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A REPORT TO
BAZIL DEVELOPMENTS INC.

PROPOSED RESIDENTIAL DEVELOPMENT

62 MILL STREET
TOWN OF UXBRIDGE

REFERENCE NO. 2011-S193

JANUARY 2021

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1.0 INTRODUCTION

In accordance with written authorization dated November 25, 2020, from Mr. Paul Bailey of Bazil Developments Inc., a geotechnical investigation was carried out at a land parcel located at 62 Mill Street in the Town of Uxbridge.

The purpose of this investigation was to reveal the subsurface conditions and determine the engineering properties of the disclosed soils for the design and construction of a new development. The geotechnical findings and resulting recommendations are presented in this Report.

2.0 SITE AND PROJECT DESCRIPTION

The Township of Uxbridge is situated on Peterborough Drumlin Field, where lacustrine sand, silt, clay and water-laid reworked till in Lake Schomberg (glacial lake) has modified the drumlinized stratigraphy in places.

The subject property is a residential lot of approximately 2.9 acres in area, located on the south side of Mill Street, between Water Street and Joseph Street in the Township of Uxbridge. The existing site gradient drops slightly in the north and east direction, having the grade difference of almost 6 m across the property.

The property will be developed for residential uses. Details of the development, however, is not available at the time of report preparation.

3.0 FIELD WORK

The field work, consisting of six (6) sampled boreholes, extending to a depth of 6.6 m, was performed on December 9 and 10, 2020. The borehole locations are presented on the Borehole Location Plan, Drawing No. 1, enclosed.

The boreholes were advanced at intervals to the sampling depths by a track-mounted, continuous-flight power-auger machine equipped for soil sampling. Standard Penetration Tests, using the procedures described on the enclosed “List of Abbreviations and Terms”, were performed at the sampling depths. The test results are recorded as the Standard Penetration Resistance (or ‘N’ values) of the subsoil. The field work was supervised and the findings were recorded by a Geotechnical Technician. The relative density of the non-cohesive strata and the consistency of the cohesive strata are inferred from the ‘N’ values. Split-spoon samples were recovered for soil classification and laboratory testing.

The field work was supervised and the findings were recorded by a Geotechnical Technician. The ground elevation of each borehole location was determined using hand-held Global Navigation Satellite System survey equipment (Trimble Geoexplorer 6000).

4.0 SUBSURFACE CONDITIONS

The investigation has revealed that beneath a layer of topsoil and earth fill in places, the site is underlain by strata of sand and silt. Detailed descriptions of the encountered subsurface conditions from boreholes are presented on the Borehole Logs, comprising Figures 1 to 6, inclusive. The revealed stratigraphy is plotted on the Subsurface Profiles, Drawing No. 2. The engineering properties of the disclosed soils are discussed herein.

4.1 **Topsoil** (All Boreholes)

Topsoil, approximately 20 to 38 cm thick, was encountered at the ground surface of the boreholes. Thicker topsoil layer may be encountered beyond the borehole location, especially in the low-lying areas.

The topsoil is dark brown in colour, indicating appreciable amounts of roots and humus. These materials are unstable and compressible under loads, which has to be removed for site development. It can only be reused for general landscaping purposes.

Due to its humus content, the topsoil may produce volatile gases and generate an offensive odour under anaerobic conditions. Therefore, it must not be buried below any structures or deeper than 1.2 m below the finished grade, so that it will not have an adverse impact on the environmental well-being of the developed areas.

4.2 **Earth Fill** (Boreholes 101, 103, 104 and 105)

A layer of earth fill, consisting of sand and silt, or silty clay, with topsoil and rootlets, was encountered below the topsoil at various borehole locations. It extends to a depth between 0.8 and 1.8 m from the prevailing ground surface.

The obtained ‘N’ values range from 2 to 8 blows per 30 cm penetration, showing the fill is loose. It is not suitable for supporting any structure sensitive to movement.

4.3 **Sand** (All Boreholes, except Borehole 105)

Beneath the topsoil or earth fill, the native sand deposit was encountered at a depth between 0.2 m and 1.5 m from grade. It is fine or fine to medium grained, with occasional silt seams and layers. The deposit extends to a depth between 1.0 m and 5.5 m from the existing ground surface.

The obtained ‘N’ values range from 3 to 43, with a median of 18 blows per 30 cm of penetration, showing the deposit is generally compact to dense in relative density, with loose spots near the existing ground surface.

The natural water content values of the sand samples range from 3% to 16%, with a median of 8%, showing moist to wet conditions, being generally moist. The wet samples may be contributed by the silt layers in the deposit or the saturated sand at the lower stratigraphy.

The engineering properties of the sand deposit are deduced:

- Moderate frost susceptibility.
- High water erodibility, the fine particles are susceptible to migration through small openings under seepage pressure.
- The shear strength is dependent on the internal friction and soil density.
- In excavation, the sand will slough, run with seepage and boil with a piezometric head of about 0.3 m.
- A good pavement-supportive material, with an estimated California Bearing Ratio (CBR) value of 12% to 15%.

4.4 **Silt** (All Boreholes)

The silt deposit was encountered below the earth fill or sand deposit, at a depth between 1.0 and 5.5m from the prevailing ground surface. It consists of fine sand seams, with trace amount of clay. Grain size analyses were performed on selected samples and the results are presented on Figure 7.

The obtained ‘N’ values range from 13 to 52, with a median of 23 blows per 30 cm of penetration, indicating the silt deposit is compact to very dense, being generally compact in relative density.

The natural water content values of the soil samples range from 11% to 23%, with a median of 19%, showing moist to wet, being generally in very moist or wet conditions.

The engineering properties of the silt deposit are deduced:

- Highly frost susceptible and high soil adfreezing potential.

- High water erodibility, the fine particles are susceptible to migration through small openings under seepage pressure.
- The soil has a high capillarity and water retention capacity.
- The shear strength is density dependent and is susceptible to impact disturbance.
- In excavation, the silt will slough, run with seepage and boil with a piezometric head of about 0.4 m.
- A poor pavement-supportive material, with an estimated CBR value of 3%.

4.5 Compaction Characteristics of the Revealed Soils

The obtainable degree of compaction is primarily dependent on the soil moisture and, to a lesser extent, on the type of compactor used and the effort applied. As a general guide, the typical water content values of the revealed soils for Standard Proctor compaction are presented in Table 1.

Table 1 - Estimated Water Content for Compaction

Soil Type	Determined Natural Water Content (%)	Water Content (%) for Standard Proctor Compaction	
		100% (optimum)	Range for 95% or +
Earth Fill	9 to 23	10 to 12	6 to 15
Sand	3 to 16 (median 8)	9	5 to 12
Silt	11 to 23 (median 19)	12	7 to 15

Based on the above findings, the majority of the sand deposit is suitable for 95% + Standard Proctor compaction. Where wet material is contacted, it should be stockpiled to allow draining of excess water or aerated by spreading thinly on the ground during the dry and warm weather, before placement and compaction.

