Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

D-4 LANDFILL IMPACT ASSESSMENT
INTERSECTION OF PEARSON DRIVE AND ESTEN DRIVE NORTH
ELLIOT LAKE, ONTARIO

Prepared for:

City of Elliot Lake
45 Hillside Dr. N.
Elliot Lake, Ontario
P5A 1X5

Attention: Mr. Steve Antunes

File No 5-21-0300-54
Date: May 30, 2022

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1.0 EXECUTIVE SUMMARY

Terraprobe was retained by the City of Elliot Lake to carry out a D-4 Landfill Assessment for an area under the City's review for commercial and residential opportunities. The subject area ("Property") is located on the north side of Pearson Drive and west of Esten Drive North in the City of Elliot Lake, Ontario, hereafter referred to as *"The Property."* The Property has no municipal address; the description of the Property is the intersection of Pearson Drive and Esten Drive North.

The Property is currently vacant and generally covered by sparse brush and trees. There are a number of small roads and trails through the Site, which appear to be used for recreational purposes (e.g., ATVs and Snowmobiles). Based on the Urban Map Schedule A (Zoning) (2018), the Property is designated as clean industrial (CM). The Property is surrounded by unevaluated wetland and woodland on the east, Pearson Drive to the west/ southwest, and vacant undeveloped lands to the northwest and the southeast.

Based on historical information, the former landfill Site covers an area of about 6 ha of the entire Property. It was reported that a non-operating closed municipal landfill Site identified with a certificate number A560803 was located on the proposed development area. The Elliot Lake Landfill, hereafter referred to as " Landfill Site " is classified as a B3 Potential Environmental Impact – urban Municipal/Domestic Waste. As such, the Property (Pearson Dr and Esten Dr. North) under review falls within 500 meters of the waste disposal Site and is considered to be within a D-4 Assessment Area. According to the Ministry of the Environment, Conservation and Parks (MECP) D-4 Guideline Landfill Impact Assessment, the D-4 Assessment Area refers to the area considered to be potentially impacted by existing and previous waste disposal Site operations. Terraprobe understands that the Township of Elliot Lake will require an assessment of the Property with respect to the MECP Guideline D-4 Assessment to be completed to determine if the "B3" Provision could be lifted. The D-4 Assessment Area refers to the area considered to be potentially impacted by existing and previous waste disposal Site operations. The assessment is required to characterize the local and regional geologic and hydrogeological conditions around the proposed development Site and determine the likelihood of any adverse effect, particularly with respect to leachate generation and/or methane gas generation impacting the proposed works.

Based on background information obtained and a Site observation of the Property (the landfill Site) made from drone video surveillance, the following conclusion are summarized below:

Ground and surface water contamination by leachate and Surface Runoff

Based on the review of the topography (ORMGP and Town of Elliot Lake, 1980) of the Property and the landfill Site #A560803, the landfill is located on a low-lying area and slopes to the south and southwest from an elevation high of 328 masl to a low of 312 masl towards Pearson Road. It is surrounded by topographically higher ridges on the northern and northwestern sides. It is expected that the shallow groundwater and surface run-off would follow the topography and flow south and southwest from the non-operating closed waste disposal Site toward a stream tributary of Esten lake and ultimately to Esten lake.

As such, the high risk of the leachate impact is confined to the fill area underneath the proposed development and the southern/ southwestern wetland and drainage valley downgradient the landfill area. Groundwater monitoring on the southerly limits of the Site at the fill footprint and the setback area is required to confirm the quality of groundwater.

Ground Settlement

As the non-operating waste disposal Site is located directly on the Property, it is likely that settlement issues associated with the degradation of loose and/or organic fills to occur. However, it was a bit difficult to observe during the Site video surveillance as most of the area was covered with snow and ice. As such, the potential for future settlement is high.

Visual Impact

The non-operating waste disposal Site is located directly on the Property. Evidence of the non-operating waste disposal Site, such as wastes, fences, and access roads, were not observed during the Site video surveillance. In addition, a review of the aerial photos dating back to 1971 showed indications of signs of landfill operations at the subject property.

Soil Contamination and Hazardous Waste

No hazardous waste or soil contamination was observed at the Property and non-operation waste disposal site during the Site video surveillance. However, it stressed vegetation was observed on the property, and this indicates the possibility of soil contamination.

Landfill Generated Gases (Methane)

Methane is a by-product of decomposing organic matter. Methane moves readily through porous, granular soils. This landfill being closed for at least 40 years, with an estimated domestic refuse volume of approximately 68,000 tons placed at this Site during its operation from May 1972 to January 1980. However, the risk of methane gas from the non-operating waste disposal Site to the subject property depends on a number of factors, including the type and age of refuse, average depth and density of the waste as well as the annual average precipitation. Since the soils are granular in nature, it is recommended to install methane gas probes to monitor the methane generation rate or decay rate at the landfill Site and buffer areas.

In summary, it is Terraprobe's opinion that a non-operating waste disposal Site will impact the proposed development. Since the non-operating waste disposal Site is directly located on the Property and the shallow groundwater travels south directly through the Property and flows south/southwest towards Pearson Drive, there is a possibility of soil and water contamination to occur at the Site.

2.0 INTRODUCTION

Terraprobe was retained by the City of Elliot Lake to carry out a D-4 Landfill Assessment for land under the City's review for commercial and residential opportunities. The subject review land is located on the north side of Pearson Drive and west of Esten Drive North in the City of Elliot Lake, Ontario, hereafter referred to as *"The Property."* The Property has no municipal address; the description of the Property is the intersection of Pearson Drive and Esten Drive North.

Based on historic information, the former landfill Site activity covers an area of about 6 ha. The Property is currently vacant and generally covered by sparse brush. There are a number of small roads and trails through the Site, which appear to be used for recreational purposes (e.g., ATVs and Snowmobiles). The Property is surrounded by commercial/residential land use on the east side and agricultural land use on the north, south and west side.

It was noted that a non-operating closed waste disposal Site identified with certificate number A560803 was located on the proposed development area approximately 3 km southeast of Elliot Lake. The Elliot Lake Landfill, hereafter referred to "Property" or " Landfill" is classified as a B3 Potential Environmental Impact – urban Municipal/Domestic Waste. As such, the Property under review falls within 500 meters of the waste disposal Site and is considered to be within a D-4 Assessment Area. According to the Ministry of the Environment, Conservation and Parks (MECP) D-4 Guideline Landfill Impact Assessment, the D-4 Assessment Area refers to the area considered to be potentially impacted by existing and previous waste disposal Site operations. Terraprobe understands that the Township of Elliot Lake will require an assessment of the Property with respect to the MECP Guideline D-4 Assessment to be completed to determine if the "B3" Provision could be lifted. The D-4 Assessment Area refers to the area considered to be potentially impacted by existing and previous waste disposal Site operations. The assessment is required to characterize the local and regional geologic and hydrogeological conditions around the proposed development Site and determine the likelihood of any adverse effect, particularly with respect to leachate generation and/or methane gas generation impacting the proposed works.

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3.0 BACKGROUND

The subject Property is located within the Township of Elliot Lake, in Algoma District, Canada. The District Official Plan requires that where development is proposed within 500 meters of a waste disposal Site, a preliminary technical study be undertaken to evaluate potential impacts and identify mitigation measures.

In reference to Section 4.1 of the D-4 Guideline entitled "Environmental Conditions," the Elliot Lake landfill would be categorized as a "non-operating" Site. As such, the guideline suggests that it is important

to consider impacts with respect to ground and surface water contamination by leachate, surface runoff, ground settlement, visual impact, soil contamination and hazardous waste and landfill generated gases when assessing subject lands within 500m of non-operating Sites.

Waste Disposal Site Inventory produced by the MECP in June 1991 identifies the Elliot Lake landfill Site with certificate No. A560803, class B3 Potential Environmental Impact – Urban Municipal/ Domestic Waste. The inventory indicates that the closure date of the landfill was on November 1, 1982. Based on the Town of Elliot Lake, 1980, the landfill commenced operation in May 1972.

4.0 REVIEW OF PREVIOUS REPORTS

Previously, the following Environmental Impact Study Report was completed for the Property, as summarized below:

4.1 Environmental Reports (December 2009)

Report Title	Draft, Preliminary Environmental Impact Study, Pearson Drive Industrial Area, Elliot Lake, Ontario
Report Date	December 23, 2009,
File No.	5-09-4009
Prepared By	Terraprobe Inc.
Prepared For	Mr. Brad Parsons

The study report presented the following results:

- The purpose of the report was to identify natural and cultural features in the area and to assess potential constraints with respect to the proposed industrial development.
- A former landfill is situated on the north side of Pearson Drive near the eastern portion of the Site.
- No evidence that a Certificate of Approval was issued for the Landfill. Based on available information, the Site began operation in 1972 and was closed approximately in 1980.
- The waste was placed in a scattered and random basis. There is no accurate information available regarding the precise extent or thickness of waste placement.
- There is a former shallow lake or marshland area located to the north of the landfill, which arrears to have been filled.
- A significant portion of the Site is subject to moderate to high constraints, which will increase the costs of development.
- Site development and servicing constraints were attributed to the presence of filled areas, bedrock outcrop, and rolling topography, and shallow pond or marsh and watercourse features.

- Recommendation for further studies covering the fill area, topographic mapping, terrestrial and aquatic biophysical inventory, geotechnical evaluation of fill material,

4.2 Guideline D-4 Study (October 2009)

Report Title	Draft, Guideline D-4 Study, Closed Pearson Drive Landfill, Elliot Lake, Ontario
Report Date	October 19, 2009,
File No.	5-09-4008
Prepared By	Terraprobe Inc.
Prepared For	Mr. Paul W. Bowen, P.Geo., P.Eng.

- The purpose of the study was to determine the potential impact of the closed landfill on proposed industrial development in the area. The impact study was conducted using MOE Guideline D-4 - Land Use On or Near Landfills and Dumps.
- There was no evidence of the significant impact of the landfill on local surface water or ground water. Similarly, there was no evidence of migration of landfill gas beyond the Site boundaries.
- Site inspection in 2009 indicated that all the refuse is adequately covered with soil; and there was no direct visual evidence of leachate or methane gas impact associated with the landfill.
- It was recommended that some additional Site investigation be conducted to confirm the extent of waste, the thickness of the cover, and the potential impacts to surface water in the area.
- Recommended that the landfill Site could be used for passive park purposes such as walking trails, playing fields and the like.
- Recommended further, more detailed studies before any significant or enclosed structures on the landfill to ensure that waste is not inadvertently exposed by Site grading or excavation activities and to prevent significant hazards with respect to landfill gas or leachate migration.
- Recommended landfill Site be surveyed and that the presence of the waste material be registered on the title of the property.
- Recommended that a nominal 50 m buffer be established around the landfill boundary to provide protection against any minor leachate or landfill gas-related impacts; and that development or land uses be limited within 50 m of the Site boundary. A work plan has to be prepared for any excavation or development work within the 50 m buffer zone
- Concluded that the closed landfill does not pose any significant constraints to the development of areas more than 50 m from the landfill boundary for light industrial purposes.
- Recommended developing a by-law be to prohibit the drilling of wells or extraction of ground water within 300 m of the landfill. The by-law could permit the use of the ground water in the event that

more detailed studies were conducted to assess potential ground water impacts. The detailed studies would consist of the installation of monitoring wells and sampling of ground water quality.

4.3 Elliot Lake Landfill Site Closure Plan (December 1980)

Report Title	Elliot Lake Landfill Site Closure Plan
Report Date	December 1980
File No.	980-690
Prepared By	Conestoga - Rovers & Associates
Prepared For	The Corporation of the Town of Elliot Lake

- It is concluded that if the Site is operated and managed in accordance with the closure report, an economical and environmentally safe landfilling operation and closure will result.
- It is recommended that the monitoring program outlined in this report be adopted.
- It is recommended that no development be permitted within a minimum 75 m buffer zone of the landfill Site as designed.

5.0 ENVIRONMENTAL SETTINGS

5.1 Physiography, Surficial Geology and Bedrock

Geological mapping indicates that the subject property and the landfill are generally located within the area known as the Clay Plains. The bedrock on the Site is the Serpentine Formation of the Bruce Group: commonly Gneissic tonalite suite Tonalite to granodiorite-foliated to gneissic with minor supracrustal inclusion. The overburden consists of Till: undifferentiated, predominantly sand to silt matrix, high content of clasts, often low in matrix carbonate content. The geological maps are provided in **Appendix E**.

5.2 Topography

Based on the topographic information from the Ontario Base Map, the Property ground surface elevation ranges from approximately 340 to 310 meters above mean sea level. The ground surface elevation of the landfill ranges from approximately 320 to 310 meters above mean sea level. The topographical map is provided in **Appendix E**.

5.3 Soil Stratigraphy and Hydrogeology

The MECP well record database was reviewed for properties within 500m of the Property. One (1) in close proximity to the subject property was identified from the MECP online water well database. The well records obtained is attached in **Appendix C**.

Stratigraphy (Property/ Study Area)	• 0 to 0.61 m – Topsoil • 0.61 to 16.76 m – Clay, Red • 16.76 to 18.89 m – Coarse Sand, Gravel
Depth to Water Table	• Approximately 4.72 to 9.14 m, with seasonal fluctuations (Based on ERIS information)
Depth to Bedrock	• Was not determined, inferred lower than 19 mbgs
Inferred Groundwater Flow Direction	• The non-operating closed waste disposal Site # A560803 is located directly on the Property. Shallow groundwater and surface water are expected to follow the topography and flow to the south and southwest through the landfill Site toward a stream along Pearson Drive and ultimately to Esten lake.

5.4 Access Environment

MECP's Access Environment was reviewed within a 500 m radius of the Property and a non-operating closed waste disposal Site (A560803). Record of Site Condition (RSC), Environmental Compliance Approval (ECA), Environmental Activity and Sector Registrations (EASR), and Permit to Take Water (PTTW) were searched using the database. There were no results with respect to RSCs, ECAs, EASRs, and PTTWs found on the Property and Study Area.

5.5 Source Protection Atlas, Official Plan, and MNRF

Terraprobe also reviewed the Municipal Official Plan, the Ontario Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre for information specific to natural areas, such as locations of environmentally sensitive areas. The non-operating waste disposal Site and the Property were assessed as shown below.

- No Area of Natural and Scientific Interest (ANSI) were identified at the Property and the non-operating waste disposal Site.

- No Provincially significant wetlands were identified at the Property and the non-operating waste disposal Site.

- Non-operating closed waste disposal Site A560803 is located within the Property boundary, approximately 3 km southeast of Elliot Lake and 480 m south of Porridge Lake.

