Hydrogeological Assessment: Onsite Sewage System

Proposed Commercial Development
1533 McAdoo's Lane
Kingston, Ontario

Prepared For: American Iron and Metal

Table of Contents

1. Introduction 1
2. Purpose and Scope 1
3. Project Details 2
4. Site Conditions 2
   - 4.1 General 2
   - 4.2 Topography 2
   - 4.3 Physiography 2
   - 4.4 Geology and Soils 3
   - 4.5 Description of Surface Water Features 3
   - 4.6 Source Water Protection 3
   - 4.7 Subsurface Exploration 3
     - 4.7.1 Groundwater 4
     - 4.7.2 Hydraulic Conductivity Testing 4
     - 4.7.3 Estimated Percolation Rates 4
5. Hydrogeology 4
   - 5.1 General 4
   - 5.2 Existing Local Water Supplies 5
   - 5.3 Property Water Supply 5
6. Impact Assessments 6
   - 6.1 Nitrate Assessment 6
   - 6.2 Phosphorus Impact Assessment 7
7. Conclusions and Recommendations 7
   - 7.1 Waste Disposal System 7
   - 7.2 Signatures 9
8. References 10
9. Statement of Limitations 11

Figure Index

Figure 1	Vicinity Plan
Figure 2	Site Plan
Figure 3	Concept Plan
Figure 4	Test Hole Plan
Figure 5	Regional Topography
Figure 6	Physiography
Figure 7	Surficial Geology
Figure 8	Quaternary Geology
Figure 9	Bedrock Geology
Figure 10	Wetlands

Table Index

Table 5.1: Summary of Water Well Records 5

Appendix Index

Appendix A	Borehole Logs and Soils Data
Appendix B	MECP Well Records

1. Introduction

This report presents the results of a hydrogeologic assessment that was completed by GHD Limited (GHD) for American Iron and Metal (the Client) for the lands located at 1533 McAdoo's Lane, Kingston, Ontario (the Site). The hydrogeologic assessment was completed pertaining to the construction of a new sewage treatment system for a proposed 1-storey slab-on-grade building of a proposed auto scrap yard. The Site encompasses 6.6 hectares (16.4 acres) of land and presently supports mini-golf, go-kart track, batting cages and a drive-in theatre. The surrounding properties are privately serviced for water and septic and consist of a gravel pit, horse racing track and mixture of residential, commercial and undeveloped properties.

The location of the Site relative to nearby roads and watercourses is illustrated on the Vicinity Plan, Figure 1. Mapping of the area showing the local topography and additional details of the area are shown on the Site Plan, Figure 2. Additional figures are discussed throughout this report.

2. Purpose and Scope

The purpose of the hydrogeologic assessment was four-fold:

1. Define the prevailing hydrogeologic conditions at the Site including subsurface soil stratigraphy, shallow groundwater movement, and local hydrochemistry;
2. Assess the groundwater supplies based on water well records;
3. Evaluate the suitability of the planned land use and assess anticipated impacts on existing and adjacent groundwater resources within the study area; and,
4. Carry out engineering analyses to assess the potential impacts and provide appropriate recommendations for the Site.

To accomplish the foregoing purposes, the following scope of work has been carried out:

I. Reviewed available background information from previous work completed at the Site such as geologic, physiographic and water resources reports and maps.

II. Inventoried well record data on file with the Ministry of the Environment, Conservation and Parks (MECP) for the immediate area to determine some of the physical characteristics of the aquifer complexes that underlie the region.

III. Conducted a walkover inspection of the Site reviewing surficial ground characteristics and surface water features.

IV. Explored the subsurface soil conditions by digging, sampling and logging fourteen (14) test holes across the Site to evaluate the soil and groundwater conditions. Piezometers were not installed as part of this investigation.

V. Carried out laboratory analyses of materials encountered including grain size and moisture content.

VI. Prepared this hydrogeologic assessment report including an impact assessment.

3. Project Details

Based on information provided by the Client, the proposed sewage treatment system is to serve a proposed commercial building and scrap metal yard with a daily design sewage flow of 4,700 litres per day (L/d) based on information provided by the Client. The proposed septic would be a raised tile bed and situated in close proximity of the building in the northeast area of the Site near McAdoo Lane.

This report assesses the potential impact from the proposed subsurface tile beds.

4. Site Conditions

4.1 General

The field methodology consisted of a site inspection and a soils exploration investigation. The site inspection was conducted on April 29, 2020 to observe the general surficial characteristics and was complimented by a subsurface exploration program consisting of fourteen (14) test holes. The test hole locations are illustrated on the Test Hole Plan, Figure 4. A detailed log of each hole was maintained and representative samples were collected. Soil samples were inspected in the field for soil type, texture, colour and relative moisture content.

Laboratory testing conducted on representative soil samples consisted of moisture content on all recovered soil samples and grain size distribution analyses on four (4) samples including hydrometers on two (2) of these samples. The test pit logs are presented in Appendix A.

4.2 Topography

Regional topography mapping is provided on Figure 5. This area generally consists of rolling topography with grade sloping in a south to southwest direction.

4.3 Physiography

The Site is situated within the physiographic region known as the Napanee Plain (Chapman and Putnam, 1984). The Napanee Plain is a flat-to-undulating plain of limestone from which the glacier stripped most of the overburden. While the soil is only a few inches deep over much of the region, some deeper glacial till occurs in the stream valleys and toward the north where this region borders on the Dummer Moraines.

The local physiography of the Site is predominantly limestone plains with a smaller portion of the Site within a clay plains as illustrated on Figure 6.

4.4 Geology and Soils

Surficial geology mapping on Figure 7 indicates the Site is comprised of Paleozoic bedrock and bedrock-drift complex. The Quaternary geology is presented on Figure 8 and indicates the Site is underlain by bedrock of undifferentiated carbonate and clastic sedimentary rock, exposed at surface or covered by a discontinuous, thin layer of drift.

The bedrock of this area, as shown on Figure 9, is comprised of limestone of the Ottawa Group / Simcoe Group of the Shadow Lake Formation. The limestone is shallow and from the Middle Ordovician period. The Site is also within an area of inferred karst topography.

4.5 Description of Surface Water Features

No natural surface water bodies or other permanently ponded water was observed on the Site. The nearest surface water body is the Little Cataraqui Creek Reservoir to the west about one (1) kilometre. The Little Cataraqui Creek Reservoir is considered a Provincially Significant Wetland as shown on Figure 10, Wetlands.

4.6 Source Water Protection

The Site is situated within a Highly Vulnerable Aquifer area due to the shallow overburden overlying the bedrock. There are no other source water protection considerations identified.

4.7 Subsurface Exploration

The exploration program encountered a thin veneer of overburden over bedrock. Generally, the soils consisted of a surficial layer of topsoil, over sandy gravel fill or native clayey silt underlain by limestone. The topsoil layer ranged from about 150 to 760 mm in thickness. This soil was observed to be in a damp, loose state with silt and gravel and high organic content. As such, it is expected to be devoid of any structural engineering properties.

Fill material was observed at the surface in test pit TP-06 and immediately beneath the topsoil in test pits TP-02, TP-03, TP-04, TP-07 and TP-13. Where encountered the fill extended to the full depth of investigation where bedrock refusal was encountered. The fill generally consisted of brown sandy gravel, with silt and clay, and was noted to exist in a moist in-situ state.

Moisture content tests conducted on samples of the fill yielded values ranging from 9% to 29% moisture by weight. Grain size distribution analyses conducted on representative samples of the fill suggests the following compositional ranges: 35 to 63 % gravel, 24 to 50 % sand, and 13 to 15 % silt and clay-sized particles. A hydrometer analysis conducted on one of these samples suggest that the fill contains 11 % silt size particles between 2 and 75 μm in size and 4 % clay size particles.

A layer of clayey silt was encountered beneath the topsoil in test pit TP-05 and extended to the full depth of investigation where bedrock refusal was encountered. The clayey silt observed appeared brown in colour and consisted of clayey silt with sand.

Moisture content of a sample of the clayey silt yielded a value of 29 % moisture by weight. A grain size distribution analysis conducted on a representative sample of the clayey silt suggests the following composition: 0 % gravel, 21 % sand, and 79 % silt and clay-sized particles. A hydrometer analysis conducted on this sample suggests that the silty clay contains 42 % silt size particles between 2 and 75 μm in size and 37 % clay size particles.

Bedrock refusal was encountered in all of the test pits at depths ranging from surface to 1.5 m. The shallow bedrock was weathered and became hard with depth. No fractures or cracks were observed by GHD in the exposed bedrock at surface and it is interpreted that extensive karst topography is not encountered at the surface at this location. If additional confirmation is required, bedrock coring should be carried out to depth at the Site.

4.7.1 Groundwater

Based upon the ground surface topography, the shallow groundwater flow direction is inferred to be towards Little Cataraqui Creek Reservoir. The contours of the shallow groundwater table normally approximate the ground surface topography flowing perpendicular to those contours. It should be noted that shallow groundwater levels are transient and tend to fluctuate seasonally and during periods of precipitation.

Groundwater seepage was observed in three (3) test pits (TP-02, TP-05 and TP-13) at depths ranging from 0.8 to 1.5 m. Groundwater conditions within the bedrock were not assessed as part of this investigation.

4.7.2 Hydraulic Conductivity Testing

Hydraulic conductivity testing was not completed due to insufficient water encountered within the test holes. Based on the laboratory soil data, it is estimated that the sandy gravel fill material would have a hydraulic conductivity estimated to be on the order of 10^{-1} to 10^{-3} cm/sec. The native clayey silt material has an estimated hydraulic conductivity on the order of 10^{-5} to 10^{-6} cm/sec.

4.7.3 Estimated Percolation Rates

Based on the laboratory soil data, it is estimated that the sandy gravel fill material has an estimated percolation rate on the order of 4 to 12 min/cm. The native clayey silt is estimated to have a percolation rate on the order of 35 to 50 min/cm.

5. Hydrogeology

5.1 General

Information regarding groundwater characteristics of the immediate area was obtained from an inventory of well records on file with the MECP. Eleven (11) water well records were identified. Two (2) of those records were for monitoring wells. The MECP well records and their approximate locations are provided in Appendix B.

5.2 Existing Local Water Supplies

The area is privately serviced for water with individual wells. All of the wells in the MECP well records were drilled. Bedrock was encountered in each of the supply wells at an average depth of 1.1 m (3.7 feet). The groundwater was generally described as "fresh" in the well records reviewed. A summary of the MECP well record data is presented in Table 5.1.

Table 5.1: Summary of Water Well Records

Total Number of Wells Inventoried:	11
Dug / Bored Wells:	0
Drilled Wells (Overburden):	0
Drilled Wells (Bedrock):	9 (82%)
Monitoring Wells:	2 (18%)

Parameters	Statistical Summary	
	Drilled – Bedrock	
WELL YIELDS Range Average	0 – 90.8 L/min 36.8 L/min	0 – 20 gpm 8.1 gpm
REPORTED YIELDS	Frequency	
Not Reported Dry 0 to 1 Igpm 2 to 4 Igpm 5 to 9 Igpm ≥10 Igpm	2 1 0 2 2 4	18% 10% 0% 18% 18% 36%
STATIC WATER LEVELS Range Average	0 – 28.3 m 10.6 m	0 – 93 feet 34.7 feet
WATER ENCOUNTERED Range Average	7.6 – 40.5 m 17.8 m	25 – 133 feet 58.5 feet
WELL DEPTH Range Average	18.1 – 54.3 m 31.4 m	59.5 – 178 feet 103.2 feet

Notes: Data based on MECP well record information (see Appendix B). L/m represents litres per minute, gpm indicates gallons per minute and m is metres.