The existing earth fill must be subexcavated, sorted free of organics or deleterious material, aerated, before reuse for structural backfill.

5.0 GROUNDWATER CONDITIONS

The boreholes were checked for the presence of groundwater and cave-in occurrence upon completion of drilling. The recorded data are plotted on the Borehole Logs and summarized in Table 2.

Table 2 - Groundwater Level and Cave-in Depth in Boreholes

Borehole No.	Borehole Depth (m)	Ground Elevation (m)	Recorded Groundwater/Cave-In* Level on Completion	
			Depth (m)	**Elevation (m)**
101	6.6	272.8	3.1*	269.7*
102	6.6	274.0	4.8*	269.2*
103	6.6	276.9	4.5	272.4
104	6.6	277.4	4.6	272.8
105	6.6	276.5	4.8*	271.7*
106	6.6	275.3	3.1*	272.2*

Free groundwater or wet cave-in was recorded in the boreholes, at a depth of 3.1 m to 4.8 m from the prevailing ground surface, or between El. 269.2 m and 272.8 m. It represents the groundwater regime at the site at the time of investigation. The groundwater regime appears to be draining in the east direction and is subject to seasonal fluctuation.

6.0 DISCUSSION AND RECOMMENDATIONS

The investigation has revealed that beneath a layer of topsoil and earth fill in places, the site is underlain by strata of sand and silt, generally compact to dense in relative density, with loose spots near the existing ground surface. The groundwater regime is apparent in the boreholes, between El. 269.2 m and 272.8 m. It appears to be draining in the east direction and is subject to seasonal fluctuation.

The property will be developed for residential uses. Details of the development, however, is not available at the time of report preparation. It is assumed that the development will consist of low-rise structures with basement.

The geotechnical findings which warrant special consideration are presented below:

1. The topsoil is unsuitable for engineering applications. It must be removed for site development and it can be reused for general landscaping purposes only.
2. After demolition of the existing structures and underground utilities, the cavities must be backfilled with selected on-site material, free of organics and compacted properly in layers.
3. For site grading, it is generally more economical to place an engineered fill for house footings, underground services and pavement construction. Weathered soil and earth fill should be subexcavated, sorted free of organic or other deleterious material, if any, prior to be reused for structural backfill.

4. The basement structures must be founded at least 1.0 m above the highest groundwater level or otherwise, the underground structure will have to be waterproofed or provided with underfloor subdrains for dewatering.

The recommendations appropriate for the project described in Section 2.0 are presented herein. One must be aware that the subsurface conditions may vary between boreholes. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.

6.1 **Site Preparation**

The existing buildings on site will be demolished for site development. After removal of the building foundation and underground utilities, the cavities must be backfilled with selected on-site material, free of organics and compacted properly in layers.

For site grading, it is generally more economical to place an engineered fill for house footings, underground services and pavement construction. Prior to site grading, the topsoil must be removed. The weathered soil and earth fill can be upgraded to engineered fill. The engineering requirements for a certifiable fill for pavement construction, municipal services, slab-on-grade, and house footings are presented below:

1. All the existing topsoil must be removed, and the subgrade must be inspected and proof-rolled prior to any fill placement. Badly weathered soils and the existing earth fill should also be subexcavated, sorted free of topsoil inclusions and deleterious materials, if any, aerated and properly compacted in layers.
2. Inorganic soils must be used, and they must be uniformly compacted in 20 cm thick lifts to at least 98% Standard Proctor dry density (SPDD), up to the proposed finished grade. The soil moisture must be properly controlled near the optimum. If the foundations are to be built soon after the fill placement, the densification process for the engineered fill must be increased to 100% of the Standard Proctor compaction.
3. If imported fill is to be used, it should be inorganic soils, free of deleterious or any material with environmental issue (contamination). Any potential imported earth fill from off site must be reviewed for geotechnical and environmental quality by the appropriate personnel as authorized by the developer or agency, before it is hauled to the site.
4. Placement of engineered fill shall be free of any frozen material.
5. If the engineered fill is to be left over the winter months, adequate earth cover, or equivalent, must be provided for protection against frost action.

6. The engineered fill must extend over the entire graded area; the engineered fill envelope and finished elevations must be clearly and accurately defined in the field, and they must be precisely documented by qualified surveyors.
7. Where the ground is wet due to subsurface water seepage, an appropriate subdrain scheme must be implemented prior to the fill placement.
8. Where the fill is to be placed on sloping ground, the face of the sloping ground must be flattened or benched so that it is suitable for safe operation of the compactor and the required compaction can be obtained.
9. The fill operation must be inspected on a full-time basis by a technician under the direction of a geotechnical engineer.
10. The footing and underground services subgrade must be inspected by the geotechnical consulting firm that inspected the engineered fill placement. This is to ensure that the foundations are placed within the engineered fill envelope, and the integrity of the fill has not been compromised by interim construction, environmental degradation and/or disturbance by the footing excavation.
11. Any excavation carried out in certified engineered fill must be reported to the geotechnical consultant who supervised the fill placement in order to document the locations of the excavation and/or to supervise reinstatement of the excavated areas to engineered fill status. If construction on the engineered fill does not commence within a period of 2 years from the date of certification, the condition of the engineered fill must be assessed for re-certification.
12. Despite stringent control in the placement of the engineered fill, variations in soil type and density may occur in the engineered fill. Therefore, the strip footings and the upper section of the foundation walls constructed on engineered fill will require continuous reinforcement, as designed by a structural engineer, to properly distribute the stress induced by the abrupt differential settlement (estimated to be 15± mm).
13. In sewer construction, the engineered fill is considered to have the same structural proficiency as a natural inorganic soil.

6.2 Foundations

Details of the proposed development is not available for review at the time of this report preparation. It is assumed that the development will consist of low-rise structures with basement.

The proposed structures can be constructed on conventional spread and strip footings founded on the native soil or engineered fill. The following bearing pressures are recommended for the design of conventional footings:

- Maximum Soil Bearing Pressure at Serviceability Limit State (SLS) = 150 kPa
- Factored Ultimate Soil Bearing Pressure at Ultimate Limit State (ULS) = 250 kPa

The total and differential settlements of footing designing for SLS are estimated at 25 mm and 20 mm, respectively.

One must be aware that the recommended pressures are given as a guide for foundation design. The footing subgrade must be assessed by a geotechnical engineer, or a geotechnical technician under the supervision of a geotechnical engineer, to ensure that the subgrade conditions are compatible with the design of the foundations.

Footings exposed to weathering, or in unheated areas, should have at least 1.5 m of earth cover for protection against frost action.

