# Proposed Residential Development

*Tribute (Brookdale) Limited*

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Preliminary Geotechnical Investigation Report

**Project Location:**
1101A, 1105 and 1163 Kingston Road, Pickering, Ontario

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# 1. Introduction

This report presents the findings of a preliminary geotechnical investigation conducted for the proposed residential development located at 1101A, 1105 and 1163 Kingston Road in Pickering, Ontario. The preliminary geotechnical investigation was being carried out for due diligence purposes by Tribute (Brookdale) Limited in support of the Site Plan Application for the development. Preliminary plans call for the design and construction of six (6) buildings with fourteen (14) condominium towers above six (6) storey podiums and up to three (3) levels of underground parking.

The purpose of the preliminary geotechnical investigation was to determine the general subsurface soil/bedrock and groundwater conditions at the site by putting down sampled boreholes and, based on an assessment of the factual borehole data, to provide preliminary geotechnical engineering guidelines for site development planning.

## 2. Site Description

The site is located at 1101A, 1105 and 1163 Kingston Road in Pickering, Ontario. It is irregular in shape, covers an area of 7.74 hectares and is currently occupied by Brookdale Centre and Walnut Lane at the northeast edge of the site. Brookdale Centre is developed with five (5) commercial retail buildings and paved parking areas and access roads. The site slopes gradually from north to south. Ground surface elevations at the borehole locations ranged from about Elevations 84.9 to 86.4 m.

The site is bounded by Kingston Road to the north, Highway 401 to the south, commercial businesses and Pine Creek to the east, and commercial businesses to the west.

# 3. Procedure

The fieldwork for the preliminary geotechnical investigation was carried out from May 8 to 18, 2023. Seven (7) sampled boreholes (Boreholes 1, 2D, 3D, 4, 5D, 6 and 7) and three (3) unsampled boreholes (Boreholes 2S, 3S and 5S) were advanced to depths of 10.80 to 30.55 m below existing grade at the approximate locations shown on the attached Borehole Location Plan (Drawing No. 1).

The boreholes were advanced using mud rotary and tri-cone equipment owned and operated by a specialist drilling contractor. In each borehole, samples of the soil and weathered shale were recovered using conventional split spoon equipment and standard penetration test methods. Field shear vane tests were conducted on saturated clayey soils with low "N" values. To confirm bedrock and to determine its quality, Boreholes 1 and 4 were extended about 3 m into shale bedrock by coring in HQ size using diamond drilling equipment.

Groundwater levels were observed in ten (10) monitoring wells installed in the boreholes for subsequent readings and hydrogeological assessment. The monitoring wells in Boreholes 2D, 2S, 3D, 3S, 5D and 5S were installed as nested wells. The monitoring wells were installed in accordance with the Ontario Water Resources Act, R.R.O. 1990, Ontario Regulation (O.Reg.) 903 – amended to O.Reg. 128/03.

The fieldwork was supervised by EXP geotechnical personnel who monitored the drilling operations and logged the borings and rock cores. All split spoon samples and rock cores were transported to our laboratory for detailed examination.

The location and ground surface elevation of the boreholes were determined in the field by EXP Services Inc. The elevations were determined from Can-Net Elevations using a Trimble TSC3 Controller.

Drill cuttings, drilling mud and core water were stored on site in 45 gallon drums. The drums will be disposed of at a licensed facility following analytical testing.

# 4. Laboratory Testing

The laboratory testing program testing program comprised the following:

- Moisture content determination on all recovered soil samples, with results presented on the Log of Borehole sheets (Drawing Nos. 2 to 11).
- Grain size analysis of six (6) soil samples, with results presented in Appendix A.
- Two (2) soil samples analyzed for pH and Sulphate content, with results presented in Appendix B.

# 5. Subsurface Conditions

## 5.1 Soil and Bedrock

The detailed soil and bedrock profile encountered in each borehole and the results of laboratory moisture content determinations are indicated on the attached borehole logs (Drawing Nos. 2 to 11). It should be noted the boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The "Notes on Sample Descriptions" preceding the borehole logs form an integral part of and should be read in conjunction with this report.

The stratigraphy of the site, as revealed in the boreholes, generally comprised pavement structure and fill followed by native deposits of silt, clayey silt, sandy silt till and silty sand till overlying shale bedrock. Wet coarse sand and wet sand and gravel deposits were encountered in Borehole 5D.

A brief description of the stratigraphy, in order of depth, follows:

***Pavement Structure***

Pavement structure, comprising 50 to 75 mm asphaltic concrete and 360 to 580 mm granular material, was encountered surficially in all of the boreholes.

***Fill***

Fill was encountered below the pavement structure in Boreholes 1, 4, 5D, 6 and 7. The fill varied from dark brown to brown topsoil-stained sandy silt to silty sand or silty clay with some gravel and topsoil inclusions. The compactness of the fill varied from loose to compact. Moisture contents of the moist to very moist fill ranged from 8 to 30%. The fill extended to depths of approximately 0.45 to 0.65 m below existing grade.

***Silty Sand***

Silty sand was encountered below the pavement structure in Borehole 2D. The silty sand deposit was brown in colour and existed in a compact state of compactness. The silty sand had a moisture content of 10%, indicating a moist condition. The silty sand deposit extended to a depth of about 1.0 m below existing grade.

***Silt***

Silt was encountered at depths ranging from approximately 0.65 to 1.65 m below existing grade in Boreholes 2D, 3D and 5D. The silt stratum was brown in colour and existed in a loose to compact state of compactness. Moisture contents of this material ranged from 17 to 20%,

indicating a saturated condition. The silt stratum extended to a depth of about 2.5 m below existing grade.

***Clayey Silt***

Clayey silt was encountered at depths ranging from approximately 1.0 to 2.5 m below existing grade in Boreholes 1, 2D, 5D, 6 and 7. The clayey silt stratum was brown and grey in colour and soft to very stiff in consistency. Field shear vane tests indicated undrained shear strengths ranging from 19 to 130 kPa. Moisture contents of this material ranged from 19 to 26%, indicating a saturated condition. The clayey silt stratum extended to depths of about 2.5 to 8.75 m below existing grade.

***Sandy Silt Till***

Sandy silt till was encountered at depths ranging from approximately 1.75 to 10.25 m below existing grade in all of the boreholes. The sandy silt till deposit was primarily grey in colour and contained wet sand/sand and gravel seams and scattered gravel and cobbles. Cobble and boulder layers were encountered in Boreholes 4 and 7. The compactness of the sandy silt till varied from loose to very dense. The sandy silt till was loose to depths of about 4.0 to 5.5 m in Boreholes 3D, 5D and 7. Moisture contents of the sandy silt till generally ranged from 7 to 13%, indicating a moist to saturated condition. The sandy silt till deposit extended to depths of approximately 7.0 m to 17.5 m below existing grade.

***Coarse Sand***

Coarse sand was encountered at a depth of about 7.0 m below existing grade in Borehole 5D. The coarse sand deposit was grey in colour, contained occasional gravel and existed in a very dense state of compactness. Moisture contents of the wet coarse sand ranged from 12 to 14%. The coarse sand deposit extended to a depth of about 11.75 m below existing grade.

***Sand and Gravel***

Sand and gravel was encountered below the coarse sand deposit in Borehole 5D. The sand and gravel deposit was brown in colour, wet with moisture contents ranging from 8 to 10%, and existed in a very dense state of compactness. The sand and gravel deposit extended to a depth of about 14.5 m below existing grade.

***Clayey Silt (lower)***

A lower clayey silt stratum was encountered at a depth of approximately 11.5 m below existing grade in Borehole 1. The clayey silt stratum was grey in colour, moist with moisture contents ranging from 16 to 18%, and hard in consistency. The lower clayey silt stratum extended to a depth of about 14.75 m below existing grade.

***Silty Sand Till***

Silty sand till was encountered at depths ranging from approximately 8.5 to 16.0 m below existing grade in Boreholes 1, 2D, 3D and 6. The silty sand till deposit was grey in colour, contained scattered gravel and cobbles, and existed in a very dense state of compactness. Cobble and boulder layers were encountered near the bottom of the deposit in Borehole 1. Moisture contents of the very moist to wet silty sand till ranged from 8 to 11%. The silty sand till deposit extended to depths of about 10.25 to 18.5 m below existing grade.

***Bedrock***

Shale bedrock was encountered at depths ranging from about 14.5 to 18.5 m below existing grade in Boreholes 1, 2D, 3D, 4, 5D, 6 and 7 (approximate Elevation 66.6 to 70.4 m), indicating variable depths to bedrock. The inferred bedrock boundaries should not be interpreted as exact planes of bedrock since the auger will frequently penetrate some distance into the weathered rock before noticeable resistance is encountered.

To confirm bedrock and to determine its quality, Boreholes 1 and 4 were extended about 3 m into the bedrock by coring in HQ size using diamond drilling equipment. The rock core logs are attached to Log of Boreholes 1 and 4. Based on the rock recovery and the Rock Quality Designation (RQD), the bedrock is poor to good quality rock with horizontal fractures and some vertical joints. Generally, the upper 1 to 2 m of the shale bedrock is weathered becoming more sound with depth. However, it should be noted that weathered shale bedrock extended to a depth of 30.55 m below existing grade in Borehole 5D based on auger resistance and recovered split spoon samples.

The bedrock encountered in the boreholes is of the Blue Mountain Formation and underlies this site to a significant depth. Based on our experience, the upper zone of the shale bedrock is typically weathered with isolated weathered zones extending to greater depth. The predominate rock type is shale, but this shale is interbedded with limestone and siltstone. Typically, EXP has found the shale component in this formation is in the order of 80 percent in Greater Toronto area excavations. The limestone and siltstone components are generally 50 to 300 mm thick; however, thicker layers of up to 1,000 mm have been encountered.

Stress relief features such as folds and faults are common in the Blue Mountain Formation. In these fractures, the rock is heavily fractured and sheared. It can also contain layers of shale rubble and clay. Due to the fracturing, these features may also contain groundwater conduits, which could result in excessive water flow into excavations. Weathering is much deeper than the surrounding sound unweathered bedrock. The stress relief features are usually in the order of 4 to 6 m wide, but in depth can vary from 4 to 5 m to in excess of 10 m.

## 5.2 Groundwater

Groundwater conditions were observed in monitoring wells installed in Boreholes 1, 2D, 2S, 3D, 3S, 4, 5D, 5S, 6 and 7 for subsequent readings and hydrogeological assessment. Short-term groundwater measurements are included in the attached borehole logs. End-of-hole water levels in the boreholes were not recorded as water was introduced into the boreholes to facilitate the mud rotary drilling operation.

Short-term groundwater readings in the monitoring wells are summarized in following Table 1.

**Table 1 - Short-Term Groundwater Levels in Monitoring Wells**

| Borehole/ Monitoring Well | Ground Surface Elevation (m) | Monitoring Wells May 20, 2023 (m below grade) | Monitoring Wells May 31, 2023 (m below grade) | Monitoring Wells June 6, 2023 (m below grade) | Groundwater Elevation (m) June 6, 2023 |
|---|---|---|---|---|---|
| 1 | 85.79 | 3.36 | 3.42 | 3.37 | 82.42 |
| 2S (shallow) | 86.38 | 2.89 | 2.97 | 2.91 | 83.47 |
| 2D (deep) | 86.38 | 2.96 | 3.83 | 3.98 | 82.40 |
| 3S (shallow) | 85.08 | 1.38 | 2.10 | 4.04 | 81.04 |
| 3D (deep) | 85.08 | 3.97 | 4.04 | 4.04 | 81.04 |
| 4 | 85.41 | 3.92 | 3.97 | 4.19 | 81.22 |
| 5S (shallow) | 84.89 | 2.56 | 2.67 | 2.62 | 82.27 |
| 5D (deep) | 84.89 | 2.60 | 2.54 | 2.61 | 82.28 |
| 6 | 85.30 | 3.03 | 3.11 | 6.79 | 78.51 |
| 7 | 85.12 | 3.07 | 3.10 | 3.59 | 81.53 |

After a period of 19 to 29 days, groundwater levels in the three (3) shallow monitoring wells ranged from 2.62 to 4.04 m below existing grade (Elevation 81.04 to 83.47 m). In the seven (7) deeper monitoring wells, groundwater levels ranged from 2.61 to 6.79 m below existing grade (Elevation 78.51 to 82.42 m), after a period of 19 to 29 days. The groundwater primarily originated from pervious seams and layers in the sandy silt till deposit and the wet coarse sand, sand and gravel, and silty sand till deposits. Seasonal fluctuation of the groundwater levels at the site should be anticipated.

Reference should be made to the Hydrogeological Study for further details of the groundwater conditions at this site.

## 5.3 Grain Size Analysis

Grain size analysis was conducted on six (6) soil samples recovered from the boreholes. The grain size distribution curves are included in Appendix A. The following Table 2 presents the estimated soil permeabilities based on the Unified Soil Classification of the grain size distribution curves.

**Table 2 - Soil Permeabilities**

| Location | Soil Type | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | Estimated Coefficient of Permeability (cm/sec) |
|---|---|---|---|---|---|---|
| BH 2D (1.5 – 2.0 m) | Clayey Silt | 0 | 2 | 53 | 45 | $10^{-7}$ or slower |
| BH 2D (4.6 – 5.0 m) | Clayey Silt | 0 | 1 | 56 | 43 | $10^{-7}$ or slower |
| BH 3D (12.2 – 12.6 m) | Silty Sand Till | 36 | 45 | 14 | 4 | $10^{-4}$ |
| BH 4 (3.0 – 3.5 m) | Sandy Silt Till | 13 | 37 | 35 | 15 | $10^{-5}$ to $10^{-6}$ |
| BH 5D (9.2 – 9.6 m) | Coarse Sand | 3 | 91 | 6 | 0 | $10^{-3}$ |
| BH 6 (10.7 – 11.1 m) | Silty Sand Till | 8 | 53 | 29 | 10 | $10^{-3}$ to $10^{-4}$ |

# 6. Engineering Discussion and Recommendations

## 6.1 General

A preliminary geotechnical investigation has been conducted for the proposed residential development located at 1101A, 1105 and 1163 Kingston Road in Pickering, Ontario. The preliminary geotechnical investigation was carried out for due diligence purposes in support of the Site Plan Application for the development. Preliminary plans call for the design and construction of six (6) buildings with fourteen (14) condominium towers above six (6) storey podiums and up to three (3) levels of underground parking.

Development of the proposed residential development is considered feasible. However, design and construction difficulties should be anticipated due to the presence of wet coarse sand, sand and gravel, and silty sand till deposits as well as the presence of deep weathered shale bedrock in Borehole 5D. The condominium towers could be supported on raft slabs founded on very dense soil or on deep foundations (i.e. caissons) founded in the sound shale bedrock. The building podiums and underground parking could be supported on conventional footings founded on dense to very dense soil.

The following subsections provide preliminary geotechnical engineering guidelines for site development planning. When conceptual design information is available, a more detailed investigation including additional boreholes with rock coring can be undertaken to provide geotechnical engineering guidelines for final design and construction of the proposed development.

## 6.2 Building Construction

### 6.2.1 Foundation Considerations

Preliminary plans call for the design and construction of six (6) buildings with fourteen (14) condominium towers above six (6) storey podiums and up to three (3) levels of underground parking. There will be three (3) levels of underground parking below Buildings A1 and A2, two (2) levels of underground parking below Buildings B, C1 and C2 and one (1) level of underground parking below Building D.

Three (3) foundation schemes are being considered for founding of the structures; namely raft slabs on very dense soil or caissons on sound shale bedrock for the condominium towers and conventional footings on dense to very dense soil for the building podiums and underground parking.

#### 6.2.1.1 Raft Slabs on Very Dense Soil

Excavation for three (3) levels of underground parking below Buildings A1 and A2 may extend to about 10.0 m below proposed ground floor level. For preliminary design purposes, raft slabs

founded on very dense soil at or below depths of about 11.0 to 12.0 m below existing grade may be designed for a geotechnical reaction of 800 kPa at Serviceability Limit States (S.L.S.), subject to inspection and effective groundwater dewatering during construction. The factored geotechnical resistance at Ultimate Limit States (U.L.S.) is 1,200 kPa. Table 3 below provides a summary of the highest founding elevations where the recommended geotechnical reaction of 800 kPa (S.L.S.) can be applied at the borehole locations for raft slabs on very dense soil.

**Table 3 – Summary of the Highest Founding Elevations where the Recommended Geotechnical Reaction of 800 kPa (S.L.S.) can be applied at the Borehole Locations for Raft Slabs on Very Dense Soil**

| Borehole No. | Approximate Ground Surface Elevation (m) | Approximate Fill/ Native Soil Interface (m) | Highest Founding Elevation (m) (Depth below ex. Grade) (m) | Founding Soil |
|---|---|---|---|---|
| 1 (Building A2) | 85.8 | 84.8 | 73.8 (12.0) | Clayey Silt (lower) |
| 2D (Building A1) | 86.4 | 85.8 | 75.4 (11.0) | Sandy Silt Till |

For raft foundation design, a subgrade modulus of 60 MPa/m can be used for the very dense soils. Once the loading contour is available, it is recommended that a settlement analysis be carried out to determine the settlement of the raft foundation(s) to verify that the settlements are within tolerable limits.

