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

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 721-7863	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 721-7864	FAX: (905) 542-2769

A REPORT TO
FIELDGATE PROPERTIES LIMITED

A PRELIMINARY GEOTECHNICAL INVESTIGATION FOR PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

2809 TOWNLINE ROAD

TOWNSHIP OF PUSLINCH

REFERENCE NO. 2507-S060

NOVEMBER 2025

DISTRIBUTION

Digital Copy – Fieldgate Properties Limited

TABLE OF CONTENTS

TABLES

ENCLOSURES

1.0 INTRODUCTION

In accordance with the written authorization from Mr. Peter Mahovlich, Development Manager of Fieldgate Properties Limited., dated July 8, 2025, a geotechnical investigation was carried out at 2809 Townline Road in the Township of Puslinch.

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

2.0 SITE AND PROJECT DESCRIPTION

The site is located within the physiographic region of Horseshoe Moraines, consisting of mainly stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain, and along the southwest limits, ice-contact stratified deposits of sand and gravel, minor silt, clay and till.

The subject site is located on the northeast quadrant of Highway 401 and Townline Road in the Township of Puslinch. The property is rectangular in shape and encompasses an approximate area of 33.4 hectare. The site is currently a farm field and is occupied by a farm house and associated farm structures, as well as a vacant sales office and parking area at the southwest corner of the property. The farm house and associated structures, along with the sales office and parking area are accessible via a paved driveway from Townline Road.

Based on a review of the Preliminary Conceptual Industrial Site Plan dated May 30, 2025, it is understood that the proposed development will consist of slab-on-grade commercial and industrial buildings with roadways meeting municipal standards.

3.0 FIELD WORK

The field work, consisting of 10 sampled boreholes extending to a depth of 6.6 m from the prevailing ground surface, was carried out on July 21 and July 22, 2025, at the locations shown on the Borehole Location Plan, Drawing No. 1.

The boreholes were advanced at intervals to the sampling depths by a track-mounted, machine with solid-stem augers equipped with split spoon sampler 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 compactness of the cohesionless 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.

Upon completion of borehole drilling, monitoring wells were installed in Boreholes 2, 3, 6, 7 and 10. Details of the monitoring wells are presented in the corresponding borehole logs.

The field work was supervised and the findings were recorded by a Geotechnical Technician. The ground elevation at each of the borehole location was obtained using the Global Navigation Satellite System (GNSS).

4.0 SUBSURFACE CONDITIONS

The investigation has disclosed that beneath the topsoil, the site is underlain by strata of sandy silt till, silty sand till, silt and sand.

Detailed descriptions of the encountered subsurface conditions from the boreholes are presented on the Borehole Logs, comprising Figures 1 to 10, inclusive. The revealed stratigraphy is plotted on the Subsurface Profile, Drawing No. 2. The engineering properties of the disclosed soils are discussed herein.

4.1 Topsoil

All boreholes were drilled within the farm field. The topsoil was contacted at the surface of all boreholes, ranging from 15 to 36 cm in thickness.

4.2 Sandy Silt Till/Silty Sand Till

The native sandy silt till/silty sand till was contacted in all boreholes below the topsoil layer, except Borehole 9. They extend to the depths of 4.6 to 6.6 m below the ground surface in most boreholes and they are the predominant soils in the revealed stratigraphy. They consist of a random mixture of particle sizes ranging from clay to gravel, with sand and silt being the dominant fraction. Sample examination indicates that they contain a trace of gravel to some gravel and a trace of clay, with occasional cobbles and boulders. Grain size analysis was performed on a representative sample each of the sandy silt till and silty sand till. The results are plotted on Figures 11 and 12, respectively.

The obtained ‘N’ values of the tills range from 2 to 61, with a median 26 blows per 30 cm of penetration, indicating the tills are very loose to very dense, being generally compact. The very loose tills were limited to the weathered zone near the ground surface, extending to depths ranging from 0.6 m to 1.2 m below the ground surface.

The natural water content values of the till range from 7% to 23%, with a median of 11%, indicating damp to wet, generally moist condition. The tills with high water content was also encountered within the weathered zone.

The engineering properties of the sandy silt till and silty sand till are listed below:

- High frost susceptibility.
- Moderate water erodibility.
- The tills will be relatively stable in steep excavation; however, they may slough after prolonged exposure.

4.3 **Silt**

The silt deposit was encountered in Boreholes 1 and 6 to 10, inclusive. It was encountered beneath the topsoil and sandy silt till deposit. Sample examinations show that the silt is fine grained with variable amounts of sand and a trace of clay. Grain size analysis was performed on 1 silt sample; the result is plotted on Figure 13.

The recorded ‘N’ values of the silt range from 5 to over 100, with a median of 38 blows per 30 cm of penetration, showing loose to very dense, being generally dense in compactness. The loose silt is restricted to the surficial silt which is weathered, extending to a depth of 0.6 m below the ground surface.

The natural water content of the silt deposit ranges from 8% to 18%, with a median of 13%, indicating the silt is moist to wet, generally very moist. The silt is generally wet below a depth of 4.6 m below the ground surface

The engineering properties of the silt deposit are presented below:

- High in frost susceptibility and high soil adfreezing potential.
- Highly water erodible; it is susceptible to migration through small openings under seepage pressure.
- High capillarity and water retention capacity, the wet silt will dilate when disturbed.

- Due to its dilatancy, the shear strength of the wet silt is susceptible to dynamic disturbance.
- In excavation, the silt will slough, run with seepage and the bottom will boil under a piezometric head of 0.3 m.

4.4 Sand

The sand deposit was contacted at Boreholes 1 to 4, 6 and 8 and occurs beneath topsoil or sandy silt till and silt deposits. The sand is fine to coarse grained to fine grained, containing some silt to being silty. It contains traces of clay and gravel. The sand is finer grained at shallower depths. Grain size analysis was performed on a sample of the sand and the result is plotted on Figure 14.

The obtained ‘N’ values range from 4 to 63 blows per 30 cm of penetration, with a median of 36 blows per 30 cm of penetration, showing loose to very dense, generally dense compactness. The loose sand was encountered near the ground surface at Boreholes 2, 3 and 4 within the weathered zone, extending to a depth of 0.6 m below the ground surface.

The natural water content of the sand deposit ranges from 3% to 14%, with a median of 7%, indicating the sand is dry to very moist, generally moist.

The engineering properties of the sand deposit are given below:

- Low to high frost susceptibility, depending on silt content.
- High water erodibility.
- In excavation, the sand will slough and run with water seepage. It will boil with a piezometric head of 0.3 m.

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 of On-Site Material

Soil Type	Determined Natural Water Content (%)	Water Content (%) for Standard Proctor Compaction	
		100% (optimum)	**Range for 95% or +**
Sandy Silt Till/ Silty Sand Till	7 to 23 (median 11)	10 to 12	6 to 17
Silt	8 to 18 (median 13)	13	8 to 17
Sand	3 to 14 (median 7)	9 to 11	5 to 16

* The above values are provided as a guideline. Standard Proctor Tests must be performed on bulk samples collected from site during construction prior to backfill and compaction.

5.0 GROUNDWATER CONDITION

Upon the completion of borehole drilling, Groundwater was observed on completion in Borehole 6 and 8, all other boreholes remained dry on completion. The boreholes where groundwater was observed on completion are summarized in Table 2.

Table 2 - Groundwater Levels on Borehole Completion

BH No.	Ground Elevation (m)	Borehole Depth (m)	Monitoring Well Depth (m)	Measured Groundwater Level on Completion	
				Depth (m)	**El. (m)**
1	310.4	6.6	No well	Dry	-
2	309.5	6.6	6.1	Dry	-
3	311.7	6.6	6.1	Dry	-
4	311.2	6.6	No well	Dry	-
5	315.3	6.6	No well	Dry	-
6	307.8	6.6	6.1	5.2	302.6
7	315.2	6.6	6.1	Dry	-
8	307.8	6.6	No well	1.4	306.4
9	313.5	6.6	No well	Dry	-
10	311.4	6.6	6.1	Dry	-

Groundwater levels in boreholes on completion were recorded at 1.4 m and 5.2 m from existing grade, or El. 306.4 m and El. 302.6 m. It is subject to seasonal fluctuation.

Further groundwater assessment will be presented in the hydrogeological assessment report, to be provided under separate cover.

6.0 DISCUSSION AND RECOMMENDATIONS

The investigation has disclosed that beneath the topsoil, the site is underlain by strata of sandy silt till, silty sand till, silt and sand.

Groundwater was encountered on completion of the borehole drilling in Boreholes 6 and 8, at depths of 5.2 m and 1.6 m from existing grade, or El. 302.6 m and El. 306.4 m, respectively. All other boreholes remained dry on completion. The groundwater level is subject to seasonal fluctuation.

Based on a review of the Preliminary Conceptual Industrial Site Plan dated May 30, 2025, it is understood that the proposed development will consist of slab-on-grade commercial and industrial buildings which will be provided with services and roadways meeting the municipal standards.

The geotechnical findings which warrant special consideration are presented below:

1. After demolition of the existing structures and foundations, the debris must be removed and disposed off-site.
2. The topsoil must be removed for site development. It can only be re-used for landscaping in designated areas.
3. The native soils are weathered extending to depths ranging from 0.6 to 1.2 m from the prevailing ground surface. It is weak and will consolidate under surcharge loads. To upgrade the weathered soils to engineered status suitable for normal footing construction, they must be subexcavated, sorted, aerated and properly compacted.
4. The engineered fill and sound native soils are suitable for supporting the proposed structures on conventional footings and for construction of underground services and road pavement.
5. The proposed structures can be supported on conventional spread and strip footing founded on the native soils or engineered fill below the frost penetration depth. The foundation subgrade must be inspected by the geotechnical engineer or a senior geotechnical technician to ensure that the revealed conditions are compatible with the foundation design requirements.
6. Due to the presence of weathered soils, and depending on site grading, saturated sand and silt, the footing subgrade must be inspected by a geotechnical engineer, or a geotechnical technician under the supervision of a geotechnical engineer, or a building

inspector who has geotechnical experience, to assess its suitability for bearing the designed foundations.

7. Additional borehole investigation and review must be carried out for the future buildings once the detailed design for the proposed development becomes available.

The recommendations appropriate for the design of the development are presented herein. One must be aware that the subsurface conditions may vary between boreholes. Should subsurface variances become apparent during construction, a geotechnical engineer must be consulted.

6.1 **Site Preparation**

The topsoil must be stripped prior to the development. It can be stockpiled at designated area for reuse in landscaped area only. Any surplus must be removed off site.

The existing structure and foundation must be demolished and the debris must be removed and disposed off-site. The cavities must be backfilled with soil that is free of topsoil or deleterious material, placed and compacted to engineered fill specifications.