It should be noted that if groundwater seepage is encountered during footing excavations, or where the subgrade of the foundations is found to be wet, the subgrade should be protected by a concrete mud-slab immediately after exposure. This will prevent construction disturbance and costly rectification.

The foundations should meet the requirements specified in the latest Ontario Building Code, and the structure should be designed to resist an earthquake force using Site Classification ‘D’ (stiff soil).

6.3 Basement Structure

Continuous groundwater is apparent in the sand or silt deposit, between El. 269.2 m and 272.8 m. It is subject to seasonal fluctuation.

The basement floor should be founded at least 1.0 m above the highest groundwater level unless it is waterproofed and designed for hydrostatic uplift pressure. In conventional design, the perimeter walls of the basement structures should be provided with a drainage board and subdrain system at the wall base.

Where groundwater is evident within 1.0 m from the basement floor, underfloor weepers should be provided below the basement floor at 5 m centres. In addition, a 6-mil polyethylene sheet should be provided between the granular bedding and the concrete slab.

The underground structure should be designed for the lateral earth pressure using the soil parameters provided in Section 6.8.

The slab should be constructed on a granular base, not less than 20 cm thick, consisting of 19-mm Crusher-Run Limestone (CRL), or equivalent, compacted to its maximum SPDD. The subgrade for slab-on-grade construction should consist of sound natural soil or properly compacted inorganic earth fill.

The exterior grade should slope away from the building structures to prevent ponding of water adjacent to the buildings.

6.4 Underground Services

The subgrade for the underground services should consist of sound natural soils or properly compacted, organic-free earth fill. Where earth fill or weathered soil is encountered, it should be subexcavated and replaced with the bedding material, compacted to at least 95% SPDD.

A Class ‘B’ bedding, consisting of compacted 19-mm CRL, is recommended for the construction of the underground services. Subject to the site condition at the time of construction, a Class ‘A’ concrete bedding should be used where water bearing soil is encountered or ground dewatering is necessary. Alternatively, 19-mm clear stone or high-performance gravel, wrapped with geotextile fabric filter, can be used for the pipe bedding in saturated soils.

The pipe joints into manholes and catch basins should be leak-proof, or wrapped with an appropriate waterproof membrane. Openings to subdrains and catch basins should be shielded with a fabric filter to prevent blockage by silting.

In order to prevent pipe floatation when the sewer trench is deluged with water, a soil cover of at least two times the diameter of the pipe should be in place at all times after completion of the pipe installation.

The on-site subsoil has moderate corrosivity to buried metal. All metal fittings for the underground services should be protected against soil corrosion. In determining the mode of protection, an electrical resistivity of 4500 ohm·cm should be used. This, however, should be confirmed by testing the soil along the service pipe alignment at the time of site service construction.

6.5 Backfilling in Trenches and Excavated Areas

The on-site inorganic soils can be used for backfilling service trenches and excavated areas. Wet soils should be stockpiled to drain away the excess moisture or spread in thin layers to allow aeration prior to placement and compaction.

The backfill in service trenches should be compacted to at least 95% SPDD. In the zone within 1.0 m below the road subgrade, the backfill should be compacted with the water content at 2% to 3% drier than the optimum, and the compaction should be increased to at least 98% SPDD. This is to provide the required stiffness for pavement construction. The lift of each backfill layer should either be limited to a thickness of 20 cm, or the thickness should be determined by test strips.

Any narrow trenches for service crossing should be cut at 1V:2H or flatter, so that the backfill can be effectively compacted. Otherwise, soil arching will prevent the achievement of proper compaction. In normal construction practice, the problem areas of settlement largely occur adjacent to manholes, catch basins, service crossings, foundation walls and columns. In areas which are inaccessible to a heavy compactor, light duty compactor can be used on imported sand backfill.

One must be aware of the possible consequences during trench backfilling and exercise caution as described below:

- When construction is carried out in freezing winter weather, allowance should be made for these following conditions. Despite stringent backfill monitoring, frozen soil layers may inadvertently be mixed with the structural trench backfill. Should the in-situ soils have a water content on the dry side of the optimum, it would be impossible to wet the soils due to the freezing condition, rendering difficulties in obtaining uniform and proper compaction. Furthermore, the freezing condition will prevent flooding of the backfill when it is required, such as in a narrow vertical trench section, or when the trench box is removed. The above will invariably cause backfill settlement that may become evident within 1 to several years, depending on the depth of the trench which has been backfilled.
- In areas where the underground services construction is carried out during the winter months, prolonged exposure of the trench walls will result in frost heave within the soil mantle of the walls. This may result in some settlement as the frost recedes, and repair costs will be incurred prior to final surfacing of the new pavement and the slab-on-grade.

- To backfill a deep trench, one must be aware that future settlement is to be expected, unless the side of the cut is flattened to at least 1V:1.5+H, and the lifts of the fill and its moisture content are stringently controlled; i.e., lifts should be no more than 20 cm (or less if the backfilling conditions dictate) and uniformly compacted to achieve at least 95% SPDD, with the moisture content on the wet side of the optimum.
- It is often difficult to achieve uniform compaction of the backfill in the lower vertical section of a trench which is an open cut or is stabilized by a trench box, particularly in the sector close to the trench walls or the sides of the box. These sectors must be backfilled with sand. In a trench stabilized by a trench box, the void left after the removal of the box will be filled by the backfill. It is necessary to backfill this sector with sand, and the compacted backfill must be flooded for 1 day, prior to the placement of the backfill above this sector, i.e., in the upper sloped trench section. This measure is necessary in order to prevent consolidation of inadvertent voids and loose backfill which will compromise the compaction of the backfill in the upper section.
- In areas where groundwater movement is expected in the sand fill mantle, anti-seepage collars (OPSD 802.095) should be provided. This can be confirmed during construction.

6.6 Driveways, Sidewalks, Interlocking Stone Pavement

Due to the frost susceptible characteristics of the subgrade soils, heaving of the sidewalk and pavement is anticipated during cold weather and the structures should be designed to tolerate the movement.

In order to minimize frost heaving, the driveways at the garage entrances should be backfilled with non-frost-susceptible granular material, with a recommended frost taper at 1V:1H towards the pavement of driveway.

Interlocking stone pavement and landscaping structures in areas which are sensitive to frost-induced ground movement must be constructed on a free-draining, non-frost-susceptible granular material such as Granular 'B'. The material should extend to 0.3 to 1.2 m below the slab or pavement surface, depending on the degree of tolerance to movement, and be provided with positive drainage, such as weeper subdrains connected to manholes or catch basins. Alternatively, the landscaping structures and interlocking stone pavement should be properly insulated with 50-mm Styrofoam, or equivalent.

6.7 **Pavement Design**

After site grading, the road subgrade is anticipated to consist of a mixture of sand and silt, having an estimated CBR value of 5% to 10%. The pavement design for local residential road and driveway is presented in Table 3.

Table 3 - Pavement Design

Course	**Thickness (mm)**	**OPS Specifications**
Asphalt Surface	40	HL-3
Asphalt Binder	50	HL-8
Granular Base	150	OPSS Granular ‘A’ or equivalent
Granular Sub-base	300	OPSS Granular ‘B’ or equivalent

Prior to the placement of granular bases for road pavement, the subgrade should be proof-rolled. Any soft subgrade identified must be subexcavated and replaced by properly compacted inorganic earth fill. In the zone within 1.0 m below the pavement subgrade, the backfill should be compacted to at least 98% SPDD, with the water content at 2% to 3% drier than the optimum. This is to provide adequate stability for the pavement construction. In the lower zone, a 95% SPDD is considered adequate.

All the granular bases should be compacted to 100% SPDD.

The subgrade will suffer a strength regression if water is allowed to saturate the mantle. The following measures should, therefore, be incorporated in the construction procedures and road design:

- If the pavement construction does not immediately follow the trench backfilling, the subgrade should be properly crowned and smooth-rolled to allow interim precipitation to be properly drained.
- Lot areas adjacent to the roads should be properly graded to prevent ponding of large amounts of water. Otherwise, the water will seep into the subgrade mantle and induce a regression of the subgrade strength with costly consequences for the pavement construction.
- In extreme cases during the wet seasons, if soft or weak subgrade is identified, it can be replaced by compacted granular material to compensate for the inadequate strength of the soft or weak subgrade. This can be assessed during construction.
- Fabric filter-encased curb subdrains will be required by the Municipality.

6.8 Soil Parameters

The recommended soil parameters for the project design are given in Table 4.

Table 4 - Soil Parameters

Unit Weight and Bulk Factor	**Unit Weight (kN/m^3)**		**Estimated Bulk Factor**	
	Bulk	**Submerged**	**Loose**	**Compacted**
Existing Earth Fill	20.5	10.5	1.25	0.95
Sand and Silt	21.0	11.0	1.25	1.00
Lateral Earth Pressure Coefficients		**Active K_a**	**At Rest K_0**	**Passive K_p**
Compacted Earth Fill		0.35	0.50	3.00
Native Sand or Silt		0.30	0.45	3.30
Estimated Coefficients of Permeability/Percolation Time			**K (cm/sec)**	**T (min/cm)**
Native Sand			10^{-3}	10
Native Silt			10^{-5}	35
Coefficients of Friction				
Between Concrete and Granular Base				0.50
Between Concrete and Sound Native Soils				0.35

6.9 Excavation

Excavation in excess of 1.2 m should be carried out in accordance with Ontario Regulation 213/91. The types of soils are classified in Table 5.

Table 5 - Classification of Soils for Excavation

Material	**Type**
Earth Fill, Drained Sand or Silt	3
Saturated Soils	4

The groundwater regime is apparent in the boreholes, between El. 269.2 m and 272.8 m. The groundwater yield in shallow excavation above the groundwater regime is anticipated to be slow in rate and limited in quantity; it can be drained to sump pits and removed by conventional pumping. Any excavation extending into the saturated soils will require dewatering from closely spaced sump wells or well points.

Prospective contractors can be asked to assess the in situ subsurface conditions for soil cuts by digging test pits to 0.5 m below the service trench subgrade. These test pits can be allowed to remain open for a period of 4 hours to assess the trenching conditions.

7.0 LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of Bazil Developments Inc., and for review by their designated consultants and government agencies. The material in the report reflects the judgement of Kin Fung Li, P.Eng., and Bennett Sun, P.Eng., in light of the information available to it at the time of preparation.

Use of this report is subject to the conditions and limitations of the contractual agreement. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, is the responsibility of such Third Parties. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

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LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS	Auger sample
CS	Chunk sample
DO	Drive open (split spoon)
DS	Denison type sample
FS	Foil sample
RC	Rock core (with size and percentage recovery)
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—•—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH	Sampler advanced by static weight
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
NP	No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding

△ Laboratory vane test

☐ Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres

1lb = 0.454 kg

1 inch = 25.4 mm

1ksf = 47.88 kPa

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JOB NO.: 2011-S193

LOG OF BOREHOLE: 101

FIGURE NO.: 1

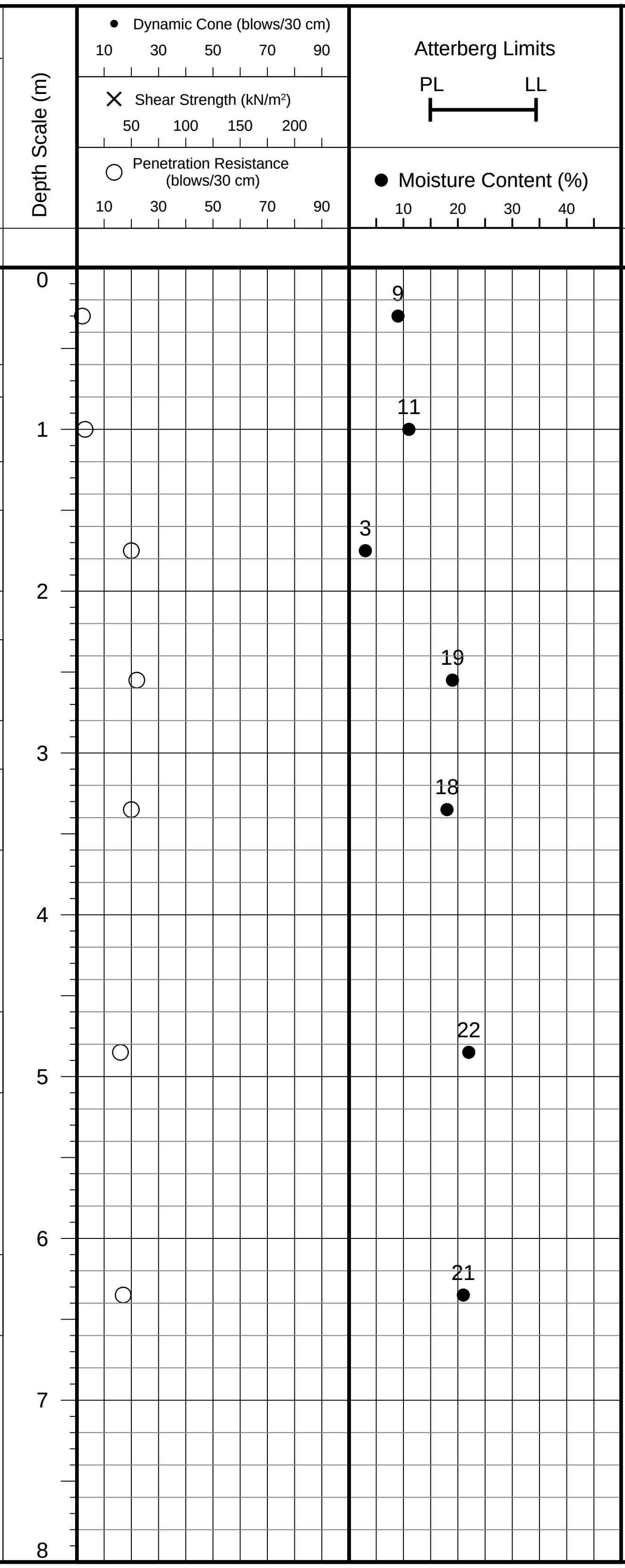
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 62 Mill Street, Township of Uxbridge

DRILLING DATE: December 9, 2020

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
272.8	Ground Surface			
0.0	**28 cm TOPSOIL**	1	DO	2
	EARTH FILL brown silty sand occ. rootlet and organic inclusions	2	DO	3
271.3 1.5	Brown, compact **SAND** fine grained occ. silt seams and layers	3	DO	20
270.4 2.4	Compact **SILT** a trace of clay occ. sand seams and layers	4	DO	22
		5	DO	20
	— — brown/grey	6	DO	16
		7	DO	17
266.2 6.6	**END OF BOREHOLE**			



WATER LEVEL

Cave-In @ El 269.7 m upon completion

Soil Engineers Ltd.

JOB NO.: 2011-S193

LOG OF BOREHOLE: 102

FIGURE NO.: 2

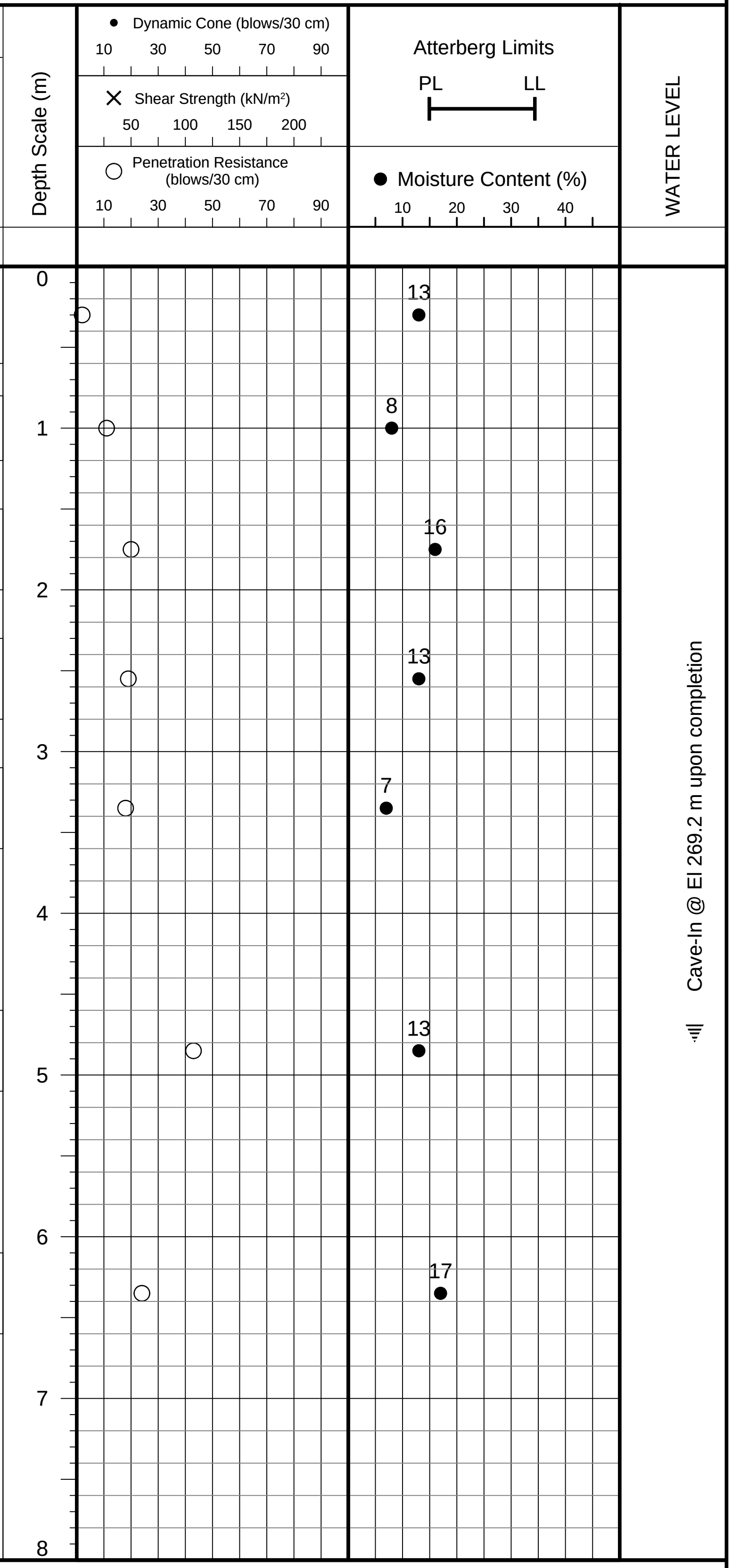
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 62 Mill Street, Township of Uxbridge

DRILLING DATE: December 9, 2020

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
274.0	Ground Surface			
0.0	**38 cm TOPSOIL**			
	Brown, very loose to dense **SAND** fine grained, fine to medium grained below 4 m weathered occ. silt seams and layers	1	DO	2
		2	DO	11
		3	DO	20
		4	DO	19
		5	DO	18
		6	DO	43
268.5 5.5	Grey, compact **SILT** a trace of clay occ. sand seams and layers	7	DO	24
267.4 6.6	**END OF BOREHOLE**			



JOB NO.: 2011-S193

LOG OF BOREHOLE: 103

FIGURE NO.: 3

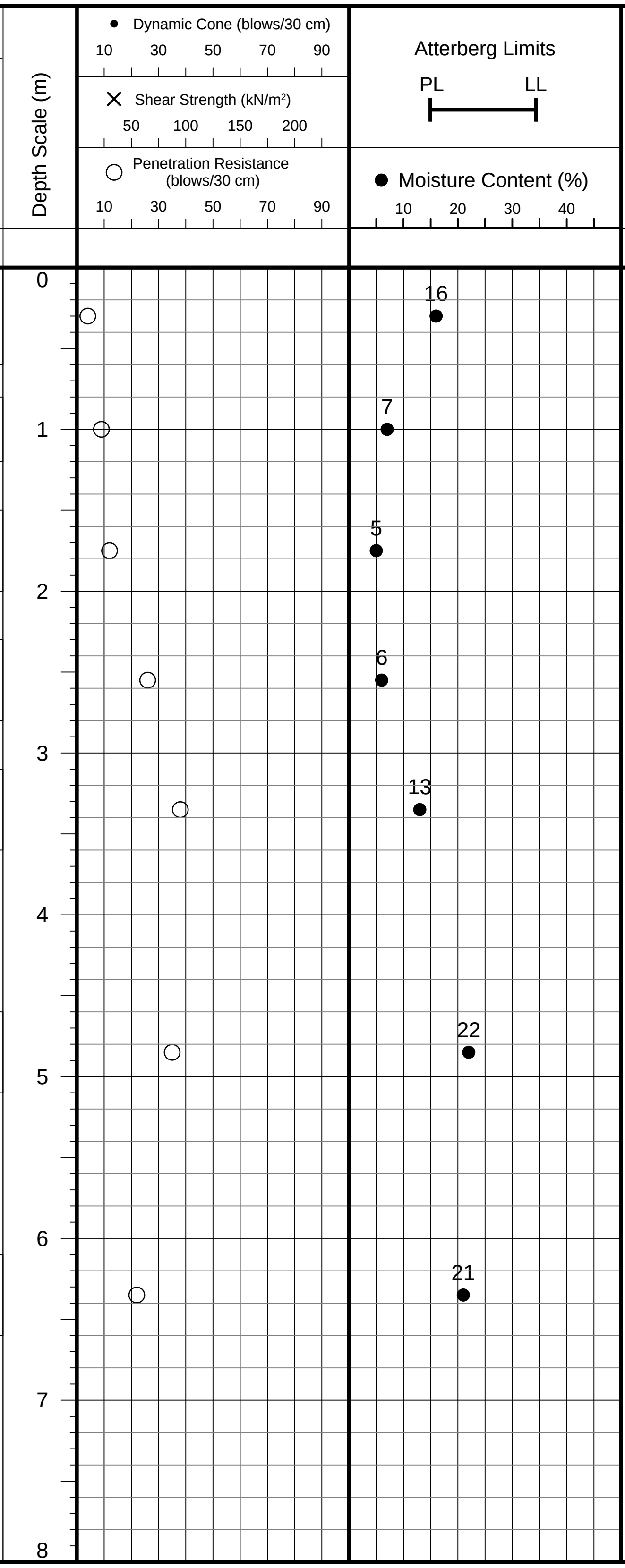
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 62 Mill Street, Township of Uxbridge

DRILLING DATE: December 9, 2020

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
276.9	Ground Surface			
0.0	**30 cm TOPSOIL**			
	EARTH FILL dark brown to brown sand and silt occ. topsoil and rootlet inclusions	1	DO	4
275.9 1.0	Brown, compact **SAND** fine grained occ. silt seams and layers	2	DO	9
		3	DO	12
274.4 2.5	Brown, compact to dense **SILT** a trace of clay occ. sand seams and layers	4	DO	26
		5	DO	38
		6	DO	35
		7	DO	22
270.3 6.6	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 272.4 m upon completion ∇

Soil Engineers Ltd.

JOB NO.: 2011-S193

LOG OF BOREHOLE: 104

FIGURE NO.: 4

PROJECT DESCRIPTION: Proposed Residential Development

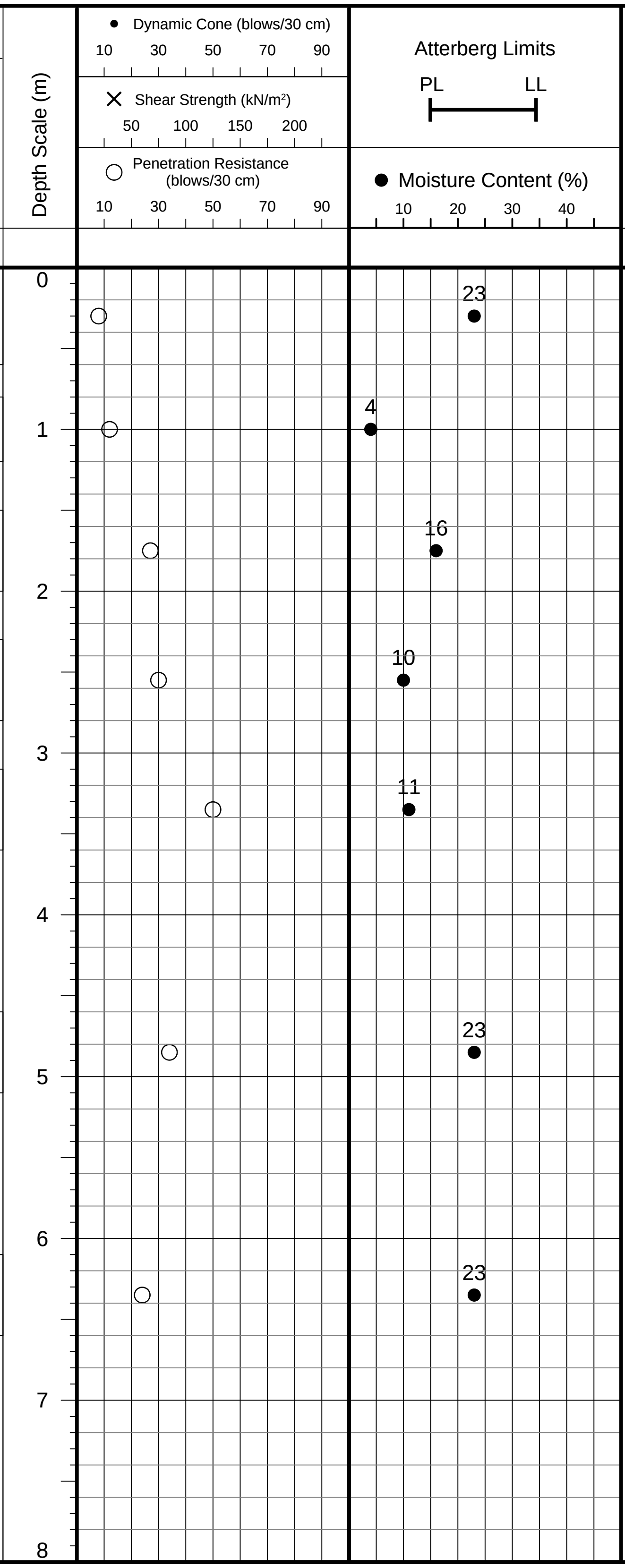
METHOD OF BORING: Flight Auger

PROJECT LOCATION: 62 Mill Street, Township of Uxbridge

DRILLING DATE: December 9, 2020

El. (m) Depth (m)	SOIL DESCRIPTION
277.4	Ground Surface
0.0	**25 cm TOPSOIL**
	EARTH FILL dark brown silty clay with sand occ. topsoil and rootlet inclusions
276.6 0.8	Brown, compact **SAND** fine grained occ. silt seams and layers
275.9 1.5	Brown, compact to very dense **SILT** a trace of clay occ. sand seams and layers
270.8 6.6	**END OF BOREHOLE**

SAMPLES		
Number	Type	N-Value
1	DO	8
2	DO	12
3	DO	27
4	DO	30
5	DO	50
6	DO	34
7	DO	24



WATER LEVEL

W.L. @ El. 272.8 m upon completion

Soil Engineers Ltd.

JOB NO.: 2011-S193

LOG OF BOREHOLE: 105

FIGURE NO.: 5

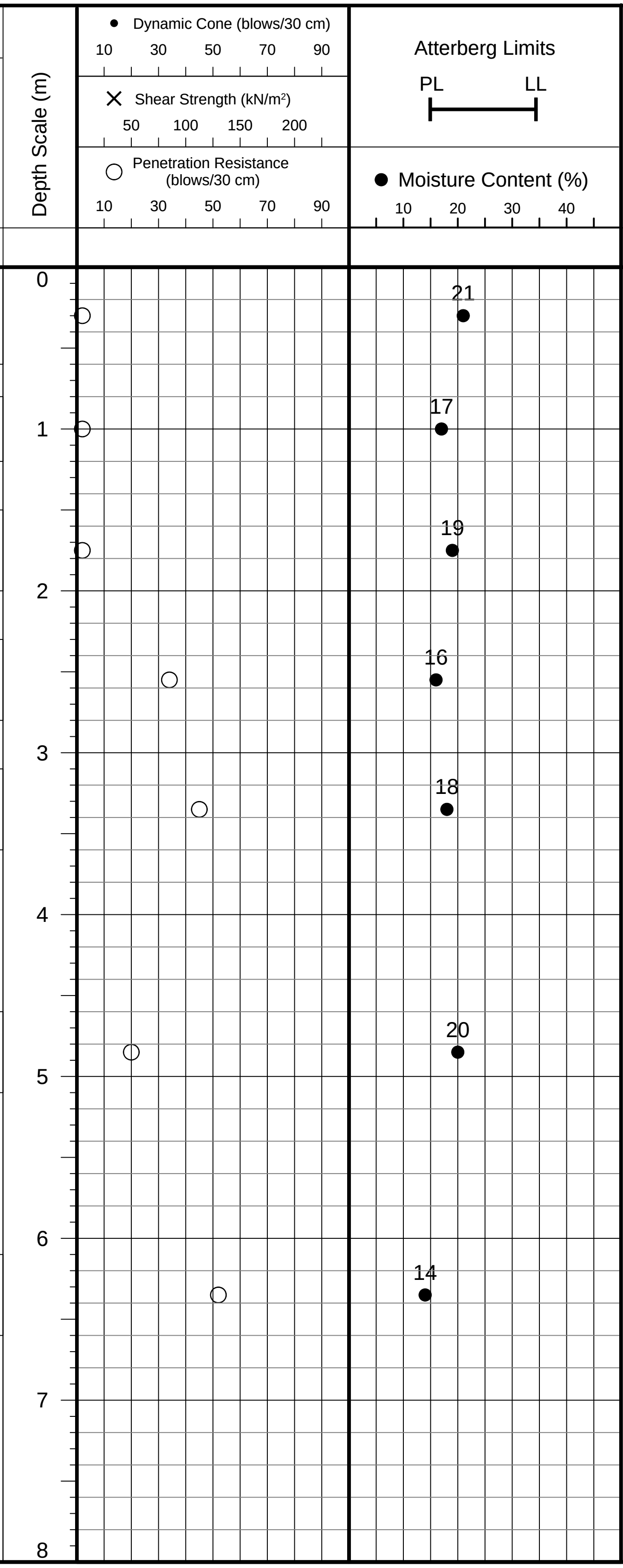
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 62 Mill Street, Township of Uxbridge

DRILLING DATE: December 10, 2020

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
276.5	Ground Surface			
0.0	**23 cm TOPSOIL**			
	EARTH FILL dark brown silty clay with sand layers occ. topsoil and rootlet inclusions	1	DO	2
		2	DO	2
		3	DO	2
274.7 1.8	Brown, compact to very dense (weathered) **SILT** a trace of clay occ. sand seams and layers	4	DO	34
		5	DO	45
		6	DO	20
		7	DO	52
269.9 6.6	**END OF BOREHOLE**			



WATER LEVEL

Cave-In @ El 271.7 m upon completion

Soil Engineers Ltd.

Page: 1 of 1

JOB NO.: 2011-S193

LOG OF BOREHOLE: 106

FIGURE NO.: 6

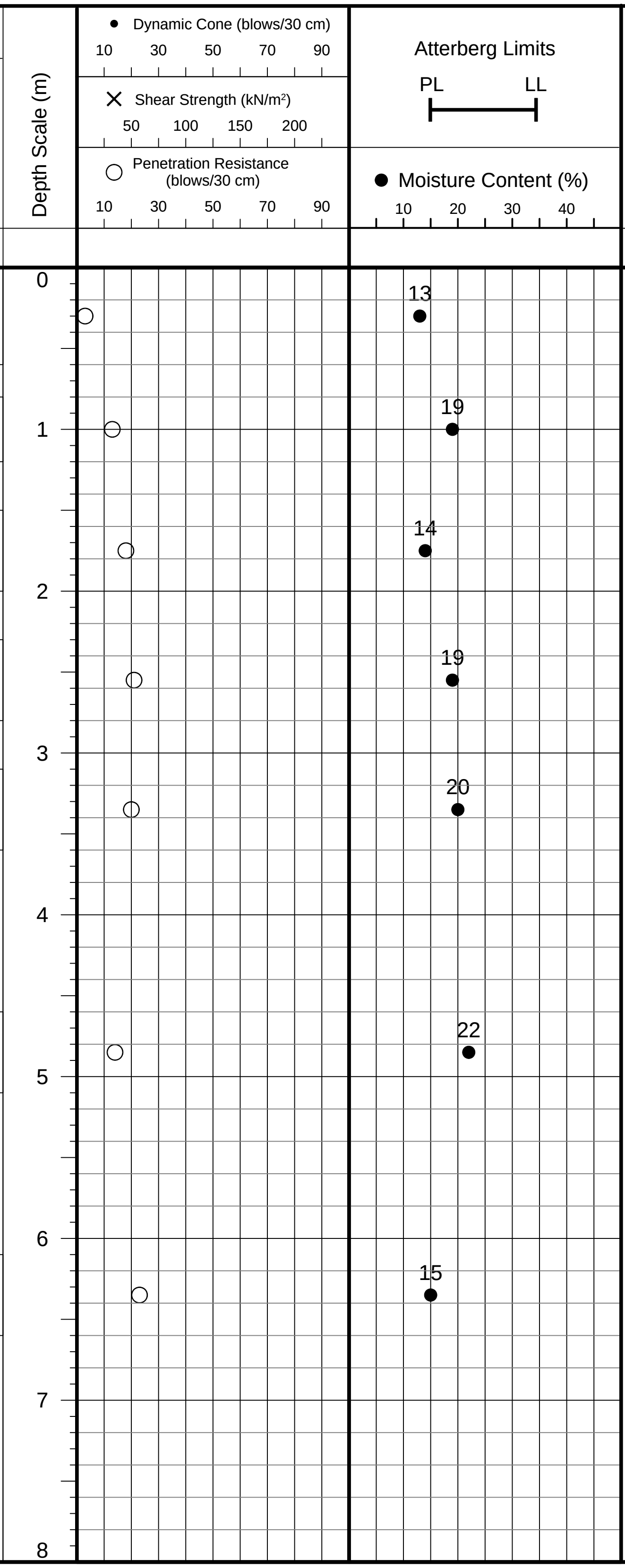
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 62 Mill Street, Township of Uxbridge

DRILLING DATE: December 10, 2020

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
275.3	Ground Surface			
0.0	**20 cm TOPSOIL**			
	Brown, very loose, weathered **SAND** fine grained	1	DO	3
274.3 1.0	Compact **SILT** a trace of clay occ. sand seams and layers	2	DO	13
		3	DO	18
		4	DO	21
		5	DO	20
		6	DO	14
	brown grey			
		7	DO	23
268.7 6.6	**END OF BOREHOLE**			



WATER LEVEL

Cave-In @ El 272.2 m upon completion

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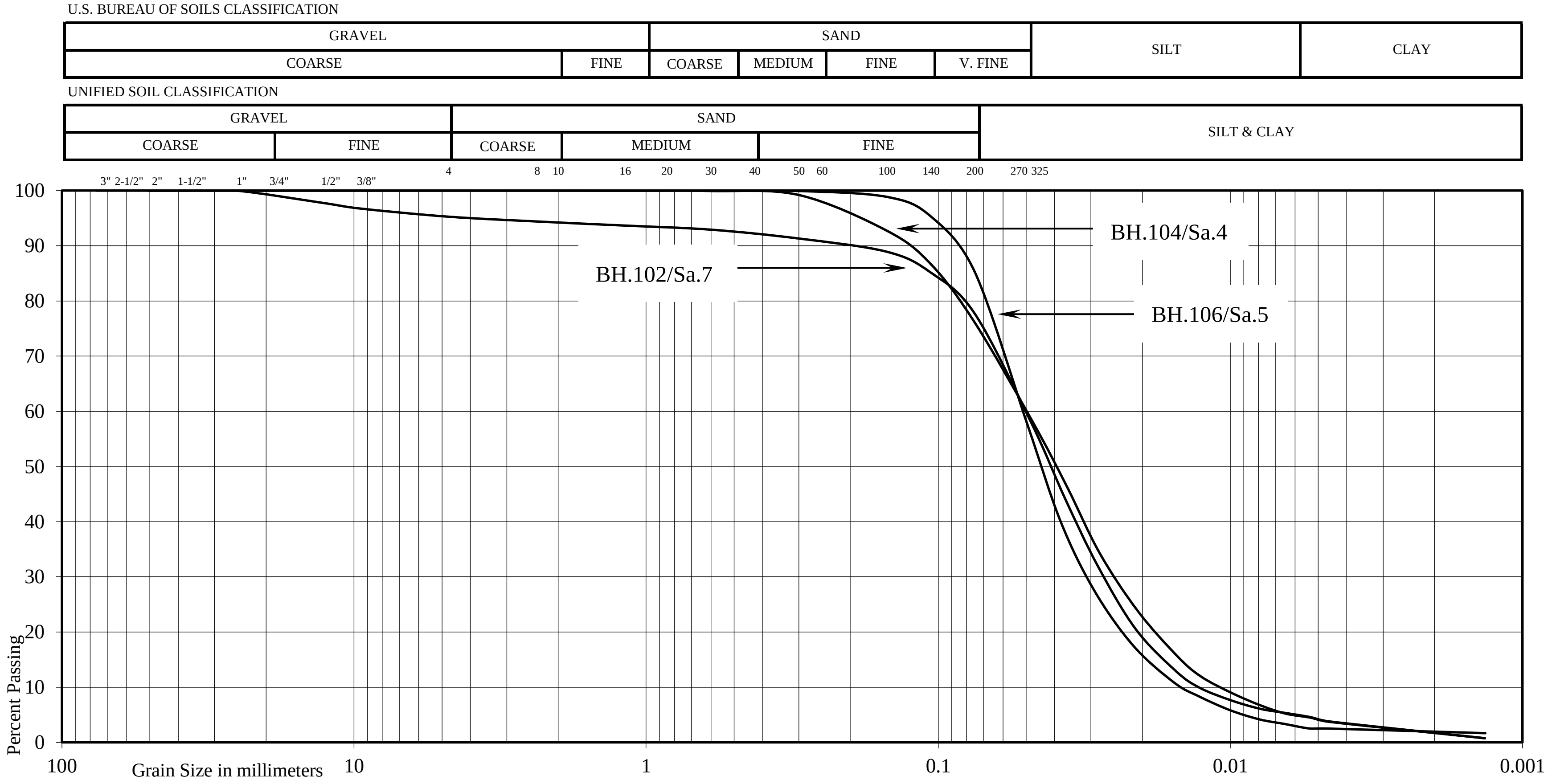
GRAIN SIZE DISTRIBUTION

Reference No: 2011-S193



Project: Proposed Residential Development

Location: 62 Mill Street, Township of Uxbridge

Borehole No:	102	104	106
Sample No:	7	4	5
Depth (m):	6.3	2.5	3.3
Elevation (m):	267.7	274.9	272.0

BH./Sa.	102/7	104/4	106/5
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	17	10	20
Estimated Permeability (cm./sec.) =	10^{-5}	10^{-5}	10^{-5}

Classification of Sample [& Group Symbol]: SILT, some sand to sandy, traces of clay and gravel

Figure: 7

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

Borehole Location Plan

SITE: 62 Mill Street, Township of Uxbridge

DESIGNED BY: K.L.
CHECKED BY: B.S.
DWG NO.: 1
SCALE: 1:1000
REF. NO.: 2011-S193
DATE: January 2021
REV -

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CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE

SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

JOB NO.:	2011-S193
REPORT DATE:	January 2021
PROJECT DESCRIPTION:	Proposed Residential Development
PROJECT LOCATION:	62 Mill Street, Township of Uxbridge

LEGEND

▨ FILL ▨ SAND ▨ SILT ▨ TOPSOIL

CAVE-IN ▽ WATER LEVEL (END OF DRILLING)