5.3 Property Water Supply

Currently there are no wells on the Site.

Based on the MECP well records for this area, a drilled well constructed by a licensed contractor in accordance with Ontario Regulation 903 of the Ontario Water Resources Act will be required. The proposed well should be located upgradient of the proposed septic field. A minimum 15 m clearance is required from the drilled well and the new sewage system. A properly constructed well is not anticipated to be impacted by the proposed septic system. A well should be installed and tested at the Site early in the development process to ensure a reliable and safe source is available.

6. Impact Assessments

A conceptual site plan was provided to GHD by the Client and was used to estimate the daily design sanitary sewage flow for the facility. It is understood that the proposed building is to consist of office spaces, four (4) washrooms and cafeteria areas. GHD modelled the daily design sanitary sewage flow based upon warehouse occupancy as per Ontario Building Code Table 8.2.1.3.B including:

- Warehouse – 4 water closets at 950 L per water closet = 3,800 L / day; and
- Warehouse – 6 loading bays at 150 L per loading bay = 900 L.

In total, the Site will has a daily design sanitary sewage flow of 4,700 L based upon the warehouse scenario. Based upon our correspondence with the Client, the facility will employ 20 staff and expect up to 140 customers per day for scrap metal and parts. It is our opinion that 4,700 L/day appears to be reasonable for septic design flow.

6.1 Nitrate Assessment

A conventional septic system is proposed for the development. Nitrate dilution calculations were completed to assess the potential impact on downgradient receptors. The following assumptions were used in the nitrate impact calculations:

- Nitrate in the septic effluent is estimated to be on the order 40 mg/L;
- The dilution area is assumed to be 6.6 ha (the area of the Site);
- The estimated recharge rate is assumed to be 200 mm/year; and
- Estimated septic effluent flow of 4,700 L/day.

The following equations were used to predict the potential impact to the shallow groundwater:

(1) $V_A = A_D \times k$

(2) $V_T = V_A + V_S$

(3) $C_{PB} = (C_S \times V_S) / V_T$

Where:

V_A = annual dilution volume (m^3);
A_D = dilution area (m^2);
V_T = total volume of water (m^3);
V_S = annual sewage volume (m^3);
C_{PB} = concentration at Site boundary (mg/L);
C_S = concentration in sewage (mg/L);
k = 0.2 m/year (annual dilution precipitation rate)

The following are Site specific values based upon the concept plan:

A_D =	66,000 m^2	Infiltration area based upon area of the Site
V_A =	13,200 m^3	Annual dilution volume
V_S =	1,716 m^3	Loading of an average of 4,700 L/day
V_T =	14,916 m^3	Total water volume

C_S =	40 mg/L	40 mg/L nitrate in septic effluent
C_{PB} =	4.60 mg/L	Nitrate concentration expected at Site boundary based upon calculations

Using dilution only, the nitrate concentration generated from sewage at the Site is calculated to be 4.60 mg/L. This is well below the ODWS value of 10 mg/L. As such no impact to the groundwater supply is expected from a nitrate perspective based upon the information provided above.

6.2 Phosphorus Impact Assessment

The main source of phosphorus loading from the proposed development would be associated with the septic effluent. Chemical precipitation, which is considered to be "permanent" removal, in calcareous soil results in a 50% removal rate of phosphorous. Adsorption in the tile bed fill material can also assist the removal of phosphorus.

The distance between the proposed tile bed location and the nearest permanent water body is estimated to be about one (1) kilometre. As per Chapter 22: Large Subsurface Sewage Disposal Systems, a separation distance of 300 m between the area of sewage infiltration and the surface water body should be sufficient to ensure that there are no appreciable detrimental effects to surface water quality. Best practices should also be considered such as the use of phosphorus free products (soaps, cleaners, fertilizers etc.) and monitoring of the tile bed for potential breakouts.

It is our opinion that phosphorous loading from the septic will be minimal and attenuated in a relatively short distance.

7. Conclusions and Recommendations

Supporting data upon which our recommendations are based, have been presented in the foregoing sections of this report. Based on the results of our investigation, it is our professional opinion that the Site is suitable for the proposed system.

7.1 Waste Disposal System

Based on the results of this assessment, it is our professional opinion that the Site requires a fully raised septic system bed. Fill will be required and drainage patterns and storm drainage will be re-directed and controlled as part of the stormwater management plan.

It is recommended that the septic system use a fully raised absorption trench leaching bed. The waste disposal systems should meet Ontario Regulation 350/06 made under the Building Code Act, 1992. GHD understands that the design of the septic system will be completed by others. The following design features should be considered:

1. Organics should be stripped from the area of the leaching beds and downgradient mantle.
2. The exposed subgrade below the tile bed should be trimmed and scarified, and provided with a gentle slope of 0.5% in the direction of the mantle.
3. The tile bed should be constructed as a fully raised leaching type bed to the full height of at least 1 m above existing grade. The raised bed should consist of clean, granular fill capable of providing an in-place percolation rate (T-time) of 4 to 8 min/cm. The bottom of the leaching bed trench shall be not less than 900 mm above the high water table or bedrock.
4. The mantle should be constructed along the downgradient margin of the raised bed. The mantle should extend along the full width of the bed and for a minimum of 15 m downgradient from the bed. The mantle should consist of similar granular fill raised to a minimum of 250 mm above the surrounding grade. Surface runoff should be diverted away from the leaching bed by means of proper site drainage.
5. The waste disposal system should be kept clear of surface drainage swales, roof leader drains, and other sources of surface water.
6. The tile bed should be kept away from shade trees and a healthy cover of vegetation should be developed and maintained over the bed to promote evapotranspiration.
7. When sighting the tile bed on sloping ground, it is recommended that procedures outlined in the Building Code be followed closely.
8. Minimum set back distances from septic tank (plus 2 times height raised):
   - Building – 1.5 m
   - Drilled well – 15 m
   - Property line – 3 m
   - Open water course – 15 m
9. Minimum set back distances from septic tile bed (plus 2 times height raised):
   - Building – 5 m
   - Drilled well, properly sealed – 15 m
   - Open water course – 15 m
   - Property line – 3 m
   - Shallow well – 30 m
10. The layout, design and construction of the waste disposal bed should be subject to inspection by experienced hydrogeologic personnel.

Minimal impacts are expected to groundwater related to the aquifer conditions and downgradient surface water quality as a result of the proposed septic system provided it is properly constructed and utilizes mitigation techniques to minimize the potential for impact. Karst topography is not anticipated based upon our visual observations and hard bedrock below the weathered layer.

As such it is our professional opinion that a septic system can be installed and have no significant impact on the nearest receiving surface water bodies or the local aquifers that supply wells in the area.

7.2 Signatures

The following signatures are provided of GHD staff that prepared and conducted the hydrogeological assessment. Mr. Nyle McIlveen, a Qualified Person within the meaning of the Environmental Protection Act and associated Regulation 153/04, has provided his opinion based on the information provided in this report. Following the References section of this report is the Statement of Limitations. These limitations are an integral part of this report. Should questions arise regarding any aspect of our report, please contact the undersigned or our office.

Sincerely,

GHD

Jason Geraldi, M.Sc., C.Chem., CISEC

Robert Neck, M.Eng., P.Geo. (Limited)

Nyle McIlveen, P.Eng.

/JG/bn/nmc/1

8. References

Chapman and Putnam, 1966. The Physiography of Southern Ontario, 2nd Edition. University of Toronto Press.

Chapman and Putnam, 1984. The Physiography of Southern Ontario, 3rd Edition. Ministry of Natural Resources.

Freeze, R. Allan and Cherry, John A. 1979. Groundwater.

9. Statement of Limitations

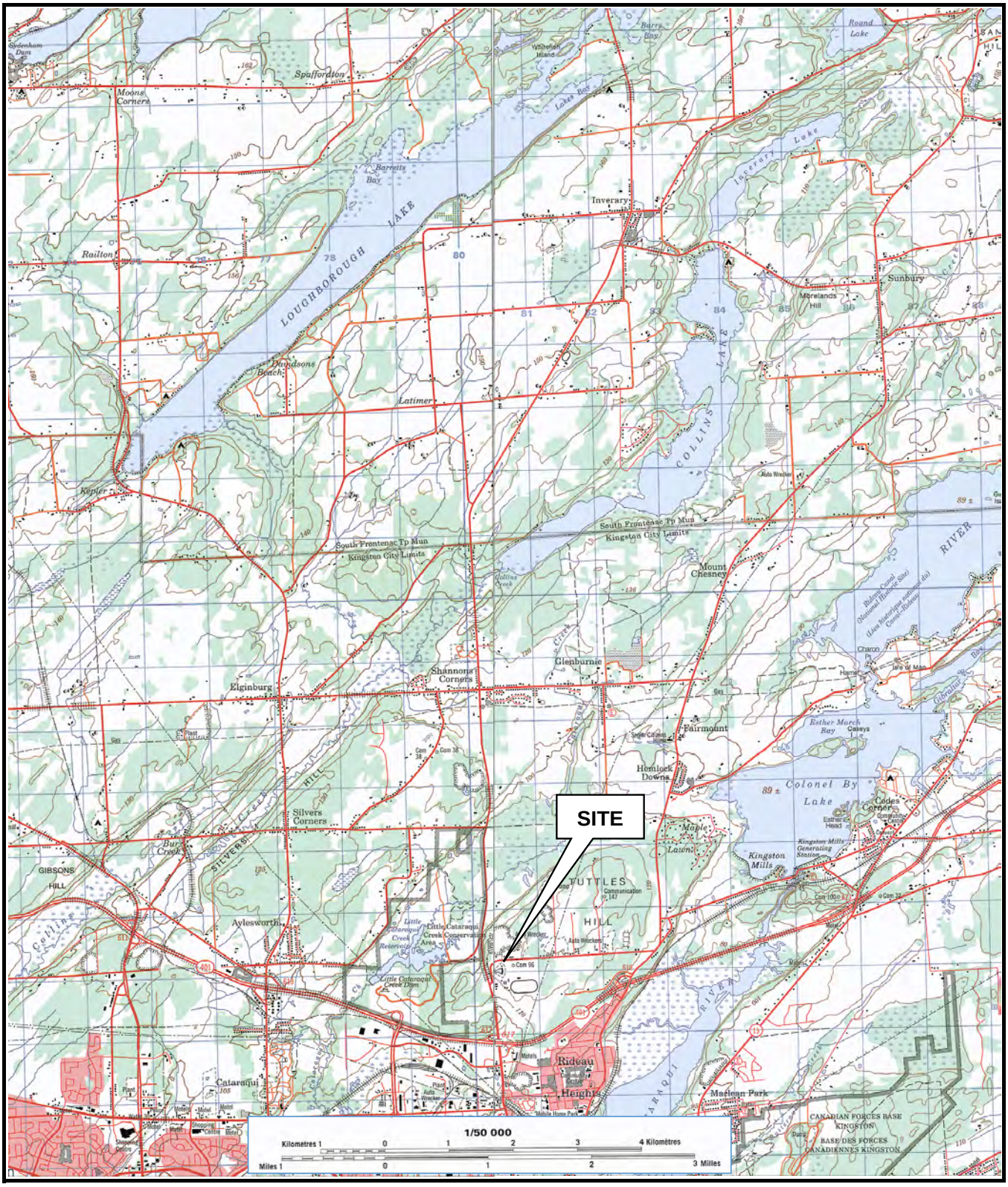
This report is intended solely for American Iron and Metal in assessing the hydrogeological aspects of the property described as 1533 McAdoo's Lane, Kinston, Ontario and is prohibited for use by others without GHD's prior written consent. This report is considered GHD's professional work product and shall remain the sole property of GHD. Any unauthorized reuse, redistribution of or reliance on the report shall be at the Client and recipient's sole risk, without liability to GHD. Client shall defend, indemnify and hold GHD harmless from any liability arising from or related to Client's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

The recommendations made in this report are in accordance with our present understanding of the project, the current site use, ground surface elevations and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with that level of care and skill ordinarily exercised by members of hydrogeological engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

All details of design and construction are rarely known at the time of completion of a hydrogeological study. The recommendations and comments made in the study report are based on our subsurface investigation and resulting understanding of the project, as defined at the time of the study. We should be retained to review our recommendations when the drawings and specifications are complete. Without this review, GHD will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based on the results obtained at the borehole locations only. The subsurface conditions confirmed at the borehole locations may vary at other locations. The subsurface conditions can also be significantly modified by the construction activities on site (ex. excavation, dewatering and drainage, blasting, pile driving, etc.). These conditions can also be modified by exposure of soils or bedrock to humidity, dry periods or frost. Soil and groundwater conditions between and beyond the test locations may differ both horizontally and vertically from those encountered at the test locations and conditions may become apparent during construction which could not be detected or anticipated at the time of our assessment. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations. If changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by GHD is completed.