The weathered soils must be subexcavated, sorted free of topsoil inclusions and deleterious materials, if any, prior to its reuse as a backfill material.

In areas where earth fill is required to raise the site or extended footings are required, it is generally more economical to place an engineered fill for normal footing, underground services and pavement construction. The engineering requirements for a certifiable fill for road construction, municipal services, slab-on-grade, and footings are presented below:

1. The exposed subgrade must be inspected and proof-rolled prior to any fill placement. Badly weathered soils should also be subexcavated, sorted free of topsoil inclusions and any deleterious materials, if any, aerated and properly compacted in layers.
2. Inorganic soils must be used for the fill, and they must be uniformly compacted in lifts 20 cm thick to 98% or + of their maximum 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 maximum Standard Proctor compaction.
3. If the engineered fill is compacted with the moisture content on the wet side of the optimum, the underground services and pavement construction should not begin until

the pore pressure within the fill mantle has completely dissipated. This must be further assessed at the time of the engineered fill construction.

4. If imported fill is to be used, it should be inorganic soils, free of any deleterious 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.
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, and the engineered fill envelope must be clearly and accurately defined in the field and precisely documented by qualified surveyors.
7. Foundations partially on engineered fill must be reinforced and designed by a structural engineer to properly distribute the stress induced by the abrupt differential settlement (estimated to be 15± mm) between the natural soils and engineered fill.
8. The engineered fill must not be placed during the period from late November to early April when freezing ambient temperatures occur either persistently or intermittently. This is to ensure that the fill is free of frozen soils, ice and snow.
9. The fill operation must be fully supervised and monitored 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 supervised 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 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 recertification.
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 foundations must be properly reinforced and designed by structural engineer for the project. The total and differential settlements of 25 mm and 15 mm, respectively, should be considered in the design of the foundations founded on engineered fill. In sewer construction, the engineered fill is considered to have the same structural proficiency as a natural inorganic soil.

6.2 Foundations

At the time of the report preparation, detailed design for the proposed development is not available; however, it is understood that the development will consist of slab-on-grade buildings for commercial and industrial uses.

Based on the borehole findings, the proposed slab-on-grade buildings can be constructed on conventional spread and strip footings founded on the sound native soils below the topsoil and weathered soil or on engineered fill. The recommended bearing pressures for the design of the conventional strip and spread footings are summarized in Table 3:

Table 3 - Bearing Pressures and Founding Depths for Foundation Design

Borehole No.	Borehole Elevation (m)	Recommended Maximum Allowable Soil Pressures and Corresponding Founding Levels					
		120 kPa (SLS) 190 kPa (ULS)		150 kPa (SLS) 225 kPa (ULS)		200 kPa (SLS) 400 kPa (ULS)	
		Depth (m)	El. (m)	Depth (m)	El. (m)	Depth (m)	El. (m)
1	310.4	1.2 or +	309.2 or -	-	-	1.8 or +	308.6 or -
2	309.5	-	-	1.0 or +	308.5 or -	3.2 or +	306.3 or -
3	311.7	-	-	-	-	1.0 or +	310.7 or -
4	311.2	-	-	-	-	1.8 or +	309.4 or -
5	315.3	-	-	-	-	1.0 or +	314.3 or -
6	307.8	1.8 or +	306.0 or -	-	-	2.5 or +	305.3 or -
7	315.2	-	-	-	-	1.0 or +	314.2 or -
8	307.8	-	-	-	-	1.0 or +	306.8 or -
9	313.5	-	-	-	-	1.0 or +	312.5 or -
10	311.4	-	-	-	-	1.8 or +	309.6 or -

The total and differential settlements of foundations designed for the recommended bearing pressures at SLS are estimated between 25 mm and 20 mm, respectively.

The foundation subgrade must be inspected by either a geotechnical engineer, or a geotechnical technician under the supervision of a geotechnical engineer, to ensure that the revealed conditions are compatible with the design of the foundation.

Footings exposed to weathering or in unheated areas should have at least 1.3 m of earth cover for protection against frost action.

The building foundation must meet the requirements specified in the latest Ontario Building Code. As a guide, the structure should be designed to resist an earthquake force using Site Classification ‘D’ (stiff soil).

The in-situ soils are high in soil ad-freezing potential. The foundations should be constructed with concrete and the perimeter foundation walls must be shielded with multi-layers of polyethylene slip membranes extending to the depth of the frost penetration depth. Alternatively, the foundation walls must be backfilled with free-draining granular material, compacted to 95% SPDD, in lifts no more than 200 mm in thickness.

6.3 Slab-On-Grade Construction

Where slab-on-grade structures are proposed, the subgrade must consist of sound native soil or properly compacted inorganic earth fill. The subgrade should be inspected and assessed by proof-rolling. Any weathered and/or loose soil should be subexcavated, sorted free of any deleterious material, aerated and uniformly compacted to at least 98% SPDD in thin lifts.

The concrete floor slab should be constructed on a granular base, 20 cm in thickness, consisting of 19-mm Crusher-Run Limestone (CRL), or equivalent, compacted to 100% SPDD. A Modulus of Subgrade Reaction of 30 MPa/m is recommended for the design of the floor slab.

The floor slab at the entrances into the building should be insulated with 50-mm Styrofoam, or equivalent, extending 1.3 m internally. This measure is to prevent cold drafts in the winter from inducing frost action in the subgrade and causing damage to the floor slab.

The external grading should be such that runoff is directed away from the building.

6.4 Underground Services

The underground services should be founded on sound native soil or properly compacted inorganic earth fill. Where incompetent or weathered soil is encountered, it should be subexcavated and replaced with the bedding material, compacted to at least 98% SPDD.

The subgrade for the underground services should consist of sound natural soil or properly compacted, inorganic earth fill. A Class ‘B’ bedding, consisting of compacted 19-mm CRL, is recommended for the underground service construction. Where the subgrade consists of wet sand and/or silt or where significant dewatering is required, a Class ‘A’ concrete bedding can also be considered.

Service pipes connecting into manholes and catch basins must be connected by leak-proof joints, or the joints should be wrapped with a water proof membrane, to prevent any soil penetration upfiltration through the joints.

In order to prevent pipe floatation when the sewer trench is deluged with water derived from precipitation, a minimum soil cover of at least the diameter of the pipe should be in place at all times after completion of the pipe installation. Openings to subdrains and catch basins should be shielded with a fabric filter to prevent blockage by silting.

The subgrade soils of the underground services are corrosive to buried metal. These soils are considered corrosive to ductile iron pipes and metal fittings and therefore, the underground services should be protected against soil corrosion. For estimation of anode weight requirements, the estimated electrical resistivity of the disclosed soil presented in Table 6 can be used.

6.5 Backfilling Service Trenches and Excavation Areas

On-site inorganic soils are suitable to be reused as trench backfill. Where the soils are too dry, they will require wetting or mixing with the wet soils. Where the soils are too wet, they should be aerated by spreading them thinly on the ground in dry warm weather. The sand can also be stockpiled to drain of excess water.

The backfill in trenches and excavated areas should be compacted to at least 95% SPDD. Below concrete slab and in the zone within 1.0 m below the pavement subgrade, the material should be compacted to 98% SPDD with the water content 2% to 3% drier than the optimum. This is to provide the required stiffness for pavement and slab 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 performed by the compaction equipment. Large boulders (15 cm or larger) should be sorted out and should not be used for backfilling.

In normal construction practice, the problem areas of ground settlement largely occur adjacent to manholes, catch basins, services crossings, foundation walls and columns. In areas which are inaccessible to a heavy compactor, sand backfill should be used.

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

- To backfill a deep trench, one must be aware that future settlement is to be expected, unless the sides is flattened to 1 vertical:2 horizontal, 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 98% 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 and the compaction must be carried out diligently 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 pipe bedding or trench backfill mantle, anti-seepage collars (OPSD 802.095) should be provided.
- When construction is carried out in freezing weather, 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 wetting of the backfill or when it is required, such as when the trench box is removed. The above will invariably cause backfill settlement in the next few years.

6.6 **Pavement Design**

The recommended pavement design for the commercial/industrial local and collector roads for the proposed development is presented in Table 4.

Table 4 - Pavement Design for Local and Collector Road

Course	Thickness (mm)	OPS Specifications
Asphalt Surface	50	HL4
Asphalt Binder	60	HL8
Granular Base Local Industrial Collector Industrial	 150 200	Granular 'A'
Granular Sub-base	450	Granular 'B', Type II

The driveway entrance for the commercial and industrial development are shown in Table 5.

Table 5 - Pavement Design for Driveway

Course	Thickness (mm)	OPS Specifications
Asphalt Surface	50	HL3
Asphalt Binder	60	HL8
Granular Base	150	Granular 'A'
Granular Sub-base	450	Granular 'B', Type II

After fine grading, the pavement subgrade should be inspected and proof-rolled. Any soft spots identified should be subexcavated and replaced by properly compacted inorganic earth fill. The subgrade within the 1.0 m zone below the underside of the granular base should be compacted to at least 98% SPDD with the moisture content 2% to 3% drier than the optimum. All the granular bases should be compacted to their maximum SPDD.

All the granular bases should be compacted in 150 to 200 mm lifts to 100% SPDD. The area around the pavement should be graded to direct surface runoffs away from the paved area.

The pavement 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:

- The subgrade should be properly crowned and smooth-rolled to allow interim precipitation to be properly drained prior to pavement construction.
- 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.

- Fabric filter-encased curb subdrains connecting to a positive outlet of catch basin, will be required on both sides of the roadway.

Within the parking lot of the proposed buildings, along the perimeter where surface runoff may drain onto the pavement, an intercept subdrain system should be installed to prevent infiltrating precipitation from seeping into the granular bases (since this may inflict frost damage on the flexible pavement). The subdrains should consist of filter-wrapped weepers, and they should be connected to the catch basins or storm manholes in the paved areas. Catch basins with stub drains in all four directions should also be provided. The invert of the subdrains should be at least 0.3 m beneath the underside of the granular sub-base and backfilled with free-draining granular material.