6.0 AERIAL PHOTOGRAPHS

Aerial and satellite photographs dating 1951, 1971, 1989, 2004, 2009, 2912, 2018, and 2021 were reviewed from the District of Algoma Interactive map. Upon the review of aerial and satellite photos, a footprint of

a non-operating closed waste disposal Site A560803 was identified about 3 km Southeast of Elliot Lake, located on the Property.

7.0 ZONING BY-LAWS

According to the Comprehensive Zoning By-Law 18-36 currently in place for the Corporation of the City of Elliot Lake, the Property is zoned as "Clean Industrial" (CM) and "Public Open Space" (O).

8.0 SITE VISIT

Due to the vast area of the Property, Terraprobe contacted a local drone company to conduct the Site Visit. The company Darren Tegel, Pits, & Quarries & Aerial Surveying Services conducted the Site Visit on February 16, 2022. The subject property was comprised primarily of agricultural land, gravel roadways accessible through ATVs or pickup trucks. There was a gravel area that seemed to be used as a snow dump zone. No waste was encountered at the Property and the landfill Site during the inspection. The visual inspection of the Property indicated that the landfill Site was at a higher elevation and sloped down south towards Pearson Drive. Additionally, an electrical substation was observed on the northern portion of the Property, accessible through a gravel road. Inspection photographs are provided in **Appendix F**.

9.0 DISCUSSION WITH RESPECT TO MECP D4 GUIDELINE (LAND USE ON OR NEAR LANDFILLS AND DUMPS)

In reference to Section 4, "Environmental Conditions" of MECP D-4 guideline, the landfill Site would be categorized as indicated in 4.2 as a "non-operating" Site. The guidelines suggest that the following factors should be considered for the D-4 Assessment:

Ground and surface water contamination by leachate and Surface Runoff

Based on the Closure report (1980), the landfill Site was finished to an elevation of approximately 328 masl in the northern section of the Site. A steep bank along the northern section of the Site indicates the boundaries of the initially disposed waste. The refuse disposal in the southerly portion of the Site is covered by Sand and gravel cover soil obtained east of the disposal area to an elevation of approximately 312 masl. It is noted that the final contours were designed on the basis of a maximum slope of 4:1 and a minimum slope of 5% to prevent any ponding of surface water on the Site.

Based on the topography of the Property and the waste disposal footprint, the landfill slopes down south towards Pearson Road. It is expected that the shallow groundwater and surface run-off would flow through the non-operating closed waste disposal Site.

Also, information obtained from the Site drone video indicated that the landfill Site was downgradient; however, leachate is expected to migrate from the Site. As such, the risk of the leachate impact on the

Property is considered high, and monitoring at the fill locations and the setback area is required to confirm the quality of groundwater.

Ground Settlement

As the non-operating waste disposal Site is located directly on the Property, it is likely for the settlement issues associated with the degradation of loose and/or organic fills to occur. However, it was a bit difficult to observe during the Site visit as most of the area was covered with snow and ice. As such, the potential for any future settlement is high.

Visual Impact

The non-operating waste disposal Site is located directly on the Property. Evidence of the non-operating waste disposal Site, such as wastes, fences, and access roads, were not observed during the drone video. In addition, a review of the aerial photos dating back to 1971 showed signs of landfill operations at the subject property, and visible stressed vegetation was identified on the Property.

Soil Contamination and Hazardous Waste

No hazardous waste or soil contamination was observed at the Property and non-operation waste disposal Site during the Site video. However, it was observed that there was fill material located on the property, and sparse vegetation, indicating the possibility of soil contamination.

Landfill Generated Gases (Methane)

Methane is a by-product of decomposing organic matter. Methane moves readily through porous, granular soils. The rate of gas generation depends on the type and age of refuse, average depth and density of the waste, as well as the annual average precipitation.

Based on the Town of Elliot Site Closure Plan (1980), it is estimated that approximately 68,000 tons of waste was placed at this Site during its operation from May 1972 to January 1980. It is estimated that the bottom of the disposed waste is at an elevation of approximately 308 masl, which is approximately 4 m below the lowest ground surface. As such, the risk of methane gas to be migrated from the non-operating landfill Site is high. However, as the landfill being closed for at least 40 years, it is recommended to install methane gas probes to monitor the methane generation rate or decay rate at the landfill Site and buffer areas.

10.0 CONCLUSIONS AND RECOMMENDATIONS

In summary, it is Terraprobe's opinion that a non-operating waste disposal Site will impact the Property. Since the non-operating waste disposal Site is directly located on the Property and the shallow groundwater travels south directly through the Property and flows southeast following Pearson Drive, there is a possibility of soil and water contamination to occur at the Site. It is recommended to conduct further

investigation including ground water sampling and gas probe installaing to confirm that the landfill impacts will not cause risks to proposed devlopemnt due to ground water contamination and Landfill generated gases migration.

We trust that this report adequately summarizes our recent assessment of the potential impact of the landfill Site on the subject property. If you should have any questions or need further assistance, please do not hesitate to contact the undersigned.

Sincerely,

Terraprobe Inc.

DRAFT

Asem Quadiri, E.I.T.
Engineer-In-Training

DRAFT

Muna Mirghani, P.Eng.
Project Manager

DRAFT

Samuel Oyedokun, P.Eng., PMP, QP_{ESA}
Associate, Environmental Engineering

REFERENCES

1. MECP, 1991, *Waste Disposal Site Inventory* produced by the MECP on June 1991

2. Terraprobe Inc. (2009), "Guideline D-4 Study Closed Pearson Drive Landfill Elliot Lake, Ontario" File No, 5-09-4008, dated October 10, 2009

3. Terraprobe Inc. 2009, Draft Preliminary Environmental Impact Study Pearson Drive Industrial Area Elliot Lake, Ontario, File No. 5-09-4009, December 23, 2009.

4. The Corporation of the Town of Elliot Lake, 1980, Elliot Lake Landfill Site Closure Plan, December, 1980

FIGURES

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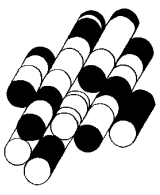


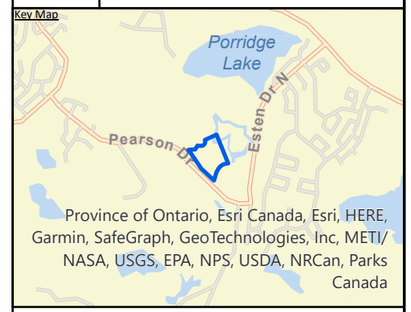
ENGLOBE Tetra Tech Inc.
Consulting Geotechnical & Environmental Engineering
Construction Materials, Inspection & Testing

N W E S

References:

ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/ Airbus Ds, USDA, USGS, AeroGRID, IGN, and the GIS User Community.Basemaps

Key Map



Notes:

Legend:

Approximate Property Boundary

Project Title:
D4 Landfill Impact Assessment Update

Site Location:
Pearson Drive and Esten Drive North, Elliot Lake, Ontario

Figure Title:
Landfill Location

Designed By: MM	*File No.:* 5-21-0300-54
Drawn By: SSK	*Scale:* As Shown
Reviewed By: SO	*Figure No.:* 1
Date: April 2022	

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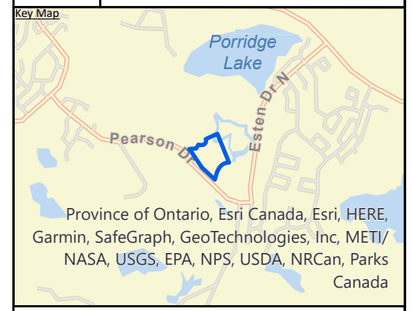
Consulting Geotechnical & Environmental Engineering
Construction Materials, Inspection & Testing

N W E S

References:

ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/ Airbus Ds, USDA, USGS, AeroGRID, IGN, and the GIS User Community.Basemaps

Key Map



Notes:

Legend:

- Approximate Property Boundary
- Landfill Setback; Approximate 50m
- D4 Study Area; Approximate 500m from the Landfill boundary

Project Title:
D4 Landfill Impact Assessment Update

Site Location:
Pearson Drive and Esten Drive North, Elliot Lake, Ontario

Figure Title:
D4 Study Area and Landfill Setback

Designed By: MM	*File No.:* 5-21-0300-54
Drawn By: SSK	*Scale:* As Shown
Reviewed By: SO	*Figure No.:* 2
Date: April 2022	

APPENDIX A

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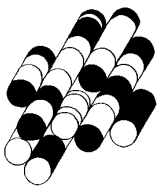

Elliot Lake

Zoning By-Law

City of Elliot Lake

Urban Map (Schedule A)

N

0 50 100 200 300 400 Meters

Legend

- Community Improvement Area

Road Network

- Road Network

Property Fabric

Stream / Creek

Water Body

Zoning Designations

- RESIDENTIAL ONE AND TWO UNIT FAMILY DWELLING (R1)
- RESIDENTIAL ONE AND TWO UNIT FAMILY DWELLING - M (R1M)
- RESIDENTIAL MULTIPLE FAMILY DWELLING (R2)
- RESIDENTIAL MULTIPLE FAMILY DWELLING - M (R2M)
- RESIDENTIAL MOBILE HOME PARK (RMH)
- CENTRAL COMMERCIAL (C1)
- TOURIST HIGHWAY COMMERCIAL (C2)
- NEIGHBOURHOOD COMMERCIAL (C3)
- SHOPPING CENTRE COMMERCIAL (C4)
- INDUSTRIAL (M)
- CLEAN INDUSTRIAL (CM)
- INSTITUTIONAL (I)
- PUBLIC OPEN SPACE (O)
- PARK (P)
- RURAL A (RA)
- RURAL B (RB)
- LIMITED SERVICE RESIDENTIAL (RL)
- SHORELINE RESIDENTIAL (RS)
- RURAL ESTATE (RE)

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Data Source: Source Data has been provided by the Ministry of Natural Resources, Ministry of Northern Development and Mines and the City of Elliot Lake.

Adopted:
Print: 2018-05-07 3:55:14 PM
Document Path: R:\27000\27355-01 - Elliot Lake Official Plan & Zoning By-law Schedules\JLR DWG\Plan\27355-01 Urban Zoning Schedule.mxd

Ontario

Ministry of Natural Resources and Forestry

Make-a-Map: Natural Heritage Areas

Natural Heritage Map

Map created:3/31/2022

Legend

- Assessment Parcel
- Evaluated Wetland
- Provincially Significant/considérée d'importance provinciale
- Non-Provincially Significant/non considérée d'importance provinciale
- Unevaluated Wetland
- Woodland
- Conservation Reserve
- Natural Heritage System

0.6 0 0.32 0.6 Kilometres

Absence of a feature in the map does not mean they do not exist in this area.

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Natural Resources and Forestry(OMNRF) shall not be liable in any way for the use of, or reliance upon, this map or any information on this map.

APPENDIX B

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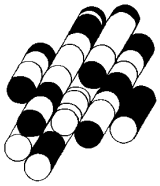


D-4 Land Use On or Near Landfills and Dumps

A guide for land use planning authorities on how to decide what types of land uses are appropriate near landfilled waste.

Legislative Authority:
Environmental Protection Act, RSO 1990, Part V, Sections 27and 46
O. Reg. 347, General -- Waste Management
Planning Act, RSO 1990, Sections 2(a)(b)(c)(f)(g)(h), 17(9),22(3), 41(4) and 51(3)
Condominium Act, RSO 1990, Section 50(3)
Environmental Assessment Act, RSO 1990, Section 5(3)

Responsible Director:
Director, Environmental Planning Branch

Last Revision Date:
April, 1994

Synopsis

This guideline specifies restrictions and controls on land use that the Ministry wishes to see implemented in the vicinity of landfills and dumps, in order to protect the health, safety, convenience and welfare of residents near such facilities. It complements existing ministry abatement programs for landfills and dumps, and is a direct application of Guideline D-1: "Land Use Compatibility."

Application of the guideline extends to all proposals for land use on, or near, operating and non-operating landfills, (as defined in O. Reg. 347) and dumps which contain municipal solid waste, industrial solid waste and/or sewage sludges. The guideline applies to all such facilities regardless of ownership. It does not apply to lands certified as organic soil conditioning sites under O. Reg. 347.

Ministry staff shall use the guideline when they are reviewing land use proposals, including official plans and amendments, and plans of subdivision/condominium:

at the request of the responsible Ministry or the delegated approving authority, under the Planning Act or the Condominium Act;

for land use requests subject to Section 46 of the Environmental Protection Act; and

for undertakings subject to the Environmental Assessment Act.

Introduction

This guideline protects the health, safety, convenience and welfare of residents from the potential adverse effects of landfills and dumps, by restricting or controlling land use in their vicinity. It complements the Ministry's existing abatement programs, and Ministry staff shall refer to it when they review land use proposals.

The principles of Guideline D-4 shall also be considered when looking for locations to establish a landfill in Ontario.

Procedure D-1-1: "Land Use Compatibility: Procedure for Implementation" discusses various implementation approaches and tools. Procedure D-1-3: "Land Use Compatibility: Definitions" provides definitions of terms, in addition to those included in Section 2.0 of this guideline.

Definitions

Note: Additional definitions are provided in Procedure D-1-3:"Land Use Compatibility: Definitions".

Fill Area
: The area of a waste disposal site set aside for landfilling or dumping (see Conceptual Diagram No. 1. below).

