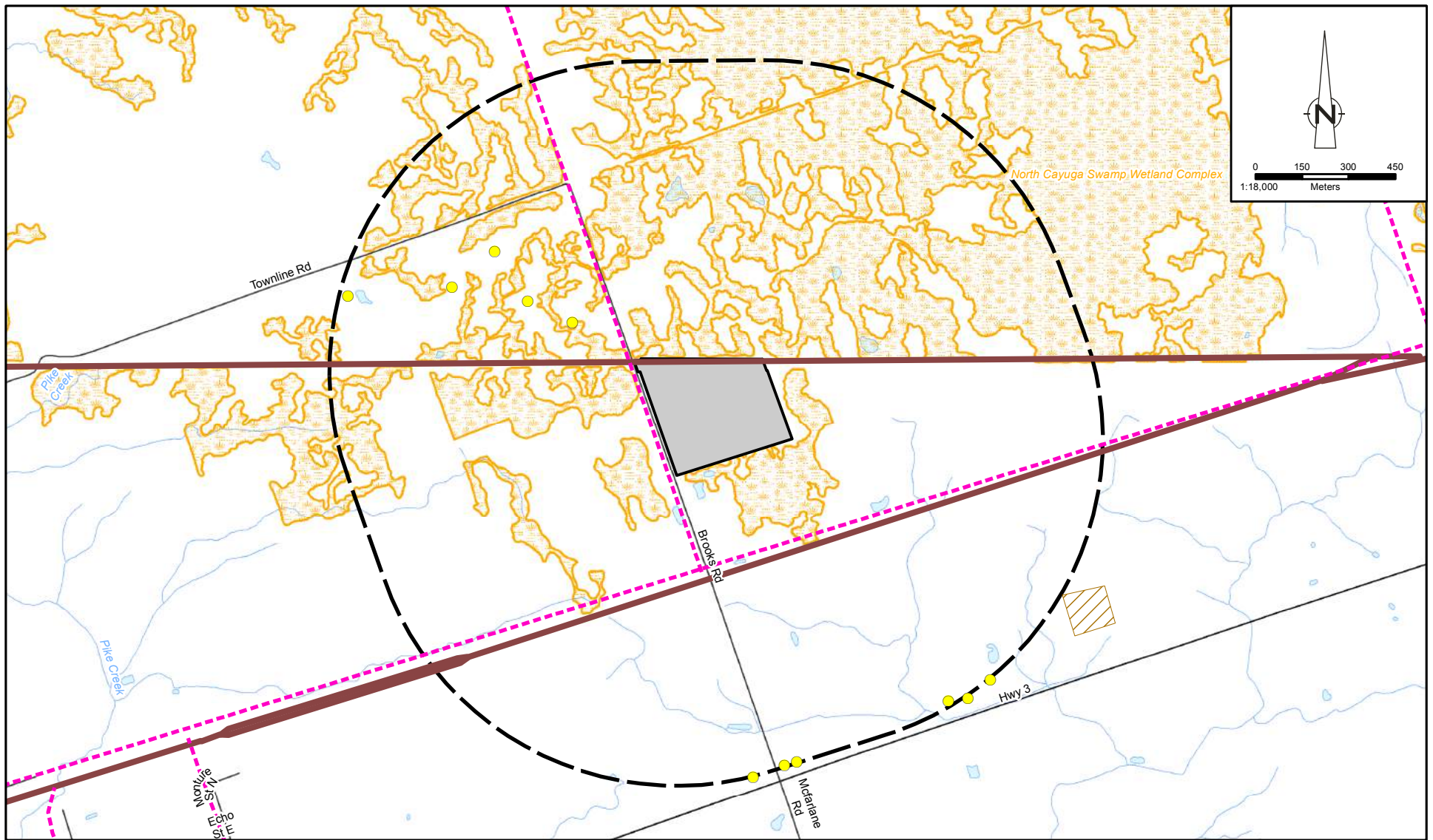
¹⁰ Provincial Policy Statement. Ministry of Municipal Affairs and Housing, 2014.



- Protection of the environment and resources
- Ensuring appropriate opportunities for employment and residential development, including support for a mix of uses

Municipalities use the PPS to develop their official plans and to guide and inform decisions on other planning matters. The PPS is issued under section 3 of the [Planning Act](#) and all decisions affecting land use planning matters "shall be consistent with" the Provincial Policy Statement. Section 1.6.10.1 of the PPS 2014, which came into effect April 30, 2014, states the following with regard to waste management:

"Waste management systems need to be provided that are of an appropriate size and type to accommodate present and future requirements, and facilitate, encourage and promote reduction, reuse and recycling objectives. Planning authorities should consider the implications of development and land use patterns on waste generation, management and diversion. Waste management systems shall be located and designed in accordance with provincial legislation and standards."



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

Legend

- | | |
|---|---|
| ● Sensitive Receiver Location | Wetland - Provincially Significant |
| Active Waste Disposal | Agriculture |
| Local Study Area (1km Radius) | Industrial Influence Area/Abandoned Railway |
| Policy Area HCOP-29B | --- Identified Trail Locations (Approximate) |

figure 4.26
STUDY AREA LAND USE
BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
BROOKS ROAD LANDFILL
160 Brooks Road, Cayuga, Ontario

A - Agricultural
MD - Disposal Industrial Zone
MR - Rural Industrial Zone



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

Legend




-  Site Location
-  Local Study Area (1km Radius)
-  Zoning

figure 4.27
 STUDY AREA ZONING
 BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
 BROOKS ROAD LANDFILL
 160 Brooks Road, Cayuga, Ontario



4.5.3 Agriculture, Soils & Mining

Characterization of existing conditions for Agriculture, Soils and Mining was limited to the Local Study Area. Available secondary sources of information were collected and reviewed to determine Agriculture, Soils and Mining existing conditions including:

- Most recent aerial photos available of the Study Area
- National Household Survey Profile from Statistics Canada
- Government of Ontario Agricultural Information Atlas
- Haldimand County Official Plan, 2009
- Ontario Ministry of Northern Development and Mines Mineral Deposit Information Search
- Abandoned Mines Hazard Abatement Program London District Site Examinations, 1994

In addition, information contained in the Geology and Hydrogeology Assessment Report was also drawn upon.