6.7 Soil Parameters

The recommended soil parameters for the project design are given in Table 6:

Table 6 - Soil Parameters

Unit Weight and Bulk Factor	**Unit Weight γ (kN/m^3)**		**Estimated Bulk Factor**	
	Bulk	**Submerged**	**Loose**	**Compacted**
Sandy Silt Till/Silty Sand Till	22.5	12.5	1.25	1.03
Silt	20.5	10.5	1.20	1.00
Sand	20.5	10.5	1.25	0.98

Lateral Earth Pressure Coefficients	**Active K_a**	**At Rest K_o**	**Passive K_p**
Sandy Silt Till/Silty Sand Till/Sand	0.30	0.40	3.33
Silt	0.33	0.43	3.00

Coefficient of Permeability (K) and Percolation Time (T)	**K (cm/sec)**	**T (min/cm)**
Sandy Silt Till/Silty Sand Till	10^{-5} to 10^{-6}	20 to 50
Silt	10^{-4} to 10^{-5}	12 to 20
Sand	10^{-3}	8

Table 6 - Soil Parameters (Cont’d)

Effective Shear Strength Parameters	**Cohesion c’ (kPa)**	**Angle of Internal Friction, ϕ’**
Sandy Silt Till/Silty Sand Till	2	31°
Silt	0	30°
Sand	0	33°
Estimated Electrical Resistivity (ohm·cm)		
Sandy Silt Till/Silty Sand Till/Silt		5000
Sand		6500
Coefficients of Friction		
Between Concrete and Granular Base		0.50
Between Concrete and Sound Native Soils		0.35

6.8 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91. The types of soils are classified in Table 7.

Table 7 - Classification of Soils for Excavation

Material	Type
Sound Tills	2
Weathered Tills, Drained Sand and Silt	3
Saturated Sand and Silt	4

In the tills deposit, any perched groundwater yield can be collected and removed by conventional pumping from sumps. Water seepage can be expected from the wet silt and sand. The groundwater seepage in the silt and sand below groundwater can be controlled by pumping from closely spaced sump pits, or if necessary, the use of well point dewatering system.

Prospective contractors must be asked to assess the in situ subsurface conditions for soil cuts by digging test pits to 1.0 m below the anticipated depth of excavation. These test pits should be allowed to remain open for a few hours to assess the trenching conditions.

6.9 Further Investigation

Further investigation may be required to confirm the recommendations given in this report when the grading plans and the proposed building layouts are available. In addition, deeper boreholes may be required if the invert of the underground services will be deeper than the depth of the present investigation.

7.0 LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of Fieldgate Properties Limited, and for review by the designated consultants, financial institutions and government agencies. The material in the report reflects the judgement of Sze Wing Yu, B.Eng. and Kelvin Hung, 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.

SOIL ENGINEERS LTD.

Sze Wing Yu, B.Eng.

Kelvin Hung, P.Eng.
SY/KH

LICENSED PROFESSIONAL ENGINEER
11/13/25
K. W. K. HUNG
100124295
KH
PROVINCE OF ONTARIO

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

Standard Penetration Resistance or 'N' Value:

The number of blows of a 63.5 kg hammer falling from a height of 76 cm required to advance a 51 mm outer diameter drive open sampler 30 cm into undisturbed soil, after an initial penetration of 15 cm.

Plotted as '○'

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows per each 30 cm of penetration of a 51 mm diameter, 90° point cone driven by a 63.5 kg hammer falling from a height of 76 cm.

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/30 cm)	Compactness
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
> 50	very dense

Cohesive Soils:

Undrained Shear Strength (kPa)	'N' (blows/30 cm)	Consistency
<12	<2	very soft
12 to <25	2 to <4	soft
25 to <50	4 to <8	firm
50 to <100	8 to <15	stiff
100 to 200	15 to 30	very stiff
>200	>30	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

METRIC CONVERSION FACTORS

1 ft = 0.3048 m
1 inch = 25.4 mm
1 lb = 0.454 kg
1 ksf = 47.88 kPa

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE

JOB NO.: 2507-S060

LOG OF BOREHOLE: 1

FIGURE NO.: 1

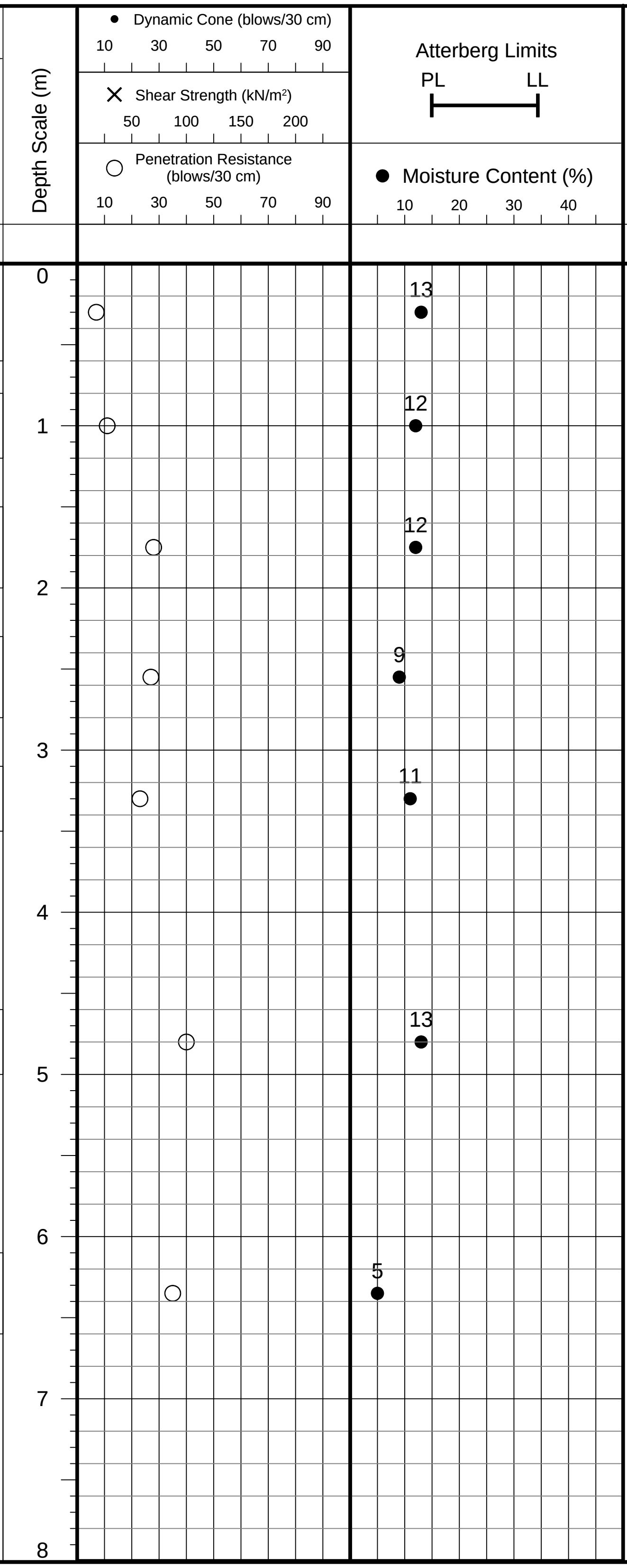
PROJECT DESCRIPTION: Proposed Commercial/Industrial Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 2809 Townline Road, Township of Puslinch

DRILLING DATE: July 22, 2025

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	WATER LEVEL
310.4	Ground Surface				
0.0	**18 cm TOPSOIL**				
	Brown, loose to dense **SANDY SILT TILL** traces of clay and gravel weathered	1	DO	7	Dry on completion
		2	DO	11	
		3	DO	28	
		4	DO	27	
		5	DO	23	
305.8 4.6	Brown, dense **SILT** traces of clay and sand	6	DO	40	
304.3 6.1	Brown, dense **SAND** fine to medium grained, a trace of gravel	7	DO	35	
303.8 6.6	**END OF BOREHOLE**				



Soil Engineers Ltd.

Page: 1 of 1

JOB NO.: 2507-S060

LOG OF BOREHOLE: 2

FIGURE NO.: 2

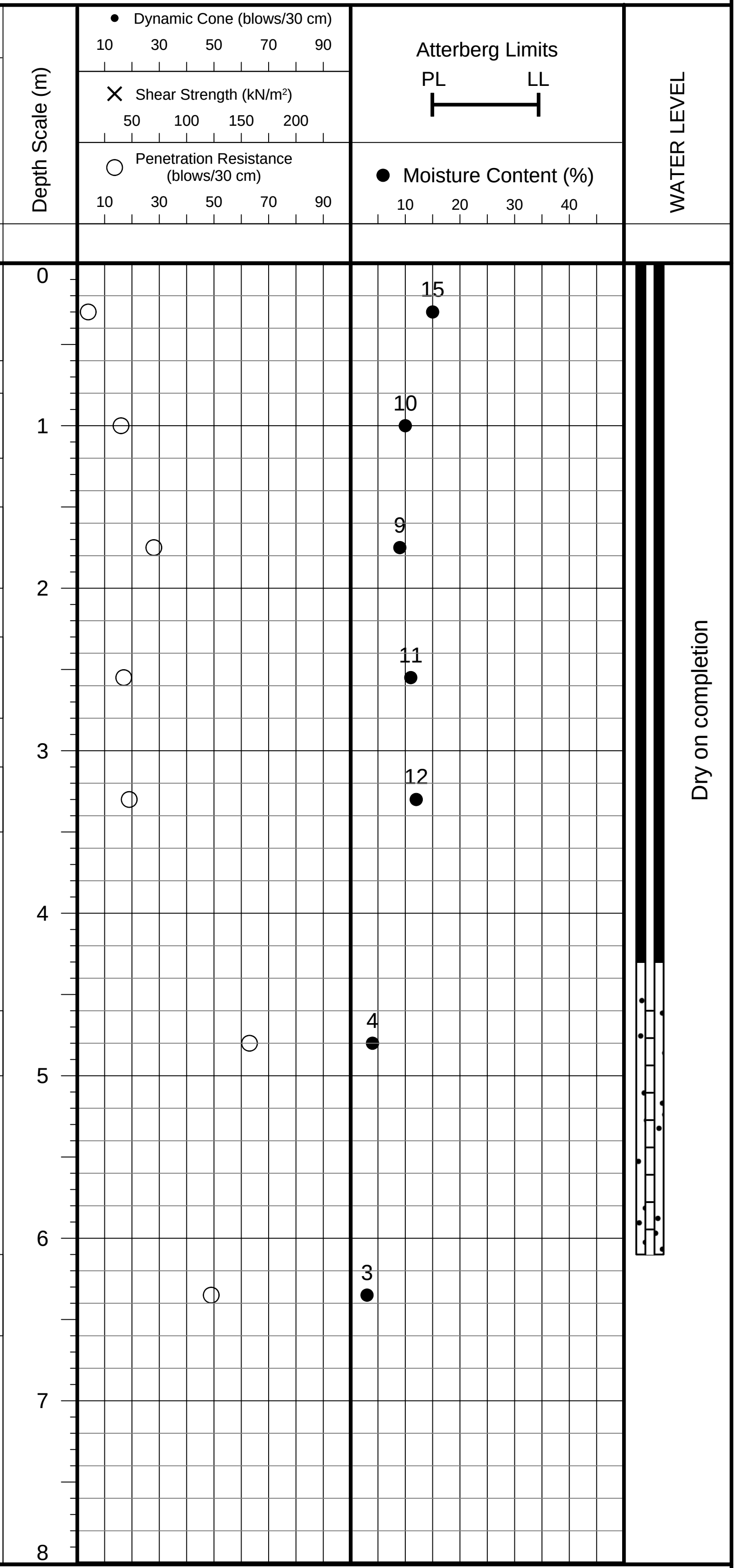
PROJECT DESCRIPTION: Proposed Commercial/Industrial Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 2809 Townline Road, Township of Puslinch