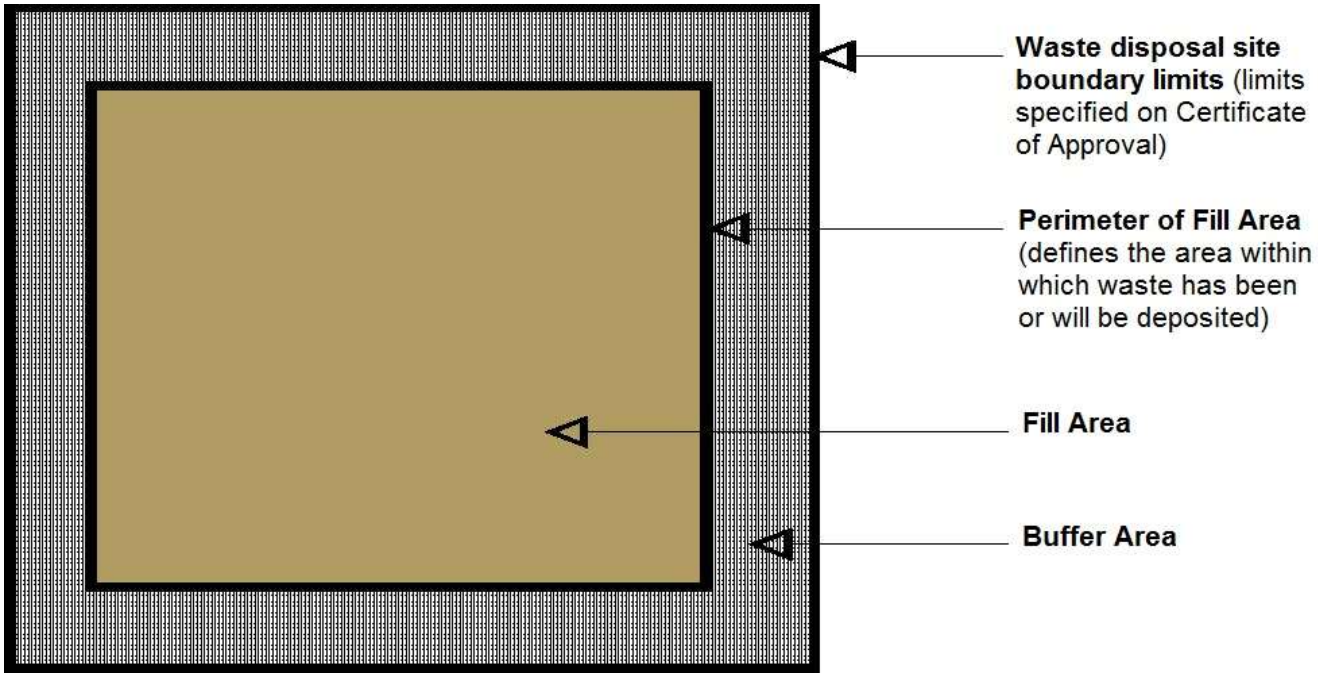
Land Use
: Any existing or proposed activity, structure, service, facility, or natural feature, either at, above, or below grade, which conforms to an approved municipal plan.

Land Used for Waste Disposal Purposes
: The land comprising the fill area, where landfilling or dumping has occurred, and the land which is being used or is to be used for the leachate buffer area and/or the gas buffer area; the land may be on- or off-site, (see Conceptual Diagram No. 1 below).

Peripheral Area
: The area controlled by the site owner/operator between the boundary of the waste disposal site and the fill area; together, the peripheral area and the fill area make up the waste disposal site; the peripheral area will contain the buffer areas required to be on-site (see Conceptual Diagram No. 1 below).

Vectors and Vermin
: Disease-carrying organisms, insects, rodents, birds (especially gulls) and other harmful creatures (e.g., bears).

Conceptual diagram no. 1 (plan view)



Application

3.1 General

This guideline applies to all proposals for land use on or near any landfill or dump which contains municipal solid waste, industrial solid waste and/or sewage sludges. It does not apply to lands certified as organic soil conditioning sites under O. Reg. 347.

3.2 Liquid industrial and hazardous waste

For proposals in the vicinity of landfills and dumps that have accepted liquid industrial, toxic or hazardous waste, the Ministry shall expect proponents to undertake further investigations and

provide a report to the approving authority. Where there is evidence of off-site migration of contaminants, the Ministry shall require abatement measures beyond those discussed in this guideline.

Environmental considerations

Environmental considerations shall be considered by all parties involved in the production, review and approval of a study/evaluation report.

4.1 Operating sites

Factors to be considered when land use is proposed near an operating site include: landfill-generated gases, ground and surface water contamination by leachate, odour, litter, contaminant discharges from associated vehicular traffic, visual impact, dust, noise, other air emissions, fires, surface runoff, and vectors and vermin. Particular attention shall be given to the production and migration of methane gas.

4.2 Non-operating sites

Factors to be considered when land use is proposed on or near anon-operating site include: ground and surface water contamination by leachate, surface runoff, ground settlement, visual impact, soil contamination and hazardous waste, and landfill- generated gases. Particular attention shall be given to the production and migration of methane gas.

4.3 Assessment

The adverse effects of the factors listed in Sections 4.1 and 4.2of this guideline may create:

a hazard or health/safety risk;

a nuisance to man; and/or

degradation of the natural environment.

The overall extent, number, degree and frequency of contaminant discharges and visual problems can vary with each site. Consideration must be given to the nature of proposed land use(s).

Reference should be made to Reference (a) (Section 7.0), if particular site conditions warrant obtaining further information with respect to methane gas.

4.4 Buffering techniques

One or a combination of buffers, as defined in GuidelineD-1: "Land Use Compatibility", may be employed in a given situation.

4.5 Hydrogeologic/engineering studies

4.5.1 Responsibility

Where the hydrogeologic and geologic setting of the proponent's property and the inter-relationship with gas and/or leachate from the fill area are unknown, Ministry staff shall recommend to the approving authority that the proponent engage a qualified hydrogeologist and/or engineer to determine the subsurface conditions and, where necessary, propose remedial measures.

4.5.2 Exceptions

The Ministry shall not normally recommend a formal site investigation, as recommended in Section 4.5.1, when its staff is satisfied that the evaluation of existing data indicates the absence of a problem.

4.6 Controls and monitoring for adverse effects

Where appropriate, Ministry staff shall recommend, as a condition of approval, that a proponent include controls to deal with adverse effects or risks to health or safety and that the approving authority monitor contaminant migration and carry out inspections of control facilities.

In the event that the approving authorities lack the expertise or resources to perform such inspections, they shall employ qualified consultants to do so.

4.7 Monitoring on private property

Where the approving authority requires monitoring and inspections on private property, Ministry staff shall recommend that a contract be executed between the proponent and the municipality, in the form of, or as part of an agreement that may be registered on title and run with the land. Documents which are able to be registered on title are identified in References (b) and (c) (see Section 7.0).

Land use considerations

5.1 Sensitive land use

The Ministry will normally recommend against proposals for sensitive land use (see Section 5.1.1. for details) adjacent to operating landfills, and on land used for waste disposal purposes where there are completed or partially completed fill areas.

Where land uses are proposed for approval on non operating landfills and dumps under Section 46 of the Environmental Protection Act, the Ministry normally shall not permit residential or other sensitive land use. Further details are provided in Reference (d) of Section 7.0.

5.1.1 Sensitive land uses for landfills currently in operation

Any existing or committed land use which includes:

a permanent structure used in animal husbandry; or

agricultural land used for pasturing livestock; or

a permanent structure where:

a person sleeps, or

a person is present on a full time basis;

but not including food or motor vehicle service facilities adjacent to a highway, utility operations, scrap yards, heavy industrial uses, gravel pits, quarries, mining or forestry activities; or

cemeteries

5.1.2 Compatible land uses for landfills currently in operation

Compatible land uses may include:

utilities and above grade transportation routes except major highways;

fences;

wood harvesting and other forestry activities;

certain farming activities;

industrial uses, including incinerators permitted to operate under O. Reg. 347;

gravel pits and quarries, and other mining activities(provided the landfill water table is not affected); or

such land uses which would not be threatened by any hazard to public health or safety and would not be impaired by nuisance effects.

5.2 Land use within 30 metres of a fill area

5.2.1 Operating sites

No land use may take place within 30 metres of the perimeter of a fill area. This is a minimum distance.

Each operating landfill shall have an on-site operational/maintenance buffer area identified on the Certificate of Approval. This buffer shall be no less than 30 metres; it is normally 60-100 metres.

5.2.2 Non-operating sites

Where technical controls for leachate, or leachate and gas are required surrounding a fill area, no land use may take place within 30 metres of its perimeter. This distance maybe reduced to 20 metres in cases where only gas controls are necessary.

5.3 Land use within 500 metres of a fill area

The Ministry considers the most significant contaminant discharges and visual problems to be normally within 500 metres of the perimeter of a fill area. Accordingly, the Ministry recommends this distance be used as a study area for land use proposals. Ministry staff shall ensure that the proponent has evaluated the presence and impact of any adverse effects or risks to health and safety and that necessary remedial measures are taken when land use proposals are within this distance. This assessment shall be based on the nature and knowledge of the disposal site, and the nature of land use(s) proposed.

Actual influence areas for the considerations listed in Section4.1 and 4.2 of this guideline will vary with the individual landfill or dump. Where the actual influence area of a site has been determined to be less than the 500 metre study area set out in this section, the study area for land use proposals can be reduced to coincide with the actual influence area.

5.4 Land use beyond 500 metres of a fill area

Where significant impacts are encountered at or beyond 500 metres, the study area within which an assessment for any change in land use is recommended, shall be extended beyond the 500 metre area set out in Section 5.3. Historical evidence in Ontario has shown that the maximum distance within which adverse effects could be experienced while a landfill is operating is up to 3 kilometres.

In exceptional hydrogeologic situations, such as areas of fractured rock or sand, where it is anticipated that leachate or gas from a non-operating landfill or dump could migrate beyond 500 metres and pose a problem, Ministry staff shall recommend that proponents carry out hydrogeologic and/or engineering studies for land use proposals beyond 500 metres of a fill area (see Section 4.5 for more details).

5.5 Significant impacts

The Ministry shall recommend against land use proposals where proponents have not incorporated feasible remedial measures to prevent or minimize adverse effects (as discussed in Section4.3).

5.6 Sequential development

In considering long-range planning, the Ministry may recommend that proponents delay or phase certain types of land use to coincide with closure of sections of a landfill, or the

operation itself, as nuisance effects are reduced or eliminated. This approach shall only be permitted in cases where no risks to health or safety are present.

Responsibilities

6.1 Operators and/or owners of landfills or dumps

The Ministry shall require operators and/or owners of operating landfills and non operating landfills and dumps to comply with the Environmental Protection Act and O. Reg. 347 (Waste Management) requirements for the control of adverse effects caused by these facilities.

6.2 Proponents/consultants

Ministry staff shall recommend to the approving authority that the proponent provide a report on environmental considerations(see Section 4.0) and, where necessary, propose and implement appropriate control measures. These measures shall include design details and specifications for any control device or facility.

6.3 Municipalities

The local municipal authority is responsible for ensuring that proponents implement and monitor proper control measures associated with new, sensitive developments. It also shall ensure that periodic inspections of operating landfills and non-operating landfills and dumps for contaminant migration and potential hazards are carried out.

6.4 Ministry

With respect to its mandate for landfills and dumps, the Ministry shall exercise the following responsibilities:

6.4.1 Near land used or to be used for waste disposal purposes

Ministry staff will expect proponents and municipalities to fulfill their responsibility to protect public health and safety in areas of land use near a landfill or dump, and to prevent significant

impacts from difficult-to-control nuisance effects which may extend beyond the lands under the Certificate of Approval for an operating landfill.

6.4.2 On land used for waste disposal purposes

Where a proponent submits a land use proposal for approval under Section 46 of the Environmental Protection Act, the proponent must assure Ministry staff and the municipality that the proposal contains adequate measures for the protection of public health and safety, in order to facilitate the Minister making a decision on approval.

Where an approval under EPA Section 46 is not required from the Minister, Section 6.4.1 of this guideline applies.

Reference documents

Procedure D-4-1: "Assessing Methane Hazards from Landfill Sites"

Ministry of Consumer and Commercial Relations Bulletin No.91003: "Environmental Warnings/Restrictions"

Ministry of Consumer and Commercial Relations Bulletin No.80023: "Registration of Certificates & Provisional Certificates"

Guideline D-7: "Requests for Land Use Approval Under EPA, Section 46" (under development)

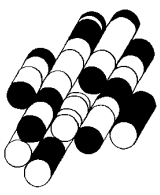
Procedure D-1-1: "Land Use Compatibility: Procedure for Implementation"

Procedure D-1-3: "Land Use Compatibility: Definitions"

Guideline D-1: "Land Use Compatibility"

APPENDIX C

TERRAPROBE INC.



Latitude:46.37214, Longitude:-82.59722 (UTM Zone:17, Easting:377156, Northing:5136635)

Show 100 entries Search:

Well ID	Well Record Information	Well Tag # (since 2003)	Audit #	Contractor Lic#	Well Depth (m)	Date of Completion (MM/DD/YYYY)
1100324	PDF | HTML	N/A	N/A	1502	18.9	08/15/1959

UTM 17 Z 217485 0 E 41 J/5 W
15 R 5136340 N

Elev. 15 R 01625

Basin 22

Desbrats Location
Lot - 6

ONTARIO

11 No 324

The Water-well Drillers Act, 1954
Department of Mines

Water-Well Record

ALGOMA

[redacted] ship, Village, Town or City ~~DESBRATS~~ Johnson
in Village, Town or City)
Address DESBRATS

Date completed 15 (day) AUG (month) 59 (year)

Pipe and Casing Record

Casing diameter(s) 5"
Length(s) 62'
Type of screen —
Length of screen —

Pumping Test

Static level 45'
Pumping rate 150 GPH
Pumping level 30'
Duration of test 1 DAY

Well Log

Overburden and Bedrock Record	From ft.	To ft.
TOP SOIL	0	2'
RED CLAY	2'	55'
SAND + COURSE GRAVEL	55'	62'

Water Record

Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
62'	47'	~~CLEAR~~ fresh

For what purpose(s) is the water to be used?
HOME
Is water clear or cloudy? CLEAR
Is well on upland, in valley, or on hillside? HILLSIDE

Drilling firm CLEAR WATER DRILLING + SUPPLY
Address NIXON RD

Name of Driller LOUISE KNOLL
Address RICHARDS LANDING

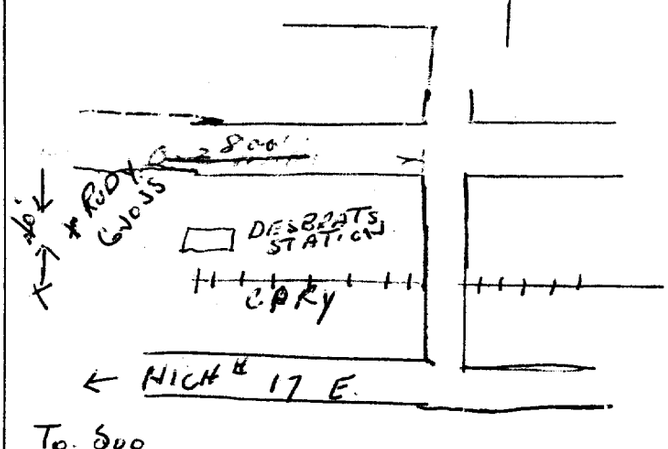
Licence Number 145

I certify that the foregoing statements of fact are true.