Agricultural Existing Conditions

For the 2014 tax year, 19 property parcels within the Local Study Area were assessed as Farm Tax Rated parcels. These parcels are shown on **Figure 4.28** and include the two parcels immediately adjacent to the Site boundary to the east and south, both of which are forested along this boundary. Eligibility criteria for classification as a Farm Tax Rated property include, among others¹¹:

- The property must be assessed and valued as farmland. This is determined by the Municipal Property Assessment Corporation (MPAC).
- The property must be used as part of a farming operation generating Gross Farm Income (GFI) of at least \$7,000 as reported to Canada Revenue Agency for income tax purposes.
- A valid Farm Business Registration number is required for the farm business operating on the land, unless one of the exemptions applies and is granted. Under the Farm Registration and Farm Organizations Funding Act, a farm business generating Gross Farm Income of at least \$7,000 as reported to Canada Revenue Agency for income tax purposes must register annually with Agricorp (1-866-327-3678). Continued eligibility for the Farm Property Class tax rate requires the yearly renewal of your Farm Business Registration number.

It can therefore be inferred, based on the eligibility criteria described above, that all properties within the Local Study Area classified as Farm Tax Rated are being actively farmed or used for farming purposes, either wholly or in part. Farming operations within the Local Study Area can

¹¹ Farm Property Class Tax Rate Program – Questions & Answers. Ministry of Agriculture, Food & Rural Affairs, 2016

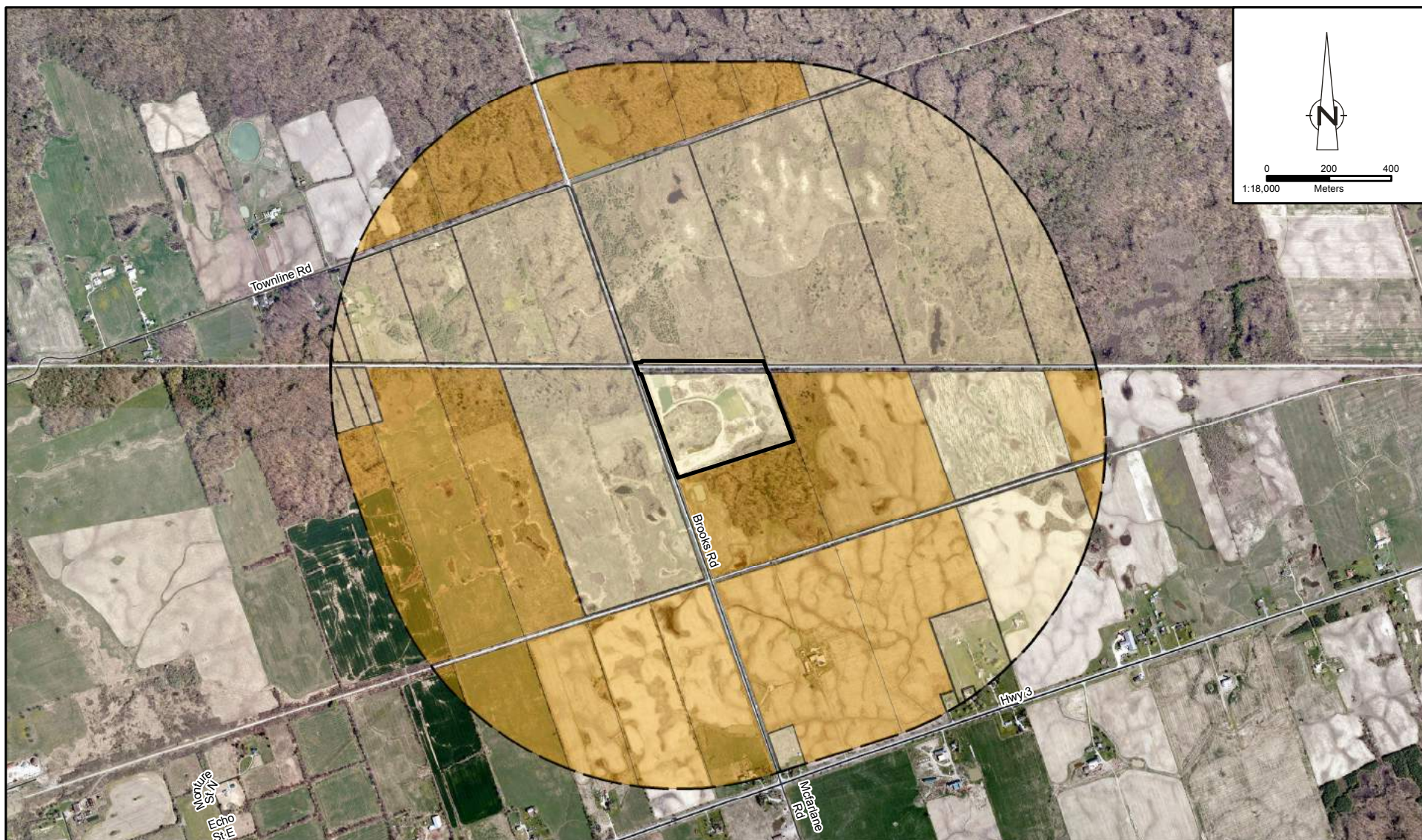
be classified as cash crop farms (e.g., soybean) and passive livestock pasture (this includes the southern, non-forested portion of the property immediately adjacent to the Site to the south as well as the eastern portion of the property immediately adjacent to the Site to the east).

