TOWN OF CALEDON
PLANNING
RECEIVED
September 23, 2025

GEMTEC
www.gemtec.ca

Geotechnical Investigation Report
Proposed Commercial Development
12100 Creditview Road
Caledon, Ontario

GEMTEC Project: 102491.013

GEMTEC
www.gemtec.ca

Submitted to:

12100 Creditview Developments Limited
c/o Fieldgate Commercial
5400 Yonge Street, 1st Floor
Toronto, Ontario
M2N 5R5

Geotechnical Investigation Report
Proposed Commercial Development
12100 Creditview Road
Caledon, Ontario

May 21, 2025
GEMTEC Project: 102491.013

experience • knowledge • integrity

GEMTEC Consulting Engineers and Scientists Limited
6695 Millcreek Drive, Unit 7,
Mississauga, ON, Canada
L5N 5M4

May 21, 2025

File: 102491.013 – Rev2

12100 Creditview Developments Limited
c/o Fieldgate Commercial
5400 Yonge Street, 1st Floor
Toronto, Ontario
M2N 5R5

Attention: Stephanie Volpentesta, Senior Development Manager

Re: Geotechnical Investigation Report
Proposed Commercial Development
12100 Creditview Road, Caledon, Ontario

Please find enclosed our Geotechnical Investigation Report for the Proposed commercial development located at 12100 Creditview Road in the Town of Caledon, Ontario. The report presented herein is based on the scope of work summarized in our proposal dated April 5, 2024. This report was prepared by Connor McCormick, P.Eng. and reviewed by Jeff Tolton, C.E.T.

Connor McCormick, P.Eng.
Geotechnical Engineer

Jeff Tolton, C.E.T.
Senior Project Manager

CM/MWK/JET/sm

N:\Projects\102400\102491.013\03_Submittals\Geotech\102491.013_RPT_Geotech Investigation_12100 Creditview Rd_2025-05-21_Rev2.docx

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 SITE AND PROJECT DESCRIPTIONS 1

2.1 Background 1

3.0 METHODOLOGY 2

3.1 Geotechnical Investigation 2

4.0 SUBSURFACE AND GROUNDWATER CONDITIONS 3

4.1 Topsoil and Organics 3
4.2 Fill Materials 5
4.3 Glacial Till (ML-CL/CL, SM) 6
4.4 Groundwater Levels 6

5.0 RECOMMENDATIONS AND CONSIDERATIONS 9

5.1 Subgrade Preparation 10
5.2 Re-use of Site Materials as Engineered Fill and Placement 11
5.3 Installation of Underground Services 12
5.3.1 Temporary Excavations – Underground Services 12
5.3.2 Pipe Bedding and Cover 13
5.3.3 Trench Backfill 13

5.4 Asphalt Pavement Construction 14

6.0 BUILDING STRUCTURES 15

6.1 Building Foundations – Spread Footings 15
6.1.1 Slab-on-Grade 16

6.2 Seismic Classification 18
6.3 Additional Considerations 18

7.0 CLOSURE 19

NOTE: This document and any attachments are confidential and intended solely for the use of the individual or entity to whom they are addressed. If you have received this document in error, please notify the sender immediately and delete the document from your system. Any unauthorized disclosure, copying, distribution, or reliance on the contents of this document is prohibited. Thank you for your cooperation.

LIST OF TABLES

Table 4.1 – Summary of Grain Size Distribution Test (Fill Materials).....5
Table 4.2 – Summary of Grain Size Distribution Test (Glacial Till) 6
Table 4.2 – Groundwater Depths 7
Table 5.1 – Flexible Pavement Design Recommendations 14

LIST OF APPENDICES

APPENDIX A	Conditions and Limitations of This Report
APPENDIX B	Borehole Location Plan
APPENDIX C	Record of Borehole Sheets
APPENDIX D	Laboratory Test Results
APPENDIX E	Terraprobe Geotechnical Report (File No. 1-22-0516-01, dated April 5, 2022)

1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) has been retained by 12100 Creditview Developments Limited c/o Fieldgate Commercial (Fieldgate), to carry out a geotechnical study, concurrently with both a Phase One Environmental Site Assessment (ESA), Phase Two ESA, and a hydrogeological investigation in support of a proposed commercial development of the property located at 12100 Creditview Road, Ontario (i.e., the Site). A previous geotechnical report was completed for this site by Terraprobe (Terraprobe File No. 1-21-0516-01, dated April 5, 2022) however this report did not address the increase in size of the overall development. This report addresses the geotechnical (physical) aspects of the design and should be read in conjunction with the environmental and hydrogeological reports (issued under separate cover).

The purpose of the geotechnical study was to identify the general subsurface soil and groundwater conditions at the site by means of a limited number of boreholes and monitoring wells advanced as part of the hydrogeological investigation, and based on the factual data obtained, to provide engineering guidelines on the geotechnical design aspects of the project, including construction considerations that could influence design decisions.

This report is subject to the Conditions and Limitations of This Report, which is included in Appendix A, and are considered an integral part of the report. The factual data, interpretations and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location or elevation, or if the project is not initiated within eighteen months of the date of the report, GEMTEC should be given an opportunity to confirm that the recommendations in this report are still valid.

2.0 SITE AND PROJECT DESCRIPTIONS

2.1 Background

The site is located on the northwest side of Mayfield Road Drive on the southwest side of Creditview Road, with the municipal address 12100 Creditview Road, in the Town of Caledon, ON. The property is undeveloped, with a municipal reservoir and pumping station on the adjacent property. The site is currently covered by farmland, and associated structures. The site is generally flat with local low/wet areas along the southeast and west corners of the overall property, based on visual observations.

Based on our correspondence and review of the provided Conceptual Site Plan, dated January 22, 2024, it is understood that the proposed Commercial development will consist of up to nine commercial building (identified as Buildings A, B1 to B5, C1 to C4), slab on grade construction (no basements) and associated parking, heavy duty drive lanes, along with underground site services and a new street (identified as Street G).

The purpose of the geotechnical investigation was to determine the subsurface soil and shallow groundwater conditions within the site by means of a limited number of shallow boreholes and to provide geotechnical comments and recommendations related to the design of foundations, site grading/preparation, site servicing and pavements for the proposed development based on our interpretation of the borehole data.

As noted above, a previous study was completed at this site by Terraprobe (Terraprobe File No. 1-21-0516-01, dated April 5, 2022). The Terraprobe report was provided to GEMTEC by Fieldgate and the subsurface information was reviewed by GEMTEC. This report is included in Appendix E for reference.

3.0 METHODOLOGY

3.1 Geotechnical Investigation

The fieldwork for this investigation was carried out between April 22 to 25, 2024 during which time ten boreholes, designated as Boreholes BH24-1 to BH24-10, were advanced to approximate depths ranging from about 4.8 m to 6.7 m below ground surface (bgs). Groundwater monitoring wells were installed in all of the boreholes to allow for groundwater level monitoring at the site. The approximate locations of the completed boreholes are shown on the Borehole Location Plan, Figure 1, in Appendix B.

On April 15, 2025, 21 shallow test pits were excavated across the site to better define the topsoil thicknesses across the site.

Prior to initiating the field work, GEMTEC contacted public utility companies to locate and clear existing underground services. As the boreholes advanced within the existing site were located on private property, GEMTEC also retained a private utility locating contractor to scan the borehole locations for buried services prior to drilling.

The boreholes were advanced with a track mounted drill rig using hollow stem augers, supplied, and operated by a specialist drilling contractor, subcontracted through GEMTEC.

Standard Penetration Tests (SPT) were carried out in the boreholes and samples of the soils encountered were recovered using a 50-millimetre (mm) diameter split spoon sampler driven by an automatic hammer in accordance with the SPT procedures outlined in ASTM International Standard D1586: *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*. The SPT N-values presented on the borehole records were measured directly in the field and are unfactored / uncorrected.

The fieldwork was supervised by a member of our engineering staff who directed the drilling operations and logged the boreholes and collected soil samples. Following completion of the drilling, the soil samples were returned to our laboratory for further examination. Selected soil samples were submitted for water content and grain size distribution testing.

Descriptions of the subsurface conditions observed in the boreholes are provided on the Record of Borehole Sheets in Appendix C. The results of the laboratory tests are provided on the Record of Boreholes (were applicable) in Appendix D.

4.0 SUBSURFACE AND GROUNDWATER CONDITIONS

As previously indicated, the soil and groundwater conditions observed in the boreholes are presented on the Record of Borehole Sheets in Appendix C. The Record of Boreholes indicate the subsurface conditions at the specific borehole locations only. Boundaries between zones on the Record of Boreholes are often not distinct and can be transitional, and as such have been interpreted. The precision with which subsurface conditions are indicated depends on the method of drilling, the frequency and recovery of samples, the method of sampling, and the uniformity of the subsurface conditions. Subsurface conditions between and beyond the borehole locations may vary from the conditions encountered in the boreholes, both laterally and with depth. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties.

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and GEMTEC does not guarantee descriptions as exact but infers accuracy to the extent that is common in current geotechnical practice.

The following presents an overview of the subsurface conditions encountered in the boreholes advanced during this preliminary investigation. In general, the subsurface conditions encountered consist of a surficial layer of topsoil overlying various fill materials generally consisting of silty clay containing various amounts of organics, which in turn generally overlies a silty clay to silty sand till deposit.

The results of GEMTEC's 2024 subsurface investigation are generally similar to Terraprobe's 2022 investigation.

4.1 Topsoil and Organics

Topsoil and surficial organic materials were encountered at the ground surface at all of the borehole locations with the exception of Boreholes BH24-5 and BH24-7. In addition, 21 shallow test pits were hand excavated to help better define the top soil thicknesses across the site. These surficial organic materials ranged in thickness from about 0.1 m to 0.8 m as summarised in the table below.

Borehole Number	Approximate Thickness of Topsoil and Organic Fill (mm)
BH24-1	200
BH24-2	290

Borehole Number	Approximate Thickness of Topsoil and Organic Fill (mm)
BH24-3	110
BH24-4	840
BH24-5	n/a
BH24-6	300
BH24-7	n/a
BH24-8	760
BH24-9	460
BH24-10	250

Shallow Test Pit	Approximate Thickness of Topsoil and Organic Fill (mm)
TS1	230
TS2	260
TS3	260
TS4	260
TS5	230
TS6	280
TS7	330
TS8	280
TS9	260
TS10	260
TS11	310
TS12	260
TS13	260
TS14	310
TS15	280

Shallow Test Pit	Approximate Thickness of Topsoil and Organic Fill (mm)
TS16	280
TS17	310
TS18	280
TS19	260
TS20	280
TS21	280

4.2 Fill Materials

Fill materials generally consisting of silty sand, some gravel, and variable clay (trace to some) were encountered at ground surface in Boreholes BH24-5 and BH24-7 extending to depths of about 0.2 to 0.8 m below grade. The fill material contained trace amounts of asphalt at Borehole BH24-5. A cohesive fill layer comprising clayey silt to silty clay, some sand, and trace gravel was encountered underlying the topsoil in Borehole BH24-8 and the cohesionless fill in Borehole BH24-5. The cohesive fill in Boreholes BH24-5 and BH24-8 contained trace to some organics, and wood fragments. The cohesionless fill extended to depths of about 2.3 m below ground surface at the Boreholes BH24-5 and BH24-8.

Standard penetration tests carried out in the cohesionless fill material gave SPT N-values of 6 per 0.3 metres of penetration, which suggests a loose compactness.

Standard penetration tests carried out in the cohesive fill material gave SPT N-values ranging from 2 blows to 8 blows per 0.3 metres of penetration, which suggests a very soft to firm consistency.

One (1) grain size distribution test was carried out on a sample of the earth fill material and the results are provided in Appendix D and are summarized in Table 4.1.

Table 4.1 – Summary of Grain Size Distribution Test (Fill Materials)

Location	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt / Clay (%)
BH24-8	2	0.7 - 1.4	3.3	16.9	79.7

Atterberg limits testing was carried out on one (1) selected sample of the cohesive till deposits and returned a plastic limit of about 17 per cent, a liquid limit of about 29 per cent, and plasticity index of about 12 per cent; indicating that the deposits generally classified as low plasticity clay.

The water content measured on one sample of the cohesive fill layer was recorded to be about 14 per cent.

4.3 Glacial Till (ML-CL/CL, SM)

A glacial till deposit generally comprised of clayey silt to silty clay, trace to some sand, trace gravel was encountered in all of the boreholes advanced at the site. The till deposit was encountered between approximate depths of about 0.1 m and 2.3 m bgs (Elevation 265.9 m to 262.7 m) and extended to the termination depths of all of the boreholes, between about 4.8 m and 6.7 m bgs (Elevation 260.17 m to 255.5 m). Borehole BH24-9 terminated in a non-cohesive glacial till layer comprising silty sand, trace to some gravel, trace to some clay.

Standard penetration tests carried out in the cohesive portions of the till deposit measured SPT N-values between 3 blows per 0.3 m of penetration and 50 blows for 0.05 m of penetration, suggesting a soft to hard (typically stiff to hard) consistency.

Standard penetration tests carried out in the non-cohesive portion of the till deposit measured an SPT N-value of 26 blows per 0.3 m of penetration, indication a compact relative density.

Three (3) grain size distribution tests were carried out on samples of the glacial till material and the results are provided in Appendix D and are summarized in Table 4.2.

Table 4.2 – Summary of Grain Size Distribution Test (Glacial Till)

Location	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt / Clay (%)
BH24-2	2	0.7 - 1.4	3.2	21.4	75.3
BH24-2	4	2.3 – 2.9	12.4	26.0	61.7
BH24-8	4	2.3 – 2.9	2.1	18.1	79.8

Atterberg limits testing was carried out on three (3) selected samples of the cohesive till deposits and returned plastic limits of about 17 to 18 per cent, liquid limits ranging from about 24 per cent to 29 per cent, and plasticity indices ranging from about 6 per cent to 12 per cent; indicating that the deposits generally classified as low plasticity silty clay to clayey silt.

The water contents measured on samples of this glacial till ranged from about 12 percent to 15 percent.

4.4 Groundwater Levels

Groundwater levels were measured in the boreholes and monitoring wells on completion of drilling, and in the monitoring wells on May 6, May 21, June 6, June 14, June 27, July 12, August 30, October 17, and November 27, 2024 and are summarised in the table below.

Table 4.2 – Groundwater Depths

Monitoring Well	Date	Depth below ground surface (m)	Elevation (m)	Screened Material
BH24-1	April 24, 2024	Dry	-	(ML-CL/CL) Clayey Silt / Silty Clay Till
	May 6, 2024	0.3	263.2	
	May 21, 2024	0.5	263.0	
	June 6, 2024	0.5	263.0	
	June 14, 2024	0.6	262.9	
	June 27, 2024	0.4	263.1	
	July 12, 2024	0.4	263.1	
	August 30, 2024	0.7	262.8	
	October 17, 2024	0.9	262.6	
	November 27, 2024	0.8	262.7	
BH24-2	April 22, 2024	4.4	260.6	(ML -CL/CL) Clayey Silt / Silty Clay Till
	May 6, 2024	0.9	264.1	
	May 21, 2024	0.9	264.1	
	June 6, 2024	1.0	264.0	
	June 14, 2024	1.0	264.0	
	June 27, 2024	0.8	264.2	
	July 12, 2024	0.8	264.2	
	August 30, 2024	1.2	263.8	
	October 17, 2024	1.6	263.4	
	November 27, 2024	1.5	263.5	
BH24-3	April 24, 2024	Dry	-	(ML -CL/CL) Clayey Silt / Silty Clay Till
	May 6, 2024	1.8	264.2	
	May 21, 2024	2.4	263.6	
	June 6, 2024	2.3	263.7	
	June 14, 2024	2.4	263.6	
	June 27, 2024	2.3	263.7	
	July 12, 2024	2.4	263.6	
	October 17, 2024	3.5	262.5	
	November 27, 2024	3.7	262.3	

Monitoring Well	Date	Depth below ground surface (m)	Elevation (m)	Screened Material
BH24-4	April 25, 2024	5.8	255.3	(ML -CL/CL) Clayey Silt / Silty Clay Till
	May 6, 2024	-0.3	261.4	
	May 21, 2024	-0.2	261.3	
	June 6, 2024	0.1	261.0	
	June 14, 2024	-0.1	261.2	
	June 27, 2024	-0.2	261.3	
	July 12, 2024	-0.1	261.2	
	August 30, 2024	0.1	261.0	
	October 17, 2024	0.5	260.6	
	November 27, 2024	0.7	260.4	
BH24-5	April 23, 2024	5.8	258.2	(ML -CL/CL) Clayey Silt / Silty Clay Till
	May 6, 2024	1.0	263.0	
	May 21, 2024	1.1	262.9	
	June 6, 2024	1.3	262.7	
	June 14, 2024	1.3	262.7	
	June 27, 2024	0.9	263.1	
	July 12, 2024	1.0	263.0	
	August 30, 2024	1.4	262.6	
	October 17, 2024	1.6	262.4	
	November 27, 2024	1.5	262.5	
BH24-6	April 23, 2024	4.9	259.6	(ML -CL/CL) Clayey Silt / Silty Clay Till
	May 6, 2024	1.1	263.4	
	May 21, 2024	1.3	263.2	
	June 14, 2024	1.4	263.1	
BH24-7	April 23, 2024	5.5	259.4	(ML -CL/CL) Clayey Silt / Silty Clay Till
	May 6, 2024	0.5	264.4	
	May 21, 2024	0.6	264.3	
	June 6, 2024	0.6	264.3	
	June 14, 2024	0.9	264.0	
	June 27, 2024	0.4	264.5	
	July 12, 2024	0.5	264.4	
	August 30, 2024	1.2	263.7	
	October 17, 2024	1.6	263.3	
	November 27, 2024	1.2	263.7	

Monitoring Well	Date	Depth below ground surface (m)	Elevation (m)	Screened Material
BH24-8	April 24, 2024	5.8	258.6	(ML -CL/CL) Clayey Silt / Silty Clay Till
	May 6, 2024	0.9	263.5	
	May 21, 2024	1.0	263.4	
	June 6, 2024	1.1	263.3	
	June 14, 2024	1.2	263.2	
	June 27, 2024	1.0	263.4	
	July 12, 2024	1.6	262.8	
	August 30, 2024	1.4	263.0	
	October 17, 2024	1.8	262.6	
	November 27, 2024	2.0	262.4	
BH24-9	April 22, 2024	5.0	257.2	(ML -CL/CL) Clayey Silt / Silty Clay Till
	May 6, 2024	1.3	260.9	
	May 21, 2024	1.4	260.8	
	June 6, 2024	1.5	260.7	
	June 14, 2024	1.5	260.7	
	June 27, 2024	1.0	261.2	
	July 12, 2024	1.2	261.0	
	August 30, 2024	1.6	260.6	
	October 17, 2024	1.7	260.5	
	November 27, 2024	1.6	260.6	
BH24-10	April 22, 2024	Dry	-	(ML -CL/CL) Clayey Silt / Silty Clay Till
	May 6, 2024	0.4	263.8	
	May 21, 2024	0.5	263.7	
	June 6, 2024	0.7	263.5	
	June 14, 2024	0.8	263.4	
	June 27, 2024	0.6	263.6	
	July 12, 2024	0.7	263.5	
	August 30, 2024	1.0	263.2	
	October 17, 2024	1.6	262.6	
	November 27, 2024	1.5	262.7	

The groundwater conditions described in this report refer only to those measured at the place and time of observation. Seasonal and annual fluctuations should be anticipated.

5.0 RECOMMENDATIONS AND CONSIDERATIONS

This section of the report provides engineering guidance on the geotechnical design aspects of the project based on our interpretation of the boreholes advanced as part of the site investigation.

It is stressed that the information in the following sections is provided for the guidance of the designers and is intended for this project only. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety, and equipment capabilities.

Based on the results of this investigation, the subsurface soil conditions encountered at the site are considered to be generally suitable for the proposed commercial development, along with the associated utilities, asphalt driveways and parking lots.

At the time of this report, preliminary design grades (i.e., finished floor slab elevations, site servicing inverts and pavement subgrade levels) were not available for review by this office. As such, the following engineering recommendations regarding the geotechnical design aspects of the project including underground services, pavements and building foundations should be considered as preliminary only, and should be reviewed and refined as required when the final design grades and utility invert levels have been finalized.

5.1 Subgrade Preparation

The final proposed site grading is outlined in the drawings noted above, in Section 2.1, and it is expected that cuts or fills of up to about 0 to 2.5 m will be required to establish subgrade levels and permit construction of the proposed development. Should cut and or fill depths be greater than those noted above, the recommendations in this section of the report should be reviewed by this office.

The existing site vegetation, surficial topsoil/organics and fill materials containing significant amounts of organics (i.e. greater than 5 percent), should be completely removed as part of the site grading operations, along with the fill materials encountered in Boreholes BH24-5. The remaining cohesive fill materials underlying the surficial topsoil or the cohesionless fill materials at surface can remain in place as subgrade outside of the building footprints, however once the subgrade has been cut to final grade, it is recommended that the existing fill materials be heavily proof-rolled with suitable equipment, in conjunction with inspection by qualified geotechnical personnel to confirm that the exposed soils are competent and have been adequately stripped of ponded water and all disturbed, loosened, softened, organic and other deleterious material. Remedial work (i.e., further subexcavation and replacement) should be carried out on poorly performing areas identified during the proof-rolling activities, as directed by GEMTEC.

It should be noted that wet areas along the south east and west corners of the property exist at the time of this investigation. As such, difficulties with large machinery travelling within these areas should be expected, along with drying of the subgrade materials prior to placement of engineered fill.

Further, former structures (existing buildings, weeping beds, sewers, etc.) located on site, will have to be removed or decommissioned. Remedial actions, such as removal of existing

foundations or recompaction of backfill will be required, as directed by the geotechnical engineer and the recommendations contained in this report.

5.2 Re-use of Site Materials as Engineered Fill and Placement

In general, the majority of the existing site soils excavated as part of the subgrade preparation or site grading operations, with the exception of the topsoil and/or localised areas containing significant amounts of organics, are suitable for re-use as engineered fill. Based on observations made during drilling and sampling operations, the existing site soils are at or slightly below the optimum water content for compaction and may require wetting prior to placement.

If, however, importation of material is required for the engineered fill process, the material that is proposed for use as engineered fill should be approved by the geotechnical engineer at its source, prior to importing the material to the site. Suitable soils, free of topsoil, organic matter or other deleterious materials can be used as engineered fill provided that the water content of the soil at the time of placement does not vary more than 2 percent above or below the optimum water content for compaction. Otherwise, the soils may require treatment (i.e. drying or wetting) prior to placement. In addition, some difficulty is expected in achieving compaction of fine-grained silty or clayey soils during wet or cold weather. As such, placement of engineered fill is not recommended in times of inclement weather (i.e. cold, wet or freezing temperatures).

The prepared subgrade for any proposed infrastructure (i.e., engineered fill, footings, utilities, roads, etc.) should be inspected by qualified geotechnical personnel to confirm that the foundation soils are uniform and consistent with those encountered in the boreholes and are free of any soft / loose or otherwise deleterious materials, as noted above. Locations where less competent subgrade conditions (i.e., soft / loose soil, construction debris, organic soils, or other deleterious materials) are identified during subgrade inspection should be sub-excavated and replaced with engineered fill.

Following the inspection and approval of the subgrade as previously described, engineered fill materials should be placed in maximum 300 mm thick loose lifts and uniformly compacted to 98 percent of the Standard Proctor maximum dry density (SPMDD) of the material. Filling should continue until the design subgrade elevations are achieved. The top of the engineered fill should extend a minimum of 1.0 m above the founding levels for all of the structures or to adjacent grade/subgrade level as applicable.

Full-time monitoring and in-situ density testing should be carried out by a qualified geotechnical engineering firm during placement of engineered fill beneath all structures and settlement sensitive areas.