Prior to placement of concrete, the raft foundation bases should be inspected by geotechnical personnel from EXP Services Inc. to verify the competency of the founding soil.

#### 6.2.1.2 Caissons on Sound Shale Bedrock

It is anticipated the condominium towers will have high column loads. The proposed condominium towers could also be supported on augered straight-shafted cast-in-place concrete caissons founded on the underlying sound shale bedrock below all weathered zones and loose rock. In general, caissons founded a minimum of 2 m into the shale bedrock (i.e. 18.5 to 20.0 m below existing grade) may be designed for a factored geotechnical resistance of 7,200 kPa at U.L.S. (Ultimate Limit States), subject to inspection during construction. The geotechnical reaction at S.L.S. (Serviceability Limit States) does not govern for “unyielding soil”. It should be noted that weathered shale bedrock extended to a depth of 30.55 m below existing grade in Borehole 5D located at the southwest part of the site (i.e. sound shale bedrock not encountered). Additional boreholes including rock coring should be carried out to confirm the lateral and vertical extent of sound shale bedrock at the site.

Table 4 below provides a summary of the highest founding elevations where the recommended factored geotechnical resistance of 7,200 kPa (U.L.S.) can be applied at the borehole locations for caissons on sound shale bedrock.

**Table 4 - Summary of the Highest Founding Elevations where the Recommended Factored Geotechnical Resistance of 7,200 kPa (U.L.S.) can be applied at the Borehole Locations for Caissons on Sound Shale Bedrock**

| Borehole | Approximate Ground Surface Elevation (m) | Highest Founding Elevation (m) (Depth below ex. Grade) (m) |
|---|---|---|
| 1 | 85.8 | 65.8 (20.0) |
| 4 | 85.4 | 66.9 (18.5) |

The caissons should be drilled from just above the P1, P2 and P3 levels. The minimum caisson diameter recommended is 760 mm. The caisson bases can be auger cleaned by mixing the loose materials at the base of the caissons with about 0.6 m of concrete. During the installation of caissons, a temporary steel liner must be installed to prevent caving of the drilled hole and to seal off seepage from the wet deposits above the founding levels. A positive head of concrete inside the liner must be maintained during withdrawal of the liner to prevent "necking" of the caisson. A 150 mm concrete slump is recommended to prevent "hang-up" of the concrete on the liner during withdrawal of the liner. If there is a significant amount of water in the caisson base which cannot be bailed out, the concrete should be placed using the tremie method.

During caisson drilling, cobbles and boulders should be anticipated in the till soils and limestone layers should be expected in the shale bedrock. An allowance should be made in the contract documents to cover any delays caused by the presence of cobbles and boulders and limestone layers.

The caisson installation operation must be inspected on a full-time basis by geotechnical personnel from EXP to confirm the bearing capacity, founding elevation, alignment and plumbness for each caisson.

#### 6.2.1.3 Conventional Footings on Dense to Very Dense Soil

Excavation for one (1) level of underground parking may extend to about 4.0 m below proposed ground floor level. Excavation for two (2) levels of underground parking may extend to about 7.0 m below proposed ground floor level. For preliminary design purposes, footings founded on dense to very dense soil at or below depths of about 6.0 to 8.0 m below existing grade may be designed for a geotechnical reaction of 500 kPa at Serviceability Limit States (S.L.S.), subject to inspection and effective groundwater dewatering during construction. The factored geotechnical resistance at Ultimate Limit States (U.L.S.) is 750 kPa. Table 5 below provides a summary of the highest founding elevations where the recommended geotechnical reaction of 500 kPa (S.L.S.) can be applied at the borehole locations for conventional footings on dense to very dense soil for founding of the building podiums and underground parking.

**Table 5 – Summary of the Highest Founding Elevations where the Recommended Geotechnical Reaction of 500 kPa (S.L.S.) can be applied at the Borehole Locations for Conventional Footings on Dense to Very Dense Soil**

| Borehole No. | Approximate Ground Surface Elevation (m) | Approximate Fill/ Native Soil Interface (m) | Highest Founding Elevation (m) (Depth below ex. Grade) (m) | Founding Soil |
|---|---|---|---|---|
| 3D (Building B) | 85.1 | 84.4 | 79.1 (6.0) | Sandy Silt Till |
| 4 (Building B) | 85.4 | 84.2 | 78.4 (6.0) | Sandy Silt Till |
| 5D (Building D) | 84.9 | 83.2 | 78.9 (6.0) * | Sandy Silt Till |
| 6 (Building C1) | 85.3 | 84.2 | 78.3 (7.0) | Sandy Silt Till |
| 7 (Building D) | 85.1 | 83.7 | 77.1 (8.0) * | Sandy Silt Till |

* For 1 level of underground parking, the soil at P1 level is weak. Building D could be founded on short caissons within the sandy silt till deposit at the depths indicated in Table 5.

Prior to placement of concrete, the footing foundation bases should be inspected by geotechnical personnel from EXP Services Inc. to verify the competency of the founding soil.

#### 6.2.1.4 Foundations General

Footings or caissons which are to be placed at different elevations should be located such that the higher foundation element is set below a line drawn up at 10 horizontal to 7 vertical from the near edge of the lower foundation element.

All footings, caissons and grade beams exposed to seasonal freezing conditions should be protected from frost action by at least 1.2 m of soil cover or equivalent insulation, depending on the final design requirements. However, for foundation elements below 2 or 3 unheated levels of basement, unmonitored experience in the last few years indicates shallow footing/grade beam depths of 1.0 m for interior columns and 0.6 m for walls have been successful.

Adjacent to air shafts and entrance and exit doors for underground parking, a footing depth of 1.2 m below floor surface level is required, or alternatively, insulation protection must be provided.

It should be noted the recommended geotechnical reaction and resistance values have been calculated by EXP from the borehole information for the design stage only. The investigation and comments are necessarily ongoing as new information on underground conditions becomes available. For example, it should be appreciated modification to the bearing levels may be required if unforeseen subsoil conditions are revealed after the excavation is exposed to full view or if final design decisions differ from those assumed in this report. For this reason, this office should be retained to review final foundation drawings and to provide field inspections during the construction stage.

### 6.2.2 Shoring Requirements

Shoring will be required along each wall of the excavation(s) to limit the horizontal and vertical movements of adjacent properties, buried utilities and roadways. In our opinion, the shoring system should consist of a continuous caisson wall supported by tiebacks due to the saturated nature of the soils and the presence of wet coarse sand, sand and gravel, and silty sand till deposits. The caisson walls should extend into the underlying shale bedrock to reduce the amount of groundwater seepage into the excavation.

The shoring system should be installed in accordance with the 'State-of-the-Art' guidelines provided in the Canadian Foundation Engineering Manual (CFEM). Based on the manual, the following earth-pressure coefficients are recommended.

0.25 Where minor movements can be tolerated.

0.35 Where utilities, roads, sidewalks must be protected from significant movement or where vibration from traffic is a factor.

0.45 Where movements are to be minimized such as near adjacent building footings or movement sensitive services (i.e. gas and watermains).

Approximate Soil Unit Weight = 20.5 kN/$m^3$ (fill, silt, clayey silt)
= 23 kN/$m^3$ (sandy silt till)
= 21.5 kN/$m^3$ (silty sand till)

Unit Weight of Groundwater = 9.8 kN/$m^3$

The soldier piles will have to be installed in such a manner to prevent the caving of holes and/or base heaving conditions when drilling below the groundwater table. Consideration must be given to the dewatering system and the vertical extent of its influence. Further, slurry drilling techniques may have to be used. The concrete toe can be poured in a relatively dry condition if a temporary liner can be sealed into the dewatered soil before removing the soil/slurry from within the liner and installing the pile. If seepage cannot be sealed off, the concrete toe will have to be tremied through the slurry, pouring from the bottom upwards. The bore depth and volume of concrete used should be monitored carefully in order to determine if base heave or caving conditions have occurred during the drilling operation. The contractor should take extra precaution during drilling as a small deviation from vertical can lead to gaps between the drilled caissons resulting in loss of soil. Any gaps, openings, loss of concrete in the caisson wall observed during excavation must be grouted immediately to prevent any loss of soil from behind the shoring walls.

Forces from lateral earth pressure on the shoring system may be resisted by grouted soil anchors. All tiebacks should be anchored within the sound shale bedrock or competent sandy silt till. The tie-back holes should be temporarily cased to minimize the risk of caving and pressure grouted.

It is recommended the actual capacity of the anchors be established by sufficient full scale pull-out tests ("performance test") in accordance with Post-Tensioning Institute (PTI) guidelines. Each installed anchor must be proof loaded to 1.33 times the design working load for the anchor, in accordance with PTI guidelines.

EXP should be retained to review the shoring design, to monitor installation and testing of the system, and to monitor the shoring movements during all phases of the excavation. Inclinometers should be installed at locations where buildings or sensitive services lie close to the excavation. Careful monitoring is needed in any shored excavation, especially when buildings are located in close proximity. This is necessary not only to anticipate when and if additional support is needed, but also to provide data to meet claims from adjacent property owners. In this regard, it is essential detailed precondition surveys be made on adjacent buildings.

### 6.2.3 Excavation and Groundwater Control

Following completion of the shoring installation, excavation for basement and foundation construction may proceed. Excavation must be carried out in accordance with the Occupational Health and Safety Act (OHSA) and local regulations. Within the meaning of OHSA, moist sandy silt till is classified as Type 2 soil. Moist sandy silt till with wet seams and saturated layers is classified as Type 3 soil. Loose fill, saturated silt and clayey silt and wet silty sand till are classified as Type 4 soils. It should be noted that boulders may be present within the till deposits. Their presence may influence the progress of excavation. Consequently, provisions should be made in the contract documents to cover any delays caused by these obstructions.

Three (3) levels of underground parking will extend to about 10.0 m below ground floor level. Two (2) levels of underground parking will extend to about 7.0 m below ground floor level. One (1) level of underground parking will extend to about 4.0 m below ground floor level. Short-term groundwater levels in the monitoring wells ranged from about 2.6 to 6.8 m below existing grade. Seepage from perched water in the fill, the saturated silt and clayey silt strata, pervious seams and layers in the sandy silt till deposit, the wet silty sand till deposit and scattered wet coarse sand/sand and gravel deposits should be anticipated during construction with the installation of continuous caisson walls extending to shale bedrock. It should be possible to control and remove this seepage water from within the excavation(s) using construction dewatering techniques, i.e. pumping from strategically located high-capacity sumps as well as localized wellpoints. The dewatering systems should be maintained until the perimeter and underfloor drainage systems are operational.

### 6.2.4 Backfill Considerations

Backfill used to satisfy underfloor slab requirements, in footing and service trenches, etc., should be compactible fill, i.e., inorganic soil with its moisture content close to its optimum value determined in the standard Proctor maximum dry density test. The excavated material will primarily consist of fill, silt, clayey silt, sandy silt till and silty sand till. The majority of the soils

are saturated/wet and require moisture content adjustment (i.e. partial drying) prior to reuse as backfill material.

Any organic or excessively wet or otherwise deleterious material should not be used for backfilling purposes. Any shortfall of suitable on-site excavated material can be made up with imported granular material, OPSS Granular 'B' or equivalent. The backfill should be placed in lifts not more than 300 mm thick in the loose state with each lift being compacted to 100% standard Proctor maximum dry density before subsequent lifts are placed. The degree of compaction achieved in the field should be checked by in-place density tests.

### 6.2.5 Floor Slab Construction and Permanent Drainage

Three (3) levels of underground parking will extend to about 10.0 m below ground floor level below Buildings A1 and A2. Two (2) levels of underground parking will extend to about 7.0 m below ground floor level below Buildings B, C1 and C2. One (1) level of underground parking will extend to about 4.0 m below ground floor level below Building D. At these levels, the soils may consist of native firm to stiff clayey silt; very dense, wet coarse sand/silty sand till and loose to very dense sandy silt till.

Subject to effective dewatering, the floor slabs can be constructed as a slab-on-grade on the native soils provided any soft spots detected are removed and replaced with compactible fill in the manner described in the "Backfill Considerations" subsection of the report. A moisture barrier consisting of 250 mm of 19 mm clear crushed stone placed directly under the floor slab should be adequate. It will be necessary to place a layer of 300 mm thick concrete sand over geotextile filter fabric on the subgrade to prevent the fine silt particles from migrating into the clear stone.

Perimeter drainage is required to remove any water adjacent to basement walls. In order to prevent the build-up of water adjacent to basement walls, it would be prudent to incorporate an exterior drainage system attached to the basement wall connected to a sump inside the building. The exterior drainage should consist of Terradrain 600 or equivalent covering the entire basement wall in order to reduce the risk of water penetration. The Terradrain panels should be outletted through the basement wall into the basement.

An underfloor drainage system is also required below all basement floor slabs at this site. For preliminary guidelines, the underfloor drains should be spaced at about 3 m apart. The underfloor drains should consist of 100 mm diameter perforated pipe surrounded by 150 mm of clear stone all wrapped in geotextile filter fabric and then surrounded by 150 mm of concrete sand placed in an approximate 0.75 m wide by 0.75 m deep trench lined with geotextile filter fabric and connected to a sump. Cleanouts should be provided at selected locations.

### 6.2.6 Earthquake Considerations

The Seismic Site Class for this site should be "C" for Buildings A1, A2, B, C1 and C2 and "D" for Building D based on the slab and foundation depths and the soil and bedrock conditions.

### 6.2.7 Subsurface Concrete

Two (2) soil samples from Boreholes 1 and 4 were analyzed for pH and sulphate content. The test results, included in Appendix B, indicated pH values of 7.84 and 7.75 and sulphate contents of 73 ppm and 700 ppm as $SO_4$, indicating a negligible degree of sulphate attack on subsurface concrete structures. Therefore type 10 Portland cement should be suitable for use in concrete at this site.

## 7. General Comments

The preliminary comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. could be greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations as well as their own interpretations of the factual borehole results so that they may draw their own conclusions as to how the subsurface conditions may affect them.

Once final conceptual design details are available, a more detailed investigation can be undertaken to provide geotechnical engineering parameters for final design and construction of the proposed development.

We trust this preliminary report is satisfactory for your purposes. Should you have any questions or comments, please do not hesitate to contact this office.

Yours truly,
EXP Services Inc.