DRILLING DATE: July 22, 2025

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
309.5	Ground Surface			
0.0	**36 cm TOPSOIL**	1	DO	4
	Brown, loose to compact **SAND** fine grained, silty a trace of gravel weathered			
		2	DO	16
		3	DO	28
307.2 2.3	Brown, compact **SILTY SAND TILL** some gravel a trace of clay	4	DO	17
		5	DO	19
304.9 4.6	Brown, dense to very dense **SAND** fine to coarse grained a trace of gravel	6	DO	63
		7	DO	49
302.9 6.6	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.1 m completed with 1.5 m screen Sand backfill from 4.3 to 6.1 m Bentonite seal from 0.0 m to 4.3 m Provided with a momument steel casing			



JOB NO.: 2507-S060

LOG OF BOREHOLE: 3

FIGURE NO.: 3

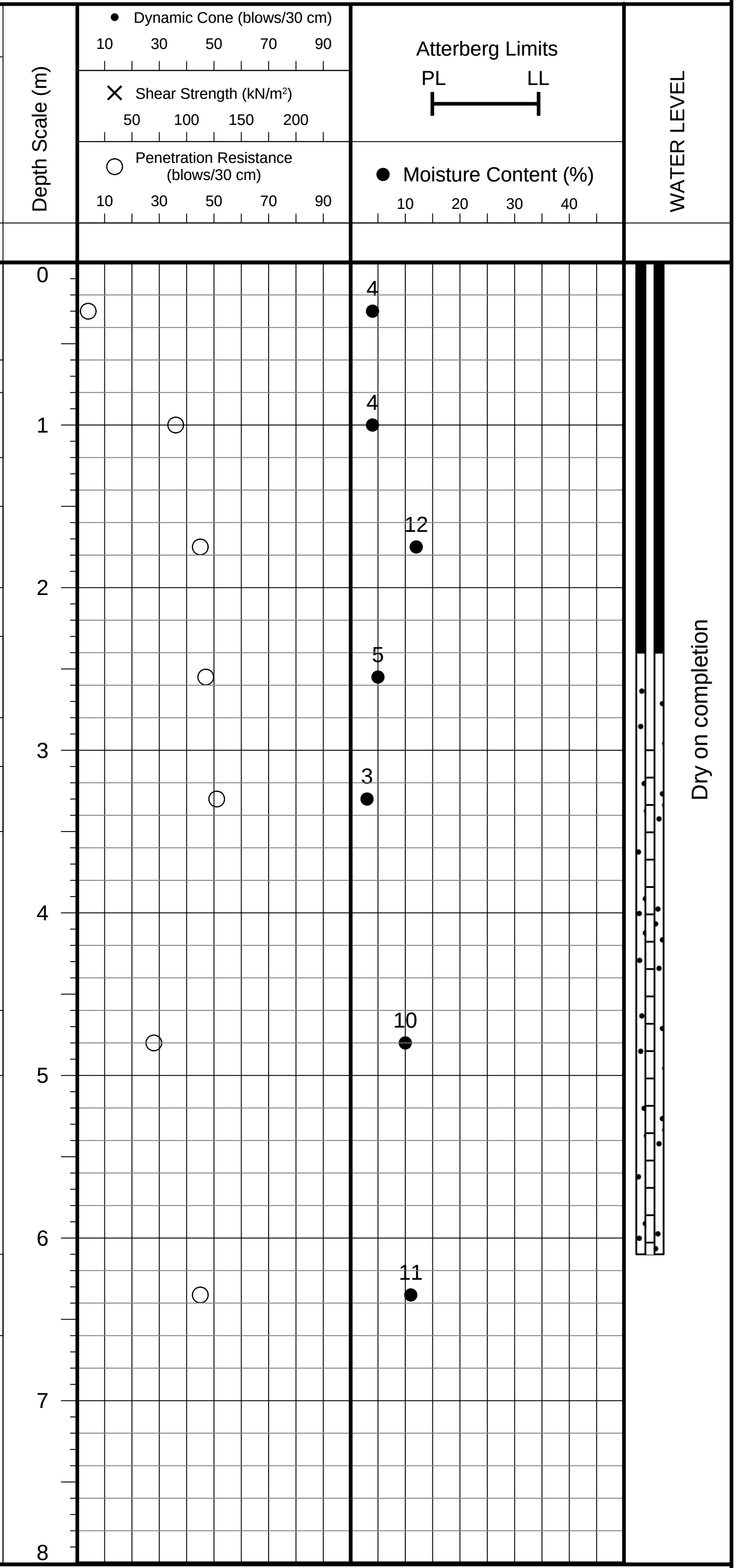
PROJECT DESCRIPTION: Proposed Commercial/Industrial Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 2809 Townline Road, Township of Puslinch

DRILLING DATE: July 22, 2025

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
311.7	Ground Surface			
0.0	**36 cm TOPSOIL**	1	DO	4
	Brown, loose to very dense **SAND** fine grained, silty occ. cobbles and boulders weathered	2	DO	36
		3	DO	45
		4	DO	47
		5	DO	51
307.1 4.6	Brown, compact to dense **SILTY SAND TILL** some gravel a trace of clay	6	DO	28
		7	DO	45
305.1 6.6	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.1 m completed with 3.1 m screen Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 m to 2.4 m Provided with a momument steel casing			



Soil Engineers Ltd.

JOB NO.: 2507-S060

LOG OF BOREHOLE: 4

FIGURE NO.: 4

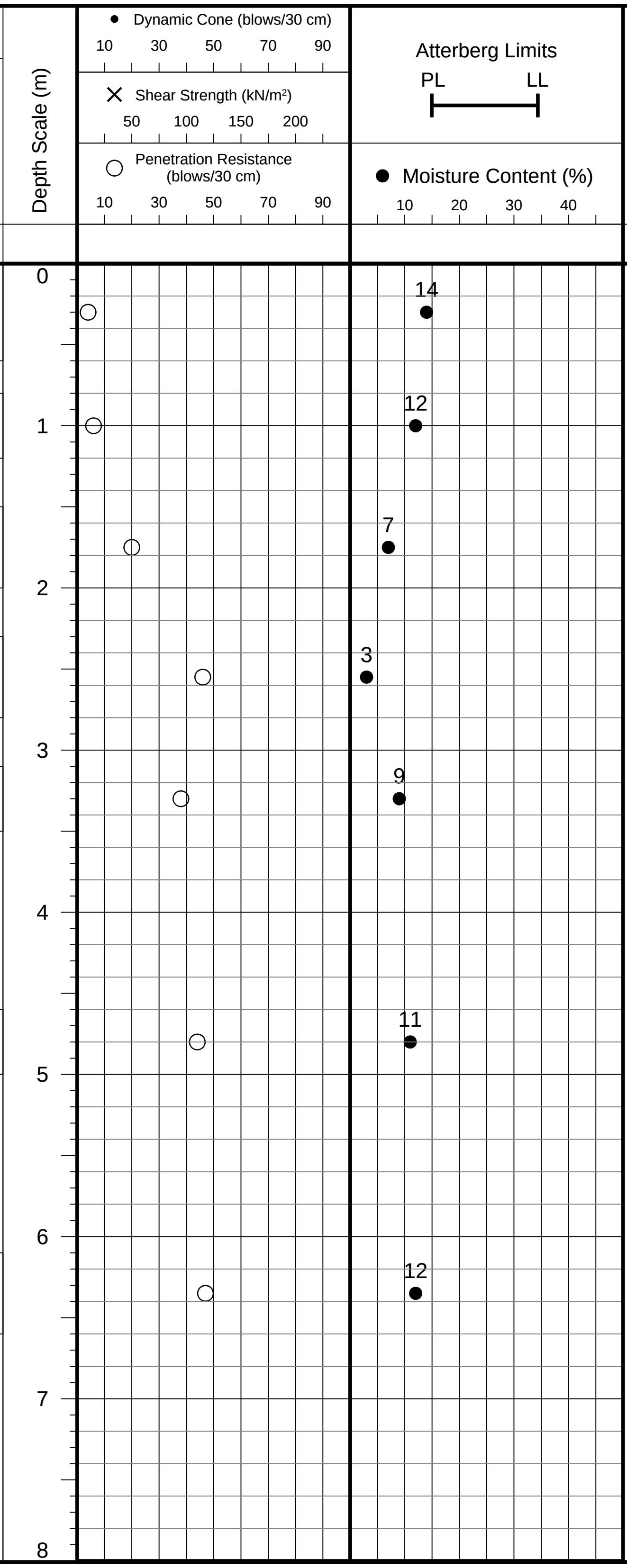
PROJECT DESCRIPTION: Proposed Commercial/Industrial Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 2809 Townline Road, Township of Puslinch

DRILLING DATE: July 22, 2025

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	WATER LEVEL
311.2	Ground Surface				
0.0	**25 cm TOPSOIL**				
	Brown, loose to dense **SAND** fine to medium grained a trace of gravel weathered	1	DO	4	Dry on completion
		2	DO	6	
		3	DO	20	
		4	DO	46	
308.1 3.1	Brown, dense **SANDY SILT TILL** traces of clay and gravel occ. clay seams	5	DO	38	
		6	DO	44	
		7	DO	47	
304.6 6.6	**END OF BOREHOLE**				



Soil Engineers Ltd.