Soils Existing Conditions

According to the Canada Land Inventory (Government of Ontario, 2014), lands within the Local Study Area are comprised of Class 2 soils (generally north and west of the Site) and Class 3 soils (generally east and south of the Site) (see **Figure 4.29**).

Mining Existing Conditions

Haldimand County Official Plan (2009) identifies an abandoned mine within the northwest corner of the Local Study Area (see **Figure 4.30** for approximate location). The MNDM (2008) locates this abandoned gypsum mine on Lot 25, Concession 1-N.T.R, approximately 112 m south of Townline Road East and approximately 300 m west of Brooks Road, in the Township of Cayuga, and identifies it as having been owned and operated by the Cayuga Gypsum Company (CGC) between 1942 and 1949. Further information about the abandoned mine is discussed in **Section 4.3.2**, above.







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

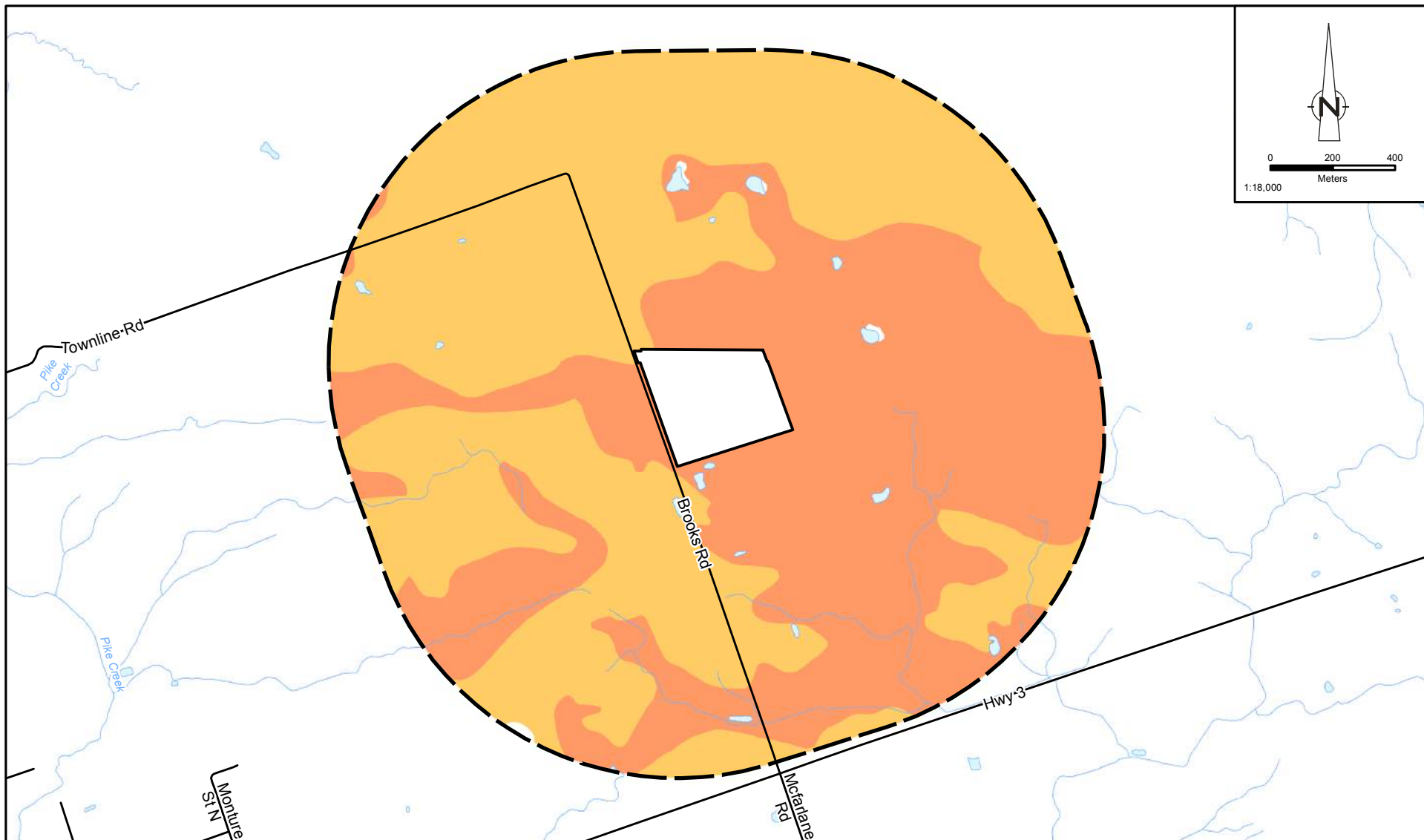
figure 4.28

LOCAL STUDY AREA FARM TAX RATED PARCELS
 BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
 BROOKS ROAD LANDFILL
 160 Brooks Road, Cayuga, Ontario



Legend

-  Site Location
-  Assessment Parcel
-  Local Study Area (1km Radius)
-  Farm Tax Rated Parcel



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

figure 4.29
 LOCAL STUDY AREA SOIL CLASSIFICATION
 BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
 BROOKS ROAD LANDFILL
 160 Brooks Road, Cayuga, Ontario