Clement Chow, P.Eng.
Project Engineer
Geotechnical Services

Peter Chan, P.Eng.
Vice President, Central Ontario
Geotechnical Services

# Appendix A

Grain Size Distribution Curves

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

# Grain Size Analysis & Hydrometer Test Report

ST08

**Sample Test No.:** 424253-1 **Report No.:** 1 **Date Reported:** 05-Jul-23

**Project No.:** gtr-22015419-b0 002
**Project Name:** Geotechnical

***Grain Size Proportion (%)***

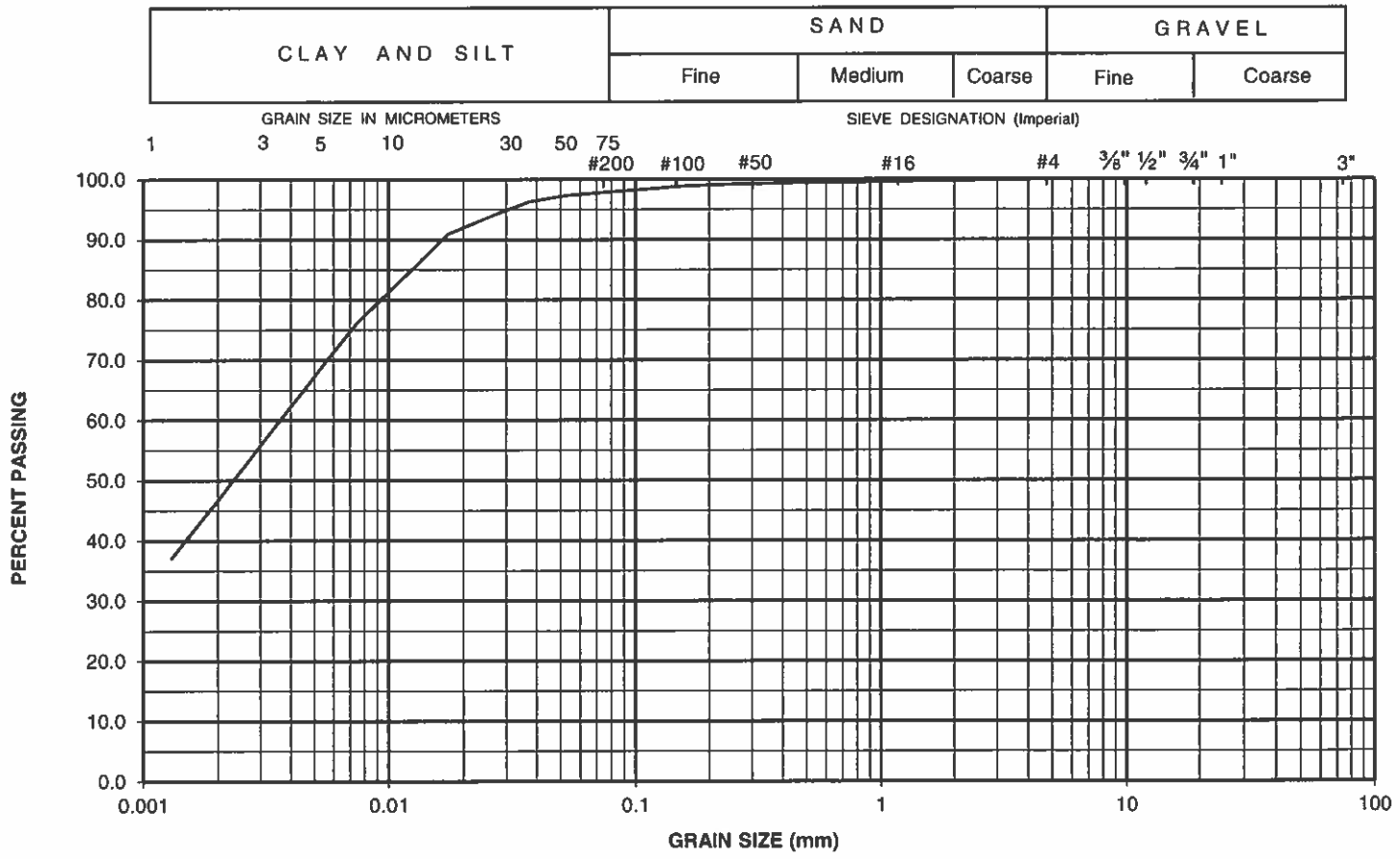
| | |
|---|---|
| **Gravel (> 4.75mm):** | |
| **Sand (> 75µm, < 4.75mm):** | 2.1 |
| **Silt (> 2µm), < 75µm):** | 52.8 |
| **Clay (< 2µm):** | 45.1 |
| **Total:** | 100.0 |

***Sample Information***

**Location:** BH 2D
**Sample Method:** SS
**Sample No.:**
**Depth:** 1.5 - 2.0 m
**Sample Description:** Silt and Clay, trace Sand; Grey
**Sampled By:** exp Markham
**Sampling Date:** 5/18/2023
**Date Received:** 6/27/2023
**Client Sample ID:**
**Comments:**

| Grain Size (mm) | % Passing | Grain Size (mm) | % Passing |
|---|---|---|---|
| 26.5 | 100.0 | 0.0374 | 96.3 |
| 22.4 | 100.0 | 0.0268 | 94.1 |
| 19 | 100.0 | 0.0172 | 90.9 |
| 16 | 100.0 | 0.0104 | 82.0 |
| 13.2 | 100.0 | 0.0075 | 76.3 |
| 12.5 | 100.0 | 0.0055 | 69.4 |
| 9.5 | 100.0 | 0.0028 | 54.2 |
| 6.7 | 100.0 | 0.0013 | 37.1 |
| 4.75 | 100.0 | | |
| 2 | 99.7 | | |
| 0.85 | 99.5 | | |
| 0.425 | 99.4 | | |
| 0.25 | 99.2 | | |
| 0.18 | 99.0 | | |
| 0.15 | 98.8 | | |
| 0.075 | 97.9 | | |
| 0.053 | 97.3 | | |

UNIFIED SOIL CLASSIFICATION SYSTEM




**Project Manager:** Clement Chow **Approved By:** *Original Signed By*
Arcadio Petrola
**Date Approved:** 05-Jul-23

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

# Grain Size Analysis & Hydrometer Test Report

ST08

**Sample Test No.:** 424254-1 **Report No.:** 2 **Date Reported:** 05-Jul-23

**Project No.:** gtr-22015419-b0 002
**Project Name:** Geotechnical

***Grain Size Proportion (%)***

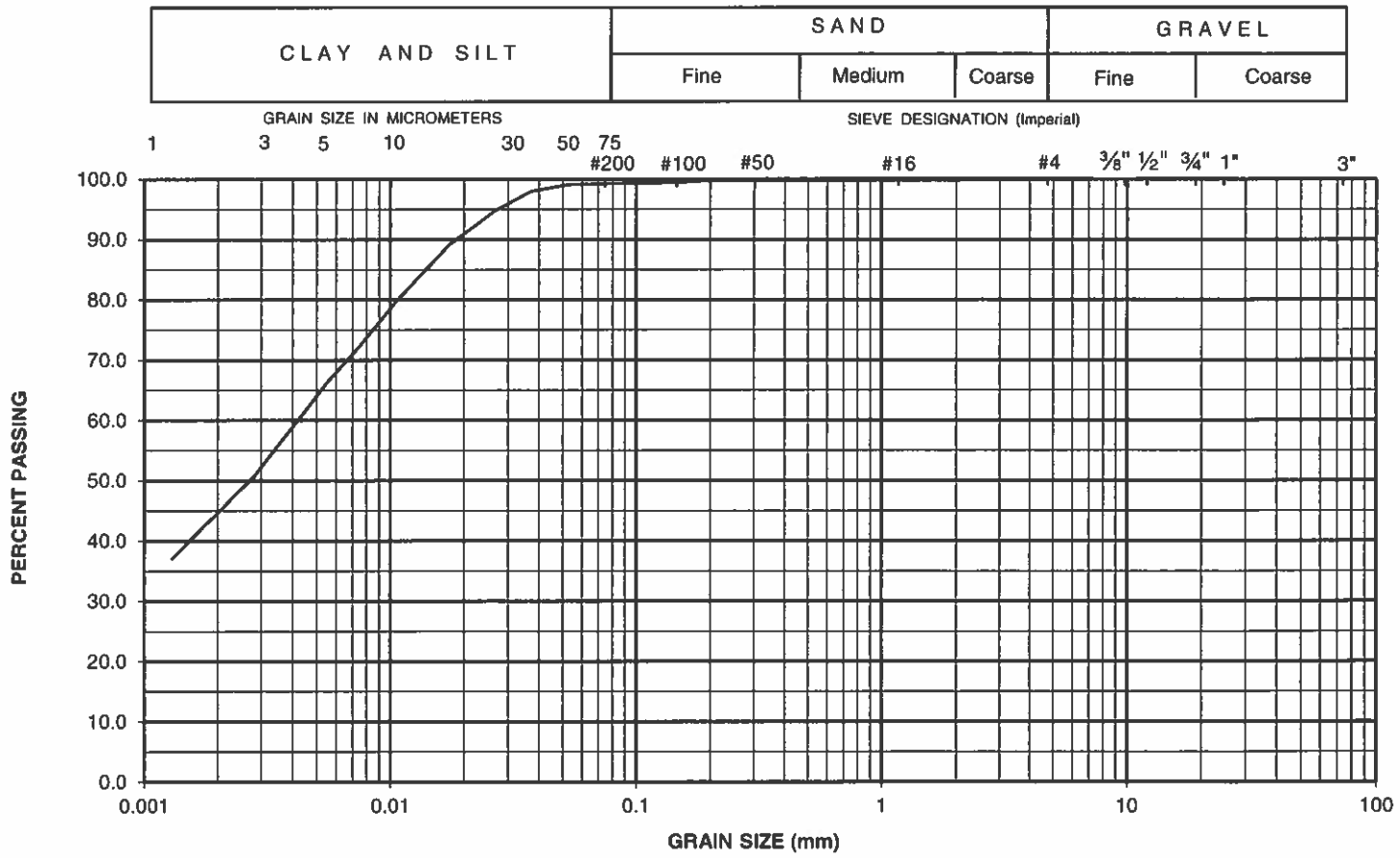
| | |
|---|---|
| **Gravel (> 4.75mm):** | |
| **Sand (> 75µm, < 4.75mm):** | **0.7** |
| **Silt (> 2µm), < 75µm):** | **55.9** |
| **Clay (< 2µm):** | **43.4** |
| **Total:** | **100.0** |

***Sample Information***

**Location:** BH 2D
**Sample Method:** SS
**Sample No.:**
**Depth:** 4.6 - 5.0 m
**Sample Description:** Silt and Clay, trace Sand; Grey
**Sampled By:** exp Markham
**Sampling Date:** 5/18/2023
**Date Received:** 6/27/2023
**Client Sample ID:**
**Comments:**

| Grain Size (mm) | % Passing | Grain Size (mm) | % Passing |
|---|---|---|---|
| **26.5** | 100.0 | **0.0371** | 98.0 |
| **22.4** | 100.0 | **0.0267** | 94.8 |
| **19** | 100.0 | **0.0174** | 89.1 |
| **16** | 100.0 | **0.0105** | 79.6 |
| **13.2** | 100.0 | **0.0076** | 72.6 |
| **12.5** | 100.0 | **0.0055** | 66.3 |
| **9.5** | 100.0 | **0.0028** | 50.7 |
| **6.7** | 100.0 | **0.0013** | 37.1 |
| **4.75** | 100.0 | | |
| **2** | 99.9 | | |
| **0.85** | 99.9 | | |
| **0.425** | 99.9 | | |
| **0.25** | 99.9 | | |
| **0.18** | 99.7 | | |
| **0.15** | 99.5 | | |
| **0.075** | 99.3 | | |
| **0.053** | 99.1 | | |

UNIFIED SOIL CLASSIFICATION SYSTEM




**Project Manager:** Clement Chow **Approved By:** *Original Signed By* Arcadio Petrola **Date Approved:** 05-Jul-23

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

# Grain Size Analysis & Hydrometer Test Report

ST08

**Sample Test No.:** 424256-1 **Report No.:** 3 **Date Reported:** 05-Jul-23

**Project No.:** gtr-22015419-b0 002
**Project Name:** Geotechnical

***Grain Size Proportion (%)***

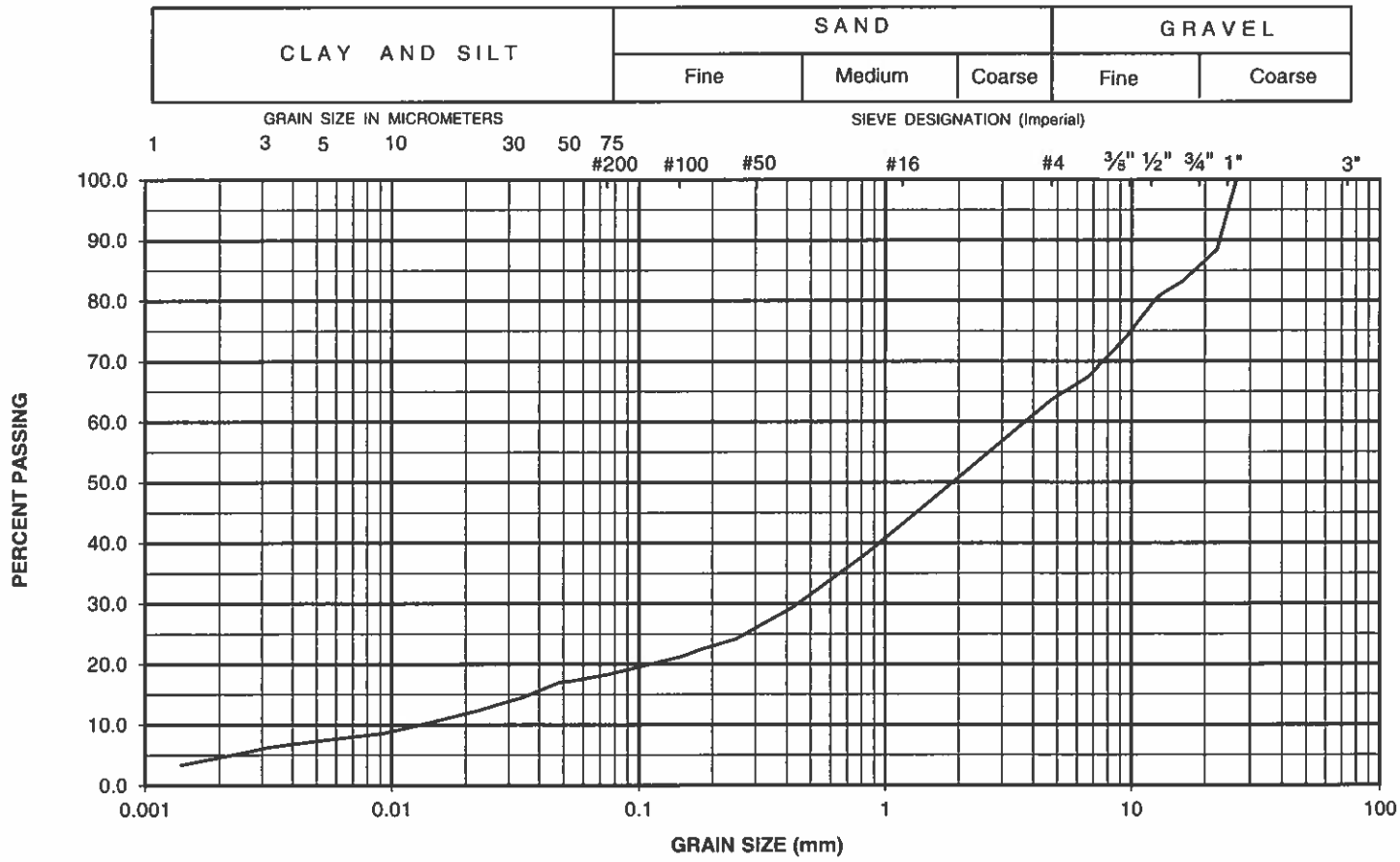
| | |
|---|---|
| **Gravel (> 4.75mm):** | **36.3** |
| **Sand (> 75µm, < 4.75mm):** | **45.4** |
| **Silt (> 2µm), < 75µm):** | **13.9** |
| **Clay (< 2µm):** | **4.4** |
| **Total:** | **100.0** |

***Sample Information***

**Location:** BH 3D
**Sample Method:** SS
**Sample No.:**
**Depth:** 12.2 - 12.6 m
**Sample Description:** Sand and Gravel, some Silt, trace Clay; Grey
**Sampled By:** exp Markham
**Sampling Date:** 5/8/2023
**Date Received:** 6/27/2023
**Client Sample ID:**
**Comments:**

| Grain Size (mm) | % Passing | Grain Size (mm) | % Passing |
|---|---|---|---|
| **26.5** | 100.0 | **0.0347** | 14.6 |
| **22.4** | 88.4 | **0.0222** | 12.3 |
| **16** | 83.0 | **0.0130** | 10.0 |
| **13.2** | 81.1 | **0.0093** | 8.6 |
| **12.5** | 80.2 | **0.0066** | 7.9 |
| **9.5** | 74.0 | **0.0032** | 6.3 |
| **6.7** | 67.5 | **0.0014** | 3.4 |
| **4.75** | 63.7 | | |
| **2** | 50.8 | | |
| **0.85** | 38.5 | | |
| **0.425** | 29.4 | | |
| **0.25** | 24.2 | | |
| **0.18** | 22.4 | | |
| **0.15** | 21.3 | | |
| **0.075** | 18.3 | | |
| **0.053** | 17.2 | | |
| **0.0482** | 17.0 | | |

UNIFIED SOIL CLASSIFICATION SYSTEM




**Project Manager:** Clement Chow **Approved By:** *Original Signed By*
Arcadio Petrola
**Date Approved:** 05-Jul-23

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
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Fax: (905) 793-0641