Enclosures



Base map complied from Centre for Topographic Information Maps 31 C/7 published 2001 and 31 C/8 published 2000.

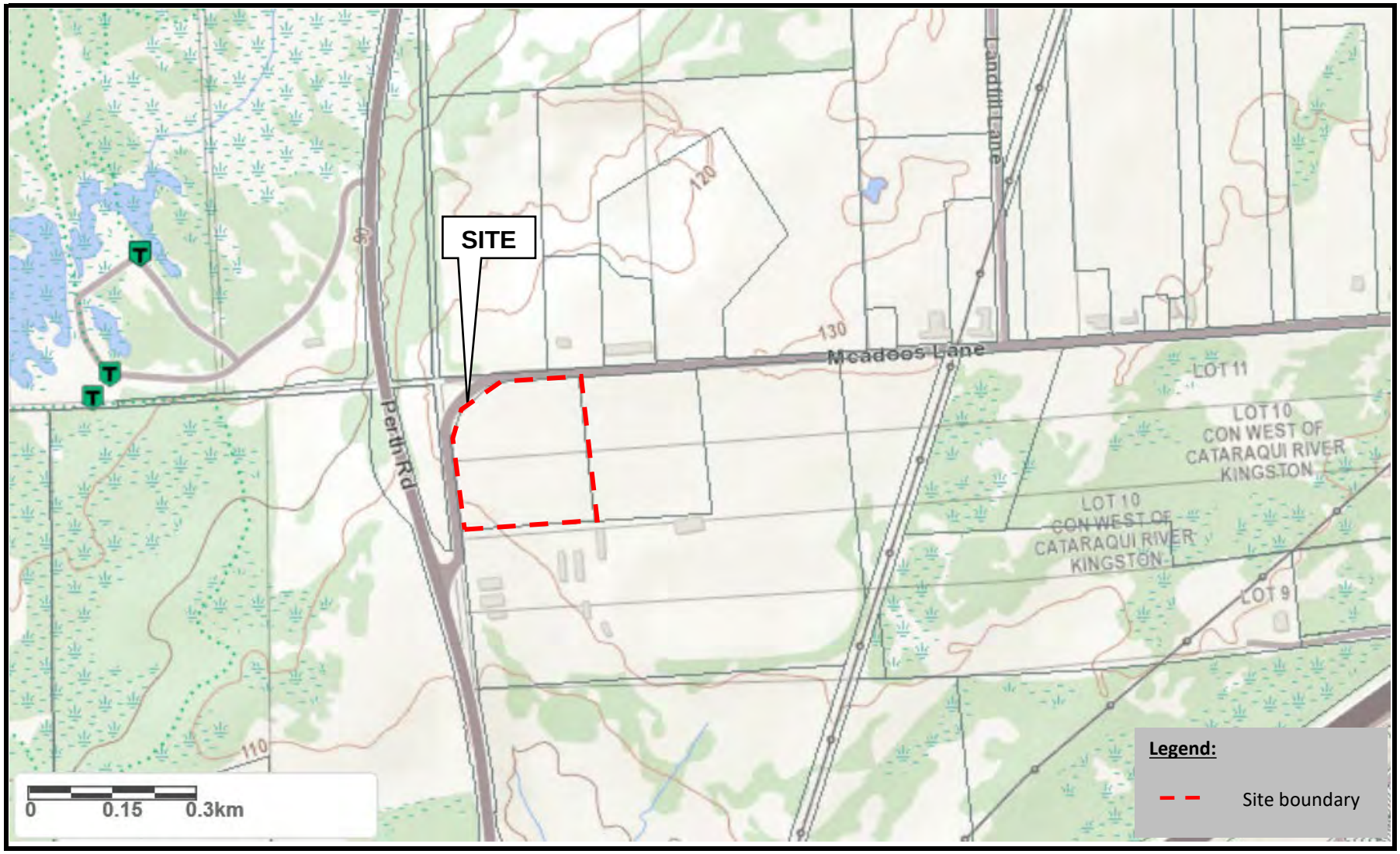
Scale:
Refer to Scale Bar
Coordinate System
NAD 1983 UTM
Zone 18

American Iron and Metal
1533 McAdoo's Lane, Kingston, ON
Hydrogeologic Assessment

11212206-01
June 2020

Vicinity Plan

FIGURE 1



Source: Ministry of Natural Resources and Forestry. © Queen's Printer for Ontario, 2020. Note: Property boundary is not a legal survey.

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Coordinate System:
NAD 1983 UTM Zone 18

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Hydrogeologic Assessment

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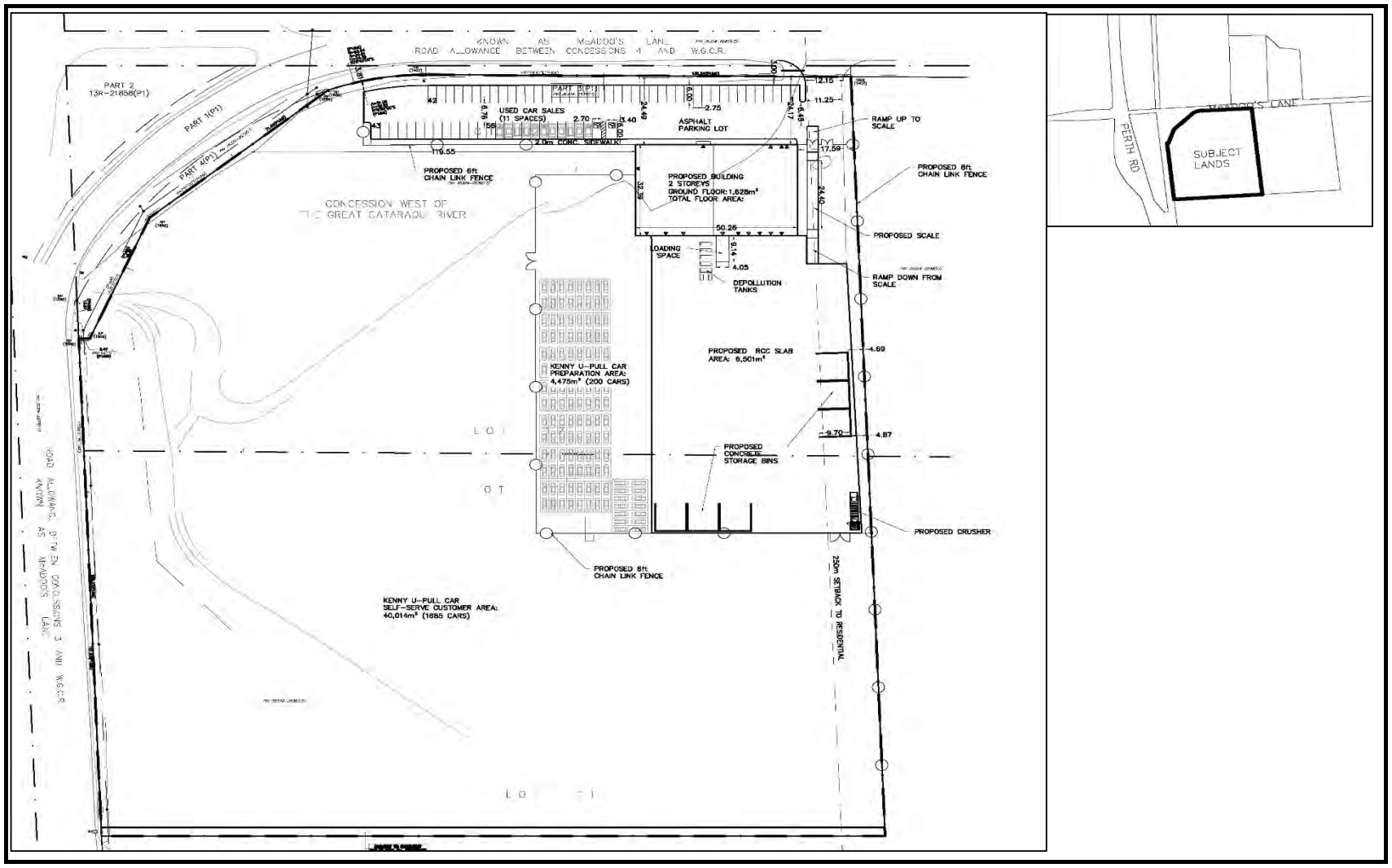
June 2020

Site Plan

FIGURE 2



Source: Site Development Plan designed by E. Derkacz. Dated February 2020.

Scale:
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Coordinate System
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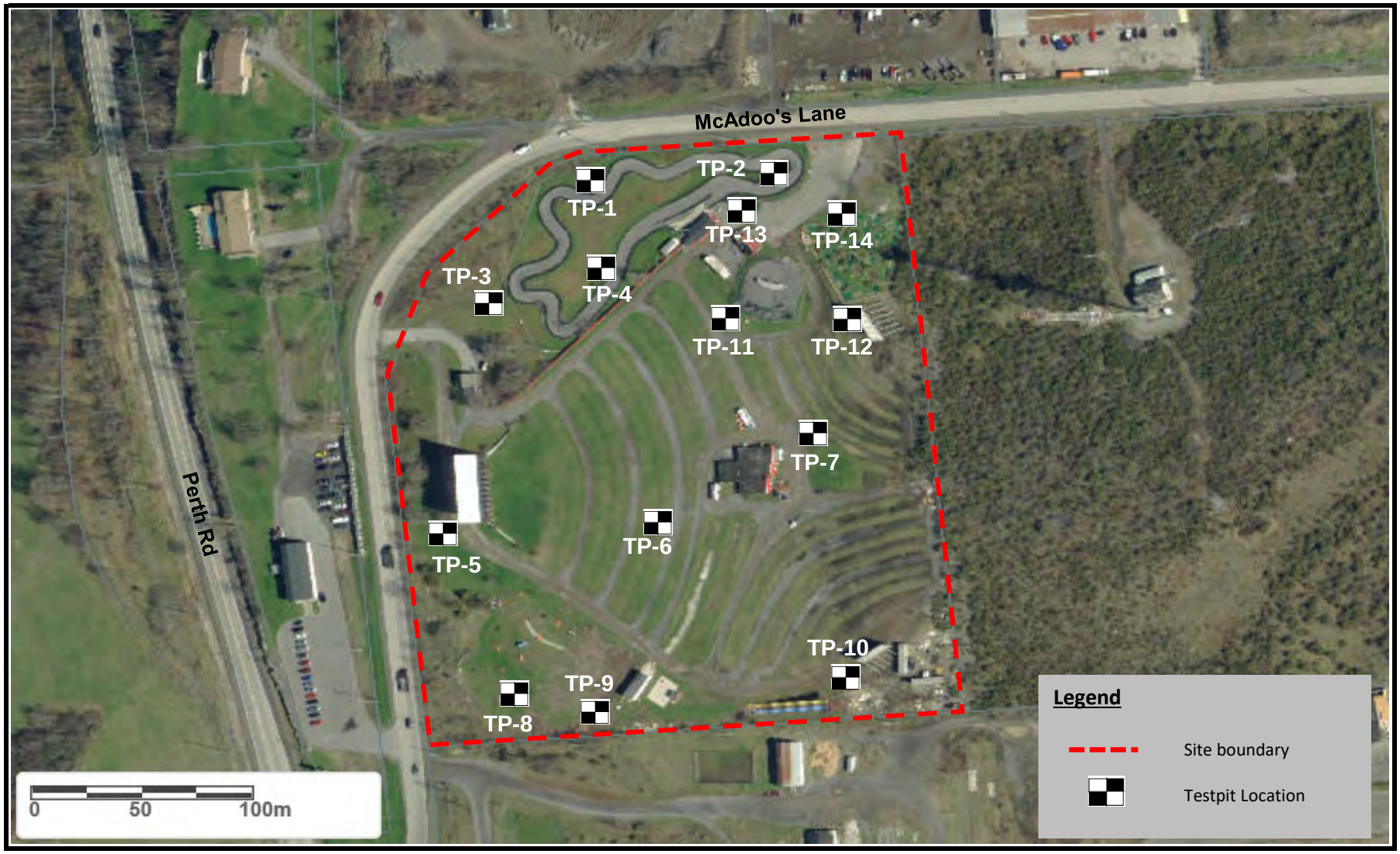
June 2020