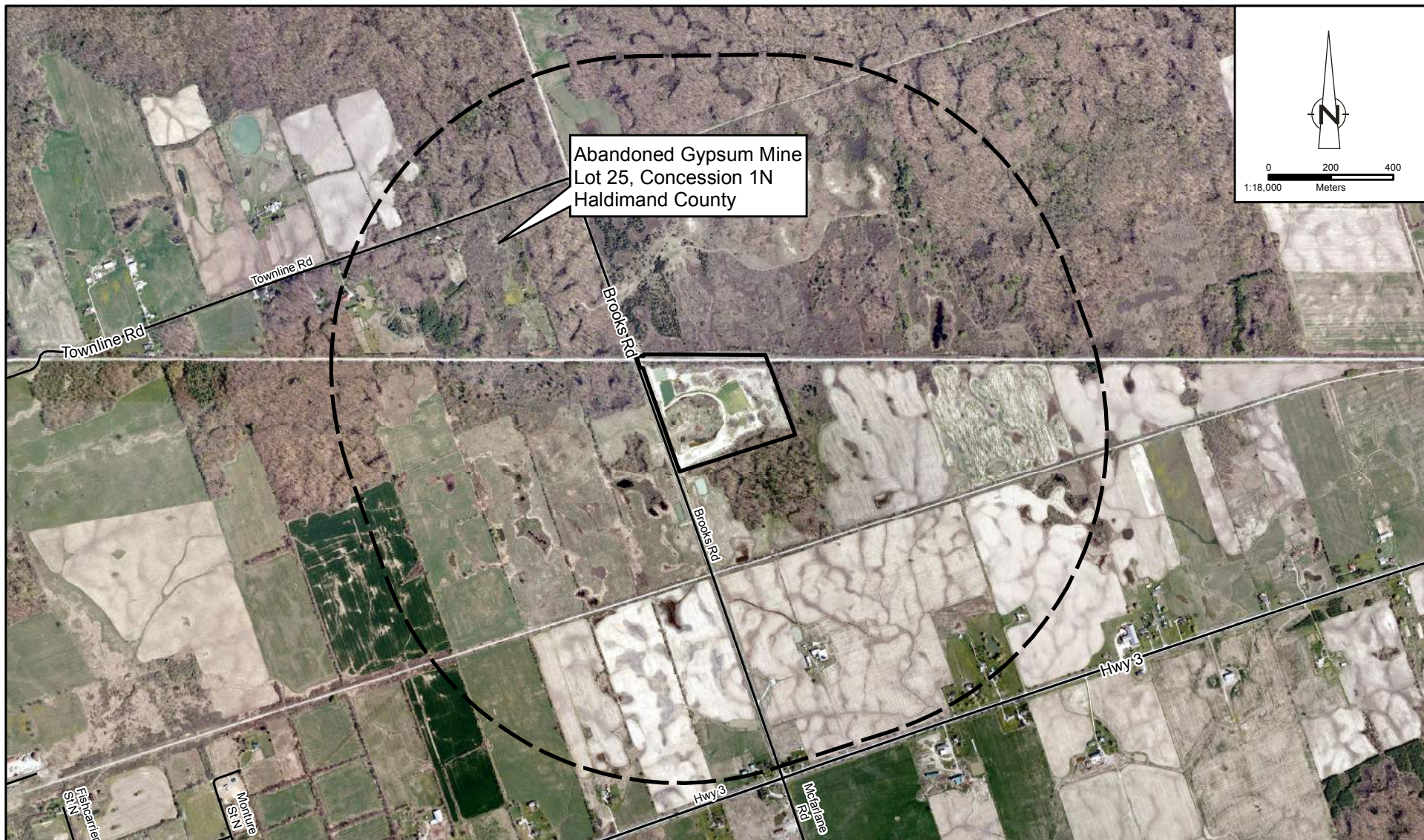
Legend

Site Location

Local Study Area (1km Radius)

Class 2 Soil (CLI)

Class 3 Soil (CLI)





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 4.30
 LOCAL STUDY AREA ABANDONED MINES
 BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
 BROOKS ROAD LANDFILL
 160 Brooks Road, Cayuga, Ontario



Legend

-  Site Location
-  Local Study Area (1km Radius)

4.5.4 Site Design & Operation

The Site is located at 160 Brooks Road near Cayuga, and is legally described as Part of Lot 24, Concession I-N.T.R., Haldimand County, Ontario. The total Site area is approximately 14.3 ha, of which 6 ha is approved for landfilling. The Site, which operates under ECA No. A110302 currently has an approved fill rate of 500 tonnes per day of post-diversion IC&I waste and contaminated soil and a capacity of 624,065 m³, including waste, daily cover, and interim cover. The Site also operates under Amended ECA Nos. 6869-9EAT28 and 1907-99NSF2, which pertain to the establishment of a stormwater management facility and a leachate collection, treatment, and disposal system.

