Terraprobe

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

# GEOTECHNICAL INVESTIGATION
# PROPOSED ADDITION (CALL UP 22-411)
# J. J. O'NEILL CATHOLIC SCHOOL
# 240 MARILYN AVENUE
# NAPANEE, ONTARIO

**Prepared for:** Ontario Infrastructure and Lands Corporation (IO)
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# ABSTRACT

Terraprobe Inc. was retained by Ontario Infrastructure and Lands Corporation (IO) to conduct a geotechnical investigation for a proposed addition to the existing school building (J J O' Neill Catholic Elementary School) located at 240 Marilyn Avenue, in the Town of Napanee, Ontario. The property currently includes a slab-on-grade school building with associated asphalt paved parking areas, driveways/access routes, sports field, and landscaped areas. The property is an irregular shaped land parcel and covers an area of about 4.7 hectares (about 11 acres).

Based on the information provided (Site Plan) by the IO, it is understood that the proposed new two-story slab-on-grade building addition will be constructed on the north side of the existing building.

Malroz Engineering Inc. (Malroz) previously conducted a preliminary geotechnical investigation for the proposed addition and parking areas which consisted of advancing a total of ten (10) boreholes extending to depths varying from about 2.1 to 6.1 m below grade. Bedrock coring was carried out in one (1) selected borehole (Borehole 8). The results of this investigation were presented in their report (*Geotechnical Investigation Report, Proposed Addition, J J O' Neil Catholic School, Napanee, ON, File: 1684.00-101, dated October 17,2022)*. A copy of this report (draft) was provided by the client for our review and use. The boreholes and rock core logs are appended for information. Terraprobe assumes no responsibility regarding the accuracy of the information noted on Malroz boreholes.

The current investigation consisted of advancing a total of thirteen (13) exploratory boreholes within or in the vicinity of the proposed addition and parking areas and driveways/access routes to obtain subsurface soil and ground water information and provide geotechnical engineering recommendations and design advice for the proposed redevelopment.

Terraprobe has also conducted Phase One and Phase Two Environmental Site Assessments and Hydrogeological Study for this site. The findings of the investigations are reported under separate covers.

The borehole information obtained during the Preliminary and Current Geotechnical investigations indicate that the site is generally underlain by competent native soils (beneath the earth fill zone). The boreholes encountered a topsoil layer/pavement structure at the ground surface underlain by a zone of earth fill material extending to depths varying from about 0.1 to 1.7 m below grade. The earth fill materials were underlain by undisturbed native soil deposit which extendedto the full depth of investigation (up to about 6.1 m depth below existing grade). The undisturbed native soil stratigraphy typically consisted of clayey silt to silty clay, which is underlain by sand, some silt layer. The native soil deposit and underlying bedrock are considered suitable to support proposed building foundations.

The cohesive clayey silt to silty clay soils of generally low permeability precludes free flowing ground water, and therefore any ground water seepage expected into the relatively shallow excavations for slab-on-grade structures in the short-term, is likely to be limited and would possibly emanate from the perched ground water typically present within the earth fill materials and the relatively permeable sand/silt lenses found above the bedrock.

In summary, subsurface soil (undisturbed native soil deposit) underlying the site is considered to be generally favorable for the proposed site redevelopment.

The native soils and bedrock would provide adequate support for the proposed building foundations and no significant ground water implications are expected for relatively shallow excavations.

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# 1. INTRODUCTION

Terraprobe Inc. was retained by Ontario Infrastructure and Land Corporation (IO) to conduct a geotechnical investigation for a proposed addition to the existing school building (J J O' Neill Catholic Elementary School) located at 240 Marilyn Avenue, in the Town of Napanee, Ontario. The property currently includes a slab-on-grade school building with associated asphalt paved parking areas, driveways/access routes, sports fields, and landscaped areas.

It is proposed to construct a new two-story slab-on-grade building addition to the existing building (on the north side of the existing building) as well as parking areas and driveways/access routes.

Malroz Engineering Inc. (Malroz) previously conducted a preliminary geotechnical investigation for the proposed addition and parking areas which consisted of advancing a total of ten (10) boreholes extending to depths varying from about 2.1 to 6.1 m below grade. Bedrock coring was carried out in one (1) selected borehole (Borehole 108). The results of this investigation were presented in their report (*Geotechnical Investigation Report, Proposed Addition, J. J. O' Neil Catholic School, Napanee, ON, File: 1684.00-101, dated October 17, 2022)*. A copy of this report (draft) was provided by the client for our review and use. The approximate locations of the Malroz boreholes are shown on Terraprobe Figures 2A and 2B. The Borehole and Rock Core Logs as well as the Borehole Location Plan by Malroz are appended.

The current investigation was carried out to supplement the previously available subsurface information collected during the previous Preliminary Geotechnical Investigation. The previous investigation (August 2022) was conducted to collect preliminary subsurface soil and ground water information to assess the general suitability of the site for the intended development, however, the limited number of boreholes advanced during the preliminary investigation stage did not provide sufficient coverage of the site as per Infrastructure Ontario AFP document to obtain adequate subsurface information for the geotechnical design of the proposed redevelopment (building addition).

The current geotechnical investigation was, therefore, undertaken to advance additional boreholes based on the preliminary development concept provided by IO which included additional building addition and parking areas. Therefore, the current report encompasses the results of the Current Geotechnical Investigation carried out for the site to provide geotechnical engineering recommendations for the project design. The current investigation consisted of advancing a total of thirteen (13) exploratory boreholes (in addition to the 10 boreholes advanced during preliminary Geotechnical Investigation by Malroz) and one (1) test pit in the vicinity of the proposed addition, parking areas and driveways/access routes to obtain additional subsurface soil and ground water information, and further coverage of the redevelopment area to provide geotechnical engineering recommendations for the design of building foundations, slab-on-grade, earthquake and earth pressure design parameters, pipe bedding and pavement structure. In addition, comments are also included on pertinent construction aspects including excavation, backfill and ground water control.

Terraprobe has also conducted Phase One and Phase Two Environmental Site Assessments and a Hydrogeological Study for this site. The findings of the investigations are reported under separate covers.

## 2. SITE AND PROJECT DESCRIPTION

The site is located on the northwest corner of Marilyn Avenue and Simcoe Street, Napanee. The Surrounding land use is largely residential. The site area was reported to be 11 acres (4.7) hectares. The general location of the property is presented on Figure 1.

The site is bounded by Marilyn Avenue from east, residential areas from west, south and north. The site is owned and maintained by Algonquin and Lakeshore Catholic District School Board (ALCDSB). The original single-story slab-on-grade building was constructed in 1983, with an addition in 1988. The property currently includes slab-on-grade school building with associated asphalt paved parking areas, driveways/access routes, sports field, and landscaped areas.

Based on the current development site plan provided by IO, it is understood that the proposed new two-story slab-on-grade building addition will be constructed adjacent to the existing building (on the north side of the existing building) as well as parking areas and driveways/access routes as shown on Figure 2B.

## 3. FIELD PROCEDURE

The current field investigation was conducted on December 14 and 15, 2022 (boreholes) and January 3, 2023 (test pit) and consisted of drilling and sampling a total of thirteen (13) exploratory boreholes (Boreholes 1 to 13) and excavating one (1) test pit as follows:

- six (6) boreholes (Boreholes 1 to 6) were advanced within or in the vicinity of the proposed building addition, extending to depths varying from about 4.0 m (Borehole 2) to 5.4 m (Borehole 5) below grade,

- five (5) boreholes (Boreholes 7, 9, 11, 12 and 13) were advanced within or in the vicinity of the proposed parking and driveways/access routes areas, extending to depths varying from about 3.5 m (Boreholes 7, 10 and 13) to 3.7 m(Boreholes11 and 12) below grade, and

- two (2) boreholes (Boreholes 8 and 10) were advanced in the vicinity of the existing transformer, extending to about 3.5 m depth below grade for the environmental study, and

- one (1) test pit (TP1) was excavated outside along the exterior foundation wall (north wall within the footprint of proposed two story addition) and obtained existing footing information (footing size, condition, and subgrade soil).

In addition to the above boreholes, the borehole logs from the previous investigation by Malroz advanced at the site during the Preliminary Geotechnical Investigation are also appended. These boreholes also provide coverage of the building addition, parking and driveways/access routes areas and this informationis utilized in this report. Refer to the enclosed Borehole Location and Test Pit Location Plan (Figures 2A and 2B) for borehole locations advanced on the property to-date as part of Preliminary and Current Geotechnical Investigations.

The borehole and test pit locations were established by Terraprobe in collaboration with the client based on the existingbuilding and other site constraints. The approximate borehole and test pit locations are shown on the enclosed Borehole and Test Pit Location Plan (Figures 2A and 2B).

The boreholes and test pit ground surface elevations were surveyed using a Trimble R10 GNSS System. The TrimbleR10 system uses the Global Navigation Satellite System and cellular data to determine target locations with GPS coordinates and their respective elevations. The Trimble R10 system is reported to have a precision of 0.5 m with respect to the GNSS and a precision of 5 mm with respect to elevation surveying. We note thatthe borehole elevations noted on the Borehole Logs are provided for the purpose of relating borehole soil stratigraphy and should not be used or relied on for other purposes.

The borings were drilled by a specialist drilling contractor using track mounted drill rig power augers, retained by Terraprobe. The boreholes were advanced using continuous flight solid stem augers, and sampled at 0.75 m (up to 3.0 m below grade) and 1.5 m (below 3.0 m depth) intervals with a conventional 50 mm diameter split barrel sampler when the Standard Penetration Test (SPT) was carried out(ASTM D 1586). The Penetration Tests results are reported as "N" values on the Borehole Logs at respectivesampling and testing depths.

One test pit was excavated using a rubber tire backhoe by a contractor retained by Terraprobe. As noted before, one test pit was advanced outside along the exterior north foundation wall (within the footprint of proposed 2nd storey addition) and extended to the foundation subgrade level. The objective of the test pit investigation was to expose the existing foundation to obtain foundation details and assess the foundation subgrade soil. The details of the test pit are presented on Figure 3 and test pit photographs are appended.

The field work (drilling, excavation, sampling, and testing) was observed and recorded by a member of our engineering field staff, who logged the boring and examined the soil samples as they were obtained. All soil samples obtained during the field investigation were sealed into clean plastic jars and transported to our geotechnical laboratory for detailed inspection and testing. Borehole soil samples were examined (tactile) in detail by a geotechnical engineer and classified according to visual and index properties. Geotechnical laboratory testing consisted of water content determination on all soil samples; and a Sieve and Hydrometer analysis on eight (8) selected native soil samples (Borehole 1, Sample 3; Borehole 2, Sample 5; Borehole 3,

Sample 4B; Borehole 4, Sample 5; Borehole 5, Sample 5; Borehole 7, Sample 2; Borehole 9, Sample 3; and Borehole 11, Sample 2B), and Atterberg Limits tests on four (4) selected soil samples (Borehole 1, Sample 3; Borehole 3, Sample 4B; Borehole 5, Sample 5; and Borehole 7, Sample 2B). Geotechnical laboratory testing results are plotted on the Borehole Logs at respective sampling depths. The results of laboratory tests are also summarized in Section 4.4 and are appended.

Ground water levels were monitored in the boreholes upon completion of drilling. Monitoring Wells comprising 50 mm diameter PVC tubing were installed in five (5) selected boreholes (Boreholes 1, 2, 4, 5 and 6) to facilitate ground water level measurements. The PVC tubing was fitted with a bentonite clayseal as shown on the accompanying Borehole Logs. The ground water levels measurements in the monitoring wells were taken on January 25 and 27, 2023 and are noted on the enclosed Borehole Logs. The results of ground water level monitoringare summarized in Section 4.5 of this report.

## 4. SUBSURFACE CONDITIONS

The results of the individual boreholes are summarized below and recorded on the accompanying Borehole Logs. This summary is intended to correlate this data to assist in the interpretation of the subsurface conditions encountered at the site. Refer to enclosed Borehole Logs for stratigraphic and other details.

It should be noted that the soil conditions are confirmed at the borehole locations only and may vary between and beyond the boreholes. The stratigraphic boundaries shown on the Borehole Logs are based on a non-continuous sampling. These boundaries represent an inferred transition between various strata, rather than a precise plane of geologic change.

In summary, the subsurface soil conditions encountered in the boreholes advanced across the site were founded to be consistent. The boreholes encountered a topsoil layer/pavement component at the ground surface underlain by a zone of earth fill materials which was in turn underlain by undisturbed native soil deposit which extended to the full depth of investigation. The boreholes (Boreholes 1 to 6) encountered auger and/or spoon refusal on inferred bedrock.

### 4.1 Surficial Layers

A surficial layer of topsoil was encountered in Boreholes 1, 2, 7, 8, 10, 11 and 12, varying in thickness from about 100 mm (Boreholes 1 and 2) to 150 mm (Borehole 8). The topsoil was noted to be dark brown to black in colour and predominantly consisted of a sandy silt matrix with organics.

A surficial layer of asphaltic concrete was encountered in Boreholes 5, 6 and 13, varying in thickness from 65 mm (Borehole 5) to 80 mm (Borehole 6). A layer of aggregate was encountered in Boreholes 3 ,4, 5, 6, 9 and 13 at the ground surface or beneath the asphaltic concrete layer, varying in thickness from 65 mm (Borehole 9) to 300 mm (Borehole 6). The aggregate material (comprising sand and gravel) was noted to be typically in a compact and damp condition.

The above noted pavement structure component and topsoil thicknesses measured from the borings are approximate. The reported thicknesses may vary between and beyond the borehole locations.

## 4.2 Earth Fill

A zone of earth fill material was encountered in all boreholes beneath the surficial topsoil/pavement structure and extended to depths varying from about 0.8 m (Boreholes 1 to 4, 6, 7, 8 and 12) to 1.5 m (Borehole 5) below grade. The earth fill materials predominately consisted of mixed composition of clayey silt/silty sand with trace amounts of gravel as well as organics.

The Standard Penetration Test results ('N' Values) obtained from the earth fill materials generally varied from 5 to 14 blows per 300 mm of penetration, indicating a loose relative density (cohesionless soils) and soft to stiff consistency (cohesive soils).

The measured moisture contents of these soil samples typically ranged from about 5 to 41 percent by weight, indicating a generally moist to locally wet (typically moist) condition. The relatively high measured moisture contents of some of the earth fill samples are likely due to the presence of the organics.

## 4.3 Native Soil

Undisturbed native soil deposit was encountered in all boreholes beneath the zone of earth fill materials and extended to the full depth of investigation (up to 5.4 m below existing grade). Limestone fragments were also noted within the lower portion of the native soil deposit. Refer to enclosed borehole logs for stratigraphic details.

Undisturbed native cohesive native soil deposit comprising clayey silt to silty clay with trace amounts of sand and gravelwas encountered in all boreholes beneath the zone of earth fill materials at depths varying from about 0.8 m (Boreholes 1 to 4, 6, 7, 8 and 12) to 1.5 m (Borehole 5) and extended to depths varying from about 2.7 m (Borehole 2) to 4.0 m (Borehole 5) below existing grade.

The Standard Penetration test results ('N' Values) obtained from the clayey silt to silty clay deposit varied from 8 to 25 blows per 300 mm of penetration, indicating a stiff to very stiff consistency.

The measured moisture content of these soil samples varied from about 7 to 33 percent by weight, indicating a moist condition.

Undisturbed native cohesionless soil deposit comprising sand with some silt to silty and trace to some clay and gravel was encountered in Boreholes 1 to 6 beneath the upper cohesive soil deposit at depths varying from about 2.7 m (Borehole 2) to 4.0 m (Boreholes 2) below grade and extended to depths varying from 4.0 m (auger refusal, Boreholes 2 and 4) to 5.4 m (auger refusal, Borehole 5) below existing grade.

The Standard Penetration Test results ('N' Values) obtained from this soil deposit varied from 6 to 38 blows per 300 mm of penetration and 50 blows per 0 to 140 mm of penetration, indicating a loose to dense relative density. Some of the high 'N' Values obtained at the interface of the overburden and inferred bedrock were discarded as they were influenced by the bedrock strength and are not representative of the relative density of the overburden soil.

The measured moisture contents of these soil samples ranged from about 5 to 10 percent by weight, indicating a moist to locally wet (typically moist) condition.

It should be noted that the native soil deposit may contain larger sized particles (cobbles and boulders) that are not specifically identified in the boreholes. The size and distribution of such obstructions cannot be predicted with borings, because the borehole sampler size is insufficient to secure representative samples for particles of this size.

The boreholes (Boreholes 1 to 6) encountered auger and/or spoon refusal on inferred bedrock and the other boreholes (7 to 13) were terminated within the native soil.

## 4.4 Geotechnical Laboratory Test Results

The geotechnical laboratory testing consisted of water content determination on all samples, and a Sieve and Hydrometer analysis and Atterberg Limits tests on selected soil samples. The results of the Sieve and Hydrometer (grain size) analyses are appended and noted on the enclosed Borehole Logs at respective sampling depths. A summary of the Sieve and Hydrometer (grain size) analysis results is presented below:

| Borehole No. Sample No. | Sampling Depth (m) | Percentage (by mass) | | | | Description (MIT System) |
|---|---|---|---|---|---|---|
| | | Gravel | Sand | Silt | Clay | |
| Borehole 1 Sample 3 | 1.8 | 1 | 6 | 24 | 69 | SILTY CLAY, trace sand, trace gravel |
| Borehole 2 Sample 5 | 3.3 | 14 | 58 | 17 | 11 | SAND, some silt, some gravel, some clay |
| Borehole 3 Sample 4B | 2.6 | 0 | 1 | 77 | 22 | CLAYEY SILT, trace sand |
| Borehole 4 Sample 5 | 3.3 | 18 | 52 | 19 | 11 | SAND, some silt, some gravel, some clay |
| Borehole 5 Sample 5 | 3.3 | 0 | 5 | 74 | 21 | CLAYEY SILT, trace sand |
| Borehole 7 Sample 2 | 1.1 | 0 | 2 | 29 | 69 | SILTY CLAY, trace sand |
| Borehole 9 Sample 3 | 1.8 | 0 | 7 | 33 | 60 | SILTY CLAY, trace sand |
| Borehole 11 Sample 2B | 1.2 | 0 | 3 | 26 | 71 | SILTY CLAY, trace sand |

The results of the Atterberg Limits tests were plotted on A-Line Graph (refer to enclosed figures, Atterberg Limits Test Results). A summary of the Atterberg Limits test results is presented below:

| Borehole No. Sample No. | Sampling Depth below Grade | Liquid Limit ($W_L$) | Plastic Limit ($W_P$) | Plasticity Index ($I_P$) | Natural Water Content ($W_N$) | Plasticity |
|---|---|---|---|---|---|---|
| Borehole 1 Sample 3 | 1.8 m | 59 | 32 | 27 | 32 | Medium Plastic |
| Borehole 3 Sample 4B | 2.6 m | 28 | 18 | 10 | 26 | Slightly Plastic |
| Borehole 5 Sample 5 | 3.3 m | 27 | 18 | 9 | 25 | Slightly Plastic |
| Borehole 7 Sample 2 | 1.1 m | 51 | 31 | 20 | 29 | Medium Plastic |

## 4.5 Ground Water

Observations pertaining to the depth of water level and caving were made in the boreholes immediately after completion of drilling and are noted on the enclosed Borehole Logs. Monitoring Wells comprising 50 mm diameter PVC tubing were installed in five (5) selected boreholes (Boreholes 1, 2, 4, 5 and 6) to facilitate ground water level measurements.The ground water levels measurements in the monitoring wells were taken on January 25 and 27, 2023 and are noted on the enclosed Borehole Logs. A summary of measured ground water level is provided as follows:

| Borehole No. | Depth of Boring (m) | Depth to Cave (m) | Water Level at the time of drilling (m) | Water Level in Monitoring Wells (m) | |
|---|---|---|---|---|---|
| | | | | Jan 25, 2023 | Jan 27, 2023 |
| 1 | 4.5 BG | open | dry | 1.1 BG | 1.1 BG |
| 2 | 4.0 BG | open | dry | 0.8 BG | 0.8 BG |
| 3 | 4.6 BG | open | dry | NMW | NMW |
| 4 | 4.0 BG | open | dry | 1.4 BG | 0.5 BG |
| 5 | 5.4 BG | open | dry | 1.4 BG | 1.0BG |
| 6 | 4.7 BG | open | dry | 0.7 BG | 0.8 BG |
| 7 | 3.5 BG | open | dry | NMW | NMW |
| 8 | 3.5 BG | open | dry | NMW | NMW |
| 9 | 3.5 BG | open | dry | NMW | NMW |
| 10 | 3.5 BG | open | dry | NMW | NMW |
| 11 | 3.7 BG | open | dry | NMW | NMW |
| 12 | 3.7 BG | open | dry | NMW | NMW |
| 13 | 3.5 BG | open | dry | NMW | NMW |

BG = Below Grade
NMW =Monitoring well not Installed

It should be noted that the groundwater level indicated above may fluctuate seasonally depending on the amount of precipitation and surface runoff.

## 4.6 Existing Building Foundation Conditions

One Test Pit (TP1) was advanced outside along the north foundation wall and extended to a depth of about 1.4 m below existing grade. The test pit encountered an asphaltic concrete layer (about 65 mm thick) at the ground surface underlain by a layer of aggregate (about 125 mm thick). A zone of earth fill material was encountered beneath the pavement structure and extended to about 0.8 depth below grade. The fill material predominately consisted of clayey silt with some sand to sandy and trace amounts of gravel and organic. The earth fill material was underlain by undisturbed native soil deposit consisting of silty clay with trace amounts of sand and gravel. The test pit was open and minor ponding water was observed at the base of excavation. The test pit was backfilled with excavated material placed in about 200 mm lifts and, compacted with plate tamper and finish the surface with granular material and compacted with plate tamper. However, it is expected that the backfill area will likely experience some settlement over time requiring periodic maintenance.

The underside/bottom of the footing was noted to be at about 1.4 m (Elev. 93.8 m) depth below existing grade. The footing consisted of poured concrete, about 300 mm thick and appeared to be supported on native soils. The concrete footing projected out about 130 ± mm from the foundation wall face. For TP1 details, refer to Figure 3 and Photographs 1 and 2.

# 5. DISCUSSION AND RECOMMENDATIONS

The following discussion and recommendations are based on the factual data obtained from this investigation and previous preliminary investigation of the site conducted by Malroz and are intended for use of the owner and the design engineer. Contractors bidding or providing services on this project should review the factual data and determine their own conclusions regarding construction methods and scheduling.

This report is provided based on these terms of reference and on the assumption that the design features relevant to the geotechnical analyses will be in accordance with applicable codes, standards, and guidelines of practice. The pertinent sections of Ontario Building Code may require additional considerations beyond the recommendations provided in this report and must be followed. If there are any changes to the site development features or there is any additional information relevant to the interpretations made of the subsurface information with respect to the geotechnical analyses or other recommendations, then Terraprobe should be retained to review the implications of these changes with respect to the contents of this report.

