Preliminary Geotechnical Investigation
Proposed High-Rise Buildings
1050 Markham Road
City of Toronto, Ontario

Prepared For:
CAPREIT

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DRAWINGS

1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by CAPREIT to undertake a preliminary geotechnical investigation for the proposed high-rise buildings located at 1050 Markham Road in the City of Toronto, Ontario.

It is DS's understanding that the client is considering an infill development to the south of the existing building on the property. The development will consist of high-rise buildings with 2 to 4 levels of underground parking (P2 to P4).

This geotechnical investigation is preliminary, based on a limited number of boreholes. Additional boreholes are required for the detailed/final design of the proposed buildings.

The purpose of this preliminary geotechnical investigation was to obtain the subsurface conditions at borehole locations and from the findings at the boreholes and provide geotechnical recommendations for the following:

1. Foundations
2. Floor slabs and permanent drainage
3. Excavations and groundwater control
4. Earth pressures
5. Earthquake considerations
6. Underground Utilities
7. Pavements

This report deals with geotechnical issues only. The findings of hydrogeological investigation by DS will be documented separately.

This report is provided on the basis of the terms of reference presented above and, on the assumption, that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations can cater to the changed design.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for CAPREIT and its designers. Use of this report by third party without DS Consultants Ltd. consent is prohibited.

2. FIELD AND LABORATORY WORK

A total of five boreholes (BH24-1 to BH24-5) were drilled to depths ranging from 12.3 to 24.5 m below existing grade, at the locations as shown on **Drawing 1**.

The boreholes were drilled with solid/hollow stem continuous flight auger and mud-rotary method by a drilling sub-contractor under the direction and supervision of DS personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the DS laboratory for detailed examination by the project engineer and for laboratory testing.

In addition to visual examination in the laboratory, all soil samples were tested for water contents. Grain size analyses of nine (9) selected soil samples were conducted and the results are presented on **Drawing 7** and **Drawing 8**. Atterberg Limits testing of two (2) selected soil samples was conducted and the results are presented on the borehole logs.

Water level observations were made during drilling and in the open boreholes at the completion of the drilling operations. Monitoring wells were installed at all borehole locations (BH24-1 to BH24-5) for groundwater table monitoring and hydrogeological study.

The elevation surveying of the borehole/well locations was undertaken by DS personnel, using the differential GPS unit. It should be noted that the elevations at the as-drilled borehole/well locations were not provided by a professional surveyor and should be considered approximate. Contractors performing any work referenced to the borehole elevations should confirm the borehole elevations for their work.

3. SITE AND SUBSURFACE CONDITIONS

The site is located at the northwest quadrant of Markham Road and Brimorton Drive in the City of Toronto. The municipal address of the site is 1050 Markham Road, Toronto, Ontario.

The borehole location plan is shown on **Drawing 1**. General notes on sample description are provided on **Drawing 1A**. The subsurface conditions in the boreholes are presented in the individual borehole logs on **Drawing 2** to **Drawing 6**. Generalized Sub-Surface Profile of the site is presented on **Drawing 9**.

The following is a summarized account of the subsurface conditions encountered in the boreholes, followed by more detailed descriptions of the major soil strata and the groundwater conditions encountered in the boreholes drilled at the site.

3.1 Soil Conditions

In summary, underlying the topsoil, fill materials were encountered in all boreholes and extended to depths ranging from about 1.5 m to 4.6 m below existing ground surface. The native soils encountered at the site consisted mainly of clayey silt till underlying by sandy silt to silty sand till. Silty sand and silt to clayey silt were encountered in varying depths in some boreholes.

Topsoil

A layer of topsoil, varying in thickness from 150 to 400 mm, was present at the surface of all boreholes. Buried topsoil was also found at a deeper depth of 1.5 to 2.3 m in borehole BH24-3 and at a deeper depth of 2.5 to 3.2 m in borehole BH24-5.

It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site. Test-pits in the close distance should be carried out to further explore the topsoil conditions.

Fill Materials:

Fill materials consisting of clayey silt and sandy silt to silty sand were encountered in all boreholes and extended to depths ranging from about 1.5 to 4.6 m below existing ground surface. These materials typically contain trace to some organic matter. Buried topsoil was found at a depth of 1.5 to 2.3 m within the fill materials in borehole BH24-3 and at a depth of 2.5 to 3.2 m in borehole BH24-5. Standard penetration tests (SPT) carried out within the clayey silt gave N values ranging from 5 to 15 blows per 0.3 m penetration, indicating a firm to stiff consistency. SPT carried out within the sandy silt to silty sand gave N values ranging from 4 to 25 blows per 0.3 m penetration, indicating a loose to compact state.

Clayey Silt Till:

Clayey silt till deposit was encountered in all boreholes and extended to depths ranging from 3.1 to 10.7 m below existing ground surface. The clayey silt till deposit was present in a firm to hard consistency, with measured SPT ‘N’ values ranging from 7 to 35 blows per 300 mm of penetration. Cobbles/boulders were inferred within the clayey silt till deposits as evidence of auger grinding during drilling.

Grain size analyses of two (2) soil samples from clayey silt till (BH24-1/SS4 and BH24-2/SS5) were conducted and the results are provided on the respective borehole logs and on **Drawing 7**, with the following fractions:

Clay:	13%
Silt:	35 to 38%
Sand:	42 to 44%
Gravel:	5 to 10%

Atterberg limits tests of the same samples (BH24-1/SS4 and BH24-2/SS5) were conducted. The results are shown on the borehole logs.

Sandy Silt to Silty Sand Till:

Sandy silt to silty sand till deposits were encountered in all boreholes and extended to depths ranging from 12.3 to 24.5 m below existing ground surface. Boreholes BH24-2, BH24-3 and BH24-5 were terminated in the sandy silt to silty sand till. The sandy silt to silty sand till was present in a loose to very dense state, with measured SPT 'N' values of 6 to over 50 blows per 300 mm of penetration. Cobbles/boulders were inferred within the sandy silt till deposits during drilling.

Grain size analysis of five (5) sandy silt to silty sand till samples (BH24-1/SS12, BH24-2/SS8, BH24-3/SS7, BH24-4/SS5 and BH24-5/SS8) was conducted and the results are provided on the respective borehole logs and on **Drawing 7** and **Drawing 8**, with the following fractions:

Clay:	10 to 12%
Silt:	36 to 65%
Sand:	20 to 49%
Gravel:	1 to 6%

Silty Sand:

Silty sand was encountered in boreholes BH24-1, BH24-3 and BH24-4, extending to depths of 20.0 to 22.9 m below existing grade. Boreholes BH24-1 and BH24-4 were terminated in the silty sand. The silty sand was present in a very dense state, with measured SPT 'N' values of over 50 blows per 300 mm of penetration.

Grain size analysis of one (1) silty sand sample (BH24-4/SS15) was conducted and the results are provided on the respective borehole log and on **Drawing 8**, with the following fractions:

Clay:	5%
Silt:	28%
Sand:	59%
Gravel:	8%

Silt to Clayey Silt:

Silt to clayey silt was encountered at a depth of 12.2 to 13.5 m in borehole BH24-3. The silt to clayey silt was present in a very dense state, with measured SPT 'N' values of over 50 blows per 300 mm of penetration.

3.2 Groundwater Conditions

Groundwater levels were generally recorded on March 5, 2024, at depths ranging from 3.5 to 4.5 m below existing ground surface, corresponding to elevations Elev. 156.4 to 156.7 m. In the deep wells installed in BH24-1 and BH24-4, the groundwater levels were measured at depths of 8.9 to 11.8 m (Elev. 149.5 to 150.4 m). The groundwater levels measured in the monitoring wells are summarized in **Table 1**.

Table 1: Summary of Groundwater Level Measurements in Monitoring Wells

Borehole No.	Ground Surface Elev. (m)	Date of Observation	Depth of Groundwater (m)	Elevation of Groundwater (m)
BH24-1	161.3	Mar. 5, 2024	11.8	149.5
BH24-2	161.0	Mar. 5, 2024	4.5	156.5
BH24-3	160.2	Mar. 5, 2024	3.5	156.7
BH24-4	159.3	Mar. 5, 2024	8.9	150.4

BH24-5	160.2	Mar. 5, 2024	3.8	156.4

Further measurements of groundwater levels in the monitoring wells are recommended.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events. Refer to hydrogeological study for more information regarding the measurements of groundwater levels at the site.

4. FOUNDATIONS

The number of storeys and sizes of the proposed high-rise buildings are unknown to us when preparing this report. The levels of underground parking are currently contemplated to be 2 to 4 (P2 to P4). The following recommendations for foundations are considered preliminary and must be further reviewed and amended as necessary once more detail design information is available. Additional boreholes are required for the final design of foundations.

Based on borehole information, conventional strip/spread footings and raft foundations founded on the competent undisturbed dense to very dense native soils can be designed for a bearing capacity value of 500 kPa at the Serviceability Limit States (SLS) and for factored geotechnical resistance of 750 kPa at the Ultimate Limit States (ULS). Soil bearing resistance and founding depths/elevations are presented in **Table 2**.