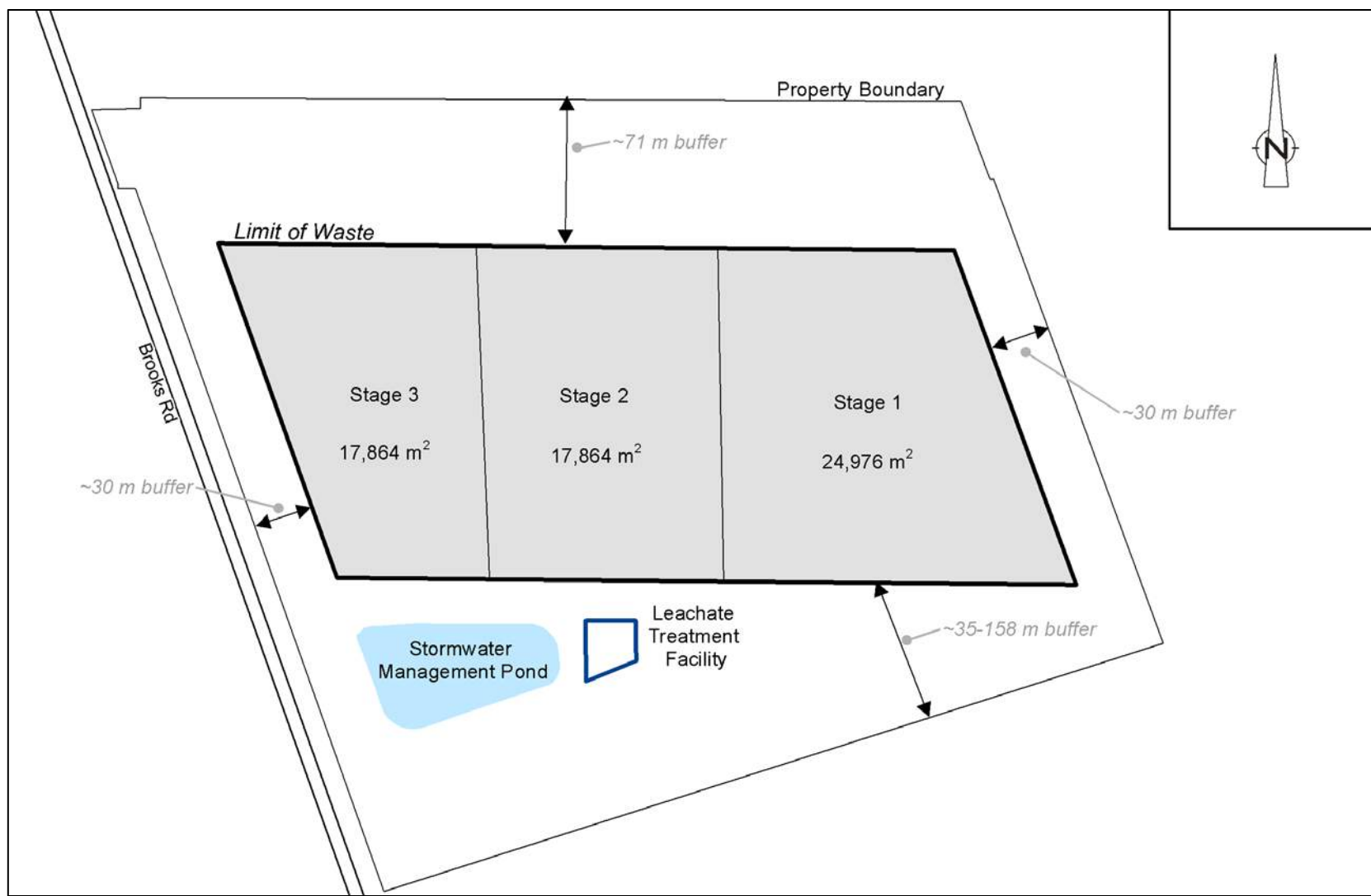
The Site is permitted to receive waste from 7 a.m. to 5 p.m., Monday to Friday, and 7 a.m. to 1 p.m. on Saturdays. The Site access is provided from Brooks Road via a driveway located approximately 30 m north of the south Site boundary. The main entrance is equipped with a lockable entrance gate to prohibit unauthorized vehicles from entering the Site.

The stormwater management system for the Site is currently being constructed. The stormwater management system consists of a perimeter ditch around the outside of the landfill footprint and a wet detention stormwater management pond in the southwest corner of the site, complete with inlet structure, forebay, outlet structure, and emergency bypass structure. Quantity and quality requirements outlined in the ECA must be satisfied prior to discharging stormwater runoff to the roadside ditch adjacent to Brooks Road.

The regulatory requirements specify a 100 m wide buffer area between the limit of the waste footprint and the site boundary, but allow this to be reduced to 30 m if it is shown to be appropriate based on a site specific assessment (e.g., if the buffer provides adequate space for vehicle movements, ancillary facilities, and ensures that potential effects from the landfill operation do not have unacceptable impacts outside of the site). The approved buffer areas are shown in **Figure 4.31**, below, and include the following:

- A 30 m buffer between the western limit of waste and the western property line adjacent to Brooks Road.
- A 30 m buffer between the eastern limit of waste and the eastern property line adjacent to undeveloped, privately owned rural properties consisting of old fields used for passive livestock pasture purposes and forested areas.
- A 35 m to 158 m buffer between the southern limit of waste and the southern property line adjacent to undeveloped, privately owned rural properties consisting of old fields used for passive livestock pasture purposes and forested areas.
- A 71 m buffer between the northern limit of waste and the property line adjacent to a rural property owned by the proponent consisting of old fields (i.e., long-term inactive agricultural crop production lands now undergoing natural regeneration) and forested areas.

Figure 4.31 Existing Brooks Road Landfill Site & Approved Buffer Areas



As reported in the 2015 Operations and Monitoring Report for the Brooks Road Landfill Site, the volume of material in-place as of November 30, 2015 (including waste and daily cover) was approximately 581,147 m³; therefore, the remaining Site capacity was approximately 42,918 m³ as of November 30, 2015. This equates to less than one year of remaining capacity based on assumed fill rates, waste to daily cover ratio, and material densities.