JOB NO.: 2507-S060

LOG OF BOREHOLE: 5

FIGURE NO.: 5

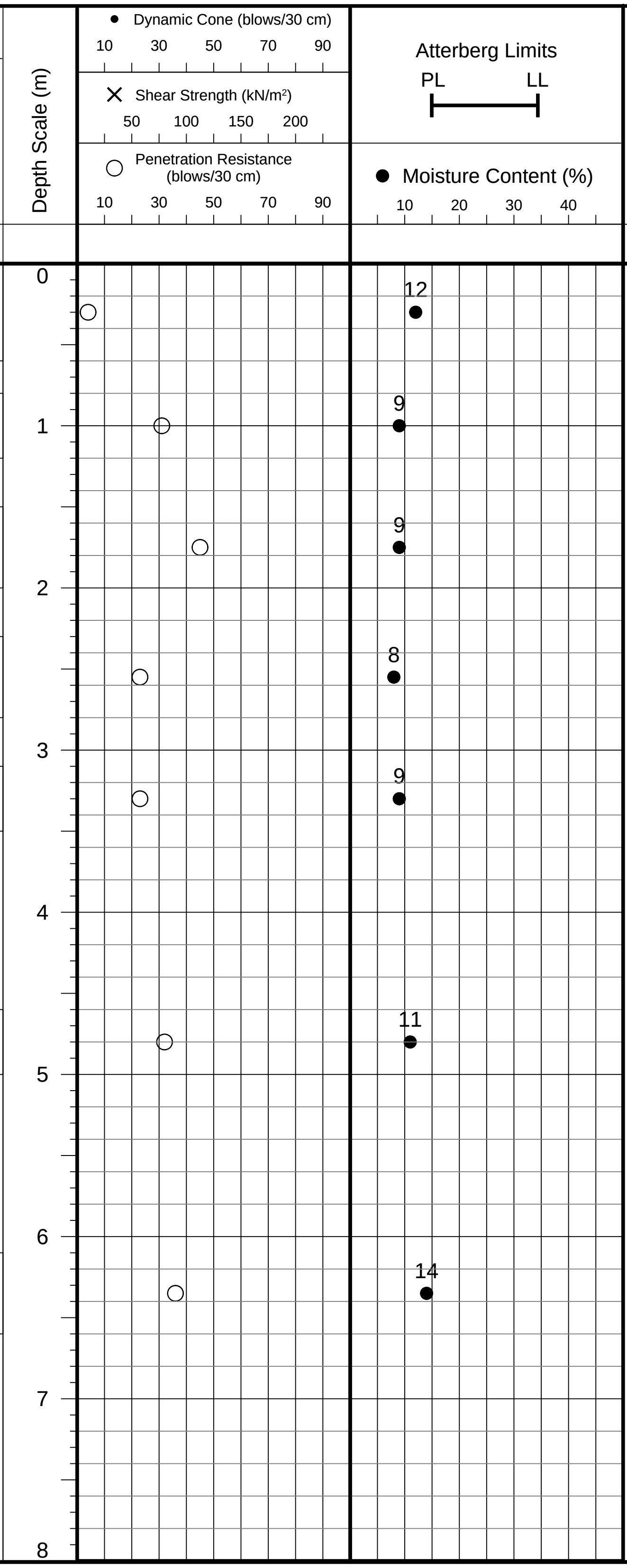
PROJECT DESCRIPTION: Proposed Commercial/Industrial Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 2809 Townline Road, Township of Puslinch

DRILLING DATE: July 21, 2025

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	WATER LEVEL
315.3 0.0	Ground Surface **25 cm TOPSOIL**				
	Brown, loose to dense **SANDY SILT TILL** traces of clay and gravel occ. cobbles and boulders weathered	1	DO	4	Dry on completion
		2	DO	31	
		3	DO	45	
		4	DO	23	
		5	DO	23	
		6	DO	32	
		7	DO	36	
308.7 6.6	**END OF BOREHOLE**				



JOB NO.: 2507-S060

LOG OF BOREHOLE: 6

FIGURE NO.: 6

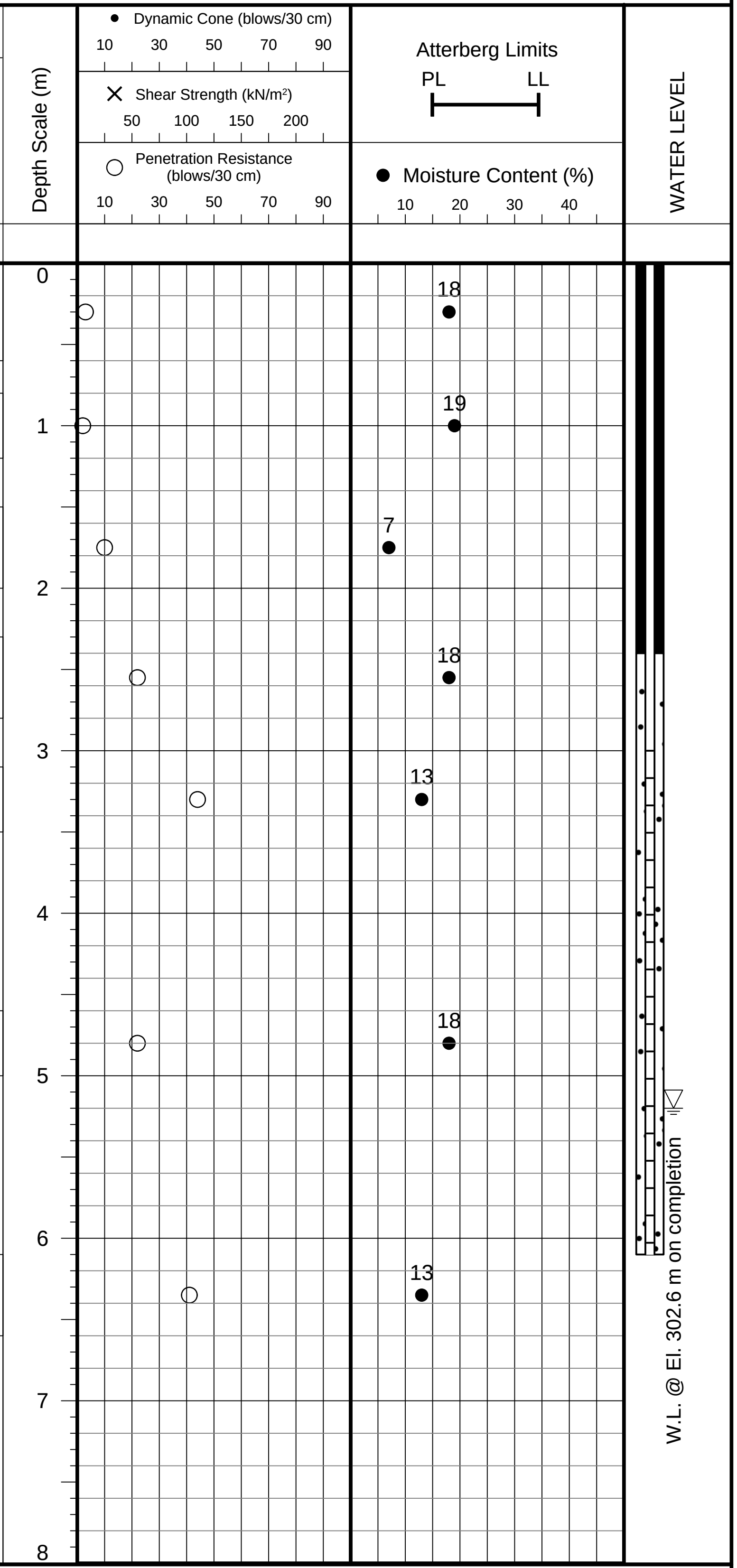
PROJECT DESCRIPTION: Proposed Commercial/Industrial Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 2809 Townline Road, Township of Puslinch

DRILLING DATE: July 21, 2025

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
307.8	Ground Surface			
0.0	**33 cm TOPSOIL**			
	Brown, very loose to dense **SANDY SILT TILL** traces of clay and gravel	1	DO	3
	weathered	2	DO	2
		3	DO	10
	sand layer	4	DO	22
		5	DO	44
303.2 4.6	Brown, compact, wet **SILT** traces of clay and sand	6	DO	22
301.7 6.1	Brown, dense, wet **SAND** fine to medium grained traces of cobbles and gravels	7	DO	41
301.2 6.6				



END OF BOREHOLE

Installed 50 mm Ø monitoring well to 6.1 m
completed with 3.1 m screen
Sand backfill from 2.4 to 6.1 m
Bentonite seal from 0.0 m to 2.4 m
Provided with a momument steel casing

Soil Engineers Ltd.

JOB NO.: 2507-S060

LOG OF BOREHOLE: 7

FIGURE NO.: 7

PROJECT DESCRIPTION: Proposed Commercial/Industrial Development

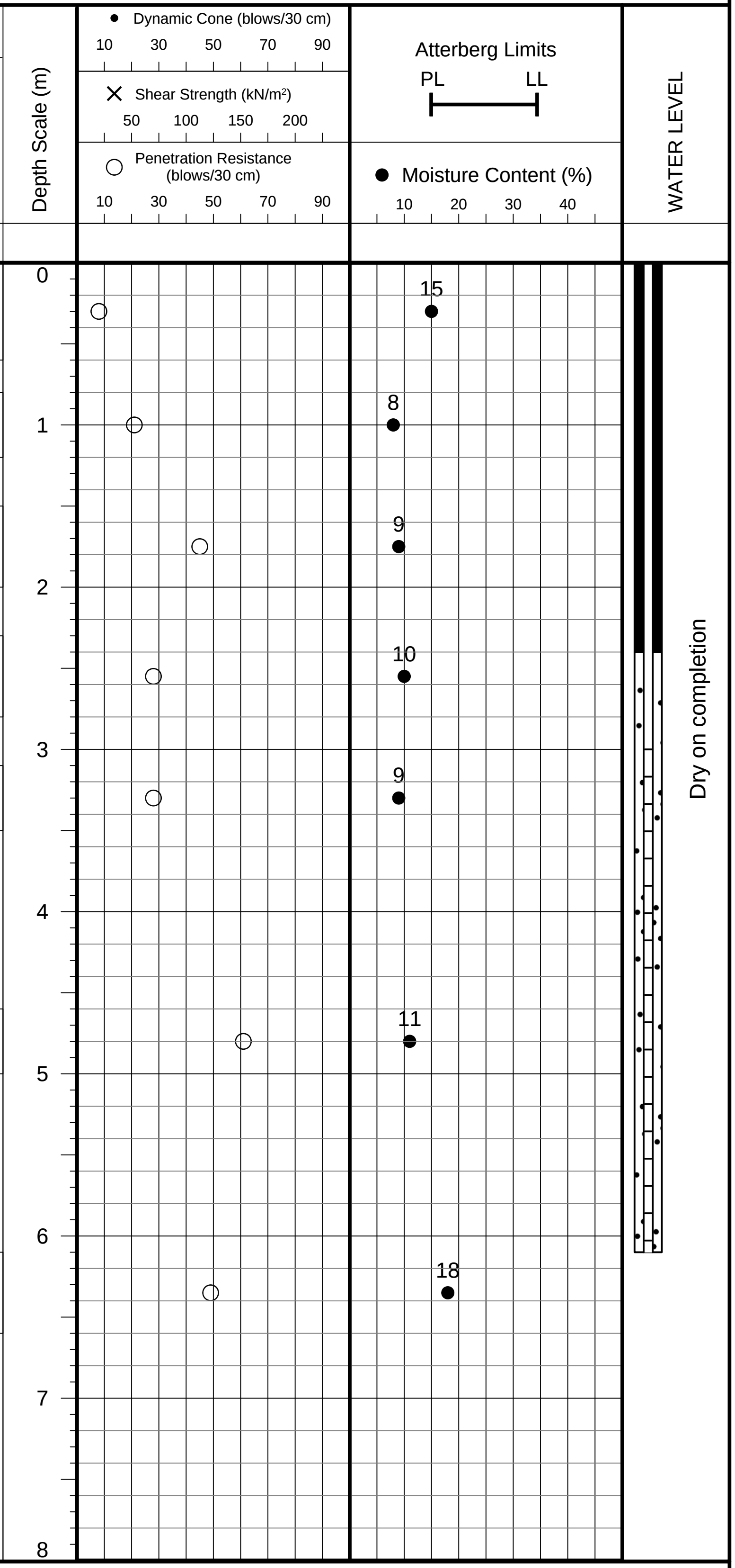
METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 2809 Townline Road, Township of Puslinch