Table 2: Bearing Values and Founding Levels of conventional Strip/Spread Footings and Raft Foundations in Native Soils

BH No.	Ground Surface Elevation At Borehole (m)	Bearing Capacity at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Depth below Existing Ground (m)	Founding Level at or below Elevation (m)
BH24-1	161.3	500	750	10.7	150.6
BH24-2	161.0	500	750	10.0	151.0
BH24-3	160.2	500	750	12.2	148.0
BH24-4	159.3	500	750	10.7	148.6
BH24-5	160.2	500	750	12.2	148.0

As indicated in **Table 2**, the competent (dense to very dense) native soils suitable for supporting shallow foundations (footings and rafts) are at depths ranging from 10.0 to 12.2 m below existing ground surface.

For proposed buildings with 3 to 4 levels of basement, footings (or extended footings) and raft foundations can be adopted to support the structures for bearing capacity values of 500 kPa at SLS and 750 kPa at ULS, at depths/elevations indicated in **Table 2**.

For proposed buildings with 2 levels of basement, deep foundations (CFA piles) will be required to support the structures.

Based on the boreholes, CFA piles of 0.6 m in diameter, to be installed minimum 7 m into the very dense cohesionless (sandy) deposits (i.e. pile tip to Elev. 141 m), can be designed for bearing capacity of 1500 kN/pile at SLS (2100 kN/pile at ULS). Higher bearing capacity values may be available for deeper CFA piles, to be confirmed by additional deep boreholes.

The actual bearing resistance and required length of the piles must be determined by field load tests, prior to the installation of the production piles. The test piles must be loaded to at least 1.67 times the design load at ULS.

It is assumed that the horizontal spacing between adjacent CFA piles is at least 3 times the pile diameter. For more closely spaced CFA piles, group effect on the bearing capacity must be considered.

The bearing resistances of CFA piles will be highly dependent on the contractor's experience, the quality and procedure of the pile installation, and the skills of the installation operator(s). The CFA contractor must review the borehole information and evaluate bearing capacity of the piles based on their experience. The quality and the design bearing resistance of the piles must be ensured by the CFA contractor. A specialty contractor should be retained to design and install the CFA piles based on the performance specification and design bearing resistances.

Prior to the pile construction, the contractor should submit the details of the installation plan, load test program, installation procedure, automated monitoring system and control parameters, grout/concrete mix design, and reinforcement installation etc. for the review by the structural engineer and the geotechnical engineer. All pile installation must be inspected by this office.

All footings and pile caps exposed to seasonal freezing conditions must have at least 1.2 metres of soil cover for frost protection.

Foundations designed to the specified bearing capacity at the serviceability limit states (SLS) are expected to settle less than 35 mm total and 25 mm differential.

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

It should be noted that the recommended bearing capacities have been calculated by DS Consultants Ltd. from the borehole information for the preliminary design stage only. The investigation and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by DS Consultants Ltd. to validate the information for use during the construction stage.

5. FLOOR SLAB AND PERMANENT DRAINAGE

Refer to DS's hydrogeological investigation for the feasibility of installation permanent underfloor drainage and perimeter drainage. If it is not feasible to install permanent underfloor and perimeter drainages based on the City of Toronto's Foundation Drainage Policy ("FDP"; November 1, 2021), tanked basement structures can be considered. The tanked basement structures must be designed to resist hydrostatic pressure, with a raft foundation at the base.

A moisture break consisting of at least 200 mm of 19 mm clear crushed stone should be installed under the floor slab.

6. EARTH AND WATER PRESSURES

The lateral earth and water pressure acting at any depth on basement walls can be calculated as follows:

In soils above the groundwater table ($z < d_w$):

$$p = K (\gamma z + q)$$

In soils below the groundwater table ($z \geq d_w$):

$$p = K \{\gamma d_w + \gamma_1 (z - d_w) + q\} + p_w$$

$$\text{In which, } p_w = \gamma_w (z - d_w)$$

where p = lateral earth and water pressure in kPa acting at a depth of z below ground surface
K = earth pressure coefficient, $K = 0.40$ for basement walls
γ = unit weight of soil above groundwater table, assuming $\gamma = 21$ kN/m^3
γ_1 = submerged unit weight of soil below groundwater table, assuming $\gamma_1 = 11$ kN/m^3
γ_w = unit weight of water, assuming $\gamma_w = 9.8$ kN/m^3
z = depth below ground surface to point of interest, in metres
d_w = depth of groundwater table below ground surface, in metres
q = value of surcharge in kPa
p_w = hydrostatic water pressure in kPa

When the basement wall is poured against the shoring caisson wall, the basement wall as well as the shoring caisson wall should be designed for hydrostatic pressure.

7. EXCAVATION, GROUNDWATER CONTROL AND BACKFILL

Excavations can be carried out with heavy hydraulic backhoe. Cobbles and boulders are present at the site as evidence of auger grinding. Provisions should be provided in the contractor documents to deal with the boulders and cobbles in the glacial tills and possible obstructions in the fill materials at the site.

Groundwater levels were generally recorded on March 5, 2024, at depths ranging from 3.5 to 4.5 m below existing ground surface, corresponding to elevations Elev. 156.4 to 156.7 m, except for the deep wells installed in BH24-1 and BH24-4. Refer to hydrogeological study for more information regarding the measurements of groundwater levels at the site.

Groundwater seepage within the clayey silt till is expected to be slow and manageable by gravity drainage and pumping from filtered sumps. More significant groundwater seepage/inflow would be expected from the cohesionless sandy silt to silty sand (till) and silt below groundwater table. Positive dewatering will be required for excavation into the cohesionless sandy silt to silty sand (till) and silt deposits below groundwater table. The groundwater must be lowered to at least 1.0 m below the excavation bases.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, fills and firm to stiff clayey silt till can be classified as Type 3 Soil above groundwater table and Type 4 Soil below groundwater table. Very stiff to hard clayey silt till deposits can be classified as Type 2 Soil above groundwater table and Type 3 Soil below groundwater table. Cohesionless sandy silt to silty sand (till) and silt can be classified as Type 3 Soil above groundwater table and Type 4 Soil below groundwater table.

DS is carrying out the hydrogeology study at the subject site. More comments regarding the type and extent of groundwater control required will be provided in the hydrogeology report.

The native soils free from topsoil and organics can be used as general construction backfill, provided its moisture content is within 2 percent of the optimum moisture content. Loose lifts of soil, which are to be compacted, should not exceed 200 mm. Depending on the time of construction and weather, some excavated material may be too wet to compact and will require aeration prior to its use.

Imported granular fill, which can be compacted with handheld equipment, should be used in confined areas. The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill such as OPSS Granular B should be used.

It should be noted that the excavated soils are subject to moisture content increase during wet weather which would make these materials too wet for adequate compaction. Stockpiles should be compacted at the surface or be covered with tarpaulins to minimize moisture uptake.

8. TEMPORARY SHORING

The proposed excavation for buildings with basements may be supported by a temporary shoring system consisting of timber lagging and soldier piles. A caisson wall may be required to support adjacent structures (e.g. surrounding buildings and utilities). The requirement for caisson walls to support adjacent structures is given on **Drawing 9**.

The shoring system must be designed in accordance with the 4th Edition of the Canadian Foundation Engineering Manual. The surcharge loading from adjacent structures must be considered. The soil parameters estimated to be applicable for this design are as follows:

1) Earth Pressure Coefficient for shoring:
   (a) where movement must be minimal K=0.45
   (b) where minor movement (.002H) can be tolerated K=0.30
   (c) passive earth pressure for soldier piles (unfactored) K_p=3.0 for compact to dense and stiff to hard soils.

2) For stability check

   $\phi = 30^\circ$

   C = 0

   $\gamma = 21$ kN/m^3

   surcharge is to be determined by shoring contractor.

3) For anchors

   A bond stress of 50 kPa can be used for post-grouted anchors in very stiff to hard or compact to very dense soil.

The bond value is for preliminary design purpose. The actual bond values will depend on anchor installation methods and grouting procedures. Gravity poured concrete can result in low bond values while pressure grouted anchors will give higher values and produce a more satisfactory anchor.

Casing will be required during the construction of the tiebacks to prevent caving of soils. The soldier piles should be installed in pre-augered holes taken below the deepest excavation. The holes should be filled with concrete below the excavation level and half bag mix above the base of the excavation. The concrete strength must be specified by the shoring designer. Temporary liners may be required to help prevent caving during the installation period. Positive measures may be required to prevent the loss of soil through the spaces between the lagging boards. This could probably be achieved by placing well-graded sand and gravel behind the lagging boards or by installing a geotextile filter cloth.

Soil anchors will be required to support the shoring. The anchors must be of a length that meets the Canadian Foundation Manual recommendations. It is important to note that the minimum length lies beyond the 45 - ϕ/2 + .15H line drawn from the base of the soldier pile and the overall stability of the system must be checked at each anchor level, where H is the shoring height.

The top anchor must not be placed lower than 3.0 meters below the top of level ground surface. Anchors will require casing when penetrating through wet sand and silt layers. The bond value of 50 kPa in very stiff to hard or compact to very dense soils are suggested but these values are preliminary since the contractor's installation procedures will determine the actual soil to concrete bond value. Hence, the contractor must decide on a capacity and confirm its availability. All anchors must be tested as indicated in the Foundation Manual, 4th edition.