Further details are provided in **Section 5.0** and in the Site's existing Design and Operations Report (CRA, November 2003), which includes information on:

- Design considerations
- Site assessments
- Site design
- Site facilities
- Site decommissioning plan
- Site operations
- Monitoring, inspection, maintenance, and reporting
- Contingency planning

4.6 Socio-Economic Environment

For the characterization of the Socio-Economic Environment, which includes the Economic Environment, Social Environment, and Aboriginal Community interests, only the Local Study Area is applicable. The following available secondary sources of information were collected and reviewed to determine existing Socio-Economic conditions and Aboriginal Community interests within the Local Study Area:

- Most recent aerial photos available of the Study Area
- Community profile from the Haldimand County website
- National Household Survey Profile from Statistics Canada
- Population data from Statistics Canada
- Government of Ontario Agricultural Information Atlas
- Six Nations of the Grand River website
- Ontario Government information on the status of negotiations with the Six Nations of the Grand River
- Mississaugas of the New Credit First Nation (MNCFN) website
- Haudenosaunee Confederacy Chiefs Council (HCCC) website

In order to catalogue the number of residences as well as the existing viewshed from within the Local Study Area, site visits were undertaken on September 11, 2015 and January 22, 2016. During these visits all residences within the Local Study Area were recorded on an aerial map

and photos were taken from various locations within and around the Local Study Area (in the direction of the existing Site) and recorded on an aerial map.

4.6.1 Economic Existing Conditions

As described in **Section 4.5.3**, 19 property parcels within the Local Study Area were assessed as Farm Tax Rated for the 2014 tax year. Eligibility criteria for classification as a Farm Tax Rated property include, among others¹²:

- The property must be used as part of a farming operation generating Gross Farm Income (GFI) of at least \$7,000 as reported to Canada Revenue Agency for income tax purposes.
- A valid Farm Business Registration number is required for the farm business operating on the land, unless one of the exemptions applies and is granted. Under the Farm Registration and Farm Organizations Funding Act, a farm business generating Gross Farm Income of at least \$7,000 as reported to Canada Revenue Agency for income tax purposes must register annually with Agricorp (1-866-327-3678). Continued eligibility for the Farm Property Class tax rate requires the yearly renewal of your Farm Business Registration number.

It can therefore be inferred, based on the eligibility criteria described above, that all properties within the Local Study Area classified as Farm Tax Rated are being actively farmed or used for farming purposes, either wholly or in part, and are registered farm businesses.

In addition to farming, the only other business operating within the Local Study Area is the Brooks Road Landfill Site, which employs six full-time and one part-time staff.

On a regional level, according to the National Household Survey Profile, Haldimand County has an employment rate of 62.5 percent and an unemployment rate of 6.6 percent (Statistics Canada, 2011b). The top three employment industries in the County include manufacturing (approximately 15 percent), health care and social assistance (approximately 12 percent), and construction (approximately 10 percent) (Statistics Canada, 2011b).

4.6.2 Social Existing Conditions

The Local Study Area for the Brooks Road Landfill EA is located within the boundaries of Haldimand County, Ontario, approximately 2 km northeast the Village of Cayuga. The Village of Cayuga was reported to have a population of 1,622 in 2011 (Statistics Canada, 2011a). There are 39 property parcels within the Local Study Area (not including the Site) and 11 residential dwellings (see **Figure 4.32**). Of these 39 properties, 19 were Farm Tax Rated for the 2014 tax

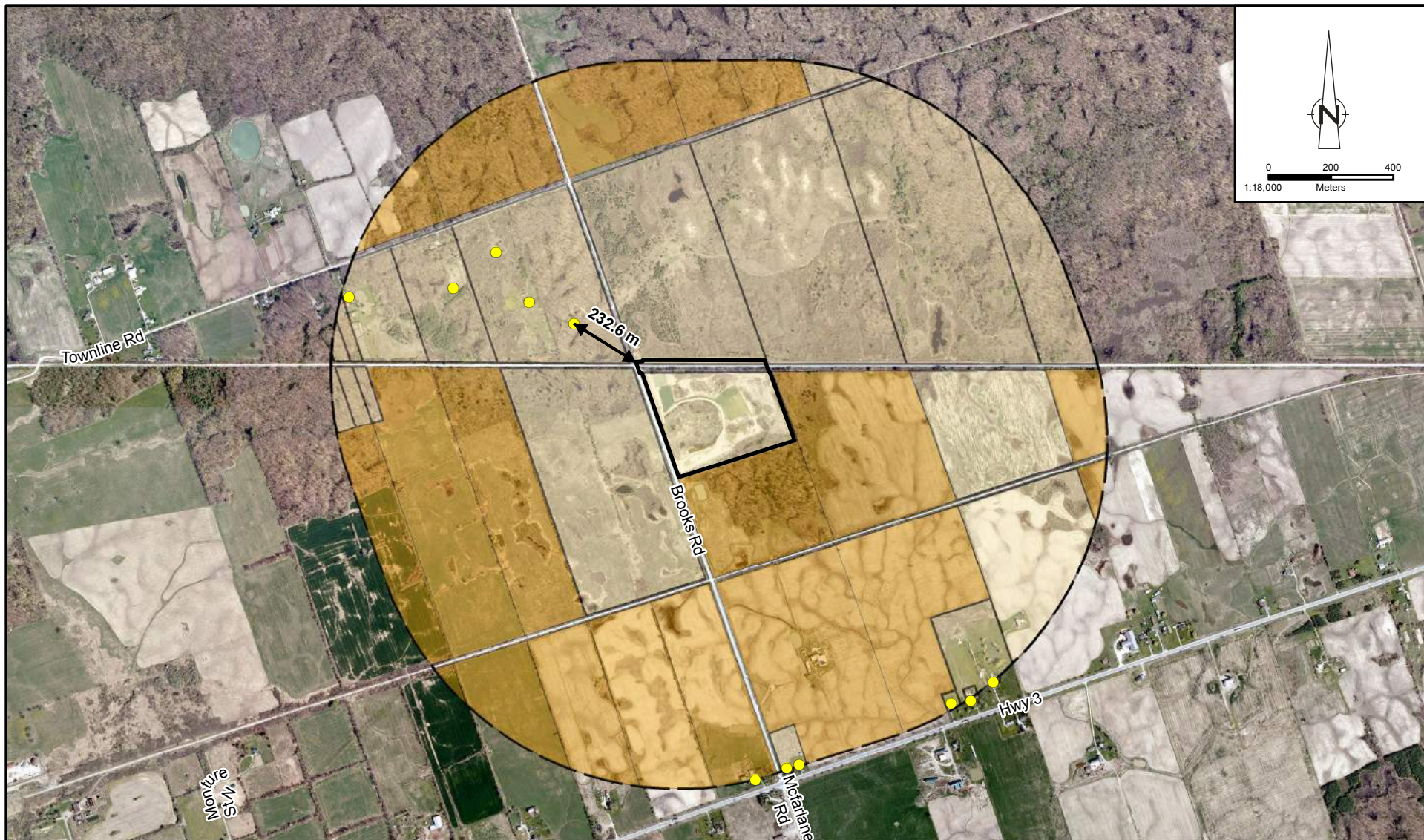
¹² Farm Property Class Tax Rate Program – Questions & Answers. Ministry of Agriculture, Food & Rural Affairs, 2016