## 5.1 Foundations

Based on the information provided by the client, it is understood that the proposed new addition would be constructed at the northwest portion of the existing building with a similar finished floor elevation to that of the existing building. It is understood that the proposed addition would be a two-story slab-on-grade structure and would be supported on conventional spread footing foundations.

As noted before, a total of ten (10) boreholes were advanced across the site during the Preliminary Investigation (August 2022) by the Malroz. Three (3) of these boreholes (Boreholes 103, 104 and 108) were advanced in the vicinity of the proposed building addition. These boreholes (Malroz) encountered a zone of earth fill materials at the ground surface or underlaying the pavement structure and extended to depths varying from about 0.4 to 0.5 m below existing grade. The earth fill was underlain by undisturbed native soil deposit which extended to the full depth of investigation in all boreholes except in the deep Borehole 108 where bedrock of the Bobcaygeon Formation of the Simcoe Group (Limestone) was encountered at depth of about 4.4 m (Elevation 90.8 m) below grade as confirmed by rock coring.

A total of thirteen (13) exploratory boreholes (Boreholes 1 to 13) were advanced within or in the vicinity of the proposed redevelopment area. Six (6) boreholes (Boreholes 1 to 6) are in the vicinity of the proposed building addition. These boreholesencountered a topsoil layer/pavement structure at the ground surface underlain by a zone of earth fill materialextending to depths varying from about 0.8 to 1.5 m below grade. The earth fill materials were underlain by undisturbed native soil deposit which extended to the full depth of investigation (auger refusal depth on inferred bedrock in deep boreholes).

The existing topsoil/pavement structure and earth fill materials are not suitable to support the proposed building foundations. All foundations must be supported on underlying competent undisturbed native soils.

### 5.1.1 Foundation on Native Soils

The following tables provide recommended geotechnical resistance at the borehole locations. The underside of footing elevations must be designed to provide a minimum of 1.5 m of soil cover or equivalent insulation to the foundation subgrade for frost protection considerations, and all footings must be designed to bear at least 0.3 m into the undisturbed native soil stratum.

The following table provides bearing capacity recommendations at Malroz borehole locations (Boreholes 103, 104, and 108). Terraprobe assumes no responsibility regarding the accuracy of the information noted on Malroz boreholes.

**Boreholes Drilled in August 2022, Preliminary Geotechnical Investigation (by Malroz)**

| BH No. | Existing Ground Surface Elev. (m) | Minimum Foundation Depth Below Existing Grade (m) | Highest (Bottom of) Foundation Elevation (m) | Net Geotechnical Reaction at S.L.S. (kPa) | Factored Geotechnical Resistance at U.L.S. (kPa) | Bearing Stratum |
|---|---|---|---|---|---|---|
| 103 | 95.3 | 0.8 | 94.5 | 150 | 225 | Silty Clay |
| 104 | 95.3 | 0.8 | 94.5 | 150 | 225 | Silty Clay |
| 108 | 95.2 | 0.7 | 94.5 | 150 | 225 | Silty Clay |

**Boreholes Drilled December 2022, Geotechnical Investigation (by Terraprobe)**

| BH No. | Existing Ground Surface Elev. (m) | Minimum Foundation Depth Below Existing Grade (m) | Highest (Bottom of) Foundation Elevation (m) | Net Geotechnical Reaction at S.L.S. (kPa) | Factored Geotechnical Resistance at U.L.S. (kPa) | Bearing Stratum |
|---|---|---|---|---|---|---|
| 1 | 95.5 | 1.1 | 94.4 | 150 | 225 | Silty Clay |
| 2 | 95.5 | 1.1 | 94.4 | 150 | 225 | Silty Clay |
| 3 | 95.1 | 1.1 | 94.0 | 150 | 225 | Silty Clay |
| 4 | 95.1 | 1.1 | 94.0 | 150 | 225 | Silty Clay |
| 5 | 95.3 | 1.8 | 93.5 | 150 | 225 | Silty Clay |
| 6 | 95.2 | 1.1 | 94.1 | 150 | 225 | Silty Clay |

Higher bearing capacity are available and can be assessed in detail, if required. Further, relatively much higher bearing capacity is available for foundations supported on the underlying bedrock and can be analyzed in detail, if required. The depths/elevations presented in the above tables include the recommended 300 mm depth of embedment into the undisturbed native soil stratum.

The minimum width of the continuous strip footings must be 500 mm and the minimum size of isolated footings must be 900 mm x 900 mm in conjunction with the above recommended geotechnical resistance,

regardless of loading considerations. The geotechnical resistance(s) as recommended allow for up to 25mm of total settlement. This settlement will occur as load is applied and is linear elastic and non-recoverable. Differential settlement is a function of spacing, loading and foundation size. Footing width provisions for small building are stipulated in Division B, Part 9 of Ontario Building Code (2012) and must be followed.

### 5.1.2 Foundation Installation

It is recommended that all excavated footing base must be evaluated by a qualified geotechnical engineer to ensure that the founding soils exposed at the excavation base are consistent with the design bearing pressure intended by the geotechnical engineer. All exterior foundations and foundations in unheated areas should be provided with a minimum of 1.5 m of earth cover for frost protection or equivalent insulation.

Where it necessary to construct footings at different elevations, the upper footing must be founded at an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize risk of undermining the upper footing.

Prior to pouring foundation concrete, the foundation subgrade should be cleaned of all deleterious materials such as topsoil, fill, softened, disturbed, or caved materials, as well as any standing water. If construction proceeds during freezing weather conditions, adequate temporary frost protection for the foundation subgrade and concrete must be provided.

It is noted that the native soils and engineered fill tend to weather rapidly and deteriorate on exposure to the atmosphere or surface water. Hence, foundation bases which remain open for an extended period of time should be protected by a skim coat of lean concrete.

## 5.2 Slab-on-Grade

Conventional lightly loaded concrete floor slab should be placed on at least 150 mm of granular base (OPSS Granular “A” or 19 mm crusher run limestone) compacted to a minimum of 98 percent Standard Proctor Maximum Dry Density (SPMDD). The existing topsoil and pavement structure must be completely removed from the building footprints. After the removal of topsoil and pavement structure the subgrade must be assessed by a geotechnical engineer or its representative, prior to the placement of any up fill material. Any soft or wet subgrade areas identified, should be subexcavated to the underlying competent subgrade and replaced with clean earth fill or imported granular materials compacted to a minimum of 98 percent SPMDD. The existing earth fill materials may remain to support the slab-on-grade provided they are approved by a geotechnical engineer at the time of construction. Based on the borehole information, selection and sorting of earth fill materials will likely be required. Above granular base thickness is considered adequate for a slab loading up to 12 kPa (about 250 psf). Further recommendations can be provided for slab-on-grade design for slabs with heavier loading (if applicable).

The following subgrade parameters are recommended for the design of slab-on-grade supported on the approved earth fill subgrade:

Ks =15,000 kPa/m
$\phi = 29^{o}$

Provided the finish floor level of the slab-on-grade buildings is at least 200 mm above the outside design grade, and the site is graded to promote drainage away from the building, subfloor drainage provisions are not required except for nominal drainage.

Regardless of the approach to slab construction, the floor slabs that are to have bonded floor finishes (such as tiles with adhesives) should be provided with a capillary moisture and vapour barrier. The floor manufacturers have specific requirements for moisture and vapour barrier, therefore, the floor designer/architect must ensure that a provision of appropriate moisture and vapour barrier conforming to specific floor finish product requirements is incorporated in the project specifications. Adequate testing must be carried out to ensure acceptable levels of moisture and relative humidity in the concrete slab prior to the installation of floor finish(es). Studies indicate that a provision of 200 mm thick 19 mm clearstone base (OPSS.MUNI 1004) under the slab helps provide a good capillary moisture break provided the granular base is positively drained. However, this provision does not replace the floor manufacturers' specific requirement(s) for a moisture and vapour barrier.

The under-slab vapour retarder specifications, selection and installation shall conform to ASTM E1745 and ASTM E1643. The moisture vapour measurement tests shall conform to RH: ASTM F2170, RH: ASTM F2420 and Calcium Chloride: ASTM F1869. The Surface Applied Moisture Vapour Barrier system shall meet the guidelines established in ASTM F3010-13.

## 5.3 Excavations and Ground Water Control

The borehole data indicate that the topsoil, pavement structures earth fill and undisturbed native soils would be encountered in the excavations. Excavations must be carried out in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects. These regulations designate four (4) broad classifications of soilsto stipulate appropriate measures for excavation safety.

**TYPE 1 SOIL**

a. is hard, very dense and only able to be penetrated with difficulty by a small sharp object;
b. has a low natural moisture content and a high degree of internal strength;
c. has no signs of water seepage; and
d. can be excavated only by mechanical equipment.

**TYPE 2 SOIL**

a. is very stiff, dense and can be penetrated with moderate difficulty by a small sharp object;
b. has a low to medium natural moisture content and a medium degree of internal strength; and
c. has a damp appearance after it is excavated.

**TYPE 3 SOIL**

a. is stiff to firm and compact to loose in consistency or is previously-excavated soil;
b. exhibits signs of surface cracking;
c. exhibits signs of water seepage;
d. if it is dry, may run easily into a well-defined conical pile; and
e. has a low degree of internal strength

**TYPE 4 SOIL**

a. is soft to very soft and very loose in consistency, very sensitive and upon disturbance is significantly reduced in natural strength;
b. runs easily or flows, unless it is completely supported before excavating procedures;
c. has almost no internal strength;
d. is wet or muddy; and
e. exerts substantial fluid pressure on its supporting system.

The earth fill and native soils encountered in the boreholes are classified as Type 3 Soil, above and Type 4 Soil below the ground water level, under these regulations.

Where workers must enter excavations advanced deeper than 1.2 m, the trench walls should be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects. The regulation stipulates steepest slopes of excavation by soil type as follows:

| Soil Type | Base of Slope | Steepest Slope Inclination |
|---|---|---|
| 1 | within 1.2 metres of bottom of trench | 1 horizontal to 1 vertical |
| 2 | within 1.2 metres of bottom of trench | 1 horizontal to 1 vertical |
| 3 | from bottom of trench | 1 horizontal to 1 vertical |
| 4 | from bottom of trench | 3 horizontal to 1 vertical |

Minimum support system requirements for steeper excavations are stipulated in the Occupational Health and Safety Act and Regulations for Construction Projects, and include provisions for timbering, shoring and moveable trench boxes.

Undisturbed native soils may contain larger particles (cobbles and boulders) that are not specifically identified in the boreholes. The size and distribution of such obstructions cannot be predicted with borings, because the borehole sampler size is insufficient to secure representative samples for particles of this size. Provision should be made in excavation contract to allocate risks associated with the time spent and equipment utilized to remove or penetrate such obstructions when encountered. Similarly, obstructions/ debris may also be present in the fill materials.

All boreholes remained open and dry upon completion of drilling. The ground water level measured in the monitoring wells (installed in Boreholes 1, 2, 4, 5 and 6) varied from about 0.7 m (Borehole 6) to 1.4 m (Boreholes 4 and 5) below grade, on January 25, 2023. The ground water level measured in the monitoring wells (installed in Boreholes 1, 2, 4, 5 and 6) varied from about 0.5 m (Borehole 4) to 1.1 m (Borehole 1) below grade, on January 27, 2023. The ground water levels may fluctuate seasonally depending upon the amount of precipitation and surface runoff.

The upper layer of native cohesive clayey silt to silty clay deposit is relatively low permeable and would preclude significant free flowing water into the excavations in the short-term. This seepage will likely emanate from ground water generally present within the earth fill material. This perched ground water seepage should diminish slowlyand can be controlled by continuous pumping from a conventional sump and pump arrangement at the baseof the excavation.

The lower layer of native cohesionless sand, some silt deposit is relatively permeable. For excavations extending below the prevailing ground water level and wet cohesionless zone/lenses, it will be necessary to lower the ground water level and maintain it below the excavation base (at least 1.0 m) prior to and during the subsurface construction. A professional dewatering expert should review the subsurface information to assess the potential requirement of dewatering and establish appropriate dewatering methodology which will be responsibility of the dewatering contractor.
The Ministry of the Environment, Conservation and Parks (MECP) has recently made changes to the requirement for Permit to Take Water approvals for construction related activities. Under the revised requirements, specific construction-related water-taking activities are eligible for Environmental Activity and Sector Registry (EASR). The trigger volume for EASR registration is water taking of more than 50,000 litres/day. This includes the ground water that is collected in the open excavation as well as any precipitation and/or surface runoff that enters the excavation.

## 5.4 Earth Pressure Design Parameters

Walls subject to unbalanced earth pressures must be designed to resist a pressure that can be calculated based on the following equation:

$$\mathbf{P = K\,[\gamma\,(h-h_w) + \gamma' h_w + q] + \gamma_w h_w}$$

where,
- **P** = the horizontal pressure at depth, **h** (m)
- **K** = the earth pressure coefficient,
- $\mathbf{h_w}$ = the depth below the groundwater level (m)
- $\gamma$ = the bulk unit weight of soil, ( $kN/m^3$ )
- $\gamma'$ = the submerged unit weight of the exterior soil, ( $\gamma$ - 9.8 $kN/m^3$ )
- **q** = the complete surcharge loading (kPa)

Where the wall backfill can be drained effectively to eliminate hydrostatic pressures on the wall, this equation can be simplified to:

$$\mathbf{P = K[\gamma h + q]}$$

This equation assumes that free-draining granular backfill is used and positive drainage is provided for the wall to ensure that there is no hydrostatic pressure acting in conjunction with the earth pressure.

Resistance to sliding of earth retaining structures is developed by friction between the base of the footing and the soil. This friction **(R)** depends on the normal load on the soil contact (**N**) and the frictional resistance of the soil (**tan** $\phi$) expressed as **R = N tan** $\phi$. This is an ultimate resistance value and does not contain a factor of safety. The factored geotechnical resistance at ULS is **0.8R.**

Passive earth pressure resistance is generally not considered as a resisting force against sliding for conventional retaining structure design because a structure must deflect significantly to develop the full passive resistance.

The appropriate values for use in the design of structures subject to unbalanced earth pressures for prominent soil stratigraphy encountered at this site, are tabulated as follows:

| Parameter | Definition | Units |
|---|---|---|
| $\varphi$ | internal angle of friction | degrees |
| $\gamma$ | bulk unit weight of soil | $kN / m^3$ |
| $K_a$ | active earth pressure coefficient (Rankin) | dimensionless |
| $K_o$ | at-rest earth pressure coefficient (Rankin) | dimensionless |
| $K_p$ | passive earth pressure coefficient (Rankin) | dimensionless |

The appropriate values for use in the design of structures subject to unbalanced earth pressures at this site are tabulated as follows:

| Stratum/Parameter | φ | γ | Ka | Ko | Kp |
|---|---|---|---|---|---|
| Compact Granular Fill<br>Granular 'B' (OPSS 1010) | 32 | 21.0 | 0.31 | 0.47 | 3.25 |
| Existing Earth Fill | 29 | 19.0 | 0.35 | 0.52 | 2.88 |
| Clayey Silt to Silty Clay | 30 | 20.5 | 0.35 | 0.50 | 3.00 |
| Sand, some silt | 30 | 20.0 | 0.35 | 0.50 | 3.00 |

The values of the earth pressure coefficients noted above are for the horizontal backfill. The earth pressure coefficients for inclined backfill will vary based on the inclination of the retained ground surface.

## 5.5 Backfill

The topsoil and earth fill materials containing excessive amounts of organic inclusion should not be reused as backfill in settlement sensitive areas, such as beneath the floor slabs, trench backfill and pavement areas. However, these materials may be stockpiled and reused for landscaping purposes.

The clean and approved earth fill materials may be used for backfill provided these soils are within 3 percent of the optimum moisture content. It should be noted that there may be some isolated wet zones within the subsurface soils which could be too wet to compact. Any soil material with 3 percent or higher in-situ moisture content than its optimum moisture content, could be put aside to dry or be tilled to reduce the moisture content so that it can be effectively compacted. Alternatively, materials of higher moisture content could be wasted and replaced with imported material which can be readily compacted.

The earth fill materials will require selection and sorting to be reused as backfill. The selection and sorting must be conducted under the supervision of a geotechnical engineer. The site soils will be best compacted with a heavy sheepsfoot type roller.

In settlement sensitive areas, the backfill should consist of clean earth and should be placed in lifts of 150 mm thickness or less, and heavily compacted to a minimum of 95 percent SPMDD at a water content close to optimum (within 3 percent).

It should be noted that the soils encountered on the site, in general are not free draining, and will be difficult to handle and compact should they become wetter as a result of inclement weather or seepage. Hence, it can be expected that the earthworks will be difficult and may incur additional costs if carried out during the wet periods (i.e. spring and fall) of the year.

## 5.6 Pavement Design

The proposed redevelopment would include construction of parking areas and driveways/access routes, likely including both heavy and light duty pavement sections.

Previously (August 2022), Malroz advanced a total of ten (10) boreholes (Boreholes 101 to 110) across the site, extending to depths varying from about 2.1 to 6.1 m below existing grade. Terraprobe advanced a total of thirteen (13) boreholes (Boreholes 1 to 13) in the vicinity of the proposed redevelopment area, extending to depths varying from about 3.5 to 5.4 m below existing grade. These boreholes encountered a surficial layer of pavement structure/topsoil and or earth fill material.The pavement structure and topsoil were underlain by a zone of earth fill material. The earth fill material was underlain by undisturbed native soil deposit extending to the full depth of investigation (auger refusal depth on inferred bedrock in deep boreholes). Therefore, the pavement subgrade is expected to consist of undisturbed native soils or clean earth fill compacted to a minimum of 98 precent SPMDD.

It is assumed that the proposed new/rehabilitation parking area grade would generally match with the existing grades of the surrounding paved areas, and therefore, significant grade changes of the proposed new/rehabilitation parking area are not expected. Therefore, the pavement subgrade would generally consist of earth fill. All topsoil, organics, soft/loose and otherwise disturbed/weathered soils should be stripped from the subgrade areas and the existing asphaltic concrete should be removed by saw cutting as and where required. Existing earth fill materials may remain to support subgrade as approved by a geotechnical engineer. The pavement subgrade should be proof-rolled with a heavy rubber tire vehicle (such as a grader) and anyloose, soft, wet, or unstable areas should be sub-excavated, and backfilled with clean earth fill material placedin 150 mm thick lifts and compacted to a minimum of 98 percent SPMDD. Local subexcavation in some areas may be required due to loose/soft, wet, and incompetent subgrade conditions or excessive topsoil/ organic presence, as identified during the proof roll.

The existing earth fill materials encountered on the site may be utilized for subgrade preparation provided they do not contain excessive amounts of organics and deleterious materials, as well as their in-situ moisture content is within 3 percent of the optimum moisture content. The selection and sorting of these soils for reuse should be conducted under the supervision of a geotechnical engineer. Pavement subgrade fill material should be compacted to a minimum of 95 percent SPMDD, while the upper zone (within 1.5 m of the design subgrade) should be compacted to a minimum of 98 percent SPMDD.

A pavement design for parking areas and driveways is presented below. The pavement design methods are based on a design life of 15 for typical weather conditions and design traffic loadings. The following pavement thickness design is provided on the above noted considerations and subgrade basis.

**Performance Asphaltic Concrete Pavement Structure**

| Pavement Layers | Minimum Component Thickness | | Compaction Requirements |
|---|---|---|---|
| | Passenger Car Parking Lots | Driveway/Fire Route | |
| **Surface Course** - Asphaltic Concrete HL3 (OPSS 1150) | 50 mm | 40 mm | as per OPSS.MUNI 310 |
| **Base Course** - Asphaltic Concrete HL8 (OPSS 1150) | NA | 80 mm | |
| **Base Course:** Granular 'A' or 19 mm Crusher Run Limestone (OPSS 1010.MUNI and Pertinent Town Specifications) | 200 mm | 200 mm | 100 % SPMDD ASTM D698 |
| **Subbase Course:** Granular 'B' or 50 mm Crusher Run Limestone (OPSS.MUNI 1010 and Pertinent Town Specifications) | 300 mm | 400 mm | |

HL 3 and HL 8 hot mix asphalt mixes should be designed, produced, and placed in conformance with OPSS 1150 and OPSS MUNI 310 requirements and pertinent Town's standards.

Granular base and subbase materials should meet the requirements of OPSS MUNI 1010 and pertinent Town's requirements. Granular materials should be compacted to 100 percent of Standard Proctor Maximum Dry Density (SPMDD). PG 58-28, conforming to OPSS 1101 is recommended in the HMA surface and binder courses. Tack coat SS-1 should be applied between hot mix asphalt binder course and surface course.

Consideration should be given to high stability asphalt mixes such as Heavy Duty Binder Course (HDBC) as asphalt base course and Dense Friction Course (DFC) as asphalt surface course particularly for the heavy duty traffic areas. These products help provide additional stability and durability against pavement distress due to excessive traffic loads, and intense turning and stopping of vehicles.

Alternatively, use of rigid Portland Cement concrete pavement may be considered where there is intense truck use, and turning of transport vehicles in conjunction with the waste handling, loading docks or delivery facilities. The following table provides the minimum recommended rigid pavement structure:

**Minimum Rigid Concrete Pavement Structure**

| Pavement Layer | Compaction Requirements | Heavy Duty Pavement |
|---|---|---|
| **Portland Cement Concrete:** (CAN3-CSA A23.1) - Class C-2 | CAN3-CSA A23.1 | 200 mm |
| **Base Course:** Granular A or 19 mm Crusher Run Limestone (OPSS.MUNI 1010) | 100% Standard Proctor Maximum Dry Density (ASTM-D698) | 300 mm |

Portland cement concrete should be design, produced and placed in conformation with CAN/CSA A23.1, OPSS.MUNI 1350 and OPSS 350 requirements and relevant Town's standards.

It must be noted that this structure does not provide full protection of the subgrade from frost penetration, therefore, the pavement slabs must be separated from the building structure. Truck loading bays are typically the lowest points in the pavement grading. It is recommended to provide a subgrade drain at the lowest point in the bay, usually at the trench drain, to facilitate an exit for subgrade drainage.

Control of surface water is an important factor in achieving a good pavement life. The need for adequate subgrade drainage cannot be over-emphasized. The subgrade must be free of depressions and sloped (preferably at a minimum grade of 2 percent) to provide effective drainage toward subgrade drains. Grading adjacent to pavement areas should be designed to ensure that water is not allowed to pond adjacent to the outside edges of the pavement. Continuous pavement subdrains should be provided along both sides of the driveway/access routes and drained into respective catch basins to facilitate drainage of the subgrade and the granular materials. The subdrain invert should be maintained at least 0.3 m below subgrade level. Continuous subdrains should also be provided for the parking lot/driveway pavement areas along the curb-lines/sidewalk and at all catch basins within the parking areas. Two lengths of subdrain (minimum of about 3.0 m long each) should be installed at each catch basin (refer to attached drawing - Pavement Drainage Alternatives).