The final surface of the engineered fill should be protected as necessary from construction traffic and should be sloped to provide positive drainage for surface water during the construction period. If the engineered fill materials will be left exposed (i.e. uncovered) during periods of freezing weather, additional soil cover should be placed above final subgrade to provide for frost

protection. Prior to placing the subbase and/or base courses within pavement areas, the surface of the engineered fill should be inspected by the geotechnical engineer.

5.3 Installation of Underground Services

5.3.1 Temporary Excavations – Underground Services

Details of the underground servicing for the proposed development are unknown at the time of this investigation; as such, for the purpose of this report, the maximum depth of the underground services was assumed to be about 2 m below proposed finished ground surface. Once detailed design is completed, review of the underground services should be completed by this office for compliance with the recommendations contained herein.

The founding soils are anticipated to generally consist of engineered fill and/or the native, generally stiff to hard glacial till. These materials are generally considered to be suitable for supporting the underground services provided that the integrity of the base of the trench excavations is maintained during construction. Where softened or disturbed native soils or other deleterious materials are encountered at the base of excavations for settlement-sensitive services, these materials should be subexcavated and replaced with compacted fills approved by the geotechnical engineer.

Following drilling, the most recent water levels (May 21, 2024) measured in the groundwater monitoring wells installed at the site were recorded at depths between about 0.3 m to 1.8 m below existing grade (Elevations of 264.4 m to 260.9 m). Water level in Borehole BH24-4 was noted to be 0.3 m and 0.2 m above ground surface on May 6 and 21, 2024, respectively. Borehole BH24-4 is noted to be at a relatively low elevation and field staff noted wet ground conditions during drilling. Extra care may be required for excavations within locally low-lying/wet areas within the site.

At some locations within the site, perched groundwater conditions should be expected to be encountered within excavations. Control of groundwater seepage originating from these perched layers and water within the glacial till can probably be handled by pumping from properly constructed and filtered sumps located within the excavations, although the inflow of near surface water could temporarily overwhelm a sump and pump system, depending on the size and number of pumps being used.

All temporary excavations must be carried out in accordance with the requirements of the OHSA. The soil types, as defined in the OHSA, for overburden soils present at the proposed development site are summarized below as an aid for design:

- Existing fill and firm glacial till, above groundwater – Type 3 soil; and
- Generally stiff to hard glacial till – Type 2 soil.

For open excavations, Type 3 soils must be sloped from the bottom of the excavation and may have a slope no steeper than 1 horizontal to 1 vertical (1H:1V) and Type 2 soils may have a

maximum allowable slope of 1H:1V to 1.2 m above the bottom of the excavation. Depending upon the construction procedures adopted, the groundwater seepage conditions and weather conditions at the time of construction, some local flattening of the slopes of open cut excavations may be required, especially in looser/softer zones or where localized seepage is encountered which may be present in the silty/sandy till layers. Further, layering of soils and the effectiveness of the Contractor's dewatering systems could affect the OHSA classification and, therefore, the classification of soils for OHSA purposes must be made at the time the excavation is open and can be directly observed during construction.

Where the side slopes of excavations are required to be steepened to limit the extent of the excavation, then some form of trench support may be required. Some trench excavations could be carried out using a vertically-excavated, unsupported excavation (using a properly-engineered trench liner box for protection, certified by an experienced engineer); or by a supported (sheeted) excavation if conditions warrant so; such as in wet areas and/or in close proximity to adjacent underground services.

5.3.2 Pipe Bedding and Cover

The bedding for watermains and sewers should be compatible with the type and class of pipe, the surrounding subsoil and anticipated loading conditions and should be designed in accordance with the Town of Caledon/Region of Peel standards. If granular bedding is deemed to be acceptable, and the base of the excavation is competent (as determined by geotechnical personnel), an Ontario Provincial Standard Specifications (OPSS) Granular A should be used from at least 150 mm below the invert to the springline. Clear stone should not be used as bedding material. From springline to 300 mm above the obvert of the pipe, sand cover could be used. All bedding and cover should be placed in maximum 150 mm loose lifts and should be uniformly compacted to at least 98 percent of standard Proctor maximum dry density (SPMDD).

5.3.3 Trench Backfill

The excavated materials from the site will consist predominantly of silty clay to clayey silt till materials. Based on the measured water contents, in general, the fill and native materials encountered at the site are estimated to be near or above their optimum water contents for compaction, and therefore, may require drying or mixing prior to placement.

Care should be taken to maintain the water content of the soils close to/at the optimum water content for compaction during the construction operations, as difficulties with compaction and/or backfill performance would be anticipated with fine-grained soils where the water content is significantly above the optimum for compaction purposes. Soils that contain significant quantities of organics or debris are also not suitable for use as trench backfill within settlement-sensitive areas. In addition and if present, all cobbles and boulders greater than 150 mm in size should be removed from the trench backfill materials. If there is a shortage of suitable in-situ material, an approved imported material such as Ontario Provincial Standard Specifications Select Subgrade Material should be used for trench backfill.

Trench backfill should be placed in maximum 300 mm loose lift thickness and uniformly compacted to at least 98 percent of the SPMDD of the material. Soil that is frozen should not be used as backfill.

Normal post-construction settlement of the compacted trench backfill should be anticipated with the majority of such settlement taking place within about 12 months following the completion of trench backfilling operations. If the trench backfill operations are completed during the winter months, post-construction settlements may increase beyond typical anticipated values. These settlements will be reflected at the ground surface. If the asphalt binder course for paved areas is laid shortly following the completion of the trench backfilling operations, any settlement that may be reflected by subsidence of the surface of the binder asphalt should be compensated for by placing an additional thickness of binder asphalt or by padding. If possible, the surface course asphalt should not be placed over the binder course asphalt for about 12 months. Where scheduling requires that the surface course be placed over the binder course asphalt before this period, trench backfill settlement would be reflected by subsidence and possible cracking of the finished pavement surface in these areas which, depending upon the extent and magnitude, may require local repairs.

5.4 Asphalt Pavement Construction

As traffic information was not available at the time of this report, minimum pavement structure requirements have been provided below for guidance purposes. It is anticipated that the parking lot/driveways/access roads will be used by passenger vehicles with periodic heavier loads from service vehicles and the future Street G will be a municipal road.

Based on the subsoil conditions encountered, conventional asphaltic (flexible) pavement designs are considered appropriate for the proposed paved parking areas and associated driveways.

The following minimum pavement structures are recommended for this site:

Table 5.1 – Flexible Pavement Design Recommendations, Driveways/Parking Lot and Street G

Material	Thickness and Type of Pavement Elements		
	Light Duty Pavement	Heavy Duty Pavement	Future Street 'G'
Surface Course	40 mm HL 3	40 mm HL 3	40 mm HL 3
Base Course	65 mm HL 8	80 mm HL 8	90 mm HL 8
Granular Base	150 mm Granular A	150 mm Granular A	150 mm Granular A
Granular Subbase	300 mm Granular B Type I or II	450 mm Granular B Type I or II	450 mm Granular B

To preserve the integrity of the completed paved areas, a permanent drainage system is recommended. It is anticipated that the drainage would consist of a system of catch basins draining to storm sewers. In this regard, the subgrade should be carefully proof-rolled, with suitable readily available construction equipment (minimum of 10 tonnes) to a smooth surface and sloped towards the catch basins to prevent ponding or entrapment of water in the subbase, which would lead to deterioration of the pavement (i.e., alligator cracks, potholes, etc.).

At internal catch basin locations, consideration should be given to properly grade and provide continuous subdrains from the internal catch basins to the perimeter edges of the parking lot or storm sewer system. If this is not feasible, short (5 m to 6 m long) perforated subdrains should be provided at the internal catch basin locations. In addition, consideration should be given to providing continuous subdrains along the sides of the access road(s) and perimeter edges of the parking areas to promote drainage of the granular materials.

It should be noted that in some cases, even though the compaction requirements have been met, the subgrade strength may not be adequate to support heavy construction loading especially during wet weather or where backfill materials wet of optimum have been placed. In this regard, the design subbase thickness may not be sufficient for a construction haul road and additional subbase (in the order of 450 mm) may be required. In any event, the subgrade should be proof-rolled and inspected by GEMTEC prior to placing the subbase and any additional material, as required, consistent with the prevailing weather conditions and anticipated use by construction traffic.

6.0 BUILDING STRUCTURES

6.1 Building Foundations – Spread Footings

Based on the subsurface conditions encountered in the boreholes, strip and spread footings may be used, provided that the footings are founded on the very stiff to hard native silty clay to clayey silt till, or on properly placed and compacted engineered fill.

For strip footings founded on the native very stiff to hard silty clay to clayey silt till deposits, a factored geotechnical resistance at Ultimate Limit States (ULS) of 375 kPa, and a geotechnical resistance at Serviceability Limit States (SLS) of 250 kPa (for less then 25 mm of settlement) may be assumed for preliminary design purposes. These resistances are based on strip footings having a minimum width of 0.6 m and a maximum width of 2.0 m.

For strip footings founded on engineered fill, a factored geotechnical resistance at Ultimate Limit States (ULS) of 250 kPa, and a geotechnical resistance at Serviceability Limit States (SLS) of 150 kPa (for less then 25 mm settlement) may be assumed for preliminary design purposes. These resistances are based on strip footings having a minimum width of 0.6 m and a maximum width of 2.0 m.

All exterior footings, and interior footings in unheated areas, should be founded at a minimum depth of 1.2 m below finished grade level in order to provide adequate protection against frost penetration.

The footings should have a clear spacing (edge to edge of adjacent footings) of twice the footing width in order to prevent overlapping zones of influence, which could lower the resistances given above. Minimum founding depths and other considerations given in the geotechnical report will still apply to these footing sizes.

It is essential that the founding surface for the footings be inspected by qualified geotechnical personnel prior to placing concrete. If the concrete for the footings cannot be placed immediately after excavation and inspection of the subgrade, it is recommended that a working mat of lean concrete be placed in the excavation to protect the integrity of the bearing stratum.

Resistance to lateral forces/sliding resistance between the concrete footings and the subgrade should be calculated in accordance with Section 6.10.4 of the CHBDC (2019). The unfactored coefficient of friction, tan δ, for the interface between the cast-in-place concrete footing and the properly prepared subgrade can be assumed to be 0.30 on the silty clay to clayey silt till or engineered fill.

6.1.1 Slab-on-Grade

For slab-on-grade foundations (interior floor slabs), a modulus of subgrade reaction, k_{vb}, is typically used to represent the soil stiffness. The modulus of vertical subgrade reaction (k_{vb}) is not a fundamental soil property, and the value changes with footing size and/or the size of the loaded area(s). The current state of practise uses a standard reference vertical subgrade reaction k_{v1} associated with a 0.3 m x 0.3 m (i.e., 1 ft x 1 ft) plate. The modulus of vertical subgrade reaction can be estimated from the equations given below for foundations and/or slabs on non-cohesive or cohesive soils (CFEM, 2006). However, it should be noted that these methods are approximate only and it is generally considered that carrying out a detailed settlement analysis is the more rational approach (once design details are known) to obtain more realistic values of k_{vb}.

For slab-on-grade foundations, the modulus of subgrade reaction is defined as:

$$k = \frac{q}{\delta}$$

Where:

k is the modulus of vertical subgrade reaction for actual foundation width, b (MPa/m);

q is the applied bearing or contact pressure on the foundation; and,

δ is the settlement of the foundation under the applied pressure q.

For cohesive soils:

$$k_{vb} = \frac{0.3\ k_{v1}}{b}\left[\frac{m + 0.5}{1.5m}\right]$$

Where:

k_{vb} is the modulus of vertical subgrade reaction for actual foundation dimension, b (MPa/m);

k_{v1} is the modulus of vertical subgrade reaction for a 1 ft x 1 ft plate (MPa/m);

b is the foundation width (m); and,

m is the ratio of foundation length to width (i.e., m = *L* / b).

For non-cohesive soils:

$$k_{vb} = k_{v1}\left[\frac{3.3b + 1}{6.6b}\right]^2$$

Where:

k_{vb} is the modulus of vertical subgrade reaction for actual foundation dimension, b (MPa/m);

k_{v1} is the modulus of vertical subgrade reaction for a 1 ft x 1 ft plate (MPa/m);

b is the foundation width (m)

For the design of interior floor slabs using a spring constant, a modulus of vertical subgrade reaction, k_{v1}, of 20 MPa/m may be used for the design of slabs placed on granular fill. The design modulus of vertical subgrade reaction is derived based on the assumption that the subgrade is not disturbed during construction.

Again, the modulus of subgrade reaction is not a fundamental nor intrinsic soil property and will vary depending on the rigidity of the slab and the thickness of the granular bedding. Additional analysis and input may be required for the structural design to refine the range of k_{vb} values. Where designs are sensitive to the specific modulus value(s), a more rigorous method of analysis (i.e., settlement analysis) should be undertaken to obtain modulus value(s) that are more representative of the site conditions.

The base of the floor slab should consist of at least 300 mm of OPSS Granular A or 19 mm crusher run limestone compacted to at least 100 percent SPMDD in suitable lift thicknesses (typically maximum 300 mm).

Perimeter drainage is not needed where the lowest finished floor is 200 mm higher than exterior grade. Drainage of the subgrade is required where doors are flush to grade or in areas where the finished floor is less than 200 mm higher than grade. This is to prevent impaired door function during winter months.

A polyethylene vapour barrier / retarder is recommended below the floor slabs where the floor will be covered by moisture sensitive flooring material or where moisture sensitive equipment, products or environments will exist. The ACI 302.1R-04 "*Guide for Concrete Floor and Slab Construction*" should be referenced for design purposes.

The floor slabs should be structurally separate from the foundation walls and columns and sawcut control joints should be provided at regular intervals and along column lines to reduce shrinkage cracking and allow for any differential settlement of the floor slabs.

If any areas of the building are to remain unheated during the winter period, thermal protection of the slab on grade may be required. Further details on the insulation requirements could be provided, if necessary.

6.2 Seismic Classification

Seismic hazard is defined in the 2012 Ontario Building Code (OBC), as amended, by uniform hazard spectral-acceleration (UHS) values at periods of 0.2 second, 0.5 second, 1.0 second, 2.0 seconds, 5.0 seconds and 10.0 seconds 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 (i.e., shear wave velocity, Standard Penetration Test (SPT) resistance, undrained soil shear strength, etc.) in the 30 m below the foundation level. There are six 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 silty peat deposits and/or liquefiable soils). The site class is then used to obtain acceleration and velocity-based site coefficients, Fa and Fv respectively, used to modify the UHS to account for the effects of site-specific soil conditions in design.

The seismic design provisions of Section 4.1.8.4-A of the 2012 Ontario Building Code depend, in part, on the shear wave velocity of the upper 30 metres of soil and/or rock below founding level. Based on the subsurface conditions encountered during the site investigation, and our experience with similar soil conditions, the foundations at the site may be designed using a Site Class C designation.

6.3 Additional Considerations

Prior too or as part of detailed geotechnical design, it may be necessary to carry-out additional field investigation in the form of targeted boreholes and installation of additional monitoring wells (or vibrating wire piezometers) to confirm certain assumptions in this report and laboratory testing, depending on the particular aspects and/or requirements of the final design and / or construction. In this regard, GEMTEC should be given the opportunity to review the final design details and provide input on the requirements for additional investigation, if any.

During construction, a sufficient degree of foundation inspections, subgrade inspections, and an adequate number of in situ density tests and materials testing should be carried out to confirm that the conditions exposed are consistent with those encountered in the boreholes and assumed in design, and to monitor conformance to the pertinent geotechnical project specifications. Concrete testing should be carried out on both the plastic material in the field at the time of placement and on sets of cylinder samples in a CSA certified laboratory.

7.0 CLOSURE

We trust that this report meets your immediate requirements. If conditions that differ from those assumed in this geotechnical investigation report are encountered during construction, GEMTEC should be given the opportunity to review the recommendations presented herein.

If you have any questions or require additional information, please contact the undersigned.

Regards,

GEMTEC Consulting Engineers and Scientists Limited



Connor McCormick, P.Eng
Geotechnical Engineer

Jeff Tolton, C.E.T.
Senior Project Manger

APPENDIX A

Conditions and Limitations of This Report

GEMTEC
Consulting Engineers and Scientists

Conditions and Limitations of This Report

1. **Standard of Care:** GEMTEC has prepared this report in a manner consistent with generally accepted engineering or environmental consulting practice in the jurisdiction in which the services are provided at the time of the report. No other warranty, expressed or implied is made.
2. **Copyright:** The contents of this report are subject to copyright owned by GEMTEC, save to the extent that copyright has been legally assigned by us to another party or is used by GEMTEC under license. To the extent that GEMTEC owns the copyright in this report, it may not be copied without our prior written agreement for any purpose other than the purpose indicated in this report. The methodology (if any) contained in this report is provided to the Client in confidence and must not be disclosed or copied to third parties without the prior written agreement of GEMTEC. Disclosure of that information may constitute an actionable breach of confidence or may otherwise prejudice our commercial interests.
3. **Complete Report:** This report is of a summary nature and is not intended to stand alone without reference to the instructions given to GEMTEC by the Client, communications between GEMTEC and the Client and to any other reports prepared by GEMTEC for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. GEMTEC can not be responsible for use of portions of the report without reference to the entire report.
4. **Basis of Report:** This Report has been prepared for the specific site, development, design objectives and purposes that were described to GEMTEC by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this report expressly addresses the proposed development, design objectives and purposes. Any change of site conditions, purpose or development plans may alter the validity of the report and GEMTEC cannot be responsible for use of this report, or portions thereof, unless GEMTEC is requested to review any changes and, if necessary, revise the report.
5. **Time Dependence:** If the proposed project is not undertaken by the Client within 18 months following the issuance of this report, or within the timeframe understood by GEMTEC to be contemplated by the Client, the guidance and recommendations within the report should not be considered valid unless reviewed and amended or validated by GEMTEC in writing.
6. **Use of This Report:** The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without GEMTEC's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, GEMTEC may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process.

   Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.
7. **No Legal Representations:** GEMTEC makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

8. **Decrease in property value:** GEMTEC shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.
9. **Reliance on Provided Information:** The evaluation and conclusions contained in this report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations. information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of misstatements, omissions, misrepresentations. or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
10. **Investigation Limitations:** Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions but even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions.

    The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. Accordingly, GEMTEC does not warrant or guarantee the exactness of of the subsurface descriptions.

    Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination-or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

    In addition, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.
11. **Sample Disposal:** GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.
12. **Follow-Up and Construction Services:** All details of the design were not known at the time of submission of GEMTEC's report. GEMTEC should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of GEMTEC's report.

    During construction, GEMTEC should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not

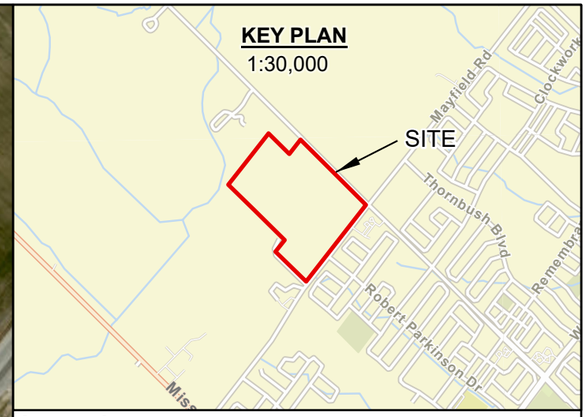
materially differ from those interpreted conditions considered in the preparation of GEMTEC's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in GEMTEC's report. Adequate field review, observation and testing during construction are necessary for GEMTEC to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, GEMTEC's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

13. **Changed Conditions:** Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEMTEC be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that GEMTEC be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.
14. **Drainage:** Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. GEMTEC takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

APPENDIX B

Borehole Location Plan





Legend

TEST # TEST WELL ID
BH # BOREHOLE ID

- MONITORING WELL - GEMTEC (GEOTECHNICAL INVESTIGATION)
- MONITORING WELL - GEMTEC (PHASE TWO ENVIRONMENTAL SITE ASSESSMENT)
- HISTORICAL BOREHOLE LOCATION - PREVIOUS STUDIES
- INFILTRATION TEST LOCATION
- TOP SOIL THICKNESS LOCATION
- SITE BOUNDARY

NOTES:

1. All locations are approximate
2. Coordinate system: NAD 1983 UTM Zone 17N
3. Geographic dataset source: Ontario GeoHub.
4. Contains information licensed under the Open Government Licence – Ontario.
5. Service Layer Credits: World Street Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
World Imagery: Peel Region, Town of Oakville, Maxar, Microsoft

Scale:
1:3,500
0 25 50 100 150 200 250 Meters

Drawing
SITE PLAN

Client:
12100 CREDITVIEW DEVELOPMENTS LIMITED
C/O FIELDGATE COMMERCIAL

Project
HYDROGEOLOGICAL INVESTIGATION
12100 CREDITVIEW ROAD, CALEDON, ONTARIO

Drwn By:	K.C. / S.J.	Chkd By:	J.T.
Project No.	102491.013	Revision No.	0
Date	JUNE 2024	**FIGURE B.1**	

GEMTEC
Consulting Engineers and Scientists
6695 Millcreek DR #7,
Mississauga, ON L5N 5M4
T: (416) 347-7427
www.gemtec.ca
graeme.skinner@gemtec.ca

Folder: N:\Projects\102400\102491.013\06_Civil Drafting\Sheets\1. Drawings\HydroG\102491_013_CreditView_HydroG_R0_2024_05_15\

APPENDIX C

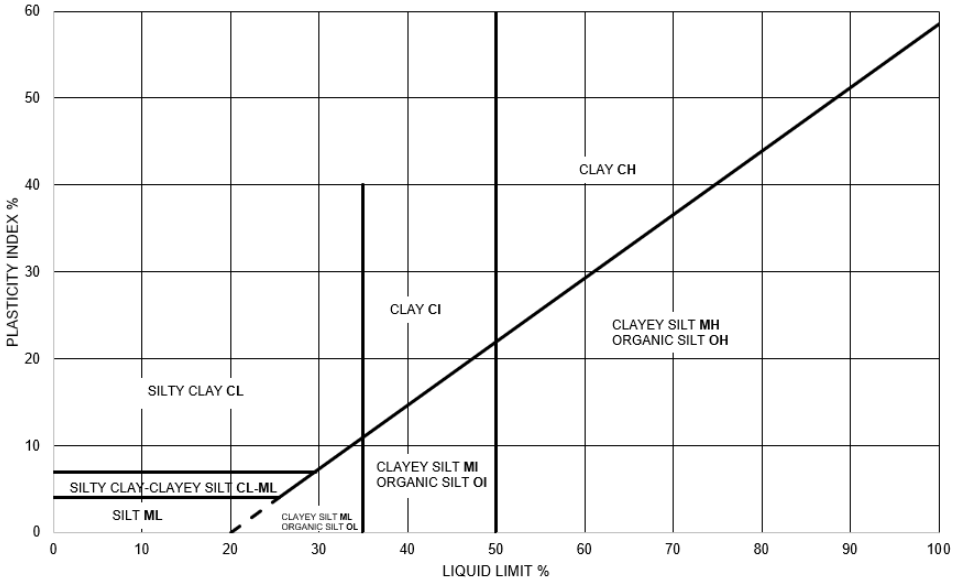
Record of Borehole Sheets

Method of Soil Classification

GEMTEC's Soil Classification is based on the MTC Soil Classification Manual (January 1980)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} X D_{60}}$	USCS Group Symbol	Group Name
Inorganic (Organic Content less than 30%)	Coarse Grained Soils (>50% is larger than 0.075 mm)	Gravel (>50% of coarse fraction is > 4.75 mm)	Gravel with ≤12% fines	Poorly Graded	<4	≤1 or ≥3	GP	Gravel
				Well Graded	≥4	1 to 3	GW	Gravel
			Gravel with >12% fines	Below A Line	N/A		GM	Silty Gravel
				Above A Line	N/A		GC	Clayey Gravel
		Sand (≥50% coarse fraction is > 4.75 mm)	Sand with ≤12% fines	Poorly Graded	<6	≤1 or ≥3	SP	Sand
				Well Graded	≥6	1 to 3	SW	Sand
			Sand with >12% fines	Below A Line	N/A		SM	Silty Sand
				Above A Line	N/A		SC	Clayey Sand

Soil Group	Type of Soil	Liquid Limit	Field Tests			USCS Group Symbol	Group Name
			Dilatancy	Thread Diameter	Toughness		
Fine Grained Soils (≥50% is smaller than 0.075 mm)	Silts (Non-Plastic or PI and LL plot below A-Line)	<50	Rapid	>6 mm	N/A	ML	Silt
			Slow	3 to 6 mm	None to low	ML	Clayey Silt
			Slow to V. Slow	3 to 6 mm	Low	OL	Organic Silt
		≥50	Slow to V. Slow	3 to 6 mm	Low to Medium	MH	Clayey Silt
			None	1 to 3 mm	Medium to High	OH	Organic Silt
	Clays (PI and LL plot above A-Line)	Liquid Limit <35	None	~3 mm	Low to Medium	CL	Silty Clay
		Liquid Limit 35 to 50	None	1 to 3 mm	Medium	CI	Silty Clay
		Liquid Limit >50	None	<1 mm	High	CH	Clay
Highly Organic (> 30%)	Peat (Amorphous or Fibrous)					PT	Peat



Dual Symbol – Is used to indicate when soils are transitional. For coarse grained soils, it is used when the soil has between 5 and 12% fines (e.g., SP-SC, Sand to Silty Sand). For fine-grained soils it is used when the plasticity index and liquid limit values plot in the area shown in the plasticity chart on this page.

