Report on

Preliminary Geotechnical Investigation
Proposed Residential Development
3056 Neyagawa Boulevard
Oakville, Ontario

Prepared For:

NEATT Communities

Project No: 22-012-101
Date: August 17, 2023

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1. INTRODUCTION

DS Consultants Ltd (DS) was retained by NEATT Communities (the Client) to to carry out a preliminary geotechnical investigation for the proposed residential development located at 3056 Neyagawa Boulevard in Oakville, Ontario.

It is understood that the subject property will be developed for residential purposes and will potentially involve the construction of several blocks which will include 18 to 27-storey high-rise buildings with 8 storey podium and four (4) levels of underground parking (P4). However, no below grade design was available at the time of writing this report. Additional boreholes with rock coring for each block will be required when final design details become available.

SHAD and Associates Inc. (SHAD) previously drilled five boreholes equipped with monitoring wells and extending to depths ranging from 8.1 to 9.4 m below existing grade, on the site as part of a previous preliminary geotechnical investigation in 2022. SHAD's boreholes did not include ground surface elevations and were not deep enough for buildings with 4-levels of basement, therefore the borehole logs from SHAD's investigation are included in this report for information purposes only.

The locations of boreholes from SHAD's previous investigation are shown on **Drawing 1**, and the borehole logs are attached in **Appendix B**.

The current DS borehole drilling program included eight (8) boreholes (BH23-1 to BH23-8) at the Site, as shown on **Drawing 1**.

Concurrent with the Geotechnical Investigation program, Hydrogeological Studies, Phase One and Two Environmental Site Assessments (ESA) and Hydrogeological Study have been carried out by DS, the results are addressed separately.

The purpose of this geotechnical investigation was to determine the subsurface conditions at the borehole locations and from the findings at the borehole locations make geotechnical recommendations for the following:

1. Foundations
2. Floor slabs and permanent drainage
3. Excavations and groundwater control
4. Temporary shoring
5. Earth pressures
6. Earthquake considerations

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 NEATT Communities and its architect and designers. Use of this report by third party without DS Consultants Ltd. consent is prohibited.

2. FIELD AND LABORATORY WORK

The fieldwork for this preliminary investigation was carried out by DS during the period between June 5 and 15, 2023, at which time a total of eight (8) boreholes (BH23-1 to BH23-8, see **Drawing 1** for borehole locations) were drilled/cored to depths ranging from 18.6 to 18.8 m below ground surface. Boreholes were drilled to bedrock surface with hollow stem continuous flight auger equipment 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. Upon encountering the bedrock surface, shale bedrock was cored in BH23-1 to a depth of 18.6 m, BH23-2, BH23-7, and BH23-8, to a depth of 18.8 m and BH23-3 to BH23-6 to a depth of 18.7 m. The bedrock was cored with HQ-2 double tube wireline equipment providing 63 mm dia. rock core samples. The coring was carried out under the full-time supervision of a representative from DS who identified and described the rock samples, noting and recording the percentages of total and solid rock core recovery, RQD values, fracture index and the percentage and thicknesses of hard layers.

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 the soil samples were tested for moisture contents and results are presented on the respective borehole logs. Six selected soil samples were tested for grain size analyses and for Atterberg Limits. Gradation curves for the grain size analyses are presented on **Drawing 10**. Atterberg Limits test results are presented on **Drawings 11**.

Water level observations were made during drilling operations. Monitoring wells were installed in all boreholes (BH23-1 to BH23-8) to allow for groundwater level monitoring and hydrogeological testing.

The geodetic ground surface elevations at the locations of the boreholes/monitoring wells were established by DS using differential GPS system. 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 to be approximate.

3. SITE AND SUBSURFACE CONDITIONS

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 (BH23-1 to BH23-8) by DS are presented in the individual borehole logs presented on **Drawings 2 to 9**. The logs of previous boreholes drilled by SHAD in 2022 are attached in **Appendix B** for information purposes only, and are not included in the summary below. The soil and bedrock conditions encountered in DS' boreholes are summarized as follows:

3.1 Soil and Bedrock Conditions

Topsoil

A surficial topsoil layer with thickness ranging from 150 to 250 mm was encountered at the ground surface in Boreholes BH23-5, BH23-6, and BH23-7.

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. Shallow hand-dug test-pits should be carried out to further explore the topsoil conditions.

Asphaltic Concrete and Granular Material

Asphaltic concrete with thickness of 150 mm was encountered at the ground surface in Borehole BH23-8 and a 50 mm thick layer of granular fill consisting of sand and gravel was present at the ground surface in BH23-2.

Fill Materials:

Fill materials consisting of clayey silt to silty clay with occasional inclusions of rootlets/organics, organic staining, weathered shale, and cobble fragments were present in all boreholes, and extended to depths ranging from 0.8 to 1.5 m below existing ground surface. Trace asphalt fragments was present in the fill in BH23-6. The consistency of clay silt to silty clay fill materials was firm to very stiff, as indicated with measured SPT 'N' values ranging from 7 to 26 blows per 300 mm penetration.

Silty Clay Till Deposit:

Silty clay till was encountered in all boreholes and extended to depths ranging from 1.6 to 3.1 m below existing ground surface. The silty clay till deposit was present in a firm to hard consistency, with measured SPT 'N' values ranging from 7 to over 50 blows per 300 mm penetration.

Grain size analyses of six (6) silty clay till samples (BH23-1/SS2, BH22-3/SS3, BH23-5/SS3, BH23-6/SS2, BH23-7/SS4 and BH23-8/SS2) were conducted and the results are presented on **Drawing 10.** The fractions of soil particles of silty clay till are presented as follows:

Clay: 22 to 29%

Silt: 48 to 61%

Sand: 12 to 21%

Gravel: 1 to 9%

Atterberg limits test of the silty clay till samples (BH23-1/SS2, BH22-3/SS3, BH23-5/SS3, BH23-6/SS2, BH23-7/SS4 and BH23-8/SS2) and the results are shown on the borehole logs and on **Drawing 11.** They are summarized as follows:

Liquid limit (WL): 25 to 31%

Plastic limit (WP): 17 to 19%

Plasticity index (PI): 8 to 13

Silty Clay Till / Shale Complex:

Overlying shale bedrock, silty clay till/shale complex with thicknesses ranging from 0.2 to 0.9 m was found in BH23-1, BH23-4, BH23-5, BH23-6, and BH23-8. This deposit was found to have generally a hard consistency, with -measured SPT 'N' values of over 50 blows per 300 mm of penetration. This deposit consisted of glacial till with clayey texture mixed with highly weathered shale.

Shale Bedrock:

Shale bedrock of Queenston Formation was found at approximate depths ranging from 2.3 to 3.3 m, corresponding to elevations varying from 152.2 to 157.0 m as presented in **Table 1** below.

Table 1: Depth and Elevation of Shale Bedrock Surface

Borehole No.	Depth of Shale Bedrock Surface below Existing Ground (m)	Approximate Elevation of Shale Bedrock Surface (masl)	Notes
BH23-1	2.5	155.6	Bedrock was cored from 4.7 to 18.6 m
BH23-2	2.6	157.0	Bedrock was cored from 4.7 to 18.8 m
BH23-3	2.4	155.8	Bedrock was cored from 4.7 to 18.7 m
BH23-4	2.4	154.5	Bedrock was cored from 4.7 to 18.7 m
BH23-5	3.3	154.3	Bedrock was cored from 4.7 to 18.7 m
BH23-6	3.2	152.2	Bedrock was cored from 4.7 to 18.7 m
BH23-7	3.3	154.3	Bedrock was cored from 4.7 to 18.8 m
BH23-8	2.4	152.5	Bedrock was cored from 4.7 to 18.8 m

Because of the method of drilling and sampling, the surface elevations of the bedrock can be different than indicated on the borehole logs. With augering, the auger may penetrate some of the more weathered shale and the coring may therefore begin below the bedrock surface. Commonly the overburden overlying the shale contains slabs of limestone which would give a false indication of the bedrock level. Similarly, the depth of weathering cannot be determined accurately due to the presence of limestone layers.

Shale bedrock of Queenston Formation was cored at all borehole locations (BH23-1 to BH23-8). General comments on shale bedrock in Toronto area are presented in **Appendix A**. Photographs of recovered bedrock cores for BH23-1 to BH23-8 are also presented in **Appendix A.** The following is detailed description of rock core samples obtained from BH23-1 to BH23-8.

Total Core Recovery (TCR): The total core recovery indicates the total length of rock core recovered, expressed as a percentage of the actual length of the core run. The total core recovery in the corehole ranged from 78 to 100%.

Solid Core Recovery (SCR): The solid core recovery is the total length of solid, full diameter rock core that was recovered, expressed as a percentage of the length of the core run. Solid core recovery ranged from 52 to 100%, and also appears to generally improve with depth. The SCR index was generally influenced by the orientations of the fractures. SCR was low when fractures oblique to the borehole axis were intercepted.

Rock Quality Designation (RQD): The rock quality designation index is obtained by measuring the total length of recovered rock core pieces which are longer than 100mm and expressing their sum total length as a percentage of the length of the core run. RQD is a function of the frequency of joints, bedding plane partings and fractures in the rock cores. While the use of double tube core barrels provided reasonably good protection of the core during drilling and core retrieval, the fissile nature of the shale greatly influences the RQD values of the rock cores. Consequently, it is believed that the RQD values recorded underestimate the rock quality classification of the laminated fissile shale. The recorded RQD values in the cores ranged from nil to 100 percent which also generally improved with depth.

Hard Layers: Based on the visual examination of the rock cores, an attempt was made to identify and record the thickness and percentages of the relatively harder siltstone and limestone layers. The percentage of the "hard layers" per core run ranges between 9 and 34%. The thickness of these layers varied but was generally less than 200 mm, however, thicker layers to be as much as 750 to 900 mm have been observed at other sites in GTA. The layers are actually lenses and they can vary significantly in thickness over short distance. Encountering such thick layers should be anticipated. It is also common to encounter closely spaced groupings of thin strong limestone/siltstone layers which individually may only be 25 to 50 mm thick but collectively can be 1 m in thickness.

Methane Gas: Although not detected during drilling at this Site, methane gas is expected in the bedrock as indicated in **Appendix A**. Appropriate care and monitoring is essential in all confined bedrock excavations.

3.2 Groundwater Conditions

Monitoring wells were installed in all boreholes (BH23-1 to BH23-8) for the long-term groundwater table monitoring and hydrogeological testing. Stabilized groundwater, in the installed monitoring wells, was found at depths ranging from 2.5 to 13.1 m below existing grade, corresponding to Elev. 141.8 to 157.1 m, as listed in **Table 2**:

Table 2: Groundwater Levels Observed in Monitoring Wells

Monitoring Well No.	Ground Surface Elevation (m)	Date of Observation	Groundwater Depth (m)	Elevation of Groundwater (m)	Note
BH23-1	158.1	June 26, 2023	4.3	153.8	Well screened in bedrock
		July 19, 2023	4.4	153.7	
BH23-2	159.6	June 26, 2023	2.5	157.1	Well screened in bedrock
		July 19, 2023	2.8	156.8	
BH23-3	158.2	June 26, 2023	3.0	155.2	Well screened in bedrock
BH23-4	156.9	June 26, 2023	9.4	147.5	Well screened in bedrock
		July 19, 2023	10.5	146.4	
BH23-5	157.6	June 26, 2023	4.2	153.4	Well screened in bedrock
		July 19, 2023	4.1	153.5	
BH23-6	155.4	June 26, 2023	4.1	151.3	Well screened in bedrock
		July 19, 2023	4.2	151.2	
BH23-7	157.6	June 26, 2023	5.0	152.6	Well screened in bedrock
		July 19, 2023	5.0	152.6	
BH23-8	154.9	June 26, 2023	12.9	142.0	Well screened in bedrock
		July 19, 2023	13.1	141.8	

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events.

Therefore, reference is made to the hydrogeology study report prepared by DS Consultants for further details on the extent and the conditions of the groundwater, as well as the recommended groundwater control.

Further groundwater monitoring should be carried out to confirm the groundwater conditions.

4. FOUNDATIONS

It is understood that the proposed development will potentially involve the construction of several blocks which will include 18 to 27-storey high-rise buildings with 8 storey podium and four (4) levels of underground parking (P4). However, no below grade design was available at the time of writing this report. Therefore, our recommendations should be considered preliminary, and should be updated with additional boreholes with rock coring for each block when final design details become available.

With 4 levels of underground parking, the P4 basement floor level is expected to be at about 12 m below grade. Footings will be founded 1 to 2 m below the P4 level, i.e., at approximately 13 to 14 m blow grade.

Shale bedrock was found at approximate depths ranging from 2.3 to 3.3 m, corresponding to elevations varying from 152.2 to 157.0 m. The depths and elevations of shale bedrock at the borehole locations are provided in **Table 1** of this report. Based on the information from boreholes, the proposed development with 4 levels of basement will be well below the bedrock surface and into sound shale bedrock.

The proposed buildings can be supported by conventional spread and strip footings and raft foundations founded on sound shale bedrock. The footings and raft foundations founded on sound shale bedrock at minimum 1.5 m below bedrock surface can be designed for a bearing pressure of 5.0 MPa at SLS and for a factored geotechnical resistance of 7.0 MPa at ULS. A modulus of subgrade reaction R_t=400 MPa/m can be used for the design of raft foundations on sound shale bedrock with bearing capacity of 5.0 MPa at SLS.

Foundations designed to the specified bearing capacity at the serviceability limit states (SLS) are expected to settle less than 25 mm total and 19 mm differential.

Where it is necessary to place footings on bedrock at different levels, the upper footing must be founded below an imaginary 1 horizontal to 1 vertical line (1H:1V in sound bedrock) 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.

The shale bedrock weathers rapidly between wetting and drying cycles. In view of this, it is suggested that a lean concrete mat slab be placed immediately after the excavation is complete to keep the shale intact, unless the footings are cast immediately after excavating.

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

The P4 basement floor slabs can be supported on grade, provided any loose rock (if any) is removed, and approved by the geotechnical engineer.

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

A perimeter and underfloor drainage system will be required with 4 levels of underground parking. Typical drainage and backfill recommendations are illustrated on **Drawings 12** and **13** for shored excavation system and **Drawing 14** for open cut excavation.

Feasibility studies of permanent underfloor drainage and perimeter drainage were carried out in the hydrogeological investigation, to estimate seepage rates into the permanent drainage systems.

6. FROST PROTECTION

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

There is no official rule governing the required founding depth for footings below unheated basement floors. Certainly, it will not be greater than the 1.2 m required in Southern Ontario for exterior footings. Un-monitored experience indicates that a shallower depth ranging from 0.82 to 0.9 m for interior column footings and 0.4 m for wall footings has been successful where 2 or more basement levels apply. The 0.82 m depth is believed to be close to the minimum structural requirement for interior column footings. Adjacent to air shafts and entrance and exit doors, a footing depth of 1.2 m below floor level is required or, alternatively, insulation protection must be provided.

It is also emphasized that underfloor drainage and/or an adequate free draining gravel base is required to minimize the risk of floor dampness. Floor dampness could lead to temporary icing and the risk of accidents.

7. EARTH AND BEDROCK PRESSURES

The design of basement walls can incorporate the conventional design in the overburden using the earth pressure coefficient $K_1=0.40$. In the bedrock, the earth pressure coefficient K can be reduced to $K_2=0.20$.

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

In soil: $p = K_1 (\gamma_1 h_1 + q)$

In rock: $p = K_2 (\gamma_1 H_1 + q + \gamma_2 h_2)$

where p = lateral earth pressure in kPa acting at depth h_1 or h_2

K_1 = earth pressure coefficient $K_1=0.40$ for overburden soil

K_2 = earth pressure coefficient K_2=0.20 for bedrock

γ_1 = unit weight of overburden soil assuming 21 kN/m^3

γ_2 = unit weight of bedrock assuming 24 kN/m^3

h_1 = depth in overburden soil

H_1 = thickness of soil above bedrock

h_2 = depth in bedrock (depth below bedrock surface)

q = value of surcharge in kPa

The above expression assumes that the perimeter drainage system prevents the buildup of any hydrostatic pressure behind the wall. If water is not drained, then the wall should be designed for hydrostatic pressure. If the foundation wall is poured against the caisson wall, then the foundation wall as well as the caisson wall should be designed for hydrostatic pressure.

8. EXCAVATION AND GROUNDWATER CONTROL

Excavation of the overburden will be relatively straightforward; however, obstructions and boulder should be expected. Excavation of the shale can be carried out using the heaviest available single tooth ripper equipment. The limestone beds are frequent and may overlay the shale bedrock surface at some locations. It will be necessary to utilize jackhammer type equipment to “open” the limestone layers for the ripper.