The granular base beneath the concrete sidewalks and walkways must be provided with positive drainage to help minimize concrete slab heaving. Alternatively, the sidewalk could be insulated. The concrete surface sidewalk and entrance slabs near flush-doors must be supported on a minimum of 1.5 m thick non-frost susceptible material (Granular 'A' or 'B', OPSS.MUNI 1010) provided with a provision of a subdrain with positive outlet to help minimize slab heave due to freezing weather conditions, alternatively a frost slab construction may be employed at these locations.

The above pavement design thicknesses are considered adequate for the design traffic. However, if the pavement construction occurs in wet, winter, or inclement weather, it may be necessary to provide additional subgrade support for heavy construction traffic by increasing the thickness of the granular sub-base, base, or both. Further, traffic areas for construction equipment may experience unstable subgrade conditions. These areas may be stabilized utilizing additional thickness of granular materials.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures must be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as possible when fill is placed, and the natural subgrade is not disturbed or weakened after it is exposed.

It should be noted that in addition to adherence of the above pavement design recommendations, a close control on the pavement construction process will also be required in order to obtain the desired pavement life. Therefore, it is recommended that regular inspection and testing should be conducted during the pavement construction to confirm material quality, thickness, and to ensure adequate compaction.

## 5.7 Pipe Bedding

The design details and invert elevations of the underground utilities were not available at the time of preparation of this report. As noted before, the site stratigraphy predominantly consists of surficial earth fill materials underlain by undisturbed native soil deposit extending to the full depth of investigation. The undisturbed native materials and approved compacted earth fill (minimum 95 percent SPMDD) will be suitable for support of buried services on a conventional well graded granular base material. It is recommended that the utility subgrade be inspected by a geotechnical engineer or its representative during construction. The utility subgrade may require stabilization as deemed necessary based on the subgrade assessment, particularly if it consists of earth fill or wet, loose/soft materials. If the disturbance of the trench base has occurred, such as due to ground water seepage or construction traffic, the disturbed soils should be subexcavated and replaced with suitably compacted granular fill.

Granular bedding material should consist of a well graded, free draining soil, such as OPSS Granular “A” or 19 mm Crusher Run Limestone or its equivalent as per the pertinent Town/Region specifications. The bedding materials should be placed in 150 mm thick lifts and compacted to a minimum of 95 percent SPMDD or vibrated/tempted to a dense state in case of a clear stone bedding (19 mm clear stone, OPSS.MUNI 1004). A clearstone type bedding may be considered if approved by the Town/Region, however, on a silt/sand subgrade it must be utilized only in conjunction with a suitable geotextile filter (Terrafix 270R or equivalent). Otherwise without proper filtering, there may be entry of fines from the native soils into the bedding. This loss of ground could result in loss of support to the pipes and possible future settlements. Where subgrade consists of clayey soils, a geotextile filter is not required.

## 5.8 Earthquake Design Parameters

The Ontario Building Code stipulates the methodology for earthquake design analysis. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration, and the site classification.

Under Ontario Regulation 88/19, the ministry amended Ontario's Building Code (O. Reg 332/12) to further harmonize Ontario's Building Code with the 2015 National Codes. These changes will help reduce red tape for businesses and remove barriers to interprovincial trade throughout the country. The amendments are based on code change proposals the ministry consulted in 2016 and 2017. The majority of the amendments came into effect on January 1, 2020, which includes structural sufficiency of buildings to withstand external forces and improve resilience.

Seismic hazard is defined in the Ontario Building Code (OBC) by uniform hazard spectra (UHS) at spectral coordinates of 0.2s, 0.5s, 1.0s and 2.0s and a probability of exceedance of 2% in 50 years. The OBC method uses a site classification system defined by the average soil/bedrock properties (e.g. shear wave velocity (vs), Standard Penetration Test (SPT) resistance, and undrained shear strength (su) in the top 30 meters of the site stratigraphy below the foundation level, as set out in the Ontario Building Code. There are 6 site classes from A to F, decreasing in ground stiffness from A, hard rock, to E, soft soil; with site class F used to denote problematic soils (e.g. sites underlain by thick peat deposits and/or liquefiable soils). The site class is then used to obtain peak ground acceleration (PGA), peak ground velocity (PGV) site coefficients Fa and Fv, respectively, used to modify the UHS to account for the effects of site-specific soil conditions.

Based on the above noted information, it is recommended that the site designation for seismic analysis be 'Site Class C', as per the Ontario Building Code. Consideration may be given to conducting a site-specific Multichannel Analysis of Surface Waves (MASW) at this site to confirm the average shear wave velocity in the top 30 metres of the site stratigraphy.

The values of the site coefficient for design spectral acceleration at period T, F(T), and of similar coefficients F(PGA) and F(PGV) shall conform to Tables 4.1.8.4.B. to 4.1.8.4.I. using linear interpolation for intermediate values of PGA.

## 6.0 LIMITATIONS AND USE OF REPORT

It must be recognized that there are special risks whenever engineering or related disciplines are applied to identify subsurface conditions. A comprehensive sampling and testing programme implemented in accordance with the most stringent level of care may fail to detect certain conditions. Terraprobe has assumed for the purposes of providing advice, that the conditions that exist between sampling points are similar to those found at the sample locations. The conditions that Terraprobe has interpreted to exist between sampling points can differ from those that actually exist.

It must also be recognized that the passage of time, natural occurrences, and direct or indirect human intervention at or near the site have the potential to alter subsurface conditions.

The discussion and recommendations provided here are preliminary and based on the factual data obtained from this investigation and the preliminary geotechnical investigation conducted by Malroz and are intended for use by the owner and its retained designers in the design phase of the project. Since the project development details are not available, aspects of the project relative to the subsurface conditions cannot be anticipated. Terraprobe should review the design drawings and specifications prior toconstruction. If there are changes to the project scope and development features, the interpretations made of the subsurface information, the geotechnical design parameters and comments relating to contractibilityissues and quality control may not be relevant to the revised project. Terraprobe should be retained to reviewthe implications of changes with respect to the contents of this report.

The investigation at this site was conceived and executed to provide information for project design. It may not be possible to drill a sufficient number of boreholes or samples and report them in a way that would provide all the subsurface information that could have an effect on construction costs, techniques, equipment, and scheduling. Contractors bidding on or undertaking work on this project should therefore, in this light, be directed to decide on their own investigations, as well as their own interpretations of the factual investigation results. They should be cognizant of the risks implicit in subsurface investigation activities so that they may draw their own conclusions as to how the subsurface conditions may affect them.

This report was prepared for the express use of Ontario Infrastructure and Lands Corporation (IO) and their retained design consultants. It is not for use by others. This report is copyright of Terraprobe Inc. and no part of this reportmay be reproduced by any means, in any form, without the prior written permission of Terraprobe Inc. and Ontario Infrastructure and Lands Corporation (IO), who are the authorized users. It is recognized that the regulatory agencies in theircapacities as the planning and building authorities under Provincial statues, will make use of and rely uponthis report, cognizant of the limitations thereof, both expressed and implied.

We trust the foregoing information is sufficient for your present requirements. If you have any questions, or if we can be of further assistance, please do not hesitate to contact us.

Yours truly,

**Terraprobe Inc.**

LICENSED PROFESSIONAL ENGINEER
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# ENCLOSURES

TERRAPROBE INC.

Terraprobe

# ABBREVIATIONS AND TERMINOLOGY

## SAMPLING METHODS

| | |
|---|---|
| AS | auger sample |
| CORE | cored sample |
| DP | direct push |
| FV | field vane |
| GS | grab sample |
| SS | split spoon |
| ST | shelby tube |
| WS | wash sample |

## PENETRATION RESISTANCE

**Standard Penetration Test (SPT)** resistance ('N' values) is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a standard 50 mm (2 in.) diameter split spoon sampler for a distance of 0.3 m (12 in.).

**Dynamic Cone Test (DCT)** resistance is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a conical steel point of 50 mm (2 in.) diameter and with 60° sides on 'A' size drill rods for a distance of 0.3 m (12 in.)."

## COHESIONLESS SOILS

| Compactness | 'N' value |
|---|---|
| very loose | < 4 |
| loose | 4 – 10 |
| compact | 10 – 30 |
| dense | 30 – 50 |
| very dense | > 50 |

## COHESIVE SOILS

| Consistency | 'N' value | Undrained Shear Strength (kPa) |
|---|---|---|
| very soft | < 2 | < 12 |
| soft | 2 – 4 | 12 – 25 |
| firm | 4 – 8 | 25 – 50 |
| stiff | 8 – 15 | 50 – 100 |
| very stiff | 15 – 30 | 100 – 200 |
| hard | > 30 | > 200 |

## COMPOSITION

| Term (e.g) | % by weight |
|---|---|
| *trace* silt | < 10 |
| *some* silt | 10 – 20 |
| silty | 20 – 35 |
| sand *and* silt | > 35 |

## TESTS AND SYMBOLS

| | |
|---|---|
| MH | mechanical sieve and hydrometer analysis |
| w, $w_c$ | water content |
| $w_L$, LL | liquid limit |
| $w_P$, PL | plastic limit |
| $I_P$, PI | plasticity index |
| k | coefficient of permeability |
| γ | soil unit weight, bulk |
| $G_s$ | specific gravity |
| φ' | internal friction angle |
| c' | effective cohesion |
| $c_u$ | undrained shear strength |

| | |
|---|---|
| ▽ | Unstabilized water level |
| ▼ | 1st water level measurement |
| ▼ | 2nd water level measurement |
| ▼ | Most recent water level measurement |
| 3.0 + | Undrained shear strength from field vane (with sensitivity) |
| $C_c$ | compression index |
| $c_v$ | coefficient of consolidation |
| $m_v$ | coefficient of compressibility |
| e | void ratio |

## FIELD MOISTURE DESCRIPTIONS

| | |
|---|---|
| **Damp** | refers to a soil sample that does not exhibit any observable pore water from field/hand inspection. |
| **Moist** | refers to a soil sample that exhibits evidence of existing pore water (e.g. sample feels cool, cohesive soil is at plastic limit) but does not have visible pore water |
| **Wet** | refers to a soil sample that has visible pore water |

# BOREHOLE LOGS

TERRAPROBE INC.

# LOG OF BOREHOLE 1

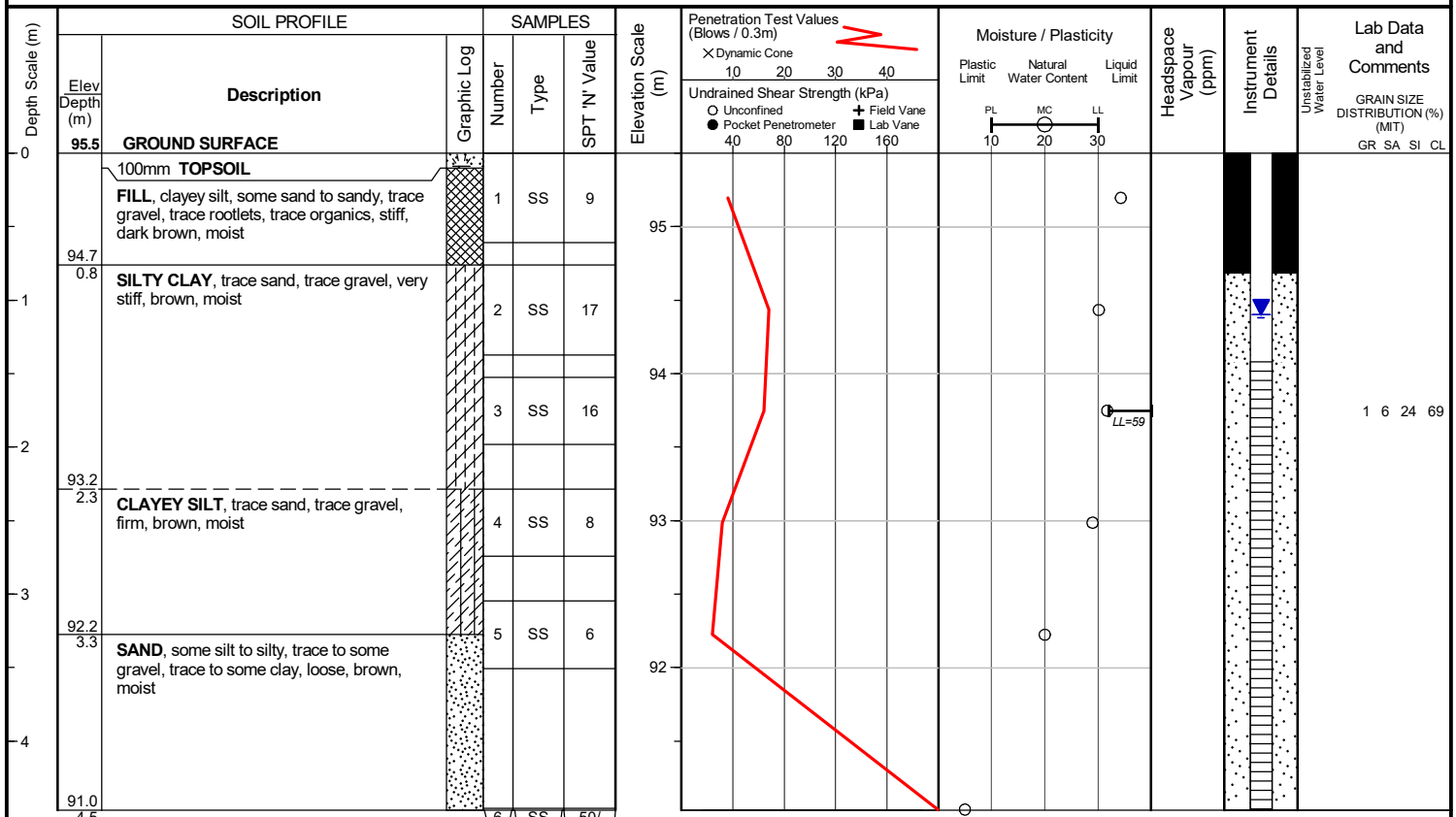
Terraprobe

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 15, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343025, N: 4901165 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Elev Depth (m) | Description | Number | Type | SPT 'N' Value |
|---|---|---|---|---|
| 95.5 | **GROUND SURFACE** | | | |
| | 100mm **TOPSOIL** | | | |
| | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, stiff, dark brown, moist | 1 | SS | 9 |
| 94.7 / 0.8 | **SILTY CLAY**, trace sand, trace gravel, very stiff, brown, moist | 2 | SS | 17 |
| | | 3 | SS | 16 |
| 93.2 / 2.3 | **CLAYEY SILT**, trace sand, trace gravel, firm, brown, moist | 4 | SS | 8 |
| | | 5 | SS | 6 |
| 92.2 / 3.3 | **SAND**, some silt to silty, trace to some gravel, trace to some clay, loose, brown, moist | | | |
| 91.0 / 4.5 | | 6 | SS | 50/ 0mm |




**END OF BOREHOLE**
Auger refusal on inferred bedrock

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

| Date | Water Depth (m) | Elevation (m) |
|---|---|---|
| Jan 25, 2023 | 1.1 | 94.4 |
| Jan 27, 2023 | 1.1 | 94.4 |

file: 02209049.000 bh logs.gpj

# LOG OF BOREHOLE 2

Terraprobe

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 15, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343018, N: 4901175 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Elev Depth (m) | Description | Number | Type | SPT 'N' Value |
|---|---|---|---|---|
| 95.5 | **GROUND SURFACE** | | | |
| | 100mm **TOPSOIL** | | | |
| | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, stiff, dark brown, moist | 1 | SS | 10 |
| 94.7 / 0.8 | **SILTY CLAY**, trace sand, trace gravel, stiff to very stiff, brown, moist | 2 | SS | 17 |
| | | 3 | SS | 13 |
| 93.2 / 2.3 | **CLAYEY SILT**, trace sand, trace gravel, stone pieces, very stiff, brown, moist | 4 | SS | 21 |
| 92.8 / 2.7 | **SAND**, some silt to silty, trace to some gravel, trace to some clay, stone pieces, compact to dense, brown, moist | 5 | SS | 38 |
| 91.5 / 4.0 | | | | |

Depth Scale (m): 0, 1, 2, 3

Elevation Scale (m): 95, 94, 93, 92

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

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) 10, Natural Water Content (MC) 20, Liquid Limit (LL) 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

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

Lab data: 14 58 17 11

**END OF BOREHOLE**
Auger refusal on inferred bedrock

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

| Date | Water Depth (m) | Elevation (m) |
|---|---|---|
| Jan 25, 2023 | 0.8 | 94.7 |
| Jan 27, 2023 | 0.8 | 94.7 |

file: 02209049.000 bh logs.gpj

# LOG OF BOREHOLE 3

Terraprobe

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 15, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343044, N: 4901178 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Elev Depth (m) | Description | Number | Type | SPT 'N' Value |
|---|---|---|---|---|
| 95.1 | **GROUND SURFACE** | | | |
| 94.9 / 0.2 | 150mm **AGGREGATE** | | | |
| | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, dark brown, moist | 1 | AS | |
| 94.3 / 0.8 | **SILTY CLAY**, trace sand, trace gravel, stiff to very stiff, brown, moist | 2 | SS | 12 |
| | | 3 | SS | 18 |
| 92.6 / 2.5 | **CLAYEY SILT**, trace sand, trace gravel, stiff, brown, moist | 4A, 4B | SS | 8 |
| 92.1 / 3.0 | **SAND**, some silt to silty, trace to some gravel, trace to some clay, compact, brown, moist | 5 | SS | 15 |
| 90.5 / 4.6 | | | | |

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

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) 10, Natural Water Content (MC) 20, Liquid Limit (LL) 30

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL: 0 1 77 22

**END OF BOREHOLE**
Auger refusal on inferred bedrock

Borehole was dry and open upon completion of drilling.

file: 02209049.000 bh logs.gpj

# LOG OF BOREHOLE 4

Terraprobe

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 15, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343036, N: 4901190 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Depth Scale (m) | Elev Depth (m) | Description | Graphic Log | Number | Type | SPT 'N' Value | Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL |
|---|---|---|---|---|---|---|---|
| 0 | 95.1 | **GROUND SURFACE** | | | | | |
| | 94.9 / 0.2 | 150mm **AGGREGATE** | | | | | |
| | | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, dark brown, moist | | 1 | AS | | |
| | 94.3 / 0.8 | **SILTY CLAY**, trace sand, trace gravel, very stiff, brown, moist | | 2 | SS | 18 | |
| 1 | | | | 3 | SS | 18 | |
| 2 | 92.8 / 2.3 | **CLAYEY SILT**, trace sand, trace gravel, stiff, brown, moist | | 4 | SS | 12 | |
| 3 | 92.1 / 3.0 | **SAND**, some silt to silty, trace to some gravel, trace to some clay, compact, brown, moist | | 5 | SS | 24 | 18 52 19 11 |
| | 91.1 / 4.0 | | | | | | |

Elevation Scale (m): 95, 94, 93, 92

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

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) 10, Natural Water Content (MC) 20, Liquid Limit (LL) 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

**END OF BOREHOLE**
Auger refusal on inferred bedrock

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

| Date | Water Depth (m) | Elevation (m) |
|---|---|---|
| Jan 25, 2023 | 1.4 | 93.7 |
| Jan 27, 2023 | 0.5 | 94.6 |

file: 02209049.000 bh logs.gpj

Terraprobe

# LOG OF BOREHOLE 5

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 15, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343062, N: 4901194 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Elev Depth (m) | Description | Number | Type | SPT 'N' Value |
|---|---|---|---|---|
| 95.3 | **GROUND SURFACE** | | | |
| 95.1 / 0.2 | 65mm **ASPHALTIC CONCRETE** / 125mm **AGGREGATE** | | | |
| | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, firm, dark brown, moist | 1 | AS | |
| | | 2 | SS | 7 |
| 93.8 / 1.5 | **SILTY CLAY**, trace sand, trace gravel, stiff to very stiff, brown, moist | 3 | SS | 9 |
| | | 4 | SS | 19 |
| 92.3 / 3.0 | **CLAYEY SILT**, trace sand, trace gravel, stiff, brown, moist | 5 | SS | 12 |
| 91.3 / 4.0 | **SAND**, some silt to silty, trace to some gravel, trace to some clay, stone pieces, loose, brown, wet | 6 | SS | 8 |
| 89.9 / 5.4 | | | | |

Lab Data and Comments: 0 5 74 21 (GR SA SI CL)

**END OF BOREHOLE**
Auger refusal on inferred bedrock

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

| Date | Water Depth (m) | Elevation (m) |
|---|---|---|
| Jan 25, 2023 | 1.4 | 93.9 |
| Jan 27, 2023 | 1.0 | 94.3 |

file: 02209049.000 bh logs.gpj

# LOG OF BOREHOLE 6

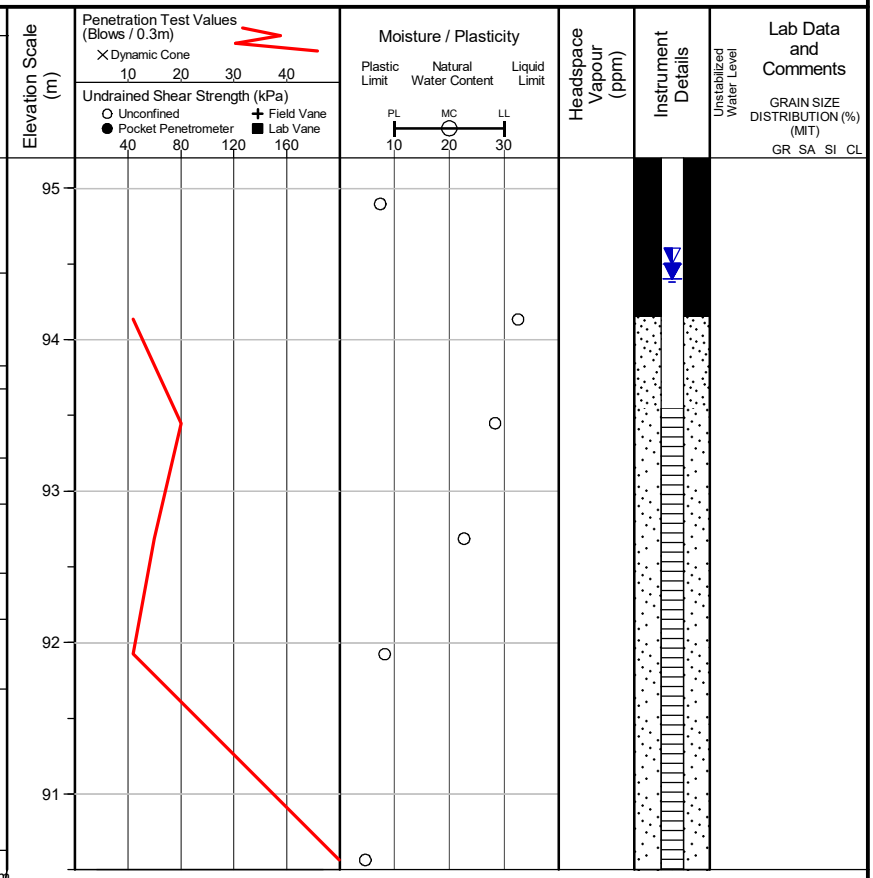
Terraprobe

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 15, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343056, N: 4901204 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Elev Depth (m) | Description | Number | Type | SPT 'N' Value |
|---|---|---|---|---|
| 95.2 | **GROUND SURFACE** | | | |
| | 80mm **ASPHALTIC CONCRETE** | | | |
| 94.8 | 300mm **AGGREGATE** | 1 | AS | |
| 0.4 / 94.4 | **FILL**, silty sand, trace to some clay, trace gravel, trace organics, dark brown, moist | | | |
| 0.8 | **SILTY CLAY**, trace sand, trace gravel, stiff to very stiff, brown, moist | 2 | SS | 11 |
| | | 3 | SS | 20 |
| 92.9 / 2.3 | **CLAYEY SILT**, trace sand, trace gravel, stiff, brown, moist | 4 | SS | 15 |
| 92.2 / 3.0 | **SAND**, some silt to silty, trace to some gravel, trace to some clay, compact, brown, moist | 5 | SS | 11 |
| 90.5 / 4.7 | ...lime stone pieces inclusion, very dense | 6 | SS | 50/140mm |




**END OF BOREHOLE**
Auger refusal on inferred bedrock

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

| Date | Water Depth (m) | Elevation (m) |
|---|---|---|
| Jan 25, 2023 | 0.7 | 94.5 |
| Jan 27, 2023 | 0.8 | 94.4 |

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Terraprobe

# LOG OF BOREHOLE 7

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 14, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343055, N: 4901228 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Depth Scale (m) | Elev / Depth (m) | Description | Graphic Log | Number | Type | SPT 'N' Value | Elevation Scale (m) | Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa) | Moisture / Plasticity (PL, MC, LL) | Headspace Vapour (ppm) | Instrument Details | Unstabilized Water Level | Lab Data and Comments / GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 94.9 | **GROUND SURFACE** | | | | | | | | | | | |
| | | 125mm **TOPSOIL** | | | | | | | | | | | |
| | | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, firm, dark brown, moist | | 1 | SS | 7 | | | 41 | | | | |
| | 94.1 / 0.8 | **SILTY CLAY**, trace sand, trace gravel, very stiff, brown, moist | | 2 | SS | 16 | 94 | | LL=51 | | | | 0 2 29 69 |
| 1 | | | | 3 | SS | 19 | 93 | | | | | | |
| 2 | | | | 4 | SS | 15 | 92 | | | | | | |
| 3 | 91.9 / 3.0 | **CLAYEY SILT**, trace sand, trace gravel, stiff, brown, moist | | 5 | SS | 11 | | | | | | | |
| | 91.4 / 3.5 | **END OF BOREHOLE** | | | | | | | | | | | |

Borehole was dry and open upon completion of drilling.