Concept Plan

FIGURE 3



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Scale:
Refer to Scale Bar
Coordinate System:
NAD 1983 UTM Zone 18

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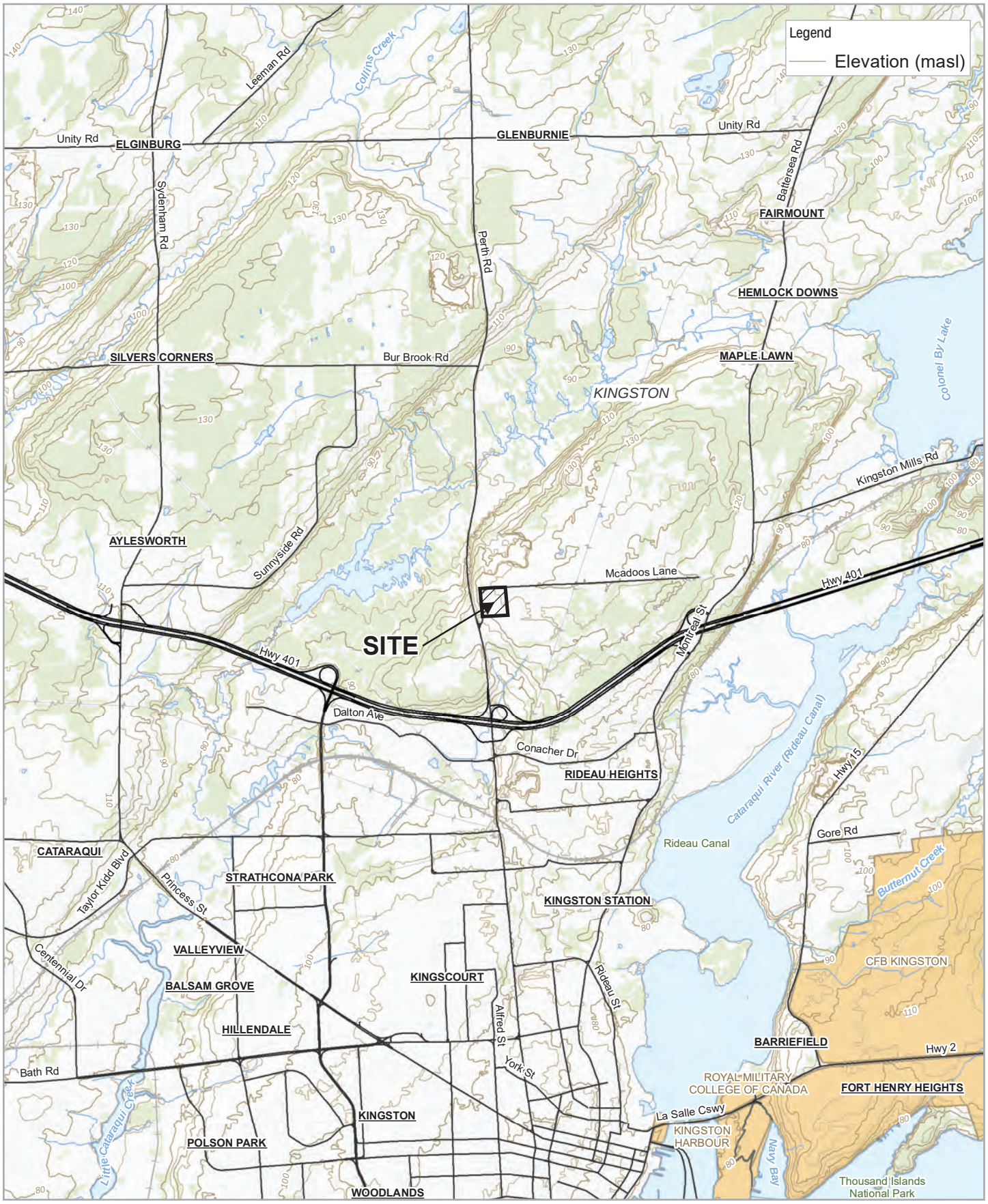
Test Hole Plan

FIGURE 4



Paper Size ANSI A

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Meters

Map Projection: Transverse Mercator
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Grid: NAD 1983 UTM Zone 18N

N

GHD

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1533 MCADOO'S LANE, KINGSTON, ON

Project No. 11212206
Revision No. -
Date June 2020

REGIONAL TOPOGRAPHY

FIGURE 5

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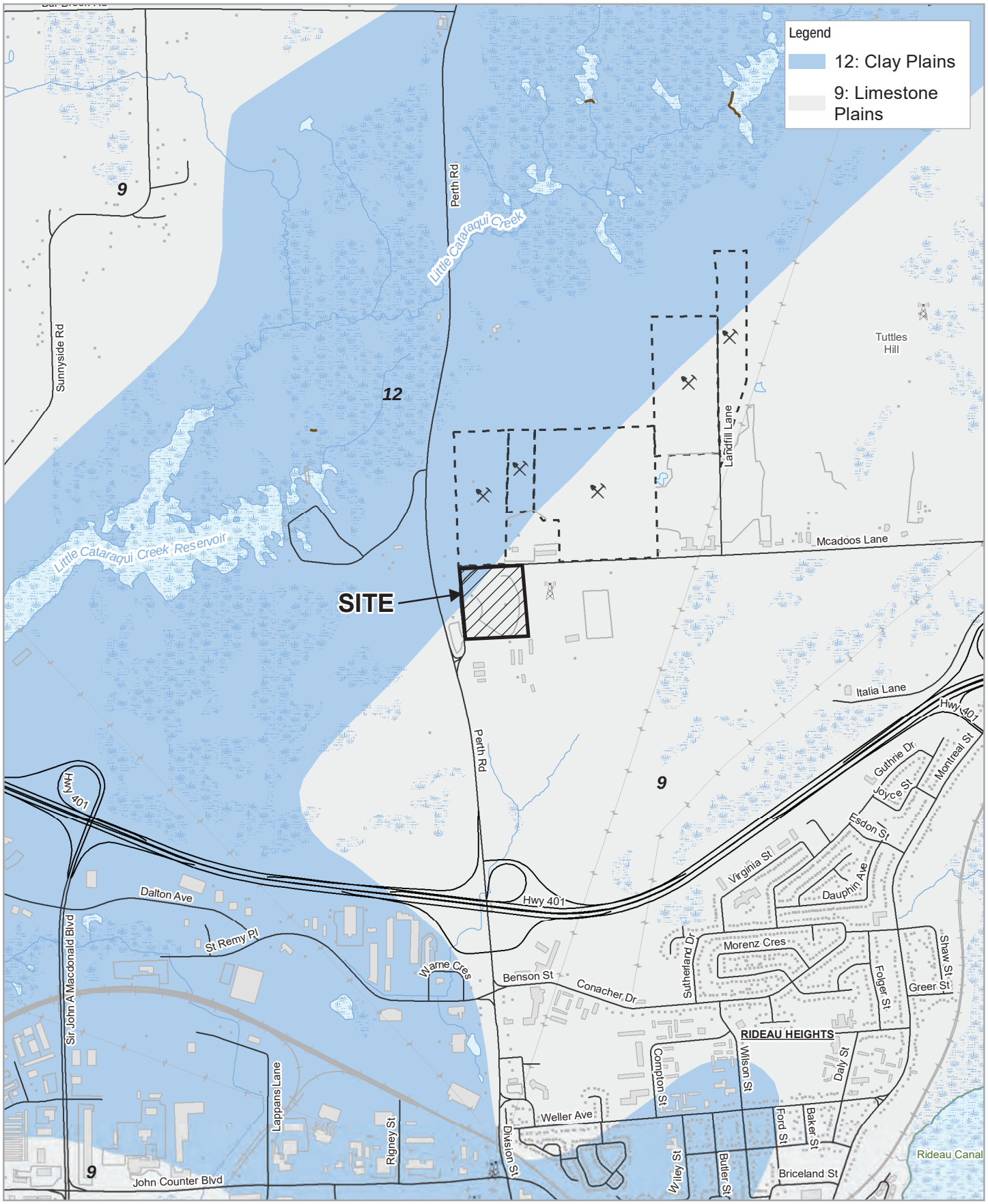
Data source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2020.