Date Aug 18/59 L A Burk
Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

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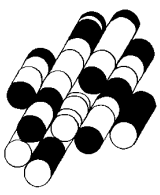
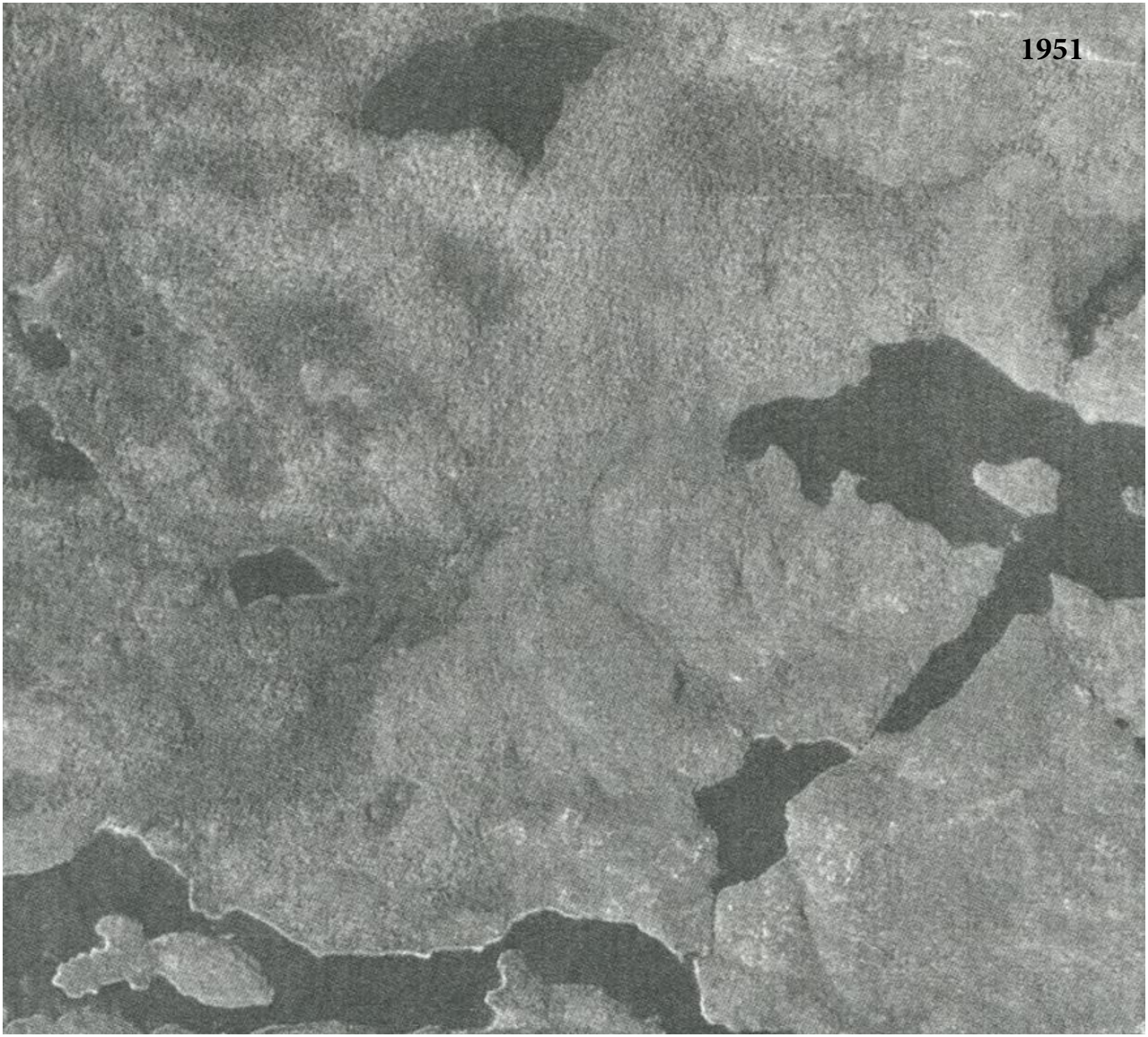
APPENDIX D

TERRAPROBE INC.




1951


1971


1985
Legend
50 m setback
Landfill Site
Google Earth
Image © 2022 CNES / Airbus
Image Landsat / Copernicus
N
400 m


1989


2012
Legend
50 m setback
Landfill Site
Google Earth
Image © 2022 Maxar Technologies
N
400 m


2018
Legend
50 m setback
Landfill Site
Google Earth
Image © 2022 CNES / Airbus
Image Landsat / Copernicus
N
400 m


2019
Legend
50 m setback
Landfill Site
Google Earth
Image © 2022 CNES / Airbus
Image Landsat / Copernicus
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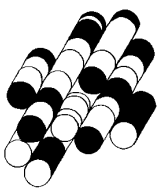
400 m

APPENDIX E

TERRAPROBE INC.



Topographic Map

Legend

- Landfill Site Boundary
- Assessment Parcel with Address

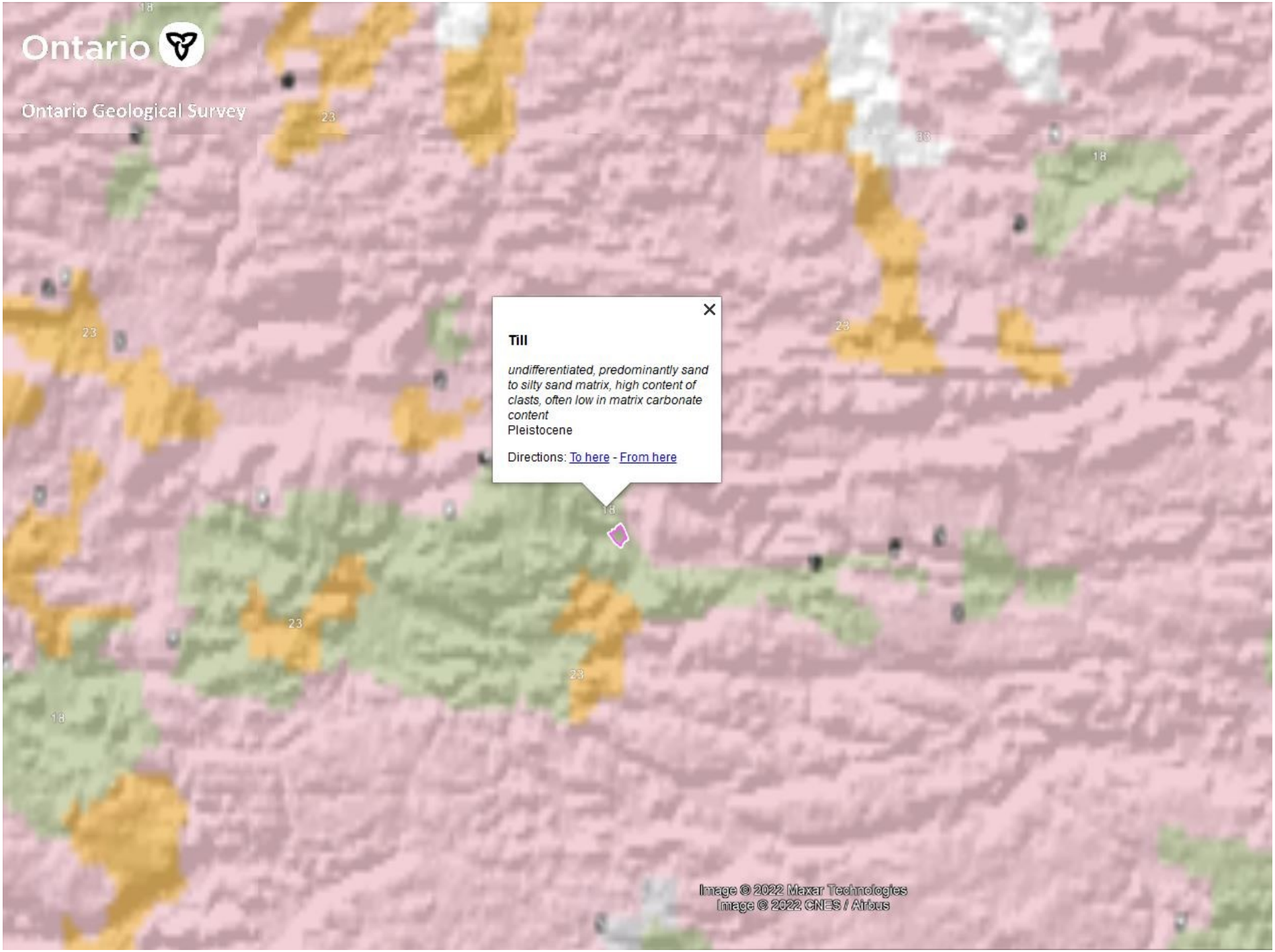
This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Environment, Conservation and Parks (MECP) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.

Map Created: 3/31/2022
Map Center: 46.36814 N, -82.63162 W

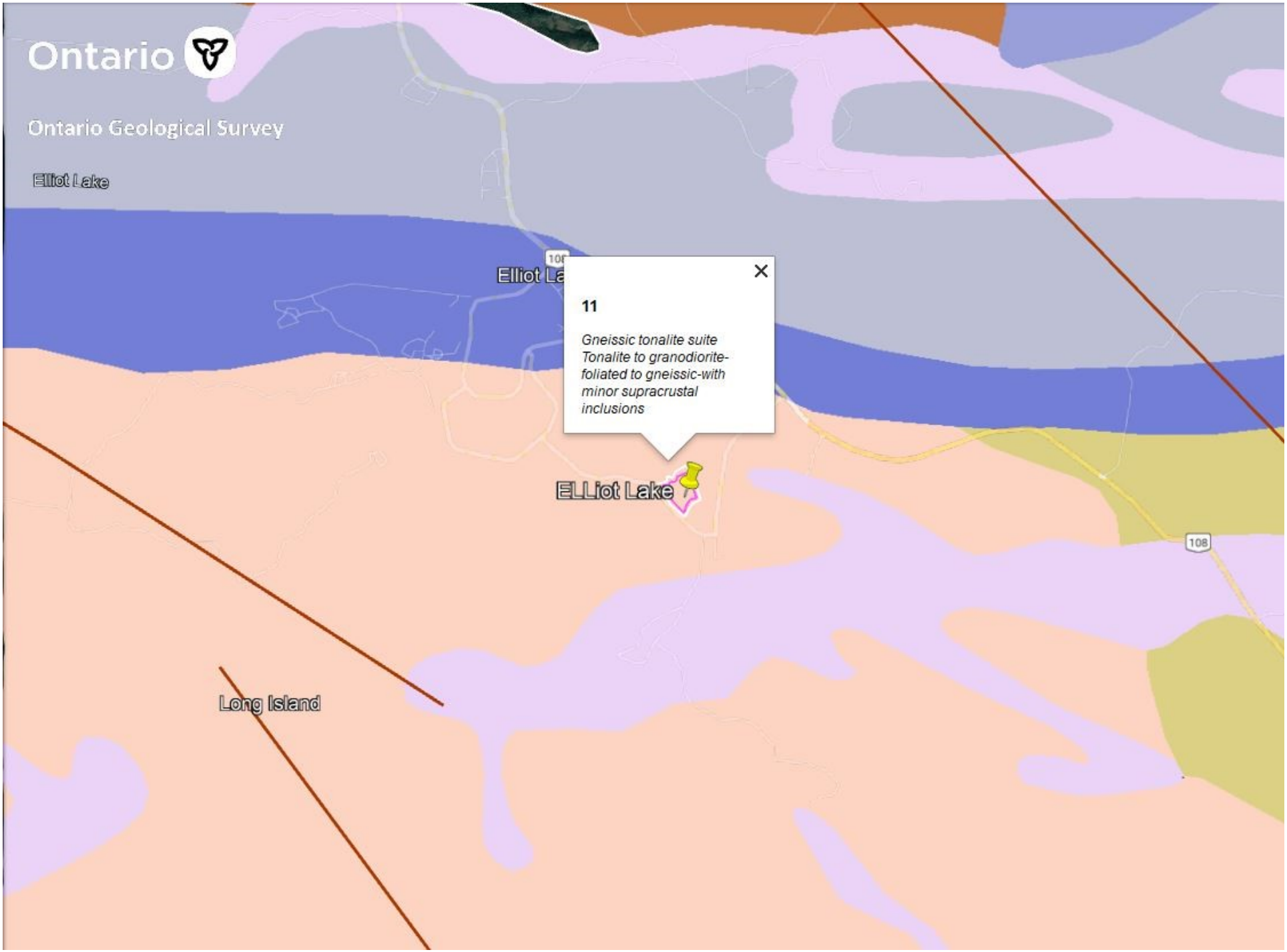
Hydrology


Porridge Lake
Highway-10
Highway-108
N
Leaflet (https://leafletjs.com) | Map data: © OpenStreetMap contributors, SRTM | Map style: © OpenTopoMap (CC-BY-SA) | Oak Ridges Moraine Groundwater Program

Quaternary Geology

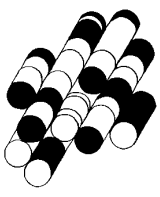


Bedrock Geology



APPENDIX F

TERRAPROBE INC.



Photograph 1

Location:	Entrance to D4 Property
Viewing:	Northeast
Description:	Viewing from the entrance to the Property from Esten Drive North. Esten Drive is a paved road while the entrance to the Property is gravel (based on google maps).

Photograph 2

Location:	D4 Property
Viewing:	South
Description:	Viewing of east side of the Property. Surrounded by trees and bushes. The ground elevation is uneven.

Photograph 3

Location:	D4 Property
Viewing:	South
Description:	Viewing of the central portion of the Property. Accessible by a vehicle.

Photograph 4

Location:	D4 Property
Viewing:	South
Description:	Viewing of the south side of the Property. Left side of the image shows the intersection between Esten Drive North and Pearson Drive. Property covered with several trees, bushes, and a trail road.

Photograph 5

Location:	D4 Property
Viewing:	South
Description:	Viewing of the portion of the Property across Pearson Drive. Property is surrounded by trees and bushes.

Photograph 6

Location:	D4 Property
Viewing:	Southwest
Description:	Viewing of the Property with Pearson Drive. Trees and bushes covering the area.

Photograph 7

Location:	D4 Property
Viewing:	West
Description:	Viewing of the west side of the Property. Pearson Drive is located on the left side of the image. A lot of trees and bushes covering the area.

Photograph 8

Location:	D Property
Viewing:	Northwest
Description:	Viewing of the northwest side of the Property. Higher elevation of land on the northwest side covered with trees and bushes.

Photograph 9

Location:	D4 Property
Viewing:	Northwest
Description:	Viewing of the trial road intersection located on the northside of the Property. Area covered with trees and bushes.