Borderline Symbol – Is used to indicate soils that are not clearly in one soil type but have similar behaviour and properties as similar materials (e.g., CL/CI or GM/SM).

ABBREVIATIONS AND TERMINOLOGY USED ON RECORDS OF BOREHOLES AND TEST PITS

SAMPLE TYPES	
AS	Auger sample
CA	Casing sample
CS	Chunk sample
BS	Borros piston sample
GS	Grab sample
MS	Manual sample
RC	Rock core
SS	Split spoon sampler
ST	Slotted tube
TO	Thin-walled open shelby tube
TP	Thin-walled piston shelby tube
WS	Wash sample

SOIL TESTS	
w	Water content
PL, w_p	Plastic limit
LL, w_L	Liquid limit
C	Consolidation (oedometer) test
D_R	Relative density
DS	Direct shear test
G_S	Specific gravity
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	Organic content test
UC	Unconfined compression test
γ	Unit weight

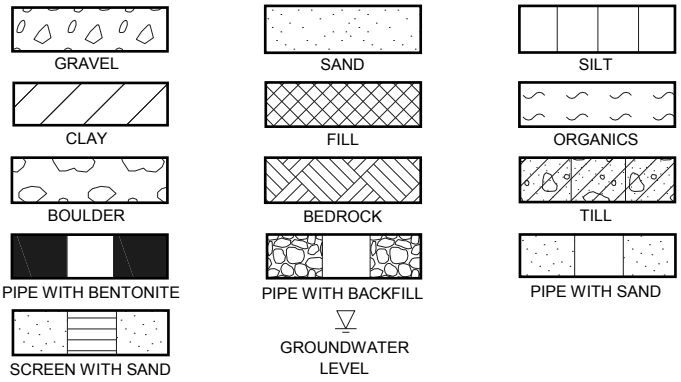
PENETRATION RESISTANCE

Standard Penetration Resistance, N
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 millimetres (30 in.) required to drive a 50 mm split spoon sampler for a distance of 300 mm (12 in.). For split spoon samples where less than 300 mm of penetration was achieved, the number of blows is reported over the sampler penetration in mm.

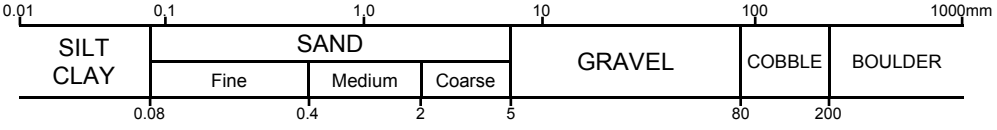
Dynamic Penetration Resistance
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive a 50 mm (2 in.) diameter 60° cone attached to 'A' size drill rods for a distance of 300 mm (12 in.).

WH	Sampler advanced by static weight of hammer and drill rods
WR	Sampler advanced by static weight of drill rods
PH	Sampler advanced by hydraulic pressure from drill rig
PM	Sampler advanced by manual pressure

COHESIONLESS SOIL Compactness		COHESIVE SOIL Consistency	
SPT N-Values	**Description**	**Cu, kPa**	**Description**
0-4	Very Loose	0-12	Very Soft
4-10	Loose	12-25	Soft
10-30	Compact	25-50	Firm
30-50	Dense	50-100	Stiff
>50	Very Dense	100-200	Very Stiff
		>200	Hard

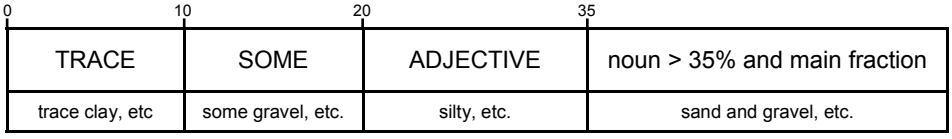


GRAIN SIZE



DESCRIPTIVE TERMINOLOGY

(Based on the CANFEM 4th Edition)



RECORD OF BOREHOLE BH24-1

CLIENT: Fieldgate Group of Companies
Fieldgate Group of Companies
PROJECT: Commercial Development, 12100 Creditview Road, Caledon, Ontario
JOB#: 102491.013
LOCATION: See Borehole Location Plan

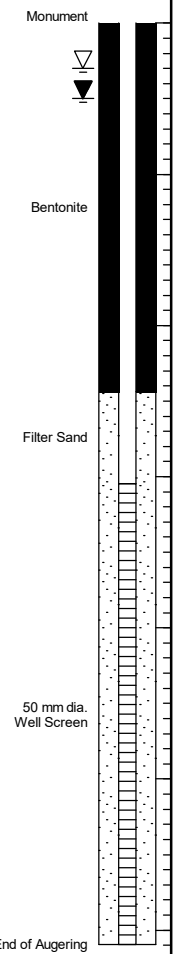
SHEET: 1 OF 1
DATUM: Geodetic
BORING DATE: Apr 24 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Power Auger / Hollow Stem Auger (203 mm)	Ground Surface		263.50				
		TOPSOIL		0.00 / 263.30	1A	SS	432	
		(ML- CL/ CL) CLAYEY SILT to SILTY CLAY, some sand, trace gravel; brown; (TILL); oxidation, cohesive, w<PL, soft to hard		0.20	1B			3
1					2	SS	584	17
2					3	SS	610	20
					4	SS	610	30
3					5	SS	610	23
4					6	SS	432	90 / 0.28
		- Becoming grey at approximately 4.6 m depth			7	SS	203	50 / 0.05
5		- Auger grinding at approximately 4.6 m depth						
6		- Shale fragments at approximately 6.1 m depth		257.20	8	SS	203	50 / 0.05
		End of Borehole		6.30				
7		Notes:						
		1. Borehole open and dry upon completion of drilling.						
8		2. Monitoring well installed as shown upon completion of drilling.						
9								
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/05/06	0.3	263.2
24/05/21	0.5	263.0

GEMTEC
Consulting Engineers and Scientists

LOGGED: GG
CHECKED: JET

GEO - BOREHOLE LOG 102491.013_CREDITVIEWRD_GINT_GEOTECH_R0_2024_05_07 - REVISED.GPJ GEMTEC 2018.GDT 5/23/24

RECORD OF BOREHOLE BH24-2

CLIENT: Fieldgate Group of Companies
Fieldgate Group of Companies
PROJECT: Commercial Development, 12100 Creditview Road, Caledon, Ontario
JOB#: 102491.013
LOCATION: See Borehole Location Plan

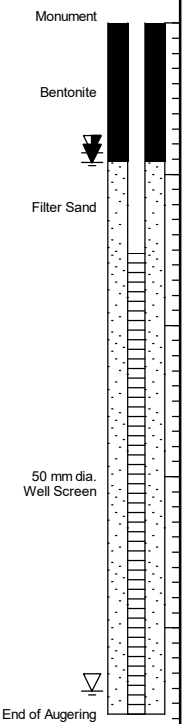
SHEET: 1 OF 1
DATUM: Geodetic
BORING DATE: Apr 22 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		Ground Surface		265.00					
0	Power Auger / Hollow Stem Auger (203 mm)	TOPSOIL		0.00 / 264.71	1A	SS	381		
		(ML - CL/ CL) CLAYEY SILT to SILTY CLAY, trace to some sand, trace gravel; mottled brown (TILL); cohesive, w<PL, soft to stiff, to hard		0.29	1B			3	
1					2	SS	533	14	MH
2					3	SS	610	26	
					4	SS	610	30	MH
3		- Becoming grey at approximately 3.3 m depth			5	SS	610	28	
4					6	SS	610	27	
		- Auger grinding between approximately 4.4 to 4.6 m depths			7	SS	254	50	
5		End of Borehole		260.17 / 4.83					
6		Notes: 1. Groundwater measured at approximately 4.4 m depth in open borehole upon completion of drilling. 2. Monitoring well installed as shown upon completion of drilling.							
7									
8									
9									
10									

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/04/22	4.4	260.6
24/05/06	0.9	264.1
24/05/21	0.9	264.1

GEMTEC
Consulting Engineers and Scientists

LOGGED: GG
CHECKED: JET

GEO - BOREHOLE LOG 102491.013_CREDITVIEWRD_GINT_GEOTECH_R0_2024_05_07 - REVISED.GPJ GEMTEC 2018.GDT 5/23/24

RECORD OF BOREHOLE BH24-3

CLIENT: Fieldgate Group of Companies
Fieldgate Group of Companies
PROJECT: Commercial Development, 12100 Creditview Road, Caledon, Ontario
JOB#: 102491.013
LOCATION: See Borehole Location Plan

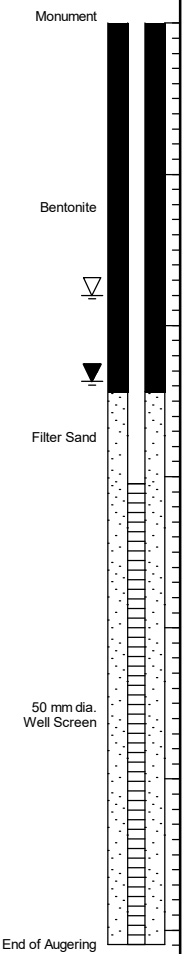
SHEET: 1 OF 1
DATUM: Geodetic
BORING DATE: Apr 24 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		266.00				
0	Power Auger Hollow Stem Auger (203 mm)	TOPSOIL		0.00	1A	SS		
		(ML - CL/ CL) CLAYEY SILT to SILTY CLAY, some sand, trace gravel; brown (TILL); oxidation, cohesive, w<PL to w=PL, firm to very stiff		0.10	1B	SS	406	6
1					2	SS	610	27
2					3	SS	508	27
					4	SS	610	28
3		- Becoming grey at approximately 3.0 m depth			5	SS	610	23
4					6	SS	0	11
5					7	SS		14
6				259.90				
		(ML- CL) CLAYEY SILT, some sand, trace gravel; brown (TILL); oxidation, cohesive, w<PL to w=PL, stiff to very stiff		6.10	8	SS	584	17
		End of Borehole		259.29 6.71				
7		Notes:						
		1. Borehole open and dry upon completion of drilling.						
		2. Monitoring well installed as shown upon completion of drilling.						
8								
9								
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/05/06	1.8	264.2
24/05/21	2.4	263.6

GEMTEC
Consulting Engineers and Scientists

LOGGED: GG
CHECKED: JET

GEO - BOREHOLE LOG 102491.013_CREDITVIEWRD_GINT_GEOTECH_R0_2024_05_07 - REVISED.GPJ GEMTEC 2018.GDT 5/23/24

RECORD OF BOREHOLE BH24-4

CLIENT: Fieldgate Group of Companies
Fieldgate Group of Companies
PROJECT: Commercial Development, 12100 Creditview Road, Caledon, Ontario
JOB#: 102491.013
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: Geodetic
BORING DATE: Apr 25 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		Ground Surface		261.10					
0	Power Auger / Hollow Stem Auger (203 mm)	TOPSOIL		0.00	1	SS	127	10	HEX: 0 IBL: 0
				260.26					
1		(ML - CL/ CL) CLAYEY SILT to SILTY CLAY, some sand, trace gravel; mottled brown-grey to brownish grey (TILL); oxidation, cohesive, w<PL, firm to hard		0.84	2	SS	381	8	HEX: 0 IBL: 0
2					3	SS	584	13	HEX: 0 IBL: 0
					4	SS	610	28	HEX: 0 IBL: 0
3		- Becoming grey at approximately 3.0 m depth			5	SS	610	25	HEX: 0 IBL: 0
4					6	SS	610	14	HEX: 0 IBL: 0
5					7	SS	610	16	HEX: 0 IBL: 0
6					8	SS	406	80 / 0.25	
				254.60					
		End of Borehole		6.50					
7		Notes: 1. Groundwater measured at approximately 5.8 m depth in open borehole upon completion of drilling. 2. Monitoring well installed as shown upon completion of drilling.							
8									
9									
10									

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION

Monument
Bentonite
Filter Sand
50 mm dia. Well Screen
End of Augering

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/04/25	5.8	255.3
24/05/06	-0.3	261.4
24/05/21	-0.2	261.3

GEMTEC
Consulting Engineers and Scientists

LOGGED: GG
CHECKED: JET

GEO - BOREHOLE LOG 102491.013_CREDITVIEWRD_GINT_GEOTECH_R0_2024_05_07 - REVISED.GPJ GEMTEC 2018.GDT 5/23/24

RECORD OF BOREHOLE BH24-5

CLIENT: Fieldgate Group of Companies
Fieldgate Group of Companies
PROJECT: Commercial Development, 12100 Creditview Road, Caledon, Ontario
JOB#: 102491.013
LOCATION: See Borehole Location Plan

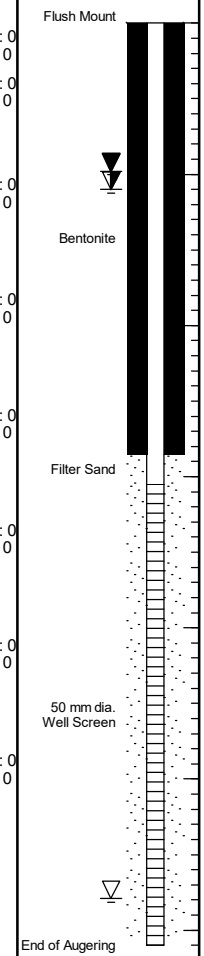
SHEET: 1 OF 1
DATUM: Geodetic
BORING DATE: Apr 23 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		Ground Surface		264.00					
0	Power Auger, Hollow Stem Auger (203 mm)	FILL - (SM) SILTY SAND, some gravel, mixed with topsoil, trace to some clay, asphalt fragments; black to dark brown; non-cohesive, moist, loose		0.00	1A				HEX: 0 IBL: 0
				0.18	1B	SS	457	6	HEX: 0 IBL: 0
1		FILL - (ML) clayey SILT, some sand, trace gravel, trace to some organics, wood fragments; brown to black; cohesive, very soft to stiff			2	SS	25	2	HEX: 0 IBL: 0
2		- Auger grinding between approximately 1.8 to 2.3 m depths			3	SS	559	8	HEX: 0 IBL: 0
				261.71					
		(ML - CL/ CL) CLAYEY SILT to SILTY CLAY, some sand, trace gravel; mottled brown to grey (TILL); cohesive, w<PL to w=PL, stiff to hard		2.29	4	SS	533	14	HEX: 0 IBL: 0
3					5	SS	533	15	HEX: 0 IBL: 0
4		- Becoming grey at approximately 3.8 m depth			6	SS	610	15	HEX: 0 IBL: 0
5					7	SS	457	12	HEX: 0 IBL: 0
6					8	SS	483	38	
				257.29					
		End of Borehole		6.71					
7		Notes: 1. Groundwater measured at approximately 5.8 m depth in open borehole upon completion of drilling. 2. Borehole was backfilled with bentonite and soil cuttings upon completion of drilling.							
8									
9									
10									

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P W W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/04/23	5.8	258.2
24/05/06	1.0	263.0
24/05/21	1.1	262.9

GEMTEC
Consulting Engineers and Scientists

LOGGED: GG
CHECKED: JET

GEO - BOREHOLE LOG 102491.013_CREDITVIEWRD_GINT_GEOTECH_R0_2024_05_07 - REVISED.GPJ GEMTEC 2018.GDT 5/23/24

RECORD OF BOREHOLE BH24-6

CLIENT: Fieldgate Group of Companies
Fieldgate Group of Companies
PROJECT: Commercial Development, 12100 Creditview Road, Caledon, Ontario
JOB#: 102491.013
LOCATION: See Borehole Location Plan

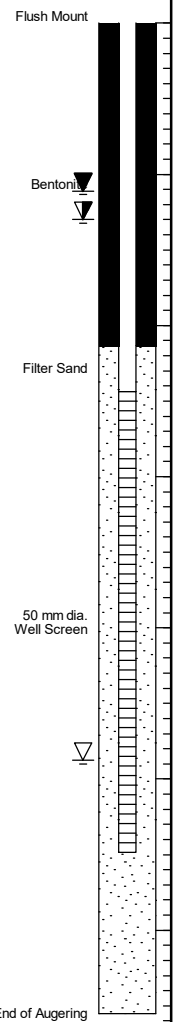
SHEET: 1 OF 1
DATUM: Geodetic
BORING DATE: Apr 23 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		Ground Surface		264.50					
0	Power Auger Hollow Stem Auger (203 mm)	TOPSOIL		0.00					
		(ML - CL/ CL) CLAYEY SILT to SILTY CLAY, some sand and gravel; brown (TILL); cohesive, w<PL, stiff to very stiff		264.20 0.30	1	SS	432	10	HEX: 0 IBL: 0
1					2A				HEX: 0 IBL: 0
					2B	SS	432	9	HEX: 0 IBL: 0
2					3	SS	610	16	HEX: 0 IBL: 0
					4	SS	610	25	HEX: 0 IBL: 0
3					5	SS	610	21	HEX: 0 IBL: 0
4					6	SS	610	11	HEX: 0 IBL: 0
					7	SS	610	10	HEX: 0 IBL: 0
5		(ML) CLAYEY SILT, some sand and gravel; grey (TILL); wet, loose		259.01 5.49					
6					8	SS	610	6	
		End of Borehole		257.95 6.55					
7		Notes: 1. Groundwater measured at approximately 4.9 m depth in open borehole upon completion of drilling. 2. Monitoring well installed as shown upon completion of drilling.							
8									
9									
10									

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/04/23	4.9	259.6
24/05/06	1.1	263.4
24/05/21	1.3	263.2

GEMTEC
Consulting Engineers and Scientists

LOGGED: CC
CHECKED: JET

GEO - BOREHOLE LOG 102491.013_CREDITVIEWRD_GINT_GEOTECH_R0_2024_05_07 - REVISED.GPJ GEMTEC 2018.GDT 5/23/24

RECORD OF BOREHOLE BH24-7

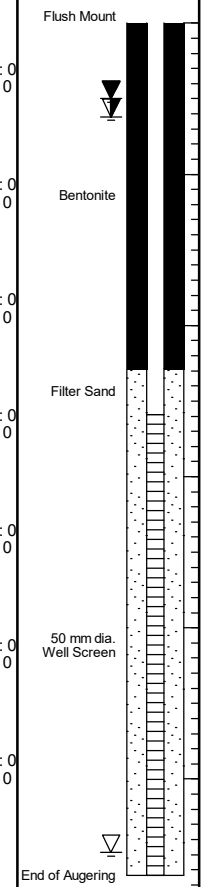
CLIENT: Fieldgate Group of Companies
Fieldgate Group of Companies
PROJECT: Commercial Development, 12100 Creditview Road, Caledon, Ontario
JOB#: 102491.013
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: Geodetic
BORING DATE: Apr 23 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		Ground Surface		264.90					
0	Power Auger / Hollow Stem Auger (203 mm)	FILL - (SM) SILTY SAND, some gravel; brown; non-cohesive, moist, loose		0.00	1	SS	356	6	HEX: 0 IBL: 0
				264.14					
1		(ML - CL/ CL) CLAYEY SILT to SILTY CLAY, some sand, trace to some gravel; brown (TILL); cohesive, w<PL to w=PL, stiff to hard		0.76	2	SS	610	15	HEX: 0 IBL: 0
2					3	SS	584	19	HEX: 0 IBL: 0
					4	SS	610	19	HEX: 0 IBL: 0
3					5	SS	610	24	HEX: 0 IBL: 0
4		- Becoming grey at approximately 3.8 m depth			6	SS		33	HEX: 0 IBL: 0
5					7	SS	610	21	HEX: 0 IBL: 0
6					8	SS	610	16	HEX: 0 IBL: 0
				258.19					
		End of Borehole		6.71					
7		Notes: 1. Groundwater measured at approximately 5.5 m depth in open borehole upon completion of drilling. 2. Monitoring well sunk during the installation process, could not pull out.							
8									
9									
10									

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/04/23	5.5	259.4
24/05/06	0.5	264.4
24/05/21	0.6	264.3

GEMTEC
Consulting Engineers and Scientists

LOGGED: GG
CHECKED: JET

GEO - BOREHOLE LOG 102491.013_CREDITVIEWRD_GINT_GEOTECH_R0_2024_05_07 - REVISED.GPJ GEMTEC 2018.GDT 5/23/24

RECORD OF BOREHOLE BH24-8

CLIENT: Fieldgate Group of Companies
Fieldgate Group of Companies
PROJECT: Commercial Development, 12100 Creditview Road, Caledon, Ontario
JOB#: 102491.013
LOCATION: See Borehole Location Plan

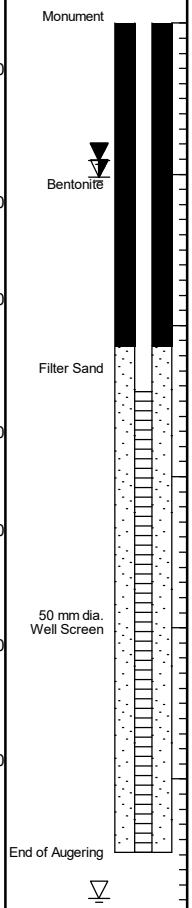
SHEET: 1 OF 1
DATUM: Geodetic
BORING DATE: Apr 24 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		Ground Surface		264.40					
0	Power Auger / Hollow Stem Auger (203 mm)	TOPSOIL		0.00	1	SS	203	3	HEX: 0 IBL: 0
				263.64					
1		FILL - (CL) SILTY CLAY, some sand, trace gravel, trace organics; mottled brown-grey to brown, grey inclusions; cohesive, w<PL, stiff to very stiff		0.76	2	SS	533	21	MH HEX: 0 IBL: 0
2					3	SS	610	21	HEX: 0 IBL: 0
				262.11					
		(ML - CL/ CL) CLAYEY SILT to SILTY CLAY, some sand, trace gravel; brownish grey to grey (TILL); oxidation, cohesive, w<PL, stiff to very stiff to hard		2.29	4	SS	610	29	MH HEX: 0 IBL: 0
3		- Becoming grey at approximately 3.3 m depth			5	SS	610	38	HEX: 0 IBL: 0
4					6	SS	610	15	HEX: 0 IBL: 0
5					7	SS	610	11	HEX: 0 IBL: 0
6					8	SS	610	16	
				257.69					
7		End of Borehole		6.71					
8		Notes: 1. Groundwater measured at approximately 5.8 m depth in open borehole upon completion of drilling. 2. Monitoring well installed as shown upon completion of drilling.							
9									
10									