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0 140 280 420 560

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

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PHYSIOGRAPHY

Project No. 11212206
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FIGURE 6

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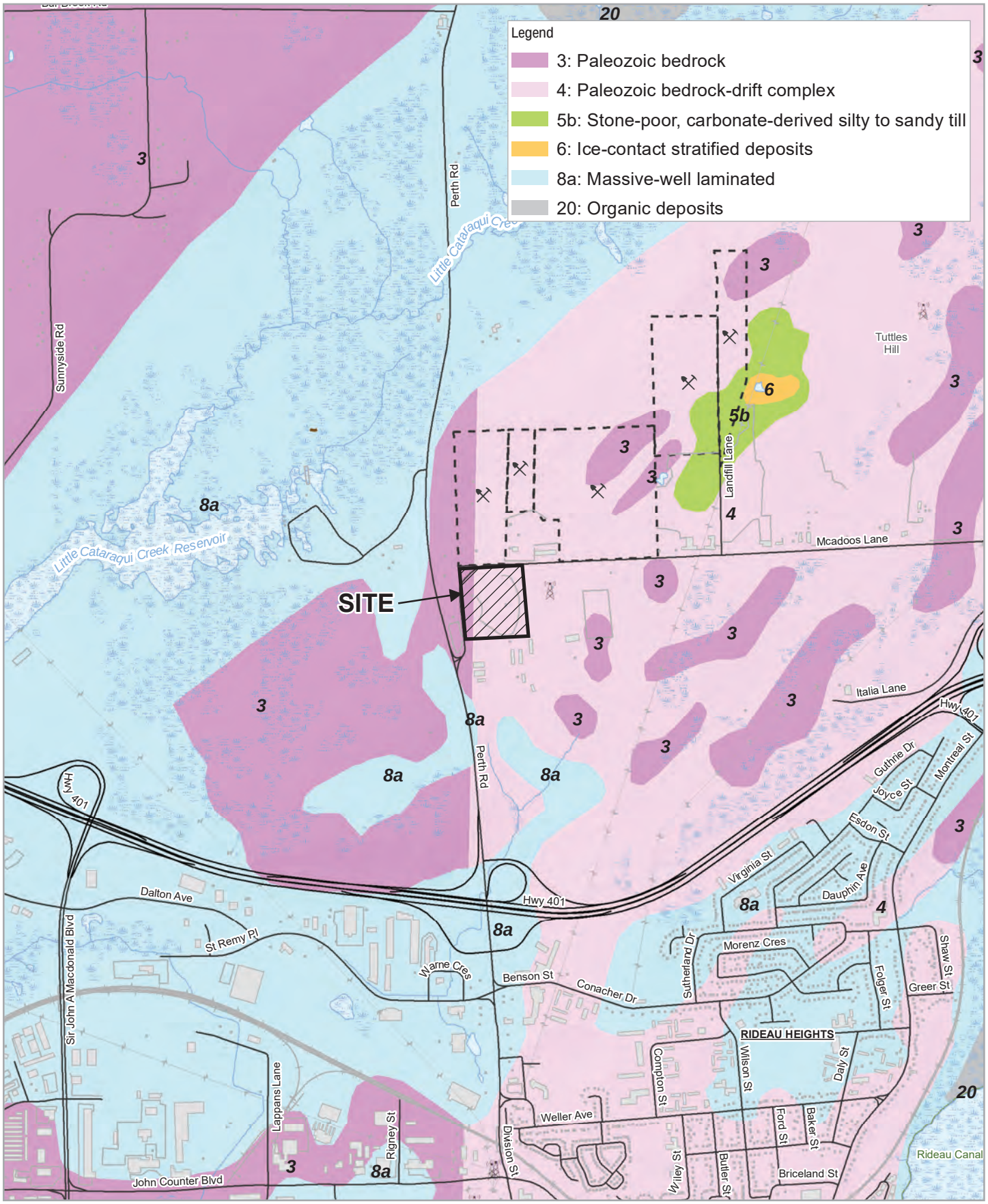
Print date: 26 May 2020 - 10:50

Data source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2020; Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.



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0 200 400 600 800

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

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SURFICIAL GEOLOGY

FIGURE 7

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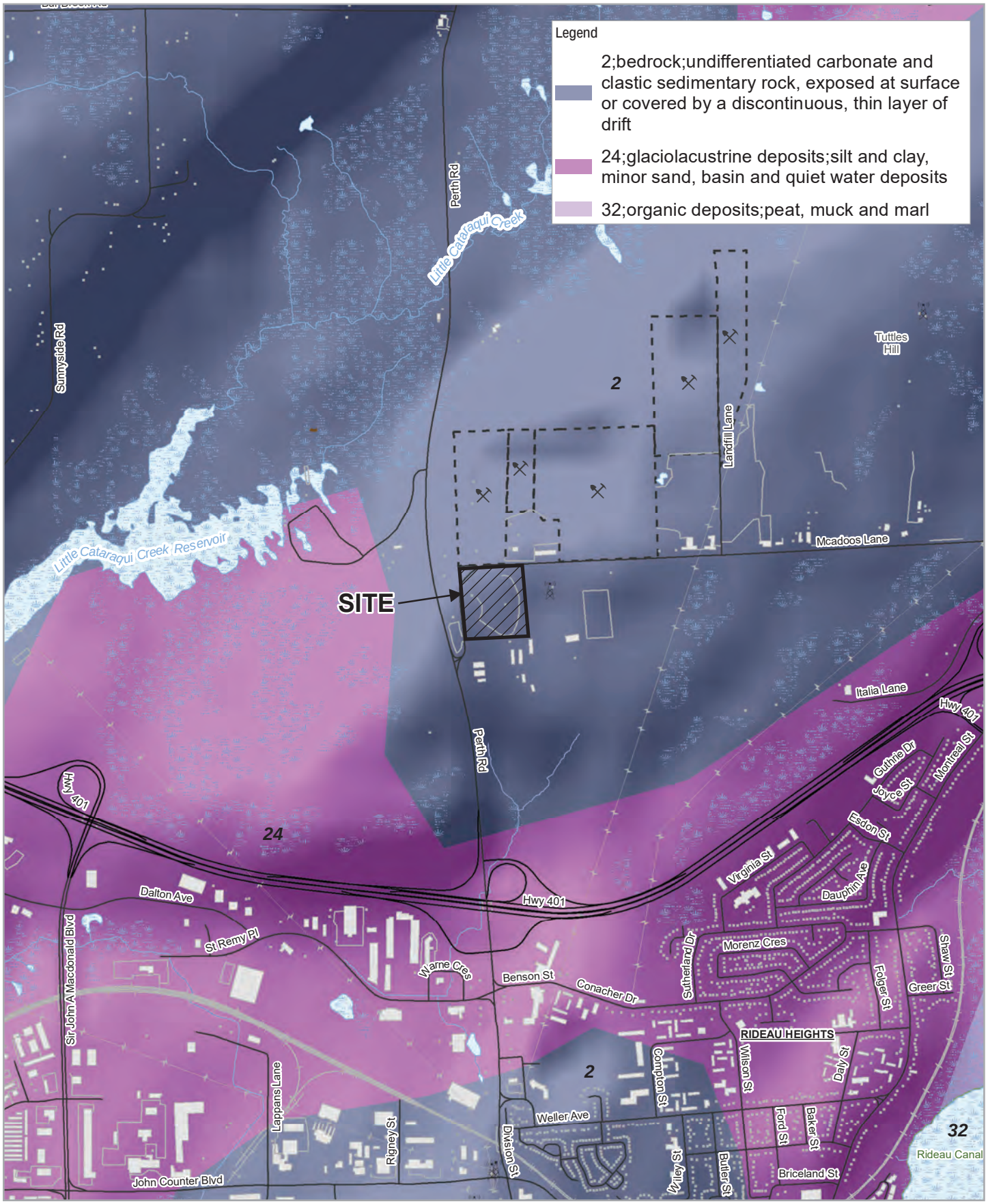
Data source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2020; Ontario Geological Survey 2003. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release---Data 128.



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0 200 400 600 800

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

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QUATERNARY GEOLOGY

FIGURE 8

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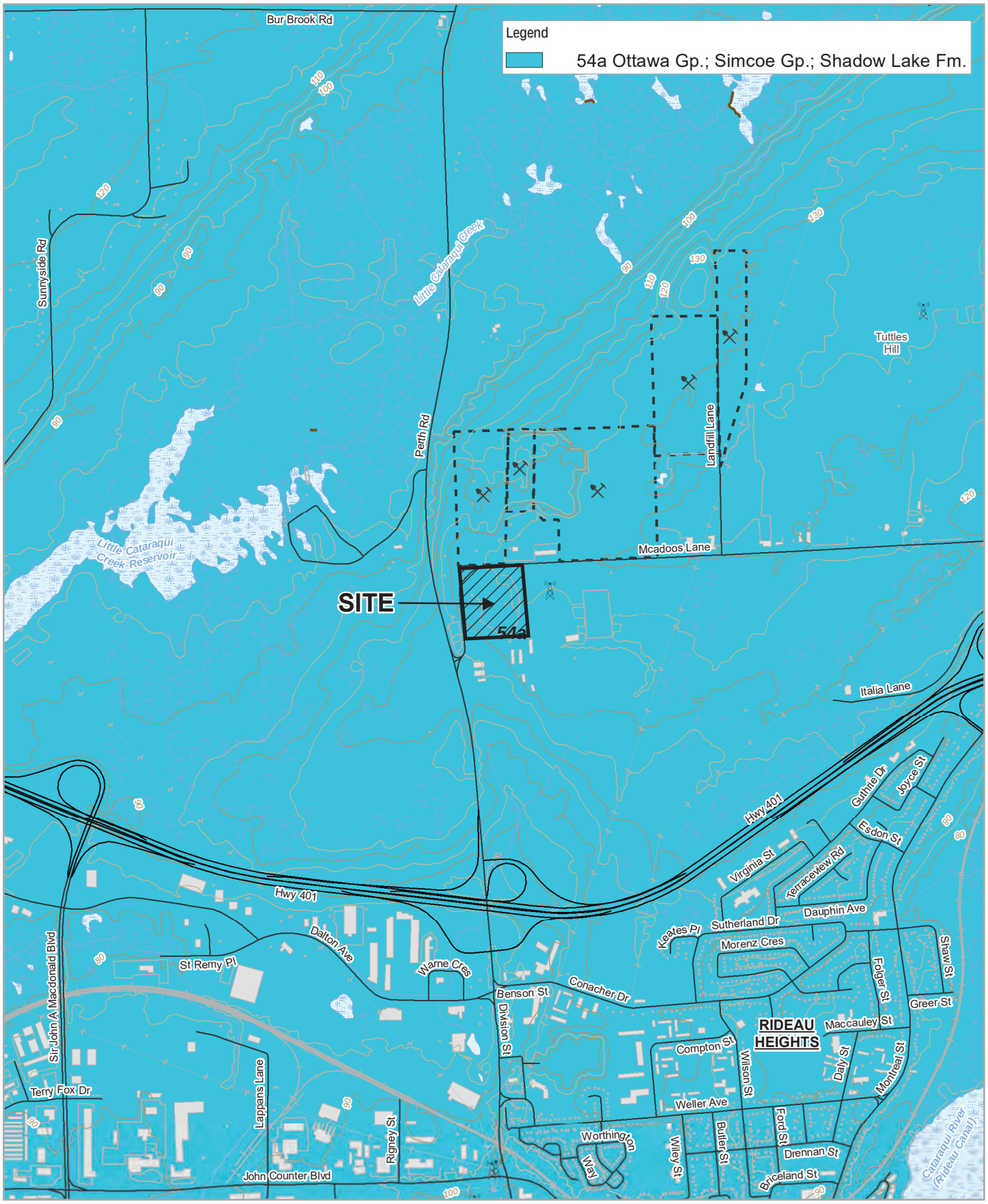
Print date: 26 May 2020 - 11:00

Data source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2020; Ontario Geological Survey 2003. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release---Data 128.