# Grain Size Analysis & Hydrometer Test Report

ST08

**Sample Test No.:** 424257-1 **Report No.:** 4 **Date Reported:** 05-Jul-23

**Project No.:** gtr-22015419-b0 002
**Project Name:** Geotechnical

***Grain Size Proportion (%)***

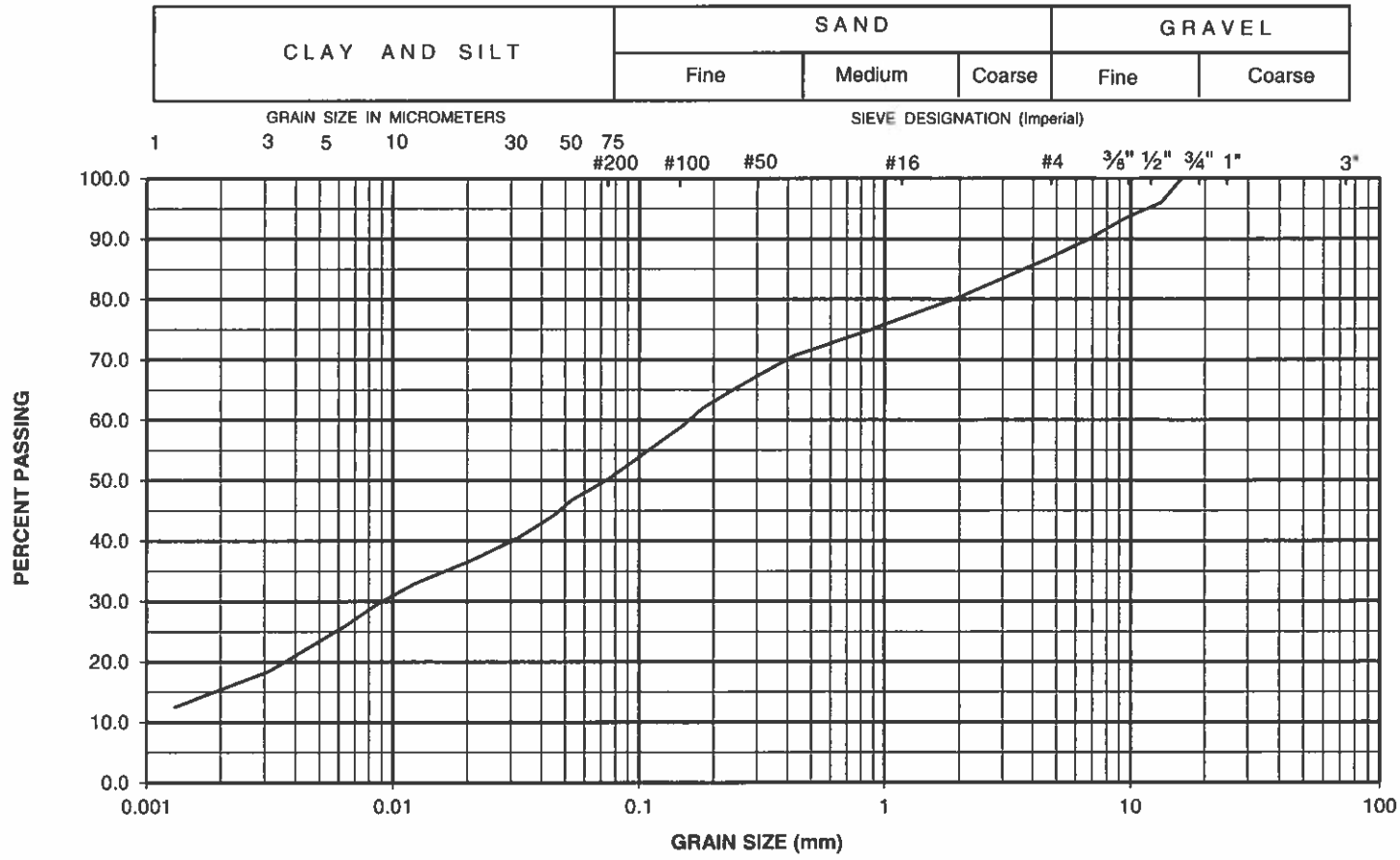
| | |
|---|---|
| **Gravel (> 4.75mm):** | **13.0** |
| **Sand (> 75µm, < 4.75mm):** | **36.8** |
| **Silt (> 2µm), < 75µm):** | **35.4** |
| **Clay (< 2µm):** | **14.8** |
| **Total:** | **100.0** |

***Sample Information***

**Location:** BH 4
**Sample Method:** SS
**Sample No.:**
**Depth:** 3.0 - 3.5 m
**Sample Description:** Sand and Silt, some Clay and Gravel; Grey
**Sampled By:** exp Markham
**Sampling Date:** 5/11/2023
**Date Received:** 6/27/2023
**Client Sample ID:**
**Comments:**

| Grain Size (mm) | % Passing | Grain Size (mm) | % Passing |
|---|---|---|---|
| 26.5 | 100.0 | 0.0322 | 40.6 |
| 22.4 | 100.0 | 0.0207 | 36.8 |
| 19 | 100.0 | 0.0122 | 32.9 |
| 16 | 100.0 | 0.0087 | 29.6 |
| 13.2 | 96.0 | 0.0063 | 25.8 |
| 9.5 | 93.4 | 0.0031 | 18.4 |
| 6.7 | 89.9 | 0.0013 | 12.5 |
| 4.75 | 87.0 | | |
| 2 | 80.4 | | |
| 0.85 | 74.7 | | |
| 0.425 | 70.6 | | |
| 0.25 | 65.4 | | |
| 0.18 | 61.9 | | |
| 0.15 | 59.1 | | |
| 0.075 | 50.2 | | |
| 0.053 | 46.7 | | |
| 0.0451 | 44.3 | | |

UNIFIED SOIL CLASSIFICATION SYSTEM




**Project Manager:** Clement Chow **Approved By:** *Original Signed By*
Arcadio Petrola
**Date Approved:** 05-Jul-23

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# Grain Size Analysis Test Report

ST06-Soil

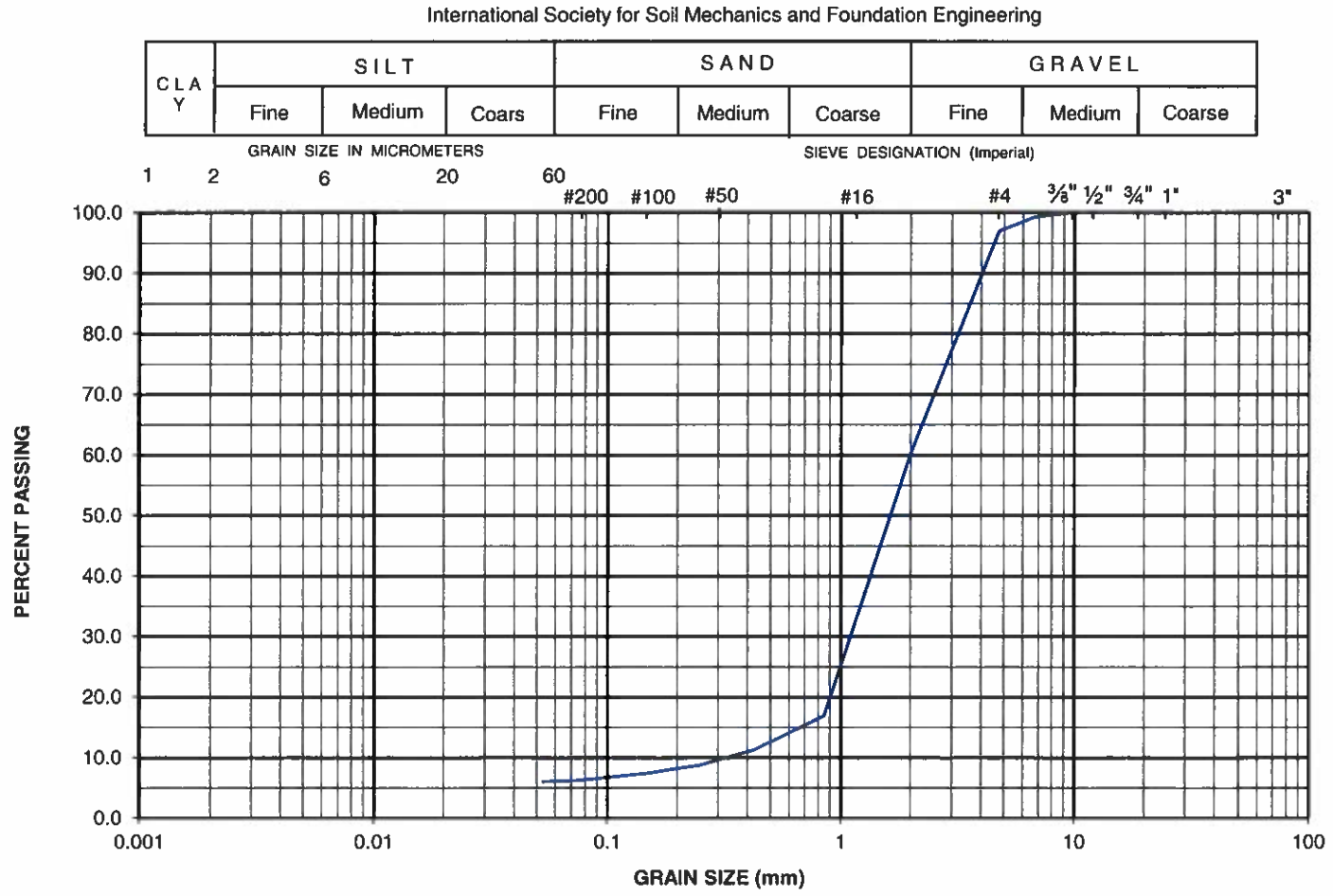
**Sample Test No.:** 424258-1 **Report No.:** 1 **Date Reported:** 30-Jun-2023

**Project No.:** gtr-22015419-b0 002
**Project Name:** Geotechnical

***Sample Information***
**Borehole No.:** BH 5D
**Sample Method:** SS
**Sample No.:**
**Depth:** 9.2 - 9.6 m
**Sample Description:**
**Sampled By:** exp Markham
**Sampling Date:** 12-May-2023
**Date Received:** 27-Jun-2023
**Client Sample ID:**
**Comments:**

| Sieve Size (mm) | % Passing Sample |
|---|---|
| 26.5 | 100.0 |
| 22.4 | 100.0 |
| 19.0 | 100.0 |
| 16.0 | 100.0 |
| 13.2 | 100.0 |
| 12.7 | 100.0 |
| 9.5 | 100.0 |
| 6.7 | 99.3 |
| 4.75 | 97.0 |
| 2.00 | 60.3 |
| 0.850 | 16.9 |
| 0.425 | 11.3 |
| 0.250 | 8.8 |
| 0.180 | 8.0 |
| 0.150 | 7.5 |
| 0.075 | 6.3 |
| 0.053 | 6.1 |

Notes: *Out of Specification




**Project Manager:** Clement Chow **Approved By:** *Original Signed By* Arcadio Petrola **Date Approved:** 30-Jun-2023

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

# Grain Size Analysis & Hydrometer Test Report

ST08

**Sample Test No.:** 424259-1 **Report No.:** 5 **Date Reported:** 05-Jul-23

**Project No.:** gtr-22015419-b0 002
**Project Name:** Geotechnical

***Grain Size Proportion (%)***

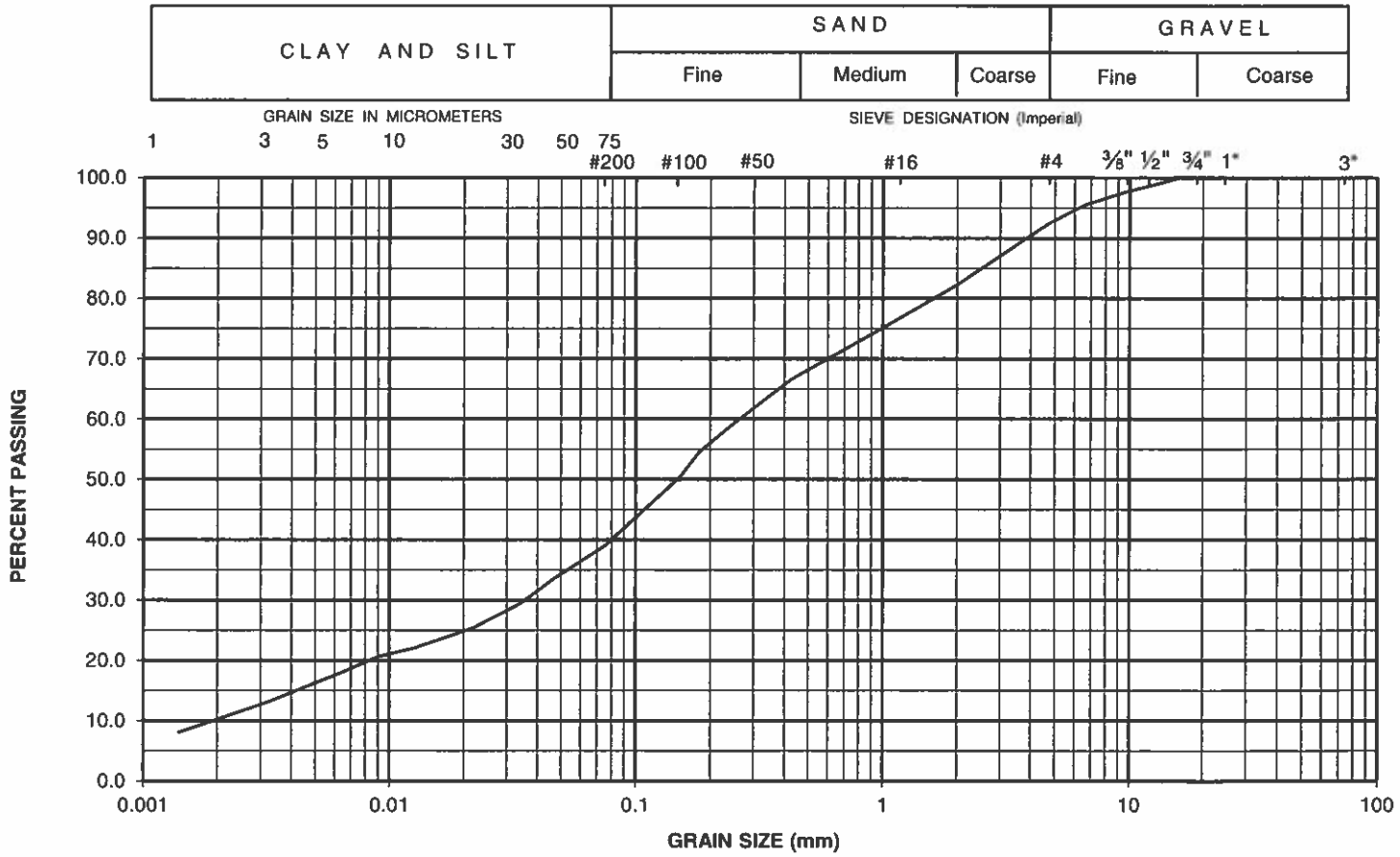
| | |
|---|---|
| **Gravel (> 4.75mm):** | **7.5** |
| **Sand (> 75µm, < 4.75mm):** | **53.5** |
| **Silt (> 2µm), < 75µm):** | **29.2** |
| **Clay (< 2µm):** | **9.8** |
| **Total:** | **100.0** |

***Sample Information***

**Location:** BH 6
**Sample Method:** SS
**Sample No.:**
**Depth:** 10.7 - 11.1 m
**Sample Description:** Silty Sand, trace Clay and Gravel; Grey
**Sampled By:** exp Markham
**Sampling Date:** 5/17/2023
**Date Received:** 6/27/2023
**Client Sample ID:**
**Comments:**

| Grain Size (mm) | % Passing | Grain Size (mm) | % Passing |
|---|---|---|---|
| 26.5 | 100.0 | 0.0339 | 29.4 |
| 22.4 | 100.0 | 0.0218 | 25.4 |
| 19 | 100.0 | 0.0127 | 22.1 |
| 16 | 100.0 | 0.0090 | 20.6 |
| 13.2 | 99.1 | 0.0064 | 18.0 |
| 9.5 | 97.6 | 0.0032 | 13.1 |
| 6.7 | 95.6 | 0.0014 | 8.1 |
| 4.75 | 92.5 | | |
| 2 | 82.3 | | |
| 0.85 | 73.5 | | |
| 0.425 | 66.5 | | |
| 0.25 | 59.3 | | |
| 0.18 | 54.5 | | |
| 0.15 | 50.4 | | |
| 0.075 | 39.0 | | |
| 0.053 | 35.0 | | |
| 0.0468 | 33.6 | | |

UNIFIED SOIL CLASSIFICATION SYSTEM




**Project Manager:** Clement Chow **Approved By:** *Original Signed By*
Arcadio Petrola **Date Approved:** 05-Jul-23

# Appendix B

Certificate of Analysis for pH and Sulphate

Your P.O. #: MRK-GEO
Your Project #: GTR-22015419-B0
Site Location: 1101A & 1105 KINGSTON RD
Your C.O.C. #: 940135-33-01

**Attention: Clement Chow**

exp Services Inc
Markham Branch
220 Commerce Valley Dr W
Suite 500
Markham, ON
CANADA L3T 0A8

**Report Date: 2023/07/04**
Report #: R7700243
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C3I9022**
**Received: 2023/06/27, 15:40**

Sample Matrix: Soil
# Samples Received: 2

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| pH CaCl2 EXTRACT | 2 | 2023/06/29 | 2023/06/29 | CAM SOP-00413 | EPA 9045 D m |
| Sulphate (20:1 Extract) | 2 | 2023/06/30 | 2023/07/04 | CAM SOP-00464 | MOE E3013 m |

**Remarks:**

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your P.O. #: MRK-GEO
Your Project #: GTR-22015419-B0
Site Location: 1101A & 1105 KINGSTON RD
Your C.O.C. #: 940135-33-01

**Attention: Clement Chow**

exp Services Inc
Markham Branch
220 Commerce Valley Dr W
Suite 500
Markham, ON
CANADA L3T 0A8

**Report Date: 2023/07/04**
Report #: R7700243
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BUREAU VERITAS JOB #: C3I9022**
**Received: 2023/06/27, 15:40**

Encryption Key

AUTHORIZED REPORT
RAPPORT AUTORISÉ

Bureau Veritas
04 Jul 2023 16:49:23

Please direct all questions regarding this Certificate of Analysis to:
Patricia Legette, Project Manager
Email: Patricia.Legette@bureauveritas.com
Phone# (905)817-5799

==========

This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.



Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C3I9022
Report Date: 2023/07/04

exp Services Inc
Client Project #: GTR-22015419-B0
Site Location: 1101A & 1105 KINGSTON RD
Your P.O. #: MRK-GEO
Sampler Initials: NT

## RESULTS OF ANALYSES OF SOIL

| Bureau Veritas ID | | WFQ102 | WFQ103 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2023/06/14 | 2023/06/16 | | |
| COC Number | | 940135-33-01 | 940135-33-01 | | |
| | **UNITS** | **BH1 3.0-3.5M** | **BH4 6.1-6.4M** | **RDL** | **QC Batch** |
| **Inorganics** | | | | | |
| Available (CaCl2) pH | pH | 7.84 | 7.75 | | 8759974 |
| Soluble (20:1) Sulphate (SO4) | ug/g | 73 | 700 | 20 | 8762503 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



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Bureau Veritas Job #: C3I9022
Report Date: 2023/07/04

exp Services Inc
Client Project #: GTR-22015419-B0
Site Location: 1101A & 1105 KINGSTON RD
Your P.O. #: MRK-GEO
Sampler Initials: NT

## TEST SUMMARY

**Bureau Veritas ID:** WFQ102
**Sample ID:** BH1 3.0-3.5M
**Matrix:** Soil

**Collected:** 2023/06/14
**Shipped:**
**Received:** 2023/06/27

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| pH CaCl2 EXTRACT | AT | 8759974 | 2023/06/29 | 2023/06/29 | Taslima Aktar |
| Sulphate (20:1 Extract) | KONE/EC | 8762503 | 2023/06/30 | 2023/07/04 | Alina Dobreanu |

**Bureau Veritas ID:** WFQ103
**Sample ID:** BH4 6.1-6.4M
**Matrix:** Soil

**Collected:** 2023/06/16
**Shipped:**
**Received:** 2023/06/27

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| pH CaCl2 EXTRACT | AT | 8759974 | 2023/06/29 | 2023/06/29 | Taslima Aktar |
| Sulphate (20:1 Extract) | KONE/EC | 8762503 | 2023/06/30 | 2023/07/04 | Alina Dobreanu |



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Bureau Veritas Job #: C3I9022
Report Date: 2023/07/04

exp Services Inc
Client Project #: GTR-22015419-B0
Site Location: 1101A & 1105 KINGSTON RD
Your P.O. #: MRK-GEO
Sampler Initials: NT

## GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

| | |
|---|---|
| Package 1 | 3.7°C |

**Results relate only to the items tested.**



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Bureau Veritas Job #: C3I9022
Report Date: 2023/07/04

## QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: GTR-22015419-B0
Site Location: 1101A & 1105 KINGSTON RD
Your P.O. #: MRK-GEO
Sampler Initials: NT

| | | | Matrix Spike | | SPIKED BLANK | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| 8759974 | Available (CaCl2) pH | 2023/06/29 | | | 100 | 97 - 103 | | | 0.11 | N/A |
| 8762503 | Soluble (20:1) Sulphate (SO4) | 2023/07/04 | 91 | 70 - 130 | 105 | 70 - 130 | <20 | ug/g | NC | 35 |

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).



Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C3I9022
Report Date: 2023/07/04

exp Services Inc
Client Project #: GTR-22015419-B0
Site Location: 1101A & 1105 KINGSTON RD
Your P.O. #: MRK-GEO
Sampler Initials: NT

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere

Cristina Carriere, Senior Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.



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CHA

27-Jun-23 15:40
Patricia Legette
C3I9022

AJH ENV-1285

Page 1 of 1

| INVOICE TO: | | REPORT TO: | | PROJECT INFORMATION: | |
|---|---|---|---|---|---|
| Company Name: | #17485 exp Services Inc | Company Name: | Exp Services Inc | Quotation #: | ~~C20320~~ Stream 3 |
| Attention: | Accounts Payable | Attention: | Clement Chow | P.O. #: | MRK-GEO |
| Address: | 220 Commerce Valley Dr W Suite 500 | Address: | | Project: | GTE-201549-B0 |
| | Markham ON L3T 0A8 | | | Project Name: | 1101A+1105 Kingston Rd. |
| Tel: | (905) 695-3217 Fax: | Tel: | Fax: | Site #: | |
| Email: | AP@exp.com; karen.burke@exp.com | Email: | clement.chow@exp.com | Sampled By: | NT |

Order #: 940135

COC #: C#940135-33-01

Project Manager: Patricia Legette

**MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY**

**Regulation 153 (2011)**
- ☐ Table 1 ☐ Res/Park ☐ Medium/Fine
- ☐ Table 2 ☐ Ind/Comm ☐ Coarse
- ☐ Table 3 ☐ Agri/Other ☐ For RSC
- ☐ Table ___

**Other Regulations**
- ☐ CCME ☐ Sanitary Sewer Bylaw
- ☐ Reg 558. ☐ Storm Sewer Bylaw
- ☐ MISA Municipality ___
- ☐ PWQO ☐ Reg 406 Table ___
- ☐ Other ___

**Special Instructions**

*Include Criteria on Certificate of Analysis (Y/N)?* ___

Field Filtered (please circle): Metals / Hg / Cr VI

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

**Regular (Standard) TAT:** ✓
*(will be applied if Rush TAT is not specified)*
*Standard TAT = 5-7 Working days for most tests.*
*Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.*

**Job Specific Rush TAT (if applies to entire submission)**
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | pH + Sulphate | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|
| 1 | | BH 1 3.0-3.5m | 2023/06/14 | - | soil | ✓ | 1 | |
| 2 | | BH 4 6.1-6.4m | 2023/06/16 | - | soil | ✓ | 1 | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |

| * RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | # jars used and not submitted |
|---|---|---|---|---|---|---|
| C. Chow Clement Chow | 2023/06/27 | 10AM | Rupinder RUPINDER | 2023/06/27 | 15:40 | |

**Laboratory Use Only**

| Time Sensitive | Temperature (°C) on Recei | Custody Seal | Yes | No |
|---|---|---|---|---|
| | 5 3 3 | Present | ✓ | |
| | | Intact | ✓ | |

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/CHAIN-CUSTODY-FORMS-COCS.

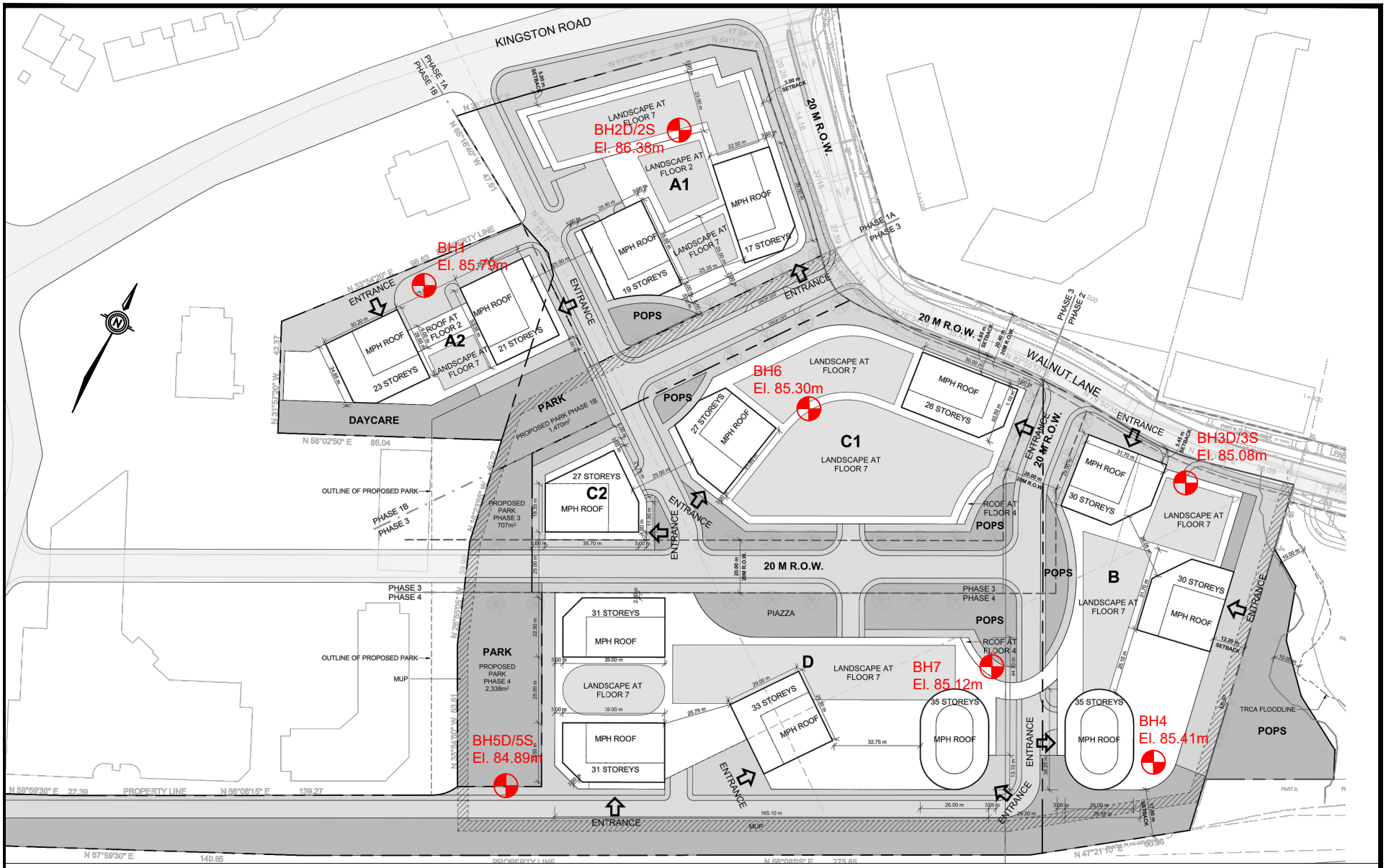
SAMPLES MUST BE KEPT COOL ( < 10° C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

# Drawings

Borehole Location Plan
Borehole Logs




NOTES:

1. THE BOUNDARIES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR
2. SOIL SAMPLES WILL BE RETAINED IN STORAGE FOR 1 MONTH AND THEN DESTROYED UNLESS CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. THIS DRAWING WAS REPRODUCED FROM A SITE PLAN PROVIDED BY TURNER FLEISCHER ARCHITECTS INC.
4. BOREHOLE ELEVATIONS SHOULD NOT BE USED FOR BUILDING GRADES.

**LEGEND:**

BOREHOLE LOCATION

**EXP** Services Inc.
t: +1.905.695.3217 | f: +1.905.695.0169
220 COMMERCE VALLEY DR., SUITE 110
MARKHAM, ON L3T 0A8
Canada
www.exp.com

PROJECT TITLE AND LOCATION:
PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
1101A, 1105 AND 1163 KINGSTON ROAD
PICKERING, ONTARIO

DRAWING TITLE:
BOREHOLE LOCATION PLAN

| | |
|---|---|
| PROJECT#: GTR-22015419-B0 | DWN.: LC |
| SCALE: 1:2000 | CHKD.: CC |
| DATE: NOVEMBER 2023 | DWG. No.: 1 |

# Notes on Sample Descriptions

1. All sample descriptions included in this report follow the International Society for Soil Mechanics and Foundation Engineering (ISSMFE), as outlined in the Canadian Foundation Engineering Manual. Note, however, that behavioral properties (i.e. plasticity, permeability) take precedence over particle gradation when classifying soil. Please note that, with the exception of those samples where a grain size analysis has 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.

UNIFIED SOIL CLASSIFICATION

| | | | | | |
|---|---|---|---|---|---|
| CLAY (PLASTIC) TO | FINE | MEDIUM | CRS. | FINE | COARSE |
| SILT (NONPLASTIC) | SAND | | | GRAVEL | |


EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

ISSMFE SOIL CLASSIFICATION

| CLAY | SILT | | | SAND | | | GRAVEL | | | COBBLES | BOULDERS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | FINE | MEDIUM | COARSE | FINE | MEDIUM | COARSE | FINE | MEDIUM | COARSE | | |

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 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 (75 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.

# Notes On Soil Descriptions

4. The following table gives a description of the soil based on particle sizes. With the exception of those samples where grain size analyses have been performed, all samples are classified visually. The accuracy of visual examination is not sufficient to differentiate between this classification system or exact grain size.

| Soil Classification | | Terminology | Proportion |
|---|---|---|---|
| Clay and Silt | <0.060 mm | "trace" (e.g. Trace sand) | 1% to 10% |
| Sand | 0.060 to 2.0 mm | "some" (e.g. Some sand) | 10% to 20% |
| Gravel | 2.0 to 75 mm | adjective (e.g. sandy, silty) | 20% to 35% |
| Cobbles | 75 to 200 mm | "and" (e.g. and sand) | 35% to 50% |
| Boulders | >200 mm | | |

The compactness of Cohesionless soils and the consistency of the cohesive soils are defined by the following:

| Cohesionless Soil | | Cohesive Soil | | |
|---|---|---|---|---|
| **Compactness** | **Standard Penetration Resistance "N" Blows / 0.3 m** | **Consistency** | **Undrained Shear Strength (kPa)** | **Standard Penetration Resistance "N" Blows / 0.3 m** |
| Very Loose | 0 to 4 | Very soft | <12 | <2 |
| Loose | 4 to 10 | Soft | 12 to 25 | 2 to 4 |
| Compact | 10 to 30 | Firm | 25 to 50 | 4 to 8 |
| Dense | 30 to 50 | Stiff | 50 to 100 | 8 to 15 |
| Very Dense | Over 50 | Very Stiff | 100 to 200 | 15 to 30 |
| | | Hard | >200 | >30 |

5. **ROCK CORING**

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundless of the rock mass. It is obtained from the rock cores by summing the length of the core covered, counting only those pieces of sound core that are 100 mm or more length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

| RQD Classification | RQD (%) |
|---|---|
| Very Poor Quality | <25 |
| Poor Quality | 25 to 50 |
| Fair Quality | 50 to 75 |
| Good Quality | 75 to 90 |
| Excellent Quality | 90 to 100 |

$$\text{Recovery Designation \% Recovery} = \frac{\text{Length of Core Per Run}}{\text{Total Length of Run}} \times 100$$