Photograph 10

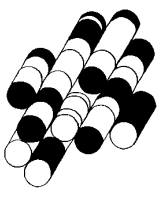
Location:	D4 Property
Viewing:	Northeast
Description:	Viewing of a substation located on the northern side of the Property. Accessible by a trail road connected to Esten Drive North.

Photograph 11

Location:	D4 Property
Viewing:	East
Description:	Viewing of the trail road and entrance towards the Property merging onto Esten Road North.

APPENDIX G

TERRAPROBE INC.



Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

DRAFT
PRELIMINARY
ENVIRONMENTAL IMPACT STUDY
PEARSON DRIVE INDUSTRIAL AREA
ELLIOT LAKE, ONTARIO

Prepared For: City of Elliot Lake
45 Hillside Drive
Elliot Lake, ON P5E 1X5

Attention: Mr. Brad Parsons

File No. 5-09-4009
December 23, 2009

Distribution of Report:

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1 copy - Terraprobe Inc.

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TABLE OF CONTENTS

1.0 INTRODUCTION

Terraprobe Limited was retained by the City of Elliot Lake to conduct a preliminary Environmental Impact Study (EIS) for a proposed new industrial area to be developed near Pearson Drive and Eston Drive in the City of Elliot Lake. The purpose of the study was to identify natural and cultural features in the area, and to assess potential constraints with respect to the proposed industrial development.

2.0 POLICY CONSIDERATIONS

Land development is subject to a variety of Federal, Provincial, and local policies. The following policies were considered in the development of the EIS:

- **Provincial Policy Statement**. The Provincial Policy Statement (Ministry of Municipal Affairs and Housing 2005), provides direction to planning authorities to develop policies for the protection and management of natural heritage features and resources. The Provincial Policy Statement defines the following natural heritage features and provides policies for each:

  - Significant wetlands.
  - Significant habitat of endangered and threatened species.
  - Fish habitat.
  - Significant woodlands.
  - Significant valley lands.
  - Significant areas of natural and scientific interest.
  - Significant wildlife habitat.

  Each of these features is protected according to Provincial guidelines and regulations.

- **Federal Fisheries Act**. The Fisheries Act has provisions that address fish habitat for the purposes of planning applications. Generally, the Act prohibits a harmful alteration, disruption, or destruction of fish habitat.

- **Existing Official Plan or Related Planning Documents**. It is our understanding that the City of Elliot Lake is in the process of developing new planning policy related to the Pearson Drive industrial area. There is no existing planning policy in place for the area.

3.0 SCOPE OF WORK

The scope of work for the study consisted of the following:

- A review of published information to assess the presence of significant natural heritage features.
- Detailed site inspection conducted in June 2009. The purpose of the inspection was to assess general site conditions with respect to existing land use, topography, and natural features.
- Discussions with the City of Elliot Lake regarding the availability of municipal servicing in the area.
- Review of background documentation regarding the presence of a former closed landfill in the area.
- Review of topographic mapping to assess site topography and drainage.
- Review of geologic mapping to assess local and regional geologic features.

A complete list of the references reviewed in the preparation of the study is provided on the accompanying List of References.

4.0 DESCRIPTION OF STUDY AREA

The existing conditions in the study area are described in this section of the report. It is noted that the description of existing conditions is based on a visual site inspection and a review of available published and background information. Detailed studies and surveys were not conducted as part of this preliminary assessment. Further more detailed studies and site assessments are recommended in order to develop detailed planning documentation for the area.

4.1 Site Location and Description

The site is situated in the vicinity of Pearson Drive and Eston Drive in the City of Elliot Lake, as shown on the accompanying Figure 1. The site is an irregular shaped parcel centred along Pearson Drive. It is proposed to utilize the site for industrial development purposes. The site will likely be divided into a number of development parcels or lots. The configuration and nature of the development have not been are not finalized at this time.

The lands immediately to the north and south of the site are generally vacant woodlot and bush. The lands immediately to the east and west consist of single and multiple family residential dwellings.

The following significant existing features are found on the site:

- A former municipal landfill area situated near the northeast portion of the property to the north of Pearson Drive.
- A former shallow lake or marshland area located to the north of the landfill which appears to have been filled.
- A cul-de-sac roadway which runs south from Pearson Drive, and is found near the western portion of the site. The lands around the roadway have been apparently levelled and filled.

Most of the remainder of the site is occupied by undulating bedrock ridges, and mixed deciduous and coniferous forest. A large shallow pond or marsh is found in the central portion of the site, immediately south of Pearson Drive.

4.2 Site Geology and Hydrogeology

The site geology and hydrogeology were assessed on the basis of subsurface investigations which were conducted for the former landfill near the northeast portion of the site, and available geologic mapping.

Much of the site comprises bedrock outcrops of granodorite and medisedimentary rocks. The eastern portion of the site, in the vicinity of the closed landfill, were covered with a mixture of glacial soil deposits. These

deposits are variable in composition but include coarse sand and gravel. The remainder of the area consists of bedrock outcrop, or a thin mantle of glacial drift.

It appears that fill materials have been placed over a number of area of the site. These include the following:

- The former landfill area.
- A former shallow pond or marsh to the northeast of the landfill.
- The cul-de-sac roadway and surrounding areas found at the western portion of the site.

Ground water occurrence is noted in the overburden deposits. Ground water flow in these deposits will generally follow local topography.

4.3 Site Topography and Drainage

Detailed topographic mapping is currently not available for the site. Site topography and drainage conditions were assessed based on 1:10,000 Ontario base mapping, and site inspection.

Site topography is dominated by bedrock knobs and ridges. Elevated bedrock ridges are found particularly on the northern portion of the site, to the north of Pearson Drive, and the western portion of the site, west of the existing cul-de-sac road.

It is noted that site topography has been altered through filling activities associated with the landfill and the cul-de-sac roadway.

The locations of local drainage features are shown on the accompanying Figures 2 and 3. In summary, there are three significant water-related features found on the site:

- Existing shallow pond or marsh to the south of Pearson Drive, near the central portion of the site.
- Water course which flows south and easterly from the pond, parallel to Pearson Drive.
- Water course which flows to the eastern portion of the site, adjacent to the former landfill property.

All of these features appear to be permanent flowing features.

4.4 Aquatic Resources

There are no aquatic resources on or within the immediate vicinity of the site which have been designated as significant natural heritage features. Specifically, Ministry of Natural Resource mapping does not indicate the presence of any significant wetlands, habitat, or areas of natural and scientific interest associated with aquatic habitat in this area.

An inventory of aquatic habitat species was not conducted. It can be expected that the watercourse features on the site provide or contribute to fish habitat.

4.5 Terrestrial Resources

As noted previously, significant areas of the site have been disturbed as a result of previous activities. The undisturbed terrestrial areas of the site are generally covered with mixed forest. A review of Ministry of Natural Resources mapping indicates that there are no areas of significant habitat or areas of natural or scientific interest associated with the terrestrial features on the site.

A detailed inventory of terrestrial features and habitat was not conducted. It can be expected that the site will provide habitat to species common to the area, including a range of birds and mammals.

4.6 Servicing Considerations

Based on discussions with the City of Elliot Lake, it is understood that full municipal servicing is available for proposed development in the area. This includes municipal piped water, sanitary sewers, and electricity.

4.7 Former Landfill Site

There is a former municipal landfill situated on the north side of Pearson Drive near the eastern portion of the site, as shown on Figure 2.

There is little specific information available regarding the development and history of the site. There is no evidence that a Certificate of Approval was issued for the landfill. Based on available information, the site began operation in 1972, and was closed in approximately 1980. The site was a former borrow pit and refuse materials were placed in excavations within the pit. The waste was apparently placed in a scattered and random basis. There is no accurate information available regarding the precise extent or thickness of waste placement.

A study of the closed landfill was conducted by Terraprobe *(Guideline D4 Study, Closed Pearson Drive Landfill, Elliot Lake, Ontario*, October 19, 2009). The study indicates that the landfill does not pose a significant concern with respect to development of an area for industrial purposes, provided a nominal buffer is provided around the landfill boundary. The buffer is required to provide protection against minor leachate or landfill gas related impacts. Recommendations are provided for additional studies to confirm the extent of waste and potential impacts of the landfill.

4.8 Previous Activity

It is evident that there has been previous activity within the site area, in addition to those related to the landfill. In particular, it appears that a shallow pond or marsh once existed immediately to the north and east of the landfill. This feature is evident on Ontario Base Mapping from 1986 (Figure 3). This feature has now been filled. There are an access roadway and several paths and ATV trails which lead through this area.

A cul-de-sac roadway has been constructed to the south of Pearson Drive near the western portion of the site. It appears that the construction involved levelling of the ground and placement of fill. This area is reportedly used for outdoor storage activities.

5.0 DEVELOPMENT CONSTRAINTS

Based on site conditions, a series of potential development constraints were identified. It is noted that these constraints are preliminary, and based on available information. Further more detailed information and inventory will be required to develop final planning policy for the site.

Potential development constraints were considered with respect to the following criteria:

- Aquatic resources.
- Terrestrial resources.
- Site development and servicing considerations.
- Landfill impacts.

A matrix of potential constraints relating to the above factors was developed and is presented below. The potential constraints with respect to each criteria were rated according to the following categories:

- **None**. This indicates that there is no constraint with respect to this category.
- **Low**. This indicates some constraint with respect to the category. The level of constraint is sufficiently low that it can be accommodated without major impact to the planning process. There may be a requirement for minor mitigation measures to minimize impacts.
- **Moderate**. This indicates some constraint will be posed. Mitigation measures will definitely be required to manage the constraint. Mitigation measures must be included as part of development. Mitigation measures may include setbacks, reconstruction or compensation of a feature, or limitations to the nature of development.
- **High**. This indicates a significant level of constraint. This will include exclusion of development from certain areas, or provision of significant setbacks or compensating or control measures.

Potential Constraint	***Level of Constraint***
Aquatic Resource	**Low** - further study required to determine if setbacks or other mitigation is appropriate.
Terrestrial Resource	**Low** - further study required to determine if setbacks or other mitigation is appropriate.
Site Development and Servicing	**Moderate** - presence of filled areas, bedrock outcrop, and rolling topography will increase costs of development
Landfill Impacts	**High** - development generally not feasible within 50 m of former landfill

As noted, a significant portion of the site is subject to moderate to high constraints. These constraints are the result of the following:

- Development will generally be precluded within the landfill area and a zone of 50 m beyond the landfill boundary.
- The presence of bedrock outcrop and steep topography. This will require significant rock blasting and excavation in order to create suitable topography for development.
- The presence of fill areas. The presence of fill areas may pose geotechnical constraints with respect to the construction of buildings.
- Water course and water features. The shallow pond or marsh and water course features potentially provide aquatic habitat. In addition, development within the pond/shallow marsh would require placement of fill, which may pose geotechnical and cost constraints.

6.0 REQUIREMENTS FOR FURTHER STUDY

The available information indicates that there are moderate to significant constraints to development in the site area. In order to fully assess the cost and planning implications of these constraints, the following detailed studies are required:

- Further detailed studies of the landfill area as recommended in Terraprobe's report of October 19, 2009.
- Detailed topographic mapping to assess potential cost constraints related to rock blasting and excavation.
- On-site terrestrial and aquatic biophysical inventory to assess the significance of the water-related features on the site.
- Geotechnical evaluation of fill materials for the cul-de-sac roadway and areas to the northeast of the former landfill. These are required to assess potential constraints of the construction of roads, servicing, and buildings in these areas.

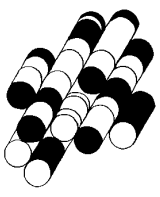
Yours truly,

Terraprobe Inc.

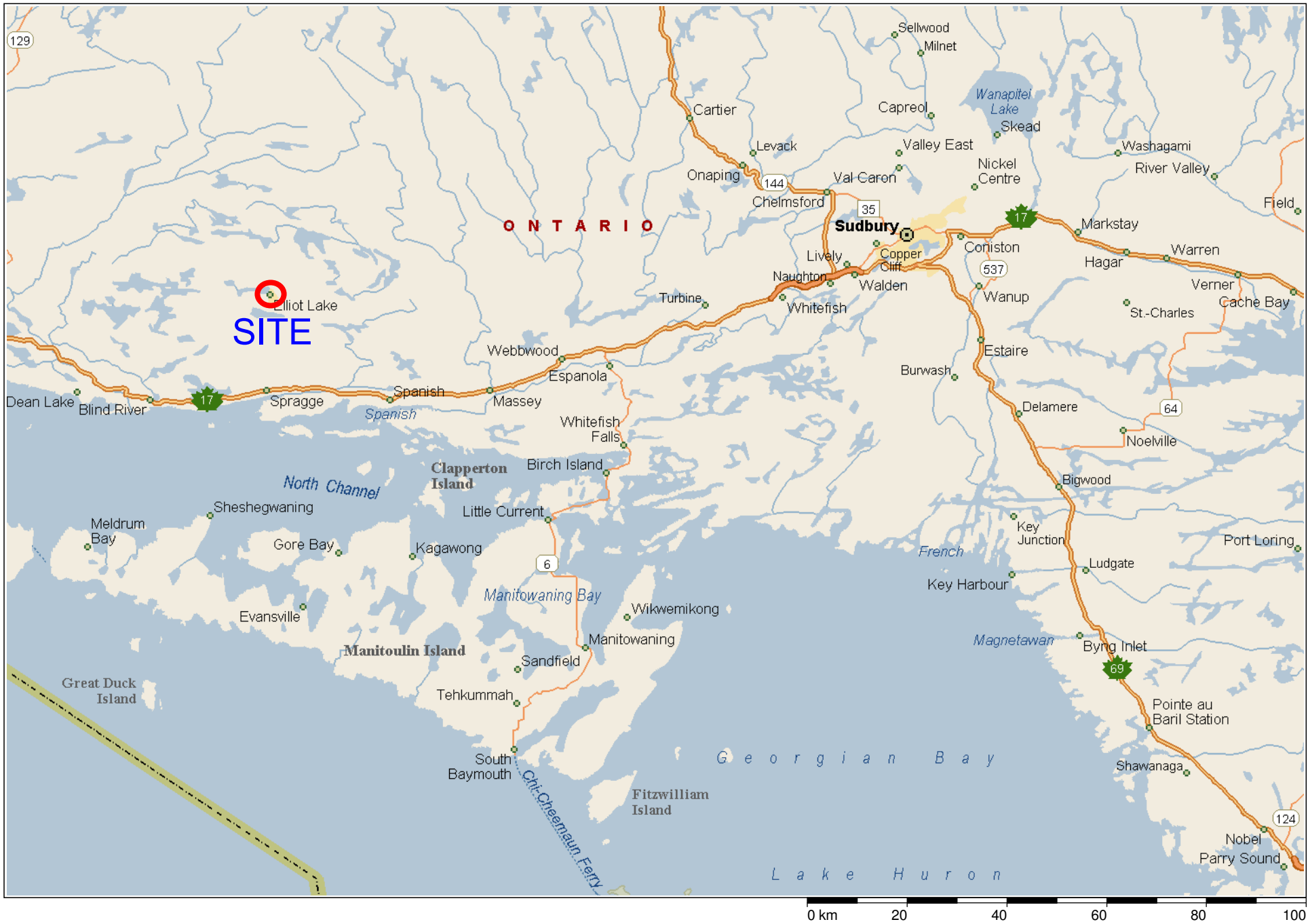
Paul W. Bowen, P.Geo., P.Eng.
Principal

FIGURES

TERRAPROBE INC.