Paper Size ANSI A

0 140 280 420 560

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

GHD

American Iron and Metal
1533 MCADOO'S LANE, KINGSTON, ON

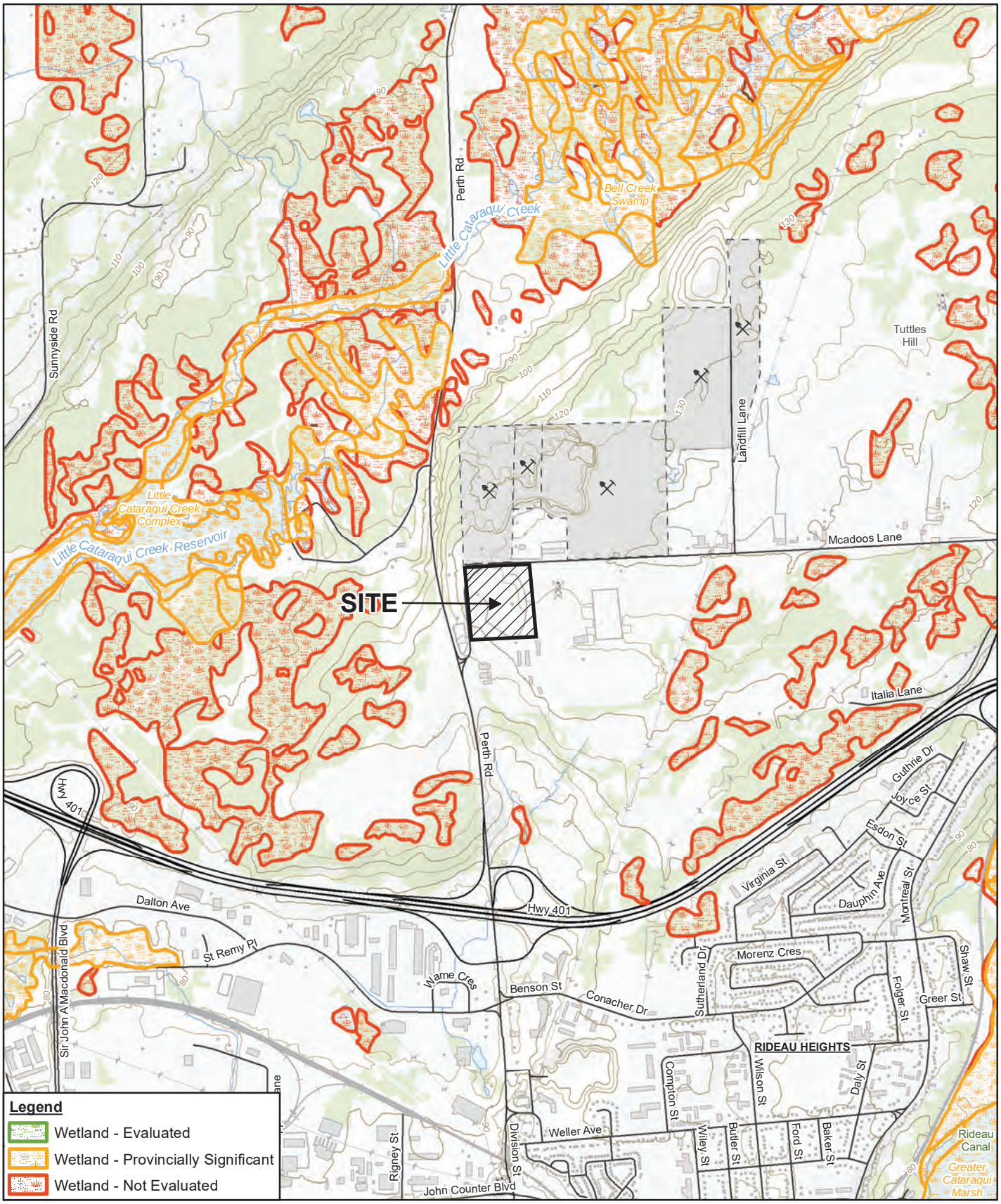
Project No. 11212206
Revision No. -
Date **June** 2020

BEDROCK GEOLOGY

FIGURE 9

Q:\GIS\PROJECTS\11212000s\11212206\Layouts\Rep001\11212206_Rep001_Bedrock_Geology.mxd
Print date: 26 May 2020 - 11:06

Source: MNRF NRVIS, 2017. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2020; Ontario Geological Survey 2006. 1:250 000 Scale Bedrock Geology of Ontario; Ontario Geological Survey, Miscellaneous Release---Data 126-revised. ISBN 0-7794-5172-4.



Source: MNRF NRVIS, 2017. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2020.

Paper Size ANSI A

0 140 280 420 560

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

GHD

American Iron and Metal
1533 MCADOO'S LANE, KINGSTON, ON

PROVINCIALLY SIGNIFICANT WETLANDS

Project No. 11212206
Revision No. -
Date **June** 2020

FIGURE 10

Q:\GIS\PROJECTS\11212000s\11212206\Layouts\Rep001\11212206_Rep001_Wetlands.mxd
Print date: 26 May 2020 - 11:15

Data source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2020; WWIS, 2017. Ontario Ministry of the Environment, Conservation and Parks. (Accessed January 2017).

Appendix A
Borehole Logs and Soils Data

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-1

TEST PIT No.: TP-01

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi

DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling

METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (Field / Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (305 mm)	GS-1	2		
1		0.3		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.3 m.
	0.5							
2								
3								
	1.0							
4								
	1.5							
5								

TEST PIT LOG GEOTECH 11212206-01-FLD-20-04-29, BH LOGS, JG.GPJ GEOLOGIC.GDT 27/5/20

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-2

TEST PIT No.: TP-02

ELEVATION: Existing Grade

TEST PIT REPORT

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi

DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling

METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft / m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
ft / m	0.0		GROUND SURFACE			
			TOPSOIL (405 mm)			
	0.4		**FILL** - sandy gravel, with silt, trace clay, brown, moist			
0.5				GS-1	18	
			wet (water seepage)			
1.0				GS-2	14	
1.5	1.5		**BEDROCK** END OF TEST PIT			Testhole was open and wet upon completion at bedrock refusal at 1.5 m.

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-3

TEST PIT No.: TP-03

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi

DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling

METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (Field / Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (305 mm)				
1		0.3		**FILL** - sandy gravel, with silt, trace clay, brown, moist	GS-1	29		
		0.4		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.4 m.
	0.5							
2								
3	1.0							
4								
5	1.5							

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-4

TEST PIT No.: TP-04

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (Field / Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (610 mm)				
1								
	0.5							
2		0.6		**FILL** - sandy gravel, with silt, trace clay, brown, moist	GS-1	18	○	
		0.8		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.8 m.
3								
	1.0							
4								
	1.5							
5								

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-5

TEST PIT No.: TP-05

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi

DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling

METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (610 mm)			
		0.6		**CLAYEY SILT** - clayey silt, with sand, brown, moist			
				wet (minor water seepage at bedrock interface)	GS-1	29	GS-1: 21% Sand 42% Silt 37% Clay (<0.002 mm)
		1.5		**BEDROCK** END OF TEST PIT			Testhole was open and wet upon completion at bedrock refusal at 1.5 m.

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-6

TEST PIT No.: TP-06

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (△ Field, □ Lab)	COMMENTS
		0.0		GROUND SURFACE				
				FILL - gravelly sand, with silt, brown, moist	GS-1	10		
		0.2		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.2 m.
1								
	0.5							
2								
3								
	1.0							
4								
	1.5							
5								

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-7

TEST PIT No.: TP-07

ELEVATION: Existing Grade

TEST PIT REPORT

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi

DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling

METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) (10 20 30 40 50 60 70 80 90)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (150 mm)				
		0.2		**FILL** - gravelly sand, with silt, brown, moist				
1					GS-1	9		GS-1: 35% Gravel 50% Sand 15% Silt and Clay
	0.5	0.5		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.5 m.
2								
3	1.0							
4								
5	1.5							

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-8

TEST PIT No.: TP-08

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (Field / Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (760 mm) - with gravel				
1								
	0.5							
2					GS-1	9		
		0.8		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.8 m.
3								
	1.0							
4								
	1.5							
5								

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-9

TEST PIT No.: TP-09

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (△ Field, □ Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (510 mm) - with gravel				
					GS-1	7	○	
	0.5	0.5		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.5 m.
	1.0							
	1.5							

TEST PIT LOG GEOTECH 11212206-01-FLD-20-04-29, BH LOGS, JG.GPJ GEOLOGIC.GDT 27/5/20

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-10

TEST PIT No.: TP-10

ELEVATION: Existing Grade

TEST PIT REPORT

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi

DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling

METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (△ Field, □ Lab) 10 20 30 40 50 60 70 80 90	COMMENTS
		0.0		GROUND SURFACE				
				BEDROCK at surface END OF TEST PIT				
1								
	0.5							
2								
3								
	1.0							
4								
	1.5							
5								

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-11

TEST PIT No.: TP-11

ELEVATION: Existing Grade

TEST PIT REPORT

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (Field / Lab)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (350 mm)				
		0.2		with gravel				
1					GS-1	7	○	
		0.4		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.4 m.
	0.5							
2								
3								
	1.0							
4								
	1.5							
5								

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-12

TEST PIT No.: TP-12

ELEVATION: Existing Grade

TEST PIT REPORT

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	COMMENTS
		0.0		GROUND SURFACE			
				TOPSOIL (230 mm) - with gravel	GS-1	22	
		0.2		**BEDROCK** END OF TEST PIT			Testhole was open and dry upon completion at bedrock refusal at 0.2 m.
1							
	0.5						
2							
3							
	1.0						
4							
	1.5						
5							

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-13

TEST PIT No.: TP-13

ELEVATION: Existing Grade

TEST PIT REPORT

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

- WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %	Shear test (Cu) △ Field; Sensitivity (S) □ Lab; ○ Water content (%); W_p W_l Atterberg limits (%) 10 20 30 40 50 60 70 80 90	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (150 mm)				
		0.2		**FILL** - sandy gravel, with silt, trace clay, brown, moist				
1					GS-1	9	○	GS-1: 63% Gravel 24% Sand 13% Silt and Clay
	0.5							
2								
3					GS-2	12	○	GS-2: 58% Gravel 27% Sand 11% Silt 4% Clay (<0.002 mm)
	1.0							
4		1.2		grey, wet (water seepage)				
	1.5	1.5		**BEDROCK** END OF TEST PIT				Testhole was open and wet upon completion at bedrock refusal at 1.5 m.
5								

REFERENCE No.: 11212206-01

ENCLOSURE No.: A-14

TEST PIT No.: TP-14

ELEVATION: Existing Grade

TEST PIT REPORT

Page: 1 of 1

CLIENT: American Iron and Metal

PROJECT: 1533 McAdoo's Lane, Kingston, ON

LOGGED BY: J. Geraldi DATE: 29 April 2020

EXCAVATION COMPANY: GET Drilling METHOD: Mini-excavator

NOTES:

LEGEND

GS - GRAB SAMPLE

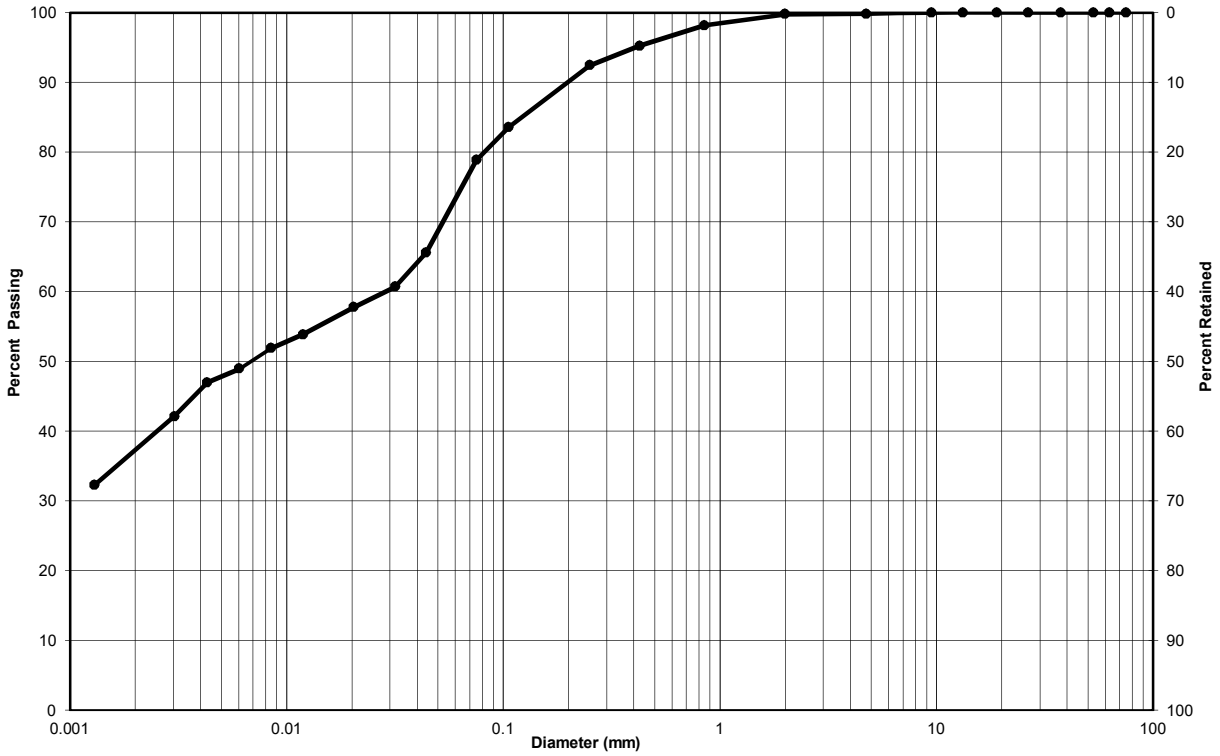
- WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (w_p w_l) (10 20 30 40 50 60 70 80 90)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (230 mm) - with gravel	GS-1	13	○	
		0.2		**BEDROCK** END OF TEST PIT				Testhole was open and dry upon completion at bedrock refusal at 0.2 m.
1								
	0.5							
2								
3								
	1.0							
4								
	1.5							
5								