DRILLING DATE: July 21, 2025

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
315.2	Ground Surface			
0.0	**15 cm TOPSOIL**			
	Brown, loose to dense **SILT** sandy a trace of clay weathered	1	DO	8
		2	DO	21
		3	DO	45
		4	DO	28
312.1 3.1	Brown, compact to very dense **SANDY SILT TILL** traces of clay and gravel	5	DO	28
		6	DO	61
309.1 6.1	Brown, dense, wet **SILT** sandy, a trace of clay	7	DO	49
308.6 6.6	**END OF BOREHOLE**			

Installed 50 mm Ø monitoring well to 6.1 m
completed with 3.1 m screen
Sand backfill from 2.4 to 6.1 m
Bentonite seal from 0.0 m to 2.4 m
Provided with a momument steel casing



JOB NO.: 2507-S060

LOG OF BOREHOLE: 8

FIGURE NO.: 8

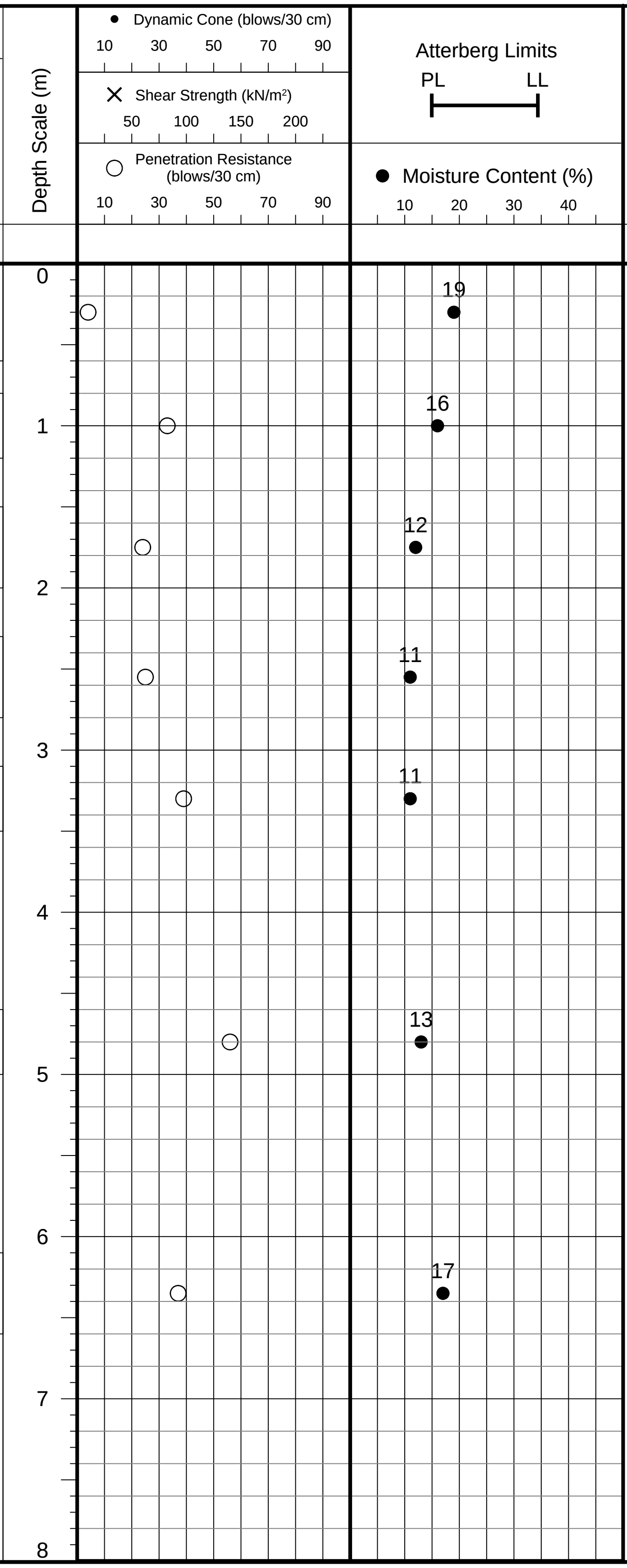
PROJECT DESCRIPTION: Proposed Commercial/Industrial Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 2809 Townline Road, Township of Puslinch

DRILLING DATE: July 21, 2025

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
307.8	Ground Surface			
0.0	**28 cm TOPSOIL**			
	Brown, loose to dense **SANDY SILT TILL** some clay a trace of gravel weathered	1	DO	4
		2	DO	33
306.3 1.5	Brown, compact **SAND** fine to coarse grained gravelly, some silt	3	DO	24
305.5 2.3	Brown, compact to dense **SANDY SILT TILL** some clay a trace of gravel	4	DO	25
		5	DO	39
303.2 4.6	Brown, dense to very dense, wet **SILT** sandy a trace of clay	6	DO	56
		7	DO	37
301.2 6.6	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 306.4 m on completion ∇

JOB NO.: 2507-S060

LOG OF BOREHOLE: 9

FIGURE NO.: 9

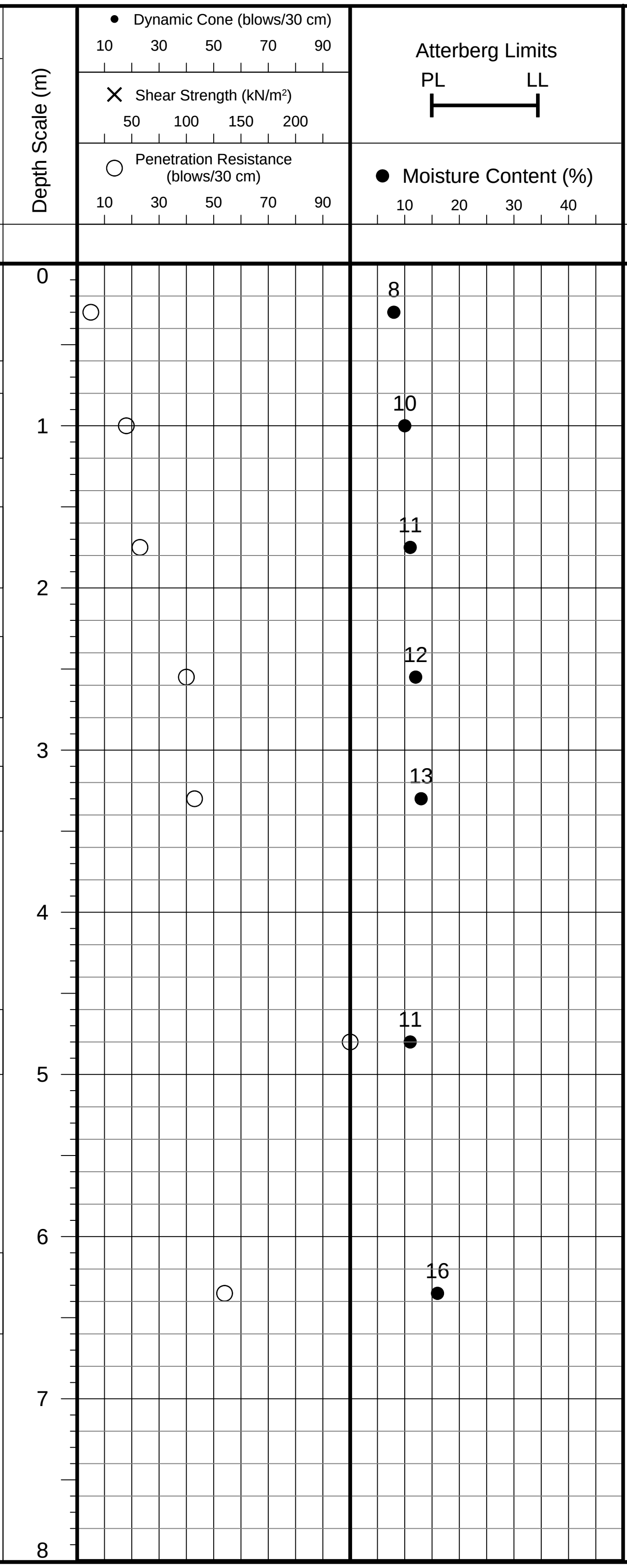
PROJECT DESCRIPTION: Proposed Commercial/Industrial Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 2809 Townline Road, Township of Puslinch

DRILLING DATE: July 21, 2025

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	WATER LEVEL
313.5	Ground Surface				Dry on completion
0.0	**33 cm TOPSOIL**	1	DO	5	
	Brown, loose to very dense **SILT** sandy a trace of clay wet below 6.0 m weathered	2	DO	18	
		3	DO	23	
		4	DO	40	
		5	DO	43	
		6	DO	78/13	
		7	DO	54	
306.9 6.6	**END OF BOREHOLE**				



Soil Engineers Ltd.