year (Government of Ontario, 2014), as described above. The closest residential dwelling is located approximately 232 m northwest of the Site.

As described in **Section 4.5.2**, no static recreational resources (e.g., picnic areas, trailer parks), churches, or cemeteries are located within the Local Study Area; however, Brooks Road as well as the abandoned railway to south of the Site (parallel to Highway 3) are identified in the Official Plan as trail locations and in the Haldimand County Trails Master Plan (2009) as "Proposed Special Use Routes" (Brooks Road as a "Proposed Signed Route" and the abandoned railway as a Proposed Multi-Use Trail") for implementation in the short-term (0 to 5 years from the publication date). There is presently no indication of the implementation of the proposed trails along either of these routes.

The topography across the Local Study Area from north to south ranges from approximately 202 m AMSL to approximately 196 m AMSL. As such, the land within the Local Study Area can be considered to be relatively flat. The majority of the lands within the Local Study Area immediately adjacent to the Brook Road Landfill Site are forested, thus obscuring the view of the Site. The exception is the parcel of land immediately west of the Site, which includes an open field, from which the Site is visible; however, the existing berm along the western perimeter of the Site obscures most views of the landfilling operations from this parcel. The existing viewshed from areas within and surrounding the Local Study Area, looking in the direction of the Brooks Road Landfill Site, are shown on **Figure 4.33**.