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	American Iron and Metal	**Lab no.:**	SS-20-27
Project/Site:	1533 McAdoos Lane, Kingston	**Project no.:**	11212206-01

Borehole no.:	TP-5	Sample no.:	GS-1
Depth:	4'	Enclosure:	A-15



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	0	21	79

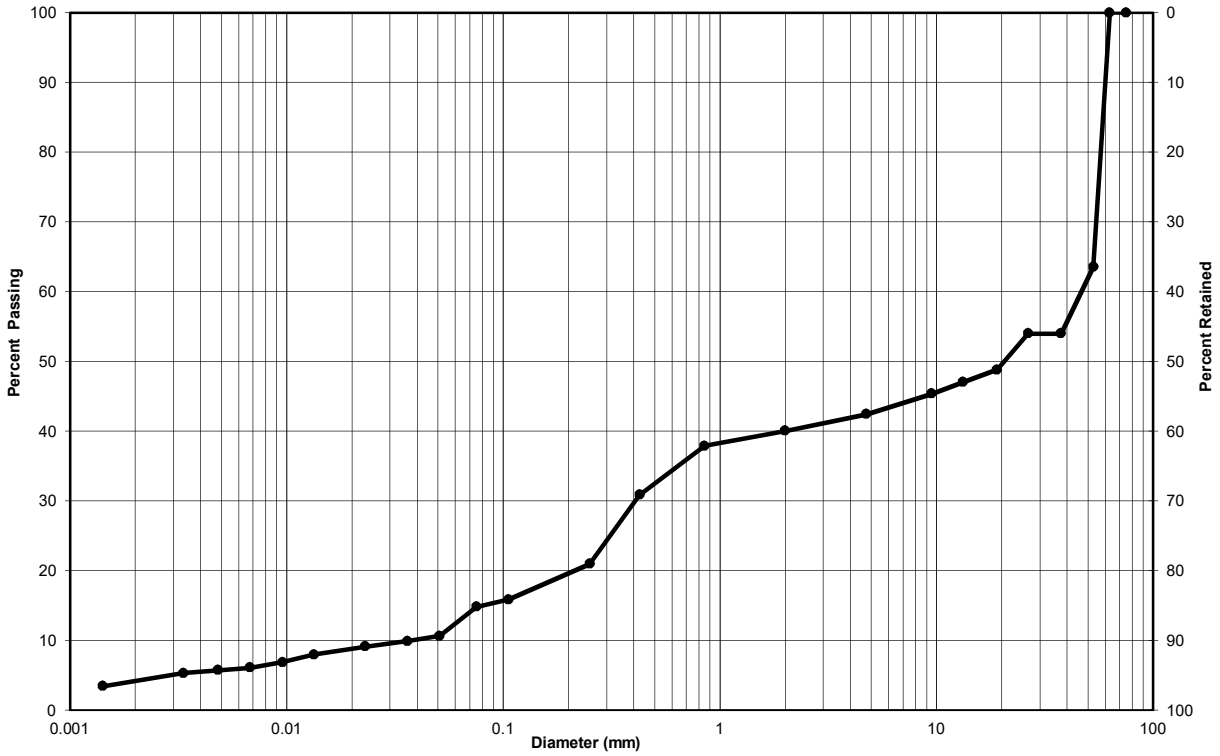
Remarks:

Performed by:	Josh Sullivan	**Date:**	May 14, 2020
Verified by:	Joe Sullivan	**Date:**	May 14, 2020

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	American Iron and Metal	**Lab no.:**	SS-20-27
Project/Site:	1533 McAdoos Lane, Kingston	**Project no.:**	11212206-01

Borehole no.:	TP-13	Sample no.:	GS-2
Depth:	3'	Enclosure:	A-16



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	58	27	15

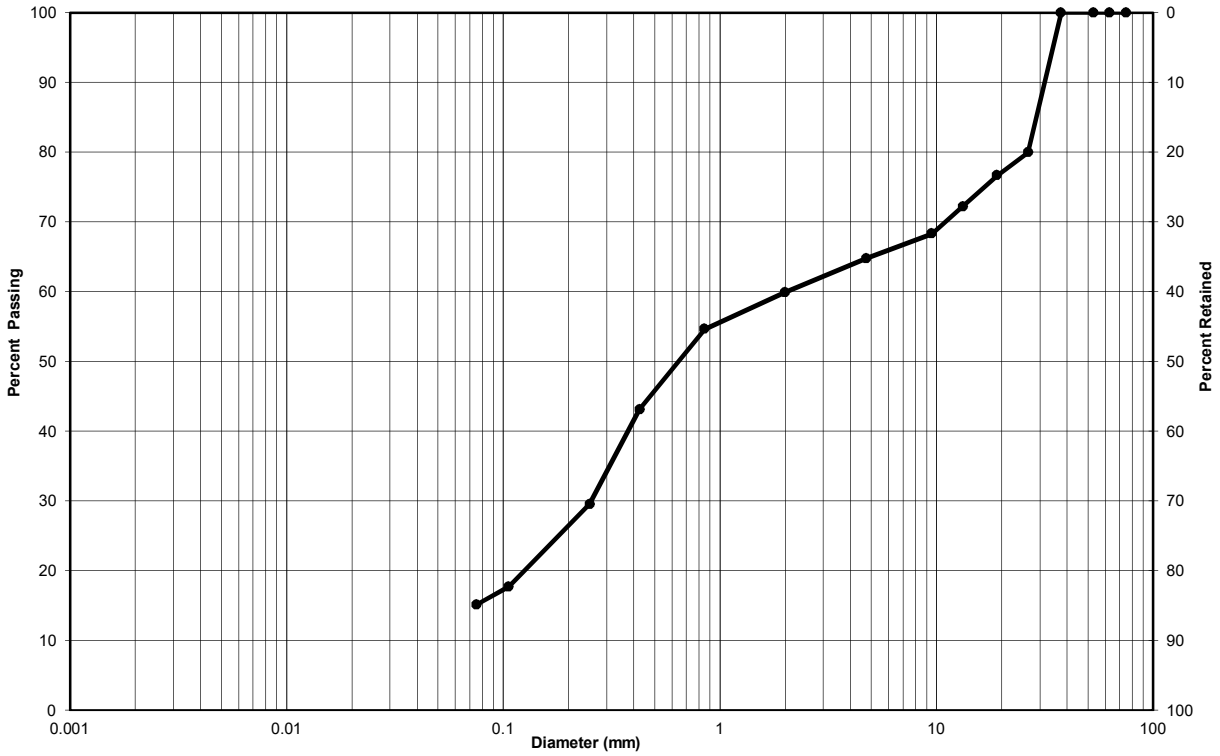
Remarks:

Performed by:	Josh Sullivan	**Date:**	May 14, 2020
Verified by:	Joe Sullivan	**Date:**	May 14, 2020

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	American Iron and Metal	**Lab no.:**	SS-20-27
Project/Site:	1533 McAdoos Lane, Kingston	**Project no.:**	11212206-01

Borehole no.:	TP-7	Sample no.:	GS-1
Depth:	1'	Enclosure:	A-17



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	35	50	15

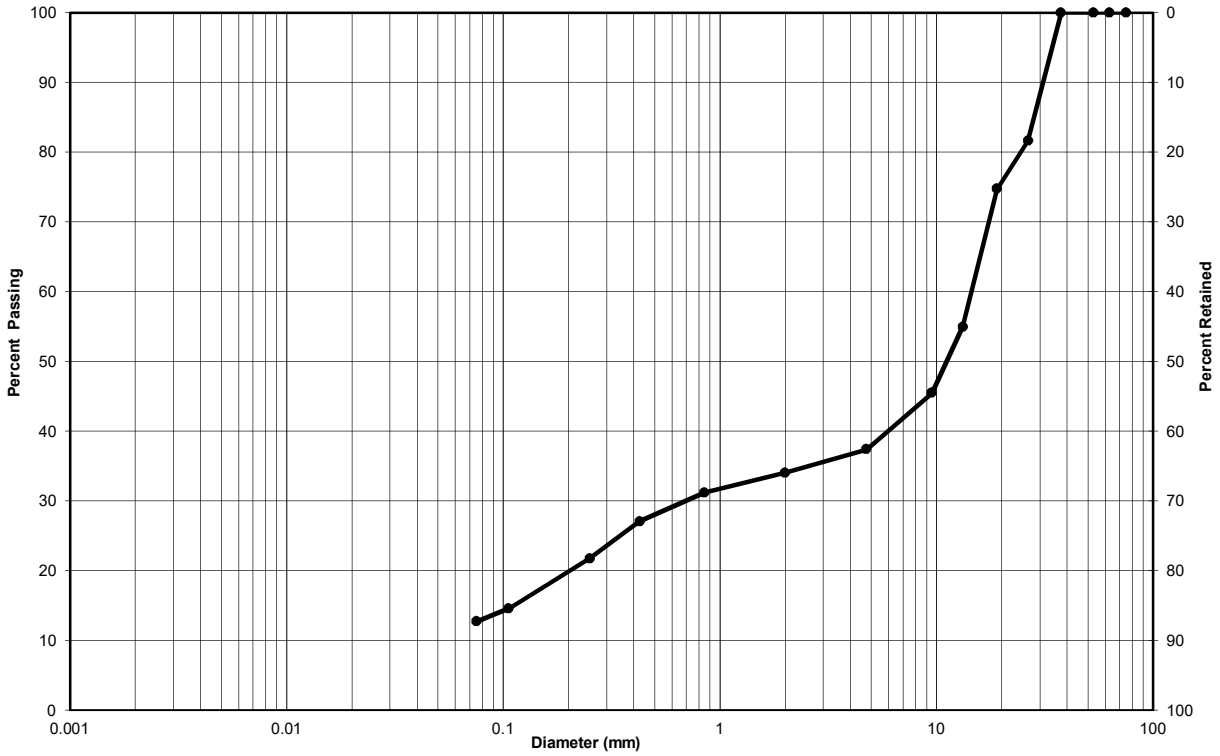
Remarks:

Performed by:	Josh Sullivan	**Date:**	May 14, 2020
Verified by:	Joe Sullivan	**Date:**	May 14, 2020