Adhesion on the buried caisson shaft or behind the shoring system must be neglected when designing this shoring system.

Movement of the shoring system is inevitable. Vertical movements will result from the vertical load on the soldier piles resulting from the inclined tiebacks and inward horizontal movement results from earth and water pressures. The magnitude of this movement can be controlled by sound construction practices, and it is anticipated that the horizontal movement will be in the range of 0.1 to 0.25%H.

To ensure that movements of the shoring are within an acceptable range, monitoring must be carried out. Vertical and horizontal targets on the soldier piles must be located and surveyed before excavation begins. Weekly readings during excavation should show that the movements will be within those predicted; if not, the monitoring results will enable directions to be given to improve the shoring.

9. EARTHQUAKE CONSIDERATIONS

Based on the borehole information and according to Table 4.1.8.4.A of OBC 2012, the seismic site response for the proposed buildings can be classified as follows:

- "Class D" for proposed buildings with 2 levels of underground parking.
- "Class D" for proposed buildings with 3 levels of underground parking. It may be possible to classify the site as "Class C" for buildings with 3 levels of underground parking , provided additional deep boreholes and field seismic shear wave velocity survey are to be carried out to confirm the "Class C" classification.
- "Class C" for proposed buildings with 4 levels of underground parking, to be confirmed by final geotechnical investigation with additional deep boreholes.

10. PAVEMENTS

The recommended pavement structures provided in **Table 3** are based upon an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples. The values may need to be adjusted based on the city standards. Consequently, the recommended pavement structures should be considered for preliminary design purposes only. A functional design life of eight to ten years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific data input from the client.

Table 3: Recommended Pavement Structure Thickness

Pavement Layer	Compaction Requirements	Light Duty Parking (Cars)	Heavy Duty Parking/Driveway (Delivery Trucks)
Asphaltic Concrete	92.0 to 96.5% Maximum Relative Density (MRD)	40 mm HL 3 or SP 12.5 40 mm HL 8 or SP 19.0	40 mm HL 3 or SP 12.5 80 mm HL 8 or SP 19.0
OPSS Granular A Base (or 19mm Crusher Run Limestone)	100% SPMDD*	150 mm	150 mm
OPSS Granular B (or 50mm Crusher Run Limestone)	100% SPMDD	250 mm	350 mm

The subgrade must be compacted to 98% SPMDD for at least the upper 500 mm unless accepted by DS Consultants Ltd.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening. This is particularly important in heavy-duty pavement areas.

Additional comments on the construction of parking areas and access roadways are as follows:

1) As part of the subgrade preparation, proposed parking areas and access roadways should be stripped of topsoil and other obvious objectionable material. Fill required to raise the grades to design elevations should conform to backfill requirements outlined in previous sections of this report. The subgrade should be properly shaped, crowned then proof-rolled in the full-time presence of a representative of this office. Soft or spongy subgrade areas should be sub-excavated and properly replaced with suitable approved backfill compacted to 98% SPMDD.

2) The locations and extent of sub-drainage required within the paved areas should be reviewed by this office in conjunction with the proposed lot grading. Assuming that satisfactory crossfalls in the order of two percent have been provided, subdrains extending from and between catch basins may be satisfactory. In the event that shallower crossfalls are considered, a more extensive system of sub-drainage may be necessary and should be reviewed by DS Consultants Ltd.

3) The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted access lanes, half-loads

during paving, etc., may be required, especially if construction is carried out during unfavourable weather.

It is recommended that DS Consultants Ltd. be retained to review the final pavement structure designs and drainage plans prior to construction to ensure that they are consistent with the recommendations of this report.

11. GENERAL COMMENTS AND LIMITATIONS OF REPORT

DS Consultants Ltd. (DS) should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, DS will assume no responsibility for interpretation of the recommendations in the report. The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to DS at the time of preparation. Unless otherwise agreed in writing by DS, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. DS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

DS CONSULTANTS LTD.

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Drawings

J:\2024 Projects\24-014-100 Geo - Hydro - Preliminary Investigations, 1050 Markham Road, Toronto, ON\Geotechnical\QGIS\1-QGIS\Figure 1 Borehole Location Plan.qgs Feb-29 10:50

Legend

🟥 Approx Site Boundary

● Monitoring Well

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Project: PRELIMINARY GEOTECHNICAL INVESTIGATION
1050 Markham Road, Toronto, ON

Title: **BOREHOLE LOCATION PLAN**

N

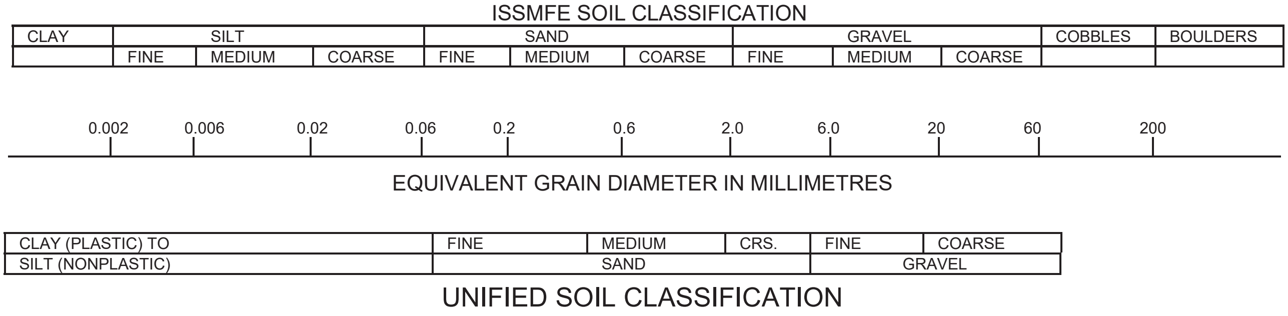
Client: CAPREIT

Size: 8.5 x 11	Approved By: D.W	Drawn By: K.T	Date: February 2024
Rev: 0	Scale: As Shown	Project No.: 24-014-100	Figure No.: 1

Image/Map Source: *Google Satellite Image*

Drawing 1A: Notes On Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by DSCL also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.



2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

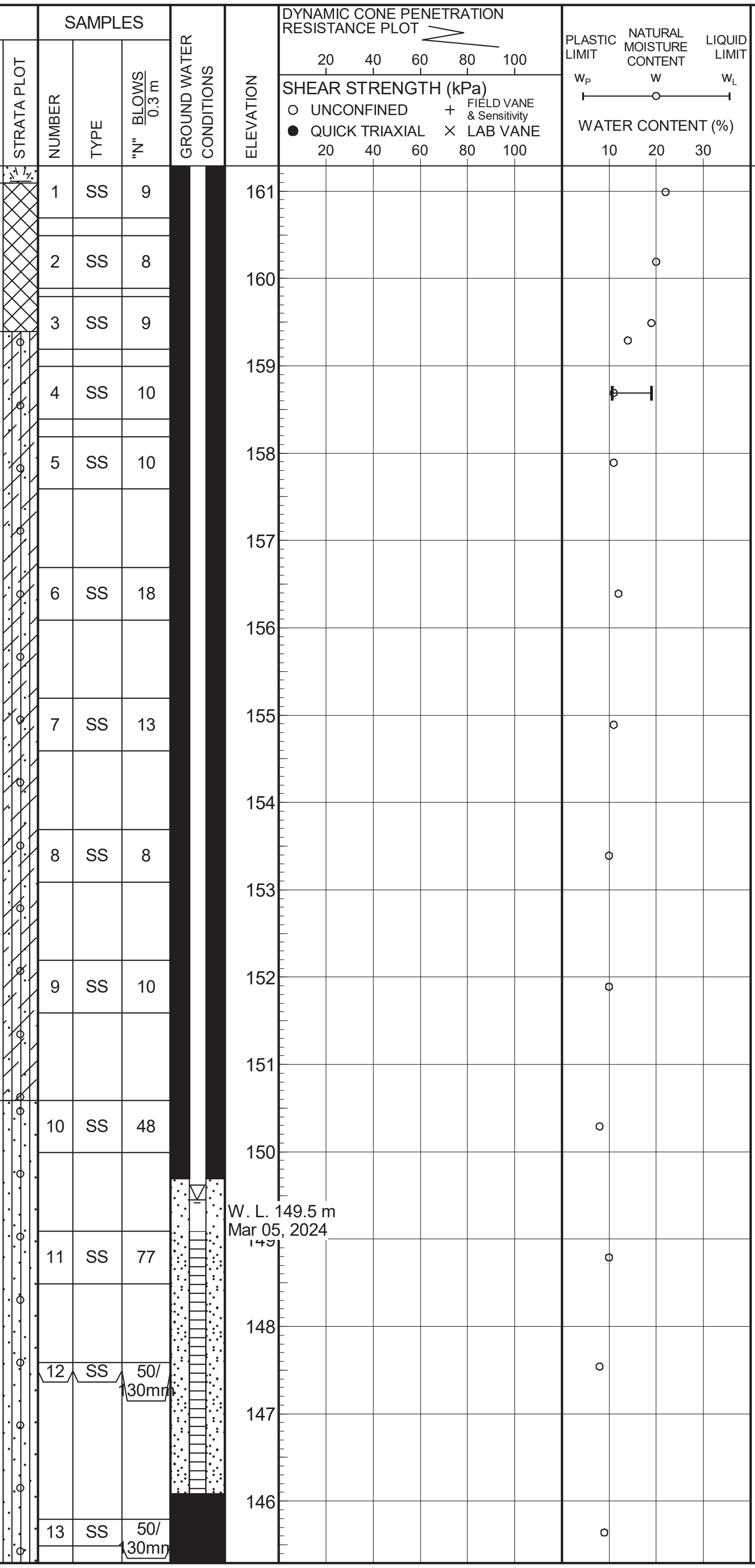
LOG OF BOREHOLE BH24-1

PROJECT: Preliminary Geotechnical Investigation
CLIENT: CAPREIT
PROJECT LOCATION: 1050 Markham Rd., Toronto, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4848287.86 E 642357.33