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

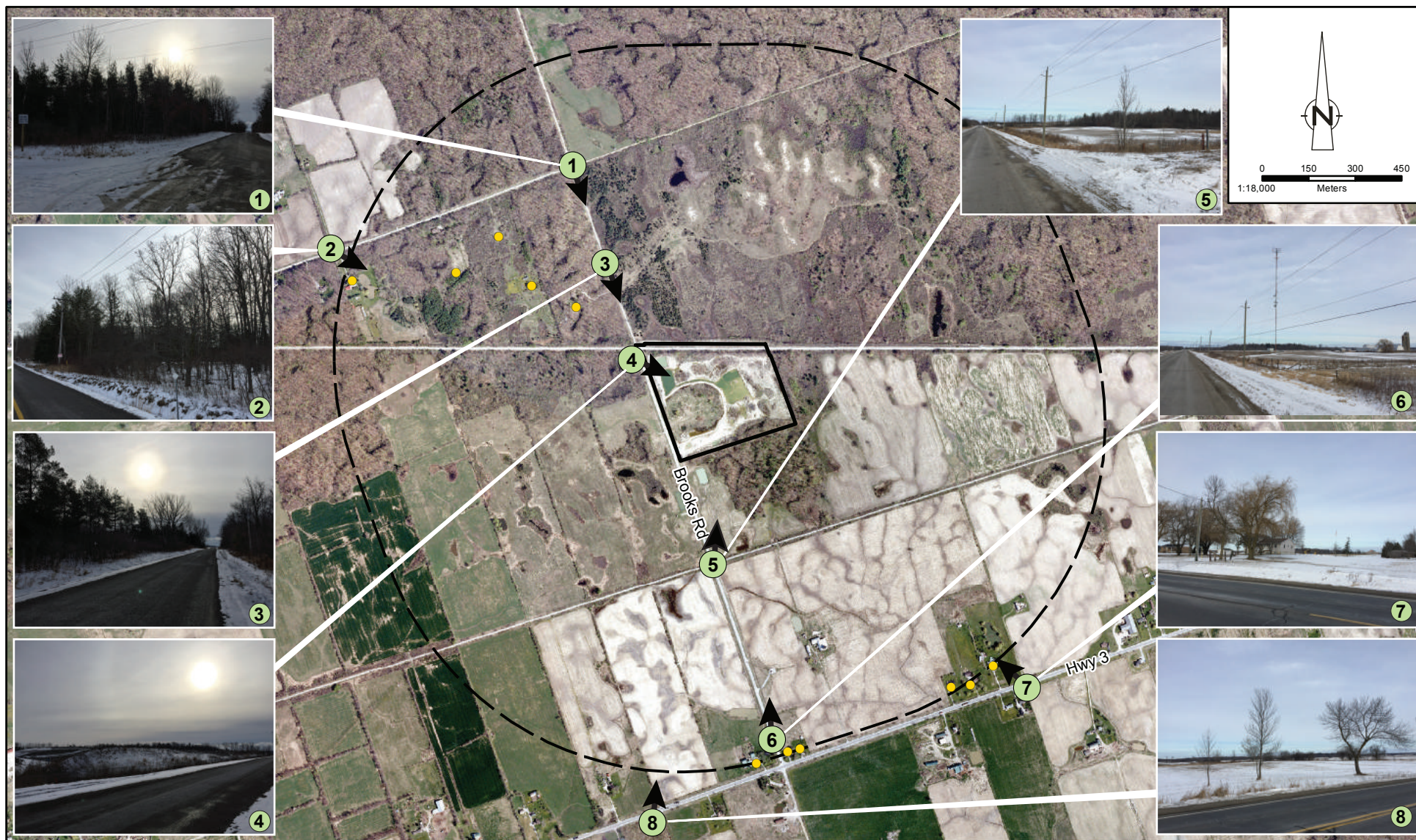
figure 4.32

LOCAL STUDY AREA PROPERTY PARCELS AND RESIDENCES
 BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
 BROOKS ROAD LANDFILL
 160 Brooks Road, Cayuga, Ontario

Legend

- Residential Dwelling
- Site Location
- Local Study Area (1km Radius)
- Assessment Parcel
- Farm Tax Rated Parcel





Source: MNR/NRVS, 2014, Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2016;
 Aerial: 2006 Grand River Conservation Authority
 Coordinate System: NAD 1983 UTM Zone 17N

Legend

-  Photo Direction
-  Photo Locations
-  Residential Dwelling
-  Site Location
-  Local Study Area (1km Radius)

figure 4.33

LOCAL STUDY AREA VIEWSHED
BROOKS ROAD LANDFILL SITE VERTICAL CAPACITY EXPANSION EA
BROOKS ROAD LANDFILL
160 Brooks Road, Cayuga, Ontario

4.6.3 Aboriginal Community Interests

The existing Site is located approximately 15 km southeast of the Six Nations of the Grand River territory, within which lies the community of Ohsweken. The Site falls within the Haldimand Tract, a swath of land roughly 9.6 km (6 miles) on either side of the Grand River that was granted to the Six Nations of the Grand River under the Haldimand Proclamation on October 25, 1784. The Six Nations of the Grand River include the Mohawk, Seneca, Oneida, Cayuga, Onondaga and Tuscarora nations. After the American War of Independence, some of the families allied to the British moved from their homeland in the Finger Lakes region of New York State to the Grand River and settled on a tract of land granted by the Haldimand Proclamation of 1784 and confirmed by the Simcoe Patent of 1793 (Ontario, 2015). The Six Nations of Grand River are seeking compensation as well as an accounting of what happened to their property, money and other assets in southwestern Ontario, within the Haldimand Tract and, as of 2009, have formally reactivated litigation against Canada and Ontario (Ontario, 2015). These claims are now being pursued in the courts (Ontario, 2015). As described in Section 6.0, Brooks Road Environmental has been in contact with Six Nations of the Grand River First Nation since the commencement of the ToR for this EA. Through meetings and discussions with members of the Six Nations of the Grand River First Nation, the lands within the Local Study Area have not been identified as being used for traditional purposes, and more specifically, the Site Study Area. Six Nations of the Grand River First Nation has expressed a desire to continue to be updated and involved in the EA process and to that end, a number of one-on-one meetings were held throughout the EA process. In addition, there is a spot reserved on the Brooks Road Public Liaison Committee (PLC) or a Six Nations of the Grand River First Nation representative for on-going engagement around the operation of the site – this would include the opportunity for discussions between Brooks Road and Six Nations to discuss any particular issues or concerns with respect to potential effects on the use of lands for traditional Aboriginal purposes. Brooks Road is open to discussing future work and partnerships with Six Nations of the Grand River, specifically as it relates to the future operation of the site. Further details on the meetings are described in Section 6.0 of the EA Report.

The Haudenosaunee Confederacy includes all of the nations that comprise the Six Nations of the Grand River as well as the Wyandot, Delaware, and Tutela nations (Haudenosaunee Confederacy, 2014). The Haudenosaunee Confederacy was intended as a way to unite its member nations through the common goal of living in harmony and create a peaceful means of decision making (Haudenosaunee Confederacy, 2014). Each member nation maintains its own council and handles its own internal affairs but defers to the Haudenosaunee Confederacy Chiefs Council (HCCC) regarding issues that affect multiple nations within the Haudenosaunee Confederacy (Haudenosaunee Confederacy, 2014). The HCCC has legislated the Haudenosaunee Development Institute (HDI) to represent HCCC interests in the development of lands within areas of Haudenosaunee jurisdiction, including but not limited to the land



prescribed by the Haldimand Proclamation and the 1701 Treaty Area (Haudenosaunee Confederacy, 2014). As described in **Section 6.0**, Brooks Road Environmental has been in contact with HCCC and HDI since the commencement of the ToR for this EA.

The Mississaugas of the New Credit First Nation (MNCFN) community is located approximately 18 km to the west of the Site in Hagersville. The traditional territory of the MNCFN is located in south-western Ontario between Toronto and Lake Erie and includes Haldimand County. As described in **Section 6.0**, Brooks Road Environmental has been in contact with the MNCFN since the commencement of the ToR for this EA. Correspondence was received as part of the EA process from the MNCFN indicating that they continue to exercise treaty rights within their traditional territory, including the Local Study Area, which include, but are not limited to, rights to harvest, fish, trap and gather species of plants, animals and insects for any purpose including food, social, ceremonial, trade and exchange purposes, and that MNCFN also has the right to use the water and resources from the rivers, creeks and lands across the MNCFN traditional territory. The correspondence also noted; however, that, at this time, MNCFN does not have a high level of concern regarding the proposed project and approves the continuation of the EA.