# Log of Borehole 1

Project No. GTR-22015419-BO

Drawing No. 2

Project: Preliminary Geotechnical Investigation - Residential Development

Sheet No. 1 of 1

Location: 1101A, 1105 and 1163 Kingston Road, Pickering, Ontario

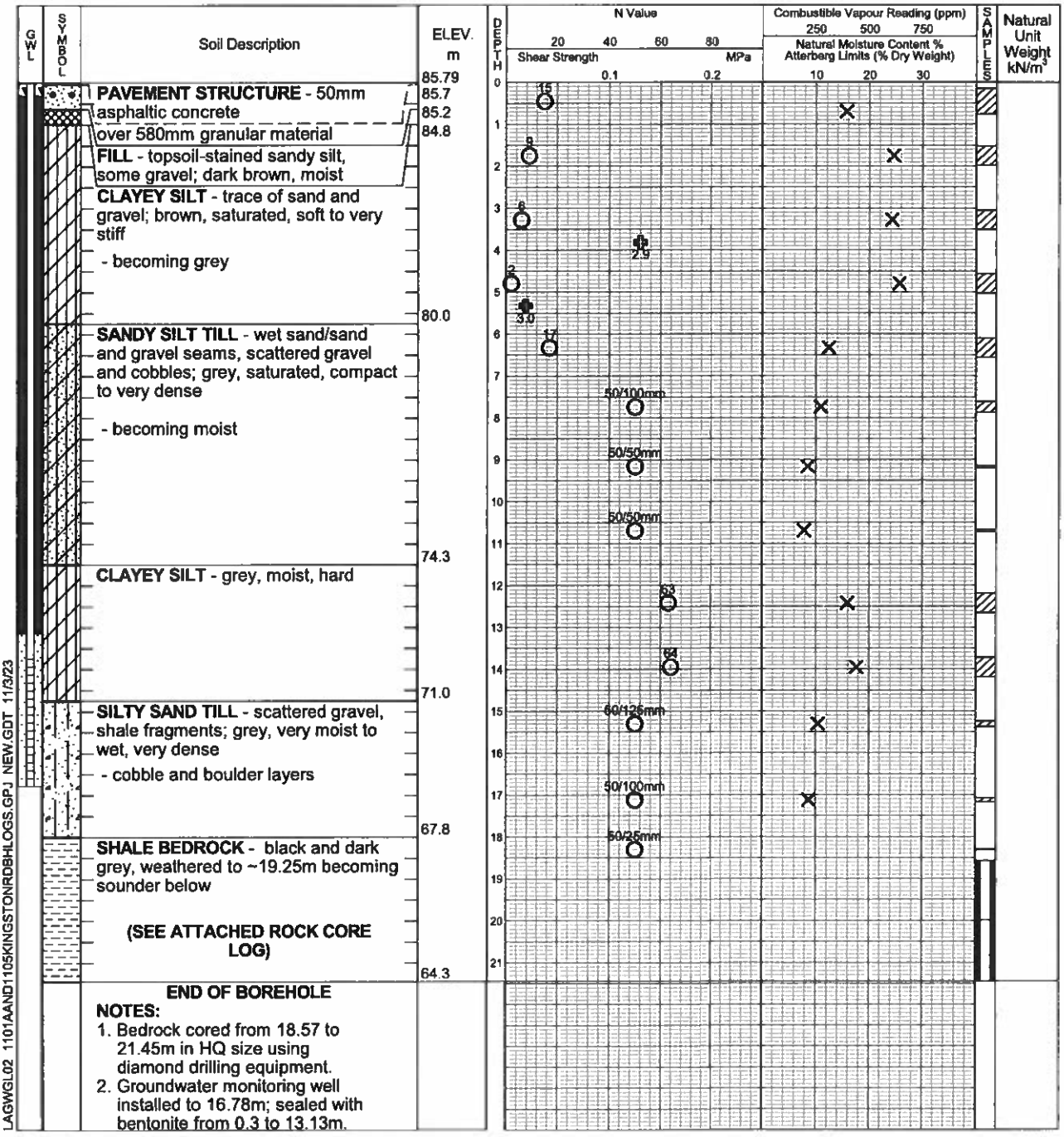
Date Drilled: May 16, 2023

Drill Type: Mud rotary with CME 75

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer




**NOTES:**

1. Bedrock cored from 18.57 to 21.45m in HQ size using diamond drilling equipment.
2. Groundwater monitoring well installed to 16.78m; sealed with bentonite from 0.3 to 13.13m.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| After 4 days | 3.36 | Well |
| After 15 days | 3.42 | Well |
| After 21 days | 3.37 | Well |

# ROCK CORE LOG

# BH1

| PROJECT | ORIENTATION | ELEVATION (m) | DATUM | PROJECT NUMBER |
|---|---|---|---|---|
| Preliminary Geotechnical Investigation | Vertical | 85.8 | Geodetic | GTR-22015419-B0 |
| **LOCATION** | **DATE STARTED** | **COMPLETED** | **LOGGED BY** | **DRAWING NUMBER** |
| 1101A and 1105 Kingston Road, Pickering, Ontario | 05/16/23 | 05/16/23 | RY | 2 |
| **CLIENT** | **DRILLER** | **DRILL TYPE** | **CORE BARREL** | **SHEET** |
| Tribute Communities | Pontil Drilling | CME 75 Truck | HQ | 1 of 1 |

| ELEVATION (m) | DEPTH (m) | SYMBOL | GENERAL DESCRIPTION | ELEVATION (m) | JOINT CHARACTERISTICS: JOINT TYPE | ORIENTATION | SPACING | ROUGHNESS | FILLING | APERTURE (mm) | WEATHERING | STRENGTH | FRACTURE FREQUENCY | RUN NUMBER | RECOVERY (%) | RQD | WATER RECOVERY (%) | WATER COLOUR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 67.2 | | | **BLUE MOUNTAIN FORMATION**<br>Dark grey to black shale with thin interbeds of limestone or calcareous siltstone | 67.2 | B | F | | SP | T | | | | | | | | | |
| | | | | | B | F | | SP | T | | | | | | | | | |
| | | | Slightly weathered (W2) to fresh (W1), weak (R3), laminated to thinly bedded, dark grey to black, fissile SHALE | | B | F | | SP | T | | | | | | | | | |
| | | | | | B | F | | SP | T | | | | | | | | | |
| | 19 | | Run 1: Shale (100%) | | | | | | | | | | | | | | | |
| | | | | | B | F | | SP | T | | | | | | | | | |
| | | | Fracture Zone:<br>18.68 - 18.75 m (76mm)<br>18.91 - 19.03 m (125mm) | | | | | | | | | | | | | | | |
| | | | SOLID CORE RECOVERY: 83% | | | | | | | | | | | 1 | 100 | 61 | 100 | Grey |
| | | | | | B | F | | SU | T | | | | | | | | | |
| | 20 | | Run 2: Shale (100%) | | | | | | | | | | | | | | | |
| | | | SOLID CORE RECOVERY: 100% | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | 2 | 100 | 100 | 100 | Grey |
| | 21 | | | | | | | | | | | | | | | | | |
| 64.4 | | | End of Borehole at 21.4 m | 64.4 | | | | | | | | | | | | | | |
| | 22 | | | | | | | | | | | | | | | | | |

EXP_ROCKCOREAM ROCK CORE LOGS.GPJ CORE_LOG.GDT 6/22/23

exp.

# Log of Borehole 2D

Project No. GTR-22015419-BO | Drawing No. 3

Project: Preliminary Geotechnical Investigation - Residential Development | Sheet No. 1 of 1

Location: 1101A, 1105 and 1163 Kingston Road, Pickering, Ontario

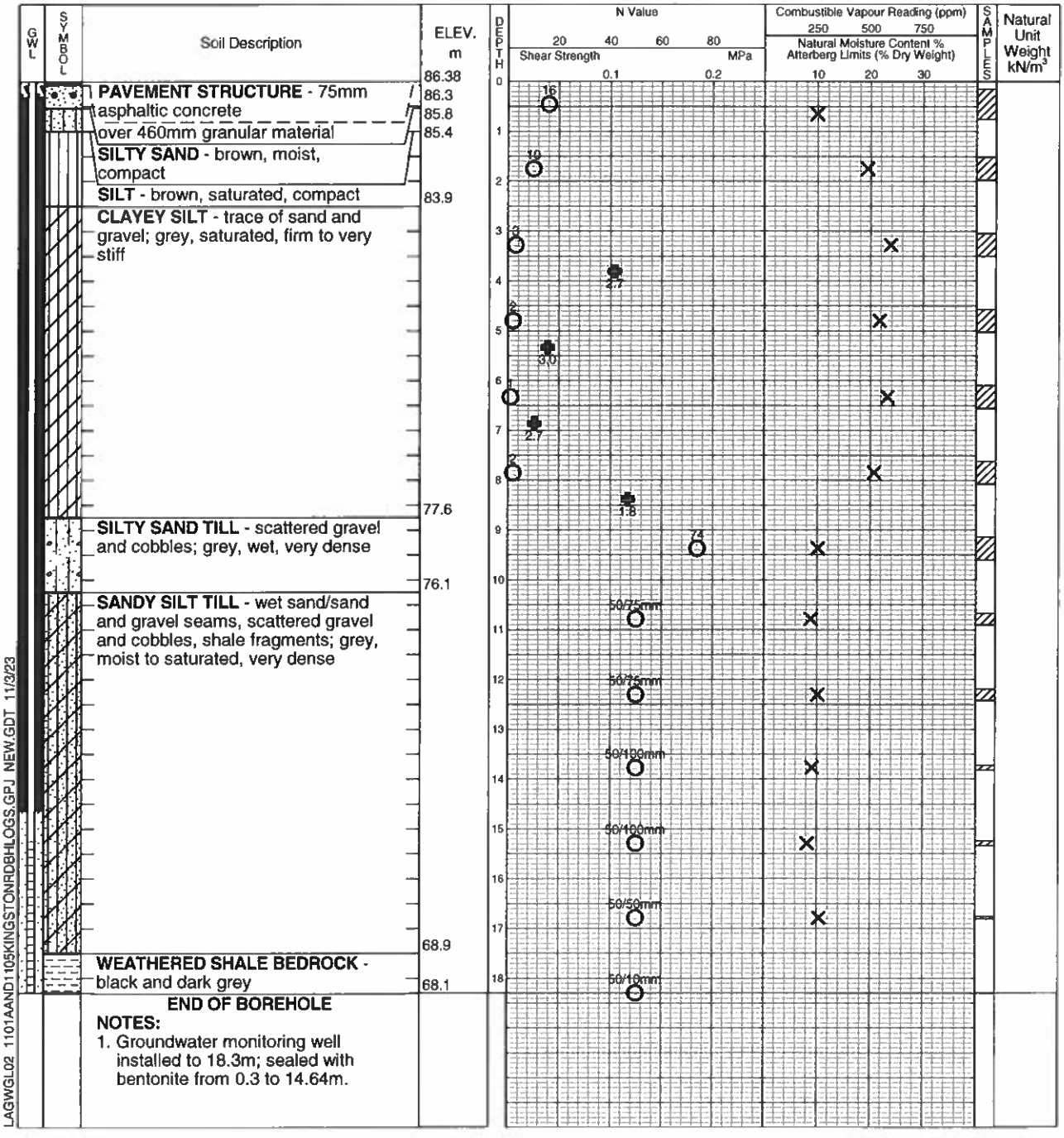
Date Drilled: May 18, 2023

Drill Type: Mud rotary with CME 75

Datum: Geodetic

Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Field Vane Test (S)

Combustible Vapour Reading | Natural Moisture | Plastic and Liquid Limit | Undrained Triaxial at % Strain at Failure | Penetrometer




NOTES:

1. Groundwater monitoring well installed to 18.3m; sealed with bentonite from 0.3 to 14.64m.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| After 2 days | 2.96 | Well |
| After 13 days | 3.83 | Well |
| After 19 days | 3.98 | Well |

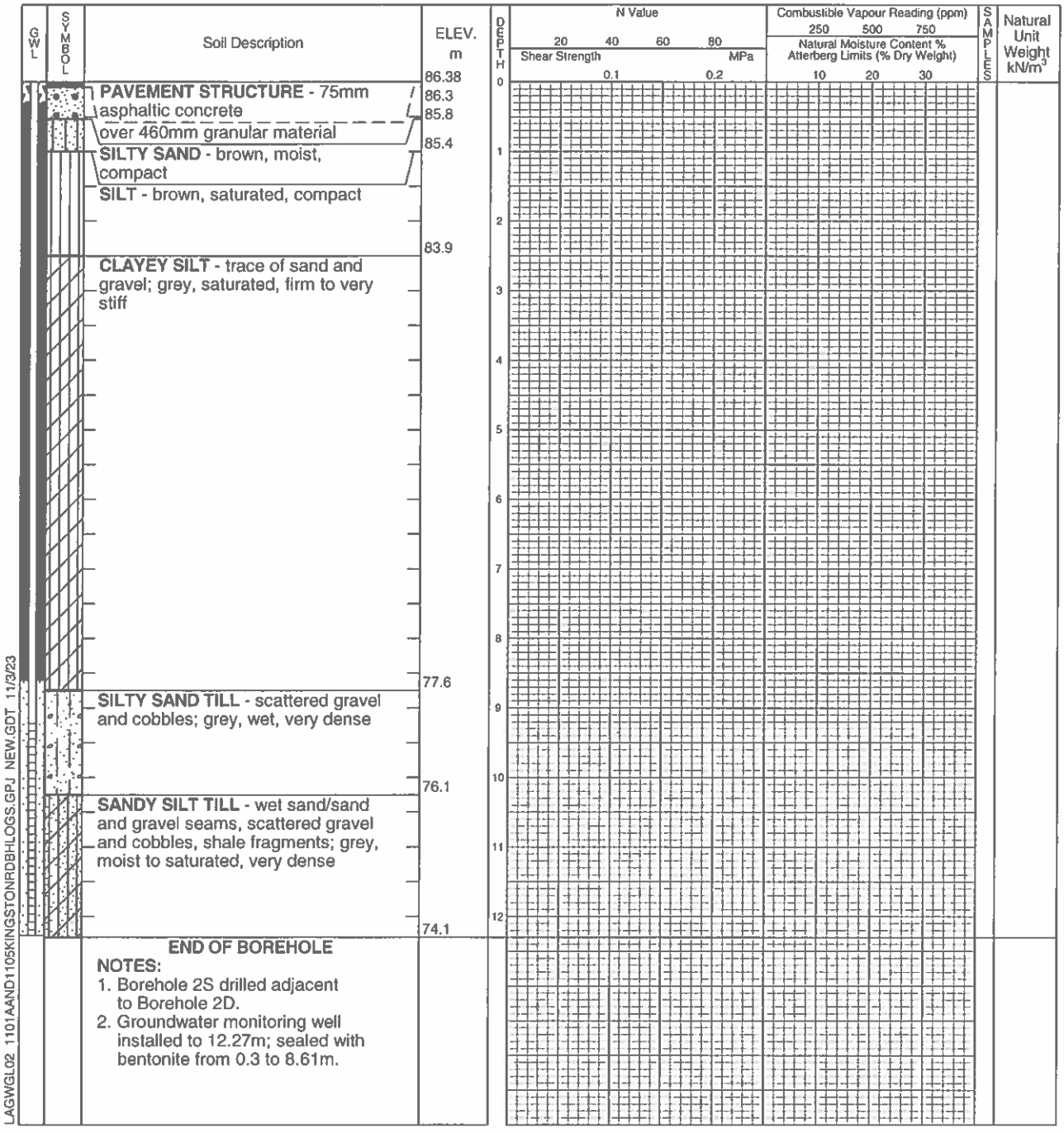
# Log of Borehole 2S

Project No. GTR-22015419-BO
Drawing No. 4
Project: Preliminary Geotechnical Investigation - Residential Development
Sheet No. 1 of 1
Location: 1101A, 1105 and 1163 Kingston Road, Pickering, Ontario

Date Drilled: May 18, 2023
Drill Type: Mud rotary with CME 75
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer




END OF BOREHOLE

NOTES:
1. Borehole 2S drilled adjacent to Borehole 2D.
2. Groundwater monitoring well installed to 12.27m; sealed with bentonite from 0.3 to 8.61m.

LAGWGL02 1101AAND1105KINGSTONRDBHLOGS.GPJ NEW.GDT 11/3/23

exp.

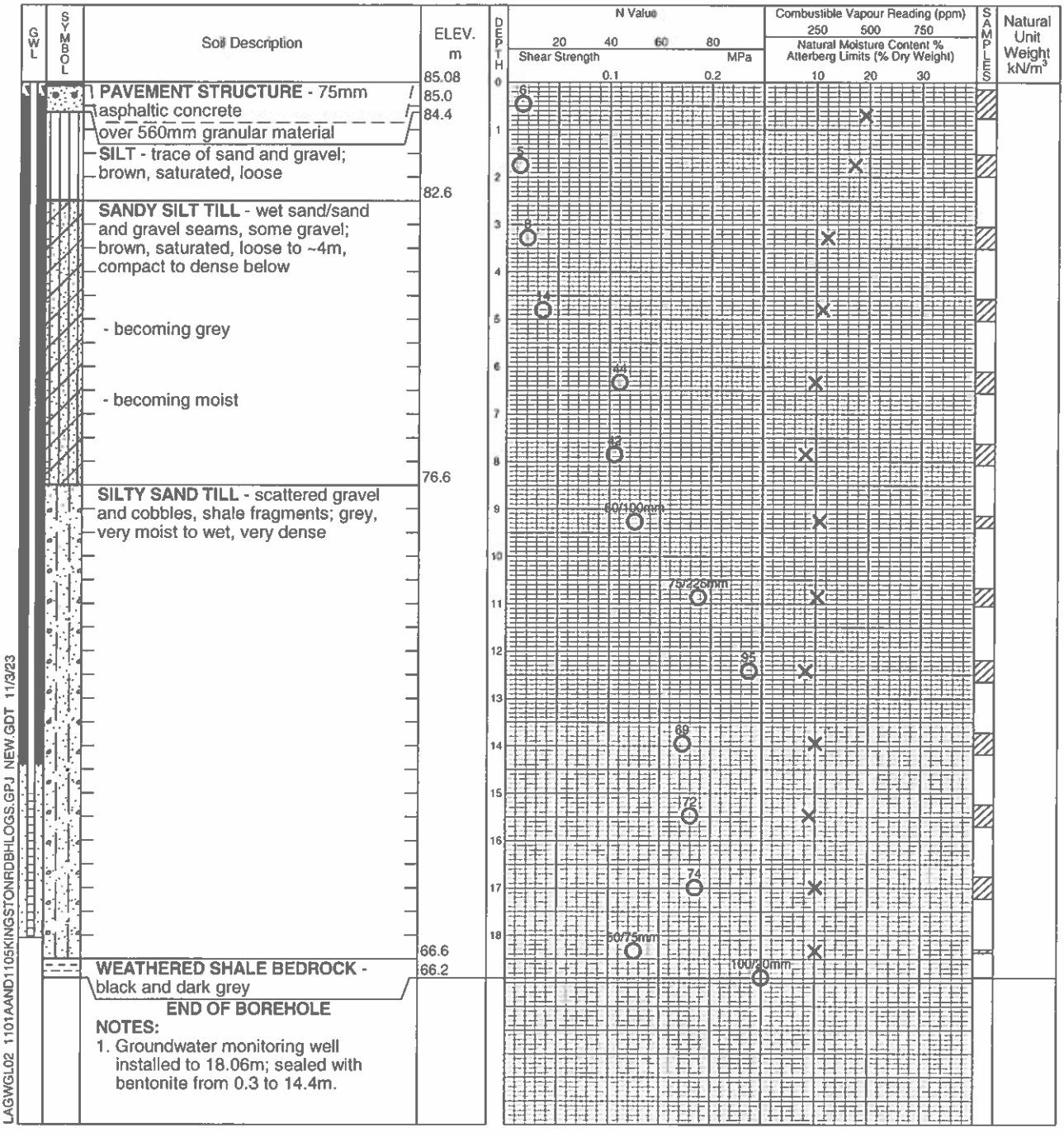
| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| After 2 days | 2.89 | Well |
| After 13 days | 2.97 | Well |
| After 19 days | 2.91 | Well |

# Log of Borehole 3D

Project No. GTR-22015419-BO
Drawing No. 5
Project: Preliminary Geotechnical Investigation - Residential Development
Sheet No. 1 of 1
Location: 1101A, 1105 and 1163 Kingston Road, Pickering, Ontario

Date Drilled: May 8, 2023
Drill Type: Mud rotary with CME 75
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test
Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer




NOTES:
1. Groundwater monitoring well installed to 18.06m; sealed with bentonite from 0.3 to 14.4m.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| After 12 days | 3.97 | Well |
| After 23 days | 4.04 | Well |
| After 29 days | 4.04 | Well |

LAGWGL02 1101AAND1105KINGSTONRDBHLOGS.GPJ NEW.GDT 11/3/23

# Log of Borehole 3S

Project No. GTR-22015419-BO

Drawing No. 6

Project: Preliminary Geotechnical Investigation - Residential Development

Sheet No. 1 of 1

Location: 1101A, 1105 and 1163 Kingston Road, Pickering, Ontario

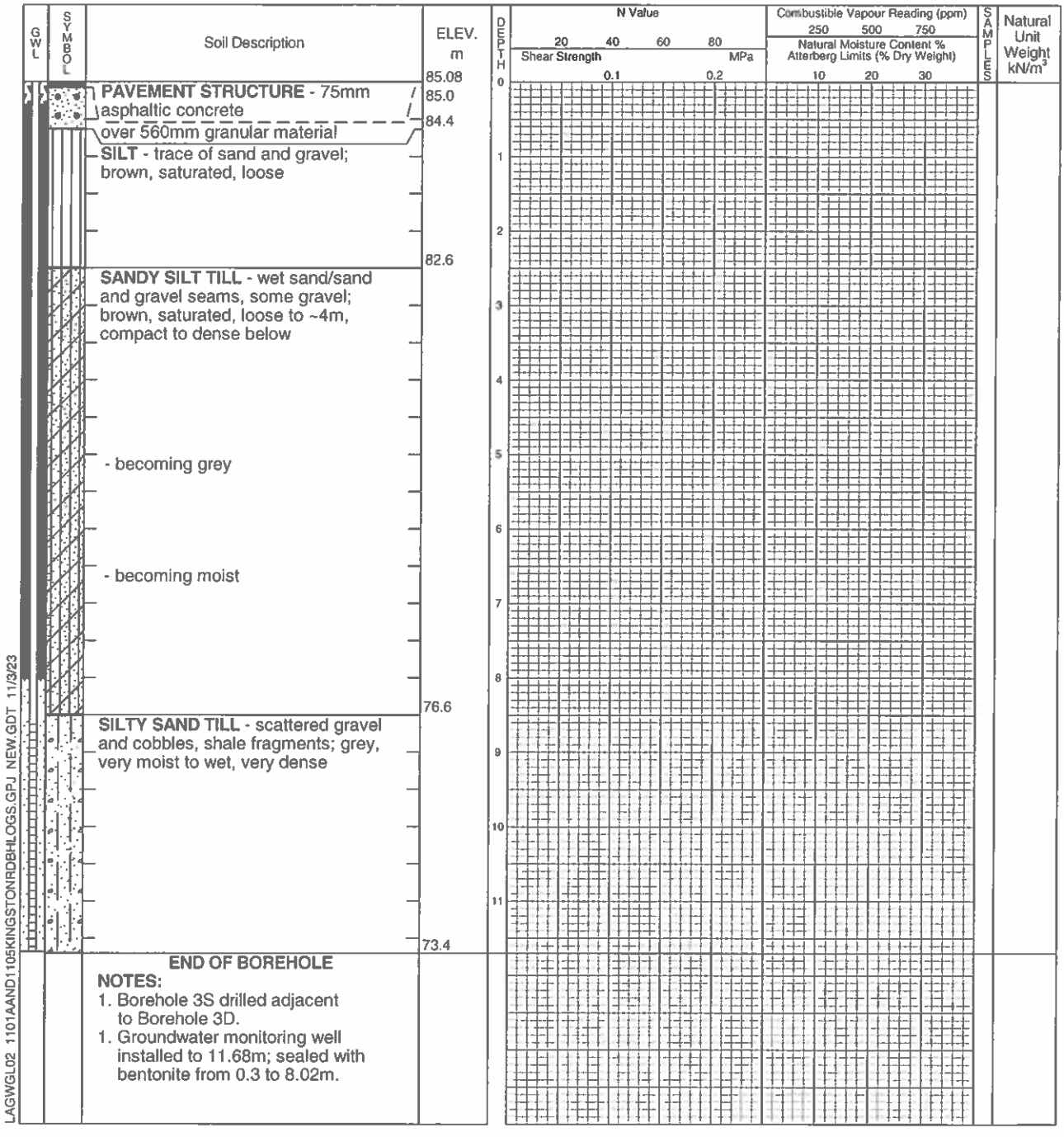
Date Drilled: May 8, 2023

Drill Type: Mud rotary with CME 75

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer




LAGWGL02 1101AAND1105KINGSTONRDBHLOGS.GPJ NEW.GDT 11/3/23

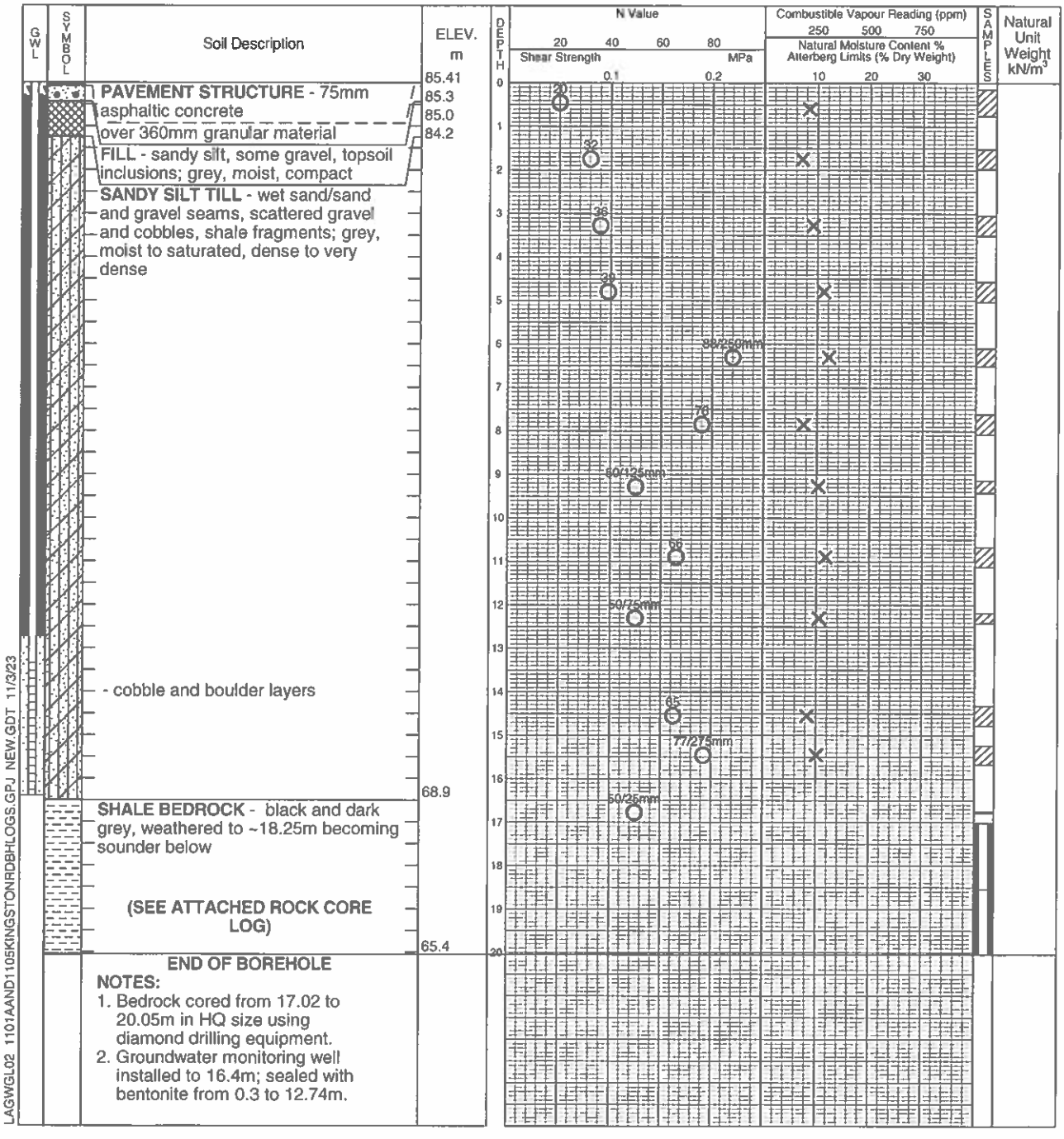
| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| After 12 days | 1.38 | Well |
| After 23 days | 2.10 | Well |
| After 29 days | 4.04 | Well |

# Log of Borehole 4

Project No. GTR-22015419-BO
Drawing No. 7
Project: Preliminary Geotechnical Investigation - Residential Development
Sheet No. 1 of 1
Location: 1101A, 1105 and 1163 Kingston Road, Pickering, Ontario

Date Drilled: May 11 and 12, 2023
Drill Type: Mud rotary with CME 75
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test
Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer




LAGWGL02 1101AAND1105KINGSTONRDBHLOGS.GPJ NEW.GDT 11/3/23

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| After 8 days | 3.92 | Well |
| After 19 days | 3.97 | Well |
| After 25 days | 4.19 | Well |

# ROCK CORE LOG

# BH4

| PROJECT | ORIENTATION | ELEVATION (m) | DATUM | PROJECT NUMBER |
|---|---|---|---|---|
| Preliminary Geotechnical Investigation | Vertical | 85.4 | Geodetic | GTR-22015419-B0 |
| **LOCATION** | **DATE STARTED** | **COMPLETED** | **LOGGED BY** | **DRAWING NUMBER** |
| 1101A and 1105 Kingston Road, Pickering, Ontario | 05/12/23 | 05/12/23 | RY | 7 |
| **CLIENT** | **DRILLER** | **DRILL TYPE** | **CORE BARREL** | **SHEET** |
| Tribute Communities | Pontil Drilling | CME 75 Truck | HQ | 1 of 1 |

| ELEVATION (m) | DEPTH (m) | SYMBOL | GENERAL DESCRIPTION | ELEVATION (m) | JOINT CHARACTERISTICS: JOINT TYPE | ORIENTATION | SPACING | ROUGHNESS | FILLING | APERTURE (mm) | WEATHERING | STRENGTH | FRACTURE FREQUENCY | RUN NUMBER | RECOVERY (%) | RQD | WATER RECOVERY (%) | WATER COLOUR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 68.4 | | | **BLUE MOUNTAIN FORMATION**<br>Dark grey to black shale with thin interbeds of limestone or calcareous siltstone | 68.4 | B | F | | SP | T | | | | | | | | | |
| | | | Fresh (W1), weak (R3), laminated to thinly bedded, dark grey to black, fissile SHALE | | B | F | | SP | T | | | | | | | | | |
| | | | | | B | F | | SP | T | | | | | | | | | |
| | | | Run 1: Shale (100%) | | B | F | | SP | T | | | | | | | | | |
| | | | Fracture Zone:<br>17.02 - 17.15 m (130mm)<br>18.16 - 18.20 m (40mm) | | | | | | | | | | | | | | | |
| | | | SOLID CORE RECOVERY: 82% | | B | F | | SP | T | | | | | | | | | |
| | | | | | B | F | | SP | T | | | | | | | | | |
| | | | | | C | V | | SP | T | | | | | 1 | 100 | 76 | 100 | Grey |
| | | | | | B | F | | SP | T | | | | | | | | | |
| | 18 | | | | | | | | | | | | | | | | | |
| | | | | | B | F | | SU | O | 1 | | | | | | | | |
| | | | | | B | F | | SP | T | | | | | | | | | |
| | | | | | B | F | | SP | T | | | | | | | | | |
| | | | | | B | F | | SP | S | 1 | | | | | | | | |
| | | | | | B | F | | SP | T | | | | | | | | | |
| | | | Run 2: Shale (100%) | | C | V | | SU | T | | | | | | | | | |
| | | | SOLID CORE RECOVERY: 100% | | B | F | | SP | T | | | | | | | | | |
| | 19 | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | 2 | 100 | 100 | 100 | Grey |
| | 20 | | | | | | | | | | | | | | | | | |
| 65.3 | | | End of Borehole at 20.1 m | 65.3 | | | | | | | | | | | | | | |

EXP_ROCKCOREAM ROCK CORE LOGS.GPJ CORE_LOG.GDT 6/22/23

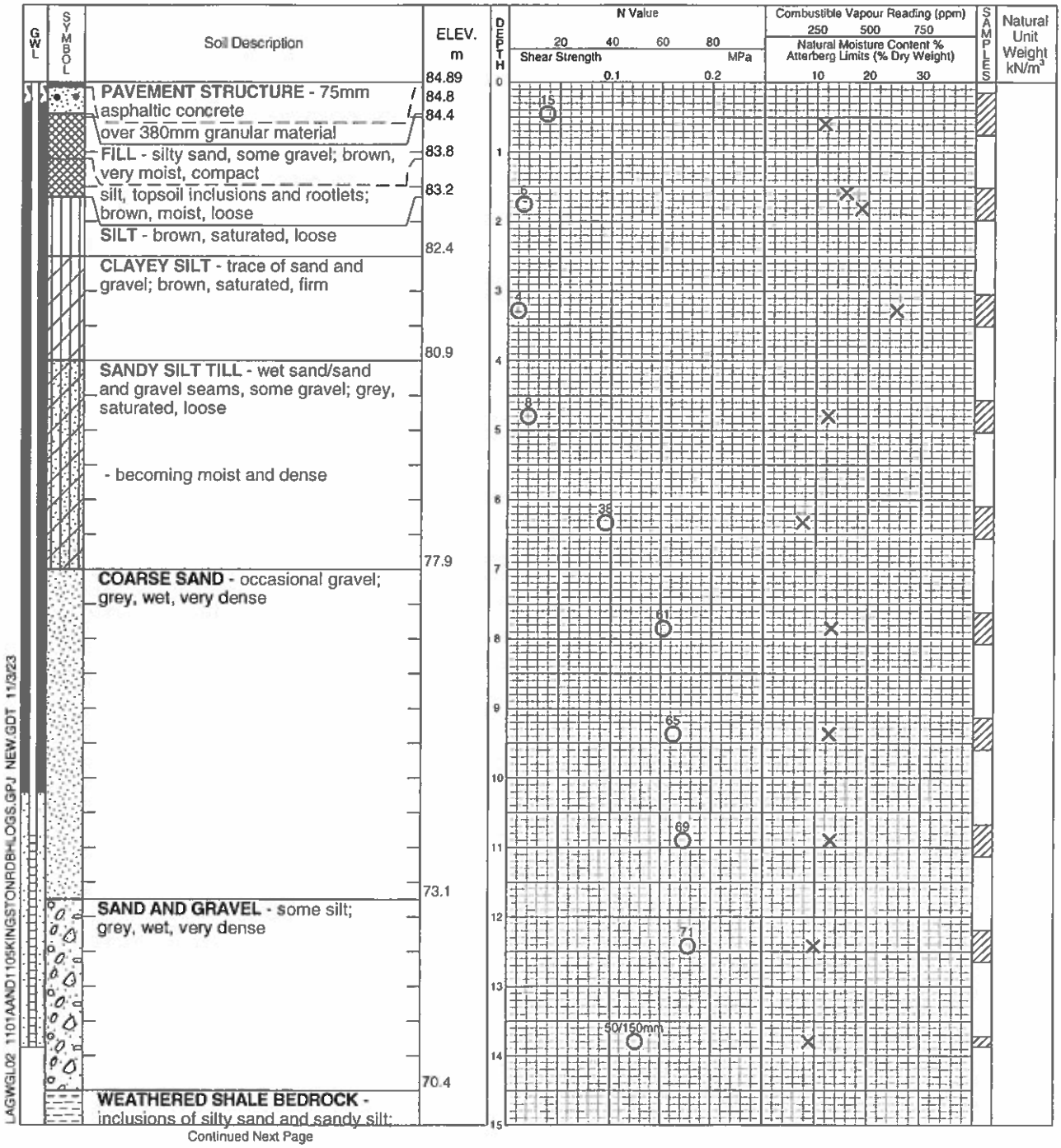
exp.

# Log of Borehole 5D

Project No. GTR-22015419-BO
Drawing No. 8
Project: Preliminary Geotechnical Investigation - Residential Development
Sheet No. 1 of 2
Location: 1101A, 1105 and 1163 Kingston Road, Pickering, Ontario

Date Drilled: May 12 and 15, 2023
Drill Type: Mud rotary with CME 75
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test
Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer




LAGWGL02 1101AAND1105KINGSTONRDBHLOGS.GPJ NEW.GDT 11/3/23

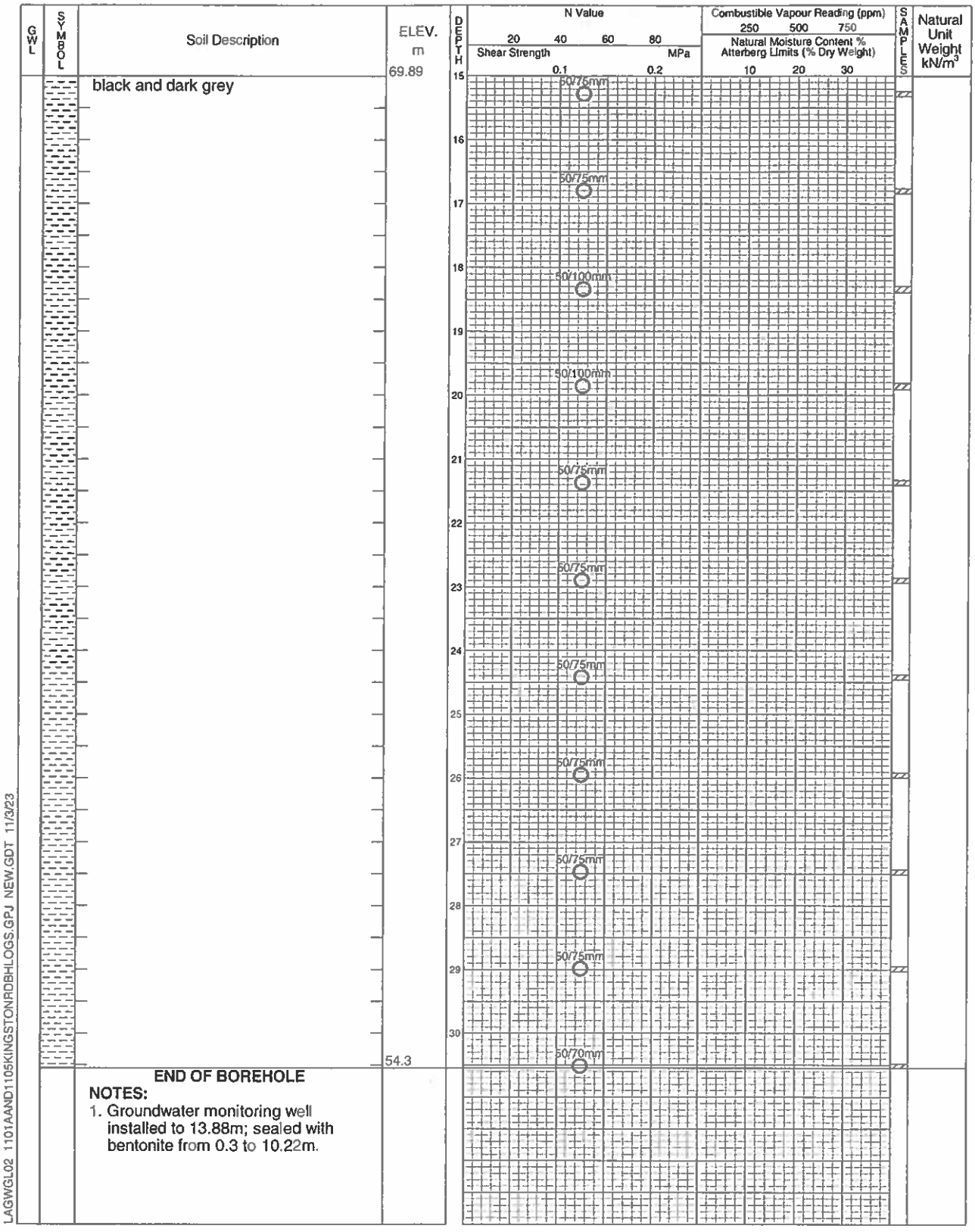
Continued Next Page

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| After 5 days | 2.60 | Well |
| After 16 days | 2.54 | Well |
| After 22 days | 2.61 | Well |

# Log of Borehole 5D

Project No. GTR-22015419-BO Drawing No. 8

Project: Preliminary Geotechnical Investigation - Residential Development Sheet No. 2 of 2




LAGWGL02 1101AAND1105KINGSTONRDBHLOGS.GPJ NEW.GDT 11/3/23

exp.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| After 5 days | 2.60 | Well |
| After 16 days | 2.54 | Well |
| After 22 days | 2.61 | Well |

# Log of Borehole 5S

Project No. GTR-22015419-BO

Drawing No. 9

Project: Preliminary Geotechnical Investigation - Residential Development

Sheet No. 1 of 1

Location: 1101A, 1105 and 1163 Kingston Road, Pickering, Ontario

Date Drilled: May 15, 2023

Drill Type: Mud rotary with CME 75

Datum: Geodetic

Auger Sample ⊠
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢—○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

| GWL | SYMBOL | Soil Description | ELEV. m |
|---|---|---|---|
| | | **PAVEMENT STRUCTURE** - 75mm asphaltic concrete | 84.89 |
| | | over 380mm granular material | 84.8 |
| | | **FILL** - silty sand, some gravel; brown, very moist, compact | 84.4 |
| | | silt, topsoil inclusions and rootlets; brown, moist, loose | 83.8 |
| | | **SILT** - brown, saturated, loose | 83.2 |
| | | **CLAYEY SILT** - trace of sand and gravel; brown, saturated, firm | 82.4 |
| | | **SANDY SILT TILL** - wet sand/sand and gravel seams, some gravel; grey, saturated, loose | 80.9 |
| | | - becoming moist and dense | |
| | | **COARSE SAND** - occasional gravel; grey, wet, very dense | 77.9 |
| | | **END OF BOREHOLE** | 74.1 |

**NOTES:**
1. Borehole 5S drilled adjacent to Borehole 5D.
2. Groundwater monitoring well installed to 10.79m; sealed with bentonite from 0.3 to 7.13m.

DEPTH: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

N Value: 20, 40, 60, 80
Shear Strength: 0.1, 0.2 MPa

Combustible Vapour Reading (ppm): 250, 500, 750
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10, 20, 30

SAMPLES

Natural Unit Weight kN/m³

LAGWGL02 1101AAND1105KINGSTONROBHLOGS.GPJ NEW.GDT 11/3/23

exp

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| After 5 days | 2.56 | Well |
| After 16 days | 2.67 | Well |
| After 22 days | 2.62 | Well |

# Log of Borehole 6

Project No. GTR-22015419-BO

Drawing No. 10

Project: Preliminary Geotechnical Investigation - Residential Development

Sheet No. 1 of 1

Location: 1101A, 1105 and 1163 Kingston Road, Pickering, Ontario

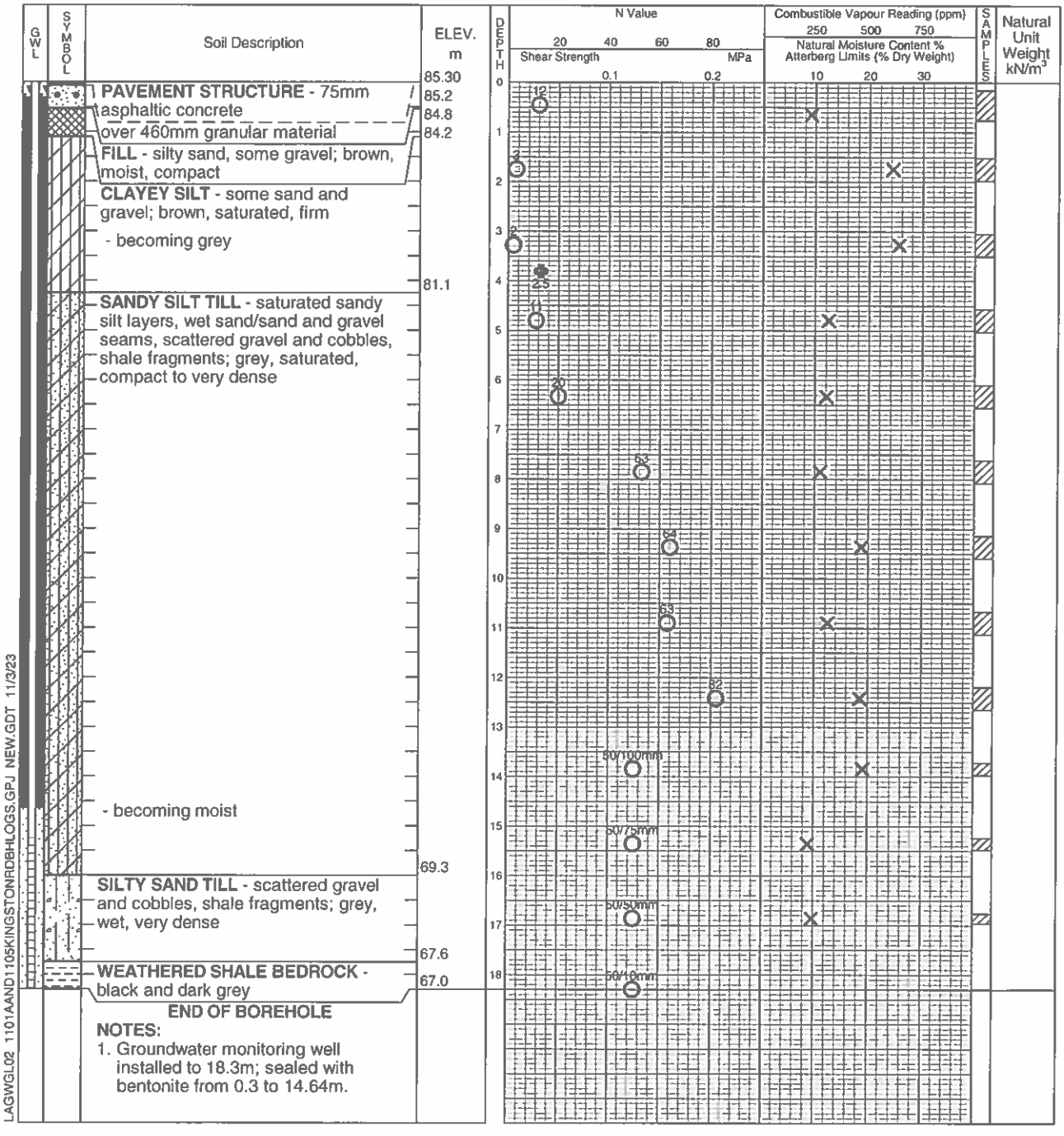
Date Drilled: May 17, 2023

Drill Type: Mud rotary with CME 75

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer




NOTES:
1. Groundwater monitoring well installed to 18.3m; sealed with bentonite from 0.3 to 14.64m.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| After 3 days | 3.03 | Well |
| After 14 days | 3.11 | Well |
| After 20 days | 6.79 | Well |

LAGWGL02 1101AAND1105KINGSTONRDBHLOGS.GPJ NEW.GDT 11/3/23

# Log of Borehole 7

Project No. GTR-22015419-BO

Drawing No. 11

Project: Preliminary Geotechnical Investigation - Residential Development

Sheet No. 1 of 1

Location: 1101A, 1105 and 1163 Kingston Road, Pickering, Ontario

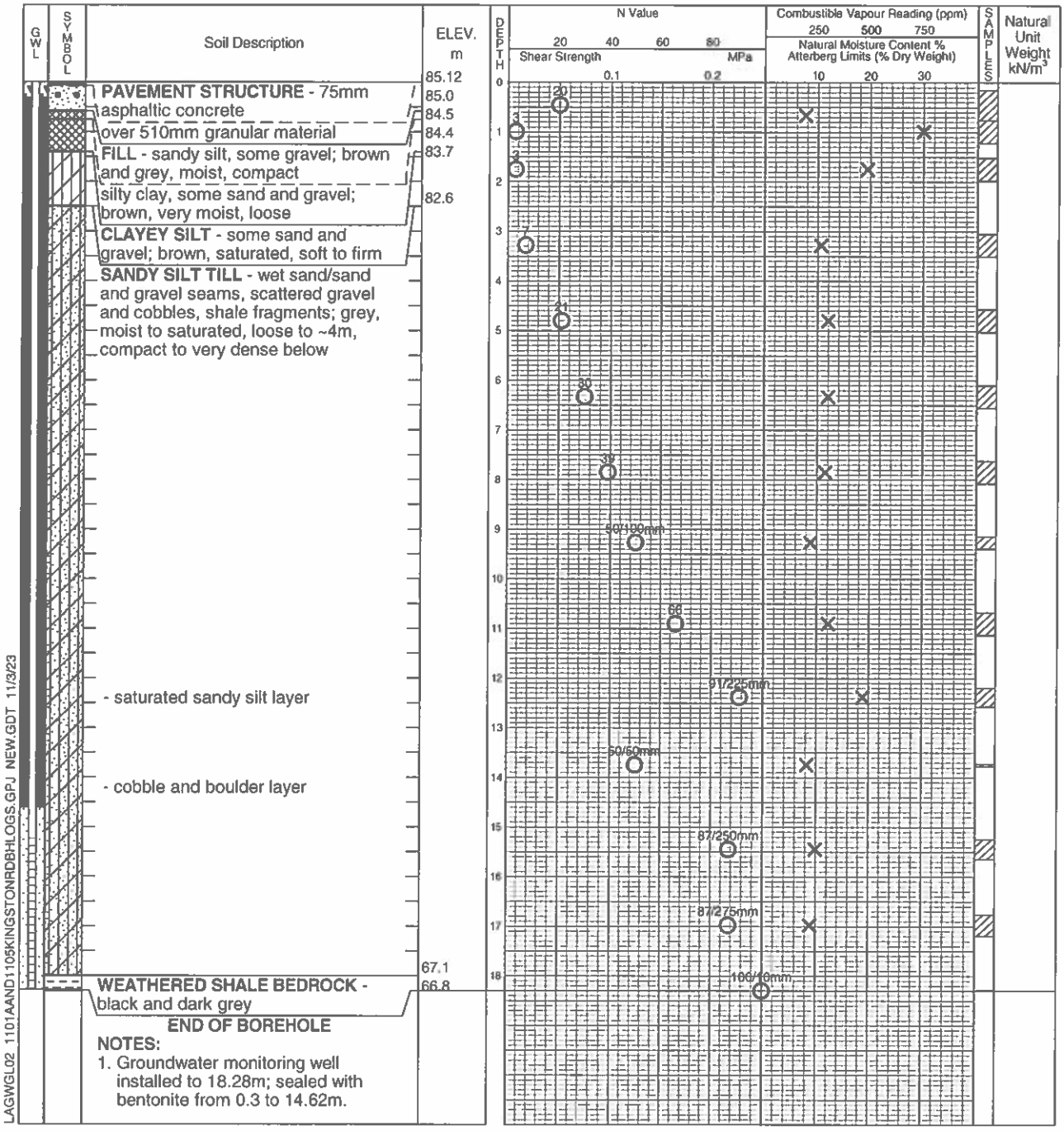
Date Drilled: May 9 and 10, 2023

Drill Type: Mud rotary with CME 75

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer




NOTES:
1. Groundwater monitoring well installed to 18.28m; sealed with bentonite from 0.3 to 14.62m.

LAGWGL02 1101AAND1105KINGSTONRDBHLOGS.GPJ NEW.GDT 11/3/23

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| After 10 days | 3.07 | Well |
| After 21 days | 3.10 | Well |
| After 27 days | 3.59 | Well |