ELLIOT LAKE, ONTARIO



SITE LOCATION PLAN

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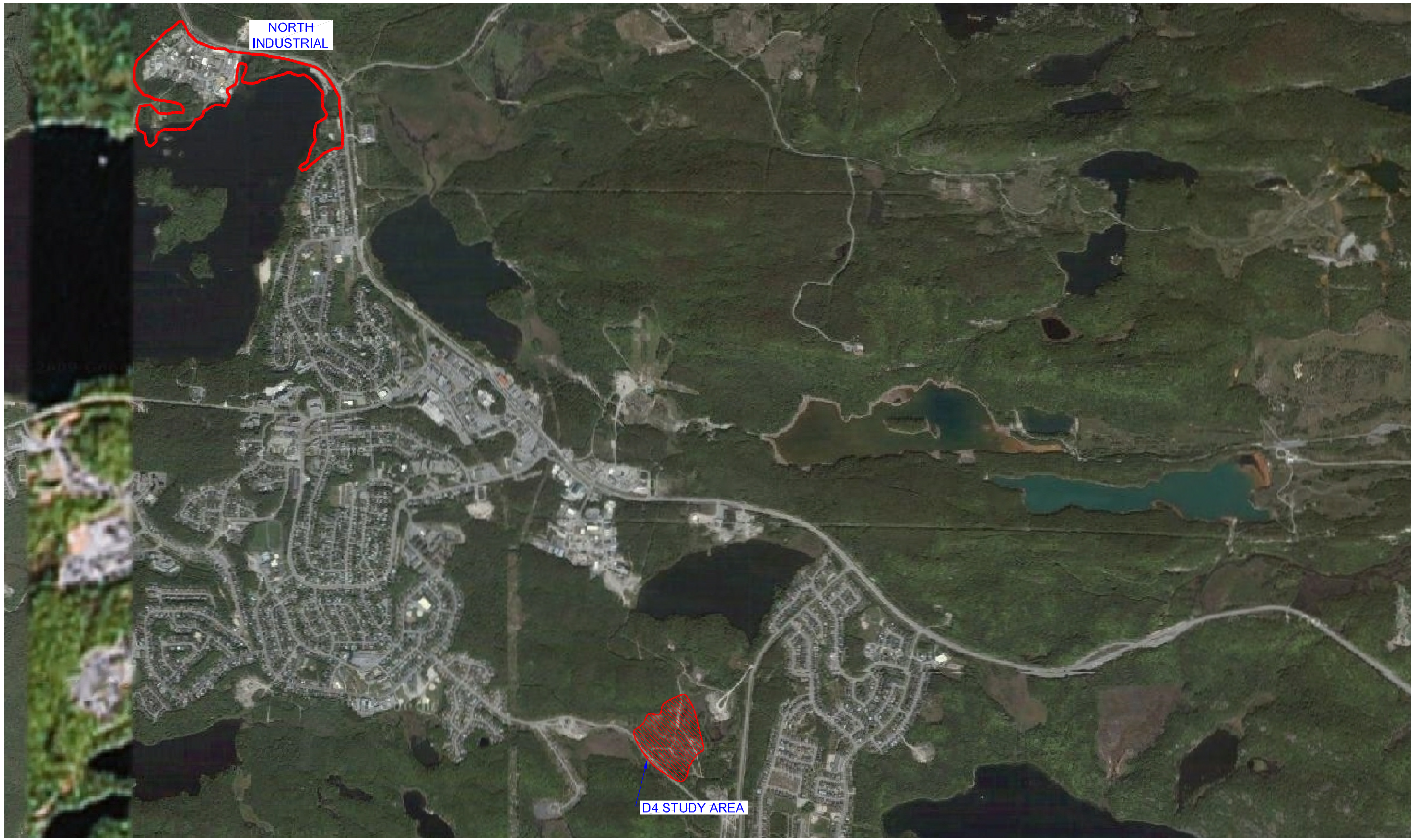
FILE No. 5-09-4009

FIGURE 1



N.T.S.

STUDY AREA - AIR PHOTO

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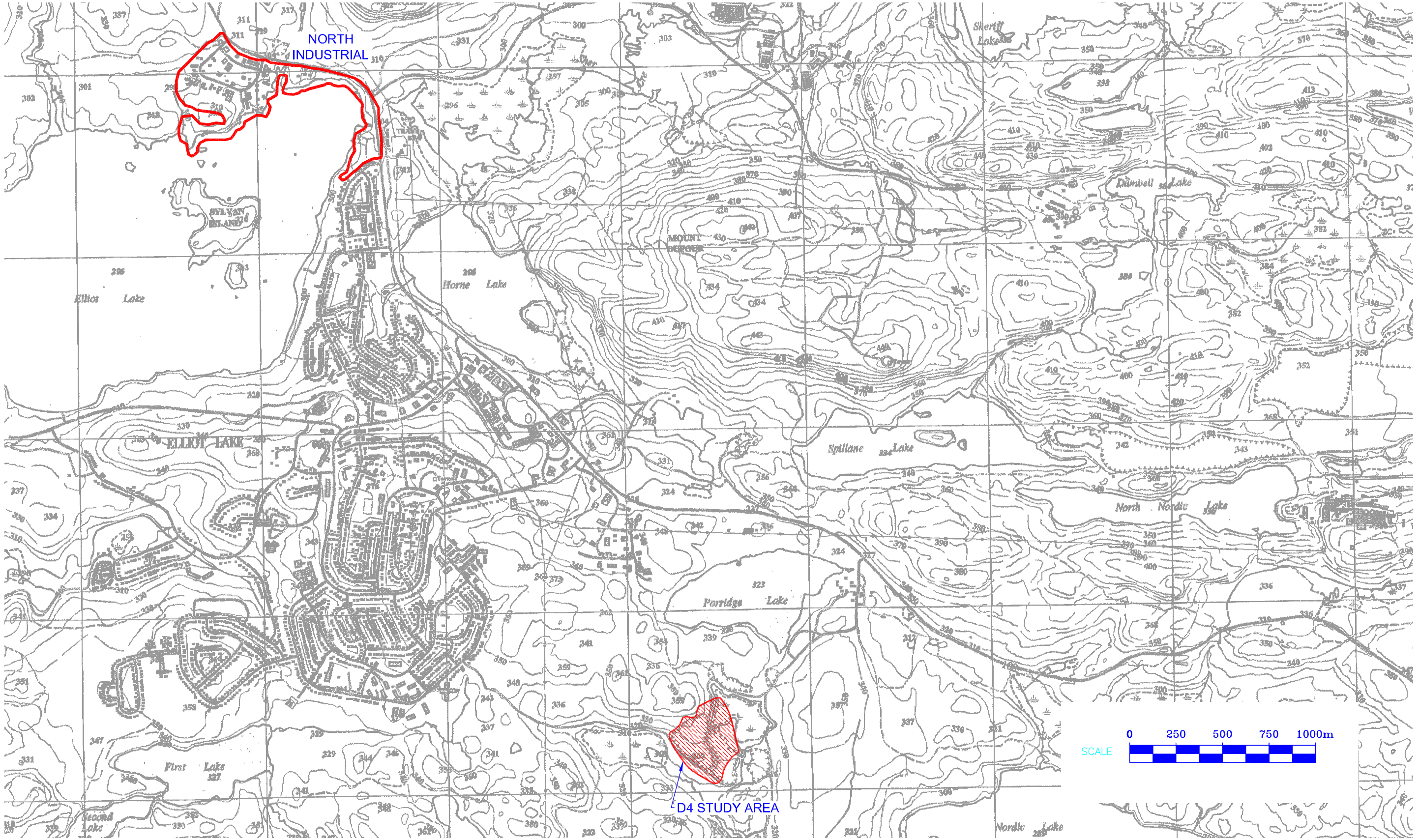
FIGURE 2



STUDY AREA - BASE MAP

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FIGURE 3

N.T.S.

SUMMARY OF POTENTIAL CONSTRAINTS - PEARSON INDUSTRIAL AREA

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FIGURE 4

Z:\Terraprobe Limited\All Projects\2009 Files\Branches\5-09-4009\A. Dwgs. Logic\AutoCAD\FIG 4 PEARSON\5-09-4008 Fig. 4 Pot Constr Pearson.dwg, SANDY

Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Engineering, Inspection & Testing

D R A F T

GUIDELINE D-4 STUDY
CLOSED PEARSON DRIVE LANDFILL
ELLIOT LAKE, ONTARIO

Prepared For: City of Elliot Lake
45 Hillside Drive North
Elliot Lake, ON P5E 1X5

Attention: Mr. Brad Parsons

File No. 5-09-4008
October 19, 2009

Distribution of Draft Report:

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Figures

1.0 INTRODUCTION

Terraprobe Limited was retained by the City of Elliot Lake to conduct a study of a closed landfill site situated near Pearson Drive and Esten Drive. The landfill was in active operation as a municipal landfill between the early 1970's and early 1980's.

The purpose of the study was to determine the potential impact of the closed landfill on proposed industrial development in the area. The impact study was conducted using MOE Guideline D-4 - *Land Use On or Near Landfills and Dumps*.

2.0 SCOPE OF WORK

The scope of work for the study generally consisted of a review of available information and detailed site inspection. The scope of work included the following:

- Review of previous reports prepared for the landfill site while it was in operation. The reports include the results of subsurface investigation and monitoring of ground water quality in the vicinity of the site.
- A review of geologic and topographic mapping for the site.
- A detailed site inspection conducted in June 2009.
- Discussions with the City of Elliot Lake Planning and Engineering staff regarding site history and available background information.
- A review of applicable regulations and guidelines from the Ministry of Environment regarding landfill site closure. Generally, MOE Guideline D-4 - *Land Use On or Near Landfills and Dumps,* provides the basis for the study. This Guideline generally requires consideration of the potential impact of the closed landfill on lands within 500 m of the boundary of the closed landfill area.

A complete list of the documents available for review is provided on the accompanying List of References.

The City of Elliot Lake is proposing to develop lands in the vicinity of the site for a mixture of light industrial purposes. The potential extent of the proposed industrial development area is shown on the accompanying Figure 4. The purpose of the study was to determine the potential impact of the closed landfill on the proposed industrial development of the adjacent lands.

3.0 SITE HISTORY AND DESCRIPTION

3.1 Site Location and Description

The site is located on the north side of Pearson Drive and west of Esten Drive in the City of Elliot Lake, as shown on the accompanying Figure 1. The site is currently vacant and generally covered by sparse brush. The site was formerly used as a municipal landfill site by the Town of Elliot Lake. Based on historic information, the former landfill site activity covers an area of about 6 ha, as shown on Figure 2.

There are a number of small roads and trails through the site, which appear to be used for recreational purposes (e.g. ATVs and snowmobiles).

Most of the site is covered by sparse brush and trees. There is no evidence of significant volumes of exposed refuse found at the ground surface. Locally, there are small volumes of building debris, tires and the like found scattered through the property.

3.2 Site Topography and Drainage

Current topographic mapping is not available for the site. However, the site generally slopes down in a southerly direction. There is a significant bedrock ridge at the northwestern portion of the site. The elevation of the site drops approximately 10 to 15 m to the south toward Pearson Drive. The site topography is hummocky, both as a result of bedrock outcrop and miscellaneous filling activities which have occurred at the site.

The locations of local drainage features are shown on Figure 2. Generally, there is a significant watercourse which flows through the eastern portion of the site and crosses beneath Pearson Drive. There are a number of smaller intermittent watercourses found on the property, in response to the uneven topography. Immediately to the south of the landfill, there is a low-lying marshy area.

3.3 Site Geology

Site geology was assessed on the basis of geologic mapping and the results of subsurface investigations conducted by others (CRA 1980). The locations of boreholes drilled at the site by CRA are shown on the accompanying Figure 3. These investigations indicate that the northern portion of the site generally consists of bedrock outcrops of granodiorite and metasedimentary rocks. The central and southern portion of the property is covered with a mixture of glacial deposits. The glacial deposits are variable in nature, but typically consist of coarse granular material (sand or sand and gravel). There are occasional layers of finer materials such as silt and silty sand glacial till.

The depth to bedrock across the site is highly variable. At the southern portion of the site, in the vicinity of OW1-80, the depth to bedrock exceeds 25 m.

Locally, the site has been disturbed as a result of earth moving activities and the placement of refuse while it operated as a landfill. It appears that the site may have been utilized as a borrow pit, and the excavation may have been filled with refuse. Based on investigations, the thickness of refuse is greatest near the central and northern portion of the site in the vicinity of OW7. In this area, the refuse is approximately 8 m in thickness. Toward the perimeter of the site, the refuse is generally less than 1 m in thickness.

3.4 Site Hydrogeology

The hydrogeologic conditions at the site were assessed on the basis of a study conducted by others (CRA 1980). The study included installation of monitoring well nests at 7 locations at, and around the perimeter of, the landfill. The monitoring was conducted for a short period of time in 1980. The results indicate that ground water flow is generally toward the south (i.e., toward the marsh area and watercourse found to the south and west of the site). It appears that there is a component of shallow ground water discharge which occurs into the watercourse area to the south of the site.

3.5 Site History

Information regarding the history of development and closure of the site was obtained based on discussions with City of Elliot Lake staff, and a review of previous studies conducted by others (CRA 1980).

There is little specific information available regarding the development and history of the site. The site was not operated under an Operation and Management Plan, and there is no evidence that a Certificate of Approval was provided for the landfill.

Based on the available information, the site began operation in approximately May 1972. It appears that the site was formerly a borrow pit and that refuse materials were placed in excavations within the borrow pit. Placement of waste was apparently conducted on a scattered and random basis. No significant burning of the waste was reported.

The site was apparently closed in approximately 1980. At that time, a soil cover was placed over the remaining waste. Reports available from 1980 suggest that a closure plan was developed for the site. The closure plan consists of placing a uniform earth cover over the property area and grading the cover for positive drainage.