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

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

Moisture / Plasticity: Plastic Limit (PL) 10, Natural Water Content (MC) 20, Liquid Limit (LL) 30

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Terraprobe

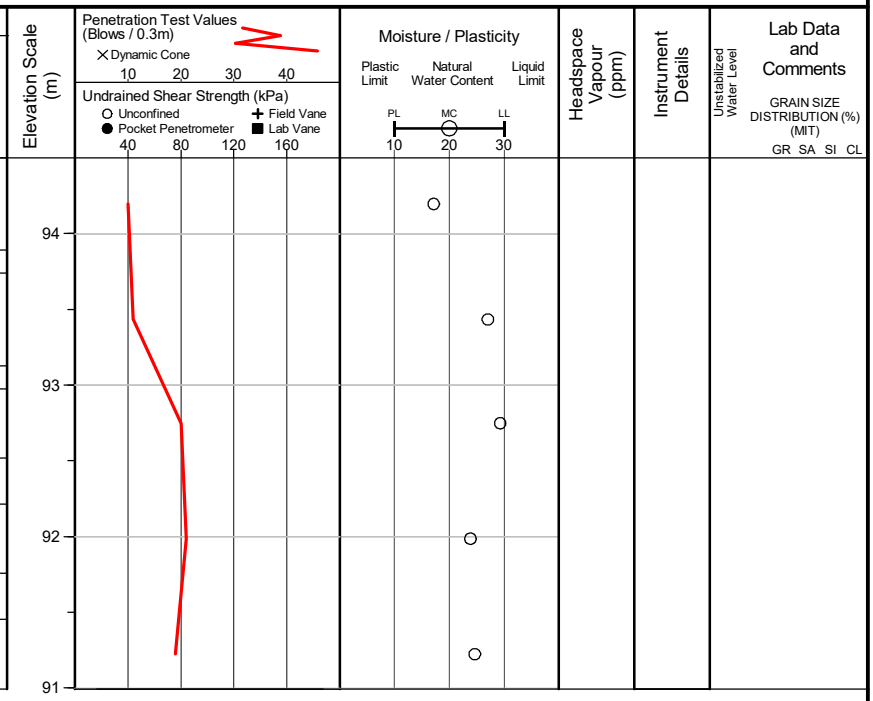
# LOG OF BOREHOLE 8

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 14, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343119, N: 4901175 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Depth Scale (m) | Elev / Depth (m) | Description | Graphic Log | Sample Number | Type | SPT 'N' Value |
|---|---|---|---|---|---|---|
| 0 | 94.5 | **GROUND SURFACE** | | | | |
| | 94.3 / 0.2 | 150mm **TOPSOIL** | | | | |
| | | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, stiff, dark brown, moist | | 1 | SS | 10 |
| | 93.7 / 0.8 | **SILTY CLAY**, trace sand, trace gravel, stiff to very stiff, brown, moist | | 2 | SS | 11 |
| 1 | | | | 3 | SS | 20 |
| 2 | | | | 4 | SS | 21 |
| 3 | | | | 5 | SS | 19 |
| | 91.0 / 3.5 | | | | | |




**END OF BOREHOLE**

Borehole was dry and open upon completion of drilling.

file: 02209049.000 bh logs.gpj

# LOG OF BOREHOLE 9

Terraprobe

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 14, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343136, N: 4901171 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Depth Scale (m) | Elev Depth (m) | Description | Graphic Log | Number | Type | SPT 'N' Value | Elevation Scale (m) | Lab Data and Comments (GR SA SI CL) |
|---|---|---|---|---|---|---|---|---|
| 0 | 94.2 | **GROUND SURFACE** | | | | | 94 | |
| | | 65mm **AGGREGATE** | | | | | | |
| | | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, stiff, dark brown, moist | | 1 | SS | 13 | | |
| | 93.4 / 0.8 | **SILTY CLAY**, trace sand, trace gravel, stiff to very stiff, brown, moist | | 2 | SS | 8 | 93 | |
| 1 | | | | 3 | SS | 13 | | 0 7 33 60 |
| 2 | | | | 4 | SS | 19 | 92 | |
| 3 | 90.9 / 3.3 | | | 5 | SS | 10 | 91 | |
| | 90.7 / 3.5 | **CLAYEY SILT**, trace sand, trace gravel, stiff, brown, moist | | | | | | |

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

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

Moisture / Plasticity: Plastic Limit (PL) 10; Natural Water Content (MC) 20; Liquid Limit (LL) 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

GRAIN SIZE DISTRIBUTION (%) (MIT)

**END OF BOREHOLE**

Borehole was dry and open upon completion of drilling.

file: 02209049.000 bh logs.gpj

Terraprobe

# LOG OF BOREHOLE 10

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 14, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343130, N: 4901179 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Depth Scale (m) | Elev / Depth (m) | Description | Graphic Log | Number | Type | SPT 'N' Value |
|---|---|---|---|---|---|---|
| 0 | 94.5 | **GROUND SURFACE** | | | | |
| | | 125mm **TOPSOIL** | | | | |
| | 93.9 / 0.6 | **FILL**, silty sand, trace to some clay, trace gravel, trace organics, loose, dark brown, moist | | 1 | SS | 10 |
| 1 | 93.4 / 1.1 | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, stiff, dark brown, moist | | 2 | SS | 10 |
| | | **SILTY CLAY**, trace sand, trace gravel, stiff to very stiff, brown, moist | | 3 | SS | 19 |
| 2 | | | | 4 | SS | 14 |
| 3 | 91.5 / 3.0 | **CLAYEY SILT**, trace sand, trace gravel, stiff, brown, moist | | 5 | SS | 12 |
| | 91.0 / 3.5 | **END OF BOREHOLE** | | | | |

Elevation Scale (m): 94, 93, 92, 91

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

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) 10, Natural Water Content (MC) 20, Liquid Limit (LL) 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

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

Borehole was dry and open upon completion of drilling.

file: 02209049.000 bh logs.gpj

Terraprobe

# LOG OF BOREHOLE 11

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 14, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343167, N: 4901132 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Depth Scale (m) | Elev / Depth (m) | Description | Graphic Log | Sample Number | Type | SPT 'N' Value | Elevation Scale (m) | Lab Data and Comments (GR SA SI CL) |
|---|---|---|---|---|---|---|---|---|
| 0 | 94.3 | **GROUND SURFACE** | | | | | | |
| | | 125mm **TOPSOIL** | | | | | | |
| | | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, firm, dark brown, moist | | 1 | SS | 8 | 94 | |
| 1 | 93.2 / 1.1 | | | 2A | SS | 7 | | |
| | | **SILTY CLAY**, trace sand, trace gravel, firm to very stiff, brown, moist | | 2B | | | 93 | 0 3 26 71 |
| 2 | | | | 3 | AS | 21 | | |
| | | | | | | | 92 | |
| 3 | | | | 4 | AS | 25 | | |
| | | | | 5 | SS | 15 | 91 | |
| | 90.6 / 3.7 | | | | | | | |

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

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) 10, Natural Water Content (MC) 20, Liquid Limit (LL) 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

**END OF BOREHOLE**

Borehole was dry and open upon completion of drilling.

file: 02209049.000 bh logs.gpj

Terraprobe

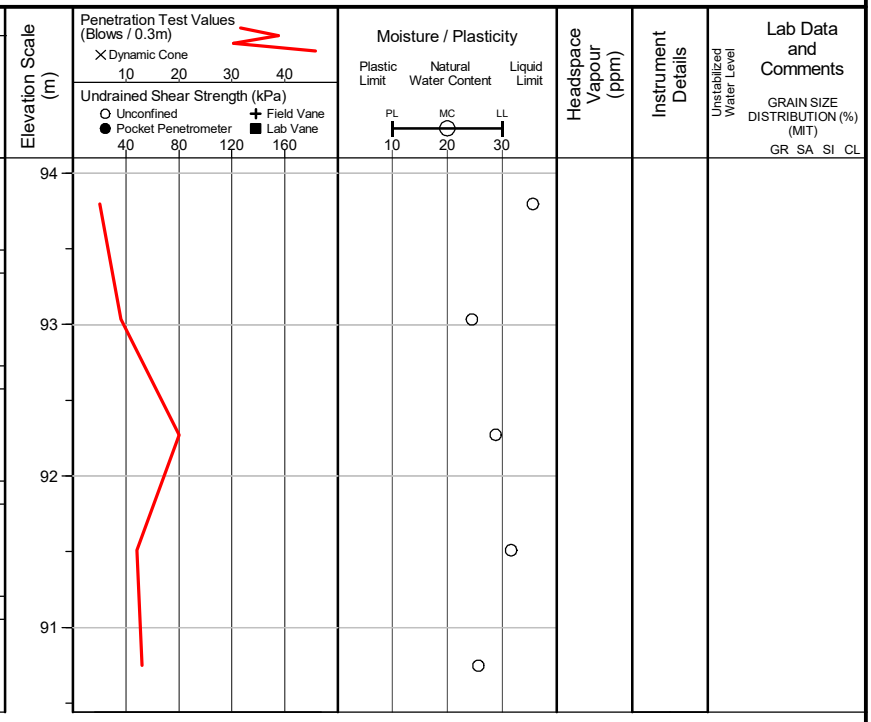
# LOG OF BOREHOLE 12

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 14, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343149, N: 4901156 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Depth Scale (m) | Elev / Depth (m) | Description | Graphic Log | Number | Type | SPT 'N' Value |
|---|---|---|---|---|---|---|
| 0 | 94.1 | **GROUND SURFACE** | | | | |
| | | 115mm **TOPSOIL** | | | | |
| | | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, firm, dark brown, moist | | 1 | SS | 5 |
| | 93.3 / 0.8 | **SILTY CLAY**, trace sand, trace gravel, stiff to very stiff, brown, moist | | 2 | SS | 9 |
| 1 | | | | 3 | SS | 20 |
| 2 | | | | 4 | SS | 12 |
| 3 | 91.1 / 3.0 | **CLAYEY SILT**, trace sand, trace gravel, stiff, brown, moist | | 5 | SS | 13 |
| | 90.4 / 3.7 | **END OF BOREHOLE** | | | | |




Borehole was dry and open upon completion of drilling.

file: 02209049.000 bh logs.gpj

Terraprobe

# LOG OF BOREHOLE 13

| | | | | | |
|---|---|---|---|---|---|
| Project No. | : 02209049.000 | Client | : Infrastructure Ontario | Originated by | : OH |
| Date started | : December 14, 2022 | Project | : 240 Marilyn Avenue | Compiled by | : MR |
| Sheet No. | : 1 of 1 | Location | : Napanee, Ontario | Checked by | : MMT |

Position : E: 343144, N: 4901207 (UTM 18T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

| Depth Scale (m) | Elev Depth (m) | Description | Graphic Log | Number | Type | SPT 'N' Value |
|---|---|---|---|---|---|---|
| 0 | 94.5 | **GROUND SURFACE** | | | | |
| | 94.3 / 0.2 | 75mm **ASPHALTIC CONCRETE** | | | | |
| | | 75mm **AGGREGATE** | | 1 | AS | |
| | 93.7 / 0.8 | **FILL**, silty sand, trace to some clay, trace gravel, trace organics, dark brown, moist | | | | |
| 1 | 93.3 / 1.2 | **FILL**, clayey silt, some sand to sandy, trace gravel, trace rootlets, trace organics, stiff, dark brown, moist | | 2 | SS | 14 |
| 2 | | **SILTY CLAY**, trace sand, trace gravel, stiff to very stiff, brown, moist | | 3 | SS | 18 |
| | | | | 4 | SS | 16 |
| 3 | 91.0 / 3.5 | | | 5 | SS | 18 |

Elevation Scale (m): 94, 93, 92, 91

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

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) 10, Natural Water Content (MC) 20, Liquid Limit (LL) 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

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

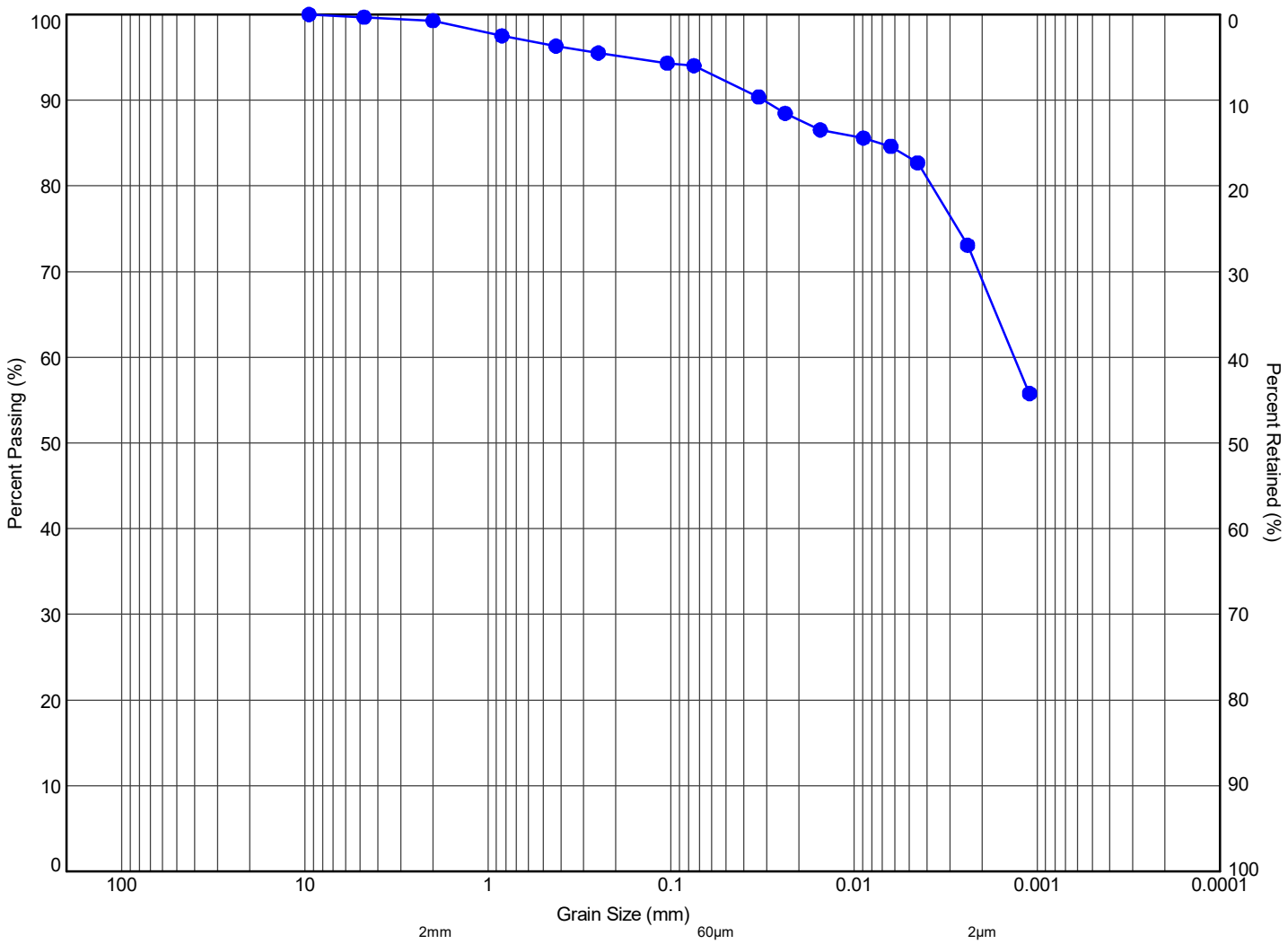
**END OF BOREHOLE**

Borehole was dry and open upon completion of drilling.

file: 02209049.000 bh logs.gpj

# SIEVE AND HYDROMETER ANALYSIS

TERRAPROBE INC.




MIT SYSTEM

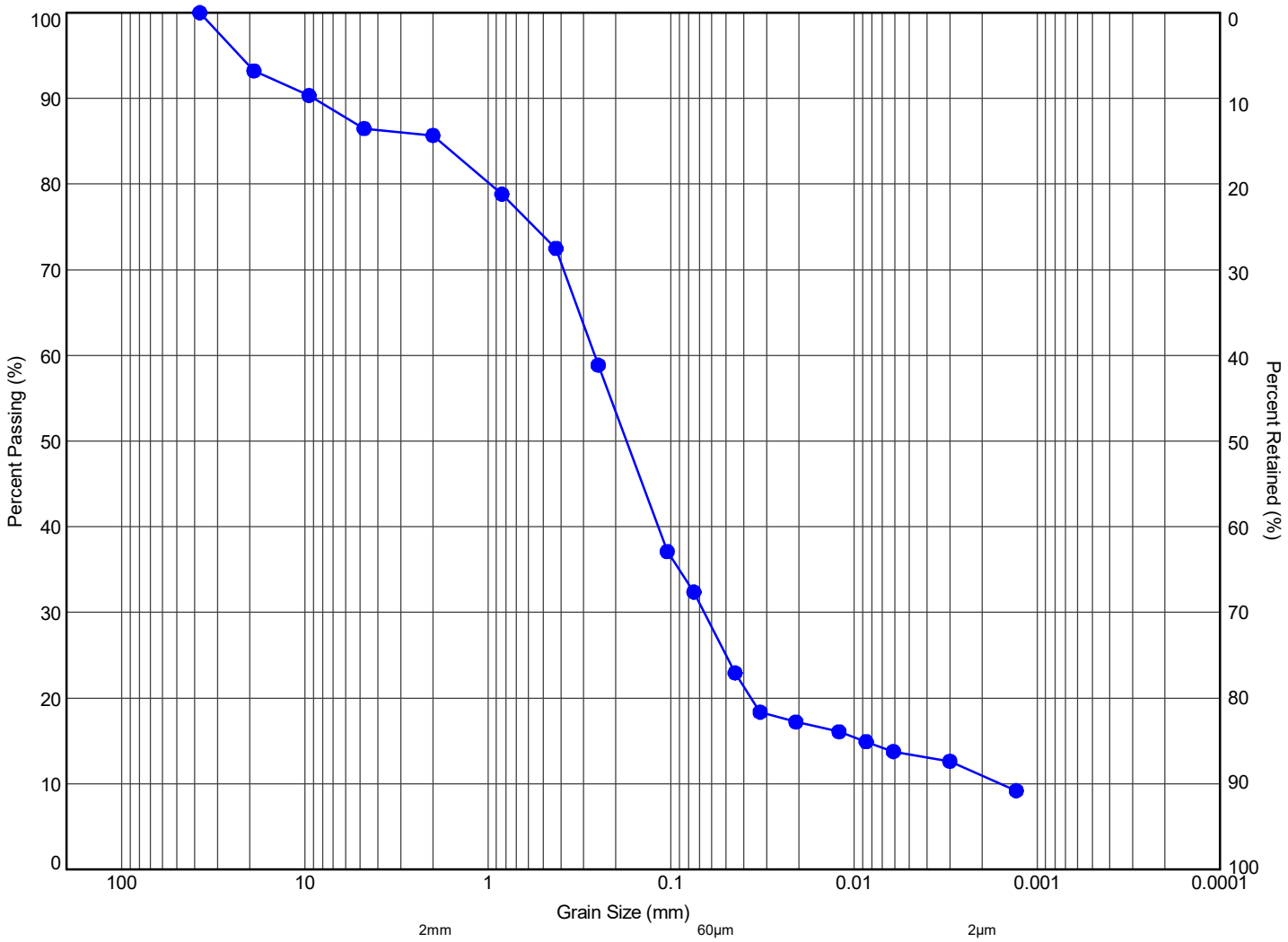
| | Hole ID | Sample | Depth (m) | Elev. (m) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | *(Fines, %)* |
|---|---|---|---|---|---|---|---|---|---|
| ● | **1** | SS3 | 1.8 | 93.7 | 1 | 6 | 24 | 69 | |

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

**GRAIN SIZE DISTRIBUTION**
**SILTY CLAY, TRACE SAND, TRACE GRAVEL**

File No.: **02209049.000**




| MIT SYSTEM | COBBLES | GRAVEL | | | SAND | | | SILT | CLAY |
|---|---|---|---|---|---|---|---|---|---|
| | | COARSE | MEDIUM | FINE | COARSE | MEDIUM | FINE | | |