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Feb-07-2024

REF. NO.: 24-014-100
ENCL NO.: 2

SOIL PROFILE (m) ELEV DEPTH	DESCRIPTION	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3 m	GR	SA	SI	CL
161.3 161.1 0.0	**TOPSOIL:** 200mm							
0.2	**FILL:** sandy silt, trace organics, trace gravel, some clay, brown to dark brown, moist, loose	1	SS	9				
		2	SS	8				
		3	SS	9				
159.4 1.9	**CLAYEY SILT TILL:** sandy, trace gravel, brown, moist, stiff to very stiff	4	SS	10	5	44	38	13
		5	SS	10				
		6	SS	18				
		7	SS	13				
	grey below 7.6m	8	SS	8				
		9	SS	10				
150.6 10.7	**SANDY SILT TILL:** trace to some clay, trace gravel, grey, moist, dense to very dense	10	SS	48				
		11	SS	77				
		12	SS	50/ 130mm	6	34	48	12
		13	SS	50/ 130mm				



Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ∇ 2nd ▼ 3rd ▼ 4th ▼

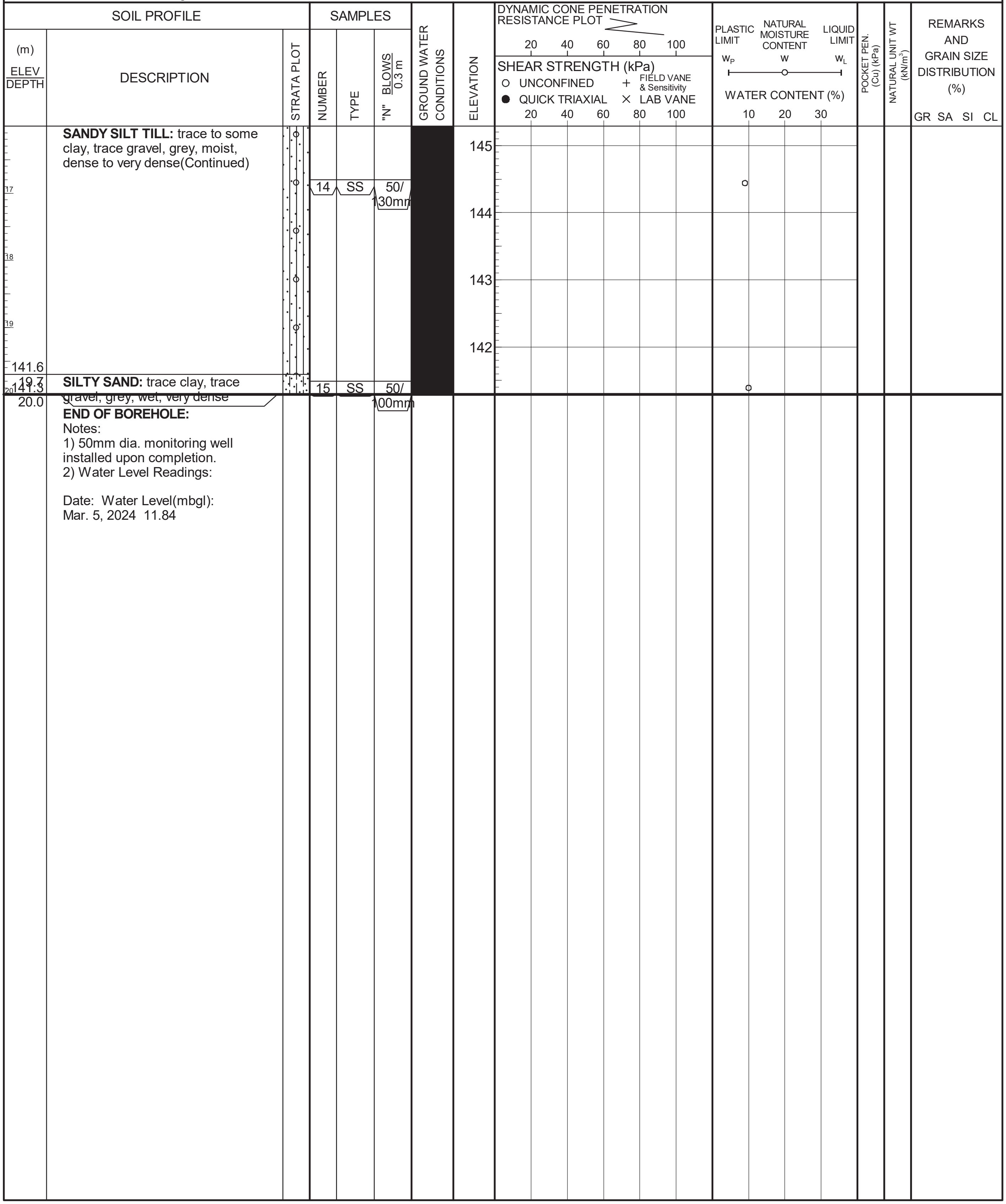
GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ 8=3% Strain at Failure

LOG OF BOREHOLE BH24-1

PROJECT: Preliminary Geotechnical Investigation
CLIENT: CAPREIT
PROJECT LOCATION: 1050 Markham Rd., Toronto, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4848287.86 E 642357.33

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Feb-07-2024

REF. NO.: 24-014-100
ENCL NO.: 2



SANDY SILT TILL: trace to some clay, trace gravel, grey, moist, dense to very dense(Continued)

141.6
19.7 **SILTY SAND:** trace clay, trace gravel, grey, wet, very dense

141.3
20.0 **END OF BOREHOLE:**

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date: Water Level(mbgl):
Mar. 5, 2024 11.84

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES $+^3, \times^3$: Numbers refer to Sensitivity ○ ^{8}=3% Strain at Failure

LOG OF BOREHOLE BH24-2

1 OF 1

PROJECT: Preliminary Geotechnical Investigation
CLIENT: CAPREIT
PROJECT LOCATION: 1050 Markham Rd., Toronto, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4848250.09 E 642364.78

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Feb-07-2024

REF. NO.: 24-014-100
ENCL NO.: 3

SOIL PROFILE

(m) ELEV / DEPTH	DESCRIPTION
161.0	
160.8 0.0	**TOPSOIL:** 200mm
0.2	**FILL:** clayey silt, trace organics, trace sand,, brown to dark brown, moist, firm to stiff layer of sand till at 2.3m
158.4 2.6	**CLAYEY SILT TILL:** sandy, trace to some gravel, brown to grey, moist, stiff to hard grey below 6.1m
153.5 7.5	**SILTY SAND TILL:** some clay, trace gravel, brown to grey, moist, loose
152.0 9.0	**SILTY SAND TILL:** some clay, trace gravel, brown to grey, moist, dense to very dense
148.7 12.3	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): Mar. 5, 2024 4.45

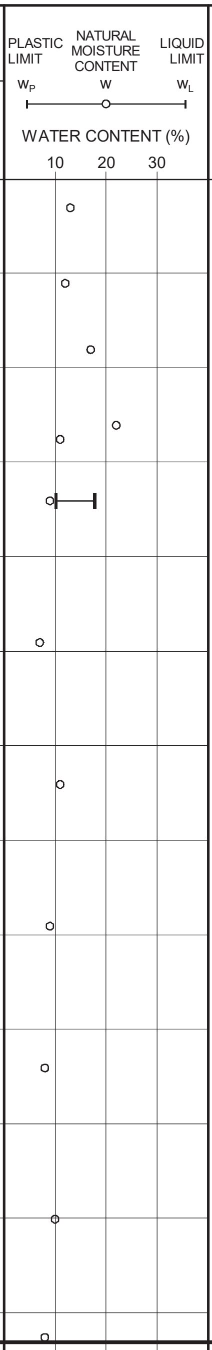
SAMPLES

NUMBER	TYPE	"N" BLOWS / 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
1	SS	7	
2	SS	12	
3	SS	5	
4	SS	14	
5	SS	18	10 42 35 13
6	SS	35	
7	SS	11	
8	SS	6	5 49 36 10
9	SS	32	
10	SS	84	
11	SS	50/ 130mm	