Page: 1 of 1

JOB NO.: 2507-S060

LOG OF BOREHOLE: 10

FIGURE NO.: 10

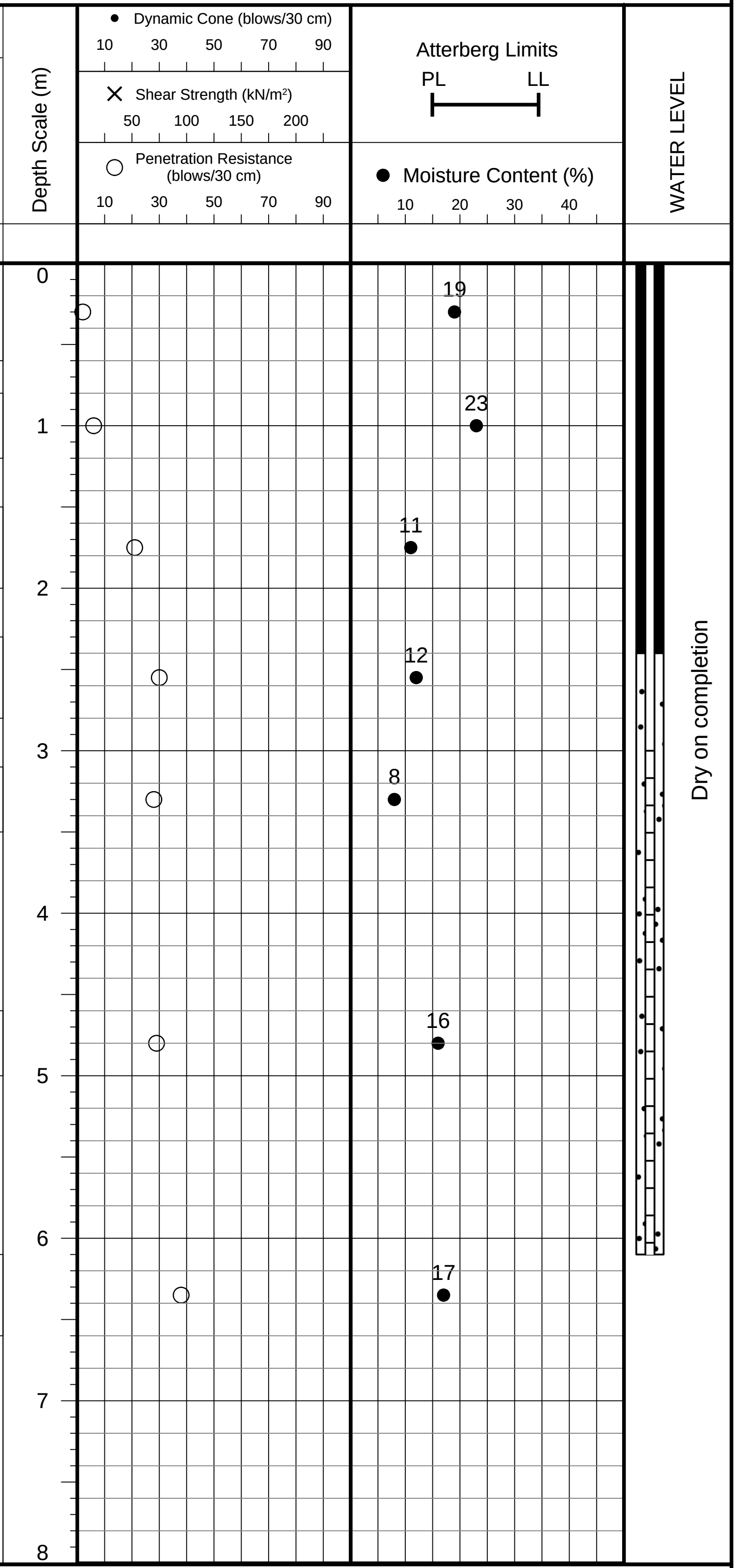
PROJECT DESCRIPTION: Proposed Commercial/Industrial Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 2809 Townline Road, Township of Puslinch

DRILLING DATE: July 21, 2025

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
311.4	Ground Surface			
0.0	**25 cm TOPSOIL**			
	Brown, loose to compact **SANDY SILT TILL** traces of clay and gravel occ. cobbles and boulders	1	DO	2
		2	DO	6
	weathered			
		3	DO	21
		4	DO	30
		5	DO	28
306.8 4.6	Brown, compact to dense, wet **SILT** traces of clay and sand	6	DO	29
		7	DO	38
304.8 6.6	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.1 m completed with 3.1 m screen Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 m to 2.4 m Provided with a momument steel casing			

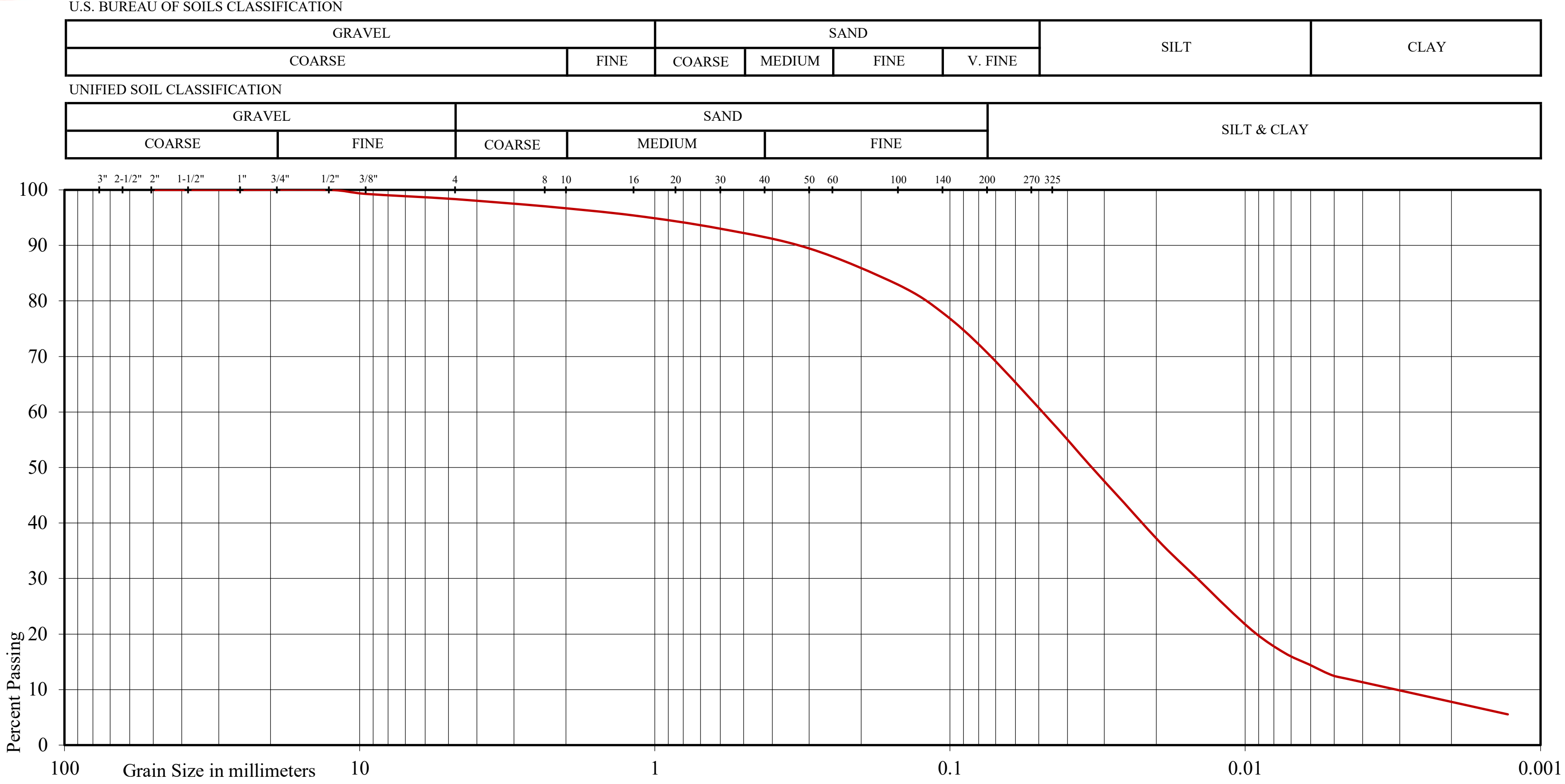


Soil Engineers Ltd.