The precise volume of waste which was disposed of at the site is not known with certainty. However, based on the site area, and thickness of refuse which was encountered, it is estimated that the volume of waste is less than 100,000 m^3.

The current inspection of the site indicates that the property is somewhat hummocky and uneven. It is not known if a final graded earth cover was placed over the property; however, this is unlikely based on the appearance of the property.

There is no evidence of waste or refuse exposed over the site. Locally, there is evidence of random surface dumping of small piles of debris or waste such as tires. The approximate extent of the waste was determined by CRA in 1980. The determination was based on site inspection and excavation of a number of shallow test pits. The locations of the test pits are shown on the accompanying Figure 3. Based on these studies, the approximate boundary of the waste disposal area, as determined by CRA, is also shown on Figure 3.

3.6 Results of Surface and Ground Water Monitoring

Monitoring of surface and ground water was conducted by CRA in 1980. The monitoring included chemical analysis of soil and ground water samples. The samples were generally analysed for a range of indicator parameters including alkalinity, hardness, chloride, phenols, and COD. Based on this analysis, it was concluded that there was no significant ground water impact associated with the landfill. It is noted that analysis was not conducted for a wide range of parameters including petroleum hydrocarbons or volatile organic compounds. However, there is no evidence in the CRA report that suggests that these were parameters of concern at the time.

It is considered that the most reliable indicator parameters available from the previous studies are chloride, hardness, alkalinity and iron in the ground water. A summary of the range of concentrations of these parameters, as compared to the typical concentration found in landfill leachate, is provided below:

Summary of Ground Water Monitoring Conducted in 1980

Parameter	*Typical Concentration in Leachate*	*Location*						
		OW1-80	*OW2-80*	*OW3-80*	*OW4-80*	*OW5-80*	*OW6-80*	*OW7-80*
Hardness	1,000 to 10,000	119	118	158	109	203	85	653
Alkalinity	500 to 10,000	107	68	101	93	105	77	978
Chloride	300 to 3,000	4	7	29	2	11	10	107
Iron	10 to 1,000	0.64	10	42	1.1	4.0	12	300

Note: all values in mg/ℓ

As noted, the concentration of most of these indicator parameters is low. The highest concentrations are noted in the central portion of the landfill where the refuse is deepest (OW7-80). At the downgradient boundary of the landfill, such as OW1, OW2 and OW3, the concentration of these parameters is significantly less.

On this basis, there is no evidence of significant off-site impact as a result of leachate when the monitoring was conducted in 1980.

3.7 Surface Water Monitoring

Surface water monitoring was conducted in 1980 at locations upstream and downstream of the landfill. The monitoring was conducted in the watercourses found immediately to the south and east of the landfill site. It is noted that, at the time of the sampling in 1980, a sewage treatment plant also discharged into the watercourse to the east. Therefore, it is difficult to interpret the results reliably. However, CRA concluded there was no evidence of significant impact as a result of the landfill occurring in the watercourse.

A detailed site inspection was conducted in June 2009. The inspection included a visual examination of the creek. Typically, leachate impact to surface water bodies is evidenced by significant iron staining or discolouration. There was no evidence of discolouration noted in the watercourse adjacent to, or downstream of, the site.

3.8 Landfill Gas Generation

The presence of combustible landfill gases was monitored in 1980 as part of the ground water and surface water monitoring program. Generally, landfill gas was consistently detected only in the monitors installed directly into refuse (including TH8, TH11, and OW7). Generally the monitors installed at the perimeter of the site (including TH1 through TH6, TH10 and TH12) did not encounter significant concentrations of methane gas. CRA concluded that there were no significant issues with respect to off-site migration of landfill gases based on their study in 1980.

Native soils at the site are often granular, consisting of sand and gravel materials. Similarly, the cover over the landfill appears to be granular, based on surface inspection. In addition, in many areas the waste appears to be thin or absent. These factors permit venting of the landfill gas through the soil materials around the refuse.

4.0 SURROUNDING LAND USES

The existing land uses in the vicinity of the site were examined based on visual inspection and review of aerial photographs. MOE Guideline D-4 requires assessment of potential impacts arising from a closed landfill in areas within 500 m of the landfill boundary. On this basis, the inspection included all of those areas within 500 m of the landfill boundary, as determined from the CRA studies of 1980.

The site location, along with the 500 m buffer zone, is shown on the aerial photograph on Figure 4.

4.1 Existing Land Uses

As noted on Figure 4, the closed landfill site and the immediately surrounding area consists of vacant wooded land. The most significant land uses in the area are shown on the aerial photograph on Figure 4 and include the following:

- Existing municipal roadways (Esten Drive North and Pearson Drive).
- Existing residential developments to the east, primarily along Taylor Boulevard. Most of the dwellings in this area consist of single-family residential dwellings that were constructed in the 1980's. These are located approximately 450 m from the boundary of the closed landfill site.
- Existing residential development to the west. There is existing residential development found on Laurier Road. This development is located approximately 800 m beyond the western boundary of the closed landfill.
- Existing municipal roadway (Senator Place) found to the south of Pearson Drive. It is noted that there is no development in this area, although the area has been used for stockpiling of materials such as asphalt and aggregate.

The boundary of the proposed industrial area is shown on Figure 4. As noted, the landfill site is located within the proposed industrial area; also a significant portion of the proposed industrial area is found within 500 m of the landfill boundary.

4.2 Natural Areas and Wildlife

A review of Ministry of Natural Resource and Environment Canada publications was conducted to assess the status of natural areas within approximately 1,000 m of the site. A review of available documents indicated that there are no environmentally sensitive areas, areas of natural or scientific interest, or other special environmental areas designated within 1,000 m of the site.

A detailed biophysical inventory of the surrounding area was not conducted as part of the scope of work for this study. However, visual inspection generally indicates the following:

- Most of the closed landfill and surrounding areas are covered with a mixture of brush and low-lying marsh areas.
- There has been significant disturbance in the study area through the construction of roadways (Pearson Drive and Senator Place) and tree-clearing activities.
- There are a number of informal ATV and snowmobile trails found throughout the landfill site area. There has been loss of vegetation and disturbance to the natural environment in these areas.

There is a significant marsh area found on the south side of Pearson Drive, immediately west of the enclosed landfill site. The marsh is drained by a watercourse which runs parallel to the south side of Pearson Drive.

A detailed visual inspection of the landfill site indicates there is no significant evidence of impact as a result of landfill leachate or gas generation. Generally, significant gas generation will result in loss of vegetative cover or damage to trees. Similarly, there was no evidence of staining or leachate present in the surface watercourse found immediately to the east of the landfill.

5.0 APPLICATION OF D-4 GUIDELINE

The Ministry of Environment provides guidelines for consideration of land developments situated on or near closed landfill sites. These are presented in MOE Guideline D-4 - *Land Use On or Near Landfills and Dumps*. In summary, the guideline generally requires the following:

- Restriction of land uses within 30 m of the fill area. Typically, no active land use is permitted within 30 m of the fill area.
- Land use within 500 m of the fill area. Land use in this area must consider the potential influence of the closed landfill (including landfill leachate and gas) on future land uses.
- Land use beyond 500 m of the fill area. Typically, land use beyond 500 m of the landfill is considered only in specialized circumstances.

The potential impacts from the landfill site are considered for each of the criteria provided in Guideline D-4.

5.1 Ground Water Impact from Leachate

There has been limited ground water monitoring conducted at the site. Monitoring was conducted in 1980. However, based on these results, there was no evidence of significant off-site impact arising as a result of the leachate from the site. The lack of impact observed at that time was due to a number of factors, including:

- The relatively small volume and thin nature of the waste at the site.
- The relatively high dilution as a result of significant infiltration through the landfill cover and ground water flow through the underlying granular deposits.
- The nature of the refuse which consists mostly of municipal domestic waste.

The site and surrounding area are serviced with municipal piped water. The water is obtained from a lake-based source (Elliot Lake). Elliot Lake is situated approximately 3 km from the site, in an upgradient or upstream direction. The developed areas in the vicinity of the site are serviced with piped municipal water. It is proposed to service the proposed industrial area with piped municipal water. There are no known wells for water supply found in the immediate area. On this basis, the potential risk to ground water supply (for potable water uses) is considered to be low.

5.2 Surface Water Contamination from Leachate

The results of surface water monitoring conducted in 1980 suggest there are no significant landfill-related impacts to local surface water. A visual inspection of surface water features on the site indicates no evidence of staining or other impact to surface water quality.

It appears that a component of local ground water flow may discharge into the surface water in the vicinity of the site. There is no evidence of leachate springs or seeps which drain directly to the surface. Therefore, any ground water discharge to local water courses is likely to be dilute. On this basis, it is concluded that the potential impact of the landfill to local surface water quality is low.

5.3 Landfill Gas Generation

Significant concentrations of landfill gas were noted in monitoring conducted in 1980, near the central portion of the site only. Significant concentrations of landfill gas were not noted at the perimeter of the site. It is likely there is significant natural venting of landfill gas through the granular materials which form the cover of the landfill.

In addition, it is noted that there have been no significant volumes of waste deposited at the site since approximately 1980 (30 years). The potential for significant generation of methane gas is further limited as a result of the age of the waste.

It is expected that there will continue to be generation of landfill gas near the central portion of the site where the waste is thickest. It is expected there will be no significant generation or migration of landfill gas beyond the site boundaries. This is based on the absence of waste from the vicinity of the site boundaries and the granular nature of the local soils.

5.4 Ground Settlement

Ground settlement will occur as the waste degrades and decomposes. The waste is expected to be thin in most areas except the extreme central portion of the site. Given the age of the waste (i.e., generally greater than 30 years), it is expected that there will be no significant future settlement, with the exception of the central portion of the site. This must be considered for future site use or maintenance.

5.5 Vectors and Vermin

There was no evidence of exposed waste at the site. The waste is adequately covered with soil. On this basis, there are no unusual conditions with respect to vectors or vermin (such as gulls, rats, or the like) associated with the site.

5.6 Visual Impact

The site is not operating. There is no waste exposed at the surface with the exception of some small localized areas of random surface dumping. The site does not pose a significant concern with respect to visual impact.

5.7 Summary of Site Impacts

A summary of the potential impacts of the site is provided below. The potential impacts are compared to the following criteria:

- Hazard or impact to human health.
- Degradation of the natural environment.
- Nuisance impacts.

Summary of Potential Impacts

Potential Impact	*Hazard to Human Health*		*Degradation of Natural Environment*		*Nuisance Impact*	
	On-Site	*Off-Site*	*On-Site*	*Off-Site*	*On-Site*	*Off-Site*
Ground Water	low	low	low	low	nil	nil
Surface Water	low	low	low	low	nil	nil
Landfill Gas	low	nil	nil	nil	nil	nil
Settlement	low	nil	low	nil	-	-
Vectors	nil	nil	nil	nil	nil	nil
Visual Impact	-	-	-	-	low	nil

Notes - On-site includes waste disposal area plus 50 m buffer.

In summary, the site does not pose any significant concerns with respect to human health, the natural environment or nuisance-related impacts.

It is noted that this conclusion is based on studies which were conducted in 1980, and a detailed visual inspection of the site. As noted subsequently, it is recommended that additional studies be conducted to confirm this conclusion. Nonetheless, the available information is sufficient for current preliminary planning purposes.

6.0 ADDITIONAL STUDIES

It is recommended that additional studies be conducted to confirm the results of the monitoring conducted in 1980. The additional studies should consist of the following:

- Limited sampling of surface water quality at locations upstream and downstream of the landfill. This will confirm potential impact to local ground water quality. The program will consist of sampling of surface water quality at approximately 6 locations. Surface water samples will be sampled for indicator parameters associated with landfill leachate, including chloride, hardness, alkalinity and volatile organic compounds.

- Assessment of soil cover and extent of waste. There is no reliable information available regarding the final closure of the landfill following the investigations in 1980. Although there is no significant volume of refuse exposed at the surface, the thickness and nature of the soil cover over the landfill is not known. It is recommended that test pits be excavated across the site to confirm the thickness and nature of the soil cover; and to further confirm the extent of the waste.

- Monitoring of landfill gas generation. It is recommended that gas probes be installed in the test pits installed through the landfill cover as noted above. The gas probes should be monitored through the winter months (when the ground surface is frozen) to assess potential landfill gas generation.

7.0 DEVELOPMENT CONSIDERATIONS

Based on the studies conducted to date, the closed landfill site does not pose significant constraints to development on the adjacent lands. Some specialized consideration must be given to development or use of the landfill site itself. The following is a summary of the considerations which must be made for development on and around the site.

7.1 Development on Landfill Site

The approximate boundaries of the landfill site, as determined in the CRA study in 1980, are shown on Figures 2 and 4. As noted previously, further investigation should be conducted to confirm these boundaries. However, the following constraints will generally apply to development on, or within 50 m of, these boundaries:

- The presence of the landfill boundary, and 50 m buffer, should be registered on the title of the land. The purpose of the registration is to ensure that there is warning to future landowners or users regarding the presence of waste materials in this area.
- There should be no active use of the site including the construction of enclosed structures. Generally, the site can be used for passive recreational purposes such as trails, park land and the like.
- Any future grading or excavation activities at the site must consider the presence of waste materials. Generally, the landfill cap should not be removed or disturbed so that the waste materials become exposed.

Depending on expected land use in the area, it may be desirable to conduct site grading activities. For example, site grading could be conducted to level the land so that it is more amenable to park or other uses. In this case, additional investigation should be conducted to confirm the thickness and nature of the soil cover. A fill placement and grading plan must be developed to ensure that the site is properly drained, and that the waste is adequately covered.

It is also possible that, with further detailed studies, the extent of the landfill will be refined. It may be possible to excavate and consolidate the waste materials into a centralized location and permit development within the current closed landfill area. However, based on the availability of undeveloped land in the area, it appears unlikely that this would occur in the near future.

7.2 Development Beyond Landfill Area

The available information suggests there are no significant constraints to development in areas which lie more than 50 m beyond the landfill boundary as shown on Figure 4. The 50 m buffer should provide adequate setback to address any minor impacts with respect to landfill gas generation or the like.

It is recommended that a by-law be developed to prohibit drilling of wells or extraction of ground water within 300 m of the landfill. Although there is no evidence of off-site migration of leachate, this would ensure there are no significant ground water related uses. The by-law could permit use of the ground water in the event that more detailed studies were conducted to assess potential ground water impacts. The detailed studies would consist of installation of monitoring wells and sampling of ground water quality.