GROUND WATER CONDITIONS: W. L. 156.5 m Mar 05, 2024

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE: 20 40 60 80 100



POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ 8 =3% Strain at Failure

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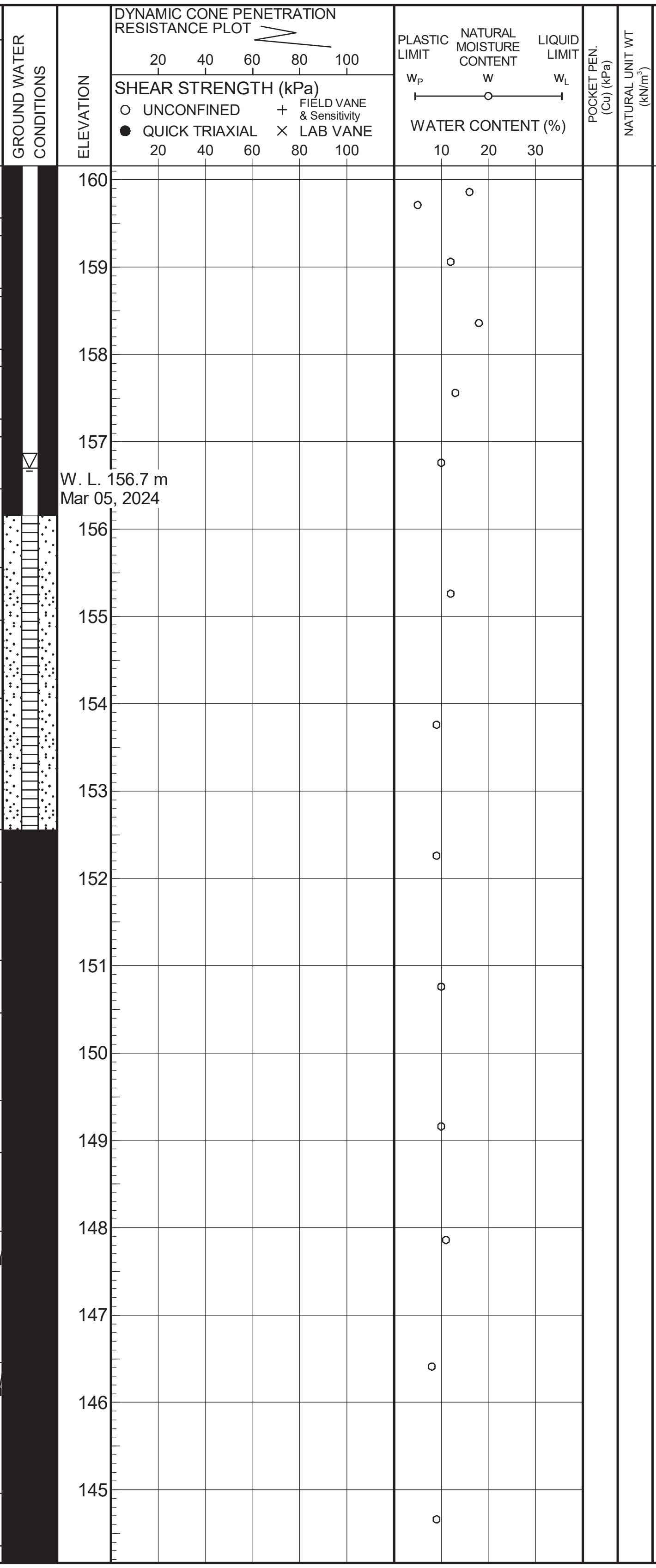
LOG OF BOREHOLE BH24-3

PROJECT: Preliminary Geotechnical Investigation
CLIENT: CAPREIT
PROJECT LOCATION: 1050 Markham Rd., Toronto, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4848253.63 E 642330.99

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Feb-12-2024

REF. NO.: 24-014-100
ENCL NO.: 4

SOIL PROFILE		SAMPLES			REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m	GR	SA	SI	CL
160.2								
160.0 0.0	**TOPSOIL:** 200mm							
0.2	**FILL:** silty sand, gravelly, grey, moist, compact	1	SS	25				
159.4 0.8	**FILL:** silty sand to sandy silt, trace rootlets, some clay, trace organics, dark brown to brown, moist, loose	2	SS	6				
158.7 1.5	**TOPSOIL:**	3	SS	10				
157.9 2.3	**FILL:** clayey silt, trace organics, brown, moist, firm	4	SS	5				
157.2 3.0	**CLAYEY SILT TILL:** sandy, trace gravel, trace cobbles/boulders, brown, sand seams, moist, very stiff	5	SS	21	Switched to Mud rotary			
	grey below 4.6m	6	SS	16				
154.2 6.0	**SILTY SAND TO SANDY SILT TILL:** some clay, trace gravel, grey, moist, loose to compact	7	SS	8	4	44	40	12
	wet sand layer at 7.6m	8	SS	14				
		9	SS	12				
		10	SS	19				
148.0 12.2	**SILT TO CLAYEY SILT:** trace sand, trace gravel, grey, moist, very dense	11	SS	50/ 50mm				
146.7 13.5	**SANDY SILT TILL:** trace to some clay, trace gravel, grey, moist, very dense	12	SS	50/ 75mm				
	clayey at 15.2m	13	SS	88				



Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES $+^3, \times^3$: Numbers refer to Sensitivity ○ ^{8}=3% Strain at Failure

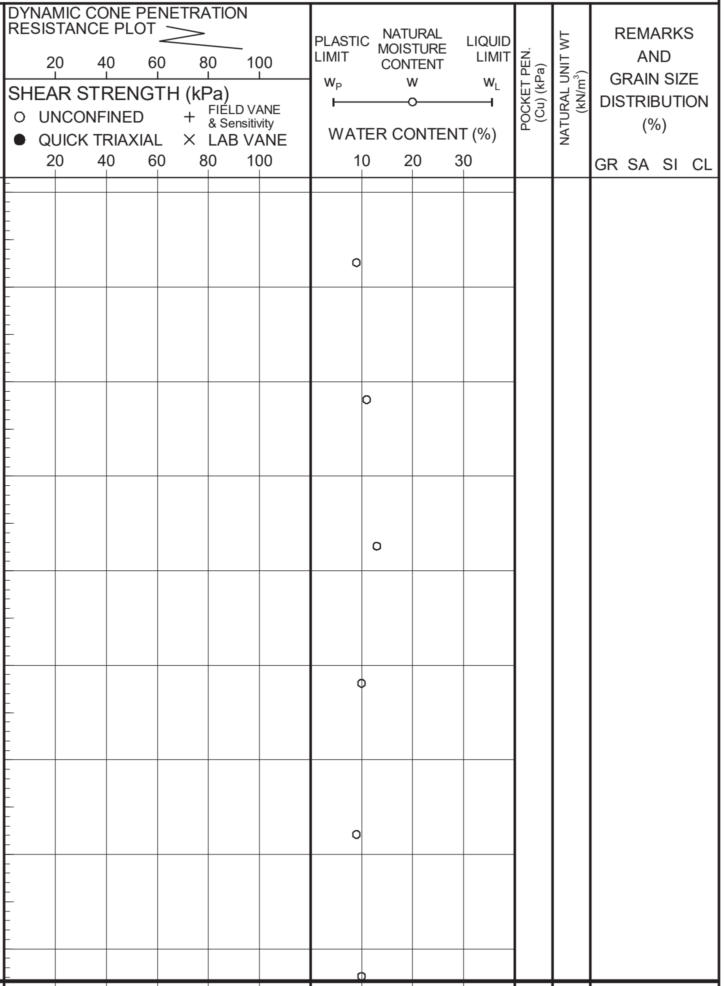
LOG OF BOREHOLE BH24-3

PROJECT: Preliminary Geotechnical Investigation
CLIENT: CAPREIT
PROJECT LOCATION: 1050 Markham Rd., Toronto, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4848253.63 E 642330.99

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Feb-12-2024

REF. NO.: 24-014-100
ENCL NO.: 4

SOIL PROFILE (m) ELEV DEPTH	DESCRIPTION	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION
	SANDY SILT TILL: trace to some clay, trace gravel, grey, moist, very dense(Continued) very moist to wet below 16.5m	14 15	SS SS	50/75mm 50/130mm		144 143 142 141
140.4 19.8	**SILTY SAND:** trace clay, trace gravel, grey, wet, very dense gravelly at 21.3m	16 17	SS SS	50/50mm 50/25mm		140 139 138
137.3 22.9	**SANDY SILT TILL:** trace clay, trace gravel, grey, moist, very dense	18 19	SS SS	50/25mm 50/50mm		137 136
135.7 24.5	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): Mar. 5, 2024 3.46					



GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+³, ×³: Numbers refer to Sensitivity
○ ³=3% Strain at Failure