The groundwater level measured in the installed monitoring wells was found at depths ranging from 2.5 to 13.1 m below existing grade, corresponding to Elev. 141.8 to 157.1 m. Dewatering will be required prior to any excavations below the groundwater table. Groundwater is expected in shale bedrock through the fractures which will also require dewatering.

DS is carrying out a hydrogeological study at the subject Site and more comments regarding the type and extent of groundwater control required will be addressed in the hydrogeology report.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill materials, firm to stiff silty clay till deposit and any sandy soils (if any) can be classified as Type 3 Soil above the groundwater table and Type 4 Soil below groundwater table. The very stiff to hard silty clay till can be classified as Type 2 Soil above the groundwater table and Type 3 Soil below the groundwater table.

It should be noted that the till is a non-sorted sediment and therefore may contain boulders. Provisions must be made in the excavation contract for the removal of possible boulders in the till or obstructions in the fill material.

The select inorganic fill and native soils can be re-used as general construction backfill, provided its water content is within two percent of its optimum water content. Loose lifts of soil, which are to be compacted, should not exceed 200 mm.

Imported granular fill, which can be compacted with hand held equipment, should be used in confined areas. Underfloor fill should be compacted to at least 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill 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.

9. TEMPORARY SHORING

Given the site setting, the proposed excavations may be supported by a temporary shoring system consisting of timber lagging and soldier piles. A tightly braced caisson wall may be required to support adjacent structures and utilities. Unsupported open cut excavation may be utilized at areas where sufficient space exists. The requirement for caisson wall to support adjacent structures is given on **Drawing 15**.

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) Kp=4.0 for weathered shale and 5.0 for sound shale

2) For stability check

   $\phi = 32°$

   C = 0

   $\gamma = 21$ kN/m^3

   surcharge is to be determined by shoring contractor.

3) For rock anchors

An allowable bond stress of 600 kPa can be used in sound bedrock for the design of anchors.

An allowable bond value of 600 kPa is suggested for anchors in sound rock. However, this value depends 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.

The soldier piles should be installed in pre-augered holes taken below the deepest adjacent 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 will be required to help prevent the fill from caving during the installation period.

The top anchor must not be placed lower than 3.0 metres below the top of level ground surface. The contractor must decide the anchor capacity and confirm its availability. All anchors must be tested as indicated in the Canadian Foundation Engineering 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% of the shoring height.

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.

10. EARTHQUAKE CONSIDERATIONS

Based on the existing borehole information and according to Table 4.1.8.4.A of OBC 2012, the subject Site for the proposed buildings with 4 levels of underground parking, to be founded on sound shale bedrock, can be classified as "Class B" for seismic site response.

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.

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Drawings

J:\-GIS\2022 PROJECTS\22-012-100 3056 Neyagawa Blvd., Oakville\1-QGIS\Geo\Drawing 1 - Borehole Location Plan.qgs Aug-14 13:07

Legend

▭ Approx Property Boundary

⊕ Monitoring Well-DS

◉ Monitoring Well -Others

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Project: PRELIMINARY GEOTECHNICAL INVESTIGATION
3056 Neyagawa Boulevard, Oakville, ON.

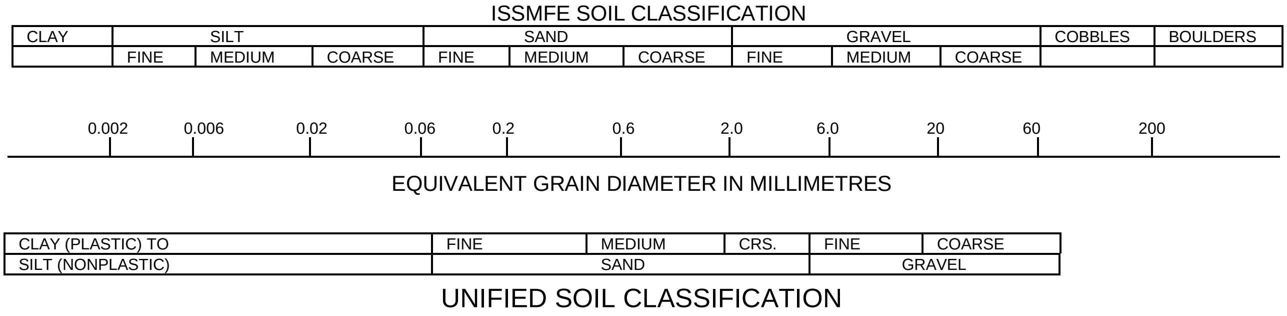
Title: **BOREHOLE AND MONITORING WELL LOCATIONS**

Client: NEATT COMMUNITIES

Size: 8.5 x 11	Approved By: O.B	Drawn By: S.Y	Date: August 2023
Rev: 0	Scale: As Shown	Project No.: 22-012-101	Drawing 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 DS 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.

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LOG OF BOREHOLE BH23-1

1 OF 1

PROJECT: Geotechnical Investigation
CLIENT: NEATT Communities
PROJECT LOCATION: 3065 Neyagawa Blvd., Oakville, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4813210.47 E 601359.2

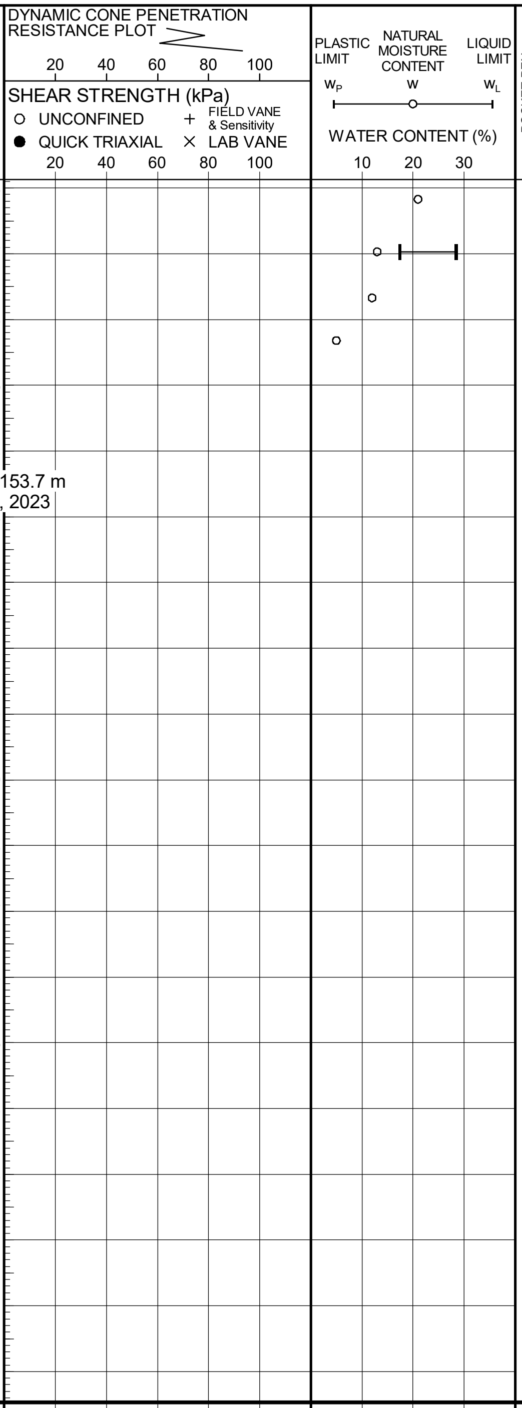
DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Jun-06-2023

REF. NO.: 22-012-101
ENCL NO.: 2

SOIL PROFILE		SAMPLES			REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS / 0.3 m	GR SA SI CL
158.1					
0.0	**FILL:** clayey silt to silty clay, trace rootlets, trace gravel, trace sand, reddish brown, moist, stiff	1	SS	9	
157.3 0.8	**SILTY CLAY TILL:** sandy, trace gravel, reddish brown, moist, very stiff to hard weathered shale pieces at 1.5m	2 3	SS SS	18 37	4 21 49 26
155.8 155.6 / 2.3 2.5	**SILTY CLAY TILL/SHALE COMPLEX:** trace sand, reddish brown, moist, hard **SHALE BEDROCK:** Queenston Formation, reddish brown, weathered	4 5	SS SS	50/ 130mm 50/ 25mm	
153.4 4.7 / 153.0 5.1	TCR=94%, SCR=77%, RQD=55% Hard layers=11%, Maximum hard layer thickness=50mm	6 R1	SS RC	50/ 130mm	
	TCR=96%, SCR=83%, RQD=46% Hard layers=25%, Maximum hard layer thickness=75mm	R2	RC		
151.5 6.6	TCR=96%, SCR=81%, RQD=72% Hard layers=14%, Maximum hard layer thickness=50mm	R3	RC		
150.1 8.0	TCR=95%, SCR=63%, RQD=51% Hard layers=10%, Maximum hard layer thickness=60mm	R4	RC		
148.5 9.6	TCR=100%, SCR=88%, RQD=86% Hard layers=25%, Maximum hard layer thickness=75mm	R5	RC		
147.0 11.1	TCR=92%, SCR=75%, RQD=64% Hard layers=11%, Maximum hard layer thickness=75mm	R6	RC		
145.4 12.7	TCR=100%, SCR=93%, RQD=55% Hard layers=20%, Maximum hard layer thickness=60mm	R7	RC		
144.0 14.1	TCR=91%, SCR=91%, RQD=88% Hard layers=18%, Maximum hard layer thickness=75mm	R8	RC		
142.5 15.6	TCR=98%, SCR=95%, RQD=95% Hard layers=16%, Maximum hard layer thickness=150mm	R9	RC		
141.0 17.1	TCR=95%, SCR=90%, RQD=77% Hard layers=10%, Maximum hard layer thickness=130mm	R10	RC		
139.5 18.6	**END OF BOREOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): June 26, 2023 4.3 July 19, 2023 4.4				

GROUND WATER CONDITIONS: W. L. 153.7 m
Jul 19, 2023

ELEVATION: 158, 157, 156, 155, 154, 153, 152, 151, 150, 149, 148, 147, 146, 145, 144, 143, 142, 141, 140



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 BH23-2

1 OF 1

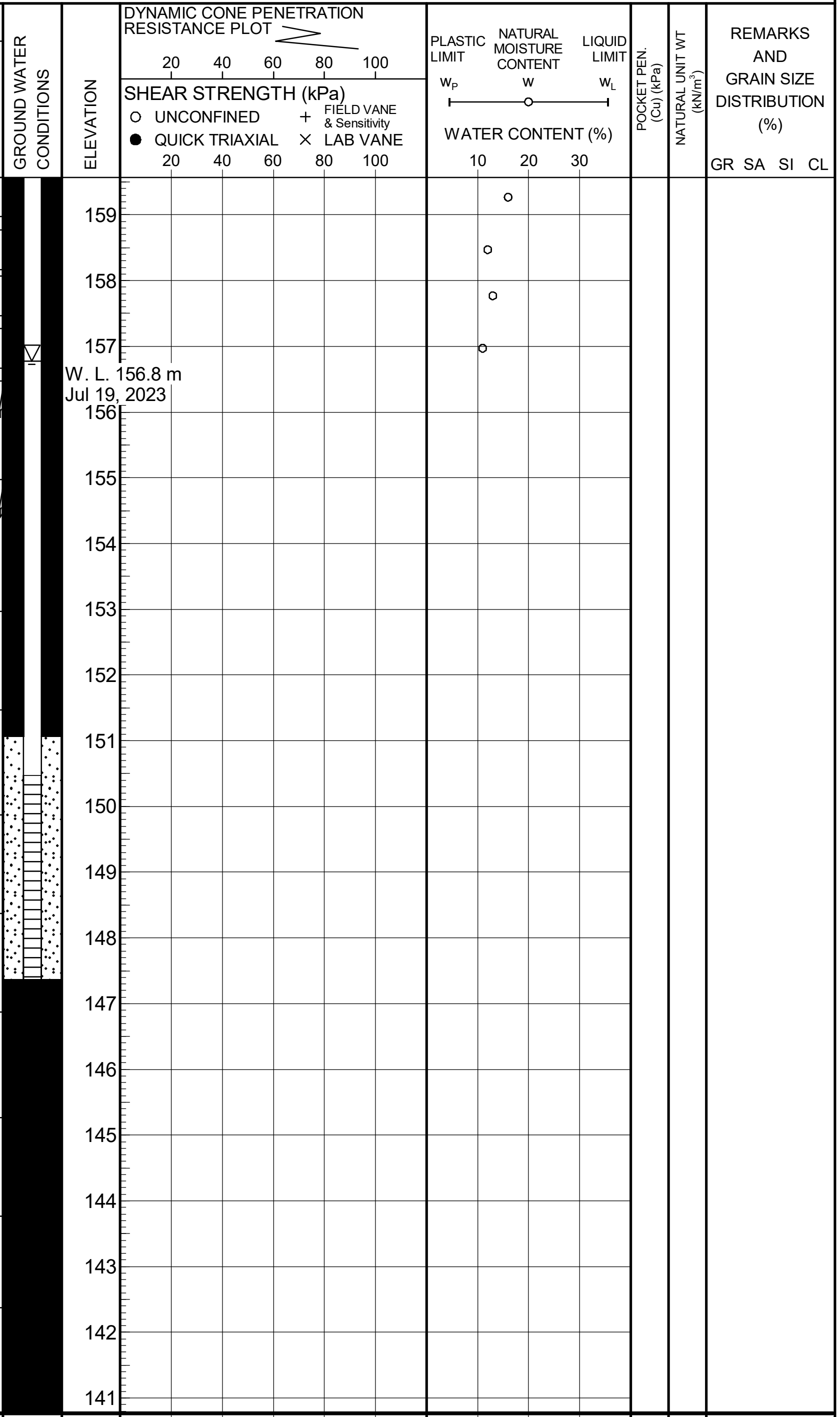
PROJECT: Geotechnical Investigation
CLIENT: NEATT Communities
PROJECT LOCATION: 3065 Neyagawa Blvd., Oakville, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4813293.29 E 601330.07

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Jun-05-2023

REF. NO.: 22-012-101
ENCL NO.: 3

SOIL PROFILE (m) ELEV DEPTH	DESCRIPTION	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3 m
159.6				
159.5 0.1	**GRANULAR FILL:** sand and gravel, 50mm	1	SS	13
158.8 0.8	**FILL:** clayey silt to silty clay, trace gravel, reddish brown, moist, stiff	2	SS	27
	SILTY CLAY TILL: some sand, trace gravel, brown to reddish brown, moist, very stiff to hard trace shale fragments at 2.3m	3	SS	29
		4	SS	62
157.0 2.6	**SHALE BEDROCK:** Queenston Formation, reddish brown, weathered	5	SS	50/ 130mm
154.9 4.7	TCR=94%, SCR=64%, RQD=23% Hard layers=11%, Maximum hard layer thickness=50mm	6 R1	SS SS	50/ 100mm
154.5 5.1	TCR=90%, SCR=81%, RQD=68% Hard layers=11%, Maximum hard layer thickness=50mm	R2	RC	
153.0 6.6	TCR=91%, SCR=85%, RQD=66% Hard layers=16%, Maximum hard layer thickness=75mm	R3	RC	
151.5 8.1	TCR=100%, SCR=93%, RQD=75% Hard layers=19%, Maximum hard layer thickness=78mm	R4	RC	
149.9 9.7	TCR=95%, SCR=91%, RQD=91% Hard layers=15%, Maximum hard layer thickness=50mm	R5	RC	
148.4 11.2	TCR=93%, SCR=93%, RQD=90% Hard layers=25%, Maximum hard layer thickness=78mm	R6	RC	
146.9 12.7	TCR=100%, SCR=93%, RQD=82% Hard layers=14%, Maximum hard layer thickness=55mm	R7	RC	
145.3 14.3	TCR=98%, SCR=93%, RQD=88% Hard layers=23%, Maximum hard layer thickness=78mm	R8	RC	
143.8 15.8	TCR=96%, SCR=96%, RQD=93% Hard layers=27%, Maximum hard layer thickness=78mm	R9	RC	
142.4 17.2	TCR=100%, SCR=100%, RQD=94% Hard layers=22%, Maximum hard layer thickness=127mm	R10	RC	
140.8 18.8	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): June 26, 2023 2.5 July 19, 2023 2.8			

GROUND WATER CONDITIONS: W. L. 156.8 m Jul 19, 2023



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

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

LOG OF BOREHOLE BH23-3

PROJECT: Geotechnical Investigation
CLIENT: NEATT Communities
PROJECT LOCATION: 3065 Neyagawa Blvd., Oakville, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4813192.51 E 601273.15