MIT SYSTEM

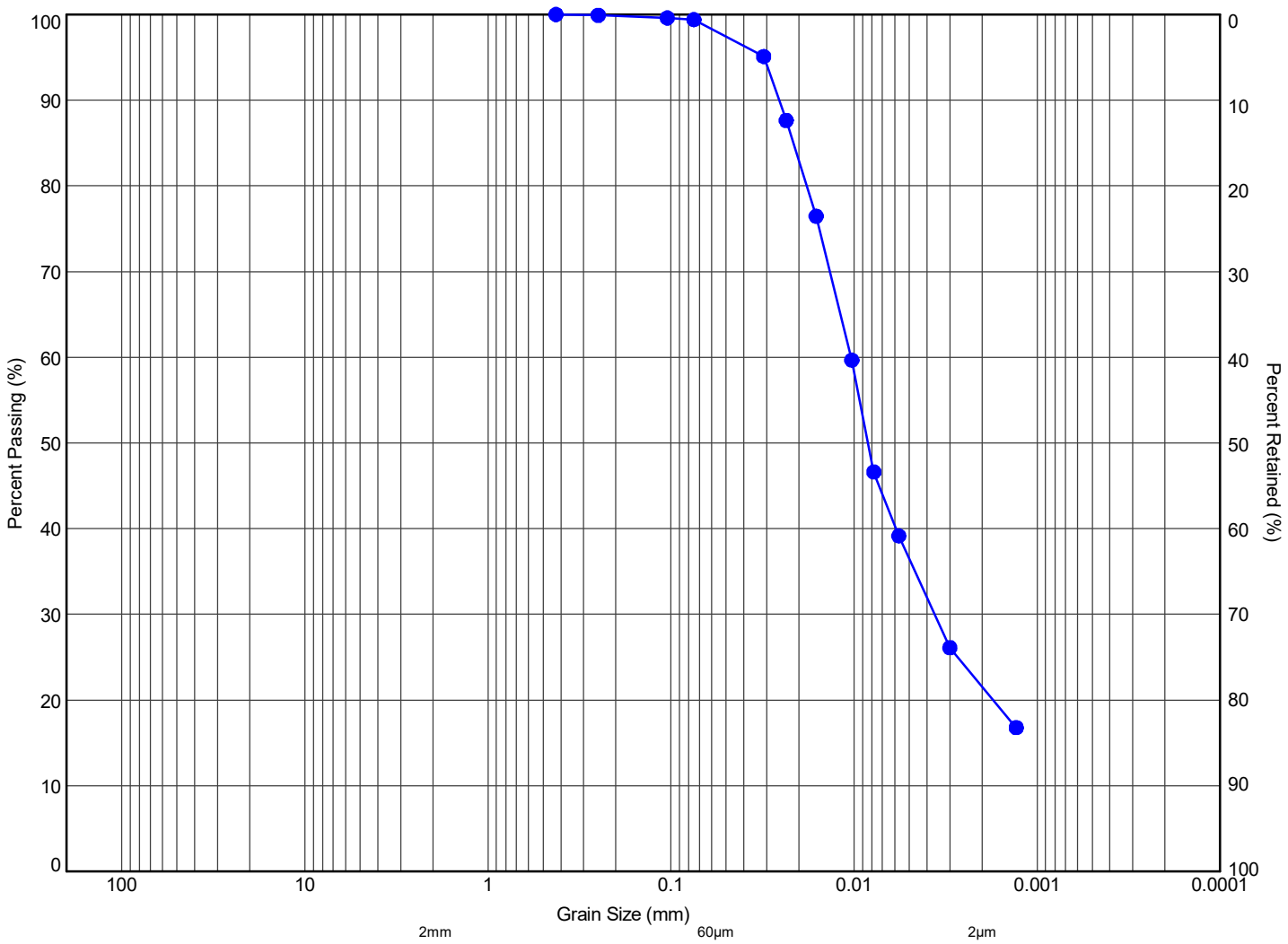
| | Hole ID | Sample | Depth (m) | Elev. (m) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | *(Fines, %)* |
|---|---|---|---|---|---|---|---|---|---|
| ● | **2** | SS5 | 3.3 | 92.2 | 14 | 58 | 17 | 11 | |

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

**GRAIN SIZE DISTRIBUTION**
**SAND, SOME SILT, SOME GRAVEL, SOME CLAY**

File No.: **02209049.000**




| MIT SYSTEM | COBBLES | GRAVEL | | | SAND | | | SILT | CLAY |
|---|---|---|---|---|---|---|---|---|---|
| | | COARSE | MEDIUM | FINE | COARSE | MEDIUM | FINE | | |

MIT SYSTEM

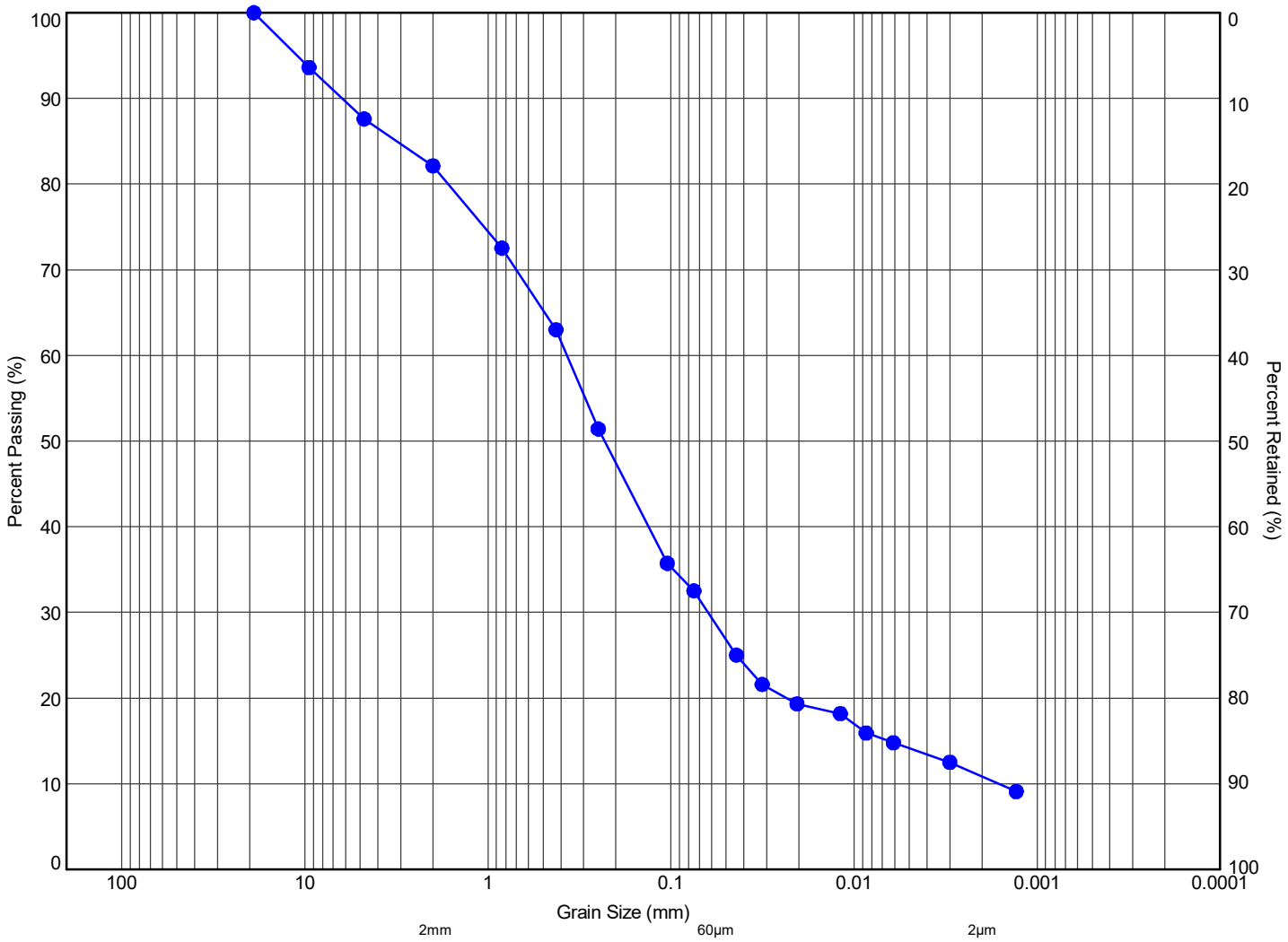
| | Hole ID | Sample | Depth (m) | Elev. (m) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | *(Fines, %)* |
|---|---|---|---|---|---|---|---|---|---|
| ● | **3** | 4B | 2.6 | 92.5 | 0 | 1 | 77 | 22 | |

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

**GRAIN SIZE DISTRIBUTION**
**CLAYEY SILT, TRACE SAND**

File No.: **02209049.000**




MIT SYSTEM

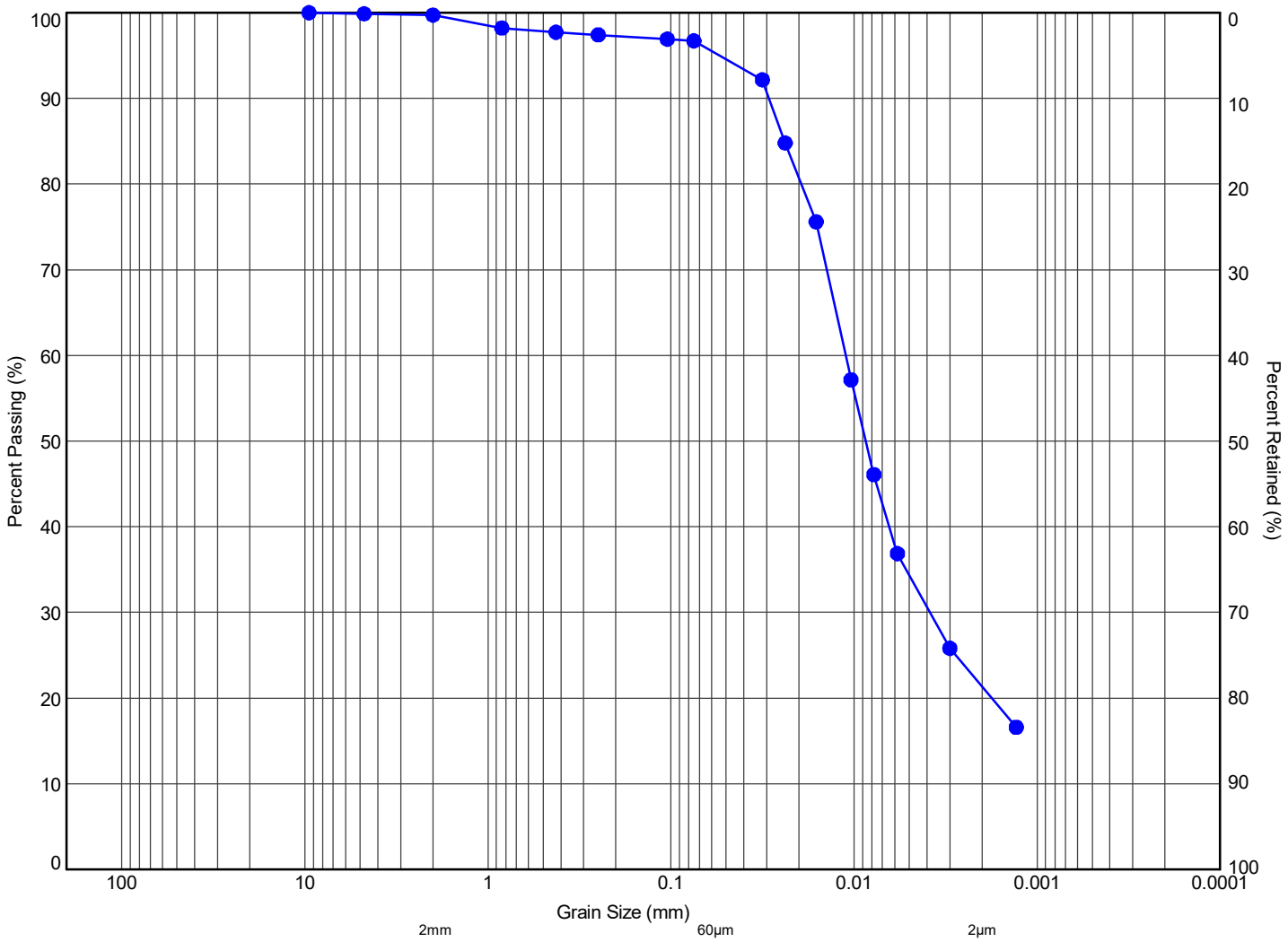
| | Hole ID | Sample | Depth (m) | Elev. (m) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | *(Fines, %)* |
|---|---|---|---|---|---|---|---|---|---|
| ● | **4** | SS5 | 3.3 | 91.8 | 18 | 52 | 19 | 11 | |

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

**GRAIN SIZE DISTRIBUTION**
**SAND, SOME SILT, SOME GRAVEL, SOME CLAY**

File No.: **02209049.000**




| MIT SYSTEM | COBBLES | GRAVEL | | | SAND | | | SILT | CLAY |
|---|---|---|---|---|---|---|---|---|---|
| | | COARSE | MEDIUM | FINE | COARSE | MEDIUM | FINE | | |

MIT SYSTEM

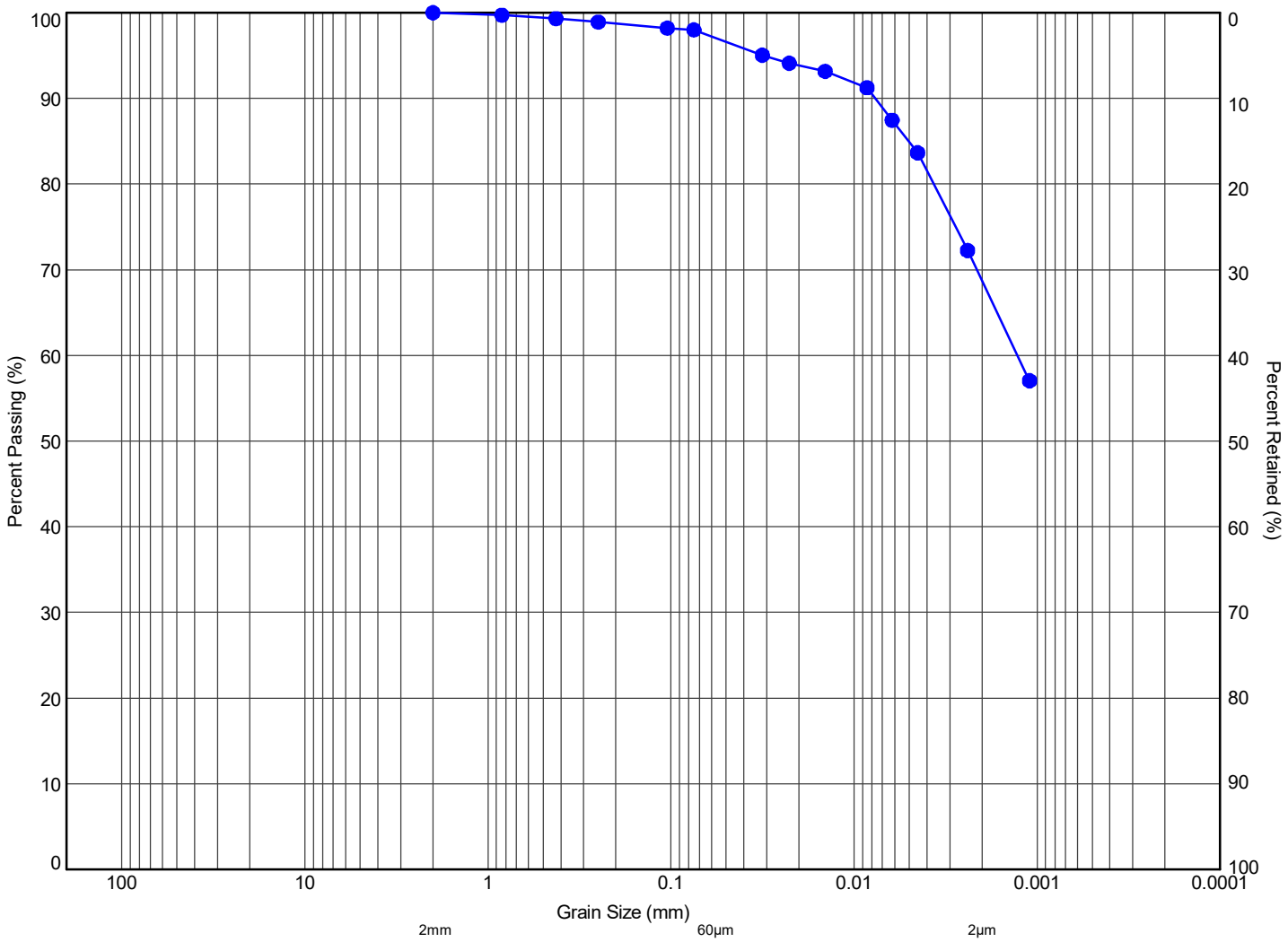
| | Hole ID | Sample | Depth (m) | Elev. (m) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | *(Fines, %)* |
|---|---|---|---|---|---|---|---|---|---|
| ● | **5** | SS5 | 3.3 | 92.0 | 0 | 5 | 74 | 21 | |

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

**GRAIN SIZE DISTRIBUTION**
**CLAYEY SILT, TRACE SAND**

File No.: **02209049.000**




| MIT SYSTEM | COBBLES | GRAVEL | | | SAND | | | SILT | CLAY |
|---|---|---|---|---|---|---|---|---|---|
| | | COARSE | MEDIUM | FINE | COARSE | MEDIUM | FINE | | |

MIT SYSTEM

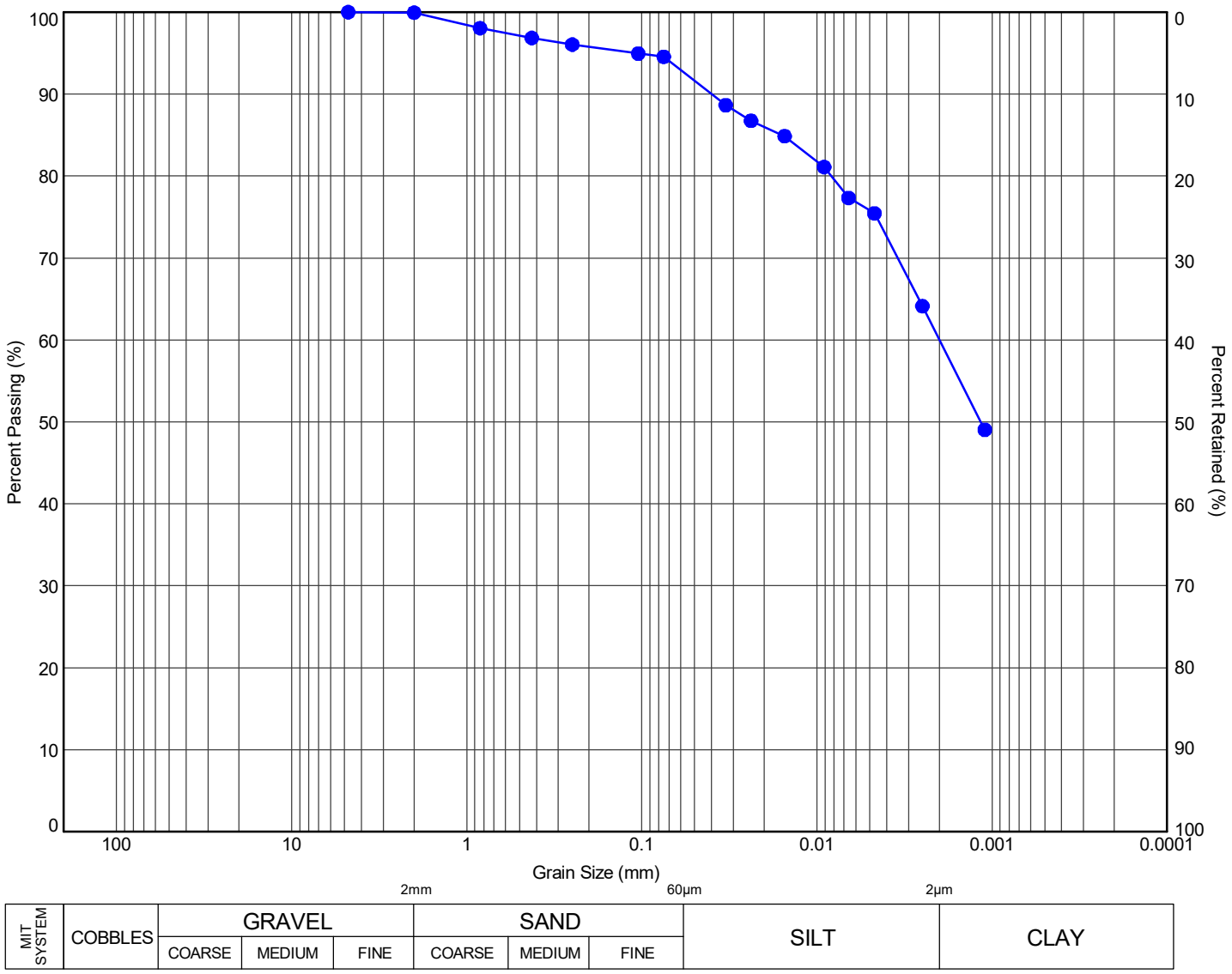
| | Hole ID | Sample | Depth (m) | Elev. (m) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | *(Fines, %)* |
|---|---|---|---|---|---|---|---|---|---|
| ● | **7** | SS2 | 1.1 | 93.8 | 0 | 2 | 29 | 69 | |