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	American Iron and Metal	**Lab no.:**	SS-20-27
Project/Site:	1533 McAdoos Lane, Kingston	**Project no.:**	11212206-01

Borehole no.:	TP-13	Sample no.:	GS-1
Depth:	1'	Enclosure:	A-18



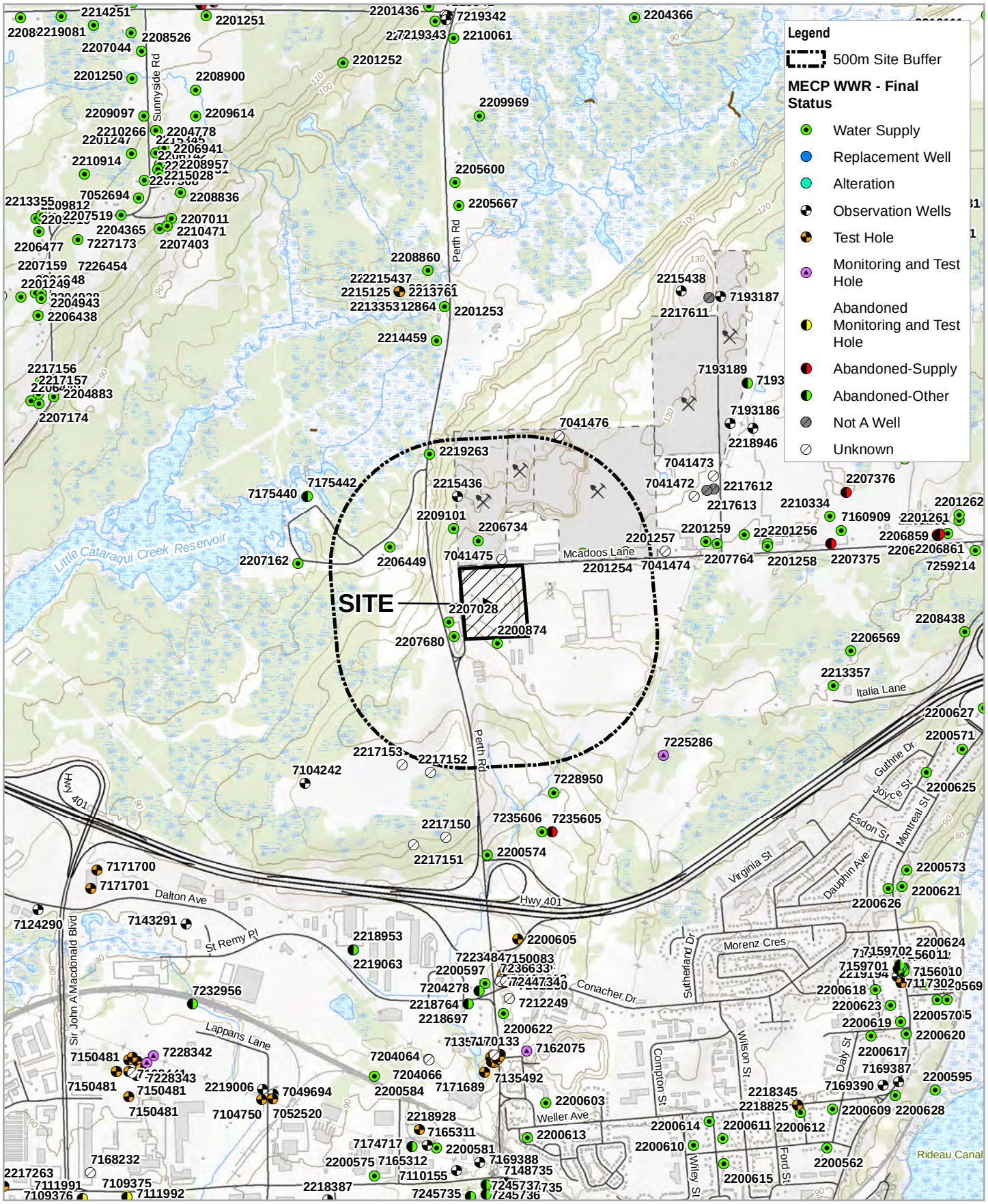
Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	63	24	13

Remarks:

Performed by:	Josh Sullivan	**Date:**	May 14, 2020
Verified by:	Joe Sullivan	**Date:**	May 14, 2020

Appendix B
MECP Well Records



Paper Size ANSI A

0 140 280 420 560

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N

N

1533 McAdoo's Lane, Kingston, ON

Project No. **11212206**
Revision No. **-**
Date **May 26, 2020**

MECP WATER WELLS

FIGURE B-1

Q:\GIS\PROJECTS\11212000s\11212206\Layouts\Rep001\11212206_Rep001_MECP_Water_Wells.mxd
Print date: 26 May 2020 - 11:37

Data source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2020; WWIS, 2017. Ontario Ministry of the Environment, Conservation and Parks. (Accessed January 2017).

MECP Water Well Record - Formation Report

Well ID: **2200874**
Concession (Lot): CON 02(010)
UTM Zone (Easting, Northing) [RC]: 18 (380399.3,4903876) [5]
Depth to bedrock (m): 6
Elevation (masl): 121.927116

County / Township: 22 / KINGSTON TOWNSHIP
Completion Date: 9/30/1965 12:00 AM
Primary Use: Commerical
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
1		*CLAY GRAVEL*	0	1.8288
2	*GREY*	*LIMESTONE*	1.8288	21.336
3	*BROWN*	*LIMESTONE*	21.336	30.48

Well ID: **2201254**
Concession (Lot): CON 04(026)
UTM Zone (Easting, Northing) [RC]: 18 (380730.3,4904227) [5]
Depth to bedrock (m): 2
Elevation (masl): 126.353652

County / Township: 22 / KINGSTON TOWNSHIP
Completion Date: 4/15/1963 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
1		*TOPSOIL*	0	0.6096
2	*GREY*	*LIMESTONE*	0.6096	18.288

Well ID: **2201257**
Concession (Lot): CON 04(028)
UTM Zone (Easting, Northing) [RC]: 18 (380896.4,4904232) [5]
Depth to bedrock (m): 0
Elevation (masl): 130.194717

County / Township: 22 / KINGSTON TOWNSHIP
Completion Date: 12/31/1959 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
1		*LIMESTONE*	0	24.6888

Well ID: **2206449**
Concession (Lot): CON 04(025)
UTM Zone (Easting, Northing) [RC]: 18 (379981.3,4904250) [4]
Depth to bedrock (m): 5
Elevation (masl): 87.495895

County / Township: 22 / KINGSTON TOWNSHIP
Completion Date: 8/8/1973 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
1	*BLUE*	*CLAY*	0	1.524
2	*BLUE*	*LIMESTONE*	1.524	24.9936

Source: Water Well Information System, Ontario Ministry of the Environment, Conservation and Parks © Queen's Printer for Ontario, 2018 (Accessed January, 2018)

3	*GREEN*	*LIMESTONE*	24.9936	28.956

Well ID: **2206734**
Concession (Lot): CON 04(026)
UTM Zone (Easting, Northing) [RC]: 18 (380324.3,4904275) [4]
Depth to bedrock (m): 0
Elevation (masl): 122.482788

County / Township: 22 / KINGSTON TOWNSHIP
Completion Date: 5/10/1974 12:00 AM
Primary Use: Commerical
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
1		*LIMESTONE*	0	54.2544

Well ID: **2207028**
Concession (Lot): CR W(011)
UTM Zone (Easting, Northing) [RC]: 18 (380210.3,4903957) [4]
Depth to bedrock (m): 2
Elevation (masl): 114.097076

County / Township: 22 / KINGSTON TOWNSHIP
Completion Date: 1/14/1975 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
1	*BROWN*	*TOPSOIL*	0	0.6096
2	*BLUE*	*LIMESTONE*	0.6096	37.1856

Well ID: **2207680**
Concession (Lot): CON 03(024)
UTM Zone (Easting, Northing) [RC]: 18 (380230.3,4903902) [4]
Depth to bedrock (m): 2
Elevation (masl): 114.967086

County / Township: 22 / KINGSTON TOWNSHIP
Completion Date: 9/2/1976 12:00 AM
Primary Use: Livestock
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
1	*BROWN*	*TOPSOIL*	0	0.6096
2	*BLUE*	*LIMESTONE*	0.6096	30.1752

Well ID: **2209101**
Concession (Lot): CON 04(026)
UTM Zone (Easting, Northing) [RC]: 18 (380229.3,4904321) [4]
Depth to bedrock (m): 0
Elevation (masl): 116.324317

County / Township: 22 / KINGSTON TOWNSHIP
Completion Date: 6/26/1981 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
1	*BLUE*	*LIMESTONE SHALE*	0	2.4384
2	*BLUE*	*LIMESTONE*	2.4384	27.432
3	*GREEN*	*LIMESTONE*	27.432	32.004

Source: Water Well Information System, Ontario Ministry of the Environment, Conservation and Parks © Queen's Printer for Ontario, 2018 (Accessed January, 2018)

4	*BLUE*	*LIMESTONE*	32.004	40.8432

Well ID: **2215436**
Concession (Lot): CON 04(025)
UTM Zone (Easting, Northing) [RC]: 18 (380244,4904446) [3]
Depth to bedrock (m): 0
Elevation (masl): 112.221725

County / Township: 22 / KINGSTON TOWNSHIP
Completion Date: 10/30/1995 12:00 AM
Primary Use: Not Used
Secondary Use: <null>
Final Status: Observation Wells

Layer	Colour	Description	Top - Bottom Depth (m)	
1	*BLUE*	*LIMESTONE FRACTURED*	0	1.2192
2	*BLUE*	*LIMESTONE*	1.2192	38.1
3	*GREEN*	*LIMESTONE*	38.1	42.0624
4	*BLUE*	*LIMESTONE*	42.0624	53.34
5	*GREEN*	*LIMESTONE*	53.34	59.436
6	*GREEN*	*SANDSTONE*	59.436	60.96
7	*GREEN*	*SANDSTONE*	60.96	61.5696
8	*RED*	*GRANITE*	61.5696	64.008

Well ID: **2219263**
Concession (Lot): 05(025)
UTM Zone (Easting, Northing) [RC]: 18 (380137,4904609) [3]
Depth to bedrock (m): 16
Elevation (masl): 88.599205

County / Township: 22 / KINGSTON TOWNSHIP
Completion Date: 11/7/2006 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
1	*BLUE*	*CLAY*	0	4.8
2	*BROWN*	*SHALE*	4.8	5.4
3	*BLUE*	*LIMESTONE*	5.4	18.299999

Source: Water Well Information System, Ontario Ministry of the Environment, Conservation and Parks © Queen's Printer for Ontario, 2018 (Accessed January, 2018)

Well ID: **7041475**
Concession (Lot): 04(026)
UTM Zone (Easting, Northing) [RC]: 18 (380417,4904204) [3]
Depth to bedrock (m): 0
Elevation (masl): 126.475662

County / Township: 22 / KINGSTON TOWNSHIP
Completion Date: 1/18/2007 12:00 AM
Primary Use: <null>
Secondary Use: <null>
Final Status: <null>

Layer	Colour	Description	Top - Bottom Depth (m)	
1	*BROWN*	*LIMESTONE*	0	10.7
2	*BLACK*	*LIMESTONE*	10.7	11.3
3	*BROWN*	*LIMESTONE*	11.3	32.599998

Source: Water Well Information System, Ontario Ministry of the Environment, Conservation and Parks © Queen's Printer for Ontario, 2018 (Accessed January, 2018)

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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