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Jun-06-2023

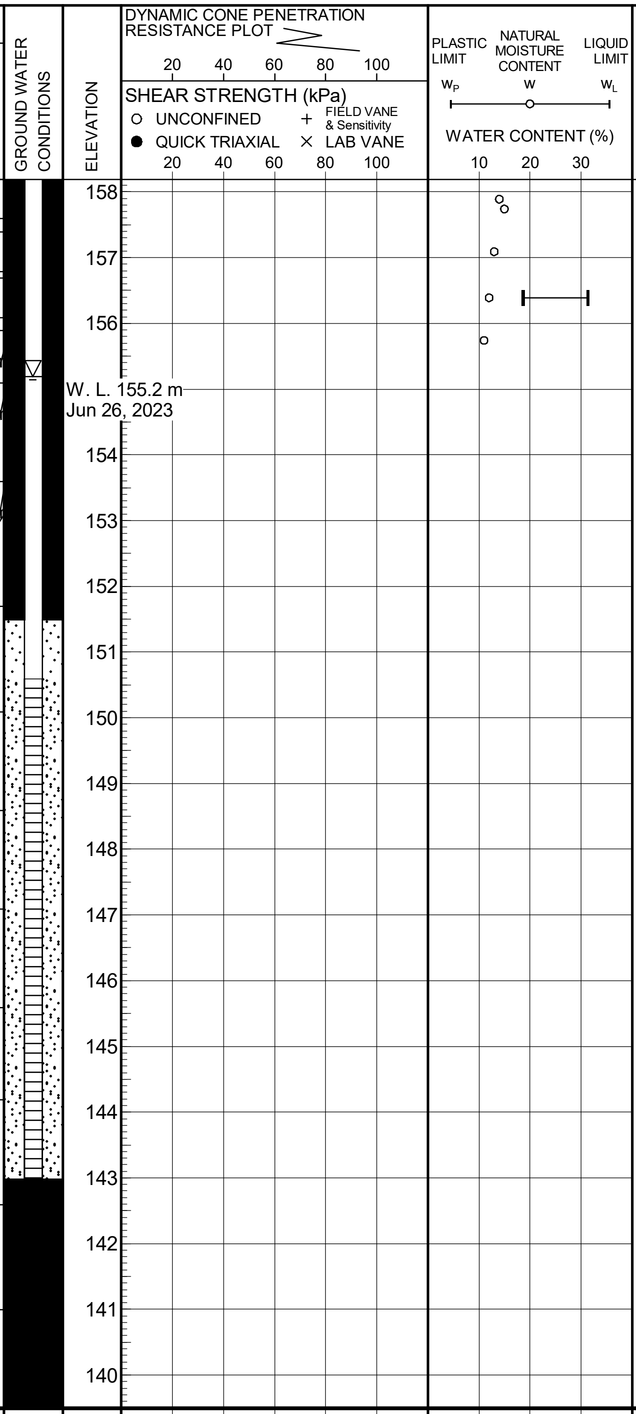
REF. NO.: 22-012-101
ENCL NO.: 4

SOIL PROFILE

(m) ELEV DEPTH	DESCRIPTION
158.2	
0.0	**FILL:** clayey silt to silty clay, some sand, trace cobble fragments, trace weathered shale, reddish brown, moist, stiff to very stiff
157.2 1.0	**SILTY CLAY TILL:** some sand, trace gravel, reddish brown, moist, stiff weathered shale inclusions at 2.3m
155.8 2.4	**SHALE BEDROCK:** Queenston Formation, reddish brown, weathered
153.5 4.7	TCR=78%, SCR=57%, RQD=28% Hard layers=5%, Maximum hard layer thickness=25mm
153.1 5.1	TCR=94%, SCR=89%, RQD=54% Hard layers=10%, Maximum hard layer thickness=50mm
151.7 6.5	TCR=98%, SCR=95%, RQD=95% Hard layers=24%, Maximum hard layer thickness=100mm
150.1 8.1	TCR=98%, SCR=98%, RQD=95% Hard layers=18%, Maximum hard layer thickness=50mm
148.6 9.6	TCR=100%, SCR=100%, RQD=95% Hard layers=20%, Maximum hard layer thickness=75mm
147.1 11.1	TCR=96%, SCR=96%, RQD=88% Hard layers=20%, Maximum hard layer thickness=50mm
145.6 12.6	TCR=94%, SCR=93%, RQD=74% Hard layers=24%, Maximum hard layer thickness=130mm
144.2 14.0	TCR=96%, SCR=94%, RQD=88% Hard layers=28%, Maximum hard layer thickness=100mm
142.6 15.6	TCR=100%, SCR=100%, RQD=88% Hard layers=16%, Maximum hard layer thickness=100mm
141.0 17.2	TCR=100%, SCR=100%, RQD=76% Hard layers=12%, Maximum hard layer thickness=50mm
139.5 18.7	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): June 26, 2023 3.0

SAMPLES

NUMBER	TYPE	"N" BLOWS / 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
1	SS	26	
2	SS	8	
3	SS	13	1 12 58 29
4	SS	50/ 130mm	
5	SS	50/ 130mm	
6	SS	50/ 130mm	
R1	RC		
R2	RC		
R3	RC		
R4	RC		
R5	RC		
R6	RC		
R7	RC		
R8	RC		
R9	RC		
R10	RC		



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

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

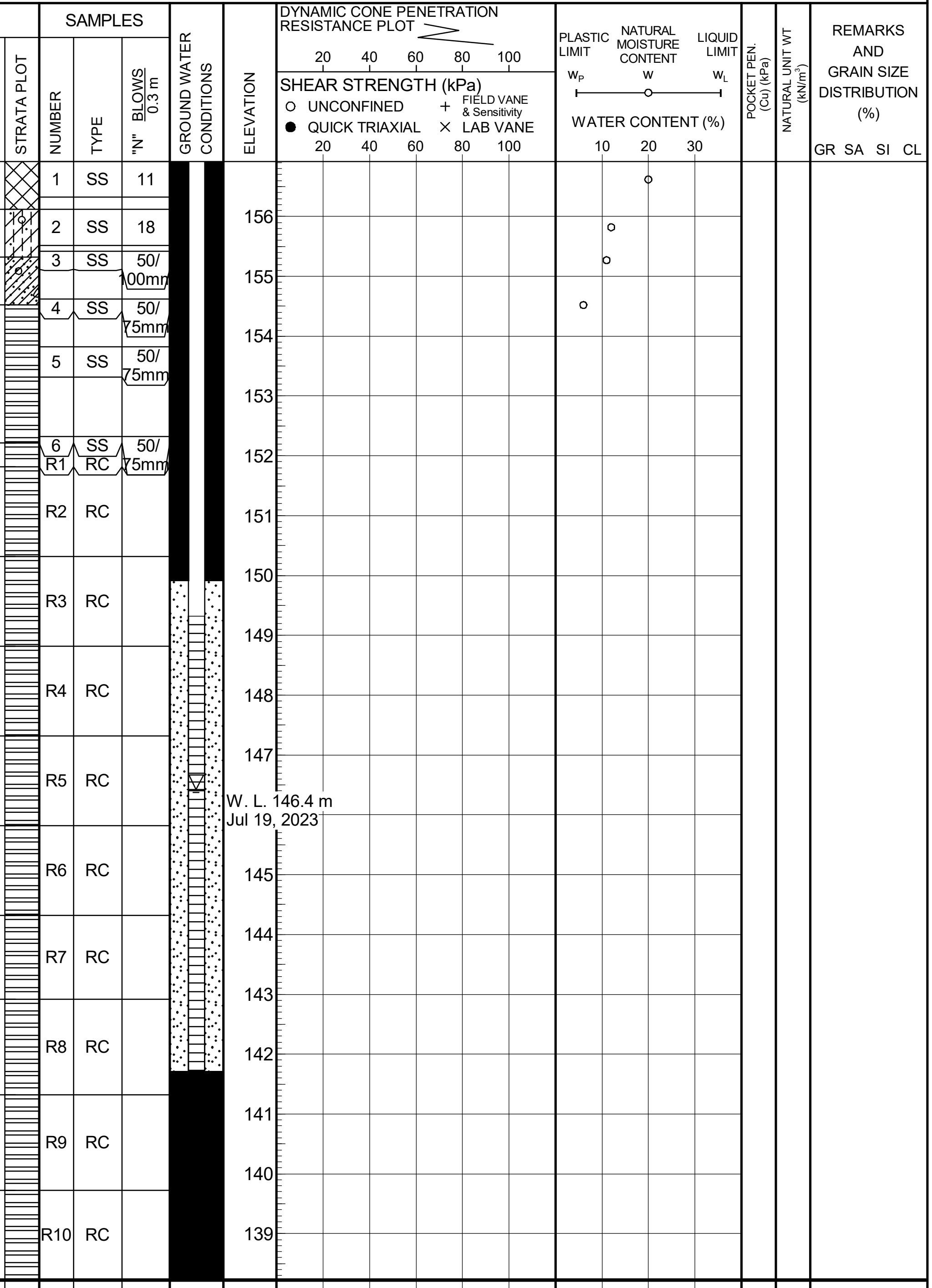
LOG OF BOREHOLE BH23-4

PROJECT: Geotechnical Investigation
CLIENT: NEATT Communities
PROJECT LOCATION: 3065 Neyagawa Blvd., Oakville, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4813123.32 E 601363.01

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Jun-07-2023

REF. NO.: 22-012-101
ENCL NO.: 5

SOIL PROFILE (m) ELEV DEPTH	DESCRIPTION	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3 m
156.9				
0.0	**FILL:** clayey silt to silty clay, trace sand, trace rootlets, reddish brown, moist, stiff	1	SS	11
156.1 0.8	**SILTY CLAY TILL:** some sand, trace gravel, reddish brown, moist, very stiff	2	SS	18
155.3 1.6	**SILTY CLAY TILL/SHALE COMPLEX:** trace sand, trace gravel, reddish brown, moist, hard	3	SS	50/ 100mm
154.5 2.4	**SHALE BEDROCK:** Queenston Formation, reddish brown, weathered	4 5	SS SS	50/ 75mm 50/ 75mm
152.2 4.7	TCR=98%, SCR=77%, RQD=66% Hard layers=19%, Maximum hard layer thickness=50mm	6 R1	SS RC	50/ 75mm
151.8 5.1	TCR=98%, SCR=93%, RQD=73% Hard layers=20%, Maximum hard layer thickness=50mm	R2	RC	
150.3 6.6	TCR=100%, SCR=98%, RQD=93% Hard layers=20%, Maximum hard layer thickness=60mm	R3	RC	
148.8 8.1	TCR=100%, SCR=100%, RQD=98% Hard layers=11%, Maximum hard layer thickness=50mm	R4	RC	
147.3 9.6	TCR=100%, SCR=98%, RQD=89% Hard layers=22%, Maximum hard layer thickness=130mm	R5	RC	
145.8 11.1	TCR=98%, SCR=98%, RQD=84% Hard layers=11%, Maximum hard layer thickness=50mm	R6	RC	
144.3 12.6	TCR=94%, SCR=94%, RQD=89% Hard layers=25%, Maximum hard layer thickness=100mm	R7	RC	
142.9 14.0	TCR=96%, SCR=96%, RQD=93% Hard layers=12%, Maximum hard layer thickness=50mm	R8	RC	
141.3 15.6	TCR=100%, SCR=91%, RQD=67% Hard layers=19%, Maximum hard layer thickness=150mm	R9	RC	
139.7 17.2	TCR=100%, SCR=100%, RQD=91% Hard layers=25%, Maximum hard layer thickness=100mm	R10	RC	
138.2 18.7	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): June 26, 2023 9.4 July 19, 2023 10.5			



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 BH23-5

PROJECT: Geotechnical Investigation
CLIENT: NEATT Communities
PROJECT LOCATION: 3065 Neyagawa Blvd., Oakville, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4813099.92 E 601201.33

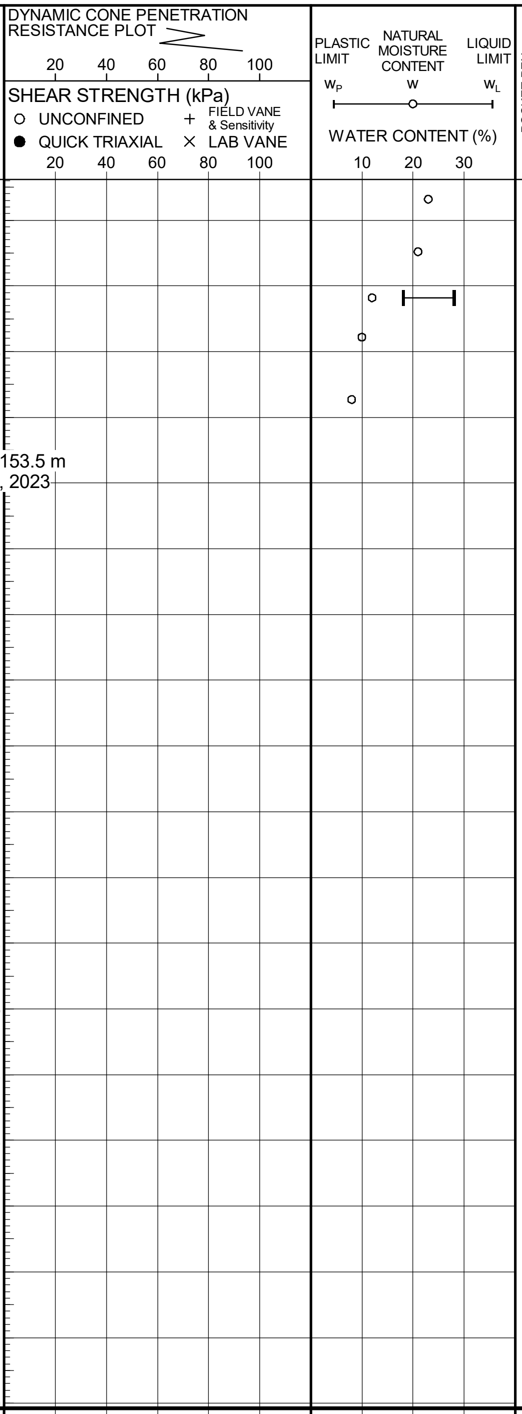
DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Jun-13-2023

REF. NO.: 22-012-101
ENCL NO.: 6

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
157.6					
157.4 0.0	**TOPSOIL:** 250mm	1	SS	8	
0.3	**FILL:** clayey silt to silty clay, trace gravel, trace organic staining, trace sand, trace rootlets, brown to reddish brown, moist, firm to stiff	2	SS	7	
156.5 1.1	**SILTY CLAY TILL:** some sand to sandy, trace gravel, reddish brown, moist, firm to hard weathered shale inclusions at 2.3m	3	SS	38	4 18 52 26
		4	SS	50/ 25mm	
154.5 153.3 3.3	**SILTY CLAY TILL/SHALE COMPLEX:** trace sand, trace gravel, reddish brown, moist, hard	5	SS	50/ 150mm	
	SHALE BEDROCK: Queenston Formation, reddish brown, weathered				
152.9 4.7		6	SS	50/ 150mm	
152.4 5.2	TCR=98%, SCR=83%, RQD=22% Hard layers=33%, Maximum hard layer thickness=50mm	R1	RC		
	TCR=84%, SCR=52%, RQD=29% Hard layers=15%, Maximum hard layer thickness=100mm	R2	RC		
151.0 6.6	TCR=98%, SCR=98%, RQD=90% Hard layers=20%, Maximum hard layer thickness=60mm	R3	RC		
149.5 8.1	TCR=100%, SCR=100%, RQD=95% Hard layers=18%, Maximum hard layer thickness=50mm	R4	RC		
148.0 9.6	TCR=100%, SCR=100%, RQD=94% Hard layers=25%, Maximum hard layer thickness=50mm	R5	RC		
146.5 11.1	TCR=98%, SCR=93%, RQD=90% Hard layers=16%, Maximum hard layer thickness=50mm	R6	RC		
144.9 12.7	TCR=95%, SCR=95%, RQD=95% Hard layers=20%, Maximum hard layer thickness=150mm	R7	RC		
143.4 14.2	TCR=100%, SCR=100%, RQD=100% Hard layers=33%, Maximum hard layer thickness=100mm	R8	RC		
141.9 15.7	TCR=100%, SCR=100%, RQD=100% Hard layers=20%, Maximum hard layer thickness=100mm	R9	RC		
140.4 17.2	TCR=100%, SCR=100%, RQD=100% Hard layers=13%, Maximum hard layer thickness=100mm	R10	RC		
138.9 18.7	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): June 26, 2023 4.2 July 19, 2023 4.1				