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/04/24	5.8	258.6
24/05/06	0.9	263.5
24/05/21	1.0	263.4

GEMTEC
Consulting Engineers and Scientists

LOGGED: GG
CHECKED: JET

GEO - BOREHOLE LOG 102491.013_CREDITVIEWRD_GINT_GEOTECH_R0_2024_05_07 - REVISED.GPJ GEMTEC 2018.GDT 5/23/24

RECORD OF BOREHOLE BH24-9

CLIENT: Fieldgate Group of Companies
Fieldgate Group of Companies
PROJECT: Commercial Development, 12100 Creditview Road, Caledon, Ontario
JOB#: 102491.013
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: Geodetic
BORING DATE: Apr 22 2024

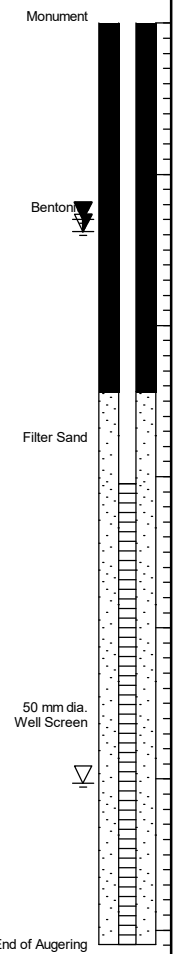
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		262.20				
0	Power Auger	TOPSOIL		0.00	1A			
				261.74	1B	SS	356	6
		(ML - CL/ CL) CLAYEY SILT to SILTY CLAY, some sand, trace gravel; mottled brown to grey to brown (TILL); cohesive, w<PL to w=PL, firm to stiff, reworked till		0.46				
1					2	SS	610	13
2					3	SS	610	22
					4	SS	610	31
3	Hollow Stem Auger (203 mm)				5	SS	610	26
4					6	SS	610	17
5					7	SS	584	22
6				255.88				
		(SM) SILTY SAND, trace to some gravel, trace to some clay (TILL); non-cohesive, wet, compact		6.32	8	SS	381	26
				255.49				
		End of Borehole		6.71				
7								
8								
9								
10								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



Notes:

1. Groundwater measured at approximately 5.0 m depth in open borehole upon completion of drilling.

2. Monitoring well installed as shown upon completion of drilling.

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/04/22	5.0	257.2
24/05/06	1.3	260.9
24/05/21	1.4	260.8

GEMTEC
Consulting Engineers and Scientists

LOGGED: GG
CHECKED: JET

GEO - BOREHOLE LOG 102491.013_CREDITVIEWRD_GINT_GEOTECH_R0_2024_05_07 - REVISED.GPJ GEMTEC 2018.GDT 5/23/24

RECORD OF BOREHOLE BH24-10

CLIENT: Fieldgate Group of Companies
Fieldgate Group of Companies
PROJECT: Commercial Development, 12100 Creditview Road, Caledon, Ontario
JOB#: 102491.013
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: Geodetic
BORING DATE: Apr 22 2024

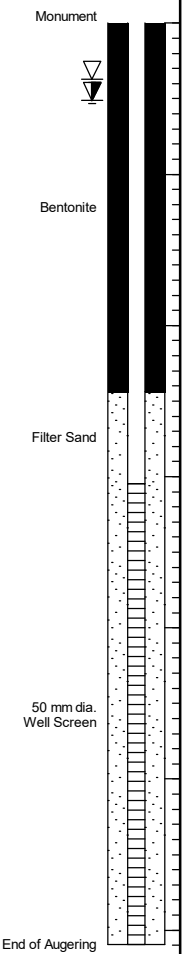
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		264.20				
0	Power Auger Hollow Stem Auger (203 mm)	TOPSOIL		0.00	1A			
		(ML - CL/ CL) CLAYEY SILT to SILTY CLAY, trace to some samd, trace gravel, silty sand inclusions; mottled brown to grey (TILL); cohesive, w<PL, soft to very stiff		0.15	1B	SS	381	8
					2A			
1					2B	SS	533	21
					3	SS	305	21
2					4	SS	610	21
3		- Becoming grey at approximately 3.4 m depth			5	SS	457	20
4					6	SS	610	7
5					7	SS	610	8
6				257.95				
		(ML) CLAYEY SILT, some sand, trace gravel; grey (TILL); w=PL, cohesive, stiff		6.25	8	SS	457	10
		End of Borehole		257.49 6.71				
7		Notes:						
		1. Trace groundwater at bottom of borehole (less than 1 inch).						
8		2. Monitoring well installed as shown upon completion of drilling.						
9								
10								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P W W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
24/05/06	0.4	263.8
24/05/21	0.5	263.7

GEMTEC
Consulting Engineers and Scientists

LOGGED: GG
CHECKED: JET

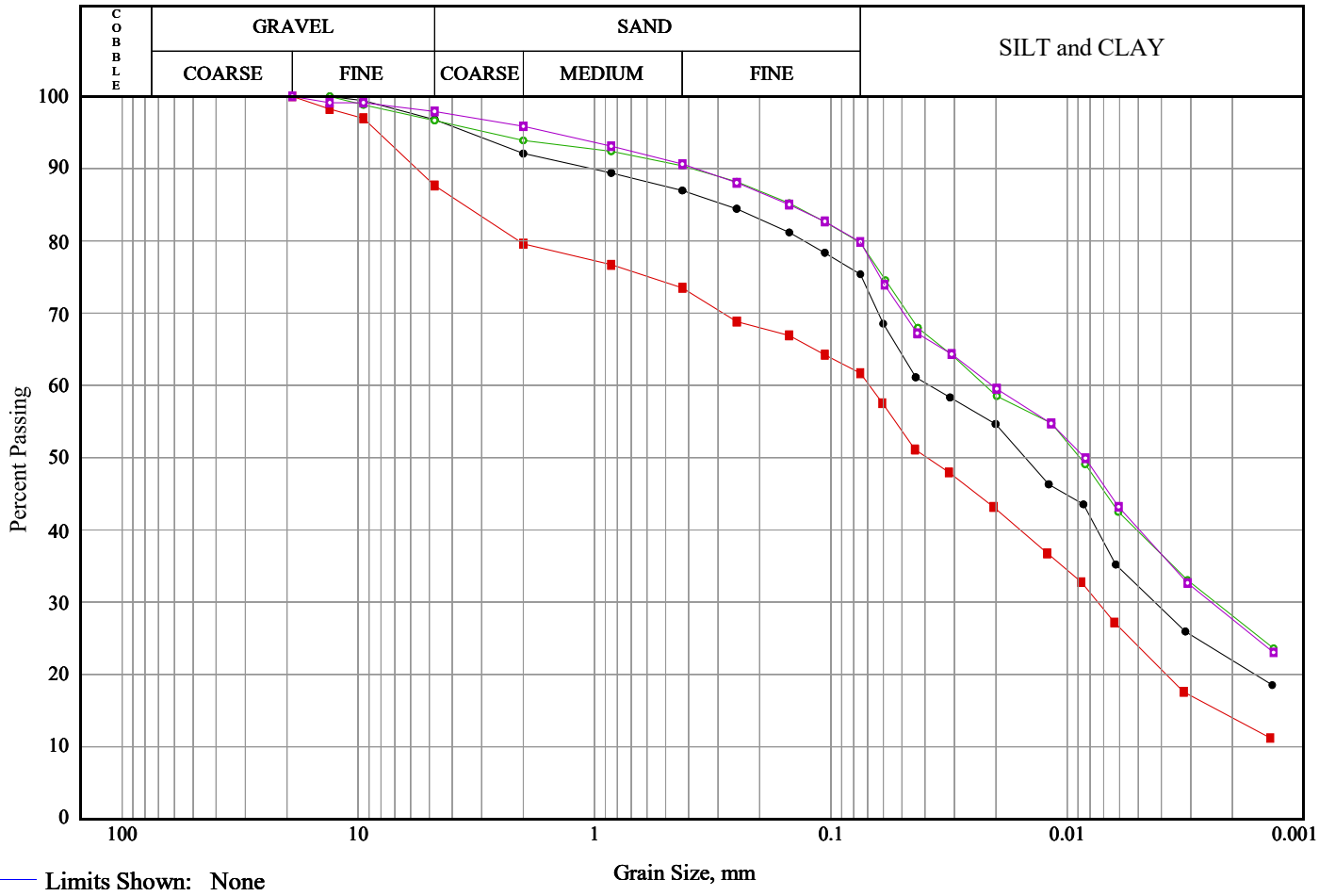
GEO - BOREHOLE LOG 102491.013_CREDITVIEWRD_GINT_GEOTECH_R0_2024_05_07 - REVISED.GPJ GEMTEC 2018.GDT 5/23/24

APPENDIX D

Laboratory Test Results

GEMTEC Consulting Engineers and Scientists	Client: Fieldgate Group of Companies	Soils Grading LS-702/ASTM D-422
	Project: Commercial Development, 12100 Creditview Road, Caledon, Ontario	
	Project #: 102491013	

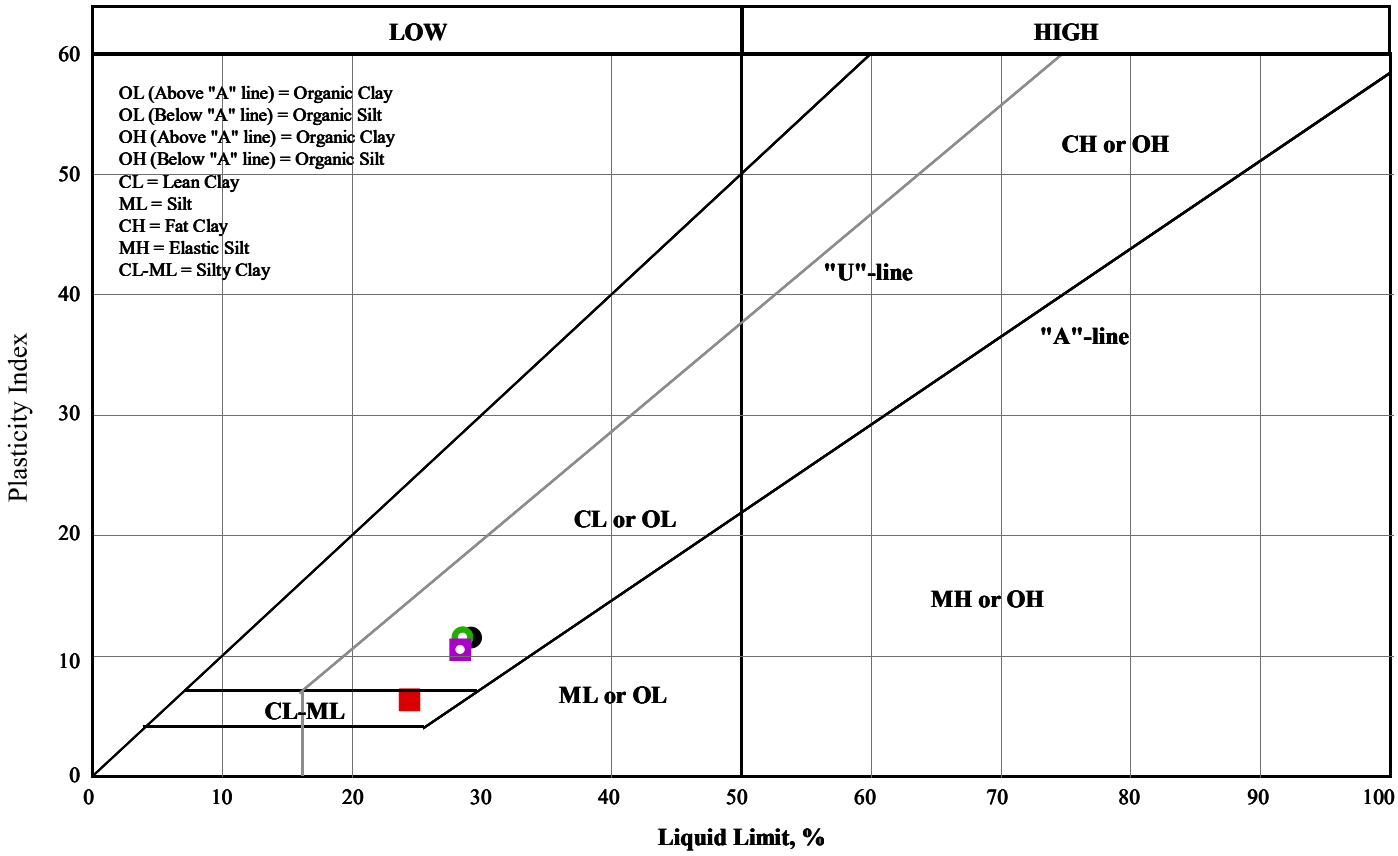
Note: More information available upon request



Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt and Clay
		24-2	SA-2	2.5-4.5	3.2	21.4	75.3
		24-2	SA-4	7.5-9.5	12.4	26.0	61.7
		24-8	SA-2	2.5-4.5	3.3	16.9	79.7
		24-8	SA-4	7.5-9.5	2.1	18.1	79.8

Line Symbol	USCS Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
	Sandy clayey silt , trace gravel	CL	---	---	0.00	0.02	0.04	0.28	53.4
	Sandy silt , some gravel, some clay	CL-ML	---	0.002	0.01	0.04	0.07	3.57	47.7
	Clayey silt , some sand , trace gravel	CL	---	---	0.00	0.01	0.02	0.15	51.6
	Clayey silt , some sand , trace gravel	CL	---	---	0.00	0.01	0.02	0.15	52.2

GEMTEC Consulting Engineers and Scientists Oshawa, ON	Client: Fieldgate Group of Companies	Plasticity Chart (ASTM D4318)
	Project: Commercial Development, 12100 Creditview Road, Caledon, Ontario	
	Project #: 102491013	



Symbol	Borehole /Test Pit	Sample Number	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Non-Plastic	Moisture Content, %
●	24-2	SA-2	2.5-4.5	29.2	17.7	12	N/A	14.3
■	24-2	SA-4	7.5-9.5	24.4	18.0	6	N/A	12.1
○	24-8	SA-2	2.5-4.5	28.5	17.0	12	N/A	14.1
▣	24-8	SA-4	7.5-9.5	28.3	17.8	11	N/A	15.0

CCIL Canadian Council of Independent Laboratories / Conseil canadien des laboratoires indépendants

Note: More information available upon request

APPENDIX E

Terraprobe Geotechnical Report
(File No. 1-22-0516-01, dated April 5, 2022)

Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

PRELIMINARY
GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
12100 CREDITVIEW ROAD
CALEDON, ONTARIO

Prepared for: 12100 Creditview Developments Limited

Attention: Ms. Stephanie Matveeva

File No. 1-21-0516-01
April 5, 2022
©Terraprobe Inc.

Distribution:

1 Copy - 12100 Creditview Developments Limited
1 Copy - Terraprobe Inc., Brampton

TABLE OF CONTENTS

1. INTRODUCTION 1

2. SITE AND PROJECT DESCRIPTION 1

3. FIELD PROCEDURE 2

4. SUBSURFACE CONDITIONS 3
4.1 Topsoil 3
4.2 Earth Fill/Weathered/Disturbed Soil Zone 4
4.3 Native Soil 4
4.4 Geotechnical Laboratory Test Results 5
4.5 Ground Water 6

5. DISCUSSION AND RECOMMENDATIONS 8
5.1 Foundations 8
5.1.1 Spread Foundations on Native Soils 8
5.1.2 Foundations on Engineered Fill 9
5.1.3 Placement of Footings 10
5.2 Floor Slab 11
5.3 Earth Pressure Design Parameters 12
5.4 Excavation and Ground Water Control 14
5.5 Backfill 16
5.6 Pipe Bedding 16
5.7 Pavement Design 17
5.8 Earthquake Design Parameters 20

6. LIMITATIONS AND USE OF REPORT 21

APPENDIX
Abbreviations and Terminology
Engineered Fill Earthworks Specifications
Borehole Logs
Sieve and Hydrometer Analysis Test Report
Figure 1 - Site Location Plan
Figure 2 - Borehole Location Plan
Figure 2A- Preliminary Site Plan
Typical Foundation Wall Details for Structures on Engineered Fill
Pavement Drainage Alternatives

1. INTRODUCTION

Terraprobe Inc. was retained by 12100 Creditview Developments Limited to conduct a preliminary geotechnical investigation for a south potion of the property located at 12100 Creditview Road, in the Town of Caledon, Ontario. The property currently consists of agricultural farmland and a rural residential dwelling and two accessory structures. The surrounding area is predominantly agricultural and residential in land use. The property is currently in agricultural land use per Ontario Regulation 153/04 (O. Reg. 153/04).

The proposed development details are currently conceptual. Based on the current development concept, it is understood that the property would be developed as commercial development (commercial structures of varying size and configurations). The proposed commercial development will be slab-on grade structures and will be serviced with municipal piped water and sanitary sewer system.

This current report encompasses a geotechnical investigation conducted for the subject site to assess its geotechnical suitability for the intended redevelopment. The field investigation consisted of advancing a total of twelve (12) exploratory boreholes within the study area to determine the prevailing subsurface soil and ground water conditions to provide geotechnical advice and engineering recommendations for the design building foundations, floor slab, earth pressure and earthquake design parameters, pipe bedding and pavement design. In addition, geotechnical comments are also included on pertinent construction aspects including trench excavation, backfilling, ground water control and installation of underground utilities.

Consideration should be given to advance additional location specific boreholes during the detailed design stage to obtain better subsurface information and coverage especially for the buildings area for foundation design.

Terraprobe has also conducted a Phase One and Phase Two Environmental Site Assessments and Hydrogelogical Study for the subject property. The findings of these investigations are reported under separate covers.

2. SITE AND PROJECT DESCRIPTION

The property is located at northwest corner of Mayfield Road and Creditview Road in the Town of Caledon, Ontario. The municipal address of the property is 12100 Creditview Road, Caledon. For site discussion purposes, Mayfield Road is oriented in an East-West direction and Creditview Road in a North-South direction. The general location of the site is presented on Figure 1.

The property is in an area of a mixed land use. The site topography is generally flat to gently rolling. The property currently consists of agricultural farmland and a rural residential dwelling and two accessory structures.

Based on the current available information (Preliminary Landscape Concept Plan, prepared by MBTW, dated March 8, 2022, Figure 2A) provided by the client, we understand that the proposed development would include construction of commercial structures of varying size and configurations. The proposed development will be serviced with municipal piped water and sanitary sewer system.

3. FIELD PROCEDURE

The field investigation was conducted on February 1 to 3, 2022 and consisted of drilling and sampling a total of twelve (12) exploratory boreholes extending to a depth of about 6.6 m below ground surface. The boreholes were staked by Terraprobe based on existing site features. Various public utility agencies, including a private locate company, were contacted to clear borehole locations of underground utility lines prior to drilling. The approximate locations of the boreholes are shown on the enclosed Borehole Location Plan (Figure 2).

The boreholes ground surface elevations were estimated from the survey plan provided by the client and are noted to be Geodetic Datum. We note that the 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 a track-mounted drill rig power auger. The borings were advanced using continuous flight solid stem augers and were sampled at 0.75 m interval (generally up to 3.0 m depth below grade) and 1.5 m interval (below 3.0 m depth) with a conventional 50 mm diameter split barrel samplers when the Standard Penetration Test (SPT) was carried out (ASTM D1586). The field work (drilling, sampling, and testing) was observed and recorded by a member of our field engineering staff, who logged the boring and examined the soil samples as they were obtained.

All borehole soil samples obtained during the field investigation were sealed into plastic jars and transported to our laboratory for detailed inspection and testing. The borehole soil samples were examined (tactile) in detail by a Terraprobe engineer and classified according to visual and index properties. Laboratory testing consisted of water content determination on all soil samples; and a Sieve and Hydrometer analysis on five (5) selected native soil samples (Borehole 4, Sample 3; Borehole 6, Sample 5; Borehole 12, Sample 3; Borehole 14, Sample 4 and Borehole 15, Sample 7) and Atterberg Limit Test on two (2) selected native soil samples (Borehole 4, Sample 3 and Borehole 14, Sample 4). The results of the laboratory testing are plotted on the enclosed Borehole Logs at respective sampling depths. The results of Sieve and Hydrometer analyses and Atterberg Limit Test are also summarized in Section 4.4 of this report and 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 (Borehole 2, 4, 6, 7 and 14) to facilitate ground water level monitoring. The results of ground water level monitoring are 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 in the boreholes advanced at the site. Refer to enclosed Borehole Logs for stratigraphic 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 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 found to be generally consistent. The boreholes encountered a topsoil layer at the ground surface underlain by a zone of earth fill materials/weathered/disturbed soil. The zone of fill material/weathered/disturbed was in-turn underlain by undisturbed native soil deposit which extended to the full depth of investigation (up to about 6.6 m below grade).

4.1 Topsoil

A surficial topsoil layer was encountered in all boreholes, varying in thickness from about 100 mm (Borehole 2) to 350 mm (Borehole 11). The topsoil was dark brown to black in colour and predominantly consisted of a silt matrix.

The topsoil thicknesses were estimated from the borings and are approximate and may vary between and beyond the boreholes. The topsoil thickness noted on the Borehole Logs refers to the distinct topsoil layer present at the borehole location, however, organic inclusions extended deeper than the topsoil thickness layer noted on the Borehole Logs. The topsoil thickness to be removed/stripped for the site development may differ from the topsoil thickness noted on the Borehole Logs. Therefore, this information is not sufficient for estimating topsoil quantities and/or associated costs. Consideration should be given to conduct a shallow test pit investigation to obtain a more precise topsoil thickness.

4.2 Earth Fill/Weathered/Disturbed Soil Zone

A zone of earth fill/weathered/ disturbed soil was encountered in all boreholes beneath the topsoil layer and extended to depths varying from about 0.8 m (Boreholes 2, 10 to 13 and 15) 1.5 m (Borehole 4) below existing grade. The earth fill material generally consisted of clayey silt with trace to some sand and trace amounts of gravel, as well as sporadic organic presence and brick pieces. The composition of weathered/ disturbed soils was generally similar to that of the underlying undisturbed native soil and included a trace amount of organics.

The Standard Penetration Test results (N-value) obtained from the earth fill/ weathered/disturbed soil samples varied from 5 to 36 blows per 300 mm of penetration, indicating a firm to stiff consistency.

Measured moisture contents of the earth fill/weathered/disturbed soil samples ranged from about 12 to 28 percent by weight, indicating a moist condition.

4.3 Native Soils

Undisturbed native soil deposit was encountered in all boreholes beneath the zone of earth fill material/weathered disturbed soil and extended to the full depth of investigation (up to 6.6 m below existing grade).

Undisturbed native cohesive glacial till clayey silt with some sand to sandy and trace amounts of gravel was encountered in all boreholes at depths varying from about 0.8 m (Boreholes 1, 10, 11, 12, 13 and 15) to about 1.5 m (Borehole 4) and extended to depths varying from about 3.0 m (Borehole 6) to 6.6 m (Boreholes 3, 4, 5, 10, 11, 12 and 14, full depth of investigation) below existing grade.

The Standard Penetration Test results (N-Value) obtained from the cohesive till soils varied from 9 to 48 blows per 300 mm of penetration, indicating a stiff to hard consistency. Measured moisture content of the cohesive till soil samples ranged from 7 to 18 percent by weight, indicating a moist to wet (locally) condition.

Undisturbed native cohesionless glacial till sandy silt/silt and sand to silty sand with trace to some clay and gravel was encountered in Boreholes 6 and 15 at depths varying from about 3.0 m (Borehole 6) to about 6.1 m (Borehole 15) and extended to depths varying from about 6.1 m (Borehole 6) to 6.6 m (Borehole 15, full depth of investigation) below existing grade.

The Standard Penetration Test results (N-Value) obtained from the cohesionless till soils varied from 24 to 29 blows per 300 mm of penetration, indicating a compact relative density. Measured moisture content of the cohesionless till soil samples ranged from 9 to 15 percent by weight, indicating a moist to wet condition.