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

**GRAIN SIZE DISTRIBUTION**
**SILTY CLAY, TRACE SAND**

File No.: **02209049.000**




MIT SYSTEM

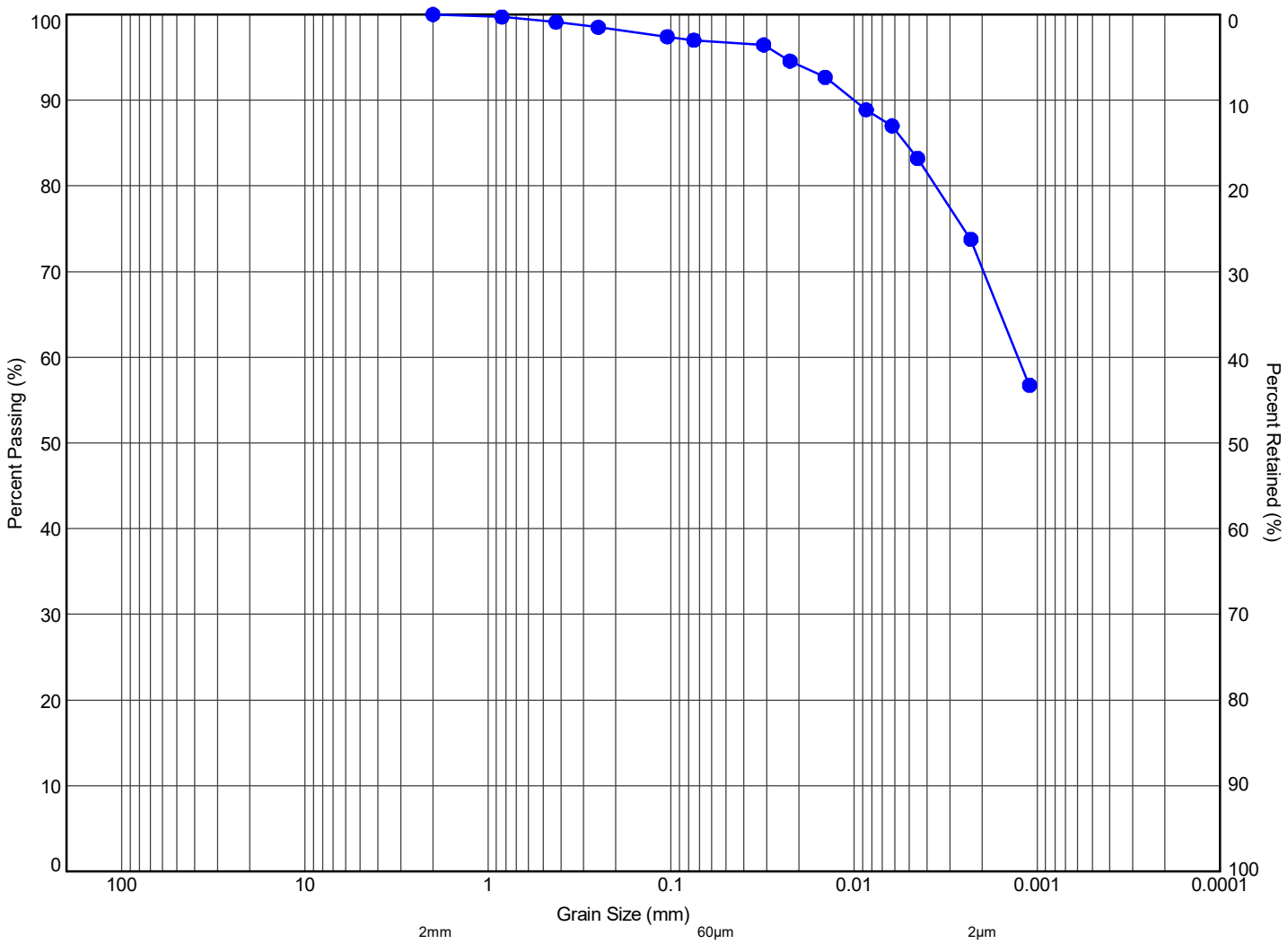
| | Hole ID | Sample | Depth (m) | Elev. (m) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | *(Fines, %)* |
|---|---|---|---|---|---|---|---|---|---|
| ● | **9** | SS3 | 1.8 | 92.4 | 0 | 7 | 33 | 60 | |

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

**GRAIN SIZE DISTRIBUTION**
**SILTY CLAY, TRACE SAND**

File No.: **02209049.000**




| MIT SYSTEM | COBBLES | GRAVEL | | | SAND | | | SILT | CLAY |
|---|---|---|---|---|---|---|---|---|---|
| | | COARSE | MEDIUM | FINE | COARSE | MEDIUM | FINE | | |

MIT SYSTEM

| | Hole ID | Sample | Depth (m) | Elev. (m) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | *(Fines, %)* |
|---|---|---|---|---|---|---|---|---|---|
| ● | **11** | 2B | 1.2 | 93.1 | 0 | 3 | 26 | 71 | |

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

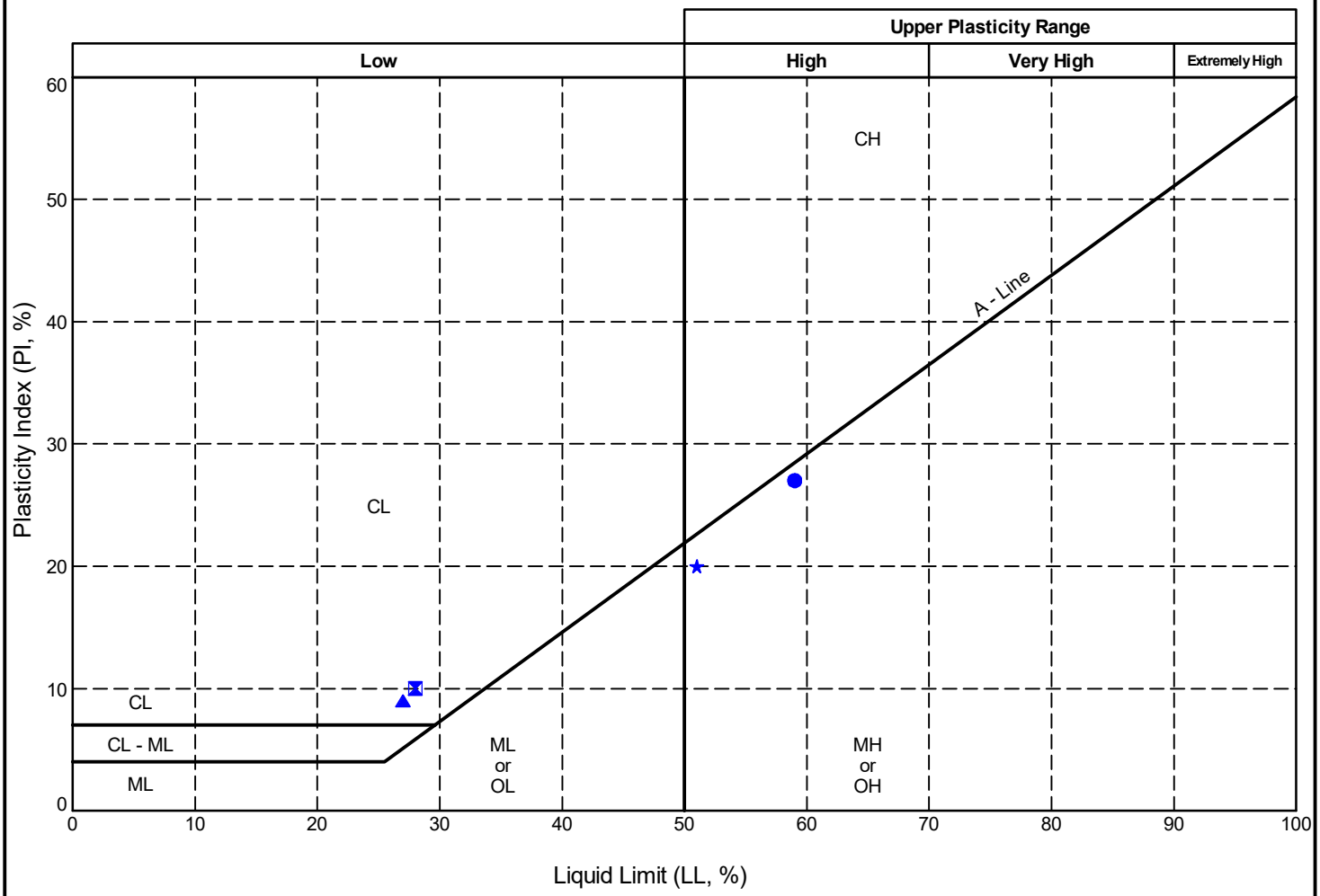
Title:

**GRAIN SIZE DISTRIBUTION**
**SILTY CLAY, TRACE GRAVEL**

File No.: **02209049.000**

# ATTERBERG LIMITS TEST RESULTS

TERRAPROBE INC.




| | Borehole | Sample | Depth (m) | Elev. (m) | LL (%) | PL (%) | PI (%) | Description |
|---|---|---|---|---|---|---|---|---|
| ● | 1 | SS3 | 1.8 | 93.7 | 59 | 32 | 27 | MEDIUM PLASTIC |
| ⊠ | 3 | 4B | 2.6 | 92.5 | 28 | 18 | 10 | SLIGHTLY PLASTIC |
| ▲ | 5 | SS5 | 3.3 | 92.0 | 27 | 18 | 9 | SLIGHTLY PLASTIC |
| ★ | 7 | SS2 | 1.1 | 93.8 | 51 | 31 | 20 | MEDIUM PLASTIC |

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

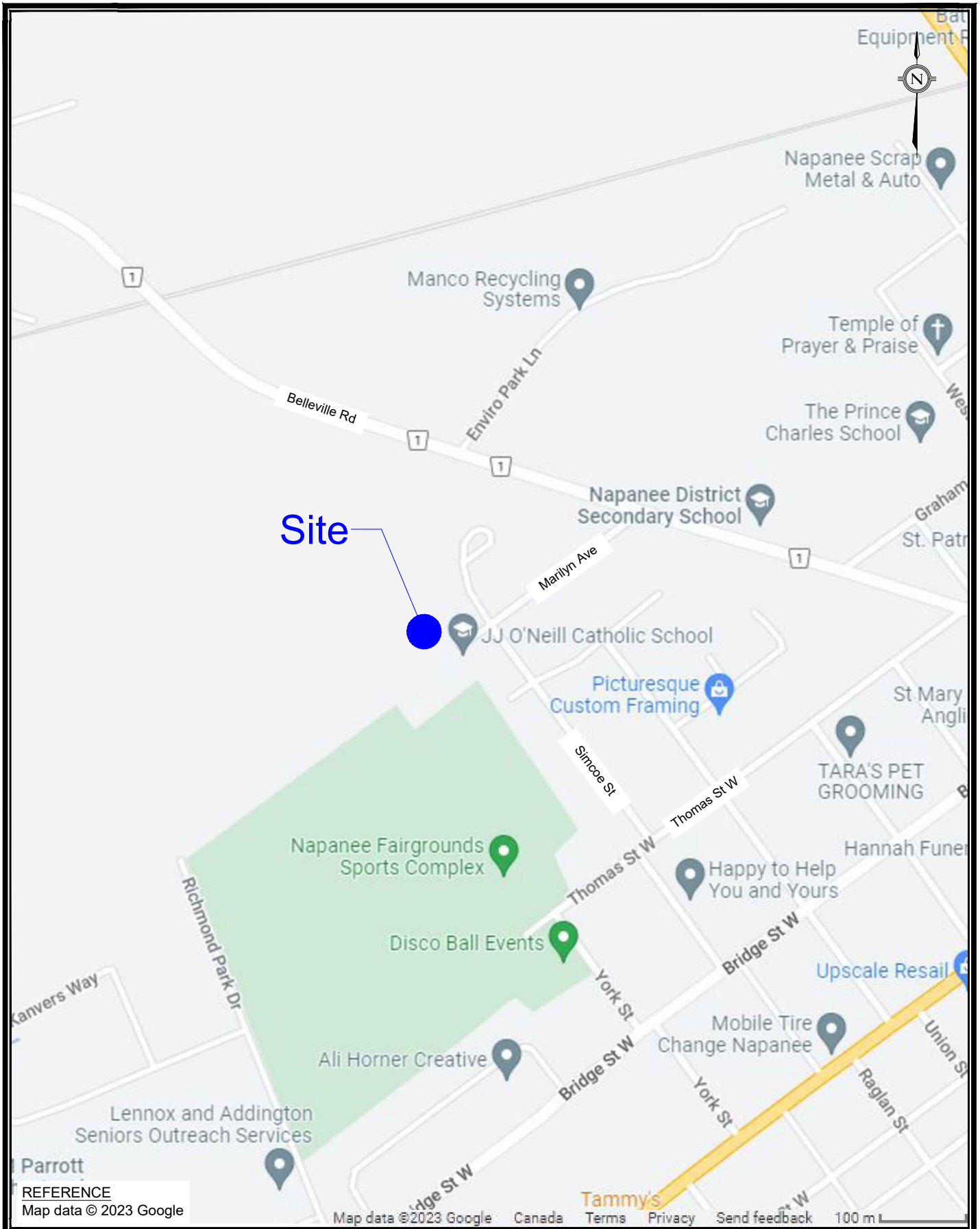
**ATTERBERG LIMITS CHART**

File No.:

**02209049.000**

# FIGURES

TERRAPROBE INC.




REFERENCE
Map data © 2023 Google

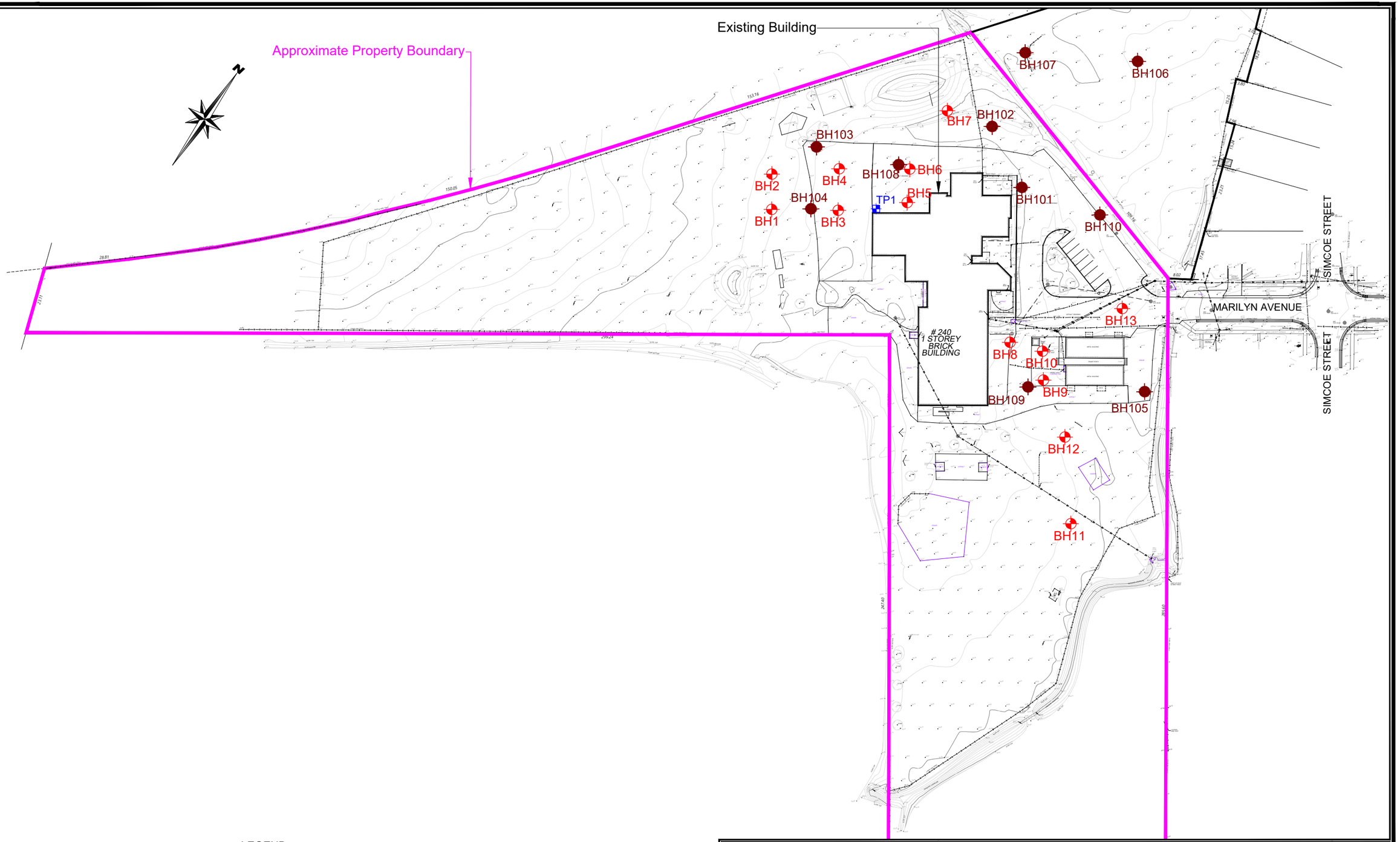
**Terraprobe**
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

Title: **SITE LOCATION PLAN**

File. No.: 02209049.000

FIGURE : 1

Y:\Share\CA\Terraprobe\Brampton\1-Project Files\2022-Englobe\02209049.000 - 240 Marilyn Avenue Napanee\0105 - Geotechnical Investigation\1-Dwgs, Logs\AutoCAD\02209049 Figures--2023.01.23.dwg, DWG To PDF.pc3, Kamal, Kamal




REFERENCE
Topographic Base Plan of 240 Marilyn Avenue
County of Lennox and Addington
File name: A-036753-Topo-V4, Date: Dec 12, 2022
By: IBW Surveyors

LEGEND
- Approximate Borehole Location (Terraprobe)
- Approximate Borehole Location (Malroz)
- Approx. Test Pit Location (Terraprobe)

8 4 0 20m
SCALE

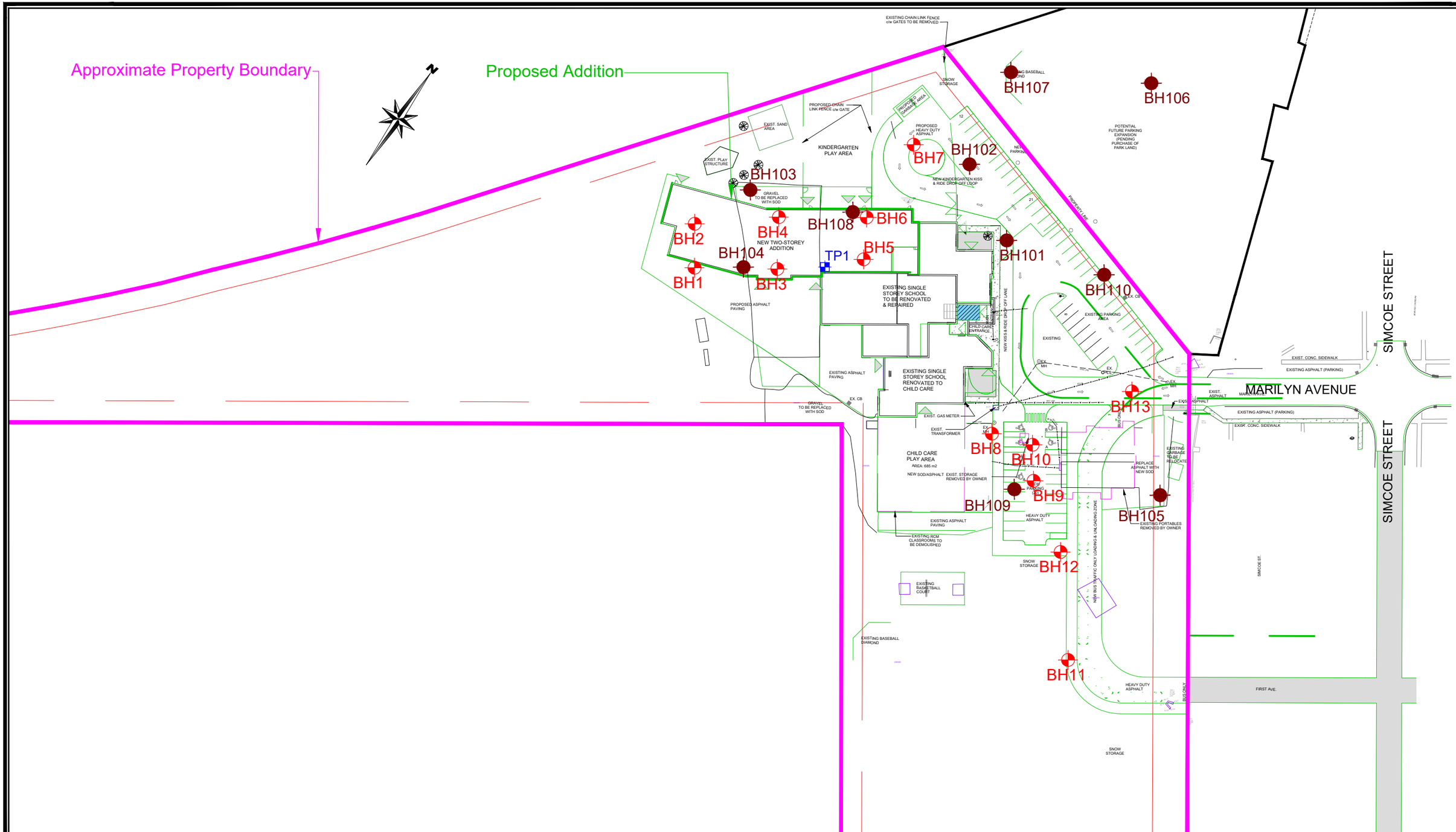
Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

Title: **BOREHOLE AND TEST PIT LOCATION PLAN EXISTING CONDITION**

File No. 02209049.000

FIGURE : 2A

Y:\Shared\CA\Terraprobe\Brampton\1-Project Files\2022-Englobe\02209049.000 - 240 Marilyn Avenue Napanee\0105 - Geotechnical Investigation\1-Dwgs, Logs\Auto\CAD\02209049 Figures - 2023.01.24.dwg DWG To PDF.pc3,
Kamal, Kamal




REFERENCES
Drawing Title: Site Plan
Proj, No.: 22026, Dwg. No.: A101
Date: 12-01-2022, By: Salterpilon Architecture

LEGEND
- Approximate Borehole Location (Terraprobe)
- Approximate Borehole Location (Malroz)
- Approx. Test Pit Location (Terraprobe)

8 4 0 20m
SCALE

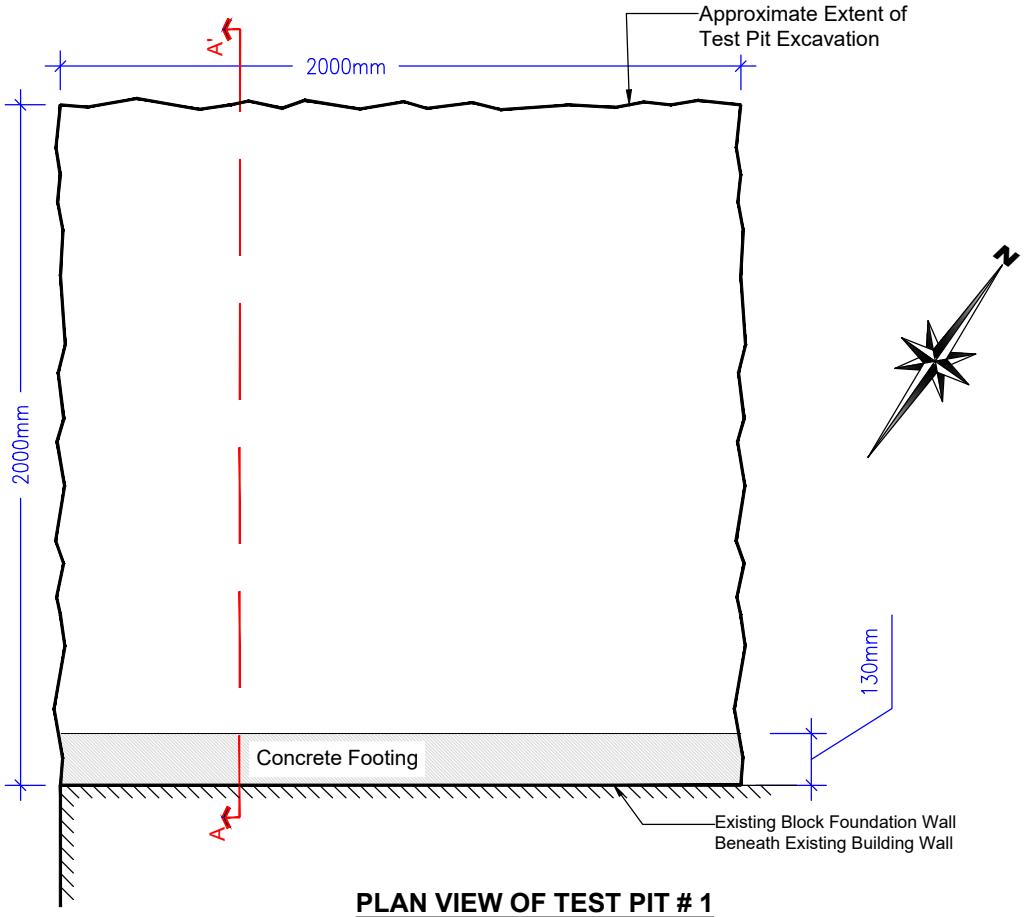
Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