STRATA PLOT | GROUND WATER CONDITIONS | ELEVATION

W. L. 153.5 m
Jul 19, 2023



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

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

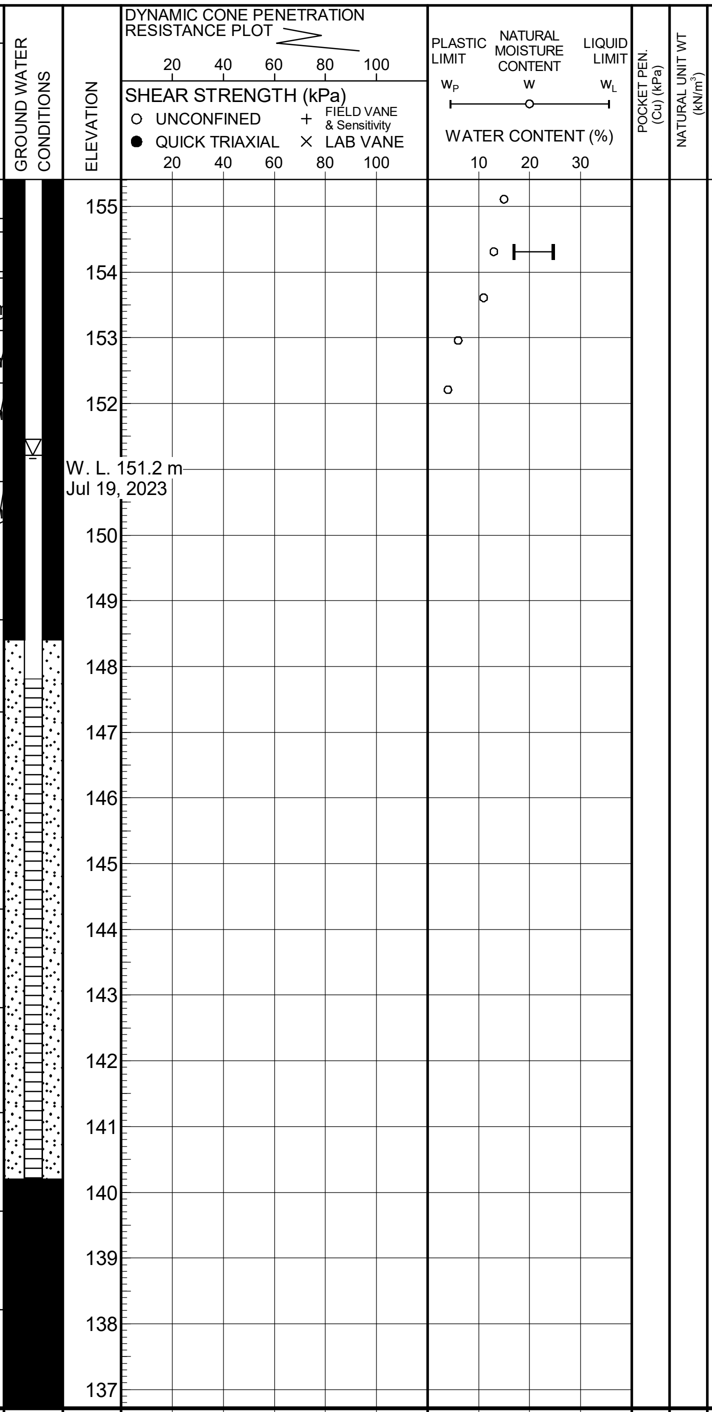
LOG OF BOREHOLE BH23-6

PROJECT: Geotechnical Investigation
CLIENT: NEATT Communities
PROJECT LOCATION: 3065 Neyagawa Blvd., Oakville, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4813009.03 E 601286.1

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Jun-09-2023

REF. NO.: 22-012-101
ENCL NO.: 7

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
155.4 0.0	**TOPSOIL:** 180mm	1	SS	12	
155.2 0.2	**FILL:** clayey silt to silty clay, trace sand, trace rootlets, trace asphalt fragment, brown, moist, stiff				
154.6 0.8	**SILTY CLAY TILL:** some sand, trace gravel, weathered shale inclusions, reddish brown, moist, hard	2 3	SS SS	54 50/ 130mm	3 14 61 22
153.1 2.3	**SILTY CLAY TILL/SHALE COMPLEX:** trace sand, reddish brown, moist, hard	4	SS	50/ 130mm	
152.2 3.2	**SHALE BEDROCK:** Queenston Formation, reddish brown, weathered	5	SS	50/ 75mm	
150.7 4.7	TCR=89%, SCR=89%, RQD=68% Hard layers=10%, Maximum hard layer thickness=50mm	6 R1	SS RC	50/ 75mm	
150.2 5.2	TCR=100%, SCR=96%, RQD=96% Hard layers=21%, Maximum hard layer thickness=100mm	R2	RC		
148.7 6.7	TCR=100%, SCR=98%, RQD=90% Hard layers=11%, Maximum hard layer thickness=50mm	R3	RC		
147.3 8.1	TCR=90%, SCR=90%, RQD=83% Hard layers=20%, Maximum hard layer thickness=50mm	R4	RC		
145.8 9.6	TCR=98%, SCR=95%, RQD=95% Hard layers=16%, Maximum hard layer thickness=60mm	R5	RC		
144.3 11.1	TCR=96%, SCR=96%, RQD=90% Hard layers=25%, Maximum hard layer thickness=200mm	R6	RC		
142.8 12.6	TCR=100%, SCR=100%, RQD=83% Hard layers=24%, Maximum hard layer thickness=50mm	R7	RC		
141.2 14.2	TCR=100%, SCR=100%, RQD=100% Hard layers=16%, Maximum hard layer thickness=50mm	R8	RC		
139.7 15.7	TCR=98%, SCR=98%, RQD=98% Hard layers=21%, Maximum hard layer thickness=100mm	R9	RC		
138.2 17.2	TCR=100%, SCR=100%, RQD=85% Hard layers=10%, Maximum hard layer thickness=50mm	R10	RC		
136.7 18.7	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): June 26, 2023 4.1 July 19, 2023 4.2				



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

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

LOG OF BOREHOLE BH23-7

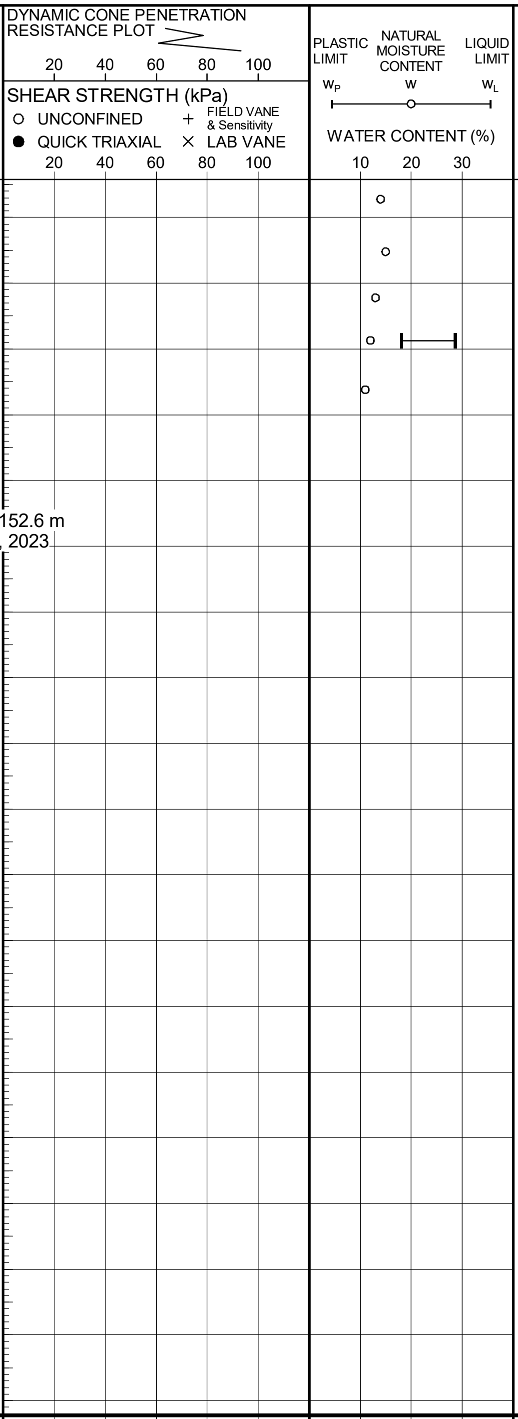
1 OF 1

PROJECT: Geotechnical Investigation
CLIENT: NEATT Communities
PROJECT LOCATION: 3065 Neyagawa Blvd., Oakville, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4813034.31 E 601133.46

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Jun-14-2023

REF. NO.: 22-012-101
ENCL NO.: 8

(m) ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
157.6						
157.4 0.2	**TOPSOIL:** 150mm					
	FILL: silty clay, trace to some organics, trace rootlets, reddish brown, moist, firm to stiff	1 2	SS SS	10 7		
156.1 1.5	**SILTY CLAY TILL:** sandy, trace clay, trace weathered shale fragments, brown to reddish brown, moist, very stiff to hard	3 4 5	SS SS SS	19 32 50/ 130mm		3 20 53 24
154.3 3.3	**SHALE BEDROCK:** Queenston Formation, reddish brown, weathered					
152.9 4.7	TCR=100%, SCR=75%, RQD=0% Hard layers=25%, Maximum hard layer thickness=100mm	6 R1	SS RC	50/ 25mm	W. L. 152.6 m Jul 19, 2023	
152.5 5.1	TCR=100%, SCR=82%, RQD=61% Hard layers=31%, Maximum hard layer thickness=100mm	R2	RC			
151.0 6.6	TCR=100%, SCR=100%, RQD=80% Hard layers=34%, Maximum hard layer thickness=75mm	R3	RC			
149.5 8.1	TCR=95%, SCR=95%, RQD=90% Hard layers=13%, Maximum hard layer thickness=50mm	R4	RC			
148.0 9.6	TCR=100%, SCR=97%, RQD=52% Hard layers=21%, Maximum hard layer thickness=50mm	R5	RC			
146.5 11.1	TCR=100%, SCR=100%, RQD=98% Hard layers=16%, Maximum hard layer thickness=100mm	R6	RC			
144.9 12.7	TCR=98%, SCR=95%, RQD=93% Hard layers=15%, Maximum hard layer thickness=60mm	R7	RC			
143.4 14.2	TCR=100%, SCR=98%, RQD=97% Hard layers=31%, Maximum hard layer thickness=100mm	R8	RC			
141.9 15.7	TCR=100%, SCR=98%, RQD=93% Hard layers=20%, Maximum hard layer thickness=100mm	R9	RC			
140.4 17.2	TCR=100%, SCR=100%, RQD=100% Hard layers=10%, Maximum hard layer thickness=50mm	R10	RC			
138.8 18.8	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): June 26, 2023 5.0 July 19, 2023 5.0					



POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

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

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

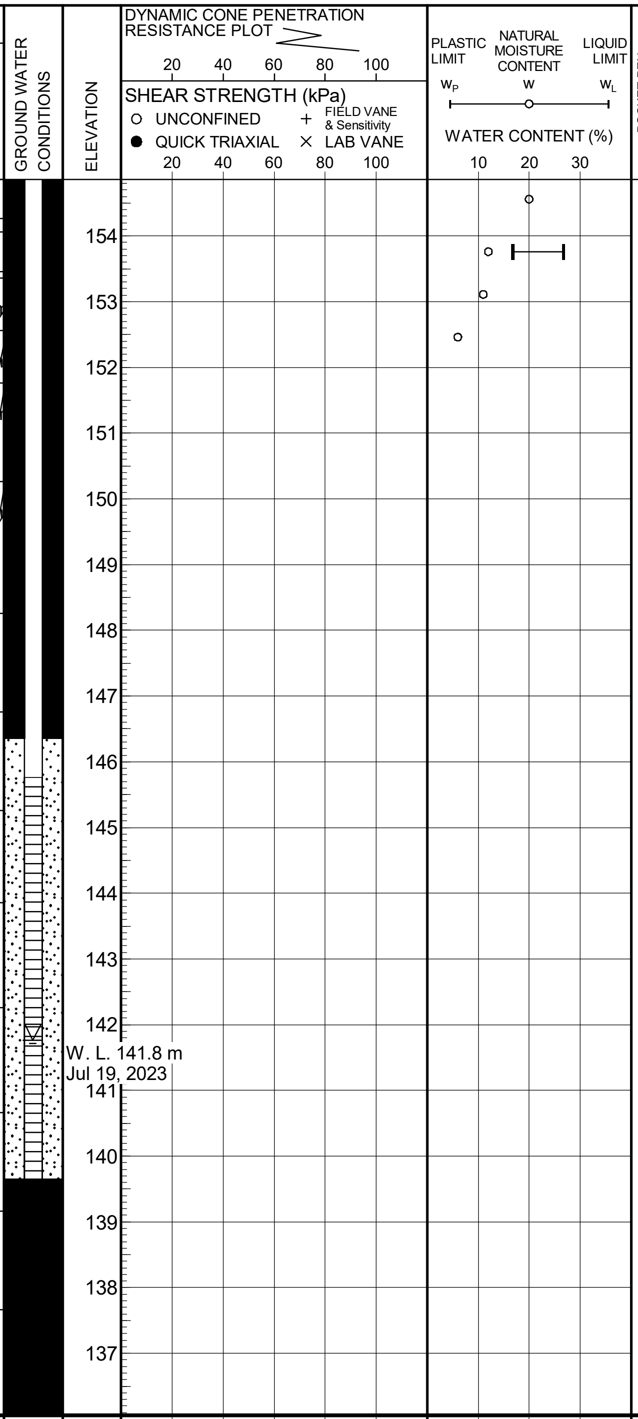
LOG OF BOREHOLE BH23-8

PROJECT: Geotechnical Investigation
CLIENT: NEATT Communities
PROJECT LOCATION: 3065 Neyagawa Blvd., Oakville, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4812943.74 E 601237.76

DRILLING DATA
Method: Hollow Stem Auger/Mud Rotary
Diameter: 200mm
Date: Jun-15-2023