Sand and gravel with trace amounts of silt and clay encountered in Boreholes 3, 6 and 7 at about 6.1 m depth and extended to the full depth of investigation (up to about 6.6 m depth below grade).

Silt with trace amounts of sand and clay encountered in Borehole 13 at about 6.1 m depth and extended to the full depth of investigation (up to about 6.6 m depth below grade).

The Standard Penetration Test results (N-Value) obtained from the cohesionless soils varied from 10 to 85 blows per 300 mm of penetration, indicating a compact to very dense relative density. Measured moisture content of the cohesionless soil samples ranged from 8 to 21 percent by weight, indicating a wet condition.

It must be noted that undisturbed native soil deposit may contain larger size 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 of the particles of this size.

4.4 Geotechnical Laboratory Test Results

The geotechnical laboratory testing consisted of water content determination on all samples, and a Sieve and Hydrometer analysis on selected native soil samples. The results of the laboratory testing are plotted on the enclosed Borehole Logs at respective sampling depths. A summary of the Sieve and Hydrometer (grain size) analysis results is presented as follows:

Borehole No. Sample No.	Sampling Depth below Grade	Percentage				Description (MIT System)
		Gravel	Sand	Silt	Clay	
Borehole 4 Sample 3	1.8 m	2	19	53	26	CLAYEY SILT, some sand, trace clay
Borehole 6 Sample 5	3.3 m	7	23	58	12	SANDY SILT, some clay, trace gravel
Borehole 14 Sample 4	2.7 m	3	27	55	15	SANDY SILT, some clay, trace gravel
Borehole 15 Sample 7	6.3	11	37	39	13	SILT AND SAND, some clay, some gravel

Atterberg Limits Tests were also carried out on selected native soil samples. The results were plotted on A-Line Graph (refer to Figure, Atterberg Limits Chart). The results of Atterberg Limits Tests are summarized below:

Borehole No. Sample No.	Sampling Depth below Grade (m)	Liquid Limit (WL)	Plastic Limit (WP)	Plasticity Index (IP)	Natural Water Content (WN)	Plasticity/ Compressibility
Borehole 4 Sample 3	1.8	33	18	15	18	slightly plastic
Borehole 14 Sample 4	2.7	22	14	7	13	slight or low compressibility

4.5 Ground Water

Observations pertaining to the depth of water level and caving were made in the boreholes upon 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 (Borehole 2, 4, 6, 7 and 14) to facilitate ground water level monitoring. Ground water level measurements in the monitoring wells were taken on February 21 and March 9, 2022 and are noted on the enclosed Borehole Logs.

A summary of the ground water level observations is provided as follows:

Borehole No.	Depth of Boring	Depth to Cave	Water Level Depth at the Time of Drilling	Water Level Depth in Monitoring Wells	
				February 21,2022	March 9,2022
2	6.6 m BG	open	dry	1.7 m BG	1.7 m BG
3	6.6 m BG	open	2.4 m BG	NMW	NMW
4	6 .6 m BG	open	4.9 m BG	damaged	damaged
5	6.6 m BG	open	dry	NMW	NMW
6	6.6 m BG	5.8 m BG	0.5 m BG	on the surface	1.5 m BG
7	6. 6 m BG	open	5.2 m BG	3.2 m BG	3.4 m BG

Borehole No.	Depth of Boring	Depth to Cave	Water Level Depth at the Time of Drilling	Water Level Depth in Monitoring Wells	
				February 21,2022	March 9,2022
10	6.6 m BG	open	dry	NMW	NMW
11	6.6 m BG	open	5.8 m BG	NMW	NMW
12	6.6 m BG	open	dry	NMW	NMW
13	6.6 m BG	open	dry	NMW	NMW
14	6.6 m BG	open	dry	0.9 m BG	0.9 m BG
15	5.0 m BG	open	3.7 m BG	1.7 m BG	1.7 m BG

BG = Below Grade
NMW = No Monitoring well Installed

It should be noted that the ground water levels may fluctuate seasonally depending on the amount of precipitation and surface runoff.

5. DISCUSSION AND RECOMMENDATIONS

The following discussion and recommendations are based on the factual data obtained from this investigation 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 on the basis of 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 geotechnical engineering 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 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

The design details were not available at the time of preparation of this report. However, based on the current available Preliminary Concept Plan, it is understood that the south portion of the property will likely be developed for commercial (non-residential) purposes.

As noted before, a total of twelve (12) boreholes (Boreholes 2 to 7 and 10 to 15) were advanced within the proposed commercial development area. The boreholes encountered a surficial layer of topsoil underlain by a layer of earth fill/weathered/disturbed soils. The earth fill/weathered/disturbed soils extended to depths varying from about 0.8 to 1.5 m below existing grade. The earth fill/weathered/disturbed soils were underlain by undisturbed native soil deposit extending to the full depth of investigation (about 6.6 m below grade).

The existing topsoil and earth fill/weathered/ disturbed soils are not suitable to support the proposed building foundations. All foundations must be supported on the undisturbed competent native soils or on engineered fill (refer to Subsection 5.1.2).

5.1.1 Spread Foundations on Native Soils

The development details (including site grading plan and foundation elevations) are not available at the time of preparation of this report. However, based on the preliminary information, it is understood that the proposed commercial buildings will be slab–on-grade structures. The undisturbed native soils

encountered (underlying the earth fill/weathered/disturbed soil zone) are considered suitable to support the proposed building foundations.

A preliminary nominal net geotechnical reaction of 150 kPa (Serviceability Limit States, S.L.S.) and 225 kPa factored geotechnical resistance at Ultimate Limit States, U.L.S. may be utilized for the design of conventional spread footing foundations supported on the undisturbed competent native soil. Higher geotechnical resistances are available and can be analyzed in detail if required.

The underside of footing elevations must be designed to provide a minimum of 1.2 m of soil cover or equivalent insulation to the foundation subgrade for frost protection considerations in unheated areas. All footings must be designed to bear at least 0.3 m into the undisturbed native soil stratum.

The minimum width of continuous strip footing should be 500 mm, while the minimum size of isolated footings should be 900 mm x 900 mm, in conjunction with the above bearing pressure. The maximum total settlement is estimated to be in the order of 25 mm. The differential settlement is a function of spacing, loading and foundation size.

The final grading plan and design drawings should be reviewed by Terraprobe to better assess the design foundation elevations and to provide updated foundation bearing pressure (geotechnical resistance) recommendations prior to the development.

5.1.2 Foundations on Engineered Fill

The final design grading information was not available at the time of preparation of this report, however, based on the existing site conditions and current available information, it is understood that both cut and fill may be required for the design site grading. It is recommended that any new fill required at the site for grading should be constructed as engineered fill which will facilitate new foundations to be supported at normal depths. The engineered fill refers to earth fill designed and constructed under full-time inspection and testing supervision of a geotechnical engineer to support foundations without excessive settlement.

Prior to the placement of the engineered fill, it is recommended that the existing topsoil and earth fill materials be stripped from beneath and beyond the proposed house/structure footprints (minimum of 2 m beyond), and that the subgrade be proof-rolled. Any soft or wet areas which deflect excessively during proof roll, should be sub-excavated and replaced with suitably compacted clean earth fill placed in lifts of a thickness of 150 mm or less. It should be noted that localized subgrade stabilization measures may be required, based on the proof-roll assessment. The selection and sorting of the existing earth fill soils present on the site should be conducted under the supervision of a geotechnical engineer. These materials may be utilized as engineered fill, provided these soils are not too wet to achieve specified compaction, and

do not contain excessive organic inclusion. The moisture content of the engineered fill material must be within 2 percent of its optimum moisture content.

The engineered fill should consist of clean earth fill or imported granular materials (OPSS.MUNI 1010), and should be placed in lifts of 150 mm thicknesses or less, and compacted to a minimum of 98 percent Standard Proctor Maximum Dry Density (SPMDD). The engineered fill should extend for a distance of at least 2 m beyond the house/building footprint as measured at the founding level, and should extend downwards from this point at a 1 to 1 (horizontal to vertical) slope, to the approved subgrade. In addition, the engineered fill should extend at least 0.6 m above the proposed foundation elevation. This is to ensure that the foundations are placed on the engineered fill both in plan and elevation. The engineered fill must be provided with a minimum of 1.2 m of earth cover or equivalent insulation to provide adequate frost protection.

The placement and inspection of the engineered fill must be conducted under the full time supervision of a qualified geotechnical engineer. Provided the engineered fill is placed and compacted as indicated above, a maximum net allowable geotechnical reaction of up to 150 kPa (Serviceability Limit States, S.L.S.) and 225 kPa (factored geotechnical resistance at Ultimate Limit States, U.L.S.) may be utilized for the design of conventional spread footing foundations supported on engineered fill. Site grading plans should be reviewed by Terraprobe to better assess the suitability and requirements for engineered fill.

In case of footings supported on engineered fill, the minimum width for the conventional spread strip footing must be 600 mm, and the minimum size of the individual column footing must be 1000 mm x 1000 mm, regardless of loading considerations.

It should be noted that for structures placed on engineered fill, nominal (non-structural) reinforcing steel is recommended in the foundation walls. The reinforcing steel should consist of two (2) continuous 15 M bars at the top of the foundation wall and two (2) continuous 15 M bars at the bottom (refer to "Typical Foundation Wall Details for Houses on Engineered Fill"). A copy of the "*Draft Engineered Fill Earthworks Specifications*" is enclosed in the appendix section of this report for reference.

5.1.3 Placement of Footings

It is recommended that all excavated footing bases 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 soil cover of 1.2 m or equivalent insulation for frost protection. All footings must be designed and constructed to bear at least 0.3 m into the undisturbed native soil.

Prior to pouring concrete for the footings, the footing 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 footing bases 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 and water. Hence, foundation base which remains open for an extended period should be protected by a skim coat of lean concrete.

5.2 Floor Slab

Conventional lightly loaded concrete floor slab should be placed on at least 150 mm of granular base (OPSS.MUNI 1010 Granular "A" or 19 mm clear crushed stone, OPSS.MUNI 1004) compacted to a minimum of 98 percent Standard Proctor Maximum Dry Density (SPMDD), or vibrated to a dense state in case of a clear stone type material. The existing earth fill materials may remain to support the slab-on-grade provided they are assessed and approved by a geotechnical engineer at the time of construction. Any subgrade area containing excessive amount of deleterious/organic materials must be subexcavated. The subgrade must be assessed by a geotechnical engineer prior to the placement of granular base. Any soft or wet subgrade areas identified, should be locally subexcavated and backfilled with clean earth fill compacted to a minimum of 98 percent SPMDD. Based on the borehole information, selection and sorting of the earth fill materials will be required.

The following subgrade parameters are recommended for the design of slab-on-grade supported on the undisturbed native till soil subgrade:

Ks =40,000 kPa/m (Modulus of Subgrade Reaction)
f = 32° (Angle of Internal Friction)

However, due to the presence of fill materials, the slab subgrade would likely comprise engineered fill materials constructed under the supervision of a geotechnical engineer. The modulus of Subgrade Reaction (Ks) of 18,000 kPa/m and an Angle of Internal Friction (f) of 30° may be used for the engineered fill subgrade.

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, other than the nominal drain for the granular base.

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 Earth Pressure Design Parameters

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

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

where:

- P = the horizontal pressure at depth h (m)
- K = the earth pressure coefficient,
- h_w = the depth below the ground water level (m)
- γ = the bulk unit weight of soil (kN/m^3)
- γ' = the submerged unit weight of soil ($\gamma_{sat} - \gamma_w$)
- γ_w = the bulk unit weight of water (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:

$$P = K[\gamma h + q]$$

This equation assumes that free-draining granular backfill is used and positive drainage is provided 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 ® depends on the normal load on the soil contact (N) and the frictional resistance of the soil ($\tan \varphi$) expressed as $R = N \tan \varphi$. 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 at this site are tabulated as follows:

Parameter	Definition	Units
φ	angle of internal friction	degrees
γ	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

Stratum/Parameter	φ	γ	K_a	K_o	K_p
Earth Fill	30	19	0.33	0.50	3.00
Sand and Gravel	36	21	0.26	0.41	3.85
Clayey Silt Till	30	21	0.33	0.5	3.00
Sandy Silt/Silt and Sand Till	34	21.5	0.28	0.44	3.54
Compact Granular Fill	32	21.5	0.31	0.47	3.25

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

5.4 Excavations and Ground Water Control

The borehole data indicate that the topsoil, earth fill/weathered/disturbed and undisturbed native soils would be encountered in the excavations. The 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 soils to 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

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

TYPE 3 SOIL

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

TYPE 4 SOIL

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

The fill/weathered/disturbed soils encountered in the boreholes are classified as Type 3 Soil above and Type 4 Soil below the prevailing ground water level. The undisturbed native soil deposit would be classified as Type 2 Soil under these regulations.

Where workmen 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 the steepest safe 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.

As noted before, the earth fill materials and undisturbed native soils may contain larger particles 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.

All boreholes remained open (except Borehole 6, caved at 5.8 m below grade) and dry (except Boreholes 3, 4, 6, 7, 11 and 15, water level varied from about 0.5 to 5.8 m depth below grade). The ground water level measurements in the monitoring wells varied from about 0.0 m (Borehole 6) to 3.4 m (Borehole 7) below grade on February 21 and March 9, 2022. The ground water levels may fluctuate seasonally depending upon the precipitation and surface runoff.

The glacial till deposit encountered within the subsurface stratigraphy is expected to have a relatively low permeability and should preclude significant ground water seepage into the excavation in the short-term. However, the till deposit and weathered/disturbed materials may include perched ground water generally present within the sand/silt seams and lenses which are typically found in the glacial till soils due to their mode of deposition. This perched ground water seepage should diminish slowly and can be controlled by continuous pumping from a conventional sump and pump arrangement installed at the lowest base of the excavation.

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 enter the excavation.

5.5 Backfill

The existing topsoil and earth fill materials containing excessive amounts of organics should not be reused as backfill in settlement sensitive areas (beneath the floor slabs, trench backfill and pavement areas). However, these materials may be stockpiled and reused for landscaping purposes. The earth fill materials with only trace amounts of organic inclusion may be utilized as backfill. The selection and sorting of earth fill materials should be conducted under the supervision of a geotechnical engineer.

The approved earth fill materials and native soils are considered suitable for backfill provided these soils are within 3 percent of the optimum moisture content. 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. The native soils excavated from below the prevailing water level are expected to be too wet to compact effectively. Alternatively, materials of higher moisture content could be wasted and replaced with imported material which can be readily compacted.

In settlement sensitive areas (beneath the floor slabs, trench backfill and pavement areas), the backfill should consist of approved clean earth and should be placed in lifts of 150 mm thicknesses or less, and heavily compacted to a minimum of 95 percent SPMDD at a water content close to optimum. The soils encountered on the site will be best compacted with a heavy sheepsfoot type roller.

It should be noted that the site soils are generally 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 earthworks will be difficult during the wet periods (i.e., spring and fall) of the year and may result in increased earthwork costs.

5.6 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 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 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 City/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.

A clear stone type bedding may be considered if approved by the City/Region, however, on a silt/sand subgrade it must be utilized only in conjunction with a suitable geotextile filter (Terrafix 270R or equivalent). Without proper filtering, there may be entry of fines from the subgrade soils into the bedding. This loss of ground could result in loss of support to the pipes and possible future settlements.

5.7 Pavement Design

The proposed development would include construction of asphalt paved parking areas and driveways/access routes.

As noted before, a total of twelve (12) boreholes were advanced within the study area. The boreholes encountered a surficial layer of topsoil underlain by a layer of earth fill/weathered/disturbed soils. The earth fill/weathered/disturbed soils extended to depths varying from about 0.8 m to 1.5 m below existing grade. The earth fill/weathered/disturbed soils were underlain by undisturbed native soil deposit extending to the full depth of investigation (about 6.6 m below grade).

Although the final design grades were not available at the time of preparation of this report, however, based on the existing site conditions and currently available information, it is understood that both cut and fill may be required for site grading, therefore, the pavement subgrade may consist of undisturbed native soil and compacted earth fill. The pavement subgrade should be proof-rolled with a heavy rubber tire vehicle (such as a grader); and any loose, soft, wet or unstable areas should be sub-excavated, and backfilled with clean earth fill material placed in 150 mm thick lifts and compacted to a minimum of 98 percent SPMDD. Local subexcavation/subgrade stabilization may be required in some areas due to incompetent subgrade conditions (loose/soft, wet and/or excessive topsoil/organic presence) as identified during 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, and their in-situ moisture content is within 3 percent of the optimum moisture content. Local sub-excavation may be required in the areas with excessive organic inclusion or incompetent subgrade conditions, as identified by the proofroll. These areas should be locally subexcavated and backfilled with approved materials compacted to a minimum of 98 percent SPMDD. The upper 1.2 m thick zone of the pavement subgrade backfill should be compacted to a minimum of 98 percent SPMDD.

The industry pavement design methods are based on a design life of 15 to 20 years for typical weather conditions and for the design traffic loadings. The following pavement thickness design is provided on the above noted consideration and subgrade basis.

Performance Asphaltic Concrete Pavement Structure

Pavement Layer	Compaction Requirements	Car Parking (Light Duty) Minimum Component Thickness	Driveway/Fire Route (Heavy Duty) Minimum Component Thickness
Surface Course Asphaltic Concrete: HL3 (OPSS 1150)	as per OPSS 310	40 mm	40 mm
Base Course Asphaltic Concrete: HL8 (OPSS 1150)	as per OPSS 310	50 mm	80 mm
Base Course: Granular 'A' (OPSS.MUNI1010 and Pertinent Town Specifications)	100% SPMDD ASTM D698	150 mm	150 mm
Subbase Course: Granular 'B' Type I (OPSS.MUNI1010 and Pertinent Town Specifications)	100% SPMDD ASTM D698	300 mm	450 mm

A minimal pavement design is also provided, which will provide an estimated service period of about 8 to 10 years. The cost of the minimal pavement design should be compared to the performance design which could be expected to last about twice as long before significant maintenance and rehabilitation.

Minimal Asphaltic Concrete Pavement Structure

Pavement Layer	Compaction Requirements	Car Parking (Light Duty) Minimum Component Thickness	Driveway/Fire Route (Heavy Duty) Minimum Component Thickness
Surface Course Asphaltic Concrete: HL3 (OPSS 1150)	as per OPSS 310	70 mm*	40 mm
Base Course Asphaltic Concrete: HL8 (OPSS 1150)	as per OPSS 310	N/A	60 mm
Base Course: Granular 'A' (OPSS.MUNI1010 and Pertinent Town Specifications)	100% SPMDD ASTM D698	150 mm	150 mm
Subbase Course: Granular 'B' Type I (OPSS.MUNI1010 and Pertinent Town Specifications)	100% SPMDD ASTM D698	200 mm	350 mm

* a 40 mm thick HL3 and 50 mm HL8 asphalt courses may be used if a staged construction is considered for the pavement areas.

Hot mix asphalt mixes should be designed, produced and compacted as per OPSS 1150 and OPSS 310 requirements and pertinent Town's requirements. The granular materials should meet the requirement of OPSS.MUNI 1010 and pertinent Town's specifications. The granular materials should be placed in lifts 150 mm thick or less and compacted to a minimum of 100 percent SPMDD. Asphalt cement PG 58-28, conforming to OPSS.MUNI 1101 requirements, should be used in both HMA surface and binder courses. Consideration should be given to use higher grade of asphalt cement (PGAC 64-28) for asphaltic concrete where applicable, particularly in the areas of intense truck turning and loading docks.

Alternatively, consideration may also be given to the use of rigid Portland Cement concrete pavement where there is intense vehicular 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' (OPSS.MUNI 1010 and Pertinent Town Specifications)	100% SPMDD ASTM D698	200 mm

It must be noted that this structure does not provide full protection of the subgrade from frost penetration, therefore, the pavement slab must be separated from the building structure. Truck loading bay is typically the lowest point 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 3 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 catchbasins to facilitate drainage of the subgrade and the granular materials. The subdrain invert should be maintained at least 0.3 m below subgrade level (refer to attached drawing - Pavement Drainage Alternatives). Continuous subdrains should also be provided for the parking lot/driveway pavement areas along the curb-lines/sidewalks draining into the catchbasin. Two lengths of subdrain (each minimum 3 m long) should be installed at each catchbasin.

The granular base beneath the sidewalks and concrete walkways should be provided with positive drainage

and help minimize concrete slab heaving. The concrete surface sidewalk and entrance slabs (near flush-doors) must be supported on a minimum of 1.2 m thick non-frost susceptible material (Granular 'A' or 'B', OPSS.MUNI 1010) provided with a subdrain with a positive outlet to help minimize slab heave due to freezing weather conditions or consideration should be given to install a frost slab in this area.

The above pavement design thicknesses are considered adequate for 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 to the above pavement design recommendations, a close control on the pavement construction process will also be required in order to obtain the desired pavement performance. 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.

5.8 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 are based on the factual data obtained from the investigation and are intended for use by the owner and its retained designers in the design phase of the project. Since the project is still in the design stage, all aspects of the project relative to the subsurface conditions cannot be anticipated. Terraprobe should review the design concept and specifications prior to the final design and construction. 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 constructibility issues and quality control may not be relevant to the revised project. Terraprobe should be retained to review the 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 sample 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 12100 Creditview Developments Limited and its retained design consultants. It is not for use by others. This report is copyright of Terraprobe Inc. and no part of this report may be reproduced by any means, in any form, without the prior written permission of Terraprobe Inc. and 12100 Creditview Developments Limited, who are the authorized users.

It is recognized that the regulatory agencies in their capacities as the planning and building authorities under Provincial statues, will make use of, and rely upon this 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 question, or if we can be of further assistance, please do not hesitate to contact us.

Yours truly,

Terraprobe Inc.

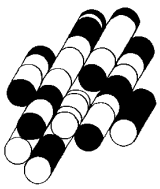


Abdus Sobahan, M. Eng., P. Eng.
Geotechnical Engineer

Michael Tanos, P. Eng.
Senior Consultant

APPENDICES

TERRAPROBE INC.



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
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

Terraprobe Inc.

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

Hamilton – Niagara
903 Barton Street, Unit 22
Stoney Creek, Ontario L8E 5P5
(905) 643-7560 Fax: 643-7559

Central Ontario
220 Bayview Drive, Unit 25
Barrie, Ontario L4N 4Y8
(705) 739-8355 Fax: 739-8369

Northern Ontario
1012 Kelly Lake Rd., Unit 1
Sudbury, Ontario P3E 5P4
(705) 670-0460 Fax: 670-0558

www.terraprobe.ca

ENGINEERED FILL EARTHWORKS SPECIFICATIONS

TERRAPROBE INC.

PART 1 GENERAL

1.01 Description

Engineered Fill refers to earth fill (earthworks) designed and constructed with engineering inspection and testing, so as to be capable of supporting structure foundations and slabs without excessive settlement. Poured concrete foundation walls must be provided with nominal reinforcing steel to provide stiffening of the foundation walls and to protect against excessive crack formation within the foundation walls.

Preparation for Engineered Fill and Engineered Fill operations must only be conducted under full time inspection and testing by the Geotechnical Engineer, in order to ensure adequate compaction and fill quality.

The work for the construction of Engineered Fill, is shown on the Design Drawings prepared by the Design Civil Engineer and as described by these specifications. The work included in this section includes the following:

a) Stripping of the existing topsoil, fill layer, and weathered/disturbed soil as needed from the ground surface below all areas to be covered with Engineered Fill,

b) Excavation of Test Holes into the subgrade to investigate the suitability of subsurface conditions for support of the Engineered Fill and determine if any prior existing fill materials are present,

c) Proof-rolling or visual inspection (as directed by the geotechnical engineer) of the subgrade below areas to be covered with Engineered Fill, to detect the presence and extent of unstable ground conditions,

d) Excavation and removal of unstable subgrade materials or other approved stabilization measures, if required prior to the placement of Engineered Fill,

e) Surveying of ground elevations prior to placing Engineered Fill,

f) Supply, placement, and compaction of approved clean earth as specified herein, with full time inspection and testing,

g) Surveying of ground elevations on completion of Engineered Fill placement,

h) Providing and maintaining survey layout of areas to receive Engineered Fill, and monitoring of ground elevations throughout the construction of Engineered Fill.