Title: **BOREHOLE AND TEST PIT LOCATION PLAN PROPOSED CONDITION**

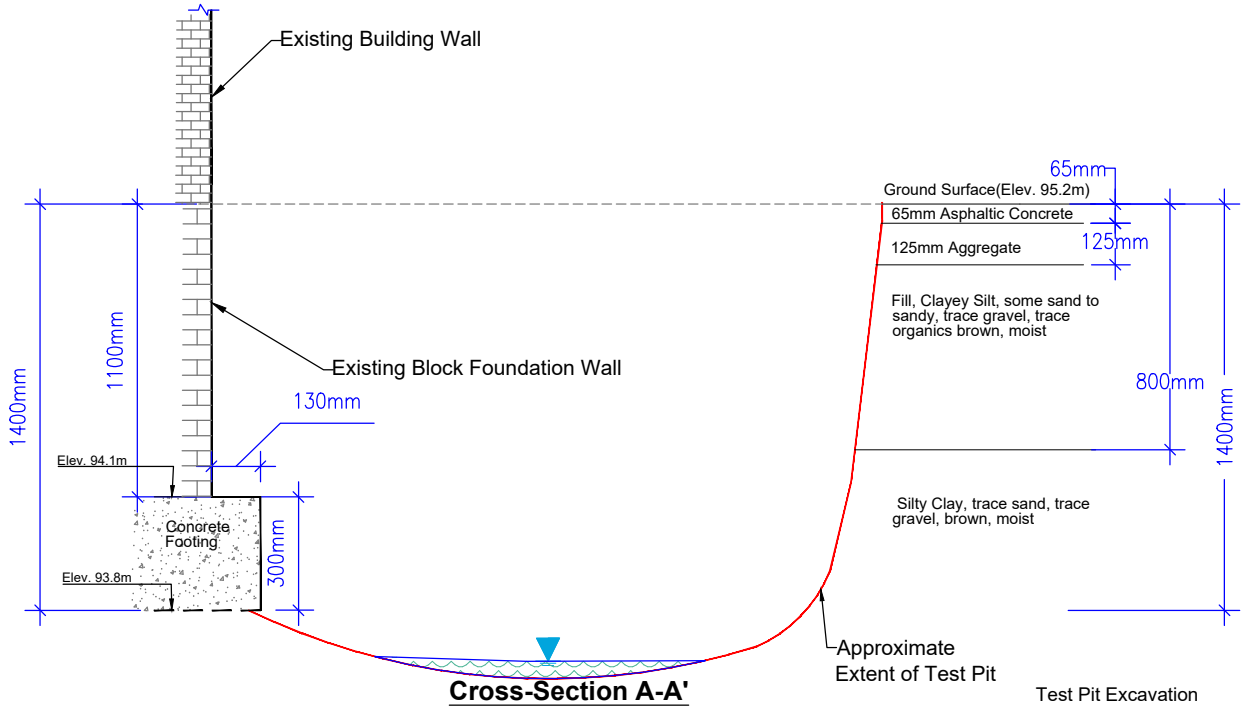
File No. 02209049.000

FIGURE : 2B

Y:\Shared\CA\Terraprobe\Brampton\1-Project Files\2022-Englobe\02209049.000 - 240 Marilyn Avenue Napanee\9105 - Geotechnical Investigation\1-Dwgs, Log\AutoCAD\02209049 Figures - 2023.01.24.dwg, DWG To PDF.pc3, Kamal, Kamal




**PLAN VIEW OF TEST PIT # 1**




**Cross-Section A-A'**

**NOTES**

1. A concrete strip footing was observed at about 1100mm below Existing Ground Surface.
2. Test pit remained open and minor ponding of water was observed at the base of excavation.
3. Test pit was backfilled with excavated material placed in about 200 mm lifts and compacted with plate tamper and finish surface with granular material and compacted with plate tamper.
4. The concrete strip footing was noted to be supported on undisturbed native soils.

Test Pit Excavation
January 03, 2023

- NOT TO SCALE
- ALL DIMENSIONS IN MM


Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250


Title: **TEST PIT # 1**

Fig. No.: 02209049.000

FIGURE : 3


Y:\Shared\CA\Terraprobe\Brampton\1-Project Files\2022-Englobe\02209049.000 - 240 Marilyn Avenue Napanee\0105 - Geotechnical Investigation\1-Dwgs. Logs\AutoCAD\02209049 TEST PIT Figure--2023.01.23.dwg, DWG To PDF.pc3,
Kamal, Kamal

# TEST PIT PHOTOGRAPHS

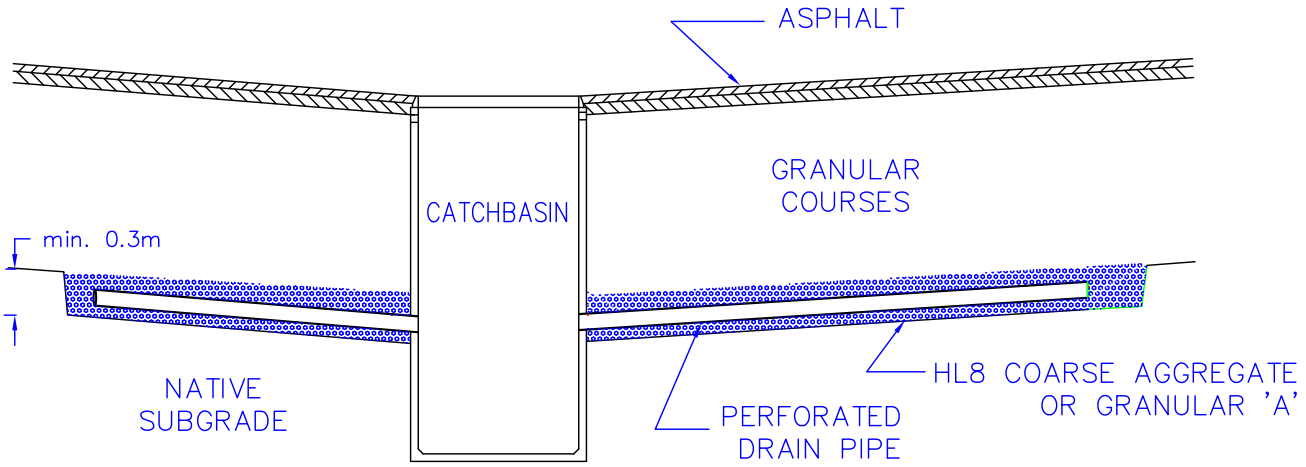
TERRAPROBE INC.

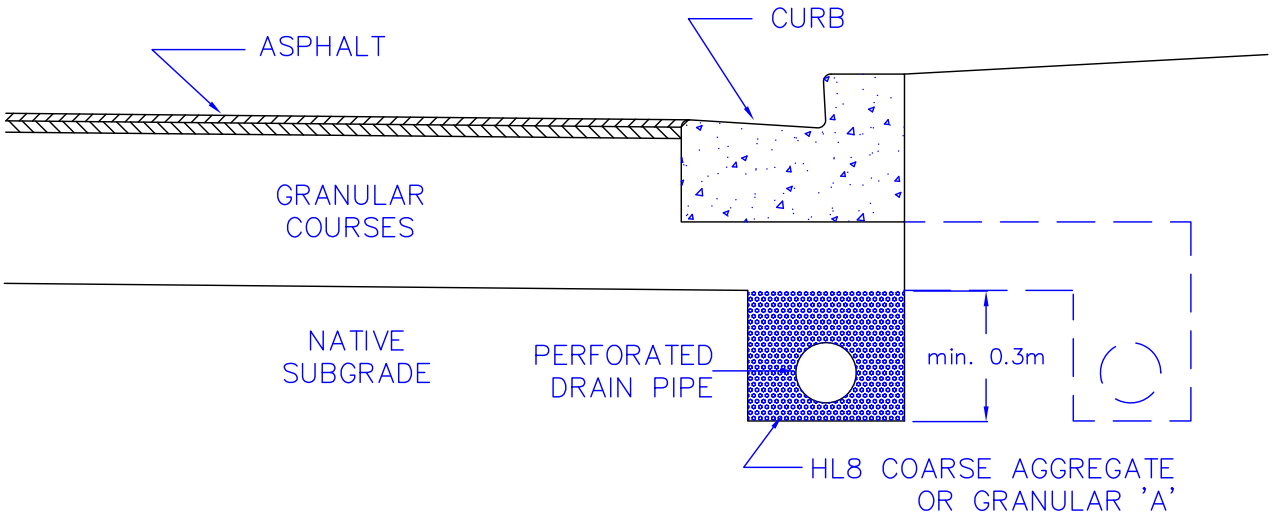
**PHOTOGRAPH 1.** TP1

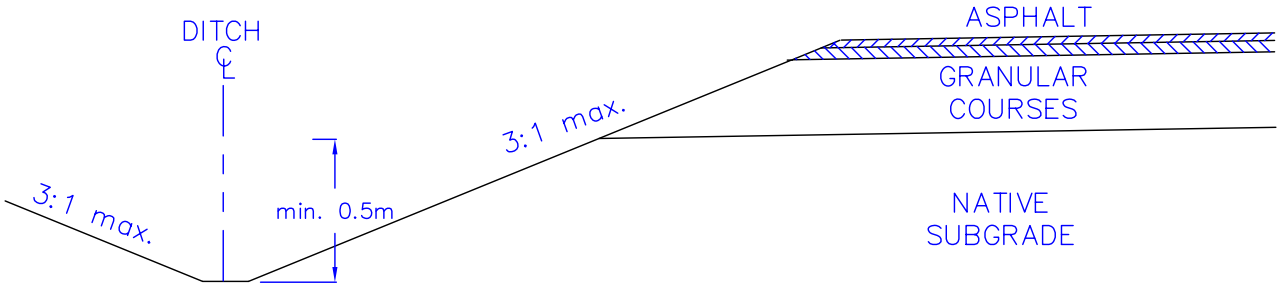
**PHOTOGRAPH 2.** TP1

# PAVEMENT DRAINAGE ALTERNATIVES

TERRAPROBE INC.




Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

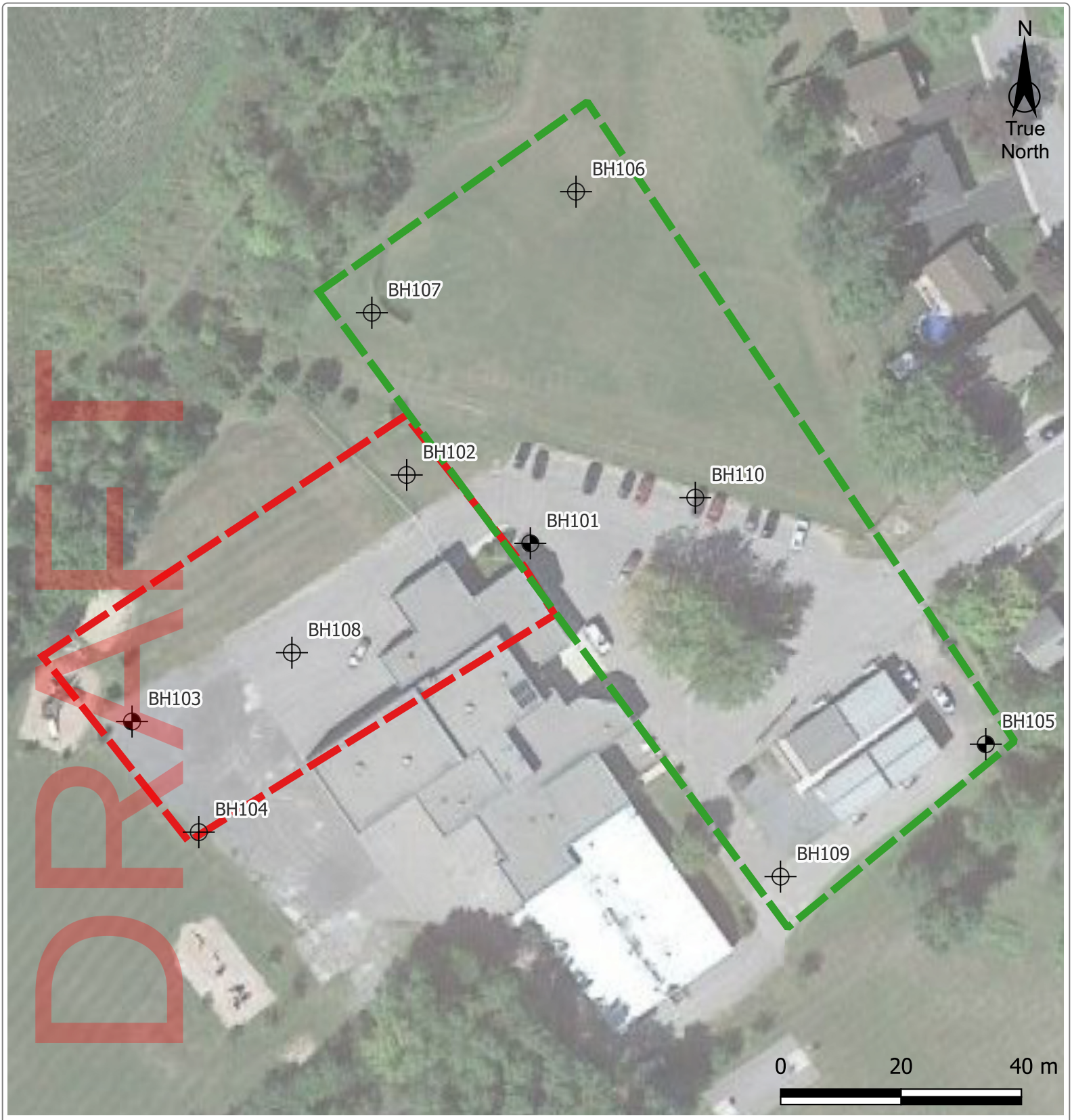
Title:

PAVEMENT DRAINAGE ALTERNATIVES

# REFERENCE DOCUMENT

## (Borehole and Rock Core Logs & Borehole Location Plan by Malroz)

TERRAPROBE INC.




**Legend**

- proposed building addition
- proposed paved parking area
- approximate borehole location
- approximate monitoring well location

| Rev | Date | Description | By | Chkd |
|---|---|---|---|---|
| D0 | 2022-10-13 | issued in draft | JMP | RF |

Borehole Location Plan

Geotechnical Investigation – Proposed Addition
Algonquin and Lakeshore Catholic District School Board
JJ O'Neil Catholic School, Napanee, ON

File: 1684.00-101

Figure 1

Draft

MALROZ

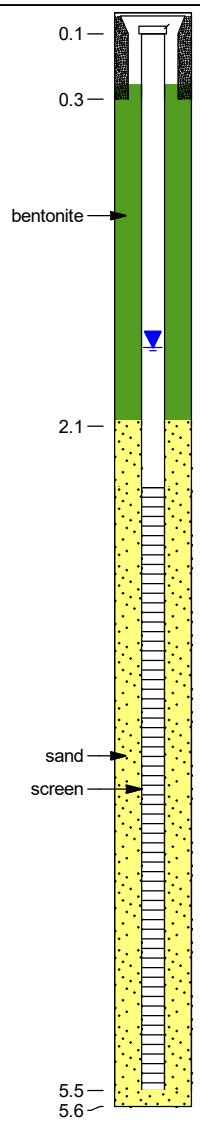
Data Sources:Figure based on Malroz field observations, Google Earth imagery and Trimble R10 GNSS survey completed on August 19 and 26, 2022.

# WELL LOG

Enclosure No.: 1

| | | | |
|---|---|---|---|
| Project Name: **Geotechnical Investigation** | | Project Number: **1684** | |
| Client: **Algonquin & Lakeshore Catholic District School Board** | Well Number: **BH101** | Page: **1 of 1** | |
| Location: **J.J. O'Neill Catholic School, Napanee, ON** | Date Started: **August 19, 2022** | Datum: **NAD 83, UTM 18N Zone** | |
| Drilling Contractor: **G.E.T. Drilling Ltd.** | Date Finished: **August 19, 2022** | Elevation: **95.1 m** | |
| Drilling Equipment: **CME 55** | Easting: **343091.4 m** | Northing: **4901221.2 m** | |
| Drilling and Sampling Method: **150mm Solid-Stem Auger, 50mm Split Spoon** | Logged By: **J. Payeur** | Checked By: **D. Hill** | |

| Depth BGS (m) | Elevation (m) | Description | Sample Number | Recovery (%) | Penetration Index / RQD | Shear Strength (kPa) (DCPT / SPT-N) | PID (ppm) / CGI (%LEL) |
|---|---|---|---|---|---|---|---|
| 0.2 | 95.0 | **ASPHALT** approx. 80 mm. | | | | | |
| 0.4 | | **FILL** silty sandy gravel, grey, moist, compact. | SS1 S01 | 46 | 14 | 14 | 0 |
| 0.6 | | | | | | | |
| 0.8 | | | | | | | |
| 1.0 | | Cobbles and fragments recovered between approximately 0.8 and 1.4 mbg. | SS2 | 0 | 11 | 11 | 0 |
| 1.2 | | | | | | | |
| 1.4 | | | | | | | |
| 1.6 | 93.5 | **SILTY CLAY** trace sand, brown, moist, stiff to very stiff. | SS3 S02 | 100 | 19 | 19 | 0 |
| 1.8 | | | | | | | |
| 2.0 | | | | | | | |
| 2.2 | | | | | | | |
| 2.4 | | | SS4 S03 | 100 | 23 | 23 | 0 |
| 2.6 | | | | | | | |
| 2.8 | | | | | | | |
| 3.0 | | | | | | | |
| 3.2 | | | SS5 S04 | 100 | 10 | 10 | 0 |
| 3.4 | | | | | | | |
| 3.6 | 91.4 | **SILTY CLAYEY SAND** some gravel, brown, moist, compact to very dense. | | | | | |
| 3.8 | | | | | | | |
| 4.0 | | | SS6 S05 | 100 | 26 | 26 | 0 |
| 4.2 | | | | | | | |
| 4.4 | | | | | | | |
| 4.6 | | Becoming grey, wet. | | | | | |
| 4.8 | | | SS7 S06 | 84 | 34 | 34 | 0 |
| 5.0 | | | | | | | |
| 5.2 | | | | | | | |
| 5.4 | | Sampler refusal at 5.5 mbg. | SS8 S07 | | R | | |
| 5.6 | 89.5 | End of borehole with practical auger refusal at 5.6 mbg. | | | | | |
| 5.8 | | | | | | | |
| 6.0 | | | | | | | |
| 6.2 | | | | | | | |
| 6.4 | | | | | | | |




NOTES: Well Construction Details
0.10 m
0.15 mm
1 mm slotted screen
3.05 m screen
#1 sand

Groundwater Monitoring Details
monitored on September 7, 2022
DTW[1]: 1.7 m
DTB[1]: 5.6 m
[1]depths are reported from TOP

DRAFT

# BOREHOLE LOG

Enclosure No.: 2

| | | |
|---|---|---|
| Project Name: **Geotechnical Investigation** | | Project Number: **1684** |
| Client: **Algonquin & Lakeshore Catholic District School Board** | Borehole Number: **BH102** | Page: **1 of 1** |
| Location: **J.J. O'Neill Catholic School, Napanee, ON** | Date Started: **August 19, 2022** | Datum: **NAD 83, UTM 18N Zone** |
| Drilling Contractor: **G.E.T. Drilling Ltd.** | Date Finished: **August 19, 2022** | Elevation: **94.9 m** |
| Drilling Equipment: **CME 55** | Easting: **343070.8 m** | Northing: **4901232.5 m** |
| Drilling and Sampling Method: **150mm Solid-Stem Auger, 50mm Split Spoon** | Logged By: **J. Payeur** | Checked By: **D. Hill** |

| Depth BGS (m) | Elevation (m) | Stratigraphy | Description | Sample Type | Sample Number | Recovery (%) | Penetration Index / RQD | Shear Strength (kPa) (50, 100, 150, 200; DCPT / SPT-N; PL, MC, LL) | PID (ppm) / CGI (%LEL) |
|---|---|---|---|---|---|---|---|---|---|
| 0.2 | 94.7 | | **TOPSOIL** sandy, brown, moist. | | | | | | |
| 0.4 | | | **SILTY CLAY** trace sand, brown, moist, stiff to very stiff G: 0%, S: 5%, SI: 44%, CL: 51%. | | SS1 S01 | 92 | 9 | 9, 18 | 0 |
| 1.0 | | | | | SS2 S02 | 100 | 15 | 15, 24 | 0 |
| 1.8 | | | | | SS3 S03 | 95 | 20 | 20, 19 | 0 |
| 2.6 | | | Becoming greyish brown. | | SS4 S04 | 92 | 13 | 13, 20 | 0 |
| 3.2 | 91.7 | | **SAND** some clay, some silt, some subrounded gravel, brown to greyish brown, moist to wet, compact to dense. G: 19%, S: 51%, SI: 18%, CL: 12%. | | SS5 S05 | 95 | 10 | 10, 18 | 0 |
| 4.0 | | | | | SS6 S06 | 84 | 31 | 5, 31 | 0, 15 |
| 4.6 | 90.3 | | End of borehole by practical auger refusal at 4.6 mbg. | | | | | | |

NOTES:

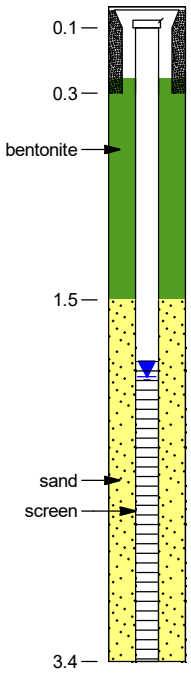
DRAFT

# WELL LOG

Enclosure No.: 3

| | | | |
|---|---|---|---|
| Project Name: **Geotechnical Investigation** | | | Project Number: **1684** |
| Client: **Algonquin & Lakeshore Catholic District School Board** | Well Number: | **BH103** | Page: **1 of 1** |
| Location: **J.J. O'Neill Catholic School, Napanee, ON** | Date Started: **August 19, 2022** | | Datum: **NAD 83, UTM 18N Zone** |
| Drilling Contractor: **G.E.T. Drilling Ltd.** | Date Finished: **August 19, 2022** | | Elevation: **95.3 m** |
| Drilling Equipment: **CME 55** | Easting: **343025.2 m** | | Northing: **4901191.6 m** |
| Drilling and Sampling Method: **150mm Solid-Stem Auger, 50mm Split Spoon** | Logged By: **J. Payeur** | | Checked By: **D. Hill** |

| Depth BGS (m) | Elevation (m) | Stratigraphy | Description | Sample Type | Sample Number | Recovery (%) | Penetration Index / RQD | Shear Strength (kPa) (DCPT / SPT-N) | PID (ppm) / CGI (%LEL) |
|---|---|---|---|---|---|---|---|---|---|
| 0.2–0.4 | 94.8 | | **FILL** sandy gravel, grey, moist, compact. | | SS1 S01 | 67 | 11 | 11 / 21 | 0 |
| 0.6–1.6 | 93.6 | | **SILTY CLAY** trace sand, trace gravel, brown, moist, stiff. | | SS2 S02 | 51 | 12 | 12 / 19 | 0 |
| 1.8–3.2 | 92.0 | | **SILTY CLAYEY SAND** trace to some subrounded gravel, brown, moist, compact. | | SS3 S03 | 84 | 10 | 10 / 15 | 0 |
| | | | | | SS4 S04 | 100 | 14 | 3 / 14 | 0 |
| | | | Sampler refusal at 3.3 mbg. | | SS5 S05 | 100 | R | 5 | 0 |
| 3.4 | | | End of borehole by practical auger refusal at 3.3 mbg. | | | | | | |




NOTES:

Well Construction Details
0.10 m
0.15 mm
1 mm slotted screen
3.05 m screen
#1 sand

Groundwater Monitoring Details
monitored on September 7, 2022
DTW[1]: 1.9 m
DTB[1]: 3.3 m
[1]depths are reported from TOP

DRAFT

# BOREHOLE LOG

Enclosure No.: 4

| | | | |
|---|---|---|---|
| Project Name: **Geotechnical Investigation** | | | Project Number: **1684** |
| Client: **Algonquin & Lakeshore Catholic District School Board** | Borehole Number: **BH104** | | Page: **1 of 1** |
| Location: **J.J. O'Neill Catholic School, Napanee, ON** | Date Started: **August 19, 2022** | | Datum: **NAD 83, UTM 18N Zone** |
| Drilling Contractor: **G.E.T. Drilling Ltd.** | Date Finished: **August 19, 2022** | | Elevation: **95.3 m** |
| Drilling Equipment: **CME 55** | Easting: **343036.3 m** | | Northing: **4901173.2 m** |
| Drilling and Sampling Method: **150mm Solid-Stem Auger, 50mm Split Spoon** | Logged By: **J. Payeur** | | Checked By: **D. Hill** |

| Depth BGS (m) | Elevation (m) | Stratigraphy | Description | Sample Type | Sample Number | Recovery (%) | Penetration Index / RQD | Shear Strength (kPa) (DCPT / SPT-N; PL MC LL) | PID (ppm) / CGI (%LEL) |
|---|---|---|---|---|---|---|---|---|---|
| 0.2–0.4 | 94.8 | | **FILL** sand and gravel, trace silt, brown, moist, compact. | | SS1 S01 | 75 | 12 | 12, 14 | 0 |
| 0.6–1.4 | 93.8 | | **SILTY CLAY** trace to some sand, brown, moist, stiff to very stiff. | | SS2 S02 | 100 | 15 | 15, 28 | 0 |
| 1.6–2.8 | 92.2 | | **CLAYEY SILT AND SAND** trace subrounded gravel, brown, moist, compact G: 1%, S: 32%, SI: 38%, CL: 29%. | | SS3 S03 | 100 | 13 | 13, 25 | 0 |
| | | | | | SS4 S04 | 51 | 11 | 11, 23 | 2 |
| 3.0–4.2 | 91.0 | | **SAND** some clay, some silt, some subrounded gravel, brown, moist, compact G: 17%, S: 56%, SI: 17%, CL: 10%. | | SS5 S05 | 84 | 12 | 12 | 0 |
| | | | | | SS6 S06 | | >100 | 5 | 0 |
| 4.2 | | | End of borehole by practical auger refusal at 4.2 mbg. | | | | | | |

NOTES:

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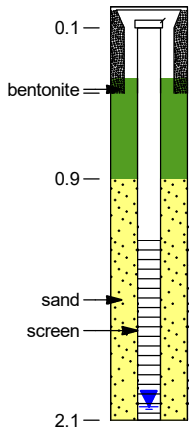
# WELL LOG

Enclosure No.: 5

| | | | |
|---|---|---|---|
| Project Name: **Geotechnical Investigation** | | | Project Number: **1684** |
| Client: **Algonquin & Lakeshore Catholic District School Board** | Well Number: **BH105** | | Page: **1 of 1** |
| Location: **J.J. O'Neill Catholic School, Napanee, ON** | Date Started: **August 19, 2022** | | Datum: **NAD 83, UTM 18N Zone** |
| Drilling Contractor: **G.E.T. Drilling Ltd.** | Date Finished: **August 19, 2022** | | Elevation: **94.1 m** |
| Drilling Equipment: **CME 55** | Easting: **343167.0 m** | | Northing: **4901187.8 m** |
| Drilling and Sampling Method: **150mm Solid-Stem Auger, 50mm Split Spoon** | Logged By: **J. Payeur** | | Checked By: **D. Hill** |

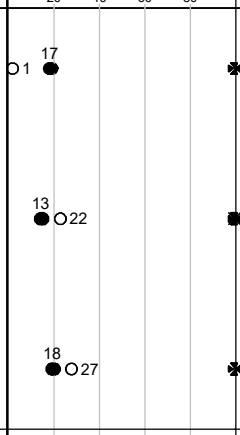
| Depth BGS (m) | Elevation (m) | Stratigraphy | Description | Sample Type | Sample Number | Recovery (%) | Penetration Index / RQD |
|---|---|---|---|---|---|---|---|
| 0.2 | | | **FILL** sandy gravel, trace silt, greyish brown, moist, compact. | | SS1 S01 S02 | 75 | 17 |
| 0.4 | | | | | | | |
| 0.6 | 93.6 | | **SILTY CLAY** trace sand, brown, moist, stiff to very stiff. | | | | |
| 0.8 | | | | | | | |
| 1.0 | | | | | SS2 S03 S04 | 80 | 13 |
| 1.2 | | | | | | | |
| 1.4 | | | | | | | |
| 1.6 | | | | | | | |
| 1.8 | | | | | SS3 S05 S06 | 84 | 18 |
| 2.0 | | | | | | | |
| 2.2 | 92.0 | | End of borehole at target depth of 2.1 mbg. | | | | |
| 2.4 | | | | | | | |
| 2.6 | | | | | | | |
| 2.8 | | | | | | | |
| 3.0 | | | | | | | |
| 3.2 | | | | | | | |
| 3.4 | | | | | | | |
| 3.6 | | | | | | | |
| 3.8 | | | | | | | |
| 4.0 | | | | | | | |
| 4.2 | | | | | | | |
| 4.4 | | | | | | | |
| 4.6 | | | | | | | |
| 4.8 | | | | | | | |
| 5.0 | | | | | | | |
| 5.2 | | | | | | | |
| 5.4 | | | | | | | |
| 5.6 | | | | | | | |
| 5.8 | | | | | | | |
| 6.0 | | | | | | | |
| 6.2 | | | | | | | |
| 6.4 | | | | | | | |

Monitoring Well




Shear Strength (kPa) 50 100 150 200 — DCPT, SPT-N — PL MC LL 20 40 60 80

PID (ppm) 20 40 60 80 — CGI (%LEL)




NOTES:

Well Construction Details
0.10 m
0.15 mm
1 mm slotted screen
0.91 m screen
#1 sand

Groundwater Monitoring Details
monitored on September 7, 2022
DTW[1]: 2.1 m
DTB[1]: 2.1 m
[1]depths are reported from TOP

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# BOREHOLE LOG

Enclosure No.: 6

| | | |
|---|---|---|
| Project Name: **Geotechnical Investigation** | | Project Number: **1684** |
| Client: **Algonquin & Lakeshore Catholic District School Board** | Borehole Number: **BH106** | Page: **1 of 1** |
| Location: **J.J. O'Neill Catholic School, Napanee, ON** | Date Started: **August 19, 2022** | Datum: **NAD 83, UTM 18N Zone** |
| Drilling Contractor: **G.E.T. Drilling Ltd.** | Date Finished: **August 19, 2022** | Elevation: **94.7 m** |
| Drilling Equipment: **CME 55** | Easting: **343099.0 m** | Northing: **4901279.6 m** |
| Drilling and Sampling Method: **150mm Solid-Stem Auger, 50mm Split Spoon** | Logged By: **J. Payeur** | Checked By: **D. Hill** |

| Depth BGS (m) | Elevation (m) | Stratigraphy | Description | Sample Type | Sample Number | Recovery (%) | Penetration Index / RQD | Shear Strength (kPa) (50, 100, 150, 200; DCPT / SPT-N; PL, MC, LL) | PID (ppm) / CGI (%LEL) |
|---|---|---|---|---|---|---|---|---|---|
| | 94.6 | | **TOPSOIL** sandy, dark brown, moist. | | | | | | |
| 0.2 | | | **SILTY CLAY** trace sand, brown, moist, stiff to very stiff. | | SS1 S01 | 75 | 13 | 13 / 24 | 0 |
| 0.4 | | | | | | | | | |
| 0.6 | | | | | | | | | |
| 0.8 | | | | | | | | | |
| 1.0 | | | | | SS2 S02 | 100 | 15 | 15 / 24 | 0 |
| 1.2 | | | | | | | | | |
| 1.4 | | | | | | | | | |
| 1.6 | | | | | | | | | |
| 1.8 | | | | | SS3 S03 | 100 | 22 | 22 / 21 | 0 |
| 2.0 | | | | | | | | | |
| | 92.6 | | End of borehole at target depth of 2.1 mbg. | | | | | | |
| 2.2 | | | | | | | | | |
| 2.4 | | | | | | | | | |
| 2.6 | | | | | | | | | |
| 2.8 | | | | | | | | | |
| 3.0 | | | | | | | | | |
| 3.2 | | | | | | | | | |
| 3.4 | | | | | | | | | |
| 3.6 | | | | | | | | | |
| 3.8 | | | | | | | | | |
| 4.0 | | | | | | | | | |
| 4.2 | | | | | | | | | |
| 4.4 | | | | | | | | | |
| 4.6 | | | | | | | | | |
| 4.8 | | | | | | | | | |
| 5.0 | | | | | | | | | |
| 5.2 | | | | | | | | | |
| 5.4 | | | | | | | | | |
| 5.6 | | | | | | | | | |
| 5.8 | | | | | | | | | |
| 6.0 | | | | | | | | | |
| 6.2 | | | | | | | | | |
| 6.4 | | | | | | | | | |

NOTES:

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# BOREHOLE LOG

Enclosure No.: 7

| | | |
|---|---|---|
| Project Name: **Geotechnical Investigation** | | Project Number: **1684** |
| Client: **Algonquin & Lakeshore Catholic District School Board** | Borehole Number: **BH107** | Page: **1 of 1** |
| Location: **J.J. O'Neill Catholic School, Napanee, ON** | Date Started: **August 19, 2022** | Datum: **NAD 83, UTM 18N Zone** |
| Drilling Contractor: **G.E.T. Drilling Ltd.** | Date Finished: **August 19, 2022** | Elevation: **95.1 m** |
| Drilling Equipment: **CME 55** | Easting: **343065.1 m** | Northing: **4901259.5 m** |
| Drilling and Sampling Method: **150mm Solid-Stem Auger, 50mm Split Spoon** | Logged By: **J. Payeur** | Checked By: **D. Hill** |

| Depth BGS (m) | Elevation (m) | Stratigraphy | Description | Sample Type | Sample Number | Recovery (%) | Penetration Index / RQD | Shear Strength (kPa) (50, 100, 150, 200; DCPT / SPT-N; PL, MC, LL) | PID (ppm) / CGI (%LEL) |
|---|---|---|---|---|---|---|---|---|---|
| | 95.0 | | **TOPSOIL** sandy, dark brown, moist. | | | | | | |
| 0.2 | | | **SILTY CLAY** trace sand, brown, moist, stiff to very stiff. | | SS1 S01 | 51 | 9 | 9, 15 | 0 |
| 0.4 | | | | | | | | | |
| 0.6 | | | | | | | | | |
| 0.8 | | | | | | | | | |
| 1.0 | | | | | SS2 S02 | 100 | 14 | 14, 21 | 0 |
| 1.2 | | | | | | | | | |
| 1.4 | | | | | | | | | |
| 1.6 | | | | | | | | | |
| 1.8 | | | | | SS3 S03 | 100 | 23 | 23, 8 | 0 |
| 2.0 | | | | | | | | | |
| | 93.0 | | End of borehole at target depth of 2.1 mbg. | | | | | | |
| 2.2 | | | | | | | | | |
| 2.4 | | | | | | | | | |
| 2.6 | | | | | | | | | |
| 2.8 | | | | | | | | | |
| 3.0 | | | | | | | | | |
| 3.2 | | | | | | | | | |
| 3.4 | | | | | | | | | |
| 3.6 | | | | | | | | | |
| 3.8 | | | | | | | | | |
| 4.0 | | | | | | | | | |
| 4.2 | | | | | | | | | |
| 4.4 | | | | | | | | | |
| 4.6 | | | | | | | | | |
| 4.8 | | | | | | | | | |
| 5.0 | | | | | | | | | |
| 5.2 | | | | | | | | | |
| 5.4 | | | | | | | | | |
| 5.6 | | | | | | | | | |
| 5.8 | | | | | | | | | |
| 6.0 | | | | | | | | | |
| 6.2 | | | | | | | | | |
| 6.4 | | | | | | | | | |

NOTES:

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# BOREHOLE LOG

Enclosure No.: 8

| | | |
|---|---|---|
| Project Name: **Geotechnical Investigation** | | Project Number: **1684** |
| Client: **Algonquin & Lakeshore Catholic District School Board** | Borehole Number: **BH108** | Page: **1 of 1** |
| Location: **J.J. O'Neill Catholic School, Napanee, ON** | Date Started: **August 19, 2022** | Datum: **NAD 83, UTM 18N Zone** |
| Drilling Contractor: **G.E.T. Drilling Ltd.** | Date Finished: **August 26, 2022** | Elevation: **95.2 m** |
| Drilling Equipment: **CME 55** | Easting: **343051.8 m** | Northing: **4901203.0 m** |
| Drilling and Sampling Method: **150mm Solid-Stem Auger, 50mm Split Spoon** | Logged By: **J. Payeur** | Checked By: **D. Hill** |

| Depth BGS (m) | Elevation (m) | Stratigraphy | Description | Sample Type | Sample Number | Recovery (%) | Penetration Index / RQD | Shear Strength (kPa) (DCPT / SPT-N) | PID (ppm) / CGI (%LEL) |
|---|---|---|---|---|---|---|---|---|---|
| | 95.1 | | **ASPHALT** approx. 80 mm. | | | | | | |
| 0.2 | | | **FILL** sandy gravel, trace silt, dark brown, moist, compact. | | | | | | |
| 0.4 | 94.8 | | **SILTY CLAY** trace sand, brown, moist, stiff to very stiff. | | SS1 S01 | 49 | 11 | 11 | 0 |
| 0.6 | | | | | | | | | |
| 0.8 | | | | | | | | | |
| 1.0 | | | | | SS2 S02 | 92 | 14 | 14 | 0 |
| 1.2 | | | | | | | | | |
| 1.4 | | | | | | | | | |
| 1.6 | | | | | | | | | |
| 1.8 | | | | | SS3 S03 | 100 | 18 | 18 | 0 |
| 2.0 | | | | | | | | | |
| 2.2 | 92.9 | | **SILTY CLAYEY SAND** some subrounded gravel, brown, moist to wet, loose to compact. | | | | | | |
| 2.4 | | | | | | | | | |
| 2.6 | | | | | SS4 S04 | 92 | 8 | 8 | 0 |
| 2.8 | | | | | | | | | |
| 3.0 | | | | | | | | | |
| 3.2 | | | | | SS5 S05 | 100 | 11 | 11 | 0 |
| 3.4 | | | | | | | | | |
| 3.6 | | | | | | | | | |
| 3.8 | | | | | | | | | |
| 4.0 | | | | | SS6 S06 | 95 | 12 | 12 | 0 |
| 4.2 | | | | | | | | | |
| 4.4 | 90.8 | | **LIMESTONE** fair quality, grey, occasional shaley partings. | | | | | | |
| 4.6 | | | | | | | | | |
| 4.8 | | | | | | | | | |
| 5.0 | | | | | | | | | |
| 5.2 | | | | | RC1 | 100 | 67 | | |
| 5.4 | | | | | | | | | |
| 5.6 | | | | | | | | | |
| 5.8 | | | | | | | | | |
| 6.0 | 89.2 | | End of borehole at 6.1 mbg in limestone bedrock. | | | | | | |
| 6.2 | | | | | | | | | |
| 6.4 | | | | | | | | | |

NOTES:

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# BOREHOLE LOG

Enclosure No.: 9

| | | | |
|---|---|---|---|
| Project Name: **Geotechnical Investigation** | | | Project Number: **1684** |
| Client: **Algonquin & Lakeshore Catholic District School Board** | Borehole Number: | **BH109** | Page: **1 of 1** |
| Location: **J.J. O'Neill Catholic School, Napanee, ON** | Date Started: **August 19, 2022** | | Datum: **NAD 83, UTM 18N Zone** |
| Drilling Contractor: **G.E.T. Drilling Ltd.** | Date Finished: **August 26, 2022** | | Elevation: **94.3 m** |
| Drilling Equipment: **CME 55** | Easting: **343132.9 m** | | Northing: **4901165.8 m** |
| Drilling and Sampling Method: **150mm Solid-Stem Auger, 50mm Split Spoon** | Logged By: **J. Payeur** | | Checked By: **D. Hill** |

| Depth BGS (m) | Elevation (m) | Stratigraphy | Description | Sample Type | Sample Number | Recovery (%) | Penetration Index / RQD | Shear Strength (kPa) (50, 100, 150, 200; DCPT / SPT-N; PL, MC, LL) | PID (ppm) / CGI (%LEL) |
|---|---|---|---|---|---|---|---|---|---|
| | 94.2 | | **ASPHALT** approx. 80 mm. | | | | | | |
| 0.2 | | | **FILL** sandy gravel, trace silt, brown, moist, loose. | | SS1 S01 S02 | 41 | 6 | 6 | 0 |
| 0.4 | | | | | | | | | |
| 0.6 | 93.7 | | **SILTY CLAY** trace sand, brown, moist, very stiff. | | | | | | |
| 0.8 | | | | | | | | | |
| 1.0 | | | | | SS2 S03 | 95 | 16 | 16 | 0 |
| 1.2 | | | | | | | | | |
| 1.4 | | | | | | | | | |
| 1.6 | | | | | | | | | |
| 1.8 | | | | | SS3 S04 | | 19 | 19 | 0 |
| 2.0 | | | | | | | | | |
| 2.2 | 92.2 | | End of borehole at target depth of 2.1 mbg. | | | | | | |
| 2.4 | | | | | | | | | |
| 2.6 | | | | | | | | | |
| 2.8 | | | | | | | | | |
| 3.0 | | | | | | | | | |
| 3.2 | | | | | | | | | |
| 3.4 | | | | | | | | | |
| 3.6 | | | | | | | | | |
| 3.8 | | | | | | | | | |
| 4.0 | | | | | | | | | |
| 4.2 | | | | | | | | | |
| 4.4 | | | | | | | | | |
| 4.6 | | | | | | | | | |
| 4.8 | | | | | | | | | |
| 5.0 | | | | | | | | | |
| 5.2 | | | | | | | | | |
| 5.4 | | | | | | | | | |
| 5.6 | | | | | | | | | |
| 5.8 | | | | | | | | | |
| 6.0 | | | | | | | | | |
| 6.2 | | | | | | | | | |
| 6.4 | | | | | | | | | |

NOTES:

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# BOREHOLE LOG

Enclosure No.: 10

| | | | |
|---|---|---|---|
| Project Name: **Geotechnical Investigation** | | | Project Number: **1684** |
| Client: **Algonquin & Lakeshore Catholic District School Board** | Borehole Number: | **BH110** | Page: **1 of 1** |
| Location: **J.J. O'Neill Catholic School, Napanee, ON** | Date Started: **August 19, 2022** | | Datum: **NAD 83, UTM 18N Zone** |
| Drilling Contractor: **G.E.T. Drilling Ltd.** | Date Finished: **August 26, 2022** | | Elevation: **94.5 m** |
| Drilling Equipment: **CME 55** | Easting: **343118.8 m** | | Northing: **4901228.8 m** |
| Drilling and Sampling Method: **150mm Solid-Stem Auger, 50mm Split Spoon** | Logged By: **J. Payeur** | | Checked By: **D. Hill** |

| Depth BGS (m) | Elevation (m) | Stratigraphy | Description | Sample Type | Sample Number | Recovery (%) | Penetration Index / RQD | Shear Strength (kPa) (50, 100, 150, 200; DCPT / SPT-N; PL, MC, LL) | PID (ppm) / CGI (%LEL) |
|---|---|---|---|---|---|---|---|---|---|
| | 94.5 | | **Asphalt** approx. 80 mm. | | | | | | |
| 0.2 | | | **FILL** sandy gravel, trace silt, brown, moist, loose. | | SS1 S01 S02 | 30 | 5 | 5 | 0 |
| 0.4 | | | | | | | | | |
| 0.6 | 93.9 | | **SILTY CLAY** trace sand, brown, moist, stiff. | | | | | | |
| 0.8 | | | | | | | | | |
| 1.0 | | | | | SS2 S03 | 95 | 11 | 11 | 0 |
| 1.2 | | | | | | | | | |
| 1.4 | | | | | | | | | |
| 1.6 | | | | | | | | | |
| 1.8 | | | | | SS3 S04 | 95 | 12 | 12 | 0 |
| 2.0 | | | | | | | | | |
| 2.2 | 92.4 | | Borehole terminated at 2.1 mbg. | | | | | | |
| 2.4 | | | | | | | | | |
| 2.6 | | | | | | | | | |
| 2.8 | | | | | | | | | |
| 3.0 | | | | | | | | | |
| 3.2 | | | | | | | | | |
| 3.4 | | | | | | | | | |
| 3.6 | | | | | | | | | |
| 3.8 | | | | | | | | | |
| 4.0 | | | | | | | | | |
| 4.2 | | | | | | | | | |
| 4.4 | | | | | | | | | |
| 4.6 | | | | | | | | | |
| 4.8 | | | | | | | | | |
| 5.0 | | | | | | | | | |
| 5.2 | | | | | | | | | |
| 5.4 | | | | | | | | | |
| 5.6 | | | | | | | | | |
| 5.8 | | | | | | | | | |
| 6.0 | | | | | | | | | |
| 6.2 | | | | | | | | | |
| 6.4 | | | | | | | | | |

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