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2507-S060



Project: Proposed Commercial/Industrial Development

Location: 2809 Townline Road, Township of Puslinch

BH./Sa. 5/7

Liquid Limit (%) = -

Borehole No: 5

Plastic Limit (%) = -

Sample No: 7

Plasticity Index (%) = -

Depth (m): 6.4

Moisture Content (%) = 14

Elevation (m): 308.9

Estimated Permeability (cm./sec.) = 10^{-5}

Classification of Sample [& Group Symbol]: SANDY SILT TILL

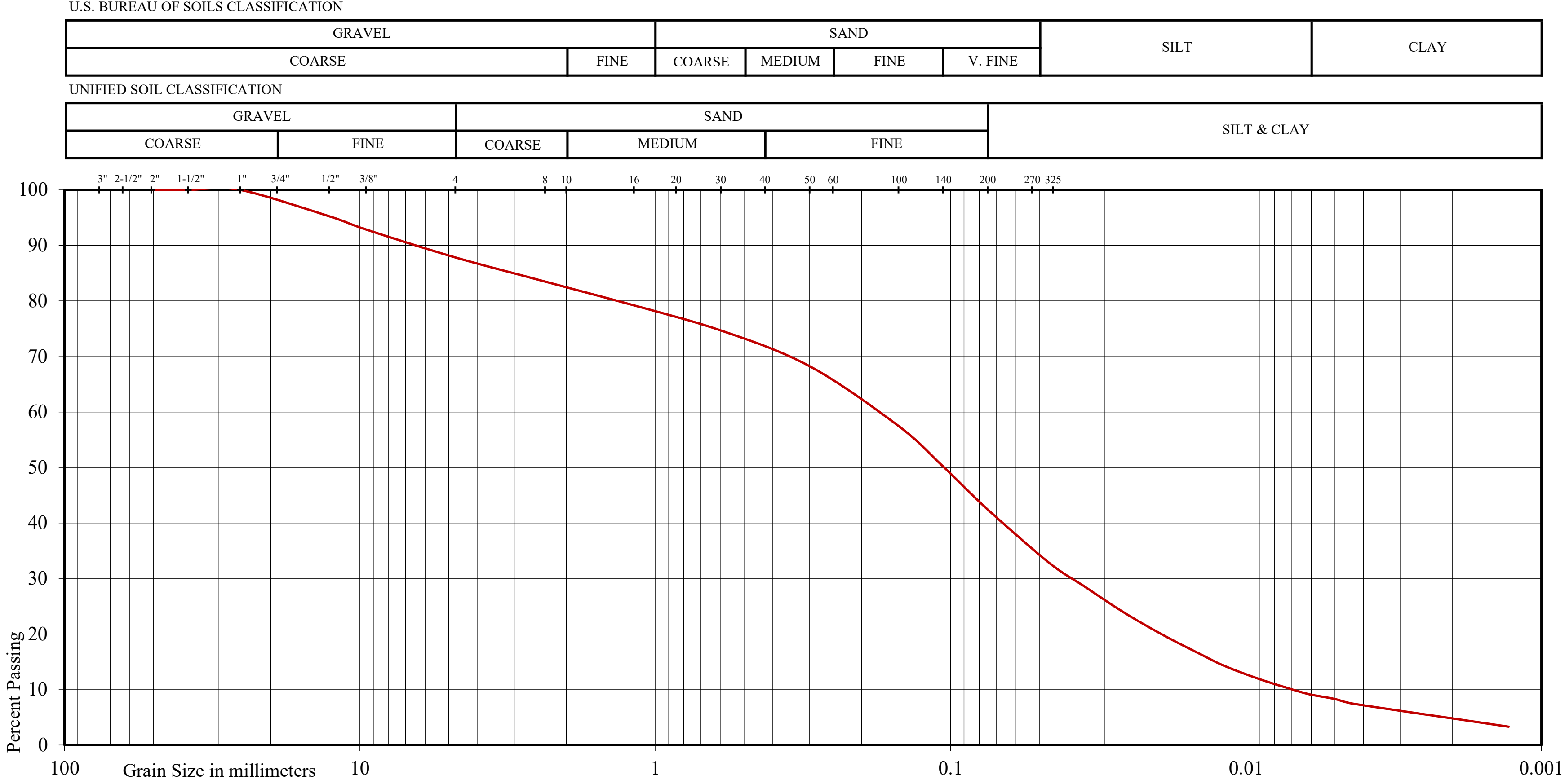
traces of clay and gravel

Figure: 11

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2507-S060



Project: Proposed Commercial/Industrial Development

Location: 2809 Townline Road, Township of Puslinch

BH./Sa. 2/4

Liquid Limit (%) = -

Borehole No: 2

Plastic Limit (%) = -

Sample No: 4

Plasticity Index (%) = -

Depth (m): 2.6

Moisture Content (%) = 11

Elevation (m): 306.9

Estimated Permeability (cm./sec.) = 10^{-5}

Classification of Sample [& Group Symbol]: SILTY SAND TILL

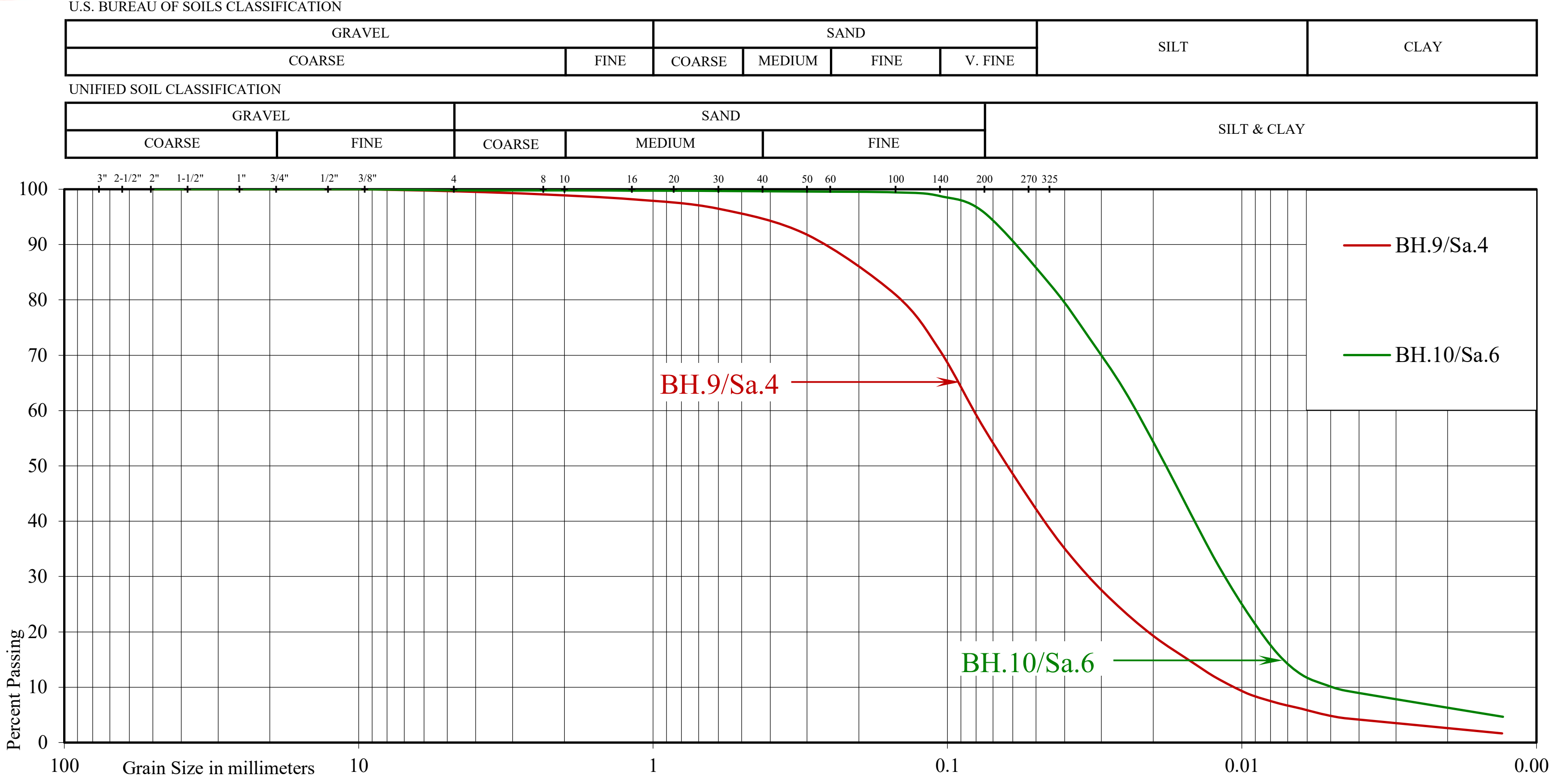
some gravel, a trace of clay

Figure: 12

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2507-S060



Project: Proposed Commercial/Industrial Development

Location: 2809 Townline Road, Township of Puslinch

Borehole No:	9	10
Sample No:	4	6
Depth (m):	2.6	4.8
Elevation (m):	310.9	306.6

BH./Sa.	9/4	10/6
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	12	16
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-5}

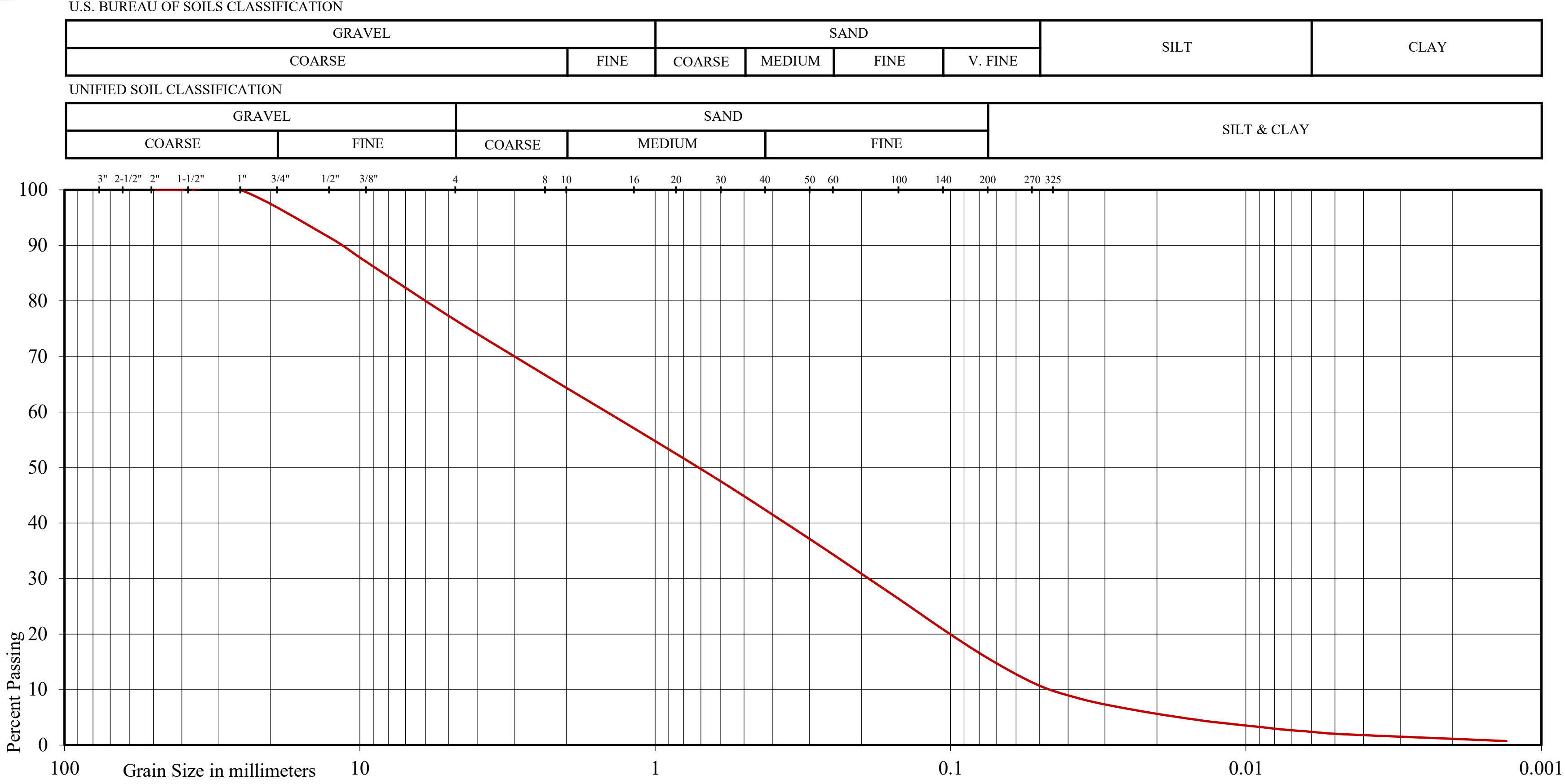
Classification of Sample [& Group Symbol]: SILT
a trace of sand to sandy, a trace of clay

Figure: 13

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2507-S060



Project: Proposed Commercial/Industrial Development

Location: 2809 Townline Road, Township of Puslinch

BH./Sa. 8/3

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

Moisture Content (%) = 12

Estimated Permeability (cm./sec.) = 10^{-3}

Borehole No: 8

Sample No: 3

Depth (m): 1.8

Elevation (m): 306.0

Classification of Sample [& Group Symbol]: SAND

fine to coarse grained, gravelly, some silt, a trace of clay

Figure: 14

LEGEND

- Borehole location

- Borehole with monitoring well

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 AND MONITORING WELL LOCATION PLAN

SITE: 2809 Townline Road, Township of Puslinch

DESIGNED BY: -
CHECKED BY: -
DWG NO.: 1
SCALE: 1:5000
REF. NO.: 2507-S060
DATE: July 2025
REV -

Soil Engineers Ltd.

CONSULTING ENGINEERS

GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE

SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

JOB NO.: 2507-S060
REPORT DATE: July 2025
PROJECT DESCRIPTION: Proposed Commercial/Industrial Development
PROJECT LOCATION: 2809 Townline Road, Township of Puslinch

LEGEND

▨ TOPSOIL
▨ SILTY SAND TILL
▨ SANDY SILT TILL
▨ SILT
▨ SAND
▽ WATER LEVEL (END OF DRILLING)