1.02 The Project Parties

A) The term Contractor shall refer to the individual or firm who will be carrying out the earthworks related to preparation and construction of Engineered Fill.

B) The term Geotechnical Engineer shall refer to the individual or firm who will be carrying out the full time inspection and testing of the earthworks related to preparation and construction of Engineered Fill.

C) The term Design Civil Engineer shall refer to the individual or firm who will be carrying out the Site Grading Design (pre-grading), the determination of Design Foundation Grades for the structures on the site, and the choice of lots and site areas to receive Engineered Fill.

PART 2 MATERIALS

2.01 Definitions

A) Topsoil Layer is the surface layer of naturally organic soil typically found at the ground surface and with thickness on the order of 25 to 250 mm thick.

B) Earth fill is soil material which has been placed by man-made effort and has not been deposited by nature over a long period of time.

C) Weathered/disturbed soil is natural or native soil that has been disrupted by weathering processes such as frost damage.

D) Subgrade soil is the “in situ” (in place) natural or native soil beneath any earth fill and/or weathered/disturbed soil and/or topsoil layer(s).

E) Engineered Fill soils must consist of clean earth materials (not excessively wet), free of organics and topsoil, free of deleterious materials such as building rubble, wood, plant materials, placed in thin lifts not exceeding 150 mm in thickness. Cohesionless soils such as sand or gravel, are the easiest to handle and compact.

F) All values stated in metric units shall be considered as accurate.

PART 3 ENGINEERED FILL DESIGN

3.01 Design Foundation Pressure

A) Engineered Fill can be expected to experience post-construction settlement on the order of 1 percent of the depth of the Engineered Fill. The time period over which most of this settlement typically occurs, depends on the composition of the Engineered Fill as follows (after initial placement);

a) Sand or gravel soil; several days,

b) Silt soil; several weeks,

c) Clay or clayey soil; several months.

The placement of Engineered Fill might also result in post-construction settlement of the underlying natural soil.

The timing of foundation construction must take into account the post-construction settlement of the Engineered Fill and the foundation soil.

B) Unless otherwise stated, the Engineered Fill is to be placed over the entire lot or site area.

C) The Engineered Fill is to extend up to 1 m above the highest level of required foundation support. Typically this can be within 1 m of the design final grades. Additional common fill can be placed over the Engineered Fill to provide protection against environmental factors such as wind, frost, precipitation, and the like.

E) A geotechnical reaction at SLS of 150 kPa for 25 mm of settlement is typically recommended for the Engineered Fill, unless it consists of glaciolacustrine silt and clay in which case a lower design foundation pressure will need to be determined on a site specific basis. Foundations shall have minimum widths of 0.6 m for continuous strip footings, and minimum dimensions of 1 m for column footings.

F) At the foundation level, sufficient Engineered Fill shall be constructed to ensure that it extends at least 1.0 m laterally beyond the edge of any foundations, and that it extends outward within an area defined by a 1 to 1 line downward from the edge of any Engineered Fill.

G) Foundations placed on the Engineered Fill must be provided with nominal reinforcing steel for protection against excessive minor cracking. The reinforcing steel must consist of 2-15M bars continuous at the top of the foundation wall, and 2-15M bars continuous at the bottom of the foundation walls.

H) At the time of foundation construction, foundation excavations must be reviewed by the Geotechnical Engineer to confirm suitable bearing capacity of the Engineered Fill. The Geotechnical Engineer must inspect the foundation subgrade immediately after excavation, and must inspect the foundation subgrade immediately prior to placement of concrete for footings. The Geotechnical Engineer must also inspect the placement of reinforcing steel in the foundation walls. Written approval must be obtained from the Geotechnical Engineer prior to,

a) placement of footing concrete, and

b) placement of foundation wall concrete.

PART 4 CONSTRUCTION

4.01 Survey Layout

A) The survey layout shall be carried out and maintained throughout the construction of Engineered Fill activities. A suitable layout stake shall be placed at the corners of the start and finish of every block or work area to receive Engineered Fill.

B) At least two temporary survey elevation benchmarks shall be provided for every work area to receive Engineered Fill, to assist in monitoring the level of the Engineered Fill as it is constructed.

C) The ground elevations of the subgrade approved for receiving Engineered Fill shall be surveyed and recorded on a regular grid pattern. Engineered Fill shall not be placed on any work area without the written approval of the Geotechnical Engineer.

D) The ground elevations of the Engineered Fill on each work area shall be surveyed and recorded on a regular grid pattern at the end of each day during the placement of Engineered Fill.

E) On completion of Engineered Fill construction, the final ground elevations shall be surveyed and recorded on a regular grid pattern.

4.02 Topsoil Stripping

A) The Geotechnical Engineer must observe the stripping of topsoil from the areas proposed for Engineered Fill, from start to finish.

B) Topsoil must be stripped from the entire building site area. The Geotechnical Engineer must photograph the work areas which have had the earth fill suitably stripped.

4.03 Test Holes Into Subgrade

A) After the topsoil has been stripped, the exposed subgrade must be investigated for the presence of weak zones or deleterious material, which may be unsuitable for the support of Engineered Fill.

B) Exploratory test holes must be dug using a small backhoe, on a suitable pattern to obtain a representative indication of the entire site area.

C) The Geotechnical Engineer must observe the digging and backfilling of the test holes; must log the test hole stratigraphy; must obtain soil samples at maximum depth intervals of 0.3m; and must photograph each dug test hole.

D) If the test holes discover any old buried fill or deleterious materials, it must be excavated and removed from the lot area down to undisturbed, stable native soil.

E) All test holes must be properly backfilled and compacted in loose lifts of maximum 150 mm thickness to at least 98 percent Standard Proctor Maximum Dry Density (SPMDD), at the optimum water content plus or minus 2 percent. The Geotechnical Engineer must observe the backfilling and compaction of the test holes.

4.04 Subgrade Proof-rolling

A) Prior to placing any Engineered Fill, the exposed subgrade must be proof-rolled with a static smooth-drum roller and the Geotechnical Engineer must observe the proof-rolling.

B) Cohesive soil will be disrupted by proof-rolling. Competency must be determined by a geotechnical engineer by cutting and inspecting the soil.

C) If unstable subgrade conditions are encountered, the unstable subgrade must be sub-excavated. If wet site conditions exist during filling, stabilization with granular materials may be required.

4.05 Engineered Fill Placement

A) Engineered fill must not be placed without the approval of the Geotechnical Engineer. Prior to placing any Engineered Fill, the existing fill must be removed down to native soil subgrade, the subgrade must be investigated for old buried fill or deleterious material, the subgrade must be proof-rolled, and the subgrade elevations must be surveyed.

B) Prior to the placement of Engineered Fill, the source or borrow area for the Engineered Fill must be evaluated for its suitability. Some of the existing site fill that is removed prior to placement of Engineered Fill may be sorted and reused as Engineered Fill, but must first be approved by the Geotechnical Engineer. Samples of the proposed fill material must be obtained by the Geotechnical Engineer and tested in the geotechnical laboratory for Standard Proctor Maximum Dry Density, prior to approval of the material for use as Engineered Fill. The Engineered Fill must be free of organics and other deleterious material (wood, building debris, rubble, cobbles, boulders, and the like).

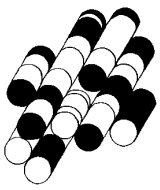
C) The Engineered Fill must be placed in maximum loose lift thicknesses of 150 mm. Each lift of Engineered Fill must be compacted with a heavy roller, to at least 98 percent Standard Proctor Maximum Dry Density (SPMDD), at the optimum water content plus or minus 2 percent.

D) Field density tests must be taken by the Geotechnical Engineer, on each lift of Engineered Fill, on each lot area. Any Engineered Fill which is tested and found to not meet the specifications, shall be either removed or, reworked and retested.

E) Engineered fill must not be placed during the period of the year when cold weather occurs, i.e., when there are freezing ambient temperatures during the daytime and overnight.

BOREHOLE LOGS

TERRAPROBE INC.



LOG OF BOREHOLE 2

Terraprobe

Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 3, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 591878, N: 4839457 (UTM 17T) 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	265.7	**GROUND SURFACE**				
		100mm **TOPSOIL**				
		FILL, clayey silt, trace to some sand, trace gravel, trace organics, stiff, brown, moist		1	SS	15
	264.9 / 0.8					
1		**CLAYEY SILT**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	20
				3	SS	21
2				4	SS	23
3				5	SS	40
4		...brownish grey below		6	SS	18
5						
6		...sand lens, wet		7	SS	37
	259.1 / 6.6					

Elevation Scale (m): 265, 264, 263, 262, 261, 260

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.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Feb 21, 2022	1.7	264.0
Mar 9, 2022	1.7	264.0

file: 1-21-0516-01 bh logs.gpj

LOG OF BOREHOLE 3

Terraprobe

Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 3, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 591978, N: 4839587 (UTM 17T) 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
	261.1	**GROUND SURFACE**				
0	260.8	250mm **TOPSOIL**				
	0.3	**FILL**, clayey silt, trace to some sand, trace gravel, trace organics, firm to stiff, brown, moist		1	SS	7
1	260.0			2	SS	13
	1.1	**CLAYEY SILT**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		3	SS	17
2				4	SS	26
3		...silty sand lense, wet		5	SS	39
4		...brownish grey		6	SS	29
5						
6	255.0					
	6.1	**SAND AND GRAVEL**, trace silt, trace clay, dense, brown, wet		7	SS	31
	254.5					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 261, 260, 259, 258, 257, 256, 255

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level ▽

Lab Data and Comments

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

Unstabilized water level measured at 2.4 m below ground surface; borehole was open upon completion of drilling.

file: 1-21-0516-01 bh logs.gpj

LOG OF BOREHOLE 4

Terraprobe

Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 3, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 592056, N: 4839691 (UTM 17T) Elevation Datum : Geodetic

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

Depth Scale (m)	Elev / Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	260.8	**GROUND SURFACE**				
	260.5	250mm **TOPSOIL**				
	0.3	**FILL**, clayey silt, trace to some sand, trace gravel, trace organics, stiff, brown, moist		1	SS	15
1		...organic inclusions		2	SS	9
	259.3					
	1.5	**CLAYEY SILT**, some sand to sandy, trace gravel, stiff to hard, brown, moist (GLACIAL TILL)		3	SS	9
2				4	SS	27
3				5	SS	36
4						
		...sandy silt lens, wet		6	SS	11
5						
6		...grey		7	SS	27
	254.2					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 260, 259, 258, 257, 256, 255

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, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

2 19 53 26

Unstabilized water level measured at 4.9 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Feb 21, 2022	damaged	n/a

file: 1-21-0516-01 bh logs.gpj

LOG OF BOREHOLE 5

Terraprobe

Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 2, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 591961, N: 4839773 (UTM 17T) 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	262.8	**GROUND SURFACE**				
	262.6	200mm **TOPSOIL**				
	0.2	**FILL**, clayey silt, trace to some sand, trace gravel, trace organics, firm to stiff, brown, moist		1	SS	5
1	261.9	**CLAYEY SILT**, some sand to sandy, trace gravel, stiff to very stiff, brown, moist (GLACIAL TILL)		2	SS	11
	0.9			3	SS	18
2				4	SS	25
3				5	SS	21
4						
		...brown, grey		6	SS	15
5						
6		...sand lens inclusions, wet		7	SS	26
	256.2					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 262, 261, 260, 259, 258, 257

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, Natural Water Content, Liquid Limit; PL, MC, LL; 10 20 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: 1-21-0516-01 bh logs.gpj

LOG OF BOREHOLE 6

Terraprobe

Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 2, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 591882, N: 4839678 (UTM 17T) 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
	262.7	**GROUND SURFACE**				
0	262.5	200mm **TOPSOIL**				
	0.2	Trace organics (WEATHERED/DISTURBED)		1	SS	13
	261.8					
1	0.9	**CLAYEY SILT**, some sand to sandy, trace gravel, stiff to very stiff, brown, moist (GLACIAL TILL)		2	SS	12
				3	SS	21
2						
				4	SS	23
3	259.7					
	3.0	**SANDY SILT**, trace to some clay, trace to some gravel, compact, brown, moist (GLACIAL TILL)		5	SS	24
4						
		...brownish grey, wet		6	SS	26
5						
6	256.6					
	6.1	**SAND AND GRAVEL**, trace silt, trace clay, dense, brown, wet		7	SS	36
	256.1					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 262, 261, 260, 259, 258, 257

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), Natural Water Content (MC), Liquid Limit (LL) (10, 20, 30)

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

7 23 58 12

Unstabilized water level measured at 0.5 m below ground surface; borehole caved to 5.8 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Feb 21, 2022	0.0	262.7
Mar 9, 2022	1.5	261.2

file: 1-21-0516-01 bh logs.gpj

LOG OF BOREHOLE 7

Terraprobe

Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 2, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 591802, N: 4839541 (UTM 17T) 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
	266.1	**GROUND SURFACE**				
0	265.9	200mm **TOPSOIL**				
	0.2	Trace organics (WEATHERED/DISTURBED)		1	SS	13
	265.2					
1	0.9	**CLAYEY SILT**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	23
				3	SS	19
2						
				4	SS	24
3						
				5	SS	29
4		...brownish grey				
				6	SS	33
5						
6	260.0					
	6.1	**SAND AND GRAVEL**, trace silt, trace clay, very dense, brown, wet		7	SS	85
	259.5					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 266, 265, 264, 263, 262, 261, 260

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) Natural Water Content (MC) Liquid Limit (LL) 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

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

Unstabilized water level measured at 5.2 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Feb 21, 2022	3.2	262.9
Mar 9, 2022	3.4	262.7

file: 1-21-0516-01 bh logs.gpj

LOG OF BOREHOLE 10

Terraprobe

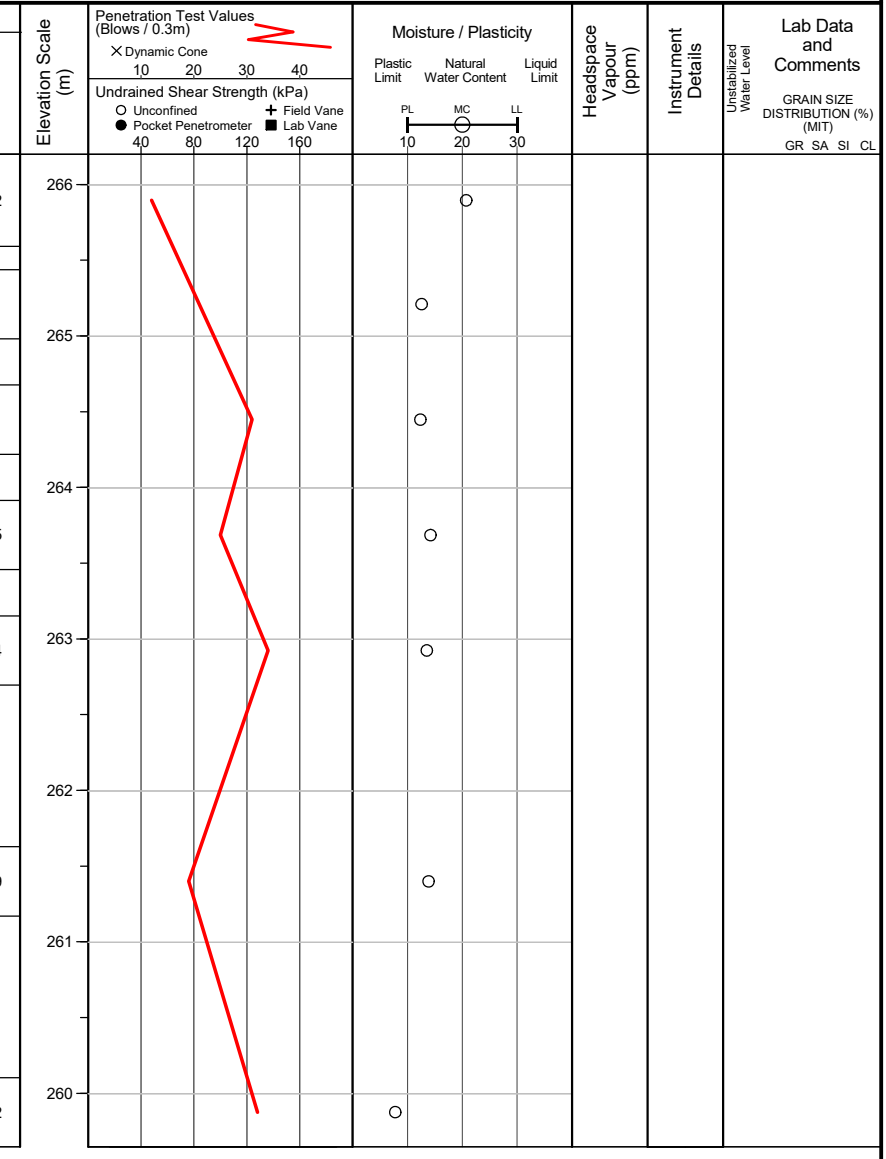
Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 1, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 591727, N: 4839589 (UTM 17T) 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
	266.2	**GROUND SURFACE**				
0	265.9	250mm **TOPSOIL**, .				
	0.3	Trace organics (WEATHERED/DISTURBED)		1	SS	12
	265.4					
	0.8	**CLAYEY SILT**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	21
1						
				3	SS	31
2						
				4	SS	25
3						
				5	SS	34
4						
		...brownish grey		6	SS	19
5						
6		...reddish brown, stone pieces inclusion		7	SS	32
	259.6					
	6.6	**END OF BOREHOLE**				

Borehole was dry and open upon completion of drilling.



Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

file: 1-21-0516-01 bh logs.gpj

LOG OF BOREHOLE 11

Terraprobe

Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 1, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 591816, N: 4839732 (UTM 17T) 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
	263.1	**GROUND SURFACE**				
0	262.7	350mm **TOPSOIL**, .		1	SS	16
	0.4	Trace organics (WEATHERED/DISTURBED)				
	262.3					
	0.8	**CLAYEY SILT**, some sand to sandy, trace gravel, stiff to hard, brown, moist (GLACIAL TILL)		2	SS	12
1				3	SS	18
2				4	SS	30
3				5	SS	29
4		...brownish grey below		6	SS	22
5				7	SS	36
6	256.5					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 263, 262, 261, 260, 259, 258, 257

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, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

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

Unstabilized water level measured at 5.8 m below ground surface; borehole was open upon completion of drilling.

file: 1-21-0516-01 bh logs.gpj

LOG OF BOREHOLE 12

Terraprobe

Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 1, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 591869, N: 4839868 (UTM 17T) 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	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
0	**262.9**	**GROUND SURFACE**										
	262.6	300mm **TOPSOIL**										
	0.3	**FILL**, clayey silt, trace to some sand, trace gravel, trace organics, stiff, brown, moist		1	SS	14				PID: 0 FID: 0		
	262.1											
	0.8	**CLAYEY SILT**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	16	262			PID: 0 FID: 0		
1				3	SS	20	261			PID: 0 FID: 0		
2				4	SS	42				PID: 0 FID: 0		
3				5	SS	37	260			PID: 0 FID: 0		
4							259					
				6	SS	15	258			PID: 0 FID: 0		
5												
6				7	SS	48	257			PID: 0 FID: 0		
	256.3											
	6.6	**END OF BOREHOLE**										

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, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

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: 1-21-0516-01 bh logs.gpj

LOG OF BOREHOLE 13

Terraprobe

Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 1, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 591770, N: 4839882 (UTM 17T) 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	263.9	**GROUND SURFACE**				
	263.7	200mm **TOPSOIL**				
	0.2	Trace organics (WEATHERED/DISTURBED)		1	SS	19
	263.1					
	0.8	**CLAYEY SILT**, some sand to sandy, trace gravel, stiff to hard, brown, moist (GLACIAL TILL)		2	SS	23
1						
				3	SS	18
2						
				4	SS	36
3						
				5	SS	32
4						
		...brownish grey below		6	SS	21
5						
6	257.8					
	6.1	**SILT**, trace sand, trace clay, dilatant, stiff, brownish grey, wet		7	SS	10
	257.3					
	6.6	**END OF BOREHOLE**				

Borehole was dry and open upon completion of drilling.

Elevation Scale (m): 263, 262, 261, 260, 259, 258

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, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

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

file: 1-21-0516-01 bh logs.gpj

LOG OF BOREHOLE 14

Terraprobe

Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 1, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 591752, N: 4839791 (UTM 17T) 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	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
0	**264.5**	**GROUND SURFACE**					264	Dynamic Cone 10 20 30 40; Unconfined / Pocket Penetrometer / Field Vane / Lab Vane 40 80 120 160	Plastic Limit / Natural Water Content / Liquid Limit PL MC LL 10 20 30		Unstabilized Water Level	GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
	264.3	200mm **TOPSOIL**										
	0.2	**FILL**, clayey silt, trace to some sand, trace gravel, trace organics, trace brick pieces inclusion, stiff, brown / dark brown, moist		1	SS	36						
1	263.4			2	SS	8	263					
	1.1	**CLAYEY SILT**, some sand to sandy, trace gravel, stiff to hard, brown, moist (GLACIAL TILL)		3	SS	14						
2		...sandy silt, some clay, trace gravel		4	SS	18	262					3 27 55 15
3				5	SS	22	261					
4		...brownish grey below		6	SS	16	260					
5							259					
6				7	SS	14	258					
	257.9											
	6.6	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Feb 21, 2022	0.9	263.6
Mar 9, 2022	0.9	263.6

file: 1-21-0516-01 bh logs.gpj

LOG OF BOREHOLE 15

Terraprobe

Project No. : 1-21-0516-01	Client : 12100 Creditview Developments Limited	Originated by : MT
Date started : February 1, 2022	Project : 12100 Creditview Road	Compiled by : AS
Sheet No. : 1 of 1	Location : Caledon, Ontario	Checked by : MMT

Position : E: 591687, N: 4839677 (UTM 17T) 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
	266.4	**GROUND SURFACE**				
0	266.2	150mm **TOPSOIL**				
	0.2	Trace organics (WEATHERED/DISTURBED)		1	SS	30
	265.6					
	0.8	**CLAYEY SILT**, some sand to sandy, trace gravel, stiff to hard, brown, moist (GLACIAL TILL)		2	SS	19
1				3	SS	20
2				4	SS	28
3		...coarse sand lens, wet		5	SS	30
4						
5				6	SS	21
6	260.3					
	6.1	**SILT AND SAND to SILTY SAND**, trace to some gravel, trace to some clay, compact, brown, wet (GLACIAL TILL)		7	SS	29
	259.8					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 266, 265, 264, 263, 262, 261, 260

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) Natural Water Content (MC) Liquid Limit (LL) 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

11 37 39 13

Unstabilized water level measured at 3.7 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

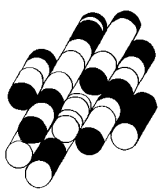
WATER LEVEL READINGS

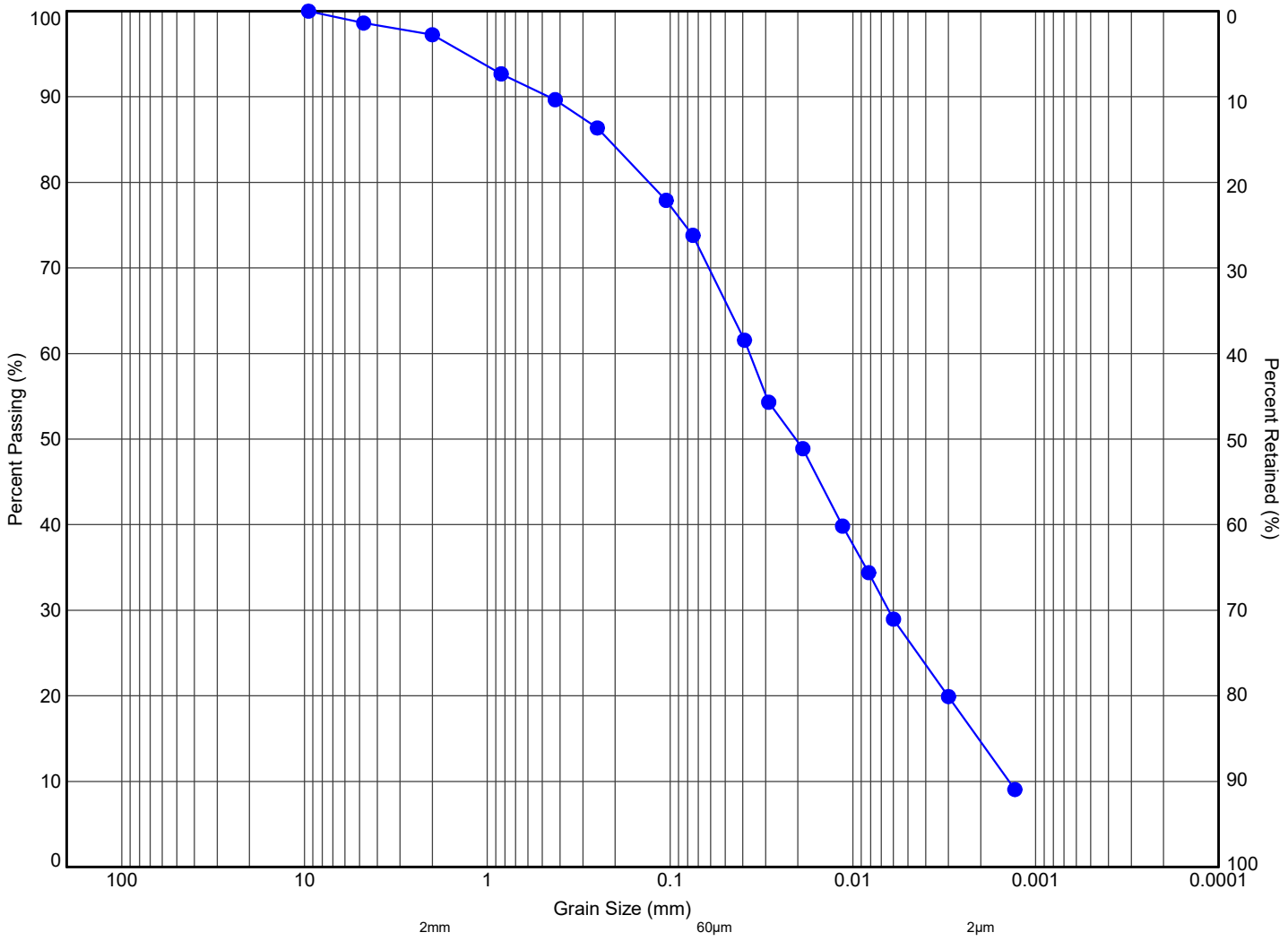
Date	Water Depth (m)	Elevation (m)
Feb 21, 2022	1.7	264.7
Mar 9, 2022	1.7	264.7

file: 1-21-0516-01 bh logs.gpj

SIEVE AND HYDROMETER ANALYSIS

TERRAPROBE INC.