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LOG OF BOREHOLE BH24-4

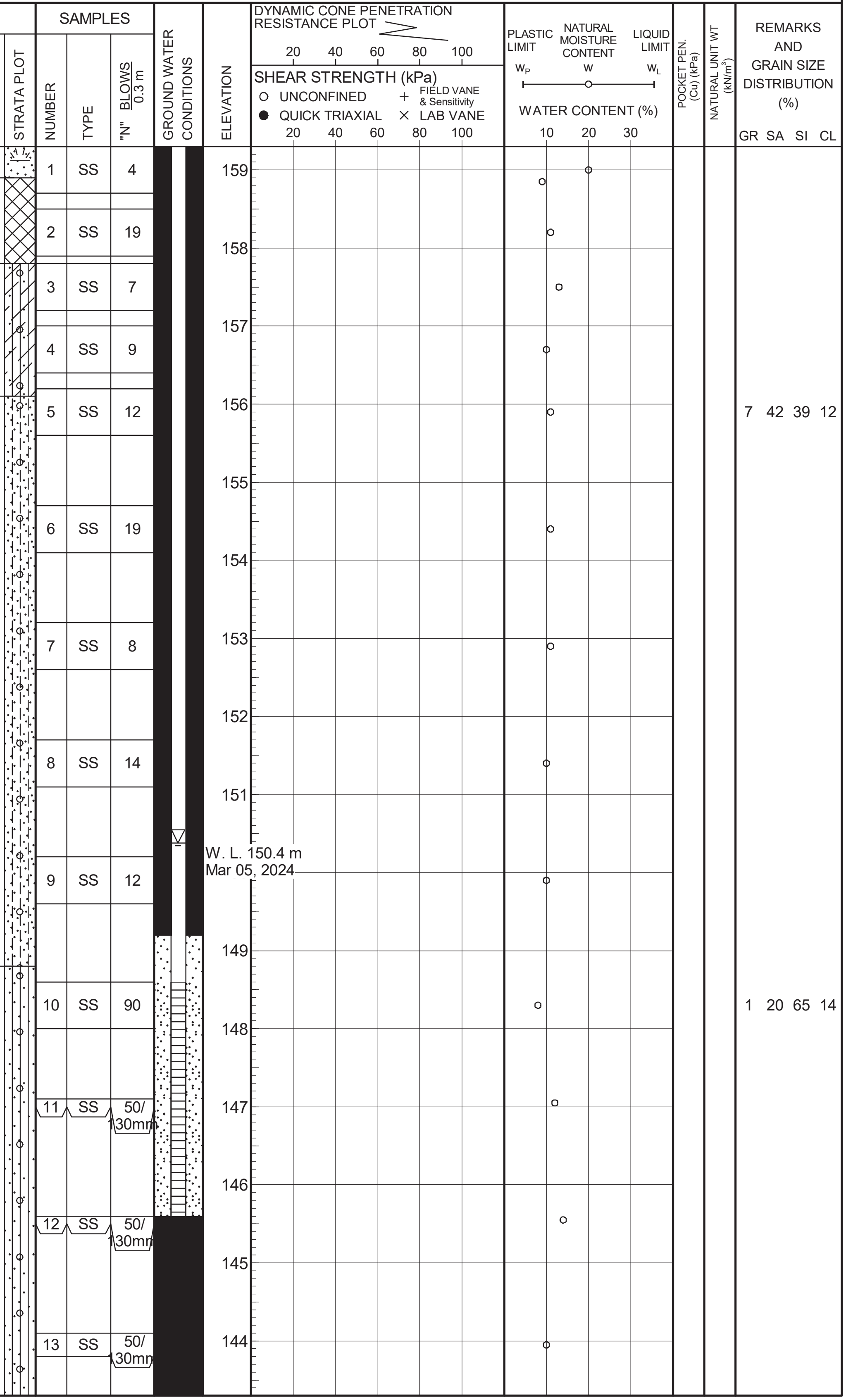
PROJECT: Preliminary Geotechnical Investigation
CLIENT: CAPREIT
PROJECT LOCATION: 1050 Markham Rd., Toronto, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4848224.55 E 642301.72

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-09-2024

REF. NO.: 24-014-100
ENCL NO.: 5

(m) ELEV DEPTH	SOIL PROFILE DESCRIPTION
159.3	
0.0	**TOPSOIL:** 400mm
158.9 0.4	**FILL:** sandy silt, trace organics, some clay, brown to dark brown, moist to wet, loose to compact
157.8 1.5	**CLAYEY SILT TILL:** sandy, trace gravel, brown to grey, moist, firm to stiff
156.1 3.2	**SILTY SAND TO SANDY SILT TILL:** some clay, trace gravel, grey, moist, loose to compact layer of wet gravelly sand at 4.0m
148.8 10.5	**SANDY SILT TILL:** trace to some clay, trace gravel, grey, moist, very dense layer of silty sand, wet at 13.7m

SAMPLES NUMBER	TYPE	"N" BLOWS/0.3 m	GR	SA	SI	CL
1	SS	4				
2	SS	19				
3	SS	7				
4	SS	9				
5	SS	12	7	42	39	12
6	SS	19				
7	SS	8				
8	SS	14				
9	SS	12				
10	SS	90	1	20	65	14
11	SS	50/ 130mm				
12	SS	50/ 130mm				
13	SS	50/ 130mm				



Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
$+^3, \times^3$: Numbers refer to Sensitivity
○ ^{8}=3% Strain at Failure

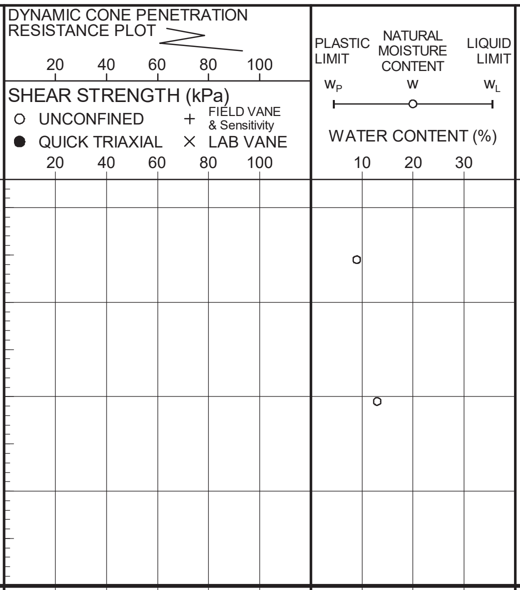
LOG OF BOREHOLE BH24-4

PROJECT: Preliminary Geotechnical Investigation
CLIENT: CAPREIT
PROJECT LOCATION: 1050 Markham Rd., Toronto, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4848224.55 E 642301.72

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-09-2024

REF. NO.: 24-014-100
ENCL NO.: 5

SOIL PROFILE		SAMPLES			ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m		GR	SA	SI	CL
	SANDY SILT TILL: trace to some clay, trace gravel, grey, moist, very dense(Continued)	14	SS	50/ 100mm	143 142				
141.0 18.3	**SILTY SAND:** trace clay, trace gravel, grey, wet, very dense	15	SS	50/ 130mm	141 140	8	59	28	5
		16	SS	50/ 130mm					
139.0 20.3	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): Mar. 5, 2024 8.92				139				



GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ 8=3% Strain at Failure

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LOG OF BOREHOLE BH24-5

1 OF 1

PROJECT: Preliminary Geotechnical Investigation
CLIENT: CAPREIT
PROJECT LOCATION: 1050 Markham Rd., Toronto, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4848256.3 E 642276.17

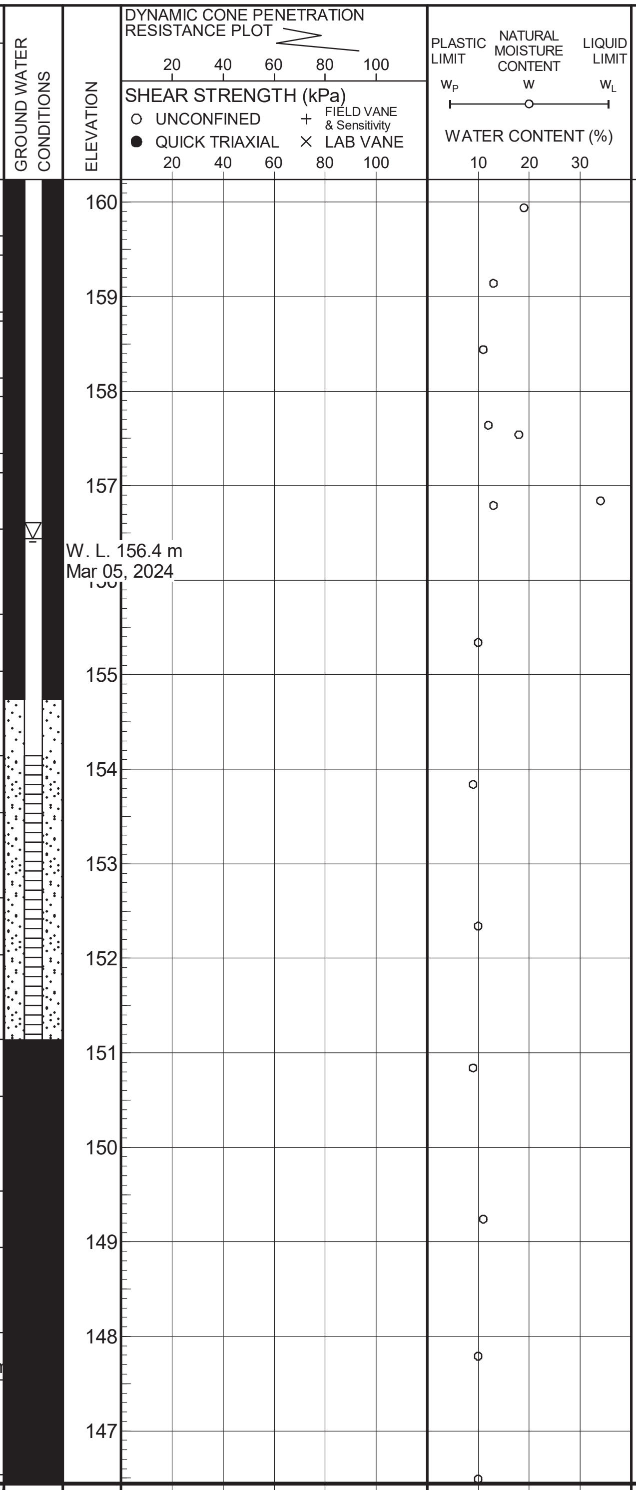
DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Feb-08-2024

REF. NO.: 24-014-100
ENCL NO.: 6

SOIL PROFILE		SAMPLES			REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m	GR	SA	SI	CL
160.2								
0.0	**TOPSOIL:** 150mm							
160.1 0.2	**FILL:** sandy silt, trace organics, trace gravel, some clay, brown to dark brown, moist, loose to compact	1	SS	5				
		2	SS	22				
	dark brown at 1.5m	3	SS	23				
157.7 2.5	**FILL:** topsoil	4	SS	12				
157.0 3.2	**FILL:** clayey silt, sandy, trace organics, dark grey, moist, stiff to very stiff	5	SS	15				
155.6 4.6	**CLAYEY SILT TILL:** sandy, trace gravel, brown to grey, moist, very stiff	6	SS	20				
	grey below 6.4m	7	SS	17				
152.6 7.6	**SANDY SILT TILL:** trace to some clay, trace gravel, grey, moist, compact	8	SS	16	3	41	44	12
		9	SS	14				
		10	SS	11				
	very dense below 12.2m	11	SS	50/140mm				
146.4 13.8	**END OF BOREHOLE:**	12	SS	50/130mm				

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date: Water Level(mbgl):
Mar. 5, 2024 3.8

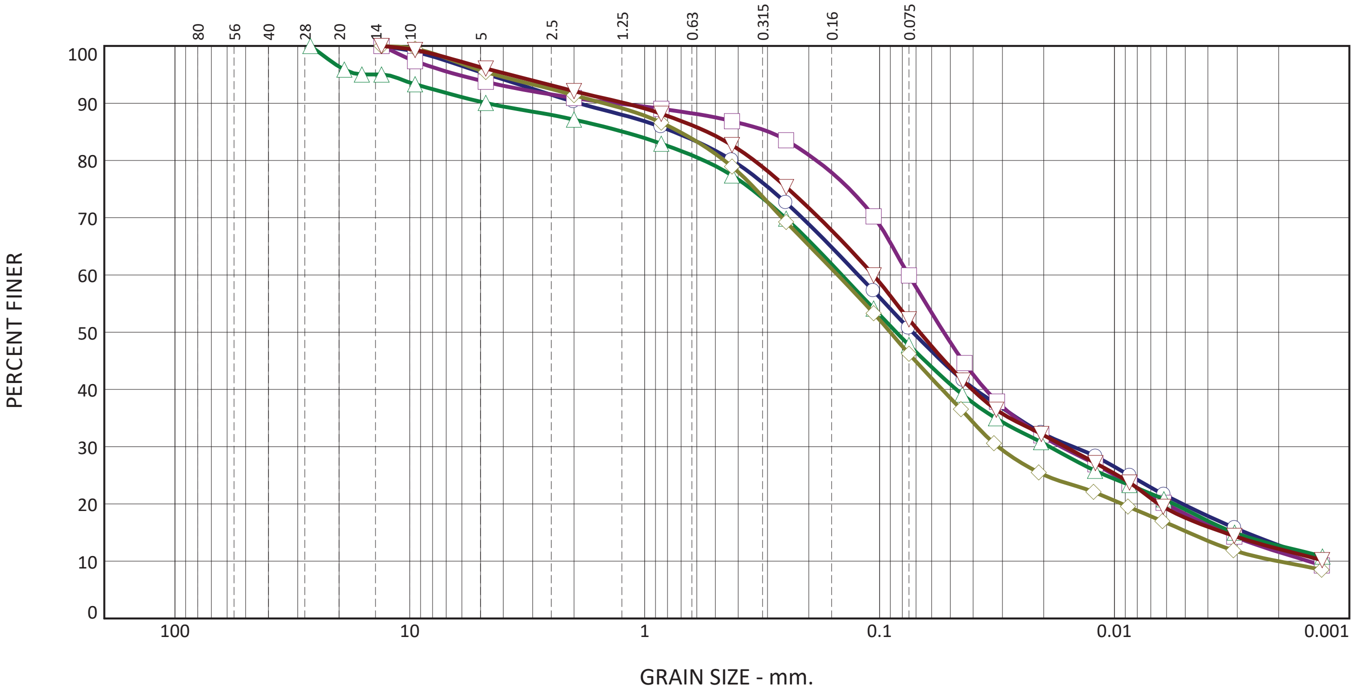


GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ 8=3% Strain at Failure

Particle Size Distribution Report

ASTM D422



	% +75mm	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	4.9	4.9	10.2	29.3	37.9	12.8
□	0.0	0.0	6.3	2.8	4.0	27.0	48.3	11.6
△	0.0	4.1	5.9	2.9	9.7	29.6	35.1	12.7
◇	0.0	0.0	4.6	4.0	12.5	32.7	36.2	10.0
▽	0.0	0.0	3.9	4.0	9.4	30.5	40.1	12.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	18.9	10.6	0.7528	0.1234	0.0723	0.0150	0.0028	0.0013	1.39	94.15
□			0.2956	0.0752	0.0533	0.0169	0.0034	0.0015	2.55	50.46
△	17.7	10.1	1.2314	0.1449	0.0849	0.0189	0.0031			
◇			0.7097	0.1508	0.0901	0.0313	0.0048	0.0020	3.22	74.98
▽			0.5426	0.1064	0.0675	0.0162	0.0034			

Material Description	USCS	AASHTO
○ Clayey silt till, sandy, trace gravel	CL	A-4(1)
□ Sandy silt till, some clay, trace gravel		
△ Clayey silt till, sandy, some gravel	SC	A-4(1)
◇ Silty sand till, some clay, trace gravel	SM	A-4(0)
▽ Silty sand till, some clay, trace gravel	ML	A-4(0)

Project No. 24-014-100 **Client:** CAPREIT

Project: Preliminary Geotechnical Investigation, 1050 Markham Rd., Toronto, ON

○**Location:** BH24-1 SS4	**Sample Number:** VM-5103
□**Location:** BH24-1 SS12	**Sample Number:** VM-5103
△**Location:** BH24-2 SS5	**Sample Number:** VM-5103
◇**Location:** BH24-2 SS8	**Sample Number:** VM-5103
▽**Location:** BH24-3 SS7	**Sample Number:** VM-5103

Remarks:

○F.M.=1.05

□F.M.=0.78

△F.M.=1.34

◇F.M.=1.08

▽F.M.=0.91

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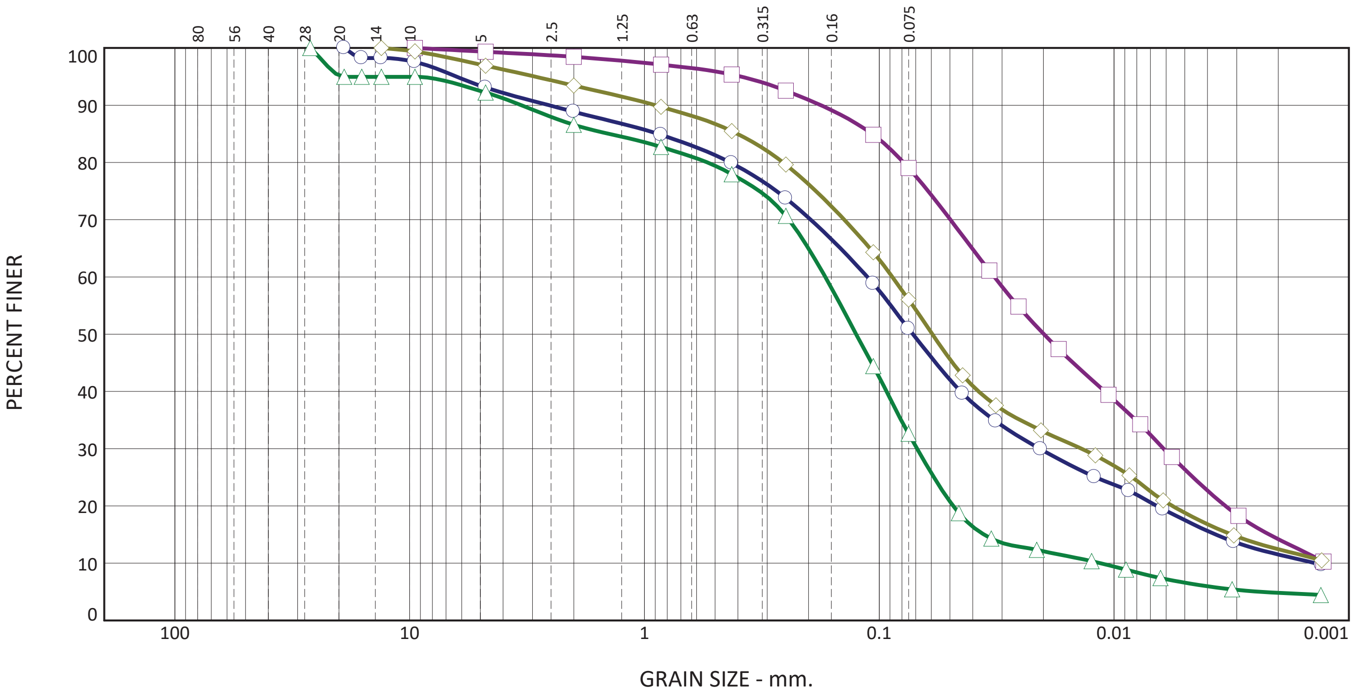
Figure 7

Tested By: Helen/Nisha **Checked By:** Jordan

Particle Size Distribution Report

ASTM D422



	% +75mm	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	6.9	4.2	9.0	29.0	39.4	11.5
□	0.0	0.0	0.7	0.9	3.0	16.4	64.8	14.2
△	0.0	5.0	2.8	5.6	8.7	45.3	27.8	4.8
◇	0.0	0.0	3.1	3.5	7.9	29.5	43.6	12.4

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.8767	0.1124	0.0719	0.0207	0.0037	0.0014	2.74	80.72
□			0.1074	0.0323	0.0199	0.0062	0.0022			
△			1.4177	0.1698	0.1255	0.0690	0.0358	0.0114	2.45	14.85
◇			0.4024	0.0880	0.0594	0.0137	0.0032			

Material Description	USCS	AASHTO
○ Silty sand till, some clay, trace gravel	ML	A-4(0)
□ Sandy silt till, some clay, trace gravel		
△ Silty sand, trace clay, trace gravel		
◇ Sandy silt till, some clay, trace gravel	ML	A-4(0)

Project No. 24-014-100 **Client:** CAPREIT

Project: Preliminary Geotechnical Investigation, 1050 Markham Rd., Toronto, ON

○**Location:** BH24-4 SS5 **Sample Number:** VM-5103

□**Location:** BH24-4 SS10 **Sample Number:** VM-5103

△**Location:** BH24-4 SS15 **Sample Number:** VM-5103

◇**Location:** BH24-5 SS8 **Sample Number:** VM-5103

Remarks:

○F.M.=1.09

□F.M.=0.26

△F.M.=1.35

◇F.M.=0.77

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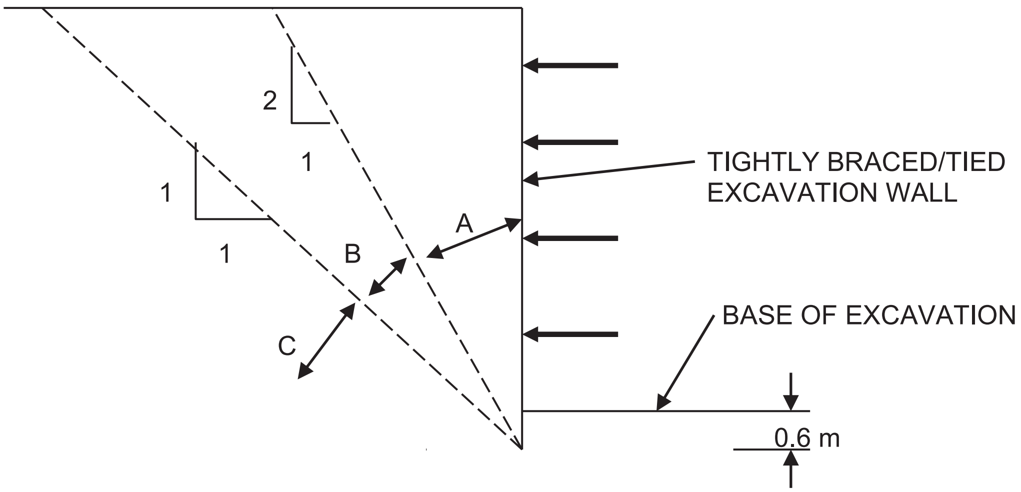
CCIL

Figure 8

Tested By: Helen/Nisha **Checked By:** Jordan

Guidelines for Underpinning in Soil and Excavation Support

Existing foundations located within Zone A normally require underpinning, especially for heavy structures. For some foundations in Zone A, it may be possible to eliminate underpinning and control foundation movement by tightly braced excavation walls, such as caisson walls.

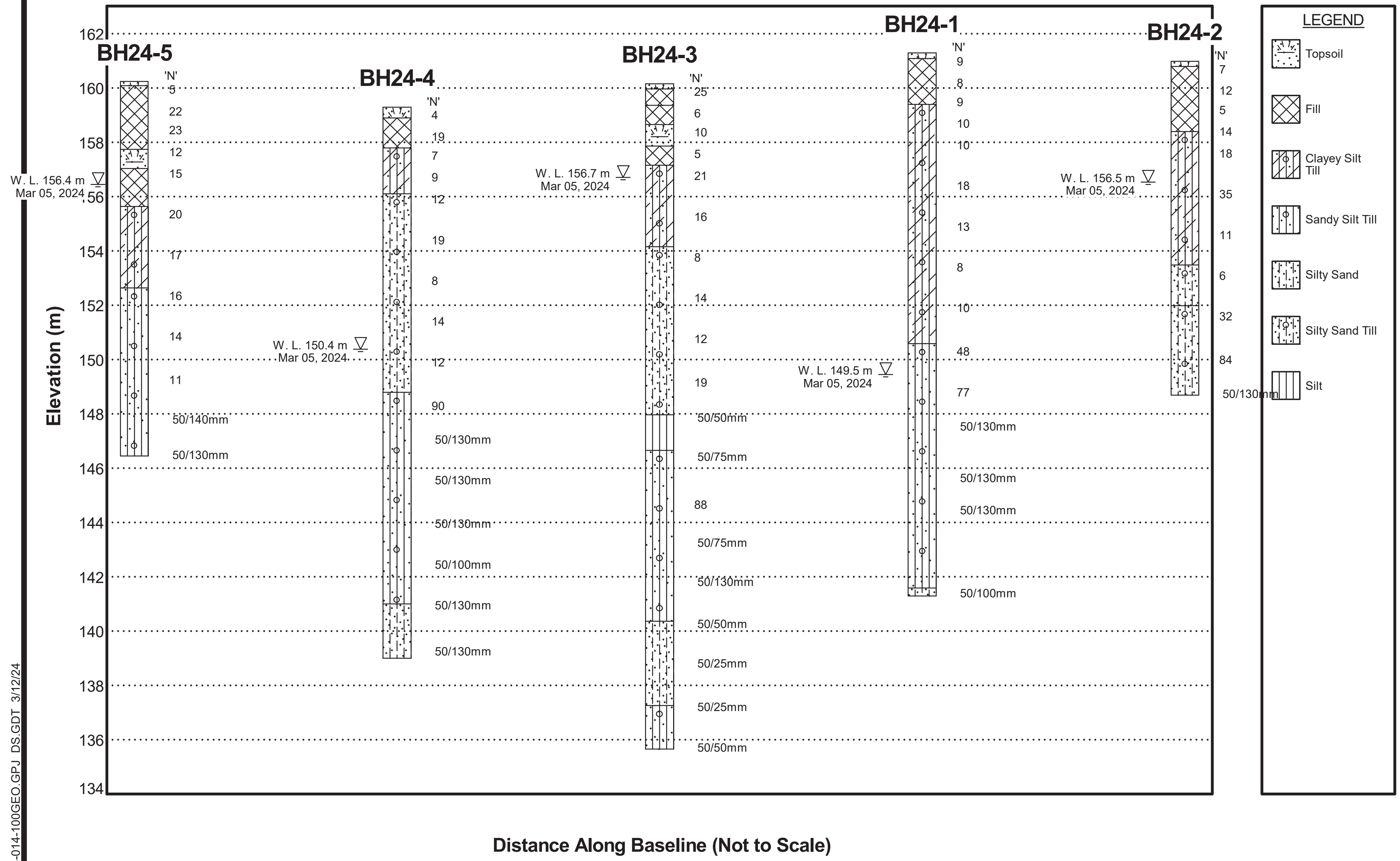


Zone A Foundations located within this zone normally require underpinning. Horizontal and vertical pressures on the excavation wall of non underpinned foundations must be considered

Zone B Foundations located within this zone normally do not require underpinning. Horizontal and vertical pressures on the excavation wall of non underpinned foundations must be considered

Zone C Underpinning to structures is normally founded in this zone. Lateral pressure from underpinning is not normally considered

(Reference: Figure 26.27 from Canadian Foundation Engineering Manual, 4th Edition)



DS FENCE (M) 24-014-100GEO.GPJ DS.GDT 3/12/24

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Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

Generalized Sub-surface Profile

DRAWING NO.	10
JOB NO.	24-014-100
DATE	March 12, 2024