REF. NO.: 22-012-101
ENCL NO.: 9

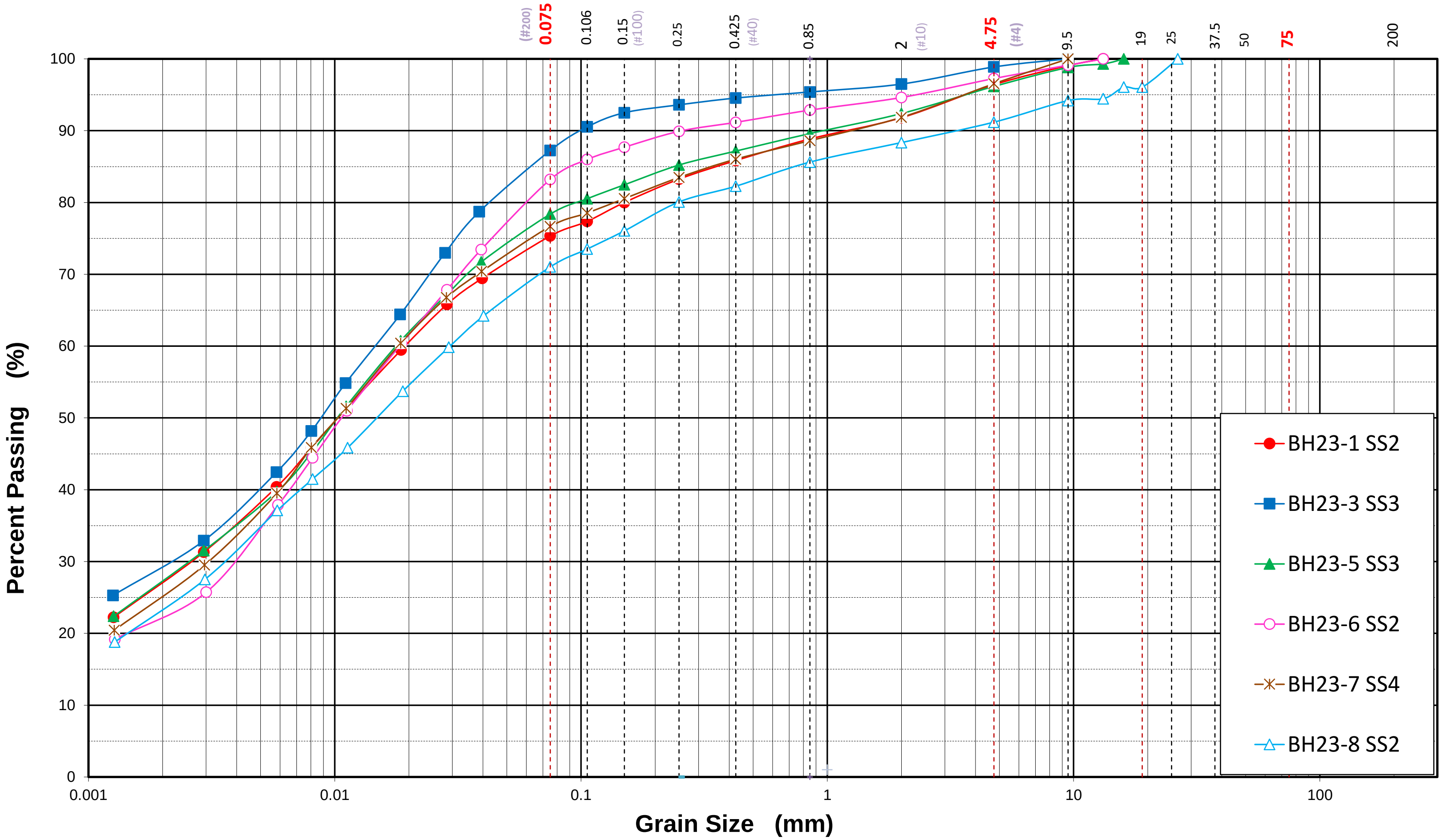
(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS / 0.3 m	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
154.9					
154.7 0.2	**ASPHALT:** 150mm				
	FILL: silty clay, trace rootlets, trace gravel, brown, moist, stiff	1	SS	13	
154.1 0.8	**SILTY CLAY TILL:** sandy, trace gravel, reddish brown, moist, very stiff	2	SS	23	9 20 48 23
153.2 1.7	**SILTY CLAY TILL/SHALE COMPLEX:** trace sand, reddish brown, moist, hard	3	SS	50/ 130mm	
152.5 2.4	**SHALE BEDROCK:** Queenston Formation, reddish brown, weathered	4 5	SS SS	50/ 75mm 50/ 100mm	
150.2 4.7	TCR=98%, SCR=75%, RQD=35% Hard layers=9%, Maximum hard layer thickness=25mm	6 R1	SS RC	50/ 50mm	
149.8 5.1	TCR=93%, SCR=93%, RQD=85% Hard layers=10%, Maximum hard layer thickness=30mm	R2	RC		
148.3 6.6	TCR=100%, SCR=97%, RQD=66% Hard layers=18%, Maximum hard layer thickness=50mm	R3	RC		
146.8 8.1	TCR=100%, SCR=100%, RQD=90% Hard layers=19%, Maximum hard layer thickness=50mm	R4	RC		
145.3 9.6	TCR=89%, SCR=63%, RQD=54% Hard layers=10%, Maximum hard layer thickness=50mm	R5	RC		
143.9 11.0	TCR=100%, SCR=100%, RQD=84% Hard layers=13%, Maximum hard layer thickness=50mm	R6	RC		
142.3 12.6	TCR=100%, SCR=94%, RQD=94% Hard layers=16%, Maximum hard layer thickness=50mm	R7	RC		
140.7 14.2	TCR=100%, SCR=100%, RQD=93% Hard layers=20%, Maximum hard layer thickness=50mm	R8	RC		
139.2 15.7	TCR=99%, SCR=99%, RQD=91% Hard layers=15%, Maximum hard layer thickness=50mm	R9	RC		
137.7 17.2	TCR=100%, SCR=100%, RQD=100% Hard layers=16%, Maximum hard layer thickness=150mm	R10	RC		
136.1 18.8	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level (mbgl): June 26, 2023 12.9 July 19, 2023 13.1				



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

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

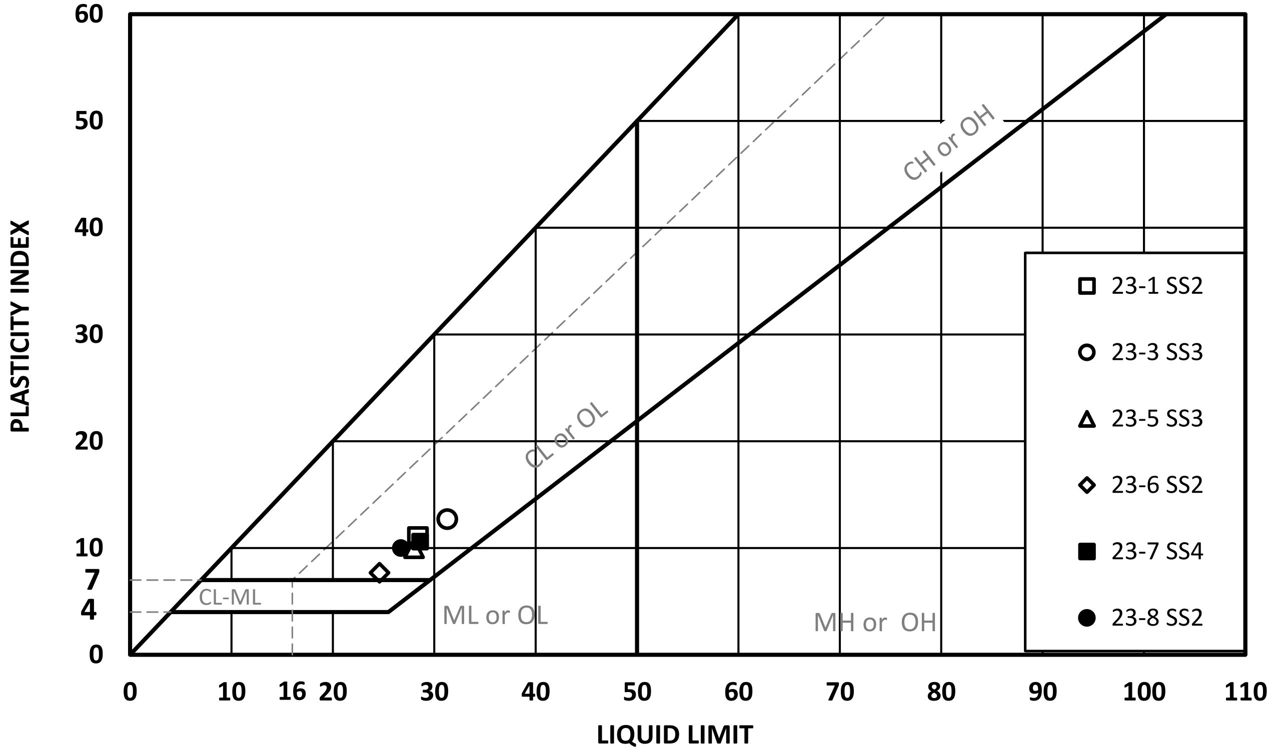
Particle Size Distribution (ASTM-D421/D422)



Silt and Clay		Sand			Gravel		Cobble +
Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	

DS CONSULTANTS LTD. 6221 Highway 7, Unit 16 Vaughan, Ontario, L4H 0K8 Telephone: (905) 264-9393 www.dsconsultants.ca	Project	**Geotechnical Investigation**	Project No	**22-012-101**
	Location	**3056 Neyagawa Blv., Oakville, ON.**	Date	**Jun-14-2023**
	Client	**NEATT Communities**	Figure No	10

Atterberg Test (ASTM D-4318)



Code	Sample ID	Sample No.		Moisture Contant (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	**USCS Symbol**
1	☐	23-1	SS2	13	28.4	17.4	11	CL
2	○	23-3	SS3	12	31.3	18.6	12.7	CL
3	△	23-5	SS3	12	28	18	10	CL
4	◇	23-6	SS2	13	24.6	16.9	7.7	CL
5	■	23-7	SS4	12	28.6	18	10.6	CL
6	●	23-8	SS2	12	26.7	16.7	10	CL

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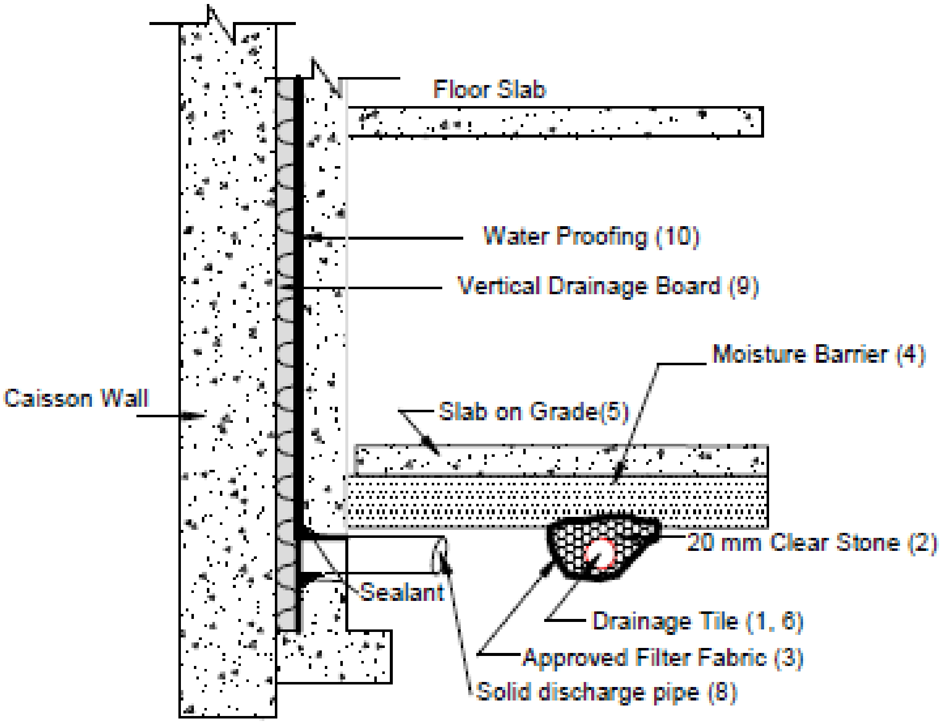
www.dsconsultants.ca

Project	**3056 Neyagawa Blv., Oakville, ON.**	Project No	**22-012-101**
Location	**3056 Neyagawa Blv., Oakville, ON.**	Date	**Jun-14-2023**
Client	**NEATT Communities**	Figure No	11



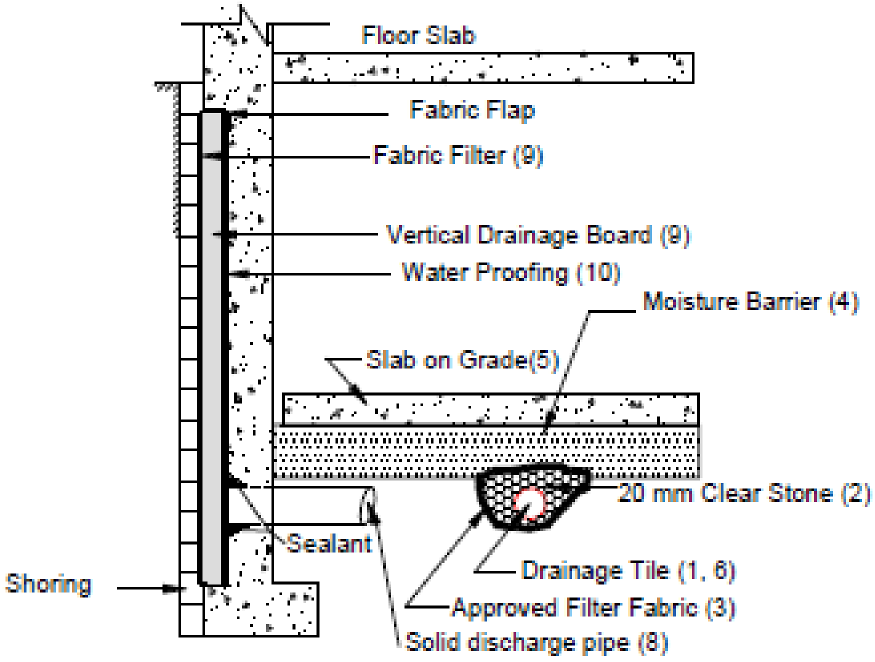
EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
5. Slab on grade should not be structurally connected to the wall or footing.
6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
7. Do not connect the underfloor drains to perimeter drains.
8. Solid discharge pipe located at the middle of each bay between the solider piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
9. Vertical drainage board mira-drain 6000 or eqivalent with filter cloth should be continous from bottom to 1.2 m below exterior finished grade.
10. The basement walls must be water proofed using bentonite or equivalent water-proofing system.
11. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE RECOMMENDATIONS
Shored Basement wall with Underfloor Drainage System

(not to scale)



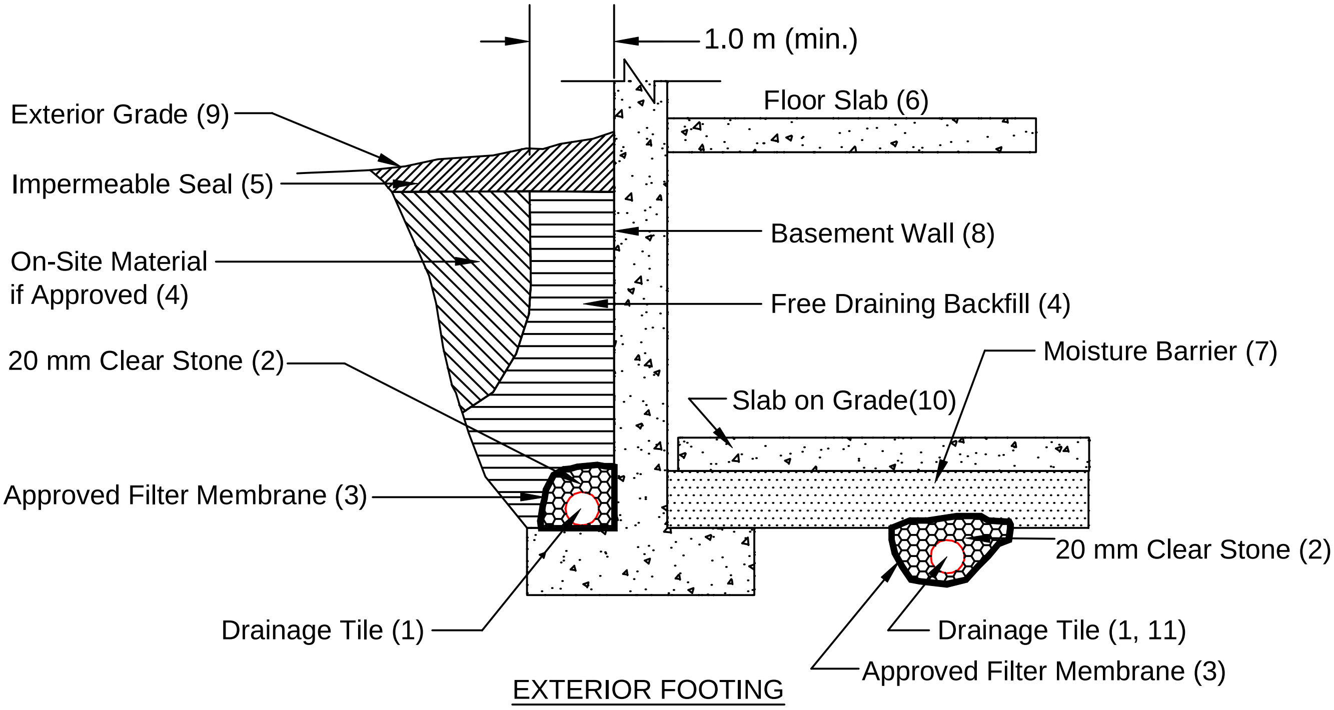
EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
5. Slab on grade should not be structurally connected to the wall or footing.
6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
7. Do not connect the underfloor drains to perimeter drains.
8. Solid discharge pipe located at the middle of each bay between the solider piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
9. Vertical drainage board with filter cloth should be kept a minium of 1.2 m below exterior finished grade.
10. The basement walls should be water proofed using bentonite or equivalent water-proofing system.
11. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE RECOMMENDATIONS
Shored Basement wall with Underfloor Drainage System

(not to scale)



Notes

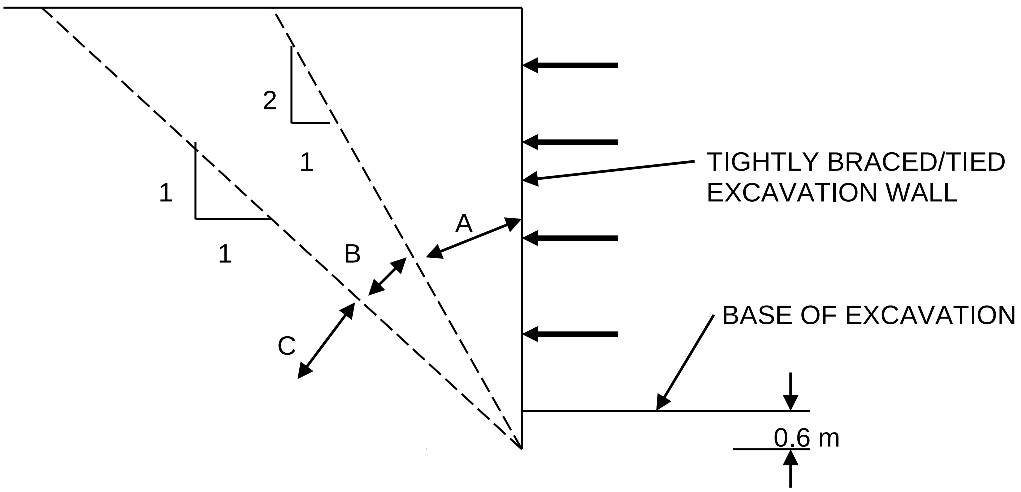
1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Free Draining backfill - OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm (18") of the wall. Use hand controlled light compaction equipment within 1.8 m (6') of wall. The minimum width of the Granular 'B' backfill must be 1.0 m.
5. Impermeable backfill seal - compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted. Maximum thickness of seal to be 0.5 m.
6. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
7. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
8. Basement wall to be damp proofed /water proofed.
9. Exterior grade to slope away from building.
10. Slab on grade should not be structurally connected to the wall or footing.
11. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
12. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
13. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
14. Do not connect the underfloor drains to perimeter drains.
15. Review the geotechnical report for specific details.

DRAINAGE AND BACKFILL RECOMMENDATIONS
Basement with Underfloor Drainage

(not to scale)

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)

Appendix A

GENERAL COMMENTS - BEDROCK IN METRO TORONTO AREA
PHOTOGRAPHS OF ROCK CORES

General Comments – Bedrock in Greater Toronto Area

The bedrock that makes spread footings or caissons a popular choice for high-rise foundation support is a shale or shale limestone composition. The highest member, the Queenston Formation, is generally found west of Toronto, while the Georgian Bay Formation underlies most of Metro Toronto, with the Collingwood Formation east of Toronto. The Queenston is, relatively speaking, the weaker of the three formations that are likely to support caissons or footings.

The Georgian Bay as well as the Queenston and Collingwood Formation are of Middle Ordovician Age. It is defined as the rock unit that overlies the bluish grey shales of the Collingwood Formation and is in turn overlain by the red shale of the Queenston Formation. The Georgian Bay Formation consists of bluish and grey shale with interbeds of sandstone, limestone and dolostone. Towards the west where the Georgian Bay formation underlies the Queenston Formation, the limestone content increases significantly and limestone and/or sandstone may comprise as much as 70 to 90 percent of the bedrock. The hard layers are usually less than about 100 to 150 mm thick, but some layers are much thicker. The thicker layers have been observed to be as much as 750 to 900 mm at some sites. The layers are actually lenses and they can vary significantly in thickness over short distances.

The upper portion of the bedrock is commonly weathered for a depth of 600 to 1000 mm and within this weathered zone hard limestone layers or lenses are common. These hard limestone layers can result in contractual problems for augers and can provide misleading bedrock elevations. Where the weathering is more extensive a shale till layer may be found above the bedrock. In the sound bedrock, the limestone, sandstone, dolostone is hard to very hard.

Stress relief features such as folds and faults are common in the bedrock. In these features, the rock is heavily fractured and sheared, and contains layers of shale rubble and clay. Weathering is much deeper than the surrounding rock in these features and often there is a lateral migration of the stress relief features resulting in sound unweathered bedrock overlying fractured and weather bedrock. The stress relief features are usually in the order of 4 to 6 m wide, but the depth can vary from 4 to 5 m to in excess of 10 m. These features occur randomly.

The bedrock contains significant high locked in horizontal stresses. These stresses can impose significant loads on tunnel walls but the slower rate of construction for basements allows for a relaxation of these stresses and they are not normally a problem for basement construction.

Groundwater seepage below the top 1000 mm is generally small, however, at several locations in Toronto and Mississauga large quantities have been encountered.

Bedding joints in the bedrock are very close-to-close, smooth planar in the shale and rough planar in the limestone. Significant vertical jointing is common.

Where the bedrock was cored, a detailed description of the rock core is appended to the borehole log.

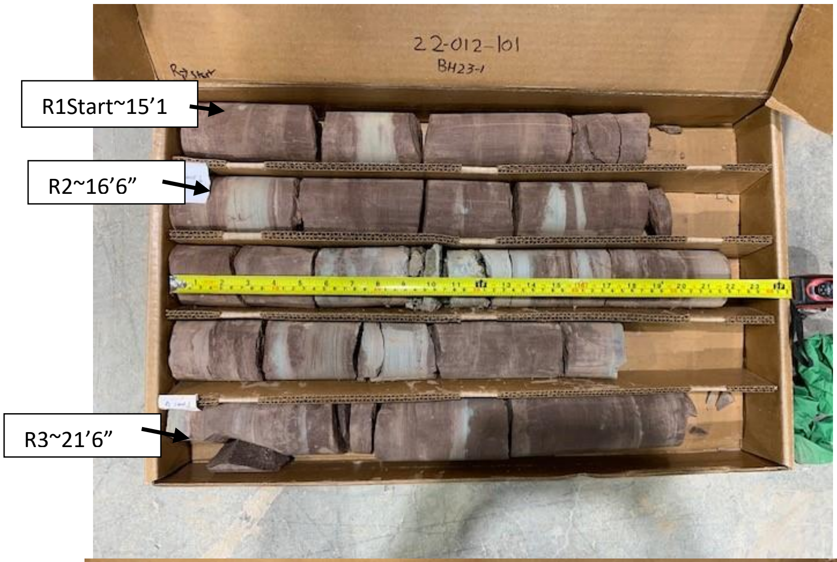
Design features related to the bedrock are discussed in other sections of this report, and these general comments must be considered with these comments.

Methane gas exists in the bedrock, normally below the top 1000 mm and more concentrated with depth. Appropriate care and monitoring are essential in all confined bedrock excavations, particularly caissons and tunnels.

22-012-101

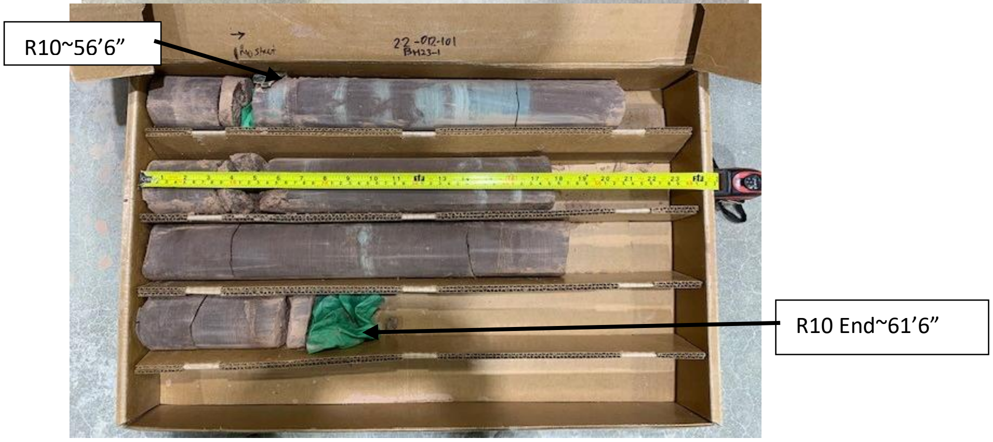
BH23-1

R1~15’1” ~16’6”
R2~16’6” ~21’6”
R3~21’6” ~26’1”
R4~26’1” ~31’6”
R5~31’6” ~36’6”
R6~36’6” ~41’7”
R7~41’7” ~46’5”
R8~46’5” ~51’5”
R9~51’5” ~56’6”
R10~56’6” ~61’6”




R5~31’6”
R6~36’6”
R7~41’7”
R8~46’’5”

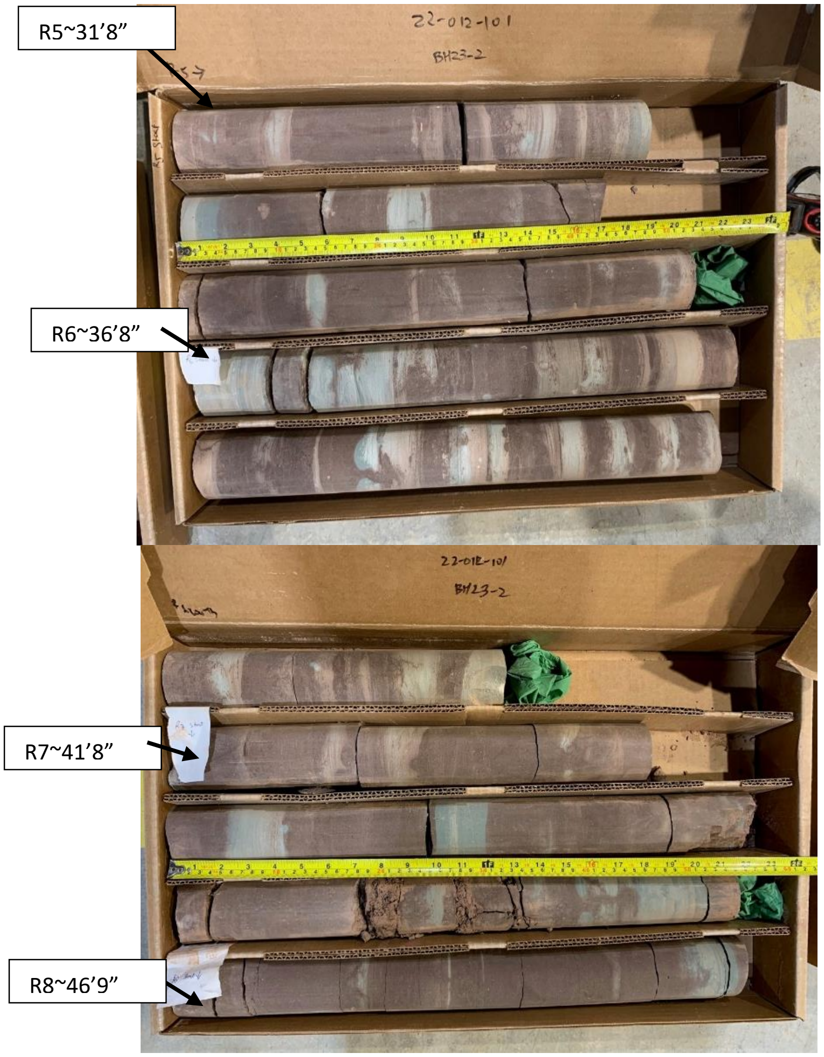

22-012-101
BH23-1
R9~51’5”


22-012-101
BH23-1
R10~56’6”
R10 End~61’6”

22-012-101

BH23-2

R1~15’5” ~16’7”
R2~16’7” ~21’7”
R3~21’7” ~26’7”
R4~26’7” ~31’8”
R5~31’8” ~36’8”
R6~36’8” ~41’8”
R7~41’8” ~46’9”
R8~46’9” ~51’7”
R9~51’7” ~56’6”
R10~56’6” ~61’8”


R5~31’8”
22-012-101
BH23-2
R6~36’8”
22-012-101
BH23-2
R7~41’8”
R8~46’9”


22-012-101
BH23-2
R9~51'7"


22-012-101
BH23-2
R10~56'6"
R10 End~61'8"

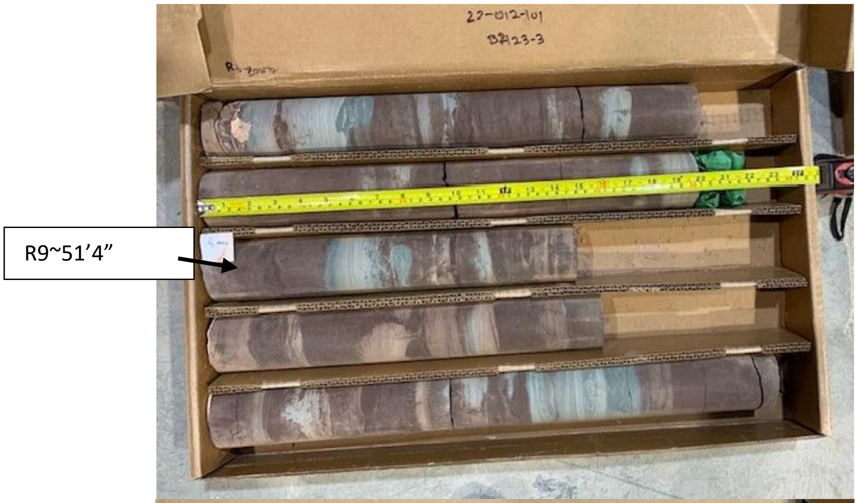
22-012-101

BH23-3

R1~15’5” ~16’8”
R2~16’8” ~21’3”
R3~21’3” ~26’6”
R4~26’6” ~31’4”
R5~31’4” ~36’4”
R6~36’4” ~41’5”
R7~41’5” ~46’
R8~46’ ~51’4”
R9~51’4” ~56’6”
R10~56’6” ~61’4”


R5~31’4”
R6~36’4”
BH23-3


22-012-101
BH23-3
R7~41’5”
R8~46’0”



R9~51’4”

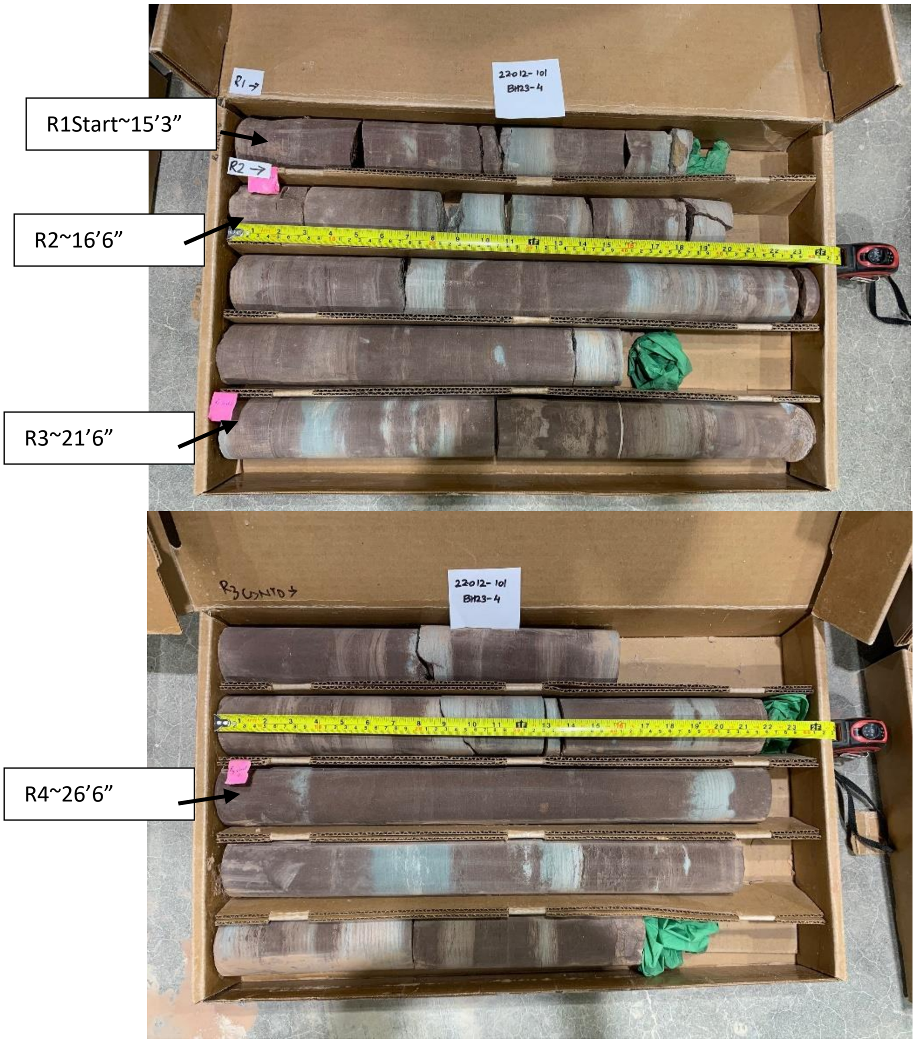
R10~56’6”

R10 End~61’4”

22-012-101

BH23-4

R1~15’3” ~16’6”
R2~16’6” ~21’6”
R3~21’6” ~26’6”
R4~26’6” ~31’6”
R5~31’6” ~36’5”
R6~36’5” ~41’6”
R7~41’6” ~46’1”
R8~46’1” ~51’3”
R9~51’3” ~56’4”
R10~56’4” ~61’5”




22012-101
BH23-4
R5→
R5~31’6”
R6~36’5”


22012-101
BH23-4
R7~41’6”
R8~46’1”

R9~51’3”

R10~56’4”

R10 End~61’5”

22-012-101

BH23-5

R1~15’5” ~16’9”
R2~16’9” ~21’6”
R3~21’6” ~26’6”
R4~26’6” ~31’6”
R5~31’6” ~36’5”
R6~36’5” ~41’6”
R7~41’6” ~46’5”
R8~46’5” ~51’6”
R9~51’6” ~56’6”
R10~56’6” ~61’6”

R1Start~15’5”

R2~16’9”

R3~21’6”

R4~26’6”

R5~31’6”


R6~36'5"


R7~41'6"
R8~46'5"


R9~51’6”
R10~56’6”


R10~61’6”

22-012-101

BH23-6

R1~15’3” ~16’9”
R2~16’9” ~21’9”
R3~21’9” ~26’8”
R4~26’8” ~31’10”
R5~31’10” ~36’5”
R6~36’5” ~41’5”
R7~41’5” ~46’6”
R8~46’6” ~51’6”
R9~51’6” ~56’6”
R10~56’6” ~61’6”

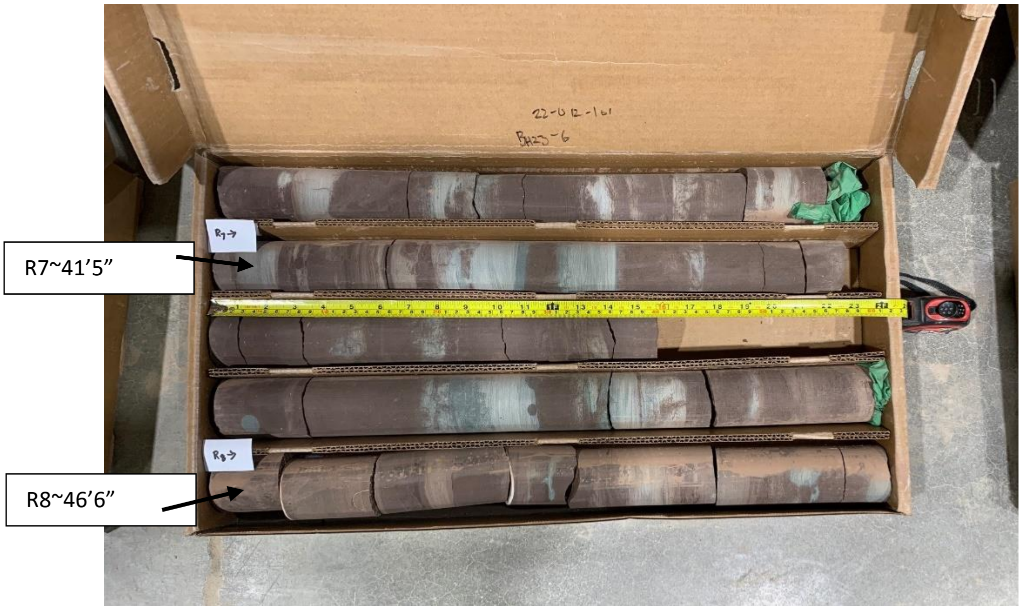
R1Start~15’3”

R2~16’9”

R3~21’9”

R4~26’8”


22012-101
BH23-6
R5~31’10”
R6~36’5”


22-012-101
BH23-6
R7~41’5”
R8~46’6”

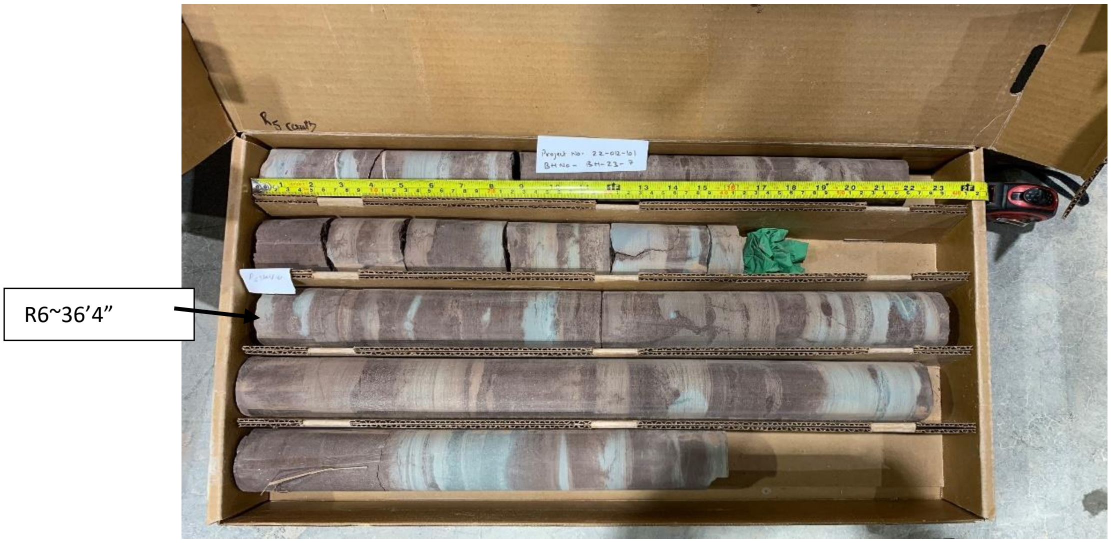

R9~51’6”

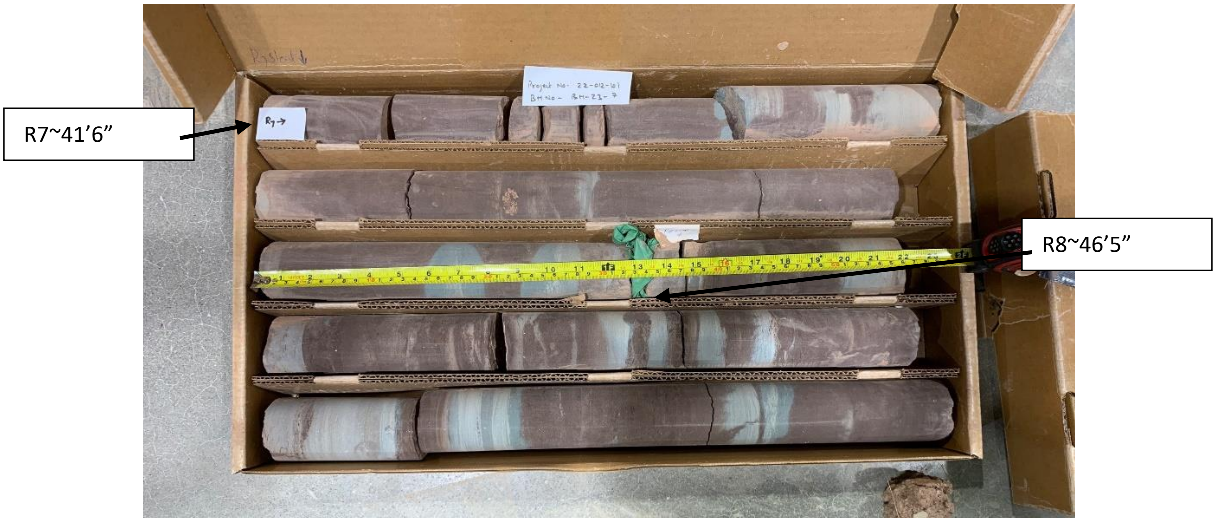

R10~56’6”
R10~61’6”

22-012-101

BH23-7

R1~15’3” ~16’5”
R2~16’5” ~21’6”
R3~21’6” ~26’5”
R4~26’5” ~31’6”
R5~31’6” ~36’4”
R6~36’4” ~41’6”
R7~41’6” ~46’5”
R8~46’5” ~51’6”
R9~51’6” ~56’6”
R10~56’6” ~61’8”


R6~36’4”


R7~41’6”
R8~46’5”


R9~51'6"
R10~56'6"
Project No- 22-012-101
BH No- BH-23-7
R9 →


R10~61'8"
R10 CONT...
Project No- 22-012-101
BH No- BH-23-7

22-012-101

BH23-8

R1~15’2” ~16’5”
R2~16’5” ~21’5”
R3~21’5” ~26’6”
R4~26’6” ~31’5”
R5~31’5” ~36’2”
R6~36’2” ~41’4”
R7~41’4” ~46’7”
R8~46’7” ~51’5”
R9~51’5” ~56’6”
R10~56’6” ~61’8”

R6~36’2”

R7~41’4”

R8~46’7”

R9~51'5"

R10~56'6"

R10~61'8"

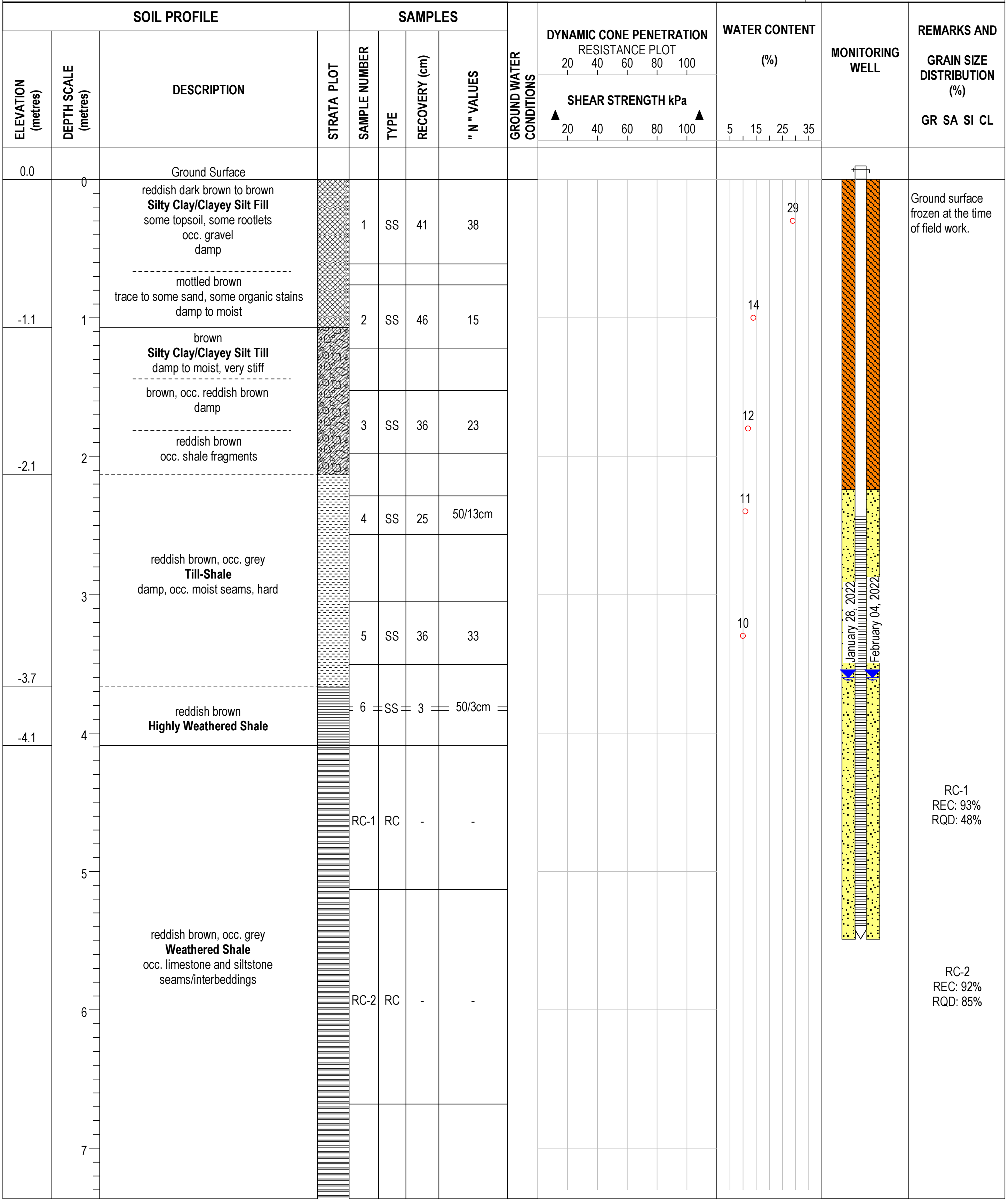
Appendix B

PREVIOUS SHAD BOREHOLE LOGS (BH1 TO BH5, 2022)

RECORD OF BOREHOLE 1

Project No.: T22883
CLIENT: NEATT Communities
ORIGINATED BY: R.H.
DATE: January 18-20, 2022
LOCATION: 3056 Neyagawa Boulevard, Oakville
COMPILED BY: R.H.
DATUM: N/A
BOREHOLE TYPE: Hollow Stem/Rock Coring
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6



ELEVATION (metres)	DESCRIPTION
0.0	Ground Surface
	reddish dark brown to brown **Silty Clay/Clayey Silt Fill** some topsoil, some rootlets occ. gravel damp mottled brown trace to some sand, some organic stains damp to moist
-1.1	brown **Silty Clay/Clayey Silt Till** damp to moist, very stiff brown, occ. reddish brown damp reddish brown occ. shale fragments
-2.1	reddish brown, occ. grey **Till-Shale** damp, occ. moist seams, hard
-3.7	reddish brown **Highly Weathered Shale**
-4.1	reddish brown, occ. grey **Weathered Shale** occ. limestone and siltstone seams/interbeddings

SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	WATER CONTENT (%)	REMARKS
1	SS	41	38	29	Ground surface frozen at the time of field work.
2	SS	46	15	14	
3	SS	36	23	12	
4	SS	25	50/13cm	11	
5	SS	36	33	10	
6	SS	3	50/3cm		
RC-1	RC	-	-		RC-1 REC: 93% RQD: 48%
RC-2	RC	-	-		RC-2 REC: 92% RQD: 85%

RECORD OF BOREHOLE 1

Project No.: T22883
CLIENT: NEATT Communities
ORIGINATED BY: R.H.

DATE: January 18-20, 2022
LOCATION: 3056 Neyagawa Boulevard, Oakville
COMPILED BY: R.H.

DATUM: N/A
BOREHOLE TYPE: Hollow Stem/Rock Coring
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

SOIL PROFILE				SAMPLES								
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	8	reddish brown, occ. grey **Weathered Shale**	▤	RC-3	RC	-	-					RC-3 REC: 99% RQD: 97%
	9		▤	RC-4	RC	-	-					RC-4 REC: 92% RQD: 92%
-9.4	10 11 12 13 14	**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: N/A Measured Groundwater Level in Installed Monitoring Well on: January 28, 2022: 3.6m February 04, 2022:3.6m										

RECORD OF BOREHOLE 2

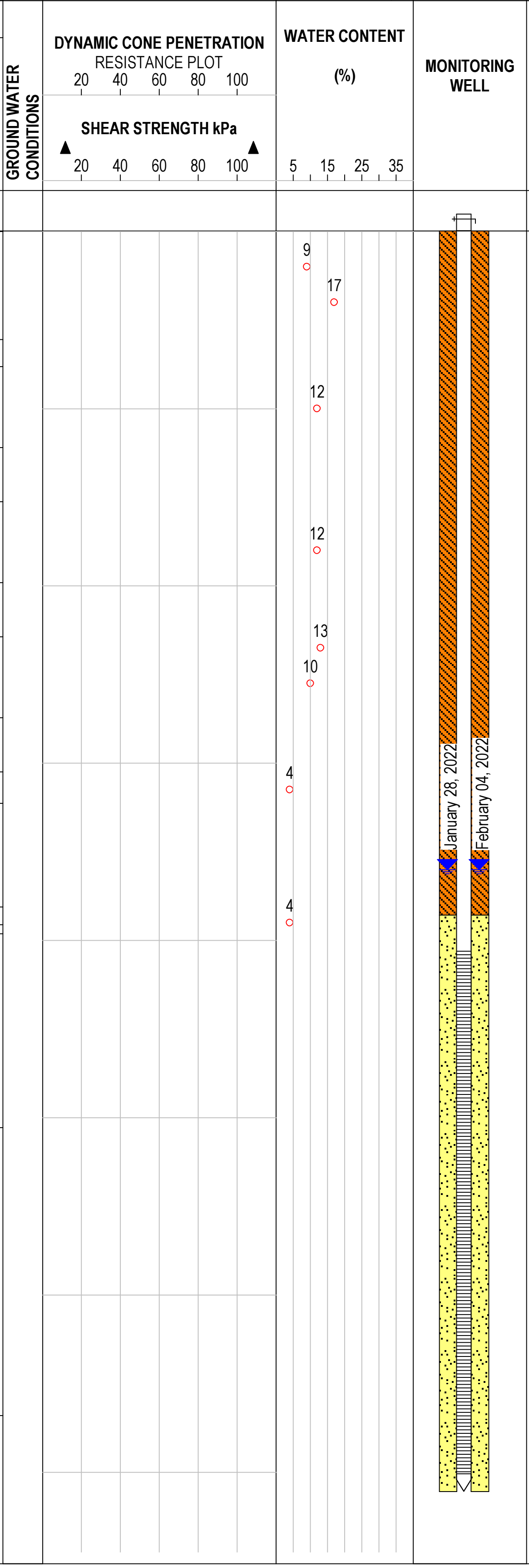
Project No.: T22883
CLIENT: NEATT Communities
ORIGINATED BY: R.H.
DATE: January 18-20, 2022
LOCATION: 3056 Neyagawa Boulevard, Oakville
COMPILED BY: R.H.
DATUM: N/A
BOREHOLE TYPE: Hollow Stem/Rock Coring
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

SOIL PROFILE		SAMPLES				
ELEVATION (metres)	DESCRIPTION	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Ground Surface					
-0.3	**Granular Fill**	1	SS	25	19	Ground surface frozen at the time of field work.
-0.9	brown, occ. dark brown **Silty Clay/Clayey Silt Fill** occ. topsoil, occ. rootlets damp					
-2.4	brown **Silty Clay/Clayey Silt Till** trace to some sand occ. oxidized fissures damp, hard --- reddish greyish brown occ. shale fragments	2 3	SS SS	30 36	31 33	
-3.2	reddish brown **Till-Shale** damp, hard	4 5	SS SS	36 15	67 50/3cm	
-4.0	reddish brown **Highly Weathered Shale**	6	SS	10	50/10cm	
	reddish brown, occ. grey **Weathered Shale** occ. limestone and siltstone seams/interbeddings	RC-1	RC	-	-	RC-1 REC: 100% RQD: 31%
		RC-2	RC	-	-	RC-2 REC: 100% RQD: 81%
		RC-3	RC	-	-	RC-3 REC: 100% RQD: 94%

DEPTH SCALE (metres): 0, 1, 2, 3, 4, 5, 6, 7

STRATA PLOT



RECORD OF BOREHOLE 2

Project No.: T22883 **CLIENT:** NEATT Communities **ORIGINATED BY:** R.H.

DATE: January 18-20, 2022 **LOCATION:** 3056 Neyagawa Boulevard, Oakville **COMPILED BY:** R.H.

DATUM: N/A **BOREHOLE TYPE:** Hollow Stem/Rock Coring **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

SOIL PROFILE				SAMPLES								
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ▲ ▲ 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	8 9	reddish brown **Weathered Shale**	▤	RC-4	RC	-	-					RC-4 REC: 100% RQD: 83%
-9.4	10 11 12 13 14 15	**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: N/A Measured Groundwater Level in Installed Monitoring Well on: January 28, 2022: 3.6m February 04, 2022: 3.6m										

RECORD OF BOREHOLE 3

Project No.: T22883
CLIENT: NEATT Communities
ORIGINATED BY: R.H.
DATE: January 18-20, 2022
LOCATION: 3056 Neyagawa Boulevard, Oakville
COMPILED BY: R.H.
DATUM: N/A
BOREHOLE TYPE: Hollow Stem/Rock Coring
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DESCRIPTION	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	WATER CONTENT (%)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Ground Surface						
-0.1	**Topsoil**					25	
-0.9	mottled brown, occ. dark brown **Silty Clay/Clayey Silt Fill** some topsoil, some rootlets damp	1	SS	46	16	26	Ground surface frozen at the time of field work.
	brown, occ. reddish brown **Silty Clay/Clayey Silt Till** trace sand, some shale fragments damp to moist, very stiff	2	SS	46	15	17	
-2.1	reddish brown, occ. grey damp, hard	3	SS	36	24	12	
	reddish brown **Highly Weathered Shale**	4	SS	10	50/13cm	6	
-3.3		5	SS	10	50/13cm	6	
	reddish brown **Weathered Shale** occ. limestone and siltstone seams/interbeddings	RC-1	RC	-	-		RC-1 REC: 40% RQD: 0%
		RC-2	RC	-	-		RC-2 REC: 85% RQD: 46%
		RC-3	RC	-	-		RC-3 REC: 100% RQD: 78%

DEPTH SCALE (metres): 0, 1, 2, 3, 4, 5, 6, 7

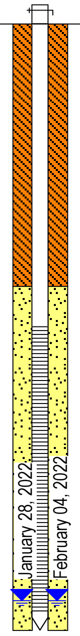
DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: 20 40 60 80 100

WATER CONTENT (%): 5 15 25 35

GROUND WATER CONDITIONS

MONITORING WELL



RECORD OF BOREHOLE 3

Project No.: T22883
CLIENT: NEATT Communities
ORIGINATED BY: R.H.
DATE: January 18-20, 2022
LOCATION: 3056 Neyagawa Boulevard, Oakville
COMPILED BY: R.H.
DATUM: N/A
BOREHOLE TYPE: Hollow Stem/Rock Coring
CHECKED BY: H.S.

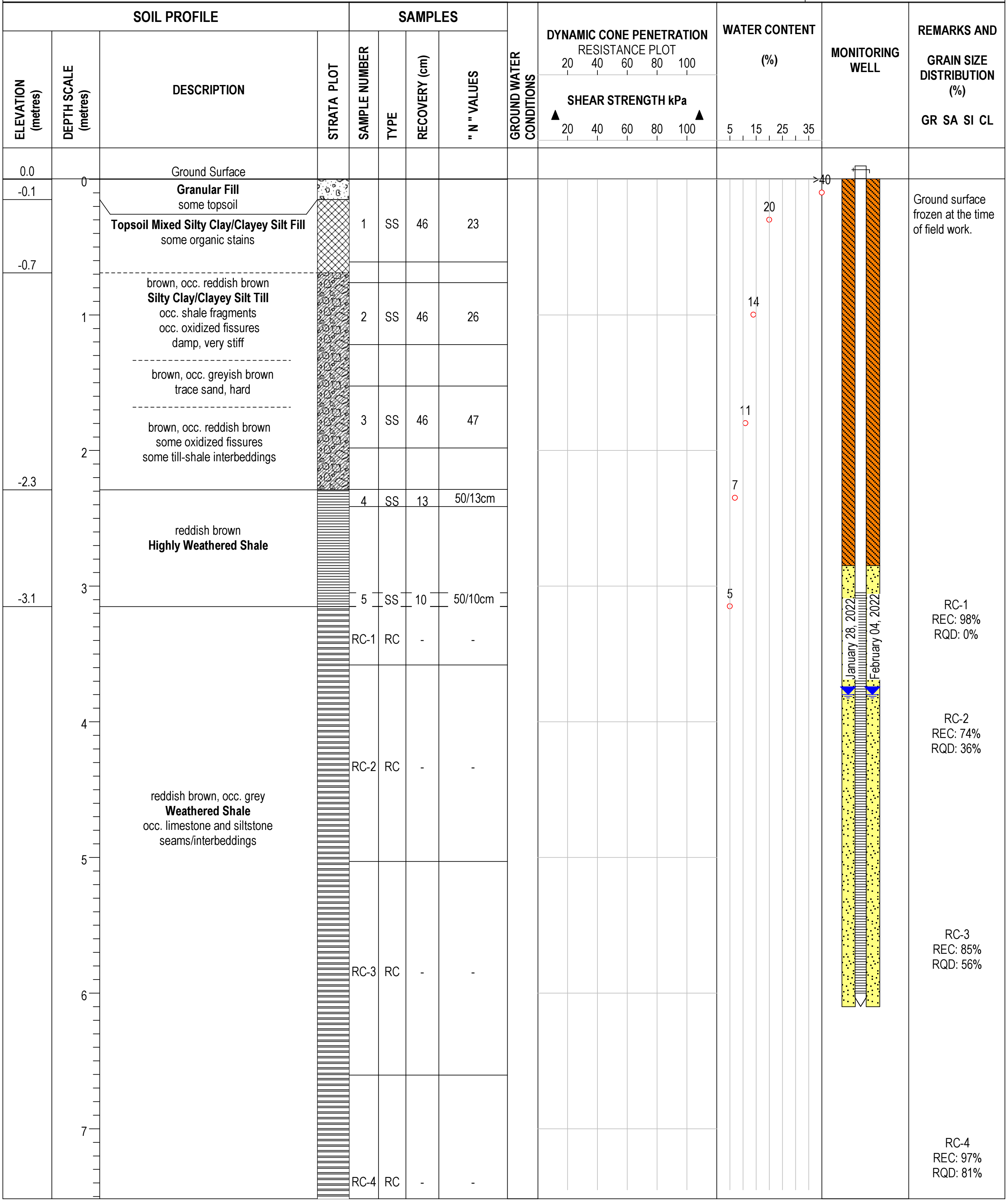
SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

SOIL PROFILE				SAMPLES								
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ▲ 20 40 60 80 100 ▲	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
-8.2	8	reddish brown **Weathered Shale**	▤	RC-4	RC	-	-					RC-4 REC: 94% RQD: 91%
	9 10 11 12 13 14	**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: N/A Measured Groundwater Level in Installed Monitoring Well on: January 28, 2022: 2.9m February 04, 2022: 2.9m										

RECORD OF BOREHOLE 4

Project No.: T22883
CLIENT: NEATT Communities
ORIGINATED BY: R.H.
DATE: January 18-20, 2022
LOCATION: 3056 Neyagawa Boulevard, Oakville
COMPILED BY: R.H.
DATUM: N/A
BOREHOLE TYPE: Hollow Stem/Rock Coring
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6



SOIL PROFILE

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION
0.0		Ground Surface
-0.1	0	**Granular Fill** some topsoil
-0.7		**Topsoil Mixed Silty Clay/Clayey Silt Fill** some organic stains
-2.3	1, 2	brown, occ. reddish brown **Silty Clay/Clayey Silt Till** occ. shale fragments occ. oxidized fissures damp, very stiff brown, occ. greyish brown trace sand, hard brown, occ. reddish brown some oxidized fissures some till-shale interbeddings
-3.1	3	reddish brown **Highly Weathered Shale**
	4, 5, 6, 7	reddish brown, occ. grey **Weathered Shale** occ. limestone and siltstone seams/interbeddings

SAMPLES

SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES
1	SS	46	23
2	SS	46	26
3	SS	46	47
4	SS	13	50/13cm
5	SS	10	50/10cm
RC-1	RC	-	-
RC-2	RC	-	-
RC-3	RC	-	-
RC-4	RC	-	-

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

Ground surface frozen at the time of field work.

RC-1
REC: 98%
RQD: 0%

RC-2
REC: 74%
RQD: 36%

RC-3
REC: 85%
RQD: 56%

RC-4
REC: 97%
RQD: 81%

RECORD OF BOREHOLE 4

Project No.: T22883 **CLIENT:** NEATT Communities **ORIGINATED BY:** R.H.

DATE: January 18-20, 2022 **LOCATION:** 3056 Neyagawa Boulevard, Oakville **COMPILED BY:** R.H.

DATUM: N/A **BOREHOLE TYPE:** Hollow Stem/Rock Coring **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

SOIL PROFILE				SAMPLES								
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ▲ 20 40 60 80 100 ▲	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
-8.1	8	reddish brown **Weathered Shale**	▤									
	9	**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: N/A Measured Groundwater Level in Installed Monitoring Well on: January 28, 2022: 3.8m February 04, 2022: 3.8m										
	10											
	11											
	12											
	13											
	14											
	15											

RECORD OF BOREHOLE 5

Project No.: T22883
CLIENT: NEATT Communities
ORIGINATED BY: R.H.
DATE: January 18-20, 2022
LOCATION: 3056 Neyagawa Boulevard, Oakville
COMPILED BY: R.H.
DATUM: N/A
BOREHOLE TYPE: Hollow Stem/Rock Coring
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

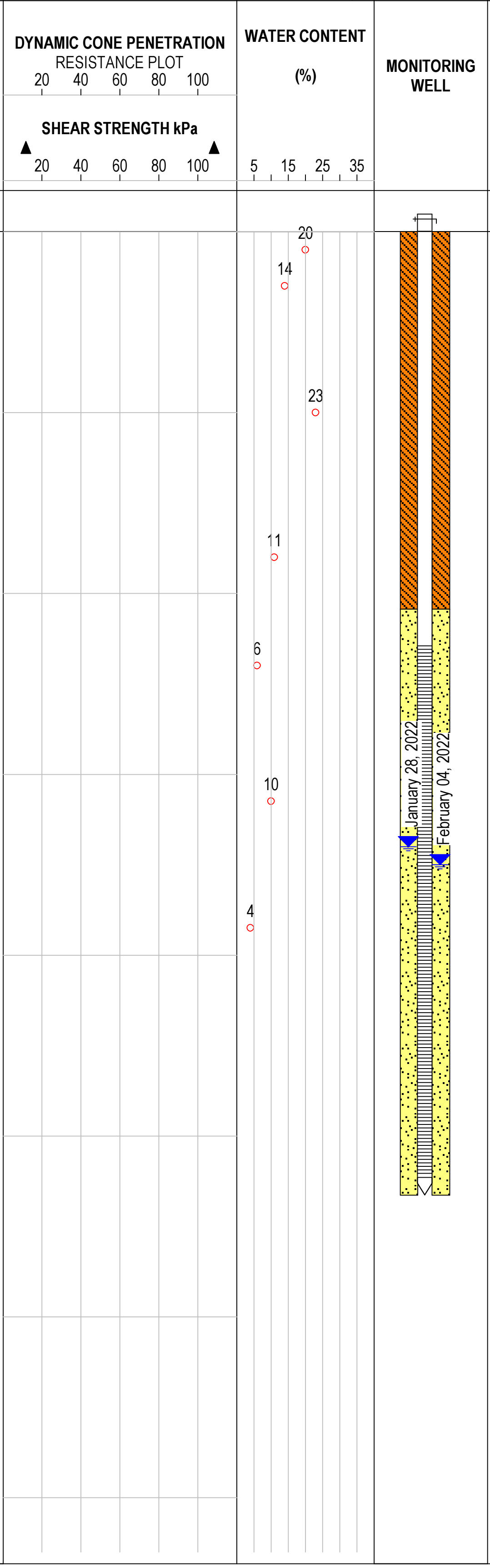
SOIL PROFILE

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION
0.0		Ground Surface
-0.1	0	**Topsoil**
		reddish brown, occ. brown **Silty Clay/Clayey Silt Fill** some organic stains damp mottled brown, occ. dark brown some sand, some topsoil occ. rootlets
-1.4		reddish brown **Silty Clay/Clayey Silt Till** some shale fragments, damp, hard
-1.8		reddish brown **Till-Shale** damp, hard occ. highly weathered shale interbeddings occ. moist seams
-3.2		reddish brown **Highly Weathered Shale**
-4.0		reddish brown **Weathered Shale** occ. limestone and siltstone layers

SAMPLES

SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES
1	SS	46	29
2	SS	25	6
3	SS	30	76
4	SS	15	50/5cm
5	SS	15	50/5cm
6	SS	5	50/8cm
RC-1	RC	-	-
RC-2	RC	-	-

GROUND WATER CONDITIONS



REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

Ground surface frozen at the time of field work.

RC-1
REC: 89%
RQD: 29%

RC-2
REC: 98%
RQD: 98%

RECORD OF BOREHOLE 5

Project No.: T22883
CLIENT: NEATT Communities
ORIGINATED BY: R.H.
DATE: January 18-20, 2022
LOCATION: 3056 Neyagawa Boulevard, Oakville
COMPILED BY: R.H.
DATUM: N/A
BOREHOLE TYPE: Hollow Stem/Rock Coring
CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

SOIL PROFILE				SAMPLES								
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	8	reddish brown **Weathered Shale**		RC-3	RC	-	-					RC-3 REC: 95% RQD: 91%
-9.4	9			RC-4	RC	-	-					RC-4 REC: 99% RQD: 91%
	10 11 12 13 14	**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: N/A Measured Groundwater Level in Installed Monitoring Well on: January 28, 2022: 3.4m February 04, 2022: 3.5m										