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

MIT SYSTEM

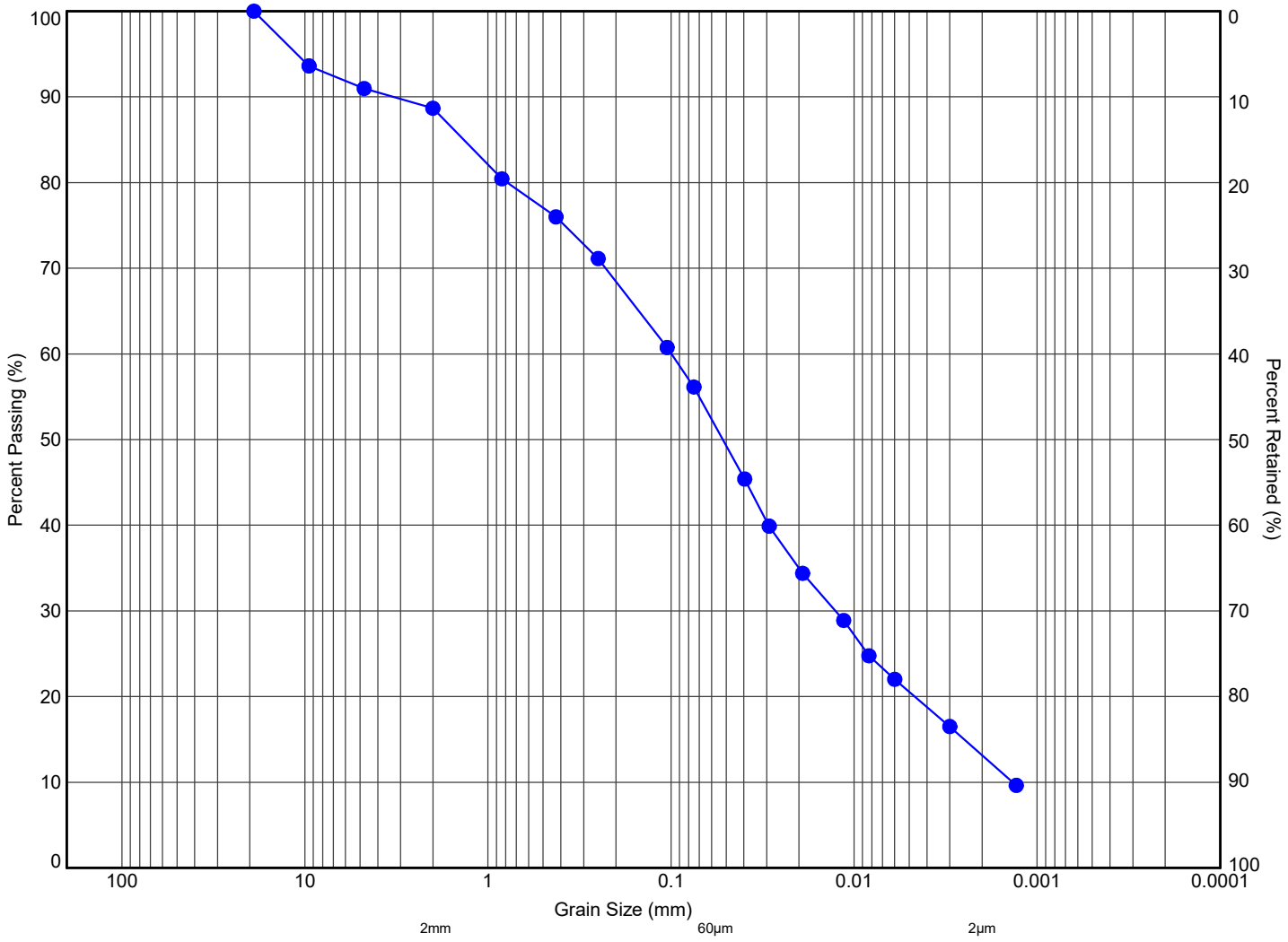
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**14**	SS4	2.7	261.8	3	27	55	15	

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

Title:

GRAIN SIZE DISTRIBUTION
SANDY SILT, SOME CLAY, TRACE GRAVEL

File No.: **1-21-0516-01**



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

MIT SYSTEM

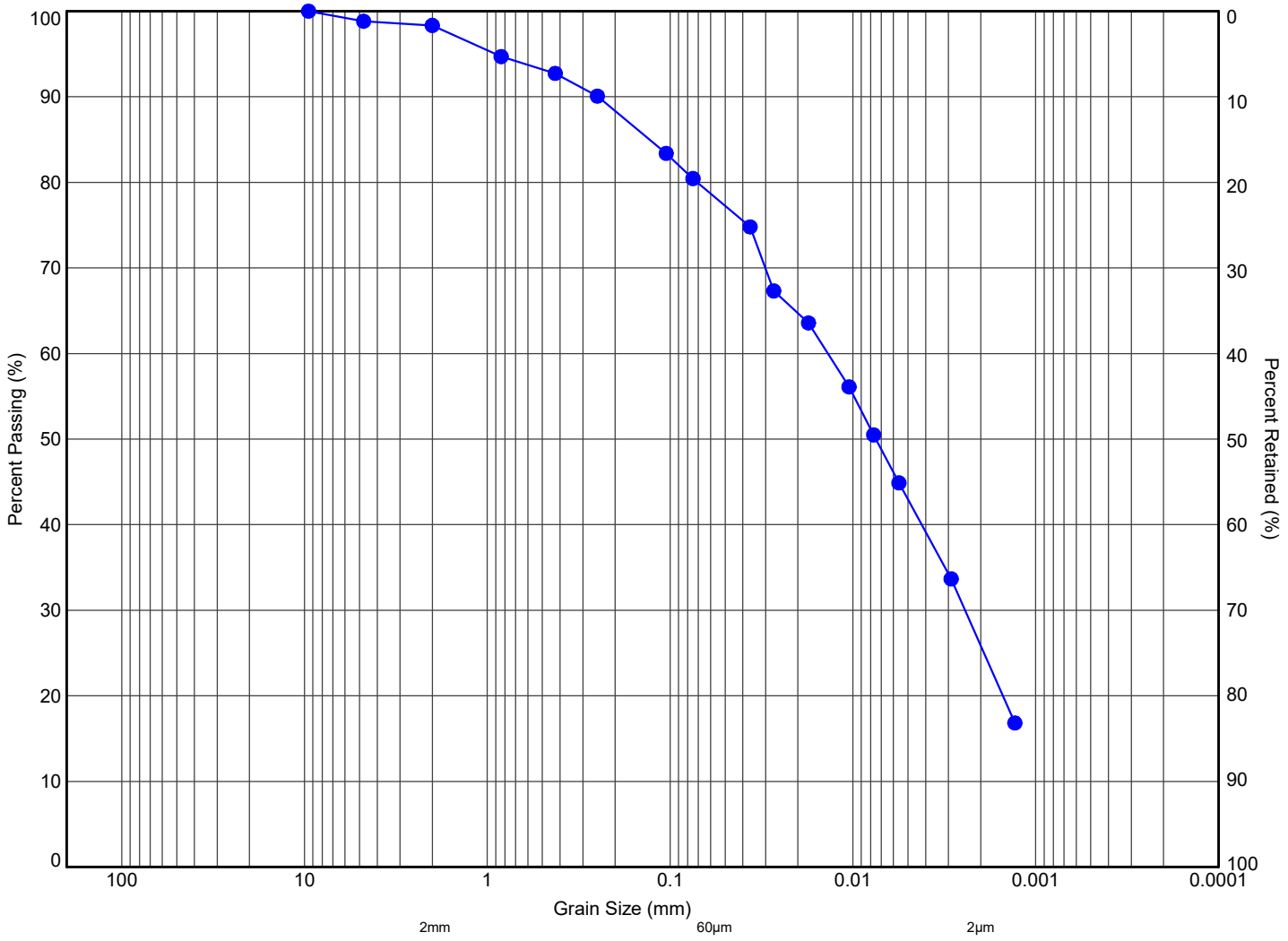
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**15**	SS7	6.3	260.1	11	37	39	13	

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

Title:

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

File No.: **1-21-0516-01**



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

MIT SYSTEM

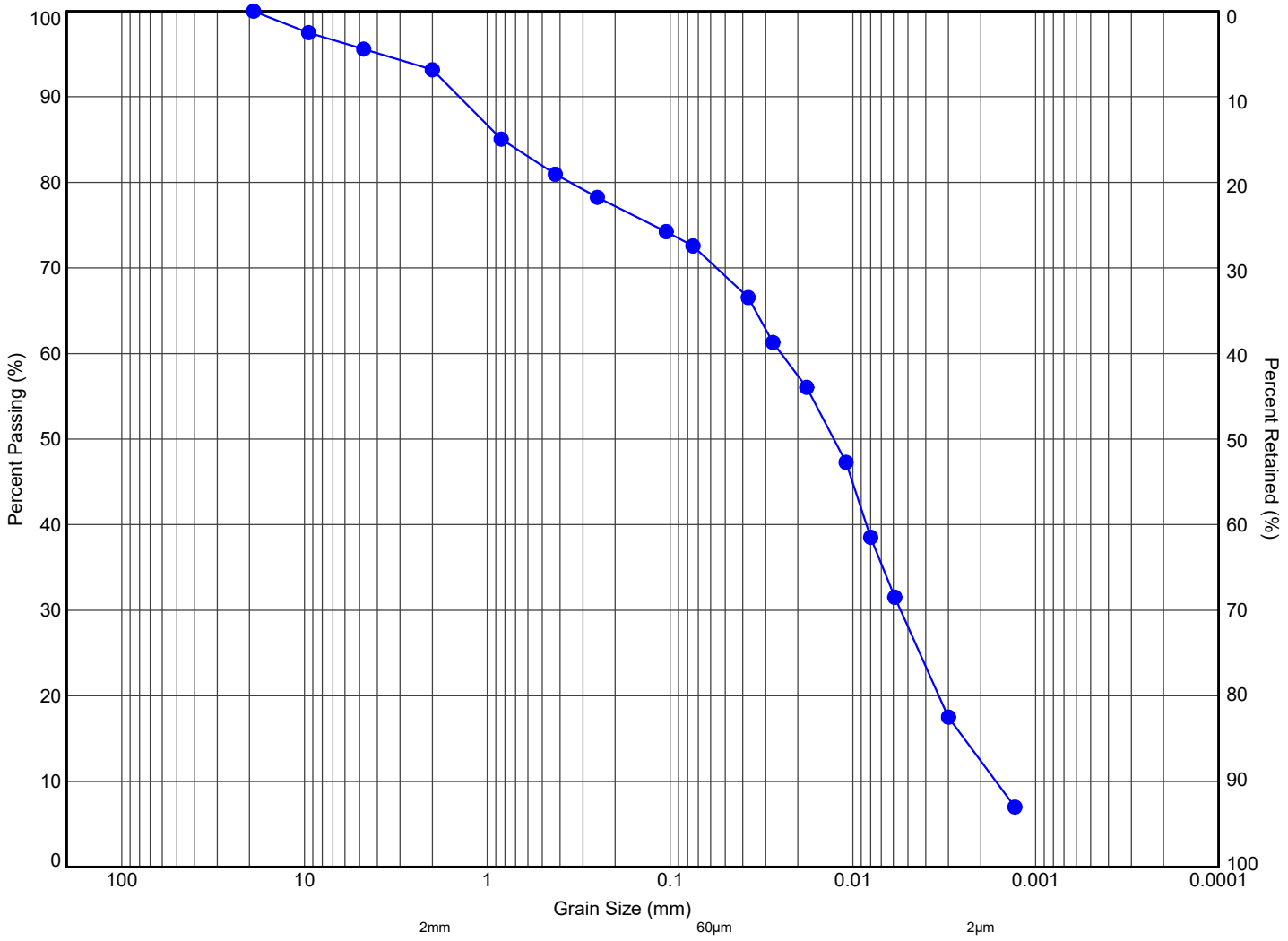
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**4**	SS3	1.8	259.0	2	19	53	26	

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

Title:

GRAIN SIZE DISTRIBUTION
CLAYEY SILT, SOME SAND, TRACE GRAVEL

File No.: **1-21-0516-01**



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

MIT SYSTEM

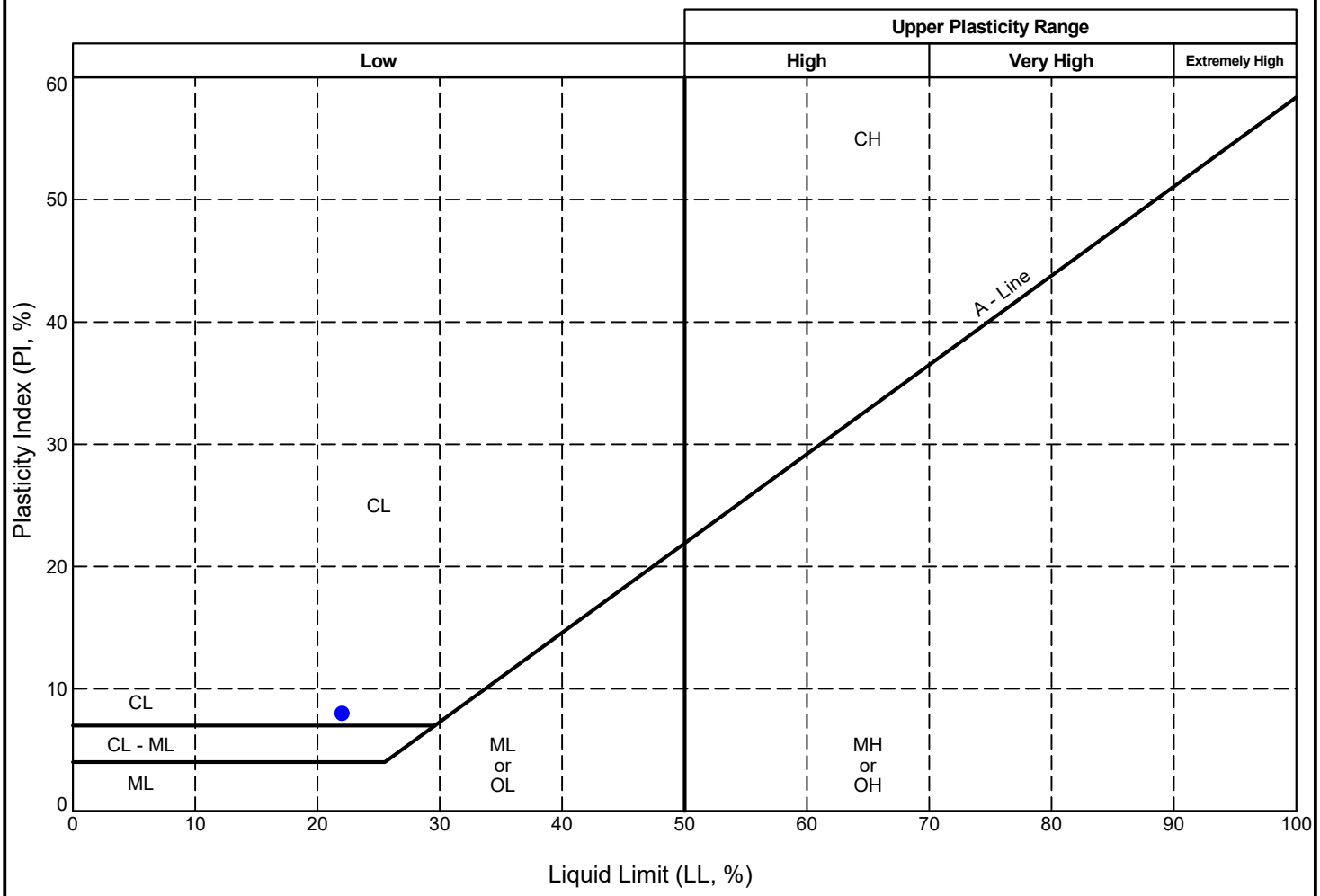
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**6**	SS5	3.3	259.4	7	23	58	12	

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

Title:

GRAIN SIZE DISTRIBUTION
SANDY SILT, SOME CLAY, TRACE GRAVEL

File No.: **1-21-0516-01**

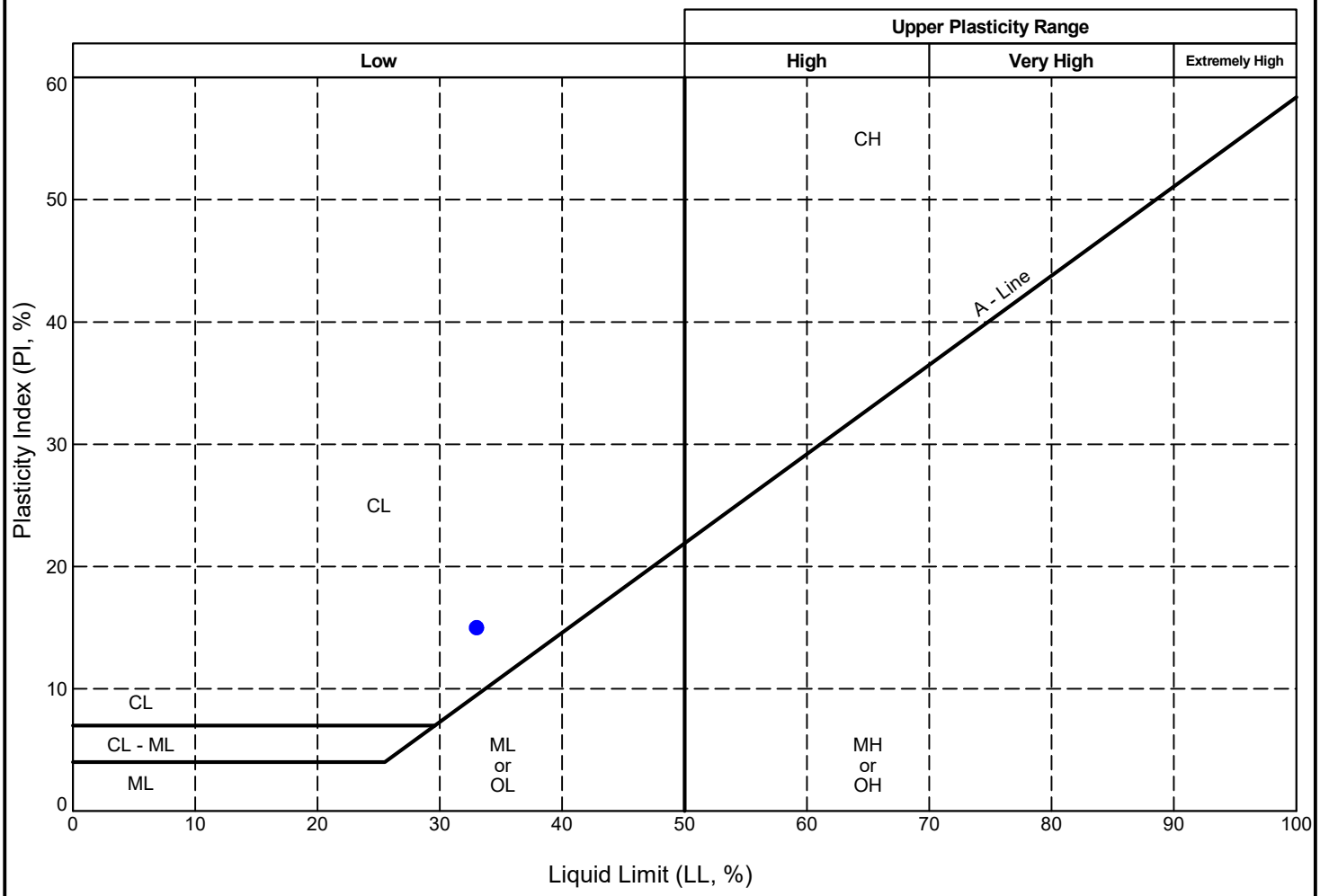


	Borehole	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)	Description
●	14	SS4	2.5	262.0	22	14	8	SLIGHTLY PLASTIC

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

Title: **ATTERBERG LIMITS CHART**

File No.: **1-21-0516-01**



	Borehole	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)	Description
●	4	SS3	1.8	259.0	33	18	15	SLIGHTLY PLASTIC

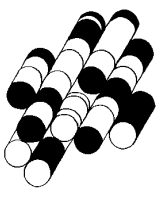
Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