8.0 SUMMARY AND CONCLUSIONS

In summary, the results of the study indicate the following:

(i) The landfill site operated between approximately 1972 and 1980. The exact volume of refuse at the site is unknown, however the site occupies an area of approximately 6 ha. The site appears to have received mostly municipal refuse.

(ii) A hydrogeologic investigation of the site was conducted in 1980. At that time, there was no evidence of significant impact of the landfill to local surface water or ground water. Similarly, there was no evidence of migration of landfill gas beyond the site boundaries.

(iii) An inspection of the site conducted in 2009 indicates that there is no significant volume of refuse exposed at the surface. It appears all the refuse is adequately covered with soil. There was no direct visual evidence of leachate or methane gas impact associated with the landfill.

(iv) It is emphasized that detailed studies of the site have not been conducted since 1980. It is recommended that some additional site investigation be conducted to confirm the extent of waste, thickness of cover, and the potential impacts to surface water in the area..

(v) It is expected there will be no significant development of the landfill site itself. Under current conditions, the landfill site could be used for passive park purposes such as walking trails, playing fields and the like. The construction of any significant or enclosed structures on the landfill would require further more detailed studies. Similarly, any site grading or excavation activities at the site will require the preparation of detailed studies. The purpose of these studies would be to ensure that the waste is not inadvertently exposed, and that the activities do not create any significant hazard with respect to landfill gas or leachate migration.

(vi) Based on the available information, the landfill does not pose a significant concern with respect to development of the surrounding properties for industrial uses. It is recommended that a nominal 50 m buffer be established around the landfill boundary to provide protection against any minor leachate or landfill gas-related impacts.

(vii) It is recommended that the boundary of the landfill site be surveyed and that the presence of the waste material be registered on title of the property. In addition, a caution should be issued which would limit development or land uses within 50 m of the site boundary. The caution should include a requirement to prepare a work plan for any excavation or development work within the 50 m buffer zone. The work program should address the potential that there may

be waste present within these areas, or minor leachate or landfill gas impacts which must be considered.

(viii) It is recommended that a by-law be developed to prohibit drilling of wells or extraction of ground water within 300 m of the landfill. Although there is no evidence of off-site migration of leachate, this would ensure there are no significant ground water related uses. The by-law could permit use of the ground water in the event that more detailed studies were conducted to assess potential ground water impacts. The detailed studies would consist of installation of monitoring wells and sampling of ground water quality.

(ix) The closed landfill does not pose any significant constraints to development of areas more than 50 m from the landfill boundary, for light industrial purposes.

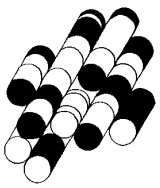
Yours truly,

Terraprobe Limited

Paul W. Bowen, P.Geo., P.Eng.
Principal

FIGURES

TERRAPROBE LIMITED



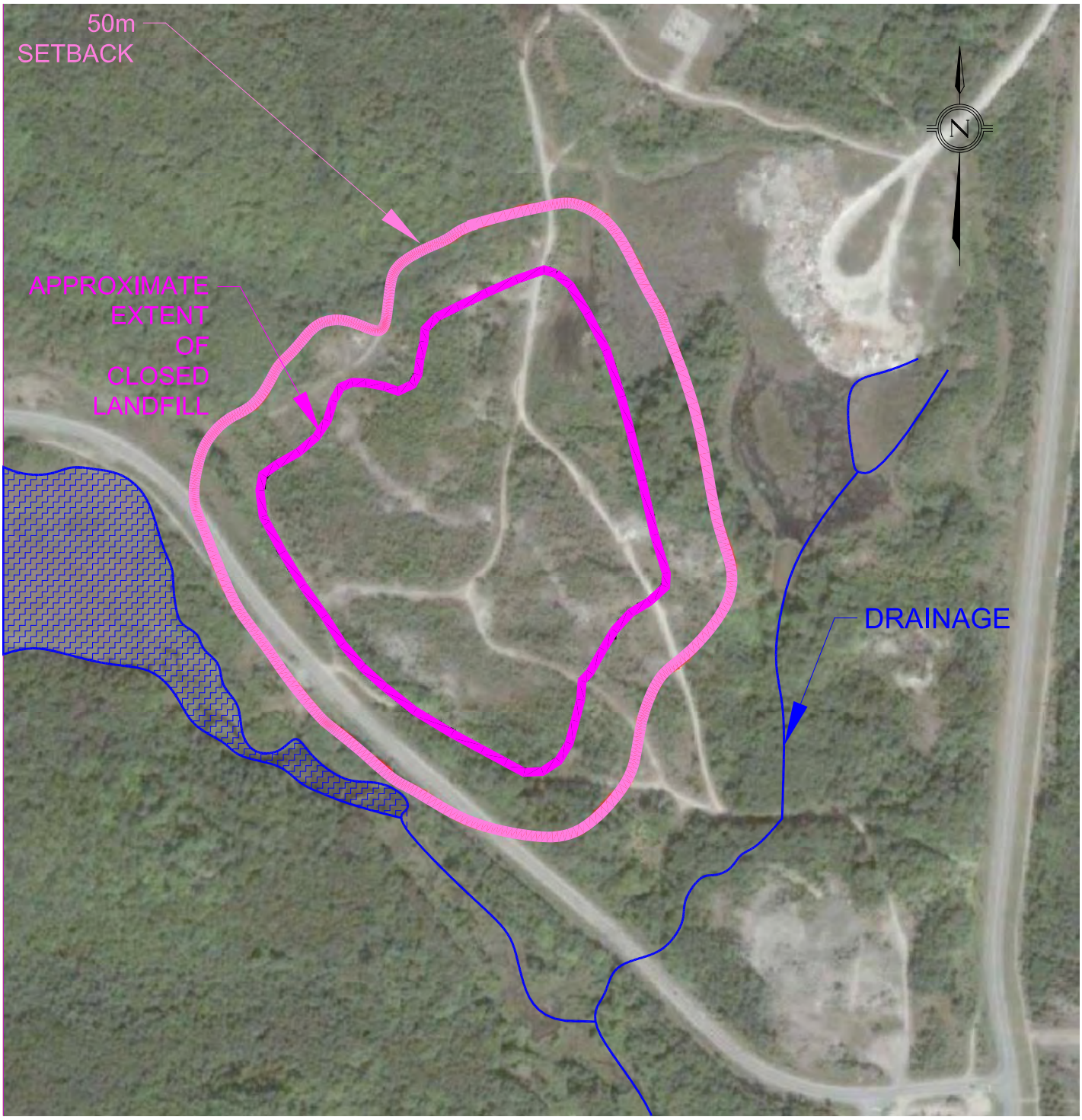
N.T.S.

SITE LOCATION PLAN

TERRAPROBE

File No. 5-09-4008

FIGURE 1



N.T.S.

SITE PLAN

TERRAPROBE

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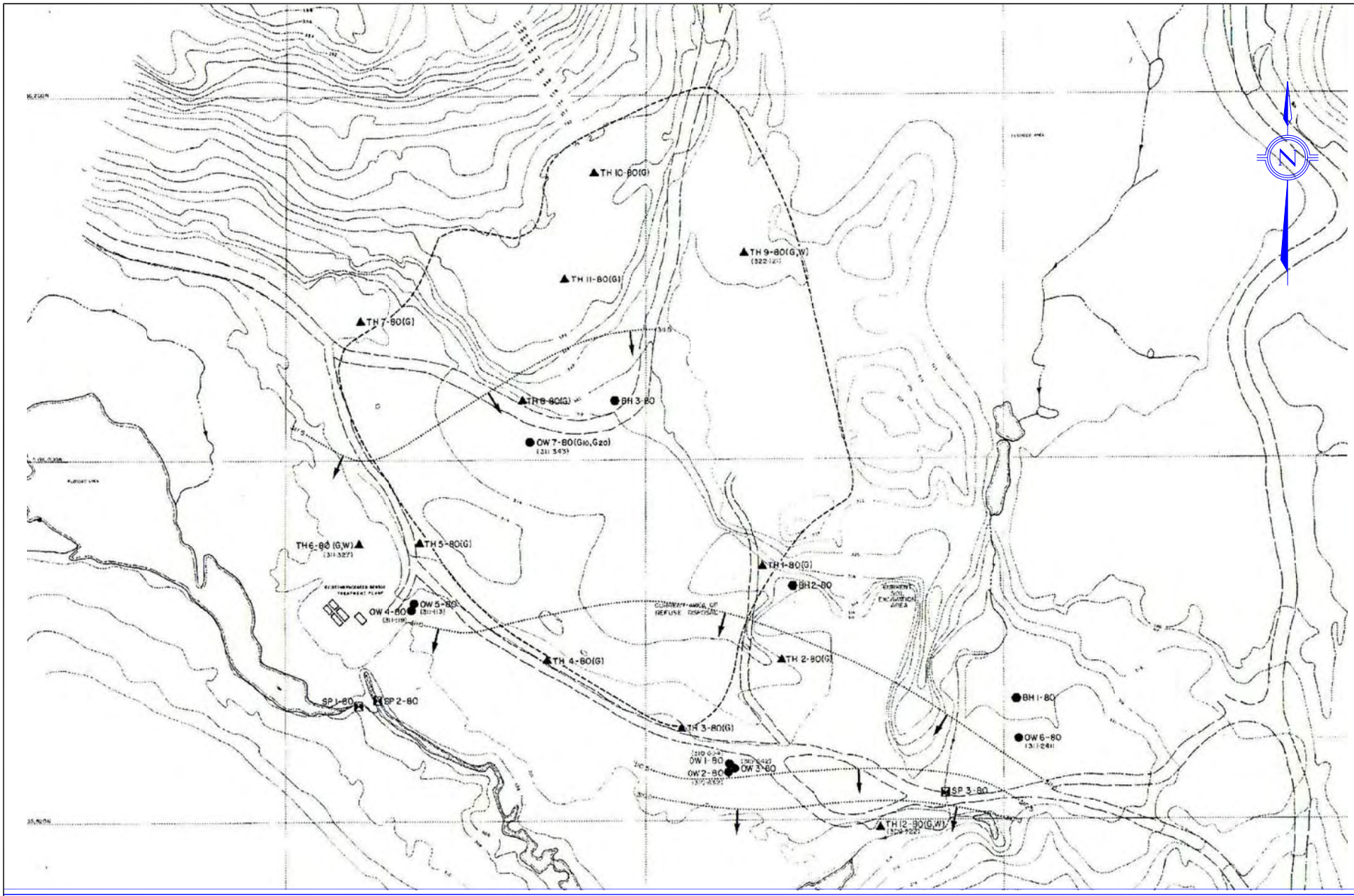
FIGURE 2



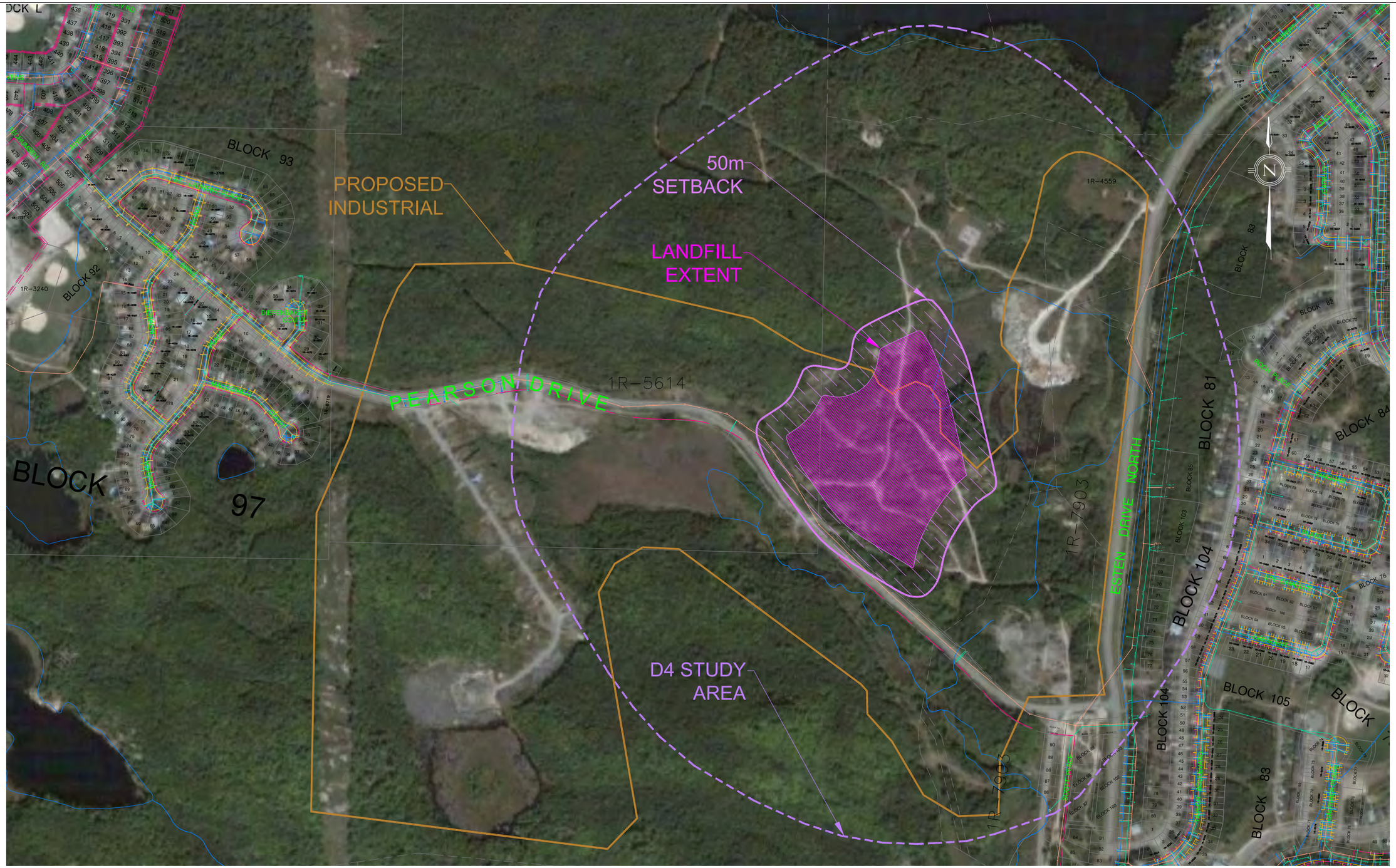
PREVIOUS STUDIES - APPROXIMATE LANDFILL BOUNDARY

N.T.S.

TERRAPROBE

File No. 5-09-4008

FIGURE 3



N.T.S.

D4 STUDY AREA

TERRAPROBE

File No. 5-08-4008

FIGURE 4