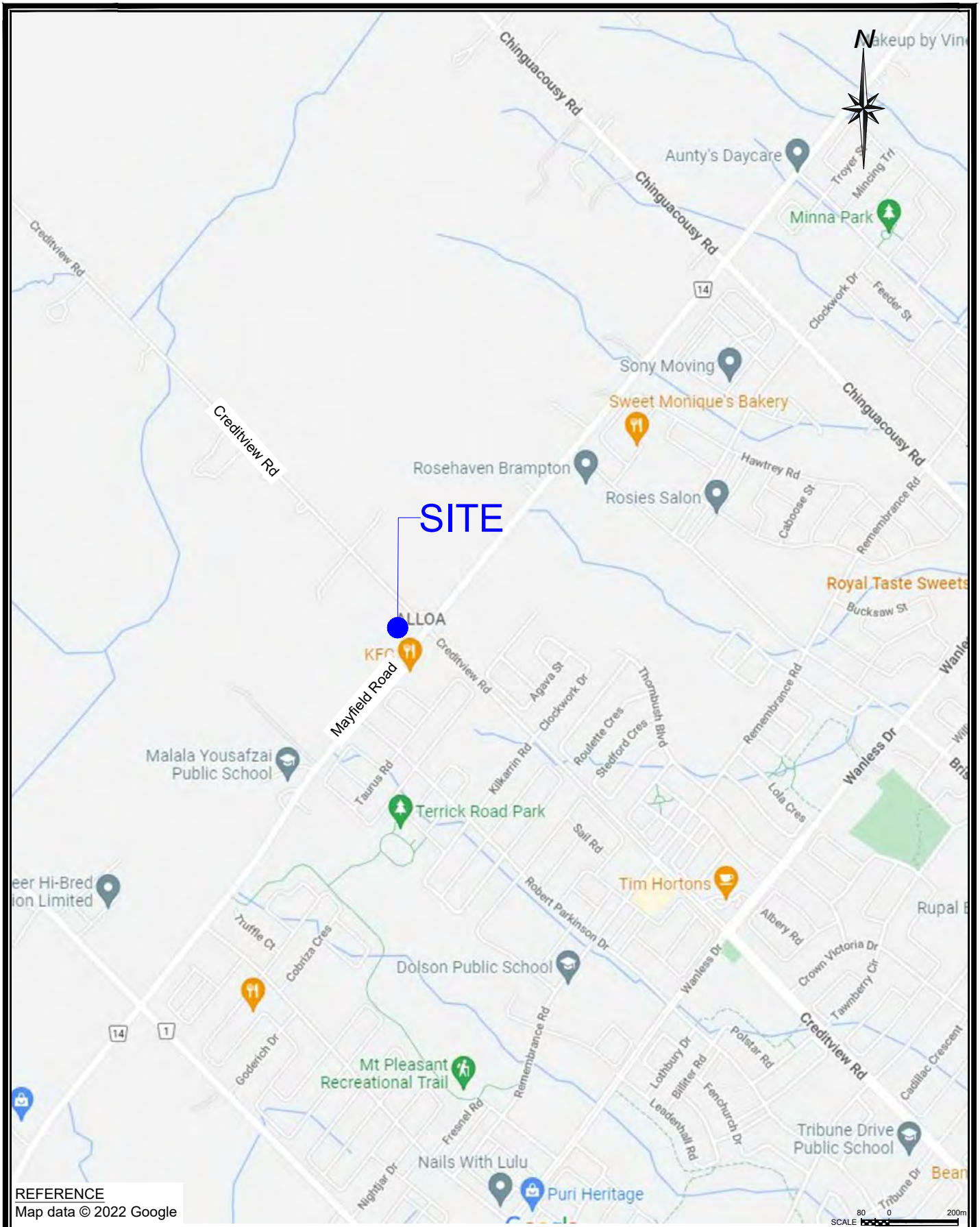
Title: **ATTERBERG LIMITS CHART**

File No.: **1-21-0516-01**

FIGURES

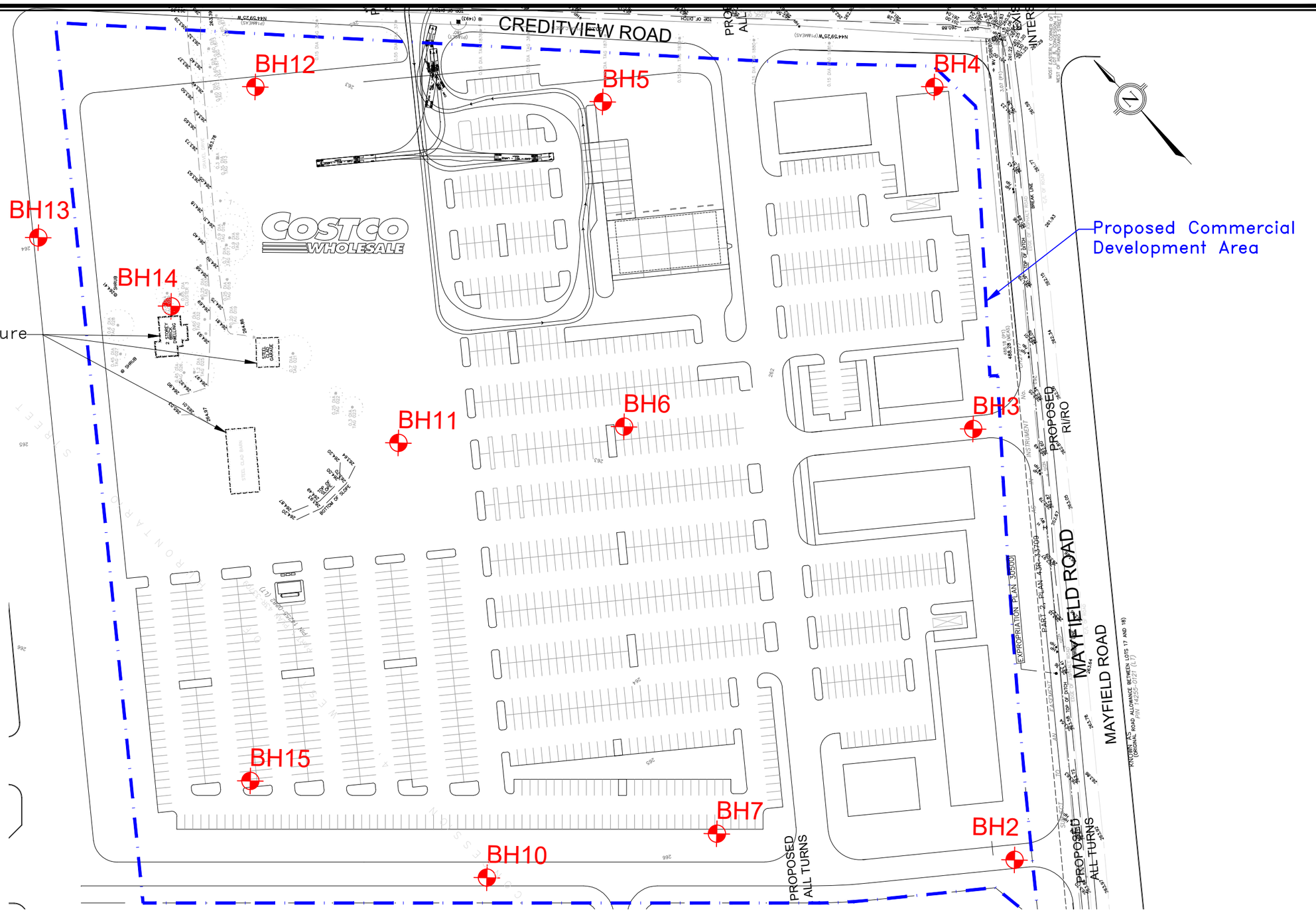
TERRAPROBE INC.





Terraprobe 11 Indell Lane, Brampton, Ontario, L6T 3Y3 Tel: (905) 796-2650 Fax: (905) 796-2250	**Title:** SITE LOCATION PLAN	**FIGURE :** 1
	File. No.: 1-21-0516-01	

Y:\Share\CAT\terraprobe\Brampton\1 - Project Files\2021\1-21-0516 - 12100 Creditview Road, Caledon\01-Geotechnical Investigation\A. Dwgs, Logs\AutoCAD\1-21-0516-01 FIGURE 1.dwg, DWG To PDF.pc3, Kamal, Kamal



REFERENCE
Drawing Title: Site Plan
Dwg. No.: SP-1, Date: February 3, 2022
By: Gsai (Glen Schnarr & Associates Inc)

LEGEND
- Approximate Borehole Location

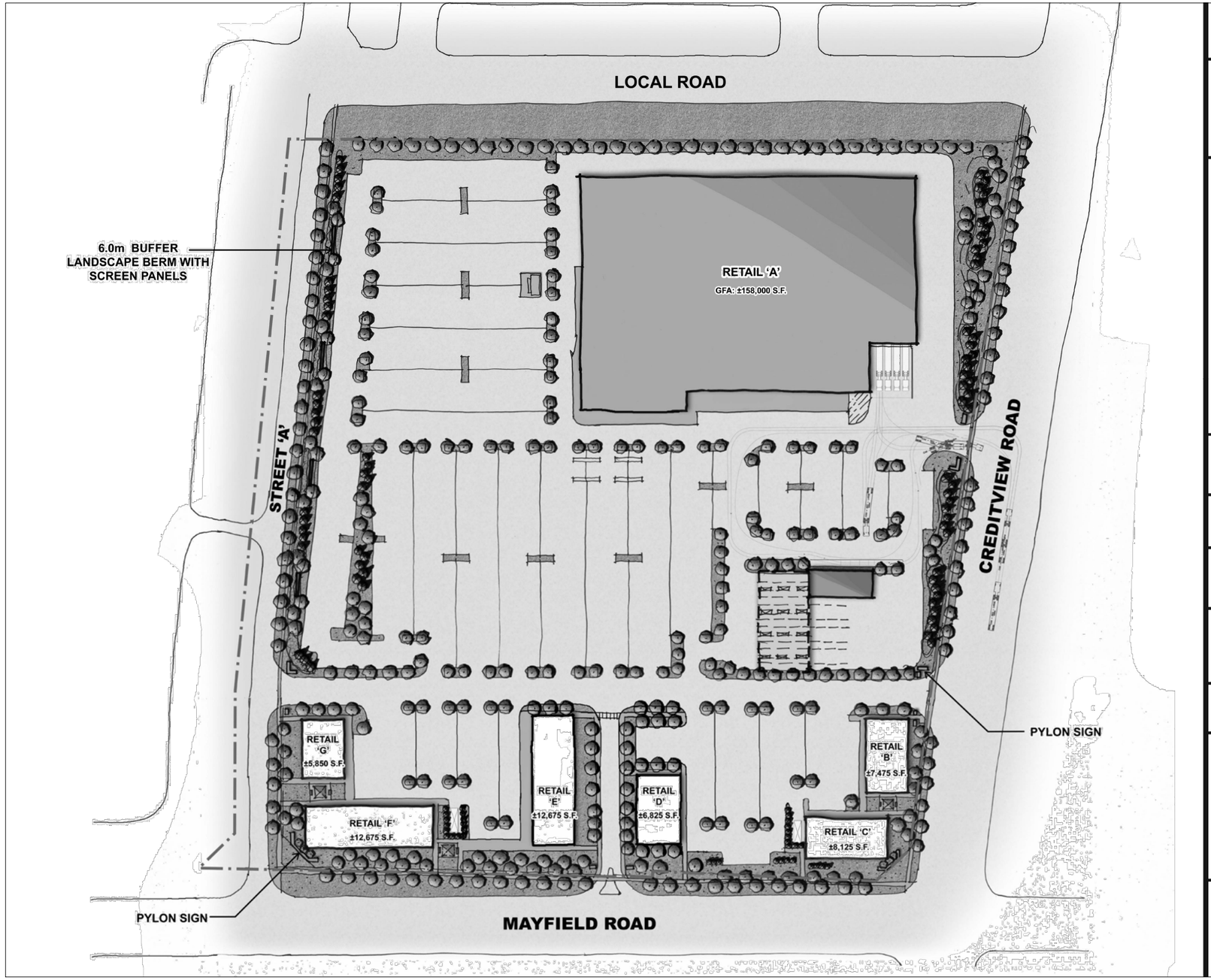
Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

Title: **BOREHOLE LOCATION PLAN**

File No. 1-21-0516-01

FIGURE : 2

Y:\Shared\CAT\terraprobe\Brampton\1-Project Files\2021\1-21-0516 - 12100 Creditview Road, Caledon\01-Geotechnical Investigation\A. Dwgs. Logs\AutoCAD\Commercial\1-21-0516 (commercial) BLP 2022-03-31.dwg
DWG To PDF.pc3, kamal, kamal



SITE STATISTICS

SITE AREA 25.30 AC
10.28 HA

GROSS FLOOR AREA (GFA)

RETAIL A:	± 158,000 SF
RETAIL B:	± 7,475 SF
RETAIL C:	± 8,125 SF
RETAIL D:	± 6,825 SF
RETAIL E:	± 12,675 SF
RETAIL F:	± 12,675 SF
RETAIL G:	± 5,850 SF
TOTAL:	± 211,625 SF

PARKING ± 1,261 SPACES

BUILDING HEIGHTS = 1 STOREY

CREDITVIEW & MAYFIELD

PRELIMINARY LANDSCAPE CONCEPT PLAN

MARCH 8, 2022

N

0 15 30 45 60
SCALE 1:750 (m)

mbtw wai

0 15 30 45 60

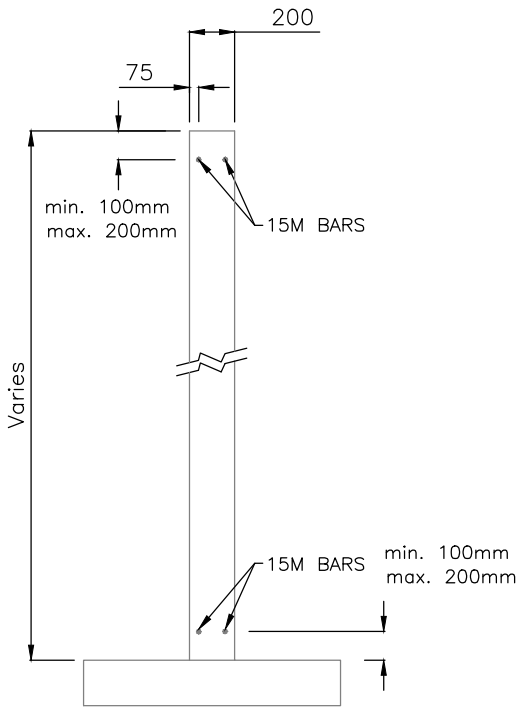
Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

Title: **PRELIMINARY SITE PLAN**

File No. 1-21-0516-01

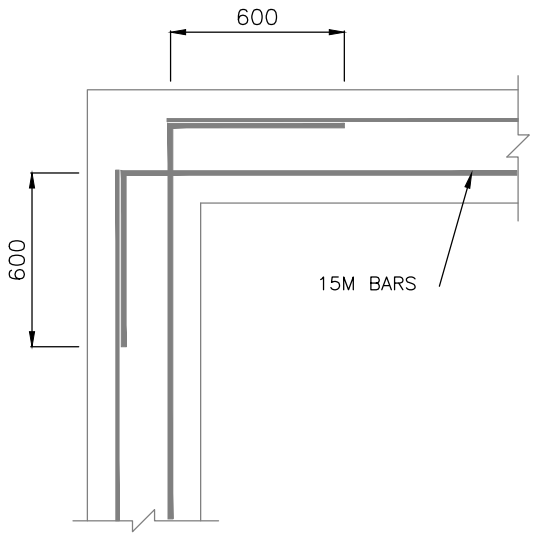
FIGURE : 2A

X:\Shared\CAD\Terraprobe\Brampton\1-Project Files\2021\1-21-0516 - 12100 Creditview Road, Caledon\01-Geotechnical Investigation\A. Dwgs, Logs\AutoCAD\1-21-0516-01 FIGURE 1.dwg, DWG To PDF.pc3, Kamal, Kamal



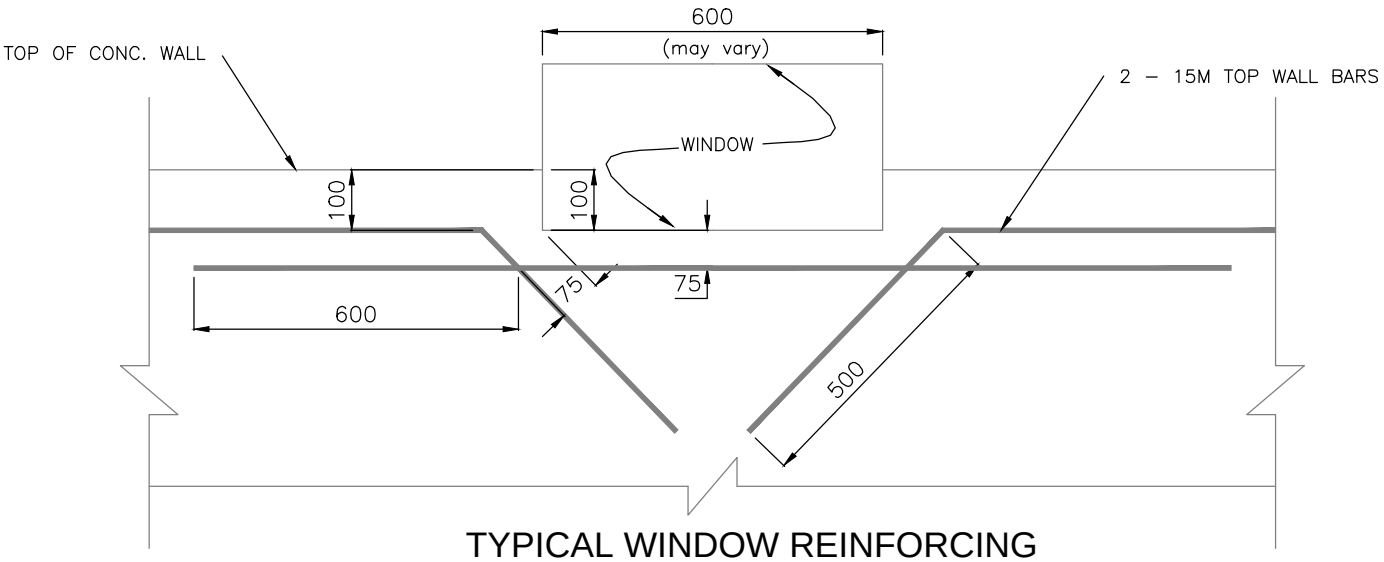
TYPICAL REINFORCED WALL

NOT TO SCALE



TYPICAL SPLICING AT CORNERS

NOT TO SCALE



TYPICAL WINDOW REINFORCING

NOT TO SCALE

NOTES:

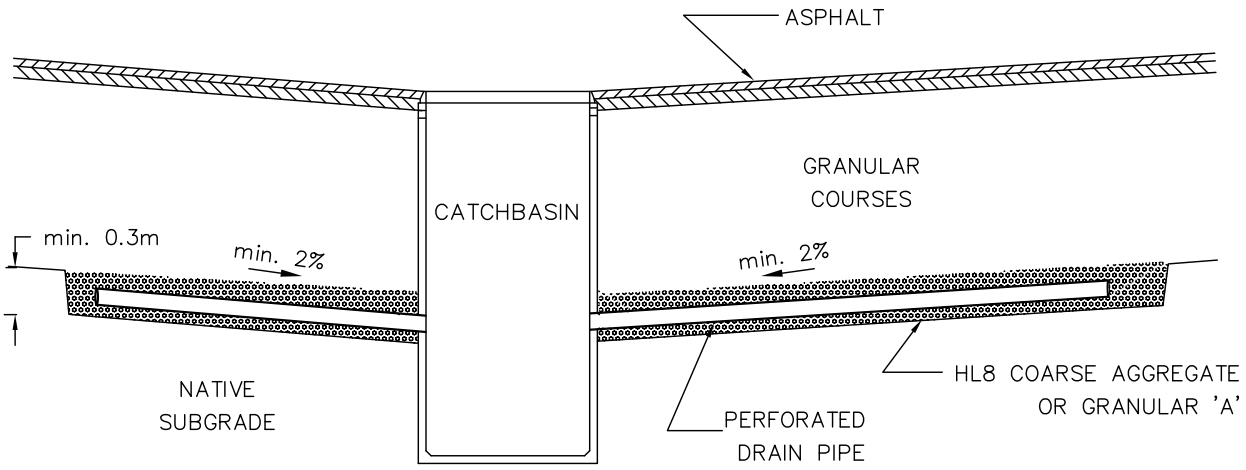
1. Reinforcing steel C.S.A. G30.18–09 Grade 400
2. Concrete min. 28 day strength 20MPa (3000psi)
3. Base of all footing excavations to be inspected and approved prior to placing formwork.
4. All dimensions are in mm.

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

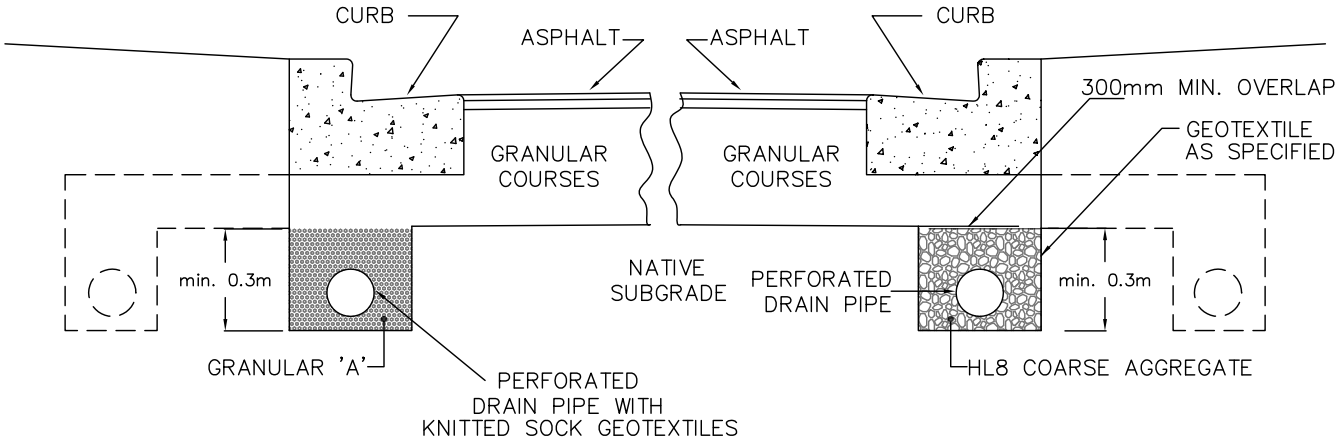
Title:

TYPICAL FOUNDATION WALL DETAILS FOR STRUCTURES ON ENGINEERED FILL

Longitudinal Subdrain Connection to Catchbasin



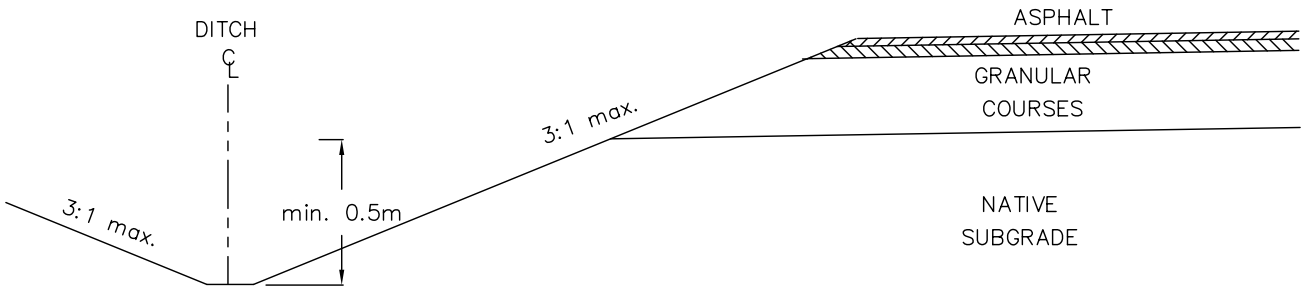
Urban Cross Sections



Unwrapped Trench

Wrapped Trench

Rural Cross Section



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

Title:

PAVEMENT DRAINAGE ALTERNATIVES

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnement
structural	structures
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité